

TABLES

Table 2-1 Import and Estimated Consumption of Sugar
(1963 - 1974)

Year	Import of Sugar ^{/1} (tons)				Total	Estimated ^{/2} Consumption (tons)	Population ^{/3} (millions)	Per Capita (kg)	
	Cube	Granu- lated	Sub-total	Raw				Import	Consumption
1963	13,329	23,210	36,539	833	37,372	36,180	7.24	5.16	5.00
1964	17,945	22,622	40,567	-	40,567	42,000	7.41	5.47	5.67
1965	20,357	35,672	56,029	-	56,029	63,905	7.59	7.38	8.42
1966	36,712	27,799	64,511	-	64,511	68,220	7.77	8.30	8.78
1967	29,615	29,356	58,971	-	58,971	67,375	7.96	7.41	8.46
1968	27,381	58,631	86,012	353	86,365	75,650	8.15	10.60	9.28
1969	29,091	37,755	66,846	-	66,846	85,000	8.34	8.02	10.19
1970	44,862	70,205	115,067	14,275	129,342	90,000	8.56	15.11	10.51
1971	25,280	24,990	50,270	10,330	60,600	95,000	8.75	6.93	10.86
1972	26,310	18,740	45,050	-	45,050	90,000	8.96	5.03	10.04
1973	26,320	29,650	55,970	130	56,100	85,000	9.17	6.12	9.27
1974	28,430	21,090	49,520	-	49,520	-	-	-	-

Source: ^{/1}: for 1963-1970; Table 1.1 of the "Structure and Prospects of the Sugar Industry in Ghana" prepared by the University of Ghana, 1972, and for 1971-1974; Ministry of Economic Planning.

^{/2}: International Sugar Organization Estimate

^{/3}: Ministry of Economic Planning

Table 3-1 Summary of Meteorological Data at Avevine

Item	Unit	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Monthly Rainfall	mm	14	34	82	104	137	213	54	25	76	120	69	21	949
Monthly Rainy Days	days	1	2	4	6	8	12	5	3	5	8	5	2	61
Mean Air Temperature	°C	27.9	28.9	29.1	28.4	27.6	26.5	25.7	25.6	26.2	27.2	27.8	27.5	Av.27.4
Maximum Air Temperature	°C	33.5	34.3	34.2	33.5	32.3	30.4	29.0	29.4	30.4	31.9	32.8	32.8	Av.32.0
Minimum Air Temperature	°C	22.3	23.5	23.9	23.3	22.9	22.6	22.3	21.8	21.9	22.4	22.7	22.2	Av.22.7
Monthly Evaporation ¹	mm	144	165	198	184	172	131	134	139	149	171	161	137	1,885
Relative Humidity	%	81	86	74	75	77	82	81	79	78	77	77	82	Av.79
Duration of Sunshine	hours	6.4	6.8	6.9	6.6	6.6	4.5	4.1	4.6	5.1	6.7	7.6	6.7	Av.6.1
Monthly Solar Radiation ¹	cal/cm ²	382.4	446.4	492.3	495.7	488.9	406.6	421.7	423.7	450.4	494.4	491.2	419.7	5,413.4

¹ The mean value of Ada and Akuse stations

Table 3-2 Land Use Classification

Land Use	Irrigation Block							Total
	1	2	3	4	5	6	7	
Settlement & associated non-agricultural land	25	5	-	-	-	-	-	30
Densely cultivated land	20	30	-	-	70	-	30	150
Variable mixture of cultivation & fallow	75	140	-	-	490	370	415	1,490
Scrub & grass land	360	640	470	380	1,690	1,280	1,430	6,250
Forest	20	5	340	370	250	270	255	1,510
Total	500	820	810	750	2,500	1,920	2,130	9,430

Table 3-3 Current Prices of
Major Crop Products (US\$ eq /ton)

<u>Crops</u>	<u>Aveyime</u>	<u>Adidome</u>	<u>Sogakope</u>	<u>Average</u>
Cassava	70	80	90	80
Maize	155	180	175	170
Groundnuts	370	370	370	370
Rice	620	580	660	620
Tomatoes	190	180	170	190
Okro	190	190	190	190
Pepper	1,020	1,020	1,020	1,020

Source: Ministry of Agriculture

Table 4-1 Proposed Type of Farm Machinery

Farm Operations	Required Machinery	Tractor
<u>Plant Cane and Ratcoons</u>		
Subsoiling	Subsoiler 3-row	140 PS class crawler tractor
Ploughing	Disc plough 32" x 3	80 PS class wheel tractor
Harrowing	Disc harrow 24" x 22	"
Furrowing	Ridger 2-furrow	"
Planting & Fertilizing	Cane planter (with fertilizer distributor)	60 PS class wheel tractor
Weeding	Spring tooth cultivator	
Plant protection	Swath sprayer 500 l	60 PS class wheel tractor (with high clearance)
Top dressing	Fertilizer distributor 2-furrow	"
Earthing	Cultivator (disc type) 2-furrow	"
Harvesting	Cane harvester (chopper type) Grab loader	(Self-propelled)
Hauling	Trailer truck 6-ton	"
Stubble cutting & Fertilizing	Stubble shaver (with fertilizer distributor)	60 PS class wheel tractor
Land clearing	Trash rake	
<u>Nursery</u>		
Loading	Grab loader	(Self-propelled)
<u>Fallow Crops</u>		
Furrowing	Ridger 3-row	60 PS class wheel tractor
Sowing	Corn planter (with fertilizer distributor)	"
Hoeing	cultivator 4-furrow	60 PS class wheel tractor (with high clearance)

Table 4-2 Required Number of Farm Machinery

<u>Description</u>	<u>Required Number</u>
Tractors and Harvesters	
- 140 PS class crawler tractor	2
- 80 PS class wheel tractor	10
- 60 PS class wheel tractor	18
- 60 PS class wheel tractor (with high clearance)	26
- Cane harvester (chopper type)	24
- Grab loader	2
- Spare parts for the above	L.S.
Implements	
- Sub soiler 3-row	2
- Disc plough 32" x 3	6
- Disc harrow 24" x 22	4
- Ridger 3-row	2
- Cane planter (with fertilizer distributor) 2-furrow	3
- Spring tooth cultivator	6
- Swath sprayer 500/	4
- Fertilizer distributor	10
- Cultivator (disc type) 2-furrow	13
- Trash rake	4
- Stubble shaver (with fertilizer distributor) 1-furrow	7
- Ridger ^{/1} 3-row	2
- Corn planter (with fertilizer distributor) ^{/1} 4-furrow	2
- Cultivator (disc type) ^{/1} 4-furrow	2
- Spare parts for the above	L.S.
Transportation Equipment	
- Trailer truck 6-ton	80
- Bus (ordinary type)	8
- 2 door-jeep	5
- 4 door-jeep	5
- Motor bicycle	20
- Spare parts for the above	L.S.
Others	
- Service equipment and tools	L.S.

/1: Implements for cultivation of fallow crops

Table 4-3 Labour Requirement

Month	<u>Total Labour Requirement</u>			Workable Days (days)	<u>Daily Average Labour Requirement</u>		
	<u>Estate Farm (man-days)</u>	<u>Settlement Farm (man-days)</u>	<u>Total (man-days)</u>		<u>Estate Farm (men/day)</u>	<u>Settlement Farm (men/day)</u>	<u>Total (men/day)</u>
Jan.	35,700	24,600	60,300	24	1,490	1,020	2,510
Feb.	32,200	23,400	55,600	24	1,340	980	2,320
Mar.	32,700	25,000	57,700	21	1,560	1,190	2,750
Apr.	21,100	17,300	38,400	20	1,060	860	1,920
May	9,000	8,700	17,700	19	470	460	930
June	8,200	11,900	20,100	16	510	740	1,250
July	7,800	20,600	28,400	23	340	890	1,230
Aug.	10,200	15,800	26,000	24	430	650	1,080
Sept.	13,800	17,800	31,600	22	630	810	1,440
Oct.	13,100	18,000	31,100	20	660	900	1,560
Nov.	37,200	36,200	73,400	21	1,770	1,720	3,490
Dec.	37,700	24,700	62,400	24	1,570	1,030	2,600
Total or Ave.	258,700	244,000	502,700	258	1,000	950	1,950

Note; Details are mentioned in Section 3.4, Annex III.

Table 4-4 Proposed Farm Inputs

Description	(Unit)	Seed Cane	Plant Crop	1st Ratoon	2nd Ratoon	Maize	Ground-nuts	Vegetables
Seed cane & seeds	(kg/ha)		6700			10	100	2
Fertilizers ¹								
- Urea	(kg/ha)	130	175	150	130	90	45	200
- Triple superphosphate	(kg/ha)	200	270	240	200	70	100	70
- Potassium chloride	(kg/ha)	25	35	25	25	-	85	35
Agri. chemicals								
- Insecticides								
Fenitrothion	(ℓ/ha)	2	2	2	2	1	1	-
Aldrex 40 ²	(ℓ/ha)	12.5	12.5	-	-	-	-	-
- Rodenticides								
Zinc phosphide	(g/ha)	40	70	60	60	20	20	20
- Fungicides								
Zineb	(ℓ/ha)							2
Thiophanate	(ℓ/ha)	1	1					

¹: Urea: N 46%, Triple superphosphate: P₂O₅ 30%, Potassium chloride: K₂O 60%

²: An emulsifiable concentrate containing 4 lb Aldrin per gallon.

Table 4-5 Sugar Cane Yields in the Accra Plains

(1) FAO - Kpong plot

<u>Variety</u>		<u>Cane yield</u> (ton/ha)	<u>Sugar yield</u> (ton/ha)	<u>Rendment</u> (%)
B41227	Plant crop	147.5	13.8	9.3
	1st ratoon	137.3	13.5	9.9
B34104	Plant crop	83.5	9.0	10.8
	1st ratoon	89.0	11.8	13.3
POJ2878	Plant crop	107.3	11.8	11.0
	1st ratoon	96.5	10.8	11.0
B37161	Plant crop	107.5	13.0	12.0
	1st ratoon	101.0	12.0	12.0

Source: FAO, Report on Survey of the Lower Volta River Flood Plain, Vol.III, pp.55-57, 1963

(2) FAO - Aveyime plot

<u>Variety</u>		<u>Cane yield</u> (ton/ha)	<u>Sugar yield</u> (ton/ha)	<u>Rendment</u> (%)
B41227	Plant crop	101.6	13.0	12.8
B34104	Plant crop	88.5	11.0	12.5
NC0339	Plant crop	99.8	11.3	11.2

Source: FAO, Report on Survey of the Lower Volta River Flood Plain, Vol.III p.64, 1963

(3) Nippon Koei - Aveyime pilot farm

<u>Variety</u>		<u>Cane yield</u> (ton/ha)	<u>Sugar yield</u> (ton/ha)	<u>Rendment</u> (%)
B41227	Plant crop	103.0	14.8	14.3
B34104	Plant crop	98.8	14.6	14.6
POJ2878	Plant crop	84.4	12.3	14.6
PR980	Plant crop	84.2	12.6	15.1
CO1001	Plant crop	74.8	9.6	13.0
POJ3142	Plant crop	63.0	9.6	15.3

Source: Nippon Koei Co., Ltd. Feasibility Report on Rice and Sugar Production Project in Accra Plain, Appendix IV, p.11, 1967

Table 4-6 Sugar Cane Production Programme

Item	(Unit)	Year							
		1980/81	1981/82	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88
(1) Harvested Area									
Sugar cane	(ha)	1,450	1,650	2,100	2,100	1,875	1,875	1,875	1,875
- Plant cane	(")	1,450	1,450	1,650	1,300	1,600	1,875	1,875	1,875
- 1st ratoon	(")			1,450	1,650	1,000	800	1,875	1,875
- 2nd ratoon	(")				410	1,150	1,000	-	-
- 3rd ratoon	(")								
Total	(")	1,450	2,100	5,200	5,460	5,625	5,550	5,625	5,625
Fallow crops									
- Maize	(")		270	270	270	270	270	270	270
- Groundnuts	(")		270	270	270	270	270	270	270
- Vegetables	(")		260	260	260	260	260	260	260
Total	(")		800	800	800	800	800	800	800
(2) Crop Production/1									
Sugar cane	(tons)	104,400	211,600	338,000	346,500	382,400	411,600	450,000	450,000
Maize	(")		650	650	650	650	650	810	810
Groundnuts	(")		320	320	320	320	320	410	410
Vegetables	(")		2,080	2,080	2,080	2,080	2,080	2,600	2,600
(3) Sugar Production									
Sugar yield	(%)	7	8	9	10	10	10	10	10
Sugar production	(tons)	7,300	16,900	30,400	34,700	38,200	41,200	45,000	45,000

1/1: The anticipated yield is estimated as follows.

Planting Year	Anticipated Yield (tons/ha)		
	Plant cane	1st ratoon	2nd ratoon
1st Planting	72	64	56
2nd Planting and after	90	80	70

Planting Year	Anticipated Yield (tons/ha)	
	Maize	Vegetable
1st Planting	2.4	1.2
2nd Planting and after	3.0	1.5

Table 4-7 Principal Features of Pumping Stations

Pumping Station	Location	Commanded Area	Diversion/1 Requirement (m ³ /min)	Numbers		Total Head (m)	Motor Output (kW)	Suction Bore (mm)	Pump Type
				Pump	of/2				
No. 1	Volta River	Block-2,5,6,7 & Sugar Factory	433.0	7	72.2	5.1	90	ø800	Vertical shaft mixed flow pump.
No. 2	Bla Lagoon	Block-5,6,7	357.8	6	71.6	21.5	355	ø800	Double suction volute pump.
No. 3	Volta River	Block-1	20.6	3	10.3	9.3	30	ø300	Vertical shaft mixed flow pump.
No. 4	Bla Lagoon	Block-2	33.6	3	16.8	8.7	37	ø350	Horizontal shaft mixed flow pump.
No. 5	Block-2	Block-2 (Booster)	16.4	3	8.2	3.8	7.5	ø300	- do -
No. 6	Volta River	Block-3	33.6	3	16.8	8.5	55	ø350	Vertical shaft mixed flow pump.
No. 7	Volta River	Block-4	31.0	3	15.5	8.0	45	ø350	- do -
No. 8	Block-4	Block-4 (Booster)	21.2	3	10.6	3.3	11	ø300	Horizontal shaft mixed flow pump.
No. 9	Bla Lagoon	Sugar Factory	41.6	4	13.9	6.0	22	ø350	- do -

Note: /1: All pumping stations will be 24-hour operation at the peak diversion requirement.
 /2: Including one unit of stand-by pump for emergency and repairing.

Table 4-8 Principal Features of Irrigation Canals

Description	Unit	Block 1	Block 2	Block 3	Block 4	Block 5	Block 6	Block 7	Total
A. Net Irrigation Area	ha	400	650	650	600	2,000	1,500	1,700	7,500
B. Maximum irrigation water requirement	ℓ/sec/ha	0.86	0.86	0.86	0.86	1.11	1.17	1.17	-
C. Length of irrigation canals									
1. Main	km	4.0	7.4	3.6	6.0	20.4	10.5	16.0	67.9
2. Secondary	km	0.6	1.4	2.2	-	5.2	8.4	4.6	22.4
3. Distribution	km	13.6	14.2	19.3	21.3	46.2	27.2	31.6	173.4
Total	km	18.2	23.0	25.1	27.3	71.8	46.1	52.2	263.7
D. Numbers of related structures									
1. Farm pond	nos.	1	2	1	2	30 ¹	22	28	86
2. Turnout (Main & Secondary)	nos.	15	18	15	15	34	25	32	154
3. Turnout (Distribution)	nos.	137	131	148	200	526	294	415	1,851
4. Cross regulator	nos.	3	4	3	3	10	8	9	40
5. Culvert	nos.	2	1	-	1	1	3	3	11
6. Drop	nos.	1	1	-	-	7	4	3	16
7. Spillway	nos.	-	2	2	1	4	3	3	15
8. Wasteway	nos.	2	2	3	1	3	3	4	18
9. Siphon	nos.	-	-	1	-	2	2	2	7

Note: /1 including a regulating pond for No.2 pumping station

Table 4-9 Construction Quantities and Materials

<u>Construction Quantities</u>			
<u>No.</u>	<u>Work</u>	<u>Unit</u>	<u>Quantity</u>
1	Site clearing, forest	ha.	1,510
2	Excavation	m ³	2,240,000
3	Embankment and Backfill	m ³	1,320,000
4	Gravel for foundation and under drain	m ³	10,000
5	Gravel for pavement	m ³	76,000
6	Laterite for pavement	m ³	180,000
7	Concrete	m ³	42,000
8	Form for concrete	m ²	79,000
9	Reinforcement bar	tons	1,900
10	Concrete block (490 ^{mm} x 290 ^{mm} x 100 ^{mm})	nos.	1,530,000
11	Concrete pipe	m	19,700
12	Concrete pile	m	11,800
13	Gate and hoist	tons	55
14	Installation of pump	sets	41
15	Stoplog	m ³	300

<u>Main Construction Materials</u>			
<u>No.</u>	<u>Item</u>	<u>Unit</u>	<u>Quantity</u>
1	Cement	tons	17,200
2	Reinforcement bar	tons	1,900
3	Gate and hoist	tons	55
4	Sand for concrete	m ³	33,000
5	Gravel for concrete	m ³	57,000
6	Unscreened gravel	m ³	86,000
7	Laterite	m ³	180,000
8	Concrete pipe	m	19,700
9	Concrete pile	m	11,800

Table 4-10 Major Construction Machinery

<u>Item No.</u>	<u>Machinery</u>	<u>Description</u>	<u>Required Numbers</u>
1	Bulldozer	21-ton	10
2	Rake attachment	21-ton	6
3	Bulldozer	11-ton	2
4	Swamp bulldozer	21-ton	1
5	Excavator (back-hoe)	0.6 m ³	9
6	Excavator (back-hoe)	0.3 m ³	6
7	Wheel loader	1.6 m ³	1
8	Motor grader	3 m blade	2
9	Road roller, macadam	8 - 10-ton	1
10	Tire roller	6 - 8-ton	5
11	Dump truck	6-ton	40
12	Water tanker	6,000 ℓ	5
13	Batcher plant	set	1
14	Concrete mixer	0.6 m ³	5
15	Concrete mixer	0.3 m ³	5
16	Agitator truck		5
17	Concrete block making machine	60 nos./hr.	5
18	Generator	20 KVA	4
19	Fuel tanker	6,000 ℓ	2
20	Grease car		1
21	Truck crane	15-ton	3
22	Pump, double suclin volute type	6"	10
23	Ordinary truck	6-ton	6
24	Pick up	2-ton	10
25	Repairing equipment		U.S.

Table 5-1 Construction Cost Estimate
(Infrastructural Facilities)

Sheet 1

Description	Foreign Currency (US\$1,000)	Local Currency (US\$1,000)	Total (US\$1,000)
1. Preparatory works	210	480	690
2. Pumping stations			
No.1 pumping station	910	670	1,580
No.2 pumping station	1,280	990	2,270
No.3 pumping station	80	130	210
No.4 pumping station	120	100	220
No.5 pumping station	80	80	160
No.6 pumping station	120	130	250
No.7 pumping station	90	130	220
No.8 pumping station	70	80	150
Sub-total	2,750	2,310	5,060
3. Irrigation canals			
Headrace	170	140	310
Main irrigation canal	770	2,970	3,740
Secondary irrigation canal	180	790	970
Distribution canal	540	400	940
Related structure	320	1,270	1,590
Farm pond	460	550	1,010
Sub-total	2,440	6,120	8,560
4. Drainage canals			
Main natural drain	480	230	710
Main drain	340	260	600
Collector drain	160	190	350
Related structure	10	830	840
Sub-total	990	1,510	2,500
5. Gate structures			
No.1 gate	280	420	700
No.2 gate	100	120	220
Sub-total	380	540	920

Description	Foreign Currency (US\$1,000)	Local Currency (US\$1,000)	Total (US\$1,000)
6. Roads			
Main road	740	1,790	2,530
Secondary road	510	630	1,140
Tertiary road	530	670	1,200
Bridge	30	1,230	1,260
Sub-total	1,810	4,320	6,130
7. On farm development			
Site clearing	580	380	960
Field preparation	340	420	760
Miscellaneous	100	120	220
Sub-total	1,020	920	1,940
8. Settlement compound	80	100	180
9. Offices and quarters			
Offices	-	590	590
Residences	-	3,220	3,220
Miscellaneous	-	390	390
Sub-total	-	4,200	4,200
Grand total	<u>9,680</u>	<u>20,500</u>	<u>30,180</u>

Table 5-2 Construction Cost Estimate
(Sugar Plant)

Description	Foreign Currency (US\$1,000)	Local Currency (US\$1,000)	Total (US\$1,000)
1. Procurement of factory plant			
Factory plant	13,800	-	13,800
Building and equipment	3,400	-	3,400
<u>Sub-total</u>	<u>17,200</u>	<u>-</u>	<u>17,200</u>
2. Construction of foundation			
Foundation of factory	29	1,091	1,120
Cane yard	3	59	62
Land grading and others	29	29	58
<u>Sub-total</u>	<u>61</u>	<u>1,179</u>	<u>1,240</u>
3. Construction of factory buildings			
Factory building	-	212	212
Sugar warehouse	-	55	55
Laboratory and factory office	-	15	15
Others	-	88	88
<u>Sub-total</u>	<u>-</u>	<u>370</u>	<u>370</u>
4. Erection and installation			
Erection and installation	1,100	2,400	3,500
Inland transportation	-	450	450
<u>Sub-total</u>	<u>1,100</u>	<u>2,850</u>	<u>3,950</u>
5. Construction of water supply system			
No. 9 pumping station	120	100	220
Water reservoir and supply channel	11	29	40
<u>Sub-total</u>	<u>131</u>	<u>129</u>	<u>260</u>
<u>Grand total</u>	<u>18,492</u>	<u>4,528</u>	<u>23,020</u>

Table 5-3
Initial Farm Investment

<u>Description</u>	<u>Foreign Currency (US\$1,000)</u>	<u>Local Currency (US\$1,000)</u>	<u>Total (US\$1,000)</u>
(1) Procurement Cost of farm machinery and equipment/ <u>1</u>	4,620	-	4,620
(2) Construction cost of farm buildings			
- Garage/ <u>2</u>	-	408	408
- Repair shop/ <u>3</u>	-	45	45
- Warehouse/ <u>4</u>	-	120	120
(3) Rehabilitation cost of pilot farm/ <u>5</u>	144	71	215
(4) Cost for expatriate assistance/ <u>6</u>	2,106	468	2,574
(5) Initial farm operation cost	112	562	674
(6) Procurement cost of O & M equipment/ <u>7</u>	200	-	200
(7) Contingency	1,068	246	1,314
Total	8,250	1,920	10,170

- 1: See Table 5-4
2: $6,800 \text{ m}^2 \times \text{US\$60/m}^2 = \text{US\$408,000}$
3: $300 \text{ m}^2 \times \text{US\$150/m}^2 = \text{US\$45,000}$
4: $1,200 \text{ m}^2 \times \text{US\$100/m}^2 = \text{US\$120,000}$
5: See Table III-16 in Annex III.
6: $468 \text{ M/M} \times \text{US\$5,500/M/M}$
7: See Table 5-5

Table 5-4 Procurement Cost of Farm Machinery and Equipment

Description	Quantity (Nos.)	Unit Price CIF Teas. (US\$)	Amount (US\$1,000)
Tractor, Harvester and Grab Loader			
- 140 HP class crawler tractor	2	50,000	100.0
- 80 HP class wheel tractor	10	12,000	120.0
- 60 HP class wheel tractor	18	10,000	180.0
- 60 HP class wheel tractor (with high clearance)	26	12,000	312.0
- Cane harvester	24	66,000	1,584.0
- Grab loader	2	11,500	23.0
- Spare parts (about 20 % of the above)	L.S.		464.0
<u>Sub-total:</u>			<u>2,753.0</u>
Implements			
- Subsoiler 3-row	2	4,300	8.6
- Disc plough 32" x 3	6	2,000	12.0
- Disc harrow 24" x 22	4	1,700	6.8
- Ridger 3-row	2	800	1.6
- Cane planter (with fertilizer distributor) 2-furrow	3	5,300	15.9
- Spring tooth cultivator	6	600	3.6
- Swath sprayer 500 lit.	4	11,500	46.0
- Fertilizer distributor 2-furrow	10	900	9.0
- Cultivator (disc type) 2-furrow	13	600	7.8
- Trash rake	4	2,200	8.8
- Stubble shaver (with fertilizer distributor) 1-furrow	7	4,000	28.0
- Ridger ^{/1} 3-row	2	600	1.2
- Corn planter ^{/1} 4-furrow	2	2,800	5.6
- Cultivator (disc type) ^{/1} 4-furrow	2	600	1.2
- Spare parts (about 30 % of the above)	L.S.		46.9
<u>Sub-total:</u>			<u>203.0</u>
Transportation Equipment			
- Trailer truck 6-ton	80	14,000	1,120.0
- Bus (ordinary type)	8	8,000	64.0
- 2 door-jeep (hard top)	5	5,000	25.0
- 4 door-jeep (station wagon)	5	6,000	30.0
- Motor bicycle	20	700	14.0
- Spare parts (about 20 % of the above)	L.S.		251.0
<u>Sub-total:</u>			<u>1,504.0</u>
Others			
- Service equipment and tools			<u>40.0</u>
Inland Transportation Charge			
			<u>90.0</u>
Totals			<u><u>4,620.0</u></u>

^{/1} : Implements of cultivation for fallow crops.

Table 5-5 Procurement Cost of O & M Equipment

<u>Equipment</u>	<u>Total No.</u>	<u>Purchase Cost (US\$1,000)</u>
Excavator (Back hoe, 0.3 m ³)	1	36
Tractor shovel, wheel type 1.3 m ³ ,	1	38
Motor grader, 3.1 m,	1	41
Vibrating roller, 0.9-ton,	1	5
Truck crane, 2-ton,	1	6
Dump truck, 6-ton,	1	18
Ordinary truck, 3-ton,	1	8
Light truck, 1-ton,	2	8
Jeep, 4-wheel driven,	3	15
Motor cycle,	10	7
Spare parts	(10%)	18
Total		200

Table 5-6

Production Cost of Sugar Cane

Item	Estate Farm (US\$1,000)	Settlement Farm (US\$1,000)	Cost (US\$1,000)
(1) Farm input cost/ ¹			
- Seed cane and seeds	65	61	126
- Fertilizers	217	192	409
- Agri. chemicals	83	70	153
(2) Personnel cost			
- Staff, operators and permanent labourers/ ²	626	250	876
- Seasonal labourers/ ³	335		335
- Family labourer/ ⁴		537	537
(3) Machinery cost			
- Replacement/ ⁵	370	279	649
- Repair and maintenance/ ⁶	291	223	514
- Fuel, oil and grease/ ⁷	322	241	563
(4) Repair and maintenance cost of buildings/ ⁸	3	3	6
(5) O&M cost of irrigation, drainage and road facilities/ ⁹	314	234	548
(6) O&M cost of pilot farm/ ¹⁰	100		100
(7) Land rent/ ¹¹	11	8	19
(8) Miscellaneous	143	102	245
Total	2,880	2,200	5,080

¹: See Table 5-7

²: See Table 5-8

³: 152,300 man-days x US\$2.2/man-day = US\$335,000 (refer to Table III-11 in Annex III)

⁴: 244,000 man-days x US\$2.2/man-day = US\$537,000

⁵: Calculated by using the "straight-line method".

Useful life: 5 years for crawler tractor, cane harvester, swath sprayer and transportation equipment of trailer truck, bus etc., 7 years for 80 PS and 60 PS wheel tractor, 3 years for implements.

⁶: Procurement cost x $\frac{\text{Repair and maintenance coefficient}}{\text{Useful life}}$

Repair and maintenance coefficient: 100% for tractor, cane harvester, and grab loader, 30% for implements and transportation equipment

⁷: Diesel oil: 1,875 kl, petrol: 75 kl, etc.

⁸: Repair and maintenance cost is assumed to be 1% of construction cost.
US\$573,000 x 0.01 = US\$6,000

⁹: Estate farm: 4,300 ha x US\$73/ha = US\$314,000
Settlement farm: 3,200 ha x US\$73/ha = US\$234,000

¹⁰: See Table III-17 in Annex III

¹¹: Estate farm: 4,300 ha x US\$2.5/ha = US\$11,000
Settlement farm: 3,200 ha x US\$2.5/ha = US\$8,000

Table 5-7 Farm Input Cost

	(Unit)	<u>Estate Farm</u>		<u>Settlement Farm</u>		Total Amount
		Required Quantity	Amount (US\$1,000)	Required Quantity	Amount (US\$1,000)	
<u>1. Seed cane and seeds</u>			<u>64.8</u>		<u>60.9</u>	<u>125.7</u>
- Seed cane	tons	7,200	64.8	5,400	48.6	113.4
- Maize	tons	-		2.70	0.5	0.5
- Groundnuts	tons	-		27.00	10.8	10.8
- Vegetables	tons	-		0.52	1.0	1.0
<u>2. Fertilizers</u>			<u>217.2</u>		<u>191.9</u>	<u>409.1</u>
- Urea	tons	489	102.7	452	94.9	197.6
- Triple superphosphate	tons	763	106.8	632	88.5	195.3
- Potassium chloride	tons	91	7.7	100	8.5	16.2
<u>3. Agri. chemicals</u>			<u>82.8</u>		<u>69.7</u>	<u>152.5</u>
- Insecticides						
Fenitrothion	ℓ	6,450	71.0	5,340	58.7	129.7
Aldrex 40	ℓ	13,400	6.7	10,000	5.0	11.7
- Rodenticides						
Zinc phosphide	kg	204	0.8	168	0.7	1.5
- Fungicides						
Zineb	ℓ	-		520	2.1	2.1
Thiophanate	ℓ	1,075	4.3	800	3.2	7.5
Total			364.8		322.5	687.3

Table 5-8 Personnel Cost for Sugar Cane Production

Staff	Estate Farm		Settlement Farm		Total	
	Nos.	Amount (US\$1,000)	Nos.	Amount (US\$1,000)	Nos.	Amount (US\$1,000)
Department head	1	7			1	7
Section head	1	5			1	5
Junior section head	6	24	1	4	7	28
Technical staff						
- Mechanical engineer	2	6			2	6
- Legal officer			4	12	4	12
- Ancillary worker	5	7.5	12	18	17	25.5
- Mechanic	5	7.5			5	7.5
- Operator and driver	186	279	144	216	330	495
- Foreman	30	45			30	45
- Permanent labourer	340	238			340	238
- Permanent labourer for repair shop	10	7			10	7
Total	588	626	159	250	747	876

Note: Detailed staff requirement is given in Annex VI.

Cost for the technical assistance is estimated in Annex Table VII-16.

Table 5-9 O & M Cost of Infrastructural Facilities

<u>Item</u>	<u>Quantity</u>	<u>Unit Price</u>	<u>Amount (US\$)</u>
1. Salaries			
1) Section head	1	5,000 ^{US\$/year}	5,000
2) Junior section head	9	4,000 "	36,000
3) Technical staff	30	1,500 "	45,000
4) Parmanent Labourer	36	700 "	25,200
5) Seasonal Labourer	2,000	2.2 ^{US\$/day}	4,400
Sub-total			115,600
2. Vehicles			
1) Replacement & Maintenance cost	L.S.		53,000
2) Operation cost	L.S.		18,700
3) Spare parts	L.S.		18,600
Sub-total			90,300
3. Repair Shop			
1) O & M cost of equipment	L.S.		17,000
2) Material cost	L.S.		48,600
Sub-total			65,600
4. Pumping Station			
1) Maintenance cost	L.S.		46,000
2) Operation cost	L.S.		230,000
Sub-total			276,000
Grand total			547,500

$$\text{O \& M cost per ha} = \frac{\text{US\$547,500}}{7,500 \text{ ha}} = \text{US\$73.0/ha}$$

Table 5-10 Sugar Cane Production Costs during Build-up Period
(Unit; US\$1,000)

Year	Farm Input Cost	Personnel Cost	Machinery Cost	Repair and Maintenance Cost of Buildings	O & M ¹ Cost	O&M Cost of Pilot Farm	Land Rent	Miscel- laneous	Total
1977/78							4		4
1978/79		7				100	8	6	121
1979/80	112	88			15	100	14	16	345
1980/81	272	277	540	1	120	100	19	66	1,395
1981/82	423	515	1,008	3	241	100	19	115	2,424
1982/83	657	1,542	1,662	4	394	100	19	219	4,597
1983/84	674	1,748	1,713	6	548	100	19	240	5,048
1984/85	683	1,748	1,727	6	548	100	19	242	5,073
1985/86	681	1,744	1,707	6	548	100	19	240	5,045
1986/87 and after	688	1,748	1,726	6	548	100	19	245	5,080

¹: Operation and maintenance cost of irrigation, drainage and road facilities.

Table 5-11 Sugar Manufacturing Cost

<u>Item</u>	<u>Cost</u> <u>(US\$1,000)</u>
(1) Sub-materials cost ^{/1}	515
(2) Personnel cost	
- Staff ^{/2}	574
- Seasonal labourers 51,000 man-days x US\$ 2.2/man-day	112
(3) Repair and maintenance cost of factory plant	
- Machinery and equipment ^{/3}	308
- Factory buildings ^{/4}	70
(4) Polyethylene laminated bags ^{/5}	135
(5) Miscellaneous	86
Total	1,800

^{/1} See Table 5-12

^{/2} See Table 5-13

^{/3} About 1.5 % of procurement cost
 $US\$20,540,000 \times 1.5 \% = US\$308,000$

^{/4} About 1 % of construction cost
 $US\$6,950,000 \times 1 \% = US\$70,000$

^{/5} US\$3.0/ton

Table 5-12 Sub-materials Cost

<u>Sub-materials</u>	<u>Required Quantity</u>	<u>Unit Price (US\$)</u>	<u>Amount (US\$1,000)</u>
Quick lime (90% CaO)	693 tons	41/ton	28.4
Active carbon	94.5 tons	1,680/ton	158.8
Diatomaceous earth	56.7 tons	360/ton	20.4
Ion exchange resin	18.9 kℓ	2,700/kℓ	51.0
NaCl (90 %)	378 tons	70/ton	26.5
HCl (25 % solution)	9 kℓ	150/kℓ	1.4
Soda ash	81 tons	300/ton	24.3
Filter cloth	4,730 m ²	2/m ²	9.5
Lubricating oil	36 kℓ	860/kℓ	31.0
Grease	4,500 kg	2.5/kg	11.3
Fuel oil (for diesel)	450 kℓ	210/kℓ	94.5
Heavy oil	225 kℓ	150/kℓ	33.8
Others (about 5% of the above)			24.1
Total			515.0

Table 5-13 Personnel Cost for Sugar Manufacturing

<u>Staff</u>	<u>Numbers</u>	<u>Annual Wage (US\$1,000)</u>	<u>Amount (US\$1,000)</u>
Department head	1	7	7
Section head	2	5	10
Junior section head	7	4	28
Technical staff			
- Processing engineer	15	3	45
- Mechanical engineer	6	3	18
- Electric engineer	6	3	18
- Chemist	4	3	12
- Draftman	5	1.5	7.5
- Operator and Mechanic	127	1.5	190.5
- Foreman	93	1.5	139.5
- Permanent labourer	140	0.7	98
<hr/>			
Total	406		573.5 (+ 574)

Note: Details are given in Annex VI. Cost of expatriate assistance for factory operation is estimated in Annex Table VII-16.

Table 5-14 Sugar Manufacturing Costs during Build-up Period

(Unit: US\$1,000)

<u>Year</u>	<u>Sub-materials Cost</u>	<u>Personnel Cost</u>	<u>Repair and Maintenance Cost for Factory Plant</u>	<u>Polyethylene Laminated Bags</u>	<u>Miscel- laneous</u>	<u>Total</u>
1980/81	119	600	378	22	58	1,177
1981/82	242	627	378	51	67	1,365
1982/83	387	658	378	92	78	1,593
1983/84	397	660	378	104	79	1,618
1984/85	438	669	378	115	82	1,682
1985/86	471	676	378	124	85	1,734
1986/87 and after	515	686	378	135	86	1,800

Table 5-15 General Administration Cost

Item	Amount (US\$1,000)
(1) Personnel cost <u>/1</u>	<u>143</u>
President	1M x US\$9,000 9
Department head	1M x US\$7,000 7
Section head	3M x US\$5,000 15
Junior section head	10M x US\$4,000 40
Staff	
- Accounting clerk	2M x US\$3,000 6
- General clerk and nurse	27M x US\$1,500 41
- Permanent labourer	36M x US\$700 25
(2) Communication and travelling expenses	<u>48</u>
Communication	12M x US\$2,000 24
Travelling	12M x US\$2,000 24
(3) Office supplies	<u>50</u>
(4) Repair and maintenance cost of offices and residences	<u>50</u>
(5) Welfare expenses 1,310 M x US\$60/head	<u>79</u>
(6) Miscellaneous	<u>20</u>
Total	390

/1 Cost for expatriate assistance is estimated in Annex Table VII-16.

Table 5-16 General Administration Cost during Build-up Period

(Unit; US\$1,000)

Year	Personnel Cost	Communication and Travelling Expenses	Office Supplies	Repair and Main- tenance Cost of Offices and Residences	Welfare Expenses	Miscel- laneous	Total
1978/79	67	1	1	8	2	4	83
1979/80	67	5	5	30	8	6	121
1980/81	67	12	12	49	19	8	167
1981/82	90	36	38	50	59	14	287
1982/83	116	45	47	50	74	17	349
1983/84 and after	143	48	50	50	79	20	390

Table 7-1 Per Capita Sugar Consumption in Countries on the Coast of the Gulf of Guinea

<u>Country</u>	<u>Consumption</u> (kg/year)
Cameroun	4.5
Nigeria	2.7
Dahomey	3.1
Togoland	3.8
Ghana	9.1
Haute Volta	2.4
Côte d'Ivoire	14.8
Liberia	4.9
Serra Leone	10.7
Guinea	3.1
Portuguese Guinea	4.2
Senegal	20.1
Arithmetic mean	7.0

(Source: ISO, International Sugar Organization Yearbook, 1974)

Table 7-2 Average Import Price of Refined Sugar into Ghana

<u>Year</u>	1965	1966	1967	1968	1969	1970	1971	1972	1973
(a) Import Price (CIF Tema, US\$/ton)	67	58	61	67	99	93	142	274	304
(b) ISC Standard Price (US\$/ton)	45	39	42	41	71	82	100	158	210
(a)/(b)	1.49	1.49	1.54	1.63	1.39	1.13	1.42	1.73	1.45

Remarks: (1) CIF Tema price was calculated from Tables 1.1 and 1.2 of "Structure and Prospects of the Sugar Industry in Ghana" prepared by the University of Ghana for 1965-1969 and data supplied from Ministry of Economic Planning for 1970-1973, respectively.

(2) ISC Standard Price is reproduced from "ISO Yearbook 1973".

Table 8-1 Net Production Value without Project

<u>Crop</u>	<u>Production</u> (tons)	<u>Unit price</u> (US\$/ton)	<u>Gross value</u> (US\$1,000)	<u>Production cost</u> (US\$1,000)	<u>Net value</u> (US\$1,000)
Cassava	1,380	80	110	57	53
Maize	240	170	41	21	20
Groundnuts	80	370	30	16	14
Rice	60	620	37	19	18
Vegetable	720	190	137	74	63
Total	-	-	355	187	168

Table 8-2 Net Production Value with Project

<u>Products</u>	<u>Production</u> (tons)	<u>Unit price</u> (US\$/ton)	<u>Gross value</u> (US\$1,000)	<u>Production cost</u> (US\$1,000)	<u>Net value</u> (US\$1,000)
Sugar	45,000	510	22,950	6,928	16,022
Maize	810	170	138	94	44
Groundnuts	410	370	152	114	38
Vegetables	2,600	190	494	134	360
Total	-	-	23,734	7,270	16,464

Table 8-3 Total Direct Benefits during Build-up Period

(Unit: US\$1,000)

Year	Gross Value		Production Cost			Net Production Value		Incremental Benefits
	Sugar	Maize Groundnuts Vegetables Total	Crop Production Cost	Sugar Manufacturing Cost	General Administration Total Cost	with Project	without Project	
	/1					(3)=(1)-(2)	(4)	(5)=(3)-(4)
1980/81	3,723	-	1,395	1,177	167	984	168	816
1981/82	8,619	-	2,424	1,365	287	4,076	168	4,375
1982/83	15,504	118	4,597	1,593	349	6,539	168	9,421
1983/84	17,697	118	5,048	1,618	390	7,056	168	11,097
1984/85	19,482	118	5,073	1,682	390	7,145	168	12,793
1985/86	21,012	118	5,045	1,734	390	7,169	168	14,299
1986/87 and after	22,950	138	5,080	1,800	390	7,270	168	16,296

/1 The unit value of sugar is assumed to be US\$510/ton.

Table 8-4 Cost and Benefit Streams of the Project

(Unit: US\$1,000)

Year	Year in Order	Initial Investment	Cost							Total	Benefit
			Infrastructure		Replacement			Office and Quarters	Farm Buildings		
			Pumping Equipment	Gate	Equipment	Sugar Factory Buildings	Pumping Equipment				
1976/77	1	640								640	
1977/78	2	3,424								3,424	
1978/79	3	23,151								23,151	
1979/80	4	28,369								28,369	
1980/81	5	8,957								8,957	816
1981/82	6	6,892								6,892	4,375
1982/83	7	2,853								2,853	9,421
1983/84	8	266								266	11,097
1984/85	9	76								76	12,793
1985/86	10	76								76	14,296
1986/87	11	76								76	16,296
1987/88	12										16,296
1988/89	13										16,296
1989/90	14										16,296
1990/91	15										16,296
1991/92	16										16,296
1992/93	17										16,296
1993/94	18										16,296
1994/95	19										16,296
1995/96	20										16,296
1996/97	21										16,296
1997/98	22										16,296
1998/99	23			408						1,085	16,296
1999/00	24			80					69	719	16,296
2000/01	25			80						707	16,296
2001/02	26			70						697	16,296
2002/03	27										16,296
2003/04	28					9,210				9,210	16,296
2004/05	29					9,210				9,210	16,296
2005/06	30										16,296
2005/07	31										16,296
2007/08	32							666		666	16,296
2008/09	33					1,950		1,880	106	3,936	16,296
2009/10	34					1,950		1,619	79	3,648	16,296
2010/11	35							141	118	259	16,296
2011/12	36								104	104	16,296
2012/13	37								108	108	16,296

∟ The unit value of sugar is assumed to be US\$510/ton.

Table 9-1 Water Charge

Item	Amount (US\$1,000)
(1) O & M cost of irrigation, drainage ^{/1} and road facilities	234
(2) Machinery operation cost ^{/2}	993
(3) Seed cane ^{/3}	49
(4) Land rent ^{/4}	8
(5) Debt repayment of the loan ^{/5}	839
(6) Miscellaneous	61
Total	1,312

(Water charge per farmer : US\$2,730)

/1 : Refer to Table 5-9

/2 : Refer to Table 5-6

/3 : Refer to Table 5-7

/4 : Refer to Table 5-6

/5 : About 30 % of annual debt repayment of the loan for
infrastructural facilities and initial farm investment.

Table 9-2 Financial Statement

(Unit: US\$1,000)

Year	Gross Revenue			Annual Fund Requirement		Gross Outgo		Total (2)	Net Revenue (3)=(1)-(2)	Loan/3	Compound Amount	Debt Repayment (4)	Surplus (5)=(1)-(4)	Accumulated Surplus
	Year Order	Sugar/1 Revenue	Water Charge	Total (1)	Annual Fund Requirement	Production Cost	Annual/2							
1976/77	1	-	-	-	-	-	-	-	-	640	694	-	-	-
1977/78	2	-	-	-	-	-	-	-	-	3,424	4,468	-	-	-
1978/79	3	-	-	-	-	-	-	-	-	23,151	29,967	-	-	-
1979/80	4	-	-	-	-	-	-	-	-	28,369	63,295	-	-	-
1980/81	5	3,723	-	3,723	984	2,739	3,723	0	0	7,973	77,323	-	-	-
1981/82	6	8,619	-	8,619	4,544	4,075	8,619	0	0	2,348	86,446	-	-	-
1982/83	7	15,504	751	16,255	2,853	7,345	10,198	6,057	6,057	-	93,794	-	6,057	6,057
1983/84	8	17,697	2,184	19,881	266	9,036	9,302	10,579	10,579	-	101,766	10,358	221	6,278
1984/85	9	19,482	2,184	21,666	76	9,252	9,328	12,338	12,338	-	99,178	10,358	1,980	8,258
1985/86	10	21,012	2,184	23,196	76	9,392	9,468	13,728	13,728	-	96,369	10,358	3,370	11,628
1986/87	11	22,950	2,184	25,134	76	9,692	9,768	15,366	15,366	-	93,322	10,358	5,008	16,636
1987/88	12	22,950	2,184	25,134	-	9,692	9,692	15,442	15,442	-	90,016	10,358	5,084	21,720
1988/89	13	22,950	2,184	25,134	-	9,692	9,692	15,442	15,442	-	86,429	10,358	5,084	26,804
1989/90	14	22,950	2,184	25,134	-	9,692	9,692	15,442	15,442	-	82,537	10,358	5,084	31,888
1990/91	15	22,950	2,184	25,134	-	9,692	9,692	15,442	15,442	-	78,315	10,358	5,084	36,972
1991/92	16	22,950	2,184	25,134	-	9,692	9,692	15,442	15,442	-	73,733	10,358	5,084	42,056
1992/93	17	22,950	2,184	25,134	-	9,692	9,692	15,442	15,442	-	68,762	10,358	5,084	47,140
1993/94	18	22,950	2,184	25,134	-	9,692	9,692	15,442	15,442	-	63,368	10,358	5,084	52,224
1994/95	19	22,950	2,184	25,134	-	9,692	9,692	15,442	15,442	-	57,516	10,358	5,084	57,308
1995/96	20	22,950	2,184	25,134	-	9,692	9,692	15,442	15,442	-	51,166	10,358	5,084	62,392
1996/97	21	22,950	2,184	25,134	-	9,692	9,692	15,442	15,442	-	44,277	10,358	5,084	67,476
1997/98	22	22,950	2,184	25,134	-	9,692	9,692	15,442	15,442	-	36,802	10,358	5,084	72,560
1998/99	23	22,950	2,184	25,134	1,085/4	9,692	10,777	14,357	14,357	-	28,692	10,358	3,999	76,559
1999/00	24	22,950	2,184	25,134	719/4	9,692	10,411	14,723	14,723	-	19,892	10,358	4,365	80,924
2000/01	25	22,950	2,184	25,134	707/4	9,692	10,399	14,735	14,735	-	10,345	10,345	4,390	85,314

/1: Sugar price is assumed to be US\$510/ton.

/2: Annual production cost includes production cost of sugar cane, sugar manufacturing cost and general administration cost. Sugar cane to be supplied by the settlers is valued at \$20/ton (US\$17.4/ton).

/3: Interest rate 8.5%. Grace period 7 years, Maturity period 25 years.

/4: Replacement cost

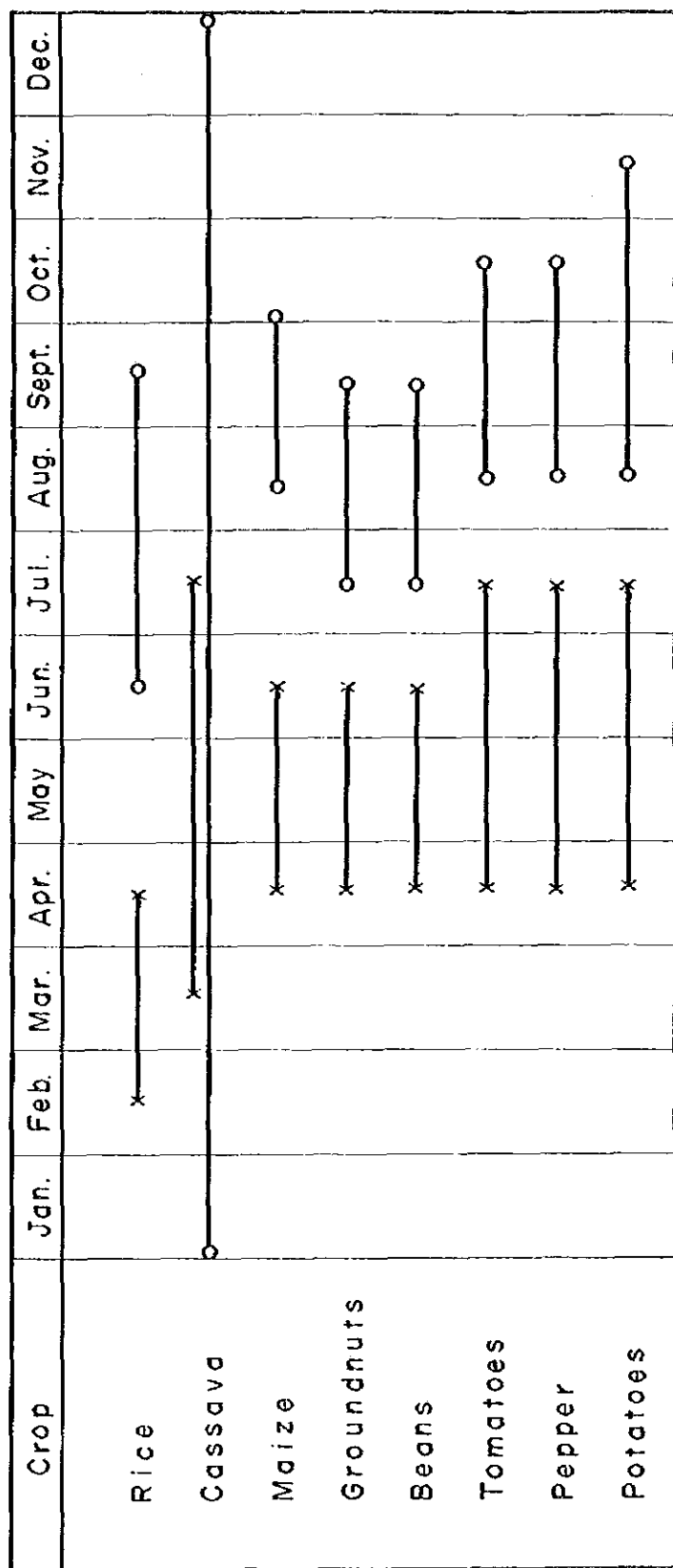
Table 9-3 Typical Farm Budget with Project

Item	Amount (US\$)
(1) Gross income	
Sugar cane	4,180
Maize	170
Groundnuts	180
Vegetables	630
Total	5,160
(2) Gross expenditure	
Farming expenses	
- Seeds of fallow crops	15
- Fertilizers	240
- Agri. chemicals	88
- Miscellaneous	47
Taxes and public imposts	240
Total	630
(3) Net farm income, (1) - (2)	4,530
(4) Living expense	820
(5) Capacity to pay, (3) - (4)	3,710
(6) Water charge	2,730
(7) Net reserve, (5) - (6)	980

(Net reserve per ha : US\$ 245)

FIGURES

Fig. 3-1 PRESENT CROPPING CALENDAR OF MAJOR CROPS



Source : Agricultural Extension Office, Sogakope district

x ————— x Seeding period
 o ————— o Harvesting period

Fig. 4-1 PROPOSED FARM OPERATION SCHEDULE

Farm Operations	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
<u>Plant Cane</u>												
Subsoiling												
Ploughing												
Harrowing												
Furrowing												
Ditching												
Irrigating												
Planting & Fertilizing												
Gap filling												
Weeding												
Plant protection												
Top dressing												
Earthing												
Burning												
Harvesting												
Hauling												
Land clearing												
<u>Ratoon Cane</u>												
Stubble cutting												
Suckening & Gap filling												
Ditching												
Irrigating												
Weeding												
Plant protection												
Top dressing												
Earthing												
Burning												
Harvesting												
Hauling												
Land clearing (after 1st ratoon)												
<u>Nursery</u>												
				Planting						Harvesting		
<u>Fallow crops</u>					Sowing or Planting					Harvesting		

Remarks: ————— machine, - - - - - manpower

Fig.4-2

OUTLINE OF PROCESS

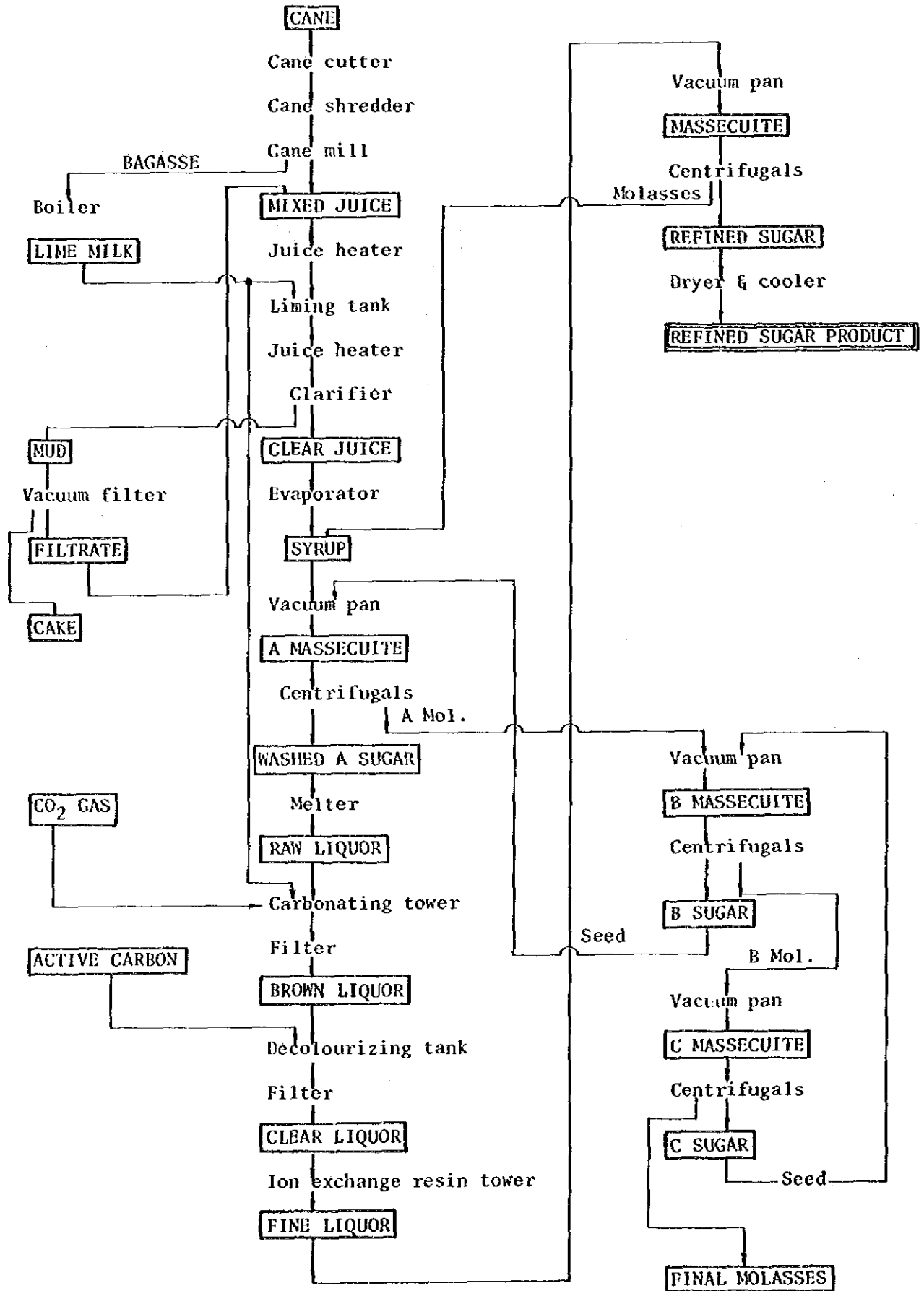


Fig.4 - 3 CONSTRUCTION TIME SCHEDULE

FISCAL YEAR	1st Year		2nd Year		3rd Year		4th Year		5th Year		6th Year		7th Year	
CALENDAR YEAR	1976	1977		1978		1979		1980		1981		1982		1983
A. DETAILED SURVEY AND DESIGN	[Timeline bar spanning 1976-1977]													
B. PREPARATORY WORKS	[Timeline bar spanning 1977-1978]													
C. INFRASTRUCTURES	[Timeline bar spanning 1977-1978]													
1) Tender call and contract for civil works	[Timeline bar spanning 1977-1978]													
2) Pumping stations	[Timeline bar spanning 1977-1978]													
—Civil works	[Timeline bar spanning 1978-1980]													
—Tender call and contract	[Timeline bar spanning 1977-1978]													
—Manufacturing and transportation.	[Timeline bar spanning 1978-1980]													
—Installation	[Timeline bar spanning 1979-1981]													
3) Irrigation facilities	[Timeline bar spanning 1978-1982]													
—Canals	[Timeline bar spanning 1978-1982]													
—Related structures	[Timeline bar spanning 1978-1982]													
4) Drainage facilities	[Timeline bar spanning 1978-1982]													
—Canals	[Timeline bar spanning 1978-1982]													
—Related structures	[Timeline bar spanning 1978-1982]													
5) Farm roads	[Timeline bar spanning 1978-1982]													
—Earthworks and pavement	[Timeline bar spanning 1978-1982]													
—Related structures	[Timeline bar spanning 1978-1982]													
6) Land reclamation	[Timeline bar spanning 1978-1982]													
7) Preparation of settlement area	[Timeline bar spanning 1979-1980]													
8) Rehabilitation of pilot farm	[Timeline bar spanning 1978-1979]													
9) Office and quarters	[Timeline bar spanning 1977-1982]													
10) Planting in new farm	[Timeline bar spanning 1979-1983]													
					(200ha)	(1650ha)	(1,650ha)	(2,100ha)	(2,100ha)					
D. SUGAR PLANT	[Timeline bar spanning 1978-1982]													
1) Civil works	[Timeline bar spanning 1979-1980]													
2) Buildings	[Timeline bar spanning 1979-1980]													
3) Tender call and contract	[Timeline bar spanning 1978-1979]													
4) Manufacturing and transportation	[Timeline bar spanning 1978-1980]													
5) Installation of plant	[Timeline bar spanning 1979-1980]													
6) Trial running	[Timeline bar spanning 1980-1981]													
7) Operation	[Timeline bar spanning 1981-1983]													

Fig. 6-1 ORGANIZATION OF THE AVEYME PROJECT AUTHORITY

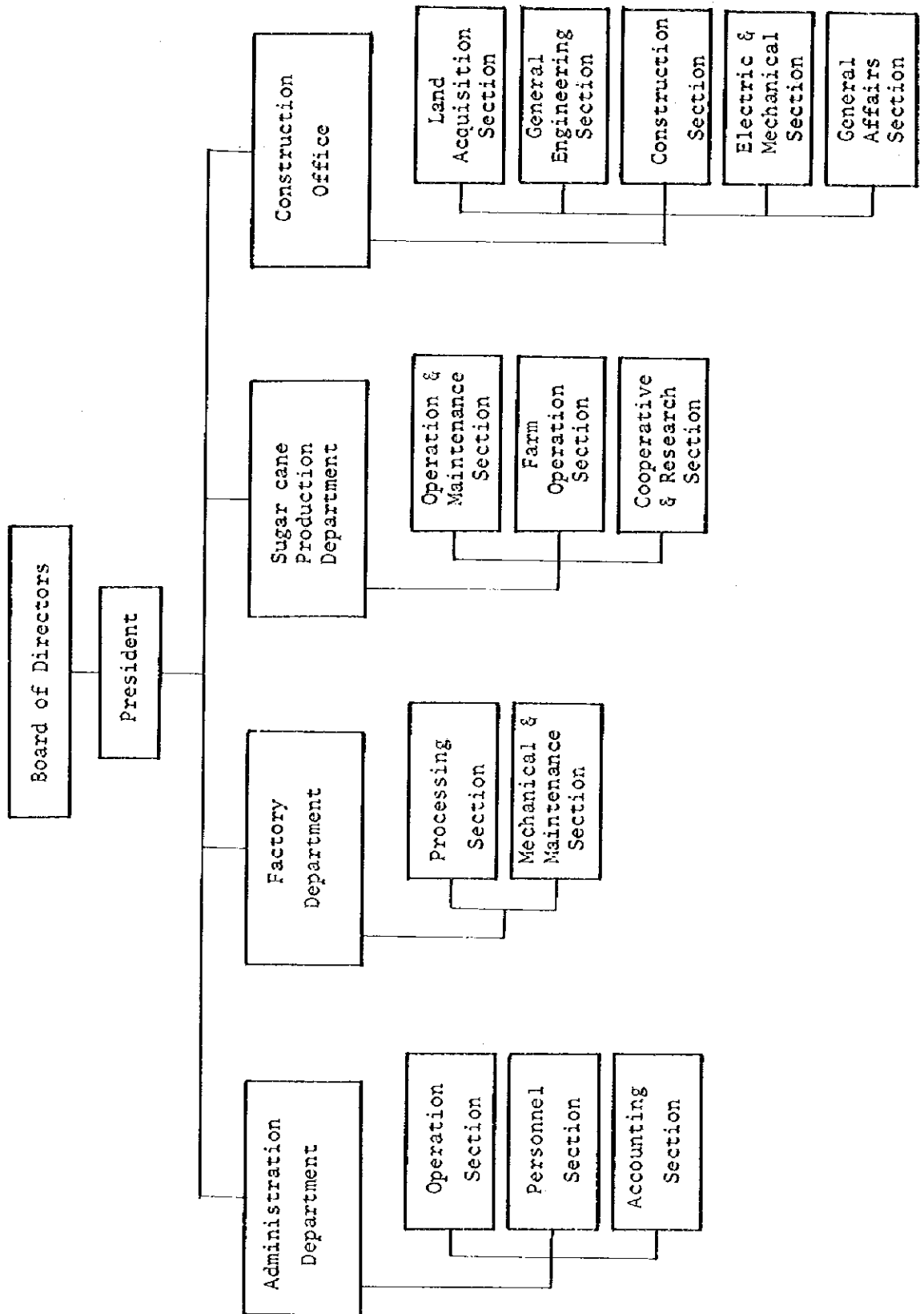
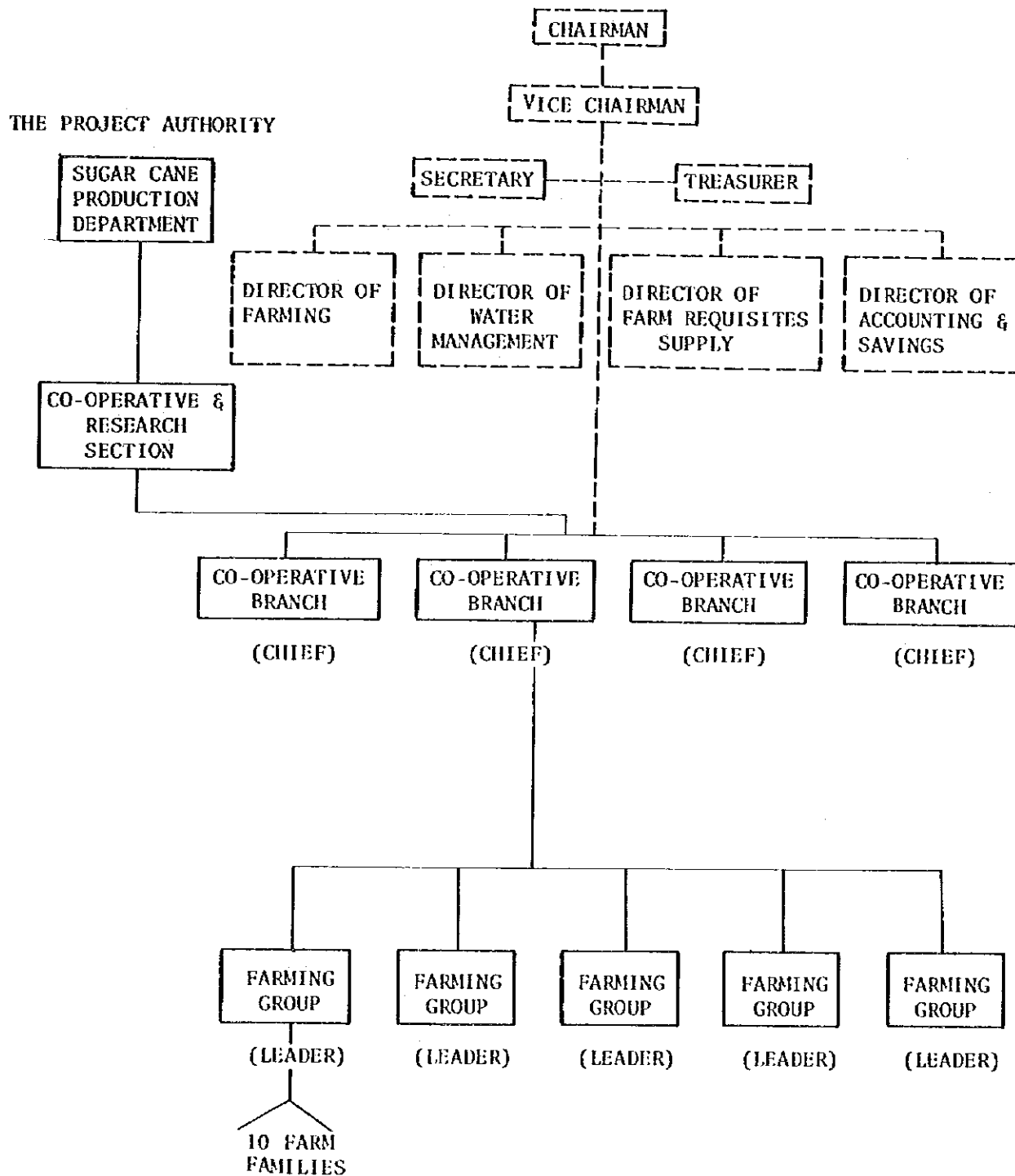


Fig. 6-2 ORGANIZATION OF CO-OPERATIVE



Legend:

- Initial stage of the settlement
- Independent stage of the settlement

Fig. 7-1 MONTHLY PRICE RANGE
OF INTERNATIONAL SUGAR
PRICE (INTERNATIONAL
SUGAR COUNCIL DAILY
RAW SUGAR PRICE)

Unit : U.S. Cents / pound

SOURCE : JAPAN SUGAR REFINERS'
ASSOCIATION

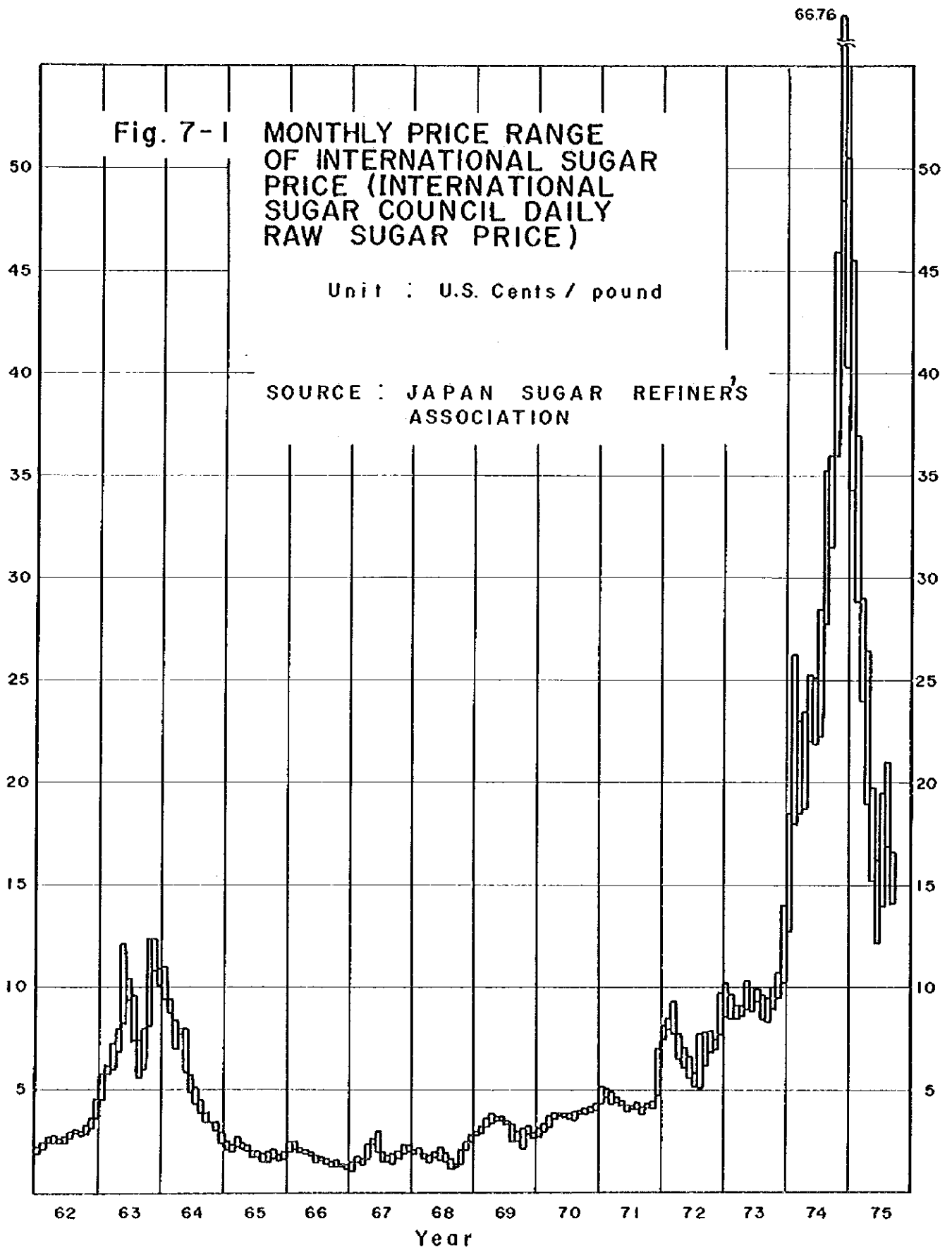


Fig.8-1 PRESENT VALUE BENEFIT-COST CURVE.

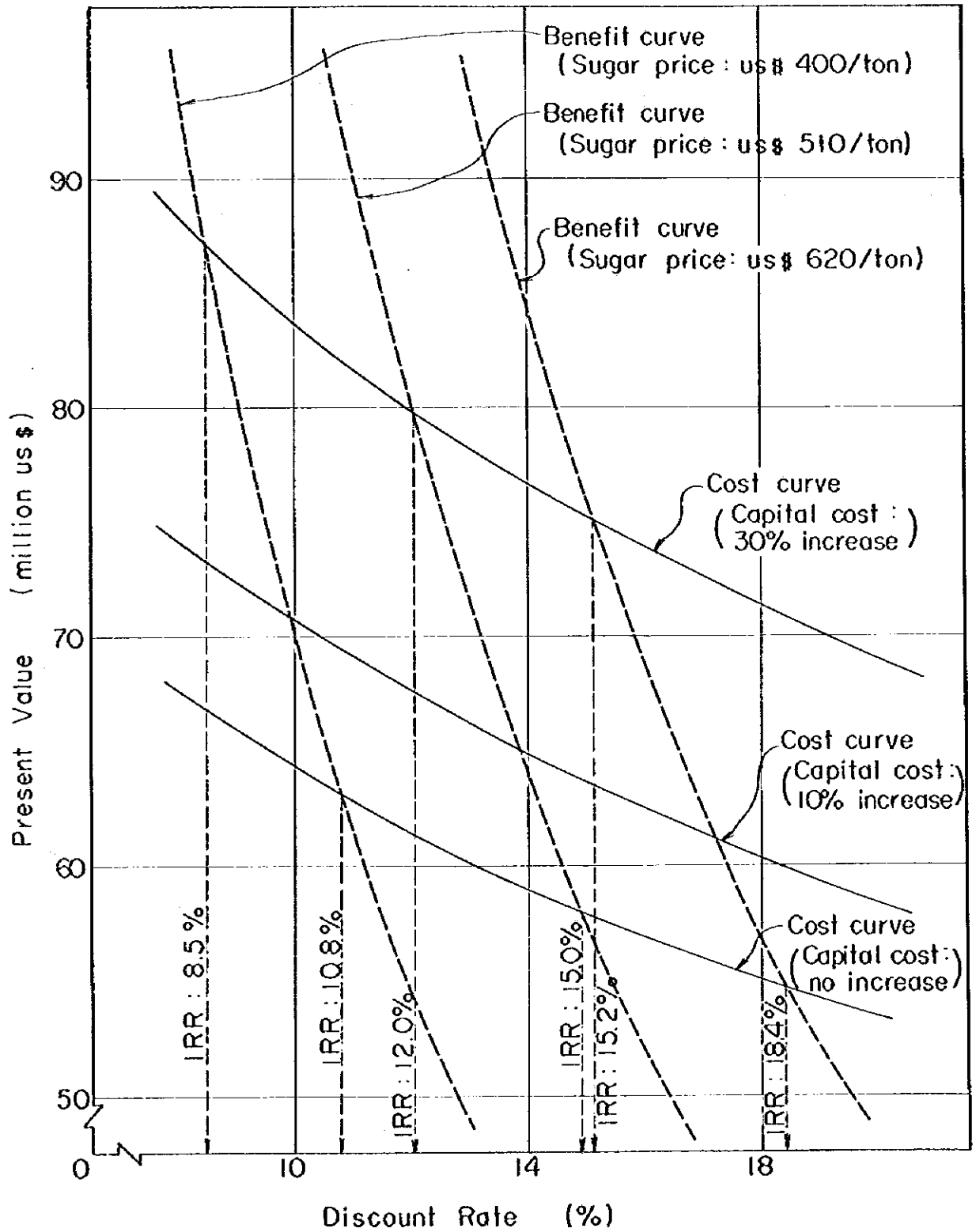
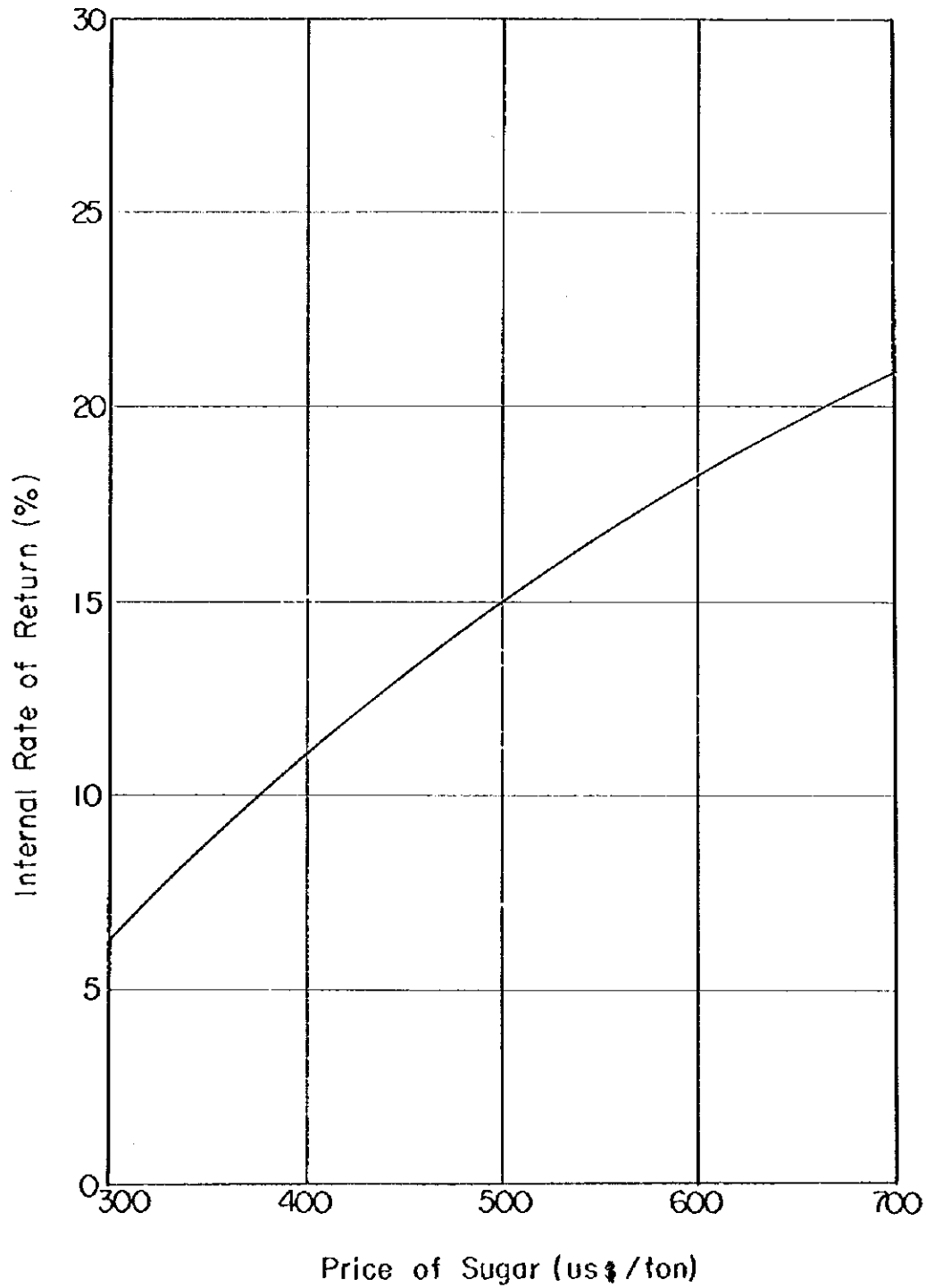


Fig. 8-2 SENSITIVITY TEST OF INTERNAL RATE OF RETURN AGAINST THE VARIATION OF SUGAR PRICE.



1

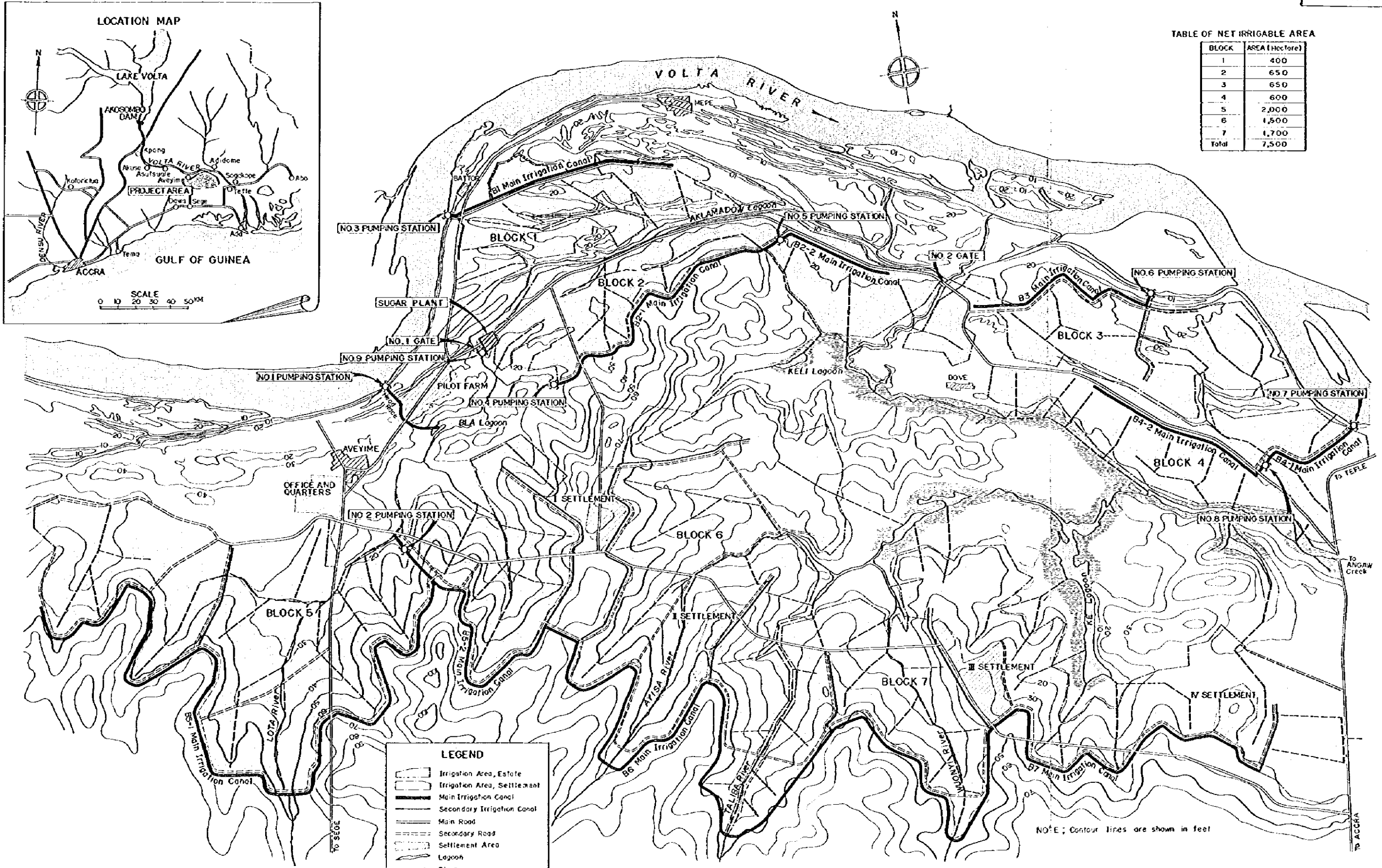
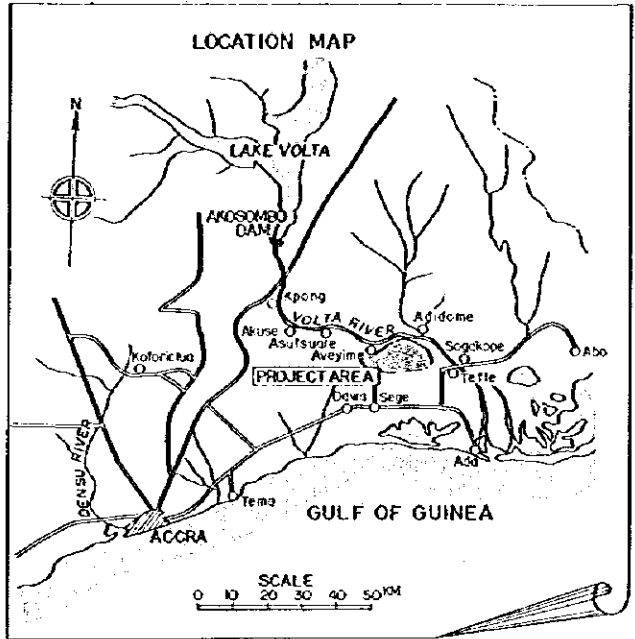
DRAWINGS

1

1

TABLE OF NET IRRIGABLE AREA

BLOCK	AREA (Hectare)
1	400
2	650
3	650
4	600
5	2,000
6	1,500
7	1,700
Total	7,500



LEGEND

- Irrigation Area, Estate
- Irrigation Area, Settlement
- Main Irrigation Canal
- Secondary Irrigation Canal
- Main Road
- Secondary Road
- Settlement Area
- Lagoon
- River
- Pumping Station
- Drainage Canal
- Swamp

NOTE: Contour lines are shown in feet

PREPARED <i>D. Yama</i>	MINISTRY OF ECONOMIC PLANNING	TITLE OF DRAWING	APPROVED
CHECKED <i>S. N. A.</i>	GOVERNMENT OF THE REPUBLIC OF GHANA	LOCATION MAP & GENERAL LAYOUT	
SUBMITTED <i>S. K. K.</i>			DATE
DATE DEC 1 1975	AVEYIME SUGAR PRODUCTION PROJECT	DWG. NO. 000-01	
		NIPPON KOEI CO., LTD. CONSULTING ENGINEERS, TOKYO	



LEGEND

GREAT SOIL GROUP	SOIL SERIES	MAP UNIT	SOIL TYPE	SOIL PHASE
Acid glesols	HAKRE	1	Sandy surface - light clayey subsoil type	A Deep, well drained, nearly flat lowland phase.
		2	Clayey surface - sandy subsoil type	B Deep, moderately well drained, nearly flat lowland phase.
		3	Sandy surface - sandy subsoil type	C Deep, moderately to well drained, nearly flat lowland phase.
		4	Loamy surface - clayey subsoil type	D Deep, imperfectly drained, flat lowland phase.
		5	Silty clay surface - clayey subsoil type	E Deep, poorly drained, flat lowland phase.
		6	Clayey surface - clayey subsoil type	F Deep, very poorly drained, severely floodable, flat least land phase.
Savannah ochrosols	AVEYME	7	Sandy surface - sandy subsoil type	I Deep, well drained, easily tillable, very gently sloping upland phase.
		8	Sandy surface - loamy subsoil type	J Deep, well drained, easily tillable, gently sloping upland phase.
		9	Loamy surface - loamy subsoil type	K Deep, well drained, nearly flat slightly elevated lowland phase.
		10	Sandy surface - loamy subsoil type	L Deep, moderately well drained, nearly flat slightly elevated lowland phase.
		11	Loamy surface - loamy subsoil type	M Deep, well drained, mottled, nearly flat elevated lowland phase.
		12	Sandy surface - clay loam type	N Deep, moderately well drained, mottled, nearly flat elevated lowland phase.
Tropical gray earths	AGWIAN	13	Sandy surface loamy subsoil type	O Moderately deep, moderately well drained, very gently sloping upland phase.
		14	Sandy surface gravelly loam subsoil type	P Moderately deep, moderately well drained, gently sloping upland phase.
		15	Sandy surface gravelly loam subsoil type	R Deep, moderately well drained, easily tillable, very gently sloping upland phase.
		16	Sandy surface gravelly loam subsoil type	S Deep, moderately well drained, easily tillable, gently sloping upland phase.
		17	Sandy surface gravelly loam subsoil type	T Deep, moderately well drained, usually rocky, very gently sloping upland phase.
		18	Sandy surface gravelly loam subsoil type	U Moderately deep, moderately well drained, very gently sloping upland phase.

Remarks
? rock outcrops

PREPARED <i>K. Osei</i> CHECKED <i>N. Osei</i> SUBMITTED <i>J. Kweku</i> DATE <i>DEC 1978</i>	MINISTRY OF ECONOMIC PLANNING GOVERNMENT OF THE REPUBLIC OF GHANA AVEYIME SUGAR PRODUCTION PROJECT	TITLE OF DRAWING SOIL MAP DWS NO. 000-02 NIPPON KOGI CO., LTD. CONSULTING ENGINEERS, TOKYO	APPROVED DATE
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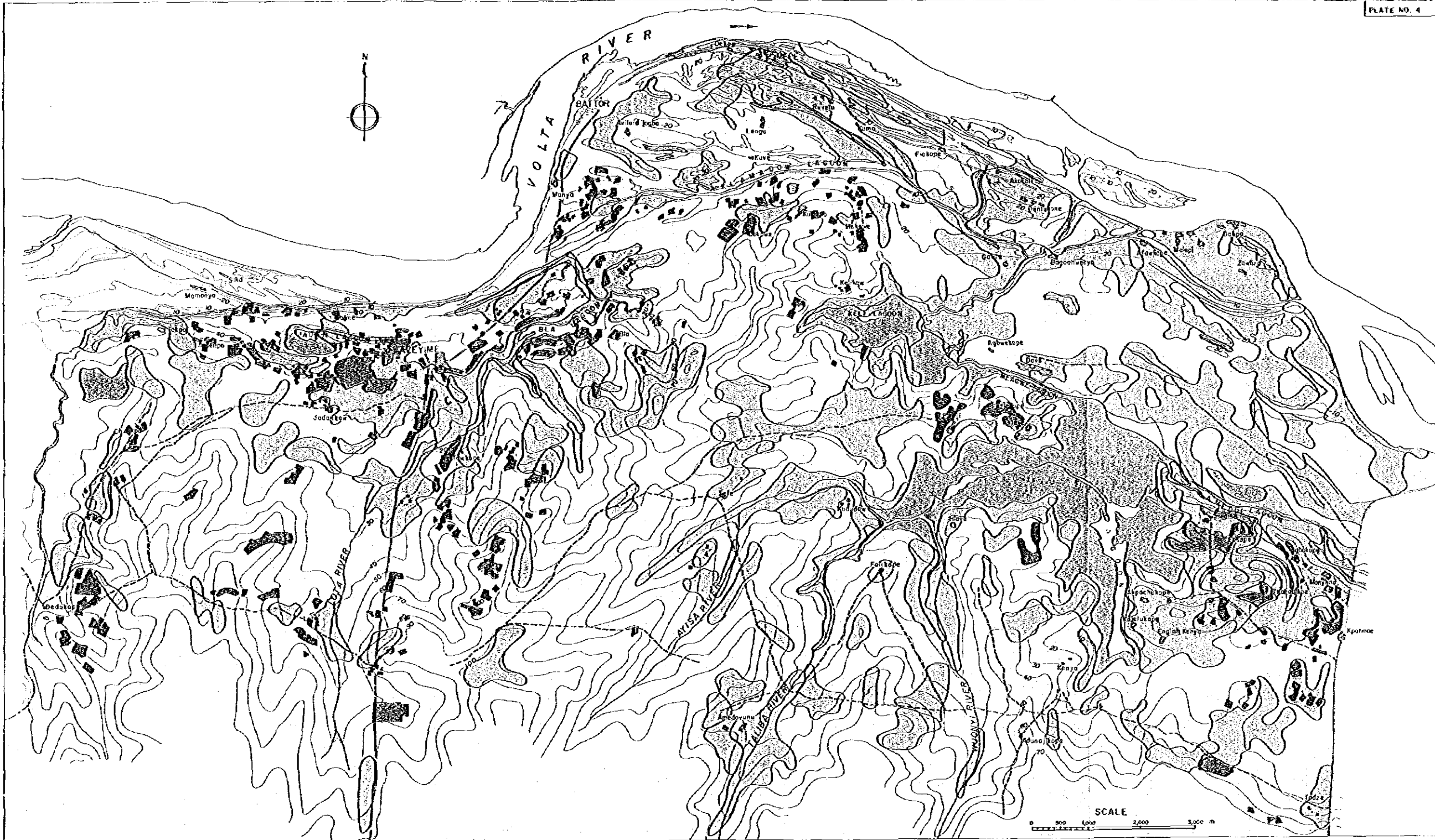


LEGEND

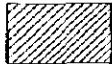

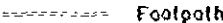

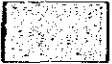




MAP UNIT	CLASS
	CLASS I Very suitable for irrigation farming. Deep, moderately to well drained, light to medium textured, slight problems of flooding, easily tillable, relatively rich fertility, fairly good irrigability, no erodibility. High productivities are got by proper management.
	CLASS IIa Moderately suitable for irrigation farming. Deep, well drained light to medium textured, no problems of flooding, easily tillable, rather low fertility, fairly good irrigability, no erodibility.
	CLASS IIb Moderately suitable for irrigation farming. Deep imperfectly to poorly drained, medium to fine textured, frequently flooded, uneasily tillable, fertile, good irrigability, no erodibility.
	CLASS IIIa Fairly suitable for irrigation farming. Compact, shallow impermeable layer, unfavourable tillability, no problems of flooding, slight problems of erodibility, moderate irrigability, poor fertility.

MAP UNIT	CLASS
	CLASS IIIb Fairly suitable for irrigation farming. Deep, very poorly drained, fine textured, rich fertility, severe problems of annual flooding, unfavourable tillability, good irrigability, no erodibility.
	CLASS IV Usable for irrigation farming. Deep, moderately well drained, light to medium textured, no problems of flooding, severe erodibility, easily tillable, low fertility, unfavourable irrigability.
	CLASS V Unavailable for irrigation farming, usable for recreation, source of construction materials etc.

PREPARED <i>H. Osei</i> CHECKED <i>N. Osei</i> SUBMITTED <i>J. Kuro</i> DATE <u>DEC 1 1955</u>	MINISTRY OF ECONOMIC PLANNING GOVERNMENT OF THE REPUBLIC OF GHANA AVEYIME SUGAR PRODUCTION PROJECT	TITLE OF DRAWING LAND CAPABILITY MAP DWG NO 000-03 NIPPON KOEN CO., LTD CONSULTING ENGINEERS, TOKYO	APPROVED DATE
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LEGEND

- | | | | | | |
|---|---|---|-------------------|---|------------|
|  | Settlement & Associated Non-agricultural Land |  | Scrub & Grassland |  | Footpath |
|  | Densely Cultivated Land |  | Forest |  | Paved Road |
|  | Variable Mixture of Cultivation & Fallow |  | Marshy Land |  | River |

PREPARED <i>K. Onika</i>	MINISTRY OF ECONOMIC PLANNING	TITLE OF DRAWING	APPROVED
CHECKED <i>M. Agye</i>	GOVERNMENT OF THE REPUBLIC OF GHANA	LAND USE MAP	DATE
SUBMITTED <i>J. Kuma</i>	AVEYIME SUGAR PRODUCTION PROJECT	DWG NO. 000-04	
DATE 1961/55		NIPPON KOEI CO., LTD CONSULTING ENGINEERS, TOKYO	

