

AGRICULTURAL DEVELOPMENT BANK OF QATAR
REGIONAL DEVELOPMENT AND INVESTMENT SERVICES (R.D.I.S.)

THE QUINING BASIN STUDY
THE QUINING BASIN INTEGRATED
AGRICULTURAL DEVELOPMENT PROJECT

FINAL REPORT
1978

AGRICULTURAL DEVELOPMENT BANK OF QATAR
REGIONAL DEVELOPMENT AND INVESTMENT SERVICES (R.D.I.S.)

FINAL REPORT
(MAIN REPORT)

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THE REPUBLIC OF COLOMBIA

NATIONAL PLANNING DEPARTMENT (D.N.P.)

REGIONAL AUTONOMOUS CORPORATION OF QUINDIO (C.R.Q.)

**THE FEASIBILITY STUDY
ON
THE QUINDIO BASIN INTEGRATED
AGRICULTURAL DEVELOPMENT PROJECT**

**FINAL REPORT
(MAIN REPORT)**

JULY 1991

**JAPAN INTERNATIONAL COOPERATION AGENCY
(JICA)**

国際協力事業団

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PREFACE

In response to a request from the Government of the Republic of Colombia, the Government of Japan decided to conduct a feasibility study on the Quindio Basin Integrated Agricultural Development Project and entrusted the study to the Japan International Cooperation Agency(JICA).

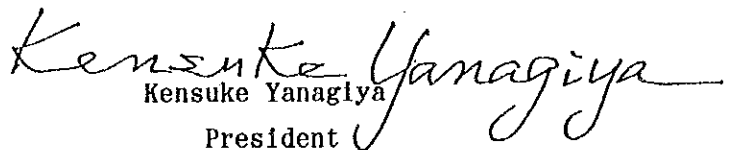
JICA sent to Colombia a study team headed by Mr. Masahito Yamanaka, Pacific Consultants International Co.,Ltd., three times between March 1990 and May 1991.

The team held discussion with the officials concerned of the Government of Colombia, and conducted field surveys at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

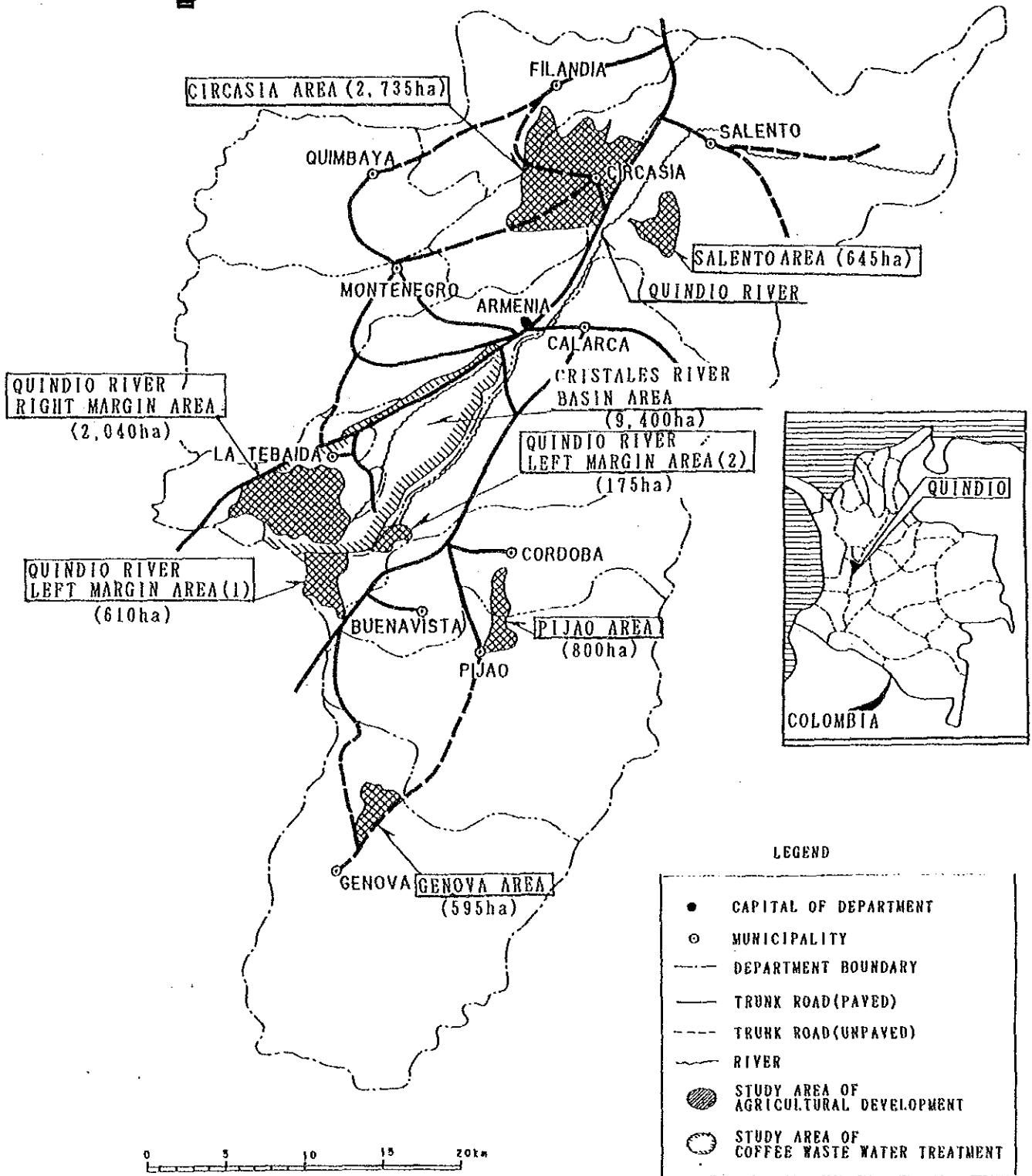
I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Colombia for their close cooperation extended to the team.

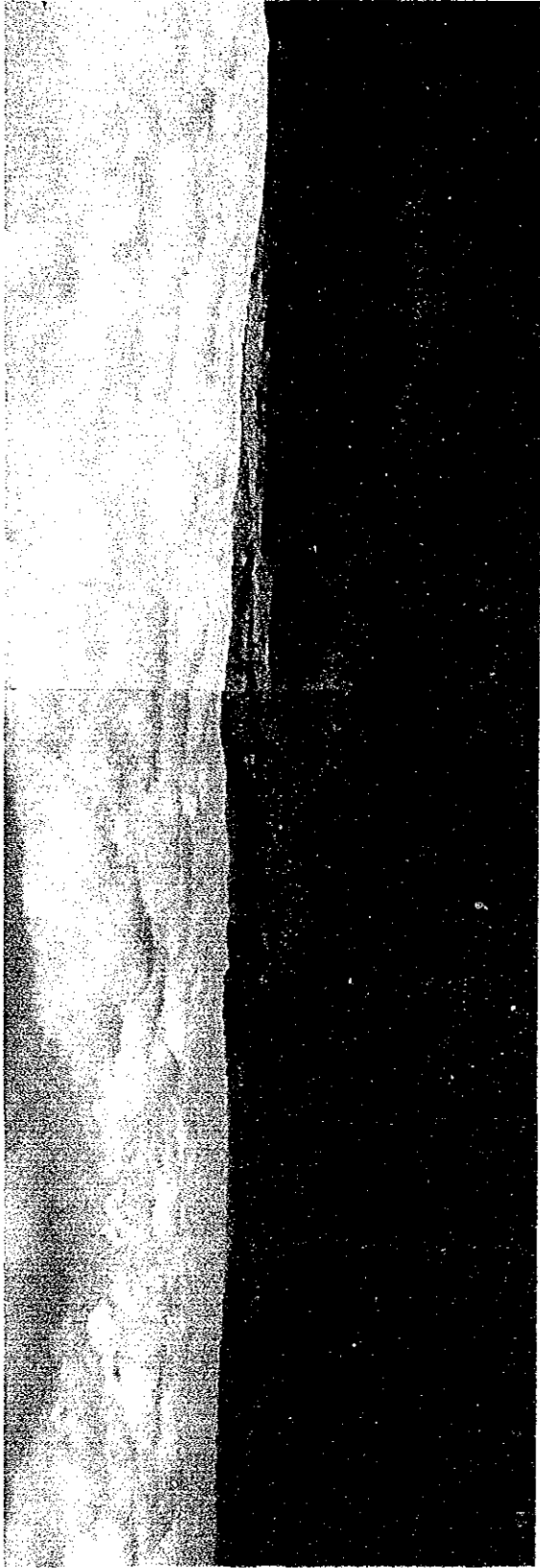
July 1991


Kensuke Yanagiya
President

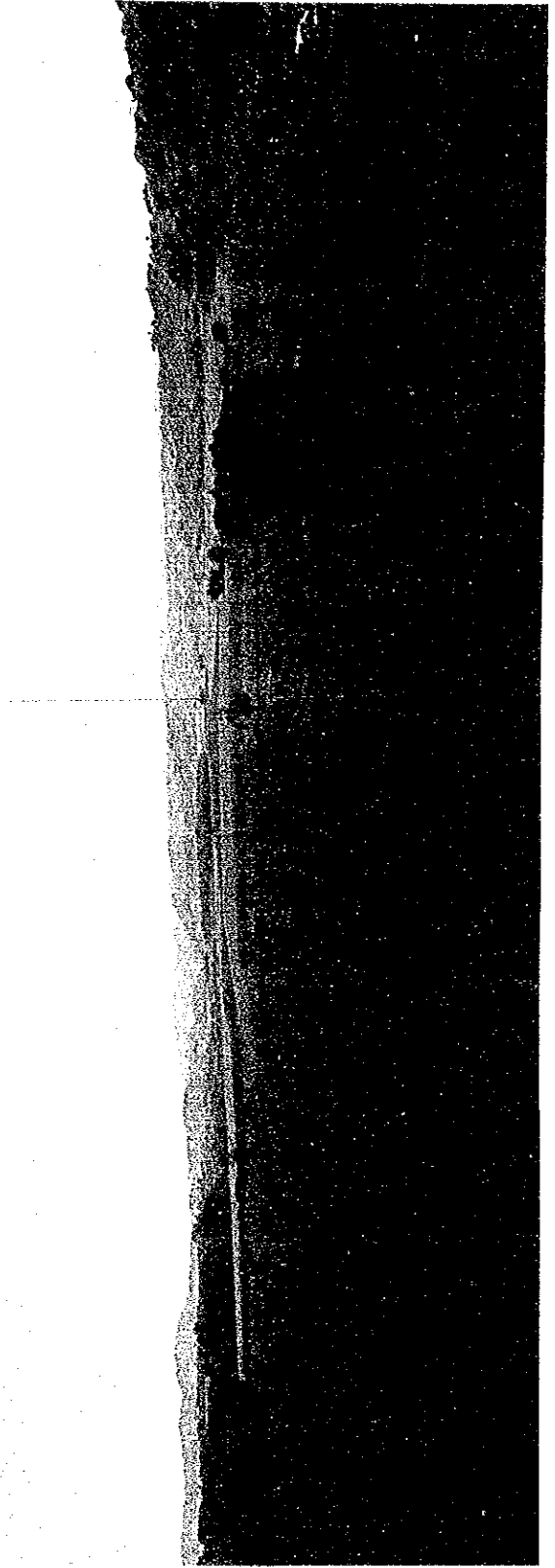
Japan International Cooperation Agency



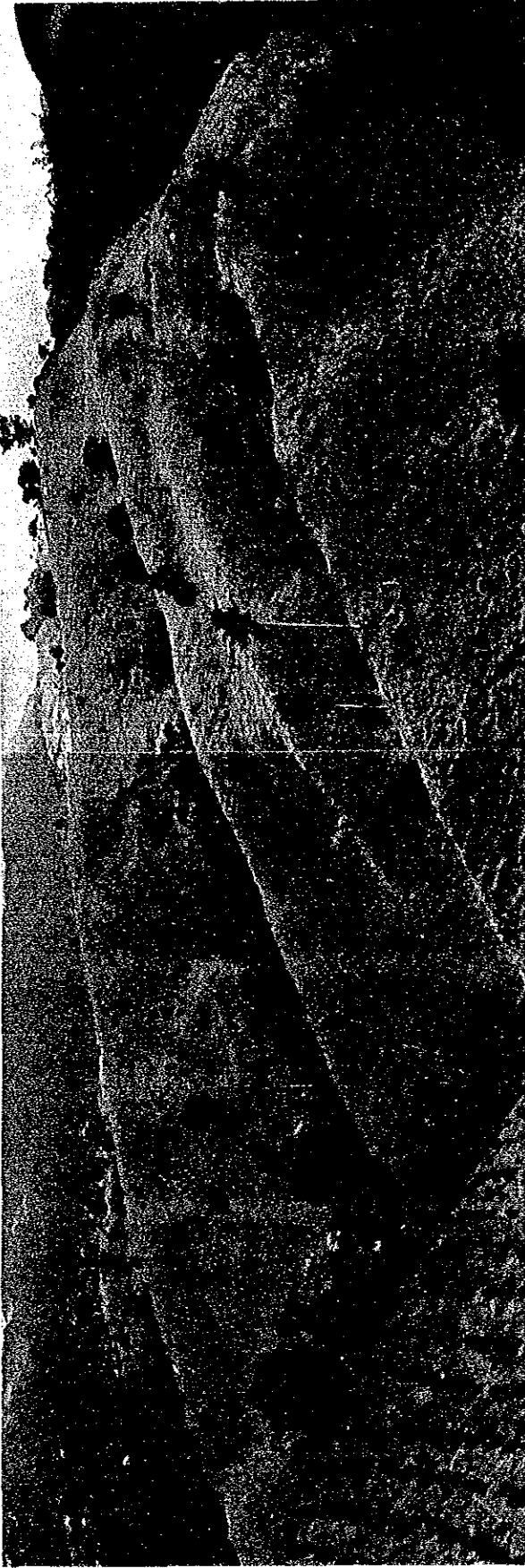
THE STUDY AREA



Circasia Area



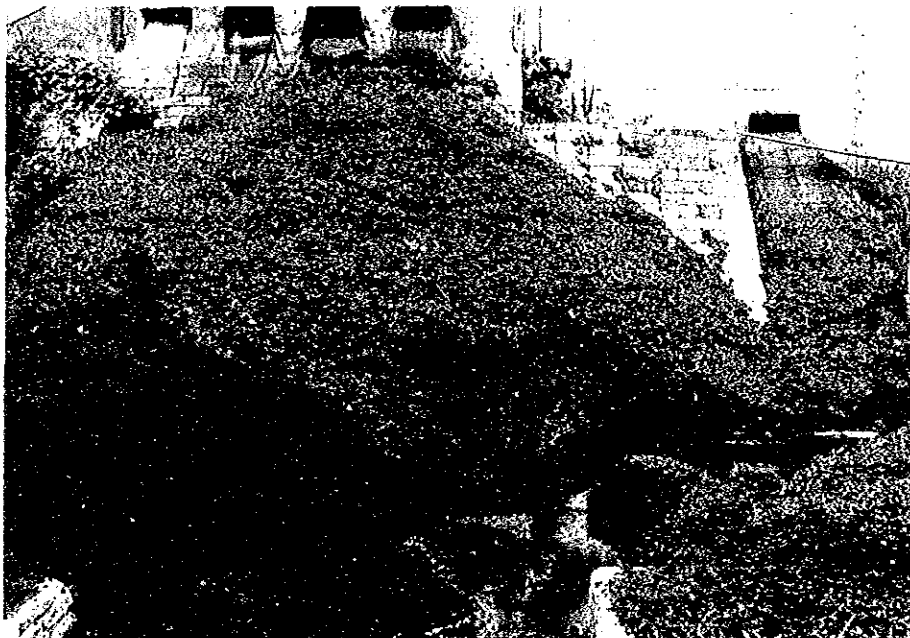
Quindio River Left Margin Area(1)



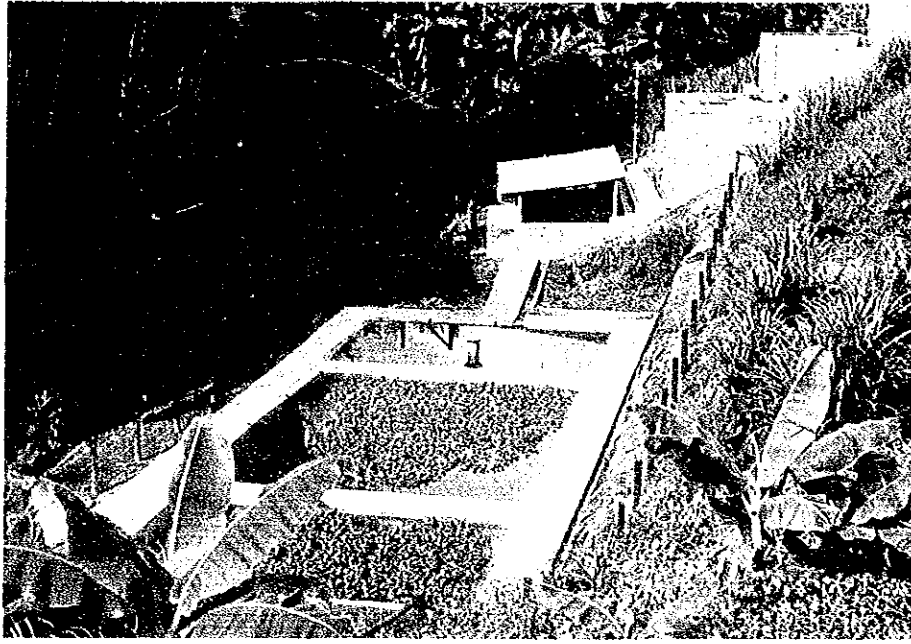
Salento Area



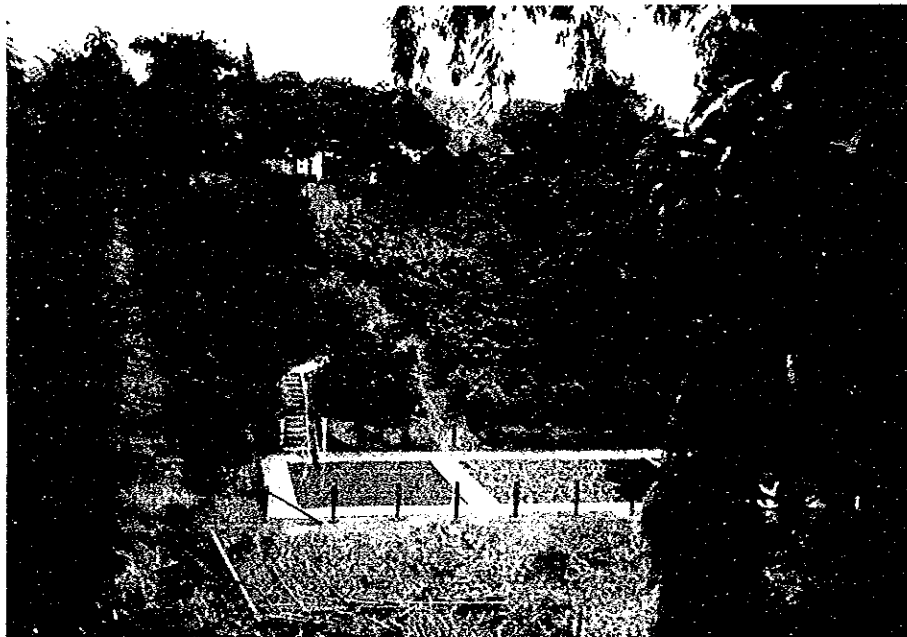
Cristales River polluted by Coffee Waste Water



Coffee Processing Plant and Waste Pulp



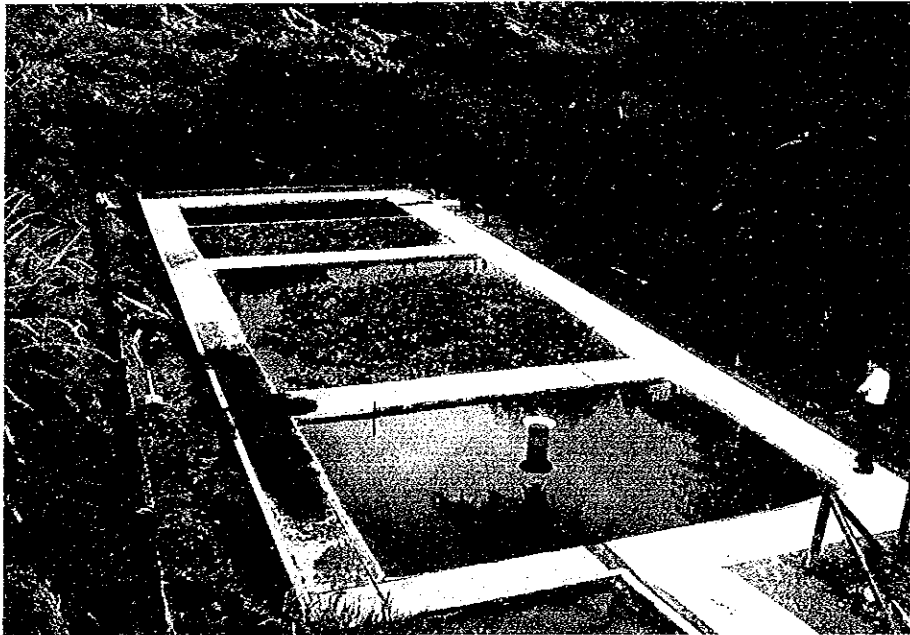
Model Plant (Sebastopol Plant)



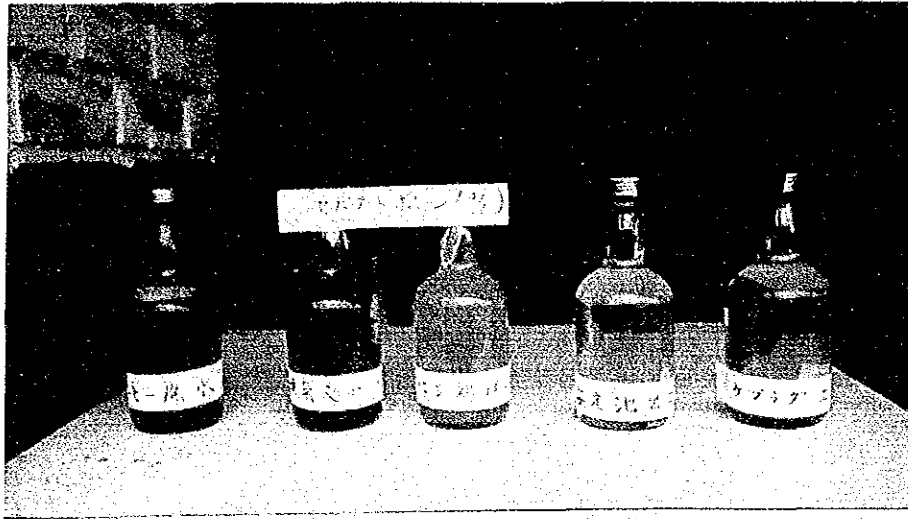
Model Plant (Rocio Plant)



Aerobic Reactor



Aquatic Plant Pond



Result of Treatment of Coffee Waste Water
with the Model Plant (Sebastopol Plant)



Result of Treatment of Coffee Waste Water
with the Model Plant (Rocio Plant)

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ABBREVIATION AND MEASURE

Banco Cafetero	Coffee Grower's Bank
Banco Ganadero	Livestock Farmer's Bank
BOD	Biochemical Oxygen Demand
Caja Agraria	Agrarian Industrial and Mining Credit Bank
CENICAFE	National Coffee Research Center
CICOLSA	Citrus of Colombia
COD	Chemical Oxygen Demand
COHOFRUQUIN	Cooperation of Horticultural Producers
CRQ	Regional Autonomous Corporation of Quindio
DANE	National Statics Department
DNP	National Planning Department
DO	Dissolved Oxygen
Fond-DRI	Integrated Rural Development Fund
EDEQ	Electric Enterprise of Quindio
EIRR	Economic Internal Rate of Return
EMPO Quindio	Public Enterprise of Quindio
ETC	Crop Evapotranspiration
ETP	Potential Evapotranspiration
FAO	Food and Agriculture Organization of the United Nations
FEDECAFE	National Federation of Coffee Growers
FIRR	Financial Internal Rate of Return
GDP	Gross Domestic Product
GNP	Gross National Product
GRP	Gross Regional Product
HIMAT	Colombian Institute of Hydrology, Meteorology and Land Improvement
ICA	Colombian Institute of Agriculture and Livestock
ICO	International Coffee Organization
IDEMA	Agriculture Market Institute
IGAC	National Geographic Institute
INCOMEX	Colombian External Trade Institute
INCORA	Colombian Institute of Agrarian Reform
INDERENA	National Institute of Renovatable Natural Resources
INS	National Institute of Health
JICA	Japan International Cooperation Agency

OPSA	Planning Office of Agricultural Sector
SENA	National Service of Apprenticeship
UASB	Upflow Anaerobic Sludge Blanked Process
UNDP	United Nations Development Program
URPA	Regional Unit of Agricultural Planning
USDA	United States Department of Agriculture

Monetary Unit

Col\$	Colombian Peso
US\$	United States Dollar
¥	Japanese Yen

Length

mm	Millimeter
cm	Centimeter
m	Meter
km	Kilometer

Weight

g	Gram
kg	Kilogram
Carga	125 kg
t	Ton

Area

m ²	Square Meter
km ²	Square Kilometer
ha	Hectare

Volume

m ³	Cubic Meter
l	litter

Others

l/s	Litter per Second
m ³ /s	Cubic Meter per Second
t/ha	Ton per Hectare
%	Percentage
C	Degree of Centigrade
a.s.l.	Above Sea Level

SUMMARY AND CONCLUSION

SUMMARY AND CONCLUSION

1. INTRODUCTION

This is a summary of the Feasibility Study on the Quindio Basin Integrated Agricultural Development Project. The report on this Study consists of the following three volumes:

- Volume I : Main Report
- Volume II : Annexes
- Volume III : Drawings

2. BACKGROUND

2.1 The Department of Quindio (hereinafter referred to as 'Quindio') is located at the western terrain of the Central Andean Range and is endowed with fertile soil and favorable climatic conditions. It has been developed as the major coffee production region in the Republic of Colombia. The agricultural sector in Quindio accounted for 23% of the Gross Regional Product (GRP) in 1988. Its share has been reduced from 37% in 1970 with the expansion of other sectors. Besides, the employment in agricultural sector accounts for 48% in Quindio, and the agriculture is still considered as a very important industry in Quindio.

2.2 However, the agriculture of Quindio mainly depends on the coffee production and the basis of the agricultural production is very weak. Introduction of new crops and advanced cropping pattern, development of marketing system and improvement of productivity of coffee are indispensable for the stable development of Quindio.

2.3 Small-scale farmers are concentrated in the area of above 1,800m A.S.L., which is not suitable for the coffee cultivation. Hence, the imbalance of incomes between the large-scale farmers who are

mainly cultivating coffee and the medium/small-scale farmers shows the imbalance of the areas. Area imbalance appears in every aspect such as the improvement of social infrastructures and it has become a big social problem in Quindio.

- 2.4 On the other hand, the water pollution in the rivers caused by waste water produced by processing of coffee beans is affecting the life of the people in Quindio. High attention has been paid on this particular problem and it needs to be solved for the improvement of the living conditions of the people as well as the protection of natural environment.
- 2.5 Based on the background mentioned above, the Regional Autonomous Corporation of Quindio (hereinafter referred to as CRQ) decided to prepare a master plan of Quindio for the development and promotion of its agriculture and animal husbandry sector with the technical cooperation of the Government of Japan. In this regard, the Japan International Cooperation Agency (hereinafter referred to as JICA) dispatched a Study Team to conduct a Master Plan Study from April 1986 to June 1988.
- 2.6 CRQ reviewed the projects recommended in the Master Plan and newly requested in August 1988 for the technical cooperation of the Government of Japan for carrying out the feasibility study of the projects which has been evaluated as having high priority and economic benefits in order to realize the early implementation of the projects. In response to the request, the Preliminary Survey Team was dispatched and concluded the Scope of Work (S/W) of this Study in September 1989. In compliance with the S/W signed between the Colombian side and the Japanese side, JICA dispatched a Study Team to conduct the required feasibility study in Colombia from March 1990 to June 1991.
- 2.7 The objectives of the Study is to conduct a feasibility study of the integrated agricultural development project in Quindio basin which includes an agriculture development plan mainly along the Quindio

river and a pilot plan for the preservation of water quality polluted by the waste water produced by processing of coffee beans.

3. BRIEF DESCRIPTION OF THE STUDY AREA

3.1 The Study Area is composed of the areas for the integrated agricultural development study and for the coffee waste water treatment study.

(1) Area for the integrated agricultural development study is 7,600 ha in total which is divided into seven (7) sub-areas as follows:

Circasia area	2,735 ha
Salento area	645 ha
Quindio river right margin area	2,040 ha
Quindio river left margin area (1)	610 ha
Quindio river left margin area (2)	175 ha
Pijao area	800 ha
<u>Genova area</u>	<u>595 ha</u>
Total	7,600 ha

(2) Area for the coffee waste water treatment study is 9,400 ha covered by the watershed of the Cristales river which is one of the branch rivers of the Quindio river.

3.2 Meteorological conditions of the seven (7) sub-areas are summarized below:

- | | |
|--------------------------------------|--------------------|
| (1) Average annual rainfall | : 1,600 - 2,800 mm |
| (2) Mean Temperature | : 15 - 22 deg C |
| (3) Annual average relative humidity | : 72 - 80% |

3.3 Topography of the Study Area is:

Area	Alutitude (m)	Area by Slope (%)					Total Area (ha)
		<3	3-8	8-15	15-35	35<	
Circasia	1,600 - 1,900	12	24	9	10	35	2,735
Salento	1,600 - 2,100	-	21	30	13	36	645
Quindio River Right Margin	1,000 - 1,200	21	26	9	15	19	2,040
Quindio River Left Margin (1)	1,000 - 1,200	64	31	3	-	2	610
Quindio River Left Margin (2)	1,000 - 1,200	48	19	14	14	5	175
Pijao	1,600 - 2,200	5	7	-	15	73	800
Genova	1,400 - 2,200	-	-	4	10	86	595

3.4 Ten (10) soil series are identified in the Study Area, seventy five percent (75%) of which are volcanic ash soil. General characteristics of the soils are:

- Medium fertility
- Good physical conditions

Soils having limitation for crop cultivation are as follows:

Limitation	Soil Series	Ratio of Area (%)		
		Right M.	Left M.(1)	Left M.(2)
Poor Drainage	CE, QU	1	100	31
Thin Soil Layer	AL	7	-	-

3.5 The existing land use is estimated based on the aerophotographs (from 1983 to 1986) and reconnaissance survey as shown below:

(unit: ha)

Area	Upland Crop	Coffee (single Cropping)	Coffee (Mixed Cropping)	Fruits	Grazing	Forest	Idle Land	Others	Total
Circasia (%)	5 (-)	243 (9)	424 (15)	0 (0)	1,660 (61)	370 (14)	25 (1)	8 (-)	2,735
Salento (%)	2 (-)	40 (6)	85 (13)	0 (0)	425 (66)	89 (14)	4 (1)	0 (0)	645
Right M. (%)	213 (10)	347 (17)	487 (24)	336 (16)	330 (16)	321 (16)	6 (-)	0 (0)	2,040
Left M. (1) (%)	276 (45)	0 (0)	0 (0)	0 (0)	267 (44)	56 (9)	11 (2)	0 (0)	610
Left M. (2) (%)	0 (0)	47 (27)	17 (10)	1 (-)	82 (47)	27 (15)	1 (-)	0 (0)	175
Pljao (%)	3 (-)	28 (4)	270 (34)	2 (-)	361 (45)	97 (12)	20 (3)	19 (2)	800
Genova (%)	1 (-)	38 (6)	242 (41)	0 (0)	210 (35)	63 (11)	41 (7)	0 (0)	595
Total (%)	500 (7)	743 (10)	1,525 (20)	339 (4)	3,335 (44)	1,023 (13)	108 (1)	27 (-)	7,600

3.6 Main crops in the Study Area are coffee, plantain and cassava. However, other crops cultivated respective study areas are different because of variation of natural conditions. The farm practices mainly depend on man power except for large-scale upland crop cultivation in the Quindio river Right and Left Margin areas. An irrigation system is not adopted in almost all farms because of high rainfall.

3.7 The problems of farming practice exist mainly in the cultivation of crops other than coffee and they are identified as follows:

- Insufficient technical extension services such as fertilizer application and disease control.
- Erosion in steep slope land
- Ineffective use of fertile land
- Insufficient rural roads for transporting products
- Less development of marketing system except for coffee, plantain, cassava and cereals

3.8 Cattle is widely raised in pastures in the Study Area. They are mainly fed by the natural grass and concentrated feed is not usually made. HOLSTEIN is kept as a milk cow. PARDO SUIZO and NORMANDO are for double purposes, and CEBU is for meat. The meat steers are raised mainly along the Vieja river and milk cows are kept on mountainous areas. Most of grazing land in the Study Area lie on the slope land, and cattle paths and footprints induce gully erosion in some places. It is one of the demerits of continuous grazing.

3.9 Present characteristics of farming practices in the Study Area are as shown in the following table:

Item Area	Area (ha)	Coffee # Suitable Area(%)	Coffee Planted Area(%) Imp. Y Tra. Y Mixed** Cropping	Grazing Land (%)	Livestock***	Other Farming Practices	Others
Circasia	2.735	7	11 14 15	61	Double purpose (meat & milk)(90%) Improved pasture(76%).	Tomato(mixed cropping with coffee), Small scale upland farming, Vegetable for self-consumption, fruit(tree tomato)	Small scale farmer (86%) Damage of high humidity and hailstorm, Considerable unused grazing land.
Salento	845	0	7 12 13	66	Dairy cattle(50%) Double purpose(40%) Natural pasture(93%).	Fruits and vegetables for self-consumption.	Considerable unused grazing land
Quindio River Right Margin	2.040	92	37 3 24	16	Beef cattle(57%) Double purpose(43%) Improved pasture (100%).	Cassava(mixed cropping with coffee), Large scale upland farming with mechanization, Citrus, Fruits(Pitahaya etc.)	Juice material expansion area, Expanding fruits, Thin soil layer(7%).
Quindio River Left Margin(1)	610	-	0 0 0	44	Double purpose(33%) Beef cattle(22%) Dairy cattle(20%) Natural pasture(39%).	Large scale upland farming with mechanization(Soybean and sorghum)	Poor drainage land(100%)
Quindio River Left Margin(2)	175	57	33 3 10	47	Double purpose(58%) Beef cattle(22%) Dairy cattle(20%) Natural pasture(39%).	Citrus.	Poor drainage land(31%)
Pijao	800	-	4 34 34	45	Double purpose(97%) Natural pasture(59%).	Small scale upland and fruits, Vegetable for self-consumption.	Considerable unused grazing land
Genova	595	20	7 40 41	35	Beef cattle(41%) Double purpose(31%) Natural pasture(69%).	Small scale upland and fruits, Vegetable for self-consumption.	Considerable unused grazing land

*:I. 100-1. 600m A.S.L. ** :Mainly plantain *** :Source: Caja Agraria(1989)

- 3.10 Very few irrigation systems exist in the Study Area. Due to the comparatively ample amount of annual rainfall of 1,600 - 2,800 mm, the farmers usually are performing rainfed cultivation. On the other hand, some drainage canals can be observed in the lower part of the Quindio River Left Margin Areas.
- 3.11 Almost all the farm roads in the Study Area have been constructed and maintained by the Coffee Committee or individual farmers. Most of these roads are unpaved and 2-3m wide. The density of the farm roads is very low.
- 3.12 All farmers except for some illegal inhabitants are receiving domestic water supply and electricity supply.
- 3.13 The Cristales river, which is selected for the coffee waste water treatment study, is about 30km in length and flows out from southwest edge of Armenia city at an altitude of 1,400m to the Pisamal at 900m. The study area which corresponds to the catchment area of the Cristales river is 9,400 ha of which coffee cultivated area shares 75%.
- 3.14 From the view of water consumption, the coffee processing method in each farm is classified roughly into the following two (2) types:
- (1) Water is used for cherry's transportation, classification and washing of fermented coffee.
 - (2) Water is mostly used for washing of fermented coffee.
- 3.15 According to the results of water analysis by CRQ and existing references, the characteristics of fresh waste water from the wet coffee processing method are as follows:

pH	:	3.5 - 4.7
Organic substances		
BOD 5	:	3,000 - 10,000 mg/l
CODcr	:	5,000 - 15,000 mg/l
Suspended Solid	:	2,000 - 3,000 mg/l

3.16 The coffee cultivation area in the Cristales at present is 7,095 ha with 670 coffee farms. Average scale is 10.6 ha per farm.

Cultivated area	5ha or less	5-30 ha	30ha or more	Total
Number of farm	285	330	55	670
Ratio (%)	42.5	49.3	8.2	100

3.17 The average amount of coffee waste water in the Study Area is estimated to be 15-30 l/kg (dry beans).

4. DEVELOPMENT CONCEPT

4.1 The development concept in establishing the proposed integrated agricultural development plan is as follows:

(1) Rationalization of land use by means of crop diversification

By introducing high remunerative crops which are suitable for natural conditions of respective areas to the low-productive pastures and coffee cultivation lands where its conventional varieties are planted, the rationalization of land use is considered.

For the promotion of diversification of crops, the improvement or introduction of the following are necessary:

- 1 Improvement of organizations which support extension, tests and studies, agriculture finance, etc. for the crops other than coffee
- 2 Establishment of producer's unions
- 3 Improvement of cultivation environment such as improvement of poor drainage
- 4 Improvement of transportation system
- 5 Improvement of crop gathering and transporting facilities

(2) Rectification of income imbalance of farmers

The rectification of income imbalance between areas and farm sizes is improved by rationalization of land use mentioned above.

(3) Preservation of environment

Preservation of soil and upkeep/uplift of water resources build-up capabilities are essential for supporting continuous agricultural production activities. Crop selection and farming system that take into account preservation of soil, upkeep/uplift of water resources build-up capabilities and supply of firewood to farmhouses for maintaining current forest area are considered as a measures for preservation of the environment of the area.

(4) Facility planning

In establishing this Integrated Agricultural Development plan, the approach to the project with the viewpoint of the integrated rural development in addition to the agricultural development is taken in mind in consideration of the existing

specific features of the Study Area such as topography, land use and availability for future development/improvement and the development target.

Therefore, in planing the agricultural water development, not only irrigation water but also domestic water supply is considered in view of its importance for the farmers in the area. In planing farm road system, the overall transportation system in and around the Study Area is also taken in mind.

4.2 The development concept in establishing the proposed coffee waste water treatment system is as follows:

(1) Standard of water quality improvement

The standard of water quality of the treated coffee waste water to be discharged to the rivers is proposed in consideration of the standard which is adopted in Colombia presently and the utilization of river water at the downstream section for irrigation, domestic water, inland fishery, etc.

(2) Water treatment system

The proposed treatment system is finalized in consideratino of the easiness of operation and maintenance and applicability of the system to other areas as well as its technical and eonomic validity. The proposed system is examined for its adaptability in a laboratory.

(3) Pilot area

The pilot area is selected from the Cristales river basin in consider of the following factors:

- To represent the whole study area of the Cristales river basin as a pilot area

- To cover a whole water shed that makes it possible to show the effect of treatment clearly
- To have the effect for demonstration

(4) Model plant

In order to verify the effectiveness of the proposed waste water treatment system, two model plants are constructed at the selected coffee farms in the pilot area. The scale of the plants are of small and medium, and two sites are selected in consideration of the following:

- To be located within a watershed and near-by each others
- To be cooperative for the treatment
- To have a reasonable technical level

(5) Others

A proposal for the treatment of waste of depulping and excess sludge generated from waste water treatment is discussed.

5. AGRICULTURAL DEVELOPMENT

5.1 The basic concept for the future land use plan are as follows:

(1) Acceleration of appropriate land use

The present inappropriate land use has resulted in loss of top soil and other disasters such as flood. Considering these situations, the land use plan is proposed mainly in accordance with the land classification.

(2) Conservation of existing forest area

Forest area including bamboo area shares only 13 percent of the total Study Area. In the light of maintenance of ecological balance and water resources, the existing forest area is conserved.

(3) Maintaining the coffee area planted with its improved Variety

Basically, the coffee area planted with its improved variety is kept unchanged in consideration of its good marketing situations and stable income for farmers.

(4) Converting from grazing land and traditional coffee planted area into high-productivity crop area

The areas where the coffee planting is not suitable are mainly used for grazing lands or coffee areas with its traditional variety. The productivity of these areas is low. To improve the income of the farmers in coffee unsuitable area, the plants of these coffee unsuitable areas are converted into other suitable crops and farming systems suitable for respective areas are planned. However, the conversion of grazing land into high-productivity crop areas is limited to the range that make it possible to maintain the present livestock production level.

(5) Maintaining existing upland crop cultivation area

Though upland crop cultivation area in Quindio River Right Margin Area is possible to convert into high productive crop area such as fruits area, the area is maintained because the farmers in the area have invested much to the agricultural mechanization.

5.2 The hectarage of the proposed land use based on the basic concept mentioned in 5.1 is shown in the following table:

(Unit:ha)

Land Use	Circasia		Salento		Right Margin		Left Margin(1)		Left Margin(2)		Pijao		Genoyz	
	Ex.	Plan	Ex.	Plan	Ex.	Plan	Ex.	Plan	Ex.	Plan	Ex.	Plan	Ex.	Plan
Upland crop	5	195	2	13	213	213	276	310	0	0	3	10	1	0
Coffee	667	246	125	46	834	763	0	0	64	58	298	36	280	43
Fruit-1*	0	606	0	0	336	371	0	0	1	1	2	0	0	0
Fruit-2**	-	596	-	212	-	42	-	0	-	7	-	414	0	364
Grazing	1,660	714	425	285	330	330	267	244	82	82	361	224	210	126
Forest	370	370	89	89	321	321	56	56	27	27	97	97	63	63
Idle land	25	0	4	0	6	0	11	0	1	0	20	0	41	0
Others	8	8	0	0	0	0	0	0	0	0	19	19	0	0
Total	2,735	2,735	645	645	2,040	2,040	610	610	175	175	800	800	595	595

*:Fruit planted area in Zonel-3 **:Fruit planted area in Zone 4 and 6.

5.3 The basic concept for the proposed agricultural production plan are as follows:

(1) Maintaining the present livestock production level

With the conversion of the existing pasture into the other crop areas, the hectareage of the pasture is reduced. However, the present livestock production level is maintained by the introduction of the improved breeding technique and improved varieties of grass in compliance with the high demand of livestock products in the market.

(2) Improvement of self-sufficiency of agro-products in Quindio through diversification of crops

"Crop Diversification Program in Coffee Unsuitable Area by Bureau of Agriculture, Quindio" is promoted in the Project. Most of vegetables and fruits consumed in Quindio are imported from the other Departments. By promoting this plan, the self-sufficiency of vegetables and fruits in Quindio will be improved.

(3) Production of raw materials materials for agro-industry

A plant of citrus fruit is under construction in Armenia and expected to complete in June 1991. The Coffee Committee is promoting the production of raw materials for this plant. Quindo River Right Margin and Left (2) Margin areas are included in the promotion area by the Committee. Therefore, in the Project, the production of raw materials for the plant in these areas is planned.

(4) Preservation of environment

In the Project, the prevention of soil erosion and improvement of water resources build-up capabilities by introducing crop production and farming system suitable for natural conditions of the respective areas are planned. Furthermore, the supply of firewood to farmhouses by planting forage tree and wind-breaker is also proposed in order to preserve the existing forest resources.

5.4 Seven (7) sub-areas of the study Area are classified into four(4) groups based on the natural conditions of respective areas. The proposed crops to be increased for respective groups in consideration of the basic concept for agricultural production plan are shown below:

Group	Sub-Area	Characteristics of Natural Conditions	Target crops
1	Circasia	High rainfall Low temperature	Vegetables Fruits
2	Quindio Right M. Left M. (2)	Suitable for coffee cultivation	Raw materials for fruit juice
3	Quindio Left M. (1)	Flat Poor drainage	Upland crops (forage crops)
4	Salento Pijao Genova	Steep Slope	Fruits

5.5 The proposed farming system in consideration of the preservation of environment is as follows:

(1) Upland with gentle slope:

To implement contour line cultivation and to promote such a plantation form that the length of time when the soil surface is exposed is minimized by promotion of mixed cropping and intercropping.

(2) Coffee field:

Weeding is currently made with sickles even for the fields with steep slope, and it causes soil erosion. Erosion is extremely minimized when weeding is made with machetes. The use of machetes is promoted.

(3) Grassland:

To promote the provision of erosion prevention zones by planting forage trees and cultivating pasture for cutting. As for renewal of pasture, it is necessary that sequential renewal is made in band form along the contour line, instead of renewal of the entire area at a time.

(4) Upland with steep slope:

To promote provision of erosion prevention zones like in grassland in order to prevent occurrence of both of water erosion and wind erosion. The erosion prevention zones are proposed to provide along contour line.

5.6 The proposed crop production based on the proposed farming system is as shown in the following table:

(Unit:ton)

Area	Crop	Tomato	Onion	Green Pea	Green Bean	Kidney Bean	Soy-Bean	Sorghum	Maize	Cassava	Cofee imp. V.	Plantain Mixed Single	Citrus Pitahaya	Passion fruit	Black berry	Lulo	Tree Tomato	
Circasia		10.922	1.185	98	14	0	0	0	0	0	394	0	0	0	4.426	2.850	6.625	
Salento		344	120	0	6	0	0	0	0	0	69	68	0	0	701	420	1.050	
Quindio River Right Margin		731	0	0	134	400	180	120	1.340	1.318	2.275	1.800	3.600	480	300	0	0	
Quindio River Left Margin(1)		0	0	0	0	828	743	0	0	0	0	0	0	0	0	0	0	
Quindio River Left Margin(2)		86	0	0	10	0	0	0	40	97	63	0	144	0	12	0	0	
Pijao		258	90	0	5	0	0	0	0	46	92	0	0	0	1.386	830	2.075	
Genova		0	0	0	5	0	0	0	0	49	72	0	0	0	1.219	780	1.825	
Total		12.341	1.395	98	174	1.228	923	120	1.380	1.973	2.633	1.800	3.744	480	312	7.732	4.630	11.575

5.7 The implementation of the research and investigation of crop farming technology to be newly introduced in this Project, research of gathering and transportation systems, investigation of crop treatment method, etc. is indispensable for the success of the Project.

The establishment of an organization of research/investigation, extension and marketing is strongly recommended.

5.8 The facilities to be constructed in the Project are as follows:

(1) Farm roads

Study area	New Road (km)			Existing Road (km)				Grand Total (km)	Area (ha)	Road Density (m/ha)
	Main (km)	Branch (km)	Sub-Total (km)	Main (km)	Branch (km)	National Provincial (km)	Sub-Total (km)			
Cristales	4.2	36.9	41.1	7.1 [7.1]	23.9 [23.9]	17.0	48.0	89.1	2,735	32.6 (17.6)
Salento	1.8	15.9	17.7	6.3 [6.3]	1.5 [1.5]	7.8	15.6	33.3	645	51.6 (24.2)
Quindio Right	2.6	18.1	20.7	22.9 [3.9]	26.2 [10.5]	-	49.1	69.8	2,040	34.2 (24.1)
Quindio Left(1)	-	9.9	9.9	5.7 [2.0]	1.8 [-]	-	7.5	17.4	610	28.5 (12.3)
Quindio Left(2)	-	1.5	1.5	- [-]	2.3 [1.5]	-	2.3	3.8	175	21.7 (13.1)
Pijao	3.9	19.9	23.8	2.7 [2.2]	2.5 [2.5]	7.9	13.1	36.9	800	46.1 (16.4)
Genova	1.8	17.3	19.1	4.7 [2.3]	5.8 [5.8]	6.3	16.8	35.9	595	60.3 (28.2)
Total	14.3	119.5	133.8	49.4 [23.8]	64.0 [45.7]	39.0	152.4	286.2	7,600	37.7 (20.1)

Note: [] shows the improvement
() shows the existing

(2) Irrigation facilities

Irrigation Area	Area (ha)	Pumping Capacity (l/min)	Pump Head (m)	Diameter (mm)	Farm Pond Capacity (m ³)
Circasia Area					
C-A Area	10.0	42.93	35.0	150	420
C-B "	19.0	228.45	20.0	200	715
C-C "	9.0	46.13	40.0	150	370
Quindio River Right Margin Area					
Q-A Area	10.0	66.19	27.5	150	405
Q-B "	9.0	78.24	15.0	150	355
Q-C "	14.0	219.40	33.0	300	500
Q-D "	7.0	55.76	27.5	150	280
Q-E "	18.0	235.66	19.0	200	670
Q-F "	6.0	58.93	36.5	150	235
Q-G "	10.0	180.00	58.0	300	345

For lifting water from streams to the field, non-power pump (RAM) system is adopted considering operation and maintenance costs. For irrigation in the fields, portable irrigation units with Diesel engine are proposed.

(3) Drainage canals

Area	Total Length (km)
Quindio Left M.(1)	10.8
Quindio Left M.(2)	0.8

(4) Marketing and agroindustry facilities

5 locations (2 for Circasia, 1 for Salento, Pijao and Genova)

(5) Research and investigation facilities

1 for Circasia

6. COFFEE WASTE WATER TREATMENT PLAN

The proposed coffee waste water treatment plan is prepared for the Chispero River basin, one of the branch streams of the Cristales River, as a pilot area on the basis of the following basic concept:

- (1) The target of the water quality improvement shall be within the practicable limit.
- (2) The treatment system shall be the one that can be operated without any high technique and maintained easily as well as that can be constructed economically.
- (3) The proposed system can be adaptable to other coffee production areas in Colombia as well as Quindio.

6.2 The proposed standard for discharge of coffee waste water is as follows:

Item	Standard Value (Daily Average)	Allowable maximum Value
Appearance odor and taste	To be normal	To be normal
Temperature(oC)	<40	<40
PH	5.8 - 8.6	5.8 - 8.6
BOD5(mg/l)	<40	<60
CODcr(mg/l)	<300	<450
DO(mg/l)	> 5	> 3
Suspended Solid(mg/l)	<30	<45
Nitrate nitrogen (mg/l)	<10	<45
Number of coliform group (MPN/100ml)	5,000	10,000
Organic phosphate(mg/l)	<0.05	<0.05
Cu(mg/l)	<0.20	<0.20

: Maximum allowable value shall not exceed for 24 hr continuously

6.3 The proposed treatment system is determined to be the combination of the following 3 methods:

- 1 First treatment : Anaerobic Bio-reaction
- 2 Second treatment : Aerobic Reaction
- 3 Third treatment : Stabilization Pond with Aquatic Plant

In addition, neutralization of the waste water with lime-stone before the first treatment is proposed due to the waste water being acid (approx. pH 4). The treatment plant is proposed to install in individual farm in general.

6.4 The general features of Chispero Pilot Area are as follows:

Item	Description
Altitude	1,200 - 1,280 m
Topography	Generally gentle sloped valley
No. of farms	100 ha or more : 1 50 - 100 ha : 3 30 - 50 ha : 5 20 - 30 ha : 8 10 - 20 ha : 8 5 - 10 ha : 8 1 - 5 ha : 15 1 ha or less : 4 Total 52
Hectarage of farm land	1,020 ha (11.3% of Cristales total)
Hectarage of coffee area	918 ha (12.1% of Cristales total)
Infrastructure	<ul style="list-style-type: none"> - Accessible from Armenia through National Road - Unpaved road inside the area: 6 - 8 km - Most of the farms are located along the roads - Electricity and water is available

6.5 Two (2) model farms (Sebastopol and El Rocio) are selected from the pilot area in order to install the model plants and to collect the basic data through actual coffee waste water treatment.

7. PROJECT IMPLEMENTATION

7.1 The project executing agency shall be CRQ. Consulting firm(s) shall be employed for the detailed design of the facilities of the Project and supervision of the construction works under the responsibility of CRQ. Construction works shall be of the contract basis and the contract shall be awarded to contractor(s) by means of tendering. The agricultural development committee and the project executing office shall be established in CRQ for executing the construction works.

7.2 The project implementation schedule is prepared in considering that an early completion of the project components, the benefits of which are expected at an early stage and that realization of the plan is desirable from the social point of view. The overall project period is set at five (5) years in consideration of the project cost, the budget of Colombian Government for the project and the capacity of the executing agency to be established.

Item	Year	1st	2nd	3rd	4th	5th
I. Detail Design						
1. Toposurvey		■				
2. Detailed Design and Preparation of Tender Documents		■				
3. Tendering			■			
II. Construction Works						
1. Land Acquisition		■				
2. Administration Work		■	■	■	■	■
3. Road Improvement incl. Drainage canal		■	■	■	■	■
4. Irrigation Facilities			■	■	■	■
5. Agroindustry Facilities				■	■	■
6. Research Center Facilities			■	■		
7. Waste Water Treatment Facilities			■	■	■	■
8. Procurement of O/M Equipment						■
9. Supervision			■	■	■	■

7.3 The project cost including physical contingency is 6.722 million col\$, of which the foreign components is 4.967 million col\$ (74%). However, the above cost does not include price escalation.

The breakdown of the project cost is as shown below:

(Unit: Col\$1,000)

Item	Project Cost		
	Foreign Currency	Local Currency	Total
1. Construction Cost of Agriculture Development			
1) Construction Cost			
- Farm Road (Incl. Drainage Canal)	1,074,010	637,710	1,711,720
- Irrigation Facilities	738,360	452,160	1,190,520
- Agroindustry Facilities	31,440	15,630	47,070
- Research Center	48,500	15,500	62,000
Sub Total	1,890,310	1,121,000	3,011,310
	(3,581)	(2,125)	(5,706)
2. Construction Cost of Coffee Waste Water Treatment Facilities	408,880	252,130	661,010
	(775)	(478)	(1,253)
3. Land Acquisition Cost	0	5,000	5,000
		(9)	(9)
4. General Cost			
1) Procurement Cost of O/M Equipment	377,180	0	377,180
2) Administration Cost	0	47,600	47,600
3) Engineering Services Cost	1,835,420	114,390	1,949,810
Sub Total	2,212,600	161,990	2,374,590
	(4,193)	(307)	(4,500)
5. Physical Contingency	455,490	214,310	669,800
	(863)	(406)	(1,269)
Total	4,967,280	1,754,430	6,721,710
	(9,412)	(3,325)	(12,737)

() : US\$1,000

- 7.4 The operation and maintenance cost is estimated to be 88 million col\$ per annum. Machines and vehicles are replaced at the end of respective durability.

The annual operation and maintenance cost shall be born by the beneficial farmers.

8. PROJECT JUSTIFICATION

- 8.1 The Criteria for the project evaluation are shown as follows:

(1) The Quindio Basin Integrated Agricultural Development Project is composed of two projects, i.e., Agricultural Development Project and Coffee Waste Water Treatment Project. The feasibility of the former project is evaluated through economic evaluation upon analysis of the benefit and cost of the project. Regarding the latter, on other hand, since the benefit obtained as a result of implementation of the project is hardly to measure, the effect of natural conditions and social impact are applied as the criteria for its evaluation.

(2) The period of evaluation is fifty years from start of the works.

(3) The prices of agricultural products are calculated based on the farm gate prices in the Department of Quindio in the latter half of 1990.

(4) The construction cost of project facilities is calculated based on the market prices in September, 1990.

- 8.2 IRR for the whole Study Area and each study area are calculated and the results of the analysis are as follows:

(1) IRR for the whole Study Area : 14.5 %

The result of IRR exceeds 12 %, which is the value of the opportunity cost of the capital in Colombia. It can, therefore, be said that implementation of the project is economically feasible.

(2) IRR by area

Group	Area	IRR(%)
1	Circasia	28.4
2	Quindio River Right Margin	10.7
	Quindio River Left Margin(2)	20.4
3	Quindio River Left Margin(1)	10.5
4	Salento	23.3
	Pijao	21.2
	Genova	17.9

The above result shows that the economic effect to be obtained by implementation of the Project will be high in the areas in Groups 1 and 4, where agricultural development has not yet made good progress by this time. On the other hand, in the areas in Groups 2 and 3, where agricultural development has already obtained relatively good progress by this time, the growth of the economic effect to be obtained by implementation of the Project will be less than the average figure except for Quindio River Left Margin (2) Area.

8.3 The result of sensitivity analysis is shown below:

Case	IRR(%)
1) Original case	14.5
2) 15% increase of construction cost	13.0
3) 15% reduction of construction cost	16.4
4) 15% increase in price of agricultural products and/or yield	17.4
5) 15% reduction in price of agricultural products and/or yield	11.8
6) Two years delay of appearance of project benefit	11.9
7) Three years delay of appearance of project benefit	11.0

It was found as a result of sensitivity analysis that profitability of the Project makes response more sensitively to increase/decrease of the benefit than to that of cost and that delay of occurrence of benefit extremely spoils profitability of the Project. Therefore, it is important that the agricultural research and extension centers will produce excellent results together with efforts of farmers themselves, in order to achieve the yield of agricultural products targeted with the Project.

8.4 The variation of farm economy which occurs as a result of implementation of the Project is estimated for each group. The estimation is made for model farms of large-scale (30ha), medium-scale (15ha) and small-scale(5 ha) suitably established. The result of the calculation is as shown below:

FARMHOUSE ECONOMY OF MODEL FARMHOUSE BY GROUP

(Unit: Col\$ 1,000)

Group	Area	Farm Size	Gross Production	Production Cost	Income	Ratio (P/Ex)
1	Circasia	Large Scale Ex. (30 ha)	6,027	3,910	2,117	6.1
		Plan	25,256	12,358	12,898	
		Medium Scale Ex. (15 ha)	3,174	2,083	1,091	7.1
Plan	14,897	7,112	7,785			
2	Quindío River Right Margin, Left Margin (2)	Large Scale Ex. (30 ha)	18,077	8,662	9,415	1.1
		Plan	18,635	8,710	9,925	
		Medium Scale Ex. (15 ha)	9,026	4,325	4,701	1.1
Plan	9,458	4,350	5,108			
3	Quindío River Left Margin(1)	Large Scale Ex. (30 ha)	10,389	5,874	4,515	1.9
		Plan	17,137	8,681	8,456	
4	Salento, Pijao, Genova	Large Scale Ex. (30 ha)	12,305	6,453	3,892	2.5
		Plan	21,016	11,652	9,464	
		Medium Scale Ex. (15 ha)	3,065	2,191	874	6.3
Plan	10,616	5,126	6,490			
4	Salento, Pijao, Genova	Small Scale Ex. (5 ha)	1,025	732	293	6.3
		Plan	3,514	1,709	1,832	

As it is apparent from the above table, improvement of income can be expected at farmhouses of all the areas as a result of implementation of the Project. There are large differences in the income at present between areas of Group 2 and 3 where agricultural development has made progress with coffee production or large-scale mechanized farming and other areas where agricultural development has been delayed. But it is anticipated that these differences by area will be almost gone or that the income level in said other areas will become even better.

Furthermore, when the figures are observed by the farm size, it can be estimated that the growth of income of medium- and small-scale farmers will be larger than that of large scale farmer.

8.5 Implementation of coffee waste water treatment should be given first priority in the Project considering following results of the study.

- (1) Removal ratio is expected to achieve 95 % by treatment of the plant. The treated water can be used for domestic water with simplified treatment as well as for irrigation and fish culture.
- (2) Construction cost of the waste water treatment plant of the whole pilot area, which consists of 52 farmhouses and 918 ha of coffee planted area, is estimated at Col.\$ 661 million accounting for Col.\$ 720,400/ha. Construction cost by farm size is that, for example, 5 ha of coffee planting farmer is estimated at Col.\$ 3,600 thousand and 20 ha at Col.\$ 14,400 thousand.
- (3) The amount to be born by farm size is that 5 and 20 ha farmers reach Col.\$ 145,400 and 581,760 (1% O/M cost included), respectively on the assumption that durable period of the treatment facility is 25 years.
- (4) The expense to be born by farmer accounts for from 2 to 3 percent of production cost of coffee. Therefore, a farmer can disburse the expense. And the disbursement of farmers will be alleviated by subsidy of Coffee Committee.
- (5) Environmental conservation is essential element for sustainable development of regions in recent years. Therefore, expansion of the coffee waste water treatment plant as well as purification of domestic and industrial sewerages should be urged.

- (6) To implement coffee waste water treatment prior to other sewerage treatments such as domestic and industrial sewerages is significant step for river water quality improvement.
- (7) The high effects of demonstration for enlightenment of environmental conservation will be expected by the construction of coffee waste water treatment plants for all coffee planted farmers in Chispero river basin, where is selected as the pilot area and consists of 52 coffee planted farmers.
- (8) Implementation in the order of their farm size will give a remarkable effect even in the case that all farmers would not be able to attach the plant from the beginning of the Project. The removal ratio of the river water pollution is estimated at 85 %, if the plants of 17 farmers cultivating coffee more than 10 ha are implemented.
- (9) The above estimation can be also applied to the whole Cristales river basin. Alleviation effect of the contamination expected by the construction of the plants by farm size is estimated as follows:

Case	Removal ratio (%)
Large scale Farmers	60 %
Large scale and medium scale farmers	90 %

Therefore, the construction of coffee waste water treatment plant in the whole Cristales river basin is proposed to enhance the exhibition effect and to expand the alleviation effect.

- 8.6 Appearance of the following secondary effects and indirect effects such as increase of farm productivity, reduction of transportation cost, increase of opportunities of employment for construction

works and farm production and effect of propagation to the regional society can be expected as a result of implementation of the Project.

- (1) Increase of opportunities of employment accompanying the project construction works.
- (2) Increase of processing and distribution operations caused by increase of agricultural products and inputs.
- (3) Increase of opportunities of employment accompanying conversion of farming system from extensive agriculture to intensive one.
- (4) Improvement of living standard caused by stabilization of farmhouse economy and increase of volume of distribution of farming materials and equipment will make contribution to the activation of the economy in and around the areas.
- (5) The development technique adopted in this area will give impact to the agricultural development in the similar areas of Colombia, and in its turn will make contribution to the development of the agriculture in Colombia.
- (6) The proposed coffee waste water treatment method will become a model of coffee waste water treatment in Colombia, and will be able to make major contribution to the improvement of environment of the coffee producing areas.

8.7 The following measures are taken into the Project against the influence over the environment by the implementation of the Project:

- (1) Farming system considering prevention of soil erosion is introduced for the slope area.

- (2) The present forest area excluded from the project development. Therefore, deterioration of the natural environment caused by decreasing forest area can be prevented.
- (3) Rehabilitation of rural roads is the main works of civil engineering works. Therefore, the civil engineering works will not exert adverse effect such as serious contamination to water quality, atmosphere, soil, etc.
- (4) Soil erosion will be prevented at both grassland and farm land by this agricultural development, and in addition, water retention capacity and recharging capacity of water resources will also be improved in the whole area.
- (5) If the proposed coffee waste water treatment is implemented, purification of river water will be achieved.

8.8 The environment improving effects which can be expected as a result of implementation of the Project are as described below:

- (1) Reduction of soil erosion in farm land and grazing land and increase of water retention capacity of soil by introducing the new farming system.
- (2) Reduction of cutting of forest trees and wind erosion by introduction of erosion protection belt.
- (3) Improvement of recharging capacity of water resources and reduction of flooding by these effects.
- (4) Improvement of river water quality by coffee waste water treatment.

RESULTS

The disparity between advanced areas and developing areas will be reduced, the income of medium- and small-scale farmers will increase, and improvement of living standard of the residents in and around the Project Area can be expected from increase of farm production, creation of opportunities for employment, increase of income, etc. as a result of implementation of the Project. Furthermore, this agricultural development project that is mainly applicable to sloped area has a meaning of a model development for similar areas in Colombia, and it will make major contribution to the growth of agriculture in Colombia.

The coffee waste water treatment project improves the water quality of the objective river. At the same time, the treatment method adopted in this project will become a new model of coffee waste water treatment in Colombia, and it can be expected to make major contribution to other coffee producing areas in Colombia where coffee waste water treatment is a social problem.

From what is mentioned above, it is judged that implementation of the Project is feasible from the economic effect calculated from the tangible benefit. It can also be judged that socio-economic effect and environment improving effect can also be fully expected as evaluated from the intangible benefit.

CHAPTER 1 : INTRODUCTION

CHAPTER I INTRODUCTION

1.1 Background of the Study

The Department of Quindio (hereinafter referred to as 'Quindio') is located at the western terrain of the Central Andean Range and is endowed with fertile soil and favorable climatic conditions. It has been developed as the major coffee production region in the Republic of Colombia. The agricultural sector in Quindio accounted for 27% of the Gross Regional Product (GRP) in 1985. Although its share has been reduced from 43% in 1960 in accordance with the leading position within the context of the GRP. Besides, the employment in agricultural sector accounts for 48% in Quindio, and the agriculture is still considered as a very important industry in Quindio.

However, the agriculture of Quindio mainly depends on the coffee production and the basis of the agricultural production is very weak. Introduction of new crops and advanced cropping pattern, development of marketing system and improvement of productivity of coffee are indispensable for the stable development of Quindio.

Small-scale farmers are concentrated in the area of above 1,800m A.S.L., which is not suitable for the coffee cultivation. Hence, the imbalance of incomes between the large-scale farmers who are mainly cultivating coffee and the medium/small-scale farmers shows the imbalance of the areas. Area imbalance appears in every aspect such as the improvement of social infrastructures and it has become a big social problem in Quindio.

On the other hand, the water pollution in the rivers caused by waste water produced by processing of coffee beans is affecting the life of the people in Quindio. High attention has been paid on this particular problem and it needs to be solved for the improvement of the living conditions of the people as well as the protection of natural environment.

Based on the background mentioned above, the Regional Autonomous Corporation of Quindio (hereinafter referred to as CRQ) decided to prepare a master plan of Quindio for the development and promotion of its agriculture and animal husbandry sector with the technical cooperation of the Government of Japan. In this regard, the Japan International Cooperation Agency (hereinafter referred to as JICA) dispatched a Study Team to conduct a Master Plan Study from April 1986 to June 1988.

CRQ reviewed the projects recommended in the Master Plan and newly requested in August 1988 for the technical cooperation of the Government of Japan for carrying out the feasibility study of the projects which has been evaluated as having high priority and economic benefits in order to realize the early implementation of the projects. In response to the request, the Preliminary Survey Team was dispatched and concluded the Scope of Work (S/W) of this Study in September 1989.

In compliance with the S/W signed between the Colombian side and the Japanese side, JICA dispatched a Study Team to conduct the feasibility study from March 1990 to June 1991.

1.2 Objectives of the Study

The objectives of the Study is to conduct a feasibility study of the integrated agricultural development project in Quindio basin which includes an agriculture development plan mainly along the Quindio river and a pilot project plan for the preservation of water quality polluted by the waste water to be produced by processing of coffee beans.

1.3 Scope of the Study

(1) Phase I

1) Work 1 (Study in Colombia)

A site survey was carried out in the Study Area in order to clarify the present situation and problems from the agricultural development and to collect the necessary data and information for the Study.

2) Work 2 (Study in Japan)

The data and information collected during the field survey was analyzed for clarifying the present situation and problems which became the basis of the Study.

A basic development concept was established. It became the basis of the further study in Phase II.

(2) Phase II

1) Work 3 (Study in Colombia)

A detailed field survey was carried out based on the results of the Phase I study in order to supplement and verify the data and information collected in Phase I.

2) Work 4 (Study in Japan)

A plan for an integrated agricultural development project was developed based on the analysis of data and information collected through the Study. Then the project evaluation was carried out and the project implementation plan was studied.

1.4 The Study Area

The Study Area was determined through the field survey and discussion with Colombian counterpart.

Circasia area	:	2,735 ha
Salento area	:	645 ha
Quindio river right margin area	:	2,040 ha
Quindio river left margin area(1)	:	610 ha
Quindio river left margin area(2)	:	175 ha
Pijao area	:	800 ha
Genova area	:	595 ha
Sub-total		7,600 ha
Area for the coffee waste water treatment in Cristales river basin	:	9,400 ha
Total		17,000 ha

1.5 Reports

The following reports was prepared and submitted to the Government of Colombia through the Study:

- Inception Report	English 20, Spanish 20
- Progress Report(1)	English 20, Spanish 20 (Summary only)
- Interim Report	English 20, Spanish 20
- Progress Report(2)	English 20, Spanish 20 (Summary only)
- Draft Final Report	English 40, Spanish 40
- Final Report	
Main Report	English 40, Spanish 40
Annexes	English 40
Drawings	English 40

**CHAPTER 2 : NATIONAL AND REGIONAL
SOCIO-ECONOMIC BACKGROUND**

CHAPTER II NATIONAL AND REGIONAL SOCIO-ECONOMIC BACKGROUND

2.1 Characterization of the Republic of Colombia

2.1.1 General

The Republic of Colombia lies to the north-western edge of the South American Continent with the latitude 4° 13'30"S - 12° 26'46"N and the longitude 66° 50'54" - 79° 02'33"W. The territorial extension is 1.14 million km², which is divided into 23 Departments, 4 Intendancies and 5 Commissaries.

According to topography and climate, the country can split up into six Regions: Caribe, Pacific, Andean, Amazon, Eastern Plains and San Andres y Providencia. These Regions are delimited by Eastern, Central and Western Mountain Ranges that stretch the country from north to south. Colombia, located in the torrid zone, has no clearly distinguished seasons. But it offers several different climates which vary depend on altitude. The hot region, from sea level to 1,000 m a.s.l, has an average temperature of 24 to 26° C. Temperate region with an altitude in the range of 1,000 to 2,000 m a.s.l. has an average temperature between 17° C and 24° C. The cold region, which altitude varies from 2,000 to 3,000 m a.s.l. is featured by an average temperature of 8 - 17° C. There are also perpetual snow region located higher than 4,000 m a.s.l.

2.1.2 Physical and Socioeconomic Features

Referring to the information of DANE (Colombia Estadística, 1989), Colombia had a population of 30,062 thousand which had growing at an annual rate of 2.05% since 1973. The distribution of population by age group as of 1985 was 36.1% (0-14 years old), 57.9% (15-60 years old), and 6.0% (older than 60 years old). An economically active population (in Colombia people older than 12 years are taken into account) was estimated to be 19,336 thousand in 1985. The rate of unemployment in four largest cities of the country (Bogota,

Medellin, Cali, and Barranquilla) was in the level of 10.7% as of September, 1989.

Colombian Gross Domestic Product (GDP) had grown at an average rate of 5.7% yearly in the 1970s, but from 1979 to 1983, as a consequence of world-wide recession, its growth was decelerated to as low as 2.2% per annum at constant price of 1975. Nevertheless, during subsequent period of 1984-1989, the Colombian economy recovered from the said sluggish performance obtaining an annual growth rate of 4.2%.

An estimate of DANE indicates that major sectors which contributed greatly to GDP formation in 1989 were: agriculture, forestry and fishery (21.7%), manufacturing (20.9%), personal and public services (13.5%), and commerce (16.6%). On the other hand, higher annual increase was recorded during 1979 to 1989 in the order of: mining (18.8%), communications (6.0%), construction (4.7%) and electricity, gas and water (4.6%). Agriculture, forestry and fishery and manufacturing, the two core sectors of the Colombian economy, were slack in the period obtaining such inferior growth rate as 2.7 and 2.5% each. These figures were below GDP's average rate of 3.3%.

External trade in Colombia is represented by agricultural and mining products for exports and raw materials and capital goods for imports. From 1981 to 1984, deficit in trade was registered due to depressed price of coffee in the international market, but in 1985 the government's import control policy drove the trade balance positive. Furthermore, the largest surplus in foreign trade of US\$1,922 million was recorded in 1986 owing to "coffee bonanza"-sharp appreciation of international price associated with worsened output of Brazilian products. The surplus in trade balance was maintained from 1984 to 1989. In 1989, despite of falling down of coffee's international price and a consequence of economic adjustment program employed by the Government of Venezuela, the trade surplus was increased from the previous year due to an

expansion of export for non-traditional products such as petroleum and minerals as well as low demand for imports. The current balance, which comprises services and transfers in addition to trade of goods, resulted in negative in 1989 on account of substantial deficit in service balance. The balance of payment for the same year accounted for a surplus of US\$57 million-reduced at approximately US\$30 million from the previous year.

The net international reserve as of May 1990 was US\$3,857 million, which is US\$1,700 million fewer than the historically high level of 1981. The external debt has been increasing in Colombia with higher pace than the growth of GDP and the debt service ratio as of 1987 was estimated to be 67%.

Since 1967, the Government of Colombia has employed a "crawling peg system" under which the exchange rate is set at the discretion of the Central Bank. An exchange rate of Colombian peso against US dollar as of September 1990 was 530.17. It is forecasted that, the devaluation of Colombian peso against US dollar will exceed 30% for the year of 1990-the highest level since 1967 with an exception of 1985 when accounted for 46.9%.

Since the middle of the 1970s, a major concern of the Colombian government has been directed toward stabilization of consumer's price. The rate of inflation had been maintained in relatively modest level although it was not low in comparison with that of other Latin American countries. But trend for higher inflation had been predominant recently ; in 1989, an annual rate was the highest in the last decade with a 26.5% and there remains a possibility to surpass 30% in 1990. Faced with such situation, the Administration of the President Cesar Gaviria, which has just organized in August 1990, have announced that they would make efforts to lower the rate of inflation within the context of their policies and have decided to take measures for achieving this foal represented by freezing of supporting prices for agro-products and easing restriction on import of materials and goods.

2.1.3 Agricultural Aspects

(1) GDP and the agricultural sector

According to the provisional estimates of DANE, the agricultural sector including forestry and fishery in 1989 generated Col\$152,025 million at the constant price of 1975, which was equivalent to 21.7% of GDP. However, as stated in the previous section, the growth of the sector for the last decade was lower than the average rate of GDP. Consequently, the participation of the sector in GDP declined from 38% in 1950 and 29% in 1970 to 22% in 1989.

(2) Land use and land tenure

It is estimated that about 14.4 million ha of land in Colombia or equivalent to 12.6% of the national territory is arable for agricultural production, whereas land capable for pasture corresponds to 19.3 million ha (16.9% of the national territory). On the other hand, crop harvest and grazing land areas accounted for 3.9 million and 22.6 million ha in 1988, which intimates that there remains considerable margin of arable land for expansion of agricultural production, and that some portion of these lands are actually used as grazing land without being realized intensified use due to lack of agricultural infrastructures.

Land tenure by size of holding in the national level is, like in other Latin American countries, characterized by imbalanced distribution; small and medium land owners with holding below 10 ha represent 78% of the total number of owners but only 9% of the total rural lands, while 61% of the total rural lands are held by only 3% of land owners with holding more than 100 ha.

(3) Agricultural output

Coffee, the mainstay of the Colombian economy, accounted for close to 15% of the total value of crop production in 1989. Next to coffee, the following crops registered higher contribution to the national production value of crops: sugarcane (9.4%), plantain (7.9%), potato (7.6%), "panela" (7.6%), and rice (7.6%).

Crops which showed a higher growth in production for the period of 1985-1989 were: soybean (170%), oil palm (169%), kidneybean (162%), fruits (147%) and potato (141%). Of these crops, the growth of soybean, oil palm and fruits were due to an expansion of harvest area, while an improvement of unit yield brought an increase of production for the case of kidneybean and potato. On the other hand, a stagnation or recession in production was reported in connection with cotton, panela and sugarcane. The inactivity of these crops was due to sluggish performance of cultivated area.

(4) Trade of agricultural products

In 1988, the trade surplus of agricultural sector reached close to US\$2 million. This surplus owed in its great majority to coffee. In case of coffee being excluded from consideration, the surplus in agricultural sector was reduced to as little as US\$355 thousand.

Up to 1960, the participation of coffee in the national exports had been more than 90% in value terms, but it had declined gradually thereafter and fluctuated around 50% in the period of 1982-1985 because of an expansion of exports other than agro-products. Despite of this background, coffee's share was recovered up to 59% in 1986 due to upsurge of its price in the international market. In contrast, in the subsequent years of 1987 and 1988, the contribution of coffee to the total exports

was reduced to the lowest level (32.9% and 32.6%) in the history because of reverse phenomenon in the international market (coffee's average price was US\$1.23/pound in 1987 against US\$1.96/pound in 1986).

So far as other agro-products are concerned, there has been a large increase in exportation of banana and cut flower, while cotton, sugar and beef have reduced their volume of exportation recently.

The importation of foods and agriculture-related materials and inputs accounted for 7.2 and 7.9% of the total imports in value terms for years 1988 and 1989, which were declined from an average rate (9.1%) for the previous four years 1984-1987. A drop of food and agriculture-related materials and inputs in respect of their participation in the total inputs in both 1987 and 1988 was due to the government policy of import control. A single product which recorded the largest participation in the total import value of agro-products was wheat with a share of 21.2% in 1988; subsequently, soybean (15.7%), beef fat (6.2%) and soybean oil (4.2%) were much imported in the same year.

(5) Labor force

The agricultural sector provides the greatest opportunity of employment within the country's labor market; it accounted for 33% of the total employment in 1984-the latest year available this kind information. In the case of contribution to GDP, the importance of the agricultural sector has been reduced relatively in recent years; the participation of the sector, which recorded 56% of the nation's total employment in 1951, declined to 49% in 1964, 35% in 1980, and 33% in 1984, as cited above.

TABLE 2.1.1 POPULATION OF COLOMBIA

YEAR	POPULATION	ANNUAL GROWTH RATE (%)
1938	8,701,816	
1951	11,548,172	2.20 (1938-51)
1964	17,484,508	3.24 (1951-64)
1973	22,915,229	3.05 (1964-73)
1985	30,062,200	2.29 (1973-85)

Source: COLOMBIA ESTADISTICA 1989, DANE

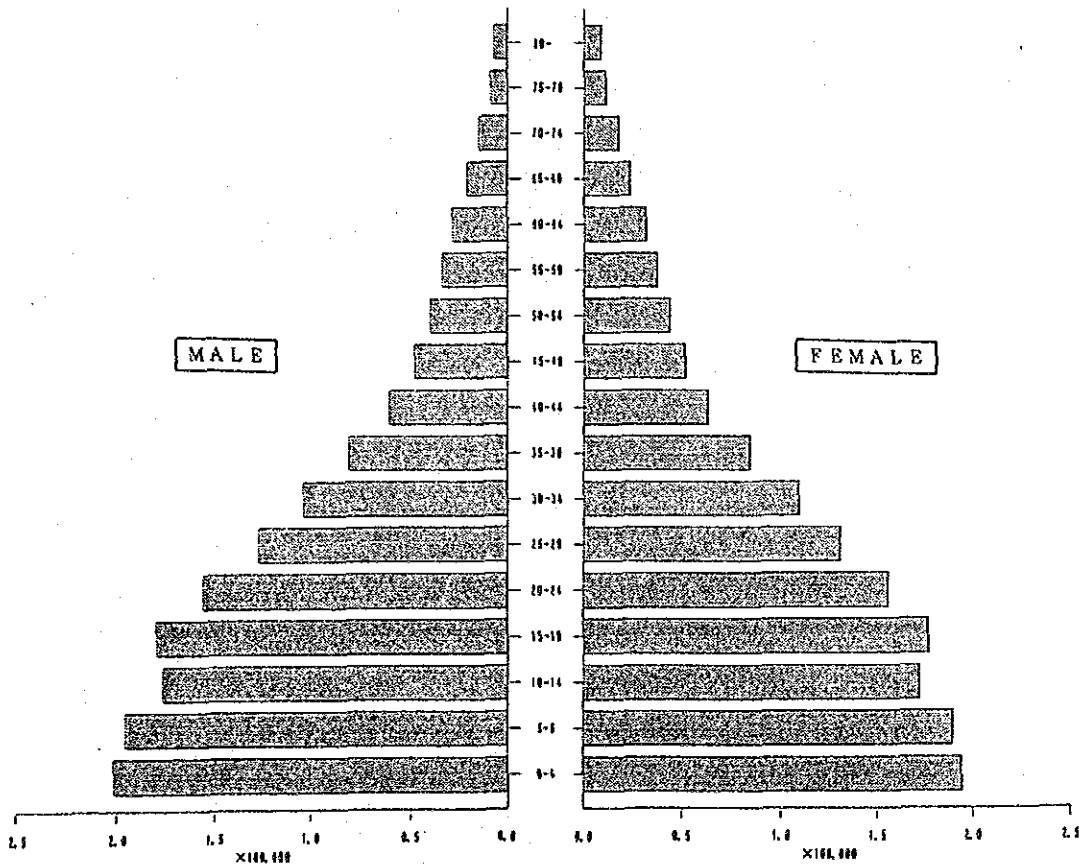


FIG. 2.1.1 POPULATION PYRAMID IN COLOMBIA (1985)

TABLE 2.1.2 CONTRIBUTION TO GDP AND GROWTH BY SECTOR

	CONTRIBUTION TO GROSS DOMESTIC PRODUCT											GROWTH RATE		
	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1980-1984	1985-1989	1980-1989	
Economic Activities	22.69%	22.90%	22.25%	22.52%	22.18%	21.86%	21.86%	21.56%	21.33%	21.67%	1.45%	4.30%	2.73%	
Agriculture, forestry and fishery	1.27%	1.31%	1.32%	1.48%	1.75%	2.34%	3.74%	4.22%	4.17%	4.47%	10.55%	22.96%	18.80%	
Mining	22.38%	21.30%	20.80%	20.71%	21.24%	21.21%	21.23%	21.40%	21.09%	20.90%	0.71%	4.15%	2.47%	
Manufacturing	0.99%	1.00%	1.02%	1.02%	1.04%	1.04%	1.04%	1.08%	1.10%	1.12%	3.29%	6.37%	4.62%	
Electricity, gas and water	3.35%	3.51%	3.62%	4.02%	4.14%	4.36%	4.32%	5.69%	3.87%	3.79%	7.57%	0.93%	4.68%	
Construction and public works	12.68%	12.61%	12.69%	12.44%	12.28%	12.12%	11.87%	11.76%	11.86%	11.62%	1.22%	3.44%	2.26%	
Commerce, restaurant and hotels	9.32%	9.39%	9.87%	9.64%	9.56%	9.37%	8.94%	8.77%	8.71%	8.72%	2.69%	2.67%	2.50%	
Transport and communications														
Banking, insurance, real estate and services to enterprize	13.97%	14.54%	14.85%	15.29%	14.35%	14.18%	13.98%	13.98%	14.21%	14.55%	2.71%	5.22%	3.72%	
Personal services	4.91%	4.96%	5.03%	5.07%	4.95%	4.82%	4.73%	4.72%	4.66%	4.61%	2.25%	3.35%	2.53%	
Government services	7.77%	8.04%	8.15%	7.87%	8.29%	8.39%	8.41%	8.55%	8.66%	8.97%	3.71%	6.29%	4.91%	
Adjustment	0.66%	0.45%	0.39%	-0.06%	0.23%	0.31%	0.37%	0.28%	0.14%	-0.42%				
Gross Domestic Product	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	

Note: Calculation based on the constant price of 1975

Source: Revista de la Banco de la Republica, Junio 1989

TABLE 2.1.3 BALANCE OF PAYMENT

Unit: in million of US\$

ITEM/YEAR	1983	1984	1985	1986	1987	1988(p)	1989(e)
I. CURRENT ACCOUNT	-2,826	-2,088	-1,586	463	-22	-356	-180
A. Trade Balance	-1,317	-404	109	1,922	1,460	824	1,252
Export	3,147	3,623	3,782	5,331	5,254	5,339	5,978
Import	4,464	4,027	3,673	3,409	3,794	4,515	4,726
B. Services Balance	-1,673	-1,983	-2,156	-2,244	-2,483	-2,145	-2,540
Financial Services	-739	-1,070	-1,202	-1,183	-1,692	-1,597	-1,838
Others	-934	-913	-954	-1,061	-791	-548	-702
C. Transfers	164	299	461	785	1,001	965	1,108
II. CAPITAL ACCOUNT	1,436	944	2,220	1,079	-9	1,086	524
A. Long-term Capital	1,528	1,822	2,350	2,629	185	851	690
B. Short-term Capital	-92	-878	-130	-1,550	-194	235	-166
III. RESERVE ADJUSTMENT	-67	20	-39	51	90	-70	27
IV. ERRORS AND OMISSIONS	-266	-137	-311	-129	-82	-301	-314
CHANGE IN NET RESERVE	-1,723	-1,261	284	1,464	-23	359	57

Note: 1988(p): Provisional amount
1989(e): Estimated amount

Source: Revista del Banco de la Republica, December 1989

TABLE 2.1.4 CROP PRODUCTION IN COLOMBIA

CROPS	Cultivated Area (ha)		Variation Production Volume (t)		Variation Unit Yield (t/ha)		Variation	
	1985	1989	(89/85)	1985	1989	(89/85)	1985	(89/85)
Annual Crops								
Corn	540500	759200	1.40	762500	1043800	1.37	1.41	1.37
Rice	385400	515300	1.33	1798200	2101300	1.17	4.55	4.07
Sorghum	192300	238900	1.24	499400	695200	1.39	2.50	2.91
Cotton	196050	185900	0.95	339570	294500	0.87	1.73	1.58
Potato	139100	172500	1.24	1910360	2896700	1.41	13.73	15.53
Kidneybean	131854	132400	1.00	60400	97700	1.62	0.45	0.74
Soybean	54440	92500	1.70	104181	177400	1.70	1.91	1.92
Vegetables	97450	109570	1.12	1427740	1602800	1.12	14.55	14.53
Permanent Crops								
Plantain	357860	393530	1.10	2092540	2442370	1.17	5.35	6.21
Panels	225150	242880	1.03	1161200	1270500	1.09	4.92	5.23
Cassava	154200	174000	1.13	1367350	1541200	1.13	8.87	8.36
Cacao	91533	119440	1.30	998620	1115920	1.12	10.90	9.34
Sugarcane	109800	110350	1.01	1366892	1487490	1.09	12.45	13.48
Oil Palm	43840	69270	1.58	125250	211300	1.69	2.86	3.05
Fruits	37705	63500	1.68	666175	980600	1.47	17.67	15.44

2.2 The Department of Quindio

2.2.1 Natural Conditions

(1) Location and topography

The Department of Quindio, located geographically in the western position of the country, extends over the western slope of the Central Range and is situated at 4° 04' - 44' N latitude and 75° 26' - 54' W longitude. The topography of Quindio can be divided into the following categories:

Alluvial Plain : The plain extended over the confluence (1,000-1,100m a.s.l.) formed by the Quindio and Barragan rivers.

Western alluvial Fan : This topography is formed by rivers (1,000-2,000m a.s.l.) flowing down from the eastern mountainous area. Undulated land is found in this category eroded by large and small rivers.

Eastern Mountain Area : The area extends from south to north (2,000-4,750m a.s.l.) and about 10 km in width, and steep slope is formed on both sides.

The area by altitude of the Department is given in the following Table:

TABLE 2.2.1 AREA BY ALTITUDE

Altitude (m)	Area (km2)	Portion (%)
Lower than 1,000	11.0	0.6
1,000 - 1,500	674.1	34.6
1,500 - 2,000	416.5	21.4
2,000 - 2,500	258.6	13.3
2,500 - 3,000	205.8	10.6
3,000 - 3,500	166.5	8.5
3,500 - 4,000	205.5	10.5
4,000 - 4,500	7.4	0.4
Higher than 4,500	1.3	0.1
Total	1,946.7	100.0

Source : The Master Plan Report

(2) Meteorology

The average annual rainfall is 2,000mm and the climate is divided into two seasons: rainy season (April and May, and October to December) and dry season (January and February, and June to August). The average annual temperature is changed from 30C to 22C with altitude.

2.2.2 Social Situation

The Department of Quindio was created in January 1966, being separated from "Old Caldas". The capital city of the Department is Armenia and there are other 11 municipalities. According to the National Census conducted in 1985, Quindio had a total population of 392 thousand and half of which was represented by Armenia. Population growth averaged 1.2% yearly with inter-census period of 1973-1985, which is inferior to that of the national average

(2.5%). 81% of inhabitants in Quindio lived in urban area in 1985

Being endowed with natural resources (soil, climate, etc.) much suitable for agricultural production especially for coffee.

Quindio is considered to be one of the most socio-economically developed Department in Colombia. The coverage of social infrastructure is as high as to be ranked 2nd for water supply and sewerage and 3rd for electricity in the national level, and as a consequence, families with unsatisfactory basic needs is the lowest (23.0%) among the country's 23 Departments - the national average including figures of the special District of Bogota is 39.5%. The literacy and university education rates are also high, but school attendance and house ownership rates are inferior to the country's average.

In spite of high level of economic and social achievement, it is no doubt that there exists marked disparity among sub-regions in Quindio ; That is to say, between central or lower areas comprising municipalities of Armenia, Calarca, Circasia, La Tebaida, Montenegro and Quimbaya, and north-southern or higher areas respected by municipalities of Buenavista, Cordoba, Filandia, Genova, Pijao and Salento. The first group corresponds to major coffee production zone with higher percentage of coffee area against total cropping acreage. Average farm size of second group is larger than of the first group, but it is worth while to indicate that the greater portion of large farms of the second group is used for extensive grazing land without realizing better use of them due to unfavorable climatic and topographic conditions.

An out-migration of people is a notable phenomenon in the north-southern area resulting in decrease of population for the period of 1973-1985. The coverage of social infrastructure and the education level corresponding to the said area is inferior to the central area of the Department.

2.2.3 Economic Performance

Similar to the case of GDP, the Gross Regional Product (GRP) of Quindio was dominated by manufacturing and agricultural sectors, which accounted for 30% and 23% of GRP in 1988 (DANE, Cuentas Regionales de Colombia). These two sectors are followed by transport and communications and commerce, which shared 13% and 11%, respectively. The agricultural sector had been the largest contributor of GRP up to the first half of the 1980s, but its importance has been reduced recently: the sector's participation in GRP declined from 37% in 1970, 32% in 1975 and 27% in 1980 to 23% in 1988.

Coffee is almost the only exportable product in the Department, covering 99.4% of foreign exchange earning in 1989. Meanwhile, imports of goods flown to the Department were represented by spare parts for vehicles.

The economically active population reached 137,811 and unemployment rate was 4.6% (National Census in 1985). According to the information of SENA, the agricultural sector dominated the leading position in the departmental labor market with a participation of 46%, while the manufacturing sector, the other staple sector of GRP, accounted for as few as 6%.

2.2.4 Agricultural Production

(1) Permanent and annual crops

An agricultural production is dominated by coffee tillage which is cultivated in one third of the total territory and more than 80% of the total cultivated area.

The cultivated area of coffee was increased from 59,839 ha (coffee period of 1984/85) to 66,820 ha (1987/88) and thanks to an elevated unit yield linked to an introduction of improved

varieties (Colombia and Catura), the output was escalated in the period. Plantain's cultivated area was maintained in almost the same level during 1985-1988; its independent plants increased by 50% in the period, while plants inter-cropped with coffee or cultivated in a traditional manner was decreased. Area for citrus was increased by 50% between 1985 and 1988 and that for cacao was quadrupled in the same period. In line with diversification programs undertaken by the Bureau of Agriculture and Departmental Coffee Committee, cultivation of such permanent crops as pitahya, tree tomato, papaya, blackberry and lulo has been started in the Department, but areas for these crops remain in negligible level (0.5% of the total cultivated area).

Annual crops had greatly decreased in terms of their cultivated area from 1985 (6,867 ha) to 1987 (4,700 ha), but they recovered dynamics a bit in 1988. The majority of this phenomenon was due to the behavior of cassava; the tillage of this crop is controlled by CRQ starting 1986 in view of conserving potential productivity of soils and cultivated area of its product shrank from 3,000 ha in 1985 to only 1,055 ha in 1987 accordingly. In the presence of decline or stagnation in cultivated area of annual crops, only soybean attained growth in the corresponding period (from 473 ha to 1,348 ha).

In Quindio beans other than soybean as well as vegetables are not permanently cultivated, because marketing circumstances for these crops are unstable, and they are usually cultivated in coffee farms only when coffee's plants are small. Of these crops, tomato is the only crop with substantial cultivated area (373 ha in 1988).

(2) Livestock

The production of cattle in the Department had been consistent more or less in the period of 1983-1985, although some increase

both in number of heads and an extension of pasture were made in the same period. In 1985, the total acreage of pasture reached 68,000 ha and the number of heads of cattle was 73,440, thus the carrying capacity was 1.08 head on the average.

There are two major areas of cattle farming in Quindio: on the valley of the Vieja River comprising municipalities of La Tebalda, Montenegro and Quimbaya for mainly meat production and the mountainous area of Salento-Calarca-Pijao-Genova for mainly dairy production. In these two areas, close to three quarters of the total number of cattle are kept.

The stagnation of cattle farming in Quindio is reflected in low level of productivity (an increase of live weight is as few as 400 kg in four or more years and production of milk is 883.3 l/head/year. Furthermore, birth and fecundity rates are interior and mortality rate is high; these circumstances have discouraged farmers to invest their resources into cattle farming. This problem is more outstanding in mountainous area where adequate technology is under-developed.

According to the information of Caja Agricola, a total of 15,260 heads of swine and 781,000 heads of poultry are kept in Quindio and these farmings are concentrated in the central zone of the region in municipalities of Armenia, Calarca and Circasia.

In connection with pisciculture, there is only one fish farm in Salento where rainbow trout is cultivated in a commercial base. Annual output of the fish is estimated to be 36 tons and the product is sold in markets of Bogota, Medellin, Cali and other major cities of the country, and some portion is to U.S.A.

2.2.5 Agricultural Development Strategies and Plans

The "Agricultural Development Plan in Quindio 1987-1990" was prepared by the Regional Unit for Agricultural Planning (URPA) in June 1987. This plan was presented in need of stimulating and orienting an agricultural sector, the leading sector for development of regional economy. In the same plan, a total of eighteen (18) programs and projects were proposed and some of which are carried out at present.

Despite it is expected that the same task be continued for preparation of the next four-year (1991-1994) agricultural plan, it has not come true up to date, because of lack of both human and financial resources. Actually, URPA's activity is limited to editing an agricultural report which comprises no other information but statistics of the agricultural sector of the Department.

Although, as stated before, an integrated agricultural development has not been formulated in Quindio, various public agencies have made efforts in proposing and formulating agricultural development programs and projects for socio-economic growth of the Department. Of programs and projects facilitated by these agencies, the following may be highlighted:

- 1) Five-year Diversification Plan 1990-1994, Departmental Committee of Coffee Growers in Quindio
- 2) Agricultural Investigation Project, Bureau of Agriculture, Governmental Office of Quindio

The former intends to develop programs other than coffee productions, in other words, to proceed with establishment of crop and livestock programs that may be developed within coffee farming area ; to be more concrete, the plan comprises four main programs (plantain, livestock, citrus and reforestation). The latter intends to prepare the answer in shorter period to the necessity

and anxiety of agronomists and farmers in promoting and diversifying cropping activity of fruits and vegetables as well as animal husbandry in marginal areas for coffee tillage. Both plans coincide in such aspect that the success of diversification of farming activity relies its major portion on how to adequately conduct investigation on crops and how to efficiently transfer the result of investigation to farmers.

Apart from these cited above, the Quindian leaders are aware that stagnation of the agricultural sector is due to an absence of better marketing infrastructures and less development of agro-industry. Under the circumstances, an "Agro-Industry Promotion Committee" has been established with a participation of concerned organizations for development of the sector including Universities of La Gran Colombia and Quindio. The committee is expected to formulate an agro-industry development plan for the Department of Quindio.

2.2.6 Natural Resources Improvement and Conservation Plan

In the Department of Quindio, improvement and conservation of natural resources is in charge of CRQ which has received delegation from INDERENA (Colombian Institute for Natural Resources and Environment) in such duties as :reforestation, conservation of soils and water, control of erosion, and promotion of pisciculture and ecological education. In this context, CRQ has been developed and undertaken programs related to conservation of natural resources and environment. In addition, in 1984 CRQ was nominated as "Water Resources Management Agency" to be responsible for control of contaminated and polluted water. As a consequence, CRQ has developed programs to control industrial effluents and domestic sewage and to investigate treatment of coffee-related waste water. Regarding coffee-related waste water, CRQ has realized since 1978 an investigation on easing the problem, and after attempting various field and laboratory tests, two pilot plants have been installed in the farms within the Department since 1989.

Through initiative of CRQ, "Five-year Action Plan of Natural Resources and Environment 1989-1993" which includes programs for conservation of water, soil, forest and animals is under way. Water resources conservation program of the plan envisages to formulate and develop the plan for recovery and conservation of water resources by the treatment of domestic, agro-industrial and industrial sewage.

TABLE 2.2.2 SOCIO-ECONOMIC DATA BY MUNICIPALITY

	Armenia	B/vista	Calarca	Circasia	Cordoba	F/dia	Genova	La T/da	M/negro	Piaco	Q/vaia	Salento
Total Population												
% of rural	2.7	61.2	22.7	33.9	43.0	56.5	47.9	8.6	18.1	41.2	24.8	55.3
Population *												
Population Density (Person/km2)	1.910.6	80.0	245.9	241.3	38.0	111.7	31.4	261.0	222.0	36.3	271.0	16.1
Average No. of Family Member	4.4	5.9	5.0	4.6	4.6	4.4	4.4	5.1	4.5	5.0	4.8	4.4
Population Growth Rate	1.85	-1.70	0.10	2.43	-4.53	-0.07	-1.90	1.72	1.22	-1.06	0.73	-1.25
Literacy Rate **	88.1	88.3	85.1	85.3	86.0	89.1	88.6	91.3	88.4	77.7	86.2	78.4
% of Family without Social Infra. **	0.6	3.1	1.2	2.9	6.6	3.3	5.4	4.3	1.5	2.5	1.7	13.7
Average Farm Size (ha)	6.4	9.8	9.1	5.3	20.7	6.0	24.4	18.0	11.6	29.6	8.2	41.7
Coffee Area/Total Area ***	0.80	0.70	0.41	0.44	0.31	0.52	0.19	0.38	0.49	0.24	0.72	0.03

Source : Quindio Estadístico 1984-1987

* : Planeacion Departamental del Quindio para 1990

** : Censos 1985

*** : Comite Departamental de Cafeteros