(9) Price contingency: 5 % per annum for the foreign currency portion and 30 % per annum for the local currency portion,

(10) The costs for rural fundamental facilities such as facilities for rural water supply, roads, and low tension line of electricity are also included.

2.2 Cost Estimate

The total construction costs of the Project are estimated at Tsh. 2,950 million consisting of Tsh. 580 million of local currency and Tsh. 2,370 million of foreign currency as summarized in Table 2-1.

The breakdown of direct construction costs is shown in Table 2-2. Direct construction cost of offices and quarters, procurement cost of major operation and maintenance equipment, administration expenses, staff salary at construction stage, and cost of engineering services are shown in Table 2-3 to 2-7. The local materials and labour wages used in the estimate and the unit rates of major works are shown in Table 2-8 and 2-9, respectively.

2.3 Annual Disbursement Schedule

The annual disbursement schedule is worked out on the basis of the construction schedule as shown in Table 2-10.

2.4 Annual Operation and Maintenance Costs and Replacement Costs

The annual operation and maintenance costs will include the salaries of the project administration and water management staffs, the materials and labour costs for repair and maintenance of the project facilities, the costs of operation and maintenance of O & M equipment, and the running cost of tubewells. They are shown in Table 2-11 and 2-12.

Some of the facilities, especially mechanical and electrical facilities have a shorter life than civil works and have to be replaced periodically. The useful lives and costs of replacement of such facilities are listed in Table 2-13.

3. OTHER COST

Other cost will include the cost of 14 tractors with attachment, 7 trucks and 640 m^2 of storage used by the Sanya River Basin Cooperative Society (SRBC) to facilitate timely land preparation, easy access to agro-inputs and market outlets of the Project area.

Total desirable other cost are estimated at Tsh. 209 million consisting Tsh. 25 million of local currency and Tsh. 184 million of foreign currency as shown in Table 3-1.

Table 1-1 ESTIMATION OF WORKABLE DAYS

Unit: day

Item	J	F	M	A	M	J	J	A	S	O	N	D	Total
1. Monthly Day	31	28	31	30	31	30	31	31	30	31	30	31	365
2. Frequency of rainfall													
3 - 10 mm	1	1	2	5	5	1	1	1	1	1	2	2	23
10 - 30 mm	1	1	2	3	2	0	0	0	0	0	2	1	12
30 - 50 mm	0	0	0	1	1	0	0	0	0	0	0	0	2
more than 50 mm	0	0	0	1	0	0	0	0	0	0	0	0	1
3. Time length to be suspended	2	2	3	9	6	1	1	1	1	1	3	2	29
4. Holidays	6	5	6	6	6	4	7	4	5	5	4	7	65
5. Total days to be suspended	8	7	9	15	12	5	8	5	6	6	7	9	94
6. Workable days	23	21	22	15	19	25	23	26	24	25	23	22	271

Note : Rainfall data are derived from Kilimanjaro International Airport. 10 year average from 1979 to 1988.

Table 1-2 REQUIRED MAJOR CONSTRUCTION EQUIPMENT

Equipment	Specification	Required Number
1. Bulldozer	32 ton	3
2. Bulldozer	21 ton	3
3. Bulldozer with ripper	21 ton	2
4. Bulldozer	15 ton	4
5. Backhoe	0.7 m3	4
6. Backhoe	0.4 m3	3
7. Wheel loader	1.7 m3	2
8. Dozer shovel	1.2 m3	3
9. Motor grader	3.1 m	2
10. Tamping roller	15 ton	1
11. Vibration roller	10 ton	1
12. Vibration roller	2.5 ton	1
13. Road roller	10 ton	1
14. Tire roller	8 ton	2
15. Dump truck	11 ton	7
16. Dump truck	8 ton	5
17. Fork lift	3 ton	1
18. Water tanker	6 kl	3
19. Tamper	80 kg	6
20. Hydraulic breaker (attachment for backhoe)	400 kg	1
21. Butcher plant	15 m3/hr	1
22. Crashing plant	20 ton/hr	1
23. Sand washing plant	10 ton/hr	1
24. Linning block plant	1,000 nos/day	1
25. Concrete mixer	0.4 m3/hr	2
26. Mortar mixer	0.08 m3	1
27. Concrete vibrator	38 mm	4
28. Agitator truck	1.6 m3	3
29. Truck crane	25 ton	1
30. Truck with crane	4ton,2.9ton	3
31. Ordinary truck	4 ton	5
32. Trailer	32 ton	1
33. Fuel tanker	4 kl	2
34. Micro bus	25 person	2
35. Jeep	4WD	10
36. Maintenence car	6 ton	1
37. Air compresser	15 m3/min	1
38. Air compresser	2 m3/min	1
39. Generetor	175 kVA	1
40. Welding machine	11.2 kW	1
41. Submergible pump	50 mm	3
42. Truck mounted drilling machine		1
43. Testing and survey equipment		1 lot
44. Repair shop equipment		1 lot

Table 2-1 SUMMARY OF DIRECT CONSTRUCTION COST

Unit : 1,000 TSh.

Work Item	Phase-1			Phase-2			Total		
	LC	FC	Total	LC	FC	Total	LC	FC	Total
Preparatory Work	9,130	43,310	52,440	4,140	30,600	34,740	13,270	73,910	87,180
Boloti Reservoir	80,070	562,540	642,610	-	-	-	80,070	562,540	642,610
Tubewell, 12 Nos.+3 Nos.	-	-	-	13,140	326,700	339,840	13,140	326,700	339,840
Sanya Chini Irrigation System	71,400	256,050	327,450	68,620	283,000	351,620	140,020	539,050	679,070
Office and Quarter	30,900	47,500	78,400	1,800	3,000	4,800	32,700	50,500	83,200
Sub-total	191,500	909,400	1,100,900	87,700	643,300	731,000	279,200	1,552,700	1,831,900
O & M Equipment	-	46,200	46,200	-	46,200	46,200	-	92,400	92,400
Administration Expences	3,200	-	3,200	3,200	-	3,200	6,400	-	6,400
Engineering Services	-	157,100	157,100	-	117,300	117,300	-	274,400	274,400
Sub-total	194,700	1,112,700	1,307,400	90,900	806,800	897,700	285,600	1,919,500	2,205,100
Physical Contingency	19,300	111,300	130,600	9,100	81,200	90,300	28,400	192,500	220,900
Total	214,000	1,224,000	1,438,000	100,000	888,000	988,000	314,000	2,112,000	2,426,000
Price Contingency	147,000	121,000	268,000	119,000	138,000	257,000	266,000	259,000	525,000
Grand Total	361,000	1,345,000	1,706,000	219,000	1,026,000	1,245,000	580,000	2,371,000	2,951,000

Table 2-2 BREAKDOWN OF DIRECT CONSTRUCTION COST

Unit : 1,000 TSh.

Work Item	Phase-1			Phase-2			Total		
	LC	FC	Total	LC	FC	Total	LC	FC	Total
Preparatory Work	9,130	43,310	52,440	4,140	30,600	34,740	13,270	73,910	87,180
Boloti Reservoir									
Boloti Dam	29,500	440,960	470,460	-	-	-	29,500	440,960	470,460
Spillway	2,330	5,210	7,540	-	-	-	2,330	5,210	7,540
Lawati Diversion Weir	7,160	25,250	32,410	-	-	-	7,160	25,250	32,410
Lawati Diversion Canal	17,690	43,320	61,010	-	-	-	17,690	43,320	61,010
Outlet Structure	3,570	9,290	12,860	-	-	-	3,570	9,290	12,860
Outlet Canal	19,820	38,510	58,330	-	-	-	19,820	38,510	58,330
	(80,070)	(562,540)	(642,610)				(80,070)	(562,540)	(642,610)
Tubewell, 12 Nos.+3 Nos.	-	-	-	13,140	326,700	339,840	13,140	326,700	339,840
Sanya Chini Irrigation System									
Headworks	3,360	11,790	15,150	-	-	-	3,360	11,790	15,150
Headreach, Left Main Canal	18,500	41,020	59,520	6,490	14,280	20,770	24,990	55,300	80,290
Right Main Canal	18,800	40,560	59,360	7,300	15,640	22,940	26,100	56,200	82,300
Left Secondary Canal	-	-	-	4,150	10,620	14,770	4,150	10,620	14,770
Right Secondary Canal	3,930	9,480	13,410	13,650	31,000	44,650	17,580	40,480	58,060
Drain	1,590	8,580	10,170	2,380	12,860	15,240	3,970	21,440	25,410
Road, 38 km	4,630	44,020	48,650	6,390	57,790	64,180	11,020	101,810	112,830
Night Storage Pond	4,690	37,670	42,360	5,660	44,940	50,600	10,350	82,610	92,960
Tertiary Development	15,900	62,930	78,830	21,350	81,910	103,260	37,250	144,840	182,090
Flood Dike	-	-	-	1,250	13,960	15,210	1,250	13,960	15,210
	(71,400)	(256,050)	(327,450)	(68,620)	(283,000)	(351,620)	(140,020)	(539,050)	(679,070)
Office and Quarter	30,900	47,500	78,400	1,800	3,000	4,800	32,700	50,500	83,200
Total	191,500	909,400	1,100,900	87,700	643,300	731,000	279,200	1,552,700	1,831,900

Table 2-3 BREAKDOWN OF DIRECT CONSTRUCTION COST OF OFFICES AND QUARTERS

Unit: TSh.1,000

Item	Unit	Q'ty	Foreign	Local
1. Main Office	m2	300	8,400	5,600
2. Boloti Office	m2	50	1,500	900
3. Sanya Office	m2	100	2,500	1,400
4. Site Offices (4 nos.)	m2	200	6,000	3,600
5. Workshop	m2	200	2,700	1,600
6. Quaterrs	m2	1,000	29,400	19,600
Total			50,500	32,700

Table 2-4 PROCUREMENT COST OF OPERATION AND MAINTENANCE EQUIPMENT

Unit: 1,000 yen

Equipment	Spec.	Unit Price	Q'ty	Amount
Backhoe	0.15 m3	9,000	1	9,000
Tamper	80 kg	260	2	520
Motor grader	3.1 m	12,000	1	12,000
Road roller	8 ton	7,500	1	7,500
Portable concrete mixer	0.06 m3	350	1	350
Dump truck	5 ton	6,000	1	6,000
Ordinary truck with crane	5 ton	5,700	1	5,700
Ordinary truck	10 ton	12,300	1	9,100
Light truck	1 ton	1,500	1	1,500
Vehicle, 4-wheel drive	jeep type	2,000	2	4,000
Motor bicycle	90 cc	90	5	450
Bicycle		18	18	324
Computer, desk-top type	16 bits	800	1	800
Walkie-talkie		5	3	15
Workshop tools and spare parts	(20 %)		L.S	11,485
Total				68,744 (TSh.92,400 x 10^3 eq.)

Table 2-5 ADMINISTRATION EXPENCES AT IMPLEMENTATION STAGE

Unit : TSh.1,000

Item	Amount
1. Design Stage (24 month)	
(1) Staff salary*1	2,736
(2) Labour wage	200
(3) Office expenses	250
(4) Equipment running cost	200
(5) Other related cost	214
Sub-total	3,600
2. Construction Stage (24 month)	
(1) Staff salary*1	1,833
(2) Labour wage	250
(3) Office expences	300
(4) Equipment running cost	250
(5) Other related cost	167
Sub-total	2,800
TOTAL	6,400

Note : *1 : Refer to Table 2-4

Table 2-6 STAFF SALARY AT IMPLEMENTATION STAGE

Unit: TSh.

Item	Monthly Rate	Design Stage		Construction Stage	
		Required Number	Yeary Amount	Required Number	Yeary Amount
(1) Project Manager	8,500	1	102,000	1	102,000
(2) Senior Irrigation Engineer	6,500	1	78,000	1	78,000
(3) Irrigation Engineer	5,800	1	69,600		
(4) Construction Engineer	5,800			1	69,600
(5) Design Engineer	5,800	4	278,400	1	69,600
(6) Electric Engineer	5,800	(1)*1	23,200	(1)*1	23,200
(7) Metal Engineer	5,800	(1)*1	17,400	(1)*1	17,400
(8) Hydro-geologist	5,800	1	69,600	1	69,600
(9) Boring Technician	5,000	3	180,000		
(10) Mechanic	5,000	1	60,000	1	60,000
(11) Topo-surveyor	4,800	2	115,200	2	115,200
(12) Draftman	4,000	2	96,000		
(13) Administrater	4,800	1	57,600	1	57,600
(14) Accountant	4,800	1	57,600	1	57,600
(15) Cleark/Typist	4,000	2	96,000	2	96,000
(16) Driver	2,800	2	67,200	3	100,800
Total		24	1,367,800	17	916,600

Remark : *1: Short time assignment

Table 2-7 COST ESTIMATE OF ENGINEERING SERVICES

Item	Amount (US$)
1. Detailed Design Stage	
(1) Remuneration and per diem	510,000
(2) Other Related cost	101,400
Sub-total	611,400 (TSh.119.2 x 10^6)
2. Construction Stage	
(1) Remuneration and per diem	750,000
(2) Other Related cost	46,000
Sub-total	796,000 (TSh.155.2 x 10^6)
Total	1,407,400 (TSh.274.4 x 10^6)

Table 2-8 PRICE LIST OF BASIC MATERIALS AND LABOUR WAGES

Unit : 1,000 TSh.

No.	Item	Unit	Unit Cost
1.	Fuel, Oil, Gas etc		
	Petrol, super	lit.	110
	Petrol, regular	lit.	105
	Diesel	lit.	52
	Light Diesel	lit.	58
	Diesel engine oil	lit.	350
	Gear oil	lit.	400
	Hydraulic oil	lit.	400
	Grease	kg	600
	LPG	kg	65
	Acetylene gas	cylinder	5,125
	Oxygen	cylinder	2,860
	Erectricity		
	a - 1500 kwh	kwh	4.00
	b 1500 - 3000 kwh	kwh	10.25
	c 3000 -10000 kwh	kwh	24.00
	d 10000 kmh -	kwh	37.50
	d basic price per meter reading		500.00
2.	Construction Materials (Market Price)		
	Cement	ton	18,000
	Fine aggregate	m3	3,400
	Coarse aggregate	m3	4,100
	Gravel	m3	4,100
	Bolder for gabion	m3	2,500
	Brick made of cement 20*15*400 cm	Nos.	110
	Timber	m3	17,000
	Reinforcement bar	ton	10,000
	Gravel for well	m3	3,000
	Jute bag 80*110 cm	Nos.	200
3.	Operator & Driver		
	Operator for heavy equipment	M/D	240
	Assistant for heavy equipment	M/D	200
	Driver for dump truck	M/D	240
	Driver	M/D	200
	Mechanic	M/D	240
4.	Labour		
	Foreman	M/D	300
	Mason	M/D	240
	Welder	M/D	240
	Carpenter	M/D	240
	Mason	M/D	240
	Mechanic	M/D	240
	Erectrician	M/D	240
	Skilled labour	M/D	200
	Common labour	M/D	150
	Surveyor	M/D	500
	Survey assistant	M/D	240
5.	Office Worker		
	Clerk	M/D	300
	Secretary	M/D	200
	Typist	M/D	200
	Draftman	M/D	240
	Tracer	M/D	240

Table 2-9 LIST OF UNIT PRICE OF MAJOR WORKS

Work Item	Unit	Foreign Currency	Local Currency	Total (Tsh.)	(Yen)
1. Land clearing	m2	11	1	12	9
2. Stripping of top soil	m3	192	11	203	151
3. Excavation					
- Weathered rock	m3	884	48	932	693
- Dam foundation	m3	221	12	233	173
- Diversion and outlet canals	m3	323	26	349	260
- Major canal and drain	m3	186	55	241	179
- Small canal	m3	0	262	262	195
4. Compacted earthfill					
- Dam embankment	m3	1,098	49	1,147	853
- Embankment of canal, road and flood dike	m3	608	48	656	488
5. Backfill					
- Large structure	m3	412	136	547	407
- Small structure	m3	442	124	565	420
6. Sod facing	m2	223	31	254	189
8. Concrete works					
- Reinforced concrete	m3	13,476	7,146	20,622	15,334
- Plain concrete	m3	11,876	7,679	19,555	14,541
- Base concrete	m3	10,812	7,498	18,310	13,615
- Concrete block lining	m3	70,385	12,846	83,231	61,890
9. Form works for concrete	m2	433	398	832	618
10. Reinfocement bar works	ton	138,600	23,440	162,040	120,491
14. Gabion	m3	4,992	504	5,496	4,087
15. Rock riprap	m3	3,204	360	3,564	2,650
16. Morrum pavement	m3	1,399	76	1,475	1,097
20. Concrete pipe work					
- dia=300mm	m	2,304	554	2,858	2,125
- dia=400mm	m	2,887	799	3,686	2,741
- dia=500mm	m	3,685	1,079	4,764	3,542
- dia=600mm	m	4,852	1,562	6,414	4,769
- dia=800mm	m	7,289	2,474	9,763	7,260
- dia=1000mm	m	8,779	3,420	12,199	9,071
21. Tubewell drilling	m	14,285	425	14,710	10,938

Table 2-10 ANNUAL DISBURSEMENT SCHEDULE OF CONSTRUCTION COST (1/3)

Unit : 1,000 TSh.

Work Item	Investment			1st Year			2nd Year			3rd Year		
	LC	FC	Total	LC	FC	Total	LC	FC	Total	LC	FC	Total
1. Preparatory Work	13,270	73,910	87,180	-	-	-	9,130	43,310	52,440	4,140	30,600	34,740
2. Boloti Reservoir												
Boloti Dam	29,500	440,960	470,460	-	-	-	29,500	440,960	470,460	-	-	-
Spillway	2,330	5,210	7,540	-	-	-	2,330	5,210	7,540	-	-	-
Lawati Diversion Weir	7,160	25,250	32,410	-	-	-	7,160	25,250	32,410	-	-	-
Lawati Diversion Canal	17,690	43,320	61,010	-	-	-	17,690	43,320	61,010	-	-	-
Outlet Structure	3,570	9,290	12,860	-	-	-	3,570	9,290	12,860	-	-	-
Outlet Canal	19,820	38,510	58,330	-	-	-	19,820	38,510	58,330	-	-	-
	(80,070)	(562,540)	(642,610)				(80,070)	(562,540)	(642,610)			
3. Tubewell, 12 Nos.+3 Nos.	13,140	326,700	339,840	-	-	-	-	-	-	13,140	326,700	339,840
4. Sanya Chini Irrigation System												
Headworks	3,360	11,790	15,150	-	-	-	3,360	11,790	15,150	-	-	-
Headreach, Left Main Canal	24,990	55,300	80,290	-	-	-	18,500	41,020	59,520	6,490	14,280	20,770
Right Main Canal	26,100	56,200	82,300	-	-	-	18,800	40,560	59,360	7,300	15,640	22,940
Left Secondary Canal	4,150	10,620	14,770	-	-	-	-	-	-	4,150	10,620	14,770
Right Secondary Canal	17,580	40,480	58,060	-	-	-	3,930	9,480	13,410	13,650	31,000	44,650
Drain	3,970	21,440	25,410	-	-	-	1,590	8,580	10,170	2,380	12,860	15,240
Road, 38 km	11,020	101,810	112,830	-	-	-	4,630	44,020	48,650	6,390	57,790	64,180
Night Storage Pond	10,350	82,610	92,960	-	-	-	4,690	37,670	42,360	5,660	44,940	50,600
Tertiary Development	37,250	144,840	182,090	-	-	-	15,900	62,930	78,830	21,350	81,910	103,260
Flood Dike	1,250	13,960	15,210	-	-	-	-	-	-	1,250	13,960	15,210
	(140,020)	(539,050)	(679,070)				(71,400)	(256,050)	(327,450)	(68,620)	(283,000)	(351,620)
5. Office and Quarter	32,700	50,500	83,200	-	-	-	30,900	47,500	78,400	1,800	3,000	4,800
Sub-total	279,200	1,552,700	1,831,900	-	-	-	191,500	909,400	1,100,900	87,700	643,300	731,000
6. O & M Equipment	-	92,400	92,400	-	-	-	-	46,200	46,200	-	46,200	46,200
7. Administration Expences	6,400	-	6,400	1,800	-	1,800	3,200	-	3,200	1,400	-	1,400
8. Engineering Services	-	274,400	274,400	-	79,500	79,500	-	117,300	117,300	-	77,600	77,600
Sub-total	285,600	1,919,500	2,205,100	1,800	79,500	81,300	194,700	1,072,900	1,267,600	89,100	767,100	856,200
9. Physical Contingency	28,400	192,500	220,900	200	8,000	8,200	19,300	107,300	126,600	8,900	77,200	86,100
Total	314,000	2,112,000	2,426,000	2,000	87,500	89,500	214,000	1,180,200	1,394,200	98,000	844,300	942,300
10. Price Contingency	266,000	259,000	525,000	600	4,400	5,000	147,800	121,100	268,900	117,600	133,500	251,100
Grand Total	580,000	2,371,000	2,951,000	2,600	91,900	94,500	361,800	1,301,300	1,663,100	215,600	977,800	1,193,400

Note : Price contingency is estimated based on the annual increse rate of 5 % and 30 % for foreign currency portion and local currency portion respectively.
The conversion rates are US$1.00 = TSh.195.00 = Yen 145.00

Table 2-10 ANNUAL DISBURSEMENT SCHEDULE OF CONSTRUCTION COST (2/3)
(Phase-1)

Unit : 1,000 TSh.

Work Item	Investment			1st Year			2nd Year			3rd Year		
	LC	FC	Total	LC	FC	Total	LC	FC	Total	LC	FC	Total
1. Preparatory Work	9,130	43,310	52,440	-	-	-	9,130	43,310	52,440	-	-	-
2. Boloti Reservoir												
Boloti Dam	29,500	440,960	470,460	-	-	-	29,500	440,960	470,460	-	-	-
Spillway	2,330	5,210	7,540	-	-	-	2,330	5,210	7,540	-	-	-
Lawati Diversion Weir	7,160	25,250	32,410	-	-	-	7,160	25,250	32,410	-	-	-
Lawati Diversion Canal	17,690	43,320	61,010	-	-	-	17,690	43,320	61,010	-	-	-
Outlet Structure	3,570	9,290	12,860	-	-	-	3,570	9,290	12,860	-	-	-
Outlet Canal	19,820	38,510	58,330	-	-	-	19,820	38,510	58,330	-	-	-
	(80,070)	(562,540)	(642,610)				(80,070)	(562,540)	(642,610)			
3. Tubewell, 12 Nos.+3 Nos.	-	-	-	-	-	-	-	-	-	-	-	-
4. Sanya Chini Irrigation System												
Headworks	3,360	11,790	15,150	-	-	-	3,360	11,790	15,150	-	-	-
Headreach, Left Main Canal	18,500	41,020	59,520	-	-	-	18,500	41,020	59,520	-	-	-
Right Main Canal	18,800	40,560	59,360	-	-	-	18,800	40,560	59,360	-	-	-
Left Secondary Canal	-	-	-	-	-	-	-	-	-	-	-	-
Right Secondary Canal	3,930	9,480	13,410	-	-	-	3,930	9,480	13,410	-	-	-
Drain	1,590	8,580	10,170	-	-	-	1,590	8,580	10,170	-	-	-
Road, 38 km	4,630	44,020	48,650	-	-	-	4,630	44,020	48,650	-	-	-
Night Storage Pond	4,690	37,670	42,360	-	-	-	4,690	37,670	42,360	-	-	-
Tertiary Development	15,900	62,930	78,830	-	-	-	15,900	62,930	78,830	-	-	-
Flood Dike	-	-	-	-	-	-	-	-	-	-	-	-
	(71,400)	(256,050)	(327,450)				(71,400)	(256,050)	(327,450)			
5. Office and Quarter	30,900	47,500	78,400	-	-	-	30,900	47,500	78,400	-	-	-
Sub-total	191,500	909,400	1,100,900	-	-	-	191,500	909,400	1,100,900	-	-	-
6. O & M Equipment	-	46,200	46,200	-	-	-	-	46,200	46,200	-	-	-
7. Administration Expences	3,200	-	3,200	1,800	-	1,800	1,400	-	1,400	-	-	-
8. Engineering Services	-	157,100	157,100	-	79,500	79,500	-	77,600	77,600	-	-	-
Sub-total	194,700	1,112,700	1,307,400	1,800	79,500	81,300	192,900	1,033,200	1,226,100	-	-	-
9. Physical Contingency	19,300	111,300	130,600	200	8,000	8,200	19,100	103,300	122,400	-	-	-
Total	214,000	1,224,000	1,438,000	2,000	87,500	89,500	212,000	1,136,500	1,348,500	-	-	-
10. Price Contingency	147,000	121,000	268,000	600	4,400	5,000	146,400	116,600	263,000	-	-	-
Grand Total	361,000	1,345,000	1,706,000	2,600	91,900	94,500	358,400	1,253,100	1,611,500	-	-	-

Note : Price contingency is estimated based on the annual increse rate of 5 % and 30 % for foreign currency portion and local currency portion respectively.
The conversion rates are US$1.00 = TSh.195.00 = Yen 145.00

Table 2-10 ANNUAL DISBURSEMENT SCHEDULE OF CONSTRUCTION COST (3/3)
(Phase-2)

Unit : 1,000 TSh.

Work Item	Investment			1st Year			2nd Year			3rd Year		
	LC	FC	Total	LC	FC	Total	LC	FC	Total	LC	FC	Total
1. Preparatory Work	4,140	30,600	34,740	-	-	-	-	-	-	4,140	30,600	34,740
2. Boloti Reservoir												
Boloti Dam	-	-	-	-	-	-	-	-	-	-	-	-
Spillway	-	-	-	-	-	-	-	-	-	-	-	-
Lawati Diversion Weir	-	-	-	-	-	-	-	-	-	-	-	-
Lawati Diversion Canal	-	-	-	-	-	-	-	-	-	-	-	-
Outlet Structure	-	-	-	-	-	-	-	-	-	-	-	-
Outlet Canal	-	-	-	-	-	-	-	-	-	-	-	-
3. Tubewell, 12 Nos.+3 Nos.	13,140	326,700	339,840	-	-	-	-	-	-	13,140	326,700	339,840
4. Sanya Chini Irrigation System												
Headworks	-	-	-	-	-	-	-	-	-	-	-	-
Headreach, Left Main Canal	6,490	14,280	20,770	-	-	-	-	-	-	6,490	14,280	20,770
Right Main Canal	7,300	15,640	22,940	-	-	-	-	-	-	7,300	15,640	22,940
Left Secondary Canal	4,150	10,620	14,770	-	-	-	-	-	-	4,150	10,620	14,770
Right Secondary Canal	13,650	31,000	44,650	-	-	-	-	-	-	13,650	31,000	44,650
Drain	2,380	12,860	15,240	-	-	-	-	-	-	2,380	12,860	15,240
Road, 38 km	6,390	57,790	64,180	-	-	-	-	-	-	6,390	57,790	64,180
Night Storage Pond	5,660	44,940	50,600	-	-	-	-	-	-	5,660	44,940	50,600
Tertiary Development	21,350	81,910	103,260	-	-	-	-	-	-	21,350	81,910	103,260
Flood Dike	1,250	13,960	15,210	-	-	-	-	-	-	1,250	13,960	15,210
	(68,620)	(283,000)	(351,620)							(68,620)	(283,000)	(351,620)
5. Office and Quarter	1,800	3,000	4,800	-	-	-	-	-	-	1,800	3,000	4,800
Sub-total	87,700	643,300	731,000	-	-	-	-	-	-	87,700	643,300	731,000
6. O & M Equipment	-	46,200	46,200	-	-	-	-	-	-	-	46,200	46,200
7. Administration Expences	3,200	-	3,200	-	-	-	1,800	-	1,800	1,400	-	1,400
8. Engineering Services	-	117,300	117,300	-	-	-	-	39,700	39,700	-	77,600	77,600
Sub-total	90,900	806,800	897,700	-	-	-	1,800	39,700	41,500	89,100	767,100	856,200
9. Physical Contingency	9,100	81,200	90,300	-	-	-	200	4,000	4,200	8,900	77,200	86,100
Total	100,000	888,000	988,000	-	-	-	2,000	43,700	45,700	98,000	844,300	942,300
10. Price Contingency	119,000	138,000	257,000	-	-	-	1,400	4,500	5,900	117,600	133,500	251,100
Grand Total	219,000	1,026,000	1,245,000	-	-	-	3,400	48,200	51,600	215,600	977,800	1,193,400

Note : Price contingency is estimated based on the annual increse rate of 5 % and 30 % for foreign currency portion and local currency portion respectively.
The conversion rates are US$1.00 = TSh.195.00 = Yen 145.00

Table 2-11 ANNUAL OPERATION AND MAINTENANCE COSTS

Unit: Tsh.

Item		Amount
1. Salary and Wages		
(1) Staff salaries (see Table 2-12)		1,959,600
(2) Labour wages, 60 M/M x TSh.3,000		180,000
2. Office Expenses	L.S	500,000
3. Tubewell Operation Cost		1,220,000
4. Repair and Maintenance Cost (0.5 % of direct construction cost)	L.S	
(1) Boloti Dam		2,390,000
(2) Irrigation/Drainage Facilities and Road Network		4,177,000
(3) Tubewell		1,556,000
5. Miscellaneous	L.S	1,200,400
Total		13,183,000

Table 2-12 STAFF SALARY AT O & M STAGE

Unit: TSh.

Item	Required Number	Monthly Rate	Yeary Amount
(1) Project Manager (Senior Irrigation Engineer)	1	8,500	102,000
(2) Irrigation Engineer	1	5,800	69,600
(3) Electrician	1	5,000	60,000
(4) Mechanic	2	5,000	120,000
(5) Computer Operator	1	5,000	60,000
(6) Irrigation Technician	3	4,800	172,800
(7) Tubewell and Gate Operator	18	4,300	928,800
(8) Administrater	1	4,800	57,600
(9) Accountant	1	4,800	57,600
(10) Cleark/Typist	2	4,000	96,000
(11) Equipment Operator	3	2,800	100,800
(12) Driver	4	2,800	134,400
Total	38		1,959,600

Table 2-13 REPLACEMENT COST AND USEFUL LIFE

Item	Useful Life (year)	Replacement Cost (Tsh.1,000)
1. O & M Equipment		
(1) Heavy equipment	10	68,300
(2) Vehicle & small equipment	5	24,100
2. Project Facilities		
(1) Intake facilities, gate	25	8,600
(2) Irrigation facilities, gate	25	80,800
(3) Tubewell, pump and motor	25	79,400

Table 3-1 ANNUAL DISBURSEMENT SCHEDULE OF OTHER COST

(Unit : 1,000 Tsh.)

	Investment			1st Year			2nd Year			3rd Year		
	LC	FC	Total	LC	FC	Total	LC	FC	Total	LC	FC	Total
1. Tractors*	0	112,960	112,960	0	0	0	0	56,480	56,480	0	56,480	56,480
2. Truk*	0	38,740	38,740	0	0	0	0	19,370	19,370	0	19,370	19,370
3. Storage**	8,360	12,540	20,900	0	0	0	4,180	6,270	10,450	4,180	6,270	10,450
Sub-total	8,360	164,240	172,600	0	0	0	4,180	82,120	86,300	4,180	82,120	86,300
4. Price Contingency***	7,880	21,360	29,240	0	0	0	2,880	8,420	11,300	5,000	12,940	17,940
Total	16,240	185,600	201,840	0	0	0	7,060	90,540	97,600	9,180	95,060	104,240

Note : *; Including cost of spare parts and procurement schedule of tractor and truck is as follows:

	1st	2nd	3rd
Tractor	0	7	7
Truck	0	2	2

**; Total capacity of storage is 640 m2 (to construct 320 m2 in 2nd year and 320 m2 in 3rd year)

***; Price contingency is estimated based on the annual increse rate of 5 % and 30 % for foreign currency portion and local currency portion respectively.

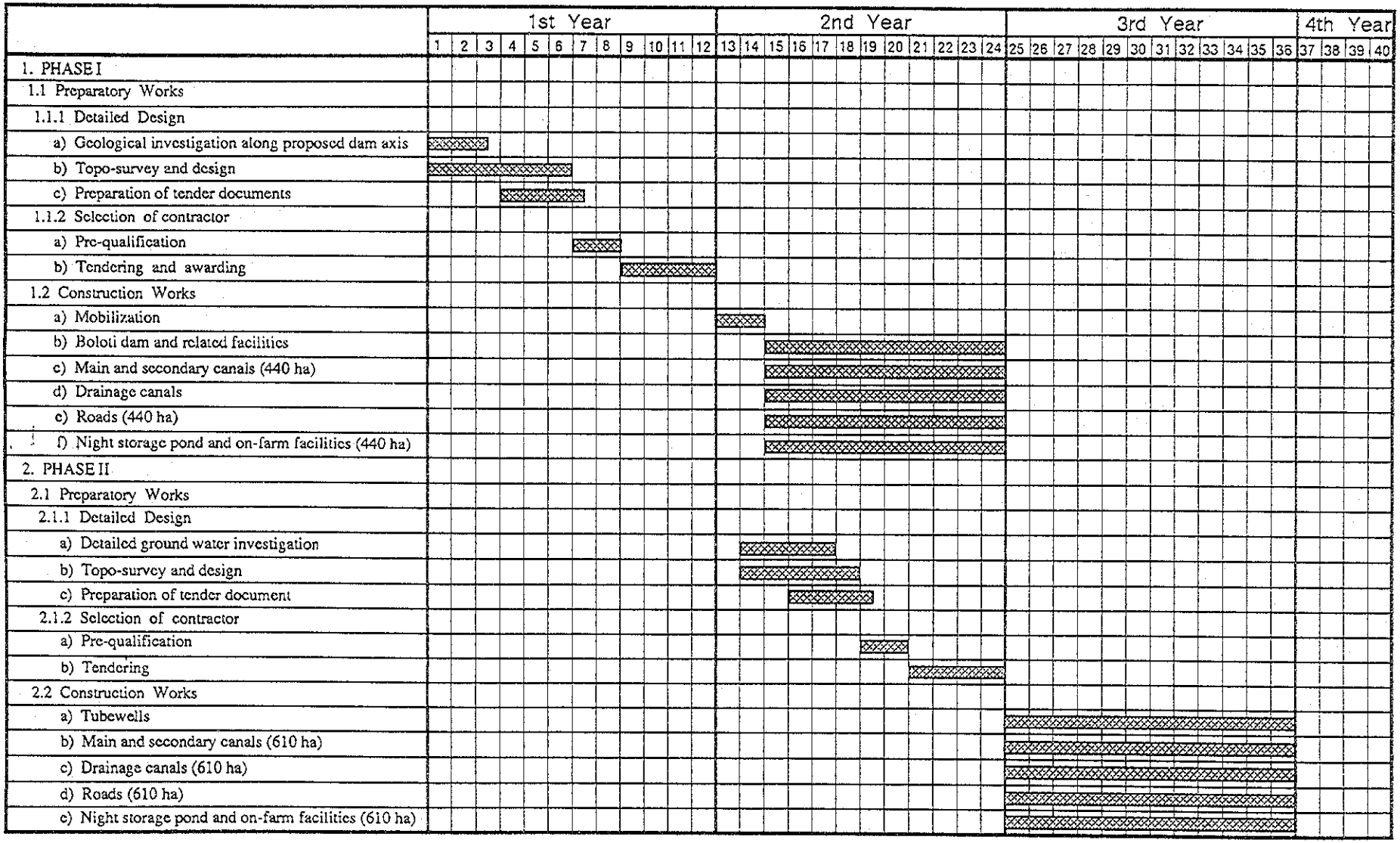

Fig. 1-1 PROJECT IMPLEMENTATION SCHEDULE

ANNEX J

PROJECT EVALUATION

ANNEX J

PROJECT EVALUATION

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1. ECONOMIC EVALUATION

1.1 General

The economic feasibility of the "Lower Hai and Lower Rombo Agricultural Development Project" was assessed through the economic internal rate of return (EIRR). A sensitivity analysis for the Project was also made assuming changes in accrued project benefit and project cost.

The economic evaluation was made on the basis of the following basic assumption:

(1) The economic useful life of the Project is 50 years.
(2) All prices are expressed in 1990 constant prices.
(3) The exchange rate of US$ 1.0 = Tsh. 195 = Yen 145 is applied.
(4) The construction period is three (3) years including one (1) year for preparatory works and detailed design.
(5) Price contingency (30 % for local currency component and 5 % for foreign currency component) are excluded from the economic cost.

1.2 Economic Project Cost

The economic construction cost estimated at 1990 price levels comprises the costs for (1) preparatory works, (2) civil works including on-farm facilities, (3) administrative expenses, (4) engineering services, (5) operation and maintenance equipment and (6) physical contingency of 10%. Details of the economic construction cost is given in Annex I PROJECT IMPLEMENTATION AND COST and Annex F IRRIGATION AND DRAINAGE. The economic construction cost of each case is summarized as follows:

(Unit: Tsh. 1,000)

Case	Local	Foreign	Total
Case-2 (Boloti dam development)	296,000	1,702,000	1,998,000
Case-4 (Groundwater development)	147,000	1,098,000	1,245,000
Case-5 (Combination of 2 and 4)	314,000	2,112,000	2,426,000

Remark: see Table 3-9 in Annex F and Table 2-10 in Annex I

In addition to the above cost, the annual operation and maintenance (O&M) cost and the replacement cost for irrigation facilities, pump and O&M equipment are given in Annex I and Annex F, and were included in the economic project cost. Economic O&M cost was estimated as follows:

(Unit: Tsh. 1,000/year)

Case	O&M Cost
Case-2	10,149
Case-4	7,783
Case-5	13,183

Remark: see Table 3-10 and 3-11 in Annex F and Table 2-11 and 2-13 in Annex I

The O&M equipment, intake facilities (gates), irrigation facilities (gates), pump equipment, etc. should be replaced at a certain period within the economic project life of 50 years. The useful life of these facilities is shown blow:

Item	Useful Life (year)
Heavy Equipment	10
Vehicle and Small Equipment	5
Intake facilities (gate)	25
Irrigation facilities (gate)	25
Tubewell, pump and motor	25

According to the implementation schedule of the Project proposed in Annex I and Annex F and works quantities, the flow of the economic construction cost, operation and maintenance cost and replacement cost were estimated as shown in Table 1-1.

1.3 Economic Project Benefit

Economic farm gate prices of tradable commodities such as maize and fertilizers were estimated on the basis of the projected world market prices of the World Bank in the long range for the period of 1988 to 2000. The World Bank forecast prices of tradable commodities were adjusted to 1990 constant prices using the manufacturing unit value (MUV). Economic farm gate prices of other tradable commodities were valued at their financial prices. On the other hand, economic farm gate prices of non-tradable agricultural commodities were estimated at five (5) years average by applying the deflator. Economic farm gate price of farm labour was estimated by using of 0.6. Details are given in Annex E AGRICULTURE AND AGRO-ECONOMY.

The economic benefit from irrigation will primarily accrue from increased crop production due to stable irrigation water supply and proper management. These benefit was estimated as the difference between the annual net economic production value from the Project under "with project condition" (the condition of the proposed development) and "without project condition" (the present conditions projected

into future). Generally, not only will the acreage be increased but productivity as well, and annual economic irrigation benefit will increase to reach their maximum in the 9th year of Project implementation. Annual full economic irrigation benefit is summarized as follows:

(Unit: Tsh. 1,000/year)

Case	Benefit
Case-2	305,775
Case-4	259,911
Case-5	482,984

Remark: see Table 5-10 in Annex E

After completion of the Project, about 15 ha of upland field in the Boloti reservoir area will be submerged under the reservoir water and non-productive. These losses on account of the Project must be deducted from the benefit with the Project mentioned above as a negative benefit. The negative benefit was estimated to be Tsh. 29,000 per annum. The loss of agricultural land for Project facilities were counted in the estimate of the primary project benefit by deducting these areas from the agricultural land under "with project condition".

The flow of the economic irrigation benefit and the negative benefit in the reservoir areas was estimated as shown in Table 1-1.

1.4 Economic Evaluation

The economic internal rate of return (EIRR) was calculated from the economic project benefits and costs flow as given in Table 1-1. The results are as follows:

Case	EIRR (%)
Case-2	11.7
Case-4	15.4
Case-5	15.1

The result shows that all the cases are economically feasible.

A sensitivity analysis was made to evaluate the soundness of the Project against possible adverse changes in future for the following three (3) conditions:

(1) Cost over run by 10 %,
(2) Reduction of irrigation benefit by 10 % due to unexpected decrease in forecast prices of agricultural products,
(3) Combined effect of (1) and (2)

The results of sensitivity analysis are summarized below:

Conditions	EIRR (%)		
	Case-2	Case-4	Case-5
(1)	10.7	14.0	13.9
(2)	10.6	13.9	13.7
(3)	9.6	12.5	12.6

All the results except for the condition (3) of Case-2 still remain economically feasible. It is indicated that the Project is insensitive to adverse changes in future.

2. FINANCIAL EVALUATION

2.1 General

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

2.2 Capacity to Pay

Financial farm gate prices are the prices used for appraising the financial variability of the Project. Financial prices for agricultural products and inputs were estimated on the basis of current farm gate prices as shown in Annex E AGRICULTURE AND AGRO-ECONOMY.

In evaluation of project feasibility from the financial viewpoint of farmers, average farm budget analyses for each area were made with future projections under "with project" conditions as shown in Annex E and summarized as follows:

(Unit: Tsh.)

	Boloti	Mungushi	Sanya
Farm Size (ha)	1.1	0.8	1.9
Net income			
Farm income	51,930	48,740	1,044,250
Livestock income	2,330	2,130	25,450
Non-farm income	22,270	25,450	11,460
Sub-total	76,530	76,320	1,081,160
Living expense	45,280	58,230	59,660
Tax and others	550	630	610
Net reserve	30,700	17,460	1,020,890

Remark: see Table 5-13 in Annex E

The Project will bring about a great improvement in farm economy and these increased net reserves will offer incentive to farmers in each area. In addition substantial capacity to pay will enable them to pay an irrigation fee. The Project could be justified from the farmer's viewpoint.

2.3 Water Charge

It is desirable that a water charge per hectare be imposed on farm lands to cover operation and maintenance (O&M) cost and the replacement cost of equipment used in the drainage

and irrigation system. The annual O&M cost of the Project is estimated to be Tsh. 13.2 million which is equivalent to about Tsh. 4,500/ha of total planted lands (2,930 ha) in the the Project area. This corresponds to following percentages of the net annual reserve of each area:

	Boloti	Mungushi	Sanya
Net reserve (Tsh.)	30,700	17,460	1,020,890
Farm Size (ha)	1.1	0.8	1.9
Cropping intensity (%)	100	106	235
Annual O&M cost per ha (Tsh.)	4,500	4,500	4,500
Water Charge (Tsh.)	4,950	3,820	20,090
Proportion (%)	16.1	21.9	2.0

The water charge to the farmers in Boloti and Mungushi areas accounts high proportion (16 % to 20 %) of the net reserve. The water charge in Sanya plain is considered to be within the capacity of the farmers to pay, and would not serve as a disincentive to production. This results mainly depend on the following irrigation water supply conditions by the Project:

(1) Boloti and Mungushi areas will receive the irrigation water (surface water) in the rainy season for maintaining of present cropping pattern and stabilization of yields and production of the crops and no investment will be done.

(2) Sanya plain will receives the irrigation water (surface and ground water) throughout the year for maximum utilization of lands from the viewpoints of effective utilization of the water resources as well as higher return of crop production and investment for irrigation development will be done.

In this connection, all water charge to cover O&M cost of the Project will be recommended to be paid by the farmers in Sanya plain. In this case annual water charge will be estimated at Tsh. 12,560/ha or Tsh. 23,860 per an average farmer which equivalents only 2.3 % of net reserve of an average farmer in Sanya plain. This water charge was taken to be the Project revenue in the financial evaluation of the Project.

2.4 Repayment of the Project Cost

On the basis of current market prices and cost as of 1990, the financial cost of the Project was estimated to be Tsh. 2,951 million, comprising Tsh. 2,371 million in foreign currency and Tsh. 580 million in local currency as shown in Annex H PROJECT IMPLEMENTATION AND COST. In this estimate,

physical contingencies of 10 %, and price contingencies of 5 % per annum for foreign currency and 30 % per annum for local currency were added to the direct project cost. Table 2-10 in Annex H shows the annual disbursement schedule of the said financial 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 by the Government through a financing institution at an assumed interest rate of 1.0 % per annum for a repayment period of 30 years including a grace period of 10 years.

(2) Local currency portion

The capital will be financed by the Government from its own resources with no repayment.

A repayment schedule for the foreign currency portion was prepared as shown in Table 2-1. This indicates that the direct revenue from the farmers cannot cover the annual repayment of the foreign currency portion and the repayment of the foreign currency portion averaging of about Tsh. 140 million/year has to be made by the Government.

3. SOCIO-ECONOMIC IMPACTS

In addition to direct benefit counted in the economic evaluation, various secondary and intangible benefit and/or favorable socio-economic impacts are expected from the implementation of the Project. The main socio-economic impacts are described hereunder.

(1) Increase in employment opportunities

The Project will generate employment opportunities for unskilled laborers during the construction period. Most of the manpower will be supplied from the farmers in and around the Project area. Furthermore, employees will be able to gain more experience and skillfulness in the various working fields. The accumulation of experience and skills will be very useful for O&M work of the farmers. The Project will create a demand for farm labour arising from the increased farming activities due to intensive use of the land resulting from year-round irrigation.

(2) Increase of production of agricultural crops

The Project will increase agricultural production of staple food which will play an important role in self sufficiency in the Project area, Hai district and Kilimanjaro region. Furthermore, increased crop production will stimulate improvement in the marketing system and the agricultural support services.

(3) Increase of farmer's income

The farmer's income will be expected to improve considerably due to the increase in crop production. The increase of net farm income will function to provide motive power in improvement of living standards of the farmers as well as of regional economic development.

(4) Improvement of local transportation

Local transportation will be much improved by the construction of operation and maintenance roads along the irrigation canals. The expanded road system will not only enhance economic activities such as transportation of the agricultural products, inputs, cattle and other commodities but will also contribute to inter-regional accessibility and communication.

(5) Secondary direct benefits

Increased crop production and improvement of the road system mentioned above will increase the business of millers millers, merchants and transporters with respect to processing, marketing and transportation costs.

(6) Mitigation of floods

After completion of Boloti dam, the flood discharge of Mungushi river flowing from Boloti swamp will be considerably reduced by the regulation effects of Boloti reservoir, and therefore the lower reach areas along the Mungushi river will be totally relieved from the dangers of floods.

(7) Improvement of domestic water supply

The main source of drinking water for people in Sanya plain is the large network of traditional furrows which pass near most houses. This results in the high level of worm infestation in children and adults. The construction of tubewells in Sanya plain by the Project will be able to supply drinking water to the local habitants and this will improve the sanitary condition of Sanya plain.

(8) Improvement of water supply to cattle grazing

Shortage of water during dry season is also a serious problem for the cattle grazing carried by Masai people in the Masai steppe around the Project area. After completion of the Project, stable water supply will be expected throughout the year from the drainage canals running along the border of Project area. Furthermore, the crop residuals after harvesting, by-products of crops from the Project area will be improved fertility of the cattle especially during the dry season.

(9) Introduction of fish farming

The construction of Boloti dam, Boloti swamp will become submerged to a certain depth throughout the year. This will give the residents living around the Boloti reservoir a chance to introduce a fresh water fish farming in the reservoir. The fish farming in the Boloti reservoir will contribute not only to improve the economy but also to improve the nutritional situation of the residents around the Boloti reservoir.

(10) Demonstration effects

With 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 the incentive for adopting improved irrigation and drainage practices will be greatly enhanced. Enthusiasm generated from this success may even shorten the development period of other projects.

All the Project benefits will serve to improve the standard of living and the quality of life of the local people in and around the Project area and will contribute

substantially to strengthening the economy of Hai district, Kilimanjaro region and Tanzania as a whole.

4. ENVIRONMENTAL IMPACTS

Environmental impacts from the implementation of the Project and their effects were studied. Various environmental impacts are expected to result from the implementation of the Project. There are:

(1) Impacts on groundwater resources

There is the hydropower station at the confluence point of the Kikuletwa and the Kware rivers. This hydropower station largely relies on the spring water coming out at Chemka, Ngulu, Rundugai, etc. The annual available discharge at the hydropower station is approximately 400 million m^3 and the seasonal variation of discharge is very small. The Sanya groundwater development area is located at about 7 km upstream of the hydropower station. The annual groundwater demands in the Sanya downstream area are estimated at only 5.2 million m^3, of which some would recharge the groundwater. Amount to be consumed in the Sanya plain, thus, will account for only about 1.3 % of annual discharge at the hydropower station. It can be, therefore, said that the groundwater development in the Sanya plain has little negative impact on the groundwater resources of the hydropower station.

(2) Impact on soil salinity

The water quality of groundwater in the Sanya plain shows low to medium salinity. Therefore, the Project will be proposed in the conjunctive use of surface and groundwater resources and in sole use of surface water resources for conservation of salinity problem. However, poor management of irrigation water application may cause logging of water and salinity problems which may result in poor productive soils. Accordingly, irrigation water should be applied properly in accordance with irrigation manual, and further when saline contamination is observed, the field shall be served with water for leaching salt. The best leaching season is May and June, when river water is usually abundant and evaporation rate is very low.

(3) Impact on wildlife animals

Many kind of wildlife animals such as monkeys, deer, rabbits, kinds of birds, etc. can be seen in and around the Project area. Because the dosage of agro-chemicals will increase due to introduction of improved farming practices, the use of agro-chemicals will be carefully made under proper guideline so as to minimize impacts on wildlife animals. In this connection, use of herbicides is not recommended and organophosphorus and organochlorine insecticides such as Metacid, Thimet, Dimecron, Sedrin, Chlorodane and BHC having high toxicity would be replaced by low-toxic insecticides.

(4) Bilharzia

Even the Boloti swamp has a logging water all the year, the Bilharzia can not be observed at present on the basis of the interview to the farmers around the Boloti swamp. Therefore, after completion of the Boloti dam, this circumstances will be expected to continue. Because of upland field irrigation, no Bilharzia will be expected in the Project area when compared to the paddy field irrigation. However, continuous monitoring in the Boloti reservoir and periodic drying of irrigation canals in the Project area will be recommended for prevention of the breeding of snails.

Table 1-1 ECONOMIC COSTS AND BENEFITS FLOW (1/3)
CASE-2

IRR 11.7 %
B-C (10%) 307 million Tsh.
B/C (10%) 1.17

(Unit: 1,000 Tsh.)

Year	Cost				Benefit			Balance
	Capital	Replacement	O&M	Total	Irrigation	Negative	Total	
1	116,900	0	0	116,900	0	0	0	-116,900
2	1,340,170	0	0	1,340,170	0	0	0	-1,340,170
3	540,930	0	6,022	546,952	54,486	-29	54,457	-492,495
4	0	0	10,149	10,149	142,742	-29	142,713	132,564
5	0	0	10,149	10,149	188,608	-29	188,579	178,430
6	0	0	10,149	10,149	234,475	-29	234,446	224,297
7	0	0	10,149	10,149	280,341	-29	280,312	270,163
8	0	24,100	10,149	34,249	305,775	-29	305,746	271,497
9	0	0	10,149	10,149	305,775	-29	305,746	295,597
10	0	0	10,149	10,149	305,775	-29	305,746	295,597
11	0	0	10,149	10,149	305,775	-29	305,746	295,597
12	0	0	10,149	10,149	305,775	-29	305,746	295,597
13	0	92,400	10,149	102,549	305,775	-29	305,746	203,197
14	0	0	10,149	10,149	305,775	-29	305,746	295,597
15	0	0	10,149	10,149	305,775	-29	305,746	295,597
16	0	0	10,149	10,149	305,775	-29	305,746	295,597
17	0	0	10,149	10,149	305,775	-29	305,746	295,597
18	0	24,100	10,149	34,249	305,775	-29	305,746	271,497
19	0	0	10,149	10,149	305,775	-29	305,746	295,597
20	0	0	10,149	10,149	305,775	-29	305,746	295,597
21	0	0	10,149	10,149	305,775	-29	305,746	295,597
22	0	0	10,149	10,149	305,775	-29	305,746	295,597
23	0	92,400	10,149	102,549	305,775	-29	305,746	203,197
24	0	0	10,149	10,149	305,775	-29	305,746	295,597
25	0	0	10,149	10,149	305,775	-29	305,746	295,597
26	0	0	10,149	10,149	305,775	-29	305,746	295,597
27	0	0	10,149	10,149	305,775	-29	305,746	295,597
28	0	113,500	10,149	123,649	305,775	-29	305,746	182,097
29	0	0	10,149	10,149	305,775	-29	305,746	295,597
30	0	0	10,149	10,149	305,775	-29	305,746	295,597
31	0	0	10,149	10,149	305,775	-29	305,746	295,597
32	0	0	10,149	10,149	305,775	-29	305,746	295,597
33	0	92,400	10,149	102,549	305,775	-29	305,746	203,197
34	0	0	10,149	10,149	305,775	-29	305,746	295,597
35	0	0	10,149	10,149	305,775	-29	305,746	295,597
36	0	0	10,149	10,149	305,775	-29	305,746	295,597
37	0	0	10,149	10,149	305,775	-29	305,746	295,597
38	0	24,100	10,149	34,249	305,775	-29	305,746	271,497
39	0	0	10,149	10,149	305,775	-29	305,746	295,597
40	0	0	10,149	10,149	305,775	-29	305,746	295,597
41	0	0	10,149	10,149	305,775	-29	305,746	295,597
42	0	0	10,149	10,149	305,775	-29	305,746	295,597
43	0	92,400	10,149	102,549	305,775	-29	305,746	203,197
44	0	0	10,149	10,149	305,775	-29	305,746	295,597
45	0	0	10,149	10,149	305,775	-29	305,746	295,597
46	0	0	10,149	10,149	305,775	-29	305,746	295,597
47	0	0	10,149	10,149	305,775	-29	305,746	295,597
48	0	24,100	10,149	34,249	305,775	-29	305,746	271,497
49	0	0	10,149	10,149	305,775	-29	305,746	295,597
50	0	0	10,149	10,149	305,775	-29	305,746	295,597

Table 1-1 ECONOMIC COSTS AND BENEFITS FLOW (2/3)
CASE-4

IRR 15.4 %
B-C (10%) 573 million Tsh.
B/C (10%) 1.48

(Unit: 1,000 Tsh.)

Year	Cost				Benefit			Balance
	Capital	Replacement	O&M	Total	Irrigation	Negative	Total	
1	81,000	0	0	81,000	0	0	0	-81,000
2	582,290	0	0	582,290	0	0	0	-582,290
3	581,710	0	2,594	584,304	51,982	0	51,982	-532,322
4	0	0	7,783	7,783	123,458	0	123,458	115,675
5	0	0	7,783	7,783	162,444	0	162,444	154,661
6	0	0	7,783	7,783	201,431	0	201,431	193,648
7	0	0	7,783	7,783	240,418	0	240,418	232,635
8	0	24,100	7,783	31,883	259,911	0	259,911	228,028
9	0	0	7,783	7,783	259,911	0	259,911	252,128
10	0	0	7,783	7,783	259,911	0	259,911	252,128
11	0	0	7,783	7,783	259,911	0	259,911	252,128
12	0	0	7,783	7,783	259,911	0	259,911	252,128
13	0	92,400	7,783	100,183	259,911	0	259,911	159,728
14	0	0	7,783	7,783	259,911	0	259,911	252,128
15	0	0	7,783	7,783	259,911	0	259,911	252,128
16	0	0	7,783	7,783	259,911	0	259,911	252,128
17	0	0	7,783	7,783	259,911	0	259,911	252,128
18	0	24,100	7,783	31,883	259,911	0	259,911	228,028
19	0	0	7,783	7,783	259,911	0	259,911	252,128
20	0	0	7,783	7,783	259,911	0	259,911	252,128
21	0	0	7,783	7,783	259,911	0	259,911	252,128
22	0	0	7,783	7,783	259,911	0	259,911	252,128
23	0	92,400	7,783	100,183	259,911	0	259,911	159,728
24	0	0	7,783	7,783	259,911	0	259,911	252,128
25	0	0	7,783	7,783	259,911	0	259,911	252,128
26	0	0	7,783	7,783	259,911	0	259,911	252,128
27	0	0	7,783	7,783	259,911	0	259,911	252,128
28	0	1,285,100	7,783	1,292,883	259,911	0	259,911	-1,032,972
29	0	0	7,783	7,783	259,911	0	259,911	252,128
30	0	0	7,783	7,783	259,911	0	259,911	252,128
31	0	0	7,783	7,783	259,911	0	259,911	252,128
32	0	0	7,783	7,783	259,911	0	259,911	252,128
33	0	92,400	7,783	100,183	259,911	0	259,911	159,728
34	0	0	7,783	7,783	259,911	0	259,911	252,128
35	0	0	7,783	7,783	259,911	0	259,911	252,128
36	0	0	7,783	7,783	259,911	0	259,911	252,128
37	0	0	7,783	7,783	259,911	0	259,911	252,128
38	0	24,100	7,783	31,883	259,911	0	259,911	228,028
39	0	0	7,783	7,783	259,911	0	259,911	252,128
40	0	0	7,783	7,783	259,911	0	259,911	252,128
41	0	0	7,783	7,783	259,911	0	259,911	252,128
42	0	0	7,783	7,783	259,911	0	259,911	252,128
43	0	92,400	7,783	100,183	259,911	0	259,911	159,728
44	0	0	7,783	7,783	259,911	0	259,911	252,128
45	0	0	7,783	7,783	259,911	0	259,911	252,128
46	0	0	7,783	7,783	259,911	0	259,911	252,128
47	0	0	7,783	7,783	259,911	0	259,911	252,128
48	0	24,100	7,783	31,883	259,911	0	259,911	228,028
49	0	0	7,783	7,783	259,911	0	259,911	252,128
50	0	0	7,783	7,783	259,911	0	259,911	252,128

Table 1-1 ECONOMIC COSTS AND BENEFITS FLOW (3/3)
CASE-5

IRR 15.1 %
B-C (10%) 1,156 million Tsh.
B/C (10%) 1.55

(Unit: 1,000 Tsh.)

Year	Cost				Benefit			Balance
	Capital	Replacement	O&M	Total	Irrigation	Negative	Total	
1	89,500	0	0	89,500	0	0	0	-89,500
2	1,394,200	0	0	1,394,200	0	0	0	-1,394,200
3	942,300	0	7,822	950,122	84,009	-29	83,980	-866,142
4	0	0	13,183	13,183	224,697	-29	224,668	211,485
5	0	0	13,183	13,183	297,145	-29	297,116	283,933
6	0	0	13,183	13,183	369,592	-29	369,563	356,380
7	0	0	13,183	13,183	442,040	-29	442,011	428,828
8	0	24,100	13,183	37,283	482,984	-29	482,955	445,672
9	0	0	13,183	13,183	482,984	-29	482,955	469,772
10	0	0	13,183	13,183	482,984	-29	482,955	469,772
11	0	0	13,183	13,183	482,984	-29	482,955	469,772
12	0	0	13,183	13,183	482,984	-29	482,955	469,772
13	0	92,400	13,183	105,583	482,984	-29	482,955	377,372
14	0	0	13,183	13,183	482,984	-29	482,955	469,772
15	0	0	13,183	13,183	482,984	-29	482,955	469,772
16	0	0	13,183	13,183	482,984	-29	482,955	469,772
17	0	0	13,183	13,183	482,984	-29	482,955	469,772
18	0	24,100	13,183	37,283	482,984	-29	482,955	445,672
19	0	0	13,183	13,183	482,984	-29	482,955	469,772
20	0	0	13,183	13,183	482,984	-29	482,955	469,772
21	0	0	13,183	13,183	482,984	-29	482,955	469,772
22	0	0	13,183	13,183	482,984	-29	482,955	469,772
23	0	92,400	13,183	105,583	482,984	-29	482,955	377,372
24	0	0	13,183	13,183	482,984	-29	482,955	469,772
25	0	0	13,183	13,183	482,984	-29	482,955	469,772
26	0	0	13,183	13,183	482,984	-29	482,955	469,772
27	0	0	13,183	13,183	482,984	-29	482,955	469,772
28	0	192,900	13,183	206,083	482,984	-29	482,955	276,872
29	0	0	13,183	13,183	482,984	-29	482,955	469,772
30	0	0	13,183	13,183	482,984	-29	482,955	469,772
31	0	0	13,183	13,183	482,984	-29	482,955	469,772
32	0	0	13,183	13,183	482,984	-29	482,955	469,772
33	0	92,400	13,183	105,583	482,984	-29	482,955	377,372
34	0	0	13,183	13,183	482,984	-29	482,955	469,772
35	0	0	13,183	13,183	482,984	-29	482,955	469,772
36	0	0	13,183	13,183	482,984	-29	482,955	469,772
37	0	0	13,183	13,183	482,984	-29	482,955	469,772
38	0	24,100	13,183	37,283	482,984	-29	482,955	445,672
39	0	0	13,183	13,183	482,984	-29	482,955	469,772
40	0	0	13,183	13,183	482,984	-29	482,955	469,772
41	0	0	13,183	13,183	482,984	-29	482,955	469,772
42	0	0	13,183	13,183	482,984	-29	482,955	469,772
43	0	92,400	13,183	105,583	482,984	-29	482,955	377,372
44	0	0	13,183	13,183	482,984	-29	482,955	469,772
45	0	0	13,183	13,183	482,984	-29	482,955	469,772
46	0	0	13,183	13,183	482,984	-29	482,955	469,772
47	0	0	13,183	13,183	482,984	-29	482,955	469,772
48	0	24,100	13,183	37,283	482,984	-29	482,955	445,672
49	0	0	13,183	13,183	482,984	-29	482,955	469,772
50	0	0	13,183	13,183	482,984	-29	482,955	469,772

Table 2-1 CASH FLOW STATEMENT

(Unit: Tsh. 1,000)

Year in Order	Capital Cost FC	Capital Cost LC	Cash Outflow: Loan Repayment Interest	Loan Repayment Principal	O & M Cost	Replacement Cost	Total	Cash Inflow: Fund FC	Fund LC	Revenue	Total	Repayment	Balance
1	91,900	2,600	919	0	0	0	95,419	91,900	2,600	0	94,500	919	0
2	1,301,300	361,800	13,932	0	0	0	1,677,032	1,301,300	361,800	0	1,663,100	13,932	0
3	977,800	215,600	23,710	0	7,822	0	1,224,932	977,800	215,600	7,822	1,201,222	23,710	0
4	0	0	23,710	0	13,183	0	36,893	0	0	13,183	13,183	23,710	0
5	0	0	23,710	0	13,183	0	36,893	0	0	13,183	13,183	23,710	0
6	0	0	23,710	0	13,183	0	36,893	0	0	13,183	13,183	23,710	0
7	0	0	23,710	0	13,183	0	36,893	0	0	13,183	13,183	23,710	0
8	0	0	23,710	0	13,183	24,100	60,993	0	0	13,183	13,183	47,810	0
9	0	0	23,710	0	13,183	0	36,893	0	0	13,183	13,183	23,710	0
10	0	0	23,710	0	13,183	0	36,893	0	0	13,183	13,183	23,710	0
11	0	0	22,525	118,550	13,183	0	154,258	0	0	13,183	13,183	141,075	0
12	0	0	21,339	118,550	13,183	0	153,072	0	0	13,183	13,183	139,889	0
13	0	0	20,154	118,550	13,183	92,400	244,287	0	0	13,183	13,183	231,104	0
14	0	0	18,968	118,550	13,183	0	150,701	0	0	13,183	13,183	137,518	0
15	0	0	17,783	118,550	13,183	0	149,516	0	0	13,183	13,183	136,333	0
16	0	0	16,597	118,550	13,183	0	148,330	0	0	13,183	13,183	135,147	0
17	0	0	15,412	118,550	13,183	0	147,145	0	0	13,183	13,183	133,962	0
18	0	0	14,226	118,550	13,183	24,100	170,059	0	0	13,183	13,183	156,876	0
19	0	0	13,041	118,550	13,183	0	144,774	0	0	13,183	13,183	131,591	0
20	0	0	11,855	118,550	13,183	0	143,588	0	0	13,183	13,183	130,405	0
21	0	0	10,670	118,550	13,183	0	142,403	0	0	13,183	13,183	129,220	0
22	0	0	9,484	118,550	13,183	0	141,217	0	0	13,183	13,183	128,034	0
23	0	0	8,299	118,550	13,183	92,400	232,432	0	0	13,183	13,183	219,249	0
24	0	0	7,113	118,550	13,183	0	138,846	0	0	13,183	13,183	125,663	0
25	0	0	5,928	118,550	13,183	0	137,661	0	0	13,183	13,183	124,478	0
26	0	0	4,742	118,550	13,183	0	136,475	0	0	13,183	13,183	123,292	0
27	0	0	3,557	118,550	13,183	0	135,290	0	0	13,183	13,183	122,107	0
28	0	0	2,371	118,550	13,183	192,900	327,004	0	0	13,183	13,183	313,821	0
29	0	0	1,186	118,550	13,183	0	132,919	0	0	13,183	13,183	119,736	0
30	0	0	0	118,550	13,183	0	131,733	0	0	13,183	13,183	118,550	0

Remarks: FC = Foreign Currency, LC = Local Currency
Condition of Loan Repayment of Foreign Currency;
Interrest (%) : 1.0
Grace Period : 10 years
Repayment Period : 30 years (including grace period)