Environmental Assessment
Heart of Palm Project

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

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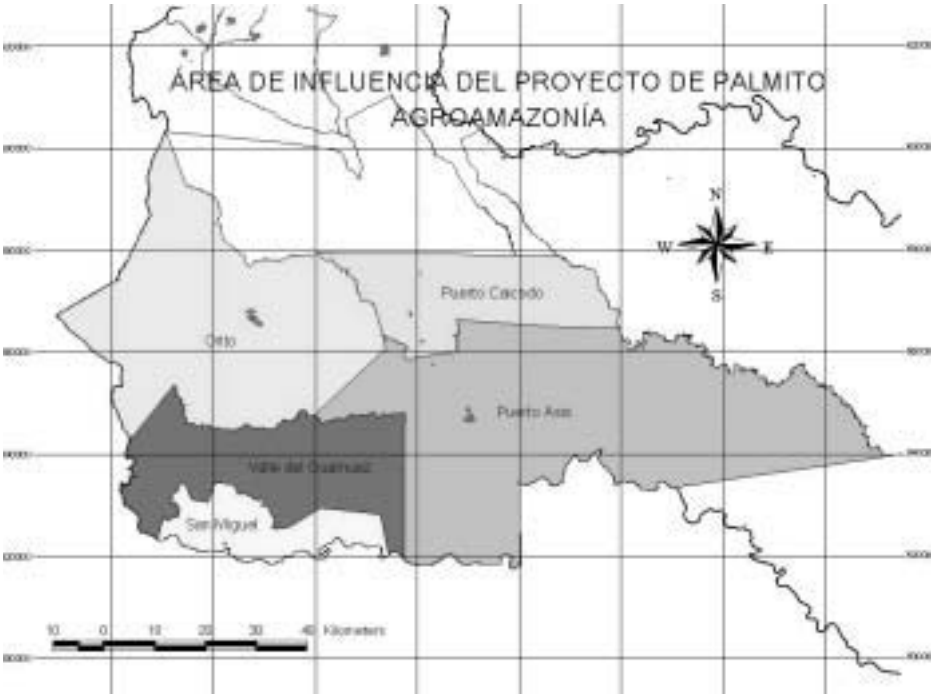
ENVIRONMENTAL ASSESSMENT (EA)

PROJECT NAME: HEART OF PALM PROJECT



TRES ELEMENTOS Ltda.
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May 2003

ENVIRONMENTAL ASSESSMENT OF THE HEART OF PALM (HEART OF PALM) PROJECT IN THE DEPARTMENT OF PUTUMAYO - COLOMBIA

SECTION 1 EXECUTIVE SUMMARY

1.1. Environmental Assessment

1.1.1. General description of the project.

The Heart of Palm Project in the Putumayo Department is located in municipalities that are mostly in the Amazon foothills, in the region known as Putumayo Medio. The municipalities of Mocoa, Villa Garzon, Puerto Caicedo, Puerto Asis, Orito, Valle de Guamuez and San Miguel belong to Putumayo Medio. The project is implemented in the latter five towns, the total surface area of which is approximately 6,726 Km^2 and amounts to 26% of the total area of the Putumayo Department.

It is in these towns that the largest areas of coca crops in Putumayo are centered and, therefore, they are a central objective of the policies and activities involved in the fight against drugs, for both interdiction and forced eradication (fumigation), as well as alternative development. This latter strategy is the framework for the Heart of Palm Project.

The Heart of Palm Project is divided into two different types of programs, the first is the agricultural program, in which the Chontaduro Palm (*Bactris gasipaes*) is being planted in different zones of the five municipalities, as alternative crops to coca (See Map-1, pag. 35.). The second industrial program gathers, processes and markets the Heart of Palm produced by the agricultural program.

The Heart of Palm processing plant is located in the municipality of Puerto Asis, approximately 5 Km to the north of the city limits of the town, on the road to Mocoa, the Departmental capital (See Map-2, pag. 36).

The Project's purpose is to develop the cultivation of Chontaduro palm for its heart - reason why it is called Heart of Palm- , with the rural people who participate in the coca eradication programs and are associated in local or municipal groups. These associations of producers are, in turn, partners of the Project, in both the agricultural and the industrial components. The latter is responsible for processing the product, packaging in cans or glass jars and marketing it to supermarket chains and institutional consumers on the national market.

Even when the chontaduro cultivations were established for the first time towards 1998, in a total area of 120 hectares and in the following years planting continued, for different reasons, the area in production or in the process of ripening is at present considerably lower.

According to the processing company - AGROAMAZONIA –, in information obtained from its Annual Operative Plan (AOP) during the visit to the processing Plant, it had an installed capacity equivalent to 18,000 hearts per 8 hour shift; that is, if an average of 20 days a month were worked, the installed capacity in one shift would be equivalent to 4,320,000 hearts per year.

The 60 hectares which are at present in production would be equivalent to a maximum supply of 330,000 hearts per year, that is, the maximum capacity used would be 7.63% of the installed capacity. In 2004, supposing that planting fulfills all the program's expectations, the supply of hearts would be approximately 3,971,000 hearts, that is 92% of the installed capacity[1].

The bio-physical conditions of Putumayo are under considerable restrictions for the development of traditional agricultural and livestock activities. The majority of the land in the region is poor and has high acidity levels, which limits the cultivation of many species or make it expensive. The chontaduro palm appears to be better adapted to the conditions in Putumayo than many other plants, but nevertheless, even the best soils of the region need programs of correction of the soils and fertilization to ensure adequate plant development.

Other soils have severe restrictions for the development of the Heart of Palm cultivations, but these, together with the reforestation programs, could represent an opportunity to recover some poor areas, especially in the hilly areas of a large part of the so-called denuded areas.

1.1.2. Commitments assumed.

The Project has been approved by the Amazon Environmental Authority - Corpoamazonia – by Resolution 0859 of October 14, 1999, and by the Waters Discharge and Use Concession under Resolution 0457 of June 2, 2000.

An element of the Project which should be highlighted is that pest and disease control in the plantations do not include the use of pesticides with active principals prohibited or restricted by Colombian or United States legal regulations. Even so, it was discovered that one of the farmers associated with the project is using the herbicide, gramoxone, whose use is restricted under USAID. Its use has since been stopped.

[1] According to information of the AOP, from the inauguration of the plant on May 28, 2001, to the month of February 2002, 1,797 boxes of Heart of Palm were processed, with a total of 124,530 hearts. This is equivalent to saying that, with the installed capacity available, the plant operated only 7 shifts of 8 hours in 9 months.

1.2. Environmental Assessment Report

1.2.1. Methodology

In the first place, three types of Forms were designed for revision in the field, the first of which was for the Project as a whole, based on its general description, the general characteristics of the area of influence and the surroundings in which the different agricultural and industrial activities took place. The second and third Forms were for the specific findings in the field for each of the components of the project. Filling in Environmental Revision Forms was complemented by notes on direct observations, interviews with people involved in the project and photographic records.

It is important to note that the environmental revision of the project refers exclusively to its present development situation and not to possible expansions or changes in productive activities. However, certain notes have been made regarding the measures which should be introduced in the event of growth or additional activities.

Two Evaluation Assessment Matrices were constructed for the two components of the project, namely the agricultural and the industrial pahses, based on data card contents and information records from the field, following the Leopold[2] methodology. These Matrices were constructed with rows signifying the Environmental Factors (or realms of the environment) that can be caused by the Project and the columns signifying the different actions (productive processing, water management, waste production, among many others) that could cause an impact. For each of the intersecting cells resulting from the criss-crossing of an Environmental Factor affected and an Affecting Action, the impact is qualified by its Magnitude (M) and Intensity (I). The Magnitude refers to the extent of the impact and will be graded on a scale from 1 to 10 in such a manner that an impact effecting one part or only a small area would receive a rating of 1; but if the impact covers a large area or affects a great number of people, it would receive a rating closer to 10.

If the impact is negative, that is, if it places an Environmental Factor at risk, the value assigned to the magnitude will be preceded by the minus sign (-); but if the impact has a beneficial value, that is, if it improves the Environmental Factor, the value assigned will be positive (+) in magnitude. With regard to Intensity, the rating procedure will be the same. Thus, a harmful, but low intensity action will be rated close to one, preceded by the minus (-) sign, and if it is very beneficial, it will be rated closer to 10 and be preceded by a plus (+) sign.

[2] Conesa Fdez.-Victoria. "*Guía Metodológica para la Evaluación del Impacto Ambiental"* (Methodological Guide for the Evaluation of Environmental Impact) páginas 60 y 61. Ediciones Mundi Prensa, Madrid 1997.

Table 1 Environmental Factors that can be caused by the Project

Row Identification	ENVIRONMENTAL FACTORS AFFECTED LEOPOLD MATRIX ROWS
	1) Environmental Impact on Soil Resource
1	Erosion
2	Exposed soils
3	Chemical contamination
4	Loss of Organic Matter
	2) Environmental Impact on Hydric Resource
5	Reduction of water volumes
6	Reduction of retention capacity
7	Interruption of flows (dams, diversions)
8	Agrochemical contamination
9	Chemical contamination
10	Solids contamination
11	Waste water contamination
12	Loss of moisture
13	Sedimentation of bodies of water
	3) Environmental Impact on the Biologic Resource
14	Reduction of Biodiversity
15	Change in land flora
16	Change in the land fauna
17	Change in aquatic flora
18	Change in aquatic fauna
19	Introduction of exotic species
20	Introduction of harmful species
21	Destruction or degradation of wooded areas
22	Changes in humid areas
23	Change in wild life
24	Change in landscape
	4) Environmental Impact on Air Resource
25	Generation of odors
26	Generation of smoke
27	Generation of dust
28	Generation of noise
	5) Environmental Impact on Human Health
29	Diseases due to water
30	Diseases due to agrochemicals
31	Diseases due to product manipulation
32	Use of toxic materials
33	Use of caustic materials
34	Work related diseases
	6) Environmental Impact in the socio-cultural y economic context
35	Intervention in historical zones
36	Intervention in archeological zones
37	Relocation of rural population
38	Conflicts with indigenous cultures
39	Community participation
40	Social inequalities
41	Introduction of cultivation practices distinct from local tradition
42	Changes in family income
43	Possibility of accumulation of capital
44	Other effects on economic expectations

1.2.2. Agricultural Component

The spatial distribution of the chontaduro plantations for Heart of Palm in the AGROAMAZONÍA Project is a peculiarity that should receive special treatment. The plants are sown in 294 properties, within 59 hamlets (*veredas*) in 6 municipalities.

From an environmental point of view, the dispersion of the Heart of Palm crops is advantageous, because it contributes to being a cleaner crop in that it does not use aggressive agro-chemicals, these do not concentrate in an area and in general do not cause landscape or ecosystem changes, as do other single crop plantations like the traditional Oil Palm plantations. Nevertheless, one should evaluate the cost-effective analysis of the economic sustainability of the project, since the logistics of product collection and transportation generate the need to have a relatively large number of technicians to provide technical assistant to agricultural producers in a disperse area, with the inherent difficulties in planning and controlling the plantations and the provision of inputs.

Map 3 (see page 37) shows the dispersion of the hamlets where the plantations are located, which, in spite of the strong restriction of roads in Putumayo, have a relatively abundant availability. Nonetheless, it must be remembered that the area on the plantations of Heart of Palm chontaduro only represents 0.57% of the total area of the 54 hamlets and, therefore, it is very likely that they are at a distance from roads and have additional difficulties in transporting the inputs and the end product.

Table 2 Impact Causing Activities – Agricultural Component

Column Identification	IMPACT CAUSING ACTIVITIES LEOPOLD MATRIX COLUMNS **AGRICULTURAL COMPONENT**
A	1.0. GERMINATORS
	1.1. Collection and treatment of seeds
	1.2. Construction of sowing beds
	1.3. Shade installation
B	2.0. NURSERIES
	2.1. Collection of substrate material
	2.2. Construction of sowing beds
	2.3. Bagging
	2.4. Weed control
	2.5. Irrigation of nursery
	2.6. Shade construction
	2.7. Fertilization of nursery
	2.8. Phyto-sanitary control
C	3.0. ESTABLISHMENT OF PLANTATION
	3.1. Soil preparation
	3.2. Tracing and hole digging
	3.3. Sowing
D	4.0. CROP MAINTENANCE
	4.1. Application of corrective measures
	4.2. Fertilization
	4.3. Weed control
	4.4. Phyto-sanitary control
	4.5. Maintenance of the vegetal layer
	4.6. Interspersed crops
	4.7. Harvesting
	4.8. Transport of stalks
E	5.0. Planting other crops
	5.1. Sowing of other crops
	5.2. Fertilization of other crops
	5.3. Weed control of other crops
	5.4. Phyto-sanitary control of other crops
	5.5. Harvesting other crops

Table .3 – Summary Table – List of Impacts – Agricultural Component

Impact Level	Cell Code Activity Code (Sub-Activity Code)	Activity (Column)	Sub-Activity (Column)	Environmental Factor (Row)	Impact (Row)	Mitigation Measure
Medium	A24(Ac24)	Germinators	Installation of shading	Soil	Modification of the landscape	Not destroying the vegetation, planting native trees, not modifying plantation surroundings
	B24 (Ba24)	Nursery	Gathering of substrate material	Biology resource	Modification of the landscape	Not destroying the vegetation, planting native trees, not modifying plantation surroundings
	B24 (Bb24)	Nursery	Construction of threshing floors	Biology resource	Modification of the landscape	Not destroying the vegetation, planting native trees, not modifying plantation surroundings
	B24 (Bf24)	Nursery	Construction of shading	Biology resource	Modification of the landscape	Not destroying the vegetation, planting native trees, not modifying plantation surroundings
	C15 (Ca15)	Establishment of the crop	Preparation of the soil	Biology resource	Land vegetation affected	Not establishing crops in plots with high stubble and not burning, applying manual controls and preserving plant cover
	C16 (Ca16)	Establishment of the crop	Preparation of the soil	Biology resource	Land fauna affected	Not modifying the ecosystem surrounding the plantation, implementing biological control and MIP (Integrated Pest Mgmt)
	C21 (Ca21)	Establishment of the crop	Preparation of the soil	Biology resource	Destruction or degradation of wooded areas	Not establishing plantations in wooded areas
	D3 (Da3)	Maintenance of the crop	Application of correctives	Soil resource	Contamination due to chemicals	Implementing manual controls and organic farming, avoiding the use of agro-chemicals
	D3 (Db3)	Maintenance of the crop	Fertilization	Soil resource	Contamination due to chemicals	Implementing manual controls and organic farming, avoiding the use of agro-chemicals
	D3 (Dc3)	Maintenance of the crop	Weed control	Soil resource	Contamination due to chemicals	Implementing manual controls and organic farming, avoiding the use of agro-chemicals
	D34 (Dg34)	Maintenance of the crop	Gathering of shoots	Human health	Work-related illnesses	Occupational health training, use safety equipment
Minimal or Low	A3(Aa3)	Germinators	Gathering and treatment of seeds	Soil resource	Contamination due to chemicals	Implementing manual controls and organic farming, avoiding the use of agro-chemicals
	A4(Ab4)	Germinators	Construction of threshing floors	Soil resource	Loss of organic matter	Avoiding destruction of the surface layer of the soil, using organic fertilizers, adding plant covers
	A24(Ab24)	Germinators	Construction of threshing floors	Soil resource	Modification of the landscape	Not destroying the vegetation, planting native trees, not modifying plantation surroundings
	A30 (Aa30)	Germinators	Gathering and treatment of seeds	Soil resource	Illnesses due to agro-chemicals	Taking recommendations of the growers into account, avoiding the use of agro-chemicals and using biological control and MIP
	B1 (Ba1)	Nursery	Gathering of substrate material	Biology resource	Erosion	Avoiding the use of soils, using organic fertilizer as substrate, avoiding soils with high slopes, assessing erosion risks
	B3 (Bd3, Bh3)	Nursery	Weed control, plant health (phyto-sanitary) control	Biology resources	Contamination due to chemicals	Using manual weed control and fully abandoning the use of pesticides
	B4 (Ba4)	Nursery	Gathering of substrate material	Biology resource	Loss of organic matter	Avoiding the destruction of the surface layer of the soil, using organic fertilizers, adding plant covers
	B30 (Ba30, Bd30, Bh30)	Nursery	Gathering of substrate material, weed control and plant health (phyto-sanitary) control	Human health	Illnesses due to agro-chemicals	Taking recommendations of the growers into account, avoiding the use of agro-chemicals and using biological control and MIP
	C1 (Cb1)	Establishment of the crop	Layout/plan and digging of holes	Soil resource	Erosion	Avoiding the use of soils, using organic fertilizer as substrate, avoiding soils with high slopes, assessing erosion risks

Table .3 - Continued

Impact Level	Cell Code Activity Code (Sub-Activity Code)	Activity (Column)	Sub-Activity (Column)	Environmental Factor (Row)	Impact (Row)	Mitigation Measure
Minimal or Low	C4 (Cb4)	Establishment of the crop	Layout / plan & digging the holes	Soil resource	Loss of organic matter	Avoiding destruction of the surface layer of the soil, using organic fertilizers, add plant covers
	C24 (Ca24)	Establishment of the crop	Preparation of the soil	Soil resource	Modification of the landscape	Not destroying the vegetation, planting native trees, not modifying plantation surroundings
	D1 (Df1)	Maintenance of the crop	Interspersed crops	Soil resource	Erosion	Avoiding the misuse of soils, using organic fertilizer as substrate, avoiding soils with high slopes, assessing erosion risks
	D2(Df2)	Maintenance of the crop	Interspersed crops	Soil resource	Exposed soil	Preserving the greatest possible amount of soil coverage and ensuring addition of biomass generated by *chontaduro* palm cultivation and interspersed crops
	D15 (Dc15)	Maintenance of the crop	Weed control	Biology resource	Land vegetation affected	Not establishing crops in fields with high stubble, not burning, applying manual controls and preserving the plant cover
	D16 (Dd16)	Maintenance of the crop	Plant health control	Biology resource	Land fauna affected	Not modifying the ecosystem that surrounds the plantation, implementing biological control and MIP
	D23 (Dd23)	Maintenance of the crop	Plant health control	Biology resource	Wildlife affected	Avoiding alterations in the ecosystem, avoiding insecticides and herbicides
	D30 (Dd30, Df30)	Maintenance of the crop	Plant health control, interspersed crop	Human health	Illnesses due to agro-chemicals	Taking the recommendations of growers into account, avoiding use of agro-chemicals and using biological control and MIP
	D31 (Da31, Db31, Dd31, Df31)	Maintenance of the crop	Application of correctives, fertilization, plant health control Interspersed crop	Human health	Illnesses due to the handling of products	Training in work safety, using safety equipment
	D34 (Dd34)	Maintenance of the crop	Plant health control	Human health	Work-related illnesses	Training in work safety, using safety equipment
Favorable	B39 (Ba39, Bb39,Bc39, Bd39, Be39, Bf39, Bg39, Bh39)	Nursery	Gathering of substrate matter, construction of threshing floor, bagging, weed control, irrigation, construction of shading, fertilization, plant health control	Social, cultural and economic context	Participation of the community	Supporting association processes
	B41 (Ba41, Bb41, Bc41, Bd41, Be41, Bf41, Bg41, Bh41)	Nursery	Gathering of substrate matter construction of threshing floor, bagging, weed control, irrigation, construction of shading, fertilization, plant health control	Social, cultural and economic context	Introduction of cultivation practices that are alien to the local tradition	Supporting the agricultural extension activities of the Technical Department
	B42 (Ba42, Bb42, Bc42, Bd42, Be42, Bf42, Bg42, Bh42)	Nursery	Gathering of substrate matter construction of threshing floor, bagging, weed control, irrigation, construction of shading, fertilization, plant health control	Social, cultural and economic context	Changes in family income	Not applicable

Table 3 - Continued

Impact Level	Cell Code Activity Code (Sub-Activity Code)	Activity (Column)	Sub-Activity (Column)	Environmental Factor (Row)	Impact (Row)	Mitigation Measure
Favorable	B43 (Ba43, Bb43, Bc43, Bd43, Be43, Bf43, Bg43, Bh43)	Nursery	Gathering of substrate material, construction of threshing floor, bagging, weed control, irrigation, construction of shading, fertilization, plant health control	Social, cultural and economic context	Possibility of accumulating capital	Giving prevalence to family work, business training
	C41 (Ca41, Cb41, Cc41)	Establishment of the crop	Soil preparation, layout / plan and digging of holes, planting	Social, cultural and economic context	Introduction of cultivation practices alien to the local tradition	Giving prevalence to family work, business training
	C42 (Ca42, Cb42, Cc42)	Establishment of the crop	Soil preparation, layout / plan and digging of holes, planting	Social, cultural and economic context	Change in family income	Giving prevalence to family work, business training
	C43 (Ca43, Cb43, Cc43)	Establishment of the crop	Soil preparation, layout / plan and digging of holes, planting	Social, cultural and economic context	Possibility of accumulating capital	Giving prevalence to family work, business training
	D1 (De1)	Maintenance of the crop	Maintenance of vegetation	Soil resource	Erosion	Giving prevalence to family work, business training
	D4 (De4)	Maintenance of the crop	Maintenance of vegetation	Soil resource	Loss of organic matter	Giving prevalence to family work, business training
	D41 (Da41, Db41, Dc41, Dd41, De41, Df41, Dg41, Dh41)	Maintenance of the crop	Application of correctives, fertilization, weed control, plant health control, conservation of vegetation, interspersed crops, gathering and transport of shoots	Social, cultural and economic context	Introduction of cultivation practices alien to the local tradition	Giving prevalence to family work, business training
	D42 (Da42, Db42, Dc42, Dd42, De42, Df42, Dg42, Dh42)	Maintenance of the crop	Application of correctives, fertilization, weed control, plant health control, maintenance of vegetation, interspersed crops, gathering and transport of shoots ,	Social, cultural and economic context	Change in family income	Giving prevalence to family work, business training
	D43 (Da43, Db43, Dc43, Dd43, De43, Df43, Dg43, Dh43)	Maintenance of the crop	Application of correctives, fertilization, weed control, plant health control, maintenance of vegetation interspersed crops, gathering and transport of shoots	Social, cultural and economic context	Possibility of accumulating capital	Giving prevalence to family work, business training
	E24 (Ea24, Eb24, Ec24, Ed24, Ee24)	Other crops (OC)	Planting OC, fertilization OC, weed control OC, plant health OC, harvest OC	Biology resource	Modification of the landscape	Giving prevalence to family work, business training
	E41 (Ea41, Eb41, Ec41, Ed41, Ee41)	Other crops (OC)	Planting OC, fertilization OC, weed control OC, plant health OC, harvest OC	Social, cultural and economic context	Introduction of cultivation practices alien to the local tradition	Giving prevalence to family work, business training
	E42 (Ea42, Eb42, Ec42, Ed42, Ee42)	Other crops (OC)	Planting OC, fertilization OC, weed control OC, plant health OC, harvest OC	Social, cultural and economic context	Change in family income	Giving prevalence to family work, business training
	E43 (Ea43, Eb43, Ec43, Ed43, Ee43)	Other crops (OC)	Planting OC, fertilization OC, weed control OC, plant health OC, harvest OC	Social, cultural and economic context	Possibility of accumulating capital	Giving prevalence to family work, business training

1.2.3. Industrial Component

Table 4 Impact Causing Activities – Industrial Component.

Column Identification	IMPACT CAUSING ACTIVITIES LEOPOLD MATRIX COLUMNS **INDUSTRIAL COMPONENT**
F	1.0 AGROINDUSTRIAL PRODUCTION PROCESSES
G	2.0 PRODUCTION. (steam and electricity)
H	3.0 TREATMENT SYSTEMS (potable water and domestic sewage water)
I	4.0 STORAGE
J	5.0 ORGANIC FERTILIZER PRODUCTION
K	6.0 GERMINATORS
L	7.0 TRANSPORTATION
M	8.0 DIVERSIFICATION PROJECTS CONSTRUCTION - OPERATION

1.3. Environmental Assessment Report and Management Plan

1.3.1. Agricultural Component

In spite of palm cultivation being carried out at present with small or no use of insecticides or fungicides or any other toxic pesticides on the plantations, the rural people do in fact apply this type of product to the rest of their properties. Therefore, it is considered important that prevention and mitigation measures be applied, both to prevent damage to the natural resources and to prevent health problems in the form of diseases derived from the use of agrochemicals.

As a prevention measure to avoid having to mitigate the use of agrochemicals, we recommend the implementation of organic agricultural programs and biological pest control. It would be desirable for AGROAMAZONIA technicians to encourage these practices for the rest of the crops grown on the farms, taking advantage of their permanent proximity to the farmers.

Table 3.1 lists the restrictions established by the United States environmental legislation, showing that there is not a problem in the utilization of the majority of the inputs for Heart of Palm at present, with the exception of Paraquat, which is under level one toxic restrictions. As a measure for the environmental management of the plantations, we recommend that the use of chemical herbicides to control weeds be avoided and replaced by manual control routines.

The Heart of Palm crop may pose a certain number of challenges regarding the management of its pests and the pesticides used to control them, which could likewise present environmental risks that need to be dealt with. A brief description of the agrochemicals is presented here, but the in-depth analysis follows the detailed requisites for pesticides in Reg. 216.3.(a).10.(b).(1).(i).(a) – (l). The following section presents a summary of the pests liable to appear in the project and their management, as well as the chemicals most likely to be used, presenting a toxic and eco-toxic analyses for the main pesticides used, as well as the existing options for an Integrated Pest Management (IPM) program that allow for a continuous decrease in the altogether use of agrochemicals.

Table 5 Agrochemical used in the Heart of Palm Project

AGROCHEMICALS USED IN THE HEART OF PALM PROJECT					
COMMERCIAL NAME	**ACTIVE INGREDIENT**	**USE**	**TOXICITY**	**USAID RESTRICTION**	
				YES	NO
VITAVAX-300	CARBOXIN 20% CAPTAN 20%	Fungicide for treatment of seeds in the germinator	Category II. Highly toxic		X
VITAVAX-400	CARBOXIN 20% TIRAN 20%	Fungicide for treatment of seeds in the germinator	Category III. Fairly toxic		X
GRAMOXONE	PARAQUAT	Herbicide for plantation maintenance	Category I. Extremely toxi	X	
ROUNDUP	GLIFOSATO	Herbicide for maintenance of paths of the germinator, nursery and on the plantation	Category IV Slightly toxic		X
GRYFOSAN-SL FAENA-320 BATALLA-SL 480	GLIFOSATO	Herbicide for maintenance of paths of the germinator, nursery and on the plantation	Category IV Slightly toxic		X

On some farms in the project Paraquat is being used as the herbicide, a practice which must be eliminated for the following reasons[3]:

A. This herbicide is catalogued by the EPA with high toxicity (Class 1), and it is on the list of restricted use Pesticides (RUP), which must be sold and applied by certified entities only.
B. High toxicity has been found if mammals (LD50 oral from 110 to 150 mg/Kg in rats. High exposition to this herbicide can cause respiratory problems, irritation of the eyes and nostrils. Many cases of diseases and/or death in humans have been reported. the lethal dose (taken by mouth) in humans is estimated at 35 mg/kg.
C. It is moderately toxic for birds and aquatic organisms
D. Accumulates in the soil over a long period of time.
E. Causes serious damage to vegetation by its desiccation action.

Costs of the Management Plan are shown in table 6

[3] Source: Toxicology Network Extension, Pesticide Information Profiles

Table 6

TABLE OF COSTS OF THE AGRICULTURAL COMPONENT MANAGEMENT PLAN			
ACTIVITY	**UNIT VALUE PER PROPERTY**	**Number of properties in year 2003**	**Total value in COL$**
Soil analysis in selection of new properties	59,000	267	15,753,000
Soil analysis to identify possible contamination with chemicals on cultivated lots	59,000	60	3,540,000
Analysis and quantification of species to be cut down	36,000	267	9,612,000
Census of species	36,000	267	9,612,000
		TOTAL $	**38,517,000**
Note : Amounts in Colombian pesos.			

1.3.2. Industrial Component

1.3.2.1. Agro-industrial Production Processes

There are two important impacts during the industrial process. The first concerns the uncertainty existing as to the quality of the drinking water consumed in the plant. The water from the purification system is used just as it comes from the network, in washing of jars and washing the hearts of palm following the scraping process and to clean the plant at the end of the process. It is also used in the preparation of the brine with which the jars are filled, but it is passed through a cartridge filter before entering the kettles.

Photo 1 [Area where jars are washed]

Photo 2 [Scraping process]

Photo 3 [Plant cleaning]

Photo 4 [Kettles in which the brine is prepared, note the cartridge filter in the drinking water network before pouring into the equipment]

A big risk is being taken for because it is impossible to detect whether the water from the purification system complies with all the quality standards required in a foodstuffs handling industrial process.

The second impact concerns the implementation of the occupational health programs. The facilities lack the first aid items which would be necessary in the event of an accident. In addition, although there is a document on the Risk Factors involved in the industrial process, the prevention measures to mitigate possible impacts are not being taken. An example of this is the provision of rubber gloves for the workers who handle the stalks, which do not provide sufficient protection from the thorns on the stalks.

Photo 5 [Use of rubber gloves when handling stalks.]

Another considerable risk has been detected in that there is no signposting for a protection zone to prevent people from entering the area surrounding heat producing equipment. The most critical case is in the area of the autoclave, where the passage between the equipment and the wall is very narrow (less than one meter). There are no danger signposts for the risk and the floor is not demarcated to show the safe transit strip.

Photo 6 [Narrow transit space surrounding the autoclave]

Photo 7 [Narrow transit space surrounding the autoclave]

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The steam tunnel chimney is inside the processing room, which generates an accumulation of humidity on the ceiling mesh. This constitutes a risk of contamination of the net and of condensation which could drop onto the product being packaged.

Photo 8 [Steam from the steam tunnel]

Among the agro-industrial process impacts which may be considered slight under the present discharge conditions, but which it is important to mention, is the discharges of industrial waste waters. At present these discharges go into a tank with very low technical specifications, then to be carried to a discharge into the Singuiya wetland.

Photo 9 [Retention Pond]

The pond consists of an excavation into natural land with no retention, slopes are not controlled and the water is transported by gravity along gullies which have been generated by the movement of the water. It is not possible with the information available to guarantee that it complies with the function for which it was built, which was to reduce temperature.

The only treatment being applied to the industrial discharges is the separation of solids using a net over the pond entry structure.

Photo 10 [Solids retention net over the retention pond entry structure.]

1.3.2.2. Power Generation

In the power generation processes, the most important risk is that the fuel tank which supplies these systems (boiler and generator) have not retention system in the event of leaks or breakage.

Photo 11 [Elevated 5,000 gallon fuel tank]

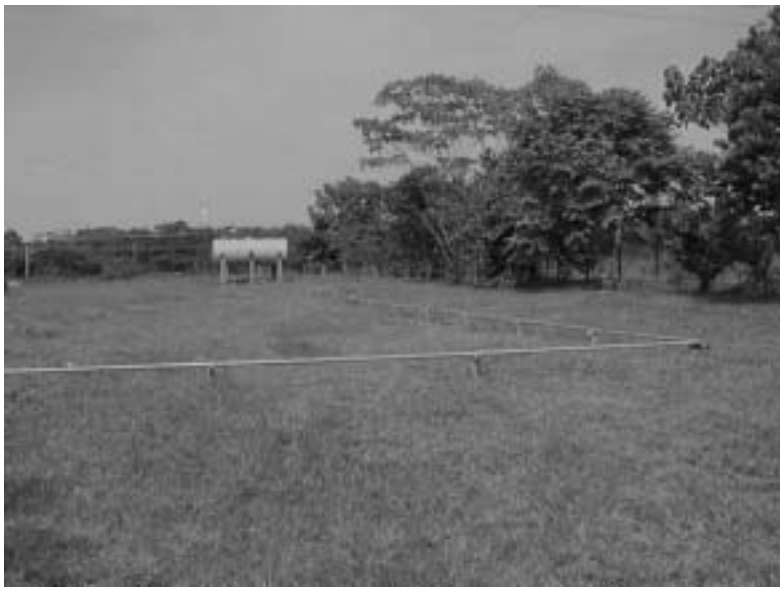


Photo 12 [Fuel tank and conduction line]

The other impact is the noise generated by the boiler which, because it is inside the building where the industrial process and the offices are located affects the plant operators and the administrative staff.

Photo 13 [Boiler]

1.3.2.3. Purification Systems

The impact of the purification systems, for both drinking and domestic waste waters, involves a big risk due to the uncertainty of its functioning and efficiency, because there are no constructive plans, operations or maintenance manuals. What is most serious is that no laboratory tests have been run to establish the quality of the water supplied after the treatments, neither has a purification quality monitoring plan been implemented.

It will be impossible to give an opinion on the functioning of the drinking water purification system until the physical, chemical and microbiological tests of the purified water and the raw water from the cisterns have been made. The volume of water produced is apparently sufficient for present process requirements.

The water management plan leaves much to be desired. There are inconsistencies in the environmental management plans in the Environmental License and the practices at present follow issues as, for example: the License mentions waters taken from the Aguas Negras Stream and the project uses water from the cisterns (with the consequent risks), raw water is used in retro-washing of the filters, when purified water should be used, the composition of the water used is unknown, because the industrial processes are empirical and those of purification uncertain, residues of chlorine are not controlled, although the consultants were unable to identify a chlorination process, in spite of the existence of the equipment to do so.

Photo 14 [Connection of the cistern for retro-washing of filters]

As far as the domestic waste waters purification system is concerned, a system has been built which consists of a septic tank, followed by a natural treatment with *macrophyte* plants (rushes). This type of system is illustrated below.

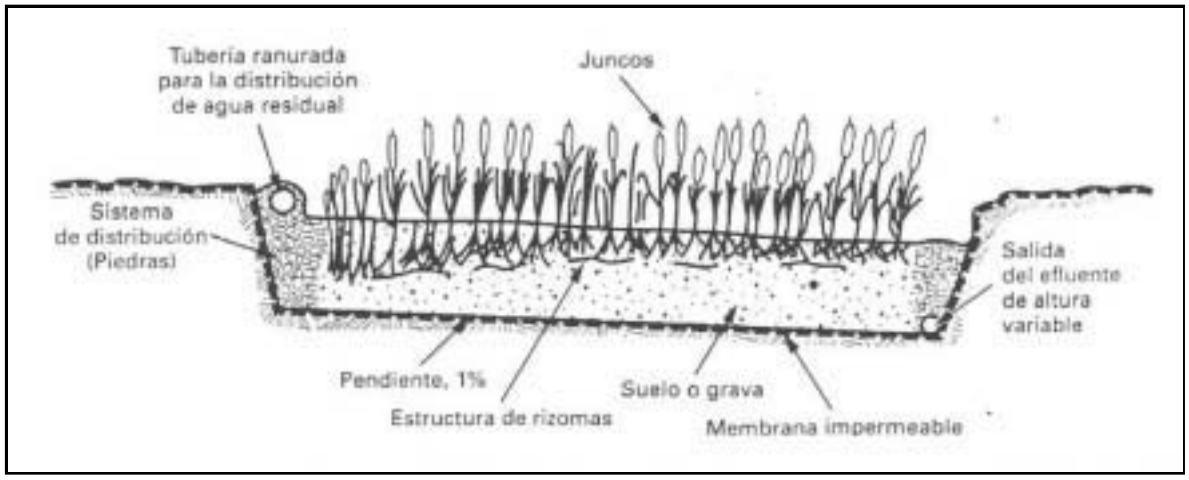


Figure 1 [Diagram of a typical purification system using aquatic plants]

The results of the sampling carried out by EcoAnálisis Ltda. for Agroamazonía in October 2002 concluded that the problem of blockage of the system of purification with rushes is due to an increase in total choliforms at the outlet of the system. Unfortunately, the sampling was not made at the outlet of the rushes system, but at that of the box where the domestic waste waters pour in following treatment with the industrial waste waters, and therefore the true efficiency of the purification is not reflected.

1.3.2.4. Illustration of mitigation and control measures

The most important mitigation and control measures involve laboratory tests to establish the water quality in:

- each of the supply cisterns.
- the outlet from the drinking water purification system.
- sampling inside the industrial plant.
- before and after the domestic waste waters purification system.
- in the box into which the industrial waste waters run.
- at the delivery points of all the liquid discharges at the Singuiya wetland.

After analyzing the results of these trials, the real impact of each of the components can be evaluated and decisions taken to reduce effects on the environment.

In the area of occupational health, all the programs should be defined as per the law and compiled in documents for the use of the company and its employees. Among the most important points to highlight are:

- Provision of gloves for operators who handle the stalks for the necessary protection against thorns.
- Evaluation of the noise levels in all areas of the plant to define the respective mitigation measures.
- Signposting safety areas surrounding equipment which operates at high temperatures.
- Provision of safety elements for first aid and fire fighting.
- Training of employees and setting up representative committees of employees.

As far as the measures which should be taken to reduce the risk of contamination of the soil and water by fuel spills, a retention pond should be built under the fuel storage tank. The pond will be of a size to contain all the fuel stored, i.e. 18.9 m^3., (5,000 gallons).
Other industrial security risks have mitigation measures presented in in section 5.2.3 (see pag. 158)

1.3.2.5. Environmental Management Plan Cost – Industrial Component

Table 7 – Environmental Management Plan Cost

MANAGEMENT PLAN COST SUMMARY						
INDUSTRIAL COMPONENT						
Row	**ACTIVITY**	**Data Sheet**	**Reference**	**Quantity**	**Unit Cost**	**Total Cost**
	INFRASTRUCTURE					
1	Construction of a perimeter channel and a retaining pond under the fuel tank to guarantee retention of the maximum volume of the storage tank	3.3.2.2	G3, G9	1	COL$ 19,600,000	COL$ 19,600,000
2	The equipment necessary for microbiological analyses (approximate value)	3.3.2.1 3.3.2.3 3.3.2.7	F29 H29 M29	1	COL$ 2,500,000	COL$ 2,500,000
3	Extension of the steam tunnel chimney and place an extraction hood over the kettles.	3.3.2.1	F25	1	COL$ 1,500,000	COL$ 1,500,000
4	Placement of insect traps and insect count.	3.3.2.4	J20	10	COL$ 160,000	COL$ 1,600,000
5	Extend boiler vent to a box for temperature reduction.	3.3.2.2	G11	1	COL$ 150,000	COL$ 150,000
	INFRASTRUCTURE SUBTOTAL					**COL$ 25,350,000**
	ANALYSES					
6	Physical-chemical analysis of water from the drinking water purification plant.	3.3.2.1 3.3.2.3 3.3.2.7	F29 H29 M29	24	COL$ 145,833	COL $ 3,500,000
7	Physical-chemical analysis of final discharge of drinking water purification plant into the Singuiya wetland.	3.3.2.3	H3	1	COL$ 270,000	COL$ 270,000
8	Physical-chemical analysis of discharge of industrial and domestic waste waters.	3.3.2.3	H11	4	COL$ 270,000	COL$ 1,080,000
	SUBTOTAL ANALYSIS					**COL$ 4,850,000**

Table 7 continuation

MANAGEMENT PLAN COST SUMMARY						
INDUSTRIAL COMPONENT						
Row	**ACTIVITY**	**Data Sheet**	**Reference**	**Quantity**	**Unit Cost**	**Total Cost**
	STUDIES AND EVALUATIONS					
9	Reconstruction of information on design, construction, operation and maintenance of the Treatment System for water for consumption and in the three cisterns.	3.3.2.3	H5 H29	1	COL$ 3,500,000	COL $ 3,500,000
10	Measurement of noise levels (pressure level, frequency spectrum and directionality) in the different areas of the plant.	3.3.2.1 3.3.2.2 3.3.2.4	F28 G28 J28	1	COL$ 1,200,000	COL$ 1,200,000
11	Reconstruction of information on design, construction, operation and maintenance of the Waste Waters Treatment System.	3.3.2.3	H11	1	COL$ 2,500,000	COL$ 2,500,000
12	Evaluation study of consumption required by the industrial plant, including the new processes and efficient water management program.	3.3.2.7	M5	1	COL$ 800,000	COL$ 800,000
13	Study to define the treatment of industrial liquids discharges from the new processes.	3.3.2.7	M11	1	COL$ 1,500,000	COL$ 1,500,000
	SUBTOTAL STUDIES AND EVALUATIONS					**COL$ 9,5000,000**
	POSSIBLE ANALYSES					
14	Physical-chemical soils analysis.	3.3.2.1 3.3.2.2 3.3.2.5 3.3.2.6 3.3.2.7	F3 G3 K3 L3 M2	1	COL$ 59,000	COL$ 59,000
15	Sampling of water at the waste waters discharge points.	3.3.2.1 3.3.2.2 3.3.2.6 3.3.2.7	F3, F11, F13, F22 G9 L9 M9, M11	1	COL$ 270,000	COL$ 270,000
16	Physical-chemical analysis of drinking water			1	COL$ 145,833	COL$ 145,833
17	Microbiological analysis of drinking water.			1	COL$ 120,000	COL$ 120,000
	SUBTOTAL POSSIBLE ANALYSES					**COL$ 594,833**
	ANALYSES OPTIONAL INFRASTRUCTURE (to be defined					
18	Construction of planning channel and temperature control.	3.3.2.1	F3, F11, F13, F22	1	COL$ 5,684,823	COL$ 5,684,823
	SUBTOTAL ANALYSIS					**COL$ 5,979,656**
	TOTAL					**COL$ 45,979,656**

1.4. Monitoring and Follow-Up Program Report

Methodology

Monitoring and Follow-up are fundamental activities to ensure good environmental management of the activities relating to the Project. Monitoring and follow-up establish the variables according to which environmental impact control should be applied, the type of analysis which should be made, the costs of each activity, the regularity with which they should be applied and the official or operator responsible for the activity.

For this purpose, the necessary data sheets were drawn up to carry out the corresponding work of Monitoring, Evaluation and Follow-up, the starting point of which is that of identifying the agricultural or industrial activities which cause an impact, proposing the activities to control, correct or mitigate that impact; the estimated cost of these activities, defining the frequency with which they should be carried out and establish who is responsible for the action. Please see Tables in Section 5.1.4.2 for a detailed presentation ot the methodology applied.

1.5. Conclusions and recommendations.

1.5.1. Conclusions.

1.5.1.1. General.

- The project does not involve any environmental risks to the surrounding areas, due in particular to the plantations being so spread out, it causes no phyto-sanitation problems requiring the use of dangerous products and the agro-industrial plant processes are relatively clean. However, the measures recommended to eliminate Contingent Risks should be put into practice immediately.

- From the socio-economic point of view, the project has produced important expectations for improvement in the quality of life of the rural population participating in it. However, the scattered layout and slow expansion of the cultivated areas are a risk to the sustainability of the project.

- As far as cultural aspects are concerned, the project provides a positive alternative to illegal coca growing activities, generates an entrepreneurial and association orientated culture. The mechanism of working only with coca growing owners of land avoids any possible conflicts with ethnic, indigenous or black groups.

1.5.1.2. Agricultural Component:

- The Project is in harmony with the natural landscape of Putumayo, because it is based on a species which is native to the region and the crop is not grown on very large areas of land.

- It does not require deforestation because the zones have already been cultivated.

- The agronomic processes, such as interspersed crops imply relative preservation of biodiversity.

- The characteristics of the crop favor soil preservation, because it retains the vegetal layer, returns a large proportion of the biomass and causes no intense extraction of nutrients.

- No high-toxicity agro-chemical inputs are used, nor any with legal restrictions under either Colombian of United states regulations. The only exception is Paraquat, which should not be used, and manual weed control is recommended.

- The surrounding area represents environmental risks for the crop, especially because of the applications of Glyphosate in crop spraying to eradicate coca plantations. At the same time, it is possible for the inputs used for the illegal crops to contaminate the soils in which chontaduro is grown and they represent a serious risk to the health of the rural population.

- The cost of the analyses and studies to minimize the environmental impacts of this component are estimated at COL$38,517,000.oo on the basis of projected planting for the year 2003. However, once these analyses and studies have been carried out, more investments may be required in accordance with the corresponding recommendations made at that time.

1.5.1.3. Industrial Component:

- Even though the industrial process is, in general, is relatively clean, a considerable number of items are lacking, especially for the treatment of waters, both for the production process of the plant, which implies serious contingent risks to the quality of the final product, and for consumption by the Plant workers, and in the disposal of waste waters.

- Regarding water for the industrial process and for consumption, the most serious problem is the lack of procedures to ensure the quality of the water from the filter systems. In addition, chlorination of the water is planned, but there has been no evidence that it is being implemented. Finally, there is no permanent control of the resulting water which is used in the industrial processes, implying

risks to the final quality of the product and causing uncertainty as to the packaged water.

- The disposal of waste waters has apparently sufficient systems and elements for adequate treatment, but they lack the necessary information on design, construction and maintenance, which implies uncertainty regarding the final results.

- Controls by sampling, which are in fact CORPOAMAZONÍA's only requirement, do not compensate for the lack of the information mentioned in the foregoing point and the results of the analyses appear to be affected by lack of knowledge of the design, construction and maintenance of the treatment system components.

- The production of organic fertilizer could become an issue as a source of insect production, due to the fertilizer waste, which requires the implementation of a control procedure.

- Another worrying aspect is related to industrial safety. In spite of AGROAMAZONÍA having all the required documentation, the procedures are not being followed and there are not enough elements to deal with possible problems. The personal protection items appropriate to a process such as receiving and classifying stalks are not being used, nor is there any danger signposting to prevent accidents. In addition, the noise generation metering has not been put in place in specific areas of the Plant.

- The design and construction of certain critical points in the industrial process, such as that of the *Autoclave*, have restricted space, implying a high risk of accidents.

- The fuel storage tank has no spill control or retention pond and the surface pipe is at significant risk, because it does not have sufficient protection or any spill mitigation mechanisms.

- The cost of the analyses and studies to minimize the environmental impacts of this component is estimated at COL$35.686.000 (US$12,745.oo), which includes both the civil works and the necessary laboratory analyses. However, once these analyses and studies have been carried out, further investment may be required, according to the corresponding recommendations made at that time.

1.5.2. Recommendations

1.5.2.1. General:

- The scattered nature of the plantations should be re-designed, as it could result in negative socio-economic impacts. The environmental advantages of scattering may be achieved with plantation designs closer to the industrial plant, which preserve diversity and have a low impact on the natural landscape.

- Fulfillment of the commitments assumed under the Environmental License, especially concerning reforestation, crop records and the use of the Aguas Negras stream's waters concession.

1.5.2.2. Agricultural Component

- Evaluation of the possibility of concentrating the plantation areas closer to the Processing Plant to facilitate phyto-sanitary control and crop management and cause scale economies because of the size of the properties, thus also facilitating the achievement of the social and economic goals of the project.

- Organic agriculture and biological pest control should be implemented in practice. Recommendations on this aspect are more extensively discussed in the Monitoring section.

- Elimination of Paraquat and any other toxic herbicide and replacement with manual weed control.

- Ensure the use of the protection and industrial safety elements.

- Carry out soil studies of plantation areas whenever there are changes in practices or inputs for fertilization or soil correction.

- Carry out a census of the forestry species affected and evaluate the impact of possible tree felling as part of the preparation of terrain for planting.

1.5.2.3. Industrial Component.

- Reconstruction of the information on the design, construction and maintenance of the Waste Waters Treatment System.

- Preparation and putting into practice a Manual of Procedures for the verification of water quality for industrial use and consumption.

- Implement a program of sampling and analysis of the waste waters treatment and discharge systems.

- Construction of a perimeter channel, a retention pond under the fuel storage tank and protection of the distribution network.

- Acquisition of the equipment necessary for microbiological analysis of waters for industrial and domestic consumption.

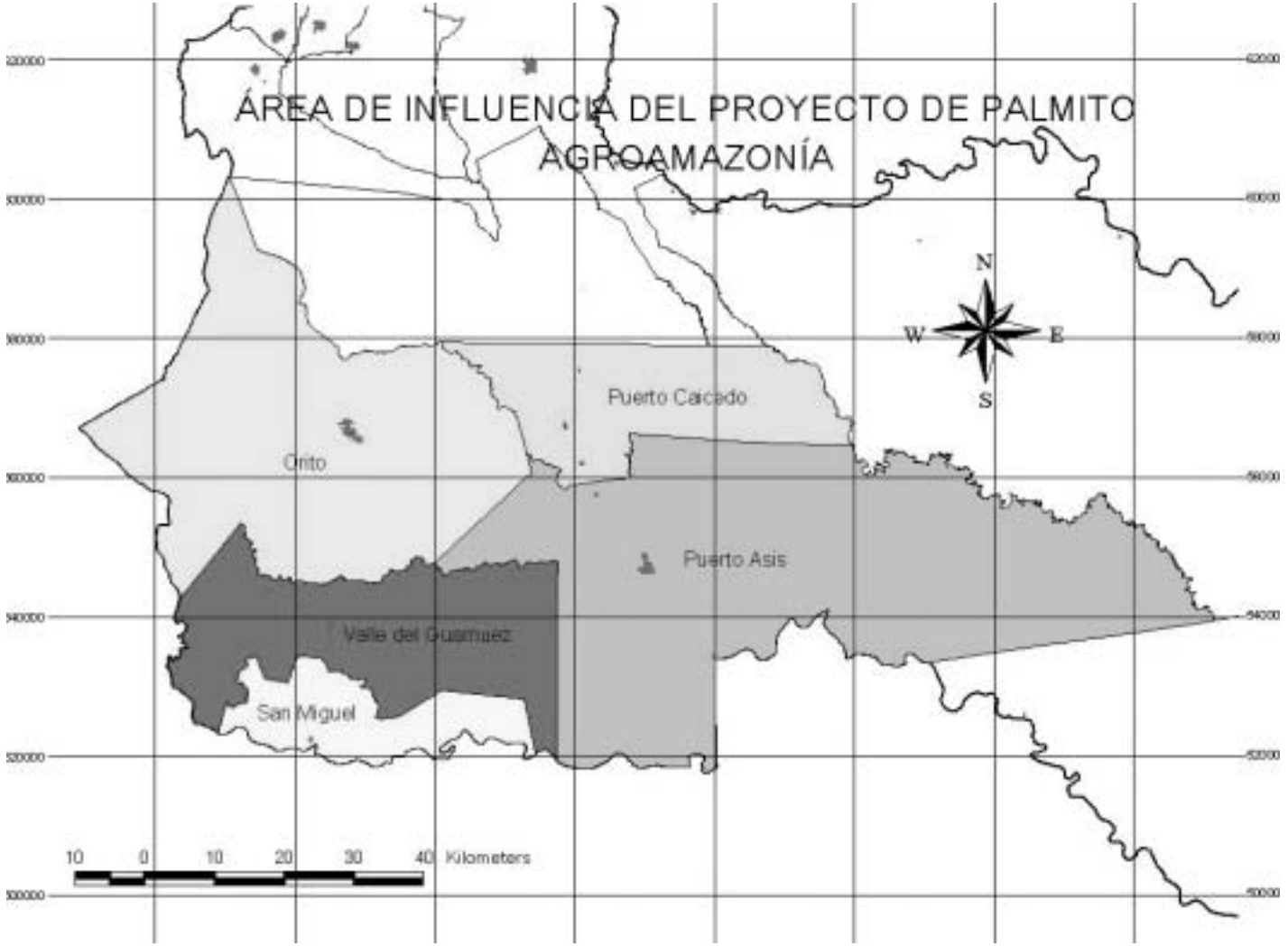
- Acquisition and placing of insect count traps.

- Implementation of the industrial safety procedures described in the documents held by AGROAMAZONÍA. Metering of noise and introduction of the measures required according to the results.

- Plans should be made for the possibility of making some studies and evaluations, mainly associated with the danger of fuel spills.

- Continue with activity to produce organic fertilizer with organic wastes, including by product from plant.

Map 1


ÁREA DE INFLUENCIA DEL PROYECTO DE PALMITO
AGROAMAZONÍA
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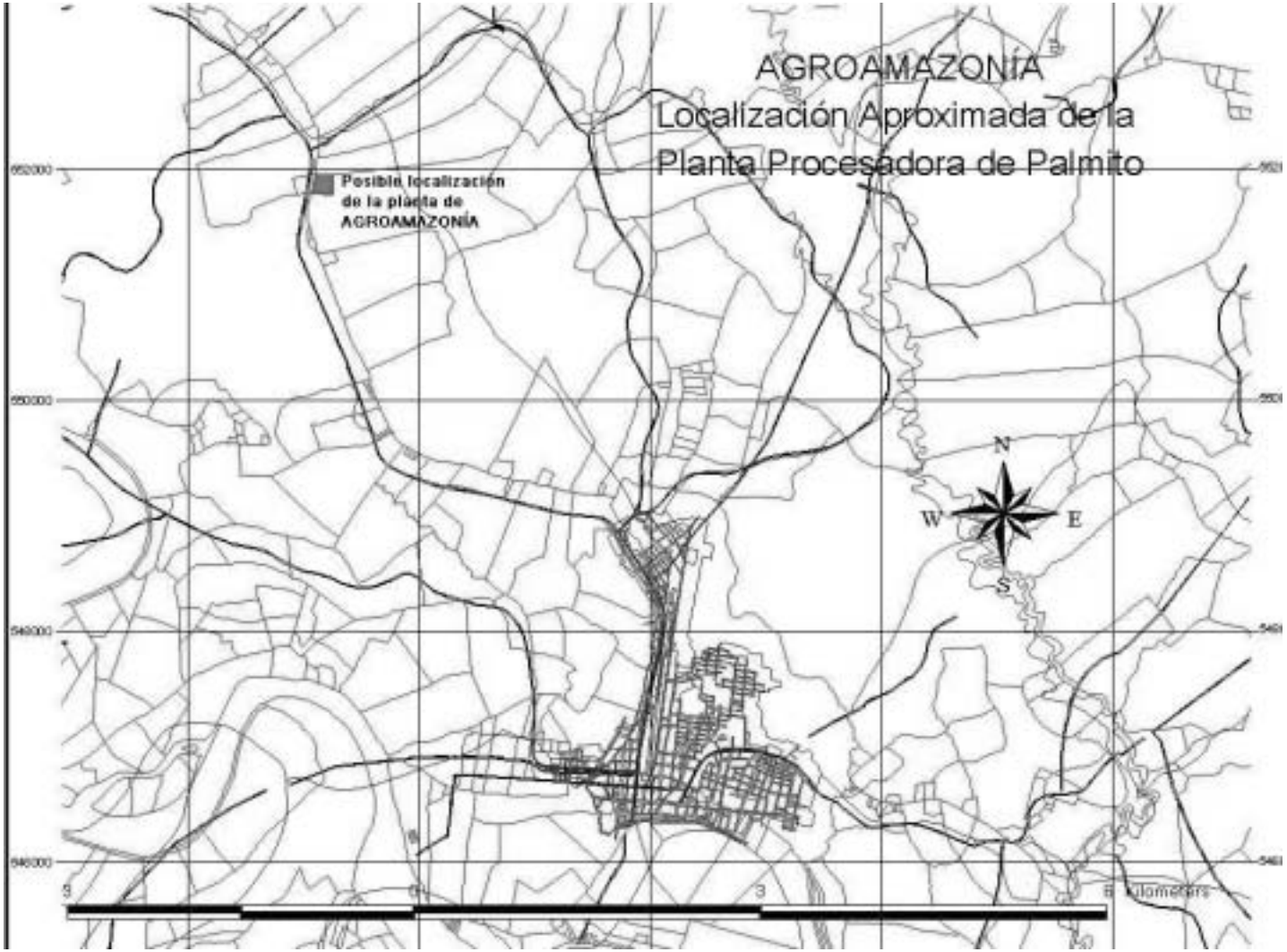
W
E
S
Puerto Caicedo
Orito
Puerto Asis
Valle del Guamuez
San Miguel
10 0 10 20 30 40 Kilometers

Map 2


AGROAMAZONIA
Localización Aproximada de la
Planta Procesadora de Palmito
Posible localización
de la planta de
AGROAMAZONIA
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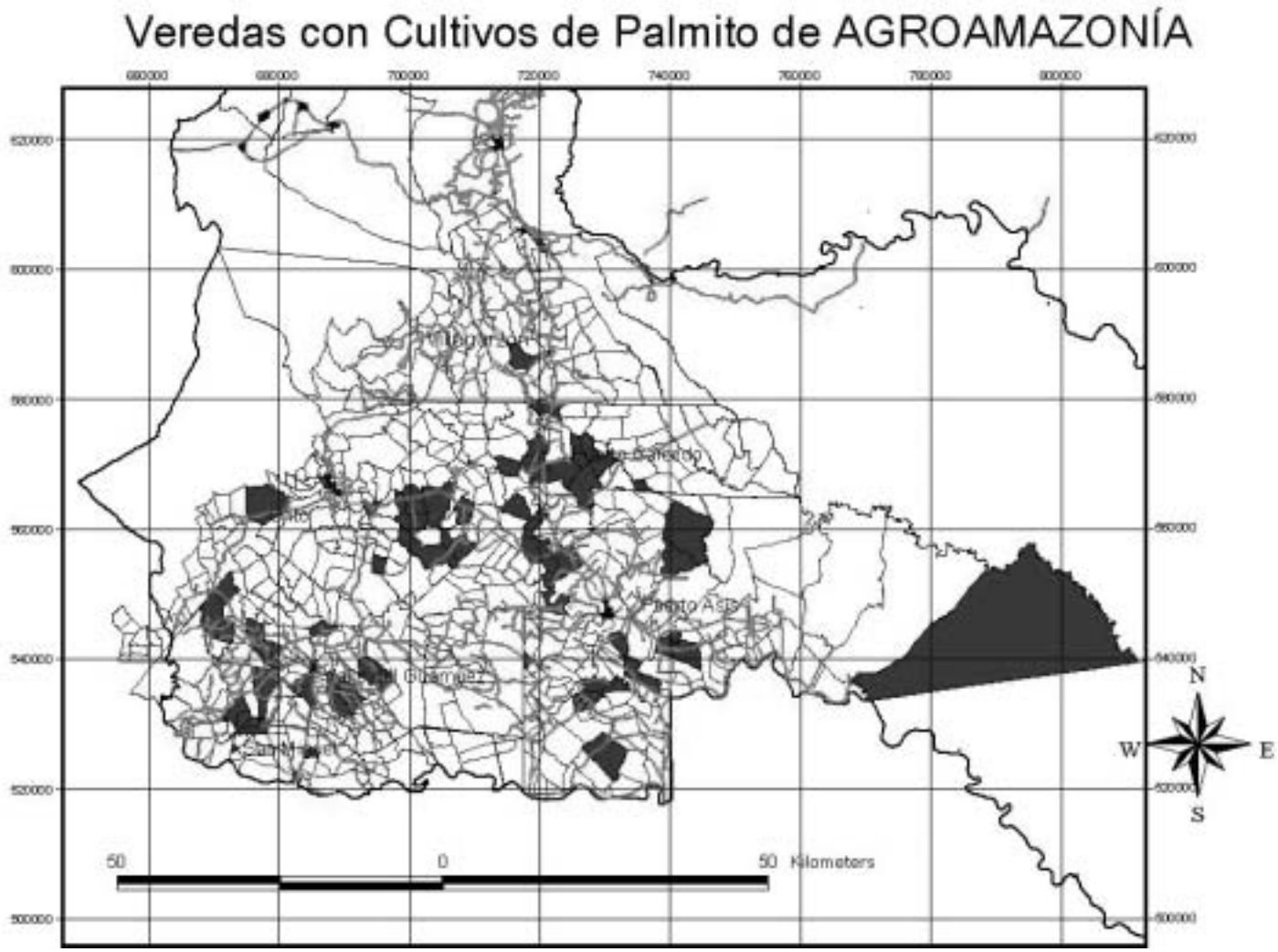
Map 3


Veredas con Cultivos de Palmito de AGROAMAZONÍA
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SECTION 2 PURPOSE

2.1. Background

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.

To this end, the CAD project 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. The present document is a legal procedure that all projects must comply with, which lead to better results and an overall more sustainable environment. The assessment of environmental impacts, the valuation of the size and depth of the impacts, are followed by the management plan to correct the negative effects. The content of this EA fulfills the requirements of Regulation 216 of USAID and provides th operators with detailed material to control all the foreseen impacts.

2.2. Scope of Work

The purpose of this Environmental Assessment is the characterization of the Chontaduro Palm (*Bactris gasipaes*) agricultural production systems, in order to obtain the heart of the palm sprout, as well as the analysis of the agro-industrial processing plant and of the processes performed or that will be performed therein, with the purpose of establishing for both cases the risks for the environment derived from these activities.

The development of the project is divided, into two different components from the environmental management point of view:

i) the agricultural activities, related to the production system into which chontaduro palm cultivation for obtaining palm hearts will be carried out; this implies honing into the effects that the agronomical practices have on soils, water and biodiversity (flora and fauna) in the project's area of influence.

ii) the agro-industrial phase, in which the risks inherent to the processing plant’s design, plus those derived from industrial processes and from risks to the personnel working in the plant. The project’s emphasis, for this component, will be the Evaluation Assessment of the environmental risks related to waste disposal (solid and liquid), availability of proper mechanisms to prevent and avoid contaminations and the verification of labor practices (company's internal environmental policy, personnel training and application of clean practices) to assure the minimization of risks.

SECTION 3 ALTERNATIVES INCLUDING THE PROPOSED ACTION

DIAGNOSTIC ALTERNATIVE: NON-IMPLEMENTATION OF THE PROJECT

3.1. Hypothesis

In this chapter, the environmental component of the Heart of Palm project in Putumayo Department on the alternative that NO ACTION is taken, or that the project continues but under the lead of the Environmental Management Plan.

Because several project activities are already advanced, the hypothesis discussed is that of the continuation and maintenance of the project, taking present conditions as the point of departure, as follows:

- AGRICULTURAL COMPONENT; 60 Hectares under production and 97 Hectares ripening.
- INDUSTRIAL COMPONENT; the building of the hearts of palm processing plant is complete.

Taking these initial conditions into account, the environmental impacts in the event that each of the activities of the project is not continued are analyzed.

3.2. Quantitative Assessment

Following the Environmental Assessment methodology proposed by Leopold, the following are the results of the quantitative evaluation for each of the components of the project.

3.2.1. Agricultural Component.

Table 1 shows the quantitative evaluation of the agricultural component. It may be deduced that, if the Heart of Palm project is NOT implemented, the environmental impacts would be high (considering illicit crop production), in comparison with those of continuing the project, mainly because the plantations are so dispersed the impact is minimal.

The effects which could result from implementing the agricultural component of the project are localized and may be classified as specific, because the plantations cover an area not exceeding 60 hectares and do not imply a regional impact on the different resources.

It is considered that there are only two environmental factors which might cause negative impacts in the event of the project not being continued. The first is related to disease caused by handling

agricultural chemicals. But the most negative environmental impact (regardless of the financial aspect from the loss of investments made so far) is that of the expectations of the communities, whom have believed in the project and look forward to gaining the sustenance of their families in the future from these plantations.

Table 8 Qualitative Evaluation - Agricultural Component

	ENVIRONMENTAL IMPACT STUDY CHARACTERISTICS OF QUALITATIVE EVALUATION				
	SCENARIO - NON-IMPLEMENTATION OF THE PROJECT AGRICULTURAL COMPONENT				
	ENVIRONMENTAL FACTORS AFFECTED	CHARACTERISTICS	OPINION	ASSESSMENT	
				M	I
	1) Environmental Impact on the Soil Resource				
3	Contamination by chemicals or waste	Agricultural chemicals would cease to be applied	The impact which could occur is minimal because the plantations are dispersed.	1	1
	2) Environmental Impact of the Hydric Resource				
8	Contamination by agricultural chemicals	There would be no possibility of agricultural chemicals reaching water sources	The favorable impact is individual to each property.	1	1
	3) Environmental impact on the Biological Resource				
15	Land flora affected	The processes in preparation for sowing on the properties, which normally destroy high undergrowth, which might eventually become secondary forests, would be avoided.	The benefits of maintaining high undergrowth is localized.	1	1
16	Land fauna affected	The diversity of species could be reduced locally with the application of insecticides.	Slight benefits in the diversity of insects would result.	1	1
	5) Environmental Impact on Human Health				
30	Diseases caused by agricultural chemicals.	Cultivation hearts of palm required very few inputs and agricultural chemicals.	Alternative crops which grow in the region of the project require more toxic inputs that those needed by a hearts of palm plantation.	-1	-2
	6) Environmental Impact in the socio-cultural and economic contexts.				
42	Changes in family income	There are expectations of workers which will not by fulfilled if the project does not go ahead.	The expectations of improvement in family income of the Heart of Palm workers will not be fulfilled.	-2	-2

KEY

1) M = Magnitude (Extent or Scale of Impact)

Theoretical area of influence of the Impact in relation to the Project environment
Rating = (Favorable (+), Unfavorable (-))+(Scale of 1 to 10)

1 = Minimal 10 = Extensive

2) I = Importance (Intensity or Degree of Incidence)
Degree of Incidence of action on the factor
Rating = (Favorable (+), Unfavorable (-))+(Scale of 1 to 10)
1 = Minimal Effect, 10 = Total Destruction

NO IMPACT

MEDIUM IMPACT

MINIMUM OR LOW IMPACT

FAVORABLE IMPACT

3.2.2. Industrial Component.

Table 9 shows the quantitative evaluation of the industrial component. From the environmental point of view, stopping the plant would bring a minimum benefit after reducing the production of liquid and solid waste, there would be no risk of contamination by fuel and oils and the noise producing equipment would not be operated. All these benefits would only be at a very focalized level and would have no effect at the regional level.

Shutting down the plant would cause a negative environmental effect (independent of the financial effect) in the socio-cultural context, because the plant employees would be unemployed and cease to have a family income, with the more serious circumstance that the possibilities of finding a similar job in the region are virtually non-existent.

Table 9 Qualitative Evaluation– Industrial Component

	ENVIRONMENTAL IMPACT STUDY CHARACTERISTICS OF QUALITATIVE EVALUATION				
	ALTERNATIVE - NON-IMPLEMENTATION OF THE PROJECT Industrial Component				
	ENVIRONMENTAL FACTORS AFFECTED	**CHARACTERISTICS**	**RESULTS**	**VALUATION**	
				M	**I**
	1) Environmental Impact on the Soil Resource				
3	Contamination by chemicals or waste	The risk of contamination by discharge of fuels and oils would cease to exist.	The benefit would be local.	1	1
	2) Environmental Impact on the Hydric Resource				
9	Contamination by chemicals	The risk of contamination by discharges of fuels and oils would cease to exist.	The benefit would be local.	1	1
11	Contamination by discharge of liquid residues or untreated waters	The risk of contamination by discharges of industrial waste waters would cease to exist.	The benefit would be local.	1	1
	6) Environmental Impact in the socio-cultural and economic context				
42	Changes in family income	The family income of all the personnel working in the plant would change because they would be left without a job.	The impact is important at local level because there are no alternative jobs at industrial level in Puerto Asis.	-2	-2

KEY

1) M = Magnitude (Extent or Scale of Impact)

Theoretical area of influence of the Impact in relation to the Project environment
Rating = (Favorable (+), Unfavorable (-))+(Scale of 1 to 10)

1 = Minimal 10 = Extensive

2) I = Importance (Intensity or Degree of Incidence)
Degree of Incidence of action on the factor
Rating = (Favorable (+), Unfavorable (-))+(Scale of 1 to 10)
1 = Minimal Effect, 10 = Total Destruction

NO IMPACT

MEDIUM IMPACT

MINIMUM OR LOW IMPACT

FAVORABLE IMPACT

SECTION 4 AFFECTED ENVIRONMENT –

4.1. General description of the project.

4.1.1. Location and coverage of the Project

The Heart of Palm Project is located in the Putumayo Department in the municipalities of the Amazon foothills in the region known as Putumayo Medio, to differentiate it from Putumayo Alto, formed by the municipalities whose territories cover the Sibundoy Valley at over 2,000 mts above sea level and Putumayo Bajo, composed of plains and Amazon terraces.

The municipalities of Mocoa, Villa Garzon, Puerto Caicedo, Puerto Asis, Orito, Valle de Guamuez and San Miguel belong to Putumayo Medio. The project is implemented in the latter five towns, the total surface area of which is approximately 6,726 Km^2 and amounts to 26% of the total area of Putumayo Department.

It is in these towns that the largest areas of coca crops in Putumayo are centered and, therefore, they are a central objective of the policies and activities involved in the fight against drugs, for both interdiction and forced eradication (fumigation), as well as alternative development. This latter strategy is the framework for the Heart of Palm Project.

The Heart of Palm Project is divided into two different types of programs, the first is the agricultural program, in which the Chontaduro Palm (*Bactris gasipaes*) is being planted in different zones of the five municipalities, as alternative crops to coca (See Map-1, pag. 35). The second industrial program gathers, processes and markets the Heart of Palm produced by the agricultural program.

The Heart of Palm processing plant is located in the municipality of Puerto Asis, approximately 5 Km to the north of the city limits of the town, on the road to Mocoa, the Departmental capital (See Map #2 in pag. 36).

4.1.2. Objectives of the Project and level of development

The Project's purpose is to develop the cultivation of chontaduro (Bactris gasipaes) for Heart of Palm, with the rural people who participate in the coca eradication programs and are associated in local or municipal groups. These associations of producers are, in turn, partners of the Project, in both the agricultural and the industrial components. The latter component is responsible for processing the product, packaging in cans or glass jars and marketing it to supermarket chains and institutional consumers on the national market.

Even when the chontaduro cultivations were established for the first time towards 1998, in a total area of 120 hectares and, in the following years, the planting continued, for different reasons, in the area which is at present in production or in the process of ripening is considerably lower.

According to the AGROAMAZONIA Annual Operative Plan (AOP), the Project should now have 80 hectares in production; 97 hectares in ripening and plant nursery material for the planting of 20 hectares during this semester. However, on visiting the Project, the present situation was as shown in the following Table.

PRESENT SITUATION OF HEART OF PALM CULTIVATION IN AGROAMAZONIA	
Plantations in production	60 hectares
Ripening plantations in production the first quarter of 2003	97 hectares
Equivalent in area of the plantules, to go into production in the fourth quarter of 2004	534 a 600 hectares.
Production density per hectare	5000 a 5500 plants
Source: AGROAMAZONÍA.	

According to the AOP and information obtained during the visit to the processing Plant, it had an installed capacity equivalent to 18,000 hearts per 8 hour shift; that is, if an average of 20 days a month were worked, the installed capacity in one shift would be equivalent to 4,320,000 hearts per year.

The 60 hectares which are at present in production would be equivalent to a maximum supply of 330,000 hearts per year, that is, the maximum capacity used would be 7.63% of the installed capacity. In 2004, supposing that all the planting programs fulfill all the planting programs, the supply of hearts would be approximately 3,971,000 hearts, that is 92% of installed capacity[4].

[4] According to information of the AOP, from the inauguration of the plant on May 28, 2001, to the month of February 2002, 1,797 boxes of Heart of Palm were processed, with a total of 124,530 hearts. This is equivalent to saying that, with the installed capacity available, the plant operated only 7 shifts of 8 hours in 9 months.

4.2. SURROUNDING AREA OF THE PROJECT.

4.2.1. Socio-political aspects of the surrounding area

The Department of Putumayo was established as such in 1991 with the issue of the new National Constitution. Until then it had formed part of a group of regions corresponding, under the title of "National Territories", to the areas furthest away from the urban and market centers and were the least densely populated and developed areas in Colombia. From the end of the decade of the 80s, coca crops and the armed conflict arrived in this Department, which had become, by the year 2000, the one with the largest percentage of land under coca cultivation.

Parallel to this, the development of illegal crops, the struggle between different armed groups outside the law for the territorial control of the coca planted areas caused violence, of which the civilian population of rural areas are the most frequent victims.

In furtherance of the fight against drugs, from the Colombian State with the international collaboration of several nations, especially the Unite States and certain multilateral organizations, has been to implement alternative development programs to provide rural communities with opportunities to facilitate the elimination of illegal coca crops and undertake legal productive activities for their subsistence in dignified conditions.

However, for different reasons, the policy of the fight against drugs itself became a threat to the development of these alternative activities, as the forced eradication component included spraying with glyphosate, which did damage a large part of the legal cultivations planted as part of the alternative development programs, among them some Heart of Palm plantations in the AGROAMAZONIA Project.

According to AGROAMAZONIA reports, 41 hectares of Heart of Palm, of which 10 hectares had reached harvest age, were damaged by the glyphosate fumigation. The areas affected, have apparently been deducted from the estimated area in production, as the damage caused to the plantations is being evaluated, which means that, in the probable event of them being lost, the ratio of supply of Heart of Palm to the installed capacity of the plant will be made all the more crititcal.

4.2.2. Demography

Putumayo is one of the least densely populated Departments in Colombia, according to the DANE. Estimates based on the Population Census of 1993 show that Putumayo had a population of 230,943 inhabitants in 2001, as well as a population density of 13.7 inhabitants per Km^2.

The municipalities corresponding to the area of influence of the AGROAMAZONIA Project are the most heavily populated of the Department because, with an area equivalent to less than 25% of that

of the Department, it is home to 52% of the total population. (See Table 10.) The majority of the population of Putumayo and of the five municipalities is rural.

Table 10.
Putumayo Department
POPULATION OF MUNICIPALITIES BY SECTOR
Years 1993, 1995, 2001

Municipalities	YEARS								
	1993			1995			2001		
	Total	Chief city	Rest	Total	Chief city	Rest	Total	Chief city	Rest
Orito	24.147	8.167	15.980	33.382	9.749	23.633	39.501	12.028	27.473
Puerto Asís	38.010	17.745	20.265	53.223	21.180	32.043	62.977	26.132	36.845
Puerto Caicedo	11.014	1.922	9.092	14.842	2.295	12.547	17.562	2.831	14.731
San Miguel [1]				19.010	5.367	13.643	22.494	6.426	16.068
Valle del Guamuez	35.919	5.939	29.980	29.839	7.089	22.750	35.308	8.747	26.561
Total Putumayo	**204.309**	**70.718**	**133.591**	**288.615**	**89.777**	**198.838**	**341.513**	**110.570**	**230.943**

Source: 1993: DANE (NATIONAL STATISTICS DEPARTMENT) census of population and housing, XVI; 1995, 2001: DANE-IGAC-IDEAM-INGEOMINAS. Bio-physical and socio-economic information of the State of Putumayo (document-summary) projections.
[1] Segregated from the municipality of Valle del Guamuez, Ordinance 45 of April 29, 1994.

According to PNDA and other organizations' estimates, the rural population involved in coca planting in Putumayo, at the beginning of 2001 was close to 30,000 families, representing approximately 44% of the total population of the Department and 65% of the rural population.

4.2.3. Economic aspects.

4.2.3.1. Legal economy

The legal economy of Putumayo is very poor. In 1998, Departmental GDP was equivalent to 0.5% of the total GDP of Colombia. The principal activities were services (Governmental and personal) oil exploitation and agriculture. A manufacturing industry is practically non-existent and it only has a few agro industrial establishments, many of them idle.

According to statistics of the Ministry of Agriculture and Rural Development, there are certain transitory and semi-permanent plantations in Putumayo, which, by the year 2000 covered 108,751 hectares. Cattle ranching is another legal activity in the Department, with a cattle census of 131,961 heads by the year 2000.

4.2.3.2. Illegal economy.

In contrast to the foregoing, the economy derived from coca was of great importance for Putumayo and the national context. In fact, by 2000, according to SIMCI, the total area in the country was 163,289 hectares, of which 40.4% were in Putumayo; by 2001, the national area was down to 144,807 hectares and the participation of Putumayo was down to 29.5% (See Table 11.). The

estimated economic value of these crops is very difficult, but it is very probably well over the value of the entire legal economy of the Department.

Table 11.

Evolution of coca plantations in Colombia in hectares by Departments

Departments	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Guaviare	21.400	22.900	24.100	26.300	28.700	38.600	29.000	7.000	28.435	17.619	25.553
Caquetá	8.600	8.400	9.300	11.700	15.600	21.600	31.500	24.000	23.718	26.603	14.516
Putumayo	2.200	2.400	4.000	5.000	6.600	7.000	19.000	30.100	58.297	66.022	41.049
Sur de Bolivar	5.300	3.400	2.300	2.000				3.500	5.897	5.960	4.824
Norte de Santander								7.000	15.039	6.280	9.145
Otros								6.600	28.733	40.805	43.649
Total	**37.500**	**37.100**	**39.700**	**45.000**	**50.900**	**67.200**	**79.500**	**78.200**	**160.119**	**163.289**	**138.736**

Source
(*) National Drugs Department "Colombia's Fight against Illegal Drugs. Actions and Results 1999-2000". For data of 1991 to 1998.
(**) Initial Simci-Sima Estimates of illegal plantations based on the interpretation of Satellite Images. For data of 1999, 2000 and 2001.

The municipalities of the area of influence of the Heart of Palm Project are those with the largest areas of coca plantations in the Department. As shown in Table 1.4, the sum of areas of these coca growing areas is 77.85% of the total area under cultivation in the Department. (See Table 12)

It is interesting to note the great variation in the size of the lots under coca in relation to the average. Thus, for example, while for Orito and Valle de Guamuez report, as maximum sizes, properties of more than 90 hectares and, the minimum areas those of less than one hectare, the average is 1.67 and 1.68, respectively. This, added to the great spread of coca plantations in the territory (See maps 3 to 7 in pag. 221-225), makes it very difficult to design plantations which can remain protected from the glyphosate spraying.

Table 12
Coca crops in Agromazonia influence area
Hectares

Municipalities area of AGROAMAZONÍA	Area Coca	%	Average Size Coca de Lot	Max. Size Coca de Lot	Min. Size Coca Lot
Orito	7.629,19	23,87	1,68	102,25	0,01
Puerto Asís	8.679,57	27,16	1,62	48,07	0,40
Puerto Caicedo	2.340,49	7,32	1,34	33,71	0,01
San Miguel	4.041,29	12,65	1,89	86,15	0,01
Valle del Guamuez	9.268,13	29,00	1,67	92,78	0,43
Total	31.958,67	100,00	1,64	72,59	0,17
Sobre Total Putumayo	41.049,63	77,85			

Source : DNE, SIMCI. Inform coca census 2001

The size of the areas under coca contrast notably with the areas reported by the Ministry of Agriculture for transitory and permanent crops and dramatically with the area under Heart of Palm cultivation, which, as it is spread among the five municipalities, is constantly threatened by the risk of fumigation.

4.2.4. Bio-physical aspects of the surrounding area

The bio-physical conditions of Putumayo are under considerable restrictions for the development of traditional agricultural and livestock activities.

The majority of the land in the region is poor and has high acidity levels, which limits the cultivation of many species or make it expensive. The Chontaduro Palm appears to be better adapted to the conditions in Putumayo than many other plants, but nevertheless, even the best soils of the region need programs of soil correction and fertilization to ensure adequate development.

Putumayo only has a general study of soil for the entire territory and certain semi-detailed studies for segments of a few municipalities, which were not possible to obtain for the purposes of this report. According to information from the general soils study (See Table 13 and Maps 8 to 12, pag. 226 and 230), in the entire territory of the five municipalities, there is only a small percentage of land in good conditions for the cultivation of Heart of Palm or any other species, which are the alluvial soil of the banks of some of the numerous rivers of the region, but some of these are restricted by poor drainage, which are followed by the fans which form alluvial plateaux in the Amazon foothills, concentrated in Orito.

The other soils have severe restrictions for the development of the Heart of Palm cultivations, but these, together with the reforestation programs, could signify the opportunity to recover some poor areas, especially in the hilly areas of a large part of the so-called denuded areas.

Table 13
SOILS IN MUNICIPALITIES AREAS OF AGROAMAZONIA INFLUENCE
SOIL GENERAL STUDIES

		MUNICIPALITIES											
		Orito		Valle del Guamuez		Puerto Asís		Puerto Caicedo		San Miguel		Total	
SIGLA	SOIL DESCRIPTION	Hectares	%	Hectares	%	Hectares	%	Hectares	%	Hectares	%	Hectares	%
Aaa	Suelos aluviales de origen andino	2.581,85	1,38	15.664,87	15,73	13.121,75	4,78	9.748,07	13,28	7.722,87	20,08	48.839,42	7,26
Aaz	Suelos de valles menores con influencia coluvio/aluvial	641,37	0,34	28.448,81	28,56	10.473,76	3,82	5.666,35	7,72			45.230,29	6,72
Ah	Suelos de formaciones aluviales o lacustres	5.732,28	3,07	6.152,41	6,18	70.066,91	25,53	1.433,38	1,95	6.747,87	17,54	90.132,84	13,40
De	Superficie denudada	63.235,35	33,87	49.330,05	49,53	144.423,33	52,62	56.565,84	77,05		0,00	313.554,57	46,62
Dd	Suelos de altillanura					28.788,07	10,49			20.811,61	54,10	49.599,68	7,37
Df	Superficie denudada fuertemente quebrada					7.575,75	2,76					7.575,75	1,13
Pg	Suelos de planicie aluvial del pie de monte (abanicos)	25.841,85	13,84							3.187,02	8,28	29.028,87	4,32
Vm	Suelos de cordillera pendiente media	23.221,63	12,44									23.221,63	3,45
Vo	Suelos de cordillera pendiente fuerte	7.547,28	4,04									7.547,28	1,12
Vr	Suelos de cordillera pendiente muy fuerte	57.875,64	31,00									57.875,64	8,60
	TOTALES	186.677,25	100,00	99.596,13	100,00	274.449,57	100,00	73.413,64	100,00	38.469,37	100,00	672.605,96	100,00

Source: DNE, Putumayo Georeference Information System.

Moreover, observation of the coverage of the soils of Putumayo, show how man's productive activity has been constantly running counter to environmental supply. The restrictions of the soils and the intense, almost permanent rain result in the Department's ecosystem being very fragile Amazon soil (jungles). However, and especially in the five municipalities in the area of influence of the AGROAMAZONIA Project, in addition to the cultivation of coca, which represents serious problems for the conservation or formation of soils, there are large extensions of prairies which tend to accelerate the soil deterioration processes, as shown in Table 14. and on Maps 13 to 17 (see pag. 231-235).

Tabla 14
COBERTURAS DEL SUELO EN LOS MUNICIPIOS DE INFLUENCIA
DEL PROYECTO AGROAMAZONÍA

	MUNICIPIOS									
	Valle del Guamuez		San Miguel		Puerto Asís		Orito		Puerto Caicedo	
COBERTURA	Hectáreas	%	Hectáreas	%	Hectáreas	%	Hectáreas	%	Hectáreas	%
Bancos de Arena	97,570	0,10	96,664	0,25	201,791	0,07	110,538	0,06	229,653	0,31
Bosques primarios y selvas	43.282,041	43,46	7.826,312	20,34	182.941,197	66,66	82.025,291	43,94	45.111,765	61,45
Bosques secundarios y rastrojos altos	10.221,777	10,26	6.499,032	16,89	32.438,610	11,82	23.792,338	12,75	13.960,392	19,02
Coca en todos sus estados	13.905,978	13,96	7.208,065	18,74	11.468,228	4,18	8.928,301	4,78	2.747,915	3,74
Cuerpos de Agua	2.069,470	2,08	2.532,776	6,58	5.017,580	1,83	4.924,114	2,64	1.380,078	1,88
Nubes y sombras	13.591,166	13,65	7.376,667	19,18	9.724,927	3,54	53.370,531	28,59	2.335,673	3,18
Otros cultivos	0,000	0,00	0,000	0,00	220,883	0,08	0,359	0,00	0,000	0,00
Pastos y rastrojos bajos	15.753,934	15,82	6.682,878	17,37	29.850,522	10,88	13.099,094	7,02	7.131,852	9,71
Suelo desnudo	0,000	0,00	0,000	0,00	0,000	0,00	0,000	0,00	2,443	0,00
Vías	284,166	0,29	168,683	0,44	106,171	0,04	135,784	0,07	93,405	0,13
Zonas de inundación	131,106	0,13	0,000	0,00	1.949,072	0,71	17,413	0,01	374,845	0,51
Zonas Urbanas y caseriós	258,925	0,26	78,292	0,20	530,585	0,19	273,482	0,15	45,623	0,06
TOTALES	99.596,133	100,00	38.469,370	100,00	274.449,567	100,00	186.677,246	100,00	73.413,643	100,00

The explanation as to why the analysis of satellite images only shows very few areas of crops different from coca, is related to technical and methodological aspects, as well as the prevailing production systems in Putumayo.

From the technical point of view, it must be borne in mind that the smallest area identifiable on a satellite image has to be larger than a pixel area of the image, which is 900 m^2. In addition, certain crops, such as plantains are interspersed in zones with high vegetation, which makes it practically impossible to differentiate them from high brush.

From the methodological point of view, the images used to draw up the census of coca, which is a permanent crop, correspond to different times in a period of close to one year. It is therefore possible that some transitory cultivations do not appear in the image.

Finally, the production systems of the rural people of Putumayo are very small rural properties where smallholding, plantain, corn and cassava crops are intermingled and whose size is generally smaller than the pixel of the image referred to two paragraphs above.

4.3. Description of cultivation activities

4.3.1. Germinators

4.3.1.1. Location:

There are at present two germinators, the first located in the municipality of Puerto Asis, within the area of the processing plant and the second in the municipality of La Hormiga.

4.3.1.2. Collection and provisions of seeds:

A company specialized in the supply of seeds has been contracted to provide seeds, already treated with Captan (Vitavax) based fungicides..

4.3.1.3. Construction of plant beds:

Washed sand from the river is extracted from the Putumayo river as substrate. The plant beds are 10 m. in length, 1,20 m. in width and 80 cm. in height, bordered by *guadua* (large bamboo). 60% Polisombra with a height of 1.80 m is being used for shade.

4.3.1.4. Sowing density

The seeds are planted at a distance of 3 cm between them and a distance of 8 cm. between rows, at a depth of 2 cm.

4.3.1.5. Germination time.

At approximately 60 days, the plantules have formed two true leaves and are ready for delivery to the cultivators.

4.3.2. Plant nurseries

4.3.2.1. Supply of plantules to farmers

AGROAMAZONIA supplies farmers with plantules with the root exposed and they are responsible for placing them or in small plastic coffee bags of 17 cm. in height by 15 cm. in width.

4.3.2.2. Substrate selection.

Earth from the same farm is used to fill these bags. At present, no mixture with organic matter is applied, nor is the texture of the soil used as substrate taken into account.

4.3.2.3. Control of weeds in nurseries.

Weeds in nurseries are controlled manually, in some cases by roadways, Glyphosate is applied in doses of 2.5 cm3 per liter of water.

4.3.2.4. Fertilization

Fertilization in nurseries with 17-6-8-2 compost fertillizer every 30 days at a dose of 2 to 5 grams per bag, depending on the size of the plantule.

4.3.2.5. Control of pests and diseases

Very few problems with pests and diseases occur in the nurseries. Sometimes, when leaf stains or symptoms of cercosporiosis appear, Mancozeb is applied using a back pump, in doses of 1.5 grams per liter of water. If the symptoms of disease persist in some plantules, they are eliminated from the nursery.

4.3.2.6. Shade

Plant material from the same zone is used for shade in the nursery, which is placed at a height of 1,7 m. and removed 4 weeks prior to planting.

4.3.2.7. Time in nursery

Plantules are considered to be in the right condition for planting in their definitive location when the have 4 well formed leaves, which takes 4 to 6 months in the nursery.

4.3.3. Selection of lots

The first Heart of Palm cultivations were planted on the slopes of hilly terrain, with very low fertility and difficult access. At present, lots with better agronomic conditions are being sought for cultivation in fertile lowlands or other regions with more fertile soil.

The majority of the lots selected have mature underbrush, in some cases they have been used to grow corn (maize) and in others illegal plantations. The primary woodlands are not being altered.

The lots on the prairies are normally excluded from cultivation because of soil compacting problems.

4.3.4. Crop establishment.

4.3.4.1. Soil preparation

The underbrush is manually cleared, cut and chopped down, and agricultural machinery is never used.

4.3.4.2. Plotting and digging

Plant lines are in squares with a distance of 2 m. between ditches and 1m. between plants, resulting in a planting density of 5,000 pals per hectare in an east to west direction.

In some old plantations, the distance between plants is 1.5 m., with 2 m between furrows.

Digging is done with picks and shovels, forming holes of 15 cm. x 15 cm. x 25 cm depth.

4.3.5. Planting

Planting is done so that the neck of the plantule is at the level of the land.

4.3.6. Maintenance of crop

4.3.6.1. Application of corrective measures

To correct the soils, Dolomita is applied at doses of 1 ton. per hectare for lots on hills and ½ ton. for lots of fertile lowlands. The application is in the form of a crown surrounding the palm.

4.3.6.2. Fertilization

250 kilos of compost fertilizer are applied annually, 17-6-18-2 in doses of 250 kilos per hectare and 10 kilos of boron per hectare. Accoriding to the POA 2002, the recommended annual amount is 600 to 900 kilos of compost fertilizer; because of the lack of availability of resources, no programmed fertilizations are beeing carried out.

4.3.6.3. Organic Fertilization

The Project includes the implementation of organic management of plantations using organic fertilizers produced by the plant in Puerto Asís. The main objective is the substitution of chemical fertilizers by organic ones.

4.3.6.4. Weed Control

Weed control is generally manual. In the early months, a 30 cm. ring round the plant is flattened. Very rarely are they controlled chemically, in which case Paraquat is applied in doses of 3 cm^3 per liter of water.

4.3.6.5. Pest and disease control.

Pest and disease control with agrochemicals has not been necessary for any of the plantations. So far no biological control program has been commenced, nor are there any traps to help evaluate populations of insects which might be plant pests.

4.3.7. Vegetal layer.

There is a cover of weeds and natural grasses in the majority of the plantations. Trials of some legumes, using caupi beans as a green cover have commenced for the new plantations.

4.3.8. Interspersed plantations

During the early months of the development of a plantation, when there is little shade, corn (maize) is interspersed. At present, trials are being carried out with Amazon fruit trees, such as *Arazá* and *Coconá*.

4.3.9. Harvesting

When the diameter of the base of the palm is approximately 14 cm., it can be cut to remove a good quality heart. A length of 70 cm is usually cut, and the external bark is removed at the site itself. Cutting residues and leaves remain at the plantation forming organic matter.

It is estimated that the production of hearts in the first year is 5,000 hearts per hectare. Cutting dates programming by nuclei of agricultural workers is made by the Agroamazonia technical department.

4.3.10. Other crops

The majority of the farms have smallholding crops such as corn (maize), plantain and cassava on small lots. At present, all these crops have been affected by the recent Glyphosate fumigations.

4.3.11. Other uses of the farms

In general, the greater part of the area of all the farms is used as natural grass meadowlands for cattle grazing. Primary natural woodlands are in very small zones of the land, with sectors of mature brush.

4.3.12. Amazon fruit trees and timber forests

For the Amazon fruit trees and timber forests, Agroamazonía S.A. has at present plantules of *Arazá, Coconá* y *Copoazu*, in the Puerto Asís and La Hormiga nurseries.

Coconá seeds are selected from a single ecotype of the *Solanum Sessiliflorum* species.

The variety of *Arazá* selected is Peruvian and of the *Copoazú* that of the ecotype of the *Theobroma grandiflorum* species from Brazil.

Some agricultural workers have sown *Coconá*. The plantations which have gone into production, the fruit harvested have been unable to find a market for it. The program for crops such as *Arazá* y *Copoazú* is at the nursery state and the plantules have not been delivered to these producers.

4.3.13. Production of organic fertilizer.

For the production of organic fertilizer, two wooden roofs and zinc tiles have been built in the Puerto Asis processing plant, in which the plant waste is processed for compost. At present, two different compost production systems are being tested with a view to evaluating the higher yield; the first is on wooden posts the form of drawers and the second on cement blocks beds. In both systems, evaluations of different treatments with accelerating bacteria from the decomposition process or with concentrates for animals are being made to obtain organic fertilizer in the shortest possible time.

4.4. Industrial aspects of the project.

4.4.1. General description of the plant

The Heart of Palm processing plant is located in the Municipality of Puerto Asís, 5 kilometers away on the road to Mocoa.

The Project lot has an area of approximately 4 hectares, in a sector considered by the Puerto Asis POT as an agroindustrial development zone. It borders to the east on the National Puerto Asis - Mocoa road.

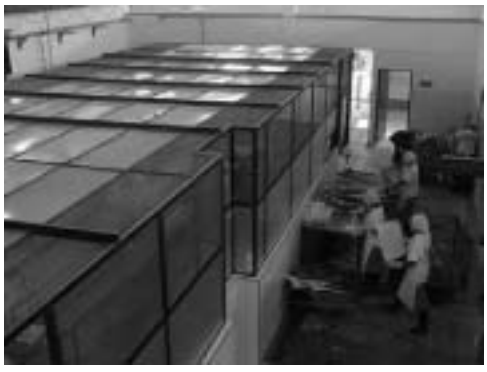
On the northern and southern borders are fields and, on the east it borders on the Singuiya wetland.

The following are on this lot: a construction where the industrial process is carried out and the administration offices, a seedbed, the area where the organic fertilizer is produced, the area with the three cisterns and the drinking water purification plant, as well as the area where the residual waters are treated. The building houses the following:

- Heart reception and classification area.

- Cooking and cooling area.

- Peeling area.



xClean area for scraping, cutting, weighing, bottling and sealing.

xPasteurization area.

xDry area.

xQuality Control Laboratory.

xBottle washing area.

xIndustrial Inputs Warehouse.

xAgricultural inputs area.

xArea where the kettle and electricity generating plant are located.

xAdministration office.

Outside the building are a 5,000 gallon fuel tank with its surface network for supply to the boiler and generating plant.

4.4.2. Drinking water supply.

The plant has its own purification system, which produces water for both industrial and domestic use. It also supplies the seedbeds and the area where the solid waste treatment is carried out for the production of organic fertilizers.

The source of water is from three cisterns within the plant property, located on the north-eastern border of the lot with a distance of approximately 20 mts between them. There is no record of the construction of the cisterns, but according to information provided by the officials of Agroamazonía, all of them have a useful depth of between 7 and 8 mts.

The water is pumped from the raw water storage tank through a battery of silic sand, anthracite and activated carbon filters. Chlorine is injected at the outlet from the filter system. The water is carried to a 10,000 liter purified water storage tank.

Each cistern has an independent electric pumping system which extracts water and pumps it through underground PVC networks to a 10,000 liter capacity storage tank. The operation of the pumps is from a central control panel, which starts up the pumps alternately, taking into account the information provided by level sensors located in each of the cisterns and the storage tank.

The purified water storage tank is connected to a hydro-pneumatic pumping system, which distributes the water to all areas of the Project.

There is at the moment no operating and maintenance manual for the water purification sysem for consumption. In addition, the laboratory is unable to carry out water quality trials.

It is important to mention that the Resolution issued by Corpoamazonía mentions that the Project will use surface industrial waters from the Aguas Negras Stream for its consumption, which is the same one which supplies the Puerto Asís water supply system.

4.4.3. Industrial Process.

4.4.3.1. Reception.

The stalks are transported to the plant in 4,000 heart capacity trucks. The hearts are collected by Agroamazonía in a truck of its own and another rented by it. The stalks have to be processed within the 24 hours following harvesting.

The hearts are received on the south-eastern side of the building. They are unloaded manually from the trucks and placed on posts. Two people carry out this operation, the truck driver and one laborer.

4.4.3.2. Classification

Classification consists of manually placing the hearts on metal baskets placing homogenous groups together by stalk diameter. The baskets have a capacity of 200 hearts with a gross diámeterna capacidad de 200 wide diameter or 260 narrow diameter hearts.

Two workers classify the hearts and handle the stalks with rubber gloves.

4.4.3.3. Cooking.

The metal baskets with the stalks are lifted with a differential and carried to the stainless steel tanks, where they are submerged in boiling water. Cooking time is according to the diameter of the stalks. The unit has four tanks, but with present production volumes, only one is used.

The water is not changed in the working day. It is replaced when reduced by evaporation. At the end of the process, the tank is drained through a bottom valve to a concrete cavity which forms part of the industrial waste water system.

4.4.3.4. Cooling

When the cooking process is complete, the basket is lifted and submerged in cold water in another tank. This procedures is to stop the cooking process and deactivate enzymatic action.

Too keep the water at a stable temperature, it is permanently recalculated through a cooling tower. The processing water is not changed in the course of the day.

Following the cold water thermal shock, the basket is lifted and placed on a platform to be carried by a worker to the peeling tables. One worker controls the cooking and cooling processes.

4.4.3.5. Peeling.

Peeling consists of removing the two external layers of the trunk and removing the heart of the palm. A cut is made along the length of the trunk with a stainless steel knife and the layers are separated manually.

This job is done at present by three women. It is a job which requires a considerably degree of skill, because the cut has to be very precise in order not to cut the heart of the palm.

The separated layers are placed on a cart. The heart of the palm is picked up, the ends are cut of (placed in a plastic waste bin) and placed on plastic trays to be carried to the following process.

In addition to the three operators, one person handles the stalks following completion of the cooling process until placement on the table for peeling. This operative is responsible for collecting and disposing of the solid wastes produced in this room.

4.4.3.6. Scraping

Scraping consists of remove the fronds from the Heart of Palm heart with a spatula.

This process takes place within the clean area, on a stainless steel table. The hearts are washed and passed to the cutting area.

The fronds remaining from scraping are thrown into a stainless steel channel on the table and flushed with water to the respective drains.

The drainage pipe from the scraping table has a mesh filter which traps the solid matter generated in the process.

4.4.3.7. Cutting

The hearts are selected according to their caliber and any which are hard or fibrous are discarded. They are placed on a conveyor and cut at a right angle with a knife. The sizes of the cuts depend on the type of packaging to be used.

4.4.3.8. Weighing and Packaging

The hearts are cut into portions according to final presentation intended and are packed in jars.

4.4.3.9. Addition of brine.

A brine of water, citrus acid and salt is added to the packaged product at a temperature of between 75 and 80 degrees Centigrade.

***The brine is prepared in kettles with water from the purification plant. The drinking water supply goes through a filter cartridge before being poured into the kettles.

4.4.3.10. Exhausting.

This process is for the purpose of obtaining a vacuum in the jars. To do so, the jars pass through a steam tunnel in which the temperature and time are controlled.

4.4.3.11. Sealing

This is done as soon as the packages come out of the steam tunnel. Tops are put on the class jars manually and cans are sealed.

4.4.3.12. Pasteurization

The sealed jars and cans are removed from the clean area and manually placed in a cylindrical basket.

When the jars and cans have been placed in the basket, a differential is lifted and carried to the vertical autoclave. The thermal process in the autoclave is to stabilize the end product.

Following the pasteurization process, the jars and cans are cooled by cold water circulating to prevent any cooking of the product.

4.4.3.13. Coding – Labeling – Packing.

After pasteurization, the packages are carried to the “dry” area where the tops are coded with the information on the process.

The packages are then labeled and packed in boxes according to the type of presentation.

4.4.4. Solid waste.

The plant generates three type of solid waste. The most important are those produced during the industrial process and consist of a:

- The ends cut off the stalk during classification are taken to the area where the organic fertilizer is produced.

- The external layers peeled from the trunks are carried to the area where the organic fertilizer is produced.

- The ends cut off the hearts of palm are given away to be used for cattle fodder.

- Hearts rejected during the cutting process because they do not comply with the consistency, hardness or fibrous standards required are given away to be used as cattle fodder.

- The fronds from scraping the hearts of palm rejected: part of this goes down the channel from the table to the drainage pipes of same and are trapped by the mesh filter. Part of the material falls to the floor of the plant and is dragged away during the final cleaning of the plant to the sumps of the sewage system.

The other sources of solid waste are those generated by maintenance work on the plant equipment and those from the offices. This waste is disposed of in drums which are taken away by the company trucks for disposal on the Puerto Asís dump.

4.4.5. Cleaning.

On completion of the production process, the entire plant is cleaned. First the tanks for the cooking and refrigeration processes are emptied.

The walls and floors of the plant are then washed with soap (in commercial powder) and water.

4.4.6. Discharge and treatment of waste waters.

The plant generates discharges of industrial and domestic waste waters. The industrial waste waters are basically those produced during the cleaning process when the industrial procedures are complete. There are some additional discharges of water used to rinse the hearts after scraping, water from washing the packages and water used in the tanks of the cooking, cooling and pasteurization processes.

Industrial discharges are made into concrete pits with gratings in all the rooms where the processes take place. They are all interconnected by pipes.

There is no treatment of industrial discharges, which are carried to an area of excavation which functions as a retaining tank.

This tank has a an inlet and outlet structure. This inlet structure where the industrial discharges are made is in concrete, with a plastic mesh to retain thick solids.

After crossing the retaining tank, the industrial discharges reach a concrete intake structure, which is the beginning of a network which transports the discharges to the ditch along the east border of the lot of the plant.

Domestic waste waters have an independent sanitation network. These discharges are collected and carried to a septic tank built in concrete and then carried to a natural treatment system with “subsurface flow” type rushes.

There are no construction plans of the system and no operation or maintenance manuals for the treatment system.

No samplings of the treated water have been taken and therefore the efficiency of the system is not known.

The water leaves the treatment system and is gathered in a concrete box where it joins the industrial discharges for the final discharged into the ditch along the western border of the project.

4.5. PESTS AND PESTICIDE PROBLEMS FOR HEART OF PALM CROP

The heart of palm crop poses a certain number of challenges regarding the management of its pests and the pesticides used to control them, which could likewise pose certain environmental risks that need to be dealt with.

The following section presents a summary of the pests of the heart of palm crop and their management, including toxic and eco-toxic analyses for some of the main pesticides used, as well as the existing options for an Integrated Pest Management (IPM) program that allow for a continuos decrease in the altogether use of agrochemicals. 1 The detailed requisites for pesticide evaluation are contained in Reg. 216.3.(a).10.(b).(1).(i).(a) – (l), which are presented in the following chapter as the Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP).

4.5.1. Most Important Findings and General Recommendations

4.5.1.1. The Colombia Alternative Development (CAD) Programme

The Colombia Alternative Development (CAD) programme, 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 programme uses a bidding approach to call for applications from farmers' organisations 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 Heart of Palm Farming and Management Guide" in table No. 18). 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.

<u>Recommendation No.1</u>: 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.

<u>Recommendation No.2:</u> In order to prevent the dissemination of contaminated crop seed with pathogens, insect pests, and weed propagules, 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 programme. 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 rationalisation 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 'rationalise' pest management programmes 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 favourable 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[5]. 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 (CoG) 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[6].

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 5 active ingredients were selected, to be further studied as possible pesticides to be used in the heart of palm crop pest management (see table No. 18). These pesticides were then subjected to the more complete 'risk analyses, discussed and shown in a table No. 21.

<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).

[5] 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).

[6] 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.

(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).

Recommendation No.5: Considering the traditional attitudes and practices of the participant farmers with respect to pesticides, as well as the limited CoG presence in the isolated, and conflictive, areas where CAD is operating, it is recommended that a strong SUP programme be implemented. The programme 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".[7]

<u>Recommendation No. 6:</u> CAD is encouraged to disseminate, among project operators, both of the below lists of bio-pesticides (Table 15) and enterprises producing bio-products (Table 16) 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.

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

Table 15: 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 16: 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)[8], and with US Environmental Protection Agency (USEPA)[9] 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[10].

Recommendation No. 8: 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).

Recommendation No.9: The summary of the pesticide analysis with the associated recommendation is:

- **Products not registered in the US and Colombia or in PIC[11] 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 crop (heart of palm) and the pest (*Leptopharsa*) are not present in the US and the**

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

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

[10] 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.

[11] '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.

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

The timeline for the implementation of these recommendations is given in Table 17.

Table 17: 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	----------	----------	----------

[12] RUP: Restricted Use Pesticide.

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 analysed 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 programmes: 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 emphasises non-chemical tactics which cause minimal disruption of the ecosystem"[13]. 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

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

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 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 minimise human and environmental risks.

Recommendation No.12: CAD SUP programme must include support for three essential components: (a) a comprehensive training programme on "best practices" in SUP; (b) locally, climatically and technologically appropriate[14] 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 15 products that passed the first screening test (see Table No 21.). 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 programme. These mitigation activities are all encompassed within the comprehensive risk mitigation-SUP and IPM programmes.

[14] 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.

<u>Recommendation No. 13</u>: CAD should socialise 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 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 shown 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.

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 CoG 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 Licences" which were further regulated by decrees 1728 of 2002 and 1180 of 2003.

The modernisation 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[15]. 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 CoG 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.

[15] 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.

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

The CAD supported SUP training programme 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 programme 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:

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 applied16.

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

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

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.

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.

Monitoring Plan for PERSUAP Recommendations

Monitoring Theme	Recommendation	Indicator/s	Special Requirements
Sustainable alternative development	1	i Poly-cropping promoted & adopted by farmers i 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	i ICA certification in place for internal movement of plant materials i 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	i Operators aware of colour band meaning in products & using info for selecting pesticides i Operators pesticide request list regularly checked by CAD-NRE[17] team i Trend for decreased 'red & yellow' band pesticides request lists i No monocrotofos & paraquat by Dec '03 i No methomyl & others by Aug 04 i No chlorpyrifos, carbofuran & others by Aug 05 i SUP KAP changed i 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	i Ecological agriculture & IPM training contracted, offered, finished & KAP[18] monitored i IPM demo fields installed & monitored for all crops i Operators aware of & using bio-pesticides i 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	i Market-led environmental compliance through: organic agriculture, EurepGap, Illicit-to-Licit or other type of certification in place, or i A third party system installed for auditing environmental compliance	Contacts made, bids open, resources allocated to initiate / catalyse both processes

[17] Natural Resources and the Environment
[18] KAP: Knowledge, Attitude and Practices.

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 '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.

4.5.4.3. Training and Best Agricultural Practices Plan (BPA).Pursuant to Recommendations in the Pesticide Evaluation Report and Safe Use Action Plan **PERSUAP**19

Insect pests[20] 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 plague 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 plague 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 plague management, as called for in 12 sections of Regulation 216, including:

1. Status of registration of pesticides in Colombia and with USEPA;

[19] Draft No. 3, 29 October 2003

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

2. Basis for selection of pesticides for any particular application; why was such pesticide selected?
3. To which extent is pesticides part of Integral Plague 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;
9. Availability and effectiveness of other pesticides and/or non-chemical methods to control target plague(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 Plague 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 plague 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 No. 18

Pests in Heart of Palm Farming (*Bactris gasipaes*) abd Management Guide

General Comments: Many phytosanitary problems found in Heart of Palm (*Sp. Chontaduro,* Heart of Palm) farming are similar to problems affecting other palm varieties. Please review Cenipalma Oil Palm summary table containing complete information on the subject.

Pest(s))	Control Methods	Pesticides[i]	Problems
Arthropods:			
Sprout worm, etc. *(Rhynchophorus palmarum*)	Microbiologic:	*Beauveria bassiana, Metarhizium* sp.	
	Ethological: use tramps systematically to capture adult individuals using pheromones and fermented plants to attract insects.		Most damages are related to nematodee transmission ***Rhadinaphelenchus cocophilus***, nematodes cause **red ring**.
	Cultural: opportune inspection of plants to spot disease, eradication of sick palms. Adequate management of chopped crop residues, cutting portions of sick trunks and sealing wounds.		
Picudo*, biter (*Geraeus *sp.)*	Ethological: use of pheromones to attack insects	*Metarhizium* sp.*, Beauveria bassiana* Monocrotofós, metomil, carbaril	Affectation of *chontaduro* fruit
	Biological: entomopathogens, parasitoids, predators		
	Cultural: fertilization, drainage, cutting of sprouts.		
	Chemical:		
Methamacius hemipterus	Cultural: Adequate management of chopped crop residues, cutting of portions of sick trunks and sealing wounds.		
	Microbiological:	*Beauveria bassiana, Metarhizium* sp.	
Foliage eaters	Cultural: weed removal and cleaning nurseries.		
	Microbiological:	*Verticillum sp.*	
Diseases:			
Fusarium sp.	Cultural: Select seed, avoid excess of humidity, adequate storage.		
	Chemical: protector	Thiabendazole	

[i] Pesticidas in this Table are not necessarily recommended for CAD projects. Check information in pesticide Tables.

Pest(s)	Control Methods	Pesticides	Problems
Colletotricum sp. Black leave stain)	Cultural: Select healthy plant material. Use adequate distance between plants. Fertilize. Cut off old leaves.		
	Chemical:	Bordelés mixture, benomyl, mancozeb	
Phytophthora palmarum	Cultural: Management of humidity in nurseries, adequate selection of substrate, adequate shading.		
	Microbiologic	*Trichoderma* sp.	
Lace chinche *(Leptopharsa gibbicarina)*	Natural: Predatory Insects, spiders, and ants (*Crematogaster*). Fungi *Beauveria*, *Paecilomices* and *Sporotrix insectorum.*		Main damages are caused by *Péstalopta, Pestalotiopsis* and other fungi causing '**Pestalopsis.**
	Biological-cultural: redistribution of *Crematogaster* colonies.		
	Cultural: plant '*bajagua*' trees (Cassia reticulata) to control ants. Weekly fertilization and pruning recommended to control disease.		
	Chemical:Use radicular injection or adsorption.	Monocrotofós, bordelés broth	Monocrotofós is a PUR. Seerecommendations
	Microbiological: use entomopathogen fungi	*Paecilomices liacinus*	
Sprout worm, etc. *(Rhynchophorus palmarum*)	Ethological: use tramps systematically to capture adult individuals, using pheromones and fermented plants to attract insects.		Most damages are related to nematode transmission ***Rhadinaphelenchus cocophilus***, nematodes cause **red ring**. This is an important plague affecting harvesting of *chontaduro,* the heart of palm fruit.
	Cultural: opportune inspection of plants to spot disease, eradication of sick palms.		

Technical assistance sources, training and contacts:

1. Hugo Calvache Guerrero, Coordinator, Phytoprotection Area, Oil Palm Research Center, Cenipalma, Bogotá hugo.calvache@cenipalma.org . Ceniplama offers training for technicians and "*plaguero"* or plague field controllers responsible for identification of disease focal points. This offer is available for all parties. ***CAD should send participants to these events.***.
2. Jairo A. Osorio, Head Researcher and MIP Coordinator, Coorporación Colombiana de Investigación Agropecuaria (Corpoica), Tibaitatá, Josorio@corpoica.org.co.
3. Leonor Romero, Palm Information Center, Fedepalma, Carrera 10A, No.71-98, Bogotá.

Principal Bibliographic References:

1. Moreno B., H. 1998. Frequent Pests in *Chontaduro*. Pages 40-52: Plant Protection Bulletin No.3. CONIF.
2. SIESA. S/f. Database in central computer at Chemonics, Bogotá.

Table No. 19
Basis for the selection of Heart of Palm Pesticides
[Addresses Reg. 216 point (b)]

Pesticide		**Uses**		**Basis for Selection**
Technical Name or Active Ingredient	**Trade or Commercial Name in Colombia**	**Crop**	**Pest**	
Beauveria bassiana	Conidia, Nativo, Brocavec, Cebio-pest, Brocaril, Agronova, Bio-expert, Botani-gard, Mycotrol	Plantain Oil palm Heart of palm	*Metamasius hemipterus,* *Brassolis sophorae* *Rinchoforus palmarum,* *Methamacius hemipterus*	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.
Captan	Captan, Merpan, Orthocide	Heart of Palm Cassava Nurseries Potato	Various diseases *Xanthomonas* *Damping off* *Phythophthora*	Cost. Availability. Effectiveness. Wide spectrum of pathogens controlled.
Carboxin	Vitavax	Heart of palms / Seed treatment	Seedling diseases	Cost. Availability. Effectiveness.
Copper sulphate + cal (Bordeaux mixture)	Bordeaux mix	Heart of palm, oil palm Vanilla Nurseries	*Pestalopsis sp.* *Colletotricum sp.* *Fusarium oxysporum & Phytophthora sp.* Damping off	Effectiveness. Limited health & environmental impacts. Easiness to prepare.
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.

Pesticide		Uses		Basis for Selection
Technical Name or Active Ingredient	**Trade or Commercial Name in Colombia**	**Crop**	**Pest**	
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.
Paecilomices liacinus	Biostat	Heart of palm	Sting bug *(Leptopharsa gibbicarina)*	Effectiveness. No health & environmental impacts
Trichoderma	Tricobac, Mycobac, Tricodex, Tricho	Heart of palm Oil Palm	*Phythophtora palmarum*	Effectiveness. No health & environmental impacts
Verticilium lecanii	Vertisol	Heart of palm	Defoliants	Effectiveness. No health & environmental impacts

Table No. 20
Heart of Palm Pesticides[i]
Registration, Problem Analysis & Preliminary Decision [Reg. 216 point (a)]

Pesticide			Crop/s	Pest / s	Type of Problem, if any	Recommenda-tions & alternative/s
Technical Name[ii]	**Trade Name[iii]**	**Type & Tox Class[iv]**				
Beauveria bassiana	Conidia, Nativo, Brocavec, Cebio-pest, Brocaril, Agronova, Bio-expert, Botani-gard, Mycotrol	Microbial insecticide: ento-mopathogen fungi. WHO TC: not available. Colombia TC: III.	Plantain Oil palm Heart of palm	*Metamasius hemipterus, Brassolis sophorae Rinchoforus palmarum, Methamacius hemipterus*		**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.**
Captan	Captan, Merpan, Orthocide	Fungicide. WHO TC: U; Colombia TC: II	Heart of Palm Cassava Nurseries Potato	Various diseases *Xanthomonas* Damping off *Phythophthora*	In 'Bad Actor' list of PAN for possible carcinogenic & acute toxicity	**Approved.**

[i] Includes the pesticides being mentioned for the heart of palm crop in question, requested by CAD Project operators and/or recommended as part of pest management programmes for these crops.
[ii] Generic name or active ingredient.
[iii] Name under which is sold in Colombia.
[iv] 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 ana cute 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**				
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.
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.**
Gliphosate (glifosato)	Roundup	Herbicide. WHO TC U; Colombia TC III ó IV	Cacao Oil palm, Heart of palm, Ru-bber, Plan-tain, Fores-try planta-tions	Cacao plants affected by *Rose-llinia pepo* Weeds in general		**Approved.**
Mancozeb	Manzate, Curzate, Dithane	Fungicide. WHO TC U; Colombia TC III	Plantain Oil palm & heart of palm Rubber Forestry Potatoe	*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.

Pesticide			Crop/s	Pest / s	Type of Problem, if any	Recommenda-tions & alternative/s
Technical Name	**Trade Name**	**Type & Tox Class**				
Metarhizium sp.	Destruxin, Detruxin	Micro-biological insecticide: entomopathogen fungi. TC not available.	Heart of palm	*Rinchoforus palmarum, Methamacius hemipterus*	Registered with USEPA *M. anisopliae*, var, Anisopliae, strain ESF1.	**Approved.**
Monocrotophos (Monocrotofós)	Azodrín, Elan-cron, Fersacrón, Fosacrón, Inisán, Monocrón, Mono-crotofós, Nuva-crón, Protofós, Ronecrón, Trifo-tóx	Insecticide, Acaricide. WHO TC IB; Colombia TC I	Oil palm & heart of palm	*Leptopharsa gibbicarina* (Chinche encaje)	Presently CANCELLED in US. It was RUP with USEPA. In PIC list.In 'Bad Actor" list of PAN for choli-nesterase inhi-bitor. Organophosphate.	**Should not be used. Phase out IMMEDIATELY**
Paecilomices liacinus	Biostat	Microbiological insecticide: ento-mopathogen fungi. Colombia TC III	Heart of palm	Chinche de encaje *(Leptopharsa gibbicarina)*	Not registered with USEPA. However, crop & pest do not exist in the USA.	**Approved.** Microbial product with unlikely environmental impact.
Paraquat	Gramoxone, Agroquat, Calli-quat, Paraquat	Herbicide. WHO TC II; Colombia TC I	Cacao, Plantain, Heart of plam	Weeds, eradication of badly diseased cacao plants	RUP with US-EPA.	**Should not be used. Phase out IMMEDIATELY** . Alternatives: gliphosate; picloram 101R
Thiabendazole	Mertect	Fungicide. WHO TC U; Colombia TC III ó IV	Heart of palm	*Fusarium sp.*	In 'Bad Actor" list of PAN for carcinogenic effects & repro-ductiv e toxin. It was in re-registration with USEPA.	**Approved.** Re-registration approved by USEPA in October 2002.

Pesticide			Crop/s	Pest / s	Type of Problem, if any	Recommenda-tions & alternative/s
Technical Name	**Trade Name**	**Type & Tox Class**				
Thiram	(Only in mixes)	Fungicide.	Heart of palm, seed treatment	Seedling diseases	In RED-04 list. In 'Bad Actor" lis of PAN for reproductive toxin.	**Approved.** But pending re—registration with USEPA in 2004.
Trichoderma sp. (harzianum y lignorum)	Tricobac, Mycobac, Tricodex, Tricho	Microbial fungicide: antago-nistic fungi. WHO TC not available; Colombia TC III ó IV	Heart of palm Oil Palm	*Phythophtora palmarum*	*T. lignorum* is not registeterd with USEPA. However, both crop & pest do not exist in the USA. *T. harzianum* is registered with USEPA.	**Approved**. Microbial product with unlikely environmental impact. Similar species registered
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. 21
Heart of Palm Pesticides – Risk Analysis

Pesticide[i]	Acute Tox Class[ii]	Type	Chronic Toxicity	Eco-toxicity	Groundwater Contamination Potential	Mitigation of risks / Comments [iii]
Beauveria bassiana	WHO: not availa-ble. Colom-bia: III	Micro -bial insecti -cide: fungi	Unlikely to cause any effect. No indication of carcinogenic, teratogenic, reproductive or mutagenic effects.	Bio-product with unlikely environmental impact.	No evidence for potential ground water contamination.	
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 potential ground water contamination.	Uses of benomyl should be controlled vis-à-vis possible environmental impacts on non-target spp.
Captan	WHO: U Colombi a: II	Fungi -cide	Possible carcinogenic , acute toxicity. Unlikely reproductive effects. Non mutagenic, non teratogenic.	Non toxic to birds & bees. Very high tocity to fish. Moderate toxicity to moluscs, insects & zooplancton.	Low persistence in soils & water bodies. Degrades rapidly in neutral water.	Use with precaution protecting humans.
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
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.	

[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 risks: protective clothing (mask, hat, long sleeves short, long pants, boots, gloves or plastic bags, washing clothing, no food, no drink, no smoking, no re-entry to firlds, 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 more general SUP.

Pesticide	Acute Tox Class	Type	Chronic Toxicity	Eco-toxicity	Groundwater Contamination Potential	Mitigation of risks / Comments
Gliphosate	WHO U; Colombia: III-IV	Herbicide	No evidence of any carcinogenic, teratogenic, mutagenic effects.	Slightly toxic to birds, non toxic to fish & bees.	Unlikely due to soil adsorption.	
Mancozeb	WHO: U; Colombia: III	Fungicide	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.
Metarhizium	WHO & Colombia: not available	Microbial insecticide: fungi	Unlikely to cause any effect. No indication of carcinogenic, teratogenic, reproductive or mutagenic effects.	Bio-product with unlikely environmental impact. Not toxic to fish, birds & other animals.	No evidence for potential ground water contamination.	
Paecilomices liacinus	WHO: not available; Colombia III.	Microbial insecticide: fungi	Unlikely to cause any effect. No indication of carcinogenic, teratogenic, reproductive or mutagenic effects.	Bio-product with unlikely environmental impact.	No evidence for potential ground water contamination.	Not registered with USEPA. However, crop & pest do not exist in the USA.
Thiabendazole	WHO: U; Colombia: III-IV	Fungicide.	Possible carcinogenic & promoter of reproductive toxin. Toxic effects in various organs.	Low toxicity to fish. No data on birds. Not toxic to bees. Very toxic to earthworms.	Not likely. Probably bound to sediment & low solubility.	Re-registration approved by USEPA in Oct 02
Trichoderma	WHO: not available; Colombia: II-IV.	Biological antagonist: microbial fungicide.	Unlikely to cause any effect. No indication of carcinogenic, teratogenic, reproductive or mutagenic effects.	Bio-product with unlikely environmental impact.	Unlikely contaminant.	Some spp. not yet registered with USEPA but the genus Trichoderma is.

Pesticide	Acute Tox Class	Type	Chronic Toxicity	Eco-toxicity	Groundwater Contamination Potential	Mitigation of risks / Comments
Verticillium lecanii	WHO & Colombia: not available.	Microbial insecticide: fungi	Unlikely to cause any effect. No indication of carcinogenic, teratogenic, reproductive or mutagenic effects.	Bio-product with unlikely environmental impact.	Unlikely contaminant.	Not yet registered with USEPA but both crop (heart of palm) & pest absent from the US

Table No. 22
THE PROHIBITED ONES
Pesticides PIC, Prohibited, Restricted or Cancelled
In Colombia and/or in the USA[i]

Pesticide[ii]	PIC List[iii]	Registration status in[iv]	
		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 tobaco), P (1985)	No
Ethylene di-bromine (EDB)		P (1985)	No
Fonofos		P (1992)	No
Fosfamin		C (1997)	RUP
Mercury Fungicides		C (1974)	No
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

Pesticide	CIP List	Registration status in	
		Colombia	**United States**
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

[i] It is not an inclusive list for the US or PIC. It is based on Colombian prohibited products.
[ii] Technical name.
[iii] 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. Alow importing countries to better know the potentially hazardous products that may be sent.
[iv] '**P'** = '**Prohibited**' = '**Banned**" = the uses of the product are not permitted in the country, by explicit decision of the regulatory agency. '**R**' = '**Restringido**' = '**Restricted**' = in the sense of the USEPA, it is a pesticide that can only be applied by a certified applicator. '**C**' = '**Cancelado**' = '**Cancelled**' = registration cancelled without a specific prohibition. **No:** not registered.

SECTION 5 ENVIRONMENTAL CONSEQUENCES

5.1. Environmental Assessment Report

5.1.1. Introduction

5.1.1.1. General Aspects of the Project

This chapter presents the present situation and recommendations for ensuring the environmental sustainability of the growth and processing of the chontaduro Heart of Palm in the department of Putumayo, developed by Agroindustrias de la Amazonía S.A. AGROAMAZONIA, of Puerto Asís and the following associations: Asociación de Productores de Puerto Asís (APAC); Asociación de Productores de Puerto Caicedo, (ASOPACA); Asociación de Productores de Orito, (ASOPRAO); Asociación de Productores de Valle del Guamuez, (ASOPRAVAG); and Asociación de Productores de San Miguel, (ASOPAS). In addition, there are chontaduro crops in the Villa Garzón, municipality, which was not included in the Donation Agreement with Chemonics.

The project is divided into two parts, agricultural and industrial. The first consists of chontaduro crops for Heart of Palm on peasant farmland that underwent eradication of the illegal coca crop. The industrial component of the project consists of processing and packaging the Heart of Palm (in glass bottles and cans). There is another project that will include planting Amazonian fruit for the production of pulp and other derivatives, and eventually using the plant to produce and package drinking water.

The greatest difficulty faced by the project was that of establishing the real magnitude of the agricultural component in order to measure the environmental impacts of the productive activity, because, while AGROAMAZONÍA's POA set a goal of 800 hectares, the information provided by the Management and the technical coordination of the project state that, by the end of the year 2004, the plantations will be from 691 to 757 hectares (see Table 23) and the National Alternative Development Plan (PNDA) mentioned a surface area of 648 hectares. However, present production is 60 hectares, complemented by some imports from Ecuador to meet commercial commitments.

Table 23

CONSOLIDATED AGRICULTURAL AREA	
PLANTATIONS AT PRESENT IN PRODUCTION	**60 HECTARES**
PLANTATIONS TO GO INTO PRODUCTION IN THE FOURTH QUARTER OF THE YEAR 2003	**97 HECTARES**
PLANTATIONS IN NURSERIES TO GO INTO PRODUCTION IN THE FOURTH QUARTER OF 2004	**534 - 600 HECTARES**
FAMILIES BENEFITED BY THE PROJECT	**400**

Source : Files from AGROAMAZONIA manager ship and technical department.

In order to achieve the goals set out for 2003, the crops should have been in the planting phase or at least in the germination phase, but it was not possible at that time. In addition, the crop areas are spread out among six (6) municipalities and 54 hamlets, with a total area of 113.257 hectares. Thus, if the crop levels reach those expected by the PNDA, the growth area will cover almost 0.57% of the hamlets and a very small percentage of the total of 760,946.31 hectares of the total area of the 6 municipalities.

For the producers, the average should vary between 2 and 3 hectares. However, if the associations that form a part of the project are taken into account, the project consists of a group of farmers that vary from the 294 reported by the PNDA and 400 by AGROAMAZONÍA. Thus, the real average would be between 0.20 and 0.15 hectares per individual associated with the project.

With regards to the industrial component, according to the POA and consistent with the information gathered during the visit to the processing Plant, the Plant has an installed processing capacity equivalent to 18,000 stalks per 8-hour shift. Thus, if there is an average of 20 work days in a month with only one shift per day, the installed capacity would amount to 4,320,000 stalks per year.

The 60 hectares that are currently in production would produce a maximum of 330,000 stalks a year, that is, the maximum capacity utilized would be 7.36% of installed capacity[29].

All of the foregoing means that the Environmental Assessment presented here is that of a production reality very inferior to what was expected. Indeed, if the project were to achieve the levels originally proposed, the observed impacts are on a very different scale from that which they could signify if the levels proposed by the original Project are reached. Nevertheless, since we must presume that the projects will be implemented, the document will propose a monitoring and evaluation scheme to ensure the procedures to mitigate any impact are considered if the project were to grow.

Even though the objective of this study is to concentrate on environmental matters, we must express our concerns regarding the present structure of the agricultural spraying component and Plant production design. In terms of Alternative Development, it is highly unlikely that the Project will achieve economic sustainability or satisfy the expectations of the rural people involved or those of the country in terms of Alternative Development.

5.1.1.2. Commitments assumed.

The Project has been approved by the Environmental Management Plan issued by Corpoamazonia according to resolution 0859 of October 14, 1999, and by the Waters Discharge and Use Concession under Resolution 0457 of June 2, 2000.

[29] According to POA information, 1,797 boxes of Heart of Palms, from 124,530 stalks, were processed between May 28, 2001 and February 2002. Regarding the available installed capacity, this means that the plant operated only 9 months, in 7 eight hour shifts.

Regarding the Environmental Management Plan, it was discovered that there are a series of commitments assumed by AGROAMAZONÍA, however, it was not possible to precisely determine whether or not they had been fulfilled. These agreements are as follows:

- To request the passes necessary to mobilize Heart of Palm.
- Within 12 months, starting on the Environmental License notification date, Plant 20 hectares of enrichment forest with native species in the high part of the Agua Negra micro-basin.
- Register with the Environmental Authority, the entity responsible for the property, the area in hectares, the location, the name of the species planted, settlement year, copy of the public deed, certificate of freedom from encumbrance and of conveyance, systems, and improvement methods of exploitation and volume to be exploited.
- Review of the environmental standards of Colombia and the United States of America.

An element of the Project which should be highlighted is that the pest and disease control in the plantations do not include extensive use of pesticides with active principals prohibited or restricted by Colombian or in United States legal regulations. Even so, it was discovered that one of the farmers associated with the project is using the herbicide Gramoxone, whose use is restricted under USAID.

5.1.2. Description of Methodology

To develop this chapter, different methodological tools were used. In the first place, three types of forms were designed for Environmental Revision in the field, the first of which was for the Project as a whole, based on the general description of the project, the general characteristics of its area of influence and the surroundings in which the different agricultural and industrial activities took place. The second and third forms were for the specific findings in the field for each of the components of the project. Filling in Environmental Revision Forms was complemented by notes on direct observations, interviews with people involved in the project and photographic records.

It is important to note that the environmental revision of the project refers exclusively to its present development situation and not to possible expansions or changes in productive activities. However, certain notes have been made regarding the measures which should be introduced in the even of growth or additional activities.

5.1.2.1. Field observation summary forms

Two evaluation matrices were constructed for the two components of the project (i.e. agricultural and industrial) based on data card contents and information records from the

field, following the Leopold[30] methodology. These Matrices were constructed with rows signifying the Environmental Factors that can be caused by the Project and the columns signifying the different actions (productive process, water management, waste products, among many others) that could cause any type of impact. For each of the cells resulting from the crossing of an Environmental Factor affected and an Affecting Action, the impact is qualified as Magnitude (M) and Intensity (I). The Magnitude refers to extent of the impact and will be graded on a scale from 1 to 10 in such a manner that an impact effecting one part or only a small area would receive a rating of 1, but if the impact covers a large area or affects a great number of people, it would receive a rating closer to 10. If the impact is negative, that is, if it places an Environmental Factor at risk, the value assigned to the magnitude will be shown by the minus sign (-); but if the impact has a beneficial value, that is, if it improves the Environmental Factor, the value assigned will be positive (+) in magnitude. With regard to Intensity, the rating procedure will be the same. Thus, a harmful, but low intensity Action will be rated close to one, preceded by the minus (-) sign, and if it is very beneficial, it will be rated closer to 10 and be preceded by a plus (+) sign.

To interpret the Matrices more easily, a conceptual reference may be given to the numeric values, as follows: if the rating is –1 it would mean that the action caused a negative effect. A rating of +1, would signify a slight positive effect, but a rating of –2 would mean there was a potentially larger negative effect. If the rating is –3 the impact was harmful, but of medium Magnitude or Intensity, or if a +3, it is also medium positive.

The ratings were also reinforced by using color in the cell backsoil or at the points where the variables cross, leaving the cell backsoil white where an impact was nil. Yellow is used to indicate slight impacts, red for medium impacts and blue for favorable or positive impacts.

Numerical Values	**Interpretation**
-3	The impact is damaging, but with medium Magnitude or Intensity
-2	Produces a slight negative effect
-1	The action does not cause either positive or negative effect.
+1	Produces a very slight positive effect
+2	Produces a slight positive effect
+3	Produces a medium positive effect.

[30] Conesa Fdez.-Victoria. "*Guía Metodológica para la Evaluación del Impacto Ambiental"* (Methodological Guide for the Evaluation of Environmental Impact) páginas 60 y 61. Ediciones Mundi Prensa, Madrid 1997.

5.1.2.2. Qualitative Assessment Characteristics

To complete the Environmental Assessment's components, there are Tables and Matrices containing the recommendations necessary to prevent and mitigate the environmental impacts caused by the agricultural and industrial activities of the project. The Tables and Matrices are shown in the rows of impacts caused by the different actions on natural resources and, in the columns, the prevention and mitigation measures for each of the corresponding impacts, expressed in short, easily understood texts.

All actions of the management plan that correspond to contingent risks are highlighted in red on all the industrial component tables.

5.1.3. Project Environment

Crop distribution

The spatial distribution of the chontaduro plantations for Heart of Palm in the AGROAMAZONÍA Project is a peculiarity that should receive special treatment. The plants are sown in 294 properties, with 59 hamlets in 6 municipalities. This contrasts significantly with the traditional plantation systems for the development of agroindustrial production of Heart of Palm followed in Costa Rica, Ecuador, and Tumaco, Colombia, where what is sought is to develop the plantations as close as possible to the processing plant with the intent of generating scale economies, rationalizing costs, and facilitating the tasks of production planning and control.

From an environmental point of view, the dispersion of the Heart of Palm crop is advantageous because it is notably a clean crop in that it does not use aggressive agro-chemicals and does not cause landscape or ecosystem variations, problems of a single crop plantation, as happens with the traditional Oil Palm and Heart of Palm plantations. Nevertheless, one should evaluate the cost-effective analysis, which, from the point of view of the economic sustainability of the project, generates difficulties in the logistics of product collection and transportation, due to the need to have a relatively large number of technicians to provide technical assistance to agricultural producers and the inherent difficulties in planning and controlling the plantations in their day to day activities, such as the provision of inputs.

In the case of the AGROAMAZONÍA Project, the crop dispersion can be explained by the nature of the coca alternative development project, in that the different municipalities and hamlets accepted the proposed projects of the National Plan for Alternative Development– PLANTE-. However, it is considered necessary to recommend that the scheme of disperse plantations be evaluated in such a manner as to reduce costs and increase the capacity for

planning and controlling productive activities, as it is not sustainable to maintain plantations of one hectare in hamlets more than 30 kilometers away from the Process Plant..

Map 18 (see pag. 236) shows the dispersion of the hamlets where the plantations are located, which, in spite of the strong restriction of roads in Putumayo, have a relatively abundant availability. Nonetheless, it must be remembered that the area on the plantations of Heart of Palm chontaduro only represents 0.57% of the total area of the 54 hamlets and, therefore, it is very likely that they are at a distance from roads and have additional difficulties in transporting the inputs and the end product.

Table 24

Agroamazonía Project
Distribution of Chontaduro plantations for Heart of Palm by Municipalities and Hamlets

Municipality	Approximate Distance of the Plantations from the Processing Plant in Kilometers	Order Number	Hamlets	No. of Affiliates	Area in Heart of Palm in Hectares	Total Area of Hamlet in Hectares	% area of hamlet under Heart of Palm
San Miguel	Minimum = 51,04	1	Alta Floresta	1	1.00	258.93	0.39
		2	Guisita	5	7.50	812.33	0.92
		3	Jordan Ortiz	9	11.50	680.27	1.69
	Maximum = 59,13	4	La Danta	2	7.50	273.99	2.74
		5	Nueva Esperanza	6	24.00	475.99	5.04
		6	San Antonio Comboy	18	43.50	89.97	48.35
Sub-total				41.00	95.00	2,591.48	3.67
Valle de Guamuez	Minimum = 36,69	1	Campo Bello	1	2.00	1,667.22	0.12
		2	Costa Rica	2	7.00	1,458.82	0.48
		3	El Cairo	3	8.90	630.88	1.41
		4	El Jardin	1	3.00	1,012.51	0.30
		5	El Placer	4	12.00	864.89	1.39
		6	Guaduales	3	8.00	453.11	1.77
		7	Santa Teresa	1	1.00	593.05	0.17
		8	La Palestina	6	19.00	941.08	2.02
	Maximum =60,87	9	la Pradera	1	3.00	620.12	0.48
		10	Las Delicias	2	4.00	931.86	0.43
		11	Los Angeles	33	79.50	1,038.65	7.65
		12	Maraveles	2	7.50	796.27	0.94
		13	San Andres	1	3.00	1,854.47	0.16
		14	San Antonio	1	3.00	378.91	0.79
		15	Santa Rosa	1	1.50	305.11	0.49
Sub-total				62	162.40	13,546.95	1.20
Puerto Caicedo	Minimum = 17,77	1	Alto Villanueva	8	10.05	838.53	1.20
		2	Caruzo	2	2.50	763.56	0.33
		3	Circacia	2	1.20	344.20	0.35
		4	Cristo Rey	1	2.00	901.63	0.22
		5	Esmeralda	2	4.00	715.63	0.56
		6	Las Delicias	1	0.50	1,140.52	0.04
		7	La Joya	2	1.00	814.60	0.12
	Maximum = 31,54	8	Maracaibo	1	0.75	1,989.80	0.04
		9	Pedregosa	11	37.00	769.28	4.81
		10	Pildoro	2	1.50	866.70	0.17
		11	Playa Rica	11	16.75	1,528.73	1.10
		12	San Cayetano	1	2.00	763.82	0.26
		13	Campo Bello	1	2.00	753.82	0.27
		14	La Cristalina	1	2.00	50.84	3.93
Sub-total				46	83.25	12,241.65	0.68

Table 24 continuation

Agroamazonía Project
Distribution of Chontaduro plantations for Heart of Palm by Municipalities and Hamlets

Villa Garzón	Minimum =40,29	1	Simón Bolívar	13	25.00	1,107.66	2.26
	Maximum=54,88	2	Villa Colombia	30	93.00	344.39	27.00
Sub-total				43	118	1,452.05	8.13
Puerto Asís	Minimum =6	1	Agua Negra	2	3.00	2,039.59	0.15
		2	Ancura	1	2.50	686.62	0.36
		3	Cabaña	3	3.20	644.56	0.50
		4	Cordialidad	1	1.00	353.33	0.28
		5	Cuembi	1	1.30	598.22	0.22
		6	El Muelle	1	2.00	916.88	0.22
		7	Horizonte	1	0.50	698.64	0.07
		8	Kilili	3	6.00	1,874.92	0.32
		9	La Bocana	1	1.00	48,794.57	0.00
	Maximum=42	10	La Carmela	4	7.00	540.32	1.30
		11	Las Delicias	1	4.00	587.13	0.68
		12	Las Malvinas	5	6.50	199.55	3.26
		13	Montañita	1	2.60	2,684.69	0.10
		14	Nariño - Nariño	15	35.55	273.16	13.01
		15	Paraiso	6	13.10	4,481.58	0.29
		16	Planadas	1	0.50	1,284.98	0.04
		17	Playa Rica	2	4.00	708.83	0.56
		18	Santa Isabel	3	3.00	1,367.46	0.22
		19	Toaya	1	2.00	813.42	0.25
Sub-total				53	98.75	69,548.45	0.14
Orito	Minimum =23,2	1	Buenos Aires	4	12.00	1,195.16	1.00
		2	Burdines	3	2.70	1,410.60	0.19
		3	El Jordan	11	19.50	530.47	3.68
		4	El Yarumo	1	1.00	391.91	0.26
		5	Estrella de la Silva	9	20.00	1,154.46	1.73
	Maximum =54,37	6	Paraiso	1	0.50	2,316.42	0.02
		7	San Andres	8	19.50	424.19	4.60
		8	Silvania	5	10.00	2,999.35	0.33
		9	Simon Bolivar	3	3.50	2,554.78	0.14
		10	Tesalia	4	2.20	899.80	0.24
Sub-total				49	90.9	13,877.13	0.66
Total		54		294.00	648.30	113,257.71	0.57

Source : Plan Nacional de Desarrollo Alternativo, Excel file, November 2002, computation by the consultant

5.1.4. Agricultural Component

5.1.4.1. Leopold Matrix

Click on picture to go to Leopold Matrix (excel file *Leopold-matrix-agriculture-xls*). See appendix with Leopold Matrix.

Row Identification	ENVIRONMENTAL FACTORS AFFECTED LEOPOLD MATRIX ROWS
	1) Environmental Impact on Soil Resource
1	Erosion
2	Exposed soils
3	Chemical contamination
4	Loss of Organic Matter
	2) Environmental Impact on Hydric Resource
5	Reduction of water volumes
6	Reduction of retention capacity
7	Interruption of flows (dams, diversions)
8	Agrochemical contamination
9	Chemical contamination
10	Solids contamination
11	Waste water contamination
12	Loss of moisture
13	Sedimentation of bodies of water
	3) Environmental Impact on the Biologic Resource
14	Reduction of Biodiversity
15	Change in land flora
16	Change in the land fauna
17	Change in aquatic flora
18	Change in aquatic fauna
19	Introduction of exotic species
20	Introduction of harmful species
21	Destruction or degradation of wooded areas
22	Changes in humid areas
23	Change in wild life
24	Change in landscape
	4) Environmental Impact on Air Resource
25	Generation of odors
26	Generation of smoke
27	Generation of dust
28	Generation of noise
	5) Environmental Impact on Human Health
29	Diseases due to water
30	Diseases due to agrochemicals
31	Diseases due to product manipulation
32	Use of toxic materials
33	Use of caustic materials
34	Work related diseases
	6) Environmental Impact in the socio-cultural y economic context
35	Intervention in historical zones
36	Intervention in archeological zones
37	Relocation of rural population
38	Conflicts with indigenous cultures
39	Community participation
40	Social inequalities
41	Introduction of cultivation practices distinct from local tradition
42	Changes in family income
43	Possibility of accumulation of capital
44	Other effects on economic expectations

Column Identification	IMPACT CAUSING ACTIVITIES LEOPOLD MATRIX COLUMNS **AGRICULTURAL COMPONENT**
A	1.0. GERMINATORS
	1.1. Collection and treatment of seeds
	1.2. Construction of sowing beds
	1.3. Shade installation
B	2.0. NURSERIES
	2.1. Collection of substrate material
	2.2. Construction of sowing beds
	2.3. Bagging
	2.4. Weed control
	2.5. Irrigation of nursery
	2.6. Shade construction
	2.7. Fertilization of nursery
	2.8. Phyto-sanitary control
C	3.0. ESTABLISHMENT OF PLANTATION
	3.1. Soil preparation
	3.2. Tracing and hole digging
	3.3. Sowing
D	4.0. CROP MAINTENANCE
	4.1. Application of corrective measures
	4.2. Fertilization
	4.3. Weed control
	4.4. Phyto-sanitary control
	4.5. Maintenance of the vegetal layer
	4.6. Interspersed crops
	4.7. Harvesting
	4.8. Transport of stalks
E	5.0. Planting other crops
	5.1. Sowing of other crops
	5.2. Fertilization of other crops
	5.3. Weed control of other crops
	5.4. Phyto-sanitary control of other crops
	5.5. Harvesting other crops

5.1.4.2. Characteristics of qualitative evaluation

The following is a presentation of the characteristics which determined that the impact of each activity on environmental factors and the qualitative opinion on the effects are shown below. Only environmental factors with minimum or medium effect level were taken into consideration.

	ENVIRONMENTAL IMPACT STUDY CHARACTERISTICS OF QUALITATIVE EVALUATION			
	1.0 GERMINATORS			
	CHARACTERISTICS	**OPINION**	**ASSESSMENT**	
			M	**I**
A3	Controls applied to weeds and seed treatment (kaptan).	Can generate slight, localized soil contamination	-1	-2
A4	During plot construction a surface layer of soil is eliminated	This procedure eliminates surface organic matter	-1	-2
A24	Effect on landscape by shade produced by use of plastic covering	Effect on the local landscape	-2	-2
A30	Possible health disorders due to toxic ingredients used in seed treatment and weed control	Inputs used are low toxicity	-1	-2

KEY

1) M = Magnitude (Extent or Scale of Impact)

Theoretical area of influence of the Impact in relation to the Project environment
Rating = (Favorable (+), Unfavorable (-))+(Scale of 1 to 10)

1 = Minimal 10 = Extensive

2) I = Importance (Intensity or Degree of Incidence)
Degree of Incidence of action on the factor
Rating = (Favorable (+), Unfavorable (-))+(Scale of 1 to 10)
1 = Minimal Effect, 10 = Total Destruction

NO IMPACT

MEDIUM IMPACT

MINIMUM OR LOW IMPACT

FAVORABLE IMPACT

ENVIRONMENTAL IMPACT STUDY
CHARACTERISTICS OF QUALITATIVE EVALUATION

2.0 NURSERIES

	CHARACTERISTICS	OPINION	ASSESSMENT	
			M	I
B1	Extraction of material for the nursery substratum	Erosion localized in the area of extraction	-1	-2
B3	Application of Chemical controls on the weeds	Can cause slight or localized soil contamination	-1	-2
B4	In collecting material from the substratum the surface soil layer is eliminated.	This procedure eliminates surface organic material.	-1	-2
B24	Effect on landscape caused by use of plastic covering.	Change in local natural landscape	-2	-2
B30	Possible health disorders due to toxicity of ingredients used in the phytosanitary controls in the nursery.	Products used are low in toxicity levels	-1	-2
B39	Community and association activities	Reinforces processes among associations and communities, generating social connectivity.	3	3
B41	Introduction of agro-forestry systems not used in the area.	Generation of new technical and administrative processes for farms.	3	3
B42	Improvement and stability in family income expected.	Erosion localized in the area of extraction	-1	2
B1	Extraction of material for the nursery substratum	Can cause slight or localized soil contamination	-1	2

KEY

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Degree of Incidence of action on the factor
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1 = Minimal Effect, 10 = Total Destruction

NO IMPACT

MEDIUM IMPACT

MINIMUM OR LOW IMPACT

FAVORABLE IMPACT

ENVIRONMENTAL IMPACT STUDY
CHARACTERISTICS OF QUALITATIVE EVALUATION

3.0 SETTLEMENT

	CHARACTERISTICS	OPINION	ASSESSMENT	
			M	I
C1	Digging process for placing the Heart of Palm plantules	Can produce insignificant erosion	-1	-2
C4	Digging process for placing the Heart of Palm plantules	Can produce insignificant erosion	-1	-2
C15	The tall field brush that could eventually become secondary forest is destroyed during the process of preparing the land for sowing. There is evidence of the burning of tall brush.	Loss of localized brush and damage to soil by loss of microorganisms	-2	-2
C16	The tall field brush that could eventually become secondary forest is destroyed during the process of preparing the land for sowing. There is evidence of the burning of high brush.	Loss of localized brush and damage to soil by loss of microorganisms	-2	-2
C21	The tall field brush that could eventually become secondary forest is destroyed during the process preparing the land for sowing. There is evidence of the burning of tall brush.	Loss of localized brush and damage to soil by loss of microorganisms	-2	-2
C24	Landscape change due to brush destruction	Slight effect on local natural landscape	-1	-2
C41	Introduction of agro-forestry systems not previously used in the area	Generation of new technical and administrative processes for farms	3	3
C42	Improvement and stability in family incomes expected.	There is an expectation for improvements in family income levels due to agricultural activities and ties to agroindustrial activities	-1	2
C43	Increase in family assets and expectation of income flow and surpluses.	Value assessment of farm due to the plantation of Heart of Palm and income expectations.	-1	2

KEY

1) M = Magnitude (Extent or Scale of Impact)

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Degree of Incidence of action on the factor
Rating = (Favorable (+), Unfavorable (-))+(Scale of 1 to 10)
1 = Minimal Effect, 10 = Total Destruction

NO IMPACT

MEDIUM IMPACT

MINIMUM OR LOW IMPACT

FAVORABLE IMPACT

ENVIRONMENTAL IMPACT STUDY
CHARACTERISTICS OF QUALITATIVE EVALUATION

4.0 PLANTATION MAINTENANCE

	CHARACTERISTICS	OPINION	ASSESSMENT	
			M	I
D3	Application of *dolomita* lime for soil correction, fertilization, and chemical weed control.	There may be slight soil contamination due to application of chemicals.	-2	-2
D15	Weed control can have localized effects.	This could cause an effect on the vegetation surrounding the crops	-1	-2
D16	The application of insecticides can reduce the diversity of local species.	This could cause slight effects on the diversity of insects.	-1	-2
D23	Weed control and insecticide use could have localized effects.	This effect may be insignificant.	-1	-2
D30	Possible health problems due to toxic ingredients used in botany sanitation and weed control.	Low toxicity inputs used	-1	-2
D31	There is the possibility of injury during the processes of cutting and collecting palm stalks.	There is a low probability of injury while cutting the stalks or manipulating the thorns on the stalks.	-1	-2
D34	There is the possibility of injury during the processes of cutting and collecting palm stalks.	There is a low probability of injury while cutting the hearts or manipulating the thorns on the stalks.	-1	-2
D41	Introduction of agro-forestry systems not utilized in the area.	Generate new technical and administrative processes for farms.	3	3
D42	Expectation of improvement and stability in family incomes.	There is an expectation for improvements in family income levels due to agricultural activities and ties to agroindustrial activities.	-1	2
D43	Increase in family assets and expectation of income flow and surpluses.	Value assessment of farm due to the plantation of Heart of Palm and income expectations.	-1	2

KEY

1) M = Magnitude (Extent or Scale of Impact)

Theoretical area of influence of the Impact in relation to the Project environment
Rating = (Favorable (+), Unfavorable (-))+(Scale of 1 to 10)

1 = Minimal 10 = Extensive

2) I = Importance (Intensity or Degree of Incidence)
Degree of Incidence of action on the factor
Rating = (Favorable (+), Unfavorable (-))+(Scale of 1 to 10)
1 = Minimal Effect, 10 = Total Destruction

NO IMPACT

MEDIUM IMPACT

MINIMUM OR LOW IMPACT

FAVORABLE IMPACT

	ENVIRONMENTAL IMPACT STUDY CHARACTERISTICS OF QUALITATIVE EVALUATION			
	5.0 OTHER CROPS			
	CHARACTERISTICS	**OPINION**	**ASSESSMENT**	
			M	**I**
E24	Partially conserve the biodiversity of the region.	Introduces other native species along with the chontaduro palm.	-1	3
E41	Introduce agro-forestry systems not used in the area.	Generate new technical and administrative processes for farms.	3	3
E42	Improvement and stability in family incomes expected.	Expectation of improvements in family income levels due to agricultural activities and ties to agroindustrial activities.	-1	2
E43	Increase in family assets and expectation of income flow and surpluses.	Value assessment of farm due to the plantation of Heart of Palm and income expectations.	-1	2

KEY

1) M = Magnitude (Extent or Scale of Impact)

Theoretical area of influence of the Impact in relation to the Project environment
Rating = (Favorable (+), Unfavorable (-))+(Scale of 1 to 10)

1 = Minimal 10 = Extensive

2) I = Importance (Intensity or Degree of Incidence)
Degree of Incidence of action on the factor
Rating = (Favorable (+), Unfavorable (-))+(Scale of 1 to 10)
1 = Minimal Effect, 10 = Total Destruction

NO IMPACT

MEDIUM IMPACT

MINIMUM OR LOW IMPACT

FAVORABLE IMPACT

5.1.4.3. Conclusions on the Leopold Matrix for the Agricultural Component

The Leopold Matrix for the agricultural component contains 32 columns representing the actions which could cause an impact as a result of the Heart of Palm chontaduro crop (5 principal activities and 27 sub-activities) and 50 rows that represent the environmental factors that could suffer some type of impact due to these activities. (6 recourses and 44 environmental factors affected).

Adding columns and rows yields a total of 1,408 cells valid for impact analysis, that is, in which the Magnitude and Intensity of the impact on each factor are recorded.

In the Leopold Matrix for the agricultural component, one observes that the majority of cells have a white background and record Magnitude values of –1 and Intensity of Impact values of -1, which means that the greater part of the activities do not produce any environmental effect on the factors studied. These cells represent 88.71% of the total. The cases of medium impact (that is with Impact and Intensity of close to –3 with a red background) are only 11, which is equivalent to 0.78% of the total cells. For their part, there are 47 cases of minimum to low impacts (yellow background), equivalent to 3.34% of the cell total. Lastly, there are 101 cells, equivalent to 7.17% of the cell total, which shows that the positive impacts outweigh the negative impacts, which, in the worst scenario, are of medium magnitude and intensity, demonstrating that Heart of Palm cultivation in Putumayo does not pose any type of significant threat to the environment of the region.

Table 25 Impact Assessment Summay
Agricultural Component

Impact Assessment	Number of Cells	Percentage
-1 No Impact	1.249	88.71 %
-2 Minimal or Low	47	3.34 %
-3 Medium	11	0.78 %
+ 1, 2 and 3 Favorable	101	7.17 %

In addition, while it does not represent an environmental problem, we must insist that the existing scheme of disperse plantations does call into doubt the economic sustainability of the Project in the medium term. The Project has suggested a significant expansion of the areas under cultivation, which, from the economic point of view, would be desirable for if carried out according to plans, means increasing establishment through associations of rural producers. These schemes have produced good results in the cases of oil palm in recently

developed projects in the Magdalena Medio region, and those of many years' standing in Malaysia and Costa Rica.

Now then, cultivations under planting schemes have environmental repercussions which are different from those caused by the disperse scheme, mainly arising from the fact of concentrating almost exclusive production of a single crop in a relatively large area (It is not correct to refer to a mono-plantation, as, in fact, several plant species are grown on these plantations, in between alleys (*callejones)*, among others parts).

The environmental impacts that this plantation scheme may produce are:

- Greater effects on native flora and fauna.
- More changes in the landscape.
- Concentration of drainage works can cause soil erosion.
- Greater concentration of inputs for controlling disease, fertilization and soil correction
- Inputs used will eventually have an effect on sources, currents and bodies of water.

This would make it necessary to undertake special management plans which, although they are identifiable in the monitoring process implemented later, should be mentioned at this stage:

- Topographic plans that demarcate the areas of importance such as, the land to be intervened and the sensitive areas to be protected, i.e. young woodlands and wetlands. In the case of Putumayo, there are abundant sensitive zones, as described in Corpoamazonia memorandum DRP-597.
- The planted alleys to be established around the Heart of Palms must be defined. The most appropriate crops for the zone would be legumes and alelophatic species, among others.
- Prepare areas to use for storage and disposal of matter, inputs and waste products.
- Establish water monitoring and control systems, which are recommended in the Industrial Component.

5.1.5. Industrial Component

5.1.5.1. Leopold Matrix

Click on picture to go to Leopold Matrix (excel file *Leopold-matrix-plant-xls*). See Matrix as printed Appendix.

Row Identification	ENVIRONMENTAL FACTORS AFFECTED LEOPOLD MATRIX ROWS
	1) Environmental Impact on Soil Resource
1	Erosion
2	Exposed soils
3	Chemical contamination
4	Loss of Organic Matter
	2) Environmental Impact on Hydric Resource
5	Reduction of water volumes
6	Reduction of retention capacity
7	Interruption of flows (dams, diversions)
8	Agrochemical contamination
9	Chemical contamination
10	Solids contamination
11	Waste water contamination
12	Loss of moisture
13	Sedimentation of bodies of water
	3) Environmental Impact on the Biologic Resource
14	Reduction of Biodiversity
15	Change in land flora
16	Change in the land fauna
17	Change in aquatic flora
18	Change in aquatic fauna
19	Introduction of exotic species
20	Introduction of harmful species
21	Destruction or degradation of wooded areas
22	Changes in humid areas
23	Change in wild life
24	Change in landscape
	4) Environmental Impact on Air Resource
25	Generation of odors
26	Generation of smoke
27	Generation of dust
28	Generation of noise
	5) Environmental Impact on Human Health
29	Diseases due to water
30	Diseases due to agrochemicals
31	Diseases due to product manipulation
32	Use of toxic materials
33	Use of caustic materials
34	Work related diseases
	6) Environmental Impact in the socio-cultural y economic context
35	Intervention in historical zones
36	Intervention in archeological zones
37	Relocation of rural population
38	Conflicts with indigenous cultures
39	Community participation
40	Social inequalities
41	Introduction of cultivation practices distinct from local tradition
42	Changes in family income
43	Possibility of accumulation of capital
44	Other effects on economic expectations

Column Identification	IMPACT CAUSING ACTIVITIES LEOPOLD MATRIX COLUMNS **INDUSTRIAL COMPONENT**
F	1.0 AGROINDUSTRIAL PRODUCTION PROCESSES
G	2.0 PRODUCTION. (steam and electricity)
H	3.0 TREATMENT SYSTEMS (potable water and domestic sewage water)
I	4.0 STORAGE
J	5.0 ORGANIC FERTILIZER PRODUCTION
K	6.0 GERMINATORS
L	7.0 TRANSPORTATION
M	8.0 DIVERSIFICATION PROJECTS CONSTRUCTION - OPERATION

5.1.5.2. Characteristics of qualitative evaluation

The following are the characteristics which determined that the impact of each activity on environmental factors and the qualitative opinion of the effect should be taken into account. Only environmental factors with minimum or medium modification levels were taken into consideration.

	ENVIRONMENTAL ASSESSMENT CHARACTERISTICS OF QUALITATIVE EVALUATION			
	1.0 AGROINDUSTRIAL PRODUCTION PROCESSES			
	CHARACTERISTICS	OPINION	ASSESSMENT	
			M	I
F3	Discharged industrial sewage water is released into a retention pond located in natural land. There is an underground layer of infiltration of this discharge.	The effect on the soil cannot be determined while there are no physical or chemical characteristics available on the industrial discharge. Apparently the effects are minimal and localized.	-1	-2
F11	Industrial discharges are made into the Singuiya wetland after it is minimally treated. The treatment consists of catching the solids with mesh and retaining them in a tank to reduce the temperature.	The effect on the Singuiva wetland cannot be determined while there are no physical or chemical characteristics available on the industrial discharge. Apparently the effect is minimal. The discharged liquid contains solids and diluted soap from the cleaning process.	-1	-2
F13	The Singuiya wetland is adjacent to the land receiving the industrial wastewater.	The quantity of solids in the discharged industrial liquids has not been quantified. Apparently there is not a significant amount of surplus solids in the discharged liquids, thus the impact is minimal and localized.	-1	-2
F22	There is an effect on the Singuiya wetland due to the discharge of waste water.	Minimal and localized	-1	-2
F24	The agroindustrial plant is predominately located in grazing land with grass and humedales.	The effect on the landscape is on a localized and low in intensity.	-1	-2
F25	The processes of boiling and exhausting generate an odor. The steam remains in the plant's interior because there is no odor extracting system.	Only the plants interior suffers any effect (local) and the odor is considered insignificant because of the existence of steam.	-1	-2
F28	The only equipment in the industrial process that generates noise during operation is the steam tunnel.	The noise levels produced in the industrial process are minimal and localized.	-1	-2

ENVIRONMENTAL ASSESSMENT
CHARACTERISTICS OF QUALITATIVE EVALUATION

1.0 AGROINDUSTRIAL PRODUCTION PROCESSES (continue)

	CHARACTERISTICS	OPINION	ASSESSMENT	
			M	I
F29	No physical, bacterial or chemical controls were implemented to determine the quality of water used in brine preparation, bottle washing, rinsing of Heart of Palms after the scraping stage and in the final cleaning stages at the Plant.	As there is no information on the quality of water used in the industrial process, there is a high probability of bacterial contamination. In addition, the bottled product is not rigorously quarantined, thus increasing risk levels.	-2	-3
F31	The operators handling the palm stalks may be hurt when handling the thorns as the rubber gloves do not provide sufficient protection. The jobs of peeling, scraping and cutting also involves the use of gloves	The majority of injuries are slight and isolated. Nevertheless, the gloves do not provide enough protection in the event of an accident occurring in the cutting stage.	-1	-2
F34	The plant has no nursing station or stretchers, nor the resources needed for providing first aid. In addition, in the industrial process area there are no fire extinguishers, no emergency exit signs or information cards with emergency procedures. Equipment such as the sterilizing unit has no signposts to direct workers to a protected area and the space for worker movement is very limited. There is no space in the building set up where workers can eat their meals.	The impact which could be caused as a result of the lack of the minimum elements to deal with an accident at work could be high. Operators should be trained to act in cases of a contingency and a study should be made of the risks and movements for the industrial process.	-1	-3
F42	There are important economic expectations for the agroindustrial process, first because the stalks will be bought from the associated farmers and second because of expectations as to the quality of the finished product to be sold commercially.	Family incomes of the Heart of Palm growers and those involved in the agricultural and agroindustrial processes are expected to grow.	-1	2

KEY

1) M = Magnitude (Extent or Scale of Impact)

Theoretical area of influence of the Impact in relation to the Project environment
Rating = (Favorable (+), Unfavorable (-))+(Scale of 1 to 10)

1 = Minimal 10 = Extensive

2) I = Importance (Intensity or Degree of Incidence)
Degree of Incidence of action on the factor
Rating = (Favorable (+), Unfavorable (-))+(Scale of 1 to 10)
1 = Minimal Effect, 10 = Total Destruction

NO IMPACT

MEDIUM IMPACT

MINIMUM OR LOW IMPACT

FAVORABLE IMPACT

ENVIRONMENTAL ASSESSMENT
CHARACTERISTICS OF QUALITATIVE EVALUATION

2.0 PRODUCTION. (steam and electricity)

	CHARACTERISTICS	OPINION	ASSESSMENT	
			M	I
G3	There is a potential risk of soil contamination by fuel leakage that can be caused by infiltration from the storage tank or a fracture in the conduction piping.	In the event of fuel leakage, the impact on the soil will be high and this will affect neighboring land.	-2	-3
G9	There is a potential risk of water contamination (surface and underground water) by fuel leakage caused by infiltration from the storage tank or a fracture in the conduction piping.	In the event of fuel leakage, the impact on water sources will be high, and this will affect neighboring land.	-2	-3
G11	The hot water from the boiler is released and a part infiltrates the land, while another part reaches the Singuiya wetland.	The boiler vent has a small holding area where the water reaches a temperature of over 40 degrees centigrade. The impact is minimal and localized.	-1	-2
G24	Located on the outside of the central building are the fuel tank, the shed with the electricity generator and the water tank for the boiler.	These elements have a minimal effect on the local landscape.	-1	-2
G26	The electric generator has a combustion motor and a carbonic gas vent.	There is a large amount of steam from the motor of the electricity generator, but there is a strip of land next to the plant building to minimize air emissions.	-1	-2
G28	The two important noise sources are the boiler inside the building and the electricity generator located in the exterior in a small shed. The boiler is on during the industrial process. The generator operates when there is no electricity and during maintenance.	The noise caused by the boiler is moderate and constant and when inside the building it can be bothersome to the operators and office staff. The noise from the electric generator is moderate but does not effect the workers because it is located in an independent area.	-1	-3
G34	Maintenance personnel in charge of the generator systems (steam and electric) have no industrial safety protection against the noise. There are no safety signs. The equipment does not have information on surrounding safety areas. In case of accident there is no contingency plan.	The noise level generated by the boiler is high enough to affect the operators. The lack of safety measures and training programs increases the risk of accidents	-1	-2

KEY

1) M = Magnitude (Extent or Scale of Impact)

Theoretical area of influence of the Impact in relation to the Project environment
Rating = (Favorable (+), Unfavorable (-))+(Scale of 1 to 10)

1 = Minimal 10 = Extensive

2) I = Importance (Intensity or Degree of Incidence)
Degree of Incidence of action on the factor
Rating = (Favorable (+), Unfavorable (-))+(Scale of 1 to 10)
1 = Minimal Effect, 10 = Total Destruction

NO IMPACT

MEDIUM IMPACT

MINIMUM OR LOW IMPACT

FAVORABLE IMPACT

ENVIRONMENTAL ASSESSMENT
CHARACTERISTICS OF QUALITATIVE EVALUATION

3.0 TREATMENT SYSTEMS (potable water and domestic sewage water)

	CHARACTERISTICS	OPINION	ASSESSMENT	
			M	I
H3	Mud from the backwashing of the filters is discharged on to the natural land.	The mud can be considered basically inert and has a minimal effect on the soil.	-1	-2
H5	The potable water plant supplies three cisterns, 7 to 8 meters in depth. Because the design of the cisterns is not known, it is not possible to determine if the water entering the cisterns comes from the surface, under soil, or farther under soil.	The use of the cisterns has a minimal effect because the large amount of rain in the zone allows water levels to be maintained.	-1	-2
H11	The mud coming from filter backwashing in the potable water plant and discharge from the wastewater treatment plant goes to the Singuiya humedal.	There are no results from the physical-chemical analysis of waters discharged into the wetland. Nevertheless, the impact on the wetland of the treatments used is expected to be minimal and localized.	-1	-2
H24	The drinking water plant is located outdoors. The treatment system for the wastewater is buried underground.	These elements have a minimal effect on the landscape.	-1	-2
H25	There is a slight odor in the area directly surrounding the septic tank.	The odor is localized and very slight.	-1	-2
H28	The motors on the cisterns produce noise while pumping.	The motors on the electric generators are not very powerful thus the noise produced is slight and localized.	-1	-2
H29	The drinking water plant does not have an operations manual. Neither physical-chemical nor bacteriological tests are run on the quality of water treated. There is uncertainty as to the efficiency of the system in the water plant. Raw water is being used in the process of filtering backwashing for one of the cisterns.	As there is no information on the quality of the raw water being treated at the drinking water plant, nor any on the quality of the treated water, there is a high risk of contamination.	-2	-3

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MEDIUM IMPACT

MINIMUM OR LOW IMPACT

FAVORABLE IMPACT

ENVIRONMENTAL ASSESSMENT
CHARACTERISTICS OF QUALITATIVE EVALUATION

5.0 ORGANIC FERTILIZER PRODUCTION

	CHARACTERISTICS	OPINION	ASSESSMENT	
			M	I
J11	In the piles where the organic fertilizer is produced the leachates are not re-circulated and they therefore filter or are poured onto the surrounding natural land, where they may be carried by the surface current to the nearby wetland.	The possible effect is slight and localized.	-1	-2
J20	The compost process attracts insects such as flies and bees. This is not recommendable as the industrial process is carried out nearby.	The actual effects are slight and localized.	-1	-2
J24	The compost is located in a shed with a zinc roof next to the industrial processing building. There is a natural hedge that minimizes the view of the shed.	The impact on the visual aspect of the landscape is minimal and localized.	-1	-2
J25	The compost process produces an odor due to the process of decomposition and to the accelerants used.	The odor is localized and not noticeable in the surrounding areas.	-1	-2
J28	The shredder produces noise during operation	The level of noise produced is localized and minimal.	-1	-2
J31	The operators who work with the husk of the Heart of Palm stalk may be injured by thorns as the rubber gloves do not provide sufficient protection. Care must be taken with the razors and mobile machine parts of the shredder while it is in operation.	The majority of injuries caused by thorns are slight and isolated. Accidents caused by cutting equipment will be minimal if security procedures are followed during operation.	-1	-2
J44	Growers of Heart of Palm and palm expect to achieve economic benefits from the utilization of the organic fertilizer produced in the plant.	The production of organic fertilizer is currently in the experimental phase and does not produce enough to satisfy project demands.	-1	-2

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NO IMPACT

MEDIUM IMPACT

MINIMUM OR LOW IMPACT

FAVORABLE IMPACT

	ENVIRONMENTAL ASSESSMENT CHARACTERISTICS OF QUALITATIVE EVALUATION			
	6.0 GERMINATORS			
	CHARACTERISTICS	**OPINION**	**ASSESSMENT**	
			M	**I**
K3	Weed control and seed treatment is applied (kaptan).	This can produce a slight and localized soil contamination	-1	-2
K4	The surface soil layer is eliminated during construction of the sowing beds.	This process eliminates surface organic matter	-1	-2
K24	The use of plastic covering will affect the landscape	Effects on the local natural landscape	-1	-2
K30	The toxic ingredients used in seed treatment and weed control may be harmful to health.	Inputs used have low toxicity levels.	-1	-2

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Degree of Incidence of action on the factor
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MEDIUM IMPACT

MINIMUM OR LOW IMPACT

FAVORABLE IMPACT

	ENVIRONMENTAL ASSESSMENT CHARACTERISTICS OF QUALITATIVE EVALUATION			
	7.0 TRANSPORTATION			
	CHARACTERISTICS	**OPINION**	**ASSESSMENT**	
			M	**I**
L3	Mechanical work on vehicles is currently being carried out inside the lot of the plant. There is no infrastructure for the management of grease, oil, and fuel products that could spill onto the natural soil at any time.	The effect will be local	-1	-2
L9	The grease, oil and fuel spills may enter into bodies of water by superficial currents.	The effect will be local.	-1	-2
L26	The combustion engines of the vehicles used for the project produce carbonic residue.	Minimum effect because of the very small number of vehicles used.	-1	-2
L31	The truck drivers that collect the stalks at the farms help with loading and unloading. They use rubber gloves during these operations.	The majority of case of the injuries which may occur are slight and individual.	-1	-2

KEY

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MINIMUM OR LOW IMPACT

FAVORABLE IMPACT

ENVIRONMENTAL ASSESSMENT
CHARACTERISTICS OF QUALITATIVE EVALUATION

8.0 DIVERSIFICATION PROJECTS

	CHARACTERISTICS	OPINION	ASSESSMENT	
			M	I
M2	For the construction of the modules where the diversification processes, excavations will be made on the northern side of the present building.	The excavation is local and doesn't effect the neighboring land.	-1	-2
M4	The vegetal layer must be removed during excavation for the construction.	The volume to be removed is minimal and localized.	-1	-2
M5	The new industrial processes require the treatment plant to supply a larger amount of drinking water.	As the capacity of the cisterns has not yet been determined, it is not known if there will be enough water for the new requirements. However, water from the Aguas Negras stream is available for use should it be necessary.	-1	-2
M9	There could be grease, oil, or fuel discharge from the machines or equipment used during construction	This discharge must be minimal and localized.	-1	-2
M11	The liquid discharge from the new industrial processes should be studied to determine if they need to be treated before final disposal.	Liquid discharges must comply with the standards for this type of elements, issued by the competent entity.	-1	-2
M24	The new buildings change the landscape within the project area.	The effect on the landscape is localized and low in intensity.	-1	-2
M28	The noise produced by equipment during construction will have an effect on the plant workers. During construction of the new phase of industrial operations the equipment will produce noise during normal operation.	The level of noise produced is minimal and localized.	-1	-2
M29	The new industrial processes will require better water quality controls in the drinking water plant. Chemical and bacteriological tests should be made routinely in an in-house laboratory.	If an extensive water quality control program is not put in place, the contamination risk will be higher as well as very difficult to detect.	-2	-3
M34	During construction and operation of the new areas industrial safety controls should be installed, first aid equipment should be available, and visible signposting and information on required procedures in the event of an emergency.	There is a substantially high risk level in the absence of the basic elements required to assist in case of an accident. Operators should be properly trained in what to do in case of an accident and a risk study should be made.	-1	-2
M42	The new processes imply there will be new customers for the raw materials and thus suppliers hold higher economic expectations.	Fruit farmers expect an improvement in family income levels due to the both agricultural and agroindustrial activities.	-1	2

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NO IMPACT

MEDIUM IMPACT

MINIMUM OR LOW IMPACT

FAVORABLE IMPACT

5.1.5.3. Conclusions regarding the Leopold Matrix for the Industrial Component.

The result of combining columns and rows gives a total of 352 valid cellsunder impact analysis, that is, in which the Magnitude and Intensity of the impact on each factor is recorded.

The Leopold Matrix for the industiral component shows that the majority of the cells have a white background and record values of –1 for the Magnitude and -1 for the Intensity of the impact, which means that the majority of the activities involved cause no environmental effect on the factors studied. There are only 7 cases of medium impact (that is, with a Magnitude and Intensity of close to –3 with a red background), which are equivalent to 1.99% of the cell total. For their part, there are 41 cases of minimum or low impact (yellow background), equivalent to11.64% of the cell total. Lastly, two cells represent a beneficial impact, equivalent to 0.57% of the cell total,.

Table 26. Impact Assessment Summary - Industrial Component

Impact Assessment	Number of Cells	Percentage
-1 No Impact	302	85.79 %
-2 Minimum or low	41	11.64 %
-3 Medium	7	1.99 %
+ 1, 2 and 3 Favorable	2	0.57 %

5.2. Environmental Management Report and Management Plan

5.2.1. Methodology

When the construction of the methodological instruments for the Qualitative Evaluation was complete, a series of Data Sheets with the Environmental Management Plan were drawn up for each of the activities, which, on the basis of the reference of the impact, describe the prevention and mitigation measures. These data sheets are complemented by others in which the planning and evaluation of the preventive and mitigations measures are set out. In addition, the most significant impacts are illustrated with texts which describe them and photographs to enhance the illustration.

In designing these instruments, existing methodological guidelines used by the Ministry of the Environment, the Colombian Agriculturalists Society (SAC) and the agricultural sub-sectors were followed, as per the publication Environmental Guidelines on the Oil Palm cultivations (because of their similarity to the Chontaduro palm), on the Raw Sugar Agro-industry (because it is an activity exclusively carried out by the rural population, as in the case of the AGROAMAZONIA producer associates), on the Fruit and Vegetables Agro-industry (because of the Amazon fruit growing activities being carried out to complement the production of the Heart of Palm Project)[31].

[31] Several Authors. "Guía Ambiental para el subsector de la agroindustria de la Palma de Aceite" (Environmental Guide for the Fruit and Vegetables sub-sector) and "Guía Ambiental para el subsector de la agroindustria de la Panela" Environmental Guide for the Panela agro-industry sub-sector). Ministry of the Environment, Colombian Agriculturalists Society, Oil Palm Growers Federation, Colombian Fruit and Vegetables Association ASOHOFRUCOL, FEDEPANELA Bogotá, 2002.

5.2.2. Agricultural Component

5.2.2.1. Preventive and Mitigation Measures Data Sheets

	ENVIRONMENTAL ASSESSMENT PREVENTIVE-MITIGATION MEASURES DATA SHEET	**1.0 GERMINATORS**
REF.	**Prevention measures**	**Mitigation measures**
A3	Do not use chemical products to control weeds and for seed treatment. Physical-chemical soil analyses when events of contamination or soil removal occur.	Implement weed control manually
A4	Avoid destruction of the surface layer of the soil in establishing plantations.	Use of organic fertilizers in establishing plantations.
A24	Avoid destruction of flora in area surrounding germinator.	Evaluation of sowing native trees in areas surrounding the germinator.
A30	Follow the recommendations of agro- chemicals producers.	Do not use chemical herbicides.

	ENVIRONMENTAL ASSESSMENT PREVENTIVE-MITIGATION MEASURES DATA SHEET	**2.0 NURSERIES**
REF.	**Prevention measures**	**Mitigation measures**
B1	Do not use soil to fill plant bags.	Use of organic fertilizer produced at the plant to fill plant bags
B3	Do not use chemical herbicides, make physical-chemical analysis of soils when contamination or removal events occur	Control weeds manually.
B4	Avoid destroying surface layer for filling plant bags.	Use organic fertilizer produced at the plant to fill plant bags.
B24	Avoid destruction of flora in area surrounding the nursery.	Evaluation of native trees planted in the area surrounding the nursery.
B30	Carry out studies of biological control taking the recommendations of the manufacturers of agro chemicals into account	Reduction in use of agro chemicals. Implementation of biological control and integrated,,, pest management.
B39	Continue support for community association processes.	Make known the advantages of working in the nursery as an association
B41	Continue the agricultural extension activities carried out by the technical department.	Continued training in new cultivation technologies
B42	Ensure sustainability of the Project.	Ensure sustainability of the Project
B43	Ensure sustainability of the Project	Ensure sustainability of the Project.

	ENVIRONMENTAL ASSESSMENT PREVENTIVE-MITIGATION MEASURES DATA SHEET	**3.0 ESTABLISHMENT OF PLANTATION**
REF.	**Prevention measures**	**Mitigation measures**
C1	Take into account the topographical conditions for the establishment of the plantation	Protect soils with vegetal layer
C4		Protect soils with vegetal layer
C15	Avoid establishing plantations on lots with high brush and make census of species	Avoid burning to destroy underbrush
C16	Avoid modifying the ecosystem in the area surrounding plantation and make census of species	
C21	Avoid establishing plantations in woodland areas, make analyses and quantity species to be cut down.	
C24	Avoid changing the ecosystem surrounding the plantation	
C41	Support agricultural extension activities carried out by the technical department	
C42	Prioritize family work in the establishment of the plantation	Continue with entrepreneurial training course for the associates
C43	Ensure sustainability of the Project	Ensure sustainability of the Project

	ENVIRONMENTAL ASSESSMENT PREVENTIVE-MITIGATION MEASURES DATA SHEET	**4.0 PLANTATION MAINTENANCE**
REF.	**Prevention measures**	**Mitigation measures**
D3	Make soil analyses (electrical conductivity before applying corrective measures.	Implement organic agriculture
D15	Avoid using herbicides	Maintain the vegetal layer
D16	Carry out the necessary studies of possible pests and diseases and their biological control	Implement biological control and integrated pest management
D23	Avoid alterations to the ecosystem	Do not use insecticides and herbicides
D30	Follow recommendations on agro chemicals management issued by the manufacturers	Do not use toxic agro chemicals Implement an integrated pest management program
D31	Train workers in cutting stalks.	Use leather gloves for cutting work
D34	Develop training programs in occupational health	Use protection equipment such as gloves, boots and masks for work requiring such protection
D41	Support agricultural extension activities	Continue training workshops in new cultivation technologies
D42	Prioritize family work in the nursery	Continue entrepreneurial training courses for the associates
D43	Ensure the sustainability of the Project	Ensure the sustainability of the Project

	ENVIRONMENTAL ASSESSMENT PREVENTIVE-MITIGATION MEASURES DATA SHEET	**5.0 OTHER CROPS**
REF.	**Prevention measures**	**Mitigation measures**
E24	Avoid intervening in zones bordering on fruit orchards/plantations	Evaluate planting of native trees in areas surrounding fruit orchards/plantations
E41	Support agricultural extension activities	Continue training in new technologies
E42	Prioritize the family in agricultural work	Continue entrepreneurial training for the associates
E43	Prioritize the family in agricultural work	Continue entrepreneurial training for the associates

5.2.2.2. Prevention and Mitigation Measures Planning and Assessment Data Sheets

	ENVIRONMENTAL ASSESSMENT PLANNING AND ASSESSMENT MEASURES DATA SHEET	**1.0 GERMINATORS**		
REF.	**ACTIVITY**	**COST PER ACTIVITY**	**FREQUENCY**	**COMMENTS**
A3	Control weeds manually and do not use chemical products.	[1]	Regularly, depending on weed proliferation	Regular revisions to analyze the magnitude
	Physical-chemical soil analysis	COL$59.000.oo	When events of contamination occur or on soil removal	One soil sample per event
A4	Avoid destruction of surface layer of soil and use organic fertilizers for establishment of plantations.	[1]	During establishment of plantations	Regular revisions to analyze magnitude
A24	Avoid destruction of flora in areas surrounding germinator and evaluate planting of native trees is those areas.	[1]	Once before commencement of germinators.	Opinion of CORPOAMAZONÍA
A30	Follow recommendations of the agro chemicals producers and avoid use of agro chemicals.	[1]	Permanent application of Occupational Health and Industrial Safety programs	The germinator is managed by Agroamazonía.

(*) This cost is not carried to the summarized accumulation shown on Table 3.2.2.1, as it will only be incurred in the event of one of the events referred to

[1] Activities carried out as part of the functions required for management of the germinators

	ENVIRONMENTAL ASSESSMENT PLANNING AND ASSESSMENT MEASURES DATA SHEET	**2.0 NURSERIES**		
REF.	**ACTIVITY**	**COST PER ACTIVITY**	**FREQUENCY**	**COMMENTS**
B1	Do not use soil to fill plant bags, use the organic fertilizer produced at the Plant to fill plant bags	[1]	During filling of plant bags	Revisions at places where nurseries are installed to evaluate the magnitude
B3	Avoid using chemical herbicides and control weeds manually	[1]	Regularly, depending on week proliferation.	Regular revisions to analyze the magnitude
	Physical-chemical soil analyses	COL$59.000.oo(*)	Once when events of contamination or removal of soils occur	One soil sample per event
B4	Avoid destruction of surface layer when filling plant bags and use organic fertilizer produced by the plant to fill plant bags	[1]	During filling of plant bags	Regular revisions to analyze the magnitude
B24	Avoid destruction of flora in areas surrounding nursery and evaluate planting of native trees in area surrounding the nursery	[1]	Once prior to commencing nurseries	CORPOAMAZONÍA opinion
B30	Carry out studies of biological control, taking into account the recommendations of the manufacturers of agro chemicals and reduce use of agro chemicals by implementing biological control and MIP	[1]	Minimum of a bi-monthly visit by the Agroamazonía technician	.
B39	Support community association processes. Make known the advantages of nursery activities as an association	[1]	During visits of the Agroamazonía technician and/or the social component or social promoter at least every two months.	Work of Agroamazonía technical and social departments
B41	Support the agricultural extension activities carried out by the technical department. Continue training workshops in new cultivating technologies.	[1]	During the visits of the Agroamazonía technician and/or the social component or social promoter at least every two months.	Work of Agroamazonía technical and social departments
B42	Ensure the sustainability of the Project.		During planning of new cultivations and programming cutting	Work of Agroamazonía management.
B43	Ensure the sustainability of the Project.		During planning of new cultivations and programming cutting	Work of Agroamazonía management.

(*) This cost is not carried to the summarized accumulation shown on Table 3.2.2.1, as it will only be incurred in the event of one of the events referred to

[1] Activities carried out as part of the functions required for management of the germinators

	ENVIRONMENTAL ASSESSMENT PLANNING AND ASSESSMENT MEASURES DATA SHEET	**3.0 ESTABLISHMENT OF PLANTATION**		
REF.	**ACTIVITY**	**COST PER ACTIVITY**	**FREQUENCY**	**COMMENTS**
C1	Soils analysis and evaluation of topography, keeping soil protected by a vegetal layer	COL$59.000.oo(*)	Once before commencing cultivation	A soil sample per property and apply indices of table 4.2.2.1
C4	Keep soils protected by a vegetal layer	[1]	During establishment of plantation	
C15	Avoid establishing plantations on high brush lots, take a census of species, and avoid burning to destroy underbrush	COL$36.000.oo(**)	Once before commencing cultivation	Species census per hectare
C16	Avoiding modifying the ecosystem surrounding the plantation and take a census of species	COL$36.000.oo(**)	Once before commencing cultivation	Species census per hectare
C21	Avoid establishing plantations in woodland areas, analyze and quantify the species to be cut down.	COL$36.000.oo(**)	Once before commencing cultivation	Species census per hectare
C24	Avoid modifying the ecosystem surrounding the plantation.	[1]	Once prior to commencing nurseries.	CORPOAMAZONÍA opinion
C41	Support the agricultural extension activities of the technical department. Continue workshops for training in new cultivation technologies	[1]	During visits of the Agroamazonía technician and/or the coordinator of the social component or social promoter, a minimum of every two months.	Work of Agroamazonía technical and social departments
C42	Ensure the sustainability of the Project		During planning of new plantations and programming of cutting	Work of Agroamazonía management
C43	Ensure the sustainability of the Project		During planning of new plantations and programming of cutting	Work of Agroamazonía management

(*) Soil analyses must be made for each property included in the program, the properties programmed for 2003 were taken into consideration in the cost evaluation in Table 3.2.2.1.

(**) The cost of these census exercises are estimated for planting one hectare of cultivation per property. The analysis of the effect on flora and Destruction of Woodland are mutually exclusive. Only one of them was therefore included in the Table 3.2.2.1 summary.

[1] Activities carried out as part of the functions involved in the establishment of the plantation

	ENVIRONMENTAL ASSESSMENT PLANNING AND ASSESSMENT MEASURES DATA SHEET	**4.0 PLANTATION MAINTENANCE**		
REF.	**ACTIVITY**	**COST PER ACTIVITY**	**FREQUENCY**	**COMMENTS**
D3	Make soil analyses (electrical conductivity) prior to applying corrective measures.	COL$59.000.oo(*)	Every 24 months if there are changes in the doses of fertilizers or soils corrective measures.	One soil sample per property and application of biological control schemes in tables 4.2.2.2 and 4.2.2.3
D15	Try to avoid using herbicides and conserve the vegetal layer	[1]	During the development of the plantation	
D16	Make the necessary studies of possible pests and diseases and their biological control. Implement biological control and integrated pest management.	[2]	During the development of the plantation	Apply biological control schemes in tables 4.2.2.2 and 4.2.2.3
D23	Avoid alterations in the ecosystem. Avoid using insecticides and herbicides.	[1]	During the development of the plantation	
D30	Follow the recommendations on the management of agro chemicals issued by the manufacturers and the use of toxic agro chemicals and implement the MIP	[2]	One visit from the Agroamazonía technician a minimum of every two months	
D31	Train workers in stalk cutting and check on the use of leather gloves for this work.	[2]	One visit from the Agroamazonía technician a minimum of every two months	
D34	Develop training programs in occupational health and check on the use of protection items, such as gloves, boots and use of masks for jobs requiring them.	[2]	One visit from the Agroamazonía technician a minimum of every two months	
D41	Support agricultural extension activities. Continue with training workshops in new cultivation technologies.	[2]	One visit from the Agroamazonía technician and the coordinator of the social component at least every two months	Work of Agroamazonía technical and social departments
D42	Continue entrepreneurial training for associates.	[2]	One visit from the Agroamazonía technician and the coordinator of the social component at least every two months	Work of Agroamazonía technical and social departments
D43	Ensure sustainability of the Project			Work of Agroamazonía management.

(*) For the purposes of cost estimation, these studies of the properties which reported with plantations established in 2002.

[1] Activities carried out as part of the functions appropriate to maintaining the plantation

[2] Forms part of the advisory service provided by Agroamazonía

	ENVIRONMENTAL ASSESSMENT PLANNING AND ASSESSMENT MEASURES DATA SHEET	**5.0 OTHER CROPS**		
REF.	**ACTIVITY**	**COST PER ACTIVITY**	**FREQUENCY**	**COMMENTS**
E24	Avoid intervening zones adjacent to fruit orchards and plantations and recommend planting native trees all around them	[1]	One visit from the Agroamazonía technician at least every two months.	
E41	Support agricultural extension activities and continue training in new technologies	[2]	One visit from the Agroamazonía technician and the social component coordinator at lease every two months	Work of the Agroamazonía technical and social departments.
E42	Prioritize family agricultural work and continue with entrepreneurial training for associates.	[2]	One visit from the Agroamazonía technician and the social component coordinator at lease every two months	Work of the Agroamazonía technical and social departments.
E43	Prioritize family agricultural work and continue with entrepreneurial training for associates.	[2]	One visit from the Agroamazonía technician and the social component coordinator at lease every two months	Work of the Agroamazonía technical and social departments.

[1] Activities carried out as functions appropriate to other plantations
[2] Forms part of the Agroamazonía advisory service

TABLE OF COSTS OF THE AGRICULTURAL COMPONENT MANAGEMENT PLAN			
ACTIVITY	**UNIT VALUE PER PROPERTY**	**Number of properties in year 2003**	**Total value in COL$**
Soil analysis in selection of new properties	59,000	267	15,753,000
Soil analysis to identify possible contamination with chemicals on cultivated lots	59,000	60	3,540,000
Analysis and quantification of species to be cut down	36,000	267	9,612,000
Census of species	36,000	267	9,612,000
		TOTAL $	**38,517,000**
Note : Amounts in Colombian pesos.			

5.2.2.3. Illustration of important impacts

In spite of palm cultivation being carried out, at present, without applying insecticides or fungicides or any other toxic pesticides, the communities do in fact apply this type of product to the rest of the properties. Therefore, it is considered important that prevention and mitigation measures be applied, both to prevent damage to the natural resources and to prevent health problems in the form of diseases derived from the use of agrochemicals.

5.2.2.4. Illustration of the mitigation and control measures

As a prevention measure to avoid having to mitigate the use of agrochemicals, we recommend the implementation of organic agricultural programs and biological pest control. It would be desirable for AGROAMAZONIA technicians to encourage these practices for the rest of the crops grown on the farms, taking advantage of their permanent proximity to the farmers.

The following table lists the restrictions established by the United States environmental legislation, showing that there is not problem involved in the use of the majority of the

inputs used in the cultivation of Heart of Palm at present, with the exception of Paraquat, which is under level one toxic restrictions. As a measure for the environmental management of the plantations, we recommend that the use of chemical herbicides to control weeds be avoided and replaced by manual control routines.

AGROCHEMICALS USED IN THE HEART OF PALM PROJECT					
COMMERCIAL NAME	ACTIVE INGREDIENT	USE	TOXICITY	USAID RESTRICTION	
				YES	NO
VITAVAX-300	CARBOXIN 20% CAPTAN 20%	Fungicide for treatment of seeds in the germinator	Category II Highly toxic		X
VITAVAX-400	CARBOXIN 20% TIRAN 20%	Fungicide for treatment of seeds in the germinator	Category III Fairly toxic		X
GRAMOXONE	PARAQUAT	Herbicide for plantation maintenance	Category I Extremely toxic	X	
ROUNDUP	N-(FOSFOMETIL) GLICINA	Herbicide for maintenance of paths of the germinator, nursery and on the plantation	Category IV Slightly toxic		X
GRYFOSAN SL FAENA 320 BATALLA SL 480	GLIFOSATO	Herbicide for maintenance of paths of the germinator, nursery and on the plantation	Category IV Category IV Slightly toxic		X

On some farms in the project, Paraquat is being used as the herbicide, a practice which must be eliminated for the following reasons[32]:

1. This herbicide is catalogued by the EPA with high toxicity (Class 1), and it is on the list of Restricted Use Pesticides (RUP), which must be sold and applied by certified entities only.
2. High toxicity has been found if mammals (LD50 oral from 110 to 150 mg/Kg in rats. High exposition to this herbicide can cause respiratory problems, irritation of the eyes and nostrils. Many cases of diseases and/or death in humans have been reported. the lethal dose (taken by mouth) in humans is estimated at 35 mg/kg.
3. It is moderately toxic for birds and aquatic organisms
4. Accumulates in the soil over a long period of time.
5. Causes serious damage to vegetation by its desiccation action.

[32] Source: Toxicology Network Extension, Pesticide Information Profiles

5.2.3. Industrial Component

5.2.3.1. Preventive and Mitigation Measures Data Sheets

	ENVIRONMENTAL ASSESSMENT PREVENTIVE-MITIGATION MEASURES DATA SHEET	**1.0 AGRO-INDUSTRIAL PRODUCTION PROCESSES**
REF.	**Prevention measures**	**Mitigation measures**
F3	Ensure that biodegradable soaps are used during cleaning of the plant. Sweep up dry solids prior to washing floors and the plant in general. Physical-chemical soil analysis.	Prepare an Operation Manual defining the procedures recommended for the different activities which generate discharges of liquids into the industrial sewage network.
	Carry out analyses of industrial discharges to define whether the retention tank needs changes. Take water samples at the points of discharge onto soil.	
F11	The necessary measures must be introduced to establish the quality of the water of the industrial liquids discharges, both at the outlet from the plant and on its arrival at the Singuiya wetland. In addition, an evaluation of the efficiency of the retention pool must be made. For so long as there is uncertainty regarding these points, it is not possible to verify the present status of the discharges or define the measures which must be applied. Take samples of waste waters and carry out physical, chemical and microbiological analyses.	Prepare an Operation Manual defining the procedures recommended for the different activities which generate discharges of liquids into the industrial sewage network. The Operation Manual will define the contingency plans to be followed in the event of discharges of contaminant elements not produced by industrial production.
	Ensure that biodegradable soaps are used for cleaning the plant. Sweep up dry solids before washing the floors and the plant in general. Carry out analyses of industrial discharges to define whether the retention tank needs changes to ensure that they comply with the standard (Decree 1594 of 1984), in particular with the reduction in temperature to below 40 degrees centigrade. Operation Manual and procedure.	Designate a company employee to be in charge of environmental follow-up of the industrial processes, treatment systems, test programming, training and fulfillment of the requirements of the environmental entity (Corpoamazonía).
F13	The necessary measures must be introduced to establish the quality of the water of the industrial liquids discharges, both at the outlet from the plant and on its arrival at the Singuiya wetland. In addition, an evaluation of the efficiency of the retention pool must be made. For so long as there is uncertainty regarding these points, it is not possible to verify the present status of the discharges or define the measures which must be applied. The analysis proposed in F11 includes a quantification of the solids in the in the samples.	The Operation Manual must define the management required for the solids generated during the industrial process. Make analysis of the scraping tables where part of the material falls to the ground and is dragged into the industrial waste network during the final washing of the plant. All this material should reach the central channel on the work table.
	The processes of collection of dry solids prior to washing the production plant can be improved.	
F22	As more is known of the quality and the quantity of liquid discharges onto the Singuiya wetland, it will be possible to establish the effect and preventive measures, The F11 analysis includes an evaluation of the contaminants which may affect humid areas.	

continued

	ENVIRONMENTAL ASSESSMENT STUDY PREVENTIVE-MITIGATION MEASURES DATA SHEET	**1.0 AGRO-INDUSTRIAL PRODUCTION PROCESSES (continued)**
REF.	**Prevention measures**	**Mitigation measures**
F24	The effect of the plant on the regional landscape is minimal. The plant managers have decided to undertake landscape measures on the lot where the plant is located to improve visual impact.	Camouflaging the buildings, nursery and the organic fertilization area with natural hedging and tree planting.
F25	Define the effects caused by steam inside the building on both employees and the industrial production. We recommend that the steam tunnel chimney be extended and take outside the building, as well as installing an extraction hood over the kettles used in the preparation of the brine.	
F28	According to the noise levels generated by the steam tunnel, it must be established whether the operators and administrative employees need hearing protectors. The noise level must be verified.	
F29 [1]	A program for the routine sampling of the quality of the water used in the industrial process, either by tests in the plant quality laboratory or under contract with an external company for the purpose. Physical, chemical and microbiological analyses of drinking water must be made.	Uncertainty regarding the quality of the water being used in the plant, above all the water used for washing packages and in the preparation of the brine used in packaging must be reduced (government,,, liquid).
F31	Change the rubber gloves used by the operators who handle stalks with thorns for others which provide greater protection. An accident risk study must also be made to establish whether the elements used by the peeling, scraping and cutting operators are sufficiently safe for the activity carried out. There must be provision of adequate industrial safety items and an accident risk study must be made. Employees must be trained in accident prevention and safe practices during the industrial process.	Employees must be trained in accident prevention and safe practices during the industrial process.
F34 [1]	Revise and implement the company's "Occupational Health Program" in its entirety. Place first aid items and extinguishers in the production area. Demarcate the working areas and pathways. Signpost emergency exits and protection zones and dangerous sectors with machines and facilities (equipment which operates with heat, such as the autoclave, kettles and the steam tunnel).	Induction of employees in the use of industrial protection items, training programs in the preventive maintenance of equipment, accident prevention and contingency plans in cases of events implying a health hazard.
F42	Continue with information to users of Agroamazonía on production, costs and income of the plant as a tool to provide security to continue with Heart of Palm plantations.	

[1] (Contingent risk must be dealt with immediately)

	ENVIRONMENTAL ASSESSMENT PREVENTIVE-MITIGATION MEASURES DATA SHEET	**2.0 GENERATION (steam and electricity)**
REF.	**Prevention measures**	**Mitigation measures**
G3 [1]	Construction of a perimeter channel and a contention pool under the fuel tank to guarantee retention of the maximum storage volume of the tank. Protection of the conduction pipes must be improved (See annex 7.2.1)	If a fuel spill onto natural land occurs, a contingency plan must be put into operation to decontaminate the area.
	Implementation of the measures necessary to avoids spilling or oils and fuels when generating equipment maintenance is being performed. Physical-chemical analysis of soils.	
	Place in bins empty oil receptacles and all material which comes into contact with grease, oil and fuel during maintenance exercises.	
G9 [1]	Construction of a perimeter channel and a contention pool under the fuel tank to guarantee retention of the maximum storage volume of the tank. Protection of conduction pipes must be improved (See annex 7.2.1)	If a fuel spill occurs, it must be prevented from reaching the Singuiya wetland and from contaminating the cistern from which water is taken for consumption of the plant.
	Implementation of the measures necessary to avoids spilling or oils and fuels when generating equipment maintenance is being performed. Physical-chemical analysis of soils.	
	Place in bins empty oil receptacles and all material which comes into contact with grease, oil and fuel during maintenance exercises.	
G11	Carry the boiler vent to a box for reducing temperature.	
G24	The fuel tank and the cabinet with the electricity generator may be included in a landscape project to camouflage them, taking into account that a security strip must be kept. Execution of a landscape project is a decision of the Agroamazonía executives	
G26	There must be maintenance programming for the engines of all the fuel and venting systems.	
G28 [1]	The noise caused by the boiler and the generator must be metered. According to the measurements of the intensity of the noise in each plant area, the industrial safety measures required must be provided (hearing protectors, dissipating screens,,,, etc.)	Evaluate the possibility of isolating the boiler area to reduce the effect of noise inside the plant.
G34	Employees responsible for operation and maintenance of the generating systems (steam and electricity) must be provided with industrial safety items (hearing protectors, gloves, etc.)	
	Protection zones and danger areas around the generating equipment must be demarcated.	
	The generating equipment maintenance program must be followed.	

[1] (Contingent risk must be dealt with immediately)

	ENVIRONMENTAL ASSESSMENT PREVENTIVE-MITIGATION MEASURES DATA SHEET	**3.0 TREATMENT SYSTEMS (drinking water and domestic waste waters)**
REF.	**Prevention measures**	**Mitigation measures**
H3	There must be a treatment system for retro-wash water if it does not comply with the standard. Take samples of retro-wash water from the filters at the points of discharge onto the soil.	Evaluate the possibility of building a drying bed for the retro-wash discharges from the filters.
H5	Determine the present construction conditions of each of the cisterns, i.e.: diameter, total depth, re-loading method (lateral filters and/or bed filter), material and whether they have a lateral gravel,,, lagging and sanitation seal.	
	Carry out pumping tests to determine the capacity of the cisterns, static level and dynamic level.	
H11	Request the company which built the works, or, if there is none, draw the building plans of the septic tank and the natural rush treatment system.	
	Request the company which built the works or, if none, write the septic tank and natural rush treatment system operation and maintenance manuals.	
H24	The drinking water purification plant may be included in the landscape project for camouflage, taking into account that a security strip must be kept. The execution of a landscape project is a decision of the Agroamazonia executives.	
H25	Follow up the levels of all sludge and foam in the septic tank and apply maintenance of same according to the recommendations of the designer.	Odors produced by a septic tank cannot be avoided. It is possible to consider the possibility of natural hedges or tree planting around to reduce smell.
H28	Meter the noise generated by the electric engines of the pumping systems. Carry out preventive maintenance of the engines.	
H29 [1]	Reconstruct the information on the design, building, operation and maintenance of the water treatment system for consumption and from the three cisterns.	
	Physical, chemical and microbiological analyses of drinking waters.	

[1] (Contingent risk must be dealt with immediately)

[33]

	ENVIRONMENTAL ASSESSMENT PREVENTIVE-MITIGATION MEASURES DATA SHEET	**5.0 ORGANIC FERTILIZER PRODUCTION**
REF.	**Prevention measures**	**Mitigation measures**
J11	Ensure that the leachates which may be generated by the piles during the decomposition process in the production of organic fertilizer are collected.	
J20	Measures must be introduced to control any vectors which may be attracted.	Place insect traps.
J24	At present there is a natural hedge which separates the cover of the industrial plant. The required maintenance must be made to this hedge for it to continue to develop.	
J25		As the natural hedge develops and densified, it will become a barrier which will serve to control odors.
J28	Noise levels must be metered and the engines of the equipment used in this zone must receive maintenance.	
J31	Adequate industrial safety items must be provided. Employees must be trained in the prevention of accidents and safe practices during the industrial process.	
J44	Use the production to set up gardens and to fill plant bags.	

	ENVIRONMENTAL ASSESSMENT PREVENTIVE-MITIGATION MEASURES DATA SHEET	**6.0 GERMINATORS**
REF.	**Prevention measures**	**Mitigation measures**
K3	Avoid the use of chemical products to control weeds and for seed treatment and carry out soil physical-chemical analyses when events of contamination or soil removal occur.	Control weeds manually.
K4	Avoid destruction of the soil surface in setting up the gardens.	Use organic fertilizer in setting up the gardens.
K24	Avoid destruction of flora around the germinator.	Evaluate planting native trees in the area surrounding the germinator.
K30	Follow the recommendations of the manufacturers of agrochemicals.	Avoid using chemical herbicides.

	ENVIRONMENTAL ASSESSMENT PREVENTIVE-MITIGATION MEASURES DATA SHEET	**7.0 TRANSPORT**
REF.	**Prevention measures**	**Mitigation measures**
L3	All vehicle mechanics work must be prohibited within the lot where the industrial plant is located. Physical-chemical analyses soil.	
L9	All vehicle mechanics work must be prohibited within the lot where the industrial plant is located. Take waste water samples at the points of discharge into bodies of water and carry out physical, chemical and microbiological analyses.	
L26	Vehicles which operate for the project must be under maintenance programs for all combustion and venting systems.	
L31	Drivers must be provided with industrial safety items appropriate to the handling of stalks.	

[33] Activity 4.0 Storage is not taken into consideration in this analysis because it causes no important impacts.

	ENVIRONMENTAL ASSESSMENT PREVENTIVE-MITIGATION MEASURES DATA SHEET	**8.0 DIVERSIFICATION PROJECTS**
REF.	**Prevention measures**	**Mitigation measures**
M5	Evaluate the consumptions required by the industrial plant, including new processes, and establish efficient water management..	
M9	Measures must be introduced during construction to prevent discharges of oils, grease and fuels which could reach bodies of water.	
M11	Measures must be introduced during construction to prevent discharges of machine wash waters or any contaminant liquid which could reach bodies of water. In the event of spills, take samples of waste water at the points of discharge into bodies of water and implement physical, chemical and microbiological analyses.	
	Industrial liquids discharges from the new processes will have to be studied to determine whether the require treatment before final disposal onto the Singuiya wetland	
M24	It is the decision of the executives of the industrial plant to present a landscape plan to camouflage the new buildings.	
M28	During construction, verify whether the workers who operate equipment which produces noise (pneumatic drills, vibration compactors, cutters, etc.) have hearing protection items.	
	Provide industrial safety items which are adequate for and an accident risk study must be made. Employees must be trained in accident prevention and safe practices during the industrial process.	
M29 [1]	Implement a drinking water sampling program and carry out the physical, chemical and bacteriological analyses at the uptakes used for the new juicing and bottled water processes.	
M34	Implement hygiene and industrial safety programs to be applied in both the construction phase and in the operation of the new processes.	
M42	Ensure the economic sustainability of the new projects.	
M5	Evaluate the consumptions required by the industrial plant, including new processes, and establish efficient water management..	
M9	Measures must be introduced during construction to prevent discharges of oils, grease and fuels which could reach bodies of water.	

[1] (Contingent risk must be dealt with immediately)

5.2.3.2. Data Sheets for Planning and Assessment of Prevention and Mitigation Measures

	ENVIRONMENTAL IMPACT STUDY PLANNING AND EVALUATION ASSESSMENT MEASURES DATA SHEET	**1.0 AGRO-INDUSTRIAL PRODUCTION PROCESSES**		
REF.	**ACTIVITY**	**COST PER ACTIVITY**	**FREQUENCY**	**COMMENTS**
F3	Ensure that biodegradable soaps are used during cleaning of the plant. Sweep up dry solids before washing floors and plant. Physical-chemical soil analysis.	COL$59,000.oo	Once when events of contamination or soil removal occur	One sample of soils per event
	Analysis of industrial discharges to define whether the retention tank requires modifications. Take water samples at points of discharge onto soil	COL$270,000)	Once when events of contamination occur	One sample of discharge per event
	Construction of a planning, channel and temperature control (optional)	COL$5,684,823	Once	See numeral 7.2.3
	Operation and procedures manual	[1]	Once	
F11	It is necessary to take the measures necessary to define the quality of the water of the industrial liquids discharges, both at the outlet of the plant and at the point of discharge onto the Siguiya wetland, In addition, an evaluation of the efficiency of the retention tank must be made.. For so long as there is uncertainty at these points it will be impossible to verify the present status of the discharges or define the measures which should be implemented. Take sample of residual waters at the points of discharge into bodies of water and physical, chemical and microbiological analyses.	COL$270,000	Annually	One sample at point of discharge (See Data Sheet PL 01)
	Ensure that biodegradable soaps are used during cleaning of the plant. Sweep up dry solids before washing floors and plant. Physical-chemical soil analysis Analyses of industrial discharges to define whether the retention tank requires modifications to ensure that they comply with the standard (Decree 1594 of 1984), in particular in the reduction of the temperature to below 40 degrees centigrade. Operation and Procedures Manual.	[1]	Once	
	Construction of a planning,,, channel and temperature control (optional). Evaluated at F3)	[2]	Once	
F13	The measures necessary to verify the quantity of solids present in the water of the industrial liquids discharges, both at the outlet from the plant and at the point of discharge onto the Singuiya wetland. In addition, an evaluation of the efficiency of the solids traps at the retention tank must be made. . For so long as there is uncertainty at these points it will be impossible to verify the present status of the discharges or define the measures which should be implemented. The analysis proposed in F11 includes the quantification of the solids in the samples. Optional construction of planning channel in F3. The processes of sweeping up dry solids before washing the plan can be improved.	[2]	Once	The same discharge sample.

continued

	ENVIRONMENTAL IMPACT STUDY PLANNING AND ASSESSMENT MEASURES DATA SHEET	**1.0 AGRO-INDUSTRIAL PRODUCTION PROCESSES (continuation**		
REF.	**ACTIVITY**	**COST PER ACTIVITY**	**FREQUENCY**	**COMMENTS**
F22	As more knowledge is acquired of both the quality and the quantity of the liquid industrial discharges onto the Singuiya wetland, it will become possible to determine the effect and the respective preventive measures. The analysis proposed in F11 includes the evaluation of the contaminants which may affect the wetland areas. Optional: construction of a planning,,, channel and temperature control.	[2]	Once	The same discharge sample
F24	The effect of the plant on the regional landscape is minimal. The executives will take the decision to undertake landscape measures on the lot where the plant is located, aimed at improving the visual impact. There is the possibility of camouflaging buildings, nursery and the place where the organic fertilizer is made with natural hedges and tree planning.	[1]	Once	Opinion of CORPOAMAZONÍA
F25	Define the effects of the steam in the building for both employees and the industrial production. We recommend that the chimney of the steam tunnel be extended to outside the building and also an extractor hood over the kettles used for the preparation of the brine.	COL$1,500.000	Once	
F28	According to the noise levels generated by the steam tunnel, it must be decided whether the operators require hearing protectors. Measurement of the noise generated by the steam tunnel.	COL$200,000	Once	
F29 [*]	A routine sampling program of the quality of the water consumed in the industrial process, either by testing in the plant laboratory or contracting an external company for the purpose. The uncertainty regarding the quality of the water being used at the plant must be reduced, especially in the case of the water used to wash packaging and in the preparation of the brine used in packaging (government liquid). Physical-chemical and microbiological analysis of drinking waters.	COL$2.500.000 COL$3.500.000	Microbiological analyses must be made daily. Physical-chemical analyses must be made twice a month.	The quality control laboratory of the plant must make the microbiological analysis. The physical-chemical analysis must be contracted from a suitable laboratory

continuation

	ENVIRONMENTAL IMPACT STUDY PLANNING AND ASSESSMENT MEASURES DATA SHEET	**1.0 AGRO-INDUSTRIAL PRODUCTION PROCESSES (continuation**		
REF.	**ACTIVITY**	**COST PER ACTIVITY**	**FREQUENCY**	**COMMENTS**
F31	Change rubber gloves used by the operators who handle the stalks with thorns for other more protective ones. In addition, carry out an accident risk study to define whether the elements used by the peeling, scraping and cutting operators are sufficiently sage for the activity they are carrying out. Provide adequate industrial safety elements and a make an accident risk study. Training for employees in accident prevention and safe practices during the industrial process.	[1]	Constant application of the occupational health manual.	
F34 [*]	Review and implement the Company's "Occupational Health Program" . Place first aid and fire extinguishers in the production area. Demarcate work areas and transit routes. Signpost emergency exits, protection zones and dangerous areas with machines and facilities (equipment operated with heat, such as the kettles autoclave and the steam tunnel). Induction for employees in the use of industrial protection elements, training programs in preventive maintenance of equipment, prevention of accidents and contingency plans in the event of a health risk.	[1]	Constant application of Occupational Health and Industrial Safety program.	(See Data Sheet PL 05)
F42	Continue with information to Agroamazonía users on the production, costs and income of the plant as a tool to provide security to continue with Heart of Palm cultivation.	[1]	Evaluation of training courses and activities and verification of achievement of proposed goals.	Work of technical and social departments of Agroamazonía

[1] Activities to be undertaken as part of Agroamazonía's own functions
[2] The cost is included in other activities.
[*] (Contingent risk must be dealt with immediately

	ENVIRONMENTAL IMPACT STUDY PLANNING AND ASSESSMENT MEASURES DATA SHEET	**2.0 POWER GENERATION. (steam and electricity)**		
REF.	**ACTIVITY**	**COST PER ACTIVITY**	**FREQUENCY**	**COMMENTS**
G3 [*]	Construction of a perimeter channel and a retaining pond under the fuel tank to guarantee maintenance of maximum storage volume of the tank. Protection of the pipe should be improved. Take the measures necessary to prevent oils and fuels spills when carrying out maintenance of generating equipment. Place empty oil receptacles and all material which comes into contact with crease, oil and fuel during maintenance exercises in bins. If fuel is spilled onto natural land, a contingency plan must be implemented to decontaminate the area.	COL$19.600.000	Once	The costs required is for the construction of the tank. The advisability of building protection for the network or changing it for flexible underground pipe must be evaluated. See numeral 7.2.1
	Physical-chemical soil analysis.	COL$59.000	Once when events of contamination or removal of soils occur.	One soil sample per event
G9 [*]	See G3 above	[2]	Once	
	Take the measures necessary to prevent spills of oils and fuels when carrying out maintenance of generating equipment. Physical-chemical analysis of waters.	COL$270.000	Once when events of contamination occur.	One sample at discharge point
G11	Carry boiler vent to a box for temperature reduction.	COL$150.000	Once	The boiler vent must comply with the liquid discharges standard, especially with the maximum temperature of 40 degrees centigrade.
G24	The fuel tank and the hut with the electricity generator may be included in a camouflage landscape project , taking into account that a safety strip must be left. Implementation of a landscape project is a decision of the Agroamazonía executives.	[1]	Once	Opinion of CORPOAMAZONÍA
G26	Programmed maintenance of all the combustion and venting systems must be followed.	[1]	According to manufacturer's recommendations.	
G28 [*]	Measurement of noise caused by the boiler and the generator. According to the measurements noise intensity in each of the areas of the plant, implement the industrial safety measures necessary if required (hearing protectors, dissipater screens).	COL$900.000	Once	
G34	Provide employees in charge of operations and carry out maintenance of the generating systems (steam and electricity) of industrial security elements (hearing protectors, gloves, etc.) Demarcate protection zones and dangerous areas around generating equipment. Follow the generating equipment maintenance Program	[1]	Constant application of Occupational Health and Industrial Safety programs	

[1] Activities carried out as part of Agroamazonía' own functions

[2] Cost is included in other activities.

[*] (Contingent risk must be dealt with immediately

Data Sheet 3.3.2.3

	ENVIRONMENTAL IMPACT STUDY PLANNING AND ASSESSMENT MEASURES DATA SHEET		**3.0 PURIFICATION SYSTEMS (drinking water and domestic waste waters)**	
REF.	**ACTIVITY**	**COST PER ACTIVITY**	**FREQUENCY**	**COMMENTS**
H3	Have available a purification system for retro-washing water if it does not comply with the standard. Take samples of the retro-wash water from the filters at the points of discharge onto the soil. Evaluate the possibility of building a drying bed for discharge of retro-washing of filters.	COL$270.000	Once	One sample of the discharge to establish whether purification is required.
H5	Establish the present construction conditions of each of the cisterns, i.e.: diameter, total depth, reloading method (lateral filters and/or bed filter), material and whether they have a lateral gravel jacket.	COL$200.000	Once	
	Carry out pump tests to define the capacity of the cisterns, static level and dynamic level.	COL$300.000	Once	If the pumping system of each cistern is used. If a different pumping system is required, the value will increase.
H11	Reconstruction of information on design, construction, operation and maintenance of the Waste Waters Purification System.	COL$2.500.000	Once	
	Take samples of residual water to verify efficiency of purification.	COL$1.080.000	Annually	Four sampling points
H24	The drinking water purification plant may be included in a landscape project for camouflage, taking into account that a security strip must be left. The execution of a landscape project is a decision of Agroamazonía executives.	[1]	Once	Opinion of CORPOAMAZONÍA
H25	Follow up the levels of sludge and foam in the septic tank and carry out the necessary maintenance of same in accordance with the recommendations of the designer. Septic tank odors cannot be avoided. The possibility of live fencing or tree planting around to reduce odor may be considered.	[1]	Quarterly	
H28	Take measurements of noise generated by electric motors of the pumping system and preventive maintenance of motors.	[1]	Once and in accordance with the recommendations of the manufacturer of the motors	
H29 [*]	Reconstruction of information on the design, construction, operation and maintenance of the consumption water and water in the three cisterns. Do not allow use of raw water from the cisterns in the filters retro-wash process.	COL$3.000.000	Once	
	Physical, chemical and microbiological analyses of drinking water.	COL$2.500.000 COL$3.500.000	Microbiological analyses must be made daily. Physical-chemical analyses must be carried out twice a month.	Microbiological analysis must be made by the plant quality control laboratory. The physical-chemical analysis is contracted from a suitable laboratory.

[1] Activities to be carried out a part of Agroamazonía's own functions.

[*] (Contingent risk must be dealt with immediately

	ENVIRONMENTAL IMPACT STUDY PLANNING AND ASSESSMENT MEASURES DATA SHEET	**5.0 PRODUCTION OF ORGANIC FERTILIZER**		
REF.	**ACTIVITY**	**COST PER ACTIVITY**	**FREQUENCY**	**COMMENTS**
J11	Ensure that leachates which may be produced in the piles during the decomposition process in the production of organic fertilizer are collected.	[1]	Permanent	Leachates must not be allowed to reach the wetland
J20	Implement measures to control vectors which might be attracted. Placement of traps and insect counts.	COL$1.600.000	Permanent	Traps should be placed at a cost per placement of COL$160,000 and ten replacements per year. (See Data Sheet PL 07)
J24	At present, there is a natural hedge separating the roof of the industrial plant. Carry out maintenance of this hedge for it to continue to develop.	[1]	Permanent	
J25	As the natural hedge develops and becomes more dense, it will become a barrier to control odors.	[1]	Permanent	
J28	Take measurements of noise levels. Carry out maintenance to engines of the equipment used in this zone.	COL$100.000	Once	
J31	Provision of adequate industrial safety elements. Train personnel in accident prevention and safe practices during the industrial process.	[1]	Permanent	Leachates must not be allowed to reach the wetland
J44	Use production for the establishment of sowing beds and filling plant bags.	[1]	Permanent application of the occupational health manual	
J11	Ensure that leachates which may be produced in the piles during the decomposition process in the production of organic fertilizer are collected.	[1]	Monthly	

	ENVIRONMENTAL IMPACT STUDY PLANNING AND ASSESSMENT MEASURES DATA SHEET	**6.0 GERMINATORS**		
REF.	**ACTIVITY**	**COST PER ACTIVITY**	**FREQUENCY**	**COMMENTS**
K3	Control weeds manually and avoid the use of chemical products.	[1]	Regularly, depending on weed density.	Check regularly to analyze magnitude.
	Physical-chemical soil analysis	COL$59.000 (*)	Once when events of contamination occur or soil is removed.	One soil sample per event.
K4	Avoid destroying the surface layer of soil and use organic fertilizer for establishment of sowing beds.	[1]	During construction of sowing beds.	Check regularly to analyze magnitude.
K24	Avoid destruction of flora surrounding the germinator and assess sowing of native trees in that area.	[1]	Once prior to starting germinators.	Opinion of CORPOAMAZONÍA
K30	Follow the recommendation of the agro-chemical producers and do not use agro-chemicals.	[1]	Permanent application of Occupational Health and Industrial Security programs	The germinator is handled by Agroamazonía.

(*) This cost is not carried to the accumulation of the summary in Table 3.2.2.1, as it will only be incurred in one of the events referred to, but it is entered as an eventual analysis

[1] Activities carried out as part of germinator management functions

	ENVIRONMENTAL IMPACT STUDY PLANNING AND ASSESSMENT MEASURES DATA SHEET	**7.0 TRANSPORT**		
REF.	**ACTIVITY**	**COST PER ACTIVITY**	**FREQUENCY**	**COMMENTS**
L3	All motor mechanical work must be prohibited within the lot where the industrial plant is located. Physical-chemical soil analysis.	[1]	Once when events of contamination occur.	One soil sample per event (See Data Sheet PL 08)
L9	All motor mechanical work must be prohibited within the lot where the industrial plant is located. Take waste waters samples at points of discharge into bodies of water and physical, chemical and microbiological analysis.	[1]	Once when events of contamination occur.	One sample at the point of discharge. (See Data Sheet PL 01)
L26	Vehicles which operate for the project must be under a program of maintenance of all the combustion and venting systems.	[1]	According to manufacturer's recommendations.	
L31	Provision of adequate industrial safety elements. Training of employees in the prevention of accidents and safe practices.	[1]	Permanent application of the occupational health manual.	

[1] Activities to be carried out as part of Agroamazonía's own functions

	ENVIRONMENTAL IMPACT STUDY PLANNING AND ASSESSMENT MEASURES DATA SHEET	**8.0 DIVERSIFICATION PROJECTS**		
REF.	**ACTIVITY**	**COST PER ACTIVITY**	**FREQUENCY**	**COMMENTS**
M2	Implement measures during excavation to avoid discharges of fuels, grease or oils from the construction equipment. Physical-chemical soil analysis.	COL$59.000	Once when events of contamination occur.	One soil sample per event.
M4	Locate material from excavation during construction within the lot.	[1]	Once	
M5	Study of evaluation of consumptions required by the industrial plant, including the new processes and efficient water management program.	COL$800.000	Once	.
M9	During construction, measures must be introduced to prevent discharges of oils, grease and fuels which could be carried to bodies of water. In the event of spills, take sample of waste water at the point of discharge in the bodies of water and make physical, chemical and microbiological analysis.	COL$270.000	Once when events of contamination occur.	One sample at point of discharge. (See Data Sheet PL 01)
M11	During construction, measures must be introduced to prevent discharges of machine washing liquids or any liquid contaminant which may reach bodies of water. In the event of spills, take sample of waste water at the point of discharge in the bodies of water and make physical, chemical and microbiological analysis.	[COL$270.000	Once when events of contamination occur.	One sample at point of discharge.
	Discharges of industrial liquids from new processes must be studied to determine whether or not they require purification before final disposal into the Singuiya wetland	COL$1.500.000	Once	.
M24	Landscape camouflage plan for the new constructions is the decision of the executives of the industrial plant..	[1]	Once	Opinion of CORPOAMAZONÍA

continuation

	ENVIRONMENTAL IMPACT STUDY PLANNING AND ASSESSMENT MEASURES DATA SHEET	**8.0 DIVERSIFICATION PROJECTS**		
REF.	**ACTIVITY**	**COST PER ACTIVITY**	**FREQUENCY**	**COMMENTS**
M28	During construction, ensure that workers operating equipment which generates noise (pneumatic drills, vibration compacters, cutters, etc.) have suitable hearing protection elements.	[1]	Permanent application of occupational health manual.	.
	Provision of suitable industrial safety elements and carry out an accident risk study. Train personnel in the prevention of accidents and safe practices in the industrial process.	[1]	Permanent application of occupational health manual.	
M29 [*]	Implement a drinking water sampling program and make the physical, chemical and bacteriological analyses of samples used for new juices and bottled water processes.	COL$2.500.000 COL$3.500.000	Microbiological analysis must be made daily. Physical-chemical analyses must be made twice a month.	Microbiological analyses must be made in the plant quality control laboratory. Physical-chemical analyses must be contracted with a suitable laboratory.
M34	Implement hygiene and industrial safety programs to be applied in both the construction and the operation phases of the new processes.	[1]	Permanent application of Occupational Health and Industrial Safety programs	
M42	Ensure the economic sustainability of the new projects.			

[1] Activities to be carried out as part of Agroamazonía's own functions
[*] (Contingent risk must be dealt with immediately

Table 27

MANAGEMENT PLAN COSTS - SUMMARY						
INDUSTRIAL COMPONENT						
Row	**ACTIVITY**	**Data Sheet**	**Reference**	**Quantity**	**Unit Cost**	**Total Cost**
	INFRASTRUCTURE					
1	Construction of a perimeter channel and a retaining pond under the fuel tank to guarantee retention of the maximum volume of the storage tank	3.3.2.2	G3, G9	1	COL$ 19,600,000	COL$ 19,600,000
2	The equipment necessary for microbiological analyses (approximate value)	3.3.2.1 3.3.2.3 3.3.2.7	F29 H29 M29	1	COL$ 2,500,000	COL$ 2,500,000
3	Extension of the steam tunnel chimney and place an extraction hood over the kettles.	3.3.2.1	F25	1	COL$ 1,500,000	COL$ 1,500,000
4	Placement of insect traps and insect count.	3.3.2.4	J20	10	COL$ 160,000	COL$ 1,600,000
5	Extend boiler vent to a box for temperature reduction.	3.3.2.2	G11	1	COL$ 150,000	COL$ 150,000
	INFRASTRUCTURE SUBTOTAL					**COL$ 25,350,000**
	ANALYSES					
6	Physical-chemical analysis of water from the drinking water purification plant.	3.3.2.1 3.3.2.3 3.3.2.7	F29 H29 M29	24	COL$ 145,833	COL $ 3,500,000
7	Physical-chemical analysis of final discharge of drinking water purification plant into the Singuiya wetland.	3.3.2.3	H3	1	COL$ 270,000	COL$ 270,000
8	Physical-chemical analysis of discharge of industrial and domestic waste waters.	3.3.2.3	H11	4	COL$ 270,000	COL$ 1,080,000
	SUBTOTAL ANALYSIS					**COL$ 4,850,000**

Table 27 continuation

MANAGEMENT PLAN COST SUMMARY						
INDUSTRIAL COMPONENT						
Row	**ACTIVITY**	**Data Sheet**	**Reference**	**Quantity**	**Unit Cost**	**Total Cost**
	STUDIES AND EVALUATIONS					
9	Reconstruction of information on design, construction, operation and maintenance of the Treatment System for water for consumption and in the three cisterns.	3.3.2.3	H5 H29	1	COL$ 3,500,000	COL $ 3,500,000
10	Measurement of noise levels (pressure level, frequency spectrum and directionality) in the different areas of the plant.	3.3.2.1 3.3.2.2 3.3.2.4	F28 G28 J28	1	COL$ 1,200,000	COL$ 1,200,000
11	Reconstruction of information on design, construction, operation and maintenance of the Waste Waters Treatment System.	3.3.2.3	H11	1	COL$ 2,500,000	COL$ 2,500,000
12	Evaluation study of consumption required by the industrial plant, including the new processes and efficient water management program.	3.3.2.7	M5	1	COL$ 800,000	COL$ 800,000
13	Study to define the treatment of industrial liquids discharges from the new processes.	3.3.2.7	M11	1	COL$ 1,500,000	COL$ 1,500,000
	SUBTOTAL STUDIES AND EVALUATIONS					**COL$ 9,5000,000**
	POSSIBLE ANALYSES					
14	Physical-chemical soils analysis.	3.3.2.1 3.3.2.2 3.3.2.5 3.3.2.6 3.3.2.7	F3 G3 K3 L3 M2	1	COL$ 59,000	COL$ 59,000
15	Sampling of water at the waste waters discharge points.	3.3.2.1 3.3.2.2 3.3.2.6 3.3.2.7	F3, F11, F13, F22 G9 L9 M9, M11	1	COL$ 270,000	COL$ 270,000
16	Physical-chemical analysis of drinking water			1	COL$ 145,833	COL$ 145,833
17	Microbiological analysis of drinking water.			1	COL$ 120,000	COL$ 120,000
	SUBTOTAL POSSIBLE ANALYSES					**COL$ 594,833**
	ANALYSES OPTIONAL INFRASTRUCTURE (to be defined					
18	Construction of planning channel and temperature control.	3.3.2.1	F3, F11, F13, F22	1	COL$ 5,684,823	COL$ 5,684,823
	SUBTOTAL ANALYSIS					**COL$ 5,979,656**
	TOTAL					**COL$ 45,979,656**

5.2.3.3. Ilustration of important impacts.

Agro-industrial Production Processes

There are two important impacts during the industrial process. The first concerns the uncertainty existing as to the quality of the drinking water consumed in the plant. The water from the purification system is used just as it comes from the pipe, for washing jars and hearts of palm following the scraping process and to clean the plant at the end of the procedures. It is also used in the preparation of the brine with which the jars are filled, but it is passed through a cartridge filter before entering the kettles.

[Area where jars are washed]

[Scraping process]

[Plant cleaning]

[Kettles in which the brine is prepared, note the cartridge filter in the drinking water network before pouring into the equipment]

A big riks is being taken because it is impossible to detect whether the water from the purification system complies with all the quality standards required in a foodstuffs handling industrial process.

The second impact concerns the implementation of the occupational health programs. The facilities lack the first aid items which would be necessary in the event of an accident. In addition, although there is a document on the Risk Factors involved in the industrial process, the prevention measures to mitigate possible impacts are not being taken. An example of this is the provision of rubber gloves for the workers who handle the stalks, which do not provide sufficient protection from the thorns on the stalks.

[Use of rubber gloves when handling stalks.]

Another considerable risk detected in the lack of signposting for zoning the dangers, to prevent people from entering the area surrounding heat producing equipment. The most critical case is in the area of the autoclave, where the passage between the equipment and the wall is very narrow (less than one meter). There are no danger signposts for the risk and the floor is not demarcated to show the safe transit strip.

[Narrow transit space surrounding the autoclave.]

[Narrow transit space surrounding the autoclave.]

The steam tunnel chimney is inside the processing room, which generates an accumulation of humidity on the ceiling mesh. This constitutes a risk of contamination of the net and of condensation which could drop onto the product being packaged.

[Steam from the steam tunnel]

Among the agro-industrial process impacts which may be considered slight under the present discharge conditions, but which it is important to mention, is the discharges of industrial waste waters. At present these discharges go into a tank with very low technical specifications, then to be carried to a discharge into the Singuiya wetland.

[Retention Pond]

The pond consists of an excavation into natural land with no retention, slopes are not controlled and the water is transported by gravity along gullies which have been generated by the movement of the water. It is not possible with the information available to guarantee that it complies with the function for which it was built, which was to reduce temperature.

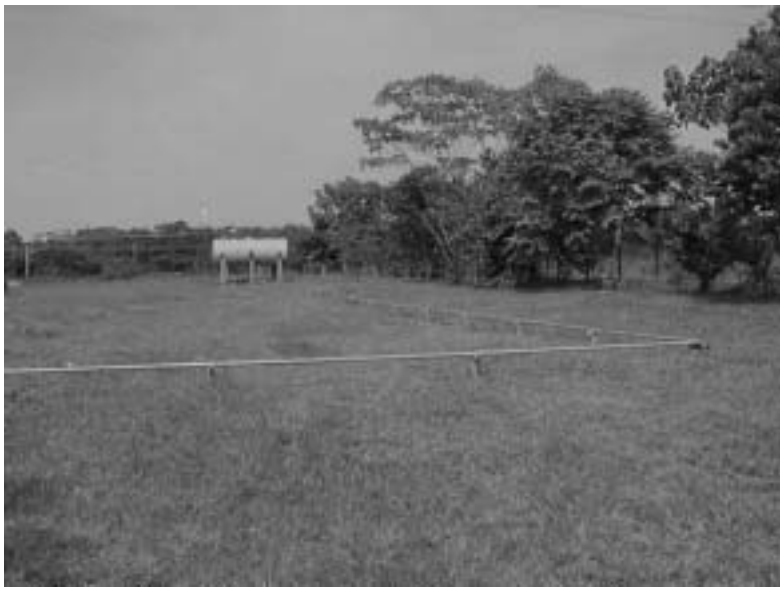
The only treatment being applied to the industrial discharges is the separation of solids using a net over the pond entry structure.

[Solids retention net over the retention pond entry structure.]

Power Generation

In the power generation processes, the most important risk is that the fuel tank which supplies these systems (boiler and generator) have not retention system in the event of leaks or breakage.

[Elevated 5,000 gallon fuel tank]



[Fuel tank and conduction line]

The other impact is the noise generated by the boiler which, because it is inside the building where the industrial process and the offices are located affects the plant operators and the administrative staff.

[Boiler]

Purification Systems

The impact of the purification systems, for both drinking and domestic waste waters, consists of the uncertainty of its functioning and efficiency, because there are not constructive, plans, operation or maintenance manuals. What is most serious is that no laboratory tests have been run to establish the quality of the water supplied after the treatments, neither has a purification quality monitoring plan been implemented.

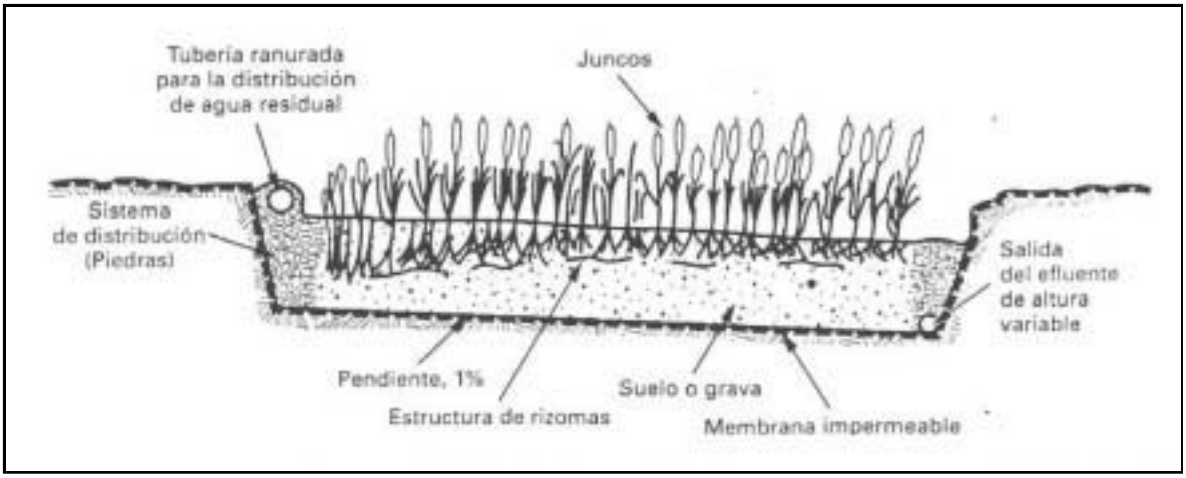
It will be impossible to give an opinion of the functioning of the drinking water purification system until the physical, chemical and microbiological tests of the purified water and the raw water from the cisterns have been made. The volume of water produced is apparently sufficient for present process requirements.

The water management plan leaves much to be desired. There are inconsistencies in the environmental management plans in the Environmental License and the practices at present followed, for example: the License mentions waters taken from the Aguas Negras Stream and the project uses water from the cisterns (with the consequent risks), raw water is used in retro-washing of the filters, when purified water should be used, the composition of the waters used is unknown, because the industrial processes are empirical and those of purification uncertain, residues of

chlorine are not controlled, although we were unable to identify a chlorination process, in spite of the existence of the equipment to do so.

[Connection of the cistern for retro-washing of filters]

As far as the domestic waste waters purification system is concerned, a system has been built which consists of a septic tank, followed by a natural treatment with *macrophyte* plants (rushes). This type of system is illustrated below.



[Diagram of a typical purification system using aquatic plants]

In theory, beds of gravel and sand with aquatic plants consist of excavations in which layers of gravel and sand alternate and plants such as water rushes, lilies, *tifos*, etc. grow. Wast waters pass through the bed and the roots of the plants exercise a biochemical action which attempts to treat or purify the waste. Neither the studies for the design of the purification plant, nor the designs themselves, were available, therefore there is no clear idea of their capacity. We recommend that the discharge into a bed for this type of purification system be pre-treated, at least in a septic tank to remove solids, which could obstruct the bed. In the case of this plant, there is a septic pond which has this function.

With these systems, if they are well calculated and construction, and also well maintained (include management plan), theoretical removals of DBO5 of between 80 and 90% are achieved and, therefore, it may be presumed that the final discharge of purified water complies with the standard established in Decree 1594 of 1984 issued by the Ministry of Health.

The results of the sampling carried out by EcoAnálisis Ltda. for Agroamazonía in October 2002 (see numeral 2 of annex 7.3 Attached – Documents) concluded that the problem of blockage of the system of purification with rushes because there has been an increase in total choliforms at the outlet of the system. Unfortunately, the sampling was not made at the outlet of the rushes system, but at that of the box where the domestic waste waters pour in following treatment with the industrial waste waters, and therefore the true efficiency of the purifications is not reflected.

5.2.3.4. Illustration of mitigation and control measures

The most important mitigation and control measures involve laboratory tests to establish the water quality in:

- each of the supply cisterns.
- the outlet from the drinking water purification system.
- sampling inside the industrial plant.
- before and after the domestic waste waters purification system.
- in the box into which the industrial waste waters run.
- at the delivery points of all the liquid discharges at the Singuiya wetland.

After analyzing the results of these trials, the real impact of each of the components can be evaluated and decisions taken to reduce effects on the environment.

In the area of occupational health, all the programs should be defined by law and compiled in the existing documents in the company. Among the most important points to highlight are:

- Provision of gloves for operators who handle the stalks for the necessary protection against thorns.

- Evaluation of the noise levels in all areas of the plant to define the respective mitigation measures.
- Signposting safety areas surrounding equipment which operates at high temperatures.
- Provision of safety elements for first aid and fire fighting.
- Training of employees and setting up representative committees of employees.

As far as the measures which should be taken to reduce the risk of contamination of the soil and water by fuel spills, a retention pond should be built under the fuel storage tank. The pond will be of a size to contain all the fuel stored, i.e. 18.9 m^3., (5,000 gallons).
Other industrial security risks have mitigation measures presented in in section 5.2.3 (see pag. 158)

5.3. Monitoring And Follow-Up Program Report

5.3.1. Methodology

Monitoring and Follow up are fundamental activities to ensure good environmental management of the activities relating to the Project. Monitoring and follow-up establish the variables according to which environmental impact control should be applied, the type of analysis which should be made, the costs of each activity, the regularity with which they should be applied and the official or operator responsible for the activity.

For this purpose, the necessary data sheets were drawn up to carry out the corresponding work of Monitoring, Evaluation and Follow-up, the starting point of which is that of identifying the agricultural or industrial activities which cause an impact, proposing the activities to control, correct or mitigate that impact; the estimated cost of these activities, defining the frequency with which they should be carried out and establish who is responsible for the action.

5.3.2. Agricultural Component

5.3.2.1. Monitoring and Follow-up Data Sheets

	STUDY OF ENVIRONMENTAL ASSESSMENT MONITORING AND FOLLOW-UP MEASURES	1.0 GERMINATORS				
REF.	FOLLOW-UP ACTIVITY	COST PER ACTIVITY	FREQUENCY	INDICATOR	PERSON RESPONSIBLE	COMMENTS
A3	Verify manual control of weeds and prevent use of chemical products. Keep a register of chemical products used.	[1]	Permanent records	Quantity of trace principles	Agricultural Department Coordinator	
A4	Ensure that the surface layer of the soil is not destroyed and use of organic fertilizers in the construction of the sowing beds.	[1]	During the construction of the sowing beds	% surface eroded	Agricultural Dept. Coordinator	Make regular reviews to analyze the magnitude
A24	Check for destruction of flora in the area surrounding the germinator and evaluate planting of native trees.	[1]	When expansions are carried out	Percentage area intervened in the area of the same lot not intervened	Agricultural Department Coordinator	CORPOAMA-ZONÍA
A30	Verify use of protection and industrial safety elements	[1]	Permanent application of Occupational Health and Industrial Safety programs	Number of cases of disease from agro-chemicals	Agricultural Department Coordinator	Germinators are managed by Agroamazonía.
	Carry out regular analyses of cholinesterase levels of personnel working in the germinators.	[1]	Half-yearly	Level of blood cholinesterase	Administrative Assistant (responsible for industrial safety and occupational health).	Activity carried out in coordination with Professional Risks Administrator (ARP)

[1] Activities carried out as part of germinator management functions.

	STUDY OF ENVIRONMENTAL ASSESSMENT MONITORING AND FOLLOW-UP MEASURES	2.0 NURSERIES				
REF.	**FOLLOW-UP ACTIVITY**	**COST PER ACTIVITY**	**FREQUENCY**	**INDICATOR**	**PERSON RESPONSIBLE**	**COMMENTS**
B1	Reviews of places where the nurseries are installed to evaluate the magnitude	[1]	Minimum of one visit by Agroamazonía technician every two months.	% of eroded surface area	Agricultural Dept. Coordinator	
B3	Keep records of the chemical products used.	[1]	Minimum of one visit by Agroamazonía technician every two months.	Presence of traces of active principles in the soil	Agricultural Dept. Coordinator	
	Physical-chemical soil analysis	[1]	Once when events of contamination or soil removal take place	Presence of traces of active principles in the soil	Agricultural Dept. Coordinator	One soil sample per event
B4	Regular revisions to analyze magnitude.	[1]	Minimum of one visit by Agroamazonía technician every two months.	% eroded surface area	Agricultural Dept. Coordinator	
B24	Analyses of change in visual quality	[1]	When expansions are made	Percentage area intervened in respect to area of same lot not intervened	Agricultural Dept. Coordinator	Opinion of CORPOAMAZONÍA
B30	Verification of use of protection and industrial safety elements	[1]	Minimum of one visit by Agroamazonía technician every two months.	Number of cases of agro-chemical diseases	Agricultural Dept. Coordinator	
	Make analyses of cholinesterase levels of employees who work in the nurseries.	[1]	Every semester	Level of blood cholinesterase	Agricultural Dept. Coordinator	
B39	Keep a record of meetings and agreements made for association work	[1]	Evaluation of courses and training activities and verification of achievement of goals set	% of associated producers who participate in all the community activities of the project	Agricultural Dept. Coordinator Social Component Coordinator	Work of Agroamazonía technical and social departments
B41	Keep a record of the training workshops carried out	[1]	Evaluation of courses and training activities and verification of achievement of goals set	% of producers who apply the recom-ended technologies	Agricultural Dept. Coordinator Social Component Coordinator	Work of Agroamazonía technical and social departments

[1] Activities carried out as part of nurseries management functions.

	STUDY OF ENVIRONMENTAL ASSESSMENT MONITORING AND FOLLOW-UP MEASURES	3.0 ESTABLISHMENT OF CROP				
REF.	**FOLLOW-UP ACTIVITY**	**COST PER ACTIVITY**	**FREQUENCY**	**INDICATOR**	**PERSON RESPONSIBLE**	**COMMENTS**
C1	Verify soil analysis and evaluation of topography	[1]	Once prior to commencing cultivation	% of the eroded surface	Agricultural Dept. Coordinator	One soil sample per property and application of indices in table 4.2.2.1
C4	Keep soil protected by vegetal layer	[1]	During the establishment of the cultivation	% of the eroded surface	Agricultural Dept. Coordinator	
C15	Verify preparation of species census	[1]	Once before commencing cultivation	% of native vegetal species destroyed	Agricultural Dept. Coordinator	Species census per hectare
C16	Verify preparation of species Census	[1]	Once before commencing cultivation	% of migration of species of fauna	Agricultural Dept. Coordinator	Species census per hectare
C21	Verify analysis and quantification of species to be cut down	[1]	Once before commencing cultivation	Number of hectares of woodland intervened on the land	Agricultural Dept. Coordinator	Species census per hectare
C24	Verify non-modification of the ecosystem surrounding the plantation.	[1]	Once before commencing nurseries	% of area intervened in respect of the area of the lot not intervened	Agricultural Dept. Coordinator	Opinion of CORPOAMAZONÍA
C41	Carry out follow-up of agricultural extension development by the technical department and verify holding of workshops on new technology	[1]	Evaluation of training courses and activities and verification of achievement of goals set.	% of producers who apply the recommended technologies	Agricultural Dept. Coordinator Social Component Coordinator	Work of technical and social departments of Agroamazonía
C42	Check that production and marketing plans are being carried out and fulfill the expectations of the associates.	[1]	Annually	% variation in family income	Agroamazonía Management	Work of technical and social departments of Agroamazonía
C43	Check that production and marketing plans are being carried out and fulfill the expectations of the associates.	[1]	Annually	Amount of capital available for investment per year	Agroamazonía Management	

[1] Activities carried out as part of crop establishment functions

	STUDY OF ENVIRONMENTAL ASSESSMENT MONITORING AND FOLLOW-UP MEASURES	4.0 MAINTENANCE OF PLANTATION				
REF.	FOLLOW-UP ACTIVITY	COST PER ACTIVITY	FREQUENCY	INDICATOR	PERSON RESPONSIBLE	COMMENTS
D3	Verify preparation of soils study before recommending soil corrective actions.	[1]	Every 24 months and if changes occur in the fertilizer dosing or corrective measures for soils	Electrical conductivity no higher than 2 milliohm,/centimeter (mmho/cm.)	Agricultural Dept. Coordinator	A soil sample per property and apply biological control schemes shown in tables 4.2.2.2 and 4.2.2.3. Keep records to establish application of the right doses of fertilizers. Make regular evaluations of the effects of fertilizations on the soil.
D15	Verify minimization in use of herbicides and maintenance of the vegetal layer	[1]	During the development of the plantation	% native vegetal species destroyed	Agricultural Dept. Coordinator	Manual weed control.
D16	Monitoring and follow-up of both pests and beneficial insects.	[2]	Visit from Agroamazonía technician a minimum of every two months	% migration of species of fauna	Agricultural Dept. Coordinator	Apply biological control schemes shown in tables 4.2.2.2 y 4.2.2.3
D23	Carry out monitoring and follow-up of both pests and beneficial insects	[2]	Visit from Agroamazonía technician a minimum of every two months	Number of Hectares of intervened woodland on the property	Agricultural Dept. Coordinator	
D30	Keep a record of applications of agro-chemical for implementation of operator and product rotation programs.	[2]	Visit from Agroamazonía technician a minimum of every two months	Number of cases of agro-chemical diseases	Agricultural Dept. Coordinator	
	Keep control of cholinesterase for persons who come into contact with agro-chemicals.	[2]	Half-yearly	Level of blood cholinesterase	Agricultural Dept. Coordinator	
D31	Follow-up use of protective cloves by workers	[2]	Visit from Agroamazonía technician a minimum of every two months	Number of cases of cholinesterase	Agricultural Dept. Coordinator	
D34	Follow-up use of the protective equipment required for each job.	[2]	Visit from Agroamazonía technician a minimum of every two months	Number of cases of work related diseases	Agricultural Dept. Coordinator	
D41	Keep a record of training workshops held and attendees and verify adoption of the recommended technologies	[2]	Visit from Agroamazonía technician a minimum of every two months	% of products which apply the recommended technologies	Agricultural Dept. Coordinator and Social Component Coordinator	Work of technical and social departments of Agroamazonía
D42	Verify assimilation of business training recommendations and analysis of records of expenses and production per farm.	[2]	Visit from Agroamazonía technician a minimum of every two months	% variation in family income	Agricultural Dept. Coordinator and Social Component Coordinator	Work of technical and social departments of Agroamazonía
D43	Evaluate the economic results of the project for the associates	[2]	Annually	Amount of capital available for investment per year	Agricultural Dept. Coordinator and Social Component Coordinator	

[1] Activities carried out as part of crop maintenance functions

[2] Part of the advisory service provided by Agroamazonía

	STUDY OF ENVIRONMENTAL ASSESSMENT MONITORING AND FOLLOW-UP MEASURES	5.0 OTHER CROPS				
REF.	**FOLLOW-UP ACTIVITY**	**COST PER ACTIVITY**	**FREQUENCY**	**INDICATOR**	**PERSON RESPONSIBLE**	**COMMENTS**
E24	Verify non-intervention of zones neighboring on orchards and recommend planting native species of trees in the zones neighboring on the plantations and check that it is being done.	[1]	Minimum of one visit from the Agroamazonía technician every two months	% area intervened in comparison with the area of same lot not intervened	Agricultural Dept. Coordinator la	.
E41	Verify the application of the recommendations for agricultural extension of training in new technologies	[2]	Visit from Agroamazonía technician and the social component coordinator a minimum of every two months	% of producers who apply the recommended technologies	Agricultural Dept. Coordinator and Social Component Coordinator	Work of Agroamazonía technical and social departments
E42	Verify assimilation of the recommendations for business training and analyze records of expenses and production per farm	[2]	Visit from Agroamazonía technician a minimum of every two months	% variation in family income	Agricultural Dept. Coordinator and Social Component Coordinator	Work of Agroamazonía technical and social departments
E43	Evaluate the economic results of the project for the associates	[2]	Minimum of one visit from the Agroamazonía technician every two months	% area intervened in comparison with the area of same lot not intervened	Agricultural Dept. Coordinator la	

[1] Activities carried out as part of functions for other crops.

[2] Forms part of the advisory service provided by Agroar

5.3.2.2. Reference Table Agricultural Component.

INDICES FOR THE INTERPRETATION OF SOIL ANALYSES				
CRITICAL LEVELS FOR THE INTERPRETATION OF SOIL ANALYSES FOR THE CULTIVATION OF CHONTADURO FOR HEART OF PALM IN COSTA RICA (Guzman. 1995)		APPROXIMATE EXTRACTION OF NUTRIENTS (Herrera,1989)		
ELEMENT	**CRITICAL LEVEL**	**ELEMENT**	**Kg/ha.-year crop (*)**	**Heart of Palm Gross**
Al	0.3 meq 100 g	N	531	28
Ca	4.0 meq 100 g	P	37,9	4,8
Mg	1.0 meq 100 g	K	248,3	31
K	0.2 meq 100 g	Ca	64,8	4,7
S	12 ppm	Mg	43	3,9
P	10 ppm	Fe	1,83	0,03
Cu	1 ppm	Cu	0,184	0,021
Fe	10 ppm	Zn	0,254	0,05
Zn	3 ppm	Mn	2,274	0,085
Mn	5 ppm	S	47,23	3,36
B	0.5 ppm	B	0,557	0,0029

(*) Density 3.200 plants/Ha.
Source: Corpoica, Chontaduro Growing and Research (Bactris gasipaes H.B.K.),Memories. Tumaco, Nariño. Mayo 1996

PESTS AND DISEASES REPORTED IN CHONTADURO FOR HEART OF PALM *(Bactris gasipaes* H.B.K.) AND RECOMMENDATIONS FOR BIOLOGICAL CONTROL		
NAME OF DISEASE	**TYPE OF DAMAGE**	**POSSIBLE BIOLOGICAL CONTROL**
Colletotrichum spp	Black stain of leaves or leaf blight. Has been reported on the Colombian Pacific coast	Keep a good nutritional balance of the plants and good drainage of the soil reduces the damage by fungi. The micorrhizas, as bio-fertilizers, help to control the disease.
Pestalotiopsis sp	Yellow stain. Affects palms in the nursery	Keep a good nutritional balance of the plants and good drainage of the soil reduces the damage by fungi. The micorrhizas, as bio-fertilizers, help to control the disease.
helminthosporirum sp ***Pestalotia sp.*** ***Curvularia sp.***	Cause dark stains and has been reported in nurseries on the Pacific coast	Controls have been reported for *helminthosporirum sp* with applications of the *trichoderma harzianum* antagonist fungus
Fusarium sp.	Causes arrow decay on the *flecha* until the meristem. Affects both palms in the nursery and adult plants. Reported in the Pacific coast zone	Controls have been reported for *Fusarium sp.* with applications of the *trichoderma harzianum* antagonist fungus
Phytophthora sp.	Rotting of the stalk. This can be detected by yellowing of the leaves surrounding the *flecha*, which dries and can affect the meristem.	Controls have been reported for the *helminthosporirum sp* with applications of the *trichoderma harzianum* antagonist fungus
NAME OF THE PEST INSECT	**TYPE OF DAMAGE**	**POSSIBLE BIOLOGICAL CONTROL**
Alurnus humeralis	Palm stalk worm. The larvae consume the *flecha* tissue, which has been reported in Tumaco.	Applications of *B. Thuringiensis y Beauveria brogniartii* could control this insect. Traps with pheromones may be used for monitoring and control.
Sagalassa valida	Lepidoptera which act as root borers and have been reported in Tumaco.	Applications of *B. Thuringiensis y Beauveria brogniartii* could control this insect. The traps with pheromones can be used for monitoring and control.
Strategus aloeus	Coleoptera which act as stem and stump,,, and has been reported in Tumaco.	Applications of *Beauveria bassiana, beauveria brogniartii* and *paecilomyces fumosoroseus* could control the insect and traps with aggregation pheromone should be installed.
Rhynchophorus palmarum	Coleóptero, known as *picudo del cocotero*. The larvae penetrate the trunk as far as the rootstalk, causing rotting which can destroy it.	Applications of *Beauveria bassiana, beauveria brogniartii* and *paecilomyces fumosoroseus* could control the insect. Placing traps with aggregation pheromones.
Metamasius hemipterus	Coleóptero, which has habits very similar to those of *Rhynchophorus palmarum,* but on a smaller scale.	Applications of *Beauveria bassiana, beauveria brogniartii* and *paecilomyces fumosoroseus* could control the insect. Placing traps with aggregation pheromones.
Posible geraeus sp.	Coleóptero. Reported on the Pacific coast is, economically, the worst pest in the Chontaduro plantations for fruit in that region of the country. The insect, in its adult status, perforates the fruit, causing it to fall.	Pocketing the bunch. This has been the most recommended control in the Pacific coast plantations. For the purpose, perforated plastic bags, similar to the ones used in banana plantations.

SOME COMMERCIAL BIOLOGICAL INSECTICIDES
for the control of chontaduro palm pests

COMMERCIAL NAME	ACTIVE INGREDIENT	PEST CONTROLLED	RECOMMENDED DOSE
DIPEL 8L	*Bacillus thuringiensis*	LEPIDOPTEROS	0,2 a 0,3 Kg/ Há.
DIPEL 2X	*Bacillus thuringiensis*	LEPIDOPTEROS	2,5 Litros/ Há.
ECOTECH BIO	*Bacillus thuringiensis*	LEPIDOPTEROS	0,4 kilos/Há.
ECOTECH PRO (SE)	*Bacillus thuringiensis*	LEPIDOPTEROS	0,4 Litros/Há
THURICIDE H.P.	*Bacillus thuringiensis*	LEPIDOPTEROS	0,4 kilos/Há.
TRACER 120 SC	*Spinosad*	LEPIDOPTEROS	0.1 a 0,2 Litros/Há.
XENTARI W.D.G.	*Bacillus thuringiensis*	LEPIDOPTEROS	0,5 kilos/Há.
CONIDIA WG	*Beauveria bassiana*	COLEOPTEROS	0,2 kilos/Há.
BROCARIL	*Beauveria bassiana*	COLEOPTEROS	0,1 Kilos/Há.
TURILAV	*Bacillus thuringiensis*	LEPIDOPTEROS	0,1 Kilos/Há.
VERTISOL W.P	*Verticillium lecanii*	HOMOPTEROS	0,1 Kilos/Há.
BIOSTAT W,P	*paecilomyces lilicinus*	NEMATODOS	0,1 Kilos/Há.

Source : Rosestein Emilio. Diccionario de Especialidades Agronomicas, PLM, 10a Edición, Bogotá, 2000
Laverlam Laboratory, faximil, November 19, 2002

5.3.3. Industrial Component

Monitoring and Follow-up Data Sheets

	STUDY OF ENVIRONMENTAL ASSESSMENT MONITORING AND FOLLOW-UP MEASURES	1.0 AGRO-INDUSTRIAL PRODUCTION PROCESSES				
REF.	**FOLLOW-UP ACTIVITY**	**COST PER ACTIVITY**	**FREQUENCY**		**PERSON RESPONSIBLE**	**COMMENTS**
F3	Ensure biodegradable soaps are used to clean the plant. Check the sweeping up of dry solids before washing floors and the plant in general.	[1]	Daily or per production shift		Management	One sample of soil per event
	Verify sampling of water at points of discharge onto soil.	[1]	Once when events of contamination occur.		Management	One sample of discharge per event
F11	Verify sampling of water at points of discharge into bodies of water and physical-chemical and microbiological analyses.	[1]	Annually		Management	One sample from point of discharge
F13	Verify sampling of water at points of discharge into bodies of water and physical-chemical and microbiological analyses.	[1]	Annually		Management	The same sample at the point of discharge
F22	Verify sampling of water at points of discharge into bodies of water and physical-chemical and microbiological analyses.		Annually		Management	The same sample at the point of discharge
F24	No monitoring required	[1]				
F25	Follow-up of recommendations made on the basis of specific metering.	[1]	Half-yearly		Management	

continuation

	STUDY OF ENVIRONMENTAL ASSESSMENT MONITORING AND FOLLOW-UP MEASURES	1.0 AGRO-INDUSTRIAL PRODUCTION PROCESSES (continuation)				
REF.	FOLLOW-UP ACTIVITY	COST PER ACTIVITY	FREQUENCY		PERSON RESPONSIBLE	COMMENTS
F29 [*]	Ensure that physical, chemical and microbiological analyses of drinking water are carried out.	[1]	Daily or per production shift		Management	The microbiological analysis should be made by the plant quality control laboratory. Physical-chemical analyses are contracted with a suitable laboratory.
F31	Check that operators are using adequate industrial safety elements. Verify the application of industrial safety standards and procedures	[1]	Monthly (on a random date)		Management and Administrative assistant (responsible for industrial safety and occupational health)	
F34 [*]	Ensure the implementation of the "Occupational Health Program" of the company, as well as "Industrial Safety".	[1]	Monthly (on random date)		Administrative Assistant (in charge of industrial safety and occupational health)	
F42	Check the achievement of the social and economic goals of the Project	[1]	Annually		Management and Agricultural Dept. Coordinator and Social Component Coordinator Social	Work of the Agroamazonía technician and social departments

[1] Activities carried out as part of Agroamazonía's own functions
[2] Cost is included in other activities
[*] (Contingent risk must be dealt with immediately)

	STUDY OF ENVIRONMENTAL ASSESSMENT MONITORING AND FOLLOW-UP MEASURES	2.0 GENERATION (steam and electricity				
REF.	**FOLLOW-UP ACTIVITY**	**COST PER ACTIVITY**	**FREQUENCY**		**PERSON RESPONSIBLE**	**COMMENTS**
G3	Ensure the fuel tank is hermetically sealed	[1]	Daily check of fuel levels in the tank and visual inspection of exterior of the tank.		Head of Production and Quality Control Maintenance Assistant	Activity included in routine maintenance
G9	Ensure the fuel tank is hermetically sealed	[1]	Daily check of fuel levels in the tank and visual inspection of exterior of the tank.		Head of Production and Quality Control Maintenance Assistant	Activity included in routine maintenance
G11	Check temperature at the discharge vent of the boiler.	[1]	Quarterly		Head of Production and Quality Control Maintenance Assistant	The boiler vent must comply with the liquid discharges standard, in particular with the maximum temperature limit of 40 degrees centigrade
G24	Carry out routine maintenance of the generator to ensure synchronization..	[1]	According to manufacturer's recommendation		Head of Production and Quality Control Maintenance Assistant	Routine maintenance of the generator motor to keep it synchronized.
G26	No monitoring required					
G28	Follow-up of recommendations given on analysis of specific metering	[1]	Once		Management	
G34	Implement the company's entire "Occupational Health Program" and "Industrial Safety".	[1]	Permanent application of Occupational Health and Industrial Safety programs		Administrative Assistant (in charge of industrial safety and occupational health)	

[1] Activities carried out as part of Agroamazonía's own functions..

	STUDY OF ENVIRONMENTAL ASSESSMENT MONITORING AND FOLLOW-UP MEASURES	3.0 PURIFICATION SYSTEMS (drinking water and domestic waste water)				
REF.	**FOLLOW-UP ACTIVITY**	**COST PER ACTIVITY**	**FREQUENCY**		**PERSON RESPONSIBLE**	**COMMENTS**
H3	Verification of sampling of backwash water from the filters at the points of discharge onto soil.	[1]	Once when events of contamination occur.		Management	One sample at point of discharge
H5	Regularly check static levels of the cisterns to check that discharge is normal	[1]	Monthly		Maintenance Assistant	
H11	Check sampling of waste water to verify efficiency of purification.	[1]	Annually		Management	Four sampling points.
H24	No monitoring required					
H25	Follow up levels of sludge and foam in the septic tank and carry out maintenance of same according to the designer's recommendations.	[1]	Quarterly		Maintenance Assistant	
H28	Check routine maintenance of electric motors.	[1]	According to manufacturer's recommendation		Maintenance Assistant	
H29	Check the physical, chemical and microbiological of drinking waters	[1]	Daily or on change of production shift.		Management	Microbiological analysis should be made in the plant quality control laboratory. The physical-chemical analyses is contracted with a suitable laboratory.

[1] Activities carried out as part of Agroamazonía's own functions..

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	STUDY OF ENVIRONMENTAL ASSESSMENT MONITORING AND FOLLOW-UP MEASURES	5.0 PRODUCTION OF ORGANIC FERTILIZER				
REF.	**FOLLOW-UP ACTIVITY**	**COST PER ACTIVITY**	**FREQUENCY**		**PERSON RESPONSIBLE**	**COMMENTS**
J11	Supervise the collection of leachates which may be produced in the piles during the decomposition process in the production of organic fertilizer.	[1]	Permanent		Head of production and quality control and Agricultural Dept. Coordinator	Prevent leachates from reaching the wetland
J20	Check the functioning of the traps and insect counts.	[1]	Permanent		Head of production and quality control and Agricultural Dept. Coordinator	Pheromone traps at a cost per placement of COL$160.000 and ten replacements per year
J24	No monitoring required					
J25	Ensure no odor producing foci are adequate cleaning.	[1]	Permanent		Head of production and quality control and Agricultural Dept. Coordinator	
J28	Follow-up of recommendations given for analysis of the specific metering.	[1]	Once		Management	
J31	Ensure that industrial safety elements are adequate	[1]	Permanent		Administrative Assistant (in charge of industrial safety and occupational health)	
J44	Evaluate dispatch programming systems and use of organic fertilizer.	[1]	Monthly		Agricultural Dept. Coordinator and Social Component Coordinator	Work of Agroamazonía technical and social departments.

[1] Activities carried out as part of Agroamazonía's own functions..

[34] Activity 4.0 Storage has not important impacts..

	STUDY OF ENVIRONMENTAL ASSESSMENT MONITORING AND FOLLOW-UP MEASURES	6.0 GERMINATORS				
REF.	**FOLLOW-UP ACTIVITY**	**COST PER ACTIVITY**	**FREQUENCY**		**PERSON RESPONSIBLE**	**COMMENTS**
K3	Carry out manual weed control and avoid use of chemical products. Keep a record of chemical products used.	[1]	Permanent records		Coordinator of Agricultural Dept.	One soil sample per property and application of biological control programs in Tables 4.2.2.2 and 4.2.2.3
K4	Avoid destruction of the surface layer of soil and use organic fertilizers in the establishment of sowing beds.	[1]	During establishment of sowing beds		Coordinator of Agricultural Dept.	
K24	Check whether there is any destruction of flora in the area surrounding the germinator and plant native trees.	[1]	For expansions.		Coordinator of Agricultural Dept.	Opinion of CORPOAMAZONÍA
K30	Check use of protection and industrial safety elements.	[1]	Permanent application of Occupational Health and Industrial Safety programs		Coordinator of Agricultural Dept.	
	Make regular analyses of cholinesterase levels of personnel working in the germinators.	[1]	Permanent application of occupational health manual		Administrative Assistant (in charge of industrial safety and occupational health)	Administrative assistant in coordination with Professional Risks Administrator (ARP)

[1] Activities carried out as part of Agroamazonía's own functions..

	STUDY OF ENVIRONMENTAL ASSESSMENT MONITORING AND FOLLOW-UP MEASURES	7.0 TRANSPORT				
REF.	**FOLLOW-UP ACTIVITY**	**COST PER ACTIVITY**	**FREQUENCY**		**PERSON RESPONSIBLE**	**COMMENTS**
L3	Ensure that vehicle maintenance is not carried out within the terrain of the Plant	[1]	Once when events of contamination occur		Management	On sample of soils per event. Mechanical check of vehicles working in the plant and maintenance of same must be carried out to guarantee there are no leaks of oil, grease or fuel.
L9	Ensure that vehicle maintenance is not carried out within the terrain of the Plant	[1]	Once when events of contamination occur		Management	One sample at point of discharge. Mechanical check of vehicles working in the plant and maintenance of same must be carried out to guarantee there are no leaks of oil, grease or fuel.
L26	Ensure compliance with the vehicle maintenance program	[1]	In accordance with manufacturer's recommendations.		Management	.
L31	Check that drivers are using adequate industrial safety elements.	[1]	Permanent application of health manual		Administrative Assistant (in charge of industrial safety and occupational health)	.

[1] Activities carried out as part of Agroamazonía's own functions..

	STUDY OF ENVIRONMENTAL ASSESSMENT MONITORING AND FOLLOW-UP MEASURES	8.0 DIVERSIFICATION PROJECTS				
REF.	FOLLOW-UP ACTIVITY	COST PER ACTIVITY	FREQUENCY		PERSON RESPONSIBLE	COMMENTS
M2	Verify preparation of physical-chemical soil analysis	[1]	Contingent		Management	One soil sample per event
M4	Verify correct location on the lot of material excavated during construction	[1]	Contingent		Management	.
M5	Evaluation,,, of water supply	[1]	Weekly		Maintenance Assistant	.
M9	In the event of fuel or oil spills, ensure that samples of waste water are taken at the points of discharge into bodies of water and that physical, chemical and microbiological analyses are carried out.	[1]	Once when events of contamination occur.		Management Follow-up and contracting of sampling	One soil sample per event
M11	In the event of waste water spills, ensure that samples of waste water are taken at the points of discharge into bodies of water and that physical, chemical and microbiological analyses are carried out.	[1]	Once when events of contamination occur.		Management Follow-up and contracting of sampling	One soil sample per event
M24	No monitoring required	[1]	.		.	.
M28	Follow up recommendations given on analysis of specific metering.	[1]	Once		Management	.
M29	Verification of physical, chemical and microbiological analyses of drinking water used in new processes.	[1]	Microbiological analyses should be made every day. Physical-chemical analyses should be made twice a month.		Management	Microbiological analyses should be made by the plant quality control laboratory. Physical-chemical analyses are contracted with a suitable laboratory.
M34	Check on implementation of the “Occupational Health Program" and “Industrial Safety” of the company .	[1]	Permanent application of Occupational Health and Industrial Safety programs		Management Administrative Assistant (in charge of industrial safety and occupational health)	.
M42	Ensure compliance with the social and economic goals of the Project	[1]	Annually		Management Agricultural Dept. Coordinator and Social Component Coordinator	Work of Agroamazonía technical and social departments

[1] Activities carried out as part of Agroamazonía’s own functions..

5.4. Management Plans Schedules

5.4.1. Agricultural Component Schedule.

CROPS COMPONENT MANAGEMENT PLAN SCHEDULE																									
Row	Activity to be Carried Out	MONTH																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	Germinators																								
1	Manual weed control																								
2	Physical-chemical soils analysis																								
	Nurseries																								
3	Manual weed control																								
4	Physical-chemical soils analysis																								
5	Verification of protection and industrial safety elements																								
	Establishment of Crop																								
6	Soils analysis and topographical evaluation.																								
7	Census of species of flora and fauna																								
8	Quantification of species to be cut down																								
	Maintenance of Crop																								
9	Electrical conductivity analysis																								
10	Implementation of biological control and integrated pest management																								

5.4.2. Industrial Component Schedule

COMPONENT MANAGEMENT PLAN SCHEDULE														
Fila	Activity to be Carried Out	MES												
		1	2	3	4	5	6	7	8	9	10	11	12	13
	INFRASTRUCTURE													
1	Construction of a perimeter channel and a containing pond under the fuel tank to guarantee retention of the maximum storage volume of the tank.													
2	Equipment necessary for microbiological analyses.													
3	Extend steam tunnel chimney. Place hood with extraction duct over kettles.													
4	Placing insect traps and insect counts													
5	Extend boiler vent to a box for temperature reduction..													
	ANALYSIS													
6	Physical-chemical analysis of water from drinking water purification plant.													
7	Physical-chemical analysis of final discharge into the Singuiya wetland from the drinking water purification plant.													
8	Physical-chemical analysis of discharge of industrial and domestic waste waters.													
	STUDIES AND EVALUATIONS													
9	Reconstruction of information on the design, construction, operation and maintenance of the Purification System for water for consumption and from the three cisterns.													
10	Metering of noise levels (pressure level, frequency spectrum and directionality) in the different areas of the plant.													
11	Reconstruction of information on the design, construction, operation and maintenance of the Waste Waters Treatment System													
12	Study of evaluation of consumptions required by the industrial plant, including the new processes and the efficient water management program.													
13	Study to define treatment of industrial liquids discharges from the new processes.													
	POSSIBLE FUTURE ANALYSES													
14	Physical-chemical soils analyses.													
15	Samplings of water at waste waters discharge points.													
16	Physical-chemical drinking water analyses.													
17	Microbiological drinking water analyses													
	OPTIONAL INFRASTRUCTURE (to be defined)													
18	Construction of clearance channel and temperature control.													

Industrial Component.

Table 28 shows the quantitative assessment of the industrial component. From the environmental point of view, stopping the plant would bring the minimal benefit of reducing the production of liquid and solid waste, there would be no risk of contamination by fuel and oils and the noise producing equipment would not be operated. All these benefits would only be at local level and would have no effect at regional level.

Shutting down the plant would cause a negative environmental effect (independent of the financial effect) in the socio-cultural context, because the plant employees would be without a job and cease to have a family income, with the more serious circumstance that the possibilities of finding a similar job in the region are virtually non-existent.

Table 28 Qualitative Evaluation – Industrial Component

	ENVIRONMENTAL ASSESSMENT CHARACTERISTICS OF QUALITATIVE EVALUATION				
	SCENARIO - NON-IMPLEMENTATION OF THE PROJECT Industrial Component				
	FACTORES AMBIENTALES AFECTADOS	**CARACTERÍSTICAS**	**DICTAMEN**	**VALORACIÓN**	
				M	**I**
	1) Environmental Impact on the Soil Resource				
3	Contamination by chemicals or waste	The risk of contamination by discharge of fuels and oils would cease to exist.	The benefit would be local.	1	1
	2) Environmental Impact on the Hydric Resource				
9	Contamination by chemicals	The risk of contamination by discharges of fuels and oils would cease to exist.	The benefit would be local.	1	1
11	Contamination by discharge of liquid residues or untreated waters	The risk of contamination by discharges of industrial waste waters would cease to exist.	The benefit would be local.	1	1
	6) Environmental Impact in the socio-cultural and economic context				
42	Changes in family income	The family income of all the personnel working in the plant would change because they would be left without a job.	The impact is important at local level because there are no alternative jobs at industrial level in Puerto Asis.	-2	-2

KEY

1) M = Magnitude (Extent or Scale of Impact)

Theoretical area of influence of the Impact in relation to the Project environment
Rating = (Favorable (+), Unfavorable (-))+(Scale of 1 to 10)

1 = Minimal 10 = Extensive

2) I = Importance (Intensity or Degree of Incidence)
Degree of Incidence of action on the factor
Rating = (Favorable (+), Unfavorable (-))+(Scale of 1 to 10)
1 = Minimal Effect, 10 = Total Destruction

NO IMPACT

MEDIUM IMPACT

MINIMUM OR LOW IMPACT

FAVORABLE IMPACT

5.5. Conclusions and Recommendations.

5.5.1. Conclusions.

5.5.1.1. General.

- The project does not involve any environmental risks to the surrounding areas, due in particular to the plantations being so spread out, so it causes no phyto-sanitation problems requiring the use of dangerous products and because the agro-industrial plant processes are relatively clean. However, the measures recommended to eliminate Contingent Risks should be put into practice immediately.

- From the socio-economic point of view, the project has produced important expectations for improvement in the quality of life of the rural population participating in it. However, the scattered layout and slow expansion of the cultivated areas are a risk to the sustainability of the project.

- As far as cultural aspects are concerned, the project provides a positive alternative to illegal coca growing activities, generates an entrepreneurial and association orientated culture. The mechanism of working only with ex-coca growers avoids any possible conflicts with ethnic, indigenous or black groups.

5.5.1.2. Agricultural Component:

- The Project is in harmony with the natural landscape of Putumayo, because it is based on a species which is native to the region and the crop is not grown on as large extensions.

- It does not require deforestation because the zones had already been cultivated.

- The agronomic processes, such as interspersed crops imply relative preservation of diversity.

- The characteristics of the crop favor soil preservation, because it retains the vegetal layer, returns a large proportion of the biomass and causes no intense extraction of nutrients.

- No high-toxicity agro-chemicals are used, nor any others with legal restrictions under neither Colombian nor United States regulations. The only exception is Paraquat, which should not be used, and manual weed control is recommended. The PERSUAP attends in detail to this

- The surrounding area represents environmental risks for the crop, especially because of the applications of glyphosate in crop spraying to eradicate coca plantations. At the same time, it is possible for the inputs used for the illegal crops to contaminate the soils in which chontaduro is grown and they represent a serious risk to the health of the rural population.

- The cost of the analyses and studies to minimize the environmental impacts of this component are estimated at COL$38,517,000.oo on the basis of projected planting for the year 2003. However, once these analyses and studies have been carried out, more investments may be required in accordance with the corresponding recommendations made at that time.

5.5.1.3. Industrial Component:

- **Even though the industrial process is, in general, relatively clean, a considerable number of items are lacking, especially for the treatment of water, both for the production process of the plant, which implies serious contingent risks to the quality of the final product, and for consumption by the plant workers, and in the disposal of waste waters.**

- **Regarding water for the industrial process and for consumption, the most serious problem is the lack of procedures to ensure the quality of the water from the filter systems. In addition, chlorination of the water is planned, but there has been no evidence that it is being implemented. Finally, there is no permanent control of the resulting water which is used in the industrial processes, implying risks to the final quality of the product and causing uncertainty as to the packaged water.**

- The disposal of waste waters has apparently sufficient systems and elements for adequate treatment, but they lack the necessary information on design, construction and maintenance, which implies uncertainty regarding the final results, as may be observed in the results of a recent sampling, which is included in the annexes to this document.

- Controls by sampling, which are in fact CORPOAMAZONÍA's only requirement, do not compensate for the lack of the information mentioned in the foregoing point and the results of the analyses appear to be affected by lack of knowledge of the design, construction and maintenance of the treatment system components.

- The production of organic fertilizer could become a source of insect production, which requires the implementation of a control procedure.

- **Another worrying aspect is related to industrial safety. In spite of AGROAMAZONÍA having all the required documentation, the procedures are not being followed and there are not enough elements to deal with possible problems. The personal protection items appropriate to a process such as receiving and classifying stalks are not being used, nor is there any danger signposting to prevent accidents. In addition, the noise generation metering have not be carried out in specific areas of the Plant.**

- The design and construction of certain critical points in the industrial process, such as that of the Autoclave, have restricted space, implying a high risk of accidents.

- **The fuel storage tank has no spill control or retention pond and the surface pipe is at significant risk, because it does not have sufficient protection or any spill mitigation mechanisms.**

- The cost of the analyses and studies to minimize the environmental impacts of this component is estimated at COL$35.686.000, which includes both the civil works and the necessary laboratory analyses. However, once these analyses and studies have been carried out, further investment may be required, according to the corresponding recommendations made at that time.

5.5.2. Recommendations

5.5.2.1. General:

- The scattered nature of the plantations should be re-designed, as it could result in negative socio-economic aspects. The environmental advantages of scattering may be achieved with plantation designs closer to the industrial plant, which preserve diversity and have a low impact on the natural landscape.

- Fulfillment of the commitments assumed under the Environmental License, especially concerning reforestation, crop records and the use of the Aguas Negras Stream waters concession.

5.5.2.2. Agricultural Component

- Evaluation of the possibility of concentrating the plantation areas closer to the Processing Plant to facilitate phyto-sanitary control and crop management and cause scale economies because of the size of the properties, thus also facilitating the achievement of the social and economic goals of the project.

- Organic agriculture and biological pest control should be implemented in practice. Recommendations on this aspect are more extensively discussed in the Monitoring section.

- Elimination of Paraquat and any other toxic herbicide and replacement with manual weed control.

- Ensure the use of the protection and industrial safety elements.

- Carry out soil studies of plantation areas whenever there are changes in practices or inputs for fertilization or soil correction.

- Carry out a census of the forestry species affected and evaluate the impact of possible tree felling as part of the preparation of terrain for planting.

5.5.2.3. Industrial Component.

- Reconstruction of the information on the design, construction and maintenance of the Waste Waters Treatment System.

- Preparation and putting into practice a manual of procedures for the verification of water quality for industrial use and consumption.

- Implement a program of sampling and analysis of the waste waters treatment and discharge systems.

- Construction of a perimeter channel, a retention pond under the fuel storage tank and protection of the distribution network.

- Acquisition of the equipment necessary for microbiological analysis of waters for industrial and domestic consumption.

- Acquisition and placing of insect count traps.

- Implementation of the industrial safety procedures described in the documents held by AGROAMAZONÍA. Metering of noise and introduction of the measures required according to the results.

- Plans should be made for the possibility of making some studies and evaluations, mainly associated with the danger of fuel spills.

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SECTION 7 APPENDIX

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14. Varios Autores. “Guía Ambiental para el Subsector Panelero” Ministerio del Medio Ambiente, Sociedad de Agricultores de Colombia, Federación Nacional de Productores de Panela. Bogotá, junio de 2002.

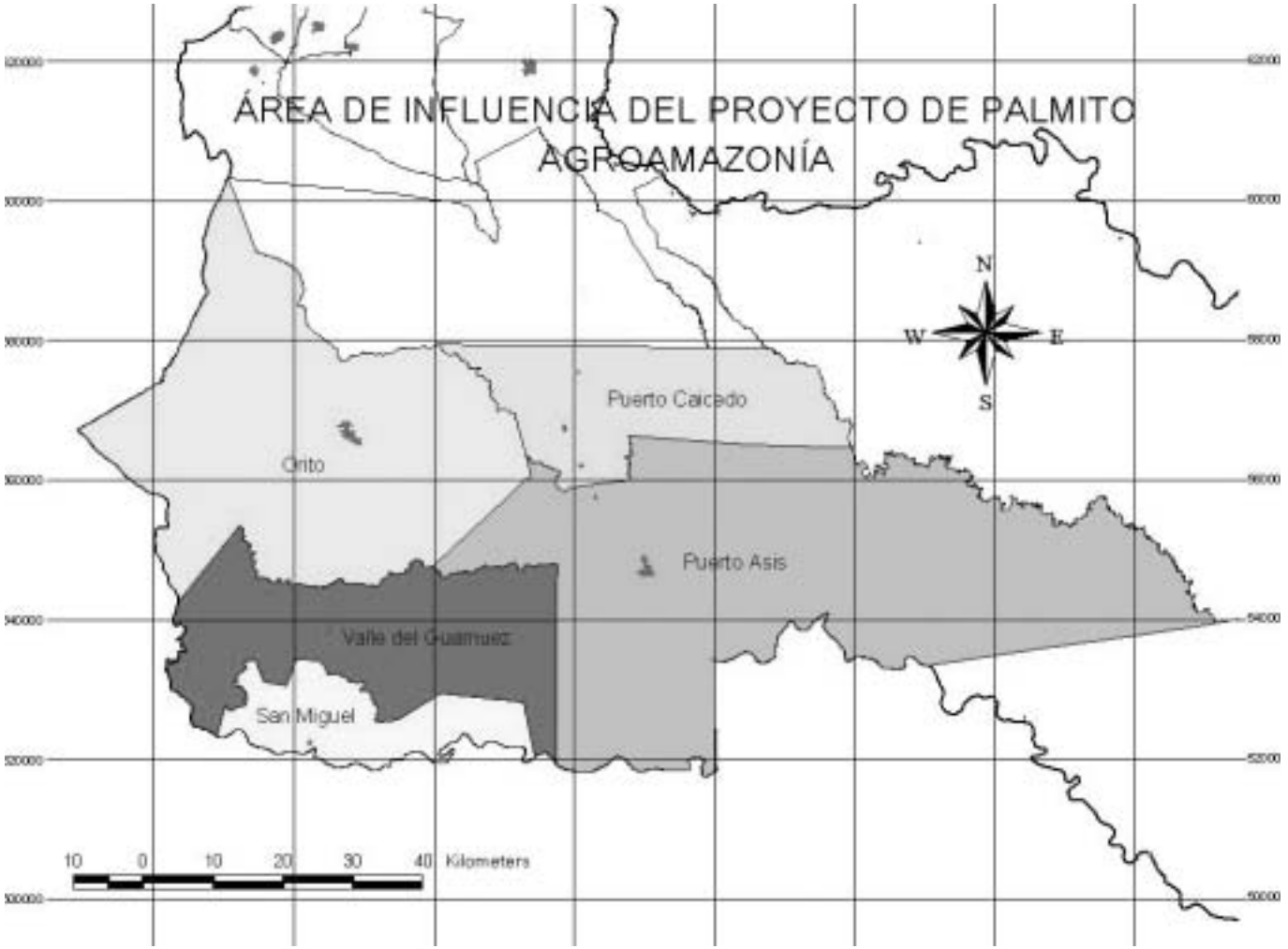
15. Varios Autores. “Guía Ambiental para Floricultura” Ministerio del Medio Ambiente, Sociedad de Agricultores de Colombia, Asociación Colombiana de Productores de Flores. Bogotá, 2002.

ANNEXES (in Spanish)

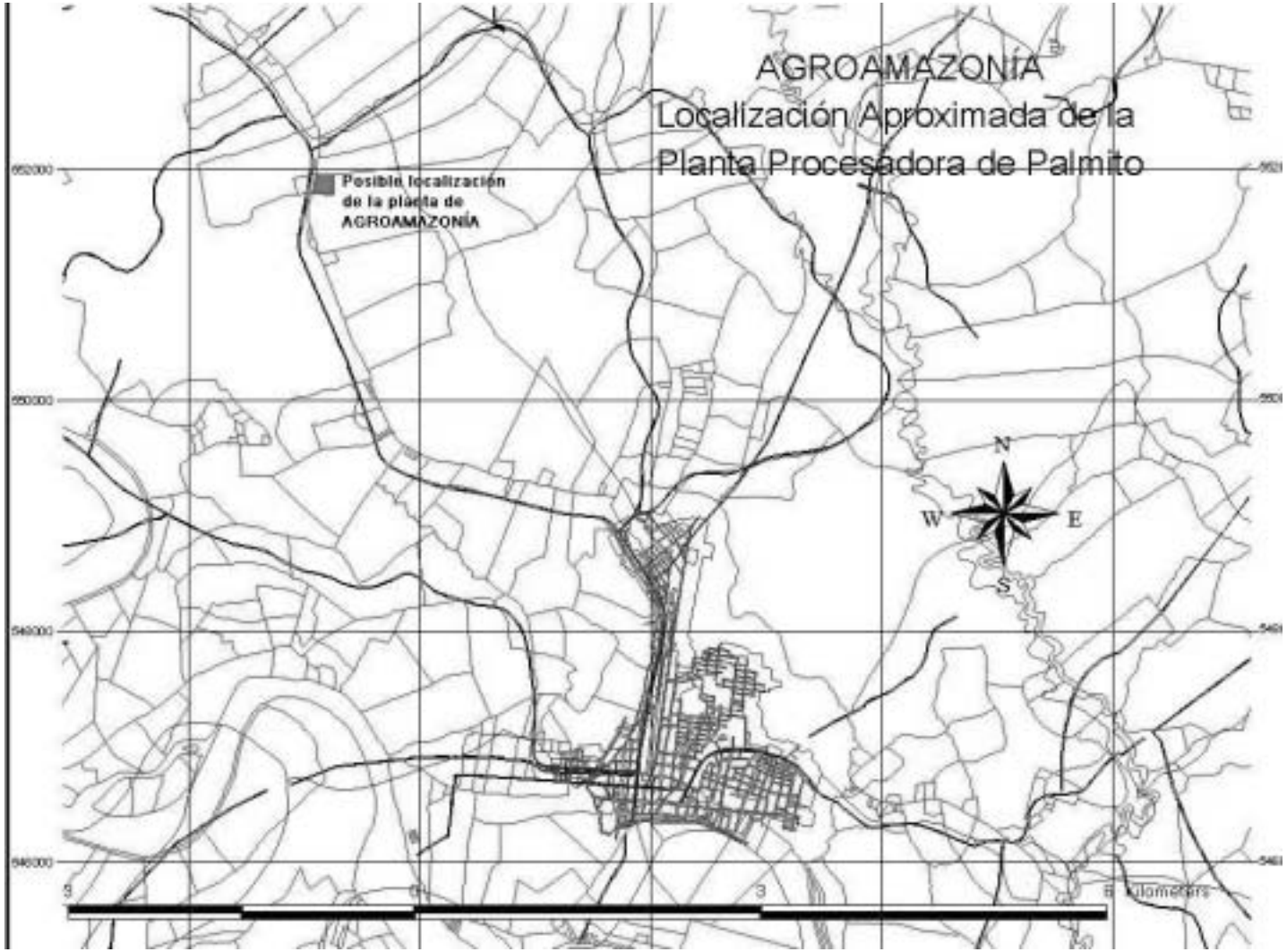
.

ANNEX - MAPS

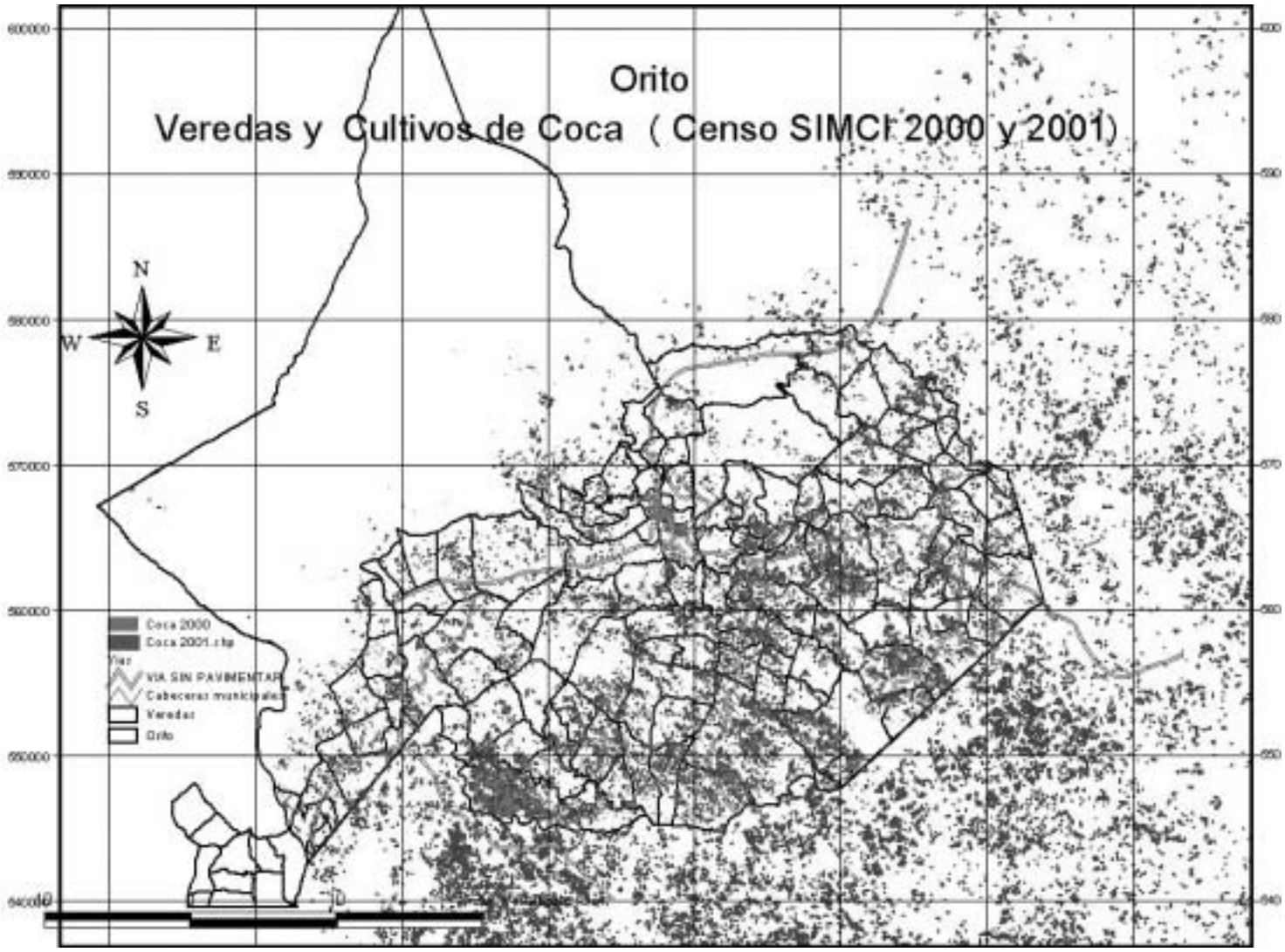
Map 1


ÁREA DE INFLUENCIA DEL PROYECTO DE PALMITO
AGROAMAZONÍA
N
W
E
S
Puerto Caicedo
Orito
Puerto Asis
Valle del Guamuez
San Miguel
10 0 10 20 30 40 Kilometers

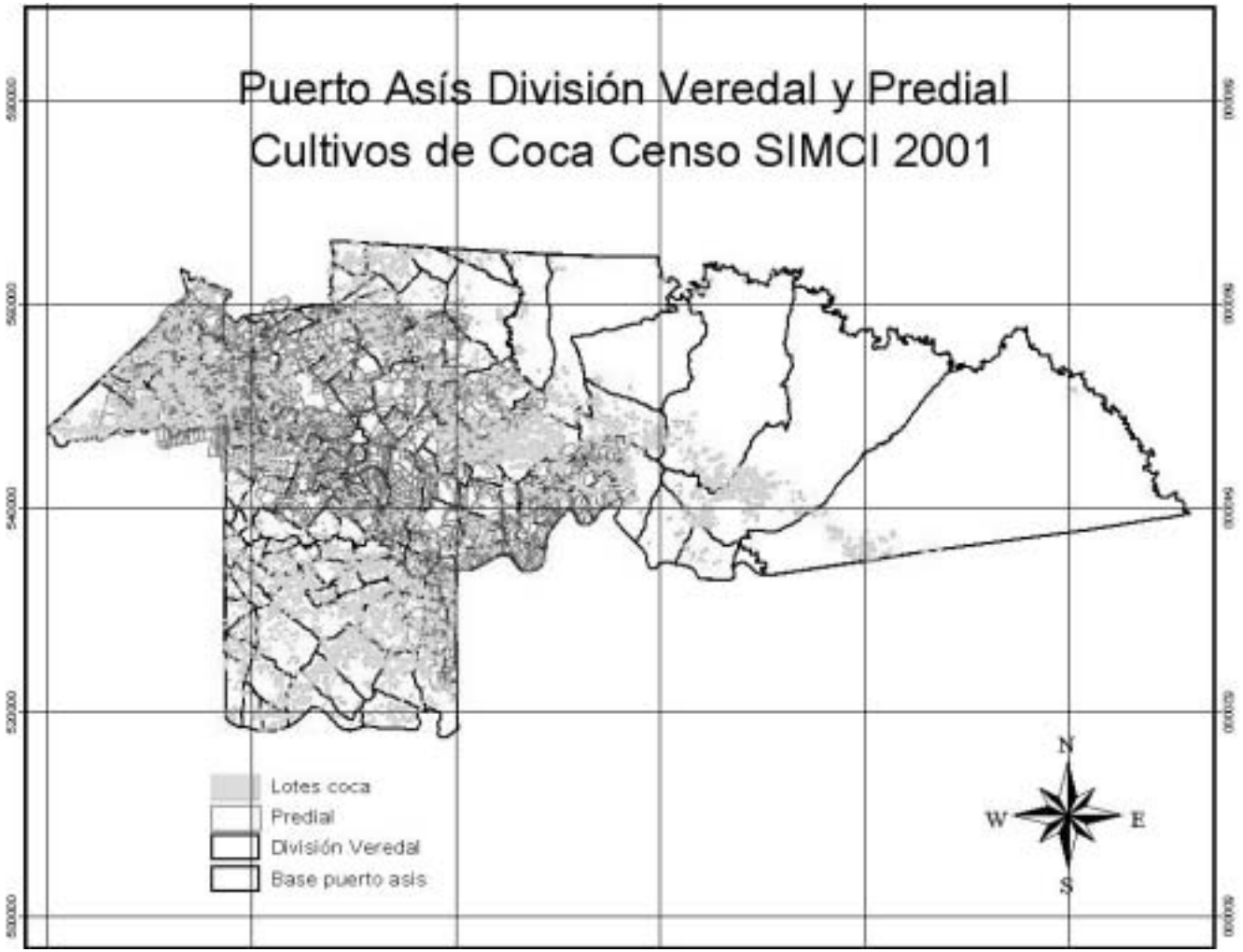
Map 2


AGROAMAZONÍA
Localización Aproximada de la
Planta Procesadora de Palmito
Posible localización
de la planta de
AGROAMAZONÍA
N
W
E
S
3
0
3
6 Kilometers

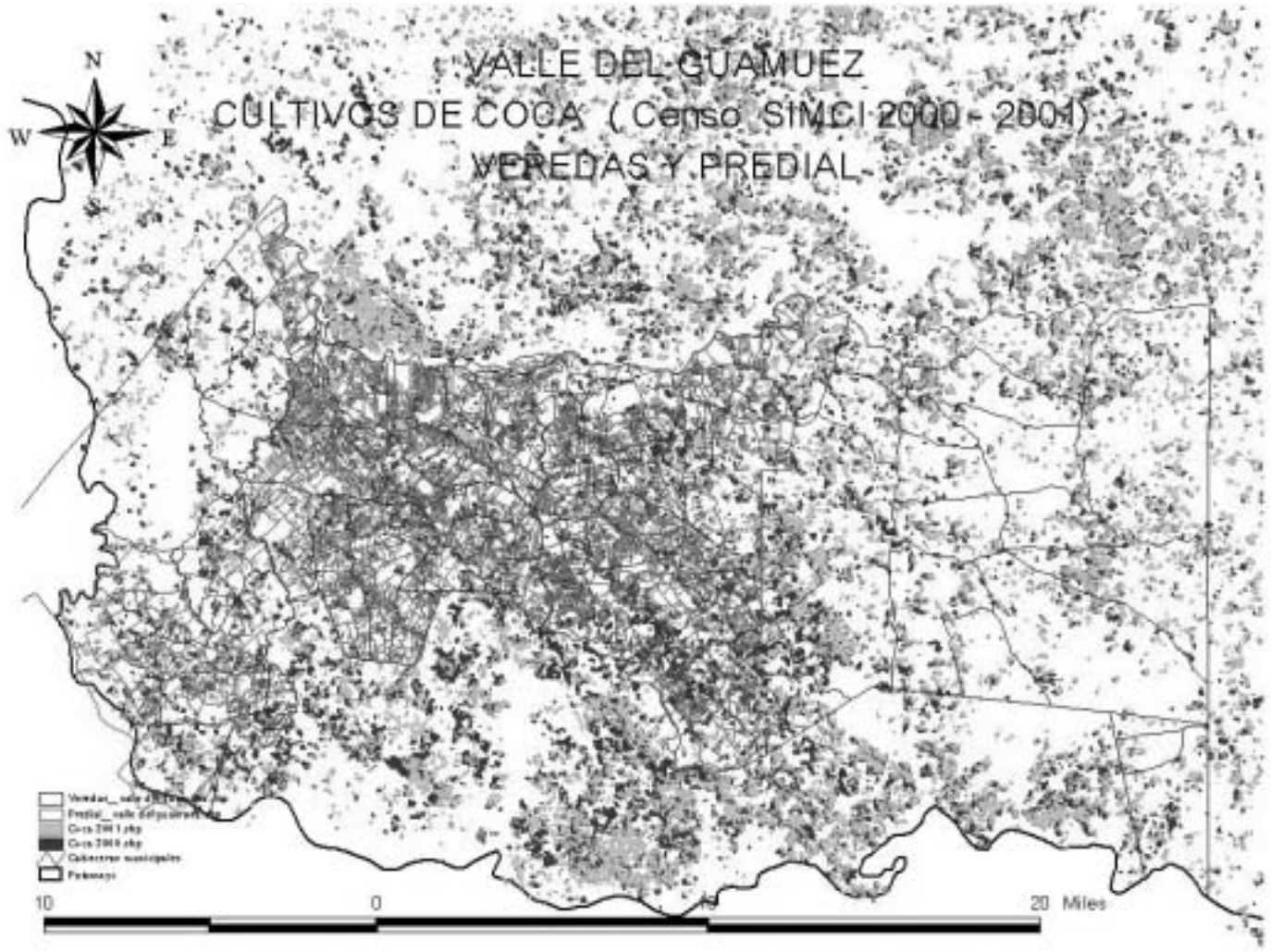
Map 3


Orito
Veredas y Cultivos de Coca (Censo SIMCI 2000 y 2001)
N
W
E
S
Coca 2000
Coca 2001.shp
VIA SIN PAVIMENTAR
Cabeceras municipales
Veredas
Orito

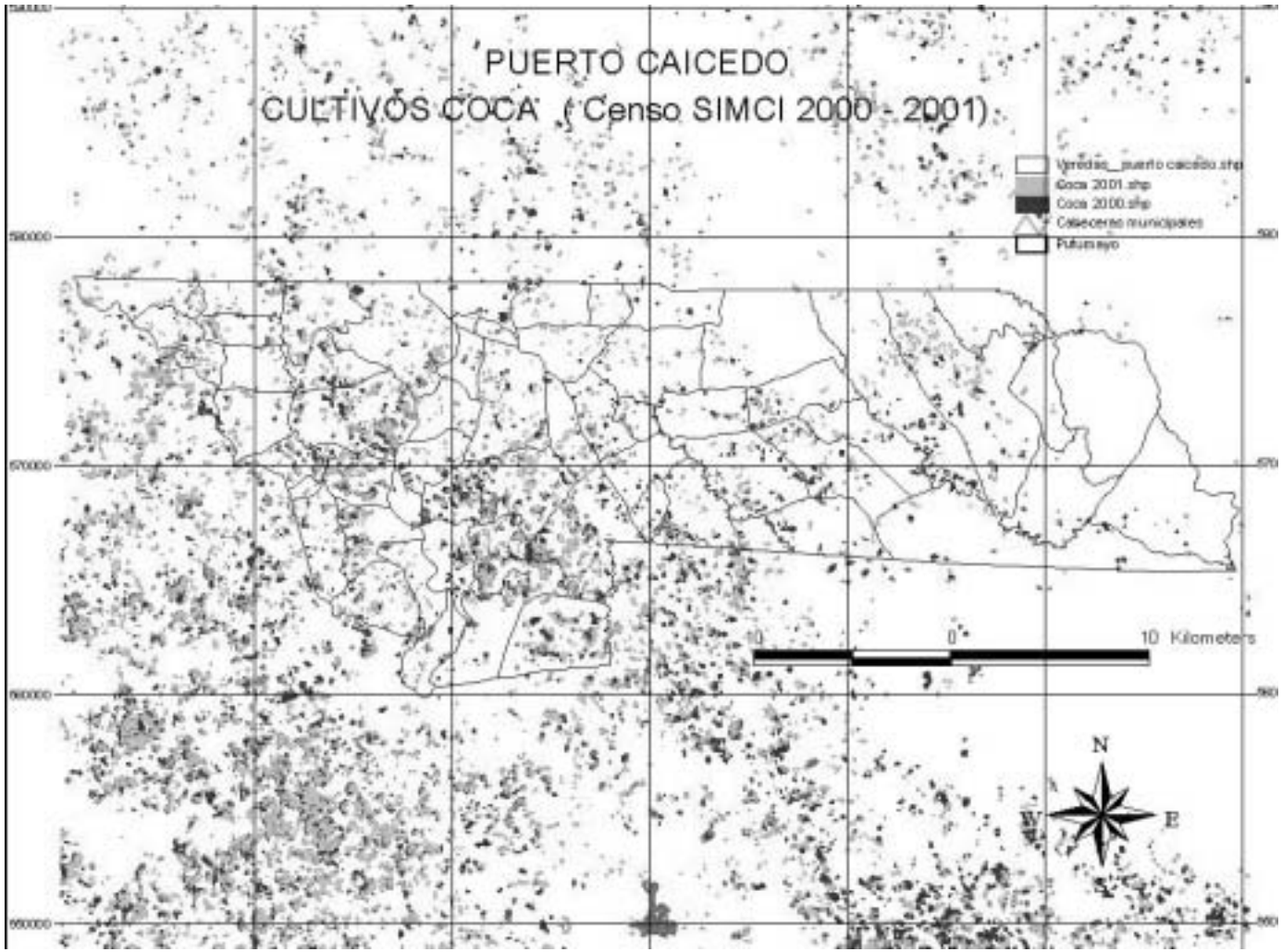
Map 4


Puerto Asís División Veredal y Predial
Cultivos de Coca Censo SIMCI 2001
Lotes coca
Predial
División Veredal
Base puerto asis
N
W
E
S

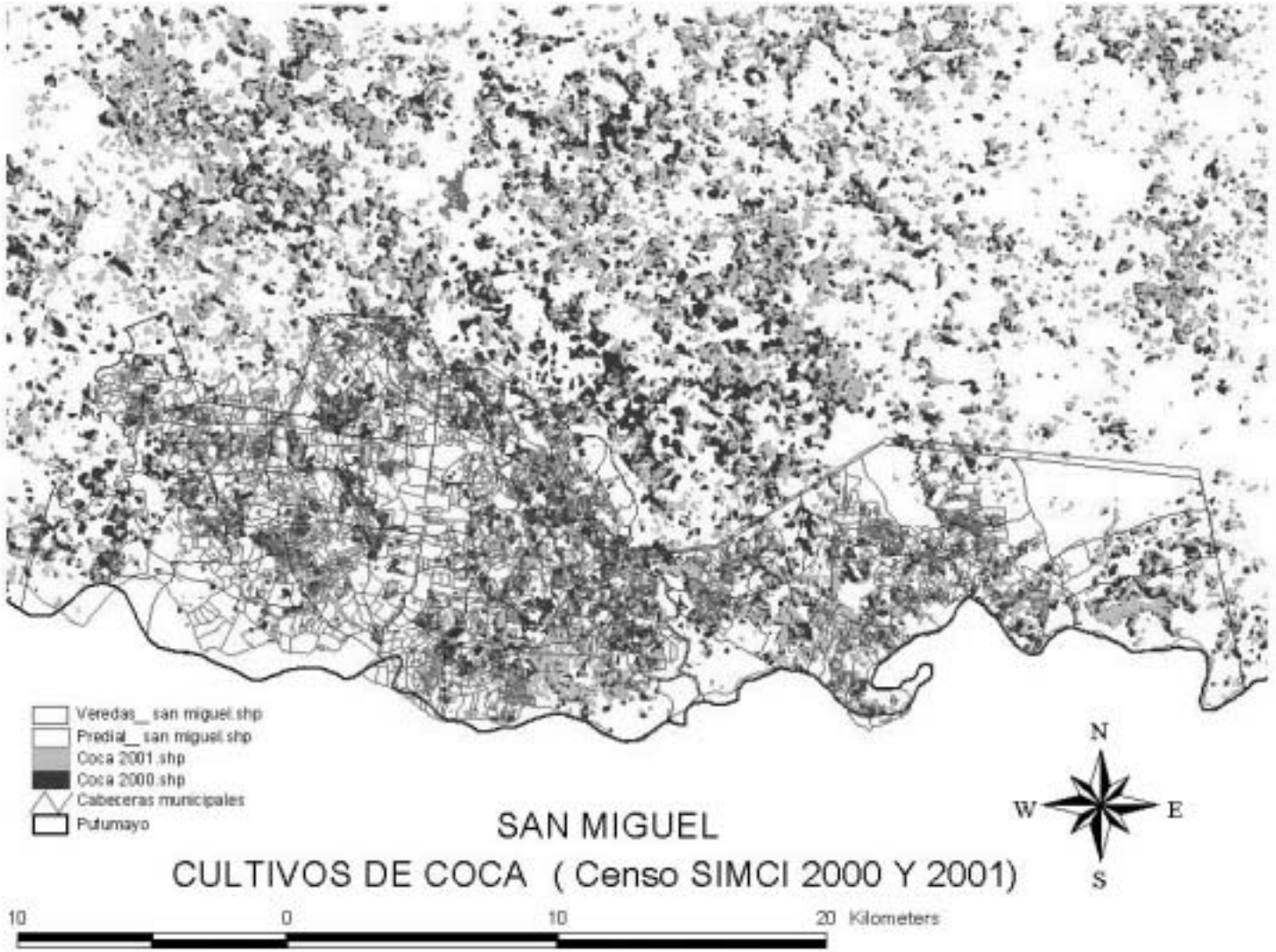
Map 5


VALLE DEL GUAMUEZ
CULTIVOS DE COCA (Censo SIMCI 2000 - 2001)
VEREDAS Y PREDIAL
N
W
E
10
0
20 Miles

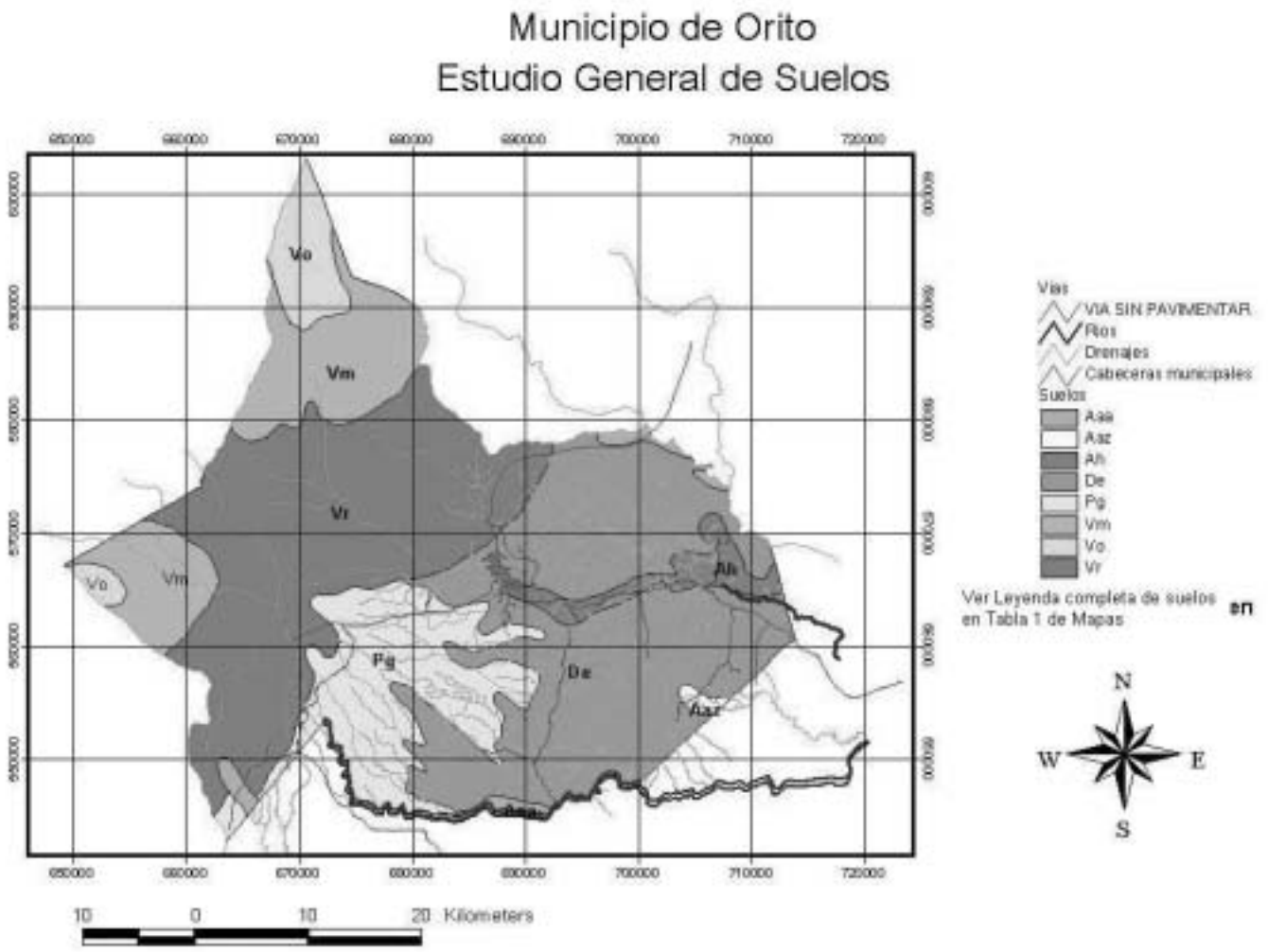
Map 6


PUERTO CAICEDO
CULTIVOS COCA (Censo SIMCI 2000 - 2001)
Veredas_puerto caicedo.shp
Coca 2001.shp
Coca 2000.shp
Cabeceras municipales
Putumayo
0
0
10 Kilometers
N
W
E

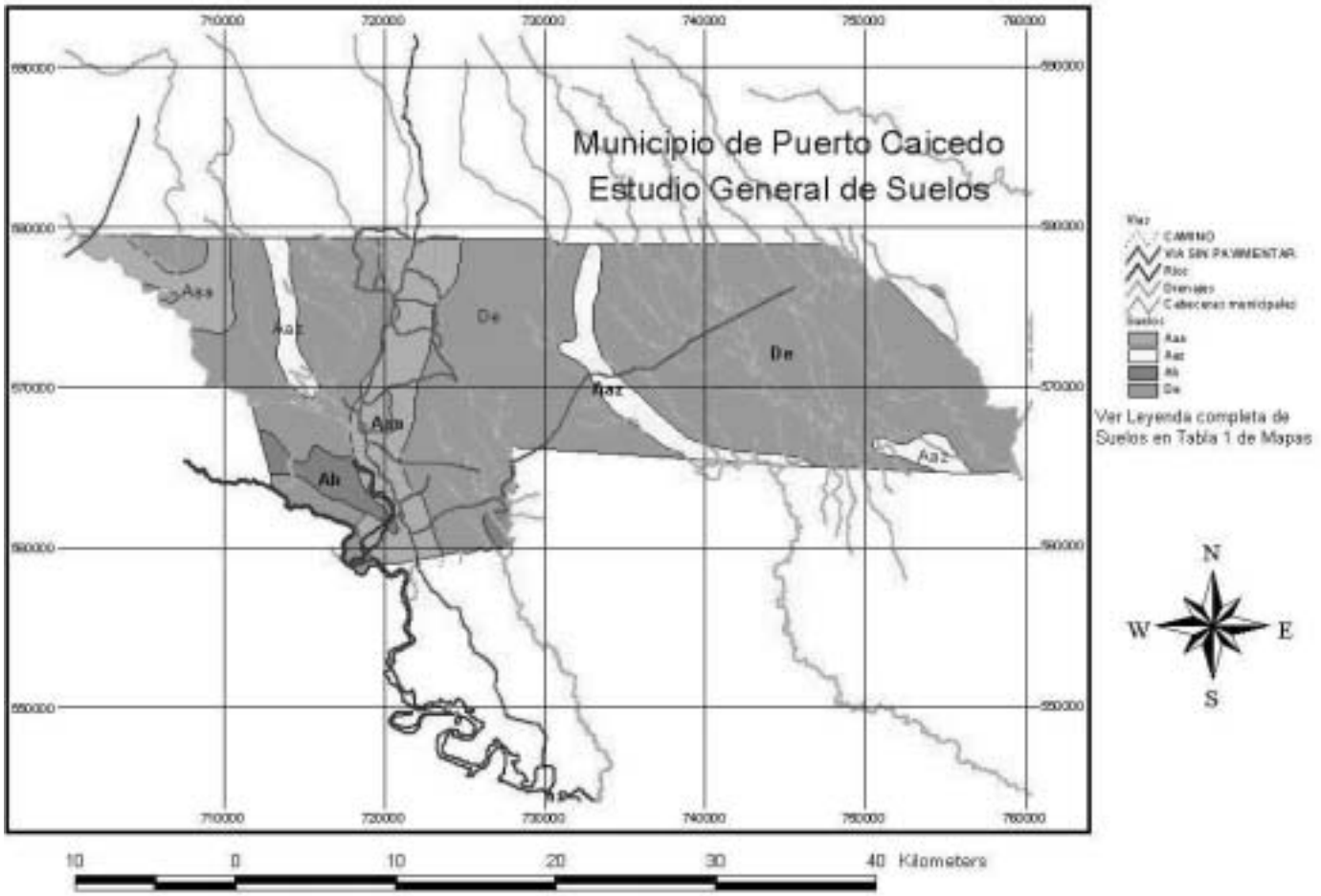
Map 7


Veredas_ san miguel.shp
Predial_ san miguel.shp
Coca 2001.shp
Coca 2000.shp
Cabeceras municipales
Putumayo
N
W
E
S
SAN MIGUEL
CULTIVOS DE COCA (Censo SIMCI 2000 Y 2001)
10
0
10
20 Kilometers

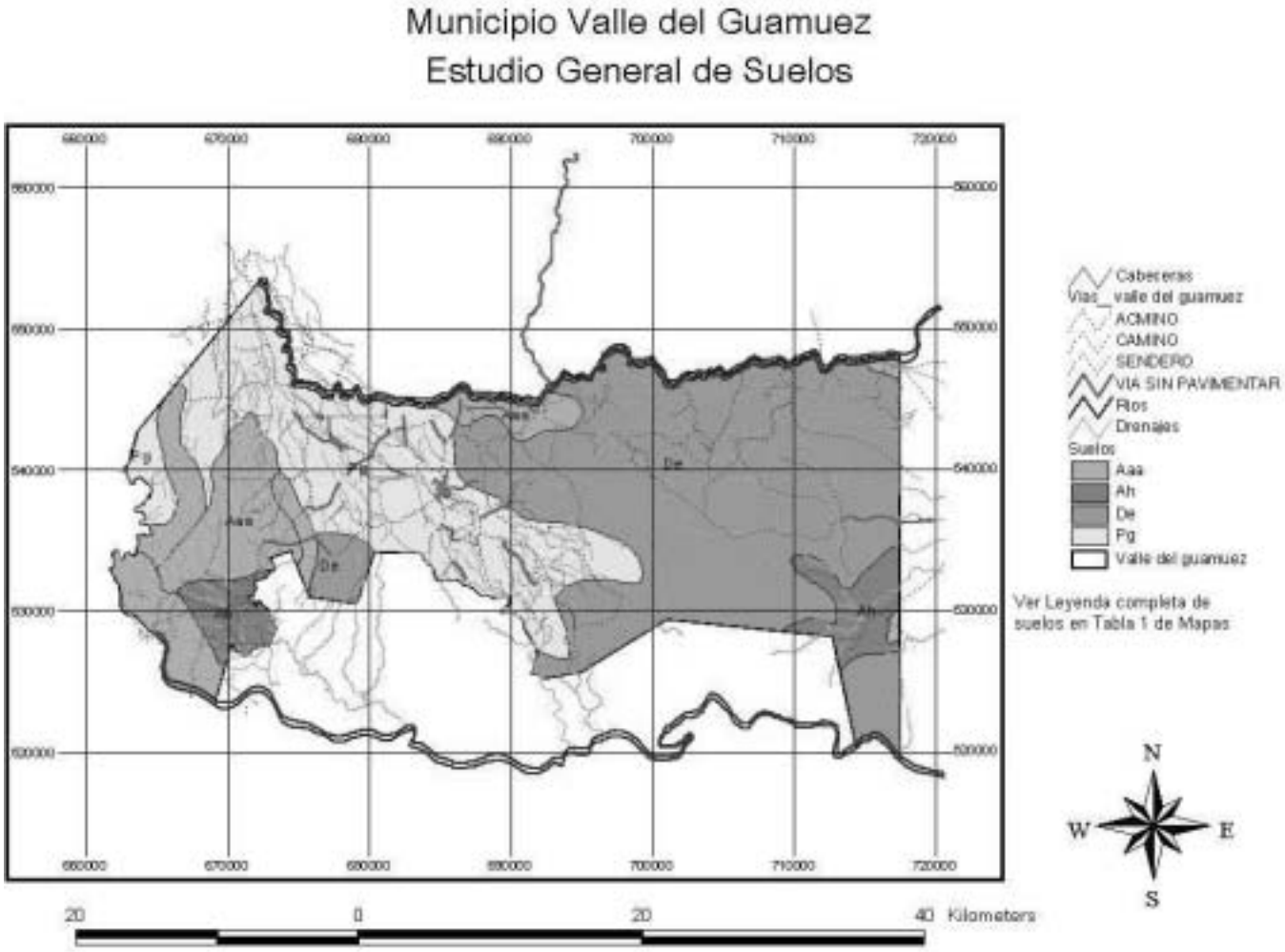
Map 8


Municipio de Orito
Estudio General de Suelos
650000
660000
670000
680000
690000
700000
710000
720000
600000
590000
580000
570000
560000
550000
Vo
Vm
Vr
Pg
De
Aaz
Ah
10
0
10
20 Kilometers
Vias
VIA SIN PAVIMENTAR
Rios
Drenajes
Cabeceras municipales
Suelos
Aaa
Aaz
Ah
De
Pg
Vm
Vo
Vr
Ver Leyenda completa de suelos en Tabla 1 de Mapas
N
W
E
S

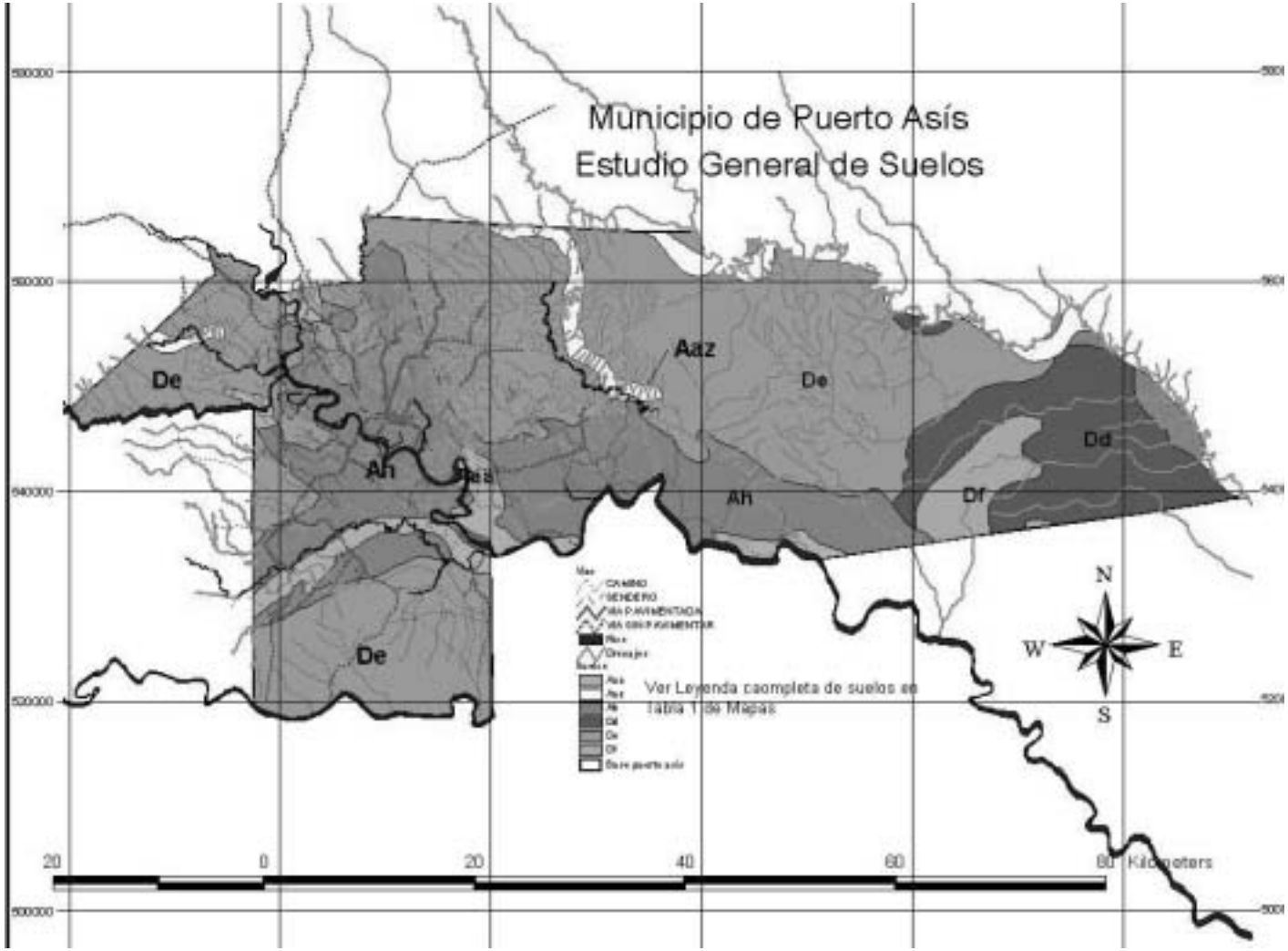
Map 9


Municipio de Puerto Caicedo
Estudio General de Suelos
Aaa
AaE
De
Aam
Ah
Aaz
Ver Leyenda completa de Suelos en Tabla 1 de Mapas
N
W
E
S
10 0 10 20 30 40 Kilometers

Map 10


Municipio Valle del Guamuez
Estudio General de Suelos
Cabeceras
Vias_valle del guamuez
ACMINO
CAMINO
SENDERO
VIA SIN PAVIMENTAR
Rios
Drenajes
Suelos
Aaa
Ah
De
Pg
Valle del guamuez
Ver Leyenda completa de suelos en Tabla 1 de Mapas
N
W
E
S
20
0
20
40 Kilometers

Map 11


Municipio de Puerto Asís
Estudio General de Suelos
De
Aaz
De
Dd
Df
Ah
Ah
De
N
W
E
S
Ver Leyenda caompleta de suelos en
Tabla 1 de Mapas
20
0
20
40
60
80 Kilometers

Map 12

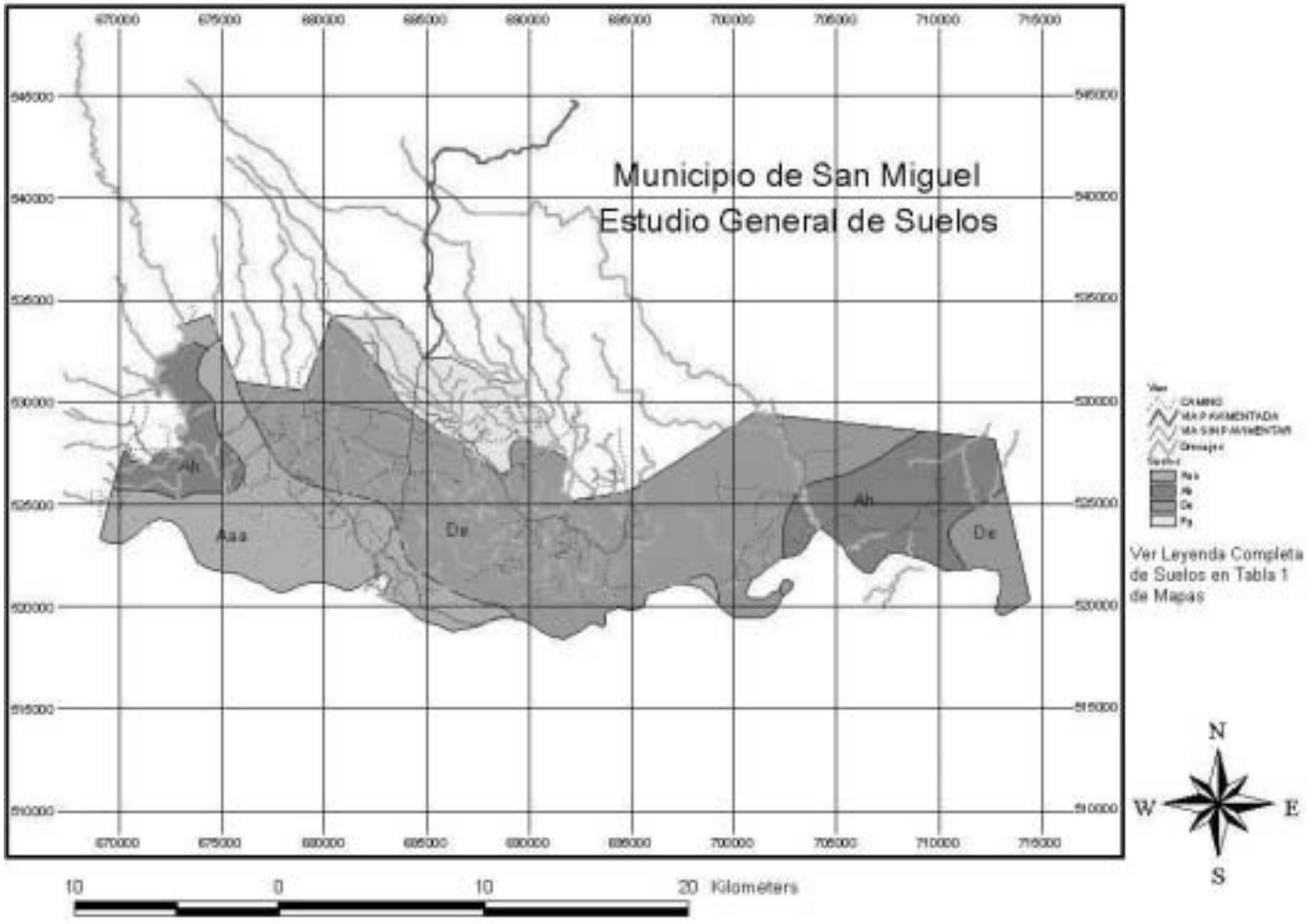
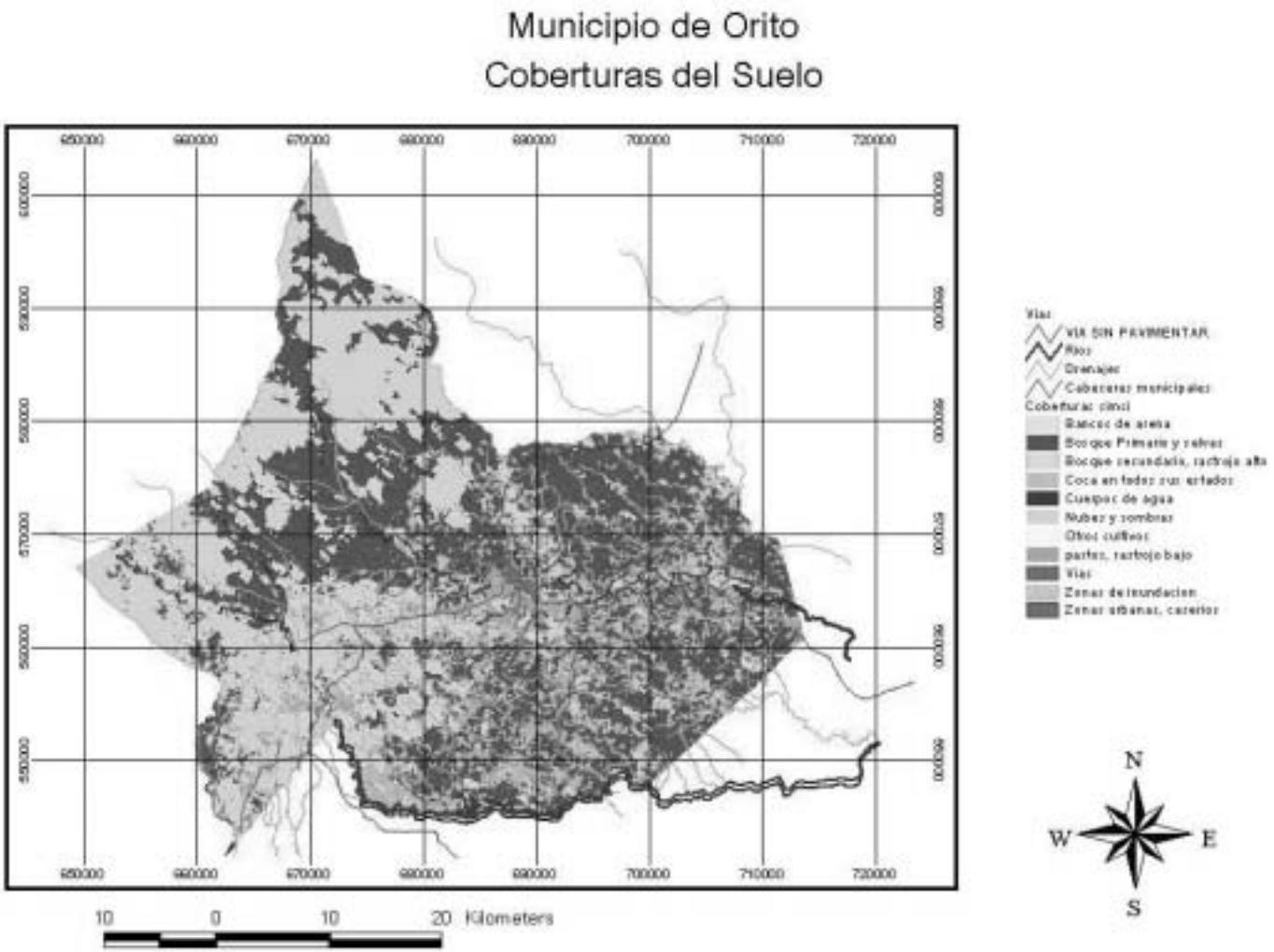

Municipio de San Miguel
Estudio General de Suelos
Ah
Aaa
De
Ah
De
Ver Leyenda Completa de Suelos en Tabla 1 de Mapas
N
W
E
S
10
0
10
20 Kilometers

Tabla 1 de Mapas

Leyenda para los Suelos de los Municipios del Proyecto Agroamazonía											
		MUNICIPIOS									
		Orito		Valle del Guamuez		Puerto Asís		Puerto Caicedo		San Miguel	
SIGLA	DESCRIPCIÓN DEL SUELO	Hectáreas	%	Hectáreas	%	Hectáreas	%	Hectáreas	%	Hectáreas	%
Aaa	Suelos aluviales de origen andino	2.575,746	1,383	15.560,487	15,728	13.123,112	4,781	9.705,651	13,278	7.670,076	20,075
Aaz	Suelos de valles menores con influencia coluvio/aluvial	639,850	0,344	28.259,240	28,564	10.474,847	3,816	5.641,695	7,718		0,000
Ah	Suelos de formaciones aluviales o lacustres	5.718,727	3,071	6.111,410	6,177	70.074,164	25,530	1.427,143	1,952	6.701,735	17,541
De	Superficie denudada	63.085,826	33,874	49.001,339	49,530	144.438,290	52,623	56.319,701	77,051		0,000
Dd	Suelos de altillanura		0,000		0,000	28.791,053	10,489		0,000	20.669,330	54,099
Df	Superficie denudada fuertemente quebrada		0,000		0,000	7.576,532	2,760		0,000		0,000
Pg	Suelos de planicie aluvial del píe de monte (abanicos)	25.780,749	13,843		0,000		0,000		0,000	3.165,232	8,285
Vm	Suelos de cordillera pendiente media	23.166,717	12,439		0,000		0,000		0,000		0,000
Vo	Suelos de cordillera pendiente fuerte	7.529,433	4,043		0,000		0,000		0,000		0,000
Vr	Suelos de cordillera pendiente muy fuerte	57.738,785	31,003		0,000		0,000		0,000		0,000
Total (Puede haber diferencias con relación a la superficie estimada del Municipio por variaciones de escalas)		186.235,833	100,000	98.932,476	100,000	274.477,998	100,000	73.094,190	100,000	38.206,373	100,000
Fuente: DNE, Sistema de Información Georeferenciada para el Putumayo, 2001. Cálculos de los autores.											

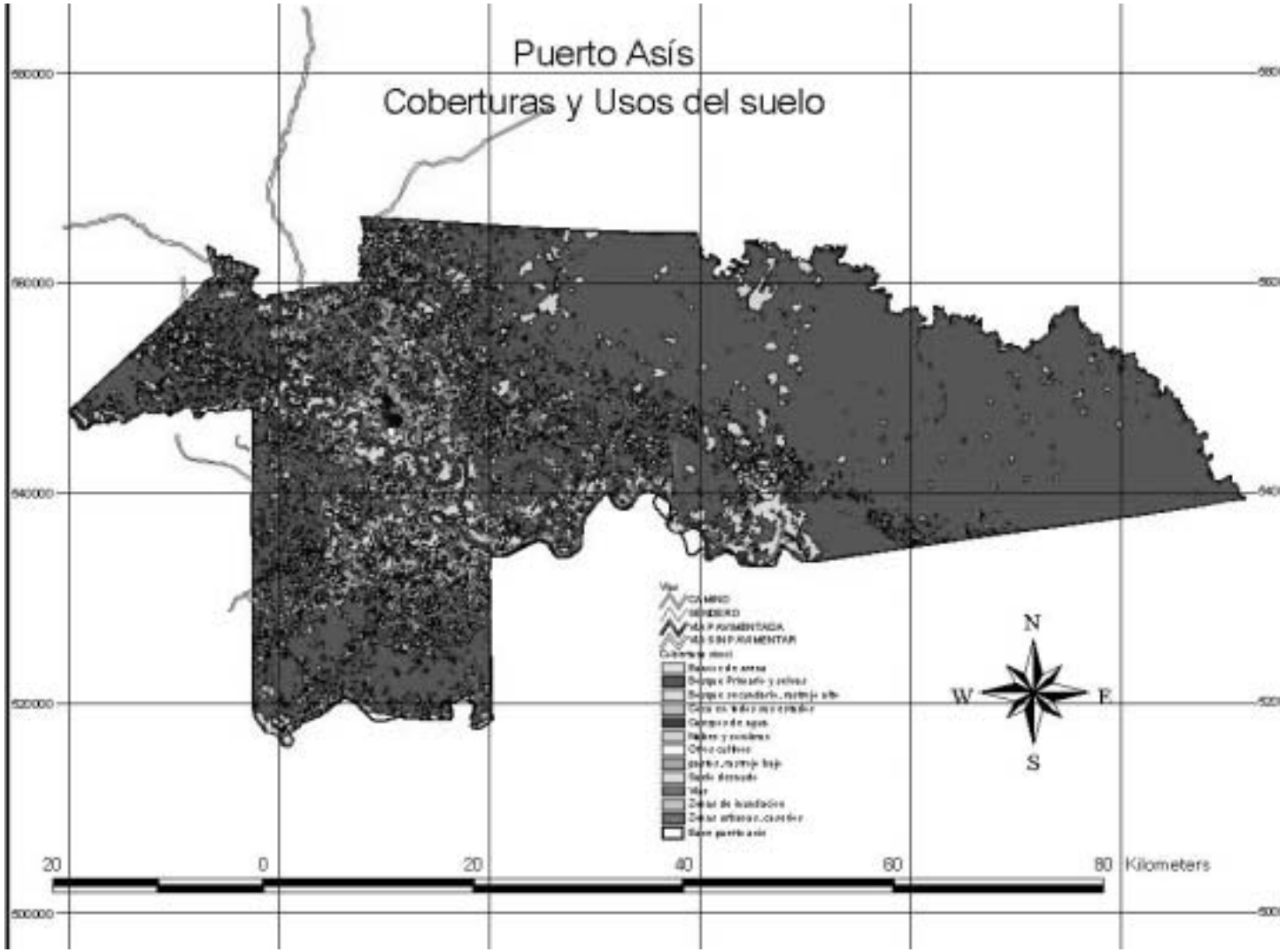
Map 13


Municipio de Orito
Coberturas del Suelo
650000
660000
670000
680000
690000
700000
710000
720000
600000
590000
580000
570000
560000
550000
10
0
10
20 Kilometers
Vias
VIA SIN PAVIMENTAR
Rios
Drenajes
Cabeceras municipales
Coberturas cinci
Bancos de arena
Bosque Primario y selvas
Bosque secundario, rastrojo alto
Coca en todas sus estados
Cuerpos de agua
Nubes y sombras
Otros cultivos
pastos, rastrojo bajo
Vias
Zonas de inundacion
Zonas urbanas, caserios
N
W
E
S

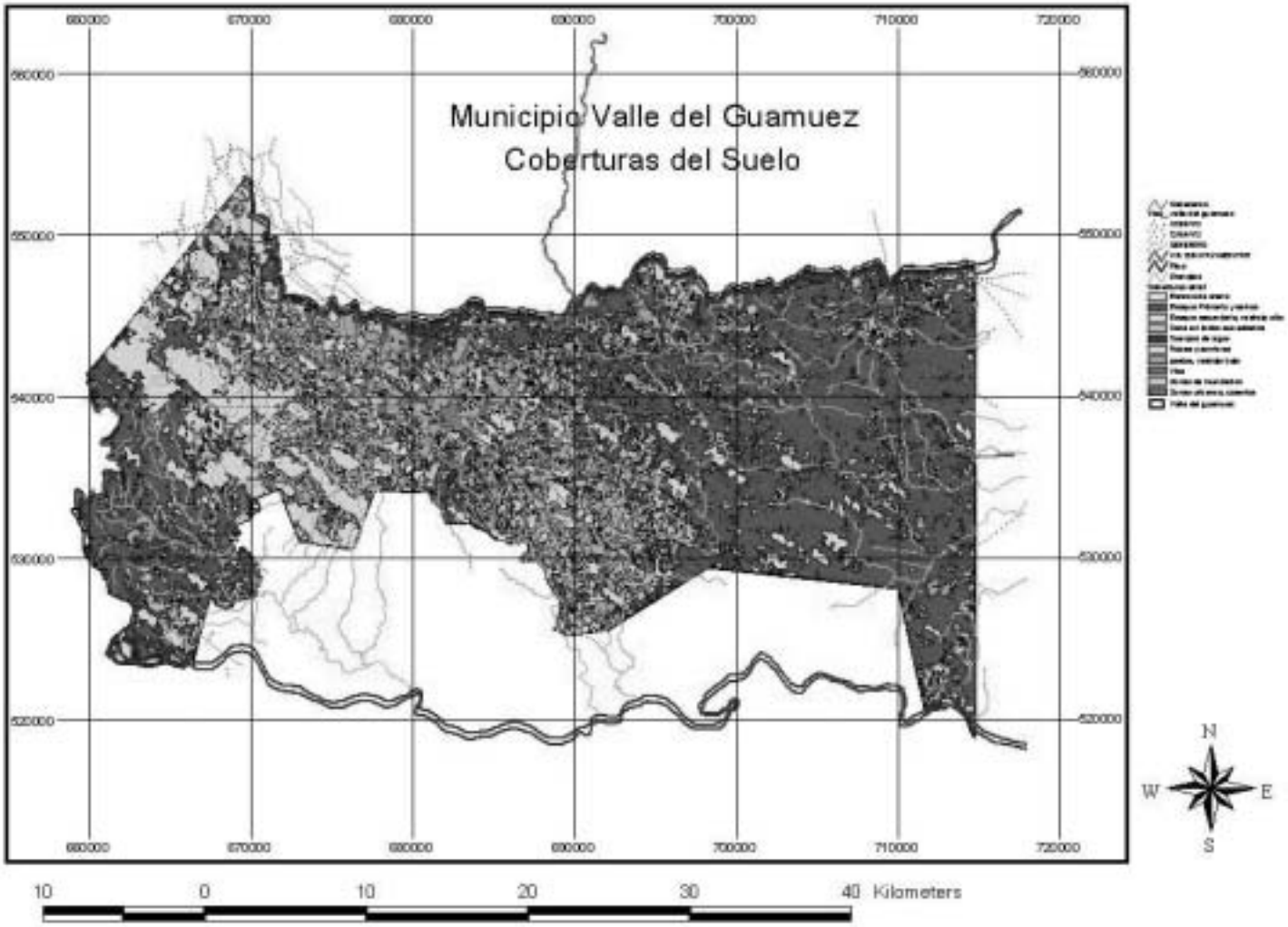
Map 14


Municipio de Puerto Caicedo
Coberturas del Suelo
710000
720000
730000
740000
750000
760000
N
W
E
S
10
0
10
20
30
40 Kilometers

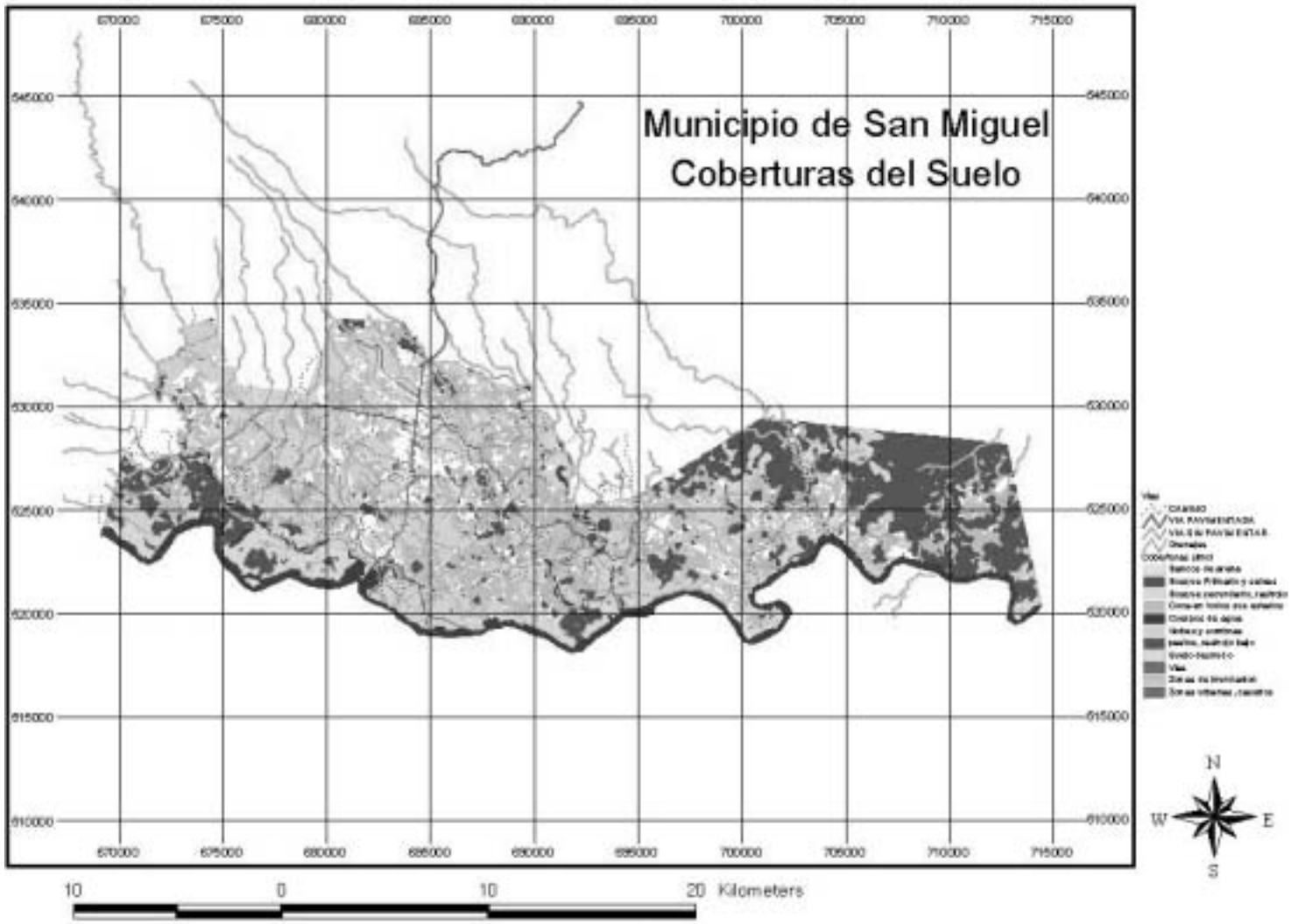
Map 15


Puerto Asís
Coberturas y Usos del suelo
N
W
E
S
20
0
20
40
60
80
Kilometers

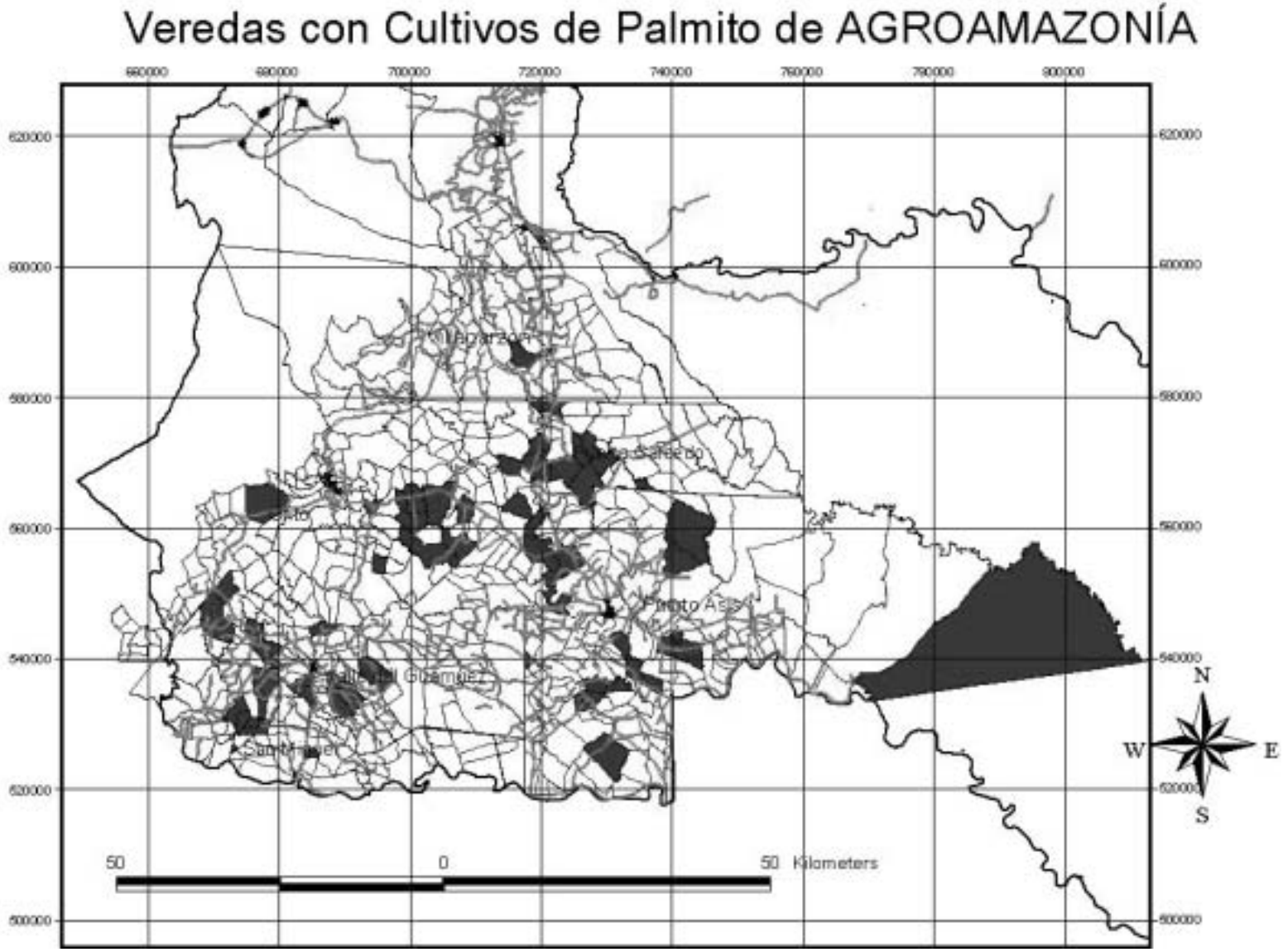
Map 16


Municipio Valle del Guamuez
Coberturas del Suelo
N
W
E
S
10 0 10 20 30 40 Kilometers

Map 17


Municipio de San Miguel
Coberturas del Suelo
670000
675000
680000
685000
690000
695000
700000
705000
710000
715000
545000
540000
535000
530000
525000
520000
515000
510000
N
W
E
S
10
0
10
20 Kilometers

Map 18


Veredas con Cultivos de Palmito de AGROAMAZONÍA
660000
680000
700000
720000
740000
760000
780000
800000
620000
600000
580000
560000
540000
520000
500000
Puerto Asís
50
0
50 Kilometers
N
W
E
S

ANNEX – DESIGNS

8.3.1 PISCINA DE CONTENCIÓN PARA EL CONTROL DE DERRAME DE COMBUSTIBLE

8.3.2 TRATAMIENTO NATURAL DE AGUAS RESIDUALES CON PLANTAS

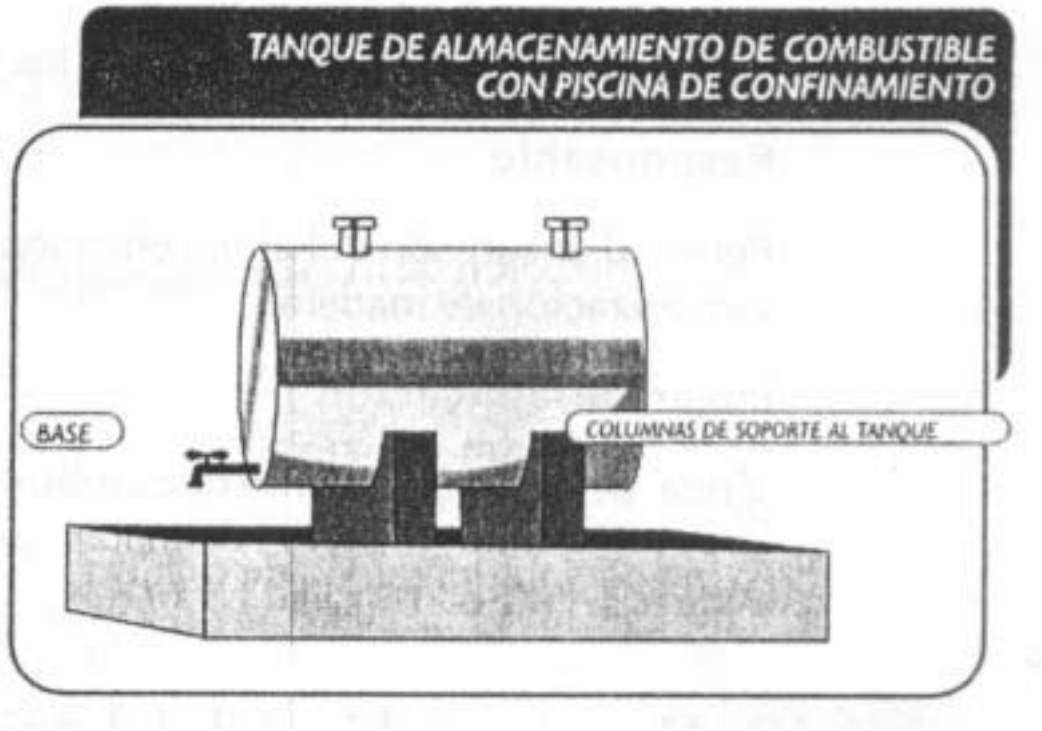
8.3.3 CANAL DE DESBASTE Y CONTROL DE TEMPERATURA

8.3.1 PISCINA DE CONTENCIÓN - CONTROL DE DERRAME DE COMBUSTIBLE

Referencias de los Impactos : G3, G9.

Recomendaciones :

La capacidad total del tanque de retención deberá ser un 10% más que la capacidad total del tanque de combustible.
Altura mínima del muro de contención será de 0.60 m.
Los bordes del tanque de retención deben estar por lo menos a 3.20 m. de cualquier lindero.
La separación mínima entre las paredes debe ser como mínimo 1.50 m.
Debe contar con un sistema de drenaje controlado, una estructura para la separación de aguas aceitosas, un sumidero para recolectar y evacuar las aguas lluvias acumuladas y el combustible derramado.



En el cuadros siguientes se valoriza la construcción de un tanque de retención con las caracteristicas aproximadas a las que deberá tener el que se construya en la Planta de Agroamazonía. Las dimensiones que se estima, tendrá dicho tanque de retención son: 6 metros de largo por 5 de ancho y altura de 0,7 metros. Los muros deberántener un espesor de 0,25 metros y la placa de fondo 0,35 metros.

CANTIDADES DE OBRAS CIVILES
TANQUE DE RETENCION DE COMBUSTIBLE
PLANTA INDUSTRIAL DE PALMITO

ITEM	DESCRIPCION	UNID	CANTIDAD	VALOR UNITARIO	VALOR TOTAL
	TANQUE DE RETENCION				
1	Replanteo	m^2	42,00	$ 2.500	$ 105.000
2	Descapote	m^2	42,00	$ 5.000	$ 210.000
3	Excavaciones	m^3	52,50	$ 19.000	$ 997.500
4	Relleno con material seleccionado	m^3	31,50	$ 22.500	$ 708.750
5	Solado de limpieza e= 0.05m	m^3	1,50	$ 265.000	$ 397.500
6	Concreto de Placa	m^3	14,25	$ 350.000	$ 4.986.975
7	Concreto Muros	m^3	4,03	$ 450.000	$ 1.811.250
8	Concreto Cañuelas	m^3	0,99	$ 310.000	$ 306.900
9	Acero de refuerzo de 60.000 PSI	Kg	2076	$ 1.300	$ 2.699.255
10	Junta en cinta PVC 22	ml	69,00	$ 30.000	$ 2.070.000
11	Instalación Pasamuros	un	4,00	$ 150.000	$ 600.000
12	Prueba de Estanquidad	gl	1,00	$ 100.000	$ 100.000
	SUBTOTAL TANQUE DE RETENCION				**$ 14.993.130**

PLANTA INDUSTRIAL - PROYECTO PALMITO

TANQUE DE RETENCION DE COMBUSTIBLES

EQUIPOS

ÍTEM	DESCRIPCIÓN	UN	CAN
1	TUBO SCH 40 DIAM 3"	MT	6
2	BRIDA ACERO DIAM 3"	UN	4
3	CODO ACERO DIAM 3"	UN	6
4	TEE ACERO DIAM 3"	UN	2
5	VALVULA MARIPOSA DIAM 3"	UN	2

SUMINISTRO DE EQUIPOS : $ 717,000

MONTAJE : $ 600,000

RESUMEN DE PRECIOS
TANQUE DE RETENCION DE COMBUSTIBLES
PLANTA INDUSTRIAL - PROYECTO PALMITO

ÍTEM	DESCRIPCIÓN		VALOR
1	OBRAS CIVILES		14,993,130
2	SUMINISTRO DE EQUIPOS		717,000
3	MONTAJES		600,000
	VALOR COSTOS DIRECTOS	**$**	**16,310,130**
	A.I.U. (Administración, Imprevistos, Utilidades) 20%	**$**	**3,262,026**
	TOTAL ANTES DE IMPUESTOS	**$**	**19,572,156**

NOTAS **1)** En los precios de obra civil no se tuvieron en cuenta ninguna cimentación especial como pilotes y/ó excavaciónes mayores de 0.50 metros. Si hay necesidad de hacer algún tipo de cimentación especial esta se cotizará como adicional. No incluye estudio de suelos

2) Se deberá agregar el valor del IVA vigente en el momento de la facturación que corresponde al 16% de las utilidades (5%).

8.3.2 TRATAMIENTO NATURAL DE AGUAS RESIDUALES CON PLANTAS

En lo que se refiere al sistema de tratamiento de aguas residuales domesticas se encuentra construido un sistema que consiste de un pozo séptico y luego un tratamiento natural con plantas *macrófitas* (juncos). Este tipo de sistema de tratamiento se ilustra en la Figura 6.2.2.1

FIGURA 6.2.2.1.

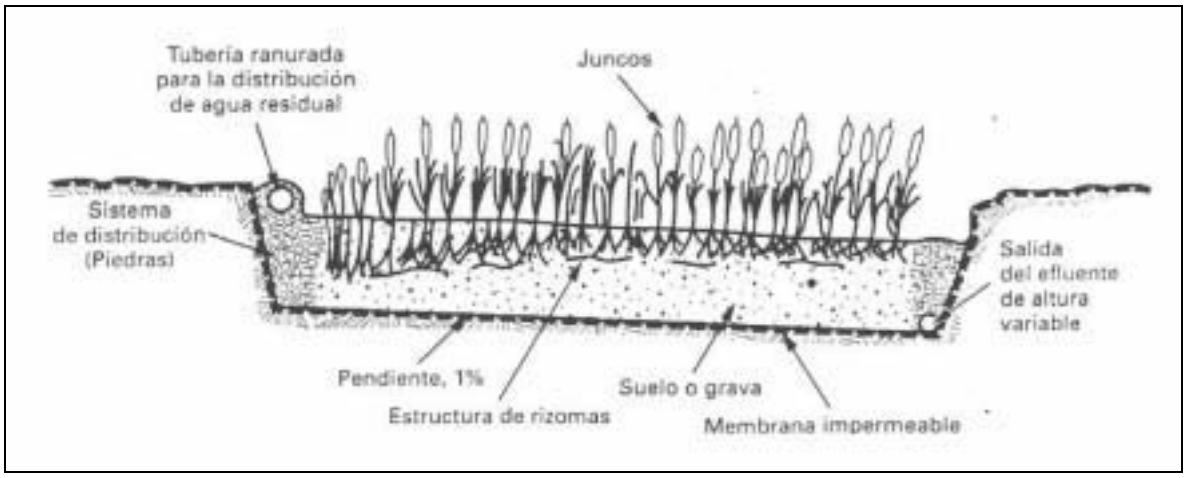


Diagrama tipo de un sistema de tratamiento con plantas acuáticas.

En teoría los lechos de grava y arena con plantas acuáticas consisten de excavaciones en donde se alternan capas de grava y arena y en donde crecen plantas como juncos de agua, lirios, tifas, etc. Las aguas residuales posan por el lecho y las raíces de las plantas ejercen una acción bioquímica que trata o purifica el desecho. No se dispuso de los estudios para el diseño de la planta de tratamiento ni de los diseños, por lo tanto no se tiene una idea de la capacidad de la misma.

Se recomienda que el vertimiento que ingresa a un lecho de este sistema tipo de tratamiento sea pre-tratado, por lo menos en un tanque séptico para remover sólidos, que puedan obstruir el lecho, en el caso de esta planta existe un pozo séptico que cumple con ésta función.

Con estos sistemas, si están bien calculados y construidos además de bien mantenidos (incorporar plan de manejo), se logran remociones teóricas de DBO5 entre 80 y 90% por lo que hace suponer que el vertimiento final de agua tratada cumple con la norma establecida en el Decreto 1594 de 1984 del Ministerio de Salud.

Una vez las plantas han alcanzado su máximo crecimiento, estás deben ser removidas para dar paso a plantas jóvenes.

De acuerdo con los resultados de los análisis del muestreo realizado a la planta de tratamiento se recomienda hacer una evaluación de todo el sistema, a partir de la

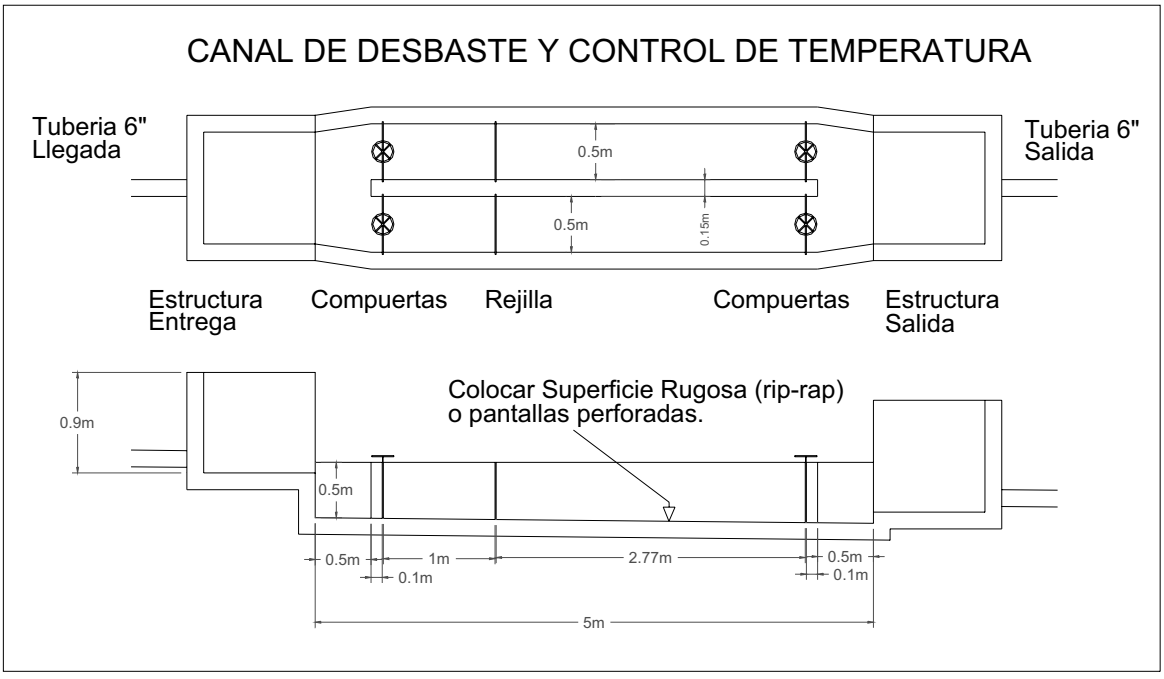
reconstrucción de los planos básicos y la revisión del funcionamiento de los diferentes componentes, para establecer la causa de los resultados arrojados por el muestreo realizado recientemente, que se anexan.

8.3.3 CANAL DE DESBASTE Y CONTROL DE TEMPERATURA

Referencias de los Impactos : F3, F11, F13, F22.

Recomendaciones :

La opción propuesta a continuación para la estructura de control de temperatura es conceptual.
La estructura definitiva se diseñará en el momento que se disponga de los resultados de los análisis físico químicos completos del agua residual industrial y el detalle de los niveles y dimensiones.
La estructura propuesta esta conceptualizada como un sistema primario que puede servir como un tratamiento previo si se requiere un sistema secundario. Esta estructura tiene la función de desbaste (retención de sólidos gruesos) y en este caso en particular la disminución de la temperatura.
La estructura esta compuesta de dos canales de 0.50 m. de ancho cada uno, donde se tienen compuertas de sectorización al inicio y al final, y rejillas colocadas en guias.
Las rejillas van a atrapar la pelusa del raspado de los corazones de Heart of Palm e impurezas de agua de cocción y enfriamiento. Por esta razón se puede colocar una malla de 80 mesh (el dimensionamiento lo dara el análisis de sólidos).
Entre la rejilla y la compuerta final de cada canal hay que colocar elementos que retengan el flujo y con esto contribuir a la reducción de la temperatura. Estos elementos pueden ser piedras embebidas en el concreto (rip-rap) o pantallas con perforaciones.
Es importante que no se produzcan condiciones anaerobias por estancamiento del agua residual en la estructura.



En el cuadros siguientes se valoriza la construcción de una estructura de desbaste con las características aproximadas a las que deberá tener la que se construya en la Planta de Agroamazonía. Las dimensiones que se estima, tendrá dicha estructura son: 5 metros de largo, dos canales de 0.50 m. de ancho separados por un tabique. La altura de los muros y el tabique es de 0.50 m. con un espesor de 0,15 metros. La placa de fondo es de 0,20 m.

CANTIDADES DE OBRAS CIVILES
CANAL DE DESBASTE Y CONTROL DE TEMPERATURA
PLANTA - PALMITO

ITEM	DESCRIPCIÓN	UNID	CANTIDAD	VALOR UNITARIO	VALOR TOTAL
1.00	**CANAL DE DESBASTE**				
1.01	Replanteo	m^2	7.25	2,500	18,125
1.02	Descapote	m^2	14.70	5,000	73,500
1.03	Excavaciones	m^3	4.83	19,000	91,770
1.04	Relleno con material seleccionado	m^3	1.21	22,500	27,113
1.05	Solado de limpieza e= 0.05m	m^3	0.74	265,000	194,775
1.06	Concreto de Placa	m^3	1.86	350,000	649,250
1.07	Concreto Muros	m^3	1.31	450,000	590,625
1.08	Concreto Cañuelas	m^3	0.58	310,000	179,955
1.09	Acero de refuerzo de 60.000 PSI	Kg	374.80	1,300	487,240
1.10	Junta en cinta PVC 22	ml	13.50	30,000	405,000
1.11	Instalación Pasamuros	un	2.00	150,000	300,000
	SUBTOTAL				**3,017,352.50**

CANTIDADES DE OBRAS CIVILES
CANAL DE DESBASTE Y CONTROL DE TEMPERATURA
PLANTA - PALMITO
EQUIPOS

ÍTEM	DESCRIPCIÓN	UN	CAN
1	REJILLAS DE RETENCION DE SOLIDOS GRUESOS	GL	2
2	COMPUERTAS DE 0.50 x 0.50 CON VOLANTE	UN	6

SUMINISTRO DE EQUIPOS : $ 1,400,000

MONTAJE : $ 320,000

RESUMEN DE PRECIOS
CANAL DE DESBASTE Y CONTROL DE TEMPERATURA
PLANTA - PALMITO

ÍTEM	DESCRIPCIÓN	VALOR
1	OBRAS CIVILES (incluye lechos de secado de lodos)	3,017,353
2	SUMINISTRO DE EQUIPOS	1,400,000
3	MONTAJES	320,000
	VALOR COSTOS DIRECTOS	**$ 4,737,353**
	A.I.U. (Administración, Imprevistos, Utilidades) 20%	**$ 947,471**
	TOTAL ANTES DE IMPUESTOS	**$ 5,684,823**

NOTAS **1)** En los precios de obra civil no se tuvieron en cuenta ninguna cimentación especial como pilotes y/ó excavaciónes mayores de 0.50 metros. Si hay necesidad de hacer algún tipo de cimentación especial esta se cotizará como adicional. No incluye estudio de suelos

2) Se deberá agregar el valor del IVA vigente en el momento de la facturación que corresponde al 16% de las utilidades (5%).

ANNEX – DOCUMENTS

8.4.1 Lista del personal involucrado a Agroamazonía S.A.

8.4.2. Informe de Monitoreo aguas residuales industriales

8.4.3. Carta Ministerio del Interior en respuesta a la solicitud de información sobre la presencia de comunidades negras en el área del proyecto de Agroamazonía.

8.4.4. Carta Corpoamazonía en respuesta a la solicitud de información sobre la localización de área especiales y/o ecosistemas frágiles en el área del proyecto de Agroamazonía.

8.4.5. Copia Resolución No 0457 del 2 de junio de 2000 de Corpoamazonía.

8.4.6. Copia Resolución No 0859 del 14 de octubre de 1999 de Corpoamazonía.

PERSONAL VINCULADO A AGROAMAZONIA S.A.
CONVENIO CAD 023-03-01

No	NOMBRES Y APELLIDOS	C.C. #	CARGO
	COMPONENTE ADMINISTRACION Y GERENCIA		
1	Jorge Yoria Rubio	17.046.331	Gerente
2	Aura Ines Mosquera Agreda	69.086.774	Asistente Administrativa
3	Aura Ligia Zambrano	69,027,074	Auxiliar Contable
4	Johanna Stella Tejada Rodriguez	69.016.268	Auxiliar Serv. Grales
5	Hoover Osorio Restrepo	18.109.938	Vigilante
6	Luis Edelio Collazos	1.510.624	Vigilante
7	Amanda Pachón Pérez	66.723.912	Contadora
8	Eugenia Alvarez	69.028.134	Auxiliar Administrativa
9	Julio Cesar Santa Delgado	18.109.525	Conductor
10	Javier Bernal	79.595.980	Almacenista
11	Rosmira Enilfa Narvaéz Caicedo	69.016.276	Revisor Fiscal
	COMPONENTE ASISTENCIA TECNICA		
12	Jaime orlando Molina Castillo	98.382.146	Coordinador Depto Agricola /
13	Educardo Chica Llano	18.385.967	Cordinador A. Técnica
14	Jorge Augusto Cardona	75.072.382	Coordinador Depto Asistencia Tecnica
15	Erik Jesus del Castillo	19,995,773	Profesional Agrícola
16	Wilmer Fabian Bastidas Cuaran	18.156.057	Auxiliar de Campo
17	Nixon Chapuez	18.162.916	Auxiliar de Campo
18	Anibal de Jesús Estrada Manrique	70.720.331	Viverista
19	Alberto Hurtado	18.460.997	Tecnico Agricola
20	Fredy Alberto Forero	93.389.328	Profesional Agrícola
21	Fredy Julian Quiroga	93.295.692	Tecnico Agricola
22	Hugo Mario Rojas	18.396.608	Tecnico Agricola
23	Carlos Andres Arciniegas	15.571.617	Auxiliar de Campo
24	Edgar Norberto Canamejoy	18.184.926	Viverista
	COMPONENTE INDUSTRIALIZACION		
25	Luis Alberto Castillo	80.271.649	Jefe Producción
26	Juan Carlos Cardona Zapata	14.575.849	Auxiliar Mantenimiento
27	Maria Nirme Ortiz Toro	41.104.996	Operario Producción
28	Osdeiry Solandy David Muñoz	69.029.811	Operario Producción
29	Albert Israel Gomez Tejada	18.189.677	Operario Producción
30	Sonia Yaqueline Valencia Ordoñez	41.104.838	Operario Producción
31	Victor Ricardo Ricardo	10.876.753	Operario Producción
32	Estella yela	27.355.467	Operario Producción
	COMPONENTE DESARROLLO SOCIAL		
33	Carmen Berdugo	46.670.310	Coordinador Componente Social
34	Floralba Ijaji	69,026,740	Promotora Social
35	Roddy Mary Bermeo	27.354.478	Promotora Social

Personal Agroamazonia S.A.
Octubre 29/02

AGROAMAZONIA
Nit. 846 000 126 - 9

Puerto Asìs, 9 de Diciembre de 2002
AA/523-02

Ingeniero:
EDUARDO PAUWELS
Tres Elementos
Bogotà D.C:

Adjunto hago llegar a Usted, los resultados del monitoreo fisicoquímico de aguas residuales industriales de la planta procesadora de palmito. Estos estudios fueron realizados por la Firma Ecoanaisìs Ltda de la ciudad de Puerto Asìs .

Atentamente,

JORGE YORIA RUBIO
Gerente

EcoAnálisis Ltda

AGROINDUSTRIAS DE LA AMAZONIA S.A.

Fecha: 22-Oct-02

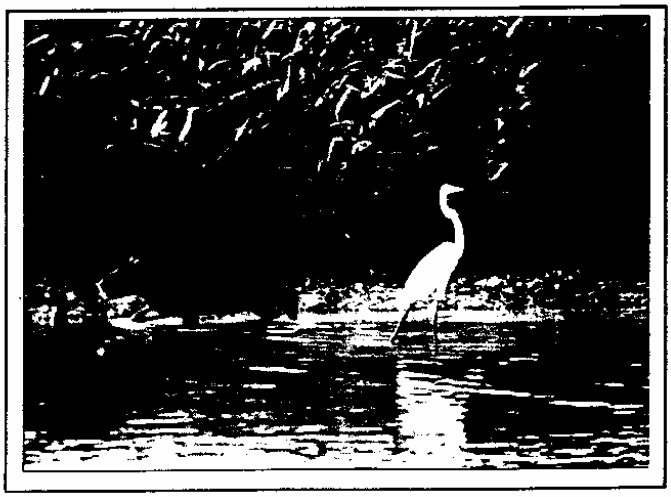
No Radicado: 331

Responsable

Firma enterado

MONITOREO FISICOQUÍMICO DE AGUAS RESIDUALES INDUSTRIALES DE LA PLANTA ENLATADORA DE PALMITO DE AGROINDUSTRIAS DE LA AMAZONIA S.A.

AGROINDUSTRIAS DE LA AMAZONIA S.A.



OCTUBRE DE 2.002

1.0 OBJETIVOS

- Determinar mediante análisis fisicoquímico, la calidad de las aguas residuales producidas en la Planta Procesadora y Enlatadora de Palmito del municipio de Puerto Asís.
- Determinar el estado actual del Humedal que recibe el vertimiento de aguas residuales tratadas.
- Efectuar la interpretación de resultados de los análisis fisicoquímicos realizados a las muestras de aguas, utilizando el Decreto 1594/84 y el Indice de Calidad del Agua (ICA) desarrollado por la NSF de los Estados Unidos.

2.0 ANTECEDENTES

Agroindustrias de la Amazonia S.A., es una empresa conformada por asociaciones de cultivadores de chontaduro para palmito, por los municipios de Puerto Asís, Puerto Caicedo, Orito, San Miguel y Valle del Guamués, con el apoyo del Programa PLANTE de la Presidencia de la República; con el objetivo de producir y comercializar palmito a partir de cultivos de palma de chontaduro plantados y manejados para ese fin.

La Planta Procesadora y Enlatadora de Palmito cuenta con un Plan de Manejo Ambiental (PMA) para su operación en el que se plantea un programa de monitoreo fisicoquímico de los vertimientos de aguas residuales y de seguimiento a las condiciones de los cuerpos de agua que reciben tales vertimientos. Agroindustrias de la Amazonia, S.A., en cumplimiento de dicho PMA, contrató el monitoreo y análisis fisicoquímico de aguas residuales y de los cuerpos de agua receptores.

En la Planta de Palmito se originan aguas residuales industriales producidas básicamente durante los procesos de lavado de los cogollos de palma, acidulación (adición de solución ácida a las latas de palmito) y pasteurizado; y aguas residuales domésticas de dos tipos, aguas grises producto del lavado de las instalaciones y aguas negras originadas en los servicios sanitarios.

El sistema de tratamiento de aguas residuales industriales está compuesto de:

- Tanque de homogeneización
- Cajilla colectora
- Piscina de aireación y enfriamiento
- Planta de Juncos

A la salida del proceso de producción los residuos líquidos industriales entran a un tanque en el que se homogeneizan para pasar a una cajilla y luego a la piscina de aireación y enfriamiento en la que, al agua se le da un tiempo de residencia de 12 horas aproximadamente para favorecer el proceso de disminución de temperatura pues el agua permanece en la piscina durante toda la noche. Posteriormente, el agua pasa a la Planta de Juncos donde hace un recorrido por lechos o capas de diferentes materiales y entra en contacto el oxígeno disuelto en la tierra a través de los juncos.

Teniendo en cuenta el sistema de tratamiento del agua, los puntos de muestreo seleccionados fueron:

PUNTO 1 (P 1) : Cajilla colectora de aguas (Entrada al sistema de tratamiento)
PUNTO 2 (P 2) : Salida de la Planta de Juncos (Salida del sistema de tratamiento)
PUNTO 3 (P 3) : Aguas arriba del punto de vertimiento.
PUNTO 4 (P 4) : Aguas abajo del punto de vertimiento.
PUNTO 5 (P 5) : Agua para consumo doméstico.

3.0 PROCEDIMIENTO PARA TOMA DE MUESTRAS

El monitoreo se realizó el día 2 de Octubre de 2.002, tomando las muestras de agua en los puntos definidos previamente.

3.1 MONITOREO FISICOQUÍMICO

En cada punto se analizaron los siguientes parámetros:

PUNTO DE MUESTREO	PARAMETROS
P 1	Cromo, DBO-5, Grasas y aceites, Hierro total, Coliformes fecales y totales, pH, Plomo, Sólidos suspendidos totales
P 2	Cromo, DBO-5, Grasas y aceites, Hierro total, Coliformes fecales y totales, pH, Plomo, Sólidos suspendidos totales
P 3	Cromo, DBO-5, Grasas y aceites, Hierro total, Coliformes fecales y totales, pH, Plomo, Sólidos suspendidos totales
P 4	Cromo, DBO-5, Grasas y aceites, Hierro total, Coliformes fecales y totales, pH, Plomo, Sólidos suspendidos totales
P 5	Coliformes fecales y Coliformes totales

La metodología del muestreo se diseño del tal forma que fuera lo más significativa posible.

3.2 PARAMETROS FISICOS IN SITU

En cada sitio de muestreo antes de la toma de la muestra se realizó el análisis de los siguientes parámetros in situ;

pH
Oxígeno Disuelto
Temperatura ambiente
Temperatura de la muestra

3.3. PARAMETROS QUIMICOS

Se utilizaron recipientes de 250 ml., debidamente rotulados, para determinar la concentración de Cromo, DBO-5, Grasas y aceites, Hierro total, Coliformes fecales y Coliformes totales, pH, Plomo, Sólidos suspendidos totales. Las rutinas se tomaron,

quedando listas para su posterior transporte y análisis en el Laboratorio Prodycon Ltda. en Santafé de Bogotá.

3.4. PRESERVACIÓN

Las muestras se recolectaron en cinco recipientes de vidrio. Inmediatamente después de la toma de las muestras, se utilizaron reactivos de calidad analítica, según las indicaciones del Standard Methods 19h, De 1995.

Las muestras fueron protegidas del sol, de la luz y de las fuentes de contaminación y refrigeradas en neveras. Igualmente, fueron transportadas vía aérea al siguiente día de la toma al laboratorio en Santafé de Bogotá.

Las Grasas y Aceites se preservaron con Acido Clorhídrico y los metales con Acido Nítrico.

3.5. MATERIAL DE TOMA DE MUESTRA

3.4.1 Recipientes

Según lo indicado en el Standard Methods De. 19yh (1995), se prepararon recipientes nuevos y se lavaron previamente de la siguiente manera :

- Tres veces con agua filtrada de la llave.
- Una vez con una solución de Acido Nítrico 50/50 en agua destilada.
- Tres veces con agua filtrada de la llave.
- Tres veces con agua destilada desionizada.

Para los recipientes destinados a las muestras de grasas, se remplazó el Acido Nítrico por mezcla Sulfocromática.

3.4.2 Equipo de Campo

Los equipos para toma de muestras y para análisis en campo fueron alistados y calibrados según las instrucciones del fabricante.

Para el análisis in situ de pH se uso una cinta indicadora de pH. El Oxígeno se realizó en un Kit marca Hach (Método *Winkler*, modificación con azida).

3.4.3 Reactivos y Materiales de Campo

- Agua Destilada : Se transportó en un tanque de 1 litro.

- Reactivos para la preservación de las muestras : Acido Nítrico, Sulfúrico y Fosfórico de calidad analítica, Merck y Carlo Erba.
- Recipientes de toma de muestra.
- Material Volumétrico.
- Formatos para reportes de análisis de campo (cadena de custodia).

3.5 PRESERVACIÓN DE LAS MUESTRAS

A los recipientes que contenían las muestras de Grasas y Aceites se les agregaron 6 gotas de Acido Clorhídrico HCl.

- Para el transporte vía aérea hacia Bogotá se acomodaron los recipientes dentro de la nevera con espuma y papel periódico con el fin de evitar su rompimiento.
- Los recipientes se cubrieron con hielo común.
- La nevera debe se selló muy bien con cinta aislante, para evitar que se derramara el agua formada al fundirse el hielo.

En la Tabla No. 1 y en el Anexo No.1, se observan los métodos utilizados en laboratorio para la determinación de cada parámetro.

TABLA No.1
DETERMINACIÓN DE PARÁMETROS EN LABORATORIO

PARÁMETRO	UNIDADES	MÉTODO DE DETERMINACIÓN
Cromo	mg/l	Absorción Atomica
DBO_5	%O2	Warbumétrico
Grasas y Aceites	mg/l	Por Infrarrojo
Hierro Total	mg/l	Absorción Atomica
Ph	Unidades	Potenciométrico
Plomo	mg/l	Por Absorción atómica
Coliformes fecales	UFC/100ml	NMP
Coliformes totales	UFC/100ml	NMP
Sòlidos Suspendidos Totales	mg/l	Nefelométrico
Oxigeno Disuelto	mg/L	Winkler

4.0 ANALISIS DE RESULTADOS

4.1 METODOLOGIA

El análisis de los puntos muestreados se establece a partir de la consideración del método evaluativo según las Normas del Decreto 1594 de 1.984

Análisis con el Decreto 1594/84

Los criterios de análisis empleados para éste método son los Artículos 38, 39, correspondientes a la destinación del agua para consumo humano y doméstico, los Artículos 40 y 41, correspondientes a la destinación del recurso para uso agrícola y para uso pecuario respectivamente.

Finalmente, se dan las conclusiones de cada uno de los análisis de resultados de los puntos muestreados.

En las **Tablas No. 2** y **No. 3** se presentan tabulados los resultados fisicoquímicos, al igual que los valores máximos permitidos por la legislación Colombiana en los artículos antes mencionados. En el Anexo No. 1 se encuentran los resultados entregados por el laboratorio de aguas.

4.1.1 Análisis Comparativo (Decreto 1594 de 1.984)

El valor del pH está por fuera de los límites establecidos para todos los usos del agua. Esto puede deberse a que en la piscina de aireación, el agua está en contacto directo con el suelo y este, como todos los suelos del departamento del Putumayo, se caracteriza por presentar un pH ácido, lo cual puede estar aumentando la acidez del agua.

La DBO_5 registra un valor de 1.050 a la entrada y 310 a la salida, lo que indica un 70% de remoción. Los Sólidos Suspendidos Totales registraron 845 mg/L a la entrada y 135 mg/L a la salida, lo que indica un 84% de remoción, con lo que se ubica dentro del rango de calidad buena. No se observan trazas de Aceite y los valores para los metales pesados, Cromo y Plomo, son muy bajos.

La materia orgánica biodegradable se mide en términos de DBO_5. Si se descargan al entorno altos contenidos sin tratar, su estabilización biológica puede llevar al agotamiento de los recursos naturales de oxígeno y al desarrollo de condiciones sépticas. La DBO es un parámetro de comparación aplicable tanto a aguas residuales como a aguas superficiales y este parámetro determina la cantidad de Oxígeno que consumen los microorganismos en el proceso de oxidación bioquímica de la materia orgánica. En este

caso los valores obtenidos para la DBO son medianamente altos y están entre 1.050 a 170 mg/L de O_2.

Los metales pesados, Cromo y Plomo, se encuentran por debajo de lo estipulado en el Decreto 1594 de 1.984. Los valores reportados para estos parámetros son bajos y caracterizan al agua de calidad excelente para el vertimiento (en cuanto a metales).

Aunque la Norma no limita el vertimiento de Coliformes fecales y Coliformes totales a una concentración específica, estas concentraciones a la salida de la planta de juncos son altas respecto a los Art. 38 y 39 del Decreto 1594 y pueden estar afectando la condición natural del humedal aguas abajo del punto de vertimiento.

TABLA No. 2
ANALISIS FISICOQUIMICOS *IN SITU* Y EN LABORATORIO

PARÁMETRO	UNIDAD	PUNTO 1	PUNTO 2	PUNTO 3	PUNTO 4	PUNTO 5
ANALISIS *IN SITU*						
TEMPERATURA AMBIENTE	°C	30,0	30	30	30	30
TEMPERATURA MUESTRA	°C	58,0	33	32	32	
OXÍGENO DISUELTO	mg/L	2	5	4	4	
pH	UNIDADES	5,5	4	4	5	
ANALISIS EN LABORATORIO						
CROMO	mg/L	< 0,01	< 0,01	< 0,01	< 0,01	
DBO-5	mg/L O_2	1050	310	170	240	
GRASAS Y ACEITES	mg/L	< 0,5	< 0,5	< 0,5	< 0,5	
HIERRO TOTAL	mg/L	0,5	1	1,5	1,5	
PH	UNIDADES	5,5	4,24	4,28	4,46	
PLOMO	mg/L	< 0,02	< 0,02	< 0,02	< 0,02	
SÓLIDOS SUSPENDIDOS TOT	mg/L	845	135	49	80	
COLIFORMES FECALES	UFC/100	2×10^3	240×10^3	9×10^2	21×10^3	<2
COLIFORMES TOTALES	UFC/100	210×10^3	75×10^5	21×10^3	75×10^3	<2

TABLA No. 3
LIMITES PERMISIBLES

PARÁMETRO	UNIDAD	DECRETO 1594 Art 38 y 39	DECRETO 1594 Art 40 y 41	DECRETO 1594 Art 72
TEMPERATURA MUESTRA	C			< 40 °C
OXÍGENO DISUELTO	mg/L			
PH	UNIDADES	5.0 – 9.0		
CROMO	mg/L	0.05	0.2 y 0.5	
DBO_5	%O2			REMOCIÓN > 80%
GRASAS y ACEITES	mg/L			REMOCIÓN > 80%
HIERRO TOTAL	mg/L	0,05	5.0 y 1.0	
PLOMO	mg/L	0.05		
SÓLIDOS SUSPENDIDOS TOT	mg/L			REMOCIÓN > 80%
COLIFORMES FECALES	UFC/100 ml	2.000		
COLIFORMES TOTALES	UFC/100 ML	20.000		

5.0 CONCLUSIONES Y RECOMENDACIONES

- En general se presenta una calidad aceptable del agua en los puntos muestreados, si se tienen en cuenta los Artículos 38, 39, 40 y 41 del Decreto 1594 de 1.984. Esto indica que los resultados obtenidos son admisibles para la destinación del recurso para consumo humano y doméstico y para uso pecuario y agrícola.

- Se recomienda adoptar algún tipo de tratamiento para aumentar el nivel del pH en el agua.

- Teniendo en cuenta los resultados obtenidos en el análisis de las sustancias de interés sanitario (Cromo y Plomo), se concluye que las concentraciones de estas sustancias en el vertimiento de aguas industriales no afectan el Humedal ni generan impacto negativo al medio ambiente.

- El porcentaje de remoción de DBO está por debajo de lo estipulado en la Norma. Esto significa que la planta de juncos no tiene las dimensiones adecuadas para tratar la carga orgánica que está circulando por ella. Si se tiene en cuenta que las concentraciones de Coliformes a la salida de la planta, Punto P 2, son mayores que a la entrada al sistema de tratamiento, Punto P 1, en algún punto entre estos dos sitios está entrando una corriente con alta carga orgánica. Se recomienda de manera urgente, verificar el tratamiento que se está dando a las aguas negras producidas en la planta de palmito y si están entrando a la planta de juncos sin pasar primero por un pozo séptico adecuado.

- Lo anterior también puede deberse a que los lechos y conductos interiores de la planta de juncos estén obstruidos y el agua residual no esté circulando de manera correcta en el sistema. Se recomienda que Agroindustrias de la Amazonia realice un mantenimiento de la planta de juncos con el fin de verificar la condición de los lechos filtrantes, de las tuberías de distribución en su interior y el estado de los juncos.

- El Indice de Calidad de Agua - ICA es un término interpretativo para determinar el valor global de la calidad del agua, incorporando los valores individuales de una serie de parámetros. Se recomienda que para el análisis de la calidad del agua por el índice ICA determinado por la NSF (*National Sanitation Fundation*), el cual se basa en la estructura del Índice de Horton, se incluya en posteriores análisis fisicoquímicos los siguientes parámetros: Oxigeno disuelto, Coliformes fecales, pH, DBO_5, NO_3, PO_4, Turbidez, Temperatura de la muestra y Sólidos Totales.

- El análisis de aguas para consumo doméstico registra contenido mínimo de coliformes totales o fecales, lo que indica un buena calidad.

BIBLIOGRAFIA

Larry W. Canter, Manual De Evaluacion De Impacto Ambiental. Segunda Edición, 1.998

APHA (American Public Health Association). Standard Methods for the Examination of Water and Waswater,15th Edition, 1.980, Washington, D.C.

EPA (United States Environmental Protection Agency) Methods for Chemical Analysis of Water and Wastewater. Cincinnati. U.S.A., 1.979.

Ministerio De Salud. Decreto 1594 del 26 de junio de 1.984.

ANEXO No. 1
TABLAS DE RESULTADOS

Prodycon

LABORATORIOS PRODYCON Ltda. y Tratamiento de Aguas

Santafé de Bogotá, D.C. 29 Octubre/02 — **Muestra No.** 021952 — Hoja No.
Fecha de recibo : 17 Octubre/02
Solicitante : ECOANALISIS LTDA — **N.I.T.** 846001499-5
Dirección : Calle 10 Cra 28 Local 3 — **Teléfono** : 2394430

DATOS DE RECEPCION DE LA MUESTRA

Fecha de Toma : 02 Octubre/02 — **Hora** : S.D.
Municipio : Puerto Asis — **Departamento** : Putumayo
Sitio de muestreo : P: 1- Tanque- Planta Procesadora de Palmito
OBSERVACIONES : Agroindustrias de la Amazonia S.A.

ANALISIS SOLICITADO : Análisis Fisicoquímicos para Aguas
Muestra No. 021952.

ANALISIS	UNIDADES	VALOR OBTENIDO
CROMO POR A.A.	mg/L Cr	<0.01
DBO-5 (Warbumetrico)	mg/L O2	1050
GRASAS Y ACEITES (POR INFRARROJO)	mg/L DE COMPUEST	<0.5
HIERRO TOTAL POR A.A.	mg/L Fe	0.50
MICROBIOLOGICO COLIFORMES TOTALES (NMP)	UFC/100 ml	*
MICROBIOLOGICO COLIFORMES FECALES (NMP)	UFC/100 ml	**
pH Potenciométrico	Unidades	5.50
PLOMO POR A.A.	mg/L Pb	<0.02
SOLIDOS SUSPENDIDOS TOTALES	mg/L	845

OBSERVACIONES :
* COLIFORMES TOTALES : 210 X 10 (3)
** COLIFORMES FECALES : 2 X 10 (3)

Atentamente, Prodycon MT 674-97

LABORATORIOS PRODYCON LTDA.
Reg. Prop. C.C.7977

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LABORATORIOS PRODYCON LTDA. Análisis y Tratamiento de Aguas

Santafé de Bogotá, D.C. 29 Octubre/02 — Muestra No. 021954 — Hoja No.
Fecha de recibo : 17 Octubre/02
Solicitante : ECOANALISIS LTDA — N.I.T. 846001499-5
Dirección : Calle 10 Cra 28 Local 3 — Teléfono : 23943430

DATOS DE RECEPCION DE LA MUESTRA

Fecha de Toma : 02 Octubre/02 — Hora : S.D.
Municipio : Puerto Asis — Departamento : Putumayo
Sitio de muestreo : P3-Aguas arriba Vertimiento Planta Procesadora de Palmito
OBSERVACIONES : Agroindustrias de la Amazonia S.A.

ANALISIS SOLICITADO : Análisis Fisicoquimicos para Aguas
Muestra No. 021954.

ANALISIS	UNIDADES	VALOR OBTENIDO
CROMO POR A.A.	mg/L Cr	<0.01
DBO-5 (Warbumetrico)	mg/L O2	170
GRASAS Y ACEITES (POR INFRARROJO)	mg/L DE COMPUEST	<0.5
HIERRO TOTAL POR A.A.	mg/L Fe	1.5
MICROBIOLOGICO COLIFORMES TOTALES (NMP)	UFC/100 ml	*
MICROBIOLOGICO COLIFORMES FECALES (NMP)	UFC/100 ml	**
pH Potenciométrico	Unidades	4.28
PLOMO POR A.A.	mg/L Pb	<0.02
SOLIDOS SUSPENDIDOS TOTALES	mg/L	49

OBSERVACIONES :
* COLIFORMES TOTALES : 21 X 10 (3)
** COLIFORMES FECALES : 9 X 10 (2)

Atentamente, Prodycon 111674-93

LABORATORIOS PRODYCON LTDA.
Reg. Prop. C.C.7977

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Prodycon

LABORATORIOS PRODYCON LTDA. Control de Calidad y Tratamiento de Aguas

Santafé de Bogotá, D.C. 29 Octubre/02 **Muestra No. 021955** **Hoja No.**
Fecha de recibo : 17 Octubre/02
Solicitante : ECOANALISIS LTDA **N.I.T.** 846001499-5
Dirección : Calle 10 Cra 28 Local 3 **Teléfono :** 23943430

DATOS DE RECEPCION DE LA MUESTRA

Fecha de Toma : 02 Octubre/02 **Hora :** S.D.
Municipio : Puerto Asis **Departamento :** Putumayo
Sitio de muestreo : P 4-Aguas abajo Vertimiento Planta Procesadora de Palmito
OBSERVACIONES : Agroindustrias de la Amazonia S.A.

ANALISIS SOLICITADO : Análisis Fisicoquimicos para Aguas
Muestra No. 021955.

ANALISIS	UNIDADES	VALOR OBTENIDO
CROMO POR A.A.	mg/L Cr	<0.01
DBO-5 (Warbumetrico)	mg/L O2	240
GRASAS Y ACEITES (POR INFRARROJO)	mg/L DE COMPUEST	<0.5
HIERRO TOTAL POR A.A.	mg/L Fe	1.5
MICROBIOLOGICO COLIFORMES TOTALES (NMP)	UFC/100 ml	*
MICROBIOLOGICO COLIFORMES FECALES (NMP)	UFC/100 ml	**
pH Potenciométrico	Unidades	4.46
PLOMO POR A.A.	mg/L Pb	<0.02
SOLIDOS SUSPENDIDOS TOTALES	mg/L	80

OBSERVACIONES :
* COLIFORMES TOTALES : 75 X 10 (3)
** COLIFORMES FECALES : 21 X 10 (3)

Atentamente, Prodycon

IMT 674-93

LABORATORIOS PRODYCON LTDA.
Reg. Prop. C.C.7977

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Prodycon

LABORATORIOS PRODYCON LTDA. Control y Tratamiento de Aguas

Santafé de Bogotá, D.C. 28 Octubre/02 **Muestra No. 021998** Hoja No.
Fecha de recibo : 17 Octubre/02
Solicitante : ECOANALAISIS LTDA **N.I.T.** 846001499-5
Dirección : Calle 10 No Cra 28 Local3 **Teléfono :** 23943430

DATOS DE RECEPCION DE LA MUESTRA

Fecha de Toma : 02 Octubre/02 **Hora :** S.D.
Municipio : Puerto Asis **Departamento :** Putumayo
Sitio de muestreo : Agua de la Llave

ANALISIS SOLICITADO : Análisis Fisicoquímicos para Aguas
Muestra No. 021998.

ANALISIS	UNIDADES	VALOR OBTENIDO
MICROBIOLOGICO COLIFORMES TOTALES (NMP)	UFC/100 ml	<2
MICROBIOLOGICO COLIFORMES FECALES (NMP)	UFC/100 ml	<2

OBSERVACIONES :

Prodycon 674-97

Atentamente,

LABORATORIOS PRODYCON LTDA.
Reg. Prop. C.C.7977

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ANEXO No. 2
IMAGENES FOTOGRAFICAS

FOTO 01.
MUESTREO DE AGUAS EN LA ZONA DEL HUMEDAL EN EL AREA POSTERIOR A LA PLANTA DE PALMITO DE AGROAMAZONIA

AGROINDUSTRIAS
DE LA AMAZONIA

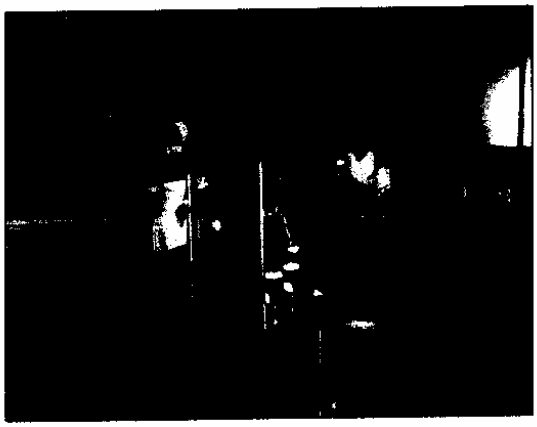

FOTO 02.
MUESTREO DE AGUAS PARA CONSUMO DOMESTICO EN LA PLANTA DE PALMITO

AGROINDUSTRIAS
DE LA AMAZONIA

FOTO 03
PRESERVACIÓN DE MUESTRAS DE AGUA

AGROINDUSTRIAS
DE LA AMAZONIA

FOTO 04

PRUEBA IN SITU DE OXIGENO DISUELTO A LA SALIDA DE LA PLANTA DE JUNCOS

AGROINDUSTRIAS
DE LA AMAZONIA

FOTO 05

PUNTO DE MUESTREO P1
CAJILLA COLECTORA

AGROINDUSTRIAS
DE LA AMAZONIA

FOTO 06

ANÁLISIS *IN SITU* DE AGUAS RESIDUALES A LA SALIDA DE LA PLANTA DE JUNCOS

AGROINDUSTRIAS
DE LA AMAZONIA

Ministerio del Interior 000273

El Suscrito Director General (E) para las Comunidades Negras, Minorías Étnicas y Culturales, de conformidad con la Ley 70 de 1993 y el Decreto 1320 de 1998 en uso de sus funciones y,

TENIENDO EN CUENTA:

Que en los municipios de Orito, Puerto Asís, Puerto Caicedo, Valle del Guamuez y San Miguel del Departamento de Putumayo, se desarrollará un proyecto de Fomento al Cultivo, Industrialización y Comercialización del Palmito en el Putumayo, AGROAMAZONIA S.A., por parte del Gobierno Nacional, con el apoyo de la Comunidad Internacional para el Desarrollo Alternativo al cultivo de coca en esa región.

1. Que el señor DIEGO MARULANDA GOMEZ, representante legal de la firma Tres Elementos Ltda, ha presentado solicitud escrita a esta Dirección, para que se expida certificación acerca de la presencia de Comunidades Negras en el área del proyecto, de los municipios mencionados en el numeral 1. de esta certificación.
2. Que con base en la información existente en la Dirección General para las Comunidades Negras, cuya fuente principal es el Plan de Desarrollo de la Población Afrocolombiana 1998 – 2002, se ha revisado lo solicitado por el interesado.
3. Se ha consultado la base de datos de las Organizaciones de Comunidades Negras existente en esta Dirección.

CERTIFICA:

Que de acuerdo con la revisión que hizo la doctora LIGIA FANNY NARANJO RAMÍREZ, funcionaria de esta Dirección, al Plan Nacional de Desarrollo de la Población Afrocolombiana, SI EXISTEN Comunidades Negras, con una población aproximada en los siguientes municipios: Orito 52%, Puerto Asís con 35% y Puerto Caicedo con 58%. Por lo tanto se requiere adelantar el proceso de Consulta Previa. Mientras que en los municipios del Valle del Guamuez y San Miguel, NO EXISTEN, comunidades afrocolombianas.

Si al realizar el respectivo estudio de impacto ambiental, (específicamente el componente socio - cultural) para la obtención de la Licencia Ambiental, se encuentra en el área de influencia del proyecto la presencia de otra comunidad negra, es necesario dar aviso por escrito al Ministerio del Interior.

Para constancia, se firma la presente en la ciudad de Bogotá D.C., a los quince (15) días del mes de noviembre de 2002.

HONORIO MIGUEL HENRÍQUEZ PINEDO
Director General (E)

LFNR

CORPORACION PARA EL DESARROLLO SOSTENIBLE DEL SUR DE LA AMAZONIA –CORPOAMAZONIA
REGIONAL PTUMAYO

DRP-579
Mocoa, 15 de noviembre de 2002

Señor
DIEGO MARULANDA GOMEZ
Representante Legal
TRES ELEMENTOS LTDA
Calle 90 No.18-35 Oficina 408 Teléfono 6167077
Bogotá

Cordial saludo.

De acuerdo con su solicitud basado en el derecho de petición sobre la información de la existencia y localización de áreas de manejo especial y localización de áreas de manejo especial y/o ecosistemas frágiles, me permito enviar un cuadro donde se relacionan éstas áreas en los municipios del departamento del Putumayo, incluyendo los municipios de su interés.

Hasta una próxima oportunidad

LEONEL CEBALLOS RUIZ
Director Regional Putumayo

Lybt

CONSOLIDADO DE AREAS DE PROTECCION Y CONSERVACION Y RESGUARDOS

Unidad Operativa	Municipio	Componente	Areas de protección y conservación		Resguardo	
			Localización	Extensión (Has)	Localización	Extensión (Has)
Andino Amazónico	Colón	Urbano	No hay información en el POT			
		Rural				
	Santiago	Urbano	Malla ambiental urbana y rural			
		Rural	Páramo de Bordoncillo cotas de 2600 msnm hasta 3600 msnm	24249 Ha		
			Bosque Protector según el plan de manejo cuenca del Río San Juan			
	Sibundoy	Urbano				
		Rural	espacio que permite la conexión entre zonas de conservación de recursos naturales y paisajísticos, zonas verdes, quebradas, ríos, parques y cesiones ambientales de protección.			
	San Francisco	Urbano				
		Rural	Bosque Protector según el plan de manejo cuenca del Río San Juan			
			zona de reserva forestal protectora de la Cuenca Alta del Río Mocoa	34.600 Ha	Se propone adjudicar al cabildo las tierras baldías que se encuentran en el municipio para conservar la biodiversidad	
	Mocoa	Urbano: Total de áreas de reserva: 62.12 Has.	Reserva "El Rosal", al sur del casco urbano. Delimitada por el sur con líneas perimetral; por el norte con el cementerio; oriente vía Mocoa-Villagarzón y occidente con urbanización proyectada	0.4.56 Ha		
			Reserva "La Loma". Al norte, con Quebrada Sangoyaco y perímetro urbano propuesto; por el sur, vivienda de estrato alto en el sector de la línea paralela al barrio Kenedy; por el oriente, con la vía propuesta que se prolonga desde la calle el progreso hasta la Empresa de Energía y con esta por el occidente.	626.499 m2		
			Reserva "La Reserva". Norte, con vía perimetral propuesta; sur, vía del anillo intermedio propuesta; occidente paralelo a la vía Mocoa-Pitalito; por el occidente, con vía que conduce al San Francisco y con la zona industrial	646.104 m2		
		Rural	Reserva Protectora de la Cuenca Alta del Río Mocoa	34.600 m2	Resguardo de Yunguillo: cabildo mayor, Orocoche y San Joaquín	
			Area de Manejo Especial Serranía del Churumbelo	12000 Ha	Resguardo La Esperanza: Condagua	
			Reservas protectoras de microcuencas: Río Dorado, Río Mulato, Quebradas Tanuca, El Conejo y Almorzadero		Resguardo Inga Puerto Limón	
			Bosque Protector según plan de manejo de la cuenca de río San Juan			
			Proyecto creación de reserva campesina de vegetales alfombrosenses ubicado entre el Río Picudo Grande y el Río Caimán en la parte sur del municipio		Proyectos de Resguardo: San Marcelino, parte baja Río cascabel y Resguardo Pueblo en la vereda la Florida	
		Urbano				

Unidad Operativa	Municipio	Componente	Areas de protección y conservación		Resguardo	
			Localización	Extensión (Has)	Localización	Extensión (Has)
Piedemonte Amazónico	Villagarzón	Rural	Reserva forestal protectora "Nukanchipa Alpa Amakunaosa Wasi" localizado en la parte alta de la subcuenca del río Vides, San Juan, Chaiguayaco y Conejo; el Cerro Patascoy, río Otilo y río Conejo.	36.230 (40,6% del total)	Se titularán los resguardos: El Líbano, San Andres, Damasco, Villaflor, Campobello, Canangucha y Alpes Orientales	
			Cuenca del río San Juan. Zona amortiguadora de reserva forestal protectora, zona forestal de uso multiple, área amortiguadora	22.210.	Area solicitada para ampliar resguardo indígena	
			Area forestal Protectora-productora que corresponde entre los Municipios de Puerto Caicedo y Villagarzón	6430		
			Area forestal Protectora-productora que corresponde al Corregimiento de Puerto Limbria, Municipio de Villagarzon	6883		
			Zona amortiguadora de reserva forestal. Abarca las veredas de Miravalle, Alto Vides y Tigres del Alto y la parte alta de las veredas La Galisana, Alto Chaguayaco, Alto San Juan, Alto Corazon, Bajo Corazón y el Cabildo Alpa Rumiyaco.			
			Propuesta de area para la conservación de fauna silvestre y manejo compartido con comunidades indígenas y campesinos	63760		
			Salados y pepesderos ubicados en la parte alta de los ros Vides y San Juan			
	Puerto Guzmán	Urbano				
		Rural	Reserva Forestal Protectora-productora del Yurilla. Ubicado entre el río Mecaya, Yurilla y Sabilla. Posee más de 10 salados.	20000	Reserva Indígena Serroguadúa, localizado cerca de las veredas La Caoseña, Modelia, Serroguadua	150
			Humedales Santa Rosa. Mayoyoque, Gallinazo, Pututo, La Ciudia, Mocholero, Saudita, Cananguchales, El Cedro, Chichico y Duamao		Resguardo Indígena Aguacitas	
			Salado de Tune y Salado de los Venados, ubicados sobre la margen derecha del río Yurilla, cerca de la vereda Los Pinos			
			Proyecto Reserva para Comunidades Negras al margen del río Yurilla			
			Zona priorizada para fomento piscícola comercial		En Proyecto: Resguardos Calenturas y El Descanso"	
* Aparecen en los mapas de las Unidades Operativas. No en los POT's						
	Puerto Caicedo	Urbano				
		Rural	Areas de reserva: Inspección del Damasco entre los ríos Vides, San Juan y quebrada Sardinas.	2500	Proyecto de titulación de los resguardos de El Líbano, Campobello, Canangucha y Alpes Orientales	
			Area de reserva forestal: faja de terreno ubicado entre los ríos Picudo Grande, Picudo Chico, quebrada La Tigra y quebrada Canangucha.	2500		
			Zona de reserva: interfluvio de los ríos Caiman, Picudo y Pitufia blanco que comprende Serras de Puerto Asis, Municipio de Puerto Guzmen y Puerto Caicedo	7500		

Unidad Operativa	Municipio	Componente	Areas de protección y conservación		Resguardo	
			Localización	Extensión (Has)	Localización	Extensión (Has)
Bosque productor Protector			Crear una reserva en los nacimientos de los ríos Cocayá y en San Pedro			
			Area forestal que comprende la superficie de Puerto Caicedo	865.440.		
	Puerto Asís	Urbano	Area conformada por una distancia de 30 metros de lado a lado desde el borde de las fuentes de agua, en todo su recorrido en el territorio del Municipio			
			Ronda de protección hídrica del Río Putumayo, y quebradas Singuiya, Cocaya y Agua Negra, con uso exclusivo para recreación pasiva y reforestación			
			Todos los humedales existentes dentro del casco urbano			
		Rural	Reserva Productora comprendida entre los ríos Piñuña Blanco y Mecaya en la parte oriental y norte. Areas Propuesta	109.000.	Buena Vista (otorgada)	4500 Ha
					Santacruz de Piñuña Blanco (otorgada)	1990 Ha
			Area de conservación del sistema de las microcuencas: quebradas Agua Negra, Siguilla y San Nicolás y del río Cocayá.		En trámite 6 constituciones de resguardo y una propuesta para zona de reserva campesina	
Zona Petrolera	Orito	Urbano	POT no disponible en la Corporación			
		Rural				
	Valle del Guamuez	Urbano	Area conformada por una distancia de 30 metros de lado a lado desde el borde de las fuentes de agua, en todo su recorrido en el territorio del Municipio	58.58 Ha		
			Todos los humedales existentes dentro del casco urbano			
			Ronda de protección hídrica del Río La Hormiga, la quebrada Aguas Claras y del Río Vanderiero, con uso exclusivo para recreación pasiva y reforestación			
		Rural	Propuesta de Reservas productoras compensadas entre los Ríos Afiladors y Lazora Azul y los ríos Guisia y Churoyaco	10000 Ha	Yarinal-San Marcelino (koñán), en los municipio de Puerto Asís y Valle del Guamuez	2688,8 Ha
			Area de conservación del sistema de microcuencas de las quebradas La Dorada y El Muerto y las cabeceras de los ríos Guisia, Jordán, Afiladors y Cuembí		Santa Rosa de Sucumbíos (koñán), en los municipios de Ipiales y Valle del Guamuez	62259,0 Ha
					Santa Rosa del Guamuez (koñán-ingá), en los municipios de Pto Asís y Valle del Guamuez	758,5 Ha
					En trámite solicitud de ampliación de Yarinal y Santa Rosa de Guamuez y de constitución de Resguardo Angeles	
	San Miguel	Urbano				
		Rural	Areas de conservación de las microcuencas de las quebradas: Dante, El Sábalo, Sabalito, El muerto, La Dorada y la cabecera de los ríos Comboy, Guisia, El Afiladors, La Hormiga y Agua Negra.		Constitución de un territorio indígena que englobe los resguardos de Yarinal, San Marcelino, Afiladors y Campoalegre.	
			Reserva productora del área comprendida entre los ríos El Afiladors y la zona del azul y los ríos Guisia y Comboy.		Creación de los resguardos La Cristalina y Comboy	

Unidad Operativa	Municipio	Componente	Areas de protección y conservación		Resguardo	
			Localización	Extensión (Has)	Localización	Extensión (Has)
Llanura Amazónica	Puerto Leguizamo	Urbano	PT: No disponible a la fecha en la Corporación		Resguardos constituidos: Agua Negra, Cocliacocha, Consaya, el Hacha, El Tablero, Jinjin, La Samaritana, Lagartococha, Puerto Nariño, Yarinal, Alto Piñuña negro, Colorcó, la Apaya, Puerto Puntales, Puerto refugio, La Quebradita, Tucunare y El Progreso.	
		Rural	Parque Nacional Natural La Paya		Resguardos en proceso de constitución:Piñuña Negro, Bajo Casacorita, Puerto Perea.	

Resolución No. 0457 del 2 de junio del 2000

Por medio de la cual se otorga a la Sociedad Agroindustrias de la Amazonia AGROAMAZONIA S.A, Concesión de Aguas para uso doméstico e industrial en la cantidad de 0.80 litros por segundo, por el sistema de bombeo, por el término de 10 años de la Quebrada Agua Negra y un Permiso de Vertimientos de 0.50 litros por segundo sobre el Humedal Singuiya, por el término de cinco (5) años, para la Planta Procesadora y Enlatadora de Palmito, en el Municipio de Puerto Asís, Departamento del Putumayo.

El Director General de la Corporación para el Desarrollo Sostenible del Sur de la Amazonia CORPOAMAZONIA, en ejercicio de sus facultades legales, en especial de las contenidas en la Ley 99 de 1993, artículo 31 numeral 2, 12, 13 y 17, artículo 42 y 43, Decreto 2811 de 1974, Artículo 88 a 97, Decreto 1541 de 1978, Artículo 36 al 67, 69 al 72, Decreto 1594 de 1984, articulo Resolución de CORPOAMAZONIA No. 0966 de 1997, Ley 344 de 1996, artículo 28, y

CONSIDERANDO

Que CORPOAMAZONIA ejerce la función de máxima autoridad ambiental en el Sur de la Amazonia Colombiana y, en cumplimiento de la Ley 99 de 1993, Artículo 31 numeral 12, le corresponde realizar la evaluación, control y seguimiento ambiental, de los usos del agua, el suelo, el aire y demás recursos naturales renovables que comprenda vertimientos, emisiones o incorporaciones de sustancias o residuos líquidos, sólidos y gaseosos, a las aguas en cualquiera de sus formas, al aire o al suelo, así como los vertimientos o emisiones que puedan causar daño o poner en peligro el normal desarrollo sostenible de los recursos naturales renovables o impedir u obstaculizar su empleo para otros usos. Estas funciones comprenden la expedición de las respectivas licencias ambientales, permisos, concesiones, autorizaciones y salvoconductos.

Que de conformidad con el artículo 92 del Decreto 2811 de 1974, toda concesión de aguas esta sujeta a condiciones especiales previamente determinadas para defender las aguas, lograr su conveniente utilización, la de los predios aledaños, y en general, el cumplimiento de los fines de utilidad pública e interés social inherente a la utilización.

Que el artículo 36, literal a y d del Decreto 2811 de 1974, determina que toda persona natural o jurídica, pública o privada, requiere concesión para obtener el derecho de aprovechamiento de las aguas para abastecimientos domésticos en los casos que requiera derivación y para uso industrial.

Que el Decreto 1541 de 1978, artículo 211, dispone que se prohibe verter, sin tratamiento, residuos sólidos, líquidos o gaseosos, que puedan contaminar o eutroficar las aguas, causar daño o poner en peligro la salud humana o el normal desarrollo de la flora o fauna, o impedir u obstaculizar su empleo para otros usos.

Por medio de la cual se otorga a la Sociedad Agroindustrias de la Amazonia AGROAMAZONIA S.A, Concesión de Aguas para uso doméstico e industrial en la cantidad de 0.80 litros por segundo, por el sistema de bombeo, por el término de 10 anos de la Quebrada Agua Negra y un Permiso de Vertimientos de 0.50 litros por segundo sobre el Humedal Singuiya, por el término de cinco (5) anos, para la Planta Procesadora y Enlatadora de Palmito, en el Municipio de Puerto Asís, Departamento del Putumayo.

Que el día 2 de diciembre de 1999, ante la Unidad Operativa Bosque Protector Productor de la Regional Putumayo de CORPOAMAZONIA, el señor Jorge Yoria Rubio, identificado con la cédula de ciudadanía No. 17.046.331 de Bogotá, en su calidad de representante legal de la Sociedad Agroindustrias de la Amazonia AGROAMAZONIA S.A, presentó solicitud del trámite de Concesión de Aguas para uso industrial y doméstico, de la Quebrada Agua Negra en la cantidad de 0.80 litros/segundos, y Permiso de Vertimiento en la cantidad de 0.5 litros/segundos sobre el Humedal Singuiya, para la Planta Procesadora y Enlatadora de Palmito, en el Municipio de Puerto Asís, Departamento del Putumayo.

Que el 3 de diciembre de 1999, la Dirección Regional de CORPOAMAZONIA mediante los autos: DRP No.083 y DRP No.084 avoco conocimiento de las solicitudes de Concesión de Aguas y Permiso de Vertimientos, respectivamente, los cuales fueron notificados personalmente al represente legal de AGROAMAZONIA S.A., conforme obra en los correspondientes expedientes.

Que dando cumplimiento al artículo 57 del Decreto 1541 de 1978, la Unidad Operativa Bosque Protector Productor de Puerto Asís fijó el día 7 de diciembre de 1999, por el término de 10 días de anticipación a la práctica de la inspección ocular al sitio donde se solicita la concesión, un aviso en la Alcaldía Municipal de Puerto Asís, a fin de que todas las personas que se crean con derecho a intervenir puedan hacerlo.

Que una vez cumplido el término de fijación, no se presento persona alguna con interés a intervenir.

Que de la visita de inspección ocular realizada el día 22 de diciembre de 1999, por parte de un funcionario de la Unidad Operativa de Puerto Asís de CORPOAMAZONIA y del Plan de Manejo Ambiental de la Planta Procesadora y Enlatadora de Palmito, aspectos bióticos, se tiene:

1. El proyecto se encuentra localizado en jurisdicción del Municipio de Puerto Asís, en el kilómetro 5 de la vía que de Puerto Asís conduce a Mocoa, en inmediaciones de la Subestación eléctrica y el matadero municipal, en el Departamento del Putumayo.
2. La Planta limita por el norte con zona de potreros, por el este con el humedal Singuiyá, por el sur con la subestación de energía de Puerto Asís y por el occidente con la vía que de Puerto Asís conduce a Mocoa.
3. En el área de influencia del proyecto se encuentra la Quebrada Agua Negra y el Humedal Singuiya.

4. Las obras de construcción se encuentran adelantadas en un 50%, las cuales se pretenden culminar en el año 2000.
5. La planta se encuentra distribuida en varias áreas, según las actividades que se realizan, así : Recepción de materia prima, sala de proceso, almacenamiento de agua, calderas, subestación eléctrica, bodega, laboratorio, taller, oficinas, casino y sistemas de manejo ambiental.
6. El equipo y maquinaria que componen el montaje industrial de la planta lo conforman el Tanque de Escaldado, Tanque de Enfriamiento, Mesa de Trabajo, Banda Transportadora de Envases, Mesa de Pesaje, Túnel de Vapor, Marmitas, Autoclaves, Puente Grúa Linea de Escaldadores, Puente Grúa Línea Autoclaves, Máquina Grafadora, Planta de Tratamiento de Agua Potable, Equipo Hidroneumático, Caldera, Torre de Enfriamiento, Tolva de Desechos, Plantas Eléctricas y Tanque de Combustible.
7. El Humedal Singuiya, es un área de recambio de agua, con vegetación invasora y típica de estos hábitats como la Mauritia flexuosa, inga, Cyathea sp, entre otras.
8. La Quebrada Agua Negra es un cuerpo de aguas oligotróficas, abastecedor de un amplio sector del Municipio de Puerto Asís.
9. La concesión de aguas para uso doméstico e industrial se pretende realizar de la quebrada Agua Negra en la cantidad de 0.8 litros/seg.
10. La Quebrada Agua Negra no tiene un caudal considerable, llegando a ser en su parte media 2.00 m3/sg.
11. La captación de agua se realizará con motobomba para luego ser conducida a través de tubería PVC hasta unos tanques elevados.
12. Los vertimientos líquidos serán arrojados al humedal singuiya en la cantidad de 0.5 litros/seg.
13. Se realizaron muestreos de análisis fisicoquímicos, microbilógicos e hidrobiológicos en los cuerpos de agua influenciados por el proyecto, entre estos, la quebrada Agua Negra, 200 metros aguas arriba del puente sobre la quebrada y el Humedal Singuiya, en la parte posterior de la planta procesadora de palmito.

Que un servidor público de la Regional Putumayo de CORPOAMAZONIA, emitió con fecha 9 de mayo del 2000 Concepto Técnico, en donde considera procedente conceder la Concesión de Aguas y el Permiso de Vertimiento solicitado.

Que el Decreto 2811 de 1974, artículos 59 a 63, 88 a 97, contienen la posibilidad de declarar la caducidad por parte de la autoridad ambiental en el evento de que el titular ceda el derecho concedido, le de destino diferente al recurso, el incumplimiento de las obligaciones impuestas o pactadas por o con la autoridad, el incumplimiento grave y reiterado de las normas sobre preservación del recurso, el no usos de la concesión por dos años, la disminución progresiva o el

agotamiento del recurso, la mora en la organización del servicio público o la suspensión del mismo por el término superior a 3 meses, y las demás que se expresen en la resolución o contrato. Estas cláusulas también son aplicables a los vertimientos de acuerdo al artículo 248 del decreto 1541 de 1978. También se establece en los artículos antes citados la posibilidad de modificar la concesión otorgada por razones especiales de conveniencia pública, la necesidad de un cambio de prelación de cada uso, o el acaecimiento de hechos que alteren las condiciones ambientales.

⇒ Que los artículos 45, 72, 74 y 75 del Decreto 1594 de 1984, establecen los parámetros de la carga de vertimiento.

Que la Ley 99 de 1993 establece en el artículo 31, numeral 17, la facultad de las Corporaciones para imponer y ejecutar a prevención y sin perjuicio de las competencias atribuidas a por la ley a otras autoridades, las medidas de policía y las sanciones previstas en la ley, en caso de violación de las normas de protección ambiental y de manejo de los recursos naturales renovables y exigir la reparación de los daños causados, previo el trámite sancionatorio contenido en la Resolución No. 0542 de 1999 de CORPOAMAZONIA.

Que la Ley 99 de 1993, artículo 31, numeral 13, determina que es función de CORPOAMAZONIA recaudar conforme a la ley, las contribuciones, tasas, derechos, tarifas y multas por concepto de uso y aprovechamiento de los recursos naturales

Que la Ley 344 de 1996 artículo 28, faculta a las autoridades ambientales para cobrar el costo de los servicios de evaluación y seguimiento que se efectúe a las licencias ambientales, permisos, concesiones y autorizaciones. Esta disposición está en proceso de reglamentación para ser aplicada en la jurisdicción de CORPOAMAZONIA.

Que mediante Resolución N° 0947 del 6 de octubre de 1997, CORPOAMAZONIA adaptó y actualizó los actos administrativos expedidos por el INDERENA y el Ministerio de Agricultura sobre tasas por utilización de agua y según Resolución N° 0966 del mismo mes y corriente año fijo las tarifas correspondientes a pagar en su jurisdicción.

Que en virtud de lo anterior, se

RESUELVE:

ARTÍCULO PRIMERO: Otorgar a favor de la Sociedad Agroindustrias de la Amazonia AGROAMAZONIA S.A, Concesión de Aguas para uso doméstico e industrial en la cantidad de 0.80 litros por segundo, por el sistema de bombeo, de la Quebrada Agua Negra y un Permiso de Vertimientos de 0.50 litros por segundo sobre el Humedal Singuiya, para la Planta Procesadora y Enlatadora de Palmito, en el Municipio de Puerto Asis, Departamento del Putumayo.

ARTÍCULO SEGUNDO: El término de la Concesión de Aguas es de diez (10) años, contados desde la ejecutoria de la presente providencia, término que podrá ser prorrogado a petición del concesionario dentro del último año de vigencia, salvo razones de conveniencia pública.

El término del Permiso de Vertimiento es de cinco (5) años, contados a partir de la ejecutoria de la presente resolución, término que podrá ser prorrogado a petición del permisionario dentro del último trimestre del año de vigencia.

ARTÍCULO TERCERO: . Son obligaciones del titular de la presente resolución:

1. Abstenerse de transferir por venta, donación o permuta las aguas de uso público o constituir sobre ellas derechos personales o de otra naturaleza.
2. Cumplir con las disposiciones legales referentes al uso y goce de las aguas para su mejor aprovechamiento salubridad e higiene, ocupación de bienes de uso público y aquellas que sobre las mismas materias rijan en el futuro, no habiendo posterior reclamación por su parte.
3. Solicitar a la Corporación autorización previa en caso de traspaso total o parcial del permiso otorgado.
4. Preservar la calidad de las aguas, cuidar y mantener la vegetación protectora de la misma.
5. Cesar el vertimiento y retirar las obras que haya realizado para este fin, al vencimiento del Permiso de Vertimiento.
6. Abstenerse de efectuar la carga del vertimiento en un parámetro mayor a lo establecido en los artículos 45, 72, 74 y 75 del Decreto 1594 de 1984, especialmente los parámetros de sólidos suspendidos, DBO5, grasas y aceites, cromo, hierro y plomo.
7. Informar por escrito inmediatamente a la Regional Putumayo de CORPOAMAZONIA, en el evento de presentarse modificaciones substanciales a las condiciones bajo las cuales se iniciaron los trámites para obtener el permiso o variación de la información suministrada, incluyendo los planes y cronogramas correspondientes.
8. Efectuar anualmente la caracterización físico - química y biológica de los vertimientos de sus instalaciones, la cuales deberán ser realizada por laboratorios normalizados, intercalibrados y acreditados según lo establecido en el Decreto 1600 de 1994, o en su defecto, los laboratorios acreditados ante alguna autoridad ambiental.

Por medio de la cual se otorga a la Sociedad Agroindustrias de la Amazonia AGROAMAZONIA S.A, Concesión de Aguas para uso doméstico e industrial en la cantidad de 0.80 litros por segundo, por el sistema de bombeo, por el término de 10 anos de la Quebrada Agua Negra y un Permiso de Vertimientos de 0.50 litros por segundo sobre el Humedal Singuiya, por el término de cinco (5) anos, para la Planta Procesadora y Enlatadora de Palmito, en el Municipio de Puerto Asís, Departamento del Putumayo.

9. Permitir el control y monitoreo del presente proyecto a los técnicos de la Regional Putumayo de CORPOAMAZONIA, facilitando el acceso y los medios para tal fin.
10. Cancelar a favor de CORPOAMAZONIA, en la cuenta que esta le designe los valores correspondientes al costo de las visitas de evaluación y seguimiento ambiental, así como de las tasas retributivas por vertimientos puntuales.

ARTÍCULO CUARTO: CORPOAMAZONIA se reserva el derecho de practicar visitas periódicas al lugar donde se efectuará la concesión y el vertimiento, como parte del seguimiento y monitoreo en cualquier momento, con el objeto de verificar el cumplimiento de las obligaciones impuestas en esta Resolución.

ARTÍCULO QUINTO: El incumplimiento a las obligaciones impuestas, dará lugar a la aplicación de las sanciones contempladas en el Artículo 85 de la Ley 99 de 1993, previo el trámite sancionatorio contenido en la resolución No. 0542 de 1999 de CORPOAMAZONIA.

ARTÍCULO SEXTO: Notificar personalmente o en su defecto por edicto del contenido de la presente providencia al representante legal de la Sociedad Agroindustrias de la Amazonia, AGROAMAZONIA S.A.

ARTÍCULO SÉPTIMO: Contra la presente providencia procede únicamente el recurso de reposición, ante el Director General, con el cual se agota la vía gubernativa, el que deberá presentarse personalmente, y por escrito dentro de los cinco (5) días siguientes a la diligencia de notificación personal o a la desfijación del edicto si a ello hubiere lugar, y con plena observancia de los requisitos establecidos en los artículo 51 y 52 del Decreto 01 de 1984.

ARTÍCULO OCTAVO: La presente Resolución rige a partir de la fecha de su notificación.

NOTIFÍQUESE, PUBLÍQUESE Y CÚMPLASE

Dada en Mocoa a los,

Luis Edmundo Maya P.
ORIGINAL FIRMADO

LUIS EDMUNDO MAYA PONCE
Director General

CORPOAMAZONIA

ACTO DE NOTIFICACION, Resolución No.

Corporación para el desarrollo Sostenible del Sur de la Amazonia
-CORPOAMAZONIA-

En PTO ASIS a los 25 días del mes de OCTUBRE de 1999, se presentó el señor JORGE YORIA RUBIO identificado con la cédula de ciudadanía número 17.046.331 de BOGOTA en calidad de GERENTE AGROAMAZONIA S.A. con el fin de notificarse del contenido de la Resolución No. 0859 del 14 del mes de OCTUBRE de 1999, proferida por CORPOAMAZONIA.

JORGE YORIA RUBIO
El Notificado,

LILIANA PATRICIA QUIÑONES
El Notificador

Resolución No. **0859 del 14 de octubre de 1999**

Por medio de la cual se aprueba el Plan de Manejo Ambiental presentado por Agroindustrias de la Amazonia AGROAMAZONIA S.A., para la construcción de la Planta Procesadora y Enlatadora de Palmito en el Municipio de Puerto Asís, Departamento del Putumayo.

El Director General de la Corporación para el Desarrollo Sostenible del Sur de la Amazonia CORPOAMAZONIA, en uso de sus facultades legales, en especial las conferidas por la Ley 99 de 1993, artículo 31, numerales 2,12,13,17, artículos 49 y 85, Decreto 1753 de 1994, artículo 8, numeral 20, literal f, Decreto 1791 de 1996, Ley 344 de 1996, artículo 28, y

CONSIDERANDO

Que CORPOAMAZONIA como máxima autoridad ambiental del Sur de la Amazonia Colombiana y en virtud de las disposiciones contenidas en la Ley 99 de 1993, artículo 31 numerales, 2, 12 y artículo 35, le corresponde ejercer las funciones de evaluación, control y seguimiento ambiental de los usos del agua, el suelo, el aire y los demás recursos naturales renovables, lo cual comprenderá el vertimiento, emisión o incorporación de sustancias o residuos líquidos, sólidos y gaseosos, a las aguas en cualquiera de sus formas, al aire o a los suelos, así como los vertimientos o emisiones que puedan causar daño o poner en peligro el normal desarrollo sostenible de los recursos naturales renovables o impedir u obstaculizar su empleo para otros usos. Estas funciones comprenden la expedición de las respectivas licencias ambiental.

Que la Ley 99 de 1993, artículo 49, determinó que la ejecución de obras, el establecimiento de industrias o el desarrollo de cualquier actividad, que de acuerdo con la Ley y los reglamentos, pueda producir deterioro grave de los recursos naturales renovables o al medio ambiente o introducir modificaciones considerables o notorias al paisaje requerirán de una licencia ambiental, y el Decreto 1753 de 1994, artículo 8, numeral 20, literal f, determinó que es competencia de las Corporaciones Autónomas Regionales otorgar Licencia Ambiental para la construcción de obras y desarrollo de la industria manufacturera de productos alimenticios.

Que el proyecto de Construcción de la Planta Procesadora y Enlatadora de Palmito es adelantado por Agroindustrias de la Amazonia AGROAMAZONIA S.A, empresa de capital mixto conformada por las diferentes asociaciones de productores, Campesinos a título individual, SURCO Ltda, SOAGROMAYO Ltda y el Municipio de Puerto Asís, creada mediante Escritura Pública No. 068 del 24 de enero de 1997 de la Notaría Única del Círculo de Puerto Asís y con Matrícula Mercantil No. 011690-04.

Que el 27 de noviembre de 1997, se recibió en la Dirección Regional Putumayo de CORPOAMAZONIA por parte del señor Alcibiades Encizo Galvis, en su calidad de Alcalde Municipal de Puerto Asís y socio de AGROAMAZONIA S.A., la solicitud del trámite de Licencia Ambiental para la Construcción de la Planta Procesadora de Palmito, en el Municipio de Puerto Asís, Departamento del Putumayo.

Que en virtud a que el proyecto no introduce modificaciones considerables o notorias al paisaje y no produce deterioro grave a los recursos naturales renovables o al medio ambiente, el 23 de julio de 1998 la Regional Putumayo de CORPOAMAZONIA expidió los términos de referencia para la elaboración de un Plan de Manejo Ambiental.

Que el proyecto adelantado por AGROAMAZONIA se constituyó como una alternativa a los cultivos ilícitos con el fin de elevar el nivel socioeconómico de los productores agrícolas del Putumayo ; además se encuentra respaldado por el Plan Nacional de Desarrollo Alternativo PNDA.

Que el 26 de julio de 1999, fue allegado a la Regional Putumayo de esta Corporación el estudio titulado Plan de Manejo Ambiental para la Planta Procesadora y Enlatadora de Palmito de Puerto Asís, del cual se tiene :

I. Descripción del Proyecto:

1. El proyecto se encuentra localizado en jurisdicción del Municipio de Puerto Asís, en el kilómetro 5 de la vía que de Puerto Asís conduce a Mocoa, en inmediaciones de la subestación eléctrica y el matadero municipal, en el Departamento del Putumayo.
2. La Planta limita por el norte con zona de potreros, por el este con el humedal Singuiyá, por el sur con la subestación de energía de Puerto Asís y por el occidente con la vía que de Puerto Asís conduce a Mocoa.
3. En el área de influencia del proyecto se encuentra la Quebrada Agua Negra y el Humedal Singuiya.
4. Las obras de construcción se encuentran adelantadas en un 50%, las cuales se pretenden culminar en el año 2000.
5. La planta se encuentra distribuida en varias áreas, según las actividades que se realizan, así : Recepción de materia prima, sala de proceso, almacenamiento de agua,

calderas, subestación eléctrica, bodega, laboratorio, taller, oficinas, casino y sistemas de manejo ambiental.

6. El equipo y maquinaria que componen el montaje industrial de la planta lo conforman el Tanque de Escaldado, Tanque de Enfriamiento, Mesa de Trabajo, Banda Transportadora de Envases, Mesa de Pesaje, Túnel de Vapor, Marmitas, Autoclaves, Puente Grúa Línea de Escaldadores, Puente Grúa Línea Autoclaves, Máquina Grafadora, Planta de Tratamiento de Agua Potable, Equipo Hidroneumático, Caldera, Torre de Enfriamiento, Tolva de Desechos, Plantas Eléctricas y Tanque de Combustible.
7. El equipo y maquinaria fueron distribuidos y ubicados en la sala de proceso en forma de S para obtener una ruta continúa y un fácil transporte dentro del área del proceso
8. Se realizaron 3 apiques en el área del proyecto a 1.5 metros de profundidad en donde no se observó lámina de agua.
9. Se cuenta con un área de 184 hectáreas cultivadas en los municipios de Puerto Asís, Orito, Valle del Guamuez y San Miguel, en el Departamento del Putumayo.
10. Para la producción de material vegetal, existe un vivero permanente con capacidad de 1.000.000 plántulas; se tiene proyectado implementar viveros comunitarios transitorios.
11. Se tiene calculado que cada hectárea producirá 7.000 cogollos/año, en promedio se obtendrán 7.350.000 cogollos/año en las 11050 hectáreas. El procesamiento y enlatado de los cogollos se viene realizando en la Planta de SURCO Ltda, ubicada en el municipio de Timbío (Cauca).
12. El palmito se obtiene de la Palma de Chontaduro (Bactris gasipaes), la cual produce numerosos rebrotes básales que crecen con rapidez lo que garantiza un mayor rendimiento por hectárea sembrada y la permanencia de la plantación.
13. Los tallos son de hasta 20 metros de alto y 15 cm de DAP, se caracterizan por ser densamente espinosos, la corona es muy densa y esta formada por 15 a 20 hojas curvadas y crespas, el raquis alcanza hasta poco más de 2 metros de largo, posee más de 100 pinas a cada lado dispuestas en grupos e insertas en todas las direcciones, razón por la cual la hoja tiene apariencia crespa.
14. La distancia de siembra empleada para la producción es de 2.5 metros x 1.0 mts x 1.0 mts, dejando un promedio de 3 tallos por cepa lo que permite duplicar la producción.
15. La cosecha se hace entresacando los tallos que van alcanzando el diámetro requerido, siendo el diámetro indicado de corte de 10 cm, a 10 cm de altura.
16. Para el transporte del cogollo se está organizando una empresa de transporte.

17. El mercado del Palmito está compuesto principalmente del palmito proveniente de las especies Euterpe edulis y Bactris gasipaes.
18. El palmito tendrá 9 presentaciones dependiendo de las tendencias de los mercados y los consumidores.
19. Los envases serán latas de una aleación de estaño, hierro y otros metales revestidos de cerámica en el interior y también frascos de vidrio.
20. Los insumos químicos utilizados en la producción serán: sal, ácido cítrico y ácido ascórbico.
21. Se pretende vincular al proyecto 350 familias, cada una de las cuales tendrá un cultivo de 3 hectáreas para un total de 1.050 hectáreas sembradas.
22. En el sector agrícola el proyecto generará 277 empleos permanentes y en el sector industrial 30 empleos directos y 10 indirectos.
23. El requerimiento de agua para uso industrial será 49.0 m3/día (0,00057 lt/sg), uso doméstico 6.0 m3/día (0,00007 Lt/sg) y uso industrial 10.0 m3/día (0,00075 Lt/sg), volúmenes que se pretenden captar de la Quebrada Agua Negra, aguas subterráneas y aguas lluvias.
24. Se contará con un sistema de tratamiento para el manejo de residuos líquidos industriales se contará con un sistema de tratamiento compuesto por caja de recolección, caja tamizadora y piscina de aireación.
25. Los residuos sólidos orgánicos serán recogidos en canastillas plásticas, para luego ser llevados a un molino o destrozador que los picara para facilitar el proceso de descomposición y transformación en abono.
26. Los residuos sólidos domésticos e industriales serán tratados de acuerdo a su origen, en reciclables y no reciclables.
27. Se implementará un sistema de tratamiento compuesto de trampa de grasas, pozo séptico y planta de láminas filtrantes para el manejo de los residuos líquidos domésticos.

II. Plan de Manejo Ambiental:

a. Medidas Preventivas:

- Minimizar los riesgos ambientales que puedan producirse por la generación y disposición final de residuos sólidos durante la operación de la planta.
- Facilitar el proceso de descomposición de los residuos sólidos orgánicos mediante la utilización de un destrozador o molino.

- Contar con un sistema de manejo adecuado para el tratamiento de los residuos líquidos domésticos.
- Contar con un sistema de tratamiento de aguas residuales industriales compuesto de caja de recolección, caja tamizadora y piscina de aireación.
- Controlar las emisiones generadas por el movimiento de vehículos en las vías utilizadas para el transporte de la materia prima.
- Establecer un programa de señalización con el fin de reducir los riesgos de accidentalidad.
- Realizar el control de la calidad del aire.

b. Medidas de Mitigación:

- Recuperar las áreas intervenidas durante la construcción de la planta mediante la reforestación con gramíneas y especies nativas y exóticas.
- Reforestar las márgenes de la Quebrada Agua Negra.

Que dentro del expediente reposa el concepto técnico emitido acerca de la evaluación del Plan de Manejo Ambiental presentado y contiene las respectivas recomendaciones bajo las cuales es viable aprobarlo.

=> Que de conformidad con el Decreto 1791 de 1996, artículo 70 a 72, la Palma de Chontaduro (Bactris gasipaes), se considera una plantación asociada a cultivos agrícolas, que debe ser registrada ante la autoridad ambiental competente, para lo cual el interesado debe identificar los predios, el área en hectáreas, ubicación, nombre de la especie plantada, año de establecimiento, copia de la escritura pública, certificado de libertad y tradición, sistemas o métodos de aprovechamiento y volumen a aprovechar.

Que la Ley 344 del 27 de diciembre de 1996, artículo 28, faculta a las autoridades ambientales para cobrar el costo de los servicios de evaluación y seguimiento que se efectúe a las licencias ambientales, permisos concesiones y autorizaciones.

Que según la Ley 99 de 1993, artículo 31, numeral 17, concordante con el artículo 85 se faculta a las Corporaciones para imponer y ejecutar a prevención y sin perjuicio de las competencias atribuidas por la ley a otras autoridades, medidas de policía y las sanciones en caso de violación a las normas de protección ambiental y del manejo de los recursos naturales y exigir la reparación de los daños causados.

Que en mérito a lo expuesto, se

RESUELVE

ARTÍCULO PRIMERO : Aprobar el Plan de Manejo Ambiental presentando por Agroindustrias de la Amazonia S.A. AGROAMAZONIA S.A., para la Planta Procesadora y Enlatadora de Palmito de Puerto Asís, Departamento del Putumayo.

ARTÍCULO SEGUNDO : A partir de la fecha de notificación de la presente Resolución, el titular debe cumplir con las siguientes obligaciones :

1. Ejecutar las medidas contenidas en el Plan de Manejo Ambiental en un término de seis (6) meses contados a partir de la notificación de la presente Resolución y presentar para el efecto dentro de los quince (15) días siguientes el respectivo cronograma de obras en los casos en que no se cumplió con este requisito.
2. Dotar al personal empleado con los elementos mínimos de seguridad industrial.
3. Tramitar y obtener en el término de un año contado a partir de la notificación de la presente Resolución Permiso de Vertimiento y Concesión de Agua.
4. Registrar ante esta Corporación la plantación de palmito dentro de los 30 días siguientes a la notificación de la presente Resolución.
5. Solicitar los salvoconductos necesarios para la movilización del palmito.
6. Establecer en forma inmediata el programa de reciclaje y adecuada disposición de residuos sólidos y el de protección de suelos de las instalaciones.
7. Compensar 20 hectáreas de enriquecimiento de bosque con especies nativas, en la parte alta de la microcuenca Agua Negra en el término de 12 meses contados a partir de la notificación del presente Acto.
8. Comunicar con la debida anticipación a la Regional Putumayo de CORPOAMAZONIA las modificaciones que en su implantación requiera el Plan de Manejo Ambiental.
9. Permitir a los empleados públicos y contratistas de la Corporación encargados de la función de seguimiento y monitoreo de esta Resolución, el acceso, elementos, personal e información necesaria para el cumplimiento de la misma.
10. Cancelar a favor de CORPOAMAZONIA en la cuenta que la Dirección Regional Putumayo le determine las tarifas correspondientes al seguimiento y monitoreo.

ARTÍCULO TERCERO : El incumplimiento de las obligaciones contenidas en el presente Acto por el titular darán lugar a la aplicación de las sanciones contempladas en el artículo 85 de la Ley 99 de 1993, previo el trámite sancionatorio.

ARTÍCULO CUARTO : Designar a la Regional Putumayo de la Corporación para que efectúe seguimiento y monitoreo a la presente Resolución, para lo cual deberá entre otras actividades :

1. Elaborar un Programa de seguimiento ambiental al proyecto para el cumplimiento de las obligaciones legales y las incorporadas en el presente Acto.
2. Coordinar con la Subdirección Administrativa y Financiera de esta Corporación, el cobro de las tarifas por evaluación y seguimiento.

ARTÍCULO QUINTO : Notifíquese personalmente o en su defecto por Edicto, el contenido de la presente Resolución, al Representante Legal de AGROAMAZONIA S.A., publicar el encabezado y la parte resolutiva del presente Acto en el Boletín Oficial de CORPOAMAZONIA.

ARTÍCULO SEXTO: Contra la presente Resolución procede el recurso de reposición ante el Director General, el cual podrá interponerse dentro de los cinco (5) días siguientes a su notificación personal o a la desfijación del Edicto.

ARTÍCULO SÉPTIMO : Esta Resolución rige a partir de la fecha de su expedición.

NOTIFÍQUESE, COMUNÍQUESE, PUBLÍQUESE Y CÚMPLASE :

Dada en San Miguel de Agreda de Mocoa a los .

Luis Edmundo Maya P.
ORIGINAL FIRMADO

LUIS EDMUNDO MAYA PONCE
Director General