B.4.2 Run-off Analysis

(1) The Basin of the Study Areas

The topography of Quindio can be divided in to the following categories: the lower area, the coffee area, the upper area and the mountain area. Each of these is explained in the following manner:

The Lower Area: This area can be found out western margin of the alluvial fan and ranges approximately from 900 m to 1,250 m above sea level. It extends along the La Vieja river which passes its western extreme and constitutes the boundary with the Department of Valle del Cauca. Undulated land, which is eroded by large and small rivers, can be found out in this category, except around the lower part of the Quindio river.

The Coffee Area: This area extends from the western margin of the alluvial fan to eastern mountain foot ranging approximately 1,250 m to 1,800 m above sea level. In this category, undulating land also can be found out but it is the most adequate area for the cultivation of coffee.

The Upper Area: This area extends from the eastern mountain foot to approximately 2,500 m above sea level where mountain slope change from comparatively gentle to steep. From the view point of meteorology, this category is limit area for agriculture.

The Mountain Area: The Central Range extends from North to South, and its watershed constitutes the departmental boundary with the Department of Tolima. The present mountain area extends over a width of approximately 10 km, and steep slope over a width of approximately 10 km, and steep slope is formed on both sides. Some valleys are developed in these areas; they are found in land over 2,500 m above sea level, while U valleys are located below that altitude.

The Conditions of the study areas are the following:

1) The Circasia Area:

This area extends over the western plain of Circasia, located approximately 10 km Northeast from Armenia which is the capital of the department. 2,735 ha of land can be found out, at approximately from 1,600 to 1900 m above sea level. In the northeastern part of this area, comparatively flat and fertile grass land can be found out. However, a large scale of canyon can be observed in the southwestern part, and a few deep vales are developed. The Roble river is one of main rivers in this area, which flow down from East to West and it's catchment area is approximately 5,040 ha at the bridge on the western boundary.

2) The Salento Area

This area extends over the Alto Canaan, located approximately 5 km East from Circasia; a mountain area covering approximately 650 ha can be observed, at from 1,800 m to 2,100 m above sea level. This area is surrounded the rural roads, ones of these are on the ridge from West to Southeast and from North to South, another is running in near the bottom of the valley located at northern boundary. The land steeply slopes from South to North and comparatively flat hilly districts extends in the eastern part of this area. The Dos Quebrados river, which is one of main rivers in this area, flow down from East to West and it's catchment area is approximately 744 ha at the bridge on the western boundary.

3) The Quindio River Right Margin Area

This area extends over the lower area, in the southwestern part of La Tebaida which is located approximately 15 km away from Armenia, on the national roads leading to Cali. Hear 2,040 ha of undulating margin of alluvial fan can be found out, ranging from 1,000 m to 1,200 m above sea level. The eastern part of this area located over than 1,150 m above sea level is comparatively flat land, however, in the western part located under than 1,150 m, it can be observed

that some valleys are developing. Almost of rural road were constructed on the ridges from East to to West and quite a few road crossing from North to South exists in the western part of this area. The El Cantaro river, which is one of main river in this are, flow from East to West and the catchment area is approximately 1,363 ha at the junction with the La Jaramilla river.

4) The Quindio River Left Margin Area

This area is located in the lower area, approximately 20 km Southwest from Armenia and it is divided into two (2) zones.

The Quindio River Left Margin Area (1)

This area extends over the low land area between the Quindio and the Barragan rivers, and covers approximately 610 ha of flat land, ranging from 1,000 m to 1,200 m above sea level. The land slopes from South to North quite gently and that is one of causes for the pour drainage of this area. Some of river terrace can be observed along the Quindio and the Barragan rivers. The La Picota river, which is one of main rivers, flows from South to North and its' catchment area is approximately 2,766 ha at the junction with the Barragan river.

The Quindio River Left Margin Area (2)

This area extends between the Quindio and the Verde rivers, and covers approximately 200 ha of low flat land, ranging from 1,000 m to 1,200 m above sea level. There is small hill at northeastern part of this area and available flat land exists as V shaped along the rivers. Only one rural road to access to this area from the national road and there is no way to cross over the rivers in this area. There are two small rivers in this area and both of them are no named. The large one has 73 ha of catchment area.

5) The Pijao Area

This area extends over the upper area, between Pijao which is

located approximately 20 km South from Armenia and Cordoba which is approximately 17 km South from Armenia. Approximately 800 ha of mountain area can be found out, ranging from 1,600 m to 2,000 m above sea level. The land slopes from East to West steeply and a lot of small valleys are developed by small streams in there. It can be said that almost of land is undulated except the ridge of eastern part of said area. The Lejos river is one of main rivers in this area and its' catchment area is approximately 1,777 ha at the bridge in Pijao.

6) The Genova Area

This area extends in the upper area and covers the valley located in the northern part of Genova which is located approximately 35 km south from Armenia. About 595 ha of mountain area can be found out, ranging approximately from 1,400 m to 2,200 m above sea level. The Tamborales river flows down at the center of this valley from Northeast to Southwest and its' catchment area is approximately 924 ha at the bridge on the southern boundary. A lot of small stream flow on the slopes at northwestern side and southeastern side and make a quite undulating land inside of the valley. There are two rural roads on ridges of both sides connecting to Pijao, however, there is no road to cross the valley.

(2) Low Flow Analysis

1) Correlation between Data of Alambrado Station and Data of Other Hydrological Stations

The observation periods of hydrological stations except the Alambrado station are only three years and it is supposed to not be sufficient for run-off analysis. The discharge data, not dominated by rainfall, was selected from the data and compared with the data of Alambrado by using specific discharge and the correlation coefficient was calculated as 87% (See Fig.B.4.6). Because of the consideration that the drought water discharge may not be influenced by rainfall, the result of low flow analysis at Alambrado station can be applied for the estimation of the drought water discharge at

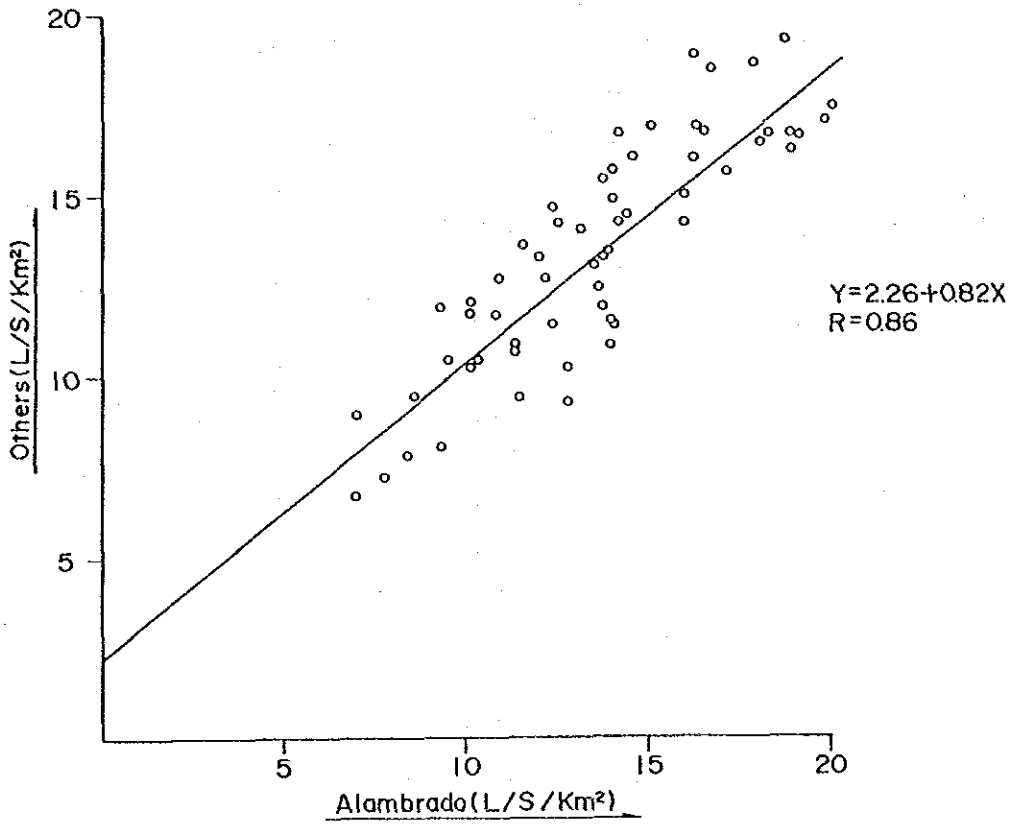


Fig. B.4.6 Relationship of the Specific Discharge between Alambrado and Others

other points in the Quindio, using specific water.

2) Drought Water Discharge

The data of river discharge at the Alambrado bridge (1953-1957, 1971-1988 : catchment area 1623.88 km2) are summarized below:

Table B.4.6 Summary of River Discharge at Alambrado (m3/s)

Month	Mean	Maximum	Minimum
Jan.	69.0	536.8	19.0
Feb.	58.2	529.3	11.8
Mar.	59.1	665.1	10.1
Apr.	73.6	540.0	15.0
May	73.8	492.0	17.0
Jun.	51.2	420.0	16.8
Jul.	35.0	194.0	13.6
Aug.	24.9	211.6	4.4
Sep.	28.0	275.0	3.0
Oct.	60.7	566.0	2.9
Nov.	100.9	620.1	15.2
Dec.	94.2	667.0	13.0
Annual	60.7	667.0	2.9

The drought water discharge was analyzed by the Hazen Plot Method as shown in Fig.B.4.7 and Table B.4.7. The result are summarized below:

Table B.4.8 Drought Water Discharge at Alambrado

Return Period	1/2	1/5	1/10	1/20
Discharge (m3/s)	14.2	10.0	8.3	7.2
Specific Discharge (l/s/km2)	8.76	6.17	5.13	4.41

The drought water discharge in the study areas are estimated as shown below:

Table B.4.7 Probability of Drought Water Discharge

Probability of Drought Water Discharge (station ALAMBRADO)

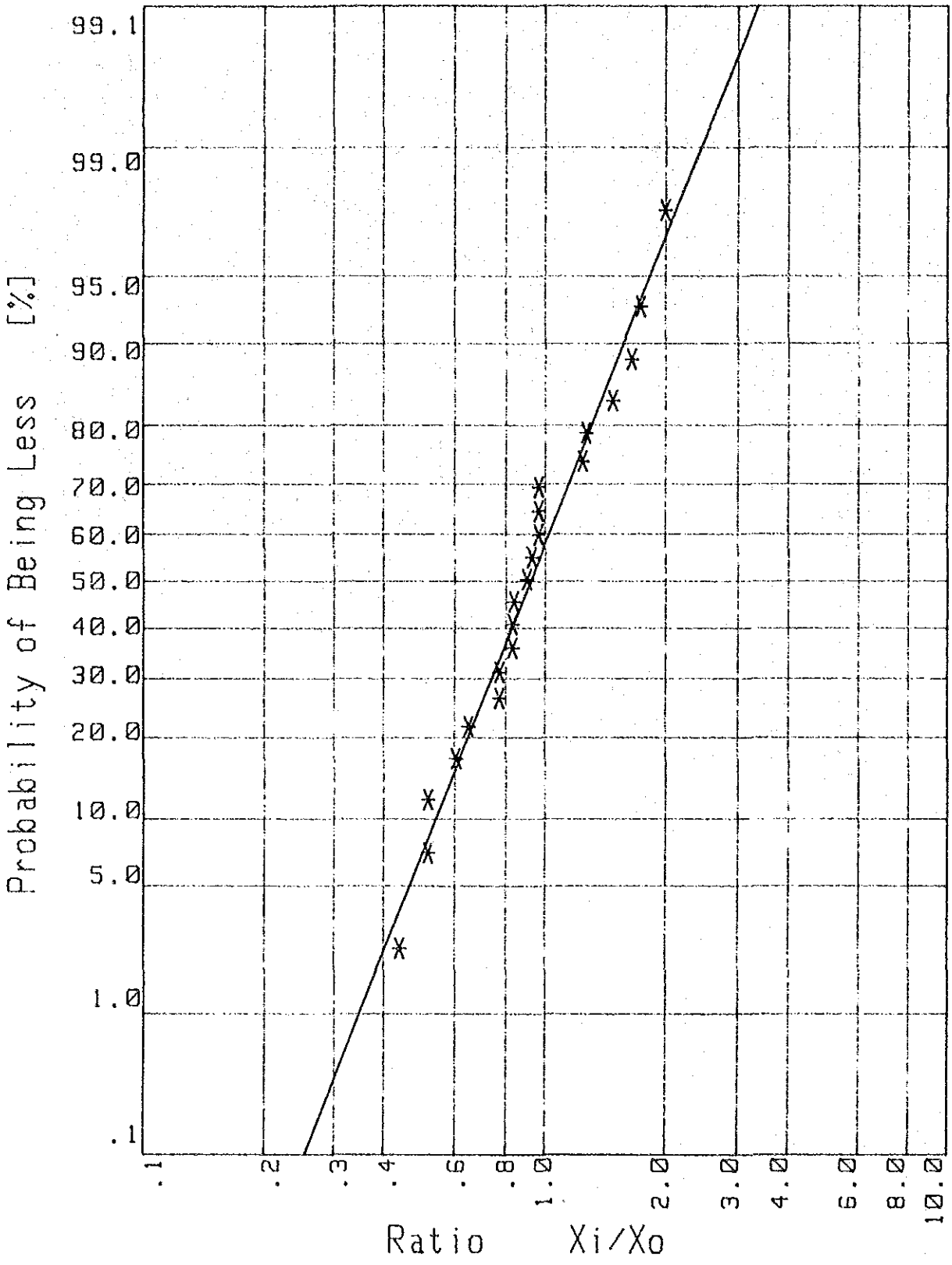
Year	Water Discharge [m3/s]	No.	Data(year) [m3/s]	Ratio Xi/Xo	Probability [%]
1954	14.4	1	6.8(1978)	0.441	2.38
1955	19.3	2	8.0(1976)	0.518	7.14
1956	13.0	3	8.0(1983)	0.518	11.90
1957	25.6	4	9.4(1979)	0.609	16.67
1958	23.0	5	10.1(1977)	0.654	21.43
1959	----	6	12.0(1982)	0.778	26.19
1960	----	7	12.0(1980)	0.778	30.95
1961	----	8	12.9(1985)	0.836	35.71
1962	----	9	12.9(1987)	0.836	40.48
1963	----	10	13.0(1956)	0.842	45.24
1964	----	11	14.0(1972)	0.907	50.00
1965	----	12	14.4(1954)	0.933	54.76
1966	----	13	15.0(1973)	0.972	59.52
1967	----	14	15.0(1981)	0.972	64.29
1968	----	15	15.0(1974)	0.972	69.05
1969	----	16	19.3(1955)	1.251	73.81
1970	----	17	19.7(1984)	1.276	78.57
1971	31.0	18	23.0(1958)	1.490	83.33
1972	14.0	19	25.6(1957)	1.659	88.10
1973	15.0	20	27.0(1988)	1.749	92.86
1974	15.0	21	31.0(1971)	2.009	97.62
1975	----				
1976	8.0				
1977	10.1				
1978	6.8				
1979	9.4				
1980	12.0				
1981	15.0				
1982	12.0				
1983	8.0				
1984	19.7				
1985	12.9				
1986	----				
1987	12.9				
1988	27.0				

Total Xs= 324.1 m3/s Average Xo= 15.4 m3/s

Hazen Plot

Probability	Return Period [year]	Ratio Xi/Xo	Water Discharge [m3/s]	[l/s/km2]	[mm/day]
5%	20	0.464	7.2	4.411	.381
10%	10	0.540	8.3	5.128	.443
20%	5	0.649	10.0	6.165	.533
25%	4	0.695	10.7	6.607	.571
33%	3	0.767	11.8	7.286	.630
50%	2	0.922	14.2	8.761	.757

* Area of Basin = 1623.88 km2



Probability of Drought Water Discharge
(Station ALAMBRADO)

Fig. B.4.7 Probability of Drought Water Discharge

Table B.4.9 Drought Water Discharge in the Study Area (m3/s)

Area	Return Period / Catchment Area	1/2	1/5	1/10	1/20
Circasia	50.40 km2	0.442	0.311	0.258	0.222
Salento	7.44 km2	0.065	0.046	0.038	0.033
Quindio Right	13.63 km2	0.119	0.084	0.070	0.060
Quindio Left (1)	27.66 km2	0.242	0.171	0.142	0.122
Quindio Left (2)	0.73 km2	0.006	0.005	0.004	0.003
Pijao	17.77 km2	0.156	0.110	0.091	0.078
Genova	9.24 km2	0.081	0.057	0.047	0.041

3) Run-off Pattern of the Drought Year

The annual mean run-off discharge was analyzed by the Hazen Plot Method as shown in Fig.B.4.8 and Table B.4.10 for the estimation of the run-off pattern of the drought year. The results are summarized below:

Table B.4.11 Run-off Pattern of the Drought Year (m3/s)

Return Period	1/2	1/5	1/10	1/20
Jan.	66.0(40.6)	50.5(31.1)	43.9(27.0)	39.1(24.1)
Feb.	55.7(34.3)	42.6(26.2)	37.1(22.8)	33.0(20.3)
Mar.	56.5(34.8)	43.2(26.6)	37.6(23.1)	33.5(20.6)
Apr.	70.4(43.3)	53.9(33.2)	46.8(28.8)	41.7(25.7)
May	70.6(43.5)	54.0(33.3)	46.9(28.9)	41.9(25.8)
Jun.	49.0(30.2)	37.5(23.1)	32.6(20.1)	29.1(17.9)
Jul.	33.4(20.6)	25.6(15.8)	22.2(13.7)	19.8(12.2)
Aug.	23.9(14.7)	18.3(11.2)	15.9(9.8)	14.2(8.7)
Sep.	26.8(16.5)	20.5(12.6)	17.8(11.0)	15.9(9.8)
Oct.	58.1(35.8)	44.5(27.4)	38.6(23.8)	34.5(21.2)
Nov.	96.1(59.2)	73.6(45.3)	63.9(39.4)	57.0(35.1)
Dec.	90.1(55.5)	69.0(42.5)	60.0(36.9)	53.5(32.9)
Annual	58.0(35.7)	44.4(27.4)	38.6(23.8)	34.4(21.2)

The Estimation of the study areas are shown in Table B.4.12.

Table B.4.10 Probability of Annual Mean Run-off Discharge

Probability of Mean Water Discharge (station ALAMBRADO)

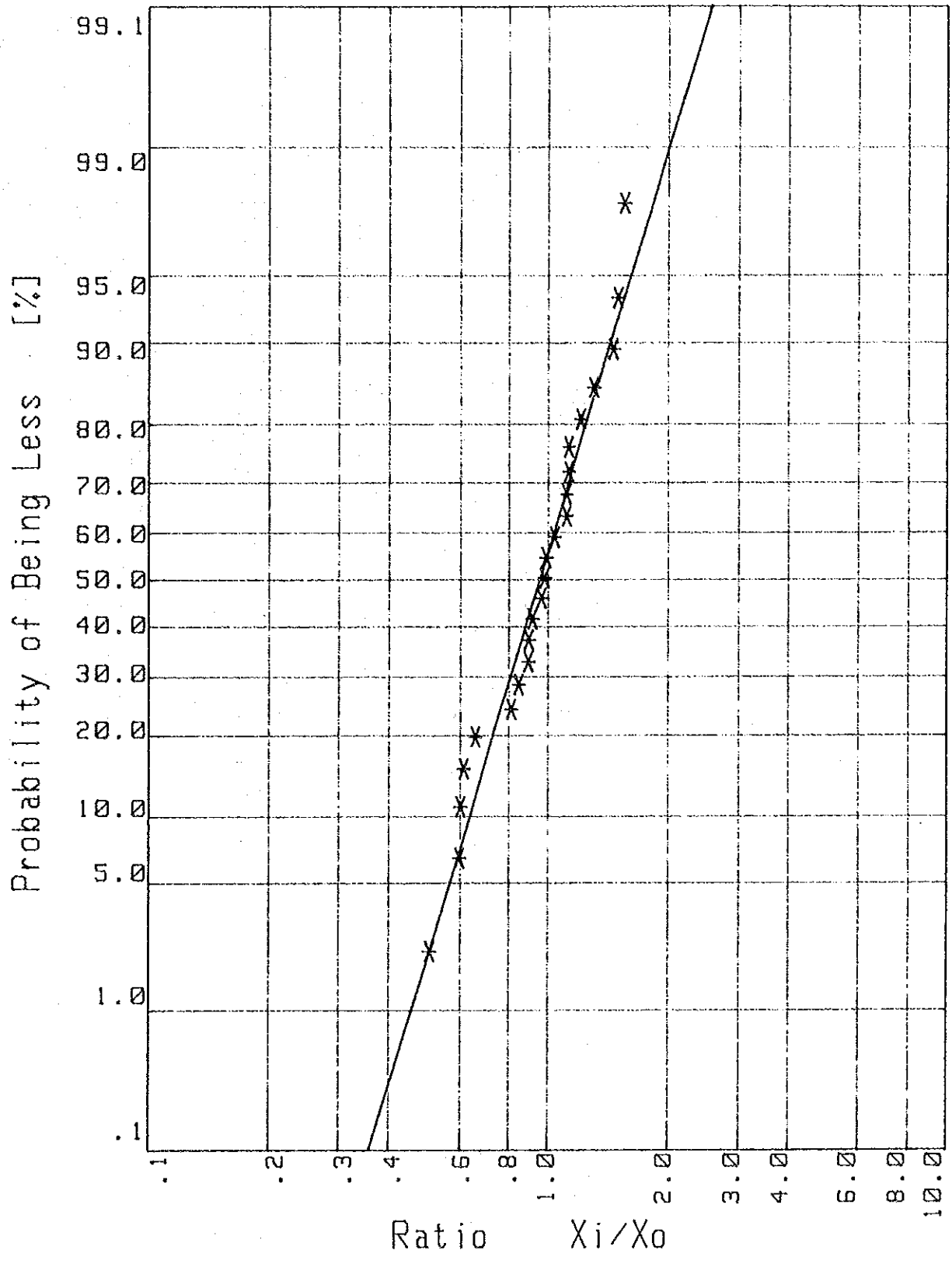
Year	Water Discharge [m3/s]	No.	Data(year) [m3/s]	Ratio Xi/Xo	Probability [%]
1954	63.5	1	30.7(1977)	0.506	2.17
1955	68.2	2	36.5(1987)	0.602	6.52
1956	94.8	3	36.7(1983)	0.605	10.87
1957	74.3	4	37.4(1980)	0.616	15.22
1958	56.0	5	40.1(1978)	0.661	19.57
1959	----	6	49.6(1986)	0.817	23.91
1960	----	7	51.7(1979)	0.852	28.26
1961	----	8	54.7(1976)	0.901	32.61
1962	----	9	54.8(1973)	0.903	36.96
1963	----	10	56.0(1958)	0.923	41.30
1964	----	11	58.9(1972)	0.971	45.65
1965	----	12	59.9(1985)	0.987	50.00
1966	----	13	60.5(1981)	0.997	54.35
1967	----	14	63.5(1954)	1.047	58.70
1968	----	15	68.2(1955)	1.124	63.04
1969	----	16	68.2(1988)	1.124	67.39
1970	----	17	69.1(1982)	1.139	71.74
1971	89.2	18	69.1(1984)	1.139	76.09
1972	58.9	19	74.3(1957)	1.224	80.43
1973	54.8	20	80.0(1975)	[illegible]	84.78
1974	91.7	21	89.2(1971)	1.470	89.13
1975	80.0	22	91.7(1974)	1.511	93.48
1976	54.7	23	94.8(1956)	1.562	97.83
1977	30.7				
1978	40.1				
1979	51.7				
1980	37.4				
1981	60.5				
1982	69.1				
1983	36.7				
1984	69.1				
1985	59.9				
1986	49.6				
1987	36.5				
1988	68.2				

Total Xs= 1395.6 m3/s Average Xo= 60.7 m3/s

Hazen Plot

Probability	Return Period [year]	Ratio Xi/Xo	Water Discharge [m3/s]	[l/s/km2]	[mm/day]
5%	20	0.567	34.4	21.203	1.832
10%	10	0.636	38.6	23.778	2.054
20%	5	0.732	44.4	27.354	2.363
25%	4	0.772	46.8	28.835	2.491
33%	3	0.831	50.4	31.065	2.684
50%	2	0.957	58.0	35.743	3.088

* Area of Basin = 1623.89 km2



Probability of Mean Water Discharge
(Station ALAMBRADO)

Fig. B.4.8 Probability of Annual Mean Run-off Discharge

Table B.4.12 Run-off Pattern of the Drought Year
in the Study Area (1) Circasia
Catchment Area 50.40 km2 (m3/s)

Return Period	1/2	1/5	1/10	1/20
Jan.	2.049	1.568	1.362	1.214
Feb.	1.729	1.322	1.149	1.024
Mar.	1.755	1.343	1.167	1.040
Apr.	2.186	1.672	1.453	1.295
May	2.192	1.677	1.457	1.299
Jun.	1.521	1.163	1.011	0.901
Jul.	1.040	0.795	0.691	0.616
Aug.	0.740	0.566	0.492	0.438
Sep.	0.832	0.636	0.553	0.493
Oct.	1.803	1.379	1.198	1.068
Nov.	2.985	2.283	1.984	1.769
Dec.	2.798	2.140	1.859	1.658
Mean	1.802	1.379	1.198	1.068

Table B.4.12 Run-off Pattern of the Drought Year
in the Study Area (2) Salento
Catchment Area 7.44 km2 (m3/s)

Return Period	1/2	1/5	1/10	1/20
Jan.	0.303	0.231	0.201	0.179
Feb.	0.255	0.195	0.170	0.151
Mar.	0.259	0.198	0.172	0.154
Apr.	0.323	0.247	0.214	0.191
May	0.324	0.248	0.215	0.192
Jun.	0.224	0.172	0.149	0.133
Jul.	0.153	0.117	0.102	0.091
Aug.	0.109	0.084	0.073	0.065
Sep.	0.123	0.094	0.082	0.073
Oct.	0.266	0.204	0.177	0.158
Nov.	0.441	0.337	0.293	0.261
Dec.	0.413	0.316	0.274	0.245
Mean	0.266	0.204	0.177	0.158

Table B.4.12 Run-off Pattern of the Drought Year
in the Study Area (3) Quindio Right
Catchment Area 13.63 km2 (m3/s)

Return Period	1/2	1/5	1/10	1/20
Jan.	0.554	0.424	0.368	0.328
Feb.	0.467	0.358	0.311	0.277
Mar.	0.475	0.363	0.315	0.281
Apr.	0.591	0.452	0.393	0.350
May	0.593	0.453	0.394	0.351
Jun.	0.411	0.315	0.273	0.244
Jul.	0.281	0.215	0.187	0.167
Aug.	0.200	0.153	0.133	0.119
Sep.	0.225	0.172	0.149	0.133
Oct.	0.488	0.373	0.324	0.289
Nov.	0.807	0.617	0.536	0.478
Dec.	0.757	0.579	0.503	0.448
Mean	0.487	0.373	0.324	0.289

Table B.4.12 Run-off Pattern of the Drought Year in the Study Area (6) Pijao
Catchment Area 17.77 km2 (m3/s)

Return Period	1/2	1/5	1/10	1/20
Jan.	0.723	0.553	0.480	0.428
Feb.	0.609	0.466	0.405	0.361
Mar.	0.619	0.473	0.411	0.367
Apr.	0.771	0.590	0.512	0.457
May	0.773	0.591	0.514	0.458
Jun.	0.536	0.410	0.356	0.318
Jul.	0.367	0.280	0.244	0.217
Aug.	0.261	0.199	0.173	0.154
Sep.	0.293	0.224	0.195	0.174
Oct.	0.636	0.486	0.422	0.377
Nov.	1.052	0.805	0.699	0.624
Dec.	0.986	0.755	0.656	0.584
Mean	0.635	0.486	0.422	0.377

Table B.4.12 Run-off Pattern of the Drought Year in the Study Area (7) Genova
Catchment Area 9.24 km2 (m3/s)

Return Period	1/2	1/5	1/10	1/20
Jan.	0.376	0.287	0.250	0.223
Feb.	0.317	0.242	0.211	0.188
Mar.	0.322	0.246	0.214	0.191
Apr.	0.401	0.307	0.266	0.237
May	0.402	0.307	0.267	0.238
Jun.	0.279	0.213	0.185	0.165
Jul.	0.191	0.146	0.127	0.113
Aug.	0.136	0.104	0.090	0.080
Sep.	0.152	0.117	0.101	0.090
Oct.	0.331	0.253	0.220	0.196
Nov.	0.547	0.419	0.364	0.324
Dec.	0.513	0.392	0.341	0.304
Mean	0.330	0.253	0.220	0.196

Table B.4.12 Run-off Pattern of the Drought Year in the Study Area (4) Quindio Left (1) Catchment Area 27.66 km2 (m3/s)

Return Period	1/2	1/5	1/10	1/20
Jan.	1.125	0.860	0.747	0.666
Feb.	0.949	0.726	0.630	0.562
Mar.	0.963	0.737	0.640	0.571
Apr.	1.200	0.918	0.797	0.711
May	1.203	0.920	0.799	0.713
Jun.	0.835	0.638	0.555	0.494
Jul.	0.571	0.436	0.379	0.338
Aug.	0.406	0.310	0.270	0.240
Sep.	0.456	0.349	0.303	0.270
Oct.	0.989	0.757	0.658	0.586
Nov.	1.638	1.253	1.089	0.971
Dec.	1.536	1.175	1.020	0.910
Mean	0.989	0.757	0.657	0.586

Table B.4.12 Run-off Pattern of the Drought Year in the Study Area (5) Quindio Left (2) Catchment Area 0.73 km2 (m3/s)

Return Period	1/2	1/5	1/10	1/20
Jan.	0.030	0.023	0.020	0.018
Feb.	0.025	0.019	0.017	0.015
Mar.	0.025	0.019	0.017	0.015
Apr.	0.032	0.024	0.021	0.019
May	0.032	0.024	0.021	0.019
Jun.	0.022	0.017	0.015	0.013
Jul.	0.015	0.012	0.010	0.009
Aug.	0.011	0.008	0.007	0.006
Sep.	0.012	0.009	0.008	0.007
Oct.	0.026	0.020	0.017	0.015
Nov.	0.043	0.033	0.029	0.026
Dec.	0.041	0.031	0.027	0.024
Mean	0.026	0.020	0.017	0.015

3) Flood Water Discharge

The flood water discharge was estimated using the Rational Formula;

$$Q=f*i*a/3.6$$

where Q : Peak Flood Water Discharge (m3/s)
f : Run-off Coefficient (Considering the condition of the study area, 0.8 of coefficient is applied)
a : Catchment Area (km2)
i : Rainfall Intensity on the Duration Time (mm/hr)

Rainfall intensities should be estimated using the formula as mentioned before. However, depending on the topographic condition, duration time varies. Duration time was estimated using following formula;

$$tp=C*a^{(0.22)}*i^{(-0.35)}$$

where tp: Duration time (min)
C : Coefficient (Considering land use, 200 of coefficient was applied)

Using these formula, the rainfall intensity, the duration time and the flood water discharge for the study areas were estimated as shown in Table B.4.13.

Table B.4.13 Flood Water Discharge (1)

Description Return Period	1/2	1/5	1/10	1/20
Circasia (Catchment Area 50.40 km2)				
Maximum 24-hour Rainfall (mm)	85	100	109	117
Duration Time (hr)	3.16	2.93	2.82	2.73
Rainfall Intensity (mm/hr)	13.68	16.91	18.93	20.76
Peak Flood Discharge (m3/s)	153.2	189.4	212.0	232.5
Specific Discharge (m3/s/km2)	3.04	3.76	4.21	4.61
Salento (Catchment Area 7.44 km2)				
Maximum 24-hour Rainfall (mm)	92	122	141	159
Duration Time (hr)	1.76	1.55	1.45	1.37
Rainfall Intensity (mm/hr)	21.88	31.61	38.18	44.65
Peak Flood Discharge (m3/s)	36.2	52.3	63.1	73.8
Specific Discharge (m3/s/km2)	4.86	7.02	8.48	9.92
Quindio Right (Catchment Area 13.63 km2)				
Maximum 24-hour Rainfall (mm)	82	100	111	121
Duration Time (hr)	2.21	2.02	1.92	1.85
Rainfall Intensity (mm/hr)	16.77	21.72	24.89	27.85
Peak Flood Discharge (m3/s)	50.8	65.8	75.4	84.4
Specific Discharge (m3/s/km2)	3.72	4.83	5.33	6.19
Quindio Left (1) (Catchment Area 27.66 km2)				
Maximum 24-hour Rainfall (mm)	81	91	97	102
Duration Time (hr)	2.72	2.58	2.50	2.45
Rainfall Intensity (mm/hr)	14.41	16.78	18.23	19.47
Peak Flood Discharge (m3/s)	88.6	103.1	112.1	119.7
Specific Discharge (m3/s/km2)	3.20	3.73	4.05	4.32
Quindio Left (2) (Catchment Area 0.73 km2)				
Maximum 24-hour Rainfall (mm)	81	91	97	102
Duration Time (hr)	0.96	0.91	0.88	0.86
Rainfall Intensity (mm/hr)	28.89	33.62	36.54	39.02
Peak Flood Discharge (m3/s)	4.7	5.5	5.9	6.3
Specific Discharge (m3/s/km2)	6.41	7.47	8.12	8.67

Table B.4.13 Flood Water Discharge (2)

Description	Return Period	1/2	1/5	1/10	1/20
Pijao (Catchment Area 17.77 km2)					
Maximum 24-hour Rainfall (mm)		82	100	111	121
Duration Time (hr)		2.38	2.18	2.07	1.99
Rainfall Intensity (mm/hr)		15.94	20.64	23.66	26.48
Peak Flood Discharge (m3/s)		62.9	81.5	93.4	104.6
Specific Discharge (m3/s/km2)		3.54	4.59	5.26	5.88
Genova (Catchment Area 9.24 km2)					
Maximum 24-hour Rainfall (mm)		67	87	100	112
Duration Time (hr)		2.17	1.92	1.80	1.71
Rainfall Intensity (mm/hr)		13.88	19.51	23.40	27.13
Peak Flood Discharge (m3/s)		28.5	40.1	48.0	55.7
Specific Discharge (m3/s/km2)		3.08	4.34	5.20	6.03

ANNEX C : SOIL

ANNEX C

CONTENTS

ANNEX C : SOIL

Soil survey consists of profile pit(23 points), arguer boring(30X3=90points) and laboratory analysis(88 samples).
Results of the survey; soil classification, representative soil profile, laboratory analysis and distribution of survey point, are summerized as follows.

C.1 SOIL CLASSIFICATION

Soil classification by IGAC and USDA is shown in following Table.

Symbol	IGAC	USDA
CI	Chinchina	Typic Dystrandept
LC	Libano	Hydric Dystrandept
SH	Complex of Santa Isabel and Herveo	Hydric Dystrandept(50%) Typic Dystrandept(40%)
TB	Complex of Tebaida and Alejandeia	Typic Dystrandept(45%) Typic Tropudalf(45%)
AL	Complex of Alejandria and Isabel	Typic Tropudalf(50%) Typic Hapludoll(40%)
CE	Complex of Ceilan and Danubio	Fluvaquentic Hapludoll(50%) Aquic Dystropept(50%)
QU	Complex of Qundio and Guarino	Fluventic Dystropept(50%) Typic Tropofluvent(30%)

CC	Complex of Chinchina and El Cedral	Typic Dystrandept(60%) Typic Hapludoll(40%)
HG	Complex of Herveo and Guacas	Typic Dystrandept(50%) Typic Dystropept(40%)
GE	Complex of El Cedral and Pedregales	Typic Hapludoll(45%) Typic Troporthent(40%)

C.2 REPRESENTATIVE SOIL PROFILE

Sample No. : 2
Soil Name : Chinchina(CI)
Land Use : Pasture
Drainage : Moderate
Land Form : Rolling
Parent Material : Volcanic Ash

Profile Description

Ap 1 - 50 cm Black(7.5 YR 2/1) Moist; Loamy Clay; Moderate medium angular; Many fine pores; Many medium and fine roots; Unclear smooth boundary.

A1 - 64 cm Brownish black(7.5 YR 2/2) Moist; Sandy Loam; Moderate medium angular; Many medium and fine pores; Many medium and fine roots; Unclear smooth boundary.

AB	- 72 cm	Very dark brown(7.5 YR 2/3) Moist; Sandy Loam; Moderate medium angular; Many medium and fine pores; Common fine roots; Unclear smooth boundary.
Bw1	- 120 cm	Brown(7.5 YR 4/4) Moist; Loamy Sand; Moderate medium angular; Many medium and fine pores; Common medium and fine roots; Unclear wavy boundary.
Bw2	-	Brown(10 YR 4/4) Moist; Sandy Clay Loam; Moderate medium angular; Many fine pores; Few fine roots.

Sample No. : 3
Soil Name : Libano(LC)
Land Use : Pasture
Drainage : Moderate
Land Form : Undulating
Parent Material : Volcanic Ash

Profile Description

Ap	0 - 30 cm	Black(7.5 YR 2/1) Moist; Sandy Loam; Moderate medium angular; Many medium and fine pores; Many medium and fine roots; Clear wavy boundary.
AB	- 35 cm	Dark brown(7.5 YR 3/3) Moist; Loamy Sand; Moderate medium angular; Many medium and fine pores; Many medium and fine roots; Unclear wavy boundary.

Bw1	- 70 cm	Brown(10 YR 4/4) Moist; Loamy Sand; Moderate medium sub-angular; Many medium and fine pores; Common medium and fine roots; Unclear smooth boundary.
Bw2	-	Dark brown(10 YR 3/4) Moist; Sandy Clay; Moderate medium sub-angular; Common fine roots.

Sample No. : 16
Soil Name : Complex of Tebaida and Alejandria(TB)
Land Use : Coffee
Drainage : Moderate
Land Form : Rolling
Parent Material : Volcanic Ash

Profile Description

Ap	0 - 45 cm	Black(10 YR 2/1) Moist, Moderate medium sub-angular; Many medium and fine pores; Many medium and fine roots; Unclear smooth boundary.
AB	- 59 cm	Brownish black(10 YR 2/3) Moist; Weak medium sub-angular; Many medium and fine pores, Common fine roots; Unclear smooth boundary.
Bw1	- 81 cm	Dark brown(10 YR 3/3) Moist; Sand; Weak medium sub-angular; Many medium and fine pores; Few fine roots; Unclear smooth boundary.
Bw2	- 105 cm	Dark brown(7.5 YR 3/4) Moist; Loamy clay; Moderate medium sub-angular; Many fine pores; Few fine roots; Unclear smooth boundary.

Bw3	-	Brown(10 YR 4/6) Moist; Loamy Clay; Moderate medium sub-angular; Many fine pores; Few fine roots.

Sample No. : 13
Soil Name : Complex of Ceilan and Danubio(CE)
Land Use : Upland Crop(Sunflower)
Drainage : Imperfect
Land Form : Flat
Parent Material : Alluvial

Profile Description

Ap	0 - 22 cm	Dark brown(10 YR 3/3) Moist; Clay Loam; Moderate medium granular; Many fine pores; Many fine roots; Unclear smooth boundary.
AB	- 39 cm	Dark brown(10 YR 3/4) with many mottles(2.5 YR 2/4) Moist; Clay Loam; Moderate medium granular; Many fine pores; Many fine roots; Clear smooth boundary.
Bg1	- 55 cm	Grayish olive(5 Y 5/2) with many mottles(7.5 YR 4/4) Moist; Loamy Sand; Moderate medium angular; Many fine pores; Common fine roots; Unclear smooth boundary.
Bg2	- 85 cm	Olive brown(2.5 Y 4/3) with many mottles(5 YR 3/3) Moist; Sand; Moderate medium sub-angular; Many fine pores; Few fine roots; Clear smooth boundary.

Bg3	-	Olive brown(2.5 Y 4/3) with many mottles(5 YR 2/4) Moist; Clay Loam; Moderate medium platy; Many fine pores; Few fine roots;

Sample No. : 14
Soil Name : Complex of Quindio and Guarino(QU)
Land Use : Pasture
Drainage : Imperfect
Land Form : Flat
Parent Material : Alluvial

Profile Description

Ap	0 - 20 cm	Brownish black(10 YR 2/2) Moist; Loamy Sand; Moderate medium granular; Many medium and fine pores; Many medium and fine roots; Unclear smooth boundary.
AB	- 40 cm	Brownish black(10 YR 2/2) with common mottles(7.5 YR 3/4) Moist; Loamy Sand; Moderate medium granular; Many medium and fine pores; Many fine roots; Unclear smooth boundary.
Bg1	- 70 cm	Dark grayish(2.5 Y 4/2) with common mottles(5 YR 3/6) Moist; Sandy Loam; Moderate Medium sub-angular; Many fine pores; Few fine roots; Unclear smooth boundary.
Bg2	-	Dark grayish(2.5 Y 4/2) with many mottles(7.5 Y 3/3) Moist; Sandy Clay; Moderate medium platy; Many fine pores; Few fine roots.

Sample No. : 10
Soil Name : Complex of Chinchina and El Cedral(CC)
Land Use : Coffee
Drainage : Moderate
Land Form : Slope
Parent Material : Volcanic Ash and Metamorphic Rock

Profile Description

Ap	0 - 34 cm	Brownish black(10 YR 2/2) Moist; Sandy Loam; Moderate medium sub-angular; Many medium and fine pores; Many medium and fine roots; Unclear smooth boundary.
AB	- 45 cm	Brownish black(10 YR 3/2) Moist; Sandy Clay Loam; Moderate medium sub-angular; Many medium and fine pores; Common fine roots; Unclear smooth boundary.
Bw1	- 65 cm	Brown(7.5 YR 4/6) Moist; Clay Loam; Moderate medium platy; Many fine pores; Common fine roots; Unclear smooth boundary.
Bw2	- 80 cm	Brown(7.5 YR 4/6) Moist; Clay Loam; Moderate medium platy; Common fine roots; Unclear smooth boundary.
CB	- 110 cm	Brown(10 YR 4/6) with many mottles(10 YR 4/3) Moist; Clay Loam; Moderate medium platy; Common fine pores; Common fine roots; Unclear smooth boundary.
C	- 115 cm	Yellowish brown(10 YR 5/6) Moist; Sandy Clay Loam; Moderate medium platy; Few fine pores; Common fine roots; Unclear smooth boundary.

Sample No. : 8
Soil Name : Complex of Herveo and Guacas(HG)
Land Use : Pasture
Drainage : Moderate
Land Form : Slope
Parent Material : Volcanic Ash and Metamorphic Rock

Profile Description

Ap	0 - 5 cm	brownish black(10 YR 3/2) Moist; Loamy Sand; Moderate fine angular; Many medium and fine pores; Many medium and fine roots; Clear smooth boundary.
A	- 25 cm	Brownish black(10 YR 2/2) Moist; Loamy Sand; Moderate medium and fine sub-angular; Many medium and fine pores; Many medium and fine roots; Unclear smooth boundary.
AB	- 35 cm	Dark brown(10 YR 3/3) with many mottles(10 YR 3/2) Moist; Loamy Sand; Moderate medium and fine sub-angular; Many medium and fine pores; Many fine roots; Unclear smooth boundary.
Bw	- 55 cm	Brown(10 YR 4/4) Moist; Loamy Clay; Moderate medium and fine sub-angular; Many medium and fine pores; Common fine roots; Unclear smooth boundary.
BC	- 75 cm	Brown(10 YR 4/4) Moist; Clay Loam; Moderate medium and fine sub-angular; Many fine pores; Common fine roots; Unclear smooth boundary.

CR1	-	Brown(10 YR 4/6) Moist; Clay Loam; Moderate medium and fine platy; Many fine pores; Common fine roots.

Sample No. : 19
Soil Name : Complex of El Cedral and Pedregales(GE)
Land Use : Coffee
Drainage : Moderate
Land Form : Steep Slope
Parent Material : Metamorphic Rock

Profile Description

Ap	0 - 25 cm	Black(10 YR 1.7/1) Moist; Sandy Loam; Moderate medium and fine angular; Many medium and fine pores; Many large, medium and fine roots; Clear wavy boundary.
AB	- 32 cm	Dark brown(10 YR 3/4) Moist; Loamy Sand; Many medium and fine stone; Moderate medium and fine angular; Many medium and fine pores; Many large, medium and fine roots; Unclear wavy boundary.
Bw1	- 45 cm	Brown(7.5 YR 4/6) Moist; Sandy Clay Loam; Many medium and fine stone; Moderate medium sub-angular; Many medium and fine pores; Many large, medium and fine roots; Unclear wavy boundary.

BC	- 75 cm	Reddish brown(5 YR 4/8) Moist; Sandy Clay Loam; Many medium and fine stone; Moderate medium sub-angular; Many medium and fine pores; Many large, medium and fine roots; Unclear wavy boundary.
C	-	Reddish brown(2.5 YR 4/8) Moist; Clay Loam; Many medium and fine stone; Weak medium sub-angular; Many medium and fine pores; Many medium and fine roots.

C.3 RESULTS OF SOIL ANALYSIS

Sample No.	Soil Unit	Depth (cm)	Horlizon	Soil Texture	pH	N (%)	P (ppm)	Exchangeable Cation (meq/100g) K	Ca	Mg	Na	Al	Total*	CEC meq/100g	Saturation (%)	Organic C (%)	C/N	Fertility**
1	CI	0 - 55	Ap	SL	5.6	0.56	2	0.3	10.2	0.8	0.10	-	11.4	28.2	40.4	5.23	9	H
		- 65	AB	SL	5.7	0.33	3	0.3	0.6	0.2	0.10	-	1.2	21.6	5.6	2.62	8	
		- 95	Aw1	SL	5.7	0.10	7	0.2	0.6	0.2	0.10	-	1.1	16.3	6.7	0.50	5	
2	LC	0 - 50	Ap	SL	5.4	0.47	3	0.3	0.6	0.2	0.05	0.4	1.1	29.8	3.7	5.14	11	M
		- 64	A1	SL	5.5	0.37	3	0.2	0.2	0.2	0.05	0.4	0.6	23.3	2.6	3.10	8	
		- 72	AB	SL	5.5	0.29	2	0.2	0.2	0.2	0.02	0.2	0.6	20.4	2.9	2.10	7	
		-120	Bw1	SL	5.7	0.32	4	0.2	0.2	0.2	0.02	-	0.6	18.4	3.3	1.01	3	
3	CI	0 - 30	Ap	SL	5.3	0.53	4	0.3	1.6	1.2	0.10	0.4	3.2	26.9	11.9	4.64	9	M
		- 35	AB	SL	5.4	0.17	4	0.2	0.4	0.2	0.05	0.2	0.8	17.5	4.6	1.51	9	
		- 70	Bw1	LS	5.5	0.15	4	0.2	0.2	0.2	0.20	0.2	0.8	15.9	5.0	1.15	8	
4	CI	0 - 55	Ap	SL	5.4	0.54	4	0.4	0.8	0.4	0.05	0.2	1.6	25.3	6.3	4.17	8	M
		- 65	AB	SL	5.5	0.32	4	0.3	0.2	0.2	0.05	0.2	0.7	18.4	3.8	2.07	7	
		- 90	Bw1	LS	5.5	0.17	4	0.3	0.2	0.2	0.02	0.2	0.7	15.5	4.5	1.08	6	
5	CI	0 - 10	Ap	SL	5.3	0.65	8	0.4	9.0	2.4	0.05	0.4	11.8	35.5	33.2	6.99	8	M
		- 65	A	SL	5.2	0.46	4	0.2	0.6	0.2	0.05	0.6	1.0	23.7	4.2	4.22	4	
		- 80	AB	SL	5.1	0.22	10	0.1	0.8	0.4	0.04	0.4	1.3	15.5	8.4	1.51	7	
		-120	Bw1	SL	5.2	0.11	19	0.1	0.4	0.2	0.03	0.2	0.7	13.1	5.3	0.75	7	
6	CI	0 - 30	Ap	LS	5.1	0.42	9	0.6	2.0	0.4	0.01	0.2	3.0	25.3	11.9	4.55	11	M
		- 40	AB	SL	5.3	0.18	6	0.4	1.4	1.4	0.01	0.6	3.2	22.0	14.5	1.66	9	
		- 70	Bw1	SL	5.5	0.12	7	0.6	1.4	1.4	0.01	0.2	3.4	23.3	14.6	0.42	3	
		- 90	Bw2	SL	5.6	0.04	13	0.3	0.8	0.4	0.02	-	1.5	13.5	11.1	0.06	1	

Cont.

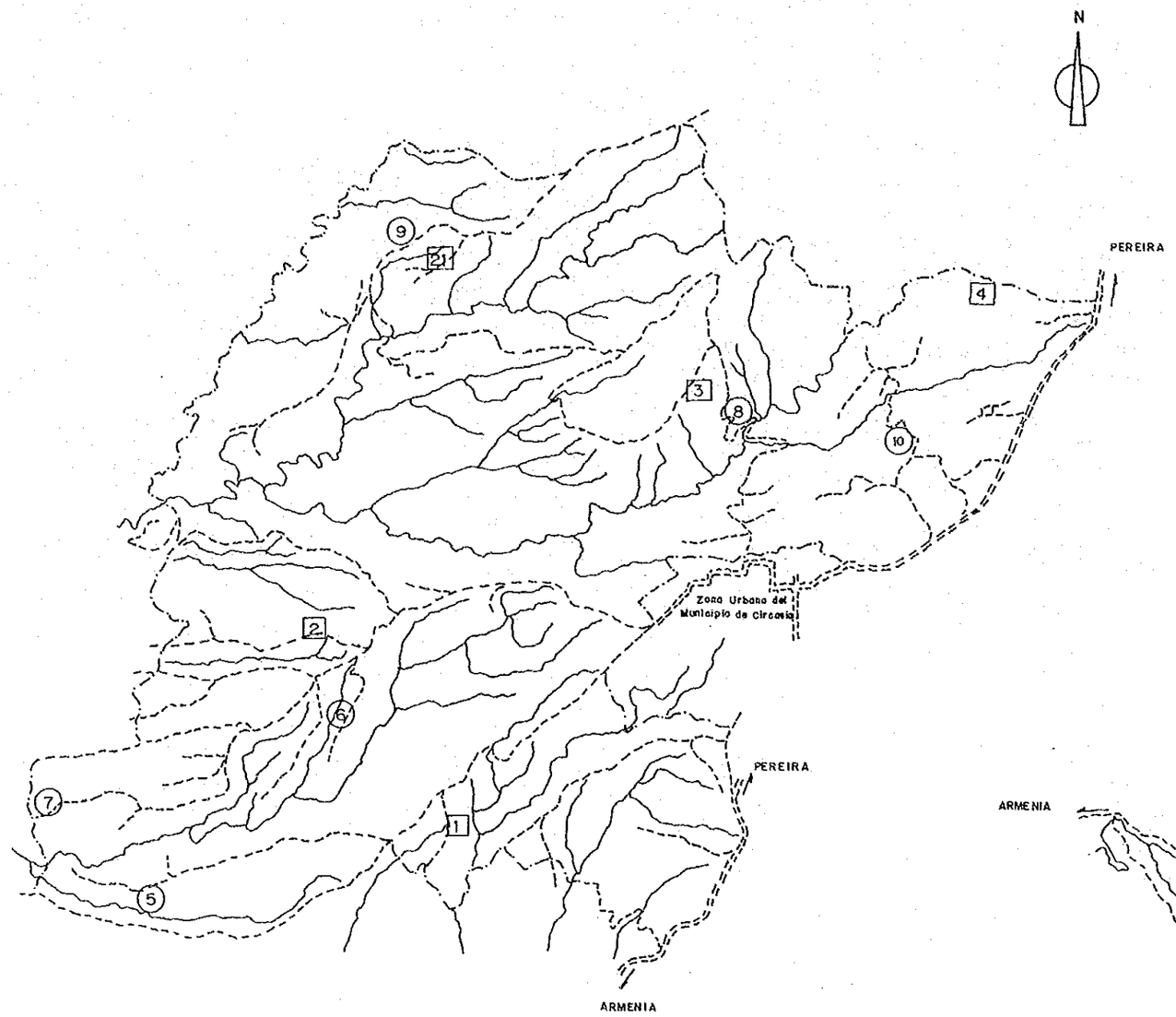
Sample No.	Soil Unit	Depth (cm)	Horlizon	Soil Texture	pH	N (%)	P (ppm)	Exchangeable Cation (meq/100g) K	Ca	Mg	Na	Al	Total*	CEC meq/100g	Saturation (%)	Organic C (%)	C/N	Fertility**
7	LC	0 - 40	Ap	SL	5.3	0.48	6	0.2	1.2	1.2	0.02	0.6	2.6	23.7	11.0	4.22	9	M
		- 45	AB	SL	5.3	0.27	6	0.2	0.6	0.2	0.02	1.0	1.0	19.2	5.2	2.01	7	
		- 60	Bw1	LS	5.5	0.18	5	0.1	0.6	0.2	0.04	0.2	0.9	22.0	4.1	1.69	9	
		-	Bw2	LS	5.6	1.23	4	0.2	1.2	1.2	0.02	-	2.6	28.6	9.1	1.23	7	
8	HG	0 - 5	Ap	SL	5.5	0.24	30	0.4	6.9	3.2	0.10	0.2	10.6	17.5	60.6	2.40	10	M
		- 25	A	SL	5.5	0.29	22	0.4	3.2	3.2	0.02	0.2	6.8	17.1	39.8	2.23	8	
		- 35	AB	SL	5.5	0.16	32	0.4	1.2	1.2	0.10	0.2	2.9	15.1	19.2	1.01	6	
		- 55	Bw	SL	5.6	0.11	39	0.4	1.2	1.2	0.10	-	2.9	15.1	19.2	0.51	5	
		- 75	BC	L	5.8	0.05	5	0.4	9.0	5.3	0.02	-	14.7	14.7	100.0	0.06	1	
		-100	CR1	L	5.6	0.05	3	0.3	10.6	5.7	0.02	-	16.6	15.2	109.2	0.13	3	
9	GE	0 - 25	Ap	SCL	4.9	0.30	7	0.6	6.1	2.8	0.50	1.0	10.0	21.2	47.2	1.73	6	M
		- 40	AB	SCL	5.2	0.18	6	0.3	10.6	1.2	0.10	0.8	12.2	13.5	90.4	0.74	4	
		- 65	Bw	SL	5.2	0.08	7	0.4	13.1	3.2	0.20	0.2	16.9	13.9	121.6	0.20	2	
		- 73	Ab	CL	5.4	0.23	6	0.2	15.5	5.7	0.20	0.4	21.6	21.6	100.0	1.18	5	
		-105	ABb	CL	5.7	0.05	7	0.3	8.9	8.9	0.10	-	18.2	11.8	154.2	0.27	5	
10	CC	0 - 34	Ap	SCL	5.4	0.30	7	0.2	6.9	10.2	0.02	0.2	17.3	20.4	84.8	1.71	6	M
		- 45	AB	CL	5.8	0.11	7	0.3	9.4	4.1	0.04	-	13.8	17.5	78.9	0.58	5	
		- 65	Bw1	CL	5.6	0.06	4	0.3	10.6	1.2	0.20	-	12.3	17.1	71.9	0.08	1	
		- 80	Bw2	SCL	5.7	0.06	7	0.3	11.4	5.3	0.30	-	17.3	18.4	94.0	0.08	1	
		-110	CB	SL	5.9	0.07	4	0.4	3.2	3.2	0.50	-	7.3	23.7	30.8	0.34	1	
11	TB	0 - 50	Ap	SCL	5.6	0.27	3	0.2	8.1	3.2	0.20	-	11.7	15.9	73.6	1.51	6	M
		- 67	AB	SCL	6.0	0.08	4	0.2	6.9	5.3	0.70	-	13.1	11.0	119.1	0.27	3	
		- 80	Bt1	SCL	6.1	0.07	3	0.1	7.3	3.6	0.10	-	11.1	8.6	129.1	0.34	5	
		-100	Bt2	SCL	6.1	0.06	2	0.1	6.5	4.9	0.20	-	11.7	8.6	136.0	0.13	2	

Sample No.	Soil Unit	Depth (cm)	Horlizon	Soil Texture	pH	N (%)	P (ppm)	Exchangeable Cation (meq/100g) K	Ca	Mg	Na	Al	CEC Total* meq/100g	Saturation (%)	Organic C (%)	C/N	Fertility**
12	TB	0 - 35	Ap	SCL	6.1	0.11	10	0.3	5.3	3.6	0.20	-	9.4	9.0	104.4	0.20	2	M
		- 58	AB	SCL	6.1	0.08	18	0.2	5.3	3.6	0.20	-	9.3	8.6	108.6	0.13	2	
		- 75	Bw1	SL	6.1	0.04	56	0.1	4.5	3.2	0.20	-	8.0	7.8	102.6	0.04	1	
		-130	Bw2	SL	6.0	0.07	24	0.4	6.1	8.9	0.30	-	15.7	19.6	80.1	0.08	1	
13	CE	0 - 22	Ap	SiL	5.5	0.26	21	0.4	8.9	8.0	0.05	0.2	17.3	25.3	68.4	1.81	5	H
		- 39	AB	SiCL	5.8	0.20	13	0.4	11.0	5.7	0.10	-	17.2	26.1	65.9	1.26	6	
		- 55	Bg1	Si	5.9	0.09	41	0.2	6.1	5.3	0.30	-	11.9	9.0	132.2	0.34	4	
		- 85	Bg2	L	6.0	0.08	13	0.1	5.3	6.9	0.20	-	12.5	10.2	122.5	0.08	1	
14	QU	0 - 20	Ap	SL	5.1	0.26	16	0.4	4.9	1.2	0.02	0.4	6.5	16.7	38.9	1.70	7	M
		- 40	AB	SL	5.2	0.23	7	0.4	3.2	3.2	0.03	0.2	6.8	13.5	50.4	1.26	6	
		- 70	Bg1	L	5.5	0.14	1	0.2	3.2	2.4	0.10	0.2	5.9	10.2	57.8	0.13	1	
		-	Bg2	L	5.8	0.06	1	0.2	4.1	3.2	0.20	-	7.7	10.2	75.5	0.04	1	
15	TB	0 - 50	Ap	SL	5.4	0.19	9	0.2	4.9	2.4	0.10	0.2	7.6	13.1	58.0	0.51	3	L
		- 72	AB	SL	5.8	0.10	9	0.3	6.2	5.6	0.40	-	12.5	23.3	53.6	0.27	3	
		-109	Bw1	SL	6.0	0.11	9	0.5	5.3	6.4	0.30	-	12.5	31.0	40.3	0.13	1	
16	TB	0 - 45	Ap	SL	5.4	0.19	10	0.4	4.9	1.6	0.05	0.2	6.9	15.5	44.5	0.66	3	M
		- 59	AB	SL	5.5	0.10	11	0.4	4.5	0.8	0.10	0.2	5.8	11.8	49.1	0.34	3	
		- 81	Bw1	SL	5.6	0.08	15	0.3	3.2	2.0	0.10	-	5.6	13.5	41.5	0.27	3	
		-105	Bw2	SL	5.9	0.06	9	0.4	6.1	4.9	0.20	-	11.6	23.6	49.1	0.08	1	
17	GE	0 - 22	Ap	SL	5.6	0.59	4	0.5	4.9	3.2	0.10	-	8.7	37.9	23.0	5.35	9	H
		- 45	AB	SL	5.7	0.22	4	0.5	1.6	1.6	0.20	-	3.9	27.7	14.1	1.67	7	
		- 75	Bw1	SL	5.7	0.15	1	0.4	2.0	1.2	0.80	-	4.4	31.8	13.8	0.95	7	
		-	Bw2	SL	5.6	0.09	2	0.5	0.4	0.4	0.05	-	1.3	26.1	5.0	0.28	3	

Cont.

Sample No.	Soil Unit	Depth (cm)	Horlizon	Soil Texture	pH	N (%)	P (ppm)	Exchangeable Cation (meq/100g) K	Ca	Mg	Na	Al	Total*	CEC meq/100g	Saturation (%)	Organic C (%)	C/N	Fertility**
18	GE	0 - 35	Ap	CL	5.2	0.27	4	0.3	10.2	3.6	0.02	0.4	14.1	24.1	58.5	2.20	9	H
		- 45	AB	CL	5.4	0.10	1	0.2	10.6	5.3	0.10	0.4	16.2	17.9	90.5	0.59	6	
		-	Bw	CL	5.4	0.08	1	0.3	8.2	9.0	0.10	0.4	17.6	22.0	80.0	0.27	3	
19	GE	0 - 25	Ap	LS	5.5	0.60	1	0.3	6.9	2.4	0.02	0.4	9.6	33.9	29.3	7.06	9	M
		- 32	AB	CL	5.3	0.16	1	0.2	4.1	4.1	0.02	0.6	8.4	21.2	29.6	1.71	11	
		- 45	Bw1	CL	5.1	0.10	1	0.2	4.5	4.5	0.02	1.0	9.2	15.9	57.9	0.83	8	
		- 75	BC	L	4.7	0.05	1	0.2	2.4	2.4	0.02	3.0	5.0	13.9	36.0	0.20	4	
20	SH	0 - 45	A	SL	5.4	0.47	9	0.5	4.2	2.5	0.20	0.4	7.4	31.6	23.4	4.88	10	L
		- 50	AB	SL	5.2	0.29	10	0.5	0.2	0.2	0.20	0.5	1.1	28.2	3.9	2.71	9	
		- 60	Bw	SiL	4.8	0.18	9	0.3	0.2	0.2	0.20	1.0	0.9	9.7	9.3	0.99	6	
		- 73	C	SiL	4.6	0.15	6	0.1	0.2	0.2	0.30	2.0	0.8	6.0	13.3	0.57	4	
21	Cl	0 - 10	Ap	SL	4.7	0.99	-	0.5	1.7	1.7	0.20	1.0	4.1	43.0	9.5	9.34	-	L
		- 40	A	SL	4.9	0.51	3	0.1	0.2	0.2	0.20	0.8	0.7	32.4	2.2	5.68	11	
		- 60	AB	SL	5.0	0.28	3	0.1	0.2	0.2	0.20	0.4	0.7	27.9	2.5	3.49	12	
		- 95	Bw1	LS	5.2	0.15	7	-	0.2	0.2	0.30	0.2	0.7	22.5	3.1	1.29	9	
22	AL	0 - 5	Ap	SiCL	5.2	0.23	4	0.2	6.1	2.9	0.20	0.3	9.4	18.8	50.0	2.20	10	M
		- 35	AB	SL	5.5	0.13	3	0.1	4.7	2.2	0.20	0.3	7.2	13.9	51.8	1.08	8	
23	TB	0 - 45	Ap	SL	5.4	0.18	4	0.2	5.7	2.8	0.20	0.2	8.9	16.3	54.6	1.26	7	M
		- 65	AB	SL	6.0	0.08	4	0.2	9.0	3.1	0.30	-	12.6	20.4	61.8	0.44	6	
		-	Bt	SL	6.3	0.05	4	0.2	10.2	4.3	0.60	-	15.2	29.8	51.0	0.14	3	

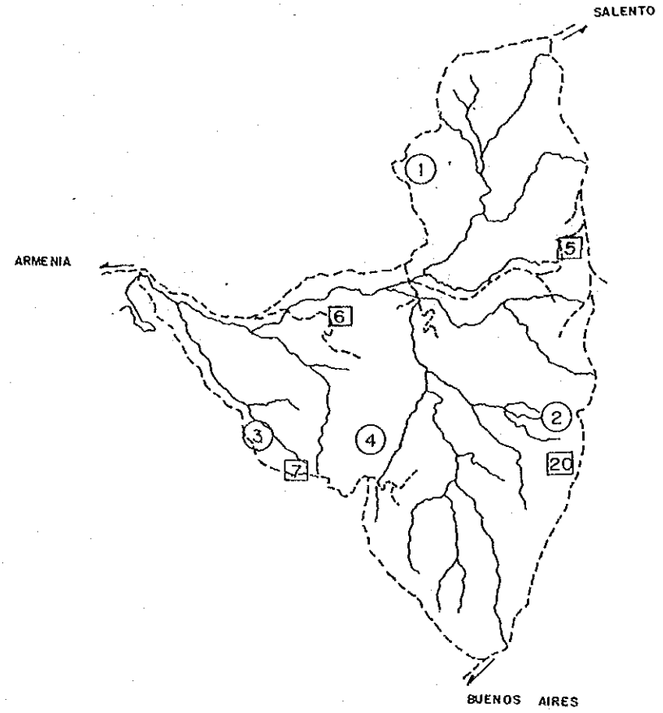
* : Except Al ** : H:high, M:Medium, L:Low



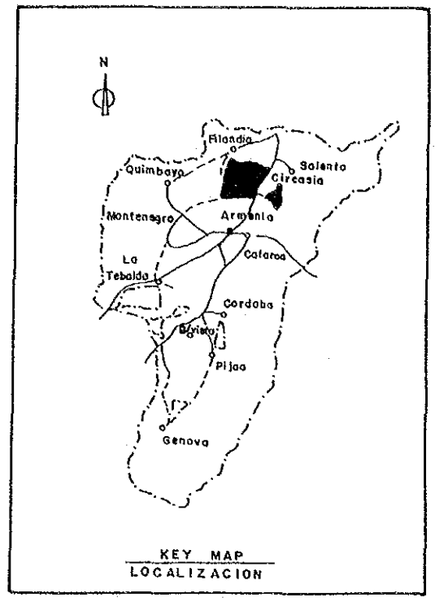
CIRCASIA
CIRCASIA

SCALE 1 : 40000
ESCALA 1 : 40000

0 500 1000 1500 m



SALENTO
SALENTO

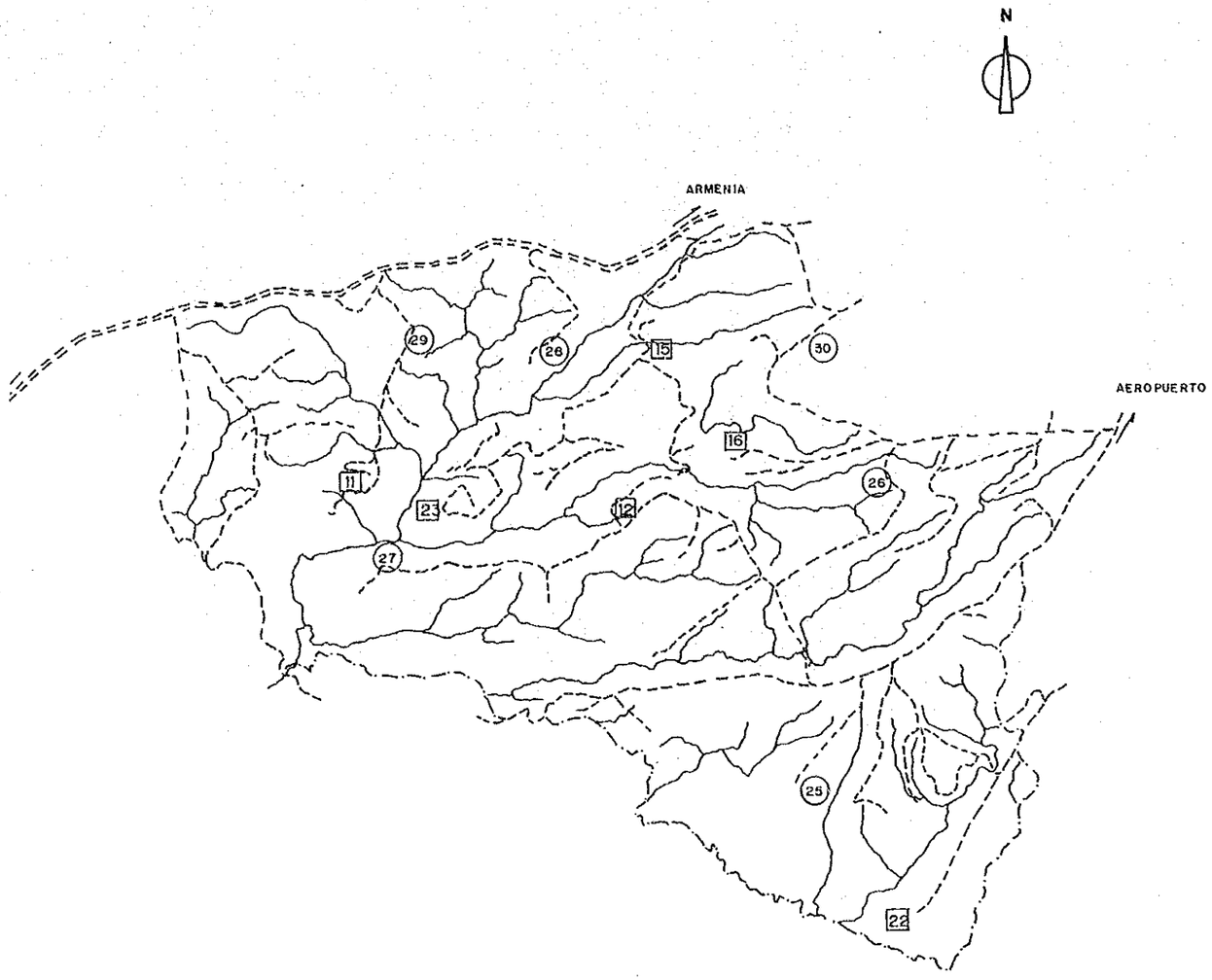


KEY MAP
LOCALIZACION

LEGEND

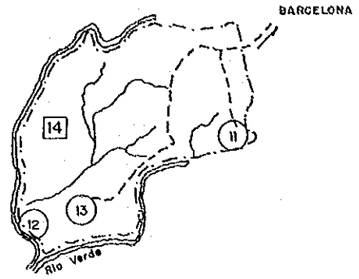
○	Arguer Boring Point
□	Profile Pit Point

C. 4 SOIL SURVEY POINT-(1)



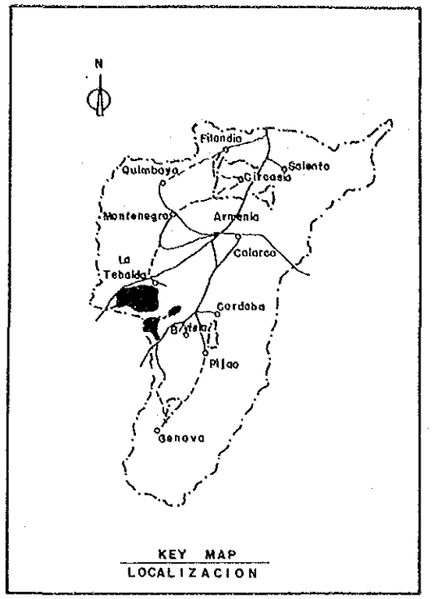
QUINDIO RIVER RIGHT MARGIN

MARGEN DERECHA DEL RIO QUINDIO



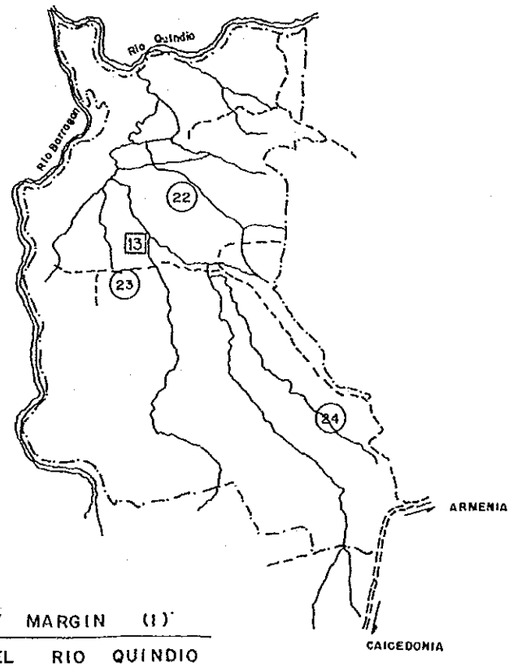
QUINDIO RIVER LEFT MARGIN (2)

MARGEN IZQUIERDA DEL RIO QUINDIO (2)



KEY MAP

LOCALIZACION



QUINDIO RIVER LEFT MARGIN (1)

MARGEN IZQUIERDA DEL RIO QUINDIO

LEGEND

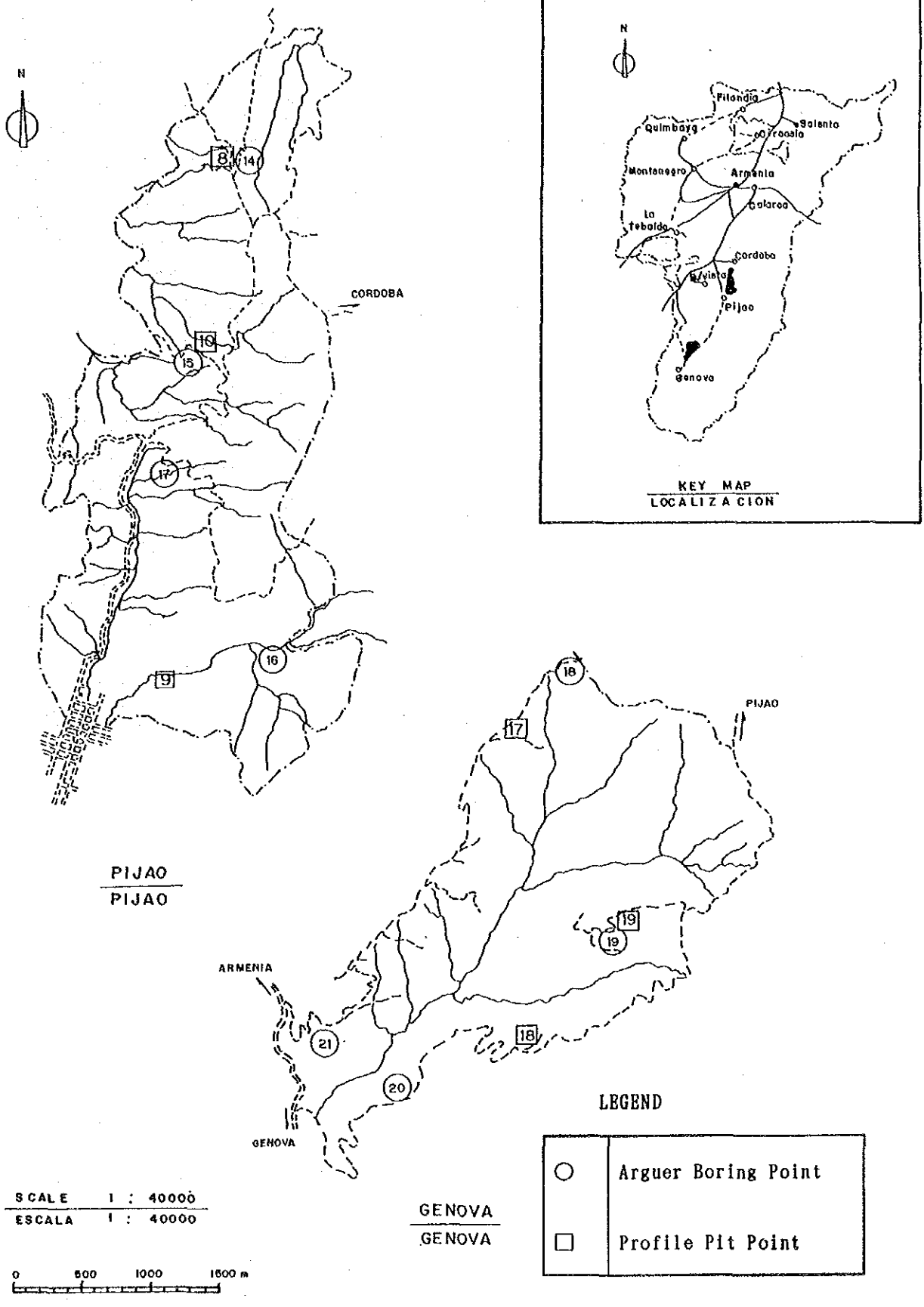
○	Arguer Boring Point
□	Profile Pit Point

SCALE 1 : 40000

ESCALA 1 : 40000

0 500 1000 1500 m

C. 4 SOIL SURVEY POINT-(2)



C. 4 SOIL SURVEY POINT-(S)

ANNEX D : AGRICULTURE

ANNEX D : AGRICULTURE

CONTENTS

D.1: Existing Situation

TABLE 1-1 SUMMERY OF FARMING PRACTICES BY AREA

Item / Area	Area (ha)	Coffee * Suitable Area(%)	Coffee Planted Area(%) Imp. V	Tra. V	Mixed** Cropping	Grazing Land (%)	Livestock***	Other Farming Practices	Others
Circasia	2,735	7	11	14	15	61	Double purpose (meat & milk)(90%).	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	645	0	7	12	13	66	Dairy cattle(60%). 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%). Impruved 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(10%).
Quindio River Left Margin(1)	610	-	0	0	0	44	Double purpose(58%)、Beef cattle(22%). Dairy cattle(20%). Natural pasture(89%).	Large scale upland farming with mechanization(Soybean and sorghum)	Poor drainage land(98%)
Quindio River Left Margin(2)	175	57	33	3	10	47	Double purpose(58%)、Beef cattle(22%)、Dairy cattle(20%). Natural pasture(89%).	Citrus.	Poor drainage land(34%)
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

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

TABLE 1-2 PLANTED AREA BY CROP

(Unit:ha)

Area \ Crop	Coffee		Plantain			Cassava	Soybean	Sorghum	Maize	Kidney Bean	Tomato	Citrus	Other Fruits	Other Veg.	Grazing Land
	Impruved Variety	Local Variety	Mixed Imp.V.	Mixed Local V.	Single										
Circasia	197	337	14	179	-	-	0	0	2	6	16	-	10	-	761
Salento	37	63	17	2	-	-	0	0	-	-	-	-	1	2	122
Quindio River Right Margin	610	57	325	65	184	68	104	54	28	10	5	85	3	75 ****	1,673
Quindio River Left Margin(1)	0	0	0	0	0	0	205	142	4	-	-	-	-	-	351
Quindio River Left Margin(2)	46	5	9	2	1	-	0	0	-	-	-	1	-	-	64
Pijao	29	210	23	51	0	-	0	0	2	2	2	-	2	3	324
Genova	34	190	18	43	0	-	0	0	-	2	-	-	1	-	288
Total	953	862	406	342	185	68	309	196	36	20	23	86	17	80	3,583

*: The ratio of improved variety to trasitional variety is quoted the statistic of agricultural production by Agropecuaria

** : Cabage, onion, velish onion and carrot etc. *** :Guamo, lulo, Gallaba and tree tomato etc.

**** : Passion fruit and pitahaya **,*** :Production mainly for self consumption

- : Negrigible but not zero

TABLE 1-3 UNIT YIELD BY CROP

(Unit: ton/ha)

Crop / Area	Coffee		Plantain			Cassava	Soybean	Sorghum	Maize	Kidney Bean	Tomato	Citrus
			Mixed		Single							
	Impruved Variety	Local Variety	Imp. V.	Local V.								
Circasia	2.00	1.00	4.5	1.8	-	-	-	-	1.05	0.70	30.0	-
Salento	1.87	0.75	4.0	0.8	-	-	-	-	-	-	-	-
Quindio River Right Margin	2.16	1.13	7.0	2.6	15.0	18.0	2.30	4.2	1.90	0.80	28.5	19
Quindio River Left Margin(1)	-	-	-	-	-	-	2.25	4.1	2.00	-	-	-
Quindio River Left Margin(2)	2.10	1.10	7.0	2.6	-	-	-	-	-	-	-	19
Pijao	1.60	0.88	4.0	1.8	-	-	-	-	1.40	0.60	20.0	-
Genova	1.44	0.64	4.0	1.4	-	-	-	-	-	0.60	-	-

Source: URPA(1989)

TABLE 1-4 ESTIMATED MAIN CROP PRODUCTION

(Unit:ton)

Crop / Area	Coffee		Plantain			Cassava	Soybean	Sorghum	Maize	Kidney Bean	Tomato	Citrus
	Impruved Variety	Local Variety	Mixed Imp. V.	Mixed Local V.	Single							
Circasia	394.0	337.0	63.0	322.2	-	-	0	0	2.1	4.2	480.0	-
Salento	69.2	47.3	68.0	1.6	-	-	0	0	-	-	-	-
Quindio River Right Margin	1,317.6	64.4	2,275.0	169.0	2,760.0	1,224.0	239.2	226.8	53.2	8.9	142.5	1,615.0
Quindio River Left Margin(1)	0	0	0	0	0	0	461.3	582.2	8.0	-	-	-
Quindio River Left Margin(2)	96.6	5.5	63.0	5.2	-	-	-	-	-	-	-	19.0
Pijao	46.4	184.8	92.0	91.8	-	-	-	-	2.8	1.2	40.0	-
Genova	49.0	121.6	72.0	60.2	-	-	-	-	-	1.2	-	-
Total	1,972.8	760.6	2,633.0	650.0	2,760.0	1,224.0	700.5	809.0	66.1	14.6	662.5	1,634.0

TABLE ´1-5 NUMBER OF CATTLE AND LIVESTOCK PRODUCTION*

Item Area	Circasia	Salento	Right M.	Left M.(1)	Left M.(2)	Pijao	Genova
Pasture Area(ha)**	1,494	383	297	240	74	325	189
Number of Cattle(Head)	1,289	255	580	438	152	152	113
Meat Production(ton)	147.9	7.8	47.6	7.1	2.2	9.5	6.9
Milk Production(Kl)	1,787	98	258	119	36	10	11
Carrying Capacity (Head/ha)	0.86	0.67	2.00	1.83	2.05	0.50	0.60
Ratio of Natural Pasture(%)	24	93	0	89	89	59	59

*: Source: Estimated based on the Statistics of Caja Agraria(1989) **: 90% of existing land use

D.2: Crop Suitability and Profit

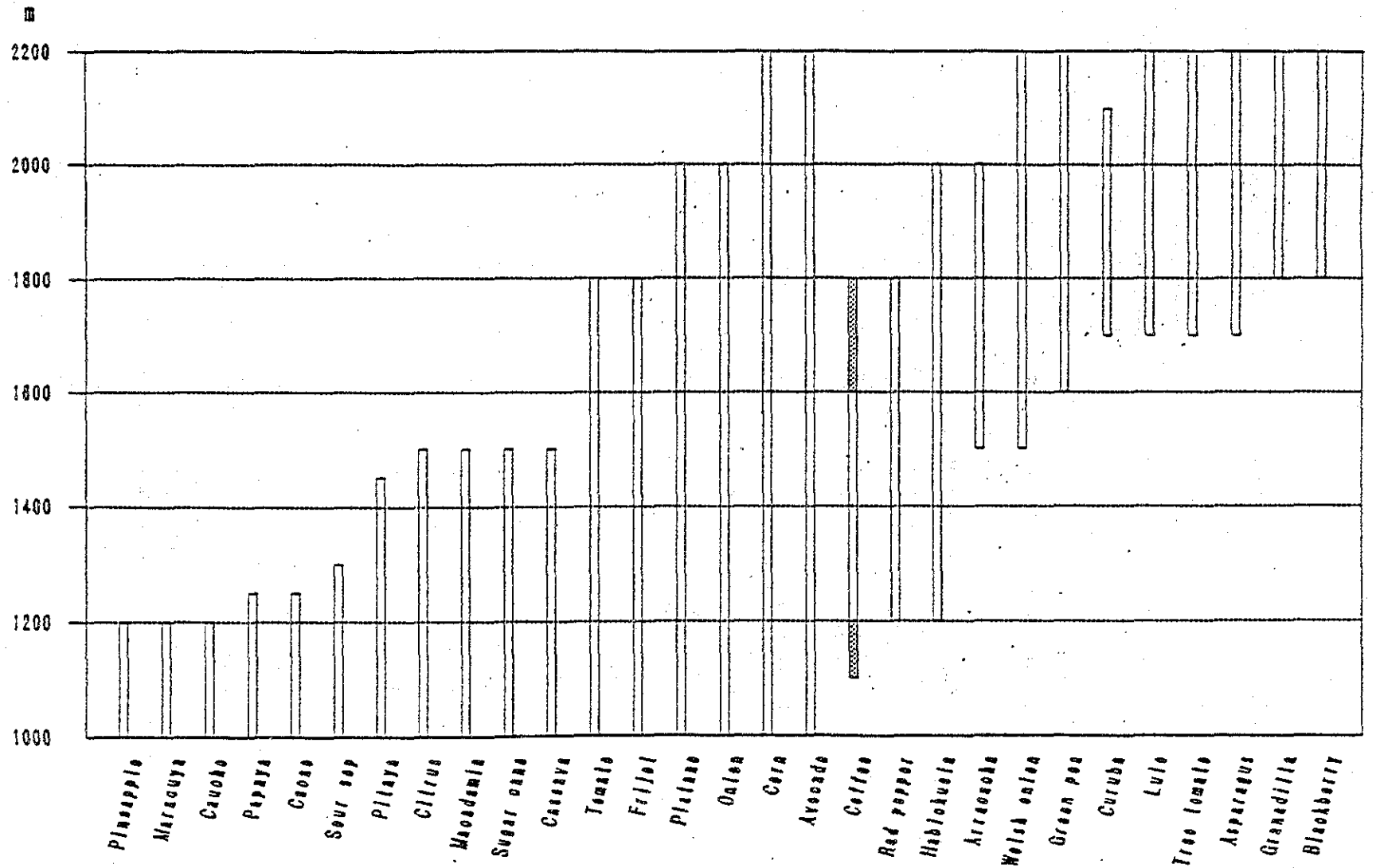


Fig. 2-1 Crop Suitablility by Altitude

TABLE 2-1 PROFIT AND SUITABILITY OF CROP BY AREA

Crop	Profit***	Suitability			
		1	2	3	4*
Coffee					
Improved V.**	1.00	▲	◎	×	▲
Vegetable					
Onion	0.33	◎	◎	◎	◎
Tomato	2.70	◎	◎	◎	○
Green Pea	0.53	◎	×	×	◎
Welish onion	0.40	◎	×	×	◎
Pimenton	0.46	◎	×	×	△
Upland Crop					
Kidney bean	0.40	◎	◎	◎	△
Maize	0.14	◎	◎	◎	◎
Soybean**	0.27	◎	◎	◎	◎
Sorghum**	0.13	◎	◎	◎	◎
Fruit					
Citrus	1.22	×	◎	◎	×
Pitahaya	4.92	×	◎	◎	×
Passion fruit	1.51	×	◎	◎	×
Pineapple	1.23	×	◎	◎	×
Black berry	0.75	▲	×	×	○
Lulo	0.92	○	×	×	◎
Cruba	0.24	○	×	×	◎
Tree Tomato	0.65	○	×	×	◎
Others					
Cassava	1.53	×	◎	◎	▲
Plantain	0.84	◎	◎	◎	○

Suitability : ◎: >80% ○:80-50% △: 50-20%
▲:<20% ×:0%
*: No. of group **: Source Caja Agraria
***:Profit of coffee improved variety is 1.00
Source:FEDECAFE

D.3: Production Plan

TABLE 3-1 MAIN PROMISING CROP FOR INTRODUCTION

Group / Area / Crop	1 Circasia	2 Right M., Left M. (2)	3 Left M. (1)	4 Salent, Pijao, Genova
Vegetable	Tomato, Onion, Welish onion, Cabbage, Carrot, Green pea, Lettuce,	Tomato,	-	Tomato, Onion, Welish onion, Cabbage, Coriander,
Upland Crop	Kidney bean,	Soy bean, Sorghum, Maize, Cassava, Kidney bean,	Soy bean, Sorghum, Maize, Sunflower,	Kidney bean,
Pasture -Grazing -Cutting	Kikuyu, Rye grass, Micay, Clover, King grass, Imperial 60,	Estrella de la India, Para, Puntero, Brachiaria humidicola, India, Imperial 60, King grass,	Estrella de la India, Puntero, Para, Brachiaria humidicola, India, Imperial 60, King grass,	Rye grass, Kikuyu, Micay, Yaragua, Clover, King grass, Imperial 60
Forage Tree Material & Fire Wood Others	Quiebrabarrigo, Chachafruto, Eucalyptus grandis, Nogal, Guamo, Vainillo, Lemon grass, Vetiver, Mulbery, Bamboo,	Maramaton, Leucaena, Eucalyptus grandis, Nogal, Guadua, Lemon grass, Mulbery, Bamboo,	Matarraton, Leucaena, Eucalyptus grandis, Nogal, Guadua, Bamboo,	Quiebrabarrigo, Chachafruto, Leucaena, Eucalyptus grandis, Pine, Cypress, Cedar, Guamo, Lemon grass, Mulbery, Bamboo, Vainillo,

TABLE 3-2 CHANGE OF LAND USE

(Unit:ha)

Area / Land Use	Circasia		Salento		Right Margin		Left Margin(1)		Left Margin(2)		Pijao		Genova	
	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

*:Fruits planted area in the Zone1-3 **:Fruit planted area in the Zone 4 and 6.

TABLE 3-3 PROPOSED CROP PLANTED AREA

(Unit:ha)

Area \ Crop	Tomato	Onion	Green Pea	Kidney Bean	Soy-bean	Sorghum	Maize	Cassava	Cofee Imp.	Cofee V.	Plantain Mixed	Plantain Single	Citrus	Pitahaya	Passion fruit	Black berry	Lulo	Tree Tomato	Total
Circasia	254	79	14	14	0	0	0	0	197	14	0	0	0	0	265	265	265		1,367
Salento	8	8	0	5	0	0	0	0	37	17	0	0	0	0	46	46	46		213
Quindio River Right Margin	17	0	0	112	160	40	40	67	610	325	120	150	60	12	0	0	0		1,713
Quindio River Left Margin(1)	0	0	0	0	331	165	0	0	0	0	0	0	0	0	0	0	0		496
Quindio River Left Margin(2)	2	0	0	8	0	0	0	2	46	9	0	6	0	-	0	0	0		73
Pijao	6	6	0	4	0	0	0	0	29	23	0	0	0	0	83	83	83		317
Genova	0	0	0	4	0	0	0	0	34	18	0	0	0	0	73	73	73		275
Total	287	93	14	147	491	205	40	69	953	406	120	156	60	12	467	467	467		4,454

TABLE 3-4 TARGET YIELD

(Unit:t/ha)

Crop	Ex. Yield*	Target Yield**
Vegetable		
Onion	-	15.0
Tomato	23.8	43.0
Green Pea	-	7.0
Welish Onion	-	38.0
Pimenton	-	12.0
Upland Crop		
Kidney bean	0.8	1.2
Maize	1.9	3.0
Soy Bean	2.1	2.5
Sorghum	3.8	4.5
Perennial Crop		
Citrus	18.0	24.0
Pitahaya	-	8.0
Passionfruit	-	25.0
Black Berry	8.8	16.7
Lulo	8.0	10.0
Curuba	6.0	10.7
Tree Tomato	22.1	25.0
Others		
Cassava	18.0	20.0
Plantain	12.3	15.0

Source: *:URPA(Average of Quindio in 1988)
**:FEDECAFE

TABLE 3-5 PROPOSED CROP PRODUCTION

(Unit:ton)

Area \ Crop	Tomato	Onion	Green Pea	Kidney Bean	Soy-bean	Sorghum	Maize	Cassava	Cofee Imp.	Cofee V.	Plantain Mixed	Plantain Single	Citrus	Pitahaya	Passion fruit	Black berry	Lulo	Tree Tomato
Circasia	10,922	1,185	98	14	0	0	0	0	394	0	0	0	0	0	0	4,426	2,650	6,625
Salento	344	120	0	6	0	0	0	0	69	68	0	0	0	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	0	0
Quindio River Left Margin(1)	0	0	0	0	828	743	0	0	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	0	0
Pijao	258	90	0	5	0	0	0	0	46	92	0	0	0	0	0	1,386	830	2,075
Genova	0	0	0	5	0	0	0	0	49	72	0	0	0	0	0	1,219	730	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	0	7,732	4,630	11,575

D.4: Labour Requirement by Crop

13) Tree Tomato

Labour (md/ha) /year		1	2	3	4
Land preparation		21	0	0	0
Making hole - planting		25	0	0	0
Fertilizing		15	12	12	12
Weed control		60	30	30	30
Diseases control		10	15	15	15
Pruning and other		8	10	10	10
Harvesting- selection - packaging		0	60	80	60
TOTAL		139	127	147	127
Fumigadora	1	0.4	0.0	0.0	0
Nursery stocks		1100	0	0	0
Fertilizer (complete)	kgs	825	990	990	990
Fertilizer (Ca+Mg)	kgs	1000	0	1000	0
Microelement	kgs	55	55	55	55
Nematicides (Furadan)	kgs	90	90	90	90
Tools		2	2	2	2
Package (box)		52	18	0	0
YIELD/ha	TONS	0	15	20	15

14) Bluck Berry

Labour (md/ha) / year		1	2	3	4
Land preparation		20	0	0	0
Tracing - making hole-planting		45	0	0	0
Weeding		45	45	45	45
Fertilizing		6	6	6	6
Pruning		15	20	20	20
Supporting		55	5	5	5
Diseases control		2	4	4	4
Harvesting and packaging		0	224	256	224
TOTAL		188	304	336	304
Fumigador		0.4	0.0	0.0	0.0
Nursery stocks		2400	0	0	0
Supports (2.5m)		1700	0	0	0
Wire (No.14)	kgs	60	0	0	0
Nails	kgs	15	0	0	0
Fertilizer (complete)	kgs	2400	2400	2400	2400
Micronutrients	kgs	1200	1200	1200	1200
Insecticides	lts	10	10	10	10
Fungicides	kgs	15	15	15	15
Baggs	kgs	0	40	40	40
Tools		2	2	2	2
Package (box)		0	190	200	0
YIELD/HA	TONS	0	14	16	14

1) Tomato

Labour	Unit	Requeriment
Land clearing- ploughing furroving	tract.hrs.	6
Nursery	md/ha	30
Transplanting	"	34
Pruning - thinning	"	80
Weeding - covering	"	110
Enverda	"	66
Supporting	"	68
fertilizing	"	50
Diseases control	"	140
Harvesting - wash - packaging	"	234
Fumigadora	unids	0.2
Seed	kgs	0.5
Fertilizing	kgs	1200
Lime	kgs	4000
Organic manure	tons	6
Supports		2700
Wire	rolles	3
String		12
Pesticides		16
Package (box)		182
Tools		3
YIELD/Ha	TONS	52

2) Onion

Labour	Unit	Requeriment
Land clearing- ploughing -	tract. hrs.	3
Nursery	md/ha	30
Harroving - furroving	tract.hrs.	3
Transplanting	md/hrs	40
Weeding- covering	"	80
Fertilizing	"	50
Diseases control	"	80
Herbicides app.	"	6
Harvesting- washing- packaging	"	90
Fumigadora	Unids	0.2
Seed	kgs	6
Fertilizer (complete)	kgs	1200
Lime	kgs	4000
Organic manure	Ton	10
Pesticides		8
Herbicides		2
Tools		2
Package (baggs)		510
YIELD/ha	TONS	30

3) Cabbage

Labour	Unit	Requeriment
Land clearing- ploughing - furrowing	tract.hrs	6
Nursery	md/ha	10
Transplanting	"	20
Replanting	"	3
Fertilizing	"	8
Diseases- pest - control	"	30
Weeding	"	24
Harvesting - packaging	"	30
Transportation	"	3
Sped	kgs	0.5
Fertilizer (complete)	kgs	400
Urea	kgs	120
Organic manure	kgs	2000
Lime	kgs	500
Package (baggs)		500
YIELD/ha	TONS	30

4) Carrot

Labour	Unit	Requeriment
Land clearing- ploughing	tract.hrs	3
Furrowing	"	3
Planting	md/ha	10
Fertilizing	"	3
Diseases-pest control	"	5
Weeding	"	30
Harvesting - wash - packaging	"	30
Seed	kgs	5
Fertilizer (complete)	kgs	500
Organic manure	kgs	1000
Pesticides	gal.	2
Package (baggs)		300
YIELD/ha	TONS	26

5) Pimenton

Labour	Unit	Requeriment
Land clearing- ploughing- furroving	tract.hrs	6
Nursery	md/ha	30
Transplanting	"	80
Weeding	"	80
Covering	"	24
Fertilizing	"	60
Diseases control	"	80
Harvesting - wash - packaging	"	120
Fumigadora	Unit	0.2
Seed	kgs	1
Fertilizer (complete)	kgs	3000
Lime	kgs	3000
Organic manure	kgs	6000
Packages		145
YIELD/ha/year	TONS	40

6) Kidney Bean

Labour	Unit	Requeriment
Land clearing - ploughing - furroving	Tract.Hrs	6
Planting	"	1
Fertilizing	md/ha	3
Weeding - covering	"	15
Diseases control	"	5
Harvesting - selection - packaging	"	20
Fumigadora	Unit	0.2
Seed	kgs	60
Fertilizer (complete)	kgs	200
Pesticides		4
Tools		2
Package (baggs)		38
YIELD/ha	TONS	2.5

7) Cassava

Labour	Unid	Requeriment
Land clearing -ploughing - furroving	tract.hrs	6
Planting	md/ha	15
Weeding and covering	"	55
Fertilizing	"	5
Diseases control	"	10
Harvesting - packaging	"	30
Fumigadore	Unit	0.2
Stem cutting		10000
Fertilizer (complete)	kgs	500
Insecticides	lts	2
Strings	rolles	10
Tools	unids	2
Package (baggs)		400
YIELD/ha	TONS	30

8) Maize

Labour	Unit	Requeriment
Ploughing /harroving	tractor hrs	3
Furroving	"	3
Planting	"	1
Fertilizing	md/ha	4
Herbicides	tractor hrs	1
Weeding	md/ha	8
Pesticides app.	"	4
Harvesting	"	8
Reaping	"	2
Packaging	"	2
Transportation	"	2
Seed	kgs	30
Fertilizer (complete)	kgs	200
Urea	kgs	200
Pesticides	kgs	2
Herbicides	kgs	2
Package		40
YIELD/ha	TONS	6

9) Sorghum

Labour	Unit	Requeriment
Ploughing/ harrowing	tractor hrs	6
Fertilizing	"	1
Land levelling	"	1
Planting	"	1
Diseases and pest control	md/ha	4
Herbicides app.	tractor hrs	1
Harvesting	combine hrs	2.5
Transportation	md/ha	2
Seed	kgs	20
Fertilizer	kgs	350
Pesticides	kgs	3
Herbicides	kgs	2
Packages		44
YIELD/ha	TONS	4

10) Soybean

Labour	Unit	Requeriment
Ploughing / harrowing	tractor hrs	6
Land .levelling	"	1
Herbicides app.	"	1
Planting	tractor hrs	1
Fertilizing	"	3
Diseases and pest control	md/ha	10
Herbicides app.	tractor hrs	1
Harvesting	combine hrs	2.5
Transportation	md/ha	2
Seed	kgs	80
Fertilizer	kgs	350
Pesticides	kgs	2
Herbicides	kgs	4
Package		32
YIELD/ha	TONS	2.5

11) Citrus

Labour (md/ha) /Year		1	2	3	4	5	6	7	8	9	10
Land preparation		21	0	0	0	0	0	0	0	0	(
Tracing - making hole - planting		15	0	0	0	0	0	0	0	0	(
Weeding		45	45	40	40	40	30	30	30	30	3(
Fertilizing		2	4	4	5	5	5	5	5	5	5
Diseases control		10	10	10	10	10	10	10	10	10	10
Pruning		10	4	4	4	4	4	4	4	4	4
Harvesting - selection - packaging		0	0	24	36	60	90	114	135	150	150
TOTAL		103	63	82	95	119	139	163	184	199	199
Fumigadora	unid	0.2	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.2
Nursery stocks		357	0	0	0	16	0	0	0	0	16
Fertilizer (complete)	kgs	240	470	470	710	710	710	710	710	710	710
Urea	kgs	30	95	180	280	425	425	425	425	425	425
Microelement	kgs	0	50	120	120	140	140	140	140	140	140
Pesticides		2.0	3.0	4.0	4.5	5.0	5.0	5.0	5.0	5.0	5.0
Tools		2	1	1	1	1	1	1	1	1	1
Packaging (box)		0	0	0	35	35	70	35	35	0	0
YIELD/ha	TONS	0	0	8	12	20	30	38	45	50	50

12) Lulo

Labour (md/ha) /Year		1	2	3	4
Land preparation		21	0	0	0
Making hole - planting		33	0	0	0
Fertilizing		20	20	20	20
Weed controling		60	30	30	30
Diseases control		15	20	20	20
Pruning and other		10	15	15	15
Harvesting - selection - packaging		0	90	135	68
TOTAL		159	175	220	153
Fumigadora		0,4	0.0	0.0	0
Nursery stocks		2500	0	0	0
Fertilizer (complete)	kgs	2000	2000	2000	2000
Fertilizer (Ca+Mg)	kgs	1000	0	1000	0
Pesticides		4	4	4	4
Nematicides	kgs	160	160	160	160
Tools		2	2	2	2
Packaging (box)		0	185	95	0
YIELD/ha	TONS	0	10	15	8

D.5: Proposed Production by Farm Size and Area

TABLE 5-1 PLNTED AREA OF MODEL FARM

(Unit : ha)

Group	Farm Size	Crop	Planted Area Exisring	Planted Area Plan	Balance
1	Large Scale (30ha)	Coffee(Imp.)	2.64	2.64	
		Vegetable	0.05	0.04	-0.01
		Plantain(M.Trd.)	2.31	2.31	
		Tomato		0.60	0.60
		Onion		0.18	0.18
		Blackberry		2.92	2.92
		Lulo		2.92	2.92
		Tree Tomato		2.92	2.92
		Pasture	21.69	9.33	-12.36
		Others	2.55	4.39	1.84
	Medium Scale (15ha)	Coffee(Imp.)	1.32	1.32	
		Vegetable	0.04	0.03	-0.01
		Plantain(M.Trd.)	1.16	1.16	
		Tomato		0.60	0.60
		Onion		0.18	0.18
		Blackberry		1.62	1.62
		Lulo		1.62	1.62
		Tree Tomato		1.62	1.62
		Pasture	12.38	5.32	-7.06
		Others	1.28	2.31	1.03
	Small Scale (5 ha)	Coffee(Trd.)	1.46		-1.46
		Vegetable	0.03	0.02	-0.01
		Plantain(M.Trd.)	0.39		-0.39
		Tomato		0.60	0.60
		Onion		0.18	0.18
		Blackberry		0.63	0.63
		Lulo		0.63	0.63
		Tree Tomato		0.63	0.63
		Pasture	2.43	1.04	-1.39
		Others	0.43	0.84	0.41

TABLE 5-2 PLNTED AREA OF MODEL FARM(2)

(Unit : ha)

	Group	Farm Size	Crop	Planted Area Exisring	Plan	Balance
			Coffee(Imp.)	5.69	5.69	
			Vegetable	0.04	0.04	
			Plantain(M. Imp.)	2.90	2.90	
			Plantain(Single)	2.02	2.02	
		Large	Citrus	0.93	0.93	
		Scale	Other Fruit	0.82	0.82	
		(30ha)	Cassava	0.95	0.95	
			Soybean	1.46	1.46	
			Sorghum	0.76	0.76	
			Maize	0.39	0.39	
			Kidnybean		0.41	0.41
			Pasture	5.02	5.02	
			Others	6.16	6.16	
			Coffee(Imp.)	2.84	2.84	
			Vegetable	0.03	0.03	
			Plantain(M. Imp.)	1.45	1.45	
			Plantain(Single)	1.01	1.01	
	2	Medium	Citrus	0.46	0.46	
		Scale	Other Fruit	0.41	0.41	
		(15ha)	Cassava	0.47	0.47	
			Soybean	0.73	0.73	
			Sorghum	0.38	0.38	
			Maize	0.20	0.2	
			Kidnybean		0.21	0.21
			Pasture	2.51	2.51	
			Others	3.08	3.08	
			Coffee(Trd.)	1.86		-1.86
			Vegetable	0.02	0.02	
		Small	Plantain(M.Trd.)	1.86		-1.86
		Scale	citrus		1.46	1.46
		(5 ha)	Pasture	1.46	1.46	
			Others	1.03	1.43	

	Group	Farm Size	Crop	Planted Area Exisring	Plan	増減
			Vegetable	0.04	0.04	
		Large	Cassava			
	3	Scale	Soybean	10.03	19.34	9.31
		(30ha)	Sorghum	6.94	9.66	2.72
			Pasture	11.88	10.87	-1.01
			Others	3.30	3.30	

TABLE 5-3 PLNTED AREA OF MODEL FARM(3)

(Unit : ha)

	Group	Farm Size	Crop	Planted Area Exisring	Plan	増減
			Coffee(Imp.)	9.90	9.90	
			Vegetable	0.04	0.04	
		Large	Plantain(M.Imp.)	2.71	2.71	
		Scale	Blackberry		0.89	0.89
		(30ha)	Lulo		0.89	0.89
			Tree Tomato		0.89	0.89
			Pasture	11.43	7.42	-4.01
			Others	4.89	5.78	0.89
			Coffee(Trd.)	4.94		-4.94
			Vegetable	0.03	0.03	
	4	Medium	Plantain(M.Trd.)	1.35		-1.35
		Scale	Blackberry		1.68	1.68
		(15ha)	Lulo		1.68	1.68
			Tree Tomato		1.68	1.68
			Pasture	5.71	3.71	-2.00
			Others	2.45	4.13	1.68
			Coffee(Trd.) (Imp.)	1.65		-1.65
			Vegetable	0.02	0.02	
		Small	Plantain(M.Trd.)	0.45		-0.45
		Scale	Blackberry		0.56	0.56
		(5 ha)	Lulo		0.56	0.56
			Tree Tomato		0.56	0.56
			Pasture	1.89	1.23	-0.66
			Others	0.82	1.38	0.56

TABLE 5-4 CROP YIELD(1)

(Unit:Ton/ha)

	Group	Farm Size	Crop	Unit Yield		Balance
				Existing	Plan	
			Coffee(Imp.)	2.00	2.00	0.00
			Vegetable	0.73	1.20	0.47
		Large	Plantain(M.Trd.)	1.80	2.16	0.36
		Scale	Tomato		43.00	
		(30ha)	Onion		15.00	
			Blackberry		16.70	
			Lulo		10.00	
			Tree Tomato		25.00	
			Pasture	0.43	1.00	0.57
			Coffee(Imp.)	2.00	2.00	0.00
			Vegetable	0.73	1.20	0.47
	1	Medium	Plantain(M.Trd.)	1.80	2.16	0.36
		Scale	Tomato		43.00	
		(15ha)	Onion		15.00	
			Blackberry		16.70	
			Lulo		10.00	
			Tree Tomato		25.00	
			Pasture	0.43	1.00	0.57
			Coffee(Trd.)	1.00		
			Vegetable	0.73	1.20	0.47
			Tomato		43.00	
		Small	Onion		15.00	
		Scale	Blackberry		16.70	
		(5ha)	Lulo		10.00	
			Tree Tomato		25.00	
			Pasture	0.43	1.00	0.57

TABLE 5-5 CROP YIELD(2)

(Unit:Ton/ha)

Group	Farm Size	Crop	Unit Yield		Balance
			Existing	Plan	
2	Large Scale (30ha)	Coffee(Imp.)	2.16	2.16	0.00
		Vegetable	0.73	1.20	0.47
		Plantain(M.Imp.)	7.00	8.40	1.40
		Plantain(Single)	15.00	15.00	0.00
		Citrus	19.00	24.00	5.00
		Other Fruit	8.00	8.00	0.00
		Cassava	18.00	20.00	2.00
		Soybean	2.30	2.50	0.20
		Sorghum	4.20	4.50	0.30
		Maize	1.90	3.00	1.10
		Kidnybean		1.20	
		Pasture	1.00	1.00	0.00
	Medium Scale (15ha)	Coffee(Imp.)	2.16	2.16	0.00
		Vegetable	0.73	1.20	0.47
		Plantain(M.Imp.)	7.00	8.40	1.40
		Plantain(Single)	15.00	15.00	0.00
		Citrus	19.00	24.00	5.00
		Other Fruit	8.00	8.00	0.00
		Cassava	18.00	20.00	2.00
		Soybean	2.30	2.50	0.20
		Sorghum	4.20	4.50	0.30
		Maize	1.90	3.00	1.10
		Kidnybean		1.20	
		Pasture	1.00	1.00	0.00
	Small Scale (5ha)	Coffee(Trd.)	1.13		
		Vegetable	0.73	1.20	0.47
		Plantain(M.Trd.)	2.60		
		citrus	19.00	24.00	5.00
		Pasture	1.00	1.00	0.00

Group	Farm Size	Crop	Unit Yield		Balance
			Existing	Plan	
3	Large Scale (30ha)	Vegetable	0.73	1.20	0.47
		Cassava	18.00		
		Soybean	2.27	2.50	0.23
		Sorghum	4.15	4.50	0.35
		Pasture	0.92	1.00	0.08

TABLE 5-6 CROP YIELD(3)

(Unit:Ton/ha)

	Group	Farm Size	Crop	Unit Yield		Balance
				Existing	Plan	
	4	Large Scale (30ha)	Coffee(Imp.)	1.62	2.00	0.38
			Vegetable	0.60	1.20	0.60
			Plantain(M.Imp.)	4.00	4.50	0.50
			Blackberry		16.70	
			Lulo		10.00	
			Tree Tomato		25.00	
			Pasture	0.30	1.00	0.70
		Medium Scale (15ha)	Coffee(Trd.)	0.76		
			Plantain(M.Imp.)	1.62		
			Vegetable	0.60	1.20	0.60
			Plantain(M.Trd.)	1.60		
			Blackberry		16.70	
			Lulo		10.00	
			Tree Tomato		25.00	
			Pasture	0.30	1.00	0.70
		Small Scale (5ha)	Coffee(Trd.)	0.76		
			Vegetable	0.60	1.20	0.60
			Plantain(M.Trd.)	1.60		
			Blackberry		16.70	
			Lulo		10.00	
			Tree Tomato		25.00	
			Pasture	0.30	1.00	0.70

D.6: Proposed Agricultural Research and Extension Organization

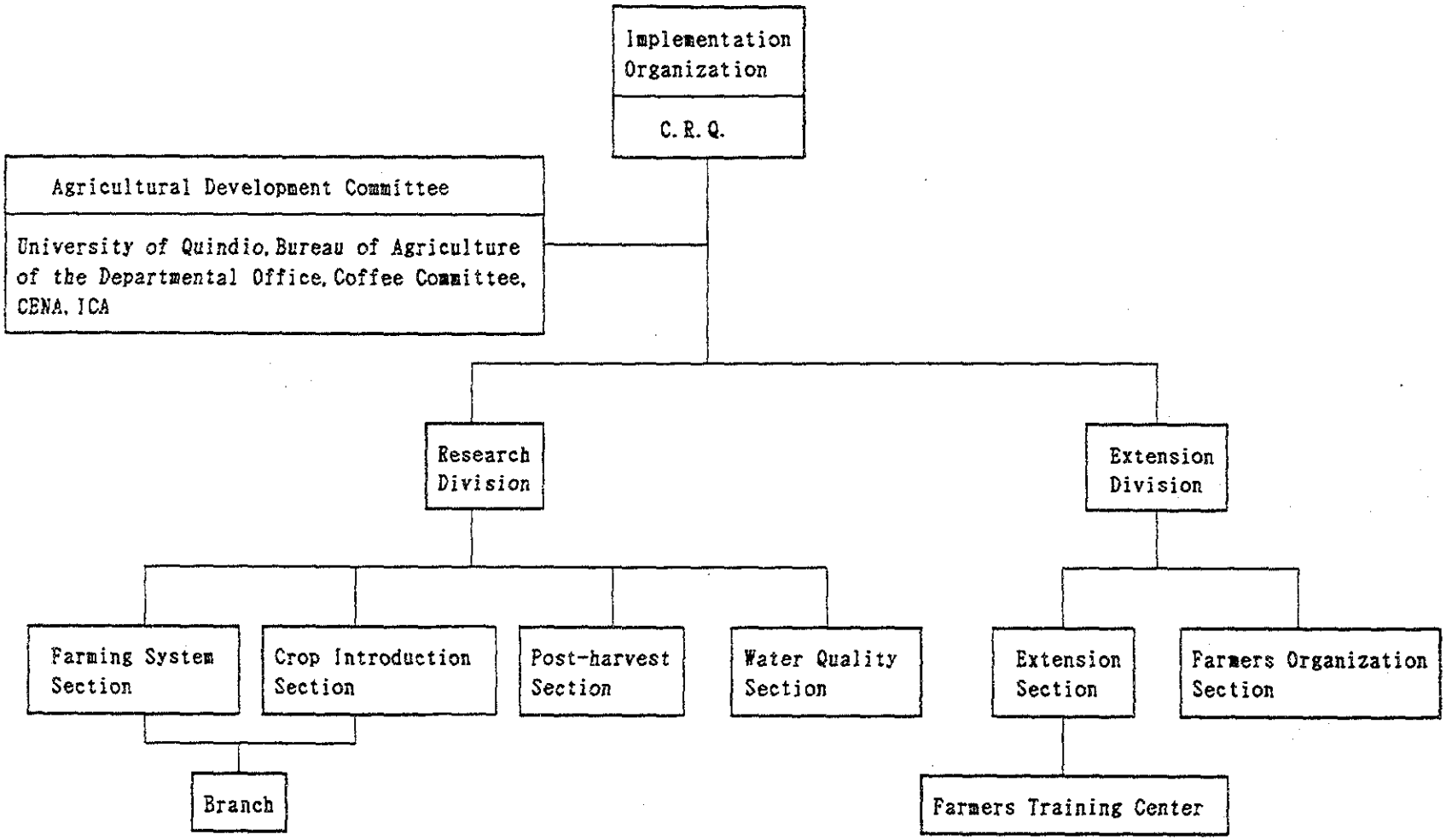


FIG. 6-1 PROPOSED AGRICULTURAL RESEARCH AND EXTENSION ORGANIZATION

ANNEX E :

FARMER'S ORGANIZATION AND

AGRICULTURAL SUPPORTING SERVICES

ANNEX E : FARMERS ORGANIZATION AND AGRICULTURAL SUPPORTING SERVICES

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIFURE

E.1 INSTITUTIONAL SUPPORTING SERVICES TO FARMERS

E.1.1 Institutional Services Actually Rendered

(1) Institutions in charge

In the Department of Quindio the following institutions are rendering farmers with supporting services.

- Institutions affiliated with the Ministry of Agriculture (ICA, INCORA, IDEMA, Caja Agraria)
- CRQ
- Bureau of Agriculture, Departmental Government Office
- Departmental Coffee Committee
- SENA
- Fondo-DRI
- Banco Cafetero, Banco Ganadero, etc.

(2) Research, investigation and extension of cropping technologies

ICA (National Agricultural Institution) is in charge of research, investigation and extension of cropping and livestock technology (production and certification of seeds, hy-breed varieties, disease control, fertilizers, animal feeds, chemicals, appropriate technology, etc.) in the national level. With regional offices throughout the country, it has been developed technologies suitable for respective region. Furthermore, through CRECED (Regional Center for Extension, Training and Diffusion) attached to regional offices, it engages in extension of appropriate technologies to farmers and collection and diagnosis of agricultural performance in regions.

The Departmental Coffee Committee is responsible for study and extension of adequate technologies for coffee production, in particular, introduction of improved varieties and control of rust

disease. Apart from FEDECAFE's CENICAFE (National Coffee Investigation Center), which is located in Chinchina- Department of Caldas, there exist five experimental farms of coffee in Quindio. And, technology transfer, provision of inputs and credit services to coffee growers are conducted through municipal coffee committees established in 12 municipalities of the Department. In addition, the Committee takes charge of planning, study and formation of projects relative to "Diversification Program"-promotion of agricultural production other than coffee in coffee productive regions of the country, promoted by FEDECAFE.

The Bureau of Agriculture of the Departmental Government Office's responsibilities cover planning and formulation of agricultural policies and plans, study on cropping technologies and their transfer to farmers, and its local offices incorporated in Circasia, Genova, Pijao and Salento are conducting direct supporting services to farmers. Presently, special attention of the Bureau is paid to promotion and activation of farming in marginal areas for coffee production and, in this connection, efforts are made to facilitate production of fruits and vegetables.

(3) Education

Studies on development of agroindustry and education of students to be engaged in this industry are realized at universities of Quindio and La Gran Colombia.

On the other hand, practical and professional knowledge and technique are taught by SENA for workers including farmers offering a variety of courses. SENA's Agricultural Center undertakes 2-year professional education for high-school graduates.

(4) Agricultural credits

The greater portion of agricultural credits in Colombia are rendered by FFA (Agricultural Financing Fund) and Caja Agraria. The FFA, which was established in 1973 following the Decree 5, is managed and supervised by the central bank (Banco de la Republica). The FFA procures resources necessary for credit service and determines credit conditions, but disbursement to beneficiaries is made through intermediate institutions, both public and private commercial banks. Credit conditions are determined in accordance with financial capacity of beneficiaries and purposes for use.

Besides being an intermediate agency for the FFA, Caja Agraria renders farmers with credits with its own resources.

In 1988, of total credits of the FFA approved in Quindio, 52% was directed to crop production (seeding, maintenance and stumping), 22% for livestock, and the rest for installation of coffee processing facilities, land improvement, purchase of agricultural equipment and machinery, land acquisition, etc. (See Table E.1.1). Credits to crop production are represented by 38% for coffee, 24% for soybean, and 13% for sorghum. On the other hand, the proportion of credits coverage in comparison with the cultivated areas is the highest (96.8%) for sorghum, which is followed by 64.8% for soybean and 57.9% for maize. By contrast, the same proportion to other crops is extremely low (below 10%) except for cassava and sugarcane, which accounted for 27.5% and 15.9% , respectively; it is worth while to indicate that the coverage proportion for coffee is as low as 7.6% (See Table G.1.2).

As a reference, Caja Agraria's credits, both FFA and its own resources, are presented in Table E.1.3.

Although for financially handicapped farmers agricultural credits are indispensable for realizing crop and animal husbandries, the coverage ratio of credits by the FFA remains low. This fact may be

rooted in troublesome procedure and rigid examination for getting credits and unavailability of timely credits for seeding and planting that makes farmers hesitate at from approaching to the FFA's credits and asking for other sources of credits services.

Under the circumstances, the FFA has proceeded to simplify the procedure for getting credits-once application for credits is accepted and the bankbook is presented, beneficiaries of credit can get subsequent credits only with the presentation of the bankbook.

So as to implement credit services effectively and continuously, it is of importance to eliminate that beneficiaries fail to repay their credits. In this context, it is expected that banking institutions should render more intensified supporting services (technical assistance for cropping) to farmers that enables them to attain anticipated production.

As mentioned above, credit conditions vary according with financial capacity and purpose for use. The following is an example of credit condition for crop production.

- Beneficiary	: Small farmers
- Crop to be covered	: Tomato
- Ceiling amount	: Col$ 530,000/ha.
- Period	: 6 months
- Interest rate	: D.T.F. (Average cost through deposits for fixed period) + 1%

(5) Distribution of agro-products

IDEMA is a public institution which intervenes in the distribution of agro-products. In the national level, IDEMA purchases crops from farmers with established supporting prices and distributes them, meanwhile in Quindio its sub-regional office located in Armenia has

not entered into the trade of grains for the last four (4) years except for sale of dairy foodstuff to consumers. This is partly due to deficient production of crops with supporting price (rice, sorghum, wheat, barley, soybean, sesame, kidneybean, maize) in the region. Another reason for that is attributable to the unfavorable condition of payment (prolonged period for the settlement of account), and growers of these crops thereby prefer to negotiate with private merchants who offer the payment instantly despite their prices are inferior to those of IDEMA.

Finally, it will be worth while to point out that supporting prices, which were hiked drastically during the administration of the President Barco (1987-1990) following the Selective Supply Plan (Plan de Oferta Selectiva), are determined to be raised slightly (between 2.6% and 4.79%) or to be freezed under the economic policy of the administration of the President Gaviria which started in August 1991.

(6) Development of infrastructure

Development of infrastructure such as roads, water supply system, electric network, schools and health centers in coffee producing areas are executed by the Coffee Committee, whereas Fondo-DRI in collaboration with other agencies is implementing various projects consist of small-scaled agricultural, infrastructure and agroindustry development, organization of rural population, enhancement of rural environment, etc. in less developed municipalities of the Department of Quindio (Cordoba, Filandia, Genova, Pijao and Salento).

Summary if Fondo-DRI's project by sector is as per attached Table E.1.6.

(7) Environmental conservation

CRQ is a responsible entity for conservation, supervision and rational utilization of natural resources in Quindio which functions are entrusted by INDERENA. For accomplishment of these functions CRQ takes charge of water quality improvement including treatment of coffee-related wastes, control of soil erosion under a guidance of an adequate cropping technology, cultivation of water resources by means of reforestation, etc.

Apart from the said activities, in view of enlightening local population with respect to environmental conservation, CRQ carries out environmental education and other activities relative to environmental conservation.

E.1.2 Institutional Services Improvement Plan

(1) Planning principles

The agricultural development plan for the Quindio Basin Integrated Agricultural Development Project contemplates an introduction of non-traditional crops composed of vegetables (onion, tomato, green pea, etc.) and fruits (tree tomato, lulo, blackberry, etc.).

Since the majority of farmers in the study area are not accustomed to cultivating the above-mentioned crops, the success of the project heavily depends on not only self-efforts of farmers, but also institutional supporting services to be rendered to farmers.

The most important factor of the institutional services shall be consolidating marketing conditions for products and transfer of adequate cropping technology to farmers. It is envisaged that the former should be strengthened by means of forming farmers' cooperatives, the proposal of which is explained in subsequent section, meanwhile the latter should be attained by establishing a "Research and Extension Center on Agricultural Technology".

(2) Research and extension center

Most of vegetables and fruits to be introduced in the present project are actually cultivated within the study area by limited farmers in small lands or for self-sufficiency of farmers. In order to expand production of these crops, it is prerequisite to strengthen research and extension services on them by means of carrying out tests and verification at field level. In this regard, it is proposed to establish a "Research and Extension Center on Cropping Technology" under the initiative of CRQ within the present project. The proposed organization of the Center is as per attached in Fig. E.1.1.

The headquarters of the center shall be established within CRQ's territory located at Bremen, municipality of Circasia. In this center, two divisions-research division and extension division shall be organized, and apart from these two divisions an Agricultural Technology Promotion Committee composed of public entities concerned with agricultural sector shall be established so that efforts and fruits developed by respective entity may be integrated.

For successful performance of the center, it is of importance that an intimate and periodic communication should be made between the said two divisions so that smooth transfer of the results of research may be realized from research staff to extension staff and at the same time feedback of problems encountered at field level may be reported vice versa.

The staff to be engaged in research activities shall be recruited from public entities constituting the Agricultural Technology Promotion Committee, while extensionists shall be selected from those who are employed with the Bureau of Agriculture, Departmental Government Office.

(3) Research division

The research division shall comprise the following sections and branches (experimental farms).

- Crop introduction section: to be engaged in investigation and selection of suitable crops and varieties to the project area among those recommended by ICA.

- Farming system section: to investigate and study on appropriate cropping technique for proposed introduced crops with special attention paid to preservation of soil erosion; study on optimum crops to respective sector of the project area;

study on mixed farming system.

- Post-harvest section: to study on marketing and processing system of fruits and vegetables, and on utilization of sub-products derived from coffee cherry.

- Water quality section: to make a research on coffee wastes treatment method and to conduct monitoring of river water.

- Branches (experimental farm): to be incorporated at each sector of different physical conditions to conduct field test and investigation on proposed crops and cropping rotation; this farm shall constitute at the same time a demonstration farm; the size of each farm shall be in the range of 1-2 has. and to be hired from farmers.

(4) Extension division

The extension division, which consists of extension section and farmers' organization section, shall be organized intensifying existing organization of the Bureau of Agriculture, Departmental Government Office. Bearing the number of farmers in mind, extension services shall be provided to farmers, not individually but in group through cooperatives. Thus, organization of farmers shall be promoted.

The extension section shall undertake on-the-job training to farmers.

TABLE E.1.1 EVOLUTION OF AGRICULTURAL CREDIT 1984-1988

Unit: In million of Col$

ACTIVITIES	1984	%	1985	%	1986	%	1987	%	1988	%
1. Annual Crops										
Sorghum	51	5.24	65	5.91	59	6.06	106	6.06	79	6.62
Soybeans	13	1.34	38	3.45	35	3.59	78	3.59	147	12.32
Cassava	33	3.39	60	5.45	45	4.62	19	4.62	36	3.02
Others	31	3.19	41	3.73	15	1.54	32	1.54	57	4.78
Sub-total	128	13.16	204	18.55	154	15.81	235	15.81	319	26.74
2. Perennial Crops										
Coffee (Maintenance)	192	19.73	168	15.27	142	14.58	114	14.58	237	19.87
Coffee (Trasnplant)	5	0.51	35	3.18	48	4.93	0	4.93	0	0.00
Coffee (Stumping)	147	15.11	217	19.73	253	25.98	0	25.98	0	0.00
Plantain	34	3.49	41	3.73	46	4.72	23	4.72	16	1.34
Others	33	3.39	29	2.64	13	1.33	72	1.33	44	3.69
Sub-total	411	42.24	490	44.55	502	51.54	209	51.54	297	24.90
3. Livestock										
Cattle	218	22.40	180	16.36	98	10.06	137	10.06	159	13.33
Poultry	19	1.95	26	2.36	52	5.34	40	5.34	90	7.54
Minor Animals	12	1.23	12	1.09	3	0.31	7	0.31	12	1.01
Others	15	1.54	3	0.27	18	1.85	9	1.85	4	0.34
Sub-total	264	27.13	221	20.09	171	17.56	193	17.56	265	22.21
4. Other Activities										
Land Improvement	60	6.17	64	5.82	34	3.49	59	3.49	92	7.71
Coffee Processing	33	3.39	31	2.82	36	3.70	0	3.70	95	7.96
Equipment	16	1.64	16	1.45	21	2.16	43	2.16	68	5.70
Acqisition of land	39	4.01	45	4.09	40	4.11	61	4.11	18	1.51
Others	22	2.26	29	2.64	16	1.64	10	1.64	39	3.27
Sub-total	170	17.47	185	16.82	147	15.09	173	15.09	312	26.15
Total	973	100	1100	100	974	100	810	100	1193	100

Source: Informe Economico del Quindio 1985-1988
Banco de la Republica

TABLE E.1.2 CULTIVATED AREA COVERED BY CREDIT (1988)

CROPS	CULTIVATED AREA (HA) TOTAL	WITH CREDIT	%
1. Perennial Crops			
Coffee (Impr.)	46,204	2,734	5.9
Coffee (Trad.)	18,397	2,166	11.8
Cacao	1,148	15	1.3
Sugarcane	452	72	15.9
Citrus	859	27	3.1
Other Fruits	302	12	4.0
Plantain	15,569	207	1.3
Cassava	1,725	474	27.5
Sub-total	84,656	5,707	6.7
2. Annual Crops			
Soybean	1,348	874	64.8
Sorghum	1,087	1,052	96.8
Maiz	416	241	57.9
Kidneybean	350	44	12.6
Potato	302	31	10.3
Sub-total	3,503	2,242	64.0
Total	88,159	7,949	9.0

Source: Anuario Estadistico del Sector Agropecuario 1989
Ministerio de Agricultura
Quindio Estadistico 1988
Direccion Planeacion Departamental

TABLE E.1.3 AGRICULTURAL CREDIT PROVIDED BY CAJA AGRARIA
(FIRST SEMESTER 1989)

LINE OF CREDIT	ORDINARY RESOURCES No.	Ha.	Amount	F.F.A. No.	Ha.	Amount	TOTAL No.	Ha.	Amount	%
CROP PRODUCTION										
A. Crops for Direct Consumption										
1. Leguminous and tuberculous crops										
Kidneybean	5	5	745	11	26	4,960	16	31	5,705	0.71
Maize	14	4	370	5	8	797	19	12	1,167	0.15
Potato	20	19	1,892	15	40	6,671	35	59	8,563	1.07
Plantain	13	58	4,000	16	97	7,700	29	155	11,700	1.47
Cassava	4	13	1,100	19	130	12,592	23	143	13,692	1.71
Peruvian carrot				1	3	212	1	3	212	0.03
Sub-total	56	99	8,107	67	304	32,932	123	403	41,039	5.14
2. Fruits										
Lulo				5	10	3,324	5	10	3,324	0.42
Blackberry				2	4	880	2	4	880	0.11
Papaya				1	2	640	1	2	640	0.08
Tree Tomato	1	3	400	2	2	410	3	5	810	0.10
Citrus				1	17	540	1	17	540	0.07
Sub-total	1	3	400	11	35	5,794	12	38	6,194	0.78
3. Vegetables										
Welsh onion				1	3	2,850	1	3	2,850	0.36
Habichuela				1	1	355	1	1	355	0.04
Tomato				7	11	5,706	7	11	5,706	0.71
Sub-total				9	15	8,911	9	15	8,911	1.12
B. Crops for Processing										
Cacao	1	4	300	8	33	9,220	9	37	9,520	1.19
Coffee	141	536	37,721	441	1,344	234,579	582	1,880	272,300	34.10
Sugarcane	1	1	150	1	2	300	2	3	450	0.06
Soybean	1	1	150	4	47	7,200	5	48	7,350	0.92
Sub-total	144	542	38,321	454	1,426	251,299	598	1,968	289,620	36.27
C. Other Investment										
Coffee Processing Equipment	1	1	1,500	49	45	70,711	50	46	72,211	9.04
Infrastructure				39	41	73,138	39	41	73,138	9.16
Machinery and Equipment	44	44	12,893	3	2	1,376	47	46	14,269	1.79
Repair for Equipment				1	1	2,290	1	1	2,290	0.29
Sub-total	45	45	14,393	92	89	147,515	137	134	161,908	20.27
TOTAL OF CROP PRODUCTION	246	689	61,221	633	1,869	446,451	879	2,558	507,672	63.57
LIVESTOCK										
Cattle Raising	9	58	3,964	30	865	76,583	39	923	80,547	10.09
Swine Raising	15	79	3,030	39	293	14,784	54	372	17,814	2.23
Poultry Farming	3	1,450	595	14	46,681	22,485	17	48,131	23,080	2.89
Pasture	3	75	1,100	7	305	11,150	10	380	12,250	1.53
Infrastructure & Equipment	2	5	361	10	10	28,785	12	15	29,146	3.65
TOTAL OF LIVESTOCK	32	1,667	9,050	100	48,154	153,787	132	49,821	162,837	20.39
OTHER ACTIVITIES										
Construction and repair of houses	33	32	11,870	56	56	59,097	89	88	70,967	8.89
Electrification	1	1	100				1	1	100	0.01
Small Industry	78	72	35,181				78	72	35,181	4.41
Purchase of farm	25	97	21,340				25	97	21,340	2.67
Mining	1	1	489				1	1	489	0.06
Industrial Fund				14		17,900	14	0	17,900	2.24
TOTAL OF OTHER ACTIVITIES	138	203	68,980	56	56	59,097	194	259	128,077	16.04
GRAND TOTAL	416	2,559	139,251	789	50,079	659,335	1,205	52,638	798,586	100.00

Source: Caja Agraria, Oficina de Armenia

TABLE E.1.4 CREDIT APPROVED UNDER F.F.A. 1984-1988

ACTIVITIES	1984		1985		1986		1987		1988	
	AMOUNT	%	AMOUNT	%	AMOUNT	%	AMOUNT	%	AMOUNT	%
ANNUAL CROPS	128	13.2	204	18.5	241	19.7	235	29.0	319	26.7
PERENNIAL CROPS	411	42.2	490	44.5	613	50.0	209	25.8	297	24.9
LIVESTOCK	264	27.1	221	20.1	211	17.2	193	23.8	265	22.2
COMPLEMENTARY	170	17.5	185	16.8	161	13.1	173	21.4	312	26.2
TOTAL	973	100	1100	100	1226	100	810	100	1193	100

Source: Informe Economico del Quindio 1984-1988

TABLE E.1.5 CREDIT PROVIDED UNDER F.F.A. BY CLASE OF FINANCING AGENCY

CLASS OF AGENCY	1984		1985		1986		1987	
	Amount	%	Amount	%	Amount	%	Amount	
PRIVATE B	131	14.9	169	16.2	186	15.4	128	
PUBLIC BA	747	85.0	873	83.7	1019	84.6	1018	
OTHERS	1	0.1	1	0.1	0	0.0	0	
TOTAL	879	100.0	1043	100.0	1205	100.0	1146	

Source: Informe Economico del Quindio 1984-1987

TABLE E.1.6 SUMMARY OF FONDO-DRI'S PROJECT TO BE IMPLEMENTED IN 1990-1991

Unit: Col$ x 1000

Sectors	Armenia		Cordoba		Filandia		Genova		Pijao		Salento		Quindio in General		Total	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
Water Supply and Basic Sanitary System	-	-	14,719	12.4	21,410	18	39,350	33.1	26,805	22.6	16,424	13.8	-	-	118,708	15.8
Technical Assistance	-	-	-	-	-	-	-		-	-	11,300	16.3	69,400	83.7	80,700	10.8
Rural Road	-	-	24,454	9.1	89,989	33.3	60,427	22.4	46,110	17.1	49,087	18.2	-	-	270,067	36.0
Adjustment of Technology	-	-	-	-	-	-	-	-	-	-	-	-	7,675	100	7,675	1.0
Training of Extensionist	10,583	100	-	-	-	-	-	-	-	-	-	-	-	-	10,583	1.4
Crop Production (Selective Supply Plan)	-	-	-	-	-	-	-	-	-	-	-	-	3,790	100	3,790	0.5
Acuaculture	35,979	100	-	-	-	-	-	-	-	-	-	-	-	-	35,979	4.8
Small-scale Irrigation	60,000	100	-	-	-	-	-	-	-	-	-	-	-	-	60,000	8.0
Conservation of Small River Basin	-	-	-	-	68,600	100	-	-	-	-	-	-	-	-	68,600	9.2
Rural Marketing	-	-	-	-	-	-	29,700	100	-	-	-	-	-	-	29,700	4.0
Basic Human Needs	9,747	100	-	-	-	-	-	-	-	-	-	-	-	-	9,747	1.3
Rural Women Development	-	-	-	-	-	-	-	-	-	-	-	-	11,942	100	11,942	1.6
Rural Organization and Education	-	-	-	-	-	-	-	-	-	-	-	-	41,989	100	41,989	5.6
Total	116,309	15.5	39,173	5.2	179,999	24	129,477	17.3	72,915	9.7	76,811	10.2	134,796	18	749,480	100

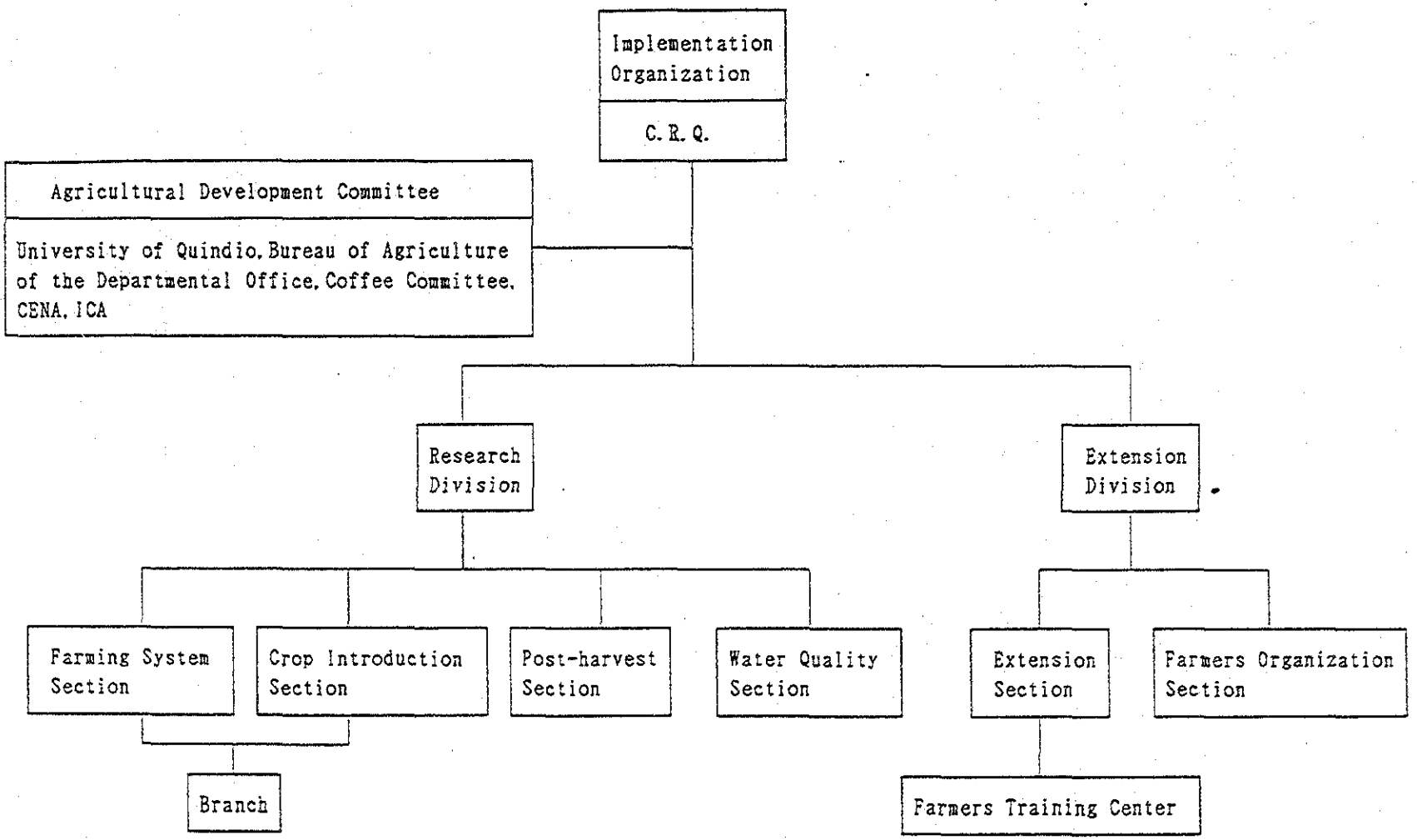


FIG. E.1.1 PROPOSED AGRICULTURAL RESEARCH AND EXTENSION ORGANIZATION

E.2 FARMERS' ORGANIZATION

E.2.1 Actual Situation of Farmers' Organization

It is said that, generally speaking, Quindian people are characterized by "individualism" and unwillingness to belong any organization for working together. This fame is proved by the fact that farmers' organization does not prevail in the Department; there are only five cooperatives (four formed by coffee growers and located in Armenia, Calarca, Quimbaya and Montenegro, and one formed by growers of vegetables and fruits).

The number of members affiliated with coffee growers' cooperatives is 6,443 as of 1988, which indicates that close to 80% of all coffee growers in Quindio are associate member of cooperatives.

In general, services of farmers' cooperatives cover the following fields:

1). Purchase and distribution of inputs and other materials and products relevant to tillage
2). Marketing of products
3). Provision of credit for farming and other relevant activities

Meanwhile, as far as coffee growers are concerned, services corresponding to items 1) & 3) are rendered by the Coffee Committee, therefore cooperative's services are focused on the item 2). Services engaged by cooperatives in the course of marketing coffee are to purchase pulped and dried coffee beans from farmers and distribute them to threshing factories or Almacafe. The cooperatives, with financial assistance rendered by Almacafe, account for 70% of the share in the trade of coffee between farmers and threshing factories or Almacafe in Quindio. Owing to the intervention of cooperatives in marketing, coffee growers are not faced with serious drawbacks on sale of their products.

The cooperative of growers for vegetables and fruits was established in 1987 supported by the Bureau of Agriculture of the Departmental Government Office for promoting production of vegetables and fruits in Quindio. The headquarters of the cooperative is located in Armenia and a total of 23 farmers from Calarca, Cordoba, Filandia, Pijao and Salento are participated to organize the cooperative. The statute of the cooperative has formulated its principal activities as follows:

- Commercialization of products provided by associate members the third party
- Produce, if the circumstances recommend, vegetables and fruits in lands of the cooperative or that of the third party, by means of tenant contract
- Supply the associate members or, as the case may be, the third party with inputs and other products required for production at reasonable prices
- Render credit services to associate members
- Promote saving of money among associate members
- Provide technical assistance to associate members
- Promote education of cooperativeness to associate members

Unfortunately, the cooperative has not functioned as anticipated up to date because of fragile foundation in terms of management and financial situation, which has been aggravated by lack of experience in marketing of products. Under the circumstances, the cooperative is forced to suspend its operation at present soliciting the Financiacoop (Financing institution for cooperatives) to prepare proposal for restructuring its organization.

In addition to the said cooperatives, there exist six rural organizations formed under initiative if Fondo-DRI in municipalities of Cordoba, Filandia, Genova, Pijao and Salento. These organizations are engaging in ameliorating rural environment. distribution foodstuff and other goods necessary for daily living,

small scale agro-industry (production of jam, sweets, etc.), but persons affiliated with these organizations are as few as 110 in total.

Referring to the survey conducted by the Study Team in the course of the field work, only one-tenth of the farmers who were interviewed are members of any rural organization. The greater portion of farmers replied that they don't belong to such organizations, because they don't have time to work for organization; another reasons are that they are not interested, they are not invited, they feel no need to participate in organization, etc.

E.2.2 Farmer' Organization Plan

(1) Planning Principle

In the project area, farmers engaging in the cultivation of vegetables and fruits (except for citrus, passion fruit and pitaya) are in their greater portion medium and small farmers, and marketing of their products is conducted mainly through intermediaries. In this transaction, farmers are disadvantageous in setting prices of their products, because they negotiate with intermediaries solely. In order to strengthen farmers' capacity of negotiation in the stage of commercialization of their products, it is prerequisite that farmers be formed in organization, and in this connection it is advisable to incorporate a cooperative formed by farmers.

In the Department of Quindio, in line with the said consideration, a cooperative of vegetables and fruits growers called "COHOFRUQUIN" has been established since 1987, but its operation is virtually suspended. It is informed that this stagnation in operation is rooted in fragile organization both financial and managerial aspects as well as lack of experience in marketing of products. For successful operation of cooperative, the following supporting services by relevant institutions are anticipated.

- Credit service for installation of office, collection and storage warehouse, procurement of vehicles and other equipment required.

- Education and campaign to rural population with regard to participation in rural organization.

- Technical assistance in marketing of products and in management (accounting, organization) of a cooperative.

(2) Incorporation and Operation Plan

Farmers' cooperative shall be incorporated in Circasia, Salento, Pijao and Genova with objectives of purchasing plantain, tomato, onion, green pea, blackberry, tree tomato and lulo from their associate members and marketing them to wholesale markets or supermarkets. In case that associate members desire to be purchased products other than those cited above, it will be examined within the board of directors of cooperatives.

Prices of fruits and vegetables to be transacted by cooperatives fluctuate considerably depending upon wholesale prices established at Corabastos, Bogota. It is thus essential that information collection system on supply and demand of products should be incorporated so that coordination and arrangement for production and marketing of crops might be attained.

At first, activities of cooperatives proposed in this project shall be limited to marketing of crops, but if organization of cooperative becomes consolidated, they may be expanded to such fields as procurement of inputs, credit service, saving, etc. In particular, it is desirable that considerable capital formation will be accomplished in such manner as to subsidize associate members in time of slump for prices of products.

Installations annexed to cooperatives are: office, collection and storage yard of products, etc. In such cooperatives, one director, one secretary -cum-accountant, one marketing specialist, and a couple of persons responsible for collecting and transacting products will be recruited. The initial cost of for the storage and distribution of cooperatives shall be Col$ 18,600,000 and the cost incurred by operation and maintenance of cooperatives shall be Col$ 18,420,000 a year.

TABLE E.2.1 COST FOR INCORPORATION AND MAINTENANCE OF STORAGE AND DISTRIBUTION CENTER OF COOPERATIVES

Unit: Col $

1. Initial Investment for Incorporation

	Circasia	Salento	Pijao	Genova	Total
Land Aquisition	2,000,000	1,000,000	1,000,000	1,000,000	5,000,000
Construction of Office and Storage Yard	1,000,000	500,000	500,000	500,000	2,500,000
Vechecle	2,000,000	2,000,000	2,000,000	2,000,000	8,000,000
Furniture $ Equipment	1,000,000	700,000	700,000	700,000	3,100,000
Total	6,000,000	4,200,000	4,200,000	4,200,000	18,600,000

2. Annual Operation and Maintenance

	Circasia	Salento	Pijao	Genova	Total
1). Salaries					
Director	1,440,000	1,440,000	1,440,000	1,440,000	5,760,000
Marketing specialist	960,000	960,000	960,000	960,000	3,840,000
Secretary	600,000	600,000	600,000	600,000	2,400,000
Assistance (2 or 3)	1,440,000	960,000	960,000	960,000	4,320,000
Sub-total	4,440,000	3,960,000	3,960,000	3,960,000	16,320,000
2) Fuel and Consumables	600,000	500,000	500,000	500,000	2,100,000
Total	5,040,000	4,460,000	4,460,000	4,460,000	18,420,000

ANNEX F :

SOCIOECONOMIC CONDITIONS OF FARMAERS

ANNEX F : SOCIOECONOMIC CONDITIONS OF FARMERS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF FIGURES-(2)

F.1 SOCIOECONOMIC SURVEY

With an eye to disclosing social and economic situations of farmers in the study area, a field survey was conducted by means of direct interview to farmers (Phase I field works). The number of farmers who were interviewed accounted for 74 which are divided into 43 for Circasia, 13 for Salento, 14 for both margins of the Quindio river, and 4 for Pijao and Genova. The questionnaire for the survey included the following major items:

- Composition of family member and living conditions
- Land tenure and land use
- Cultivated crops and their marketing
- Technical assistance, credit and other services rendered
- Problems relevant to farming

The survey was also conducted during the second phase of the field works, but with focus brought into production cost of crop and animal husbandries.

According to what the survey revealed, the number of family members among interviewed farmers is 4.8 on the average-superior to the departmental average of 4.6. One of the common phenomena taken place among farmers in Quindio is that there are not a few "absent" farmers who live in urban areas entrusting farming activities in their farms to farm administrators; the survey disclosed that 66% of interviewees correspond to "absent" farmers. The Department of Quindio is one of those departments which have attained the highest level of socio-economic development in Colombia, and this is especially true in the rural area, in which, owing to the attention of the Coffee Committee, more adequate social infrastructure are provided than other part of the country. Of farmers interviewed, all but two (2.7%) are provided electric service, close to 80% have access to water supply system (the reminder takes water from wells and small streams), and one for every ten farmers has sewage

treatment system constructed by himself.

Every interviewees owns his farm (in the study area in general, there are some tenant farmers who cultivate soybean, sorghum, cassava and other crops mainly on the right margin of the Quindio River). The farm size among interviewed farmers averaged 25.6 ha (Circasia: 20.6 ha, both margins of the Quindio River: 38.2 ha and Salento-Pijao-Genova: 28 ha), which surpass an average size of the department as a whole (8.1 ha). Nevertheless, this fact can not lead to the conclusion that farmers in the study area are regarded to be wealthy judging from their size of holding. This is to say that, the survey was carrying out aiming at collecting major information from farmers engaging in farming activities other than coffee cultivation , and, with an exception of both sides of the Quindio river, farm lands in the study area are generally under-developed or used in extensive manner as grazing land because of their being located in mountain zone with steeper slope. Consequently, productivity in these farm lands is low and farmers' income is accordingly inferior despite holding larger property.

Within the study area, small farmers are concentrated in the Circasia area, where one-third of surveyed farmers do not have a land larger than 5 ha. On the other hand, in both mountain and flat areas, small farmers with holding less than 5 ha are scarcely found (only 1 among 31 interviewees); particularly, greater portion (64 percent of the interviewed) of farmers in the latter area are represented by large farmers with farm land exceeding 30 ha.

Farming practice among interviewees was classified into some groups with similar nature, and model farms have been identified by area and by farm size. In Annex L (L.4) returns of farming activities per model farm are presented.

One-tenth of interviewed farmers had income from activities other than crop and animal husbandries and an average size of holding for these farmers are 18.9 ha. It is supposed that these farmers engage in non-agricultural activities not because they seek for other

source of income due to low income in agriculture, but they have disposal time with employing administrator who take charge of routine farming. These farmers get income from such activities as: commerce, employees of bank and public enterprise, farm extensionist, lawyer, driver, etc.

60% of interviewees answered that they are rendered technical assistance services from public institutions or private agronomist, but the great majority of these services are provided by the Coffee Committee. Therefore, technical services for farming other than coffee cultivation are scarcely rendered, which constitutes one of factors that prevent farmers from diversifying their tillage. Approximately 20% of farmers who were interviewed expressed that they have no objection to sell their lands (the highest proportion was in the sector of Salento with 38%). Actual value of lands assessed by farmers in the study area is average Col$ 4,180,000/ha for both margins of the Quindio River and Col$ 1,830,000/ha for Circasia-Pijao-Genova-Salento.

Major problems associated with farming are climatic factors, disease and pest control and lack of financial resources, which together represented about 70% of the total. Other problems, although they are few in number, are higher cost of inputs, inadequate technical assistance, inferior quality of seed, and low productivity. On the other hand, constrains relevant to commercialization of products are significant fluctuation of prices and lack of appropriate distribution system and infrastructure. Coffee growers, in their greater portion, replied that no constrain is identified in term of marketing of coffee.

Table F.1.1 SOCIOECONOMIC FEATURES OF FARMERS IN THE STUDY AREA (RESULT OF INTERVIEW SURVEY)-(1)

SURVEY ITEM/AREAS	CIRCASIA	BOTH MARGINS OF THE QUINDIO RIVER	PIJAO, GENOVA AND SALENTO	Total or Average
1. No. of interviewed farmers	43	14	17	74
2. No. of family member per farmer	5.2	3.5	4.7	4.8
3. Source of domestic water				
-Piping system	41	11	8	60
-Well	0	2	1	3
-River or fountain	2	1	8	11
4. Energy supply system				
-Electric network	41	14	17	72
-Independent plant	0	0	0	0
-Without supply	2	0	0	2
5. Sanitary system				
-Sewerage	4	2	1	7
-Septic well	35	10	15	60
-Latrina	3	2	1	6
-Without system	1	0	0	1
6. Location of living quarter				
-Within farmland	18	2	5	25
-Rural area where farmland is locaed	1	1	3	5
-Urban area	24	11	9	44
7. Land tenure				
-Land owner	43	14	17	74
-Tenant farmer	0	0	0	0
-Beneficiary of agrarian reform	0	0	0	0
8. Farm size				
-Below 5 has.	14	0	1	15
-5-30 has.	22	5	12	39
-More than 30 has.	7	9	4	20
-Average size (has.)	20.6	38.2	28.0	25.6
9. Problems with farming				
-Climatological factors	7	6	4	17
-Disease and/or insect	12	4	0	16
-Financial resources	9	0	7	16
-Technical asistance	2	0	1	3
-Quality of seeds	2	0	1	3
-Labor force	2	0	6	2
-Production cost	3	1	0	8
-Without information	20	3	4	27

Table F.1.1 SOCIOECONOMIC FEATURES OF FARMERS IN THE STUDY AREA
(RESULT OF INTERVIEW SURVEY)-(2)

SURVEY ITEM/AREAS	CIRCASIA	BOTH MARGINS OF THE QUINDIO RIVER	PIJAO, GENOVA AND SALENTO	Total or Average
10. Sources of income other than farming				
-Commercial	5	-	3	8
-Own enterprise private enterprises	2	-	-	2
-Employee for public/ private enterprises	2	-	-	2
-Engineer	1	1	-	2
-Accountant	1	-	-	1
-Driver	1	-	-	1
-Lawer	-	-	1	1
-Teacher	-	1	-	1
-Veterinarian	-	-	1	1
-Agronomist	-	-	1	1
11. Technical assistance is rendered from:				
-Coffee Committee	16	7	7	30
-Secretary of Agriculture	2	1	1	4
-SENA	1	-	-	1
-Caja Agraria	1	-	-	1
-CRQ	-	-	1	1
-Banco Ganadero	-	-	1	1
-Private extensionist	3	2	1	6
-None	22	4	6	32
12. Interest in irrigation				
-Yes	5 (11.6%)	3 (21.4%)	7 (41.2%)	15 (20.3%)
-No	38 (88.4%)	11 (78.6%)	10 (58.8%)	59 (79.7%)
11. Evaluation of farmland (Col$/ha)	1,720,000	4,180,000	1,540,000	2,120,000
12. Affiliation with association				
-Yes	7 (16.3%)	1 (7.1%)	5 (29.4%)	13 (17.6%)
-No	36 (83.7%)	13 (92.9%)	12 (70.6%)	61 (82.4%)

Table F.1.1 SOCIOECONOMIC FEATURES OF FARMERS IN THE STUDY AREA (RESULT OF INTERVIEW SURVEY)-(3)

SURVEY ITEM/AREAS	CIRCASIA	BOTH MARGINS OF THE QUINDIO RIVER	PIJAO, GENOVA AND SALENTO	Total or Average
13. Intension to continue farming				
-Yes	39 (90.7%)	12 (85.7%)	15 (88.2%)	66 (89.2%)
-No	4 (9.3%)	2 (14.3%)	2 (11.8%)	8 (10.8%)
14. Intention to expand cultivated area				
-Yes	23 (53.5%)	1 (7.1%)	2 (11.8%)	26 (35.1%)
-No	43 (46.5%)	13 (92.9%)	15 (88.2%)	48 (64.9%)
15. Satisfaction with actual farming				
-Yes	35 (81.4%)	12 (85.7%)	12 (70.6%)	59 (79.7%)
-No	8 (18.6%)	2 (14.3%)	5 (29.4%)	15 (20.3%)
16. Intention to sell farmland				
-Yes	8 (18.6%)	2 (14.3%)	6 (35.3%)	16 (21.6%)
-No	35 (81.4%)	12 (85.7%)	11 (64.7%)	58 (78.4%)

F.2 SOUNDING OF OPINIONS ABOUT THE ATTITUDE OF LAND OWNERS IN THE STUDY AREA

F.2.1 Introduction

This sounding survey was conducted by SENA within the course of the Phase II field works.

The social aspects to be surveyed are of importance within the context of the present feasibility study in view of sounding opinions of land owners with respect to project planning, because these land owners should not consent to the proposal presented by the Study Team, it will be difficult to realize it.

The sounding was conducted by means of explaining directly to farmers objectives and scope of the project and, at the same time, obtaining information on farmers' opinions regarding acceptance difficulty, conditioning and suggestion on shifting actual farming practice, forming organization and so forth. This survey result was analyzed in connection with the study area in general and the group of sectors.

F.2.2 Objective

The survey had the objective to sound opinions of land owners in the study area for the purpose of identifying their attitude toward the change and conditioning with which necessary adjustment for implementing the project.

F.2.3 Methodology

1) No. of farmlands

Areas	Viallage	No. of farmlands
Circasia	Barcelona Alto	431
	La Concha	
	Membrillal	
	El Congal	
	La Cristalina	
	Naranjal	
	San Antonio	
Salento	Canaan Alto	30
Pijao	Carniceros	
	Las Pizzaras	
	La Cumbre	51
Genova	El Cerdral Alto y Bajo	
	El Recreo	36
La Tebaida	n.a.	112
Total		660

Of these 660 land owners, 113 (17.12%) were interviewed.

2) Manners to be interviewed

Through circulars and telephone calls interviewees gathered where interview surveys were conducted. The sounding of opinions was carried out in the following manner:

1. General exhibition of the project to participants.

2. Collection of information through direct interview to land owners.

3) Tabulation and analysis of information

The result of sounding is compiled in the following way:

1. General information of answers given by interviewees.

2. Information of answers by each geographic sectors in such groups as: Circacia-Salento, Quindio River Right Margin and Pijao-Genova.

3. Table for the summary of answers.

3) Constraints

Principal constraints found during the survey are:

1. Lack of time for diffusing and motivating the present study as well as interviewing land owners.

2. Dispersion of land owners (about 30% live in municipalities other than Armenia or farmlands are in the process of succession; 30% live in Armenia and 40% live in farmlands).

3. Apathy toward this live of activities (meetings).

4. Ignorance of the program developed by the Japanese Mission.

F.2.4 Analysis

For the analysis of information compiled in view of disclosing land owners' attitudes toward shifting their farming activities and

their disposition in forming organization, it is considered to be necessary to make the following sketches.

Concerning questions which try to judge the position of land owners toward shifting their farming activities and their opinions on participating in any association, it is stressed that a high level of acceptance is manifested by interviewees. In investigated aspects, as a consequence of dissatisfaction with the actual situation followed by inadequate land use associated with low level of income land owners are willing to shift their land use, if their lands are betterly exploited by means of introduction of new crops and technologies. These owners have not realized to shift their actual land use due to their anxiety and doubt on marketing of newly introduced crops.

By the said reason, it is required to make a detailed marketing analysis prior to recommending land owners to proceed to activities other than what they are engaging at present.

Motivated by the dissatisfaction of land owners mentioned above, it is proposed to make further survey on actual farming systems of land owners and afterward to analyze and experiment for new farming systems that are supposed to contribute to ameliorating land productivity.

Under the circumstances, it is necessary to analyze the anxieties manifested by interviewees in such aspects as better marketing for new products and stable technical assistance.

The criticism of land owners faced with the change of actual farming activities is that officers in charge of institutional services should not continue to work as what they are presently doing without any coordination among respective institutions. It is required to reinforce institutions that offer credit to farmers in accordance with their necessity, and among others that promise to introduce new farming system experimenting it step by step.

In this regard, land owners are ready to accept changes subject to

being provided permanent supporting services from the part of entities promoting for the development of project.

With respect to forming associations, farmers are interested in it, but it should be conditioned that such associations have specific objectives in production and marketing. This aspect shall receive direct flow of the actions of institutions with their offer of services and will have demonstration effect for inducing farmers to organize associations.

Contents of each question and analysis of answers are given hereinunder.

1) Relation between the economic return and the satisfaction of farmers

80.5% of interviewed land owners are not satisfied with economic return of their farmlands, because they consider that these lands are not made use of to the maximum level because of lack of financial resources for exploitation, absence of established marketing system for products other than coffee, and elevated price of inputs.

Although coffee is not profitable in some areas, farmers continue to cultivate it for assuring then stable income.

19.5% of interviewees are satisfied with economic return of their farmlands, because their lands are completely cultivated due to limitation of arable area.

2) Attitude toward proposal for improvement of farmlands

92.9% of land owners interviewed are ready to listen proposals for improvement of their farmlands, but always subject to being profitable the crops to be introduced, being duly established the markets for these crops, and being rendered appropriate credit and technical assistance services.

The reasons for those who answered no are that their farmlands are completely used and they don't want to be bothered with administration, labor force, debts and taxes.

3) Attitude toward change of the actual land use

91.2% are disposed to shifting their actual land use to other forms, but they are anxious to know how this will be made; it will be made gradually or with experiments partially; whether credit services and technical assistance will be rendered or not.

The negative answers are caused by two main categories: the principal interest on their lands is to evaluate them and they do not have confidence in crops but coffee.

4) Attitude toward change of production system and marketing

The percentage of acceptance for establishment of new production method and marketing is 91.2% but subject to being assured of the coordination and fulfillment by the part of institutions for the marketing and demonstration of new products.

8.8% of interviewees denied engagement of new production system associated with their distrust in it and in cropping technologies which they are not accustomed with. Furthermore, frequent thefts in their farmlands make them to hesitate introducing new products, because, due to this phenomenon, much benefit will not be expected.

5) Knowledge of coffee growers' cooperative services

84.1% have knowledge regarding services rendered by coffee growers' cooperatives evaluating them to be adequate, especially in such fields as marketing, prices for purchasing inputs and technical assistance.

Generally speaking, farmers have confidence in marketing of coffee owing to the presence of cooperatives.

6) Attitude toward affiliating organization

The great majority (83.2%) of interviewed land owners manifested that they are disposed to affiliate some possible organization, but under clear supporting conditions from the part of public entities consist of soft credit service and permanent and fundamental technical services that bring to better marketing of products.

The remaining 16.8% are not interested in participating in organization because they have problems to work together and due to difficulty in marketing crops other than coffee.

7) Fields to which an assistance is rendered

The greater portion of farmers have received technical assistance mainly in crops; coffee from technicians of Coffee Committee, fruits and vegetables from Secretary of Agriculture of Departmental Government and SENA.

27.4% of land owners are rendered credit services for crop and animal husbandries from 4 institutions.

12.3% are provided technical assistance from ICA and Banco Ganadero with respect to vaccination.

8) Opinions of farmers on institutional supporting services.

Of 90 interviewees who are rendered technical assistance, 42.2% have positive opinions regarding timing of attention, provision of inputs and the quality of training.

The farmers who manifested dissatisfaction with technical

assistance consider that technicians have only limited technical knowledge and do not have much experience in farming.

On the other part, some farmers consider public institutions not to be supporting organizations but to be coercive ones. They also criticize the absence of coordination among them, that causes duplication in function in some aspects and lack of services in other aspects.

9) Opinion on institutions which offer technical assistance

Coffee Committee

70.9% are receiving technical services in crop production and credit in continuous and appropriate manner.

SENA

18.5% are rendered technical guidance in crop production; there are no continuity with programs and to many meetings are held.

Secretary of Agriculture

16.81% are receiving technical assistance, being provided inputs and their programs are more constantly attended.

ICA

10.61% are rendered technical assistance in livestock which has programs for vaccination.

Caja Agraria

10.61% are receiving credit services.

Fondo-DRI

7.96% are rendered technical assistance in crop production, but it has no continuity in paying attention and is too much theoretical.

Banco Cafeteroro

3.54% are receiving credit services and they complain that interests collected in advance.

Banco Ganadero

0.18% receives credit and technical assistance services.

20.35% are not rendered any kind of technical assistance from public institutions.

These sounding result both the total area and each group is presented in the form of round graph in figures F.2.1 thru F.2.7.

F.2.5 Conclusion

1) The positive attitude of farmers toward affiliation of organization is is a field which should be intensified for developing any socioeconomic project from the part of public entities.

2) For attainment of the objectives proposed in the project-forming farmers' association, it is of importance to prepare conditions (marketing of product, credit with low interest rate and appropriate and timely technical assistance) so that farmers are willing to affiliate an association.

3) It is indispensable to rectify an absence of coordination existing among institutions, which causes duplication of functions in some aspects and lack of services in other aspects.

4) In order to succeed in the project, it is prerequisite to define clearly functions to be expected by respective organizations which are concerned with the project. This is to aim not to produce false anticipations for farmers that leads to decrease confidence of farmers in connection with institutional supporting services and as a consequence farmers' attitudes toward shifting of their farming activities.

5) It is worth while to indicate that there are significant imbalance in answers between land owners of the southern sector (Pijao-Genova-Quindio River Right Margin) and northern sector (Circasia-Salento). In the southern sector, more interest is observed to investing in lands in view of valuing them, not to expecting for better production. In this regard, more land owners in the northern sector have not shown interest in improvement of their farmlands in comparison with the southern sector. By contrast, in the northern sector, the land owners manifested more interest in investment of productive activities in relatively small lands and proposal for improvement of lands is accepted by greater portion of land owners than the northern sector. Therefore, it is necessary to bear this imbalance in mind in formulating development plan.

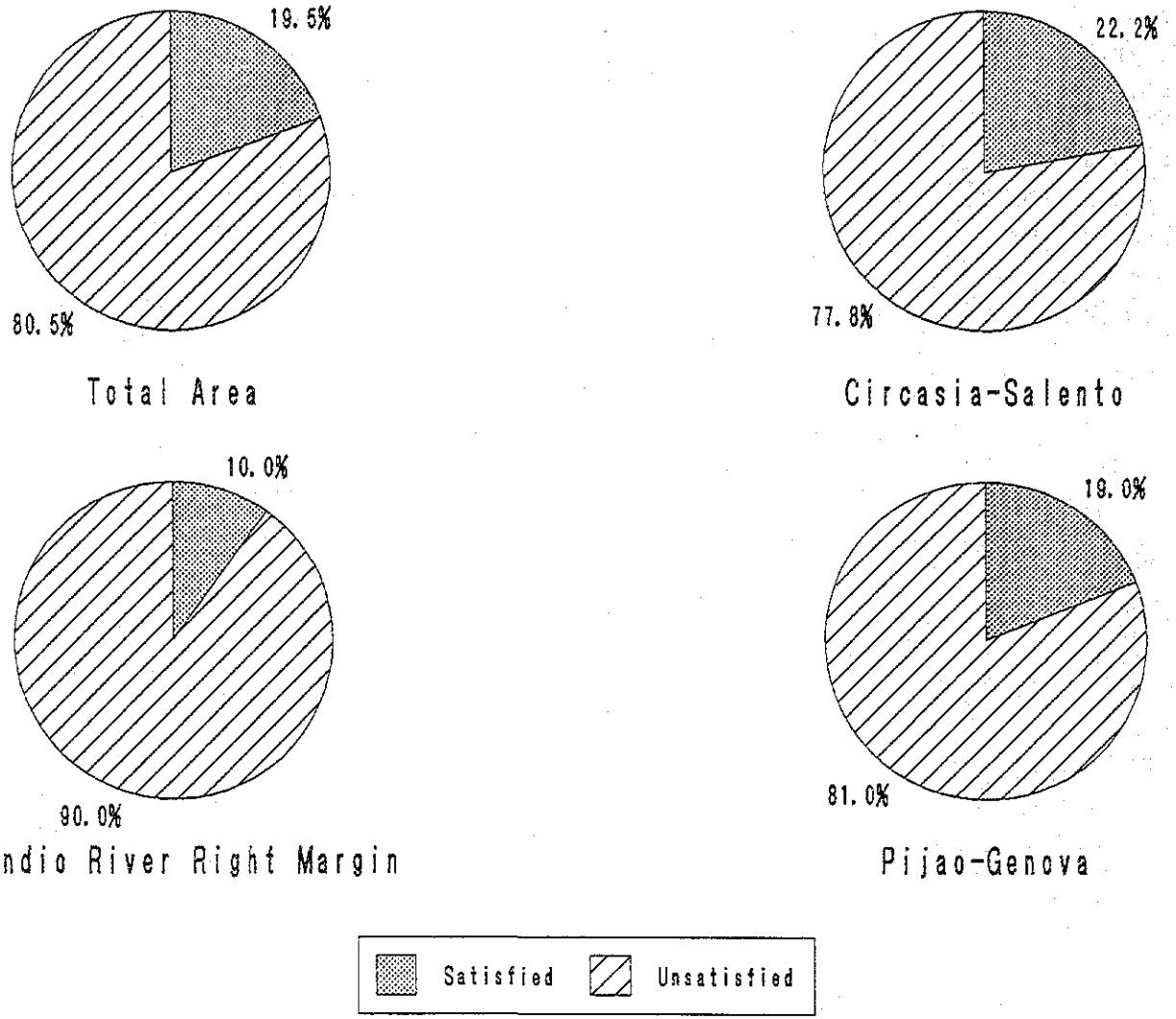


FIG. F.2.1 RELATION BETWEEN THE ECONOMIC RETURN AND THE SATISFACTION OF FARMERS

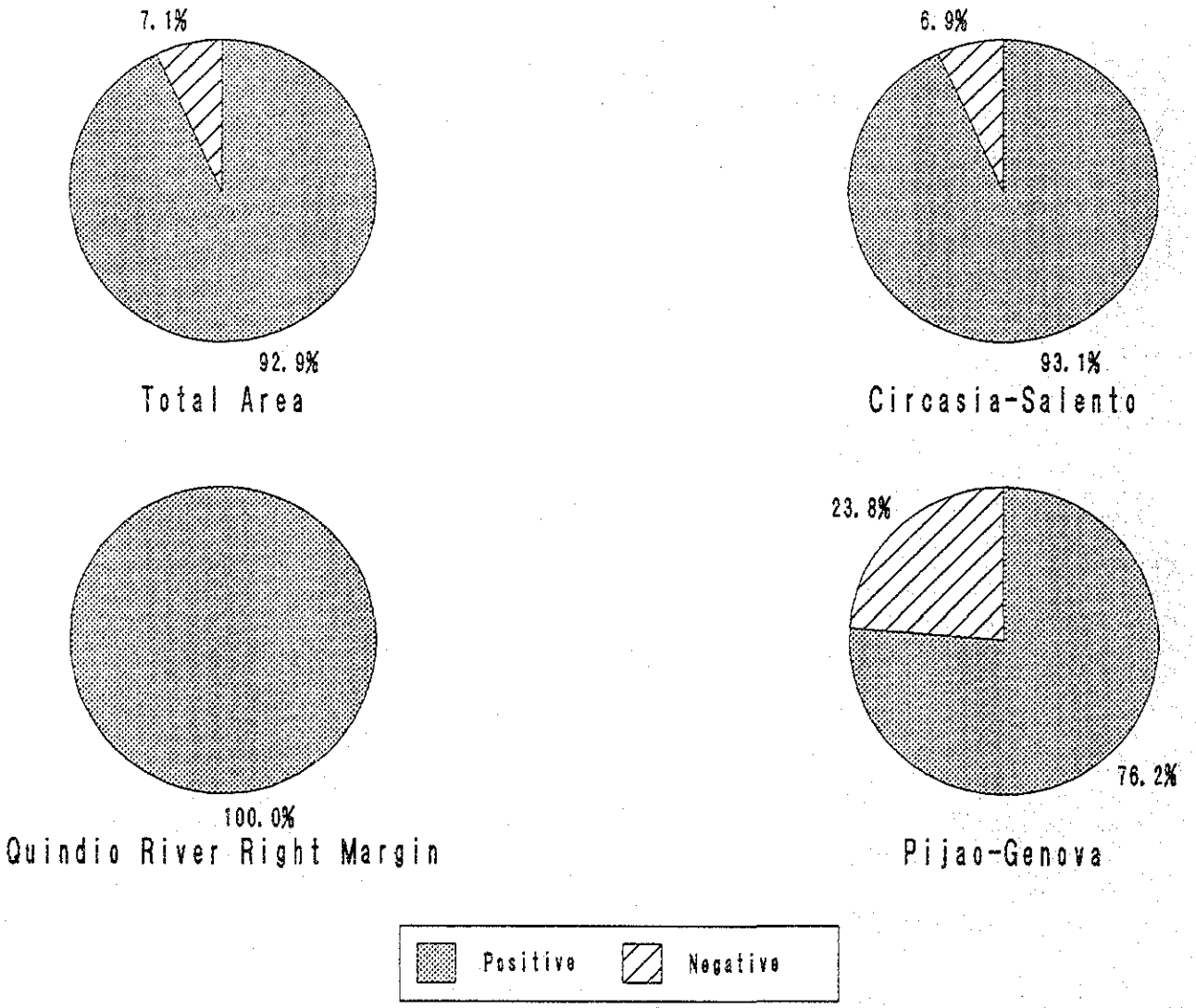


FIG. F.2.2 ATTITUDE TOWARD PROPOSAL FOR IMPROVEMENT OF FARMLANDS

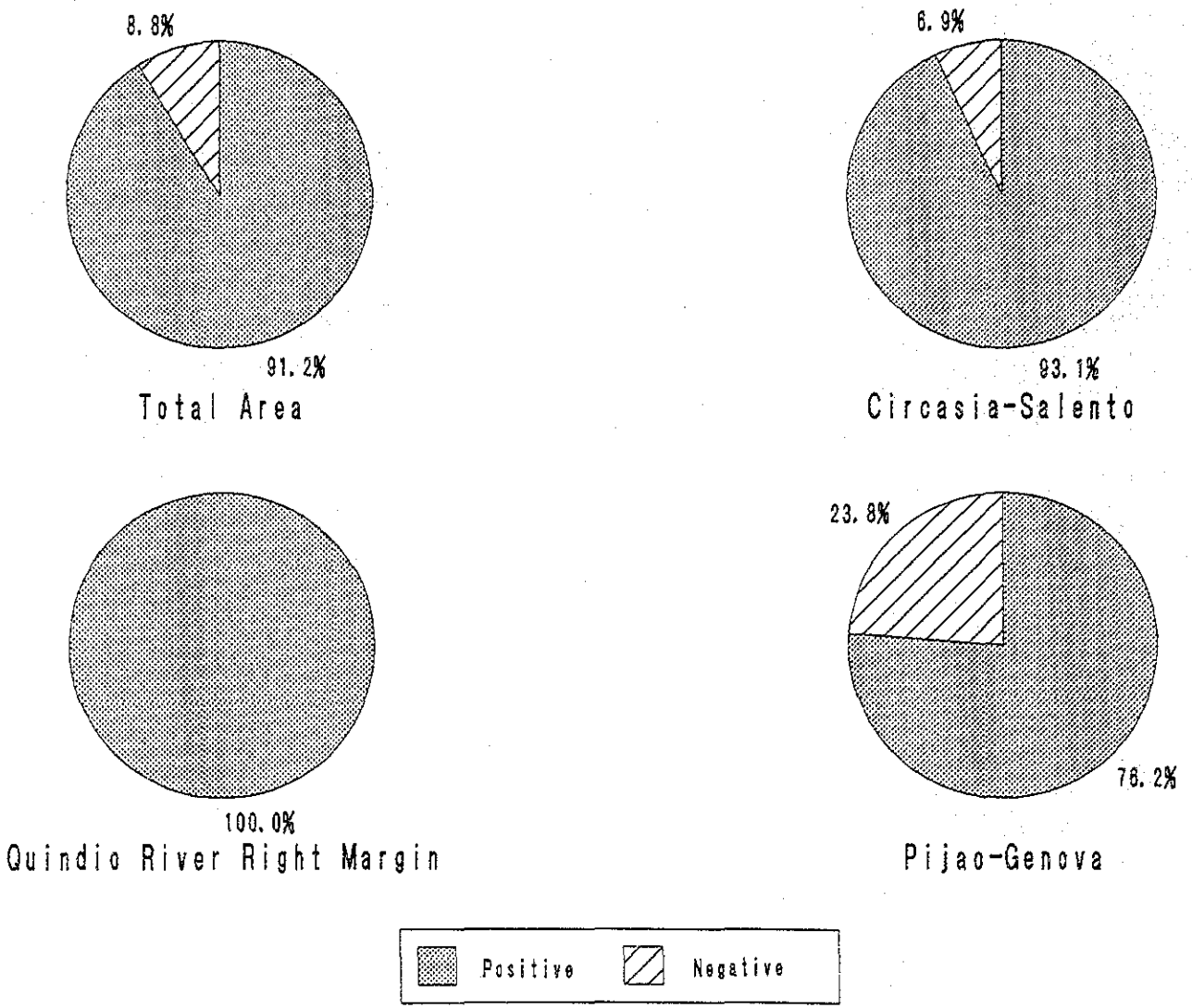


FIG. F.2.3 ATTITUDE TOWARD CHANGE OF THE ACTUAL LAND USE

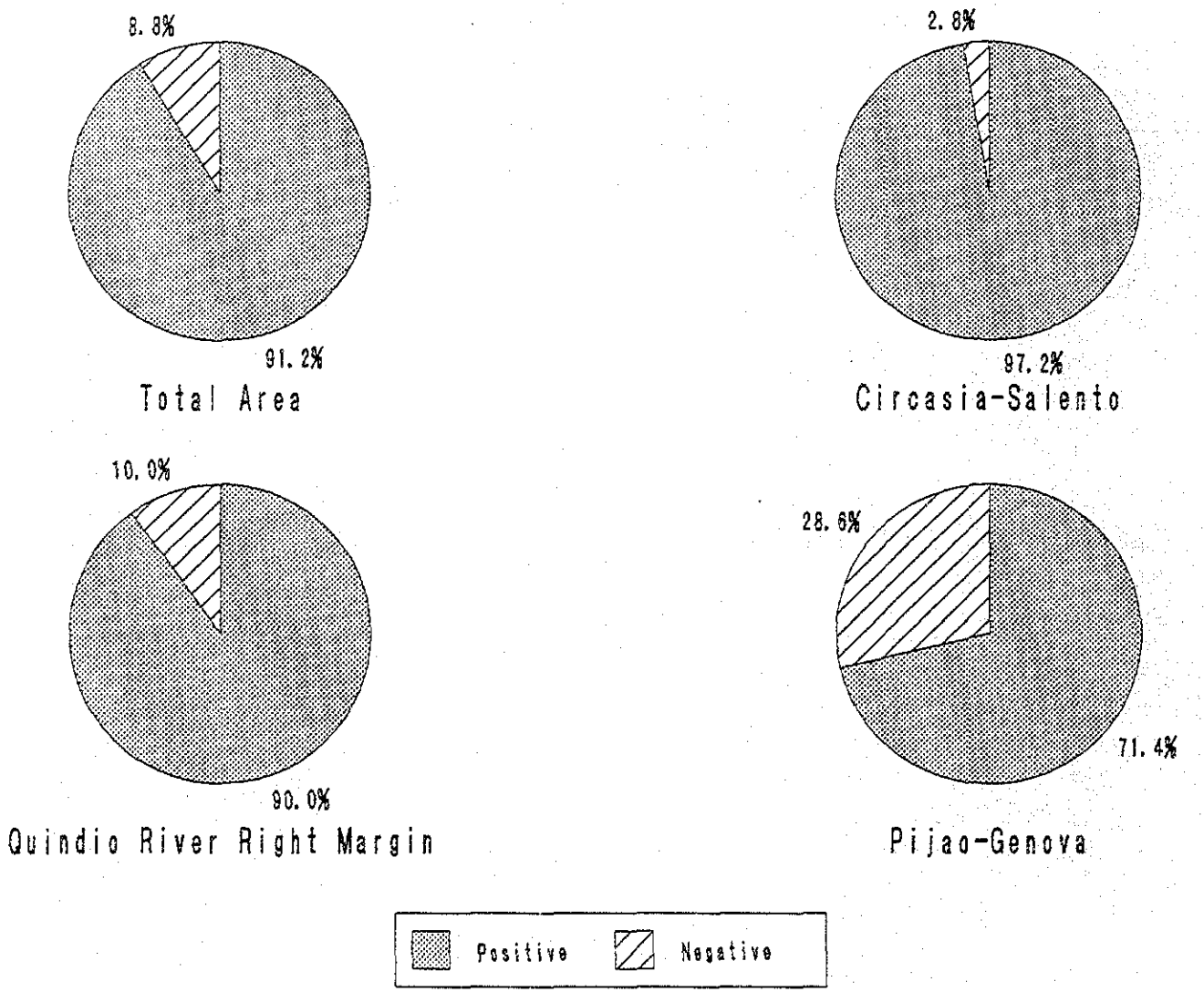


FIG. F.2.4 ATTITUDE TOWARD CHANGE OF PRODUCTION SYSTEM AND MARKETING

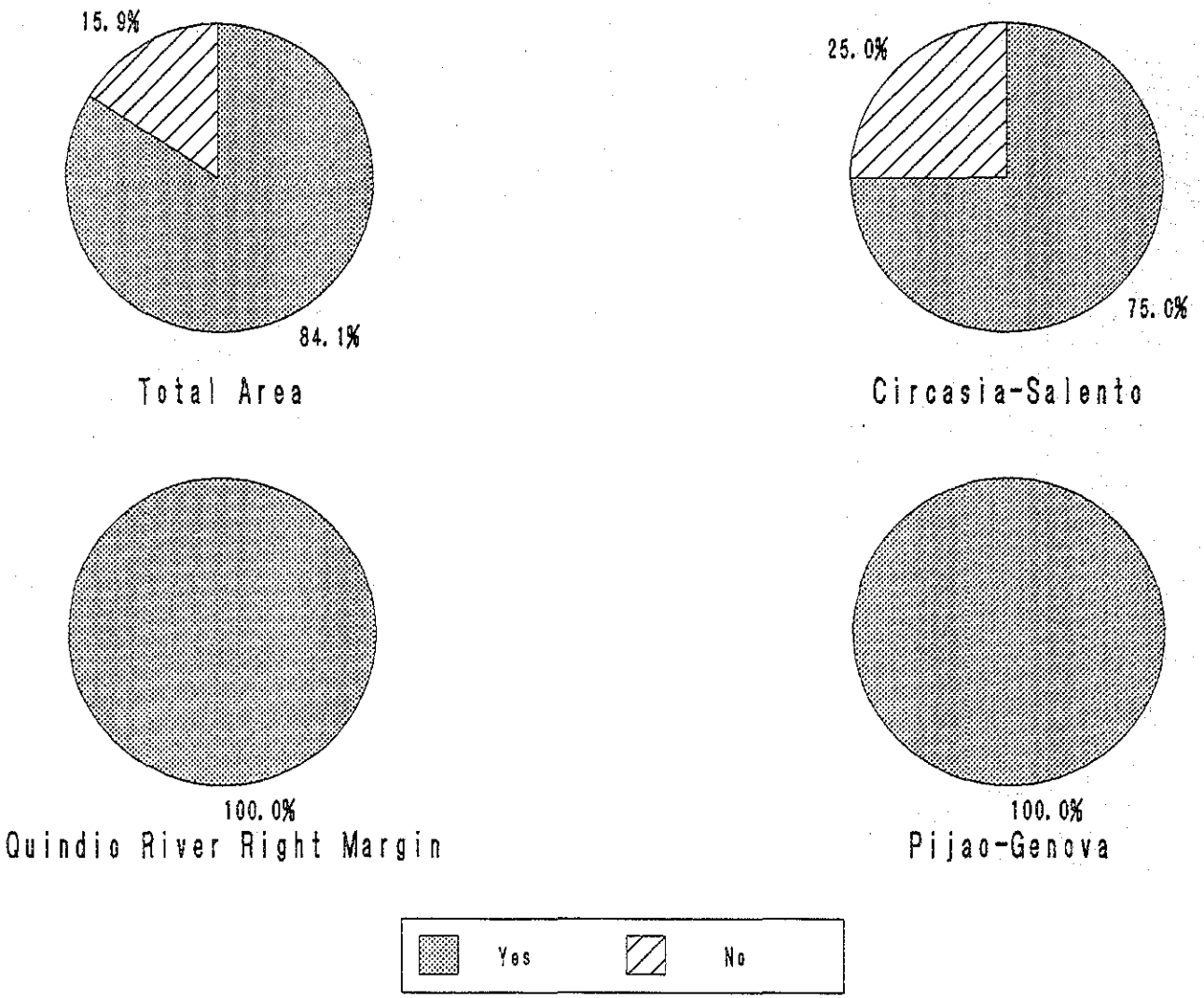


FIG. F.2.5 KNOWLEDGE ON COFFEE GROWERS' COOPERATIVE SERVICES

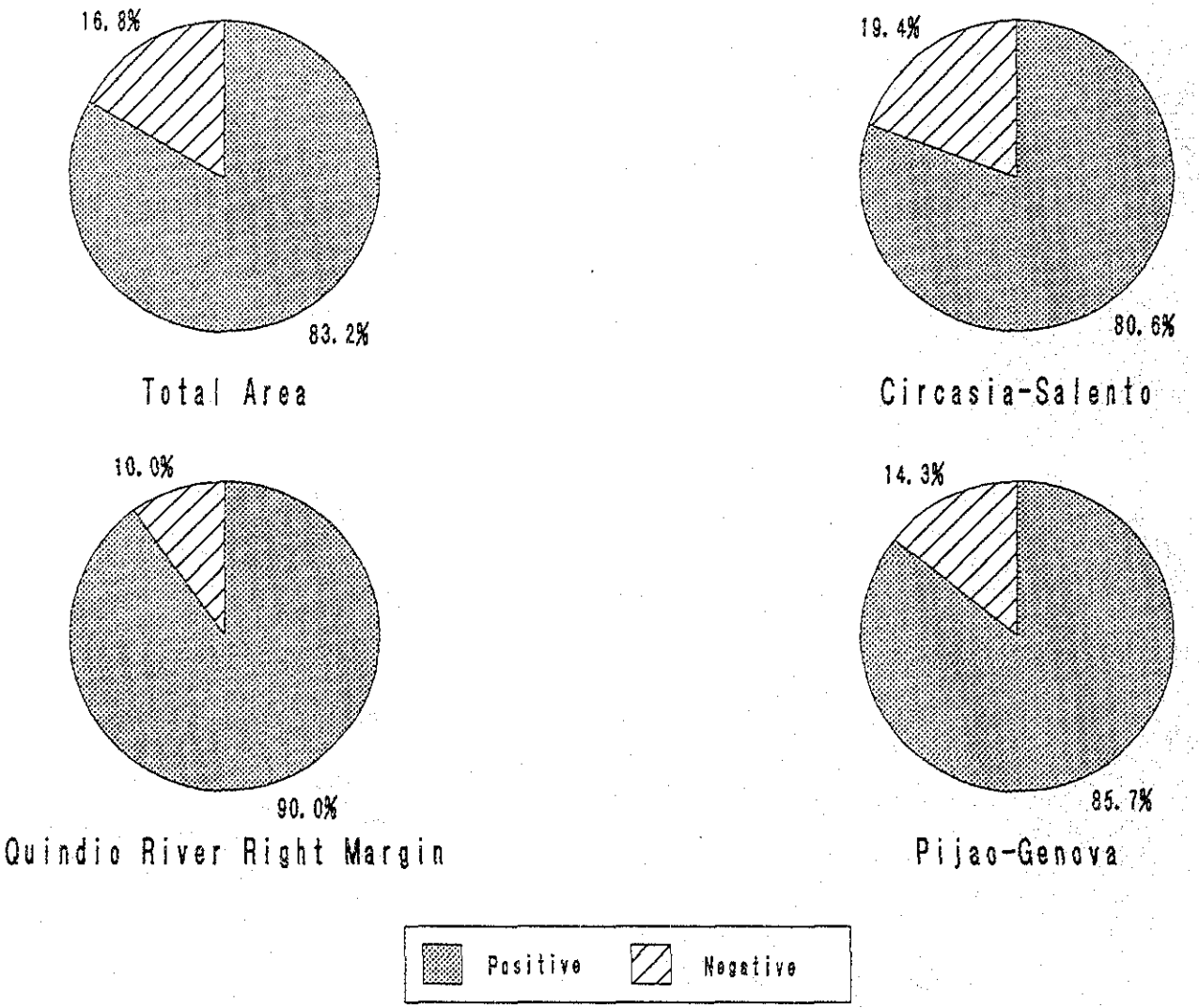


FIG. F.2.6 ATTITUDE TOWARD AFFILIATING ORGANIZATION

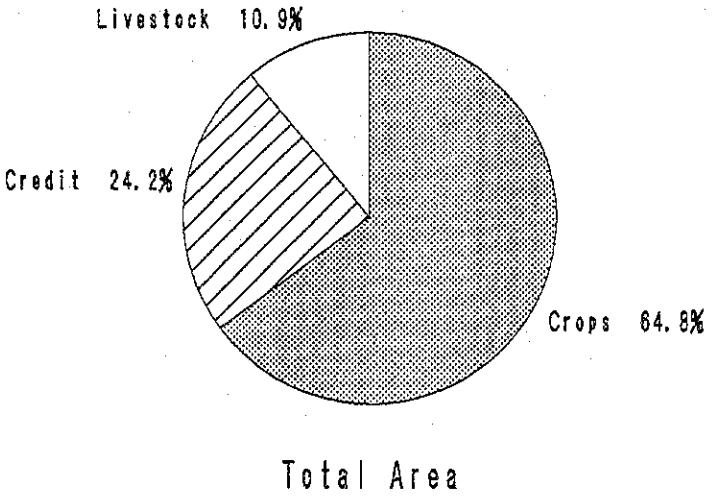


FIG. F.2.7 FIELDS TO WHICH AN ASSISTANCE IS RENDERED

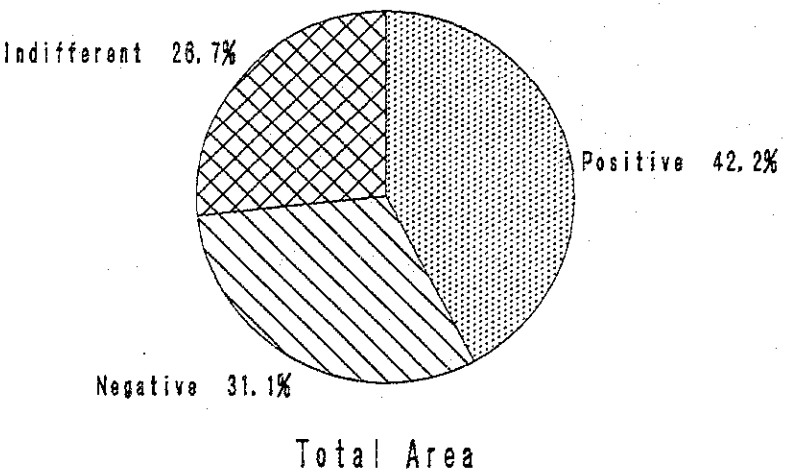


FIG. F.2.8 OPINIONS OF FARMERS ON INSTITUTIONAL SUPPORTING SERVICES