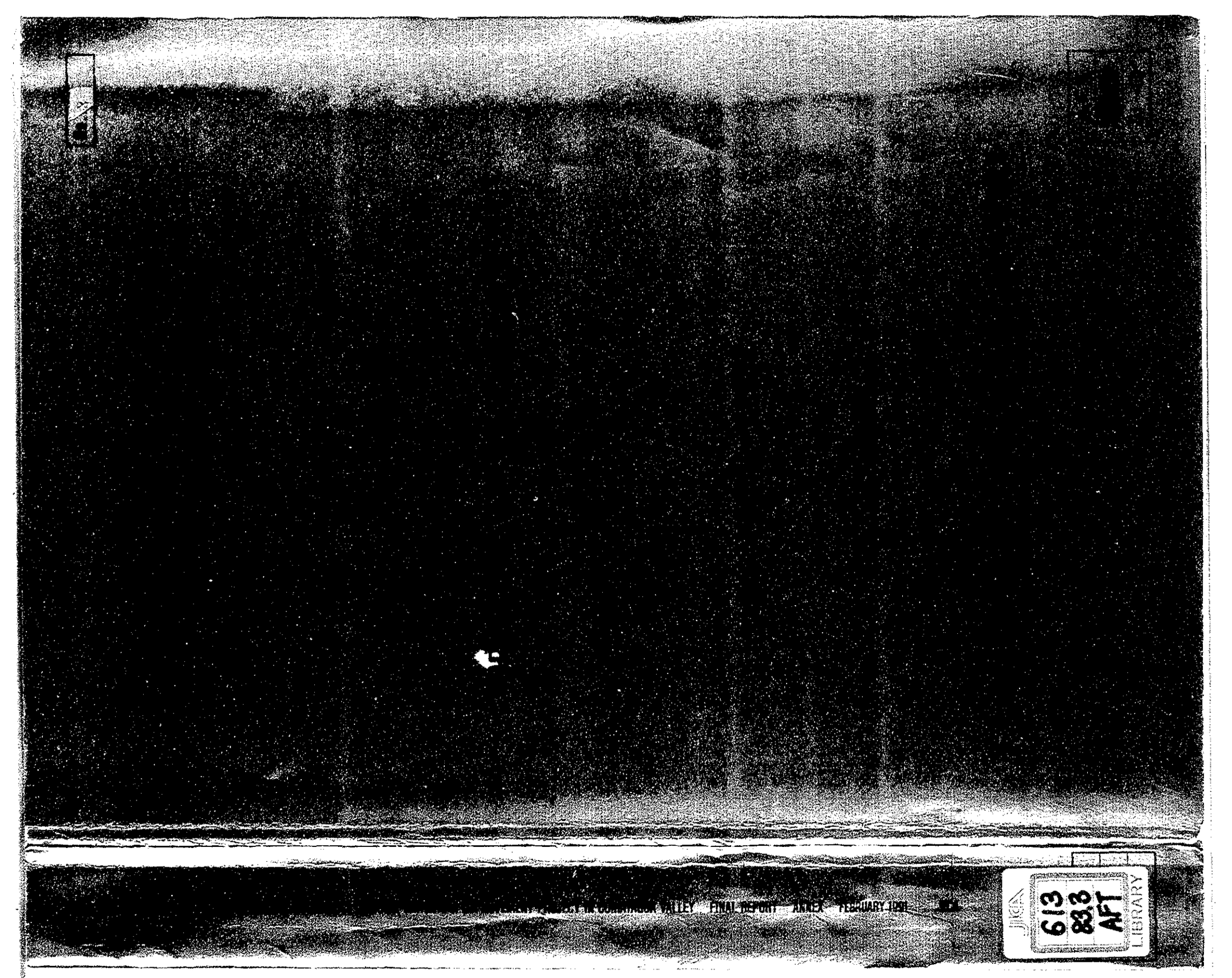


THE REPUBLIC OF HONDURAS

THE FEASIBILITY STUDY ON REHABILITATION OF COYOLAR DAM AND IRRIGATION IMPROVEMENT PROJECT IN COMAYAGUA VALLEY

FINAL REPORT
ANNEX

FEBRUARY 1991

JAPAN INTERNATIONAL COOPERATION AGENCY
(JICA)

TABLE OF CONTENTS

ANNEX A : NATIONAL AND REGIONAL SOCIO-ECONOMIC BACKGROUND

TABLE OF CONTENTS

A.1 Population

Table A.1-1 shows area, population and population density according to the 1974 and 1988 national population census. For Comayagua Department (area: 5,196 km²), population in 1974 and 1988 were: 136,619 and 238,790 people respectively. It represented an annual population growth rate of 4.07% for the period 1974-1988. Population density was 26.3 persons/km² in 1974 and 46.0 persons/km² in 1988.

BCH population data from Table A.1-2 shows that share of urban population has grown from a participation of 38.8% in 1987 to 40.0% in 1989. population in Comayagua and the Study Area are shown in Tables A.1-3 and A.1-4, respectively.

BCH economically active population data by sector from Table A.1-5 shows that agriculture sector, even though it has decreased its share from 49.6% in 1987 to 47.9% in 1989, is still the sector which concentrates the biggest number of economically active population. other sectors have kept a stable share for the same period. Economically active population has grown 4.0% in 1989 and for agriculture sector, it has grown 2.1%. The regional data is shown in Table A.1-6.

ECLA data of Table A.1-7 shows that the rate of open unemployment has been fluctuating around the 10.7% and 12.1% range for the period 1984-88. If underemployment is also considered, then the rate of unemployment would increase twice.

Table A.1-7 Rate of Open Unemployment

(Unit : thousand)

	1984	1985	1986	1987	1988
Total population	4,321	4,372	4,510	4,656	4,801
Eco. Active Pop.	1,418	1,471	1,526	1,583	1,643
Open unemployment	10.7%	11.7%	12.1%	11.4%	11.5%

Source : Comisión Económica para América Latina y el Caribe, 1988

Table A.1-1 Area, Population Density according to the 1974 and 1988 Population Census

Department	Area (Km2)	Population		Annual Population Growth Rate (%)	Population Density (persons/Km2)	
		1974	1988	1974-1988	1974	1988
Honduras	112,088	2,656,948	4,376,839	3.63	23.7	39.0
Department						
1. Atlantida	4,251	148,285	237,180	3.41	34.9	55.8
2. Colon	8,875	77,750	146,224	4.62	8.8	16.5
3. Comayagua	5,196	136,619	238,790	4.07	26.3	46.0
4. Copan	3,203	151,859	218,864	2.65	47.4	68.3
5. Cortes	3,954	369,616	644,807	4.05	93.5	163.1
6. Choluteca	4,211	193,336	293,260	3.02	45.9	69.6
7. El Paraiso	7,218	140,793	255,400	4.35	19.5	35.4
8. Francisco Morazan	7,946	453,597	797,611	4.11	57.1	100.4
9. Gracias a Dios	16,630	20,738	34,159	3.63	1.2	2.1
10. Intibuca	3,072	81,815	123,512	2.99	26.6	40.2
11. Islas de la Bahia	261	13,194	21,533	3.56	50.6	82.5
12. La Paz	2,331	66,046	105,996	3.44	28.3	45.5
13. Lempira	4,290	127,782	175,450	2.29	29.8	40.9
14. Ocotepeque	1,680	51,038	74,286	2.72	30.4	44.2
15. Olancho	24,351	151,436	282,018	4.54	6.2	11.6
16. Santa Barbara	5,115	186,106	277,995	2.91	36.4	54.3
17. Valle	1,565	91,901	119,889	1.92	58.7	76.6
18. Yoro	7,939	195,037	329,845	3.82	24.6	41.5

Source: Poblacion y Vivienda por Departamento y Municipio, Censo 1974 y 1988 (Recuento Preliminar), Secretaria de Planificacion, Coordinacion y Presupuesto.

Table A.1-2 Population Data (whole country)

Unit : Thousand

	1987	1988	1989
Total population (1000 person)	4,313.4	4,456.8	4,604.8
urban (1000person)	1,675.6	1,757.0	1,841.8
rural (1000person)	2,637.8	2,699.8	2,763.0
Share of urban population (%)	38.8	39.4	40.0
Annual growth rate (%)	3.3	3.3	3.3
Population density (person/km2)	38.5	39.8	41.1

Source: BCH Honduras en Cifras 1987 - 1989

Table A.1-3 Population in Comayagua and the Country

		Whole country	Comayagua department	Comayagua municipality	Villa de San Antonio municipality	Population in urban area		
						Comayagua	Villa de San Antonio	Flores
1961	Total	1,884,765	96,442	19,055	4,408			
	Male	939,029	48,546	9,543	2,191			
	Female	945,736	47,896	9,512	2,217			
1974	Total	2,656,848	136,623	30,760	6,169	15,941	2,359	
	Male	1,317,307	68,568	15,505	3,051	7,677	1,100	
	Female	1,339,541	68,055	15,255	3,118	8,264	1,259	
1988	Total	4,376,839	238,790	59,534	11,429	36,414	3,597	2,149
	Male	2,170,561	119,107	29,032	5,771	17,116	1,757	1,107
	Female	2,206,278	119,683	30,502	5,658	19,298	1,840	1,042
Area (sq.km)		112,088.0	5,196.4	930.0	214.0			
Population density in 1988 (person/sq km)		39.0	46.0	64.0	53.4			
Annual growth ratio								
(1961 - 74)		2.68	2.72	3.48	2.62			
(1974 - 88)		3.63	4.07	4.83	4.50	6.08	3.06	
(1961 - 88)		3.17	3.41	4.31	3.59			
No.of household								
	1974	526,566	27,630	6,038	1,383			
	1988	809,263	42,296	10,931	2,123			
Average size of House-hold								
	1974	5.0	4.9	5.1	4.5			
	1988	5.4	5.6	5.4	5.4			

Source : Censo Nacional Poblacion 1961, 1974 and 1988

Table A.1-4 Population in the Study Area

Area	Population	No. of House-hold
Total of Villa de San Antonio Department	11,429*	2,123*
Study Area		
Urban		
- Villa de San Antonio	3,597*	780**
- Flores	2,149*	380**
Subtotal	5,746	1,160
Rural		
- Las Mercedes	700**	140**
- San Jose	400**	80**
- Los Palillos	500**	80**
- Others	1,220**	210**
Subtotal	2,820	510
Total	8,570	1,670

Source : * Population census 1988
** Estimated from the information of Regional Office and Flores Local Office

Table A.1-5 Economically Active Population by Sector

Unit : Thousand

sector	1987	(%)	1988	(%)	1989	(%)
Agriculture	644.9	49.6	658.9	48.7	673.2	47.9
Mining	3.4	0.3	4.1	0.3	4.1	0.3
Manufacture	152.5	11.7	158.9	11.8	165.5	11.8
Constructin	66.4	5.1	71.4	5.3	76.8	5.5
Electricity,gas,water	7.4	0.6	8.0	0.6	8.7	0.6
Transport,communication	36.6	2.8	38.1	2.8	39.6	2.8
Commerce	126.3	9.7	133.2	9.9	140.6	10.0
Banking,finance	21.2	1.6	22.7	1.7	24.3	1.7
Service	241.3	18.6	256.4	19.0	273.3	19.4
Total	1,300.0	100.0	1,351.7	100.0	1,406.1	100.0

Source: BCH Honduras en Cifras 1987 - 1989

Table A.1-6 Economically Active Population in 1974

	Whole country	Comayagua department	Villa de San Antonio municipality
Total population	2,656,948	136,619	6,169
Population of above 10 years old	1,746,707	87,720	3,995
Economically active population	762,795	37,398	1,890
Rate of Economically active population (in total population)	28.7 %	27.4 %	30.6 %

Source : Censo Nacional de Poblacion (1974)

A.2 National Economy

Table A.2-1 shows GDP and GNP for the period 1984-89. Data shows that GDP (constant factor cost) average annual growth rate was 3.6% while the one for agriculture sector was only 2.5%.

For the years 1987 and 1988, the annual growth rate for agriculture was 1.8% and 1.4% , respectively. It means that agriculture sector, which is the most important economic sector in Honduras in terms of production, employment and exports, is growing at a very slow pace and this represents a big problem for the country.

Real GNP per capita has been decreasing, with the exception of 1987 and 1989, since 1984. As an average, annual growth rate has been -0.9% for the period 1984-89.

Table A.2-2 shows exports data for the period 1982-89. Exports average annual growth rates for bananas and coffee are 6.7% and 3.2%, respectively. For other agriculture products like sugar, tobacco and cotton, this rate is negative. Shrimp, lobster, canned fruits are being also increasingly exported.

Table A.2-3 shows that imports of oil and lubricants, chemical products, manufactured products and machinery have the biggest share in imports.

Table A.2-4 shows disagreed balance of payments data for the period 1982-89. Current account negative trend showed a peak in 1984, Lps. 632.9 million, decreasing to Lps. 294.3 million in 1986. However, in 1989 the current account deficit became Lps. 543.1 million.

Honduras needed to borrow funds from foreign countries in order to cover the above mentioned deficits. This increasing dependency on foreign funds tend to depress the Honduras economy.

Tables A.2-5 and A.2-6 show structure of public finance and central government finances, respectively. The central government has suffered from an increasing deficit reaching a level of Lps. 779.9 million in 1989. External financing represented 30% of this deficit. According to the BCH data ("Honduras en Cifras", 1987-89), public debt was Lps. 7,294.5 million for 1989 of which

external debt was Lps. 4,557.4 million (53% of the GDP).

Table A.2-7 shows outline of the national budget and the budget assigned to the SNR and DGRH. Foreign funding of the SNR and DGRH budgets represents a big share. In other words, funding of these institutions rely heavily on foreign sources.

Tables A.2-8 and A.2-9 show wholesale and consumer price indexes for the period 1982-1989. Average annual growth rates for wholesale and consumer price indexes are 5.2% and 5.3%, respectively. However, in 1989, wholesale price index registered a sharp increase of 18.6%. For consumer price index, it increased 9.8% for 1989. For 1990, this inflationary tendency seems to continue.

The Government has floated the foreign exchange rate and as a result the Lempira has been devaluated from Lps. 2 per US Dollar to Lps. 4.2 per US Dollar as part of its new economic policy. The interest rate, tax rate also have gone up.

Table A.2-1 Gross Domestic Product (GDP) and Gross National Product (GNP), 1984-1989

Unit : Million Lps.

Item	1984	1985	1986	1987	1988	1989	Average Annual Growth Rate(%) 1984~1989
GDP by Economic activity at constant factor cost (1978=100)							
Agriculture	1,053	1,084	1,110	1,156	1,177	1,194	2.5
Mining	87	89	87	69	71	83	-0.9
Manufacturing	578	565	580	644	698	718	4.4
Construction	222	218	200	166	177	185	-3.6
Electricity, Gas and Water	52	55	110	112	114	117	17.6
Transportation & Communication	303	306	316	333	356	358	3.4
Wholesale & Retail	456	457	484	512	527	532	3.1
Banking, Insurance & Real estate	218	222	230	246	277	287	5.7
Housing	236	254	258	272	288	304	5.2
Pub. administration & Defence expense	175	189	198	218	225	229	5.5
Other services	340	350	378	406	430	425	4.6
GDP at constant factor cost	3,720	3,789	3,951	4,134	4,340	4,432	3.6
Annual growth rate (%)	2.0	1.9	4.3	4.6	5.0	2.1	
GDP at market prices in real terms	4,175	4,308	4,441	4,674	4,896	4,999	3.7
Annual growth rate (%)	2.8	3.2	3.1	5.2	4.7	2.1	
Net factor payments from abroad	-197	-222	-244	-257	-292	-288	-7.9
GNP	3,978	4,086	4,198	4,417	4,604	4,711	3.4
Annual growth rate (%)	2.5	2.7	2.7	6.5	4.2	2.3	
Real GNP per capita (in lempiras)	1,070	1,068	1,052	1,086	1,091	1,023	-0.9
at current prices							
GDP at factor cost	5,757	6,135	6,771	7,183	7,897	8,641	8.5
Annual growth rate (%)	6.2	6.6	10.4	6.1	9.9	9.4	
GNP	6,154	6,643	7,145	7,724	8,447	9,299	8.6
Annual growth rate (%)	7.0	7.9	7.6	8.2	9.4	10.1	
GNP per capita (in lempiras)	1,656	1,735	1,825	1,791	1,895	2,019	4.0

Source: Banco Central de Honduras

Table A.2-2 Exports (FOB),1982-1989

Unit : Million Lps.

Products	1982	1983	1984	1985	1986	1987	1988/p	1989/e	Share (%)	Average Annual Growth Rate(%) 1982~1989
Bananas	436.6	406.3	464.5	547.0	513.5	643.6	690.7	686.1	36.5	6.7
Coffee	306.2	302.4	338.2	370.4	644.1	399.8	384.2	381.8	20.3	3.2
Wood	89.3	80.8	69.7	68.2	64.6	69.5	59.6	50.9	2.7	-7.7
Lead & Zinc	32.4	49.6	76.1	71.8	64.9	38.0	60.1	177.5	9.4	27.5
Silver	18.6	35.1	31.0	26.0	25.1	15.3	17.2	13.5	0.7	-4.5
Petroleum derivate	1.2	7.9	9.4	11.9	0.9	3.2	4.9	5.5	0.3	24.3
Frozen meat	67.8	62.7	42.4	36.3	39.9	45.2	40.8	38.1	2.0	-7.9
Shrimp & lobster	55.9	72.0	99.6	81.9	90.7	116.8	164.0	158.6	8.4	16.1
Sugar	43.2	55.7	51.3	42.9	25.0	37.2	28.8	20.3	1.1	-10.2
Tobacco	21.5	21.6	16.7	17.3	10.6	8.3	7.6	13.8	0.7	-6.1
Cotton	13.0	8.4	15.4	13.6	9.3	4.3	1.6	1.9	0.1	-24.0
Detergents	19.5	22.1	12.0	4.7	2.9	1.6	1.6	2.6	0.1	-25.0
Resin	8.5	3.1	3.3	2.9	2.6	3.2	3.6	4.0	0.2	-10.2
Cement	1.5	-	-	0.2	1.7	4.3	7.6	6.8	0.4	24.1
Canned fruits	9.4	7.8	10.1	11.6	12.4	8.8	8.6	12.2	0.6	3.8
Others	184.6	208.1	211.0	222.5	200.3	217.0	256.5	307.1	16.3	7.5
Total	1,309.2	1,343.6	1,450.7	1,529.2	1,708.5	1,616.1	1,737.4	1,880.7	100.0	5.3

Source: Banco Central de Honduras

Note 1988/p: preliminary 1989/e: estimation

Table A.2-3 Imports (CIF), 1982-1989

Unit : Million Lps.

Goods	1982	1983	1984	1985	1986	1987	1988	1989	Share (%)	Average Annual Growth Rate(%) 1982～1989
Food products	116.9	146.5	154.4	160.7	165.8	170.4	179.9	184.4	9.4	6.7
Beverage & tobacco	8.9	5.0	9.3	9.1	9.1	9.7	9.8	9.4	0.5	0.8
Non edible raw materials	14.2	19.5	18.9	18.8	19.8	16.0	16.4	17.2	0.9	2.8
Oil & lubricants	340.1	327.6	359.3	317.1	194.7	238.5	229.8	292.9	14.9	-2.1
Vegetable & animal Oil & fats	10.8	9.9	13.5	14.8	15.1	11.8	12.1	11.5	0.6	0.9
Chemical products	256.8	337.6	337.4	353.8	403.9	388.8	406.6	417.8	21.3	7.2
Manufactured products	395.6	458.3	497.4	489.0	492.4	453.6	495.8	509.6	26.0	3.7
Machinery & transportation material	274.1	297.2	393.0	404.1	406.6	482.5	489.2	496.5	25.3	8.9
Others	6.3	3.6	3.6	8.8	42.7	26.0	26.2	22.8	1.2	20.2
Total	1,423.7	1,605.2	1,786.8	1,776.2	1,750.1	1,797.3	1,865.8	1,962.1	100.0	4.7

Source: Banco Central de Honduras

Table A.2-4 Balance of Payments Data, 1982-1989

Unit : Million Lps.

Account	1982	1983	1984	1985	1986	1987	1988
1. Trade balance	-8.4	-115.2	-295.6	-179.1	34.4	-99.0	-47.3
(1) Export (FOB)	1,353.0	1,397.3	1,474.0	1,579.2	1,782.5	1,688.7	1,786.0
(2) Import (FOB)	1,361.4	1,512.5	1,769.6	1,758.3	1,748.1	1,787.7	1,833.3
2. Service account	-500.4	-412.2	-497.3	-520.4	-645.4	-613.3	-681.4
3. Transfer account	60.0	89.0	160.0	291.2	316.7	262.6	270.0
4. Current account	-448.8	-438.4	-632.9	-408.3	-294.3	-449.7	-458.7
5. Capital account	254.1	388.1	648.2	510.1	385.4	486.5	456.1
6.Errors & Omissions	9.7	14.5	-21.9	-66.9	-102.9	42.5	47.9
7. Balance of payment	-185.0	-35.8	-6.6	34.9	-11.8	79.3	45.3

Source : Banco Central de Honduras

Table A.2-5 Revenue and Expenditure of The Central Government, 1982-1989

Unit: Million Lempiras

Particulars	1982	1983	1984	1985	1986	1987	1988	1989
Revenue	1,483.2	1,632.0	2,031.2	2,146.3	2,225.6	2,402.7	2,754.5	2,998.9
Current revenue	772.7	801.5	977.3	1,091.1	1,182.4	1,327.6	1,439.6	1,521.9
Tax revenue	715.4	711.1	881.3	985.8	999.4	1,122.5	1,183.2	1,289.0
Income tax	198.8	190.3	233.9	240.6	250.3	298.1	340.8	374.3
Tax on property	7.4	7.0	8.0	8.8	8.5	10.3	12.1	13.3
Tax on production, domestic trade & transaction	237.1	233.8	292.5	326.4	334.1	370.0	415.6	457.1
Import duties	178.1	201.5	258.8	316.6	302.6	348.8	347.9	373.0
Export duties	93.3	77.8	87.3	92.5	103.0	94.3	65.3	70.1
Other taxes	0.7	0.7	0.8	0.9	0.9	1.0	1.5	1.2
Non-tax revenue	11.1	11.0	13.7	19.2	27.3	33.4	34.9	34.5
Transfer	21.0	35.5	44.8	45.9	44.5	46.7	63.8	59.7
Other revenue	25.2	43.9	37.5	40.2	112.2	125.0	157.7	138.7
Capital revenue	719.3	855.5	1,060.2	1,059.5	1,072.7	1,134.0	1,496.1	1,398.5
Internal debt	408.7	487.5	460.2	555.2	633.0	740.7	935.6	1,116.6
External debt	310.6	334.2	478.0	389.3	313.6	287.1	442.3	216.9
Transfer	-	33.8	122.0	115.0	126.1	106.2	118.2	65.0
Others	-8.8	-25.0	-6.3	-4.3	-29.5	-58.9	-181.2	78.5
Expenditure	1,483.2	1,632.0	2,031.2	2,146.3	2,225.6	2,402.7	2,754.5	2,998.9
Current expenditure	868.1	990.4	1,078.7	1,235.8	1,358.3	1,507.4	1,650.7	1,843.7
Consumption	749.1	860.5	963.5	1,078.0	1,180.5	1,326.9	1,480.0	1,623.5
Current transfers	119.0	129.9	115.2	157.8	177.8	180.5	170.7	220.2
Capital expenditure	261.8	276.8	406.7	351.4	330.9	357.6	417.7	431.1
Direct investment	153.5	161.6	200.0	207.9	202.3	273.6	309.0	338.5
Indirect investment	108.3	115.2	206.7	143.5	128.6	84.0	108.7	92.6
Net lending	205.9	163.2	234.0	156.3	86.2	92.6	37.2	27.0
Public debt service	147.4	201.6	311.8	402.8	450.2	445.1	648.9	697.1
Internal	118.4	169.8	268.2	327.4	369.5	377.0	526.0	641.9
External	29.0	31.8	43.6	75.4	80.7	68.1	122.9	55.2

Source: Banco Central de Honduras

Table A.2-6 Finance of Central Government

Unit : Million Lps.

	1986	1987	1988/p	1989/e
Current Revenue	1,182.4	1,327.2	1,428.8	1,520.3
Current Expenditure	1,356.3	1,522.8	1,635.2	1,842.1
Current account Savings	-175.9	-195.6	-206.6	-321.8
Capital revenue	331.0	288.1	318.0	431.1
Nete lending	86.2	80.1	122.8	27.0
lending	115.3	100.5	156.7	n.a.
Credit Recuperation	-29.1	-20.4	-33.9	n.a.
Deficit	-593.1	-563.8	-647.4	-779.9
External Financing	359.0	234.7	341.6	237.4
Net Credit	232.9	128.2	234.6	172.4
Uses	313.6	197.3	320.0	232.0
Amortization	-80.7	-69.1	-85.4	-59.6
Transferenees	126.1	106.5	107.0	65.0
Internal Financing	234.1	329.1	305.8	542.5
Net Credit	263.5	365.2	373.0	487.9
Uses	633.0	738.0	891.0	840.4
Amortization	-369.5	-372.8	-518.0	-352.5
Cash Position variation and others	-29.4	-36.1	-67.2	54.6

Source : Banco Central de Honduras

Note p: Preliminar e: Presupuesto y ajustudo, datos reales a noviembre/1989

Table A.2-7 Outline of National Budget

National Budget

unit:1000Lps

Year	Local	Foreign	Total	Annual Growth
1985	1,410,093	444,805	1,854,898	
1986	1,589,762	297,217	1,886,979	1.73 %
1987	1,764,205	167,815	1,932,021	2.39 %
1988	1,815,983	199,622	2,015,606	4.33 %
1989	1,998,182	175,705	2,173,887	7.85 %

Budget of S.N.R

unit : 1000Lps

Year	Local	Foreign	Total	Annual Growth
1985	67,905	38,549	106,454	
1986	78,120	35,870	113,990	7.08 %
1987	83,903	33,334	117,237	2.85 %
1988	57,626	44,028	101,654	-13.29 %
1989	61,754	49,605	111,359	9.55 %

Budget of D.G.R.H

unit : 1000Lps

Year	Local	Foreign	Total	Annual Growth
1985	3,981	3,318	7,299	
1986	3,655	9,689	13,344	82.82 %
1987	4,703	6,294	10,997	-17.59 %
1988	3,278	3,055	6,333	-42.41 %
1989	6,732	3,912	10,644	68.07 %

Source:SRN
Note:The data for F/Y 1989 was based on the budget allocation before made revision and ajustment

Table A.2-8 Wholesales Price Index, 1982-1989,(1978=100)

Goods	1982	1983	1984	1985	1986	1987	1988	1989	Average Annual Growth Rate(%) 1982~1989
Domestic goods	147.3	156.4	158.0	161.2	164.9	166.0	173.6	197.7	4.29
(Annual Growth Rate %)		6.2	1.0	2.0	2.3	0.7	4.6	13.9	
Agricultural products	115.3	132.0	124.1	129.9	136.5	138.6	144.6	168.4	5.56
Livestock	140.6	144.3	142.9	142.8	148.7	148.8	158.7	177.0	3.34
Industrial products	157.0	165.1	169.4	172.1	174.0	174.2	181.6	203.6	3.78
Food	146.6	152.5	153.2	153.4	153.7	152.7	157.1	173.6	2.44
Beverages & tobacco	178.7	186.2	194.4	209.3	225.9	227.0	228.9	242.6	4.46
Construction materials	146.8	154.9	156.6	157.5	156.3	155.2	165.4	193.0	3.99
Textiles	122.7	145.7	163.1	159.7	159.8	164.0	186.1	213.8	8.26
Clothing	124.6	137.8	142.5	142.5	144.0	142.6	151.1	173.6	4.85
Chemicals	133.7	135.5	136.6	137.7	137.9	137.7	139.5	211.5	6.77
Petroleum	220.7	220.8	220.8	220.8	211.6	211.6	211.6	211.6	-0.60
Imported goods	156.0	173.3	176.3	175.6	177.8	179.3	194.9	248.0	6.85
(Annual Growth Rate %)		11.1	1.7	-0.4	1.3	0.8	8.7	27.2	
Food	144.4	151.4	152.8	154.1	156.8	155.4	163.9	232.6	7.05
Beverages	198.0	258.8	264.6	237.1	228.5	228.8	231.2	272.3	4.66
Textiles	187.7	203.0	204.2	207.7	219.6	220.2	224.9	230.1	2.95
Chemicals	153.4	174.6	176.2	183.0	184.4	189.6	217.1	277.7	8.85
Pharmaceuticals	126.9	135.0	138.3	139.5	139.2	139.7	142.4	143.8	1.80
General index	150.2	162.0	164.0	165.9	169.1	170.4	180.6	214.2	5.20
(Annual Growth Rate %)		7.9	1.2	1.2	1.9	0.8	6.0	18.6	

Source: Banco Central de Honduras

Table A.2-9 Consumer Price, 1982-1989, (1978=100)

Goods	1982	1983	1984	1985	1986	1987	1988	1989	Average Annual Grow Rate (%) 1982~1989
Food	149.3	157.4	158.1	160.5	164.9	167.0	179.5	201.9	4.4
Housing	155.7	172.3	188.6	198.5	212.0	221.3	229.2	245.2	6.7
Clothing	200.1	217.2	228.3	234.9	240.0	242.6	246.2	275.9	4.7
Health care	160.9	177.4	186.0	189.9	192.4	197.3	203.6	215.2	4.2
Beverages & tobacco	188.5	200.5	206.6	220.3	245.8	247.1	248.9	268.6	5.2
Transportation	149.5	156.4	158.6	161.9	167.7	169.5	170.5	175.4	2.3
Education & entertainment	157.5	170.8	187.8	200.6	206.4	215.6	224.0	247.1	6.6
General index	158.4	170.9	178.9	184.9	193.0	197.8	206.7	227.0	5.3
Annual Growth Rate(%)		7.9	4.7	3.4	4.4	2.5	4.5	9.8	

Source : Banco Central de Honduras

ANNEX B : METEOROLOGY AND HYDROLOGY

TABLE OF CONTENTS

B.1 Meteorology

Meteorological gauging stations in the Study Area are shown in the Fig. B.1-1. El Coyolar gauging station locates at the Coyolar Dam site to represent characteristics of drainage area of the Coyolar Dam. Flores gauging station in the Flores Irrigation Area stands characteristics of Flores Irrigation Area, which is the beneficiary area of the Coyolar Dam.

The Study Area, which consists of the drainage area of the Coyolar Dam and the Flores Irrigation Area, covers around 230 km^2 of eastern part of the Comayagua Valley. Meteorological characteristics in the Study Area are briefly described below.

(1) Rainfall

In accordance with rainfall records in El Coyolar gauging station and Flores gauging station, rainy season is clearly distinguished from dry season. Rainy season starts in May and ends in October. Around 90 percent of rainfall concentrates in rainy season, and the rest falls in dry season. Average total amount of rainfall in the Study Area is around 900 mm/year.

Meanwhile, patterns of monthly total precipitation at gauging stations indicate two peaks of rainfall in the rainy season. The typical dip of rainfall pattern is observed in July during rainy season.

(2) Temperature and Relative Humidity

Temperature in the Study Area is stable, ranging 22 to 26 degrees centigrade. Relative humidity in the Study Area ranges from 50 % to 70 %, and its annual average is about 62 percent.

Theses stable conditions benefit cropping if moisture availability for crops is ensured.

(3) Solar Radiation and Sunshine Hours

Solar radiation in this area is fairly enough for botanical necessity. Monthly average sunshine hours shows most of all months in the year enjoy enough sunshine, even in the rainy season. 200 hours of sunshine is available in each month.

(4) Wind Velocity and Wind Direction

Wind velocity in this area is moderate, especially in the rainy season. Average wind direction in the Study Area is N - NE for all the year.

(5) Pan Evaporation and Evapo-transpiration

Pan evaporation is observed both at El Coyolar gauging station (the Coyolar Dam site) and at Flores gauging station (the Flores lAgricultural Extension Office). Pan evaporation increases from January to March, then it decreases to May. Evaporation rate is stable from June to December. Evapo-transpiration in Flores area was calculated as follows applying F.A.O. formula by the Honduran government, and the figures are used as standard value in the Study Area.

Table B.1-1 Evapo-transpiration in Flores (by Penmann method)

(unit : mm/day)

Date	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1-10	3.4	4.1	4.2	5.3	5.1	4.3	4.4	4.5	4.1	3.9	2.4	3.3
11-20	3.6	4.1	5.1	5.2	5.0	4.3	4.5	4.4	3.9	3.9	3.4	3.2
21-31	4.1	4.4	5.4	5.2	4.4	4.3	4.5	4.4	3.8	3.7	3.4	3.4

The Following table shows average monthly meteorological data at the Flores gauging station.

Table B.1-2 Climatological Data at Flores Gauging Station

Month	Rainfall	Temp.	Pan Ev.	RH	Wind V.	Sunshine Hours
	(mm)	(deg.c)	(mm)	(%)	(m/s)	(hr)
Jan.	1.8	22.1	160.8	59.7	5.3	215.2
Feb.	6.2	23.2	183.4	55.6	4.2	232.7
Mar.	7.2	24.7	239.8	51.9	4.6	265.4
Apr.	33.4	25.8	221.2	53.3	3.6	198.6
May	129.3	25.9	181.5	59.0	2.8	211.5
Jun.	170.3	25.0	144.4	66.6	2.0	175.3

Jul.	104.3	24.8	153.4	63.5	3.0	185.2
Aug.	125.8	24.9	154.3	64.4	2.4	204.7
Sep.	171.8	24.5	127.6	67.8	1.8	175.6
Oct.	106.9	23.9	130.8	68.6	3.5	190.1
Nov.	25.2	22.9	123.2	66.5	3.4	185.5
Dec.	6.2	22.5	139.2	62.7	3.8	207.6
Total	888.4		1959.6			2447.4
Average	74.0	24.2	163.3	61.6	3.4	204.0
Period	1945-88	1958-88	1945-88	1945-88	1945-88	1945-88

(Source : Feasibility Study on Underground Water Development in the Comayagua Valley, Government of Honduras)

B.2 Hydrology

(1) Available Data

1) Rainfall

Active raingauge stations in the Study Area as of 1990 are El Coyolar gauging station and Flores gauging station. Both of the stations gauge hourly and daily rainfall. Available data record at the both gauging stations are shown below.

Station Name	Hourly Rainfall	Daily Rainfall	Daily Data Lacking
El Coyolar	1978. 1-1989. 7	1963-1989	5.85 %
Flores	1973.12-1989. 9	1962-1989	17.94 %

Daily rainfall data at El Coyolar gauging station is used for runoff analysis in the upper San José River basin upto the Flores Diversion Work, while daily rainfall data at Flores gauging station is used for calculation of water requirement in the Flores Irrigation Area.

For the purpose of the above, lack of daily data need be supplemented. Though correlation coefficient between daily rainfall data groups of the two gauging stations is only 0.68, this is the best correlation among gauging stations in and around the Study Area, as shown in Table B.2-1.

Table B.2-1 Correlation of Daily Rainfall Data

Station	Coyolar	Flores	Lamani	Lepate rique	Playi tas	Siguate peque	Ajute rique	Botijas	Laguna	La Paz	Morazan	Snta Clara	Zambrano	El Horno
Comayagua	0.259	0.300	0.285	0.237	0.268	0.152	0.169	0.266	0.217	0.361	0.205	0.231	0.298	0.264
El Coyolar		0.680	0.324	0.452	0.508	0.366	0.078	0.314	0.400	—	0.335	0.469	0.607	0.526
Flores			0.324	0.465	0.514	0.329	-0.005	0.264	0.401	—	0.365	0.425	0.538	0.509
Lamani				0.325	0.223	0.158	0.214	0.228	0.161	0.417	0.201	0.213	0.324	0.322
Lepaterique					0.368	0.395	—	0.278	0.273	—	0.289	0.350	0.469	0.429
Playitas						0.547	—	0.269	0.500	—	0.411	0.394	0.440	0.397
Siguatepeque							0.038	0.231	0.409	—	0.380	0.272	0.419	0.373
Ajuterique								—	—	—	—	0.101	—	—
Botijas									0.209	—	0.186	0.334	0.356	0.476
Laguna										—	0.400	0.328	0.374	0.306
La Paz											—	—	—	—
Morazan												0.258	0.317	0.292
Zambrano													0.528	0.477
El Horno														0.516

The regression formulae for supplementation of the lacked data are;

$$R_C = 0.759\ R_F + 0.732 \quad (\text{when } R_F > 0.0)$$
$$R_F = 0.609\ R_C + 0.831 \quad (\text{when } R_C > 0.0)$$

where R_C : rainfall at El Coyolar (mm/day)
R_F : rainfall at Flores (mm/day)

Summary of supplemented rainfall data are shown in Table B.2-2 and Table B.2-3, respectively.

Table B.2-2 Monthly Rainfall over the Coyolar Drainage Area

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1964	.0	.0	15.0	21.7	122.0	268.0	129.0	102.6	322.5	44.8	31.0	23.2	1079.8
1965	1.0	10.0	.0	22.0	143.2	127.5	23.0	40.3	322.4	214.1	26.5	32.6	962.6
1966	3.0	26.3	38.3	5.8	320.9	162.2	130.8	47.2	189.0	95.3	13.8	13.4	1046.0
1967	4.0	12.2	26.5	131.6	48.4	136.4	29.0	28.6	120.7	116.5	43.9	5.9	703.7
1968	.0	3.0	3.1	36.2	171.3	263.3	34.0	101.3	160.3	178.5	51.5	16.1	1018.6
1969	10.4	8.1	11.0	30.3	223.0	380.5	89.7	295.7	298.4	116.1	29.6	.0	1492.8
1970	1.9	.0	.0	78.4	45.0	122.7	178.9	182.8	245.7	187.1	14.7	15.3	1072.5
1971	.0	20.2	1.9	33.2	151.5	54.6	41.0	239.3	129.5	166.9	109.5	11.6	959.2
1972	.5	.7	.6	15.9	63.2	120.5	24.2	41.9	72.1	90.4	5.9	1.7	437.6
1973	.0	.1	.0	59.3	186.1	140.0	60.0	120.8	134.2	182.5	23.8	5.7	912.5
1974	1.6	3.6	5.5	5.0	293.1	138.4	30.1	79.9	294.8	109.6	19.1	4.8	985.5
1975	11.7	.5	.0	4.9	111.0	85.2	73.1	37.0	370.1	261.4	130.8	2.4	1088.1
1976	1.5	.3	.0	56.9	97.3	505.1	31.0	51.9	82.5	219.4	12.6	7.3	1065.8
1977	.0	1.5	.0	45.9	262.1	121.2	13.3	53.1	166.8	37.7	44.9	11.9	758.4
1978	6.0	2.2	17.8	33.9	145.4	123.4	64.1	52.0	168.7	126.4	38.0	31.9	809.8
1979	.1	4.1	22.4	121.1	80.6	181.1	125.7	83.7	149.9	190.4	13.8	12.2	985.1
1980	7.8	.5	.5	20.0	117.7	248.8	130.0	108.6	199.9	77.2	21.0	20.7	952.7
1981	.5	44.8	26.0	4.4	83.0	308.8	58.6	241.7	141.8	125.1	7.8	24.6	1067.1
1982	8.4	10.3	4.1	55.8	186.6	156.6	29.0	25.9	108.2	51.7	32.4	4.5	673.5
1983	3.1	11.1	1.0	50.4	32.1	253.8	51.7	88.3	185.1	104.5	78.3	11.8	871.2
1984	6.5	6.0	4.5	38.7	81.9	169.1	222.3	91.4	255.7	112.1	3.2	1.5	992.9
1985	.4	.0	4.9	21.0	126.4	124.9	89.1	83.9	92.1	86.2	40.1	4.3	673.3
1986	10.4	1.4	.2	.0	124.0	108.2	25.5	48.9	142.8	116.7	47.3	.7	626.1
1987	.0	.0	1.6	42.5	134.6	181.9	69.4	67.0	236.5	13.8	22.5	7.4	777.2
1988	.6	1.0	9.2	54.1	113.4	242.8	158.6	243.8	160.7	87.4	13.6	5.1	1090.3
Ave.	3.2	6.7	7.8	39.6	138.6	189.0	76.4	102.3	190.0	124.5	35.0	11.1	924.1

Table B.2-3 Monthly Rainfall over the Flores Irrigation Area

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1964	.0	.0	10.8	16.6	82.8	182.3	91.8	73.2	212.4	34.9	25.4	19.8	750.0
1965	1.4	8.6	.0	18.2	98.0	89.3	21.5	31.2	212.7	140.4	1.0	2.8	625.1
1966	.3	3.5	5.6	13.0	182.0	176.0	145.0	142.8	189.6	75.0	9.5	3.5	945.8
1967	1.2	15.0	19.0	84.5	31.0	122.5	47.0	61.6	70.5	156.2	7.9	1.3	617.7
1968	.0	.5	3.5	24.0	170.7	256.4	75.4	94.8	138.2	117.9	41.0	9.6	932.0
1969	7.0	4.8	20.0	19.5	104.1	323.0	110.1	235.5	260.5	135.8	34.2	.0	1254.5
1970	.6	.0	.0	53.9	136.2	120.7	245.2	182.3	228.3	211.4	16.7	11.7	1207.0
1971	.0	17.6	1.0	19.5	114.1	62.2	65.0	159.9	98.8	117.4	72.5	10.4	738.4
1972	1.5	2.5	.0	35.0	50.0	85.1	23.0	34.6	54.6	70.1	7.7	4.4	368.5
1973	.0	.9	.0	40.2	124.1	97.0	47.6	85.1	96.0	53.9	33.3	1.5	579.6
1974	4.0	1.4	5.0	4.2	194.4	206.5	73.1	102.2	205.8	141.3	25.7	5.1	968.7
1975	.0	.0	.0	.9	106.0	48.6	82.4	104.3	315.9	213.2	61.0	1.2	933.5
1976	1.6	.2	.0	99.4	94.1	411.2	72.2	101.5	49.6	184.3	9.7	5.0	1028.8
1977	.0	.5	.0	52.8	188.6	170.8	12.5	66.5	150.2	18.5	70.3	11.8	742.5
1978	1.2	.0	8.9	55.8	132.1	165.5	94.4	89.6	154.3	39.1	19.9	12.8	773.6
1979	.0	.1	14.8	70.0	93.7	197.3	160.7	128.4	103.0	66.5	7.4	5.9	847.8
1980	5.7	.3	.0	47.9	100.9	152.0	124.4	137.5	218.9	75.3	11.4	17.0	891.3
1981	.6	48.7	36.7	4.4	87.5	203.0	121.0	231.3	152.6	102.8	6.9	15.2	1010.7
1982	3.4	14.1	6.7	59.0	205.9	178.7	49.1	29.3	82.2	43.7	7.9	15.5	695.5
1983	4.2	5.0	2.7	32.4	58.7	221.4	56.3	165.7	243.7	84.9	47.3	14.1	936.4
1984	4.4	7.8	26.3	18.4	61.4	129.7	214.2	164.6	264.2	108.8	1.2	.1	1001.1
1985	.1	.6	7.3	55.6	113.3	116.2	87.9	117.9	84.9	90.6	37.8	.8	713.0
1986	7.3	20.4	.0	.0	128.9	73.8	52.5	74.1	125.7	93.6	58.7	.1	635.1
1987	.1	.0	3.0	32.9	123.1	189.8	95.7	153.3	219.4	7.0	17.4	1.8	843.5
1988	.3	4.4	1.1	21.7	58.5	239.5	176.9	221.8	175.5	70.5	7.6	.0	977.8
Ave.	1.8	6.3	6.9	35.2	113.6	168.7	93.8	119.6	164.3	98.1	25.6	6.9	840.7

2) River Discharge

River basins relevant to the Study Area are the San José River basin, the Tujaca River basin and basins of a few streams (quebradas). Their watershed areas and relation among them are shown in the Fig. B.2-1.

However, on most of the rivers shown above, stream gauging has not been made recently. Except the Humuya River, only daily and monthly discharge records of the San José River at El Coyolar (1954-1959) are found in the "Department of Hydrological and Climatological Study Bulletin No.6, Summary of 1954-59 and 1964-66" published by the Irrigation Department of the Ministry of Natural Resources.

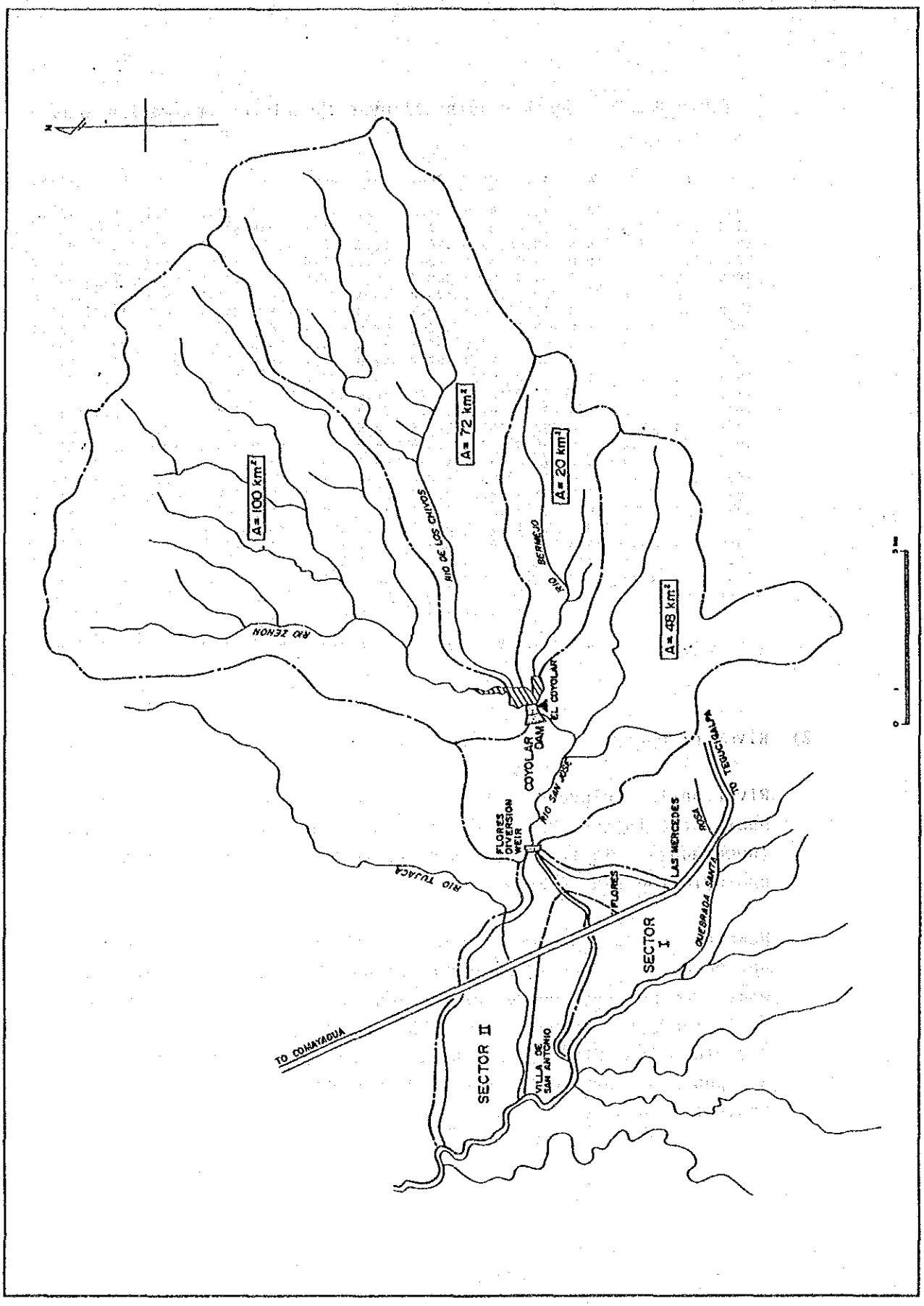


Figure B.2-1 River System in the Study Area

Table B.2-4 Monthly Mean Runoff at El Coyolar (1954-1959)

D.A.=192 km²

(1) Flow (unit: m³/sec)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
1954	---	---	---	---	---	---	---	---	5.2	4.6	1.0	0.6	2.9
1955	0.5	0.5	0.4	0.3	0.3	0.4	2.1	1.8	2.6	5.1	2.6	1.3	1.5
1956	1.1	0.8	0.5	0.5	1.8	7.1	2.7	2.0	4.3	7.2	2.8	2.3	2.7
1957	2.2	1.9	1.3	1.0	2.8	7.5	2.8	2.4	2.7	2.7	1.8	1.4	2.5
1958	1.2	1.2	1.0	0.8	2.4	8.1	6.9	5.0	3.5	5.5	2.6	1.3	3.3
1959	0.8	1.0	0.6	1.0	0.8	1.4	0.7	0.7	1.6	5.9	1.6	0.9	1.4
Ave	1.2	1.1	0.8	0.7	1.6	4.9	3.0	2.4	3.3	5.2	2.1	1.3	2.4

(2) Discharge Volume (unit: million m³)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Tot.
1954	---	---	---	---	---	---	---	---	13.4	12.3	2.6	1.7	30.0
1955	1.2	1.0	1.0	0.8	0.9	1.0	5.7	4.8	6.8	13.5	6.7	3.5	47.1
1956	3.0	2.0	1.4	1.2	4.7	18.3	7.1	5.3	11.1	19.4	7.1	6.1	86.7
1957	5.8	4.8	3.5	2.5	7.6	19.3	6.1	6.4	7.0	7.4	4.7	3.8	78.9
1958	3.1	3.0	2.8	2.1	6.5	22.3	18.5	13.0	9.1	14.8	6.8	3.5	105.6
1959	2.2	2.5	1.7	2.6	2.1	3.5	1.9	1.9	4.2	15.8	4.1	2.3	44.7
Ave	3.1	2.7	2.1	1.8	4.4	12.9	7.9	6.3	8.6	13.9	5.3	3.5	65.5

From the above table (2), annual average of specific discharge of the San José River at El Coyolar is 0.34 million m³/km²/yr. Meanwhile, average rainfall at El Coyolar is 924 mm/yr (1964-1988). Therefore, annual runoff coefficient is 0.37, from these figures.

El Coyolar hydrological gauging station had worked until 1960, observation was halted since construction of the Coyolar Dam started. Daily discharge observation of the San José River at El Coyolar (the Coyolar Dam site) has not been made since 1960. However, daily rainfall data during the same period of the discharge observation (1954-1959) is not available.

The Study Team has gauged discharge at key rivers/streams to estimate their dry season's base flow.

Table B.2-5 Dry Season's Discharges (1990)

River Name	Gauging Point	Discharge (m^3/s)	Date
R. Zenon	Mouth to Coyolar Dam	0.6	Feb.14
R. Bermejo	- ditto -	0.4	Feb.12
R. Chivos	- ditto -	0.1	Feb.12
R. San José	Bridge at N. Highway	0.1	Mar. 1
	Bridge at borders of Sectors	0.1	Feb.24
R. Tujaca	Bridge at N. Highway	0.0	Mar. 1
S. Mamegua	Agua Cantera	0.1	Mar. 1
S. Agua Fria	Flores	0.0	Feb.24
S. Seca	Bridge at N. highway	0.0	Feb.24

(Discharge of the San José R. may fluctuate by means of release from the Coyolar Dam and canal intake at the Flores Diversion Work)

3) Reservoir Inflow

The Coyolar Dam has three inflow rivers, namely the Zenon River, the Bermejo River and the Chivos River. Discharge observation along the three rivers has not been made before, however. Therefore, discharge record as reservoir inflow record is not available.

Meanwhile, reservoir water level at the Coyolar Dam site has been observed twice a day (at 6:00 and 18:00) since 1981. This record can be utilized for estimation of inflow to the Coyolar Dam.

Reservoir water level at the Coyolar Dam shows beginning of rainy season clearly. At the beginning of the rainy season, reservoir water level rises sharply. During the rainy season, around July to August, reservoir water level falls for about one month because of intermission of rainfall. Fig. B.2-2 shows typical rising patterns of reservoir water level.

Evaporation from reservoir water surface is a kind of reservoir loss, the evaporation rate at El Coyolar is used for reservoir loss calculation.

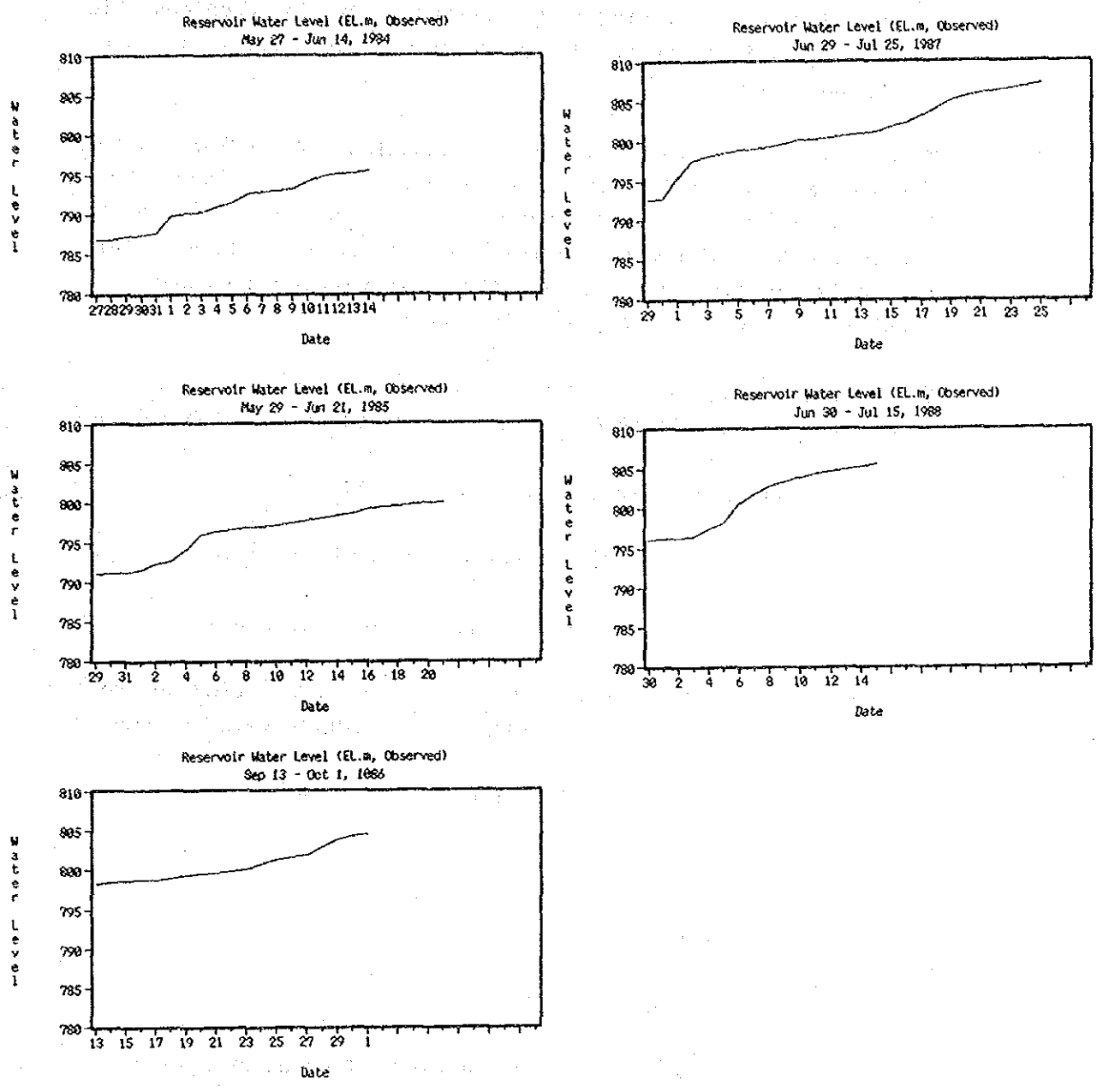


Fig. B.2-2 Observed Reservoir Water Level

For estimation of runoff by use of rainfall, relation between rainfall and runoff is formulated. Also, for evaluation of the estimated values, matching with observed data is required. In this study, inflow converted from reservoir water level is used as the observed data.

Water level at a reservoir is a function of inflow, water release, and reservoir losses such as evaporation. Since there is no data of water release, data to be utilized is the data at the period of rising water level in the rainy season. This period is characterized that i) water release is suppressed ii) significant inflow raises water level clearly.

Therefore, during this period, reservoir water level may be considered as a function of inflow volume and evaporation volume.

$$dH = f(W_{vo1}) - f(W_{vo}) \quad \cdots\cdots\cdots\cdots (1)$$

where dH : difference of reserved water level

W_{vo1}: reserved water volume (present)

W_{vo} : water volume of a certain period before (for example, yesterday's water volume)

f() : calibration formula of H-V curve

$$dV = Q_{in} - Ev \quad \cdots\cdots\cdots\cdots\cdots\cdots (2)$$

where dV : $W_{vo1} - W_{vo}$

Q_{in} : inflow

Ev : evaporation volume from water surface determined by H-A curve and evaporation rate

From the equation (1) and (2), observed inflow is obtained. Runoff Coefficient in flood is 24.8 %. Flood retention period is 2 days and 85 % of flood discharge is runoff within one day.

Table B.2-6 Reservoir Inflow at the Coyolar Dam in Flood

Observation Period	Flood Retention (day)	Inflow (MCM)	Rainfall (mm)	Runoff Coefficient
1984 May 27-Jun.13	2	3.45	72.9	0.264
1985 May 29-Jun.14	2	5.19	183.5	0.147
1986 Sep.13-Sep.27	2	4.27	86.5	0.257
1987 Jun.29-Jul.16	3	9.49	133.1	0.371
1988 jun.30-Jul.14	2	7.47	198.8	0.196
			Average	0.248

(2) Runoff Analysis

1) Runoff Model

In case that there exists discharge observation record of inflow at the Coyolar Dam, the existing data should be used for hydrological study such as water balance study. However, in case that there is no discharge record, runoff model is needed to be developed. In this section, runoff at the Coyolar Dam site and at the Flores Diversion Work are to be estimated (Fig. B.2-3).

Based on the flood data at El Coyolar, direct flow of flood is derived by the following equation;

$$Q_{do} = f \times (a_o R_o + a_1 R_1)$$

Q_{do} : direct runoff of today (mm)
f : flood runoff coefficient (0.248)
a_o, a_1 : regression coefficients (0.85, 0.15 respectively)
R_o : today's rainfall (mm)
R_1 : rainfall in yesterday (mm)

Daily runoff is summation of direct runoff mentioned above and base flow. That is ;

$$Q = Qd0 + Qb$$

Q : daily runoff (mm)
$Qd0$: flood runoff (mm)
Qb : base flow (mm)

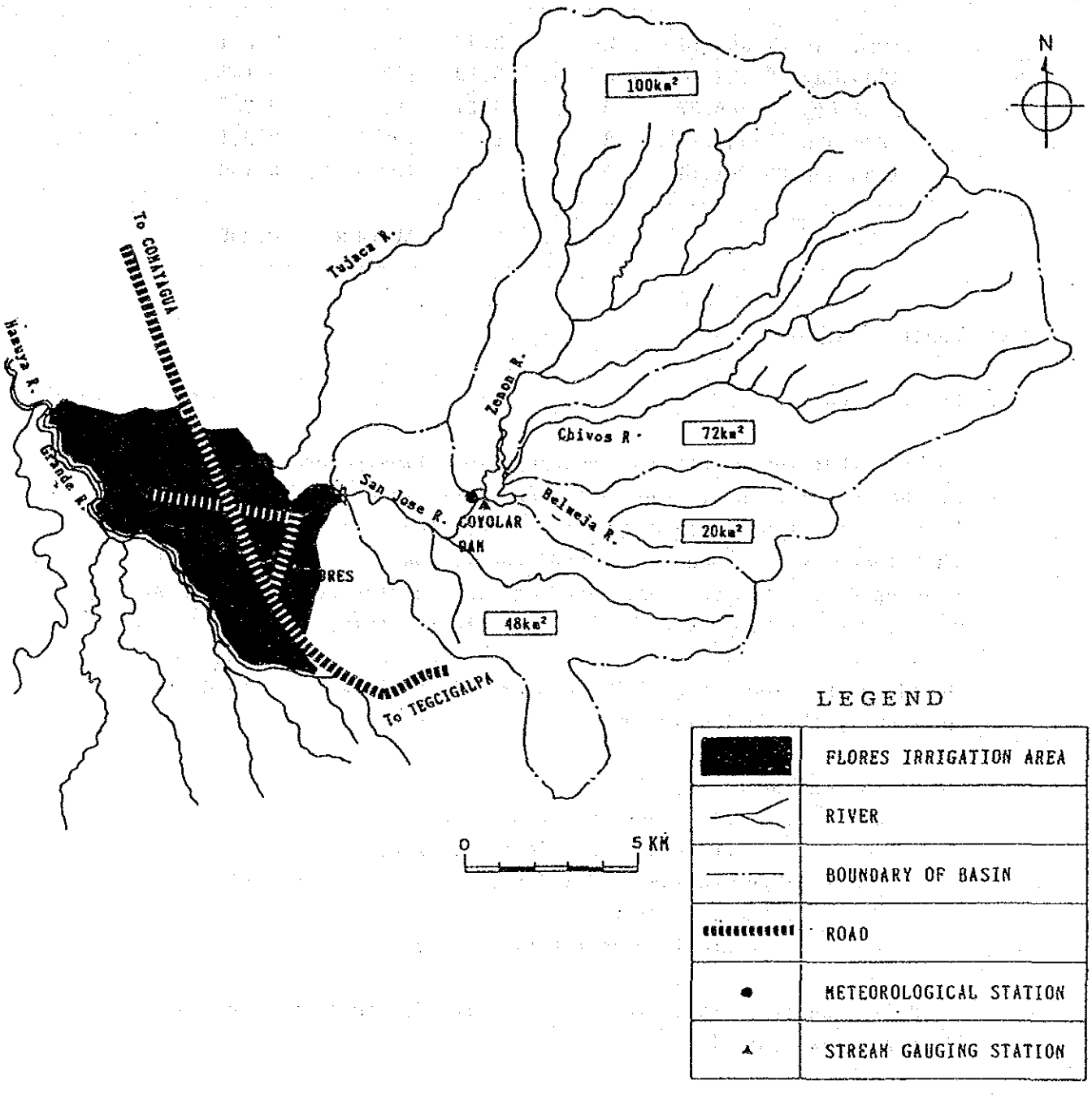


Fig. B.2- 3 Drainage Area

Taking into consideration of existing data of the San José River (1954-1959), monthly base flow is estimated as following table.

Table B.2-7 Estimated Base Flow (mm/day)

Month	Base Flow	Month	Base Flow
Jan.	0.179	Jul.	0.451
Feb.	0.178	Aug.	0.431
Mar.	0.118	Sep.	0.481
Apr.	0.124	Oct.	0.758
May	0.198	Nov.	0.601
Jun.	0.475	Dec.	0.321

Comparison of estimated runoff with observed one is shown in Fig. B.2-4. According to the Fig.B.2-4, estimated runoff follows observed one basically well. Difference of pattern may be come from spotty rainfall in the drainage area.

2) Runoff Estimation

Though available daily rainfall data at El Coyolar gauging station is from 1963 to 1989, data of 1963 and 1989 include lacked data which is not supplemented by the data at Flores gauging station. Therefore, runoff simulation is made for El Coyolar's daily rainfall data from 1964 to 1988. Calculation of estimated runoff is made on daily base.

Summary of estimated runoff at El Coyolar is shown in Table B.2-8.

Meanwhile, runoff between the Coyolar Dam and the Flores Diversion Work is estimated as proportion of runoff at the Coyolar Dam.

Its drainage area is 48 km^2. Also, taking into consideration of difference of annual rainfall height at El Coyolar gauging station and Flores gauging station, specific runoff at the Flores Diversion Work is estimated as 90 % of specific runoff at the Coyolar Dam.
Calculation period is the same as the runoff calculation at El Coyolar.Summary of estimated runoff at the Flores Diversion Work is shown in Table B.2-9.

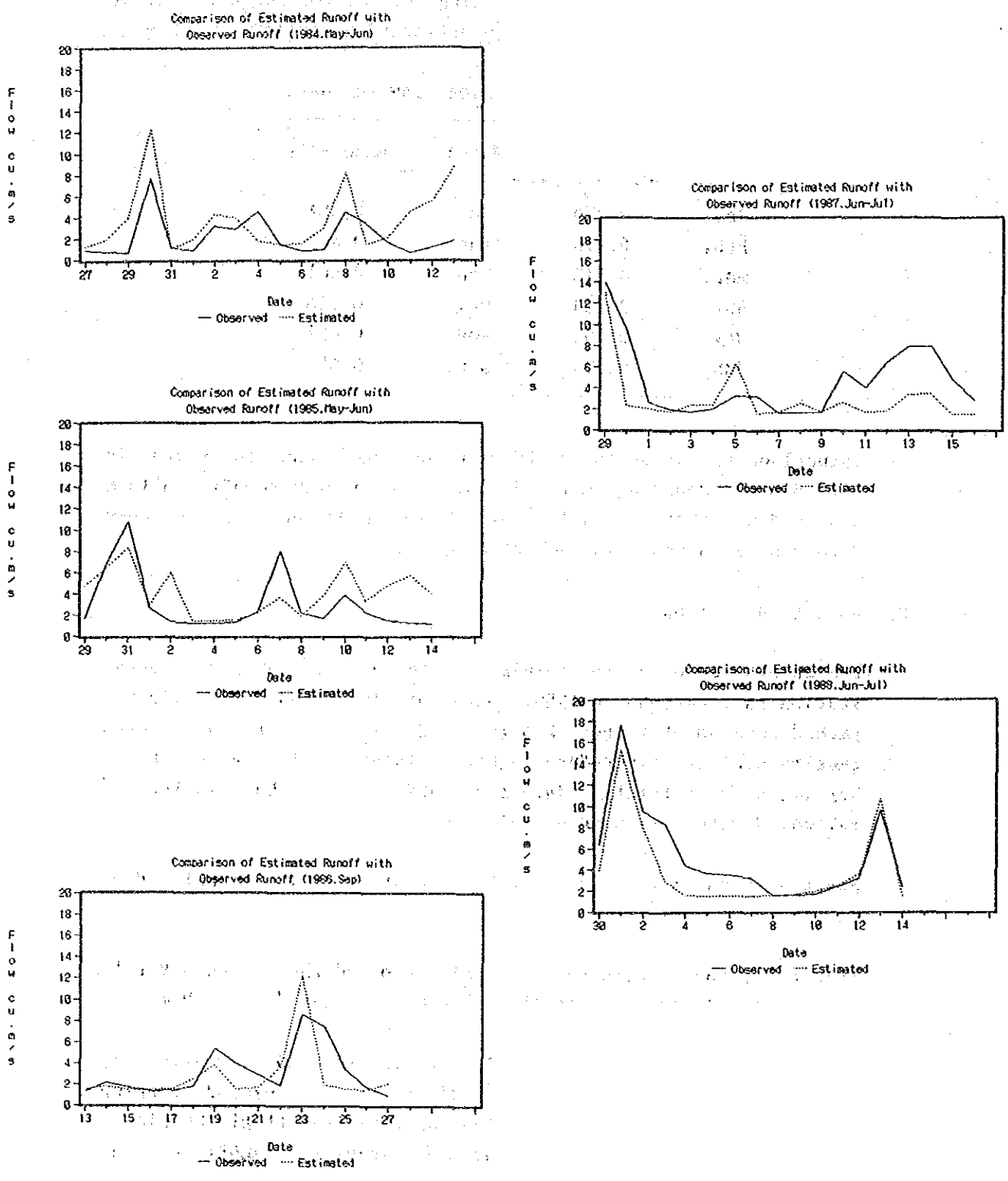


Fig. B.2-4 Comparison of Estimated Runoff with Observed Runoff

Table B.2-9 Estimated Monthly Runoff at the Coyolar Dam

Year	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	TOTAL
1964	6.941	15.392	8.985	7.203	18.170	6.852	4.939	3.017	1.066	0.990	1.416	1.746	76.717
1965	7.993	8.723	3.874	4.485	18.122	14.708	4.725	3.465	1.114	1.432	0.702	1.760	71.103
1966	16.319	10.588	8.929	4.814	11.749	9.072	4.120	2.550	1.209	2.208	2.516	0.998	75.072
1967	3.251	9.466	4.067	3.928	8.509	10.051	5.571	2.193	1.257	1.472	2.014	6.993	58.772
1968	9.274	15.338	4.291	7.352	10.438	13.007	5.920	2.697	1.066	1.133	0.849	2.436	73.801
1969	11.703	29.952	6.903	16.700	16.979	10.035	4.871	1.919	1.561	1.341	1.225	2.156	105.345
1970	3.324	8.580	11.180	11.293	14.464	13.391	4.202	2.641	1.149	0.963	0.702	4.446	76.335
1971	8.363	5.369	4.526	14.073	8.917	12.481	8.677	2.465	1.066	1.917	0.792	2.294	70.940
1972	4.190	8.474	3.840	4.561	6.183	8.825	3.758	1.993	1.090	1.023	0.730	1.470	46.137
1973	10.043	9.403	5.543	8.318	9.075	13.289	4.596	2.184	1.066	0.960	0.702	3.536	68.715
1974	15.137	9.248	4.199	6.365	16.796	9.734	4.388	2.141	1.142	1.127	0.964	0.951	72.192
1975	6.467	6.794	6.167	4.326	20.315	16.889	9.843	2.027	1.623	0.979	0.702	0.946	77.078
1976	5.961	26.841	4.171	5.037	6.691	14.963	4.062	2.261	1.138	1.004	0.702	3.214	76.045
1977	12.930	9.239	3.304	5.110	10.713	6.186	5.723	2.479	1.066	1.027	0.702	2.898	61.377
1978	8.100	8.509	5.847	5.042	10.804	10.524	5.280	3.431	1.352	1.060	1.549	2.327	63.825
1979	5.022	11.199	8.833	6.441	10.018	13.581	4.118	2.495	1.071	1.151	1.768	6.476	72.173
1980	6.817	14.585	8.869	7.745	12.205	8.238	4.498	2.898	1.437	1.013	0.725	1.634	70.664
1981	5.026	17.548	5.477	13.962	9.635	10.470	3.834	3.084	1.090	3.089	1.940	0.922	76.077
1982	10.455	10.196	4.055	3.808	7.915	6.987	5.006	2.127	1.466	1.446	0.897	2.979	57.337
1983	2.698	14.834	5.148	6.550	11.728	9.500	7.257	2.474	1.214	1.483	0.750	3.112	66.748
1984	5.081	10.789	13.210	6.910	14.945	9.897	3.640	1.984	1.376	1.275	0.916	2.556	72.579
1985	7.024	8.925	6.929	6.561	7.151	8.609	5.368	2.136	1.085	0.956	0.912	1.671	57.327
1986	7.086	7.889	3.901	4.848	9.616	10.070	5.715	1.946	1.561	1.022	0.711	0.713	55.078
1987	7.585	11.376	18.057	5.755	13.886	5.318	4.534	2.265	1.066	0.956	0.778	2.736	74.312
1988	6.530	14.349	10.235	14.173	10.427	8.675	4.111	2.155	1.095	1.037	1.140	3.289	77.216

Table B.2-10 Estimated Monthly Runoff at the Flores Div. Work

Month	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	TOTAL
1964	1.562	3.463	2.022	1.621	4.088	1.542	1.111	0.679	0.240	0.223	0.319	0.393	17.263
1965	1.798	1.963	0.872	1.009	4.077	3.309	1.063	0.780	0.251	0.322	0.158	0.396	15.998
1966	3.672	2.382	2.009	1.083	2.643	2.041	0.927	0.574	0.272	0.497	0.566	0.225	16.891
1967	0.732	2.130	0.915	0.884	1.915	2.261	1.253	0.493	0.283	0.331	0.453	1.573	13.223
1968	2.087	3.451	0.966	1.654	2.349	2.927	1.332	0.607	0.240	0.255	0.191	0.548	16.607
1969	2.633	4.714	1.553	3.757	3.820	2.258	1.096	0.432	0.351	0.302	0.276	0.485	21.677
1970	0.748	1.930	2.516	2.541	3.254	3.013	0.946	0.594	0.258	0.217	0.158	1.000	17.175
1971	1.882	1.208	1.018	3.166	2.006	2.808	1.952	0.555	0.240	0.431	0.178	0.516	15.960
1972	0.943	1.907	0.864	1.026	1.391	1.986	0.846	0.448	0.245	0.230	0.164	0.331	10.381
1973	2.260	2.116	1.247	1.872	2.042	2.990	1.034	0.491	0.240	0.216	0.158	0.796	15.462
1974	3.406	2.081	0.945	1.432	3.779	2.190	0.987	0.482	0.257	0.254	0.217	0.214	16.244
1975	1.455	1.529	1.388	0.973	4.571	3.800	2.215	0.456	0.365	0.220	0.158	0.213	17.343
1976	1.341	6.039	0.938	1.133	1.506	3.368	0.914	0.509	0.256	0.226	0.158	0.723	17.111
1977	2.909	2.079	0.743	1.150	2.410	1.392	1.288	0.558	0.240	0.231	0.158	0.652	13.810
1978	1.823	1.914	1.316	1.134	2.431	2.368	1.188	0.772	0.304	0.239	0.349	0.524	14.362
1979	1.130	2.520	1.987	1.449	2.254	3.056	0.927	0.561	0.241	0.259	0.398	1.457	16.239
1980	1.534	3.282	1.995	1.743	2.746	1.854	1.012	0.652	0.323	0.228	0.163	0.368	15.900
1981	1.131	3.948	1.232	3.142	2.168	2.356	0.863	0.694	0.245	0.695	0.436	0.208	17.118
1982	2.352	2.294	0.912	0.857	1.781	1.572	1.126	0.478	0.330	0.325	0.202	0.670	12.899
1983	0.607	3.338	1.158	1.474	2.639	2.138	1.633	0.557	0.273	0.334	0.169	0.700	15.020
1984	1.143	2.428	2.972	1.555	3.363	2.227	0.819	0.446	0.310	0.287	0.206	0.575	16.331
1985	1.580	2.008	1.559	1.476	1.609	1.937	1.208	0.481	0.244	0.215	0.205	0.376	12.898
1986	1.594	1.775	0.878	1.091	2.164	2.266	1.286	0.438	0.351	0.230	0.160	0.160	12.393
1987	1.707	2.560	1.354	1.295	3.124	1.197	1.020	0.510	0.240	0.215	0.175	0.616	14.013
1988	1.469	3.228	2.303	3.189	2.346	1.952	0.925	0.485	0.246	0.233	0.256	0.740	17.372

(3) Flood Analysis

1) Design Flood Discharge

Since there is no available flood observation at the Coyolar Dam site and at the Flores Diversion Work, flood analysis for the Coyolar Dam site and the Flores Diversion Work needs to be made by use of estimated probable flood. Hourly/daily rainfall data used in this analysis is data at El Coyolar gauging station.

For estimation of probable flood, the runoff function method, which is a kind of unit hydrograph method, established by Dr. Seiichi Satoh is adopted. By the method, the direct flood discharge caused by rainfall of r(mm.hr) during an unit time t_o(hr) is expressed as follows;

$$Q = 0.2778\ A \cdot f \cdot r \cdot [e^{-at'}(at'+1) - e^{-at}(at+1)] \cdot s$$
$$= 0.2778\ A \cdot f \cdot r \cdot D \cdot s$$
$$t' = t - t_o$$

where;

A : watershed area (km^2)

f : runoff coefficient

r : rainfall in unit time t_o for calculation
(effective rainfall=total rainfallx65%)

D : distribution rate of discharge

t_o: unit time for calculation (= 1.0 hr)

a : flood modules defined by the following equation
$a = 2.303 \log [Tp/(Tp-1)]$

s : coefficient of recession
(real area of rainfall=total areax60%)

Tp: time of concentration (hr) obtained by
Rziha's formula
$Tp = L/(3600\ V)$
$V = 20(H/L)^{0.6}$
L : river length from the origin (m)
V : average velocity of river flow (m/s)
H : height difference in the section of L (m)

Runoff caused by a long-term rainfall can be produced by synthesizing direct runoff in unit time.

In order to estimate design rainfall for the Coyolar Dam and the Flores Diversion Work, rainfall intensity equation is derived by

applying specific coefficient method as described below;

$$I_t^n = R_{24}^n / 24 \times a' / (t + b)$$

$$b = (24 - \beta'^n_t \times t) / (\beta'^n_t - 1)$$

$$\beta'^n_t = 24R^n_t / R^n_{24}$$

$$a' = b + 24$$

where I_t^n : rainfall intensity for t hours with a return period of n-year (mm/hr)

R_{24}^n : rainfall intensity for 24 hours with a return period of n-year (mm/24hr)

R_t^n : rainfall intensity for t hours with a return period of n-year (mm/hr)

β'^n_t : specific coefficient defined by the ratio of R^n_t and R^n_{24} with a return period of n-year

If the data of both 1-day and 1-hour rainfall are available, the above equations are expressed below;

$$I_t^n = R_{24}^n / 24 \times a' / (t + b)$$

$$b = (24 - \beta_t^n) / (\beta_t^n - 1)$$

$$\beta_1^n = 24R_1^n / R_{24}^n$$

$$a' = b + 24$$

then, $\beta = a' / (t + b)$

$$I_t^n = R_{24}^n / 24 \times \beta$$

where β : specific coefficient equation

2) Rainfall Intensity

a. Probable Rainfall

Probable annual peak rainfall (daily) by Iwai's method is shown in the following table.

Table B.2-11 Probable Daily Rainfall

Probability (1/year)	Peak Rainfall (mm/day)
1/2	60.62
1/5	78.74
1/10	90.76
1/20	102.30
1/50	117.31
1/100	128.69
1/200	140.18
1/500	155.59

Similarly, probable annual peak rainfall (hourly) by Iwai's method is as follows.

Table B.2-12 Probable Hourly Rainfall

Probability (1/year)	Peak Rainfall (mm/hour)
1/2	32.80
1/5	39.87
1/10	44.19
1/20	48.14
1/50	53.03
1/100	56.57
1/200	60.04
1/500	64.52

b. Rainfall Intensity

Several specific equations correspondent to return periods are shown in the Table B.2-13.

Table B.2-13 Specific Coefficient Equation (ß)

Return Period (yrs)	R_{24}^n (mm/day)	R_1^n (mm/hr)	$24R_1^n$	$ß'^n_1$	b	a'	ß
2	61	33	792	13.0	0.9	24.9	24.9/(t+0.9)
5	79	40	960	12.2	1.1	25.1	25.1/(t+1.1)
10	91	44	1056	11.6	1.2	25.2	25.2/(t+1.2)
20	102	48	1152	11.3	1.2	25.2	25.2/(t+1.2)
50	117	53	1272	10.9	1.3	25.3	25.3/(t+1.3)
100	129	57	1368	10.6	1.4	25.4	25.4/(t+1.4)
200	140	60	1440	10.3	1.5	25.5	25.5/(t+1.5)
500	156	65	1560	10.0	1.6	25.6	25.6/(t+1.6)

c. Design Rainfall

For estimation of the hourly rainfall, the specific coefficient equation ß obtained above is applied to development of rainfall intensity equation for each Sub-Project. The result is shown in Table B.2-14.

Table B.2-14 Rainfall Intensity Equation for each Sub-Project (mm/hr)

Project	R.P.=200yrs	R.P.= 50yrs
Coyolar Dam	149/(t+1.5)	-----
Flores Diversion Work	-----	123/(t+1.3)

3) Unit Hydrograph

On the hourly arrangement for a maximum 1-day rainfall, Distribution of Central Heading type, Design Flood, and Distribution Rate of Unit Hyrograph are as shown in Table B.2-15 and Fig. B.2-5. As an effective rainfall, 65 percent of design rainfall is deemed to be effective conservatively.

Table B.2-15 Unit Hydrograph

Design Flood (R.P. =200 Yrs.)

Time (hr)	Rainfall (mm)	Time (hr)	Discharge (m3/Sec)
1	0.3	2.5	3.9
2	0.4	3.5	6.7
3	0.5	4.5	9.1
4	0.6	5.5	12.0
5	0.8	6.5	15.4
6	1.0	7.5	19.6
7	1.3	8.5	26.0
8	1.8	9.5	35.8
9	2.7	10.5	53.7
10	4.5	11.5	91.7
11	8.8	12.5	205.8
12	25.6	13.5	502.3
13	60.0	14.5	685.0
14	14.2	15.5	538.4
15	6.2	16.5	337.7
16	3.5	17.5	199.2
17	2.2	18.5	112.9
18	1.6	19.5	67.7
19	1.1	20.5	42.7
20	0.8	21.5	28.6
21	0.7	22.5	19.6
22	0.5	23.5	14.9
23	0.5	24.5	12.2
24	0.4	25.5	8.9
25		26.5	4.9
26		27.5	2.2

Design Flood (R.P. = 50 Yrs.)

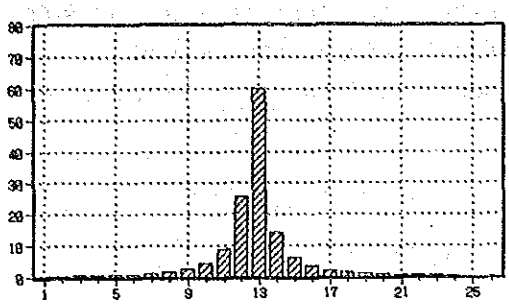
Time (hr)	Rainfall (mm)	Time (hr)	Discharge (m3/Sec)
1	0.3		0.0
2	0.4		1.1
3	0.4		3.2
4	0.4		5.5
5	0.6		7.2
6	0.7		9.1
7	1.0		11.5
8	1.3		14.7
9	2.1		19.2
10	3.5		26.6
11	7.0		40.0
12	21.0		67.7
13	53.5		151.1
14	11.3		379.2
15	4.8		520.8
16	2.6		485.6
17	1.7		386.3
18	1.2		283.0
19	0.8		198.8
20	0.7		136.5
21	0.5		93.1
22	0.4		63.7
23	0.4		43.9
24	0.4		30.6
25			22.7
26			16.4
27			10.5
28			5.9
29			3.5
30			2.1

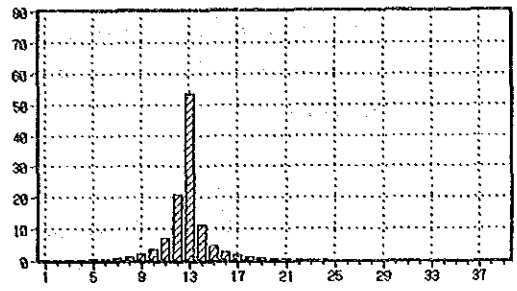
Unit Hydrograph

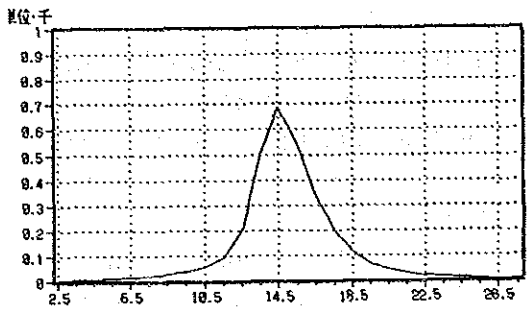
Time (hr)	Distribution Rate
0.0	0.000
0.5	0.194
1.0	0.287
1.5	0.368
2.0	0.329
2.5	0.257
3.0	0.188
3.5	0.130
4.0	0.089
4.5	0.059
5.0	0.038
5.5	0.025
6.0	0.016
6.5	0.010
7.0	0.006
7.5	0.004
8.0	0.003
8.5	0.002
9.0	0.001

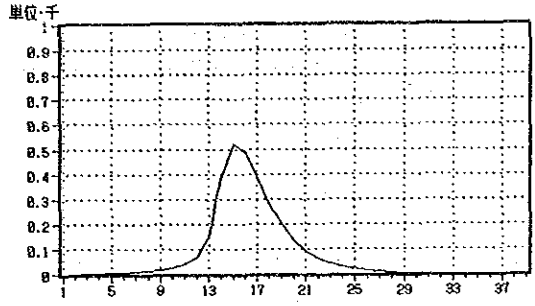
Unit Hydrograph

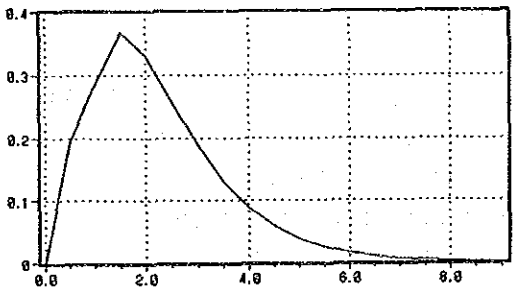
Time (hr)	Distribution Rate
0.0	0.000
1.0	0.137
2.0	0.233
3.0	0.207
4.0	0.153
5.0	0.103
6.0	0.066
7.0	0.041
8.0	0.025
9.0	0.015
10.0	0.009
11.0	0.005
12.0	0.002
13.0	0.002
14.0	0.001

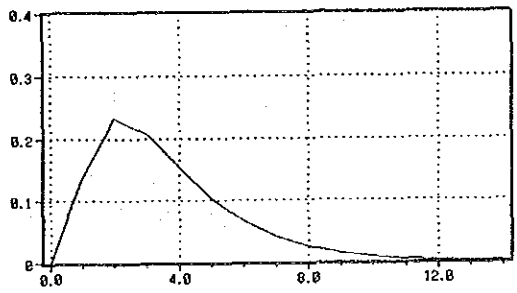












Design Flood (R.P. =200 Yrs.)

Design Flood (R.P. = 50 Yrs.)

Fig. B.2-5 Unit Hydrograph

4) Design Flood Discharge

Since there is no flood record at stream gauging station, runoff function method, which is a kind of unit hydrograph method, is to be applied. Return periods of the design flood are decided as follows:

Type of Structure	Frequency (yrs)
Service Spillway	200
Diversion Work	50

a. Time of Concentration (Tp) and Flood Modulus (a)

Time of concentration and flood modulus for each damsite are obtained as following table by applying rational method.

Table B.2-16 Time of Concentration (Tp) and Flood Modulus (a)

Project	River Length (km)	Elevation EH (m)	Elevation EL (m)	V (m/s)	Tp (hr)	a (hr-1)
Coyolar Dam	18.0	1800	800	3.5	1.5	1.097
Flores Diversion Work	24.0	1800	700	3.2	2.1	0.646

b. Design Flood at Proposed Damsite

Design flood hydrograph with return periods of 200- and 50-year derived from the previously obtained unit hydrographs and rainfall are shown in Table 2-15 and Fig.B.2-5.

Table B.2-17 Peak Discharge for each Sub-Project

(unit : m^3/sec)

Return Period (year)	Coyolar Damsite	Flores Diversion Work
50	---	520
200	685	---

ANNEX C : SOIL, LAND CLASSIFICATION AND WATER QUALITY

TABLE OF CONTENTS

C.1 Soils and Land Classification

(1) Soils

Table C.1-1 Physical and Chemical Characteristics of Soils (1/2)

Soil series	Pit No.	Depth cm	Particle size Sand %	Silt %	Clay %	Texture	pH H2O	pH KCl	Extractable acid meq/100g	Organic material %	Total nitrogen %
1. MOC	15	0- 18	54	31	15	SL	6.7	6.3	6.2	2.6	0.20
		18- 40	40	23	37	CL	8.1	6.9	4.1	0.9	0.14
	16	0- 30					5.7	5.2	0.1	3.7	0.21
		30- 42					5.9	5.5	0.1	1.4	0.10
		42- 67					6.6	5.9	-	0.3	0.06
2. CER	6	0- 20	32	44	24	L	6.7	5.7	6.2	1.5	0.17
		20- 47	34	30	36	CL	7.7	6.5	4.1	0.6	0.10
		47- 75	54	18	28	SCL	8.5	6.8	4.1	0.3	0.12
3. COM	3	0- 25	52	26	22	SCL	7.4	6.6	4.1	2.4	0.20
		25- 60	46	16	38	SC	6.6	5.4	4.1	0.6	0.12
	17	0- 30					6.5	5.8	0.1	2.7	0.17
		30- 55					7.9	6.4	0.1	0.5	0.05
		55- 85					8.5	6.9	0.1	0.4	0.05
		85-110					8.5	7.0	0.2	0.6	0.06
4. PY	14	0- 15	40	41	19	L	6.4	5.6	4.1	1.6	0.12
		15- 55	28	25	47	C	7.0	5.8	6.2	1.2	0.15
		55- 90	30	21	49	C	8.0	6.4	4.1	0.2	0.08
		90-110	32	23	45	C	7.9	6.6	6.2	0.3	0.10
	18	0- 20					6.5	5.8	-	1.8	0.12
		20- 45					7.5	6.6	0.1	0.8	0.08
		45- 75					7.7	6.9	-	0.5	0.05
5. CAN	5	0- 22	23	22	55	C	6.7	6.0	4.1	1.6	0.18
		22- 53	19	26	55	C	7.3	6.5	4.1	1.1	0.18
		53- 90	19	32	49	C	8.0	6.8	4.1	0.7	0.15
6. FL	4	0- 15	44	16	40	CL	6.6	5.6	4.1	1.4	0.12
		15- 45	42	10	48	C	6.9	6.1	8.2	1.2	0.14
7. YR	10	0- 16	49	22	29	SCL	7.3	6.4	4.1	0.6	0.15
		16- 40	35	38	27	CL	7.6	6.7	4.1	0.4	0.11
		40- 85	58	31	11	SL	8.4	6.9	4.1	0.4	0.11
	20	0- 10					6.1	5.4	0.1	1.5	0.10
		10- 35					6.0	4.7	-	0.4	0.05
		35- 80					6.0	5.3	0.1	1.2	0.08
		80-120					5.7	5.1	0.1	0.8	0.08
8. STE	7	0- 20	72	18	10	SL	5.9	5.3	8.2	1.4	0.11
		20- 45	74	16	10	SL	5.8	5.0	6.2	4.0	0.12

Note: The soil samples were analyzed by FUNDACION HONDUREÑA DE INVESTIGACION AGRICOLA (FHIA)

Table C.1-1 Physical and Chemical Characteristics of Soils (2/2)

Soil series	Pit No.	Depth cm	Particle size Sand %	Silt %	Clay %	Texture	pH H2O	pH KCl	Extractable acid meq/100g	Organic material %	Total nitrogen %
9. SAN	11	0- 50	65	12	23	SCL	6.2	5.4	8.2	1.4	0.17
10. LEP	12	0- 17	42	15	43	C	7.7	6.3	4.1	1.1	0.12
		17- 45	52	9	39	CL	7.9	6.9	6.2	0.6	0.11
	22	0- 27					7.3	7.3	-	1.5	0.10
		27- 50					7.7	7.7	0.1	0.5	0.05
11. CQ	9	0- 30	53	14	33	SCL	6.3	5.5	4.1	0.3	0.16
		30- 55	55	26	19	CL	8.0	6.6	4.1	0.4	0.10
		55- 90	69	20	11	CL	7.2	6.2	4.1	0.3	0.10
	23	0- 20					6.4	6.4	-	1.5	0.11
		20- 48					7.7	7.7	0.1	0.9	0.09
							7.9	7.9	0.1	0.5	0.51
12. LAM	1	0- 20	28	39	33	CL	6.5	5.5	8.2	2.6	0.22
		20- 45	29	36	35	CL	7.1	6.0	6.2	0.6	0.11
		45- 70					7.9				
13. MN	5	0- 25	50	16	34	SCL	6.5	6.5	4.1	1.6	0.17
		25- 55	62	2	36	SC	8.0	6.5	4.1	0.3	0.10
	21	0- 23					6.5	5.8	-	1.3	0.07
		23- 45					5.7	5.2	0.1	0.6	0.05
		45- 85					7.2	6.4	0.1	0.4	0.07
		85-105					7.3	7.3	0.1	0.4	0.05
14. PM	2	0- 20	46	30	24	L	6.6	5.8	6.2	1.4	0.07
		20- 50	32	20	48	C	8.0	6.5	4.1	0.3	0.12
15. RP	13	0- 25	32	39	29	CL	6.0	5.7	6.2	3.1	0.24
		25- 45	34	37	29	CL	7.7	6.6	4.1	1.5	0.17
16. HU	19	0- 16					5.4	4.8	-	1.6	0.11
		16- 50					7.1	6.1	0.1	0.8	0.08
		50- 75					7.6	6.4	-	0.9	0.05
		75-100					7.8	6.7	0.3	0.5	0.05

Note: The soil samples were analyzed by FUNDACION HONDUREÑA DE INVESTIGACION AGRICOLA (FHIA)

Table C.1-2 Chemical Characteristics of Soils (1/2)

Soil series	Pit No.	Depth cm	EC dS/m	Soluble salts ppm	CEC meq/100g	Exchangeable Cations Ca	Mg	K	Na	Soluble P	K	Ca	Mg
						meq/100g				ppm			
1. MOC	15	0- 18	0.34	218	16.9	7.0	1.3	1.7	1.0	31	826	1420	185
		18- 40	0.50	320	24.2	8.4	1.4	5.3	5.0	8	384	2800	208
	16	0- 30	0.48	307	20.3	3.9	1.1	2.2	1.2	1	705	1700	218
		30- 42	0.40	256	22.6	6.6	1.7	2.2	1.6	1	760	2830	365
		42- 67	0.40	256	24.1	8.9	2.0	4.9	2.7	1	1595	2880	368
2. CER	6	0- 20	0.26	166	12.1	7.0	0.8	1.0	1.0	4	280	550	79
		20- 47	0.50	320	20.2	9.6	1.2	0.8	2.1	4	211	2080	143
		47- 75	0.46	294	12.1	9.1	1.0	1.0	2.6	3	286	2460	154
3. COM	3	0- 25	0.30	192	28.2	11.5	2.1	5.5	1.3	6	1660	2560	272
		25- 60	0.20	128	21.0	9.0	1.5	4.1	1.1	2	1210	1150	168
	17	0- 25	0.40	256	29.3	7.3	1.6	10.7	2.9	4	2140	1910	191
		25- 55	0.56	358	20.3	6.5	1.7	10.6	7.8	1	2640	2660	232
		55- 85	0.56	358	33.8	10.8	1.5	14.3	10.2	1	2950	4120	190
		85-110	0.56	358	35.3	14.3	1.3	14.0	11.0	1	2650	3690	187
4. PY	14	0- 15	0.20	128	20.2	7.0	1.1	1.5	2.2	4	620	1140	125
		15- 55	0.24	154	24.2	10.9	2.3	1.2	0.9	3	437	3730	384
		55- 90	0.26	166	32.2	13.8	4.1	1.8	1.6	7	589	4280	535
		90-110	0.30	192	29.0	12.2	3.3	1.6	2.5	3	790	4200	487
	18	0- 20	0.48	307	19.6	3.3	2.0	1.5	2.9	2	954	1970	333
		20- 45	0.70	448	22.6	5.4	3.6	1.3	6.4	1	559	2670	592
		45- 75	1.08	691	26.3	7.6	4.0	1.8	6.9	1	790	4780	681
5. CAN	8	0- 22	0.82	525	31.4	17.3	4.9	1.6	1.1	6	1415	4170	587
		22- 53	0.62	397	33.9	22.1	4.7	5.1	1.1	4	1515	5000	652
		53- 90	0.64	410	33.1	23.5	5.2	5.1	1.4	7	1495	5220	606
6. FL	4	0- 15	0.34	218	25.0	11.1	4.4	1.1	1.4	3	548	2880	648
		15- 45	0.50	320	29.8	16.7	6.3	1.1	2.2	3	468	3760	882
7. YR	10	0- 16	0.62	397	20.2	8.5	2.2	4.8	0.9	3	1320	2780	324
		16- 40	0.84	538	25.8	9.0	2.6	5.7	1.4	3	1755	2690	345
		40- 85	0.74	474	29.8	5.0	0.6	9.8	2.4	38	2540	2960	357
	20	0- 10	0.32	205	20.3	2.6	0.9	1.4	1.1	1	773	1700	214
		10- 35	0.28	179	20.3	2.3	0.7	1.5	1.1	1	739	1120	122
		35- 80	0.28	179	15.8	2.5	0.6	1.7	1.0	1	625	1620	147
		80-120	0.28	179	18.8	2.7	0.9	1.9	1.2	1	620	1860	204
8. STE	7	0- 20	0.14	92	12.1	6.7	1.1	1.0	0.7	3	212	540	154
		20- 45	0.10	65	12.9	7.0	1.2	0.8	0.7	3	167	580	149

Note : The soil samples were analyzed by FUNDACION HONDUREÑA DE INVESTIGACION AGRICOLA (FHIA)

Table C.1-2 Chemical Characteristics of Soils (2/2)

Soil series	Pit No.	Depth cm	EC dS/m	Soluble salts ppm	CEC meq/100g	Exchangeable Cations Ca meq/100g	Mg	K	Na	Soluble P ppm	K	Ca	Mg
9. SAN	11	0- 50	0.24	154	15.3	7.0	2.1	1.1	3.6	4	485	2460	398
10. LEP	12	0- 17	0.42	269	38.7	13.1	6.3	1.5	0.9	3	697	2200	886
		17- 45	0.56	358	34.5	29.1	8.7	4.1	1.8	3	995	4680	1030
	22	0- 27	0.44	282	33.8	5.9	4.3	2.5	3.7	1	675	3410	430
		27- 50	0.44	282	27.1	3.2	2.3	1.2	5.7	1	1140	2570	411
11. CQ	9	0- 30	0.42	269	30.6	10.0	3.9	1.2	2.0	3	401	3080	515
		30- 55	0.34	218	24.2	11.5	4.2	1.3	1.0	3	495	3670	560
		55- 90	0.16	101	18.5	8.3	2.5	1.3	1.3	3	433	2520	381
	23	0- 20	0.44	282	39.1	2.5	1.7	0.4	4.0	1	226	1470	278
		20- 48	0.56	358	18.8	3.8	3.6	0.6	5.2	1	326	2910	617
		48- 75	0.72	461	31.6	5.0	4.2	0.7	6.1	1	443	4670	618
12. LAM	1	0- 20	0.22	141	26.6	12.6	3.2	2.2	1.0	5	710	3010	288
		20- 45	0.20	128	21.0	9.8	2.5	2.6	1.0	4	975	2230	304
		45- 70	0.40										
13. MN	5	0- 25	0.24	154	35.5	10.7	2.0	1.2	1.0	3	582	2880	294
		25- 55	0.36	230	25.0	13.6	3.1	3.0	1.5	4	985	3600	332
	21	0- 23	0.28	179	20.3	2.8	0.7	0.4	1.1	1	255	1870	206
		23- 45	0.28	179	17.3	2.7	0.7	0.4	1.2	1	265	1760	162
		45- 85	0.34	218	37.6	24.2	2.1	0.8	1.4	1	420	2760	243
		85-105	0.34	218	26.3	4.0	1.8	0.9	1.4	1	485	3240	342
14. PM	2	0- 20	0.24	154	20.2	8.6	1.7	3.0	1.0	4	1200	1730	215
		20- 50	0.70	448	26.3	16.5	3.7	7.0	5.5	4	2355	3940	487
15. RP	13	0- 25	0.32	205	22.6	9.3	3.2	5.3	2.5	3	1220	2850	370
		25 -45	0.42	269	37.1	8.4	1.6	5.2	1.2	3	1345	2711	215
16. HU	19	0- 16	0.32	205	17.3	2.8	2.1	0.5	1.2	1	255	1080	176
		16- 50	0.42	269	24.8	4.3	2.4	0.5	3.1	1	256	3220	525
		50- 75	0.60	384	26.3	5.3	3.3	0.4	5.6	1	271	3540	586
		75-100	0.60	384	31.6	16.4	3.3	1.1	5.2	1	507	5140	644

Note : The soil samples were analyzed by FUNDACION HONDURENA DE INVESTIGACION AGRICOLA (FHIA)

Table C.1-3 Micro-nutrients and Active Aluminum in Soils

(unit : ppm)

Soil series	Pit No.	Depth cm	Micro-Nutrients Fe	Mn	Cu	Zn	Active Al
1. MOC	16	0- 30	57	37	0.66	0.66	0.09
		30- 42	10	9	0.78	0.22	0.09
		42- 67	8	7	0.60	0.22	-
3. COM	17	0- 25	12	11	0.64	1.64	0.09
		25- 55	7	7	0.58	0.20	0.09
		55- 85	8	6	0.58	0.20	0.09
		85-110	7	6	0.58	0.20	0.09
4. PY	18	0- 20	13	10	0.88	0.26	-
		20- 45	7	7	0.78	0.18	0.09
		45- 75	8	7	0.72	0.20	-
7. YR	20	0- 10	18	13	0.64	0.72	0.09
		10- 35	10	10	0.54	0.38	-
		35- 80	13	20	0.56	0.44	0.09
		80-120	9	26	0.60	0.46	0.09
10. LEP	22	0- 27	7	10	1.64	0.34	-
		27- 50	8	7	1.68	0.28	0.09
11. CQ	23	0- 20	26	11	2.20	0.46	-
		20- 48	8	8	1.18	0.24	0.09
		48- 75	7	7	0.76	0.26	0.09
13. MN	21	0- 23	8	14	0.92	0.26	-
		23- 45	8	14	0.94	0.30	0.09
		45- 85	6	7	0.66	0.26	0.09
		85-105	7	8	0.60	0.28	0.09
16. HU	19	0- 16	51	60	0.98	0.40	-
		16- 50	7	8	1.28	0.22	0.09
		50- 75	8	7	1.08	0.18	-
		75-100	9	6	0.70	0.22	0.09

Note : The soil samples were analyzed by FUNDACION HONDUREÑA DE INVESTIGACION AGRICOLA (FHIA)

Table C.1-4 Soil Moisture Contents (1/3)

Soil series	Depth cm	1/3 bar vol. %	15 bar/1 vol. %	Available moisture vol. %	Available moisture mm
1. MOC	0 - 23	23.1	10.2	12.9	29.7
	23 - 40	24.2	10.7	13.5	23.0
	40 - 69	24.8	11.1	13.7	39.7
	69 - 87	25.0	11.2	13.8	15.2
	87 -125	20.3	8.7	11.6	
	125 -150	17.7	7.3	10.4	
	Total(0 to 80 cm)				107.5
2. CER	0 - 10	16.2	6.6	9.6	9.6
	10 - 24	19.4	8.2	11.2	15.7
	24 - 51	24.2	10.2	14.0	37.8
	51 - 80	27.1	12.2	14.9	43.2
	80 -115	23.8	10.6	13.2	
	Total(0 to 80 cm)				106.3
3. COM	0 - 7	19.0	8.1	10.9	7.6
	7 - 24	27.3	12.4	14.9	25.3
	24 - 56	19.7	8.4	11.3	36.2
	56 - 95	22.7	10.0	12.7	30.5
	Total(0 to 80 cm)				99.6
4. PY	0 - 10	19.1	8.1	11.0	11.0
	10 - 40	26.2	11.8	14.4	43.2
	40 - 71	32.2	15.0	17.2	53.3
	71 -125	27.4	12.4	15.0	13.5
	Total(0 to 80 cm)				121.0
5. CAN	0 - 18	18.4	7.7	10.7	19.3
	18 - 50	23.7	10.5	13.2	42.2
	50 - 64	25.1	11.3	13.8	19.3
	64 - 74	28.6	13.1	15.5	15.5
	74 - 88	26.3	11.9	14.4	8.6
	88 -115	29.0	13.3	15.7	
	Total(0 to 80 cm)				105.0
6. FL	0 - 9	15.2	6.1	9.1	8.2
	9 - 13	19.2	8.2	11.0	4.4
	13 - 40	28.3	12.9	15.4	103.2
	Total(0 to 80 cm)				115.8

Source : Estudios de Suelos a Semidetalle del Valle de Comayagua (1982), Direccion Ejectiva del Catastro Nacional

Table C.1-4 Soil Moisture Contents (2/3)

Soil series	Depth cm	1/3 bar vol. %	15 bar/1 vol. %	Available moisture vol. %	Available moisture mm
7. YR	0 - 23	19.0	8.1	10.9	25.1
	23 - 45	19.8	8.5	11.3	24.9
	45 - 62	16.1	6.5	9.6	16.3
	62 - 75	12.7	4.8	7.9	10.3
	75 -105	18.3	7.7	10.6	5.3
	105 -108	10.9	3.8	7.1	
	108 -148	21.2	9.2	12.0	
	Total(0 to 80 cm)				81.8
7. YR	0 - 5	30.4	14.0	16.4	8.2
	5 - 65	14.1	5.5	8.6	64.5
	65 - 75				
	Total(0 to 80 cm)				72.7
8. STE	0 - 46	17.6	7.3	10.3	47.4
	46 - 57	20.4	8.7	11.7	12.9
	57 - 76	20.0	8.5	11.5	21.9
	76 -113	21.8	9.5	12.3	4.9
	Total(0 to 80 cm)				87.0
9. SAN	0 - 12	18.5	7.8	10.7	12.8
	12 - 39	32.1	14.9	17.2	117.0
	Total(0 to 80 cm)				129.8
10. LEP	0 - 5	17.7	7.4	10.3	82.4
	Total(0 to 80 cm)				82.4
11. CQ	0 - 9	19.5	8.3	11.2	10.1
	9 - 25	19.8	8.4	11.4	18.2
	25 - 83	18.8	7.9	10.9	60.0
	Total(0 to 80 cm)				88.3
12. LAM	0 - 5	13.5	5.2	8.3	4.2
	5 - 14	17.4	7.2	10.2	76.5
	Total(0 to 80 cm)				80.7

Source : Estudios de Suelos a Semidetalle del Valle de Comayagua (1982), Direccion Ejectiva del Catastro Nacional

Table C.1-4 Soil Moisture Contents (3/3)

Soil series	Depth cm	1/3 bar vol. %	15 bar/1 vol. %	Available moisture vol. %	mm
13. PM	0 - 43	27.7	12.6	15.1	65.0
	43 - 58	26.2	11.8	14.4	21.6
	58 -102	18.0	7.5	10.5	23.1
	Total(0 to 80 cm)				109.7
14. PM	0 - 20	31.9	14.8	17.1	34.2
	20 - 60	35.4	16.6	18.8	112.8
	60 -120				
	Total(0 to 80 cm)				147.0
15. RP	0 - 10	34.2	16.0	18.2	18.2
	10 - 36	31.1	14.4	16.7	43.4
	36 - 90	42.5	20.3	22.2	97.7
	90 -140	19.6	8.3	11.3	
	Total(0 to 80 cm)				159.3
16. HU	0 - 20	10.7	3.7	7.0	14.0
	20 - 45	19.3	8.3	11.0	27.5
	45 - 70	6.2	1.4	4.8	12.0
	70 -100	8.3	2.5	5.8	5.8
	100 -135	17.4	7.2	10.2	
	135 -145	6.6	1.6	5.0	
	Total(0 to 80 cm)				59.3

Available Moisture Content (Depth 0 - 80 cm)

Average : 103.1 mm
Max. : 159.3 mm
Min. : 59.3 mm

Source : Estudios de Suelos a Semidetalle del Valle de Comayagua (1982),
Direccion Ejectiva del Catastro Nacional
/1 : 1/3 bar, Field Capacity Moisture
15 bar, Wilting Point Moisture

Table C.1-5 Calculated Available Moisture (1/3)

Soil series	Depth /1 cm	Available moisture vol. %	Available moisture mm/20cm	Moisture extraction ratio %	Exractable moisture mm	TRAM /2 mm
1. MOC	0-20	12.9	25.8	40	64.5*	64.5
	20-40	13.4	26.8	30	89.4	
	40-60	13.7	27.4	20	137.0	
	60-80	13.8	27.5	10	275.1	
	Total	53.8	107.5	100		
2. CER	0-20	10.4	20.8	40	52.0*	52.0
	20-40	13.4	26.9	30	89.6	
	40-60	14.4	28.8	20	144.1	
	60-80	14.9	29.8	10	298.0	
	Total	53.1	106.3	100		
3. COM	0-20	13.5	27.0	40	67.5*	67.5
	20-40	12.0	24.0	30	80.1	
	40-60	11.6	23.2	20	115.8	
	60-80	12.7	25.4	10	254.0	
	Total	49.8	99.6	100		
4. PY	0-20	12.7	25.4	40	63.5*	63.5
	20-40	14.4	28.8	30	96.0	
	40-60	17.2	34.4	20	172.0	
	60-80	16.2	32.4	10	324.2	
	Total	60.5	121.0	100		
5. CAN	0-20	11.0	21.9	40	54.8*	54.8
	20-40	13.2	26.4	30	88.0	
	40-60	13.5	27.0	20	135.0	
	60-80	14.8	29.7	10	296.6	
	Total	52.5	105.0	100		
6. FL	0-20	11.7	23.4	40	58.6*	58.6
	20-40	15.4	30.8	30	102.7	
	40-60	15.4	30.8	20	154.0	
	60-80	15.4	30.8	10	308.0	
	Total	57.9	115.8	100		

Note : Available moisture is converted using Table C.1-4.
* : Restricting Layer of Moisture Extraction
/1 : Root Zone (0 to 80 cm)
/2 : Total Readily Available Moisture

Table C.1-5 Calculated Available Moisture (2/3)

Soil series	Depth /1 cm	Available moisture vol. %	Available moisture mm/20cm	Moisture extraction ratio %	Exractable moisture mm	TRAM /2 mm
7. YR	0-20	10.9	21.8	40	54.5*	54.5
	20-40	11.2	22.5	30	74.9	
	40-60	10.0	20.1	20	100.3	
	60-80	8.7	17.5	10	174.9	
	Total	40.9	81.8	100		
8. STE	0-20	10.6	21.1	40	52.8*	52.8
	20-40	8.6	17.2	30	57.3	
	40-60	8.6	17.2	20	86.0	
	60-80	8.6	17.2	10	172.0	
	Total	36.4	72.7	100		
9. SAN	0-20	10.3	20.6	40	51.5*	51.2
	20-40	10.3	20.6	30	68.7	
	40-60	11.3	22.5	20	112.5	
	60-80	11.7	23.3	10	233.2	
	Total	43.5	87.0	100		
9. SAN	0-20	13.3	26.6	40	66.5*	66.5
	20-40	17.2	34.4	30	114.7	
	40-60	17.2	34.4	20	172.0	
	60-80	17.2	34.4	10	344.0	
	Total	64.9	129.8	100		
10. LEP	0-20	10.3	20.6	40	51.5*	51.5
	20-40	10.3	20.6	30	68.7	
	40-60	10.3	20.6	20	103.0	
	60-80	10.3	20.6	10	206.0	
	Total	41.2	82.4	100		
11. CQ	0-20	11.3	22.6	40	56.6*	56.6
	20-40	11.0	22.1	30	73.5	
	40-60	10.9	21.8	20	109.0	
	60-80	10.9	21.8	10	218.0	
	Total	44.1	88.3	100		

Note : Available moisture is converted using Table C.1-4.
* : Restricting Layer of Moisture Extraction
/1 : Root Zone (0 to 80 cm)
/2 : Total Readily Available Moisture

Table C.1-5 Calculated Available Moisture (3/3)

Soil series	Depth /1 cm	Available moisture vol. %	Available moisture mm/20cm	Moisture extraction ratio %	Exractable moisture mm	TRAM /2 mm
12. LAM	0-20	9.7	19.5	40	48.6*	48.6
	20-40	10.2	20.4	30	68.0	
	40-60	10.2	20.4	20	102.0	
	60-80	10.2	20.4	10	204.0	
	Total	40.3	80.7	100		
13. MN	0-20	15.1	30.2	40	75.5*	75.5
	20-40	15.1	30.2	30	100.7	
	40-60	14.1	28.2	20	141.2	
	60-80	10.5	21.0	10	210.0	
	Total	54.8	109.6	100		
14. PM	0-20	17.1	34.2	40	85.5*	85.5
	20-40	18.8	37.6	30	125.3	
	40-60	18.8	37.6	20	188.0	
	60-80	18.8	37.6	10	376.0	
	Total	73.5	147.0	100		
15. RP	0-20	17.5	34.9	40	87.2*	87.2
	20-40	17.8	35.6	30	118.7	
	40-60	22.2	44.4	20	222.0	
	60-80	22.2	44.4	10	444.0	
	Total	79.7	159.3	100		
16. HU	0-20	7.0	14.0	40	35.0*	35.0
	20-40	11.0	22.0	30	73.3	
	40-60	6.4	12.7	20	63.5	
	60-80	5.3	10.6	10	106.0	
	Total	29.7	59.3	100		
Average	0-20	12.1	24.1	40	60.4*	60.4
	20-40	13.1	26.3	30	87.6	
	40-60	13.3	26.6	20	132.8	
	60-80	13.1	26.1	10	261.4	
	Total	51.6	103.1	100		

Note : Available moisture is converted using Table C.1-4.
* : Restricting Layer of Moisture Extraction
/1 : Root Zone (0 to 80 cm)
/2 : Total Readily Available Moisture

Table C.1-6 Results of Intake Rate Tests

No. of Test pit	Soil Series	Accumulated Infiltration (mm)	Intake Rate (mm/hr)	Basic Intake Rate (mm/hr)
1	PM	$D = 9.9\ T^{0.58}$	$I = 345\ T^{-0.42}$	34
2	COM	$D = 4.4\ T^{0.59}$	$I = 156\ T^{-0.41}$	16
3	CAN	$D = 7.4\ T^{0.58}$	$I = 258\ T^{-0.42}$	67
4	LEP	$D = 3.6\ T^{0.66}$	$I = 143\ T^{-0.34}$	23
5	MOC	$D = 9.0\ T^{0.50}$	$I = 270\ T^{-0.50}$	16

The tests were carried out by the Study Team by cylinder method.

Note: Accumulated Infiltration (mm) $D = C\ T^{n}$
Intake Rate (mm/hr) $I = 60\ C\ n\ T^{n-1}$
Basic Intake Rate (mm/hr) $Ib = 60\ C\ n\ \{600(1-n)\}^{n-1}$

(2) Land Classification

Table C.1-7 Specification of Land Capability Class

A. Land Capability Definition

Land capability class	: Definition
Land Class I	: Highly suitable for irrigation farming, without limitation.
Land Class II	: Moderately suitable for irrigation farming, with moderate limitations due to coarse texture, rather steep slope or impermeability.
Land Class III	: Rather suitable for irrigation farming, with limitation due to shallow soils, gravelly soils or low fertility.
Land Class IV	: Marginally or conditionally suitable for irrigation farming, with relatively serious limitations due to very shallow soils, steep slope or imperfect drainage.
Land Class V,VI	: Unsuitable for cropping, with serious limitations.

Note : The definitions are based on the Bureau of Reclamation Manual of United States (USBR Manual).

B. Subclass : Factors for Assessment of Land Capability for the Study Area

Land Characteristics	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6
Soils (s)						
Texture of surface soil	SL to CL	LS to C	LS to C	LS to C	-- Sand gravely and impermeable clay --	
Thickness of effective soil depth	>150 cm	>100 cm	>50 cm	>50 cm	<50 cm	<30 cm
Presence of surface stone or rock outcrops	<1 %	<2 %	<5 %	<10 %	>10%	>20 %
Fertility	-- >20 meq/100g CEC --		-- >8 meq/100g CEC --		-- <8 meq/100g CEC --	
Salinity	----- <2 dS/m ------		----- <4 dS/m ------		----- >4 dS/m -----	
Topography (t)						
Slope	<2 %	<5 %	<8 %	<15 %	<20 %	>20 %
Erosion	Non	Non	Slightly	Slightly	Serious	Serious
Drainage (d)						
Internal	-Well to moderately well		-Imperfectely to poorly		--- Very poorly ----	
Flooding	Non	Non	---- Occasional -----		--- Every year ----	

Note : The specifications were defined by the Study Team applying to the condition of the Study Area on the basis of the USBR Manual.

Table C.1-8 Classified Area of Land Capability

Land Capability Class	Sector I ha	Sector II ha	Total ha	(%)
Class I	160	210	370	(10)
Class II	260	420	680	(19)
IIs	110	270	380	
IId	20	10	30	
IIsd	130	140	170	
Class III	380	680	1,060	(30)
IIIs	250	380	630	
IIIt	40	150	190	
IIIst	90	150	240	
Subtotal (Class I to III)	800	1,310	2,110	(59)
Class IV	140	250	390	(10)
IVs	40	30	70	
IVt	70	150	220	
IVst	30	70	100	
Subtotal (Class I to IV)	940	1,560	2,500	(69)
Class V	130	220	350	(10)
Vt	40	80	120	
Vd	90	140	230	
Class VI	100	300	400	(11)
Vt	70	240	310	
Vd	30	60	90	
Urban & settlement area	60	110	170	(5)
Roads,canals,rivers,etc.	70	110	180	(5)
Total	1,300	2,300	3,600	(100)

Subclass factor
s : soil, t : topography, d : drainage

C.2 Water Quality

Table C.2-1 Vertical Variation of Temperature of Water in Reservoir

	'90 Ⅱ/7	Ⅱ/14	Ⅱ/16	Ⅲ/12	Ⅳ/10
W.L	802.44	801.90	801.61	799.73	806.94m
0 m	24.2	24.2	25.2		26.8℃
2	24.2	24.0	24.7		26.0
5	24.1	23.6			24.8
10	23.2	21.9			24.5
15	22.8				24.8
20	22.8	21.6			23.6
25		22.2			
30	23.5	23.6			24.0
35					24.6
40					24.4
Leakage (2)	21.5		21.5	22.5	23.4℃
(3)	23.5		23.0	21.5	23.4

Note Water Temperature Measured at the Dam Center and 25m ~0m upstream side in the Reservoir.
Leakage (2),(3): refer to 'Leakage'

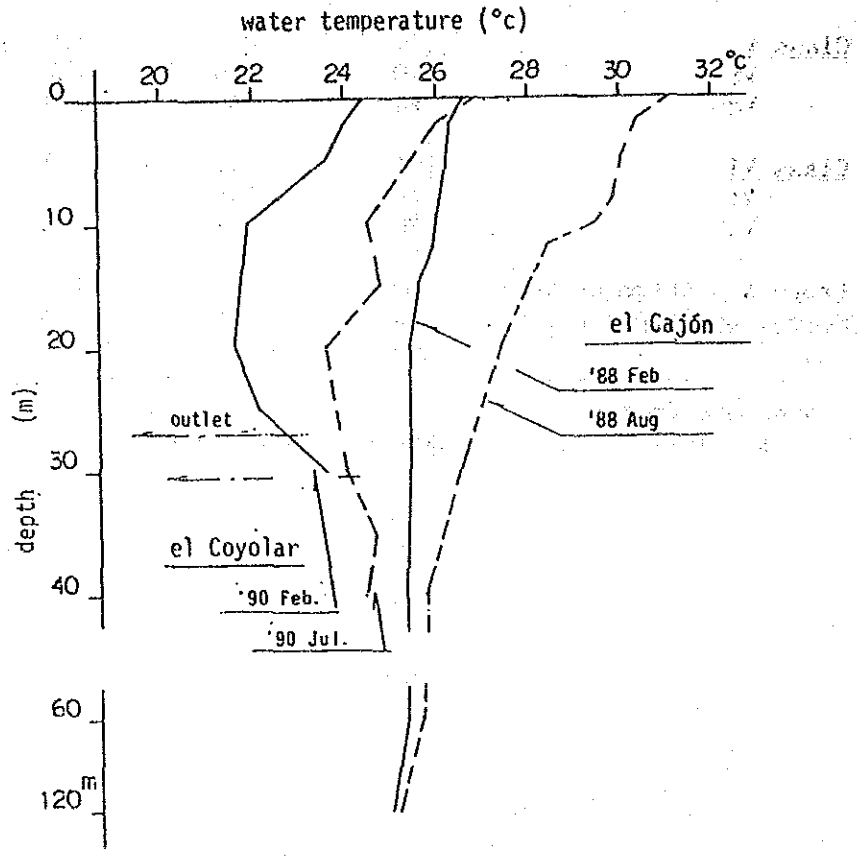


Table C.2-2 Water Quality Data of Reservoir

	Halcrow		B.L.Morris 83.4.28		Lavaline-Gatesa 84.12.7			J.I.C.A 90.3		90.7.10		90.7.26
	No.4	No.10	WL-1m	WL-22m	WL-10m	WL-15m	WL-36m	WL-1m	WL-1m	WL-2m	WL-20m	WL-2m
Turbidity	clear	clear										
Colour	none	none	brown	brown								
Odour	none	none										
Taste;Smell	-	-	(H_2S)	(H_2S)	H_2S	H_2S	H_2S					
Ph	7.7	7.8	6.8	6.4	5.2	5.3	5.1	7.8	7.0	6.5	6.5	5.9
Res	66	52								20	20	20
E.C	42	60	82	76				0.56	0.53	0.20	0.20	
Ca^{++} mg/l	3.9	2.4	4.9	6.1	3.48	3.2	4.78			4	5	8.4
Mg^{++}	0.2	0.7	1.0	1.3	0.7	0.62	0.8			0.8	0.8	2.4
Na^{+}	3.2	3.0	5.7	5.1	10	8	15			2.6	4.6	2.4
K^{+}	3.1	3.3	4.3	3.5	13	13	10			3.2	3.2	2.6
Fe^{++}	0.01	0.01										
Cl^{-}	2.1	2.8	2.0	2.0	6.91	6.91	6.91			1.9	2.9	3.0
SO_4^{--}	8.8	5.7	4.0	1.2	5.2	5.0	4.7			5.34	7.12	7.12
HCO_3^{-}	14.6	14.0	27.9	38.6	28.06	31.72	30.5			12.62	19.15	12.62
Ca^{++} meq/l	0.195	0.120	0.245	0.304	0.174	0.160	0.239			0.200	0.250	0.420
Mg^{++}	0.016	0.058	0.082	0.107	0.058	0.051	0.066			0.066	0.066	0.198
Na^{+}	0.139	0.130	0.248	0.222	0.435	0.348	0.652			0.113	0.200	0.104
K^{+}	0.079	0.084	0.110	0.090	0.332	0.332	0.256			0.082	0.082	0.066
Cl^{-}	0.059	0.079	0.056	0.056	0.195	0.195	0.195			0.054	0.082	0.084
SO_4^{--}	0.183	0.119	0.083	0.025	0.108	0.104	0.098			0.111	0.148	0.148
HCO_3^{-}	0.239	0.230	0.457	0.633	0.460	0.520	0.500			0.207	0.314	0.207
Alkalinity	12.0	11.5										
Hardness	10.6	8.9								13	13	17
Ca+Mg/+ion (%)	49.3	45.4	47.8	56.8	23.1	23.6	25.1			57.7	52.8	78.4
HCO/-ion (%)	49.7	53.7	76.7	88.7	60.3	63.5	63.1			55.6	57.7	47.2
Clorofil A												
Coli										no		

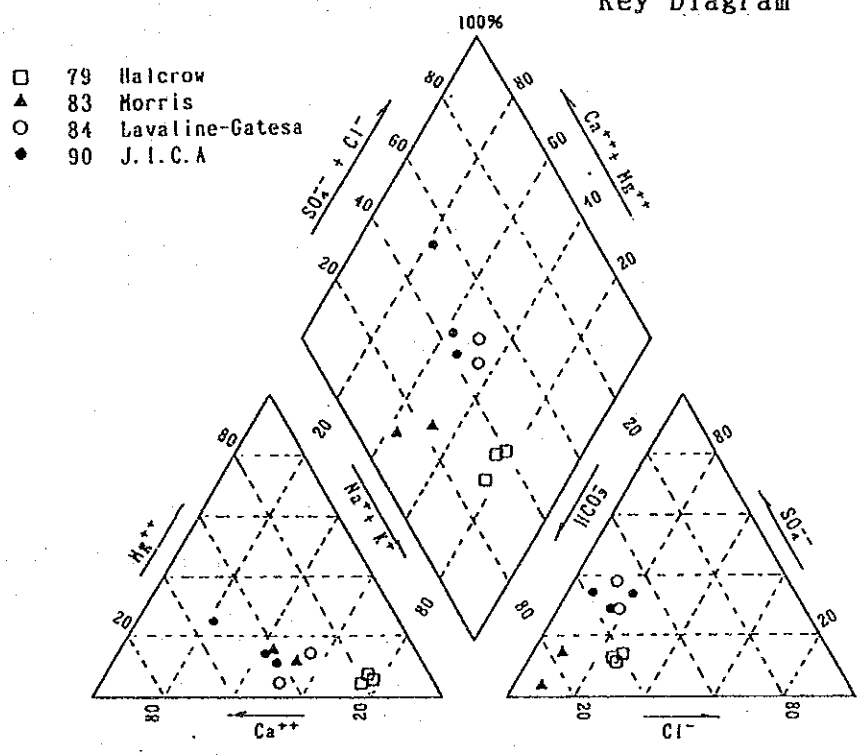


Fig. C.2-1 Compositional Diagram of Water Quality of Reservoir

Table C.2-3 Water Quality of Dam and Canal

	Unit	1. Dam	2. Rio San Jose	3. Canal San Antonio	4. Rio San Jose
Date of sampling		25,Jul,90	25,Jul,90	25,Jul,90	29,Jan,80
Total solid	mg/lit	20	20	30	
pH		5.9	5.8	5.0	
EC	dS/m	0.2	0.2	0.2	0.07
Hardness	mg/lit	17	50	50	
Cations					
-Na+	mg/lit	2.4	4.0	3.6	
	meq./lit	0.10	0.173	0.156	0.72
-K+	mg/lit	2.6	2.4	5.4	
	meq./lit	0.163	0.061	0.136	0.15
-Ca++	mg/lit	8.4	7.8	9.6	
	meq./lit	0.42	0.39	0.48	0.24
-Mg++	mg/lit	2.4	1.11	5.2	
	meq./lit	0.20	0.093	0.26	0.07
Total cations	meq./lit	0.83	7.17	1.03	
Anions					
-Cl-	mg/lit	3.0	2.9	5.0	
	meq./lit	0.084	0.081	0.14	0.0
-NO3-	mg/lit	4.64	3.94	2.62	
	meq./lit	0.075	0.064	0.042	
-HCO3-	mg/lit	12.62	28.06	51.91	
	meq/lit	0.20	0.46	0.085	0.66
-SO4--	mg/lit	7.12	11.88	1.78	
	meq/lit	0.148	0.247	0.037	
Total anions	meq/lit	0.507	0.851	1.06	
Bacteria	No./100ml		200	100	
Coli form	No./100ml		1,700	200	
SAR *		0.31	0.35	0.26	1.83

Note : Water samples No.1,2 & 3 were analyzed by CENTRO DE ANALYSIS LABORATORIO SUELO, AGUA, PLANTA (CALASP), SRN.
Water sample No.4 was quoted from ESTUDIOS DE SUELOS A SEMIDETALLE DEL VALLE DE COMAYAGUA (1982).

*SAR : Sodium Adsorption Ratio

$$SAR = \frac{Na}{\sqrt{\frac{Ca + Mg}{2}}}$$

Na, Ca & Mg are given in meq./lit.

Table C.2-4 Guidelines for Interpretations of Water Quality for Irrigation

Water parameter	Symbol	Unit[1]	Usual range in irrigation water	
SALINITY				
Salt Content				
Electrical Conductivity	EC_w	dS/m	0 - 3	dS/m
(or)				
Total Dissolved Solids	TDS	mg/l	0 - 2000	mg/l
Cations and Anions				
Calcium	Ca^{++}	me/l	0 - 20	me/l
Magnesium	Mg^{++}	me/l	0 - 5	me/l
Sodium	Na^{+}	me/l	0 - 40	me/l
Carbonate	CO_3^{--}	me/l	0 - .1	me/l
Bicarbonate	HCO_3^{-}	me/l	0 - 10	me/l
Chloride	Cl^{-}	me/l	0 - 30	me/l
Sulphate	SO_4^{--}	me/l	0 - 20	me/l
NUTRIENTS[2]				
Nitrate-Nitrogen	NO_3-N	mg/l	0 - 10	mg/l
Ammonium-Nitrogen	NH_4-N	mg/l	0 - 5	mg/l
Phosphate-Phosphorus	PO_4-P	mg/l	0 - 2	mg/l
Potassium	K^{+}	mg/l	0 - 2	mg/l
MISCELLANEOUS				
Boron	B	mg/l	0 - 2	mg/l
Acid/Basicity	pH	1-14	6.0 - 8.5	
Sodium Adsorption Ratio[3]	SAR	$(me/l)^{1,2}$	0 - 15	

[1] dS/m = deciSiemen/metre in S.I. units (equivalent to 1 mmho/cm = 1 millimmho/centimetre)

mg/l = milligram per litre ≈ parts per million (ppm).

me/l = milliequivalent per litre (mg/l ÷ equivalent weight = me/l); in SI units, 1 me/l = 1 millimol/litre adjusted for electron charge.

[2] NO_3-N means the laboratory will analyse for NO_3 but will report the NO_3 in terms of chemically equivalent nitrogen. Similarly, for NH_4-N, the laboratory will analyse for NH_4 but report in terms of chemically equivalent elemental nitrogen. The total nitrogen available to the plant will be the sum of the equivalent elemental nitrogen. The same reporting method is used for phosphorus.

[3] SAR is calculated from the Na, Ca and Mg reported in me/l

Source : WATER QUALITY FOR AGRICULTURE, FAO Irrigation and Drainage Paper No.29, page 8, (1985), FAO.

Table C.2-5 Standard of Drinking Water Quality in Honduras

Item	Standard
pH	6.5 - 8.5
Cations	
Ca++	< 180 mg/lit.
Mg++	< 160 mg/lit.
Fe++	< 0.3 mg/lit.
Mn++	< 0.005 mg/lit.
Al++	< 230 mg/lit.
Na+	< 200 mg/lit.
K+	< 200 mg/lit.
As++	< 0.05 mg/lit.
Cr++	< 0.05 mg/lit.
Cu++	< 0.05 mg/lit.
Zn++	< 0.05 mg/lit.
Pb++	< 0.10 mg/lit.
Anions	
Cl-	< 30 mg/lit.
F-	< 1.0 mg/lit.
CO3--	< 250 mg/lit.
HCO3-	< 250 mg/lit.
SO4--	< 90 mg/lit.
PO4--	< 0.01 mg/lit.
NO3-	< 10 mg/lit.
NO2-	< 0.05 mg/lit.
Total solid	< 250 mg/lit.
Hardness	< 250 mg/lit.
Organic Nitrogen	< 0.10 mg/lit.
Ammonium Nitrogen	< 0.5 mg/lit.
Dissolved Oxygen	> 8.0 mg/lit.
Alkalinity	< 250 mg/lit.
Residual Cl	< 0.3 mg/lit.
Free CO2	< 50 mg/lit.
Turbidity(NTU)	< 5 degree
Color	< 5 degree
Odor	Non

Source : SERVICIO AUTONOMO NACIONAL DE ACUEDUCTOS Y ALCANTARILLADOS.

ANNEX D : AGRICULTURE

TABLE OF CONTENTS

D.1 Land Use and Land Holding

(1) Land Use

Table D.1-1 Land Use in the Country and Comayagua

(unit : ha)

Land Use	Whole Country		Centro-Occidental Region		Comayagua Department		Villa de San Antonio Municipality
	1965/66	1974	1965/66	1974	1965/66	1974	1974
Total Farms (No.)	178350	195341	19856	19600	12034	11124	471
Total Area	2420649	2629859	210751	203575	142267	125166	3520
Annual Crop Land	342267	366344	32981	32774	22043	20652	826
Permanent Crop Land	190556	212011	21267	21601	16187	15609	54
Fallow Land	225020	140291	21259	14750	10962	6525	214
Improved Pasture Land	702239	877666	49520	57565	36610	39034	962
Natural Pasture Land	428959	470111	41101	32796	28069	19228	839
Mountain & Forest Land	460472	533046	39013	42790	24677	23103	616
Other Land	71136	30390	5610	1299	3719	1015	9
Area per Farm	13.572	13.463	10.614	10.386	11.822	11.252	7.473
Cropped Area per Farm	8.187	8.172	6.297	6.464	7.130	7.355	4.365

Source : Censo Nacional Agropecuario (1965/66 and 1974)

(2) Land Holding

Table D.1-2 List of Land Owners in the Study Area Individual Farmer (1/9)

NAME OF OWNER	Area (ha)
Aeschliman Berny	37.8
Aeschliman Frei Juan	34.1
Aeschliman Juan	154.2
Aguilar Cruz Tomas	1.1
Aguilar Miguel	4.2
Agurcia Aida de Ulloa	17.6
Agurcia Jose Ma. y Her.	4.4
Agurcia Mercedes	28.0
Almemdarez Ma. Rosalia	1.2
Almendarez D. Claudio	0.6
Almendarez Juan	1.2
Almendarez Julio	2.1
Almendarez Roberto	4.4
Almendarez R. Leovigildo	4.2
Alonso Flores Juan Jose	0.3
Alonso Flores Lorenzo	0.3
Alonso G. Jose Angel	0.6
Alvarado Canales Doroteo	1.5
Alvarado Canales Fausto	0.6
Alvarado C. Jose Santos	6.8
Alvarado Eduardo	2.3
Alvarado Fidelia	0.4
Alvarado M. Eduardo A.	14.0
Alvarado Nazario	2.1
Alvarado Puerto Andres	191.9
Alvarado Ramirez Adan	69.1
Alvarado Ramirez Pablo	2.6
Alvarez Amalia de	2.1
Amador Juan	2.1
Amador Perez Israel	2.0
Andino Castro Angel A.	13.1
Andino Castro Fausto	6.0
Andino Castro Santos	18.2
Andino Castro Teodoro	6.1
Andino Julio	2.1
Atala Jacobo	12.5
Atala Simon Pedro	36.5
Avelar Santos Crecencio	0.2
Ayestas GG. Marco A.	18.9
Ayestas Marco Antonio	2.7
Banegas Lola	2.1
Banegas Nieve	2.1
Batista Pedreti	2.8
Berlios B. Fernando	19.2
Bonilla Arturo	2.1
Bonilla Celso	3.5
Bonilla Jimenez Elias	1.9

Table D.1-2 List of Land Owners in the Study Area
Individual Farmer (2/9)

NAME OF OWNER	Area (ha)
Bonilla Jimenez Manuel	14.4
Bonilla Jimenez Omar	6.3
Bonilla Jose Lisandro	0.9
Bonilla Lisimaco	2.1
Bonilla Moreno Celso	4.6
Bonilla Santos	10.2
Bonilla Velasquez Elvira	1.6
Bonilla Velasquez Maura	1.7
Bonilla Vicente	0.1
Bonilla V. Candida	4.3
Bonilla V. Felipe Nestor	17.0
Borjas Delia Mirna Hayde	40.2
Bueso Saddy Oscar	7.2
Bustillo Alejandro	2.1
Bustillo Bonilla Luis	9.3
Bustillo Ch. Guillermo	11.1
Bustillo Emilia	8.4
Bustillo Enrique	108.4
Bustillo Galeas Ruben	5.5
Bustillo Ismael	0.6
Bustillo Justo Pastor	3.5
Bustillo M. Monico	10.6
Bustillo Ochoa Jose Enrique	0.6
Bustillo Rafael	3.5
Bustillo Ruben	5.6
Cabrera Gonzales Estanislao	2.3
Calderon Humberto	7.2
Calderon Zuniga Humberto	6.9
Calix Angel Antonio	2.4
Calix German Modesto	1.5
Calix Zelaya Edra Ester	1.0
Camoriano Walter	1.4
Campos Vicenta	3.8
Canales Bogran	9.4
Canales Cruz	0.7
Canales Luciano	7.6
Canales Lucila	1.8
Canales Martinez M. Lucila	2.7
Canales Melendes Ricardo	2.4
Canales Pedro	2.4
Canales Ramirez Fausto	3.6
Canales Santos	1.4
Canales Vivian	4.8
Carbajal Fausta v. de	4.9
Carias Guillermo	2.1
Carranza Jose	2.1
Carrillo V. Fredesvinda	0.4

Table D.1-2 List of Land Owners in the Study Area
Individual Farmer (3/9)

NAME OF OWNER	Area (ha)
Castellanos Maurilia	0.4
Castillo A. Indalecio	48.8
Castillo Ciriaco	14.0
Castillo Gilberto	2.8
Castillo Guiza Hernan	2.5
Castillo G. Benjamin	11.1
Castillo G. Hernan	12.2
Castillo G. Humberto	1.0
Castillo G. Rolando A.	10.3
Castillo M. Baldomero	2.9
Castillo P. Juan de Dios	23.8
Castillo Rodimiro	4.6
Castillo Rojas Guillermo	48.7
Castillo Suazo Gilberto	12.6
Casula Conrado	2.8
Cerrato Jose	1.4
Cerrato Rigoberto	2.1
Chavarria V. Clemente	3.3
Chavez Francisco	2.1
Chavez Luis Alonso	1.5
Chevez P. Florillia	0.2
Chevez Rubenia	0.1
Cooil Emilio	8.4
Corleto Josefina M. de	2.0
Cortes Trinidad Rene	0.6
David Jose	0.7
Davila Lorenzo	2.1
Deras Maria del Carmen	2.0
Diaz Garcia Hernan	1.3
Diaz Hernan	2.1
Diaz Ramon	0.9
Diaz Tiburcio	1.4
Dominguez Federico A.	1.6
Dominguez Indulfo	2.2
Dominguez Maria E.	0.7
Duron Enrique	10.3
Enamorado Marcial	0.7
Escalante Alicia	41.0
Escalante Edgardo	2.8
Escalante Gilberto	13.7
Escalante Rene	2.8
Escalante Roy Emilio	3.5
Escobar Francisco	1.8
Escobar Gonzalez Daniel	3.7
Escobar Gonzalez David	2.4
Escobar Gonzalez Elias	0.5
Escobar Gonzalez Martha	0.6

Table D.1-2 List of Land Owners in the Study Area
Individual Farmer (4/9)

NAME OF OWNER	Area (ha)
Escobar Guiza Luis	0.8
Escobar Maria	2.1
Escobar Mercedes	0.6
Escobar Rebeca	0.6
Espinal Marcia Cecilia	25.4
Espinoza G. Heliodoro	1.0
Estrada Francisco	3.5
Estrada Ramon	4.2
Estrada Rigoberto	1.4
Estrada Roberto	0.7
Estrada Santos Francisco	4.3
Estrada Victoriano	2.8
Euceda Zavala Lucia	14.9
Fernandez Paz Jose S.	2.4
Fiallos Mariano	8.0
Fiallos Miguel Angel	4.2
Flores Alberto	1.4
Flores Jorge Alberto	1.4
Flores Jose	3.2
Fuentes Alberto	4.1
Funez Eduardo	1.0
Funez Miguel Angel	3.5
Galdama Benjamin	0.6
Galindo Calderon Hector	3.8
Galindo Calderon Hector	27.0
Galindo R. Gumercindo	1.6
Galindo Torres Fausto	2.2
Galvez Gloria de	7.0
Garay Roque Jacinto	0.5
Garcia Carlos	5.6
Garcia Gilberto	8.7
Garcia I. Salomon	3.8
Garcia U. Raymundo	8.2
Giron Efigenio	3.5
Gonzalez Aleman Rito	12.5
Gonzalez Ernestina	2.8
Guiza M. Alicia e Hijos	4.9
Gutierrez Maradiaga Santos	6.5
Gutierrez M. Angel A.	2.2
Gutierrez M. Luciano	2.7
Hasbun Juan	7.8
Herederos Andino Castro	9.1
Hermanos Nazar V.	0.7
Hermanos Paz	4.9
Hernandez Aluvina	1.2
Hernandez Antonio	2.1
Hernandez B. Urbano	5.0

Table D.1-2 List of Land Owners in the Study Area
Individual Farmer (5/9)

NAME OF OWNER	Area (ha)
Hernandez Emiliano	2.1
Hernandez Flores Gregorio	1.5
Hernandez Guillermo	10.7
Hernandez I. Jose A.	19.5
Hernandez Joaquin	2.1
Hernandez Juan	31.5
Hernandez Miguel A.	3.8
Hernandez Raymundo	8.4
Hernandez Sebastian	15.4
Hernandez Sinforso	2.4
Hernandez S. Juan Angel	16.1
Inestroza Adolfo	11.2
Inestroza A. Gustavo A.	23.0
Inestroza Eulogio	2.8
Inestroza Heriberto	11.2
Inestroza Ma. Cecilia	21.5
Inestroza M. Marcial	8.5
Inestroza V. Carlos Humberto	21.0
Izaguirre Ramon	28.0
Izaguirre Ruben	1.4
Jalil Jose Elias	2.8
Jimenez A. Angela	2.3
Jimenez Indalecio	10.1
Jimenez Jose Indalecio	0.9
Jimenez Rufino	1.1
Jimenez Tomas	0.7
Jose Saul	0.6
Kubisep Steven	5.6
Lainez Ruben	2.1
Leon Baudilia	2.1
Leon Rivera Mauro	4.3
Leon Romero Hernan	1.9
Leon Romero Tomas	0.3
Letelier Jaime	30.7
Linares Juana	1.8
Lino Diaz Jose	2.1
Maldonado E. Pastora	12.9
Maldonado Maria	0.4
Maldonado Valle Josefa	1.8
Mananarez G. Alberto	34.2
Manzanares G. Alejandro	4.0
Maradiaga Jose Maria	2.1
Maradiaga Mejia Vicente	2.2
Maradiaga Pedro	6.3
Maradiaga Rivera Luis	19.8
Maradiaga Rivera Pedro	13.8
Maradiaga R. Juan Fco.	4.1

Table D.1-2 List of Land Owners in the Study Area
Individual Farmer (6/9)

NAME OF OWNER	Area (ha)
Maradiaga R. Tomasa	7.5
Martinez Asterio	2.5
Martinez Cruz Ramiro	2.1
Martinez Hernan	4.2
Martinez H. Leila	4.4
Martinez Jose	10.7
Martinez Juan Angel	4.1
Martinez Justo	1.4
Martinez Luis	13.1
Martinez Marcos	4.2
Martinez Ma. Domitila	13.7
Martinez Ramirez Justo	20.5
Martinez R. Margarita	1.3
Martinez S. Ma. Olga	15.9
Matute Suazo Sebastian	0.4
Medina Escobar Humberto	1.9
Medina Herminio	0.4
Medrano Domingo	2.8
Mejia Alvarado Cornelio	5.9
Mejia Emilio	1.2
Mejia Francisco	6.6
Mejia Gerardo	4.9
Melendez Canales Felix	1.3
Mendoza Alfonso	1.9
Mendoza Isidro	1.4
Mendoza Juan	5.6
Mendoza Marcelino	2.1
Mendoza Oscar	1.4
Meza Figueroa Edolfo R.	0.1
Molina Otoniel	14.6
Moncada Enriqueta	5.3
Moncada Esteban	0.7
Moncada Humberto	0.4
Moncada Octavio	2.5
Moncada Ramirez Octavio	1.5
Moncada R. Antolino E.	3.0
Moncada R. Enriqueta	2.9
Monroy Guillermo A.	5.9
Montes Dario Humberto	30.4
Morales Euceda Onofre	7.6
Morales Onofre	4.4
Morales R. Norma Iris	1.6
Moreno Andrea	3.5
Moreno Gustavo	18.2
Nassar Espana Juan Pedro	34.6
Nassar Jacobo	2.6
Nassar Valladares Juan Pedro	1.1

Table D.1-2 List of Land Owners in the Study Area
Individual Farmer (7/9)

NAME OF OWNER	Area (ha)
Nassar Valladares Moises	1.8
Nasser Nicolas	5.0
Nazar Domitila	1.1
Ortiz Fugon Jose A.	2.1
Osorto F. Marcos Domitila	4.1
Padilla Apolinaria y H.	4.7
Padilla Dionisia	9.1
Padilla Francisco	25.4
Padilla Pineda Angela	15.4
Padilla Teodoro	1.4
Pagoada F. Bayardo	7.6
Paguada Angel	5.6
Pastor Calderon Justo	4.2
Paz Flores Frank	4.2
Peraza C. Hector Anibal	14.8
Perdomo Santiago	5.6
Perez Carlos	2.1
Perez Concepcion	3.2
Perez David	2.1
Perez Esteban	6.7
Perez Gilberto	2.1
Perez Guillermo	2.1
Perez Luis Alonso	0.4
Perez Manuel	1.4
Perez Matias	1.4
Portillo Ana R. y Hnos.	7.5
Quan Martin	9.1
Ramirez Canales Fausto	3.5
Ramirez C. Sebastian	1.5
Ramirez Enemesio	4.2
Ramirez Euceda (Rene)	0.7
Ramirez Isabel	1.5
Ramirez Marcos	1.4
Ramirez Moncada Antonio	1.2
Ramirez Sebastian	2.8
Ramos Marcelino	3.7
Ramos Medina Agustin	0.9
Ramos Zelaya Francisco	2.0
Raudales Andino Enrique	19.5
Raudales Cristobal	3.9
Raudales Enrique	2.8
Raudales Julia Cristina	8.0
Raudales Ma. Eulogia	1.5
Raudales Santos	0.7
Rivera A. Carlos Luis	3.7
Rivera Carbajal Jose I.	5.5
Rivera Guiza Francisco	3.0

Table D.1-2 List of Land Owners in the Study Area
Individual Farmer (8/9)

NAME OF OWNER	Area (ha)
Rivera Mauro	1.4
Rivera Rojas Jose Ramon	15.1
Rivera Telma	0.9
Rivera Torres Marcos	0.6
Rivera Velasquez Octavio	4.8
Rivera V. Lisandro	46.9
Rivera V. Orlando	1.6
Rodriguez Amalia de	2.1
Rodriguez Ivan	8.9
Rodriguez Jose	2.1
Rodriguez Martina	28.7
Rojas Laura	0.8
Rojas Ramon	6.6
Romelia Portillo Ana	4.9
Romero T. Marta Lucia	6.3
Romero T. Ma. Lucila	0.8
Romero T. Pedro Pablo	8.6
Roque Rodolfo	1.4
Rubio Garcia Juan Fco.	70.0
Rubio Melendez Olga M.	0.3
Rubio Torres Miguel	3.9
Ruiz Tolentino Leoncio	1.0
Salgado H. Jose G.	2.9
Salinas Rosendo	3.1
Sanchez Hernan	1.4
Sanchez Higinia	2.9
Sanchez Sanchez Antonio	2.8
Santander Carlos Arturo	10.2
Sempe Isabel de	80.1
Sempe Rene	15.3
Sevilla Gabino	2.5
Soto Turcios Enrique	20.2
Suazo Emilio	1.5
Terreno Libre	13.7
Torres Angela	2.0
Torres Eusebio	0.1
Torres Isidro	0.5
Torres Jose	7.0
Torres Manuel de Jesus	5.8
Torres Maradiaga Israel	4.3
Torres M. Hermenegilio	0.6
Torres Padilla Luis	29.8
Torres Rafael	0.7
Torres Romelia	1.7
Torres R. Juan de la Cruz	6.8
Torres Tomas	1.4
Torres Wenceslao	26.8

Table D.1-2 List of Land Owners in the Study Area
Individual Farmer (9/9)

NAME OF OWNER	Area (ha)
Tosta Fiallos Rafael	10.8
Ulloa Morel Norberto	0.4
Varela A. Benigno	3.9
Varela Fausto	42.0
Varela Gregorio	3.9
Varela Guadalupe	7.4
Varela Justo	4.2
Varela Mendoza Gregorio	4.0
Varela Mendoza Jose Justo	18.3
Varela Ramirez Urbano	1.3
Varela R. Manuel Jesus	23.1
Varela Urbano	0.7
Vargas de Flores Natividad	1.6
Vargas Marcelina	6.6
Velasquez Antonio	2.1
Velasquez Celestino	13.9
Velasquez G. Jose Ramon	72.1
Velasquez Maria	5.6
Velasquez Ma. Angela	2.5
Velasquez Pedro	2.1
Velasquez Rojas Maria Magdalena	20.0
Velasquez Rojas Salomon	7.1
Velasquez R. Isidoro	2.4
Velasquez R. Jose Modesto	44.9
Velasquez R. Pascual	1.5
Velasquez Salomon	2.8
Velasquez Suazo Alfonso	1.0
Velasquez Suazo Pedro	1.4
Velasquez S. Fernando	2.7
Yanez Mejia Santos	0.6
Yanez Ruben	0.3
Zavala Aurelio	45.1
Zelaya Encarnacion	5.3
Zelaya Omar Antonio	2.1
Zelaya Ruiz Manuel de J	9.7
Zuniga R. Maria Santos	12.2
Total (412 farmers)	3,407.1

Source : DGRH (1986)

Table D.1-3 Lands of Small-Farmers Groups

Name of group	Area of lands lands (ha)	No. of member	Average Area per member (ha)
1. La Villa No.1	101	24	4.2
2. La Villa No.2	23	5	4.6
3. El Esfuerzo	29	10	2.9
4. Sub-Seccional Exitos de ANACH	36	13	2.8
5. Yarumela No.1	43	8	5.4
6. Las Mercedes No.1	38	13	2.9
7. Las mercedes No.2	23	15	1.5
8. Union Fueruza	14	9	1.6
9. Santa Ana	38	13	2.9
10. Maximiliado Kolve	18	9	2.0
11. Los Valientes	22	12	1.8
Total	385	131	2.9

Source : Flores Agricultural Development Office
Note : All grops are organized by "Cooperativa Carcomal"

Table D.1-4 Farm Size Distribution in the Country and Comayagua

	Whole Country				Comayagua Department				Villá de San Antonio Municipality			
	No. of Farms	(%)	Area (ha)	(%)	No. of Farms	(%)	Area (ha)	(%)	No. of Farms	(%)	Area (ha)	(%)
Under 1 ha	33,771	17	21,542	1	1,707	15	1,094	1	114	24	78	2
1 to 2 ha	38,650	20	53,648	2	2,288	21	3,178	3	102	22	145	4
2 to 3 ha	28,703	15	69,880	3	1,780	16	4,339	3	73	15	172	5
3 to 4 ha	11,659	6	40,790	2	693	6	2,429	2	19	4	66	2
4 to 5 ha	11,998	6	53,133	2	696	6	3,080	2	23	5	106	3
5 to 10 ha	28,264	14	201,274	8	1,690	15	11,973	10	58	12	414	12
10 to 20 ha	19,220	10	268,145	10	1,124	10	15,546	12	46	10	635	18
20 to 50 ha	15,170	8	461,216	18	772	7	23,248	19	29	6	884	25
50 to 100 ha	4,433	2	301,228	11	228	2	15,902	13	4	1	257	7
100 to 200 ha	1,971	1	266,697	10	90	1	11,957	10	1	0	195	6
200 to 500 ha	1,057	1	313,207	12	39	0	12,265	10	2	0	568	16
500 to 1000 ha	276	0	183,769	7	11	0	7,313	6	0	0	0	0
1000 to 2500 ha	129	0	185,980	7	5	0	9,973	8	0	0	0	0
Over 2500 ha	40	0	209,350	8	1	0	2,869	2	0	0	0	0
Total	195,341	100	2,629,859	100	11,124	100	125,166	100	471	100	3,520	100
Average Farm Size (ha)	13.46				11.25				7.47			

Source : Censo Nacional Agropecuario (1974)

D.2 Agricultural Production

(1) Agricultural Production

Table D.2-1 Agricultural Production in the Country and Comayagua in 1973/74 (1/6)

	Whole Country	Centro-Occi-dental Region	Comay-agua Depart-ment	La Paz Depart-ment	Villa de San Antonio Municipio
Maize of Rainy Season					
No. of Cropped Farmers	165,953	16,753	9,324	7,429	418
Planted Area (ha)	286,093	26,912	15,535	11,378	678
Production (ton)	309,774	19,396	13,192	6,204	386
Unit Yield (ton/ha)	1.08	0.72	0.85	0.55	0.57
Maize of Dry Season					
No. of Cropped Farmers	25,645	963	804	159	20
Planted Area (ha)	33,799	1,103	937	166	27
Production (ton)	33,566	760	680	80	20
Unit Yield (ton/ha)	0.99	0.69	0.73	0.48	0.74
Maize of Total					
Planted Area (ha)	319,892	28,015	16,471	11,544	705
Production (ton)	343,340	20,156	13,872	6,284	406
Unit Yield (ton/ha)	1.07	0.72	0.84	0.54	0.58
Rice					
No. of Cropped Farmers	16,093	1,073	921	152	11
Planted Area (ha)	14,761	1,051	928	123	19
Production (ton)	19,958	1,308	1,219	89	16
Unit Yield (ton/ha)	1.35	1.25	1.31	0.72	0.86
Frijol of Rainy Season					
No. of Cropped Farmers	39,419	4,199	2,847	1,352	31
Planted Area (ha)	41,868	5,725	3,511	2,214	63
Production (ton)	18,762	2,040	1,678	362	18
Unit Yield (ton/ha)	0.45	0.36	0.48	0.16	0.29
Frijol of Dry Season					
No. of Cropped Farmers	28,438	2,324	1,986	338	39
Planted Area (ha)	28,525	2,338	2,090	248	58
Production (ton)	15,464	1,268	1,164	104	29
Unit Yield (ton/ha)	0.54	0.54	0.56	0.42	0.49
Frijol of Total					
Planted Area (ha)	70,393	8,063	5,601	2,462	121
Production (ton)	34,226	3,308	2,842	466	47
Unit Yield (ton/ha)	0.49	0.41	0.51	0.19	0.38
Sorghum					
No. of Cropped Farmers	38,703	2,291	666	1,625	62
Planted Area (ha)	59,025	4,149	1,546	2,603	131
Production (ton)	40,717	2,719	1,150	1,570	68
Unit Yield (ton/ha)	0.69	0.66	0.74	0.60	0.52

Source : Censo Nacional Agropequario (1974)

Table D.2-1 Agricultural Production in the Country and Comayagua in 1973/74 (2/6)

	Whole Country	Centro-Occi-dental Region	Comay-agua Depart-ment	La Paz Depart-ment	Villa de San Antonio Municipio
Soy Bean					
No. of Cropped Farmers	24	2	2	0	0
Planted Area (ha)	77	2	2	0	0
Production (ton)	96	2	2	0	0
Unit Yield (ton/ha)	1.25	1.00	1.00	-	-
Cotton					
No. of Cropped Farmers	245	0	0	0	0
Planted Area (ha)	6,282	0	0	0	0
Production (ton)	11,874	0	0	0	0
Unit Yield (ton/ha)	1.89	-	-	-	-
Tobacco					
No. of Cropped Farmers	1,013	44	42	2	12
Planted Area (ha)	2,984	95	93	2	19
Production (ton)	3,199	141	139	2	31
Unit Yield (ton/ha)	1.07	1.48	1.49	1.00	1.63
Sesame					
No. of Cropped Farmers	767	8	8	0	0
Planted Area (ha)	1,528	7	7	0	0
Production (ton)	948	7	7	0	0
Unit Yield (ton/ha)	0.62	1.00	1.00	-	-
Sorghum for Forage					
No. of Cropped Farmers	82	6	5	1	0
Planted Area (ha)	741	56	43	13	0
Production (ton)	1,245	66	62	4	0
Unit Yield (ton/ha)	1.68	1.18	1.44	0.31	-
Potatoes					
No. of Cropped Farmers	913	76	49	27	0
Planted Area (ha)	722	63	44	19	0
Production (ton)	3,761	249	192	57	0
Unit Yield (ton/ha)	5.21	3.95	4.36	3.00	-
Yucca					
No. of Cropped Farmers	5,750	443	389	54	0
Planted Area (ha)	3,588	377	330	47	0
Production (ton)	3,290	1,706	1,651	55	0
Unit Yield (ton/ha)	0.92	4.53	5.00	1.17	-

Source : Censo Nacional Agropequario (1974)

Table D.2-1 Agricultural Production in the Country and Comayagua in 1973/74 (3/6)

	Whole Country	Centro-Occi-dental Region	Comay-agua Depart-ment	La Paz Depart-ment	Villa de San Antonio Municipio
Sweet Potatoes					
No. of Cropped Farmers	451	20	13	7	0
Planted Area (ha)	312	21	15	6	0
Production (ton)	910	19	13	6	0
Unit Yield (ton/ha)	2.92	0.90	0.87	1.00	-
Melon					
No. of Cropped Farmers	231	1	0	1	0
Planted Area (ha)	401	1	0	1	0
Production (ton)	648	1	0	1	0
Unit Yield (ton/ha)	1.62	1.00	-	1.00	-
Garlic					
No. of Cropped Farmers	116	12	11	1	0
Planted Area (ha)	87	12	11	1	0
Production (ton)	96	12	11	1	0
Unit Yield (ton/ha)	1.10	1.00	1.00	1.00	-
Tomatoes					
No. of Cropped Farmers	947	351	279	72	45
Planted Area (ha)	1,595	1,218	1,151	67	49
Production (ton)	7,097	6,105	5,383	722	294
Unit Yield (ton/ha)	4.45	5.01	4.68	10.78	6.00
Cabbage					
No. of Cropped Farmers	936	129	86	43	1
Planted Area (ha)	560	92	68	24	1
Production (ton)	1,287	248	212	36	1
Unit Yield (ton/ha)	2.30	2.70	3.12	1.50	1.00
Water Melons					
No. of Cropped Farmers	772	27	15	12	3
Planted Area (ha)	1,221	31	20	11	3
Production (ton)	7,741	187	123	64	23
Unit Yield (ton/ha)	6.34	6.03	6.15	5.82	7.67
Onions					
No. of Cropped Farmers	881	298	280	18	3
Planted Area (ha)	583	204	190	14	2
Production (ton)	1,496	618	600	18	2
Unit Yield (ton/ha)	2.57	3.03	3.16	1.29	1.00

Source : Censo Nacional Agropequario (1974)

Table D.2-1 Agricultural Production in the Country and Comayagua in 1973/74 (4/6)

	Whole Country	Centro-Occi-dental Region	Comay-agua Depart-ment	La Paz Depart-ment	Villa de San Antonio Municipio
Gourds					
No. of Cropped Farmers	4,956	241	96	145	
Production (ton)	4,386	216	101	115	
Chili					
No. of Cropped Farmers	172	56	51	5	
Production (ton)	513	374	364	10	
Lettuce					
No. of Cropped Farmers	174	9	7	2	
Production (ton)	203	8	6	2	
Beet					
No. of Cropped Farmers	174	10	6	4	
Production (ton)	166	8	4	4	
Carrot					
No. of Cropped Farmers	132	11	8	3	0
Production (ton)	222	30	27	3	0
Cauliflower					
No. of Cropped Farmers	82	3	0	3	0
Production (ton)	61	7	0	7	0
Cucumber					
No. of Cropped Farmers	112	25	21	4	1
Production (ton)	175	68	60	8	1
Radish					
No. of Cropped Farmers	130	7	0	7	0
Production (ton)	138	6	0	6	0
Sugar Cane					
No. of Cropped Farmers	17,616	1,446	609	837	2
In Production (ha)	25,983	1,641	1,135	506	2
In Non-production (ha)	2,729	206	166	40	1
Production (ton)	875,630	22,914	13,714	9,200	5
Unit Yield (ton/ha)	33.70	13.97	12.08	18.20	3.33

Source : Censo Nacional Agropequario (1974)

Table D.2-1 Agricultural Production in the Country and Comayagua in 1973/74 (5/6)

	Whole Country	Centro-Occi-dental Region	Comay-agua Depart-ment	La Paz Depart-ment	Villa de San Antonio Municipio
Coffee					
No. of Cropped Farmers	48,715	6,856	3,732	3,124	4
In Production (ha)	101,593	15,235	10,605	4,631	2
In Non-production (ha)	14,215	1,778	1,535	243	2
Production (ton)	41,872	7,057	4,396	2,662	1
Unit Yield (ton/ha)	0.41	0.46	0.41	0.57	0.57
Banana					
No. of Cropped Farmers	5,379	106	40	66	0
In Production (ha)	18,925	996	948	49	0
In Non-production (ha)	338	3	1	2	0
Production (ton)	821,843	51,601	51,424	177	0
Unit Yield (ton/ha)	43.43	51.81	54.27	3.65	-
Platanos					
No. of Cropped Farmers	5,396	113	88	25	3
In Production (ha)	7,630	84	61	23	3
In Non-production (ha)	1,181	2	2	0	0
Production (ton)	51,600	300	229	71	12
Unit Yield (ton/ha)	6.76	3.59	3.75	3.16	4.00
Other Bananas					
No. of Cropped Farmers	4,913	534	279	255	0
In Production (ha)	2,757	329	151	179	0
In Non-production (ha)	144	8	5	3	0
Production (ton)	7,715	683	361	322	0
Unit Yield (ton/ha)	2.80	2.07	2.40	1.80	-
Orange					
No. of Cropped Farmers	2,031	172	150	22	1
In Production (ha)	2,603	148	135	13	1
In Non-production (ha)	351	21	21	0	0
Production (ton)	6,839	434	400	34	1
Unit Yield (ton/ha)	2.63	2.93	2.95	2.72	1.00
Grape Fruits					
No. of Cropped Farmers	142	12	12	0	0
In Production (ha)	731	11	11	0	0
In Non-production (ha)	734	0	0	0	0
Production (ton)	5,752	52	52	0	0
Unit Yield (ton/ha)	7.87	4.84	4.84	-	-

Source : Censo Nacional Agropequario (1974)

Table D.2-1 Agricultural Production in the Country and Comayagua in 1973/74 (6/6)

	Whole Country	Centro-Occi-dental Region	Comay-agua Depart-ment	La Paz Depart-ment	Villa de San Antonio Municipio
Other Citrus					
No. of Cropped Farmers	121	23	21	2	0
In Production (ha)	148	50	48	2	0
In Non-production (ha)	28	31	31	0	0
Production (ton)	1,599	1,397	1,395	2	0
Unit Yield (ton/ha)	10.81	28.22	29.37	1.00	-
Mangos					
No. of Cropped Farmers	914	53	41	12	1
In Production (ha)	560	44	37	8	1
In Non-production (ha)	21	1	1	0	0
Production (ton)	3,263	170	153	17	4
Unit Yield (ton/ha)	5.82	3.86	4.19	2.27	4.00
Pineapple					
No. of Cropped Farmers	1,669	54	40	14	1
In Production (ha)	1,345	42	31	11	2
In Non-production (ha)	96	2	2	0	0
Production (ton)	13,011	51	36	15	1
Unit Yield (ton/ha)	9.68	1.23	1.18	1.36	0.50
Avocado					
No. of Cropped Farmers	326	17	13	4	1
In Production (ha)	227	13	11	2	1
In Non-production (ha)	6	0	0	0	0
Production (ton)	436	16	10	6	3
Unit Yield (ton/ha)	1.92	1.23	0.91	3.00	3.00
Coconuts					
No. of Cropped Farmers	1,270	1	1	0	2
In Production (ha)	3,857	1	1	0	1
In Non-production (ha)	359	0	0	0	1
Production (ton)	16,608	3	3	0	4
Unit Yield (ton/ha)	4.31	3.00	3.00	-	4.00

Source : Censo Nacional Agropequario (1974)

Table D.2-2 Production of Maize in 1980/81 to 1989/90

Year	Season	Centro Occidental Region			Whole Country		
		Area ha	Production ton	Yield ton/ha	Area ha	Production ton	Yield ton/ha
1980/81	Wet season	37,198	30,043	0.81	251,050	284,764	1.13
	Dry season	4,994	5,140	1.03	87,078	102,560	1.18
	Total	42,192	35,183	0.83	338,127	387,324	1.15
1981/82	Wet season	34,425	32,986	0.96	259,785	380,397	1.46
	Dry season	3,296	2,972	0.90	77,748	100,151	1.29
	Total	37,721	35,958	0.95	337,533	480,548	1.42
1982/83	Wet season	26,853	19,846	0.74	204,381	300,971	1.47
	Dry season	2,672	1,936	0.72	66,564	64,680	0.97
	Total	29,526	21,782	0.74	270,945	365,650	1.35
1983/84	Wet season	31,504	27,609	0.88	235,204	370,056	1.57
	Dry season	3,697	3,225	0.87	72,278	88,079	1.22
	Total	35,201	30,834	0.88	307,482	458,134	1.49
1984/85	Wet season	49,865	37,316	0.75	294,449	406,048	1.38
	Dry season	1,818	1,674	0.92	72,781	100,641	1.38
	Total	51,684	38,990	0.75	367,230	506,689	1.38
1985/86	Wet season	22,953	10,937	0.48	207,238	316,769	1.53
	Dry season	5,183	4,940	0.95	80,321	106,224	1.32
	Total	28,136	15,877	0.56	287,559	422,994	1.47
1986/87	Wet season	44,069	43,864	1.00	263,935	376,741	1.43
	Dry season	4,175	2,963	0.71	71,367	96,443	1.35
	Total	48,244	46,827	0.97	335,302	473,184	1.41
1987/88	Wet season	52,542	46,492	0.88	340,986	556,132	1.63
	Dry season	3,203	2,257	0.70	58,789	85,003	1.45
	Total	55,745	48,748	0.87	399,776	641,135	1.60
1988/89	Wet season	52,281	56,474	1.08	278,647	437,373	1.57
	Dry season	7,317	6,691	0.91	94,966	133,982	1.41
	Total	59,598	63,166	1.06	373,612	571,355	1.53
1989/90	Wet season	46,189	41,046	0.89	276,015	404,381	1.47
	Dry season						
	Total						
1980/81 to 1989/90		434,236	378,411	0.87	3,293,581	4,711,394	1.43

Source : Encuesta Agricola Nacional, Pronostico de Cosecha de Granos Basicos, SECPLAN

Table D.2-3 Production of Rice in 1980/81 to 1989/90

Year	Season	Centro Occidental Region			Whole Country		
		Area ha	Production ton	Yield ton/ha	Area ha	Production ton	Yield ton/ha
1980/81	Wet season	2,620	3,684	1.41	17,267	32,021	1.85
	Dry season	312	325	1.04	2,327	3,835	1.65
	Total	2,932	4,009	1.37	19,593	35,856	1.83
1981/82	Wet season	3,192	3,706	1.16	20,672	35,646	1.72
	Dry season	0	0	-	449	989	2.20
	Total	3,192	3,706	1.16	21,121	36,634	1.73
1982/83	Wet season	958	712	0.74	14,357	21,533	1.50
	Dry season	48	60	1.25	627	379	0.60
	Total	1,006	773	0.77	14,983	21,912	1.46
1983/84	Wet season	2,697	7,288	2.70	18,012	36,756	2.04
	Dry season	428	797	1.86	3,661	9,499	2.59
	Total	3,125	8,085	2.59	21,673	46,255	2.13
1984/85	Wet season	1,395	4,539	3.25	17,208	46,482	2.70
	Dry season	42	227	5.42	620	2,104	3.39
	Total	1,437	4,766	3.32	17,829	48,586	2.73
1985/86	Wet season	1,482	3,850	2.60	13,046	41,325	3.17
	Dry season	181	717	3.96	1,545	4,306	2.79
	Total	1,663	4,567	2.75	14,591	45,631	3.13
1986/87	Wet season	760	2,417	3.18	12,113	29,941	2.47
	Dry season	81	208	2.57	688	2,096	3.05
	Total	841	2,625	3.12	12,801	32,038	2.50
1987/88	Wet season	2,377	5,551	2.34	19,204	55,576	2.89
	Dry season	266	745	2.80	1,409	2,853	2.03
	Total	2,643	6,296	2.38	20,613	58,429	2.83
1988/89	Wet season	2,533	6,271	2.48	15,435	37,119	2.40
	Dry season	431	1,040	2.41	2,913	9,011	3.09
	Total	2,964	7,311	2.47	18,349	46,130	2.51
1989/90	Wet season	2,725	6,847	2.51	14,896	38,784	2.60
	Dry season						
	Total						
1980/81 to 1989/90		22,528	48,985	2.17	176,449	410,255	2.33

Source : Encuesta Agricola Nacional, Pronostico de Cosecha de Granos Basicos, SECPLAN

Table D.2-4 Production of Frijol (Kidney) Beans in 1980/81 to 1989/90

Year	Season	Centro Occidental Region			Whole Country		
		Area ha	Production ton	Yield ton/ha	Area ha	Production ton	Yield ton/ha
1980/81	Wet season	5,392	1,865	0.35	36,514	20,128	0.55
	Dry season	4,512	2,114	0.47	31,526	15,732	0.50
	Total	9,904	3,979	0.40	68,040	35,860	0.53
1981/82	Wet season	8,057	2,175	0.27	38,952	23,204	0.60
	Dry season	3,426	1,719	0.50	37,190	18,954	0.51
	Total	11,482	3,893	0.34	76,142	42,158	0.55
1982/83	Wet season	4,770	1,441	0.30	21,363	13,639	0.64
	Dry season	3,560	2,168	0.61	29,493	16,988	0.58
	Total	8,329	3,609	0.43	50,856	30,628	0.60
1983/84	Wet season	7,224	1,598	0.22	22,312	11,289	0.51
	Dry season	3,470	2,129	0.61	28,192	19,253	0.68
	Total	10,694	3,726	0.35	50,505	30,542	0.60
1984/85	Wet season	3,308	625	0.19	27,518	15,985	0.58
	Dry season	1,216	724	0.59	31,085	16,838	0.54
	Total	4,524	1,349	0.30	58,603	32,824	0.56
1985/86	Wet season	2,644	674	0.26	31,249	18,977	0.61
	Dry season	1,998	960	0.48	36,077	19,649	0.54
	Total	4,642	1,635	0.35	67,326	38,626	0.57
1986/87	Wet season	7,841	2,116	0.27	38,409	20,325	0.53
	Dry season	2,389	1,013	0.42	45,278	36,059	0.80
	Total	10,230	3,129	0.31	83,687	56,383	0.67
1987/88	Wet season	9,943	3,580	0.36	57,130	33,285	0.58
	Dry season	1,607	420	0.26	25,126	13,733	0.55
	Total	11,549	4,000	0.35	82,256	47,017	0.57
1988/89	Wet season	10,622	4,350	0.41	45,638	24,824	0.54
	Dry season	6,450	3,619	0.56	99,112	73,291	0.74
	Total	17,072	7,969	0.47	144,750	98,115	0.68
1989/90	Wet season	1,874	661	0.35	24,060	16,332	0.68
	Dry season						
	Total						
1980/81 to	1989/90	90,301	33,949	0.38	706,225	428,484	0.61

Source : Encuesta Agricola Nacional, Pronostico de Cosecha de Granos Basicos, SECPLAN

Table D.2-5 Production of Sorghum in 1980/81 to 1989/90

Year	Season	Centro Occidental Region			Whole Country		
		Area ha	Production ton	Yield ton/ha	Area ha	Production ton	Yield ton/ha
1980/81	Wet season	7,026	5,771	0.82	54,130	45,574	0.84
	Dry season	192	174	0.91	7,512	6,522	0.87
	Total	7,217	5,946	0.82	61,642	52,096	0.85
1981/82	Wet season	8,248	9,412	1.14	52,145	52,030	1.00
	Dry season	1,175	1,379	1.17	5,968	5,936	0.99
	Total	9,423	10,791	1.15	58,114	57,966	1.00
1982/83	Wet season	3,633	6,410	1.76	18,668	25,824	1.38
	Dry season	1,228	910	0.74	6,529	6,403	0.98
	Total	4,862	7,320	1.51	25,197	32,226	1.28
1983/84	Wet season	9,617	6,985	0.73	46,506	43,059	0.93
	Dry season	36	26	0.73	4,333	3,447	0.80
	Total	9,652	7,011	0.73	50,838	46,506	0.91
1984/85	Wet season	6,500	5,233	0.81	55,813	48,850	0.88
	Dry season	770	931	1.21	3,515	3,516	1.00
	Total	7,270	6,164	0.85	59,328	52,365	0.88
1985/86	Wet season	1,337	1,076	0.80	6,493	7,362	1.13
	Dry season	1,046	884	0.84	7,215	4,792	0.66
	Total	2,383	1,959	0.82	13,708	12,154	0.89
1986/87	Wet season	4,947	4,458	0.90	35,987	14,289	0.40
	Dry season	2,152	1,496	0.70	9,259	7,547	0.82
	Total	7,099	5,954	0.84	45,246	21,836	0.48
1987/88	Wet season	10,974	8,770	0.80	58,740	61,141	1.04
	Dry season	0	0	-	1,664	1,370	0.82
	Total	10,974	8,770	0.80	60,404	62,510	1.03
1988/89	Wet season	6,628	5,309	0.80	40,416	37,783	0.93
	Dry season	1,530	1,362	0.89	15,876	13,700	0.86
	Total	8,158	6,670	0.82	56,293	51,483	0.91
1989/90	Wet season	13,410	10,658	0.79	51,197	46,709	0.91
	Dry season						
	Total						
1980/81 to 1989/90		80,448	71,243	0.89	481,966	435,853	0.90

Source : Encuesta Agricola Nacional, Pronostico de Cosecha de Granos Basicos, SECPLAN

Table D.2-6 Agricultural Production of Major Crops in Honduras

Year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Maize																				
Planted area(ha)	316,782	323,697	330,631	320,746	320,127	314,440	337,538	303,477	313,234	325,364	291,060	339,194	339,473	334,273	358,238	330,559	316,898	340,054	317,665	349,593
Production (1000ton)	352.5	359.1	361.8	350.4	358.4	343.0	377.9	343.6	369.6	362.0	333.5	418.4	404.0	388.1	430.0	426.5	405.6	399.0	431.8	497.9
Unit yield (ton/ha)	1.11	1.11	1.09	1.09	1.12	1.09	1.12	1.13	1.18	1.11	1.15	1.23	1.19	1.16	1.20	1.29	1.28	1.17	1.36	1.42
Rice																				
Planted area(ha)	8,282	13,990	14,791	14,756	14,565	14,754	14,721	13,749	14,912	18,119	19,597	21,121	22,811	25,152	21,790	18,694	20,654	20,481	16,890	22,959
Production (1000ton)	15.1	29.3	36.4	31.6	30.6	34.0	35.0	29.2	37.4	41.1	45.1	45.0	49.7	63.7	58.6	52.2	61.9	57.0	47.4	65.8
Unit yield (ton/ha)	1.83	2.10	2.46	2.14	2.10	2.30	2.38	2.12	2.51	2.27	2.30	2.13	2.18	2.53	2.69	2.79	3.00	2.78	2.81	2.86
Frijol (Kidney Beans)																				
Planted area(ha)	71,552	79,757	73,618	66,954	73,445	72,511	65,950	66,438	66,354	65,906	68,024	76,124	70,682	63,455	70,276	78,316	83,995	84,271	96,875	83,549
Production (1000ton)	47.9	54.6	49.7	41.9	51.7	47.5	43.0	43.1	44.4	43.9	44.9	54.2	54.4	44.8	49.8	50.6	50.5	45.0	23.2	59.2
Unit yield (ton/ha)	0.67	0.68	0.68	0.63	0.70	0.66	0.65	0.65	0.67	0.67	0.66	0.71	0.77	0.71	0.71	0.65	0.60	0.53	0.24	0.71
Sorghum																				
Planted area(ha)	58,868	60,125	60,077	59,585	62,103	60,175	62,685	60,186	60,088	60,569	61,237	49,348	47,809	50,964	55,882	45,285	48,455	54,816	48,800	61,926
Production (1000ton)	46.0	47.7	50.7	49.3	52.2	48.7	52.4	49.3	50.7	39.0	52.1	42.0	42.4	44.4	49.0	38.6	32.1	36.3	46.2	55.4
Unit yield (ton/ha)	0.78	0.79	0.84	0.83	0.84	0.81	0.84	0.82	0.84	0.64	0.85	0.85	0.89	0.87	0.88	0.85	0.66	0.66	0.95	0.89
Coffee																				
Planted area(ha)	93,137	95,864	98,671	101,560	108,615	110,493	112,402	114,346	116,322	118,333	120,379	121,562	122,462	123,662	121,962	123,758	122,337	124,188	125,894	140,632
Production (1000ton)	33.7	36.0	36.4	48.0	45.4	51.0	50.1	48.3	66.7	72.5	69.7	80.4	77.0	90.3	69.2	88.3	76.1	79.9	93.8	98.8
Unit yield (ton/ha)	0.36	0.38	0.37	0.47	0.42	0.46	0.45	0.42	0.57	0.61	0.58	0.66	0.63	0.73	0.57	0.71	0.62	0.64	0.75	0.70
Banana																				
Planted area(ha)	22,137	21,300	21,599	22,689	18,919	19,243	18,414	19,501	20,482	20,893	20,675	20,002	20,608	19,066	20,327	20,698	19,740	20,564	20,974	20,994
Production (1000ton)	956.1	1,188.4	1,070.1	1,043.8	861.9	582.0	812.9	939.9	952.1	1,122.8	1,096.4	1,002.5	1,050.4	874.9	990.4	1,089.0	1,018.0	1,150.2	1,106.5	1,076.5
Unit yield (ton/ha)	43.2	55.8	49.5	46.0	45.6	30.2	44.1	48.2	46.5	53.7	53.0	50.1	51.0	45.9	48.7	52.6	51.6	55.9	52.8	51.3
Platano (Cooking Banana)																				
Planted area(ha)	6,810	7,677	7,828	8,252	7,733	6,378	7,485	5,610	5,874	9,017	7,302	7,276	7,409	7,415	7,548	8,035	8,889	9,614	10,373	10,528
Production (1000ton)	82.9	87.5	94.3	102.2	95.6	83.0	95.0	93.7	91.7	96.5	110.5	112.2	116.0	118.1	122.8	133.8	146.9	157.6	159.8	172.3
Unit yield (ton/ha)	12.2	11.4	12.1	12.4	12.4	13.0	12.7	16.7	15.6	10.7	15.1	15.4	15.7	15.9	16.3	16.7	16.5	16.4	15.4	16.4
Sugar cane																				
Planted area(ha)	25,101	25,162	25,402	24,203	26,979	27,221	27,917	30,925	32,535	36,877	39,856	43,973	44,879	44,223	44,304	44,637	41,683	41,612	38,304	40,533
Production (1000ton)	1,374.2	1,406.8	1,484.5	1,157.1	1,570.9	1,556.8	1,644.8	1,992.9	2,101.1	2,554.9	2,864.7	2,879.7	3,051.8	3,149.5	3,047.3	2,988.3	2,988.0	2,658.4	2,503.4	2,664.6
Unit yield (ton/ha)	54.7	55.9	58.4	47.8	58.2	57.2	58.9	64.4	64.6	69.3	71.9	65.5	68.0	71.2	68.8	66.9	71.7	63.9	65.4	65.7
Cotton																				
Planted area(ha)	3,252	3,636	7,238	9,283	8,207	4,599	10,242	17,702	11,947	11,120	8,541	7,997	4,374	4,508	7,608	7,237	4,121	3,990	4,378	2,035
Production (1000ton)	5.7	6.4	12.2	14.9	14.6	8.8	19.8	31.7	21.1	24.7	21.2	18.6	8.2	12.8	17.9	14.6	8.9	8.0	8.5	4.6
Unit yield (ton/ha)	1.76	1.77	1.68	1.60	1.77	1.90	1.93	1.79	1.77	2.22	2.48	2.33	1.87	2.85	2.35	2.01	2.17	2.01	1.94	2.27
African palm																				
Planted area(ha)	4,432	4,706	5,154	5,412	5,937	7,638	7,677	13,198	15,233	18,478	17,711	20,148	20,299	20,435	20,453	22,232	23,013	20,214	22,521	23,686
Production (1000ton)	32.8	43.3	47.9	51.8	50.8	51.1	49.5	56.7	61.9	60.9	85.7	107.7	159.2	200.0	259.6	311.6	325.3	293.5	314.0	298.9
Unit yield (ton/ha)	7.40	9.19	9.29	9.58	8.56	6.69	6.44	4.30	4.06	3.30	4.84	5.35	7.84	9.79	12.69	14.02	14.13	14.52	13.94	12.62
Tobacco																				
Planted area(ha)	4,560	3,420	3,507	4,136	5,327	5,982	6,763	7,823	7,861	8,644	8,428	8,381	7,431	7,593	7,213	7,010	6,304	6,232	6,230	7,293
Production (1000ton)	3.9	2.9	3.0	3.6	4.6	5.2	5.9	6.8	6.8	7.5	7.3	7.3	6.4	6.6	5.4	5.3	4.7	4.3	4.8	6.3
Unit yield (ton/ha)	0.87	0.86	0.87	0.87	0.87	0.86	0.87	0.86	0.87	0.87	0.87	0.87	0.87	0.87	0.75	0.75	0.75	0.68	0.77	0.86

Source : Banco Central de Honduras, Depto. Estudios Economicos

(2) Livestock Production

Table D.2-7 Number of Cattle in the Country and Comayagua

(unit : Number of animals)

	Whole Country	Comayagua Department	Villa de San Antonio Municipality
No. of Cattle Raising Farmers	82,610	4,087	198
Calf (under 1 year)	451,166	22,913	1,150
Heifer (1 to 2 years)	342,438	14,925	616
Cow	622,702	30,840	1,520
Young bull (under 1 year)	146,514	6,457	228
Young bull (1 to 2 years)	82,723	1,703	212
Bull for beef	67,615	840	9
Ox	51,645	3,410	205
Stud bull	30,312	1,305	44
Total cattle	1,795,115	82,393	3,984

Source : Censo Nacional Agropecuario, 1974

Table D.2-8 Production of Livestock Sector in Honduras

Year	Beef	Pork	Sheep & Goat	Chicken	Other Birds	Eggs	Milk
	ton	ton	ton	ton	ton	million pieces	million liters
1978	66,208	7,707	286	13,303	482	450.5	218.6
1979	68,260	7,905	294	13,674	495	470.9	227.4
1980	64,474	7,974	303	14,059	509	453.8	231.8
1981	61,674	8,150	311	14,458	523	507.3	233.8
1982	62,260	8,646	315	14,872	538	502.7	236.6
1983	59,400	8,946	324	15,300	554	514.5	244.4
1984	59,128	9,233	334	15,746	570	538.0	249.7
1985	63,626	9,507	343	16,207	587	553.2	257.9
1986	70,309	9,775	354	16,677	604	569.3	269.3
1987	73,636	10,055	364	17,160	621	585.0	282.7
1988/1	80,003	10,340	374	17,658	639	603.9	298.7
1989/2	81,249	10,634	385	18,170	658	621.0	316.9

/1 : Preliminary
/2 : Estimated
Source : Departamento Estudios Economicos, Banco Central de Honduras
Compendio Estadistico P.19

(3) Agricultural Labor Force

Table D.2-9 Labor Requirement per Hectare by Month

(unit : man-day/ha)

Crop	Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
	(ha)													
Maize-1	270	-	-	-	2	7	10	14	11	9	7	-	-	60
Maize-2	420	10	14	11	7	-	-	-	-	-	2	7	9	60
Rice	480	-	-	2	7	8	8	8	7	7	7	3	-	57
Sorghum	20	-	-	-	-	3	6	12	12	3	-	-	-	36
Kidney bean-1	20	-	-	-	-	5	9	11	11	10	3	-	-	49
Kidney Bean-2	50	11	10	3	-	-	-	-	-	-	5	9	11	49
Vegetable-1	95	-	-	-	5	26	30	33	37	37	30	23	-	221
Vegetable-2	40	37	37	30	23	-	-	-	-	5	26	30	33	221
Vegetable-3	150	37	30	23	-	-	-	-	5	26	30	33	37	221
Tobacco	40	36	57	8	-	-	-	-	15	36	28	24	20	224
Coffee	50	12	12	17	19	16	13	12	12	11	12	12	12	160
Papaya	30	13	13	13	13	11	11	11	11	11	11	12	12	142
Avocado	30	14	14	14	13	13	13	13	13	12	11	14	14	158
Mango	20	14	14	14	13	13	13	13	13	12	11	14	14	158
Orange	10	14	14	14	13	13	13	13	13	12	11	14	14	158
Pasture	970	5	5	5	5	5	5	5	5	5	5	5	5	60

Table D.2-10 Labor Balance by Month in Present Condition

(unit : man-day)

Crop	Area	Jan	Feb	Mar	Apr.	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
	(ha)													
Maize-1	270	0	0	0	540	1,890	2,700	3,780	2,970	2,430	1,890	0	0	16,200
Maize-2	420	4,200	5,880	4,620	2,940	0	0	0	0	0	840	2,940	3,780	25,200
Rice	480	0	0	960	3,360	3,840	3,840	3,840	3,360	3,360	3,360	1,440	0	27,360
Kidney bean-1	20	0	0	0	0	100	180	220	220	200	60	0	0	980
Kidney bean-2	50	550	500	150	0	0	0	0	0	0	250	450	550	2,450
Sorghum	20	0	0	0	0	60	120	240	240	60	0	0	0	720
Vegetables-1	95	0	0	0	475	2,470	2,850	3,135	3,515	3,515	2,850	2,185	0	20,995
Vegetables-2	40	1,480	1,480	1,200	920	0	0	0	0	200	1,040	1,200	1,320	8,840
Vegetables-3	150	5,550	4,500	3,450	0	0	0	0	750	3,900	4,500	4,950	5,550	33,150
Tobacco	40	1,440	2,280	320	0	0	0	0	600	1,440	1,120	960	800	8,960
Coffee	50	600	600	850	950	800	650	600	600	550	600	600	600	8,000
Papaya	30	390	390	390	390	330	330	330	330	330	330	360	360	4,260
Avocado	30	420	420	420	390	390	390	390	390	360	330	420	420	4,740
Mango	20	280	280	280	260	260	260	260	260	240	220	280	280	3,160
Orange	10	140	140	140	130	130	130	130	130	120	110	140	140	1,580
Pasture	970	4,850	4,850	4,850	4,850	4,850	4,850	4,850	4,850	4,850	4,850	4,850	4,850	58,200
Total (A)		19,900	21,320	17,630	15,205	15,120	16,300	17,775	18,215	21,555	22,350	20,775	18,650	224,795
Available labor (B)		43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	525,600
Difference (B-A)		23,900	22,480	26,170	28,595	28,680	27,500	26,025	25,585	22,245	21,450	23,025	25,150	300,805
(A/B)		0.45	0.49	0.40	0.35	0.35	0.37	0.41	0.42	0.49	0.51	0.47	0.43	0.43

Note : Available labor
Population in the project area at present (a) ; 8,570
Economical active population (b) ; (a) x 0.30 = 2,570
Agricultural labor (c) ; (b) x 0.70 = 1,800
Available agricultural labor force per month ; (c) x 365 day x 0.80 /12 month = 43,800 man-day

(4) Agricultural Machinery

Table D.2-11 Total Working Hectares of Agricultural Machineries by month in Present Condition

(unit : ha)

	Cropped Area/2	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
	(ha)													
1 Tractor /1	2,695	24.0	0.0	576.0	832.5	726.2	259.3	61.8	60.2	58.0	362.0	592.0	366.0	3,917.9
(Attachment for tractor)														
2 Subsoiler	2,695	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3 Plow	2,695	12.0	0.0	192.0	271.0	265.5	129.7	30.7	30.0	28.0	181.0	296.0	183.0	1,619.0
4 Disk harrow	2,695	12.0	0.0	384.0	561.5	460.6	129.5	31.1	30.2	30.0	181.0	296.0	183.0	2,299.0
5 Tooth harrow	2,695	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6 Ridger	2,695	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7 Seeder	2,695	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8 Cultivator	2,695	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9 Sprayer	2,695	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10 Combine	2,695	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note /1 : Total hectare of tractor is the summation of attachment working hectares (2 to 9).
/2 : Total cropped area at present

Table D.2-12 Total Working Hours of Agricultural Machineries in Present Condition

(unit : hour)

	Working hour (hr/ha)/2	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
1 Tractor /1		58.9	0.0	1,146.2	1,638.5	1,510.5	636.7	151.2	147.5	139.6	888.7	1,453.4	898.5	8,669.8
(Attachment for tractor)														
2 Subsoiler	2.78	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3 Plow	3.85	46.2	0.0	739.2	1,043.4	1,022.3	499.4	118.2	115.5	107.8	696.9	1,139.6	704.6	6,233.0
4 Disk harrow	1.06	12.7	0.0	407.0	595.2	488.3	137.3	33.0	32.0	31.8	191.9	313.8	194.0	2,436.9
5 Tooth harrow	0.84	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6 Ridger	1.76	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7 Seeder	2.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8 Cultivator	1.39	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9 Sprayer	0.79	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10 Combine	1.19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note /1 : Total working hour of tractor is the summation of attachment working hours (2 to 9).
/2 : Refer Table D.8-2

Table D.2-13 Number of Agricultural Machinery Requirement in Present Condition

(unit : No. of machinery)

		Working hour (hr/ha)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Peak Month
1	Tractor /1		0.31	0.00	5.97	8.53	7.87	3.32	0.79	0.77	0.73	4.63	7.57	4.68	9
(Attachment for tractor)															
2	Subsoiler	2.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
3	Plow	3.85	0.24	0.00	3.85	5.43	5.32	2.60	0.62	0.60	0.56	3.63	5.94	3.67	6
4	Disk harrow	1.06	0.07	0.00	2.12	3.10	2.54	0.72	0.17	0.17	0.17	1.00	1.63	1.01	4
5	Tooth harrow	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
6	Ridger	1.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
7	Seeder	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
8	Cultivator	1.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
9	Sprayer	0.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
10	Combine	1.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0

Note /1 : Total requirement of tractor is the summation of attachment requirement (2 to 9).

(5) Farm Inputs

Table D.2-14 Farm Input Requirement per Hectare in Present Condition

	Cropped Area ha	Seed kg	Sapling No.	Fertilizer N kg	Fertilizer P2O5 kg	Fertilizer K2O kg	Insect-cide time	Fungi-cide time	Herbi-cide time
Maize	690	16.0	0	30	10	0	1	0	0
Rice	480	75.0	0	60	30	0	1	0	1
Kidney Bean	70	60.0	0	15	15	0	1	0	0
Sorghum	20	10.0	0	5	15	0	0	0	0
Tomato	220	0.3	0	75	20	0	2	2	0
Cucumber	10	2.0	0	60	10	0	1	1	0
Onion	15	1.0	0	90	45	0	1	2	0
Chili	25	2.0	0	60	30	0	1	1	0
Watermelon	15	2.0	0	60	30	0	1	1	0
Tobacco	40	0.5	0	90	45	0	1	1	0
Coffee	50	0.0	30	30	30	30	2	2	0
Papaya	30	0.0	800	90	30	10	2	3	0
Avocado	30	0.0	3	60	45	10	1	2	0
Mango	20	0.0	3	60	45	10	1	2	0
Orange	10	0.0	4	60	45	10	1	2	0
Pasture	970	0.0	0	0	0	0	0	0	0
Total	2,695								

Table D.2-15 Total Requirement of Farm Inputs in Present Condition

	Cropped Area ha	Seed kg	Sapling No.	Fertilizer N kg	Fertilizer P2O5 kg	Fertilizer K2O kg	Insect-cide ha	Fungi-cide ha	Herbi-cide ha
Maize	690	11.0	0	20.7	6.9	0.0	690	0	0
Rice	480	36.0	0	28.8	14.4	0.0	480	0	480
Kidney Bean	70	4.2	0	1.1	1.1	0.0	70	0	0
Sorghum	20	0.2	0	0.1	0.3	0.0	0	0	0
Tomato	220	0.1	0	16.5	4.4	0.0	440	440	0
Cucumber	10	0.0	0	0.6	0.1	0.0	10	10	0
Onion	15	0.0	0	1.4	0.7	0.0	15	30	0
Chili	25	0.1	0	1.5	0.8	0.0	25	25	0
Watermelon	15	0.0	0	0.9	0.5	0.0	15	15	0
Tobacco	40	0.0	0	3.6	1.8	0.0	40	40	0
Coffee	50	0.0	1,500	1.5	1.5	1.5	100	100	0
Papaya	30	0.0	24,000	2.7	0.9	0.3	60	90	0
Avocado	30	0.0	90	1.8	1.4	0.3	30	60	0
Mango	20	0.0	60	1.2	0.9	0.2	20	40	0
Orange	10	0.0	40	0.6	0.5	0.1	10	20	0
Pasture	970	0.0	0	0.0	0.0	0.0	0	0	0
Total	2,695	51.6	25,690	82.9	35.9	2.4	2,005	870	480

(6) Prices of Products and Inputs

Table D.2-16 Farm-Gate Prices of Products

(unit : Lps/ton)

Product	Unit prices (Lps)
Maize	620
Rice	640
Kidney bean	1,400
Sorghum	480
Tomato	450
Cucumber	220
Onion	980
Chili	1,400
Water melon	310
Tobacco	4,400
Coffee	4,200
Papaya	660
Avocado	1,000
Mango	600
Orange	960
Milk	690
Beef (Lived cattle)	1,000

Source: Survey by the Team (Farm house-hold survey)
BCH (Departamento de Estudios)
SECPLAN (Boletin Mensual de Precios de los Principales Productos Agropecuarios)

Table D.2-17 Supporting Prices of Basic Grains by IHMA

(unit : Lps/ton)

Basic Grains	Unit price	(Lps/qq)
Maize (white and yellow)	463	(21.00)
Kidney bean (red)	1,411	(64.00)
Kidney bean (mixed red)	1,367	(62.00)
Kidney bean (black)	1,301	(59.00)
Rice husked	639	(29.00)
Sorghum (white and red)	419	(19.00)
Soy bean	1,080	(49.00)

Note: The prices are applied period of Sep,1989 to Aug,1990.

Quality

	Humidity	Impurity	Wicked grain
Maize	15-13 %	4-1 %	0-7 %
Kidney bean	16-14 %	2-1 %	0-7 %
Soy bean	16-14 %	2-1 %	0-10 %
Rice	15-13 %	2-1 %	0-7 %
Sorghum	13-11 %	2-1 %	0-7 %

(Source : IHMA)

Table D.2-18 Farm-Gate Prices of Farm Input Materials (1/3)

Input	Description	Unit	Unit Price (Lps.)
A. SEEDS			
Maize	Honduras-Planta Baja	kg	1.76 (40 Lps/50 lb)
	Hybrid	kg	2.65 (60 Lps/50 lb)
Rice	CICA-8	kg	2.21 (50 Lps/50 lb)
Frijol Beans	Catrachita	kg	2.43 (55 Lps/50 lb)
Soy Beans		kg	2.43 (55 Lps/50 lb)
Sorghum	Sureno	kg	2.21 (58 Lps/50 lb)
Tomatoes		kg	72.8 (33 Lps/lb)
	Hybrid	kg	187.4 (85 Lps/lb)
Cucumber		kg	63.9 (29 Lps/lb)
	Hybrid	kg	220.5 (100 Lps/lb)
Cabbage		kg	61.7 (28 Lps/lb)
Onion	Hybrid	kg	154.4 (70 Lps/lb)
Chili		kg	194.0 (88 Lps/lb)
	Hybrid	kg	551.3 (250 Lps/lb)
Water Melon		kg	63.9 (29 Lps/lb)
	Hybrid	kg	264.6 (120 Lps/lb)
Melon		kg	68.4 (31 Lps/lb)
	Hybrid	kg	374.9 (170 Lps/lb)
Tobacco		kg	264.6
B. SAPLINGS			
Papaya		plant	2.50
Avocado		plant	13.00
Mango		plant	15.00
Orange		plant	21.00
Coffee		plant	10.00

Source: 1. BOLETIN ANUAL, PRECIOS DE INSUMOS Y AGRICOLA (1989)
2. BANADESA
3. Survey by the Team

Table D.2-18 Farm-Gate Prices of Farm Input Materials (2/3)

Input	Description	Unit	Unit Price (Lps.)
C. FERTILIZERS			
12-24-12		kg	0.702
			(35 Lps/110 lb)
Nutrient content		kg	1.462
18-46-0		kg	0.802
			(40 Lps/110 lb)
Nutrient content		kg	1.253
15-15-15		kg	0.802
			(40 Lps/110 lb)
Nutrient content			1.782
17-50-0		kg	0.882
			(40 Lps/100 lb)
Nutrient content			1.316
Urea	(N=46%)	kg	0.702
			(35 Lps/110 lb)
Nutrient content			1.525
Ammon. Sulphate	(N=20%)	kg	0.375
			(17 Lps/100 lb)
Nutrient content			1.874
TSP	(P_2O_5=46%)	kg	0.782
			(39 Lps/110 lb)
Nutrient content			1.700
Potash	(K_2O=60%)	kg	0.641
			(32 Lps/110 lb)
Nutrient content			1.069
D . INSECTICIDES			
Basamid	granular	kg	21.6
			(9.8Lps/lb)
Counter	10% granular	kg	13.5
Dipel		kg	63.9
			(29.0Lps/lb)
Fenon 200 EC		lit	180.0
Lannate	90%	kg	90.0
Metasystox	R-500	lit	40.5
Nudrin		kg	90.0
Tamaron 600		lit	34.0
Decis		lit	78.0
Perfektion		lit	6.1
			(23 Lps/gallon)
Tambo		lit	90.0
Thiodan		lit	50.0

Source: 1. BOLETIN ANUAL, PRECIOS DE INSUMOS Y AGRICOLA (1989)
2. BANADESA
3. Survey by the Team

Table D.2-18 Farm-Gate Prices of Farm Input Materials (3/3)

Input	Description	Unit	Unit Price (Lps.)
E. FUNGICIDES			
Antracol	70wp	kg	16.0
Daconil	W-75	lit	35.5
Dithane	M-45	kg	17.5
Hinosan		lit	37.0
Kocide 101		kg	14.3 (6.5 Lps/lb)
Ridmil	MZ-58-WP	kg	88.0
F. HERBICIDES			
2-4-D	Concentrated	lit	10.6 (40 Lps/gallon)
Dual		lit	36.0
Fusilade		lit	90.0
Goal 2-S		lit	100.0
Sencor		kg	126.0
Surcopur	360 EC	lit	16.0 (60 Lps/gallon)
Gesaprin 80		kg	16.0
Stam LV-10		lit	13.7 (52 Lps/gallon)
G. WETTING AGENT			
Triton	CS-500	lit	10.5
H. INPUT FOR ANIMAL			
Vaccine		time	2.10
Anthelmintics		time	0.23
Disinfectant for dipping		time	0.13
Mineral rock		kg	4.50
Concentrate feed		kg	0.20

Source: 1. BOLETIN ANUAL, PRECIOS DE INSUMOS Y AGRICOLA (1989)
2. BANADESA
3. Survey by the Team

(7) Production Cost and Profit

Table D.2-19 Production Cost and Profit per Hectare in Present Condition (1/16)

Crop : Maize

Item	Unit	Quantity	Unit price Lps	Amount Lps
A. Gross Income				
1) Product	ton	1.6	620	992.0
2) By-Product				
Total				992.0
B. Production Cost				
1) Labor Cost				
-Family Labor	man-day	45	0	0.0
-Hired Labor	man-day	15	6	90.0
2) Farm Inputs				
-Seed	kg	16	1.76	28.2
-N	kg	30	1.525	45.8
-P2O5	kg	10	1.700	17.0
-K2O	kg	0	1.069	0.0
-Insecticide	time	1	57.5	57.5
-Fungicide	time	0	110.0	0.0
-Herbicide	time	0	109.0	0.0
3) Machinery				
-Subsoiling	time	0	83	0.0
-Plowing	time	1	135	135.0
-Harrowing(Disk)	time	1	37	37.0
-Harrowing(Tooth)	time	0	29	0.0
-Ridging	time	0	53	0.0
-Seeding	time	0	80	0.0
-Cultivating/Weeding	time	0	49	0.0
-Spraying	time	0	24	0.0
-Harvesting	time	0	131	0.0
4) Irrigation	time	6	2	12.0
5) Miscellaneous	(10%)			42.2
Total				464.7
C. Primary Profit (A-B)				527.3
-Profit ratio				0.53
-Profit per growth period		3.33 month		158.4

Table D.2-19 Production Cost and Profit per Hectare in Present Condition (2/16)

Crop : Rice

Item	Unit	Quantity	Unit price Lps	Amount Lps
A. Gross Income				
1) Product	ton	2.6	640	1,664.0
2) By-Product				
Total				1,664.0
B. Production Cost				
1) Labor Cost				
-Family Labor	man-day	43	0	0.0
-Hired Labor	man-day	14	6	84.0
2) Farm Inputs				
-Seed	kg	75	2.21	165.8
-N	kg	60	1.525	91.5
-P2O5	kg	30	1.700	51.0
-K2O	kg	0	1.069	0.0
-Insecticide	time	1	57.5	57.5
-Fungicide	time	0	110.0	0.0
-Herbicide	time	1	109.0	109.0
3) Machinery				
-Subsoiling	time	0	83	0.0
-Plowing	time	1	135	185.0
-Harrowing(Disk)	time	2	37	74.0
-Harrowing(Tooth)	time	0	29	0.0
-Ridging	time	0	53	0.0
-Seeding	time	0	80	0.0
-Cultivating/Weeding	time	0	49	0.0
-Spraying	time	0	24	0.0
-Harvesting	time	0	131	0.0
4) Irrigation	time	10	2	20.0
5) Miscellaneous	(10%)			78.8
Total				866.5
C. Primary Profit (A-B)				797.5
-Profit ratio				0.48
-Profit per growth period		4.67 month		170.8

Table D.2-19 Production Cost and Profit per Hectare in Present Condition (3/16)

Crop : Kidney Beans

Item	Unit	Quantity	Unit price Lps	Amount Lps
A. Gross Income				
1) Product	ton	0.6	1,400	840.0
2) By-Product				
Total				840.0
B. Production Cost				
1) Labor Cost				
-Family Labor	man-day	37	0	0.0
-Hired Labor	man-day	12	6	72.0
2) Farm Inputs				
-Seed	kg	60	2.43	145.8
-N	kg	15	1.525	22.9
-P2O5	kg	15	1.700	25.5
-K2O	kg	0	1.069	0.0
-Insecticide	time	1	57.5	57.5
-Fungicide	time	0	110.0	0.0
-Herbicide	time	0	109.0	0.0
3) Machinery				
-Subsoiling	time	0	83	0.0
-Plowing	time	1	135	135.0
-Harrowing(Disk)	time	1	37	37.0
-Harrowing(Tooth)	time	0	29	0.0
-Ridging	time	0	53	0.0
-Seeding	time	0	80	0.0
-Cultivating/Weeding	time	0	49	0.0
-Spraying	time	0	24	0.0
-Harvesting	time	0	131	0.0
4) Irrigation	time	5	2	10.0
5) Miscellaneous	(10%)			50.6
Total				556.2
C. Primary Profit (A-B)				283.8
-Profit ratio				0.34
-Profit per growth period		2.67 month		106.3

Table D.2-19 Production Cost and Profit per Hectare in Present Condition (4/16)

Crop : Sorghum

Item	Unit	Quantity	Unit price Lps	Amount Lps
A. Gross Income				
1) Product	ton	1.2	480	576.0
2) By-Product				
Total				576.0
B. Production Cost				
1) Labor Cost				
-Family Labor	man-day	27	0	0.0
-Hired Labor	man-day	9	6	54.0
2) Farm Inputs				
-Seed	kg	10	2.21	22.1
-N	kg	5	1.525	7.6
-P2O5	kg	15	1.700	25.5
-K2O	kg	0	1.069	0.0
-Insecticide	time	0	57.5	0.0
-Fungicide	time	0	110.0	0.0
-Herbicide	time	0	109.0	0.0
3) Machinery				
-Subsoiling	time	0	83	0.0
-Plowing	time	1	135	135.0
-Harrowing(Disk)	time	1	37	37.0
-Harrowing(Tooth)	time	0	29	0.0
-Ridging	time	0	53	0.0
-Seeding	time	0	80	0.0
-Cultivating/Weeding	time	0	49	0.0
-Spraying	time	0	24	0.0
-Harvesting	time	0	131	0.0
4) Irrigation	time	0	2	0.0
5) Miscellaneous	(10%)			28.1
Total				309.3
C. Primary Profit (A-B)				266.7
-Profit ratio				0.46
-Profit per growth period		3.33 month		80.1

Table D.2-19 Production Cost and Profit per Hectare in Present Condition (5/16)

Crop : Tomato

Item	Unit	Quantity	Unit price Lps	Amount Lps
A. Gross Income				
1) Product	ton	15.5	450	6,975.0
2) By-Product				
Total				6,975.0
B. Production Cost				
1) Labor Cost				
-Family Labor	man-day	176	0	0.0
-Hired Labor	man-day	59	6	354.0
2) Farm Inputs				
-Seed	kg	0.3	72.8	21.8
-N	kg	75	1.525	114.4
-P2O5	kg	20	1.700	34.0
-K2O	kg	10	1.069	10.7
-Insecticide	time	2	57.5	115.0
-Fungicide	time	2	110.0	220.0
-Herbicide	time	0	109.0	0.0
3) Machinery				
-Subsoiling	time	0	83	0.0
-Plowing	time	1	135	135.0
-Harrowing(Disk)	time	1	37	37.0
-Harrowing(Tooth)	time	0	29	0.0
-Ridging	time	0	53	0.0
-Seeding	time	0	80	0.0
-Cultivating/Weeding	time	0	49	0.0
-Spraying	time	0	24	0.0
-Harvesting	time	0	131	0.0
4) Irrigation	time	6	2	12.0
5) Miscellaneous	(10%)			105.4
Total				1,159.3
C. Primary Profit (A-B)				5,815.7
-Profit ratio				0.83
-Profit per growth period		2.67 month		2,178.2

Table D.2-19 Production Cost and Profit per Hectare in Present Condition (6/16)

Crop : Cucumber

Item	Unit	Quantity	Unit price Lps	Amount Lps
A. Gross Income				
1) Product	ton	10.5	220	2,310.0
2) By-Product				
Total				2,310.0
B. Production Cost				
1) Labor Cost				
-Family Labor	man-day	161	0	0.0
-Hired Labor	man-day	54	6	324.0
2) Farm Inputs				
-Seed	kg	2.0	63.9	127.8
-N	kg	60	1.525	91.5
-P2O5	kg	10	1.700	17.0
-K2O	kg	0	1.069	0.0
-Insecticide	time	1	57.5	57.5
-Fungicide	time	1	110.0	110.0
-Herbicide	time	0	109.0	0.0
3) Machinery				
-Subsoiling	time	0	83	0.0
-Plowing	time	1	135	135.0
-Harrowing(Disk)	time	1	37	37.0
-Harrowing(Tooth)	time	0	29	0.0
-Ridging	time	0	53	0.0
-Seeding	time	0	80	0.0
-Cultivating/Weeding	time	0	49	0.0
-Spraying	time	0	24	0.0
-Harvesting	time	0	131	0.0
4) Irrigation	time	5	2	10.0
5) Miscellaneous	(10%)			91.0
Total				1,000.8
C. Primary Profit (A-B)				1,309.2
-Profit ratio				0.57
-Profit per growth period		2.67 month		490.3

Table D.2-19 Production Cost and Profit per Hectare in Present Condition (7/16)

Crop : Onion

Item	Unit	Quantity	Unit price Lps	Amount Lps
A. Gross Income				
1) Product	ton	8.0	980	7,840.0
2) By-Product				
Total				7,840.0
B. Production Cost				
1) Labor Cost				
-Family Labor	man-day	156	0	0.0
-Hired Labor	man-day	52	6	312.0
2) Farm Inputs				
-Seed	kg	1.0	154.4	154.4
-N	kg	90	1.525	137.3
-P2O5	kg	45	1.700	76.5
-K2O	kg	0	1.069	0.0
-Insecticide	time	1	57.5	57.5
-Fungicide	time	2	110.0	220.0
-Herbicide	time	0	109.0	0.0
3) Machinery				
-Subsoiling	time	0	83	0.0
-Plowing	time	1	135	135.0
-Harrowing(Disk)	time	1	37	37.0
-Harrowing(Tooth)	time	0	29	0.0
-Ridging	time	0	53	0.0
-Seeding	time	0	80	0.0
-Cultivating/Weeding	time	0	49	0.0
-Spraying	time	0	24	0.0
-Harvesting	time	0	131	0.0
4) Irrigation	time	6	2	12.0
5) Miscellaneous	(10%)			114.2
Total				1,255.8
C. Primary Profit (A-B)				6,584.2
-Profit ratio				0.84
-Profit per growth period		3.33 month		1,977.2

Table D.2-19 Production Cost and Profit per Hectare in Present Condition (8/16)

Crop : Chili

Item	Unit	Quantity	Unit price Lps	Amount Lps
A. Gross Income				
1) Product	ton	4.3	1,400	6,020.0
2) By-Product				
Total				6,020.0
B. Production Cost				
1) Labor Cost				
-Family Labor	man-day	119	0	0.0
-Hired Labor	man-day	40	6	240.0
2) Farm Inputs				
-Seed	kg	2.0	154.4	308.8
-N	kg	60	1.525	91.5
-P2O5	kg	30	1.700	51.0
-K2O	kg	0	1.069	0.0
-Insecticide	time	1	57.5	57.5
-Fungicide	time	1	110.0	110.0
-Herbicide	time	0	109.0	0.0
3) Machinery				
-Subsoiling	time	0	83	0.0
-Plowing	time	1	135	135.0
-Harrowing(Disk)	time	1	37	37.0
-Harrowing(Tooth)	time	0	29	0.0
-Ridging	time	0	53	0.0
-Seeding	time	0	80	0.0
-Cultivating/Weeding	time	0	49	0.0
-Spraying	time	0	24	0.0
-Harvesting	time	0	131	0.0
4) Irrigation	time	6	2	12.0
5) Miscellaneous	(10%)			104.3
Total				1,147.1
C. Primary Profit (A-B)				4,872.9
-Profit ratio				0.81
-Profit per growth period		3.33 month		1,463.3

Table D.2-19 Production Cost and Profit per Hectare in Present Condition (9/16)

Crop : Water Melon

Item	Unit	Quantity	Unit price Lps	Amount Lps
A. Gross Income				
1) Product	ton	10.0	310	3,100.0
2) By-Product				
Total				3,100.0
B. Production Cost				
1) Labor Cost				
-Family Labor	man-day	104	0	0.0
-Hired Labor	man-day	34	6	204.0
2) Farm Inputs				
-Seed	kg	2.0	63.9	127.8
-N	kg	60	1.525	91.5
-P2O5	kg	30	1.700	51.0
-K2O	kg	0	1.069	0.0
-Insecticide	time	1	57.5	57.5
-Fungicide	time	1	110.0	110.0
-Herbicide	time	0	109.0	0.0
3) Machinery				
-Subsoiling	time	0	83	0.0
-Plowing	time	1	135	135.0
-Harrowing(Disk)	time	1	37	37.0
-Harrowing(Tooth)	time	0	29	0.0
-Ridging	time	0	53	0.0
-Seeding	time	0	80	0.0
-Cultivating/Weeding	time	0	49	0.0
-Spraying	time	0	24	0.0
-Harvesting	time	0	131	0.0
4) Irrigation	time	6	2	12.0
5) Miscellaneous	(10%)			82.6
Total				908.4
C. Primary Profit (A-B)				2,191.6
-Profit ratio				0.71
-Profit per growth period		3.33 month		658.1

Table D.2-19 Production Cost and Profit per Hectare in Present Condition (10/16)

Crop : Tobacco

Item	Unit	Quantity	Unit price Lps	Amount Lps
A. Gross Income				
1) Product	ton	1.6	4,400	7,040.0
2) By-Product				
Total				7,040.0
B. Production Cost				
1) Labor Cost				
-Family Labor	man-day	168	0	0.0
-Hired Labor	man-day	56	6	336.0
2) Farm Inputs				
-Seed	kg	0.5	264.6	132.3
-N	kg	90	1.525	137.3
-P2O5	kg	45	1.700	76.5
-K2O	kg	0	1.069	0.0
-Insecticide	time	1	57.5	57.5
-Fungicide	time	1	110.0	110.0
-Herbicide	time	0	109.0	0.0
3) Machinery				
-Subsoiling	time	0	83	0.0
-Plowing	time	1	135	135.0
-Harrowing(Disk)	time	1	37	37.0
-Harrowing(Tooth)	time	0	29	0.0
-Ridging	time	0	53	0.0
-Seeding	time	0	80	0.0
-Cultivating/Weeding	time	0	49	0.0
-Spraying	time	0	24	0.0
-Harvesting	time	0	131	0.0
4) Irrigation	time	8	2	16.0
5) Miscellaneous	(10%)			103.8
Total				1,141.3
C. Primary Profit (A-B)				5,898.7
-Profit ratio				0.84
-Profit per growth period		4.67 month		1,263.1

Table D.2-19 Production Cost and Profit per Hectare in Present Condition (11/16)

Crop : Coffee

Item	Unit	Quantity	Unit price Lps	Amount Lps
A. Gross Income				
1) Product	ton	1.0	4,200	4,200.0
2) By-Product				
Total				4,200.0
B. Production Cost				
1) Labor Cost				
-Family Labor	man-day	120	0	0.0
-Hired Labor	man-day	40	6	240.0
2) Farm Inputs				
-Saplings	plant	30	10.0	300.0
-N	kg	30	1.525	45.8
-P2O5	kg	30	1.700	51.0
-K2O	kg	30	1.069	32.1
-Insecticide	time	2	57.5	115.0
-Fungicide	time	2	110.0	220.0
-Herbicide	time	0	109.0	0.0
3) Machinery				
-Subsoiling	time	0	83	0.0
-Plowing	time	0.02	135	2.7
-Harrowing(Disk)	time	0.02	37	0.7
-Harrowing(Tooth)	time	0	29	0.0
-Ridging	time	0	53	0.0
-Seeding	time	0	80	0.0
-Cultivating/Weeding	time	0	49	0.0
-Spraying	time	0	24	0.0
-Harvesting	time	0	131	0.0
4) Irrigation	time	15	2	30.0
5) Miscellaneous	(10%)			103.7
Total				1,141.0
C. Primary Profit (A-B)				3,059.0
-Profit ratio				0.73
-Profit per growth period		12 month		254.9

Table D.2-19 Production Cost and Profit per Hectare in Present Condition (12/16)

Crop : Papaya

Item	Unit	Quantity	Unit price Lps	Amount Lps
A. Gross Income				
1) Product	ton	12.0	660	7,920.0
2) By-Product				
Total				7,920.0
B. Production Cost				
1) Labor Cost				
-Family Labor	man-day	114	0	0.0
-Hired Labor	man-day	28	6	168.0
2) Farm Inputs				
-Saplings	plant	800	2.5	2,000.0
-N	kg	90	1.525	137.3
-P2O5	kg	30	1.700	51.0
-K2O	kg	10	1.069	10.7
-Insecticide	time	2	57.5	115.0
-Fungicide	time	3	110.0	330.0
-Herbicide	time	0	109.0	0.0
3) Machinery				
-Subsoiling	time	0	83	0.0
-Plowing	time	0.25	135	33.8
-Harrowing(Disk)	time	0.25	37	9.3
-Harrowing(Tooth)	time	0	29	0.0
-Ridging	time	0	53	0.0
-Seeding	time	0	80	0.0
-Cultivating/Weeding	time	0	49	0.0
-Spraying	time	0	24	0.0
-Harvesting	time	0	131	0.0
4) Irrigation	time	15	2	30.0
5) Miscellaneous	(10%)			288.5
Total				3,173.4
C. Primary Profit (A-B)				4,746.6
-Profit ratio				0.60
-Profit per growth period		12 month		395.5

Table D.2-19 Production Cost and Profit per Hectare in Present Condition (13/16)

Crop : Avocado

Item	Unit	Quantity	Unit price Lps	Amount Lps
A. Gross Income				
1) Product	ton	4.0	1,000	4,000.0
2) By-Product				
Total				4,000.0
B. Production Cost				
1) Labor Cost				
-Family Labor	man-day	118	0	0.0
-Hired Labor	man-day	40	6	240.0
2) Farm Inputs				
-Saplings	plant	3	13.0	39.0
-N	kg	60	1.525	91.5
-P2O5	kg	45	1.700	76.5
-K2O	kg	10	1.069	10.7
-Insecticide	time	1	57.5	57.5
-Fungicide	time	2	110.0	220.0
-Herbicide	time	0	109.0	0.0
3) Machinery				
-Subsoiling	time	0	83	0.0
-Plowing	time	0.02	135	2.7
-Harrowing(Disk)	time	0.02	37	0.7
-Harrowing(Tooth)	time	0	29	0.0
-Ridging	time	0	53	0.0
-Seeding	time	0	80	0.0
-Cultivating/Weeding	time	0	49	0.0
-Spraying	time	0	24	0.0
-Harvesting	time	0	131	0.0
4) Irrigation	time	15	2	30.0
5) Miscellaneous	(10%)			76.9
Total				845.5
C. Primary Profit (A-B)				3,154.5
-Profit ratio				0.79
-Profit per growth period		12 month		262.9

Table D.2-19 Production Cost and Profit per Hectare in Present Condition (14/16)

Crop : Mango

Item	Unit	Quantity	Unit price Lps	Amount Lps
A. Gross Income				
1) Product	ton	5.0	600	3,000.0
2) By-Product				
Total				3,000.0
B. Production Cost				
1) Labor Cost				
-Family Labor	man-day	118	0	0.0
-Hired Labor	man-day	40	6	240.0
2) Farm Inputs				
-Saplings	plant	3	15	45.0
-N	kg	60	1.525	91.5
-P2O5	kg	45	1.700	76.5
-K2O	kg	10	1.069	10.7
-Insecticide	time	1	57.5	57.5
-Fungicide	time	2	110.0	220.0
-Herbicide	time	0	109.0	0.0
3) Machinery				
-Subsoiling	time	0	83	0.0
-Plowing	time	0.02	135	2.7
-Harrowing(Disk)	time	0.02	37	0.7
-Harrowing(Tooth)	time	0	29	0.0
-Ridging	time	0	53	0.0
-Seeding	time	0	80	0.0
-Cultivating/Weeding	time	0	49	0.0
-Spraying	time	0	24	0.0
-Harvesting	time	0	131	0.0
4) Irrigation	time	15	2	30.0
5) Miscellaneous	(10%)			77.5
Total				852.1
C. Primary Profit (A-B)				2,147.9
-Profit ratio				0.72
-Profit per growth period		12 month		179.0

Table D.2-19 Production Cost and Profit per Hectare in Present Condition (15/16)

Crop : Orange

Item	Unit	Quantity	Unit price Lps	Amount Lps
A. Gross Income				
1) Product	ton	3.5	960	3,360.0
2) By-Product				
Total				3,360.0
B. Production Cost				
1) Labor Cost				
-Family Labor	man-day	118	0	0.0
-Hired Labor	man-day	40	6	240.0
2) Farm Inputs				
-Saplings	plant	4	21	84.0
-N	kg	60	1.525	91.5
-P2O5	kg	45	1.700	76.5
-K2O	kg	10	1.069	10.7
-Insecticide	time	1	57.5	57.5
-Fungicide	time	2	110.0	220.0
-Herbicide	time	0	109.0	0.0
3) Machinery				
-Subsoiling	time	0	83	0.0
-Plowing	time	0.02	135	2.7
-Harrowing(Disk)	time	0.02	37	0.7
-Harrowing(Tooth)	time	0	29	0.0
-Ridging	time	0	53	0.0
-Seeding	time	0	80	0.0
-Cultivating/Weeding	time	0	49	0.0
-Spraying	time	0	24	0.0
-Harvesting	time	0	131	0.0
4) Irrigation	time	15	2	30.0
5) Miscellaneous	(10%)			81.4
Total				895.0
C. Primary Profit (A-B)				2,465.0
-Profit ratio				0.73
-Profit per growth period		12 month		205.4

Table D.2-19 Production Cost and Profit per Hectare in Present Condition (16/16)

Crop : Improved Pasture

Item	Unit	Quantity	Unit price Lps	Amount Lps
A. Gross Income				
1) Milk	ton	1.38	690	952.2
2) Beef	ton	0.069	1,000	69.0
Total				1,021.2
B. Production Cost				
1) Labor Cost				
-Family Labor	man-day	45	0	0.0
-Hired Labor	man-day	15	6	90.0
2) Farm Inputs				
-Seed	kg	0.0	150	0.0
-N	kg	0	1.525	0.0
-P2O5	kg	0	1.700	0.0
-K2O	kg	0	1.069	0.0
3) Animal Health & Feed				
-Vaccination	head	2.3	2.10	4.8
-Anthielmintics	head	2.3	0.23	0.5
-Dipping	head	2.3	0.40	0.9
-Mineral	kg	2.3	4.50	10.4
-Concentrate	kg	0	0.20	0.0
3) Machinery				
-Subsoiling	time	0	83	0.0
-Plowing	time	0.025	135	3.4
-Harrowing(Disk)	time	0.05	37	1.9
-Harrowing(Tooth)	time	0	29	0.0
-Ridging	time	0	53	0.0
-Seeding	time	0	80	0.0
4) Irrigation	time	0	2	0.0
5) Miscellaneous	(10%)			11.2
Total				123.0
C. Primary Profit (A-B)				898.2
-Profit ratio				0.88
-Profit per growth period		12 month		74.8