CHAPTER 7 INDIRECT BENEFIT AND SOCIO-ECONOMIC IMPACT

In addition to the benefits stipulated in the economic evaluation, indirect benefits and favourable intangible socio-economic impacts can be expected from the implementation of the Project.

(1) Food supply to the metropolis and commercial centers

Since the demand for rice and vegetables in the metropolis and commercial centers such as Douala, Yaoundé and Bafoussam, would continue to increase with the population growth, the West Province including the project area will have to be a supply base to these centers.

(2) Saving of foreign exchange

Agricultural production which is expected to increase under the Project, in particular about 5,798 tons of rice, after deduction of the amount consumed in the project area, will be supplied to other consumption centers within the country. This means that a foreign exchange amount of about CFA F 517 million for rice import would be saved annually.

(3) Increase of employment opportunities for local people

Employment opportunities for local people would increase along with the project implementation, and result in bringing about a favourable impact on the regional economy. Furthermore, the employees will be able to gain more experience, technical know-how and skill in various working fields. This accumulation of knowledge would be useful for future development of the region.

(4) Improvement of living standards and contribution to regional economy

After the implementation of the Project, income of the farmers in and around the project area is expected to increase considerably as a direct result of the increase in crop production. Such increase in income would contribute to improving the living standards of the local people. Moreover, it is expected that the farmers' purchasing power would increase along with the improvement of their living standards, and this fact would benefit the development of the regional economy as a whole.

(5) Establishment of marketing systems and consolidation of farmers' associations

Market facilities in the project region may be expected to be improved as compared with the present condition. With anticipated higher agricultural production, farm products could be marketed by the farmers more effectively with the support of the Authority.

Through the marketing of substantial farm inputs and outputs, farmers' organizations in and around the project area would be consolidated and this would give beneficial impacts on the region, in the agro-institutional aspect.

(6) Improvement of sanitary conditions

The Project would have a positive effect on the natural environment due to the introduction of improved drainage systems. The negative impacts of the environment and diseases such as malaria, dysentery, etc. would be reduced in the project area.

(7) Settlement from densely populated areas and diminution of population drift from country-side

A cultivated area of about 2,000 ha would be newly created through the realization of the Baigom Agricultural Development Project. If the people from the densely populated areas are settled in this new land, the socio-economic problems such as demographic pressure and rural exodus to the urban area will be considerably reduced.

Table 10.1 ECONOMIC PROJECT COST

(Unit: CFA F 10^3)

Year	Direct Construction Cost	Cost for Rice-Mill, Office, etc.	Administration Cost	Engineering Cost	Sub-Total	Physical Contingency (10%)	Total
1987			51,802	367,330	419,132	41,913	461,045
1998	907,551 (15%)	262,770	77,938	117,272	1,365,531	136,553	1,502,084
1989	1,512,585 (25%)	455,480	77,937	117,272	2,163,274	216,327	2,379,601
1990	1,512,585 (25%)	-	77,938	117,272	1,707,795	170,780	1,878,575
1991	1,210,068 (20%)	-	77,937	117,272	1,405,277	140,528	1,545,805
1992	907,551 (15%)	-	77,938	117,272	1,102,761	110,276	1,213,037
1993	-	-	-	-	-	-	-
1994	-	-	-	-	-	-	-
Total	6,050,340	718,250	441,490	953,690	8,163,770	816,377	8,980,147

Table 10.2 ESTIMATED ECONOMIC OPERATION AND MAINTENANCE COST

(At 1985 Price, Unit: CFAF 10^6)

Year	Personnel Expenses	Operation and Maintenance		Total
		Direct Cost	Rice Mill Equipment	
1990	38.4	7.7	20.0	66.1
1991	60.3	12.1	21.2	93.6
1992	69.0	13.8	23.2	106.0
1993	163.0	32.6	27.2	222.8
1994	166.9	33.4	28.1	228.4
1995	200.1	40.0	28.8	268.9
1996	200.1	40.0	29.2	269.3
1997	200.1	40.0	29.5	269.6
1998	200.1	40.0	29.5	269.6
1999	200.1	40.0	29.5	269.6
2000	200.1	40.0	29.5	269.6
2036	200.1	40.0	29.5	269.6

Table 10.3 PROJECT BENEFITS

(Estimated according to Economic Prices)

Agricultural Products	Situation "With" Project			Situation "Without" Project			Profits (CFA 10^3)
	Cultivated Area (ha)	Net Income (CFA/ha)	Total (CFA 10^3)	Cultivated Area (ha)	Net Income (CFA/ha)	Total (CFA 10^3)	
Rice	2,000	471,285	942,570	-	-	-	942,570
Maize	750	260,293	195,220	160	131,900	21,104	174,116
Groundnuts	500	144,400	72,200	160	91,600	14,656	57,544
Haricot beans	-	-	-	160	169,200	27,072	-27,072
Soybeans	250	171,600	42,900	-	-	-	42,900
Tomato	500	1,217,200	608,600	35	71,300	2,496	606,104
Haricot (green)	-	-	-	35	44,200	1,547	-1,547
Total	4,000		1,861,400	550		66,875	1,794,615

Table 10.4 ECONOMIC COST AND BENEFIT FLOW

(Unit: CFA F 10^6)

Year in Order	Year (Tantative)	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

EIRR: 12.1%

Table 10.5 CASH FLOW STATEMENT

(Unit: CFA F 10^6)

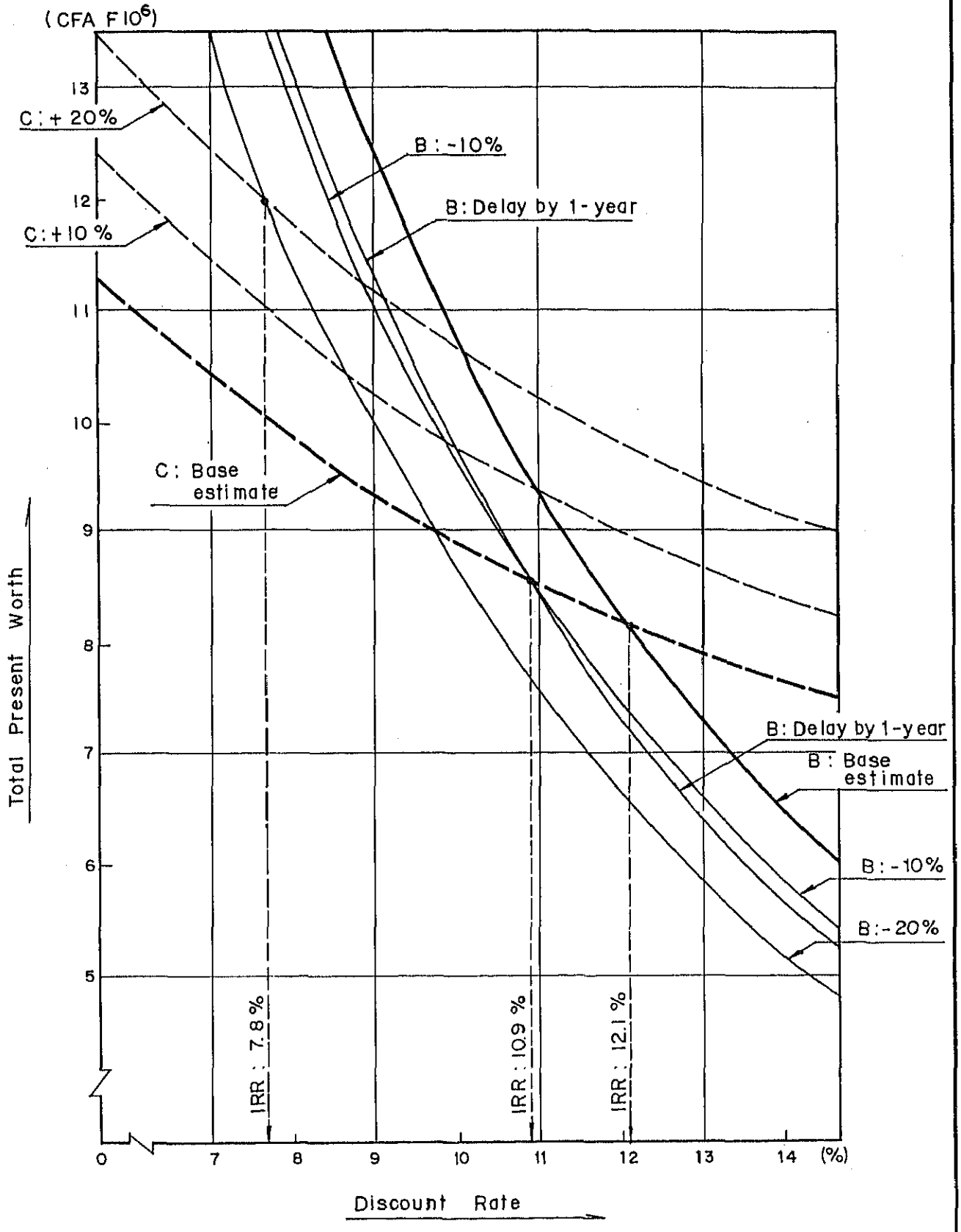
Year in Order	Year (Tentative)	Cash Outflow								Cash Inflow							Balance
		Capital Cost		Loan/1 Repayment		Replacement Cost	O & M Cost	Fund for Purchase of Paddy	Total	Foreign Currency	Local Currency	Revenue from Forest Expl.	Revenue from Milled Rice	O & M/2 Service Fee	Government Subsidy	Total	
		Foreign Currency	Local Currency	Interest	Principal												
1.	1987	444.3	174.7	-	-	-	-	-	619.0	443.3	174.7	-	-	-	-	619.0	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	0
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	0
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	21.1	152.1	3,559.6	0
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	52.8	176.1	3,364.2	0
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	105.7	115.7	3,124.6	0
7.	1993	-	-	248.2	-	-	299.4	543.3	1,090.9	-	-	-	677.5	211.3	202.1	1,090.9	0
8.	1994	-	-	248.2	-	-	308.0	604.6	1,160.8	-	-	-	753.8	211.3	195.7	1,160.8	0
9.	1995	-	-	248.2	-	-	362.1	654.0	1,264.3	-	-	-	815.5	211.3	237.5	1,264.3	0
10.	1996	-	-	248.2	-	-	362.6	681.9	1,292.7	-	-	-	850.2	211.3	231.2	1,292.7	0
11.	1997	-	-	248.2	354.5	-	362.9	695.8	1,661.4	-	-	-	867.5	211.3	582.6	1,661.4	0
12.	1998	-	-	235.7	354.5	0.2	362.9	695.8	1,649.1	-	-	-	867.5	211.3	570.3	1,649.1	0
13.	1999	-	-	223.3	354.5	228.1	362.9	695.8	1,864.6	-	-	-	867.5	211.3	785.8	1,864.6	0
14.	2000	-	-	210.9	354.5	-	362.9	695.8	1,624.1	-	-	-	867.5	211.3	545.3	1,624.1	0
15.	2001	-	-	198.5	354.5	-	362.9	695.8	1,611.7	-	-	-	867.5	211.3	532.9	1,611.7	0
16.	2002	-	-	186.1	354.5	-	362.9	695.8	1,599.3	-	-	-	867.5	211.3	520.5	1,599.3	0
17.	2003	-	-	173.7	354.5	-	362.9	695.8	1,586.9	-	-	-	867.5	211.3	508.1	1,586.9	0
18.	2004	-	-	161.3	354.5	-	362.9	695.8	1,574.5	-	-	-	867.5	211.3	495.7	1,574.5	0
19.	2005	-	-	148.9	354.5	-	362.9	695.8	1,562.1	-	-	-	867.5	211.3	483.3	1,562.1	0
20.	2006	-	-	136.5	354.5	-	362.9	695.8	1,549.7	-	-	-	867.5	211.3	470.9	1,549.7	0
21.	2007	-	-	124.1	354.5	-	362.9	695.8	1,537.3	-	-	-	867.5	211.3	458.5	1,537.3	0
22.	2008	-	-	111.7	354.5	0.2	362.9	695.8	1,525.1	-	-	-	867.5	211.3	446.3	1,525.1	0
23.	2009	-	-	99.3	354.5	228.1	362.9	695.8	1,740.6	-	-	-	867.5	211.3	661.8	1,740.6	0
24.	2010	-	-	86.9	354.5	-	362.9	695.8	1,500.1	-	-	-	867.5	211.3	421.3	1,500.1	0
25.	2011	-	-	74.4	354.5	-	362.9	695.8	1,487.6	-	-	-	867.5	211.3	408.8	1,487.6	0
26.	2012	-	-	62.0	354.5	-	362.9	695.8	1,475.2	-	-	-	867.5	211.3	396.4	1,475.2	0
27.	2013	-	-	49.6	354.5	153.0	362.9	695.8	1,615.8	-	-	-	867.5	211.3	537.0	1,615.8	0
28.	2014	-	-	37.2	354.5	-	362.9	695.8	1,450.4	-	-	-	867.5	211.3	371.6	1,450.4	0
29.	2015	-	-	24.8	354.5	-	362.9	695.8	1,438.0	-	-	-	867.5	211.3	359.2	1,438.0	0
30.	2016	-	-	12.4	354.5	-	362.9	695.8	1,425.6	-	-	-	867.5	211.3	346.8	1,425.6	0
31.	2017	-	-	0	0	-	362.9	695.8	1,058.7	-	-	-	867.5	211.3	-	1,078.8	20.1

Remarks: /1: Interest : 3.5% Grace period : 10 years Repayment period including grace period : 30 years

/2: Revenue from operation and maintenance 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 F222,000 per year.

This analysis was made on the basis of price level and exchange rate (US$1.0 =CFA F384.5) as of December, 1985.

Fig. 10.1 SENSITIVITY TESTS OF EIRR



Remarks : B Benefit
C Cost

ANNEX XI

PILOT SCHEME

ANNEX XI

PILOT SCHEME

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1 OBJECTIVE OF THE PILOT SCHEME

Since her independance in 1960, the Government of the Republic of Cameroon has been steadily promoting the national economic development programs with great emphasis being put on development of the agricultural sector. In the Fifth 5-year National Development Plan (1980/81 - 1985/86), priority is still given to development of the agricultural sector in the national economy. Accordingly, the Government's policy is to promote "Integrated Rural Development Programs" in order to attain self-sufficiency in food crops and to increase agricultural production in general.

Based on the results of analysis of food crops forecast, it is estimated that in the short time, there would be no crucial problem with regard to food supply and demand balance. But, it can be foreseen that after 1990, the food shortage will increase at a quick pace as a result of the improvement of living standard and the rapid growth of consumption. Under such circumstances, the Government of Cameroon has always contemplated to implement the Baigom Agricultural Development Project as a model farm scheme for rice cultivation in the West Province, since the Baigom plain has been expected as one of the suitable regions for rice cultivation.

The Baigom plain with the gross area of about 2,800 ha is mostly covered with grasses and forests, and is inundated during about nine months from March to November at present. After implementation of the Baigom Agricultural Development Project, the plain would be reclaimed with the appropriate irrigation and drainage system, and most of the reclaimed fields would be distributed to the newly settled individual farm household.

In order to lead the Project up to the final goal smoothly, it would be inevitable to establish a pilot scheme with a proper executive organization prior to the development of the whole project area. The pilot scheme would be set up to establish the irrigation farming technics of rice cultivation together with other upland crops and to train the leading farmers and extension workers. The main reasons for the necessity of the pilot scheme are as follows:

(1) Skilled engineers and technicians on the irrigation farming are not sufficient in Cameroon due to her rather short history especially for rice cultivation. In order to secure successful operation of the Project, the engineers and technicians should be trained through the pilot scheme in the framework of the Project.

(2) The results of experiments obtained from the existing experimental plot in the plain still remain in a level of preliminary one mainly due to lack of engineers and facilities. It is essential to carry out various experiments on introduction of suitable varieties of crops, cropping calendar, plant protection, high-yielding farming method, proper irrigation method, harvest and post-harvest technology, etc. to acquire high quality products with reduction of losses of production and so on.

(3) Farmers are not familiar and skillful in a modern irrigation farming. It is very important to train the leading farmers and extension workers in order to extend proper irrigation farming practices all over the project area.

(4) The executive body for the project operation is necessary to have experiments in a certain scale of settlement of farmers prior to the development of the whole project area. Through the experiments in the pilot scheme, the executive body would acquire sufficient trained staff in the field and proper organization of the farmers for the operation of the whole project area.

CHAPTER 2 THE PILOT SCHEME AREA

2.1 Location

The Baigom plain is located about 35 km north-east of Bafoussam, the capital of the West Province. The pilot scheme area was selected on the north-eastern corner of the Baigom plain as shown in Fig. 11.1 on the basis of the following reasons:

(1) Irrigation water can easily be got by gravity from the Ndoup river,

(2) Topographically the area is situated on the relatively higher land of the plain so as to enable the drainage improvement economically without any radical measures in the downstream of the plain,

(3) Soil condition in the area is favourable for agricultural production consisting of Humic Gleysols, Humic Cambisols and Dystric Nitosols which are the main soil units in the whole project area,

(4) The existing experimental plot in which rice cultivation is practiced, is included in the area, and

(5) Access to the area is very easy being close to the national road No. 2, and the demonstration would be effectively achieved.

2.2 Topography

The gross area of the pilot scheme would be about 170 ha. The average slope of the area is about 1/300 with the elevation ranging from 1,118 m to 1,125 m. At present, the area consists of 33 ha of arable land, 90 ha of grass land and 47 ha of forest.

2.3 Climate

The climate in the Baigom plain is relatively mild throughout the year and distinct two seasons are observed: rainy season from March to October and dry season from November to February. The mean annual rainfall is about 2,016 mm showing the maximum monthly rainfall of 351 mm in September and the minimum of 4.7 mm in January. The total rainfall during the rainy season is estimated to be about 1,919 mm or 95% of the annual rainfall.

The annual mean temperature in the plain is about 21.6°C with the mean maximum of 27.8°C and the mean minimum of 16.8°C. The mean maximum temperature in the dry season is higher than that in the rainy season, while the mean minimum temperature in the dry season becomes lower. The mean relative humidity varies between about 78% during the rainy season and about 61% during the dry season. The mean sunshine duration in the rainy season is 5.8 hours/day and 8.5 hours/day in the dry season. The annual mean A-pan evaporation is about 1,587 mm, which is equivalent to the daily mean of 4.3 mm/day. The mean pan evaporation in the dry and rainy seasons are 5.2 mm/day and 3.9 mm/day, respectively.

2.4 Soils

The soils in the Baigom plain are classified into seven soil units according to the FAO-UNESCO soil classification system, i.e. Dystric Histosols, Humic Gleysols, Mollic Andosols, Humic Andosols, Humic Cambisols, Dystric Nitosols and Lithosols. Among them, Humic Gleysols, Mollic Andosols, Humic Andosols, Humic Cambisols and Dystric Histosols have higher suitability for agricultural production.

Dystric Nitosols are distributed over the hilly areas or high terraces around the plain. These soils generally have potential for food crop production, but are marginal to irrigated cultivation due to high permeability and short supply of plant nutrient. Lithosols cover the hilly portion of the volcanic island, some spot hills along the western edge and foot of Mt. Mbetpit. These soils have almost no potential for agricultural production.

Soil conditions in the pilot scheme area are favourable for agricultural production consisting of Humic Gleysols (80%), Humic Cambisols (15%) and Dystric Nitosols (5%).

2.5 Population

The Baigom plain spreads over Foumbot Sub-Division and Koutaba District of the Noun Division in the West Province. In 1984, the population of the areas within the radius of 10 km from the plain was estimated at some 32,000, consisting of 15,000 in Koutaba District and 17,000 in Foumbot Sub-Division, which was about 12% of the total of the Noun Division. Population in the area is unevenly distributed due to its topography; it is dense in the villages along the national road No. 2 and the main tracks. The total population in the two villages of Baigom and Ngoundoup adjacent to the Baigom plain, was estimated to be 6,331 consisting of 4,800 in Baigom and 1,531 in Ngoundoup.

The average population growth rate around the plain was 2.2% per annum during the period from 1976 to 1984, reflecting a slight outflow of the population to outside. This percentage is fairly low compared with 2.5% of the Noun Division. Under such circumstances, it can be said that the Baigom Agricultural Development Project could find easily the manpower required for its implementation around the plain.

2.6 Infrastructure

Access to the Baigom plain is very easy because the plain is located along the national road No. 2 linking Bafoussam, provincial capital of the West Province and Foumban, chief town of the Noun Division. However, access to the inside of the plain is not easy due to the inundation in the plain especially during the rainy season.

In Foumbot Sub-Division and Koutaba District in which the Baigom plain is situated, there is not yet a telephone exchange. In Foumbot city, the automatic exchange is planned to be installed until the end of 1985. Mails are delivered twice a week to the subscribed P.O. boxes in the post office in Foumbot.

The electricity in the region is supplied by SONEL through the 30 kV transmission line running along the national road No. 2 from Bafoussam to Foumban. Using several transformers, the voltage for domestic use is dropped to 220 - 380 volts. The households using electricity are limited only in the urban areas, comprising Foumbot, Foumban, Koutaba, Koundja, etc.

As for the water supply, only the big municipalities such as Foumbot and Foumban are served piped water by SNEC in the Noun Division. In the rural areas, the source of water is mainly streams from hills and mountains. The well water supply is not an usual practice here.

CHAPTER 3 PILOT SCHEME DEVELOPMENT PLAN

3.1 Development Concept

The pilot scheme would be established with 45 ha of the experimental and demonstration farms, 110 ha of the pilot model areas and 15 ha of lands for buildings and facilities as shown below:

Gross area : 170 ha

1)	Experimental and Demonstration Farms :	45 ha
	- Experimental Farms :	16 ha
	- Demonstration and Training Farms :	29 ha
2)	Pilot Model Areas for Farmers :	110 ha
3)	Lands for Buildings and Facilities :	15 ha

The general layout of the pilot scheme is shown in Fig. 11.2.

To achieve the objectives of the pilot scheme, the following activities are required:

(1) To reclaim the area and convert the existing swampy area into new agricultural land with the irrigation and drainage systems,

(2) To provide buildings, utility facilities and equipments for farm operation, experiment, training, etc.,

(3) To operate the experiment and demonstration farms for carrying out the experiment and demonstration of the modernized irrigation farming,

(4) To train engineers, technicians, extension workers and farmers,

(5) To promote the farmers cooperative activities for smooth supply of farm inputs, effective extension of farming technics,

(6) To operate farm machinery center, and

(7) To operate rice processing facilities.

3.2 Farm Development Plan

3.2.1 Land reclamation plan

In the pilot scheme, 155 ha in gross of farm lands would be newly developed with the proper irrigation and drainage facilities. The breakdown of the farm lands is summarized as follows:

Farm	Gross Area (ha)		Net Area (ha)	
Experimental Farm	16.2	Paddy Field : 10.7 Upland Field: 5.5	14.6	Paddy Field : 9.6 Upland Field: 5.0
Demonstration & Training Farm	28.8	Paddy Field : 19.3 Upland Field: 9.5	25.9	Paddy Field : 17.4 Upland Field: 8.5
Pilot Model Area	110.0	—	99.0	—
Total	155.0		139.5	

The average slope of the area is 1/300 with the elevation of 1,118 m to 1,125 m. The soil depth to be useful for plowing layer is considered to be about 30 cm based on the result of the soil survey. Taking into consideration these topographic and soil conditions, and efficient farming practices, the typical size of a plot in the pilot model area was determined to be 0.3 ha (100 m x 30 m). The plot would be reclaimed in parallel to the contour line and to be of rectangular shape in order to minimize the earth moving volumes and the cutting depth as small as possible. On the other hand, a plot in the experimental farm was planned to be 0.15 ha (100 m x 15 m) for various experiments.

3.2.2 Irrigation plan

The Ndoup river is the water source for irrigation in the pilot scheme. A intake weir of concrete fixed type would be constructed on the Ndoup river at about 250 m downstream of the culvert crossing the national road No. 2, and water taken from the river would be conveyed to the fields through the proposed irrigation system. The irrigation canal network would consist of two main irrigation canals, five secondary irrigation canals and many farm ditches. These canals were designed to be earth canals with the trapezoidal sections. The required structures related to the above canals would be turnouts for distribution of irrigation water and culverts for conveyance of water under the roads. The general features of the proposed irrigation facilities are shown below:

Intake Weir	Type	: Fixed type concrete weir
	Crest Elevation	: El. 1,125 m
	Crest Length	: 13.0 m
	Scouring Sluice Gate	: Wl.0m x Hl.5m
	Intake Discharge	: 0.25 m^3/s
	Intake Gate	: Wl.0m x Hl.0m

Canal		Discharge (m^3/s)	Length (m)	Bed Width (m)	Water Depth (m)
Main Irrigation Canal	Right	0.19	1,180	0.70	0.80
	Left	0.06	1,600	0.50	0.70
Secondary Irrigation Canal	No. 1	0.09	1,590	0.50	0.70
	No. 2	0.06	940	0.50	0.70
	No. 3	0.02	570	0.40	0.50
	No. 4	0.01	170	0.40	0.40
	No. 5	0.01	270	0.40	0.40
Farm Ditch		0.01	7,595	0.40	0.40

Related Structure	Turnout	: 38 nos.
	Culvert	: 22 nos.

3.2.3 Drainage plan

The Ndoup river would be the main drainage channel in the area. As the existing condition of the river is not sufficient for the smooth draining, the river would be improved by providing with the flow capacity enough for the design drainage discharge of 15.0 m^3/s in the portion of the pilot scheme area. The secondary drainage canals and the farm drainage ditches would be newly constructed to convey the excess water in the fields. In addition to the above drainage canals, the catch drains would be provided along the boundaries of the pilot scheme area and the surrounding hills to catch the drainage water from the external drainage basins, and the boundary drainage canals would also be constructed at the downstream of the area to collect drainage water in the area. All drainage canals would be of earth canals with the trapezoidal sections. In relation to the above canals, the related structures such as drops and culverts would be provided to protect the canals and to convey water under the roads.

The following table shows the general features of the proposed drainage facilities in the pilot scheme;

Canal		Discharge (m3/s)	Length (m)	Bed Width (m)	Water Depth (m)
Main Drainage Canal		18.80-15.00	3,010	8.0-7.0	2.0
Secondary Drainage Canal	No. 1	0.06	1,600	0.5	0.7
	No. 2	0.06	1,230	0.5	0.7
	No. 3	0.07	780	0.5	0.7
Farm Drainage Ditch		0.01	7,595	0.4	0.4
Catch Drain	Left	0.90	2,345	2.0	1.1
	Right	0.70	2,400	1.8	1.1
Boundary Drainage Canal	Left	0.96	580	2.1	1.1
	Right	0.72	1,145	2.1	1.1
Related Structure	Drop : 9 nos.				
	Culvert : 25 nos.				

3.2.4 Farm road plan

The proposed road network would consist of trunk road, main farm road, lateral farm road and on-farm road. The existing road linking the national road No. 2 and the present experimental plot would be improved with the asphalt pavement so that this road would be the trunk road in the pilot scheme. The other farm roads would be newly provided along the irrigation and drainage canals for operation and maintenance of the facilities and also for effective agricultural activities.

The general features of the proposed farm roads are summarized as follows:

Road		Length (m)	Total Width (m)	Effective Width (m)	Pavement
Trunk Road		2,700	7.0	6.0	Asphalt
Main Farm Road,	Left	5,040	5.0	4.0	Gravel
	Right	5,385	5.0	4.0	Gravel
Lateral Farm Road,	Left	225	4.0	3.0	Gravel
	Right	3,650	4.0	3.0	Gravel
On-Farm Road,	Left	675	2.6	2.0	Earth
	Right	1,860	2.6	2.0	Earth
Related Structure	Culvert : 2 nos.				

3.3 Building and Equipment Plan

To fulfill the functions of the pilot scheme such as experiment, demonstration, training, etc., the following buildings, utility facilities and equipments would be required.

3.3.1 Buildings

The buildings required for the pilot scheme would consist of three categories, i.e. buildings for farm operation, buildings for experiment and demonstration, and residences for staff. These buildings would be constructed on the hilly area located at the eastern part of the pilot scheme area. All buildings were designed to be single-story houses taking into account the sizes of buildings, available lands for buildings, construction conditions, etc. The breakdown of the buildings is summarized in Table 11.1 and the general features are shown in Annex-XII "Drawings".

3.3.2 Utility facilities

(1) Electric power supply system

Since the 30 kV transmission line runs along the national road No. 2, the electric power supply system for the pilot scheme would be installed by connecting with the above transmission line. The load required for the facilities in the pilot scheme would be about 180 kVA comprising 80 kVA for motive power and 100 kVA for electric lamp.

(2) Water supply system

The water demand for the facilities in the pilot scheme was assumed to be about 20 m^3 per day. Two deep wells would be dug near the buildings to utilize groundwater which would be pumped up to the receiving tanks and then be conveyed to the buildings by the distribution pipes.

3.3.3 Machinery and equipment

For effective activities and smooth operation of the pilot scheme, the following machineries and equipments would be required:

(1) Agricultural machineries

(2) Operation and maintenance machineries

(3) Vehicles

(4) Rice-mills

(5) Repair shop equipments

(6) Meteorological and farm observation equipments

(7) Experimental and training equipments

The details of the above machineries and equipments are shown in Table 11.2 - 11.8.

3.4 Farm Operation Plan

Farm lands in the pilot scheme would consist of the experiment and demonstration farms, and the pilot model area. The main activities required for these farms are described below to fulfill the function of the pilot scheme.

3.4.1 Experiment and demonstration farms

The activities to be carried out in the experiment and demonstration farms would be agronomic experiments, demonstration on advanced farming, seed multiplication and training.

(1) Experiments

The experiments aim at establishment of practical farming technics suitable for the project area with satisfying the economical aspects in both levels of the farmers and the nation. The prospective experiments would be made for practicable and applicable ones rather than fundamental research works which are generally done in a research station or institute. The experiments would be concentrated on carrying out the introduction of superior crop varieties of rice as well as upland crops like maize, groundnuts, soybean, etc. with the rotation cropping system.

(2) Demonstration

The demonstration works aim to exhibit and demonstrate the introduced crops and farming practices in a practical level prior to the actual extension to the farmers. As the farmers expected to be settled in the project area are generally not familiar and skillful in a modern irrigation farming, it would be inevitable to train the farmers as well as extension workers through the demonstration works on the crop cultivation and farm management technics, high yield and superior quality of products. In this connection, a series of exhibit and demonstration works on superior crop varieties, advanced crop cultivation methods, harvesting and post-harvest technics, mechanized farming, etc. would be executed at the initial stage of the Project.

(3) Seed multiplication and training

The superior crop varieties to be introduced in the area would be multiplied for distribution to the farmers. The seed multiplication works would be carried out in the same field of the demonstration farm and utilized for training of farmers and extension workers on crop cultivation technics and machinery operation practices. The multiplied seed would be treated and stored until distribution to the farmers. The technical trainings for farmers to be settled in the project area would be carried out for 6 months prior to the settlement and be expected periodically on the seasonal farming practices. These trainings would be done mainly by use of the demonstration and seed multiplication farms, and processing facilities in the scheme.

3.4.2 Pilot model area

The pilot model area would become a model development area for the development of the whole Baigom plain. The main activities expected in the model area would consist of actual settlement of farmers, farm operation by farmers, promotion of establishment of farmers organization and agricultural extension system, and solution of problems which may be raised in establishing the modern irrigation farming to be introduced in the area.

In the pilot model area, the irrigation and drainage systems and farm road network would be developed in conformity with the development plan of the whole project area. The farmers settled in the area would have 2.1 ha of the net agricultural land per household and would operate the farmers in line with farming practices and cropping patterns proposed for the whole project area described in Annex-V. At the initial stage of farm operation, the farmers would be supported by the Development Authority especially in arrangement of farm machinery, fertilizers and agro-chemicals, and processing of rice. It would be required to establish farm machinery services, fertilizers and agro-chemicals supply system, and rice processing facilities for effective management of the pilot model area.

3.5 Settlement Plan

To realize the introduction of intensive farming practices in the pilot scheme area, it would be essential to transmigrate farm households into the area. The priority of migration would be given to the households living around the Baigom plain and then to the young farmers in accordance with the Government's policy.

Selection of farmers would be carried out on the basis of the following qualifications:

(1) General Conditions

- Ability of reading and writing
- Good health and mental conditions
- Capability of satisfying adequately the conditions fixed by the Development Authority
- Having no other wage-earning occupations

(2) For Local Farmers

- Residing in the radius of 10 to 20 km from the Baigom plain
- Aged 20 - 55 years
- Married and having at least two other family members of over 15 years old who can help cultivate the alotted land

(3) For Young Farmers

- Aged 20 - 35 years
- Having at least two other family members of over 15 years old who can help cultivate the alotted land
- Trained by the National Civil Service Center for Participation in Development or having participated in other training programs

Application for settlement will be submitted by the interested farmers to the Development Authority or the Divisional Agricultural Delegation Office, and a selection committee composed of representatives of the authorities concerned will pick out the most appropriate candidate farmers after examining the application documents.

CHAPTER 4 CONSTRUCTION PLAN AND COST ESTIMATE

4.1 Construction Plan

The pilot scheme comprises new construction of the Ndoup intake weir, irrigation and drainage canals and their related structures, farm roads, buildings and their utility facilities. As most of the proposed area are inundated covering with grasses and forests at present, firstly it would be required to carry out clearing and grubbing of grasses and forests, and drainage works for drying up the area. And then, the irrigation facilities and farm roads would be constructed. The proposed buildings would be located at rather high lands and the construction works would be executed without any particular restrictions. The major construction equipments required for the works would be swamp bulldozer, swamp rake-dozer, back-hoe shovel, dump truck, concrete mixer, etc.

The construction period of the pilot scheme was planned to be 17 months taking into consideration the workable days, construction method and construction equipment plan. The annual workable days were assumed to be 213 days for earth works and 264 days for concrete works based on the daily rainfall records at the Koundja meteorological station. Prior to the actual construction works, it would be required to carry out the detailed design including preparation of the tender documents for selection of the contractors. The implementation schedule of the pilot scheme is shown in Fig. 11.3.

4.2 Cost Estimate

The cost of the pilot scheme comprises the construction cost of farm facilities, buildings and utility facilities, equipment cost, physical contingency and engineering cost. The total cost was estimated to be CFA F 3,312.85 million as shown below:

Item	Cost (CFA F 10^3)
1. Construction Cost	
1-1. Farm Development Works	1,022,708
1-2. Building Works	965,591
1-3. Utility Facility Works	222,947
Sub-total	2,211,246
2. Equipment Cost	
2-1. Agricultural Machineries	187,242
2-2. Operation and Maintenance Machineries	115,799
2-3. Vehicles	41,580
2-4. Rice-mills	164,759
2-5. Repair Shop Equipments	8,758
2-6. Meteorological and Farm Observation Equipments	25,828
2-7. Experimental and Training Equipments	27,148
Sub-total	571,114
3. Physical Contingency	221,124
4. Engineering Cost	315,877
Total	3,319,361

For the above cost estimate, the following considerations were taken into account:

(1) The exchange rate used in the estimate was US$1.0 = CFA F 384.5 = ¥203 as of Decemger, 1985.

(2) The construction works would be executed on a contract basis. The construction machinery and equipment required for the construction works would be provided by the contractors themselves. Therefore, the depreciation costs of machinery and equipment were included in the construction unit costs.

(3) The physical contingency related to the construction quantities was set at 10% of the construction cost.

CHAPTER 5 EXECUTIVE ORGANIZATION

For smooth implementation of the pilot scheme, the Baigom Agricultural Development Authority (SODABA: Société de Développement Agricole de Baigom) would be created under an establishment agreement with the Government of the Republic of Cameroon. At present, the Baigom Rice Cultivation Project Office operates and manages small scale experimental farms under control of the Directorate of Studies and Projects, Ministry of Agriculture, and it would be necessary to expand and reinforce their organization structures until establishment of the SODABA.

The proposed organization for the pilot scheme consists of four departments, i.e. administrative and financial department, pilot area management department, construction, supervision and O & M department, and experiments & demonstration department as shown in Fig. 11.4.

Establishment of a system for technical and financial assistance to farmers and for stable operation and maintenance of the pilot scheme would be of major importance to enable to attain the anticipated agricultural production in the area through intensive cropping practice. Therefore, it would be essential in the first place to use rationally the existing agricultural support agencies and institutions in charge of research and extension, investment and credit services, cooperative and farmers' organization, etc.

To ensure smooth implementation of the pilot scheme, it is recommended to assign 86 persons of the staff with adequate qualifications required at the full development stage of the scheme. The number of staff, especially that of senior officers will be gradually increased according to the volume of services. This means that during the first period, the senior officers should cumulate also other posts as much as possible from the standpoint of financial rationality. The personnel expenses at the full development stage of the scheme was estimated to be about CFA F 68.9 million per annum on the assumption that salaries and housing allowances of managing and technical staff will be borne by the Government.

Table 11.1 LIST OF BUILDINGS

Building	Floor Space x Number
(1) Buildings for Farm Operation	
(i) Main office	650 m^2 x 1 no.
(ii) Warehouse	200 m^2 x 1 no.
(iii) Workshop	300 m^2 x 1 no.
(iv) Rice-mill and warehouse	350 m^2 x 1 no.
(v) Garage	200 m^2 x 2 nos.
(2) Buildings for Experiment and Demonstration	
(i) Laboratory and lecture hall	650 m^2 x 1 no.
(ii) Nursery bed	400 m^2 x 1 no.
(iii) Hut	105 m^2 x 1 no.
(iv) Net house for birds and rodents	100 m^2 x 1 no.
(v) Net house for insectary and pathology	9 m^2 x 10 nos.
(vi) Warehouse	100 m^2 x 1 no.
(vii) Garage	200 m^2 x 1 no.
(viii) Meteorological station	20 m^2 x 1 no.
(3) Residences for Staff	
(i) Family quarters	140 m^2 x 6 nos.
(ii) Bachelor quarters	425 m^2 x 1 no.
(iii) Dormitory for Trainees	560 m^2 x 1 no.

Table 11.2 LIST OF AGRICULTURAL MACHINERY

Machinery	Specification	Number
1. Crawler Tractor	Blade	2
2. Crawler Tractor	Backet	2
3. Wheel Tractor	50 PS	5
4. Disc Plow	26" x 3	3
5. Disc Harrow	18" x 20	3
6. Chizel Plough	7 tines	3
7. Rotary Tiller	2,000 mm	3
8. Drum Rotor	3,000 - 4,000 mm	4
9. Subsoiler	40 - 50 cm depth with mole drain	1
10. Paddy Wheel		5
11. Rear Grader		1
12. Ridger	Triple row	2
13. Trailer	2 ton	2
14. Rotary Thresher		2
15. Mower	Frail	1
16. Hand Tractor	Power tiller with rotary tiller	20
17. Ridger	Single row	8
18. Trailer	500 Kg capacity	8
19. Swamp Wheel		8
20. Germination Accelerator	40 Kg capacity	1
21. Soil Crushing/Sieving Machine		
22. Fertilizer Mixer		1
23. Sprinking Conveyer	Manual operation 100 boxes/hr	1
24. Seedling Box Container Caster	100 boxes	8
25. Seedling Box	for transplanter	2,000
26. Seedling Box	for broadcast transplanting	500
27. Transplanter	4 rows	1
28. Transplanter	2 rows	2
29. Power Sprayer	PTO driven trailer type	1
30. Power Sprayer	Portable/hand carry type	2
31. Knapsack Type Power Mist Duster		5
32. Power Cultivator	3 rows	2
33. Man-Power Cultivator	2 rows	20
34. Combine Harvestor	3 rows	2
35. Automatic Feed Thresher	500 Kg/hr	8
36. Treadle Thresher	Man-power driven	10
37. Brush Cutter	Shoulder holding type 1 - 2 ps	5

Table 11.3 LIST OF OPERATION AND MAINTENANCE MACHINERY

Machinery	Specification	Number
1. Swamp Bulldozer	7 t class	1
2. Back-Hoe	0.4 m^3 class	1
3. Motor Grader	2.2 m blade	1
4. Dump Truck	7 t class	2
5. Portable Generator	2 KVA	2
6. Submersible Pump	"	2

Table 11.4 LIST OF VEHICLES

Vehicle	Number
1. Pick-up Truck	2
2. Jeep	2
3. Mini Jeep	2
4. Motorcycle	5
5. Mini Bus	2

Table 11.5 LIST OF RICE-MILLS

Rice-Mill	Specification	Number
1. Rice-Mill for Experimental Farm	Capacity - 0.5 t/hr	1
2. Rice-Mill for Pilot Model Area	Capacity - 1.0 t/hr	1

Table 11.6 LIST OF REPAIR SHOP EQUIPMENT

Equipment	Number
1. Engine and General Tools	L.S
2. Tire and Chassis	L.S
3. Welding Tools	L.S
4. Electric Tools	L.S

Table 11.7 LIST OF METEOROLOGICAL AND FARM OBSERVATION EQUIPMENT

Equipment	Specification	Number
1. Thermograph	7 days roll	1
2. Hygrograph	7 days roll	1
3. Barograph	7 days roll, Aneroid	1
4. Recording Rain Gauges	7 days roll, Overturning cup	1
5. Combination Anemometer	1 month roll, AC	1
6. Actinograph	7 days roll, Robitzsch	1
7. Sunshine Recorder	7 days roll, Bimetal	1
8. Evaporation Gauges	120 cm, Vernier	1
9. Standard Thermometer	0°C - 50°C	1
10. Max. & Min. Thermometer	Fuess	1
11. Weather Instrument Screens	H1,500 x W1,100 x D1,000	1
12. Pole for Combination Anemometer, 5 m	With Flange	1
13. Pole for Sunshine Recorder, 2 m	With Flange	2
14. Staff Gauge, 3 m	Width 13 cm	3
15. Water Level Recorder	1 month roll	3
16. Current Meter	Digital	1
17. Box for Water Level Recorder		3
18. Water Thermograph	Mercury	2
19. Water/Earth Termometer	Each 10 points for water and Earth	1
20. Recording Soil Moisture Meter	with Auger	1
21. L-tube Earth Thermometer	0, 5, 10, 20, 30 cm set	1
22. Earth Thermometer with Iron Tube	50, 100, 200, 300 cm set	1
23. U-tube Max. & Min. Thermometer	With Plate	10

Table 11.8 LIST OF EXPERIMENTAL AND TRAINING EQUIPMENT

Equipment	Number
1. Audio Visual Aids	
(i) Video Projector Set	L.S
(ii) Slide Projector Set	L.S
(iii) Overhead Projector Set	L.S
(iv) Screen Projector Set	L.S
2. Experimental Apparatus	
(i) Pots	L.S
(ii) Germinaters	L.S
(iii) Sprayers	L.S
(iv) Balances	L.S
(v) Testing Apparatus	L.S
(vi) Measuring Apparatus	L.S
(vii) Glass Tools	L.S
(viii) Microscopes	L.S
(ix) Others	L.S

Fig. 11.1 LOCATION OF PILOT SCHEME

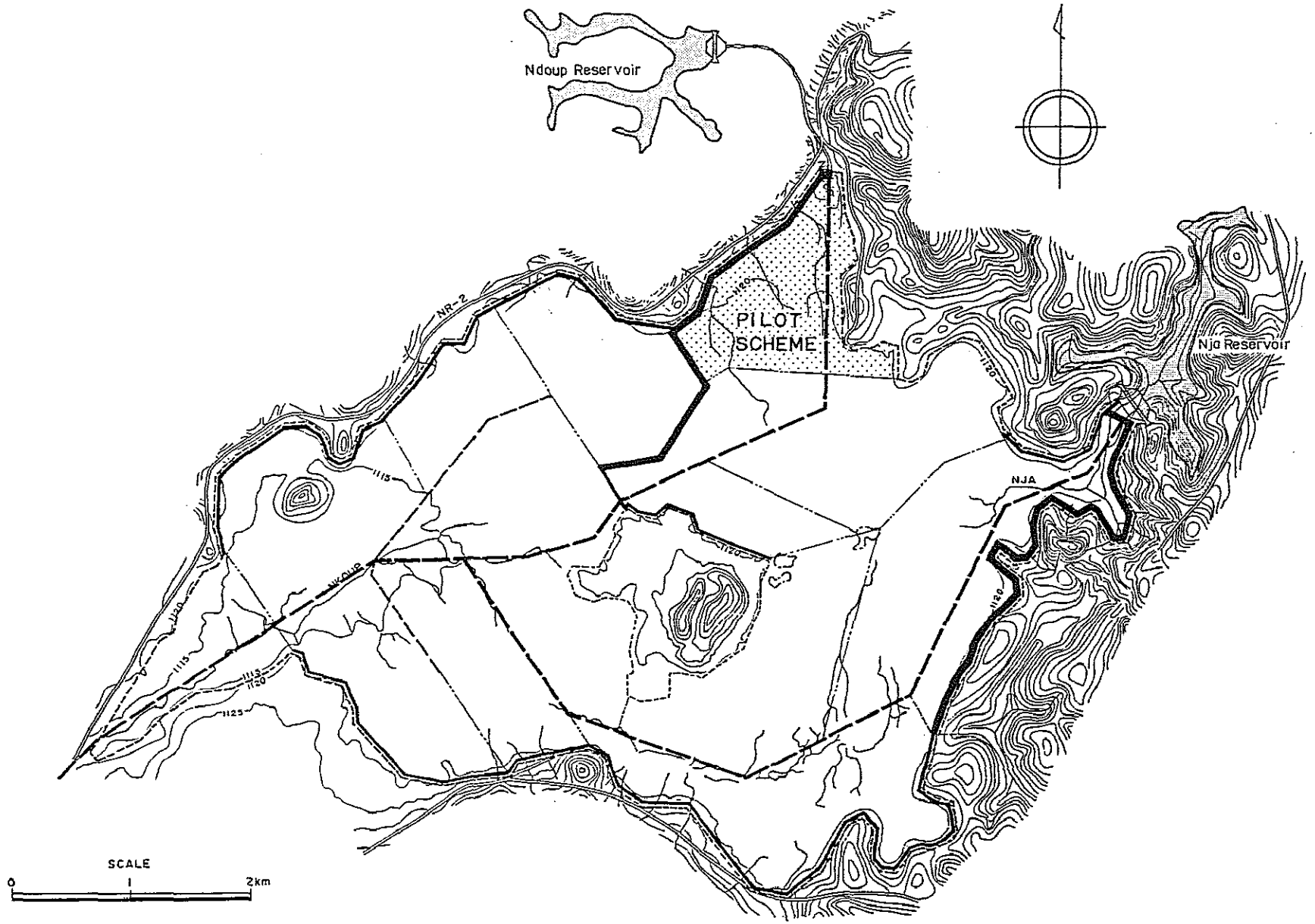


Fig. 11.2 GENERAL LAYOUT OF PILOT SCHEME

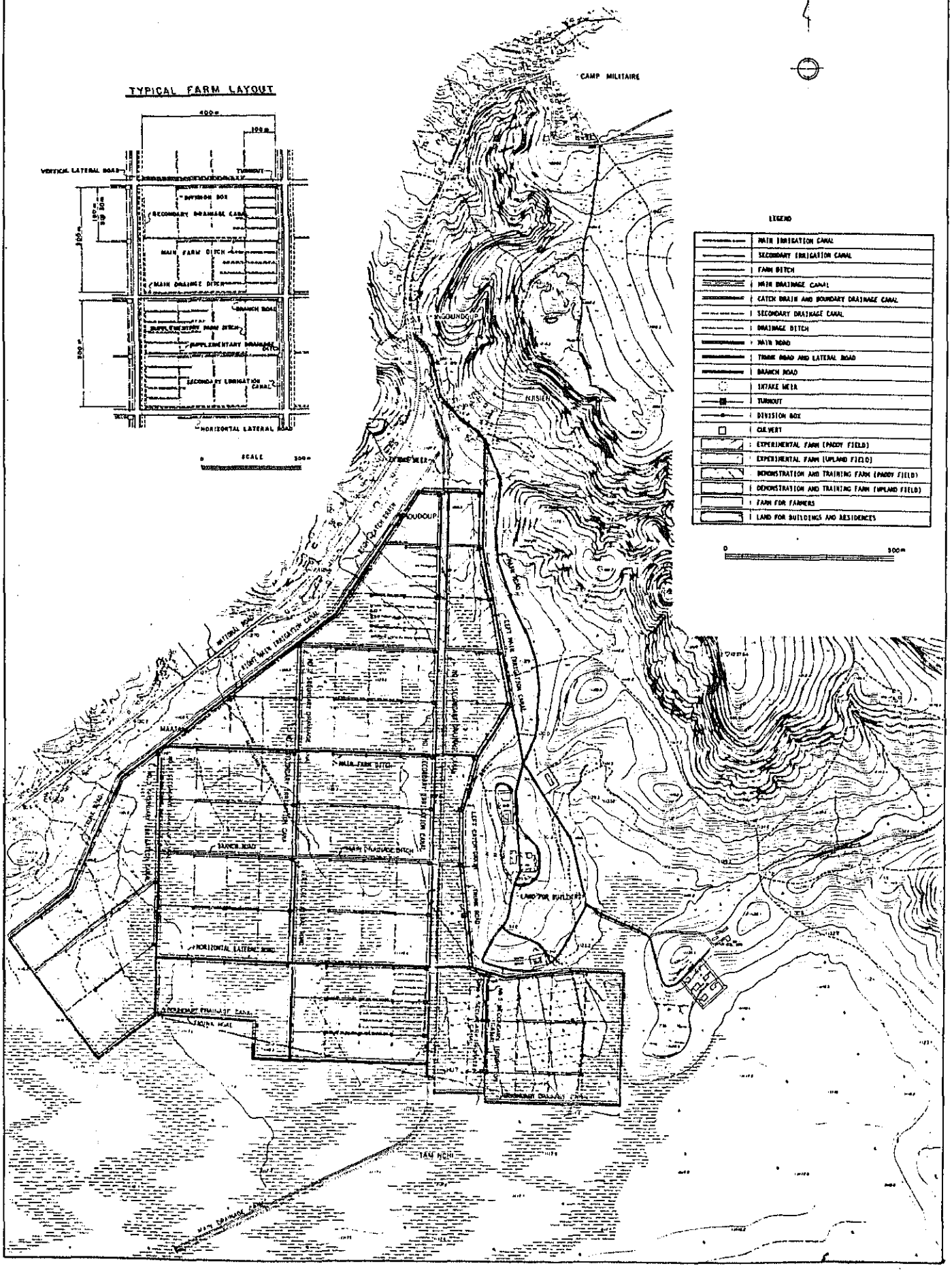


Fig. 11.3 IMPLEMENTATION SCHEDULE OF PILOT SCHEME

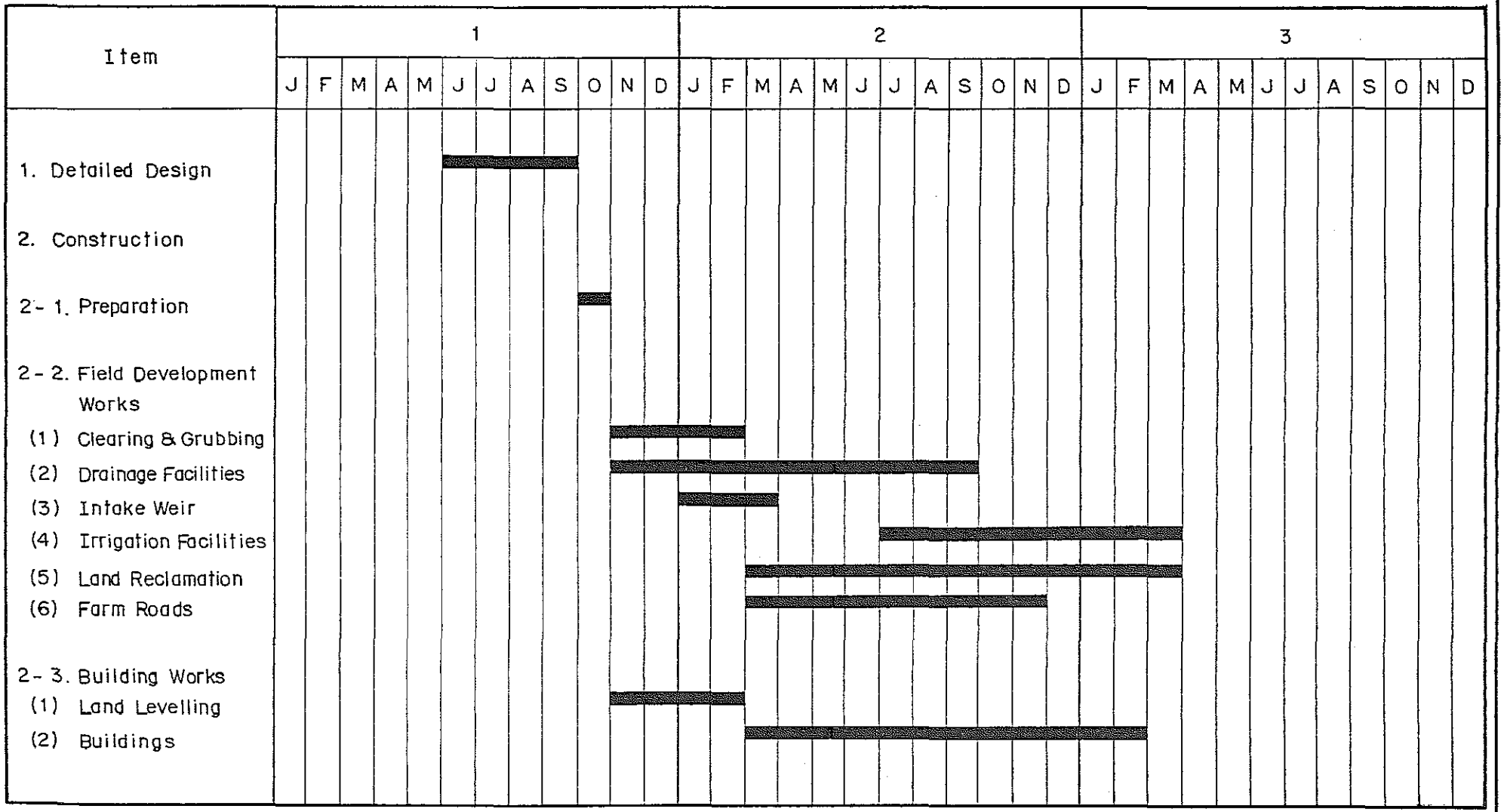
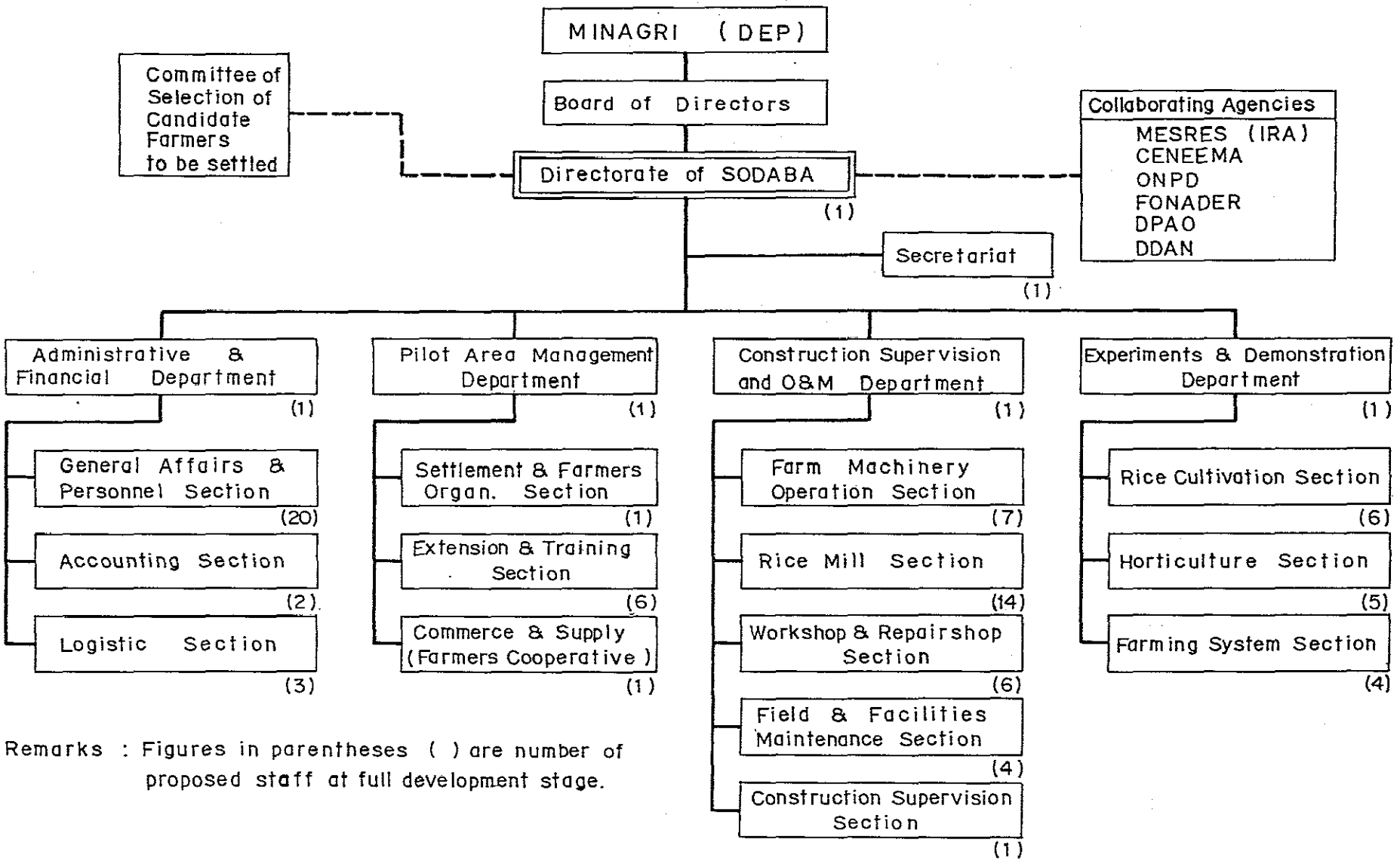


Fig. 11.4 PROPOSED ORGANIZATION FOR PILOT SCHEME



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