Table N-1 ESTIMATION OF WORKABLE DAYS

(Unit: day)

Item	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1. Monthly day	31	28	31	30	31	30	31	31	30	31	30	31	365
2. Frequency of rainfall 1/													
0 - 10 mm	1	2	1	2	2	2	2	2	2	2	0	1	19
10 - 30 mm	1	1	2	3	4	2	4	4	5	7	2	1	36
30 - 50 mm	1	2	1	1	2	0	0	1	1	2	0	1	12
more than 50 mm	1	0	0	2	1	0	0	0	1	1	0	1	7
3. Time length to be suspended	6	5	3	10	9	1	2	4	8	11	1	6	66
4. Workable days	25	23	28	20	22	29	29	27	22	20	29	25	299

Remarks: 1/: Averaged data from 1979 to 1983 at Lacovia rainfall station.

Table N-2 SUMMARY OF INITIAL INVESTMENT COST

(Unit: US$10^3)

	Item	Foreign Currency	Local Currency	Total
I.	Construction Cost			
1.1	*Direct Construction Cost*			
	Holland Area	2,460	1,570	4,030
	Black River Left Bank Area	5,060	2,390	7,450
	Broad River Right Bank Area	3,840	1,770	5,610
	Broad River Left Bank Area	3,870	1,910	5,780
	Office & Quarters	720	780	1,500
	Observation Wells	50	20	70
	Conservation of Environment	100	100	200
	Sub-total	16,100	8,540	24,640
1.2	O & M Equipment	830	0	830
1.3	General Expense	0	650	650 1/
1.4	*Land Acquisition*	*0*	730	730
1.5	Engineering Service	2,930	1,110	4,040 2/
	Sub-total	19,860	11,030	30,840
1.6	Physical Contingency	1,990	1,100	3,080
	Sub-total	21,850	12,130	33,980
1.7	Price Contingency	4,370	5,090	9,460
	Sub-total	26,220	17,220	43,440
II.	Farm Guidance Service	2,790	180	2,970
III.	Farm Machinery (see Annex G)	7,470	440	7,910
IV.	Total (I + II)	36,480	17,840	54,320
V.	Post Harvest Facility (see Annex G)	10,830	860	11,690
VI.	Social Infrastructures (see Annex F)	-	5,610	5,610
VII.	Grand Total (IV + V + VI)	47,310	24,310	71,620

Remarks: 1/: Including environmental monitoring cost.
2/: Including cost for investigation and computer model simulation analysis of post project ground water inflow.

Table N-3 ANNUAL DISBURSEMENT SCHEDULE

(Unit: US$10³)

Item	1st Year		2nd Year		3rd Year		4th Year		5th Year		6th Year		7th Year	
	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.
I. Construction														
1.1 Direct Construction Cost														
Holland Area	0	0	586	384	1,287	682	587	502	0	0	0	0	0	0
Black River Left Bank Area	0	0	999	340	2,259	901	1,414	854	390	290	0	0	0	0
Broad River Right Bank Area	0	0	0	0	1,007	346	1,249	546	973	450	610	429	0	0
Broad River Left Bank Area	0	0	0	0	829	232	1,293	605	1,039	500	708	569	0	0
Office & Quarters	0	0	720	780	0	0	0	0	0	0	0	0	0	0
Observation Wells	0	0	54	23	0	0	0	0	0	0	0	0	0	0
Conservation of Environment	0	0	20	20	20	20	20	20	20	20	20	20	0	0
Sub-total	0	0	2,379	1,547	5,402	2,181	4,563	2,527	2,422	1,260	1,338	1,018	0	0
1.2 O & M Equipment	0	0	0	0	0	0	430	0	0	0	400	0	0	0
1.3 General Expense	0	58	0	106	0	114	0	123	0	123	0	123	0	0
1.4 Land Acquisition	0	360	0	370	0	0	0	0	0	0	0	0	0	0
1.5 Engineering Services	580	220	470	180	470	180	470	180	470	180	470	172	0	0
Sub-total	580	638	2,849	2,203	5,872	2,475	5,463	2,830	2,892	1,563	2,208	1,313	0	0
1.6 Physical Contingency	58	64	285	220	587	248	546	283	289	156	221	131	0	0
Sub-total	638	702	3,134	2,423	6,459	2,723	6,009	3,113	3,181	1,719	2,429	1,444	0	0
1.7 Price Contingency	32	70	321	509	1,018	901	1,295	1,445	879	1,050	826	1,114	0	0
Sub-total	670	772	3,455	2,932	7,477	3,624	7,304	4,558	4,060	2,769	3,255	2,558	0	0
II. Farm Guidance Service	0	0	0	0	509	29	535	32	562	35	590	39	596	49
III. Farm Machinery	0	0	1,565	220	2,007	110	0	0	3,895	113	0	0	0	0
IV. Grand Total	670	772	5,020	3,152	9,993	3,763	7,839	4,590	8,517	2,917	3,845	2,598	596	49

Remarks: F.C.: Foreign Currency
L.C.: Local Currency

Table N-4 DIRECT CONSTRUCTION COST OF EACH AREA

(Unit: 10^3US$)

Work Item	Development Area												Total		
	Y.S. Intake System Holland Area			Lacovia Pump Up System											
				Black River Left Bank Area			Broad River Right Bank Area			Broad River Left Bank Area					
	F.C.	L.C.	Total	F.C.	L.C.	Total	F.C.	L.C.	Total	F.C.	L.C.	Total	F.C.	L.C.	Total
1. Preparatory works	120	78	198	249	115	364	184	97	281	185	96	281	738	386	1,124
2. Dike	369	50	419	323	50	373	178	23	201	213	26	239	1,083	149	1,232
3. Drainage Pump Station	765	205	970	1,186	315	1,501	976	260	1,236	773	208	981	3,700	988	4,688
4. Drainage Canal	54	38	92	1,090	164	1,254	667	68	735	738	82	820	2,549	352	2,901
5. Catch Drain	-	-	-	-	-	-	67	37	104	174	73	247	241	110	351
6. Intake Weir	30	60	90	-	-	-	-	-	-	-	-	-	30	60	90
7. Irrigation Pump Station	-	-	-	256	74	330	260	75	335	260	75	335	776	224	1,000
8. Irrigation Canal	271	529	800	376	596	972	231	318	549	208	449	657	1,086	1,892	2,978
9. Farm Road	204	81	205	292	105	397	236	91	327	240	90	330	972	367	1,339
10. On-Farm-Development	647	527	1,174	1,290	966	2,256	1,040	802	1,842	1,078	807	1,805	4,055	3,102	7,157
11. Office & Quarters	-	-	-	-	-	-	-	-	-	-	-	-	720	780	1,500
12. Observation Wells	-	-	-	-	-	-	-	-	-	-	-	-	54	33	77
13. Conservation of Environment	-	-	-	-	-	-	-	-	-	-	-	-	100	100	200
Total	2,460	1,568	4,028	5,062	2,385	7,447	3,839	1,771	5,610	3,809	1,906	5,775	16,104	8,543	24,647

Remarks: F.C.: Foreign Currency
L.C.: Local Currency

Table N-5 BREAKDOWN OF DIRECT CONSTRUCTION COST FOR THE HOLLAND AREA

(Unit: US$)

	Item	Unit	Q'ty	Foreign Currency	Local Currency
1.	Preparatory Works	L.S.		120,000	78,000
2.	Dike				
2.1	Black river right dike (1.9 km)			77,000	12,000
	Embankment (Clay)	m^3	47,000	26,000	2,500
	Excavation and embankment (Clay)	m^3	25,000	51,000	4,500
	Slope tamping	m^2	18,800	0	5,000
2.2	Holland east dike (2.9 km)			60,000	8,000
	Excavation and embankment	m^3	29,000	60,000	5,000
	Slope tamping	m^2	10,500	0	3,000
2.3	Holland west dike (2.4 km)			17,000	3,000
	Embankment (Clay)	m^3	3,900	2,000	200
	Excavation and embankment (Clay)	m^3	7,300	15,000	1,500
	Slope tamping	m2	5,600	0	1,300
2.4	Y.S. river bank (Improvement) (1.6 km)			11,000	2,000
	Excavation and embankment	m^3	5,400	11,000	1,000
	Slope tamping	m^2	2,900	0	1,000
2.5	Black river short cut (0.5 km)				
	Excavation and hauling	m^3	33,000	201,000	19,000
2.6	Miscellanous works	L.S.		3,000	6,000
	Sub-total (2.1 - 2.6)			369,000	50,000
3.	Drainage Pump Station				
	Approach road	m	300	1,500	500
	Excavation	m^3	1,200	1,500	1,000
	Backfill	m^3	300	500	500
	Reinforced concrete	m^3	360	16,000	29,000
	Plain concrete	m^3	50	500	3,000
	Form and scaffoldings	L.S.		500	12,500
	Pump control house	m^2	60	0	30,000
	Related facilities	L.S.		1,000	200
	Pump equipment (ø800)	set	3	742,000	128,000
	Miscellaneous works	L.S.		1,500	300
	Sub-total			765,000	205,000
4.	Drainage Canal (8.9 km)				
	Excavation, peat soil	m^3	30,000	53,000	5,000
	Slope tamping	m3	28,000	0	7,000
	Drainage culvert Type I	nos.	1	100	4,000
	Drainage culvert Type III	nos.	6	400	21,000
	Miscellaneous	L.S.		500	1,000
	Sub-total			54,000	38,000

- to be continued -

(Unit: US$)

	Item	Unit	Q'ty	Foreign Currency	Local Currency
5.	Intake Weir				
	Excavation	m^3	1,900	2,500	400
	Embankment	m^3	100	100	100
	Gabion	m^3	740	3,700	6,000
	Demolition of existing weir	m^3	80	0	4,500
	Reinforcement concrete	m^3	450	21,000	41,500
	Metal works	kg	3,000	1,800	2,300
	Miscellaneous works	L.S.		900	5,200
	Sub-total			30,000	60,000
6.	Irrigation Canal				
6.1	Holland main canal (3.2 km)			45,000	147,000
	Excavation	m^3	1,000	1,000	100
	Embankment	m^3	18,700	16,000	1,000
	Slope tamping	m^2	16,000	0	4,000
	Concrete lining	m^3	1,600	20,000	99,000
	Sod facing	m^2	6,300	0	12,000
	Related structures				
	- Turnout	nos.	3	1,000	2,000
	- Culvert	nos.	7	3,000	14,000
	- Checkgate	nos.	2	1,000	8,000
	- Spillway	nos.	2	500	4,000
	- Cross drain	nos.	5	100	500
	Miscellaneous works	L.S.		2,400	2,400
6.2	Secondary and sub-secondary canal (11.1 km)			226,000	382,000
	Excavation	m^3	3,500	4,000	500
	Embankment	m^3	30,900	27,000	2,000
	Embankment (Dump truck 500 m)	m^3	30,800	125,000	13,000
	Slope tamping	m^2	30,000	0	8,000
	Concrete lining	m^3	3,000	37,000	183,000
	Sod facing	m^2	43,000	0	81,000
	Related structures				
	- Turnout	nos.	11	10,000	17,000
	- Culvert	nos.	37	12,000	58,000
	- Spillway	nos.	4	1,000	7,000
	- Checkgate	nos.	7	1,000	1,500
	- Drop	nos.	5	1,000	4,000
	Miscellaneous works	L.S.		8,000	7,000
	Sub-total (6.1 and 6.2)			271,000	529,000
7.	Farm Road				
7.1	Main farm road (9.0 km)			85,000	34,000
	Pavement	m^3	16,000	78,000	32,000
	Excavation (Clay)	m^3	3,900	3,000	300
	Embankment (Clay)	m^3	3,900	3,000	100
	Slope tamping	m^2	1,600	0	400
	Miscellaneous works	L.S.		1,000	1,200

- to be continued -

(Unit: US$)

	Item	Unit	Q'ty	Foreign Currency	Local Currency
7.2	Secondary farm road (19.4 km)			119,000	47,000
	Pavement	m^3	19,000	92,000	38,000
	Embankment (Peat)	m^3	2,800	2,500	300
	Embankment (Clay)	m^3	15,000	13,000	1,000
	Excavation (Clay)	m^3	9,100	6,500	200
	Slope tamping	m^2	13,000	0	3,000
	Road passing	nos.	1	500	3,000
	Miscellaneous works	L.S.		4,500	1,500
	Sub-total (7.1 and 7.2)			204,000	81,000
8.	Land Reclamation (560 ha)				
8.1	Irrigation facilities			76,000	237,000
	Soil cement	m^3	3,600	50,000	122,000
	Excavation	m^3	7,400	0	45,000
	Embankment	m^3	18,700	13,000	1,000
	Slope tamping	m^2	183,000	0	5,000
	Related structure				
	- Culvert	nos.	28	4,000	25,000
	- Division box	nos.	140	12,000	39,000
8.2	Drainage facilities			131,000	60,000
	Excavation	m^3	7,300	9,000	1,000
	Slope tamping	m^2	16,000	0	4,000
	Farm drain	km	120	115,000	7,000
	Culvert	nos.	28	7,000	48,000
8.3	Farm road			128,000	84,000
	Embankment	m^3	51,000	36,000	1,700
	Slope tamping	m^2	61,000	0	16,000
	Marl pavement	m^3	17,000	82,200	34,000
	Tractor passage (with Flume)	nos.	140	9,500	32,000
	Tractor passage	nos.	420	300	300
8.4	Land grading			802,000	140,000
	Land clearing (Pasture)	ha	280	0	102,000
	Land grading (Clay)	m^3	134,000	124,000	5,000
	Ripping	ha	560	178,000	8,000
	Levee	ha	560	0	25,000
8.5	Miscellaneous works	L.S.		10,000	6,000
	Sub-total (8.1 - 8.5)			647,000	527,000
	Total			2,460,000	1,568,000

Table N-6 BREAKDOWN OF DIRECT CONSTRUCTION COST FOR THE BLACK RIVER LEFT BANK AREA

(Unit: US$)

	Item	Unit	Q'ty	Foreign Currency	Local Currency
1.	Preparatory Works	L.S.		249,000	115,000
2.	Dike (8.7 km)				
	Excavation and embankment (Clay)	m^3	117,000	230,000	21,000
	Embankment (Clay)	m^3	70,000	40,000	3,000
	Embankment (Peat)	m^3	46,000	40,000	3,000
	Sodding	m^2	61,800	0	16,000
	Miscellaneous works	L.S.		13,000	8,000
	Sub-total			323,000	50,000
3.	Drainage Pump Station				
	Approach road	m	1,000	5,000	2,000
	Excavation	m^3	2,000	1,500	500
	Backfill	m^3	350	500	500
	Reinforced concrete	m^3	500	24,000	42,500
	Plain concrete	m^3	100	1,000	4,000
	Form and scaffoldings	L.S.		1,000	20,000
	Pump control house	m^2	60	0	30,000
	Related facilities	L.S.		1,500	500
	Pump equipment (ø800)	set	5	1,150,000	214,000
	Miscellaneous works	L.S.		1,500	1,000
	Sub-total			1,186,000	315,000
4.	Drainage Canal (13.6 km)				
	Excavation (Clay)	m^3	104,000	181,000	16,000
	Excavation (Peat)	m^3	193,000	890,000	50,000
	Excavation (Limestone)	m^3	1,350	2,000	100
	Sodding (Clay)	m^2	75,000	0	19,000
	Sodding (Peat)	m^2	118,000	0	30,000
	Drainage culvert Type I	nos.	2	200	15,000
	Drainage culvert Type II	nos.	1	100	5,000
	Drainage culvert Type III	nos.	6	400	26,000
	Miscellanous works	L.S.		16,300	2,900
	Sub-total			1,090,000	164,000

- to be continued -

(Unit: US$)

	Item	Unit	Q'ty	Foreign Currency	Local Currency
5.	Lacovia Irrigation Pump Station				
	Approach road	m	500	2,500	1,000
	Excavation	m^3	2,100	2,300	1,400
	Backfill	m^3	400	400	200
	Reinforced concrete	m^3	500	23,000	40,000
	Plain concrete	m^3	100	600	3,000
	Form and scaffoldings	L.S.		800	18,000
	Pump control house	m^2	60	1,400	31,000
	Related facilities	L.S.		800	300
	Pump equipment (ø700)	set	4	743,000	128,000
	Miscellaneous works	L.S.		1,200	1,100
	Sub-total			776,000	224,000
	Allocation for Black River Left Bank Area			256,000	74,000
	Allocation for Broad River Right Bank Area			260,000	75,000
	Allocation for Broad River Left Bank Area			260,000	75,000
6.	Irrigation Canal				
6.1	Slipe main canal (5.2 km)				
	Excavation	m^3	18,000	21,000	1,000
	Embankment (with Backhoe)	m^3	10,000	21,000	1,000
	Embankment (Dump Truck 2,000 m)	m^3	49,000	228,000	26,000
	Slope tamping	m^2	29,000	0	7,000
	Concrete lining	m^3	3,000	36,000	180,000
	Sod facing	m^2	23,000	0	44,000
	Related structures				
	- Turnout	nos.	16	13,000	21,000
	- Culvert	nos.	6	4,000	21,000
	- Checkgate	nos.	6	23,000	21,000
	- Spillway	nos.	5	1,000	9,000
	- Drop	nos.	1	500	1,000
	Miscellaneous works	L.S.		7,500	5,000
	Total			355,000	337,000
	Allocation for Black River Left Bank Area			214,000	203,000
	Allocation for Broad River Right Bank Area			141,000	134,000
6.2	Secondary and sub-secondary canal (12.3 km)			162,000	393,000
	Excavation	m^3	8,000	10,000	1,000
	Embankment (with Backhoe)	m^3	36,000	76,000	5,000
	Slope tamping	m^2	36,000	0	9,000
	Concrete lining	m^3	4,000	44,000	223,000
	Sod facing	m^2	30,000	0	56,000
	Related structures				
	- Turnout	nos.	25	16,000	43,000
	- Culvert	nos.	12	7,000	35,000
	- Spillway	nos.	5	1,000	9,000
	- Checkgate	nos.	13	1,000	2,000
	- Drop	nos.	3	1,000	3,000
	Miscellaneous works	L.S.		6,000	7,000
	Sub-total (6.1 and 6.2)			376,000	596,000

- to be continued -

(Unit: US$)

	Item	Unit	Q'ty	Foreign Currency	Local Currency
7.	Farm Road				
7.1	Main farm road (7.1 km)			97,000	34,000
	Pavement	m^3	13,000	63,000	26,000
	Embankment (Clay)	m^3	31,000	27,000	2,000
	Slope tamping	m^2	13,000	0	3,500
	Miscellaneous works	L.S.		6,000	2,500
7.2	Secondary farm road (26.5 km)			195,000	71,000
	Pavement	m^3	27,000	131,000	54,000
	Embankment (Peat)	m^3	16,000	13,500	1,500
	Embankment (Clay)	m^3	47,000	41,500	3,000
	Slope tamping	m^2	35,000	0	9,000
	Miscellaneous works	L.S.		9,000	3,500
	Sub-total (7.1 and 7.2)			292,000	105,000
8.	Land Reclamation (920 ha)				
8.1	Irrigation facilities			116,000	509,000
	Soil cement	m^3	6,500	70,000	217,000
	Excavation	m^3	8,800	0	54,000
	Embankment	m^3	27,500	19,500	1,500
	Slope tamping	m^2	43,500	0	11,400
	Related structure				
	- Culvert	nos.	46	8,000	57,500
	- Division box	nos.	230	18,500	167,600
8.2	Drainage facilities			316,000	105,000
	Excavation	m^3	12,000	22,000	2,000
	Slope tamping	m^2	26,000	0	7,000
	Farm drain	km	200	283,000	24,000
	Culvert	nos.	46	11,000	72,000
8.3	Farm road			249,000	123,000
	Embankment	m^3	192,000	130,000	10,000
	Slope tamping	m^2	100,000	0	26,000
	Marl pavement	m^3	24,000	117,300	48,500
	Tractor passage (with Flume)	nos.	165	1,200	38,300
	Tractor passage	nos.	570	500	200
8.4	Land grading			584,000	213,000
	Land clearing - Grass -	ha	460	0	143,000
	Land grading	m^3	190,000	217,000	13,000
	Ripping	ha	920	367,000	16,000
	Levee	ha	920	0	41,000
8.5	Miscellaneous works	L.S.		16,000	16,000
	Sub-total (8.1 - 8.5)			1,290,000	966,000
	Total			5,062,000	2,385,000

Table N-7 BREAKDOWN OF DIRECT CONSTRUCTION COST FOR THE BROAD RIVER RIGHT BANK AREA

(Unit: US$)

	Item	Unit	Q'ty	Foreign Currency	Local Currency
1.	Preparatory Works	L.S.		184,000	97,000
2.	Dike (5.5 km)				
	Excavation and embankment (Peat)	m^3	27,000	128,000	8,000
	Embankment (Peat)	m^3	55,000	48,000	4,000
	Sodding	m2	20,000	0	5,000
	Miscellaneous works	L.S.		2,000	6,000
	Sub-total			178,000	23,000
3.	Drainage Pump Station				
	Approach road	m	200	1,000	400
	Excavation	m^3	1,400	4,000	2,800
	Backfill	m3	300	300	200
	Reinforced concrete	m3	450	20,000	35,000
	Plain concrete	m3	50	600	3,000
	Form and scaffoldings	L.S.		500	16,000
	Pump control house	m^2	60	0	30,000
	Related facilities	L.S.		700	700
	Pump equipment (ø800)	set	4	948,000	171,000
	Miscellaneous works	L.S.		900	900
	Sub-total			976,000	260,000
4.	Drainage Canal (7.0 km)				
	Excavation (Peat)	m3	142,000	655,000	57,000
	Drainage culvert Type III	nos.	2	200	10,500
	Miscellaneous	L.S.		11,800	500
	Sub-total			667,000	68,000
5.	Catch Drain (4.0 km)				
	Excavation	m3	42,000	51,700	3,000
	Embankment	m3	8,000	4,500	500
	Ripping	m2	4,200	7,300	300
	Related structures				
	- Culvert Type I	nos.	2	400	12,000
	- Culvert Type II	nos.	1	200	3,500
	- Drain culvert Type I	nos.	1	2,000	16,500
	Miscellaneous works	L.S.		900	1,200
	Sub-total			67,000	37,000
6.	Lacovia Irrigation Pump Station			260,000	75,000

- to be continued -

(Unit: US$)

	Item	Unit	Q'ty	Foreign Currency	Local Currency
7.	Irrigation Canal				
7.1	Mountainside main canal (8.8 km)				
	Excavation	m^3	10,000	13,000	900
	Embankment	m^3	34,000	30,000	2,000
	Embankment (Dump truck 1,000 m)	m^3	18,000	77,000	8,000
	Slope tamping	m^2	42,000	0	11,000
	Concrete lining	m^3	4,000	52,000	260,000
	Sod facing	m^2	24,000	0	44,000
	Related structures				
	- Turnout	nos.	13	8,000	13,000
	- Culvert	nos.	6	4,000	27,000
	- Checkgate	nos.	6	22,000	20,000
	- Spillway	nos.	2	500	4,000
	- Cross drain	nos.	3	700	4,000
	Miscellaneous works	L.S.		7,800	7,100
	Total			215,000	401,000
	Allocation for Broad River Right Bank Area			43,000	80,000
	Allocation for Broad River Left Bank Area			172,000	321,000
7.2	Slipe main canal (5.2 km)			141,000	134,000
7.3	Secondary and sub-secondary canal (3.1 km)			47,000	104,000
	Excavation	m3	300	500	100
	Embankment (Backhoe)	m^3	12,000	25,000	1,000
	Slope tamping	m^2	10,000	0	2,000
	Concrete lining	m^3	1,000	12,000	62,000
	Sod facing	m^2	9,000	0	18,000
	Related structures				
	- Turnout	nos.	8	5,000	8,000
	- Culvert	nos.	4	1,000	6,000
	- Spillway	nos.	2	1,000	4,000
	- Checkgate	nos.	2	500	500
	Miscellaneous works	L.S.		2,000	2,400
	Sub-total (7.1 - 7.3)			231,000	318,000
8.	Farm Road				
8.1	Main farm road (8.7 km)			118,000	46,000
	Pavement	m^3	19,000	92,000	38,000
	Embankment, peat	m^3	8,700	7,500	1,000
	Embankment, clay	m^3	17,000	15,000	1,000
	Slope tamping	m^2	18,000	0	4,500
	Miscellaneous works	L.S.		3,500	1,500

- to be continued -

(Unit: US$)

	Item	Unit	Q'ty	Foreign Currency	Local Currency
8.2	Secondary farm road (16.5 km)			118,000	45,000
	Pavement	m^3	17,000	83,000	34,000
	Embankment (Peat)	m^3	7,500	6,000	1,000
	Embankment (Clay)	m^3	27,000	24,000	2,000
	Slope tamping	m^2	25,000	0	6,500
	Miscellaneous works	L.S.		5,000	1,500
	Sub-total (8.1 and 8.2)			236,000	91,000
9.	Land Reclamation (800 ha)				
9.1	Irrigation facilities			89,000	482,000
	Soil cement	m^3	5,900	50,000	198,000
	Excavation	m^3	7,100	0	44,000
	Embankment	m^3	24,000	16,000	1,000
	Slope tamping	m2	42,000	0	11,000
	Related structure				
	- Culvert	nos.	40	8,000	54,000
	- Division box	nos.	200	15,000	174,000
9.2	Drainage facilities			302,000	100,000
	Excavation	m^3	10,000	20,000	2,000
	Slope tamping	m^2	23,000	0	6,000
	Farm drain	km	168	272,000	24,000
	Culvert	nos.	40	10,000	68,000
9.3	Farm road			215,000	73,000
	Embankment	m3	174,000	117,600	10,000
	Slope tamping	m^2	87,000	0	22,900
	Marl pavement	m^3	20,000	97,000	40,000
	Tractor passage	nos.	400	400	100
9.4	Land grading			415,000	134,000
	Land clearing - Grass -	ha	800	0	79,000
	Land grading (Peat)	m^3	65,000	78,000	6,000
	Ripping	ha	800	337,000	14,000
	Levee	ha	800	0	35,000
9.5	Miscellaneous works	L.S.		19,000	13,000
	Sub-total (9.1 - 9.5)			1,040,000	802,000
	Total			3,839,000	1,771,000

Table N-8 BREAKDOWN OF DIRECT CONSTRUCTION COST FOR THE BROAD RIVER LEFT BANK AREA

(Unit: US$)

	Item	Unit	Q'ty	Foreign Currency	Local Currency
1.	Preparatory Works	L.S.		185,000	96,000
2.	Dike (5.7 km)				
	Excavation and embankment (Peat)	m^3	35,000	168,000	10,000
	Embankment (Peat)	m^3	49,000	43,000	4,000
	Sodding	m^2	20,000	0	5,000
	Miscellaneous works	L.S.		2,000	7,000
	Sub-total			213,000	26,000
3.	Drainage Pump Station				
	Approach road	m	1,400	7,000	3,000
	Excavation	m3	1,200	4,000	2,000
	Backfill	m^3	300	300	200
	Reinforced concrete	m^3	360	17,000	29,000
	Plain concrete	m^3	40	500	2,000
	Form and scaffoldings	L.S.		500	12,000
	Pump control house	m^2	60	0	30,000
	Related facilities	L.S.		1,500	1,000
	Pump equipment (ø800)	set	3	741,000	128,000
	Miscellaneous works	L.S.		1,200	800
	Sub-total			773,000	208,000
4.	Drainage Canal (8.2 km)				
	Excavation (Peat)	m^3	158,000	730,000	65,000
	Drainage culvert Type I	nos.	1	100	7,000
	Drainage culvert Type III	nos.	2	100	9,000
	Miscellaneous	L.S.		7,800	1,000
	Sub-total			738,000	82,000
5.	Catch Drain (13.0 km)				
	Excavation	m^3	105,400	130,000	7,000
	Embankment	m^3	38,000	21,000	2,000
	Ripping	m^2	10,500	18,000	1,000
	Related structures				
	- Culvert Type I	nos.	5	1,000	30,000
	- Culvert Type II	nos.	4	500	13,500
	- Drainage culvert Type I	nos.	1	2,000	17,000
	Miscellaneous works	L.S.		1,500	2,500
	Sub-total			174,000	73,000
6.	Lacovia Irrigation Pump Station			260,000	75,000

- to be continued -

(Unit: US$)

	Item	Unit	Q'ty	Foreign Currency	Local Currency
7.	Irrigation Canal				
7.1	Mountainside main canal (8.8 km)			172,000	321,000
7.2	Secondary and sub-secondary canal	(5.05 km)		36,000	128,000
	Excavation	m^3	3,500	4,000	200
	Embankment	m^3	8,000	7,000	500
	Slope tamping	m^2	15,000	0	4,000
	Concrete lining	m^3	1,500	18,000	93,000
	Sod facing	m^2	8,000	0	15,000
	Related structures				
	- Turnout	nos.	3	2,000	3,000
	- Culvert	nos.	4	1,000	6,000
	- Spillway	nos	1	200	2,000
	- Checkgate	nos.	2	100	300
	- Cross drain	nos.	1	200	2,000
	Miscellaneous works	L.S.		3,500	2,000
	Sub-total (7.1 and 7.2)			208,000	449,000
8.	Farm Road				
8.1	Main farm road (9.7 km)			129,000	45,000
	Pavement	m^3	17,500	85,000	35,000
	Embankment (Peat)	m^3	4,500	4,000	500
	Embankment (Clay)	m^3	38,000	33,000	2,000
	Slope tamping	m^2	18,000	0	5,000
	Miscellaneous works	L.S.		7,000	2,500
8.2	Secondary farm road (17.3 km)			111,000	45,000
	Pavement	m^3	17,300	84,000	34,000
	Embankment (Peat)	m^3	7,600	6,000	1,000
	Embankment (Clay)	m^3	17,400	15,000	1,000
	Slope tamping	m^2	25,000	0	7,000
	Miscellaneous works	L.S.		6,000	2,000
	Sub-total (8.1 and 8.2)			240,000	90,000
9.	Land Reclamation (800 ha)				
9.1	Irrigation facilities			98,000	482,000
	Soil cement	m^3	5,900	59,000	198,000
	Excavation	m^3	7,100	0	44,000
	Embankment	m^3	24,000	16,000	1,000
	Slope tamping	m^2	42,000	0	11,000
	Related structure				
	- Culvert	nos.	40	8,000	54,000
	- Division box	nos.	200	15,000	174,000
9.2	Drainage facilities			302,000	100,000
	Excavation	m^3	10,000	20,000	2,000
	Slope tamping	m^2	23,000	0	6,000
	Farm drain	km	168	272,000	24,000
	Culvert	nos.	40	10,000	68,000

- to be continued -

(Unit: US$)

	Item	Unit	Q'ty	Foreign Currency	Local Currency
9.3	Farm road			215,000	73,000
	Embankment	m^3	174,000	117,000	9,900
	Slope tamping	m^2	87,000	0	23,000
	Marl pavement	m^3	20,000	97,600	40,000
	Tractor passage	nos.	400	400	100
9.4	Land grading			452,000	139,000
	Land clearing - Grass -	ha	800	0	79,000
	Land grading (Peat)	m^3	96,000	115,000	10,000
	Ripping	ha	800	337,000	14,000
	Levee	ha	800	0	36,000
9.5	Miscellaneous works	L.S.		11,000	13,000
	Sub-total (9.1 - 9.5)			1,078,000	807,000
	Total			3,869,000	1,906,000

Table N-9 BREAKDOWN OF DIRECT CONSTRUCTION COST OF OFFICE AND QUARTERS

(Unit: US$)

	Item	Unit	Q'ty	Foreign Currency	Local Currency	Total
1.	Main office	m^2	400	100,000	76,000	176,000
2.	Branch office ($90m^2$x4)	m^2	360	96,000	62,000	158,000
3.	Workshop	m^2	100	24,000	20,000	44,000
4.	Quarters	m^2	2,000	480,000	400,000	880,000
5.	Motor pool	m^2	5,000	0	75,000	75,000
6.	Land reparation for office yard including fencing, etc.	L.S.		20,000	147,000	167,000
	Total			720,000	780,000	1,500,000

Table N-10 PROCUREMENT COST OF MAJOR OPERATION AND MAINTENANCE EQUIPMENT

(Unit: US$)

	Equipment	Q'ty	Unit Price	Total
1.	Tractor shovel 1.0 m^3	1	60,000	60,000
2.	Swamp type bulldozer 13 t	2	95,000	190,000
3.	Swamp type backhoe 0.4 m^3	2	100,000	200,000
4.	Dump truck 8 t	1	30,000	30,000
5.	Truck 4 t	2	15,000	30,000
6.	Light truck 4 wheel drive 1 t	4	12,000	48,000
7.	Passenger car 4-wheel drive	8	12,000	96,000
8.	Motor cycle 90 cc	8	850	6,800
9.	Slope compactor 3 PS	1	5,500	5,500
10.	Concrete mixer 7 PS	2	3,500	7,000
11.	Pump with engine 7 PS	4	2,000	8,000
	Sub-total			681,300
	Workshop equipment and miscellaneous			10,700
	Spare parts (20%)			138,000
	Total			830,000

Table N-11 GENERAL EXPENSES (Construction Stage)

(Unit: US$)

Year	Staff 1/ Salary	Labour Wage	Office Expenses	Fuel Cost for Passenger Car	Other Related Cost	Total
1	54,000	-	2,000	1,000	1,000	58,000
2	85,200	9,600	5,400	2,000	4,000	106,200
3	86,400	9,600	10,800	3,000	4,400	114,200
4	92,400	9,600	10,800	3,000	7,000	122,800
5	92,400	9,600	10,800	3,000	7,000	122,800
6	92,400	9,600	10,800	3,000	7,200	123,000
Total	502,800	48,000	50,600	15,000	30,600	647,000

Remarks: 1/: Refer to Table N-12.

Table N-12 STAFF SALARY FOR THE PROJECT OFFICE

(Construction Stage)

(Unit: US$)

Year	Director		Engineer		Assistant Engineer		Administrator		Equipment Procurement Office		Clarical Staff		Total	
	No.	Salary	No.	Salary	No.	Salary	No.	Salary	No.	Salary	No.	Salary	No.	Salary
1	1	18,000	2	24,000	1	12,000	-	-	-	-	-	-	3	54,000
2	1	18,000	2	24,000	2	7,200	1	12,000	1	12,000	2	12,000	8	85,200
3	-	-	3	86,000	4	14,400	1	12,000	1	12,000	2	12,000	10	86,000
4	-	-	3	36,000	4	14,400	1	12,000	1	12,000	3	18,000	11	92,400
5	-	-	3	36,000	4	14,400	1	12,000	1	12,000	3	18,000	11	92,400
6	-	-	3	36,000	4	14,400	1	12,000	1	12,000	3	18,000	11	92,400
Total		36,000		192,000		76,800		60,000		60,000		78,000		502,800

Remarks: Since the farm operation will commence from the fall cultivation in third year, the organization for O & M is to be established in the second year. The director is also responsible to manage the O & M. His salary would be covered by O & M cost since second year (Table N-16).

Table N-13 PRICE LIST OF BASIC MATERIALS AND LABOUR WAGES

(Unit: J$)

Item	Unit	Unit Price
A. Materials		
1. Ordinary portland cement	ton	550.0
2. Reinforcement bar	ton	2,250.0
3. Course aggregate	m^3	48.8
4. Fine aggregate	m^3	42.0
5. Marl	m^3	15.7
6. Light diesel oil	ℓ	1.58
B. Labour		
1. Common labour	man-day	23.0
2. Carpenter	man-day	31.3
3. Mason	man-day	29.2
4. Operator	man-day	42.1
5. Driver	man-day	41.5
6. Steel fixer/bender	man-day	31.3
7. Foreman	man-day	60.0

Table N-14 LIST OF UNIT PRICE FOR MAJOR WORK ITEMS

(Unit: US$)

Work Items	Unit	Foreign Currency	Local Currency	Total
1. Stripping including site clearing	m^2	0.06	0.02	0.08
2. Excavation				
- Hard limestone by pick hammer	m^3	7.65	5.73	13.38
- Decomposed limestone	m^3	1.72	0.10	1.82
- Inundated peat	m^3	4.61	0.26	4.87
- Soft clayey soil	m^3	1.74	0.15	1.89
- Clayey soil	m^3	1.23	0.07	1.30
3. Embankment				
- Peat	m^3	0.87	0.07	0.94
- Clayey soil	m^3	0.56	0.05	0.61
- Clayey soil including hawling L= 1.0km	m^3	4.26	0.46	4.72
4. Backfill	m3	0.98	0.06	1.04
5. Sod facing	m^2	-	1.91	1.91
6. Land clearing				
- Grass	ha	-	363	363
- Forest	ha	810	470	1,280
7. Land leveling L= 10m	m^3	0.67	0.06	0.73
8. Concrete works				
- Reinforced concrete 1:2:4	m^3	46.88	82.02	128.90
- Plain concrete 1:3:6	m^3	12.29	60.00	72.29
- Leveling concrete 1:4:8	m^3	12.49	51.30	63.79
- Lining concrete 1:3:6	m^3	12.29	62.01	74.73
- Soil cement, cement 100 kg/m3	m^3	10.00	33.50	43.50
9. Form works for concrete	m^2	-	11.10	11.10
10. Metal works	kg	0.59	0.78	1.37
11. Concrete pipe				
- ø300	m	-	27.31	27.31
- ø600	m	-	48.96	48.96
12. Marl pavement	m^3	4.86	2.00	6.86
13. Ripping for deep tillage				
- Clayey soil	ha	319	13.50	332.50
- Peat	ha	421.50	17.84	438.89
14. Gravel foundation	m^3	4.15	13.77	17.92
15. Slope tamping	m^2	-	0.26	0.26

Table N-15 ANNUAL OPERATION AND MAINTENANCE COST

(Unit: 10^3US$)

Item			Amount
1.	Salary and wages		
	(1) Staff salaries (see Table N-16)		298
	(2) Labour wages		188
2.	Office expenses	L.S.	59
3.	O & M for pump stations		
	(1) Lacovia pump station	L.S.	70
	(2) Four drainage pump stations	L.S.	225
4.	Repair and maintenance cost		
	(1) Cutting grass and repair of embankment	L.S.	69
	(2) Repair of lining concrete	L.S.	26
	(3) Repair of soil cement lining	L.S.	44
	(4) Repair of road pavement	L.S.	38
	(5) Others	L.S.	18
5.	Miscellaneous		65
	Total		1,100

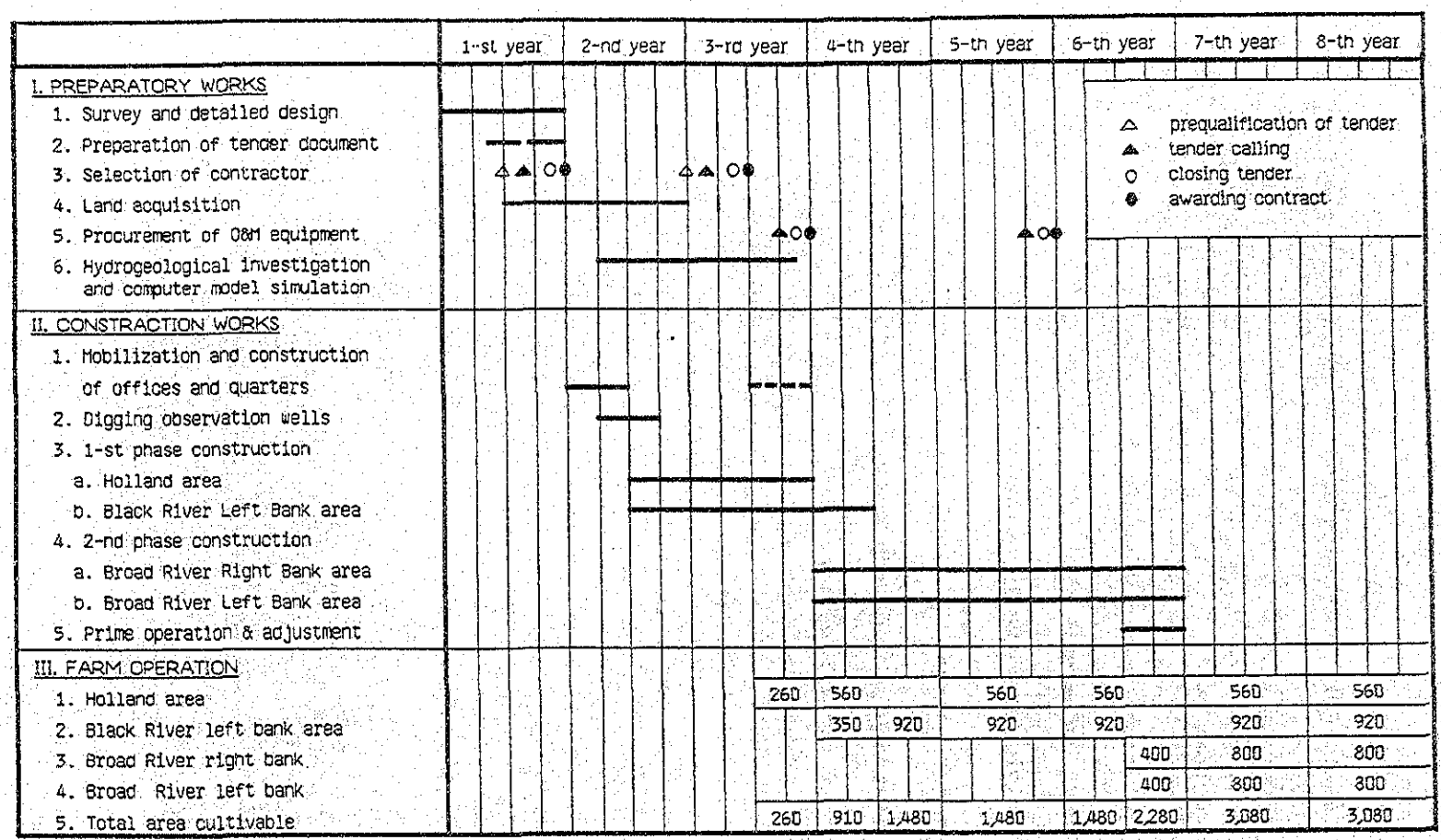
Table N-16 ANNUAL STAFF SALARY AT O & M STAGE

Item	Required Number	Monthly Rate (US$)	Annual Amount (US$)
A. Management Department Director			
Director	1	1,500	18,000
Secretary	2	500	12,000
B. Technical Department			
Manager	1	1,000	12,000
i) Irrigation & drainage unit			
Irrigation engineer	1	1,000	12,000
Civil engineer	1	1,000	12,000
Mechanical engineer	1	1,000	12,000
Assistant engineer	6	500	36,000
Clerical staff	3	500	18,000
ii) Pilot farm unit			
Research officer	1	1,000	12,000
Clerical staff	1	500	6,000
iii) Settlement unit			
Officer	1	1,000	12,000
Extension officer	7	800	67,200
Clerical staff	2	500	12,000
C. Administration Department			
Finance officer	2	800	19,200
Personnel	3	800	28,800
Land management	1	800	9,600
Total			298,800 (298,000)

Remarks: The salary of drivers and operators is included in the labour wages in Table N-15.

Table N-17 REPLACEMENT COST AND USEFUL LIFE

Item	Useful Life (year)	Replacement Cost (US$)
1. O & M Equipment (see Table N-10)		
(1) Heavy equipment	10	510,000
(2) Vehicles and small equipment	5	320,000
2. Project Facilities		
(1) Irrigation and drainage pump	20	5,031,000
(2) Gates for irrigation and drainage facilities	20	26,000



BLACK RIVER LOWER MORASS
AGRICULTURAL DEVELOPMENT PROJECT

Fig. N-1
PROJECT IMPLEMENTATION SCHEDULE

JAPAN INTERNATIONAL COOPERATION AGENCY

		1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year
I. PREPARATORY WORKS							
Detailed design & selection of contractor	L.S.						
Land acquisition	L.S.						
Procurement of O & M equipment	L.S.						
Construction of groundwater observation wells	L.S.						
II. CONSTRUCTION WORKS							
Mobilization & construction of office and quarters	L.S.						
Phase I							
Holland area							
Embankment of polder dike 9.3 km	118,000 m3						
Drainage pump station ø800 x 3	L.S.						
Drain canal 8.9 km	30,000 m3						
Irrigation canal 14.3 km	80,000 m3						
Road 28.4 km	22,000 m3						
Diversion weir & intake	L.S.						
Land reclamation & on-farm facilities	560 ha						
Black River left bank area							
Embankment of polder dike 8.7 km	233,000 m3						
Drainage pump station ø800 x 5	L.S.						
Drain canal 13.6 km	298,000 m3						
Irrigation canal 15.4 km	90,000 m3						
Road 33.6 km	94,000 m3						
Irrigation pump station ø700 x 3	L.S.						
Land reclamation & on-farm facilities	920 ha						
Phase II							
Broad River right bank area							
Embankment of polder dike 5.5 km	82,000 m3						
Drainage pump station ø800 x 4	L.S.						
Drain canal 7.0 km	184,000 m3						
Irrigation canal 7.0 km	55,000 m3						
Road 25.2 km	60,000 m3						
Land reclamation & on-farm facilities	800 ha						
Broad River left bank area							
Embankment of polder dike 5.7 km	84,000 m3						
Drainage pump station ø800 x 3	L.S.						
Drain canal 21.2 km	263,000 m3						
Irrigation canal 12.1 km	62,000 m3						
Road 27 km	68,000 m3						
Land reclamation & on-farm facilities	800 ha						
Prime operational, adjustment	L.S.						
Total construction period 5 years							

BLACK RIVER LOWER MORASS AGRICULTURAL DEVELOPMENT PROJECT

Fig. N-2
PROJECT CONSTRUCTION SCHEDULE

JAPAN INTERNATIONAL COOPERATION AGENCY

ANNEX O

PROJECT EVALUATION

ANNEX O

PROJECT EVALUATION

TABLE OF CONTENTS

LIST OF TABLES

ANNEX O

PROJECT EVALUATION

1. GENERAL

The economic feasibility of the Black River Lower Morass Agricultural Development Project was assessed through the economic internal rate of return (EIRR). The sensitivity analysis was made assuming changes in accrued benefits, built-up and project cost. Then the financial evaluation was carried out by following two ways; farm budget analysis to assess the net reserve of the settlement farm both on mineral and peat soils and the analysis of financial projections of the Farm Development Company and of the Project as a whole to evaluate their repayment capacity on the basis of the estimated fund requirement with assumed terms of the anticipated loan and the expected revenue from the Project. The socio-economic and environmental impacts from the implementation of the Project and their effects on the regional development were also studied.

2. ECONOMIC EVALUATION

2.1 Irrigation and Drainage Benefits

The irrigation and drainage benefits of the Black River Lower Morass Agricultural Project will primarily accrue from the increased crop production due to stable irrigation water supply and drainage. These benefits were estimated as the difference between the annual net production values under the present conditions projected into the future, as against those of the proposed development. Gradually, not only will the acreage be increased but productivity as well. Construction work for the whole project area will be completed in 1990. The full development stage will be attained in 1997 making allowance for a phased agricultural development during construction. The economic gross direct benefits will amount to about J$33.7 million (US$8.2 million) per annum at full development.

The economic net direct benefit amounted to about J$33.3 million (US$8.1 million) per annum at the full development stage of 3,080 ha.

According to the proposed construction plan, the benefits will begin to accrue in 1987 with completion of the Y.S. intake weir and canals, and will gradually increase as more lands become available. The Project will reach maximum paddy production 7 years after completion of the construction works. The incremental benefits were also considered, as they will accrue annually during the development period, as shown in Table O-1.

2.2 Economic Cost

The financial costs for construction works, replacement of certain equipment, and operation and maintenance of the Project were estimated at 1984 price levels as given in Annex N. The economic cost of the Project was obtained by deducting transfer payments from the financial costs. Price contingencies are not included in the economic cost nor the costs of land acquisition and farm guidance service. And also the shadow exchange rate (SER) of 1.02 is applied to the economic costs.

The total economic cost of the Project was estimated to be J$136.0 million (US$33.3 million), consisting of J$89.6 million (US$21.9 million) of foreign currency component and J$46.4 million (US$11.4 million) of local currency component.

It was assumed that the engineering work for the Project would commence at the beginning of 1985 and be completed by the end of 1990; whole project works would be implemented within 6 years. According to the construction schedule proposed in Annex N and the work quantities, the flow of the project costs, operation and maintenance cost, and replacement costs were estimated as shown in Table O-2.

2.3 Economic Evaluation

2.3.1 Economic internal rate of return (EIRR)

The proejct life is assumed to be 50 years from 1985 to 2034. The construction period will be 5 years from the beginning of 1986 excluding about one year for detailed design and selection of contractor. The project benefits will begin to accrue in 1987 and will increase annually to attain the maximum level in 1997.

Operation and maintenance cost of the Project will commence being disbursed in 1987 when the partial operation will commence. The operation and maintenance costs will increase linearly year by year and will reach the full amount in 1990 when the full operation will start for the whole Project area of 3,080 ha. Pumps and their attachments will be replaced twice during the entire period of the project life and operation and maintenance equipments both heavy and small for the irrigation and drainage system will be replaced every ten and five years respectively.

The economic internal rate of return (EIRR) was calculated from the economic direct benefit and cost flows given in Table O-2. The EIRR thus calculated was 13.3%. The result shows that the Project was economically feasible.

2.3.2 Sensitivity analysis

The sensitivity analysis was made with respect to change in annual irrigation and drainage benefits, project costs, and over-runs in the agricultural development schedules. The following five conditions to be anticipated are tested:

1) Base case
2) 20% cost increase and benefit as scheduled
3) 20% benefit decrease and cost as scheduled
4) 20% cost increase and 20% benefit decrease
5) 2 years over-run in the agricultural development schedule
6) 2 years over-run in the agricultural development schedule and 20% cost increase.

The results are summarized below:

Conditions	EIRR (%)	SI*
1)	13.3	-
2)	11.6	0.6
3)	10.6	1.0
4)	9.1	-
5)	10.8	-
6)	9.5	-

*: SI = Sensitivity Indicator = (% change in EIRR)/ (EIRR of base case x % change in condition)

According to the above results, the change in benefits is most sensitive to economical feasibility of the Project. Therefore, to maintain economical feasibility, careful management for attainment of the anticipated benefits as scheduled will be required.

3. FINANCIAL EVALUATION

3.1 General

The financial feasibility of the Project is evaluated from the viewpoint of farmer's economy. In this connection, the assessment of the amount of water charge to be collected the farmer is made on provisional basis. Assessment of capital cost repayment capability is also made at Project and Farm Development Company level by preparing the cash flow tables.

3.2 Financial Cost

Based on the current market prices and costs as of 1984, the financial cost of the Project was estimated to be J$217.3 million (US$54.3 million), comprising J$145.9 million (US$36.5 million) in foreign currency and J$71.4 million (US$17.8 million) in local currency as shown in Annex N. In this estimate, the physical contingencies of 10%, and the price contingencies of 5% per annum for foreign currency and 10% per annum for local currency were added to the direct cost. Table N-3 in Annex N shows the annual disbursement schedule of the said financial cost.

3.3 Capacity to Pay

In evaluation of project feasibility from the financial viewpoint of farmers, average farm budget analyses both on mineral soil and peat soil were made with future projections under the Project conditions as shown in Table O-3.

The potential net reserve of a small farmer working in the Project was estimated to be J$21,310 on 3.0 ha of mineral soil and J$25,390 on 5.0 ha of peat soil.

3.4 Water Charge

It is desirable that a water charge per hectare be imposed on small farm land to cover operation and maintenance cost and the replacement cost of equipment utilized in the drainage and irrigation system.

The annual operation and maintenance cost of the Irrigation and Drainage System was estimated to be J$4.4 million which is equivalent to about J$2,000/ha of the land of small farmer. This corresponds to about 28% on mineral soil and 39% on peat soil of the net annual reserve of each farmer

The water charge of J$2,000/ha/annum was considered to be within the capacity of the farmers to pay, and would not serve as a disincentive to production. This charge was taken to be the project revenue in the financial evaluation of the Project.

3.5 Repayment Capability of the Farm Development Company

The financial evaluation of the Farm Development Company was made for recovery of the capital cost of the farm machinery and workshop. In examining the repayment capability, it was assumed that the capital required for implementation would be arranged under the following conditions.

1) Capital cost of farm machinery and workshop: The capital will be financed by the Holding Company at an assumed interest rate of 4.75% per annum for a repayment period of 25 years including a grace period of 7 years.

2) Water charge: The amount of this charge will be J$2,000/ha/annum same as for small farm.

A repayment schedule for the capital cost of farm machinery and workshop was prepared as shown in Table O-4. This table indicates that the direct revenue from the benefit of the mother farm and from hire of farm machinery can cover the necessary annual repayments, except during the initial operation stage. Hence, it is considered that some financial arrangement like a subsidy from the Government will be indispensable for implementation during the initial operation stage.

3.6 Repayment of the Project Cost

The financial evaluation of the Project was made by examining the repayment capacity for the capital cost of the Project. In examining the repayment capability, it was assumed that the capital required for the project implementation would be arranged under the following conditions:

1) Foreign currency portion: The capital will be financed through the arrangements by the Government at an assumed interest rate of 4.75% per annum for a repayment period of 25 years including a grace period of 7 years.

2) Local currency portion: The capital will be invested by the budget allocation of the Government with no repayment.

A repayment schedule for the foreign currency portion was prepared as shown in Table O-5. This indicates that the direct revenue from Farm Development Company and small farmers cannot cover the annual repayment of the fund, except the farm machinery cost, O & M cost and replacement cost, and the repayment of the fund has to be made by the Government

4. SOCIO-ECONOMIC IMPACTS

Various socio-economic impacts are expected to result from the implementation of the Project. There are:

1) Foreign exchange saving

Rice production in Jamaica is insufficient to meet domestic demand. In 1983, 57,000 tons of rice were imported at a cost of J$44.8 million (US$11.2 million). With the Project, local paddy production will be increased by 28,950 tons of dried paddy (15,400 tons of marketable milled rice) per annum. The estimated foreign exchange saving will be approximately J$12.1 million (US$3.0 million) per annum by substituting for imported rice.

2) Demonstration effects

With the completion of the Project, farmers in other agricultural areas as well as those in the Project area will become familiar with modern irrigation and drainage practices and their incentive for adopting improved irrigation and drainage practices will be greatly enhanced. Enthusiasm generated from this success may even shorten the development period of the Project.

3) Increase of employment opportunities

It is expected that the present unemployment in and around the Project area will be reduced by the implementation of the Project. After completion of the Project, more intensive land use resulting from year-round irrigation system, drainage, and farm mechanization, will certainly increase employment opportunities. In addition, there are the experience, technical know-how and skills in farmers. These up-graded human resources will provide motivation for future development in the Parish of St. Elizabeth and in Jamaica.

4) Environmental impacts

As shown in Annex L the Project would have minor or negligible impacts on the natural environment providing the use and choice of agricultural chemicals is properly monitored. It is nevertheless essential that such monitoring be carried out on a systematic basis

together with monitoring of effects on local biota especially as there are many existing or potential economic activities in the Black River Lower Morass.

5) Secondary benefits

The implementation of the Project works would certainly lead to beneficial changes in the rural economy. The social infrastructure and local transportation system would be improved. This would contribute to the improvement of rural economic activities. The increased crop production in the Project area would stimulate improvement of the marketing system and the agricultural support services.

6) In summary

Together these benefits will serve to improve the standard of living and the quality of life of the local people and contribute substantially to one of the main objectives of the Project.

Table O-1 ECONOMIC BENEFITS FLOWS

(Unit: J$10^3)

Year	Planted Area (ha)		Direct Benefit		Annual Direct Benefits
	Mineral Soil	Peat Soil	Mineral Soil	Peat Soil	
1	-	-	-	-	-
2	-	-	-	-	-
3	260	-	718	-	718
4	780	130	5,354	862	6,216
5	780	700	6,773	1,653	8,426
6	780	1,500	8,433	2,913	11,346
7	780	2,300	9,346	6,212	15,558
8	780	2,300	10,219	8,542	18,761
9	780	2,300	10,863	11,210	22,073
10	780	2,300	11,241	14,543	25,784
11	780	2,300	11,241	18,453	29,694
12	780	2,300	11,241	21,009	32,250
13	780	2,300	11,241	22,107	33,348

Remark: From 13th year, the annual direct benefit continues constantly.

Table O-2 ANNUAL ECONOMIC COSTS AND BENEFIT FLOW

(Unit: J$10^3)

Year	Construction Cost	O & M Cost	Replacement Cost	Total Cost	Benefit
1	3,870	0	0	3,870	0
2	21,115	0	0	21,115	0
3	37,646	1,640	0	39,286	718
4	37,400	2,669	0	40,069	6,216
5	20,090	3,559	0	23,649	8,426
6	15,879	4,449	0	20,328	11,346
7	0	4,449	0	4,449	15,558
8	0	4,449	1,312	5,761	18,761
9	0	4,449	0	4,449	22,073
10	0	4,449	0	4,449	25,784
11	0	4,449	0	4,449	29,694
12	0	4,449	0	4,449	32,250
13	0	4,449	403	7,852	33,348
14	0	4,449	0	4,449	33,348
15	0	4,449	0	4,449	33,348
16	0	4,449	0	4,449	33,348
17	0	4,449	0	4,449	33,348
18	0	4,449	1,312	5,761	33,348
19	0	4,449	0	4,449	33,348
20	0	4,449	0	4,449	33,348
21	0	4,449	0	4,449	33,348
22	0	4,449	0	4,449	33,348
23	0	4,449	24,137	28,585	33,348
24	0	4,449	0	4,449	33,348
25	0	4,449	0	4,449	33,348
26	0	4,449	0	4,449	33,348
27	0	4,449	0	4,449	33,348
28	0	4,449	1,312	5,761	33,348
29	0	4,449	0	4,449	33,348
30	0	4,449	0	4,449	33,348
31	0	4,449	0	4,449	33,348
32	0	4,449	0	4,449	33,348
33	0	4,449	3,403	7,852	33,348
34	0	4,449	0	4,449	33,348
35	0	4,449	0	4,449	33,348
36	0	4,449	0	4,449	33,348
37	0	4,449	0	4,449	33,348
38	0	4,449	1,312	5,761	33,348
39	0	4,449	0	4,449	33,348
40	0	4,449	0	4,449	33,348
41	0	4,449	0	4,449	33,348
42	0	4,449	0	4,449	33,348
43	0	4,449	24,137	28,585	33,348
44	0	4,449	0	4,449	33,348
45	0	4,449	0	4,449	33,348
46	0	4,449	0	4,449	33,348
47	0	4,449	0	4,449	33,348
48	0	4,449	1,312	5,761	33,348
49	0	4,449	0	4,449	33,348
50	0	4,449	0	4,449	33,348

EIRR = 13.3%

Table O-3 FARM BUDGET ANALYSIS

	Planting/ Harvesting Area	Gross Income				Gross Outgo			Net Reserve
		Unit Yield	Production	Unit Price	Total Value	Farming Expense: Unit Production Cost	Farming Expense: Total Cost	Living Expense	
	(ha)	(ton/ha)	(ton)	(J$/ton)	(J$)	(J$/ha)	(J$)	(J$)	(J$)
I. Mineral Soil									
Spring rice	3	5.5	16.5	1,100	18,150	1,465	4,395	-	-
Fall rice	3	5.5	16.5	1,100	18,150	1,367	4,101	-	-
Soya bean	3	2.5	7.5	1,300	9,750	2,082	6,246	-	-
Total	-	-	-	-	46,050	-	14,742	10,000	21,308
II. Peat Soil									
Spring rice	5	4.5	22.5	1,100	24,750	1,477	7,385	-	-
Fall rice	5	4.5	22.5	1,100	24,750	1,346	6,730	-	-
Total	-	-	-	-	49,500	-	14,115	10,000	25,385

Table O-4 CASH FLOW STATEMENT OF THE FARM DEVELOPMENT COMPANY

(Unit: J$10³)

Year	Cash Outflow							Cash Inflow					
	Capital Cost	Loan Repayment 1/		O & M Cost	Replacement Cost	Water Charge	Total	Fund	Revenue		Total	Balance	Accumulation
		Interest	Principal						Benefit from Mother Farm	Hire of Machinery			
1	0	0	0	0	0	0	0	0	0	0	0	0	0
2	7,140	339	0	0	0	0	7,479	7,140	0	0	7,140	-339	-339
3	8,468	741	0	811	0	400	10,420	8,468	356	507	9,331	-1,089	-1,428
4	0	741	0	1,990	0	800	3,531	0	955	2,967	3,922	391	-1,037
5	16,032	1,503	0	2,503	0	800	20,838	16,032	1,307	2,967	20,306	-532	-1,569
6	0	1,503	0	2,503	0	1,600	5,606	0	1,796	4,355	6,151	545	-1,024
7	0	1,503	0	2,503	800	1,600	6,406	0	2,362	5,744	8,106	1,700	676
8	0	1,420	1,754	2,503	1,290	1,600	8,567	0	2,969	5,744	8,713	146	822
9	0	1,336	1,758	2,503	0	1,600	7,197	0	3,612	5,744	9,356	2,159	2,981
10	0	1,253	1,758	2,503	5,400	1,600	12,514	0	4,339	5,744	10,083	-2,431	550
11	0	1,169	1,758	2,503	4,760	1,600	11,790	0	4,991	5,744	10,735	-1,055	-505
12	0	1,086	1,758	2,503	800	1,600	7,747	0	5,387	5,744	11,131	3,384	2,879
13	0	1,002	1,758	2,503	10,260	1,600	17,123	0	5,519	5,744	11,263	-5,860	-2,981
14	0	919	1,758	2,503	0	1,600	6,780	0	5,519	5,744	11,263	4,483	1,502
15	0	835	1,758	2,503	2,440	1,600	9,136	0	5,519	5,744	11,263	2,127	3,629
16	0	752	1,758	2,503	0	1,600	6,613	0	5,519	5,744	11,263	4,650	8,279
17	0	668	1,758	2,503	800	1,600	7,329	0	5,519	5,744	11,263	3,934	12,213
18	0	585	1,758	2,503	4,250	1,600	10,696	0	5,519	5,744	11,263	567	12,780
19	0	501	1,758	2,503	4,760	1,600	11,122	0	5,519	5,744	11,263	141	12,921
20	0	418	1,758	2,503	2,440	1,600	8,719	0	5,519	5,744	11,263	2,544	15,465
21	0	334	1,758	2,503	8,970	1,600	15,165	0	5,519	5,744	11,263	-3,902	11,563
22	0	251	1,758	2,503	800	1,600	6,912	0	5,519	5,744	11,263	4,351	15,914
23	0	167	1,758	2,503	1,290	1,600	7,318	0	5,519	5,744	11,263	3,945	19,859
24	0	84	1,758	2,503	0	1,600	5,945	0	5,519	5,744	11,263	5,318	25,177
25	0	0	1,758	2,503	2,440	1,600	8,301	0	5,519	5,744	11,263	2,962	28,139

Remarks: 1/: Interest; 4.75%
Grace period; 7 years
Repayment period including grace period; 25 years

Table O-5 CASH FLOW STATEMENT OF THE PROJECT

(Unit: J$10^3)

Year	Cash Outflow							Cash Inflow					Balance
	Capital Cost		Loan Repayment 3/		O & M Cost	Replacement Cost	Total	Fund		Revenue		Total	
	F.C 1/	L.C 2/	Interest	Principal				F.C	L.C	Development Company	Small Farmer		
1	2,680	3,088	127	0	0	0	5,895	2,680	3,088	0	0	5,768	-127
2	20,080	12,608	1,081	0	0	0	33,769	20,080	12,608	339	0	33,027	-742
3	39,972	15,052	2,980	0	1,600	0	59,604	39,972	15,052	1,141	120	56,285	-3,319
4	31,356	18,360	4,469	0	2,604	0	56,789	31,356	18,360	1,541	2,040	53,297	-3,492
5	34,068	11,668	6,087	0	3,472	0	55,295	34,068	11,668	2,303	2,040	50,079	-5,216
6	15,380	10,392	6,818	0	4,340	0	36,930	15,380	10,392	3,103	2,840	31,715	-5,215
7	2,384	196	6,931	0	4,340	0	13,851	2,384	196	3,103	4,440	10,123	-3,728
8	0	0	6,439	7,978	4,340	1,280	20,037	0	0	4,774	4,440	9,214	-10,823
9	0	0	6,060	7,974	4,340	0	18,374	0	0	4,694	4,440	9,134	-9,240
10	0	0	5,681	7,974	4,340	0	17,995	0	0	4,611	4,440	9,051	-8,944
11	0	0	5,303	7,974	4,340	0	17,617	0	0	4,527	4,440	8,967	-8,650
12	0	0	4,924	7,974	4,340	0	17,238	0	0	4,444	4,440	8,884	-8,354
13	0	0	4,545	7,974	4,340	3,320	20,179	0	0	4,360	4,440	8,800	-11,379
14	0	0	4,166	7,974	4,340	0	16,480	0	0	4,277	4,440	8,717	-7,763
15	0	0	3,788	7,974	4,340	0	16,102	0	0	4,193	4,440	8,633	-7,469
16	0	0	3,409	7,974	4,340	0	15,723	0	0	4,110	4,440	8,550	-7,173
17	0	0	3,030	7,974	4,340	0	15,344	0	0	4,026	4,440	8,466	-6,878
18	0	0	2,651	7,974	4,340	1,280	16,245	0	0	3,943	4,440	8,383	-7,862
19	0	0	2,273	7,974	4,340	0	14,587	0	0	3,859	4,440	8,299	-6,288
20	0	0	1,894	7,974	4,340	0	14,208	0	0	3,776	4,440	8,216	-5,992
21	0	0	1,515	7,974	4,340	0	13,829	0	0	3,692	4,440	8,132	-5,697
22	0	0	1,136	7,974	4,340	0	13,450	0	0	3,609	4,440	8,049	-5,401
23	0	0	758	7,974	4,340	23,548	36,620	0	0	3,525	4,440	7,965	-28,655
24	0	0	379	7,974	4,340	0	12,693	0	0	3,442	4,440	7,882	-4,811
25	0	0	0	7,974	4,340	0	12,314	0	0	3,358	4,440	7,798	-4,516

Remarks: 1/: Foreign Currency
2/: Local Currency
3/: Interest; 4.75%
Grace period; 7 years
Repayment period including grace period; 25 years

THE AGRICULTURAL DEVELOPMENT PROJECT