

VII) 試験・訓練用器材

9.5 建設計画及び事業費積算

9.5.1 建設計画

パイロット事業による工事は、ンドウupp取水堰、用・排水路とその付帯構造物、農道、建物とその設備施設の新規建設工事から成る。計画地区は現在、草地や森林で浸・湛水状態にあり、まず最初に、草や樹木の伐採、抜根を行い、圃場造成のための排水工事を実施しなければならない。続いてかんがい施設、農道の建設工事を実施する。計画された建物は丘陵高位部にあり、その建設工事にあたって特に支障をきたすような問題は発生しない。工事用の主要機械は、湿地用ブルドーザー、湿地用レーキドーザー、バックホウショベル、ダンプトラック、コンクリートミキサーである。

工事期間は、作業可能日数、建設方法及び施工機械計画を考慮して、17ヶ月とした。年間作業可能日数は、クンジャ気象観測所の日雨量記録をもとに、土工事について 213日、コンクリート工事については 264日と算定した。実際の建設工事に先立って、工事請負業者の選定のための入札書類作成を含む詳細設計を実施する必要がある。パイロット事業の実施工程計画を図19. に示す。

9.5.2 事業費積算

本パイロット事業の事業費は、圃場施設、建物および設備の工事費、機械及び器材費、予備費並びに詳細設計及び工事監理費より成る。総事業費は33億1936万 CFAフランでその内訳は以下のとおりである。

項 目	費用 (×10 ³ CFA フラン)
1. 工 事 費	
1.1 圃場整備工事*	1,022,708
1.2 建築工事	965,591
1.3 設備工事	222,947
小 計	<u>2,211,246</u>
2. 機械および器材費	
2.1 農業機械	187,242
2.2 維持・管理機械	115,799
2.3 車 輛	41,580
2.4 ライスミル	164,759
2.5 整備工場器具	8,758
2.6 気象・水文、圃場観測器材	25,828
2.7 試験・訓練器材	27,148
小 計	<u>571,114</u>
3. 予備費 (フィジカル)	<u>221,124</u>
4. 詳細設計及び工事監理費	<u>315,877</u>
総 計	<u>3,319,361</u>

(注 : 1.0 US ドル = 384.5 CFAフラン = 203.0円)

* : この工事は全体開発事業と重複する

9.6 事業実施体制

本パイロット事業の円滑な実施を図るため、カメルーン国政府 (農業省) の監督下で「バイゴム農業開発公社」 (仏語の略でSODABAと称す) を設立することが望ましい。現在、農業省計画局の監督の下でバイゴム稲作事業事務所 (Bagiom Rice Cultivation Project office) が、小規模な栽培試験圃場を運営、管理しているが、SODABAが設立さ

れるまでの間は、同事務所の機構組織を拡張・強化して事業実施にあたることになる。

同パイロット事業の実施機構は、図20. に示すように「総務・財務」、「パイロット圃場管理」、「建設、維持・管理」及び「試験・展示」の4部で構成する。

農民に対する技術的、財務的な援助と、パイロット事業の安定的な運営・管理のための組織の設立は、集約的な農業を通じてこの地区から期待どおりの農業生産を上げるために非常に重要である。そこでまずその第一歩として、調査・普及、投資・資金貸出しサービス、共同組合・農民組織等に関連する既存の農業支援組織及び機関を効果的に利用することが不可欠である。

パイロット事業の円滑な実施を確保するため、この事業の最終開発段階においては、86名の適正な資質を備えたスタッフを配置することが望まれる。スタッフ数、特に、高級職員の数は、作業量の増大に伴って徐々に増加させて行くことになる。これは、初期段階においては、これらの高級職員が出来る限り他の職種をも併任することが合理的な財政運用の観点からみて必要なことであるからである。パイロット事業の最終段階における人件費は、管理・技術スタッフの給与および住宅手当を政府が支給するものとして概そ、6,890万 CFAフラン程度になる。

付 表

表 1 実施調査団、カメルーン国カウンターパート名簿

Name	Title/Speciality
<u>JICA Study Team</u>	
1. Mr. Kensaku TAKEDA	Team Leader
2. Mr. Takeshi KAWAGUCHI	Irrigation & Drainage Engineer
3. Mr. Akio MAEDA	Agronomist
4. Mr. Fumihiko FURUICHI	Agro-Economist/Institutional Expert
5. Mr. Kuninobu NODA	Hydrologist
6. Mr. Shigeyuki SHIOSE	On-Farm Design Engineer
7. Mr. Naotsugu TAGUCHI	Structural Design Engineer
8. Mr. Naoto MORIOKA	Pedologist
9. Mr. Hirohisa ISOGAI	Geologist/Soil Mechanical Engineer
10. Mr. Tomoo FUKAZAWA	Surveying Engineer
<u>Counterpart Personnel</u>	
1. Mr. ATEBA Jean-Marie	Chief Counterpart
2. Mr. MBIADA Emmanuel	Irrigation & Drainage/Hydrology/ Topographic Survey
3. Mr. ONDOUA Jacob	On-Farm Design
4. Mr. KOM	Agronomy
5. Mr. BANGOWENI Paul-Félix	Soil/Geology
6. Mr. TENTCHOU Jean	Agro -Economy/Institution
7. Miss. ELOGO Mafouma	Agro -Economy/Institution

表 2 カメルーン国行政区分

Province	Administrative Headquarters	Population	Distribution (%)
Centre	Yaoundé	1,764,400	18.4
Littoral	Douala	1,829,900	19.1
West	Bafoussam	1,233,200 /*	12.9
South	Ebolowa	356,400	3.7
South West	Buea	700,900	7.3
North West	Bamenda	1,009,100	10.6
East	Bertoua	420,000	4.4
North	Garoua	508,200	5.3
Far North	Maroua	1,400,000	14.6
Adamaoua	Ngaoundéré	355,800	3.7
Total		9,577,900	100.0

Source : Note Annuelle de Statistique, 1983-1984, Direction de la Statistique et de la Comptabilité Nationale.

Remarks : /* The figure was adjusted to be logical.

表 3 主要穀物の生産量と輸入量

(Unit: Thousand tons/CFA F million)

Year	Production (tons)				Imports			
	Rice		Maize	Millet & Sorghum	Rice		Wheat	
	Quantity	Value			Quantity	Value	Quantity	Value
1969	22.0	(-)	250	400	10.3	421.4	34.5	628.4
1970	-	(-)	-	-	7.8	389.7	29.8	842.8
1971	13.7	(-)	278	357	31.9	871.8	26.8	608.3
1972	15.2	(10.9)	298	339	28.2	743.2	44.3	907.0
1973	12.2	(-24.6)	319	322	23.9	1,270.9	37.9	824.2
1974	13.3	(9.0)	332	322	17.3	2,121.3	46.9	1,871.9
1975	15.0	(12.8)	341	325	1.7	195.5	36.4	1,897.9
1976	22.2	(48.0)	380	370	7.0	504.3	37.9	1,759.3
1977	25.0	(12.6)	395	380	23.1	1,473.9	62.8	2,911.2
1978	33.0	(32.0)	380	330	18.8	1,365.6	57.1	2,781.1
1979	42.0	(27.3)	350	400	41.3	2,863.1	64.4	2,973.4
1980	46.0	(9.5)	410	410	20.7	1,385.8	78.8	4,164.5
1981	45.6	(-0.9)	414	441	11.0	967.6	50.2	3,270.9
1982	67.6	(48.2)	431	351	16.7	1,174.9	59.8	4,311.3
1983	-	-	-	-	51.2	5,102.2	89.8	6,452.0
1984	-	-	-	-	31.0	2,765.4	65.5	5,320.3
Average					21.4	1,476.0	51.4	2,595.3

Source: Marchés Tropicaux et Méditerranéens - Le Marché Camerounais; Documents de la Direction de la Statistique et de la Comptabilité Nationale; The Fifth Five-Year Economic, Social and Cultural Development Plan, 1981-1986; Annuaire de Statistiques Agricoles, 1981-1982.

表 4 調査地区の気象条件

Koundja Station: Lat. 5°37'N, Long. 10°45'W, Altitude 1,208 m, Record Period 1975-1984

Description	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total or Average
Temperature (°C)	Mean	21.3	23.1	23.0	22.4	21.4	20.4	19.6	19.7	20.4	20.7	20.5	21.0
	Mean Max.	29.3	30.6	29.7	28.2	26.7	25.7	24.8	25.1	26.1	27.4	28.5	27.2
	Mean Min.	14.5	16.1	17.4	17.8	17.2	16.5	16.3	16.5	16.3	15.3	13.9	16.2
Relative Humidity (%)	Mean	57	55	62	74	80	81	83	81	78	69	61	72
	Mean Max.	87	85	90	96	99	99	100	100	99	96	92	95
	Mean Min.	26	23	34	50	60	62	65	66	62	56	40	30
Pan Evaporation (mm/day)	Total (mm)	163.2	184.0	188.8	146.2	124.4	104.4	91.1	99.7	120.0	133.4	143.7	1,586.6
	Mean (mm/day)	5.2	6.5	6.1	4.9	4.0	3.5	2.9	3.3	3.9	4.4	4.6	4.3
Atmospheric Pressure (millibars/day)	Mean	879.7	879.0	879.0	879.3	880.3	881.5	881.4	881.0	880.4	880.2	879.8	880.2
	Mean (millibars/day)	13.9	14.4	17.2	20.4	21.0	20.5	20.1	20.0	19.9	17.4	14.9	18.3
Sunshine Duration (hours/day)	Total (hours)	268.9	239.9	219.3	205.5	208.3	195.4	135.7	139.0	187.3	244.1	268.8	2,437.5
	Mean (hours/day)	8.7	8.5	7.1	6.8	6.7	6.5	4.4	4.6	6.0	8.1	8.7	6.7
Wind Velocity (m/s)	Mean	1.2	1.6	1.6	1.4	1.2	1.1	1.0	1.1	1.4	1.2	1.0	1.2
	Max.	7.2	8.3	11.6	11.2	10.6	10.4	8.3	8.5	9.1	10.8	8.7	9.3

Note: As the Baigom plain is about 100 m below the Koundja meteorological station, the temperatures in the plain are estimated by adding 0.6°C to the above records.

表 5 西部州, ヌン県, 調査地区周辺の人口

Region	Area (km ²)	Population		Average Growth Rate of Population per Annum (%)	Population Density per km ²	
		1976	1984		1976	1984
<u>Cameroon</u>	465,458	7,661,000	9,578,000	2.83	16.5	20.6
<u>West Province</u>	13,890	968,856	1,233,200	3.06	69.8	88.8
<u>Noun Division</u>	7,687	211,142	257,132	2.49	27.5	33.5
(Sub-Divisions & District) ^{/*}						
Foumban	1,363		104,762			76.9
Magba	1,169	137,876	12,946	1.5	31.4	11.1
Malentouen	1,360		16,630			12.2
Koutaba (Dist.)	500		21,109			42.2
Foumbot	1,002	73,266	72,517	4.2	22.2	72.4
Massangam	2,291		29,168			12.7
<u>Project Zone</u>	314	26,436	31,547	2.2	84.2	100.5
(Villages in Koutaba District)		12,054	14,779	2.6		
Ngoundoup		1,465	1,531	0.6		
Koundja		2,117	3,054	4.7		
Koundja Military Camp		2,580	3,000	1.9		
Poundimoun Didango		1,378	1,960	4.5		
Kouchakap		1,718	1,802	0.6		
Maparé		1,718	2,085	2.4		
Bafolé		1,078	1,347	2.8		
(Villages in Foumbot Sub-Division)		14,382	16,768	1.9		
Baigom		4,285	4,800	1.4		
Nkoundja		807	1,410	7.2		
Nkouparé		9,290	10,558	1.6		

Sources : Rapport Annuel du Service Provincial des Statistiques Agricoles de l'Ouest, 1983-1984;
 Note Annuelle de Statistique 1983-1984;
 Bilan Diagnostique du Secteur Agricole de la Province de l'Ouest;
 Rapport de l'Etude de Faisabilité de la Plaine de Baigom, SEDA, 1984.

Remarks : /* Reorganization of the administrative divisions took place in 1979 and 1982.
 Two (2) Sub-Divisions: Foumban and Foumbot were divided into 5
 Sub-Divisions and 1 District.

表 6. (1/2) ヌン県における主要作物生産量，市場流通量及び市場価格

Products	Production (tons)	Marketed Volume (tons)	Marketing Rate (%)	Price per Kg (CFA F)
<u>Food Crops</u>				
Maize	209,500	65,000	31.0	550
Rice	75	9,200	122.7	190
Yam	60,300	35,000	58.0	60
Macabo	10,750	5,050	47.0	40
Taro	1,110	370	33.3	50
Sweet potato	25,000	12,000	48.0	30
Cassava	71,000	35,000	49.3	35
Groundnuts	43,000	27,500	64.0	170
Haricot beans	53,500	35,600	66.5	222
Plantain	71,230	30,000	42.1	50
Banana	40,250	24,300	60.4	55
Potato	4,650	3,800	81.7	150
<u>Garden Crops</u>				
Tomato	19,450	18,500	95.1	140
Cabbage	1,500	1,480	98.7	125
Onion	25	23	92.0	200
Lettuce	1,800	1,780	98.9	125
Carrot	1,955	1,945	99.5	175
Celery	250	248	99.2	1,000
Pumpkin	360	359	99.7	90
Red pepper	130	110	84.6	2,700
Soybean	40	37	92.5	75
Beet	150	150	100.0	260
Turnip	35	35	100.0	100
Welsh onion	420	400	95.2	85
Eggplant	975	970	99.5	100
Water melon	4	3.5	87.5	500
<u>Garden Crops</u>				
Parsley	10	10	100.0	800
Radish	42	42	100.0	185
Sweet pimento	19	19	100.0	185
French bean	134	134	100.0	175
African vegetable	15,000	5,500	36.7	70

表 6. (2/2) ヌン県における主要作物生産量、市場流通量及び市場価格

Products	Production (tons)	Marketed Volume (tons)	Marketing Rate (%)	Price per Kg (CFA F)
Fruits				
Oil palm - Oil	700	450	64.3	900/ℓ
- Kernel	150	150	100.0	-
Orange	15	12	80.0	300
Grapefruit	-	-	-	-
Lemon	10	9.5	95.0	210
Avocado	950	750	78.9	100
Mango	15,500	11,000	71.0	75
Papaya	20	5	25.0	25
Guava	0.2	0.2	100.0	230
Cooking plums	150	100	66.7	300
Kola	5	2	40.0	600

Source: Rapport Annual de la Section Départementale de la Statistique Agricole du Noun, 1983-1984.

表 7 泉別農民融資狀況

(Unit: CFA F)

Divisions/Year	1980/81	1981/82	1982/83	1983/84	1984/85	Total
Noun	154,992,945 (75.1)	82,464,000 (69.4)	45,514,746 (48.8)	42,950,560 (37.3)	451,055,155 (19.1)	776,977,406 (26.8)
Mifi	20,929,160 (10.2)	15,750,000 (13.2)	15,225,040 (16.3)	22,848,510 (19.9)	580,961,067 (24.6)	655,713,777 (22.6)
Bamboutos	11,453,000 (5.6)	5,189,000 (4.4)	8,950,000 (9.6)	8,500,000 (7.4)	527,097,950 (22.3)	561,189,950 (19.4)
Ndé	8,342,500 (4.0)	- (0.0)	5,200,000 (5.6)	5,692,350 (4.9)	191,711,105 (8.1)	210,945,955 (7.3)
Ménoua	8,389,200 (4.1)	7,800,000 (6.6)	13,911,000 (14.9)	31,056,270 (27.0)	527,202,731 (22.3)	588,359,201 (20.3)
Haut - Nkam	2,258,000 (1.0)	7,610,000 (6.4)	4,463,015 (4.8)	4,003,000 (2.5)	84,904,456 (3.6)	103,238,471 (3.6)
Total	206,364,805 (100.0)	118,813,000 (100.0)	93,263,801 (100.0)	115,050,690 (100.0)	2,362,932,464 (100.0)	2,896,424,760 (100.0)

Source: FONADER, Agence de Bafoussam

表 8 財務及び経済価格

Farm Outputs and Inputs		Financial Prices as of December 1985	Economic Prices in 1995 (1985 constant)
Paddy	(CFA F/kg)	78	150
Maize	(CFA F/kg)	70	103
Groundnuts	(CFA F/kg)	200	200
Soybeans	(CFA F/kg)	100	190
Tomato	(CFA F/kg)	80	80
French beans	(CFA F/kg)	110	110
Timber			
- Diameter	> 50 cm (CFA F/m ³)	25,700	28,800
- Diameter	20~50 cm (CFA F/m ³)	10,100	7,800
- Firewoods	(CFA F/m ³)	1,000	770
Fertilizers			
- Urea	(CFA F/kg)	145	210
- TSP	(CFA F/kg)	130	136
- KCl	(CFA F/kg)	107	112
Agro-chemicals			
- Insecticides	(CFA F/kg)	2,950	2,800
- Fungicides	(CFA F/kg)	1,500	1,400
Machinery			
- Hand tractor	(CFA F)	1,318,000	-
- Sprayer	(CFA F)	682,000	-
- Thresher	(CFA F)	596,000	-
Labour	(CFA F/day)	830	600

表 9 ンドウツプおよびンジャ貯水ダム概要

Description	Ndoup Dam	Nja Dam
1. Reservoir		
(1) Drainage Area	16.7 km ²	20.8 km ²
(2) Gross Storage Capacity	8,760,000 m ³	4,930,000 m ³
(3) Dead Storage Capacity	130,000 m ³	160,000 m ³
(4) Active Storage Capacity	8,630,000 m ³	4,770,000 m ³
(5) High Water Level	El. 1,173.0 m	El. 1,142.5 m
(6) Full Water Level	El. 1,171.5 m	El. 1,141.0 m
(7) Low Water Level	El. 1,156.0 m	El. 1,127.0 m
(8) Reservoir Area at Full Water Level	620,000 m ²	580,000 m ²
2. Dam		
(1) Dam Type	Fill Type	Fill Type
(2) Dam Crest Elevation	El. 1,175.5 m	El. 1,145.0 m
(3) Freeboard	2.5 m	2.5 m
(4) Dam Height	25.5 m	26.0 m
(5) Dam Crest Length	155.0 m	260.0 m
(6) Embankment Volume	180,900 m ³	245,600 m ³
3. Spillway		
(1) Design Discharge	95.0 m ³ /sec	115.0 m ³ /sec
(2) Type	Over Flow Type	Over Flow Type
(3) Crest Length	26.0 m	32.0 m
(4) Overflow Depth	1.5 m	1.5 m
4. Outlet		
(1) Design Discharge	1.261 m ³ /sec	1.157 m ³ /sec
(2) Type	Drop Inlet Type	Drop Inlet Type
(3) Intake Section	φ800 mm Steel Pipe	φ800 mm Steel Pipe
(4) Energy Dissipator	Jet Flow Gate	Jet Flow Gate
5. Diversion Structure		
(1) Design Discharge	12.3 m ³ /sec	9.4 m ³ /sec
(2) Section	Concrete Box 2.0 m x 2.0 m	Concrete Box 2.0 m x 2.0 m
(3) Length	150.0 m	150.0 m

表10 灌溉施設概要

1. Ndoup Intake Weir

- 1) Type : Fixed type concrete weir
 2) Crest Elevation : El. 1,125 m
 3) Crest Length : 13.0 m
 4) Height of Weir : 1.0 m
 5) Scouring Sluice Gate : Width 1.0 m x height 1.5 m x 1 no.
 6) Intake Discharge : 1.44 m³/sec
 7) Intake Gate : Width 1.0 m x height 1.0 m x 2 nos.

2. Irrigation Canals and Related Structures

Name of Irrigation Canal	Canal Length (m)	Related structures (nos.)				
		Turnout	Drop	Culvert	Checkgate	Spillway
1) DMIC	3,650	4	3	-	3	1
2) DSIC-1	5,900	2	-	2	3	1
3) DSIC-2	1,950	2	-	1	2	1
4) JMIC	4,420	3	-	-	3	-
5) JSIC-1	1,230	1	-	-	2	1
6) JSIC-2	9,050	2	-	-	3	1
Total	26,200	14	3	3	16	5

Note : DMIC - Ndoup Main Irrigation Canal
 DSIC - Ndoup Secondary Irrigation Canal
 JMIC - Nja Main Irrigation Canal
 JSIC - Nja Secondary Irrigation Canal

表11 排水施設概要

1. Drainage Canals and Related Structures

Name of Drainage Canal	Canal Length (m)	Related structures (nos.)				
		Drop	Culvert	Drain Inlet	Drainage Junction	Cross Drain
1) KMDC	3,690	1	1	7	1	-
2) KSDC-1	2,090	-	1	6	-	-
3) KSDC-2	910	-	1	4	-	-
4) JMDC	7,725	3	2	18	-	-
5) DMDC	5,540	11	3	7	-	-
6) CD	36,400	-	-	-	-	23
Total	56,355	15	8	42	1	23

Note: KMDC - Nkoup Main Drainage Canal
 KSDC - Nkoup Secondary Drainage Canal
 JMDC - Nja Main Drainage Canal
 DMDC - Ndoup Main Drainage Canal
 CD - Catch Drain

2. Diversion Flood Way

- 1) Side Spillway : Crest length 8.0 m, Overflow depth - 0.6 m
- 2) Cross Drain : Length 28.3 m
- 3) Flood Canal : Length 700 m

3. Regulating Gates

- 1) Gate Type : Roller Gate
- 2) Number of Gate : 3 nos.
- 3) Size of Gate : Width 3.0 m x height 2.5 m

表12 事業実施段階及び実施後における必要スタッフ数

Staff	Stage	Category & Grade	Detailed Design				Construction (including O&M)					Operation & Maintenance			
			1987	1988	1989	1990	1991	1992	1993	1994	1995-				
<u>Managing Staff</u>															
a) Director General of the Project		A2/940	1	1	1	1	1	1	1	1	1	1	1	1	
b) Department Director		A2/605	-	-	-	2 (2)	3 (3)	3 (3)	3 (3)	4	4	4	5		
c) Senior Officer or Principal Engineer		B2/610	2	2	2	2	2	2	2	3	3	3	3		
<u>Technical and Administrative Staff</u>															
d) Civil Engineer		A1/530	1	2	2	2	2	2	2	2	2	2	2		
e) Agricultural Engineer		B2/420	1	3	3	4 (1)	4 (1)	4 (1)	5	5	5	5	6		
f) Agricultural Technician		B1/480	2	3	3	6 (3)	9 (6)	11 (8)	12	12	12	12	17		
g) Accountant & Cashier		B1/480	2	2	2	2	2	2	2	3	3	3	4		
h) Agricultural Extension Worker		C/250	-	-	-	3 (3)	5 (5)	5 (5)	6	6	6	7			
i) Secretary & Typist, Clerk, Store Keeper		V/D	8	16	16	16	16	16	16	18	18	20	22		
j) Mechanic, Electrician		V/D	-	-	-	1 (1)	2 (2)	2 (2)	2	2	2	2	3		
<u>Workers and Laborers</u>															
k) Gatekeeper, Milling Operator		IV/D	-	-	-	10 (10)	12 (12)	15 (15)	22	22	22	22	22		
l) Driver, Operator of Tractor and Foreman		III/D	5	5	5	8 (3)	10 (5)	10 (6)	11	11	12	12	15		
m) Guardsman, Office keeper		II/D	3	5	5	10 (5)	11 (6)	11 (6)	12	12	12	13	13		
n) Laborers															
- Permanent		II/D	4	6	6	10 (4)	14 (8)	16 (10)	18	18	20	20	23		
- Temporary (A)		II/D	-	-	-	5 (5)	5 (5)	5 (5)	8	8	10	10	10		
- Temporary (B)		II/D	-	-	-	15 (15)	20 (20)	20 (20)	30	30	35	35	40		
Total			29	45	45	97 (52)	118 (73)	125 (80)	157	157	170	170	193		

Remarks: Figures in Parentheses () show the number of staff required for operation and maintenance during the construction stage.

表13 スタッフの資格

No.	Post	Qualifications Required	Least Experience (Years)	Other Abilities or Qualifications Expected
1.	Director General	Bachelor	15	Master or Ph.D.
2.	Department Director	Bachelor	8	Master, Proficiency in English
3.	Senior Officer & Principal Engineer	Bachelor	5	Command of English
4.	Civil Engineer, Agricultural Engineer, Agricultural Technician	Bachelor or Diploma of College	3	Command of English
5.	Accountant & Cashier, Nurse	Diploma of College or Senior High School	2	Certificate of Accountancy, Notion of English
6.	Agricultural Monitor	Graduate of Junior High School	1	Completion of Training Programme, Notion of English
7.	Secretary & Typist, Draftsman, Clerk & Store Keeper	Diploma of Senior or Junior High School	2	Certificate of Speciality, Notion of English
8.	Mechanic, Electrician, Mason, etc.	Diploma of Senior or Junior High School	3	Certificate of Speciality, Notion of English
9.	Gatekeeper, Milling Operator	Diploma of Junior High School	2	Certificate of Speciality, Notion of English
10.	Driver and Operator of Tractor	Graduate of Primary School	5	Certificate of Speciality, Proficiency in French
11.	Laborer	Good Health and Diligence	-	Notion of French

表14 經濟的費用

(Unit: CFA F 10³)

Year in Order	Year (Tentative)	Direct Construction Cost	Cost for Rice-mill, Office, etc.	Administration Cost	Engineering Cost	Sub-Total	Physical Contingency	Total
1	1987	-	-	51,802	367,330	419,132	41,913	461,045
2.	1988	907,551 (15%)	262,770	77,938	117,272	1,365,531	136,553	1,502,084
3.	1989	1,512,585 (25%)	455,480	77,937	117,272	2,163,274	216,327	2,379,601
4.	1990	1,512,585 (25%)	-	77,938	117,272	1,707,795	170,780	1,878,575
5.	1991	1,210,068 (20%)	-	77,937	117,272	1,405,277	140,528	1,545,805
6.	1992	907,551 (15%)	-	77,938	117,272	1,102,761	110,276	1,213,037
7.	1993	-	-	-	-	-	-	-
8.	1994	-	-	-	-	-	-	-
Total		6,050,340	718,250	441,490	953,690	8,163,770	816,377	8,980,147

表15 經濟的便益

(Unit: CFA F 100)

Crops	Total Value									
	1990	1991	1992	1993	1994	1995	1996	1997 -		
<u>With Project</u>										
- Rice	46.4	132.5	290.4	595.7	736.2	845.6	909.5	942.6		
- Maize	8.2	24.1	53.3	111.8	147.8	175.7	195.2	195.2		
- Tomato	20.9	72.2	166.7	347.0	488.6	568.6	608.6	608.6		
- Soybean	0.5	4.1	9.1	20.1	30.6	38.1	42.9	42.9		
- Groundnuts	0.2	4.0	10.1	25.2	48.2	62.2	72.2	72.2		
Sub-total	<u>76.2</u>	<u>236.9</u>	<u>529.6</u>	<u>1,099.8</u>	<u>1,451.4</u>	<u>1,690.2</u>	<u>1,828.4</u>	<u>1,861.5</u>		
<u>Without Project</u>	<u>66.9</u>	<u>66.9</u>	<u>66.9</u>	<u>66.9</u>	<u>66.9</u>	<u>66.9</u>	<u>66.9</u>	<u>66.9</u>		
<u>Incremental Benefit</u>	<u>9.3</u>	<u>170.0</u>	<u>462.7</u>	<u>1,032.9</u>	<u>1,384.5</u>	<u>1,623.3</u>	<u>1,761.5</u>	<u>1,794.6</u>		

表16 年経済的費用及び便益の流れ

(Unit: CFA F 10⁶)

Year in Order	Year (Tentative)	Economic Cost			Economic Benefit			
		Construction Cost	Replacement Cost	O&M Cost	Total	Agricultural Benefit	Other Benefit (Forest Exp.)	Total
1	1987	461.0	-	-	461.0	-	-	0
2	1988	1,502.1	-	-	1,502.1	-	-	0
3	1989	2,379.6	-	-	2,379.6	-	12.0	12.0
4	1990	1,878.6	-	66.1	1,944.7	9.3	18.0	27.3
5	1991	1,545.8	-	93.6	1,639.4	170.0	30.0	200.0
6	1992	1,213.0	-	106.0	1,319.0	462.7	60.1	522.8
7	1993	-	-	222.8	222.8	1,032.9	-	1,032.9
8	1994	-	-	228.4	228.4	1,384.5	-	1,384.5
9	1995	-	-	268.9	268.9	1,623.3	-	1,623.3
10	1996	-	-	269.3	269.3	1,761.5	-	1,761.5
11	1997	-	-	269.6	269.6	1,794.6	-	1,794.6
12	1998	-	0.2	269.6	269.8	1,794.6	-	1,794.6
13	1999	-	192.7	269.6	462.3	1,794.6	-	1,794.6
14	2000	-	-	269.6	269.6	1,794.6	-	1,794.6
15	2001	-	-	269.6	269.6	1,794.6	-	1,794.6
16	2002	-	-	269.6	269.6	1,794.6	-	1,794.6
17	2003	-	-	269.6	269.6	1,794.6	-	1,794.6
18	2004	-	-	269.6	269.6	1,794.6	-	1,794.6
19	2005	-	-	269.6	269.6	1,794.6	-	1,794.6
20	2006	-	-	269.6	269.6	1,794.6	-	1,794.6
21	2007	-	-	269.6	269.6	1,794.6	-	1,794.6
22	2008	-	0.2	269.6	269.8	1,794.6	-	1,794.6
23	2009	-	192.7	269.6	462.3	1,794.6	-	1,794.6
24	2010	-	-	269.6	269.6	1,794.6	-	1,794.6
25	2011	-	-	269.6	269.6	1,794.6	-	1,794.6
26	2012	-	-	269.6	269.6	1,794.6	-	1,794.6
27	2013	-	130.0	269.6	399.6	1,794.6	-	1,794.6
28	2014	-	-	269.6	269.6	1,794.6	-	1,794.6
29	2015	-	-	269.6	269.6	1,794.6	-	1,794.6
30	2016	-	-	269.6	269.6	1,794.6	-	1,794.6
31	2017	-	-	269.6	269.6	1,794.6	-	1,794.6
32	2018	-	0.2	269.6	269.8	1,794.6	-	1,794.6
33	2019	-	192.7	269.6	462.3	1,794.6	-	1,794.6
34	2020	-	-	269.6	269.6	1,794.6	-	1,794.6
35	2021	-	-	269.6	269.6	1,794.6	-	1,794.6
36	2022	-	-	269.6	269.6	1,794.6	-	1,794.6
37	2023	-	-	269.6	269.6	1,794.6	-	1,794.6
38	2024	-	-	269.6	269.6	1,794.6	-	1,794.6
39	2025	-	-	269.6	269.6	1,794.6	-	1,794.6
40	2026	-	-	269.6	269.6	1,794.6	-	1,794.6
41	2027	-	-	269.6	269.6	1,794.6	-	1,794.6
42	2028	-	0.2	269.6	269.8	1,794.6	-	1,794.6
43	2029	-	192.7	269.6	462.3	1,794.6	-	1,794.6
44	2030	-	-	269.6	269.6	1,794.6	-	1,794.6
45	2031	-	-	269.6	269.6	1,794.6	-	1,794.6
46	2032	-	-	269.6	269.6	1,794.6	-	1,794.6
47	2033	-	-	269.6	269.6	1,794.6	-	1,794.6
48	2034	-	-	269.6	269.6	1,794.6	-	1,794.6
49	2035	-	-	269.6	269.6	1,794.6	-	1,794.6
50	2036	-	-	269.6	269.6	1,794.6	-	1,794.6

Discount Rate	10%	12%	15%
B/C	1.206	1.006	0.788
B-C (CFA F 10 ⁶)	1,829.76	52.03	-1,557.14
EIRR: 12.1%			

表17 資金繰り表

(Unit: CFA.F 106)

Year in Order	Year (tentative)	Cash Outflow				O&M Cost	Replacement Cost	Fund for Purchase of Paddy	Total	Cash Inflow				Government Subsidy	Total Balance
		Capital Cost		Loan Repayment						Construction Fund		Revenue from	O&M Service Fee/2		
		Foreign Currency	Local Currency	Interest	Principal				Foreign Currency	Local Currency	Revenue from Forest/Expl.	Milled Rice			
1	1987	443.3	174.7	-	-	-	-	619.0	444.3	174.7	-	-	-	619.0	
2	1988	1,052.6	1,253.4	15.6	-	-	-	2,321.6	1,052.6	1,253.4	-	-	15.6	2,321.6	
3	1989	1,860.5	2,000.3	52.4	-	-	-	3,913.2	1,860.5	2,000.3	13.6	-	38.8	3,913.2	
4	1990	1,476.2	1,829.2	117.5	-	88.0	48.7	3,559.6	1,476.2	1,829.2	20.3	60.7	152.1	3,559.6	
5	1991	1,249.2	1,691.7	169.2	-	125.4	128.7	3,364.2	1,249.2	1,691.7	33.9	160.5	176.1	3,364.2	
6	1992	1,007.2	1,494.3	212.9	-	142.3	267.9	3,124.6	1,007.2	1,494.3	67.8	333.9	115.7	3,124.6	
7	1993	-	-	248.2	-	299.4	543.3	1,090.9	-	-	-	677.5	202.1	1,090.9	
8	1994	-	-	248.2	-	308.0	604.6	1,160.8	-	-	-	753.8	195.7	1,160.8	
9	1995	-	-	248.2	-	362.1	654.0	1,264.3	-	-	-	815.5	237.5	1,264.3	
10	1996	-	-	248.2	-	362.6	681.9	1,292.7	-	-	-	850.2	231.2	1,292.7	
11	1997	-	-	248.2	354.5	362.9	695.8	1,661.4	-	-	-	867.5	582.6	1,661.4	
12	1998	-	-	235.7	354.5	362.9	695.8	1,649.1	-	-	-	867.5	570.3	1,649.1	
13	1999	-	-	223.3	354.5	362.9	695.8	1,864.6	-	-	-	867.5	785.8	1,864.6	
14	2000	-	-	210.9	354.5	362.9	695.8	1,624.1	-	-	-	867.5	545.3	1,624.1	
15	2001	-	-	198.5	354.5	362.9	695.8	1,611.7	-	-	-	867.5	532.9	1,611.7	
16	2002	-	-	186.1	354.5	362.9	695.8	1,599.3	-	-	-	867.5	520.5	1,599.3	
17	2003	-	-	173.7	354.5	362.9	695.8	1,586.9	-	-	-	867.5	508.1	1,586.9	
18	2004	-	-	161.3	354.5	362.9	695.8	1,574.5	-	-	-	867.5	495.7	1,574.5	
19	2005	-	-	148.9	354.5	362.9	695.8	1,562.1	-	-	-	867.5	483.3	1,562.1	
20	2006	-	-	136.5	354.5	362.9	695.8	1,549.7	-	-	-	867.5	470.9	1,549.7	
21	2007	-	-	124.1	354.5	362.9	695.8	1,537.3	-	-	-	867.5	458.5	1,537.3	
22	2008	-	-	111.7	354.5	362.9	695.8	1,525.1	-	-	-	867.5	446.3	1,525.1	
23	2009	-	-	99.3	354.5	362.9	695.8	1,740.6	-	-	-	867.5	661.8	1,740.6	
24	2010	-	-	86.9	354.5	362.9	695.8	1,500.1	-	-	-	867.5	421.3	1,500.1	
25	2011	-	-	74.4	354.5	362.9	695.8	1,487.6	-	-	-	867.5	408.8	1,487.6	
26	2012	-	-	62.0	354.5	362.9	695.8	1,475.2	-	-	-	867.5	396.4	1,475.2	
27	2013	-	-	49.6	354.5	362.9	695.8	1,615.8	-	-	-	867.5	537.0	1,615.8	
28	2014	-	-	37.2	354.5	362.9	695.8	1,450.4	-	-	-	867.5	371.6	1,450.4	
29	2015	-	-	24.8	354.5	362.9	695.8	1,438.0	-	-	-	867.5	359.2	1,438.0	
30	2016	-	-	12.4	354.5	362.9	695.8	1,425.6	-	-	-	867.5	346.8	1,425.6	
31	2017	-	-	0	0	362.9	695.8	1,058.7	-	-	-	867.5	-	1,073.8	

Remarks: /1 Interest: 3.5%

Grace period: 10 years

Repayment period including grace period: 30 years

Revenue from operation service fee to be collected from farmers. The total amount

of this fee for each farm household occupying 2.1 ha was fixed at CFA.F 222,000 per year.

This analysis was made on the basis of price level and exchange rate (US\$1.0 = CFA.F 384.5) as of November, 1985.

表18 水質汚濁に係わる環境基準

- (1) Standard relating to human health (Hazardous substances)
 - Standards are indiscriminate to all aquatic areas

(unit: mg/ℓ)

Item	Standard Value
Cadmium	0.01
Cyanide	not detectable
Organic phosphorous*	not detectable
Lead	0.1
Hexavalent chromium	0.05
Arsenic	0.05
Total mercury	0.0005**
Alkyl mercury	not detectable
PCB (polychlorinated biphenyl)	not detectable

* Organic phosphorous includes parathion, methyl demeton and E.P.N

** Standard value for total mercury is based on the yearly average value

- (2) Standards relating to living environment
 - Standards are set up by classifying the public water area into categories of utilization purposes

(unit: mg/ℓ)

Category***	pH	BOD (max.)	COD (max.)	Suspended substance (max.)	Dissolved oxygen (min.)	No. of coliform group bacteria (max.) (MPN/100ml)	Others
River AA	6.5-8.5	1	—	25	7.5	50	
A	6.5-8.5	2	—	25	7.5	1,000	
B	6.5-8.5	5	—	25	5.0	5,000	
C	6.0-8.5	5	—	50	5.0	—	
D	6.0-8.5	10	—	100	2.0	—	
E	6.0-8.5	10	—	—*	2.0	—	* Floating matters and garbages should not be observed

*** AA, A, B and C can be used as drinking water by using suitable water treatment facilities in purification plant.

表19 販売の禁止及び使用の制限を受ける農薬

Name	Application
γ-BHC	Prohibited to sell
DDT	Prohibited to sell
Endrin	Can be used for control of insects on citrus, before seed-setting
Dyldrin	Can be used for control of insects on trees, except for fruit trees
Aldrin	Can be used for control of <i>Scepticus griseus</i> (Roelofs) on nursery stock

表20 バイコム地区での使用が推奨可能な農薬・肥料

(1) Farm Chemicals

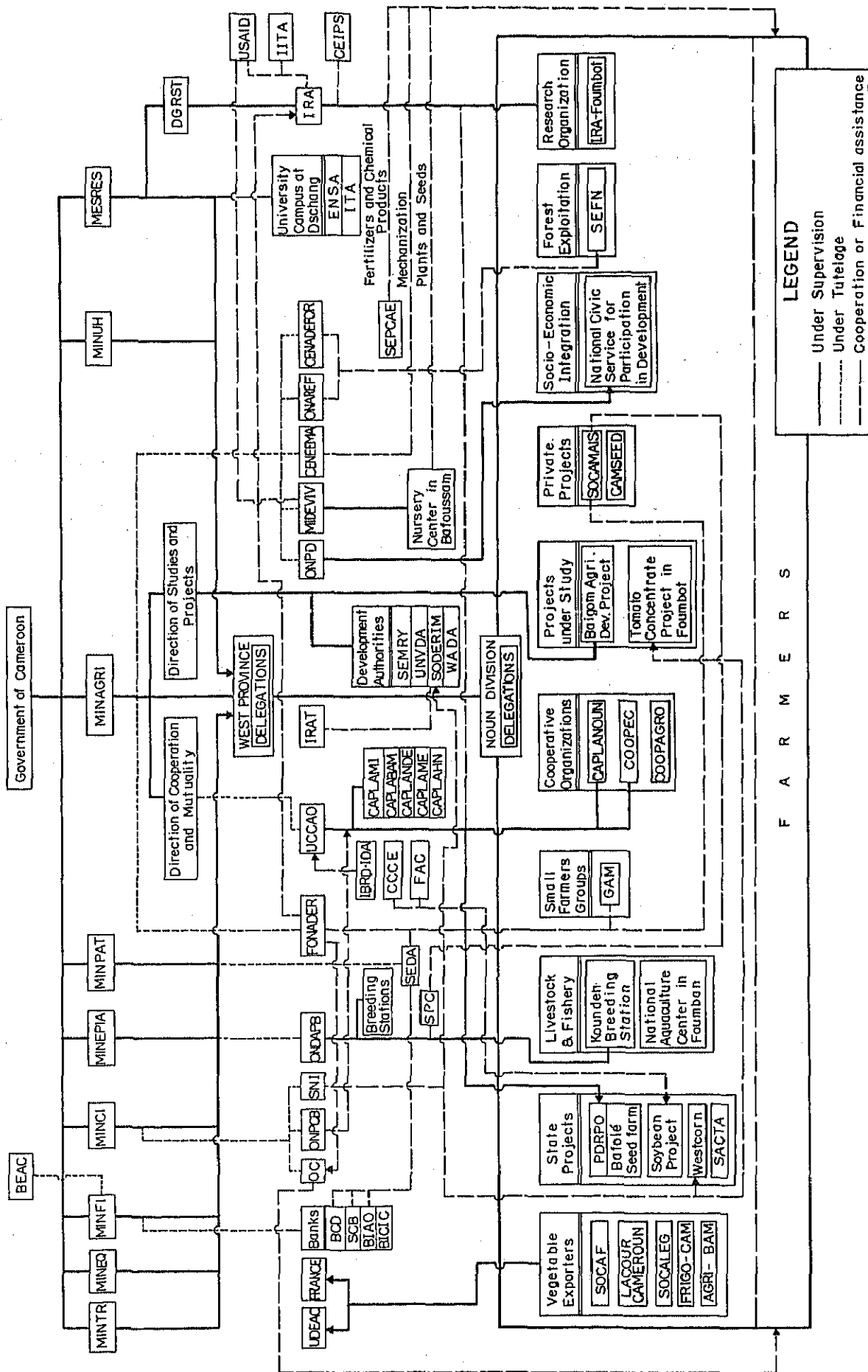
Item	Production Name	LD ₅₀ (RAT)
Insecticides	Sumithion EC.	800 mg/kg
	Sumithion L. (60)	800 mg/kg
	Diazinon EC. (40)	500 mg/kg
	EPN EC. (1.5)	20 - 40 mg/kg
Pesticides	Rabcide EC.	2,500 mg/kg
	Rabcide EC., F.	2,500 mg/kg
	Rabcide - Validacin EC.	2,500 mg/kg
	Rabcide - Neosaso EC.	2,500 mg/kg

(2) Chemical Fertilizers

Name	Formula
Ammonium Sulfate	$(\text{NH}_4)_2\text{SO}_4$
Triple Super Phosphate	$\text{Ca}(\text{H}_2\text{PO}_4)_2 \cdot \text{H}_2\text{O}$
Mixed Fertilizer	N:P:K = 10:14:12

付 図

図1 地域農村開発のための組織図



F A R M E R S

LEGEND
 — Under Supervision
 - - - Under Tutelage
 - - - Cooperation or Financial assistance

図2 地域農業支援組織図

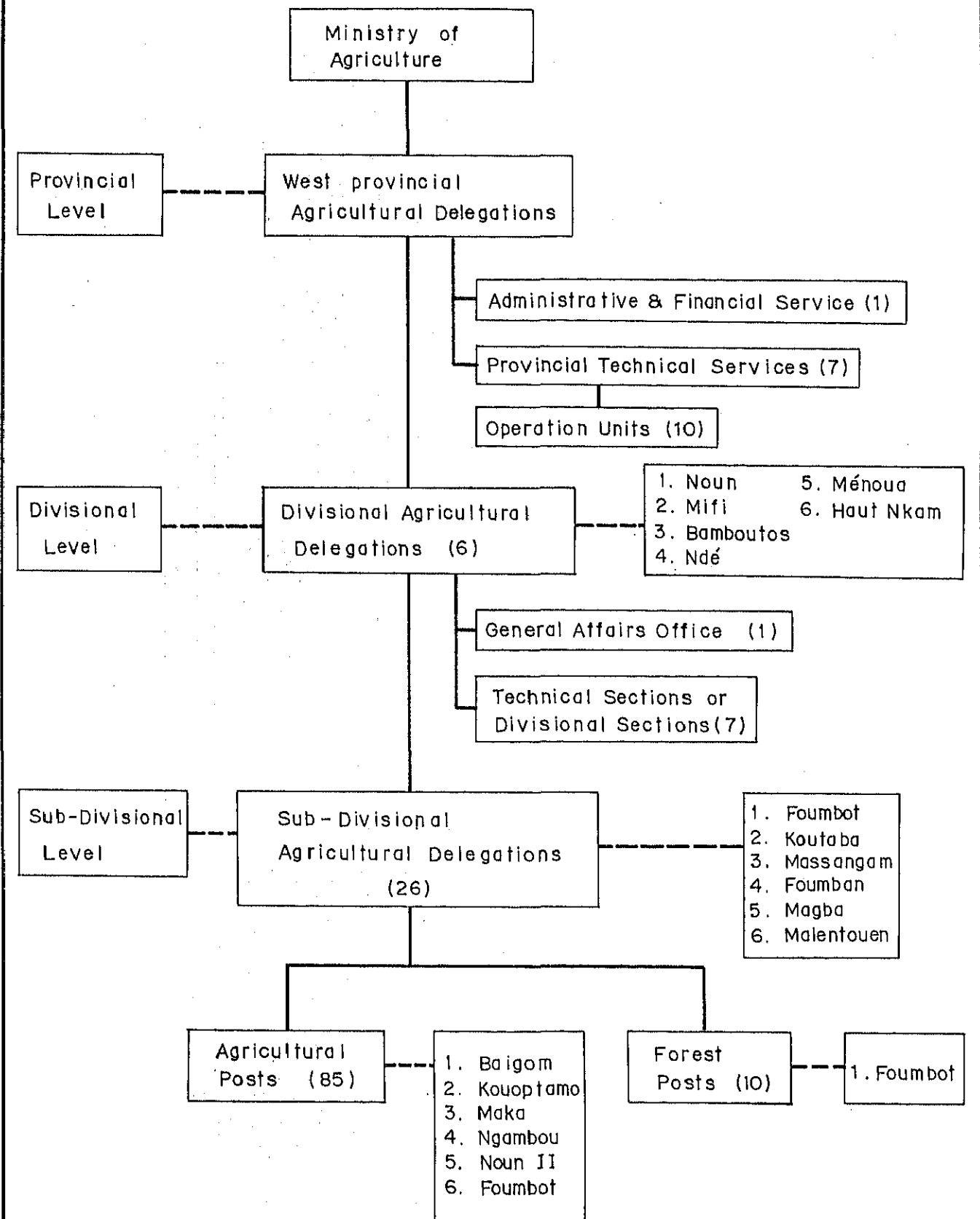
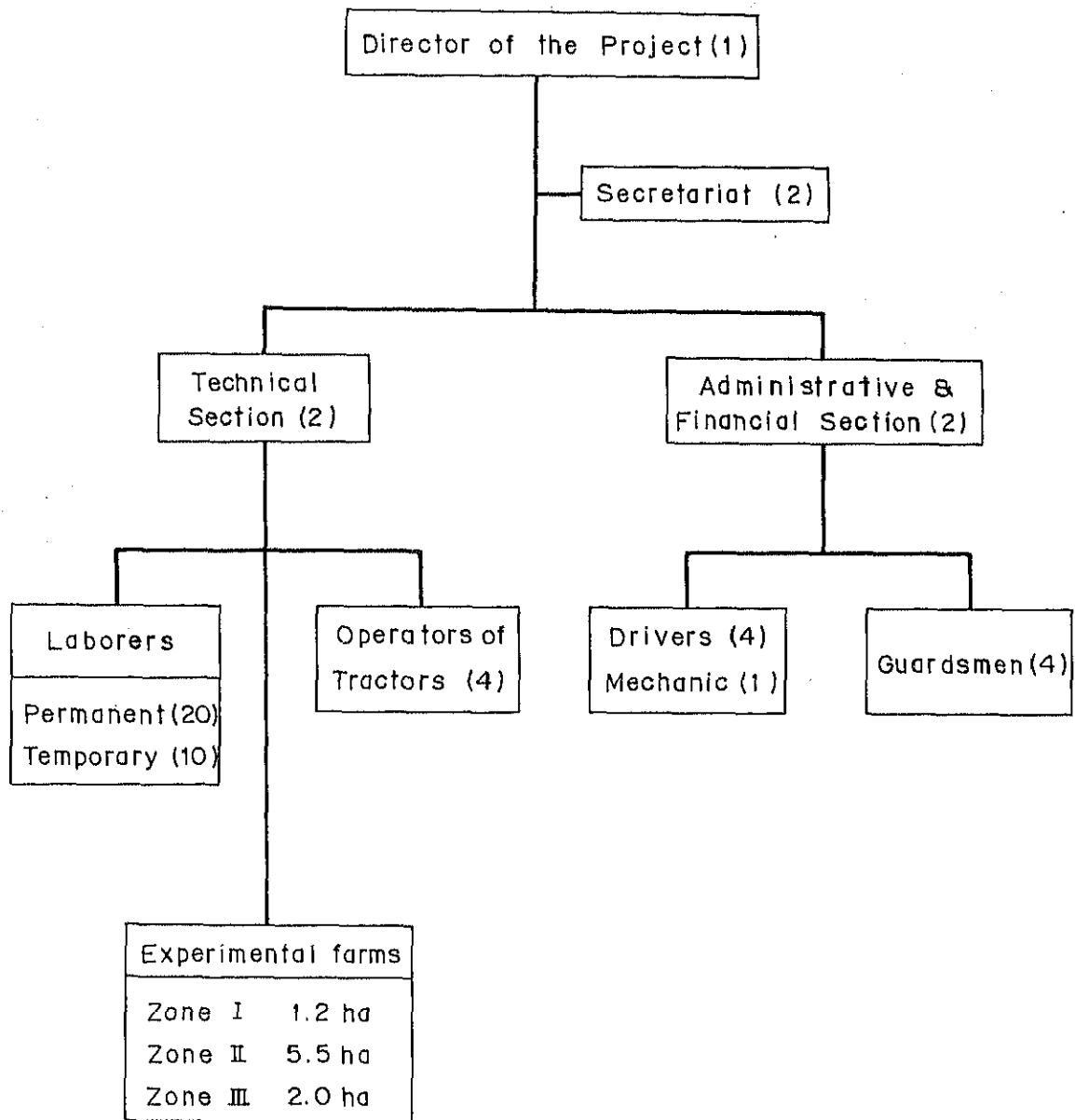


図3 バイコム稲作開発事務所組織図



Remarks : Figures in parentheses () are number of staff as of November 1985.

图 4 計画作付体系

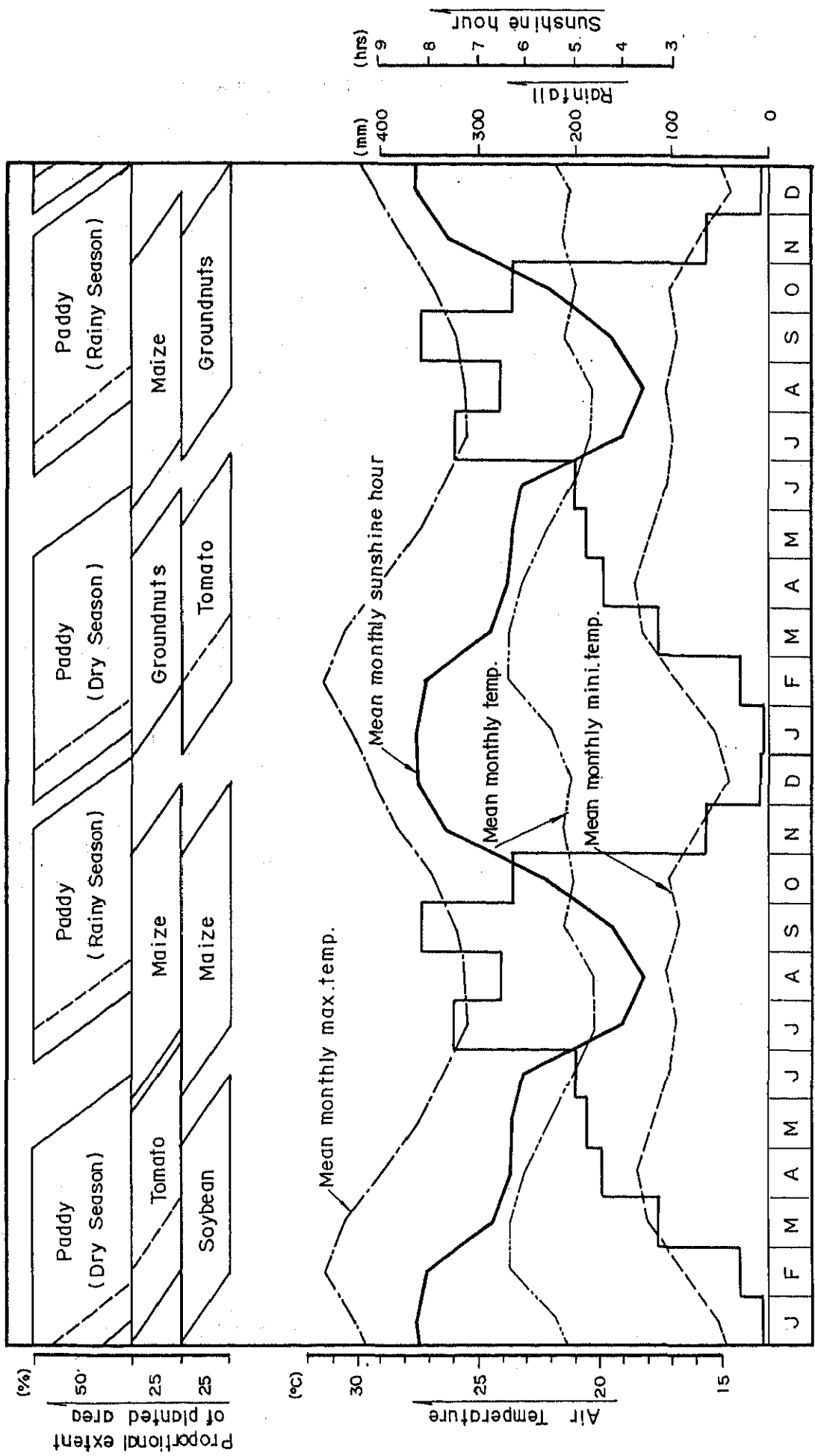


图 5 計畫灌溉系統圖

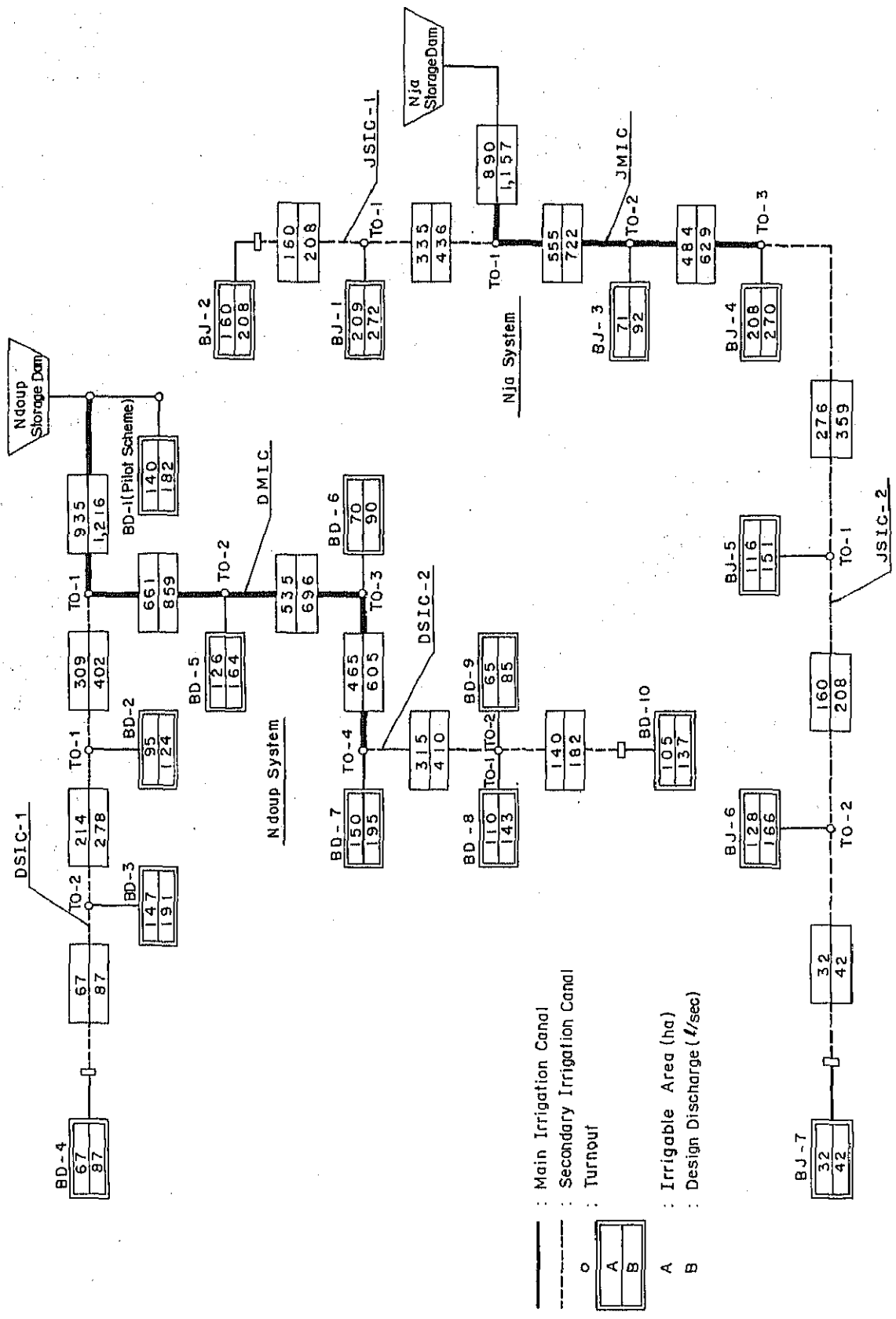


图 6 計畫灌溉排水組織圖

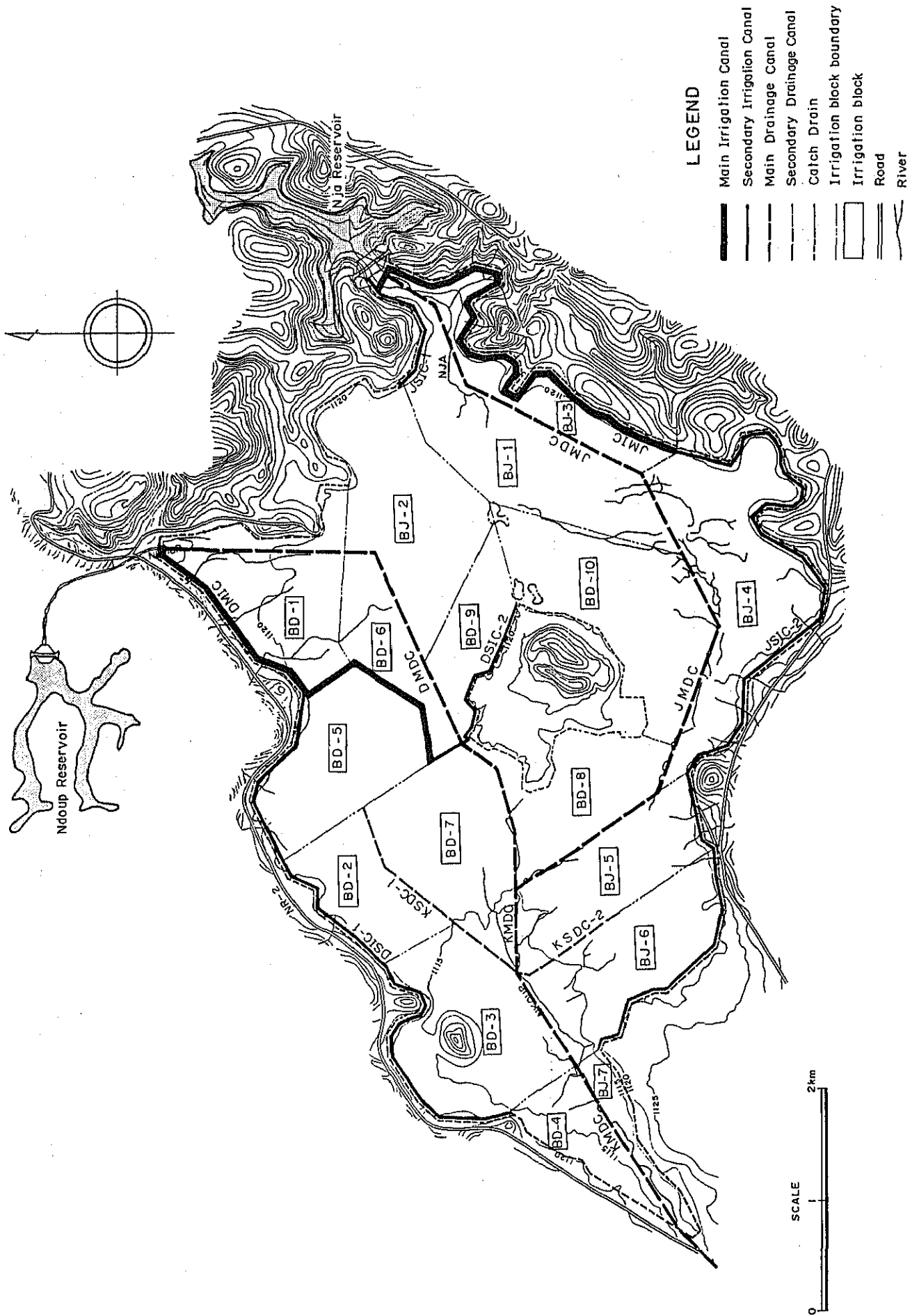


図7 インドウップ貯水池水位～貯水量、貯水面積曲線

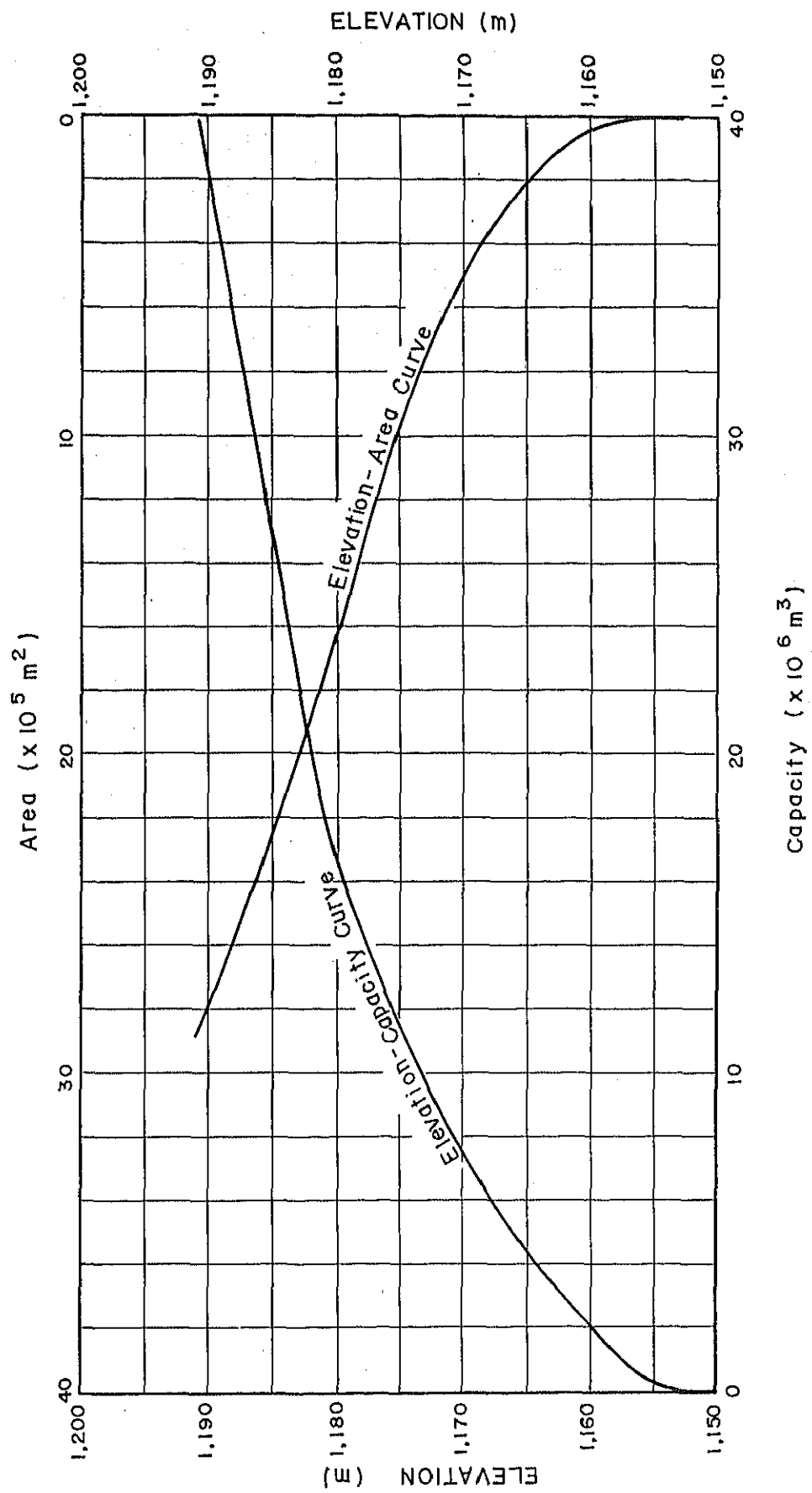


図 8 インドウアップダム標準断面図

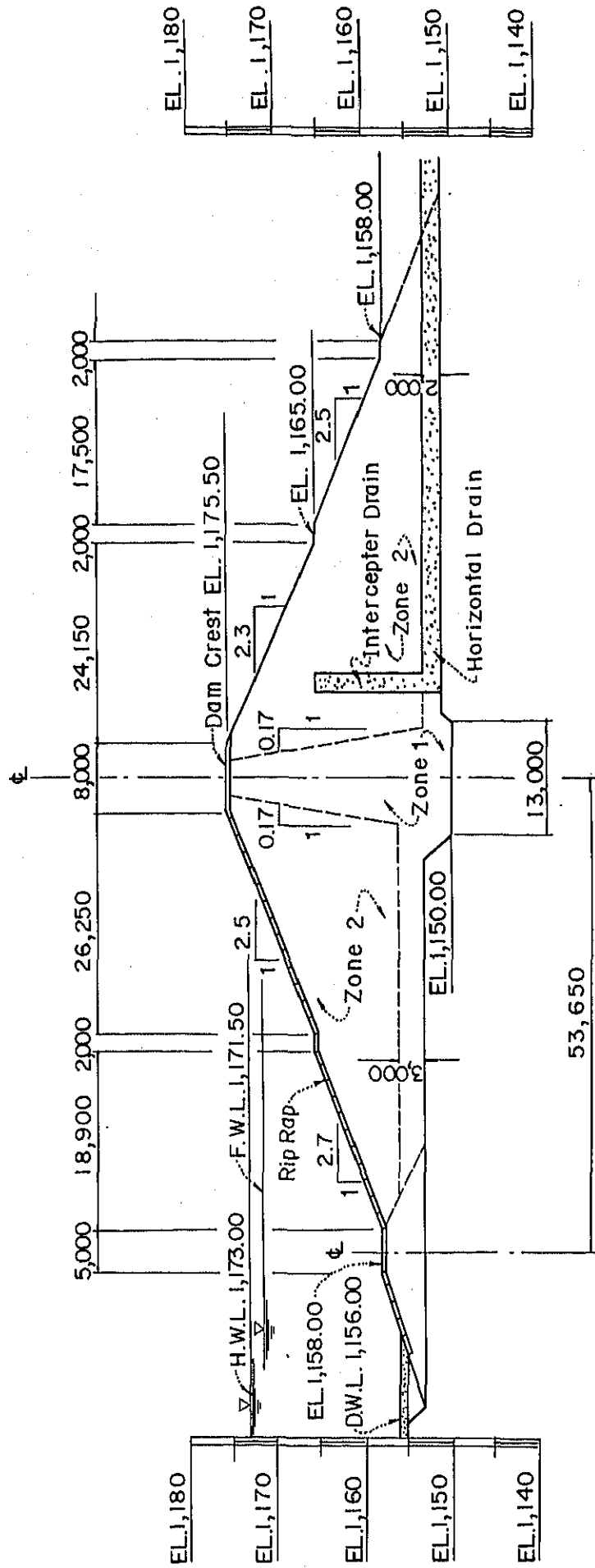


図 9 ンジャ貯水池水位～貯水量，貯水面積曲線

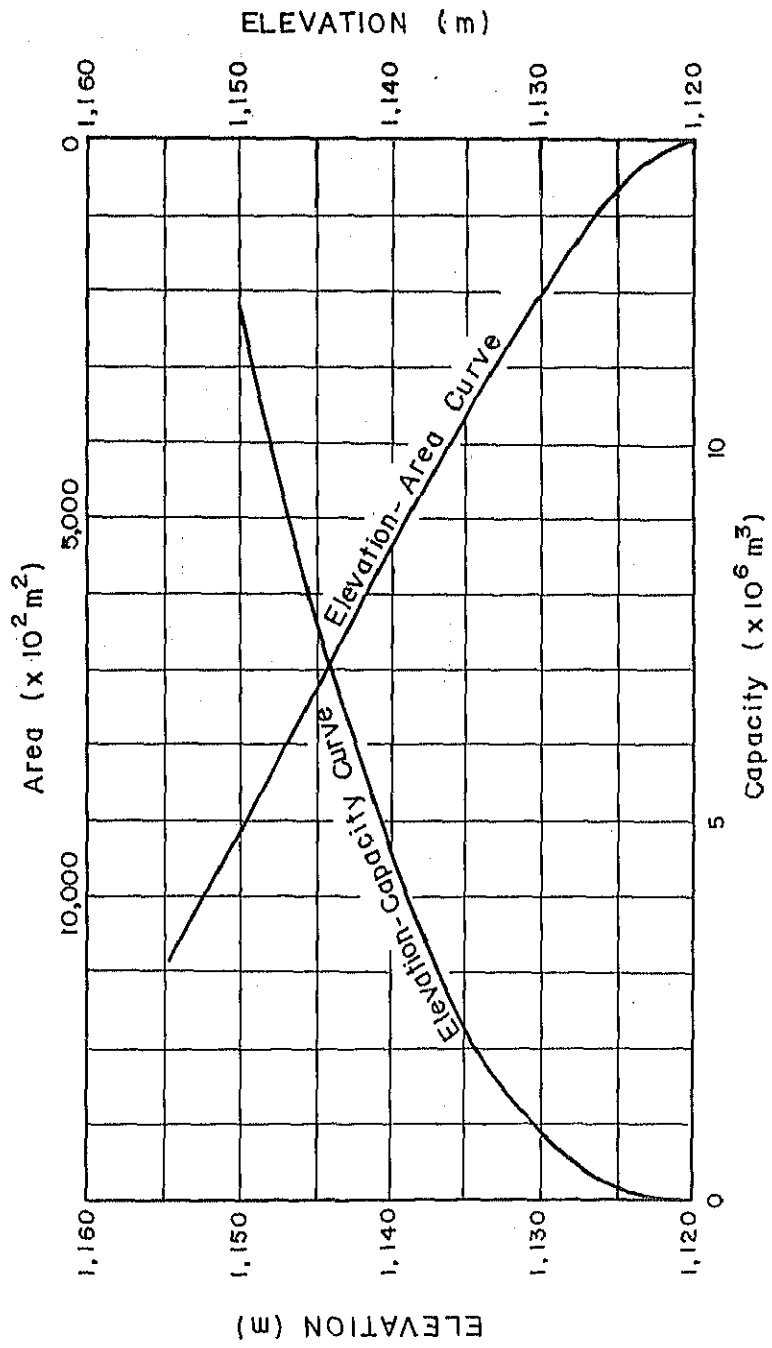


図10 シンジャダム標準断面図

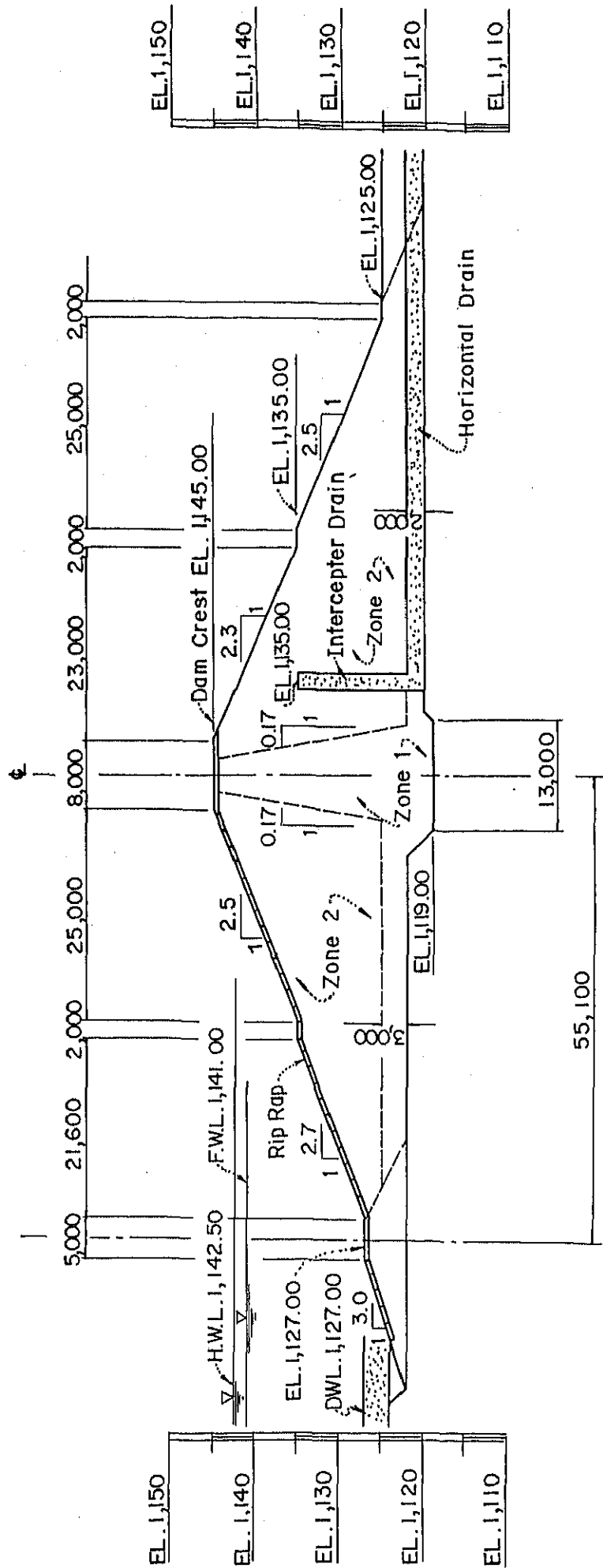
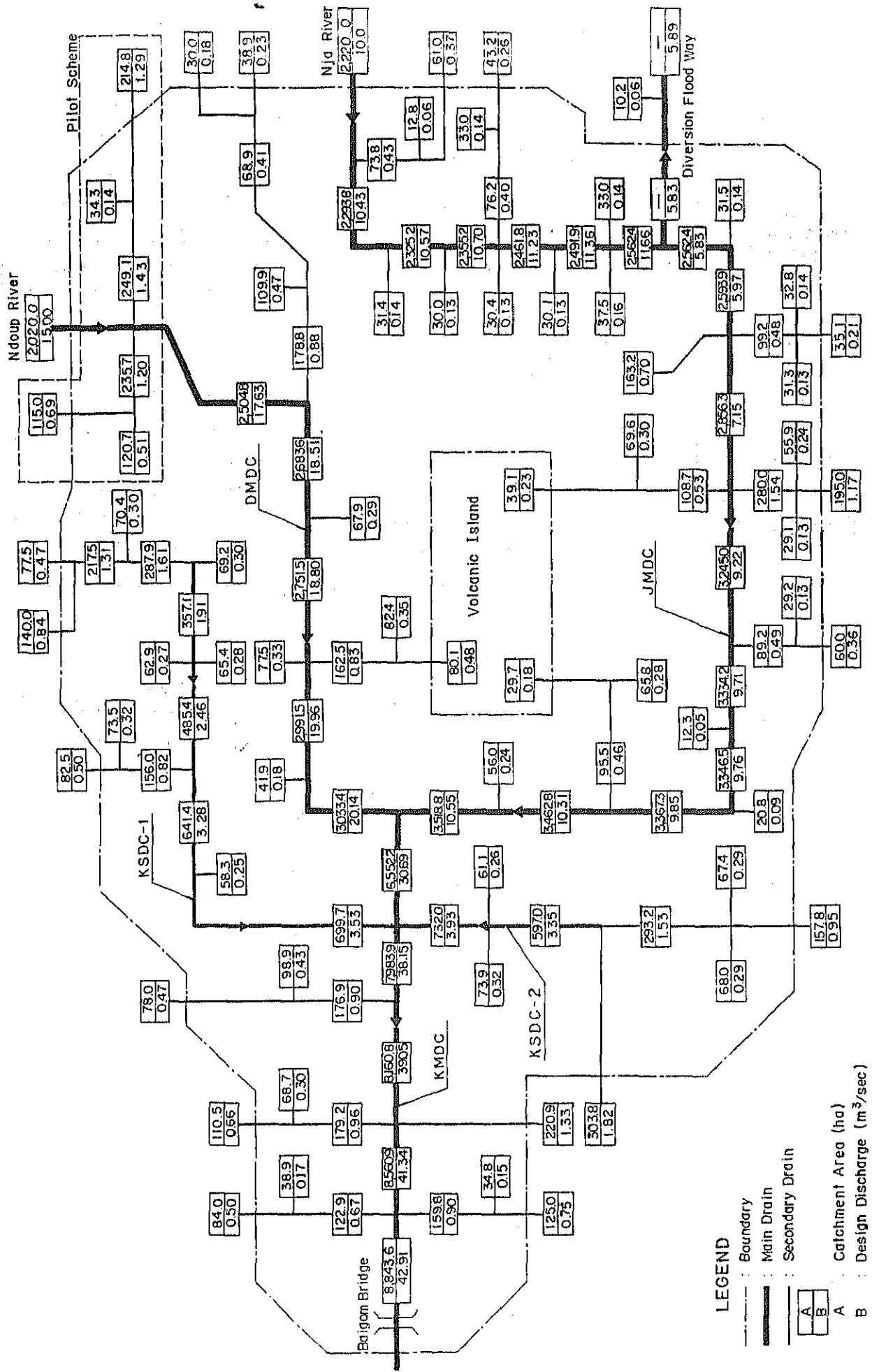


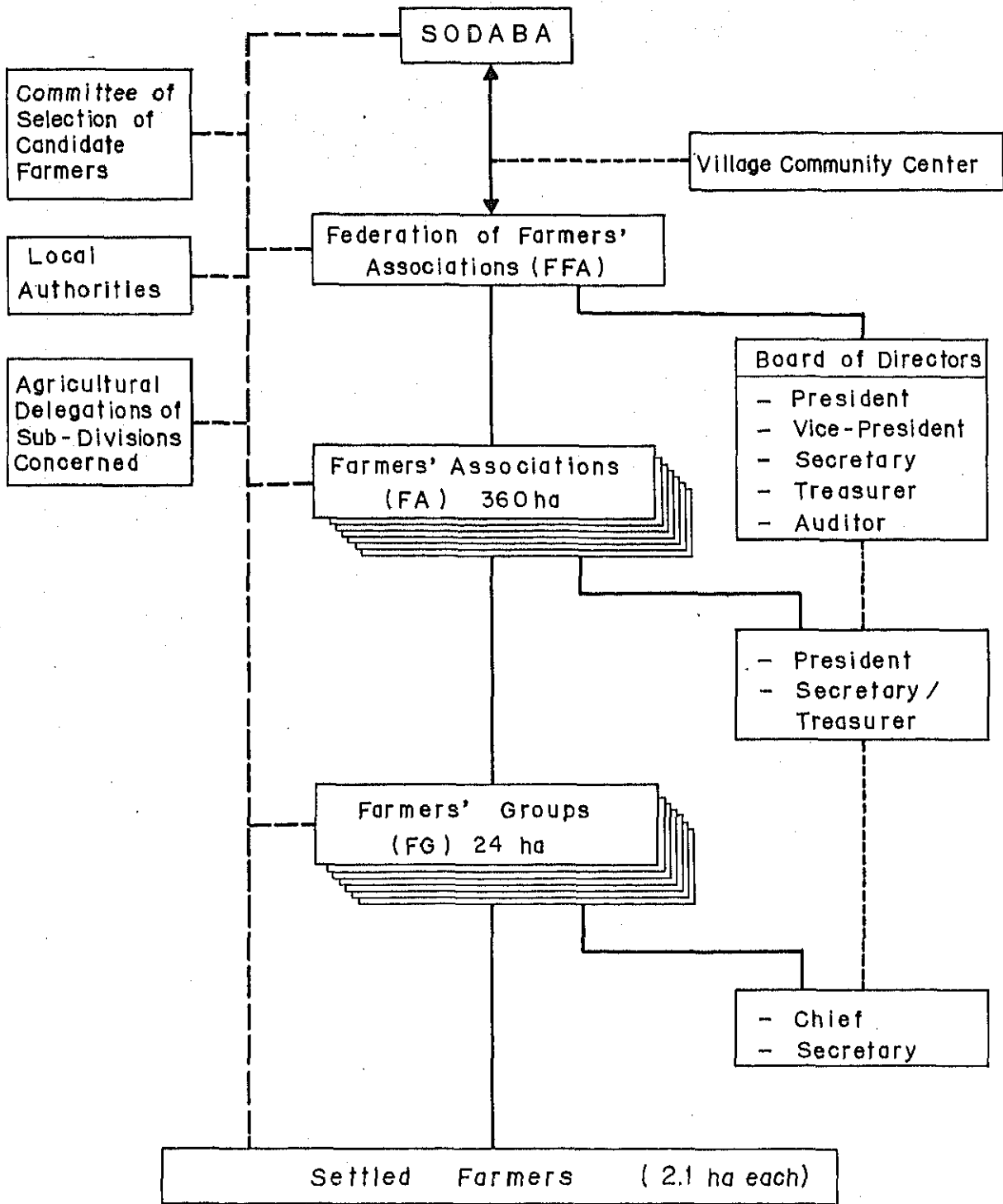
圖11 計畫排水系統圖



LEGEND

- - - - - Boundary
- Main Drain
- Secondary Drain
- A Catchment Area (ha)
- B Design Discharge (m³/sec)

図12 計画農民組織図



Remarks :

- : Direct linkage
- - - - - : Supervisory relation
- - - - - : Coordinating relation

图13 事業実施計画

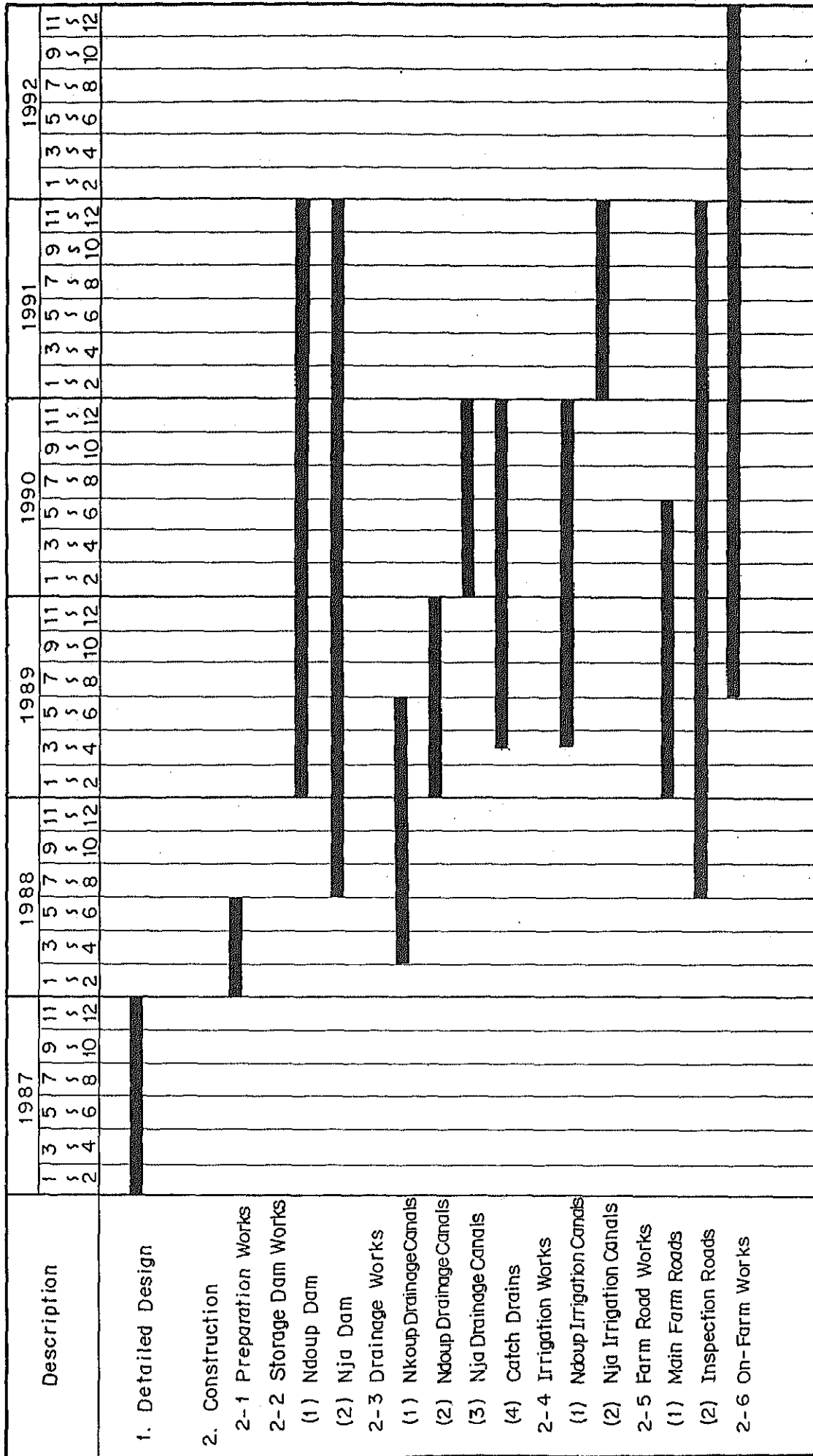


図14 事業実施段階における組織計画図

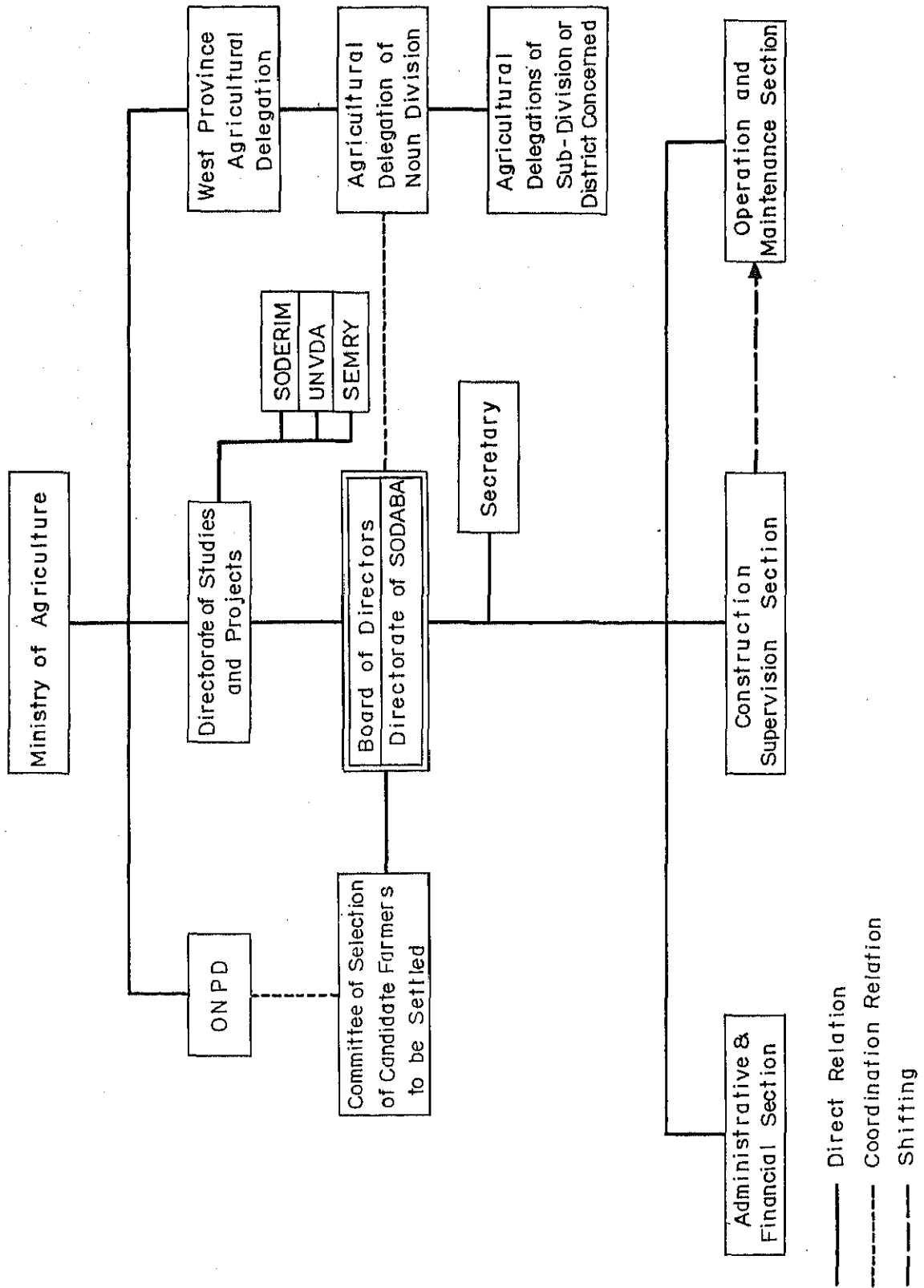
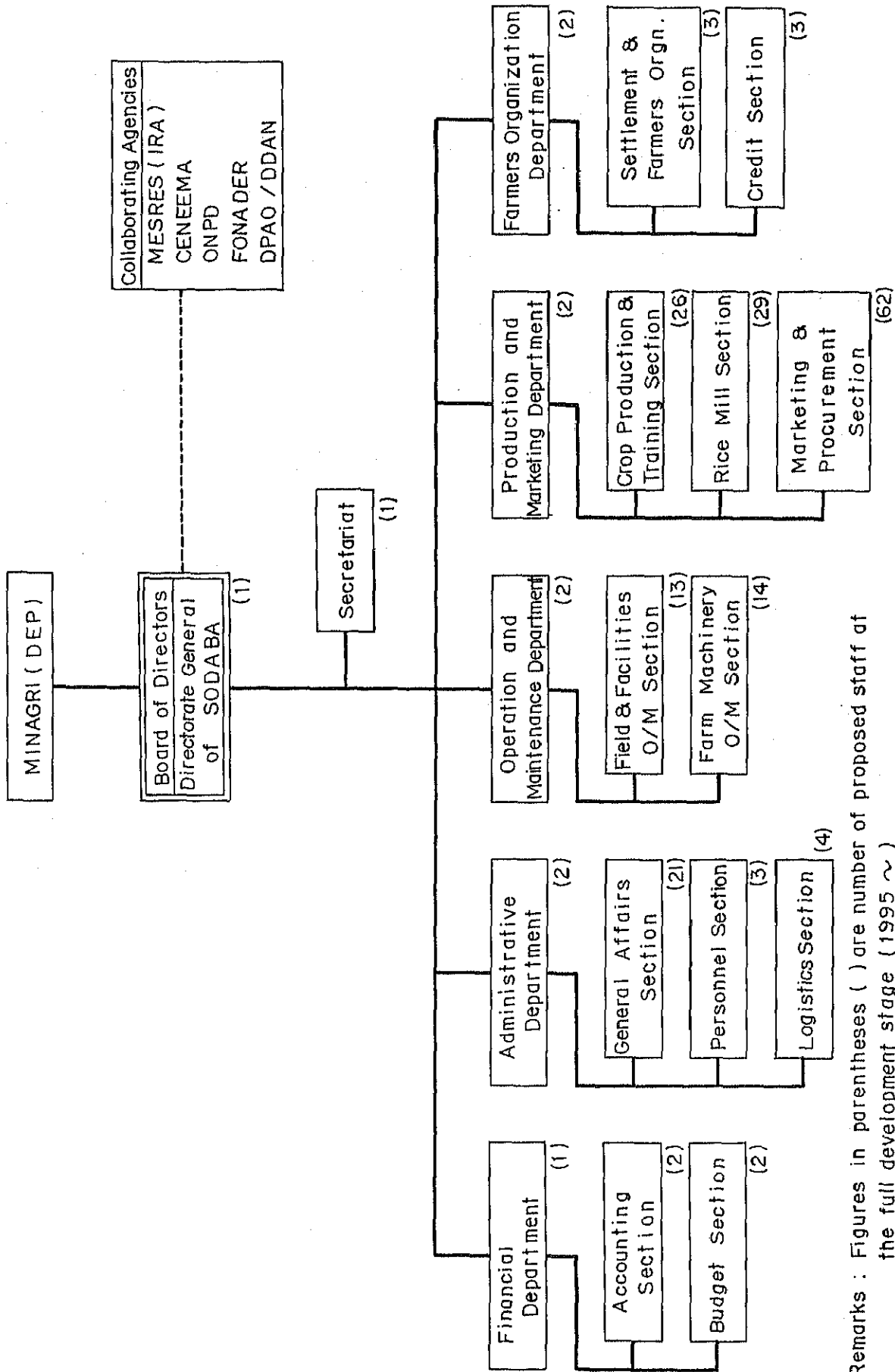
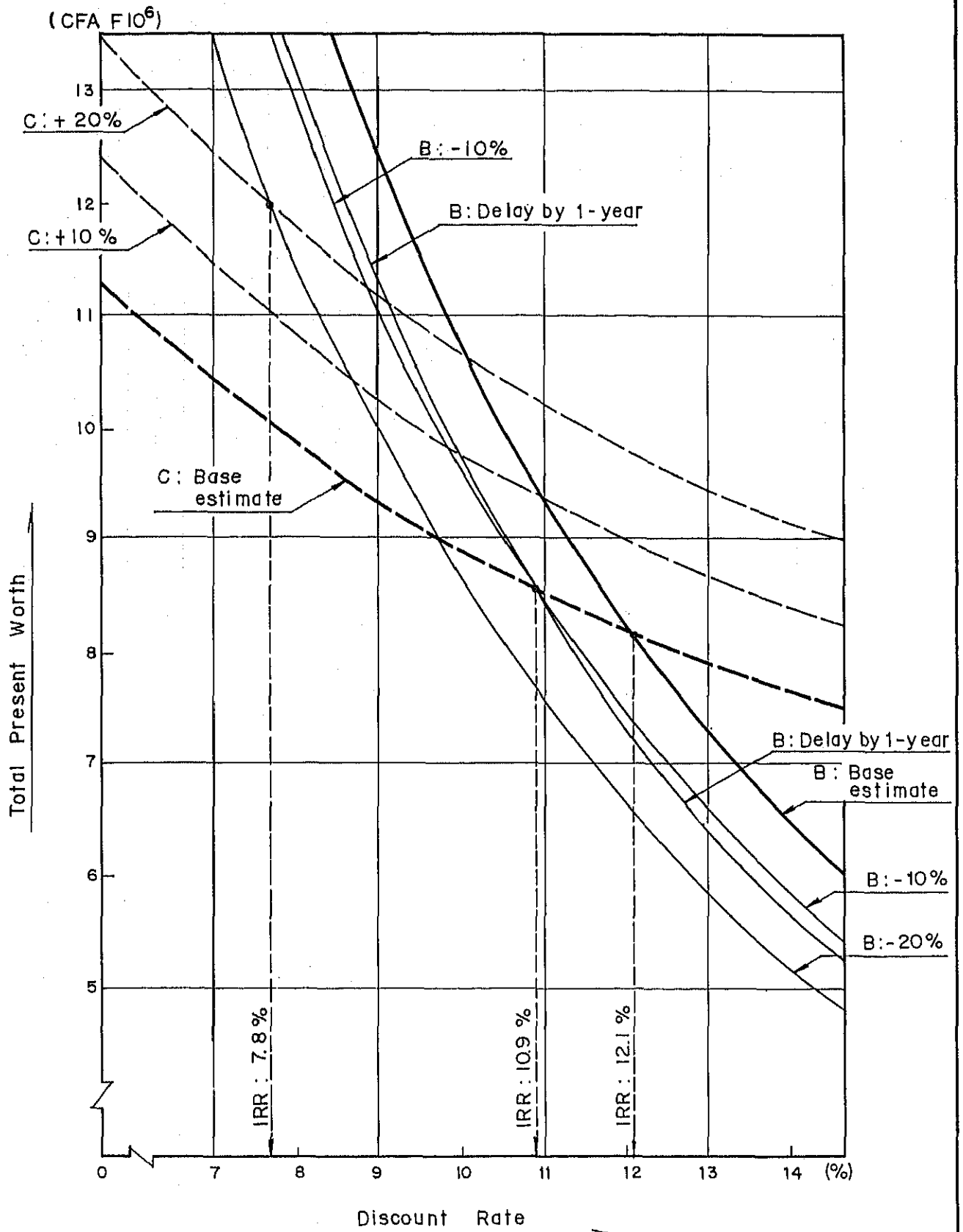


図15 事業実施後における維持管理組織計画図



Remarks : Figures in parentheses () are number of proposed staff at the full development stage (1995 ~)

図16 経済内部収益率における感度分析



Remarks : B Benefit
C Cost

図17 パイロットスキーム位置図

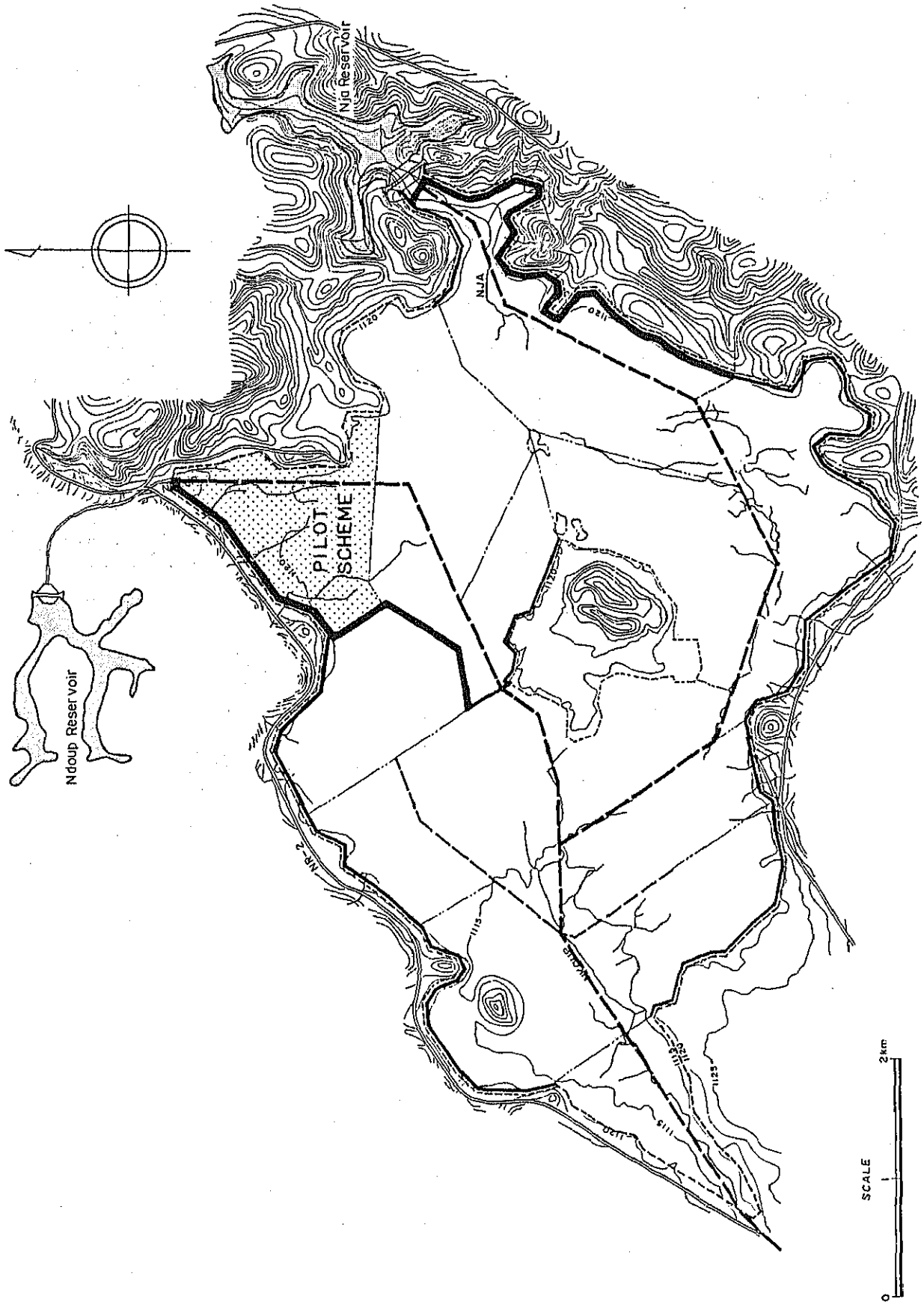
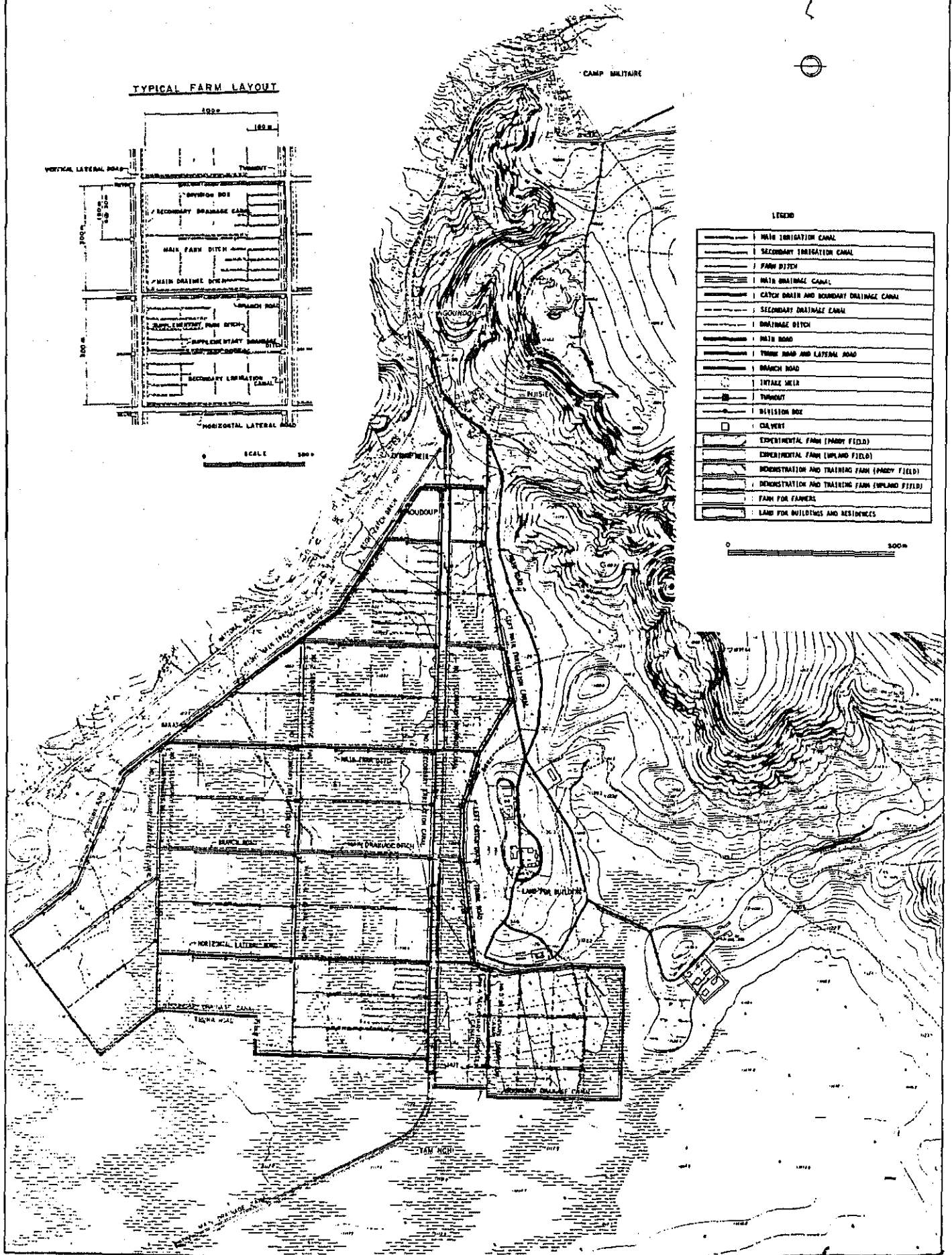
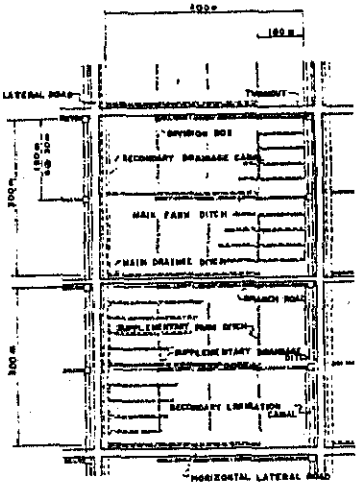


図18 パイロットスキーム一般図



TYPICAL FARM LAYOUT



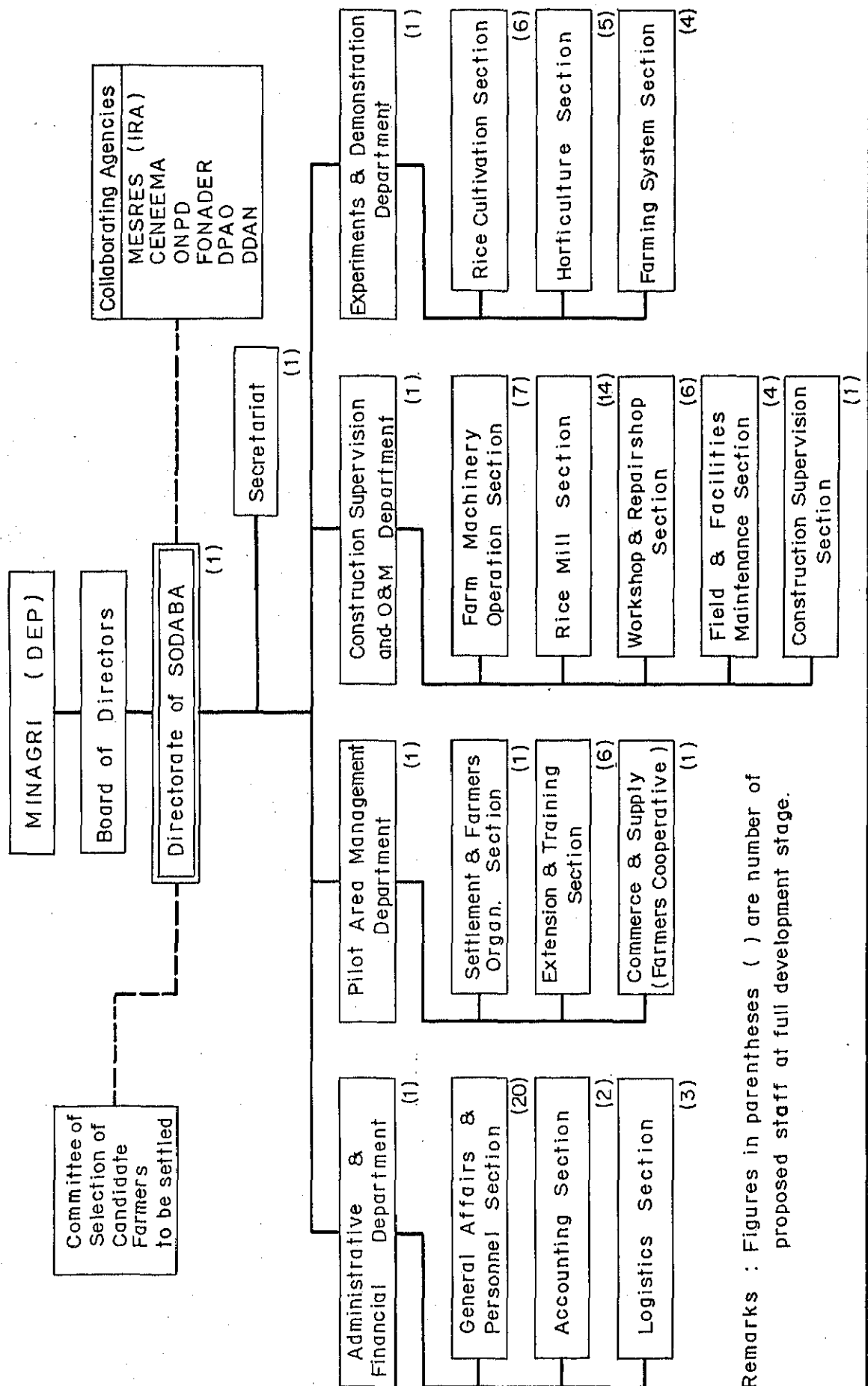
SCALE 500

LEGEND

	MAIN IRRIGATION CANAL
	SECONDARY IRRIGATION CANAL
	FARM DITCH
	MAIN DRAINAGE CANAL
	CATCH DRAIN AND BOUNDARY DRAINAGE CANAL
	SECONDARY DRAINAGE CANAL
	DRAINAGE DITCH
	MAIN ROAD
	TURN ROAD AND LATERAL ROAD
	BRANCH ROAD
	INTAKE WEIR
	TURNOUT
	DIVISION BOX
	CULVERT
	EXPERIMENTAL FARM (PADDY FIELD)
	EXPERIMENTAL FARM (UPLAND FIELD)
	DEMONSTRATION AND TRAINING FARM (PADDY FIELD)
	DEMONSTRATION AND TRAINING FARM (UPLAND FIELD)
	FARM FOR FARMERS
	LAND FOR BUILDINGS AND RESIDENCES

500M

図20 パイロット事業運営計画組織図



Remarks : Figures in parentheses () are number of proposed staff at full development stage.

JICA