

- 1) To bear all the expenses necessary for the execution of the Project other than those to be borne by the Grant Aid.

5.6.3 Construction Plan

The Project will be executed in accordance with the organization and scope of work stated in Section 5.6.2. The outlines of construction methods and the work schedule are described in this section.

(1) Detailed design

The following survey, detailed design and tendering works are necessary to be executed before the start of the construction of the Project.

- 1) Topographical survey and other additional investigations
 - a) Canal route centering survey based on the canal alignment prepared in this Basic Design, and establishment of the bench marks to be used for construction works,
 - b) Additional geological survey at the headworks, and
 - c) Additional soil mechanics survey for the embankment materials.
 - 2) Detailed design
 - a) Confirmation of the project cost based on the results of the detailed design.
 - 3) Preparation of the tender documents
 - a) Preparation of the tender drawings
 - b) Preparation of all documents required for tendering for the construction works and supply of equipment.
- (2) Construction methods

1) Access roads for construction works

The Nairobi-Makutano road and Makutano-Embu road can be used for the transportation of construction materials and equipment to the project site. The existing farm roads in the Project area will be utilized as access roads for the construction after minor repairing and widening, if necessary. The proposed operation roads will be constructed in parallel with the construction of canals in order to use them as access roads.

2) Earthworks

The earthworks for irrigation canals and operation roads will be carried out basically by heavy construction equipment, taking into account the earth quantities and the working efficiency. Stripping and excavation will be done by use of bulldozer and backhoe. Embankment of canals and operation roads will be constructed by means of combination of bulldozer, motor grader, tire roller and water tanker and the finishing works will be executed by heavy equipment together with man power. Excavated soils and embankment materials will be transported by dump trucks. The excavated soils will be used as the embankment materials as much as possible to minimize the earth quantities to be transported to spoil banks. Laterite pavement materials and embankment materials for black cotton soils area will be transported over an average distance of 10 km and 3-6 km respectively.

3) Concrete works

The concrete works will be mainly required for construction of the Nyamindi and Thiba headworks, canal lining, construction and rehabilitation of irrigation related structures in the project area, buildings and irrigation and drainage facilities in the pilot farm. Concrete will be produced by concrete plants installed in the project site and aggregates will be procured from the manufacturers in Kenya. Concrete produced by the plants are transported to each construction site by concrete transfer machine and placed in each structure. Concrete for headworks, Nyamindi diversion structure and syphon in Link canal-I will be cast by such machines as truck crane and bucket and that for other small structures by man power.

4) Building works

The land acquisition and land levelling for the pilot farm buildings and machine center will be under the responsibility of the Kenyan Government. These works shall be completed before the start of construction works. The proposed land has been determined during the period of Basic Design Study.

(3) Construction schedule

The construction of the Project is proposed to be divided into three (3) phases, taking into account (a) Scale of the Project works, (b) Work quantities, (c) Construction time, (d)

Maximum performance period under the Japanese Grant Aid Program, and (e) Meteorological and social conditions in the Project area. The main components of the works to be executed in respective phases are as follows:

- 1st Stage : Rehabilitation of Thiba headworks
Rehabilitation of Link canal-II
Rehabilitation of Thiba main canal
Construction of pilot farm

- 2nd Stage : Construction of Nyamindi headworks
Construction of Nyamindi headrace
Construction of new Nyamindi main canal
Rehabilitation of Link canal-I

- 3rd Stage : Rehabilitation of Nyamindi main canal
Rehabilitation of related structures in Thiba branch canal-IV
Rehabilitation of related structures in other branch irrigation canals and drainage canals

The reasons for division of the work execution into stages are as follows:

- 1) The Government of the Republic of Kenya intends to introduce double cropping of rice to the Mwea section in the Thiba irrigation system at present. To this end, rehabilitation of irrigation facilities and stable water supply to the Mwea section shall be urgently realized. Then, since the Kenyan Government strongly requested the technical cooperation for mechanized agriculture and guidance in water management by the Japanese Government, the construction of a pilot farm as the base of such technical cooperation constitutes an urgent work. Therefore, the rehabilitation works for irrigation facilities in the Mwea section among those in the Thiba system and the construction works for the pilot farm shall be promptly implemented in the 1st Stage.

- 2) Since the irrigation sections in the Thiba system, especially the Wamumu and Karaba section, are presently suffering from serious shortage of irrigation water, it is the basic objective of the Project to divert and supply the surplus water of the Nyamindi river to the Thiba system. In the 2nd Stage, the construction of the irrigation facilities required for diversion and supply of water from the Nyamindi river will be carried out, taking into account the significance of these irrigation facilities for solving the severe water shortage problems.

- 3) The rehabilitation of medium-sized irrigation canals and construction of machine center will be involved in the 3rd Stage because these works will not affect the general situation of the project works such as the function and construction works of other major irrigation facilities.

5.6.4 Procurement and Transportation Plan

(1) Procurement

It was planned that the construction materials will be procured in Kenya as far as possible, but those which are not available in adequate quality and quantity in local market or are difficult to be procured in Kenya will be imported from Japan. Major materials procurable in Kenya are fuel, oil, electricity, cement, reinforcement bar, aggregate for concrete and timber including plywood.

(2) Transportation

The cargoes shipped from Japan for the Project will be unloaded at the Mombasa port and transported by trucks through Mombasa (about 500 km) and Nairobi (about 1000 km) to the project site. Although there is a train service between Mombasa and Nairobi, the inland transportation of cargoes by trucks from Mombasa to Nairobi was recommended considering the transportation costs by train and by truck (Truck : KShs. 1,038/FT, Train : KShs. 1,067/FT), the limitation of cargo load on train, the time and labor required for transferring the cargoes from train to truck at Nairobi. The transportation period of cargoes from Japan to the project site was estimated at two (2) months, taking into account the period required for procurement, customs clearance, loading, waiting in the offing in Japan, and unloading, customs formalities at Mombasa port and inland transportation to the project site.

5.6.5 Detailed Design and Construction Supervision

(1) Detailed design and tendering

Immediately after the Exchange of Note between the both Governments, the consultant will conclude the consultancy services contract with NIB and start the detailed design, following the execution plan agreed upon between NIB and the consultant. NIB will complete the urgent works such as land acquisition, levelling works, etc. as described in Section 5.6.2 in time for the commencement of the project works. All detailed design works will be carried out at the

consultant's head office in Japan after completion of additional field surveys and investigations in Kenya. The results of detailed design shall be approved by NIB before tendering.

The advertisement of tender calling will be run in major Japanese papers in the name of the Government of Kenya. The tender documents will be delivered at the consultant's head office and sealed tenders publicly opened in the presence of the representative of the Government of Kenya. The consultant will assist the Kenyan Government in evaluating tenders and drafting the contract.

(2) Construction supervision

After signing of the construction contract, the consultant's representative will go to Kenya to arrange the commencement of construction works. After that, the consultant's chief engineer will be posted at the construction site during the whole construction period and will supervise the construction works on site. He will regularly report the construction progress and related matters to the agencies concerned of the Government of Kenya as well as to the Embassy of Japan and JICA in Kenya and coordinate all construction-related matters with the officials concerned with the Project. In addition, the consultant will dispatch to Kenya several kinds of engineers for a required time to supervise the construction works, keeping pace with the construction progress.

The consultant will conduct the supervision work in such a manner as to ensure smooth construction progress and completion of the works on schedule, paying special attention to the natural conditions, religion, customs, traditions and systems in Kenya and the capability of local workers.

The major activities to be carried out by the consultant's personnel are presented below:

- a) Assistance in tendering and contract award: Assistance in pre-qualification of tenderers, tendering, evaluation of tenders and drafting of contract.
- b) Examination and approval of shop drawings: Inspection, examination and approval of the shop drawings, samples, catalogues, etc. and inspection at the manufacturer's plant.
- c) Supervision of construction works: Supervision to check whether the construction works executed by the contractor comply with the contract in terms of construction

plan and schedule, construction methods and quality. Inspection, instruction and approval of field works.

- d) Approval of payment: Approval of payment claims based on the progress of the works.
- e) Reporting: Preparation of the progress reports on all matters concerning the construction for the information of the agencies concerned of the Kenyan Government and the Japanese Government.
- f) Handing-over of completed works: Handing-over of the completed works to the Government of Kenya after examination and confirmation of the fulfillment of all contractual obligations. Upon the acceptance of the completed works by the Government of Kenya, the consultant will be released from all of duties.

5.6.6 Implementation Schedule

The Project will be implemented in three (3) Stages as mentioned previously. Immediately after the Exchange of Notes for the construction of the 1st Stage, the contract for the consultancy services will be concluded. The detailed design, preparation of tender documents, tendering, tender evaluation and contract award for the construction work will be executed in a period of about six (6) months. The construction of the Project was planned to be completed within fourteen (14) months including the period for procurement of construction materials and equipment.

As for the 2nd Stage, the period required from the commencement of detailed design to the contract signing for the construction will be six (6) months. The construction works in the 2nd Stage will be completed within fourteen (14) months. The equipment and tools for the pilot farm and O/M equipment will be procured within three (3) months from the contract award to the arrival at the site.

The 3rd Stage will require a period of five and a half (5.5) months from the start of detailed design to the contract signing for construction and eleven (11) months for the construction works. The procurement to the site of equipment and tools for the machine center and of agricultural machinery in this Stage will be carried out during the period of three (3) months after the contract signing. The implementation schedule is given in Fig.5.1.

The construction of fence around the pilot farm, etc. as shown below, of which preliminary cost was estimated at KShs. 717,000 (Yen 5,040,500 : KShs.1.0 = Yen 7.03), shall be undertaken by the Government of Kenya.

Work Items	Cost (KShs.)
Fencing around the pilot farm buildings	357,000
Erection of electric distribution line to the buildings	70,000
Erection of telephone distribution line to the buildings	5,000
Land clearing, grading and levelling for building area	267,000
Fencing around the machine center	18,000
Total	717,000

In addition, the rehabilitation works (earthworks) of medium-sized branch canals with the design discharge of less than 2.0 m³/s and excavation and reshaping works of drainage canals' section, which are excluded from the Japanese Grant Aid Program, shall be implemented by the Government of Kenya by use of its own O/M equipment and those procured under this program. The quantities of the above works are as follows;

Work Items	Quantity
Excavation for branch irrigation canals	33,522 m ³
Embankment for the above	29,390 m ³
Excavation for drainage canals	533,043 m ³
Embankment for the above	9,121 m ³

CHAPTER 6
PROJECT EVALUATION

CHAPTER 6 PROJECT EVALUATION

The direct benefits to be derived from the Project are increase in rice production, improvement of farm income and saving of foreign currency required for food import. In addition, it is expected that the Project would contribute to the introduction of rice production technology in Kenya and to the improvement of working environment.

(1) Increase in rice production and food self-sufficiency

MIS area has been a pioneer area on rice production in Kenya for 30 years and now shares 66% of rice production of 41,000 tons in the country. However, the unit yield of rice has tended to decline due to several undesirable reasons : insufficient water management caused by the overage irrigation and drainage facilities, delay of puddling work due to shortage of tractor, sifting of harvesting period into rain season, insufficient distribution of farm inputs, etc.

The overaged irrigation and drainage facilities will be improved through the project implementation, and the irrigation water supply in water deficit areas can be stabilized by the construction of a connecting canal between the Nyamindi river and Thiba river. Further, agro-machinery supplied by the Project will help to ensure the progress of farming works on schedule.

The paddy production in MIS area is expected to increase remarkably as shown below:

Items	Without Project	With Project
Unit yield (tons/ha)		
Short rains rice	3.5	6.0
Long rains rice	-	6.0
Production (paddy tons)		
Short rains rice	20,510	35,160
Long rains rice	-	6,000
Total	20,510	41,160

The annual paddy production is estimated to decline to about 20,500 tons or 76% of the present production under the without project condition, but to increase to about 41,200 tons or 150% of the present production under the with project condition. Furthermore, the Project will make the double cropping of paddy possible and an annual production of 70,300 tons will be attainable.

The country has imported 23,900 tons of rice annually for the half decade of 1982-1986. This means that the country can save US\$ 8.3 million of foreign currency per year by the Project.^{/1}

(2) Improvement of farmer's income

It is expected that the Project would directly increase the rice production in the area and substantially improve the farmer's income. In order to clarify the impact by the production increase, farm budget under the with and without project condition were analyzed for the farmer with a standard farm size of 1.6 ha (paddy field). The results are summarized as follows.

(Unit: KShs 1,000)

Items	Gross Farm Income	Non-farm Income	Farm Expenditure	Net Farm Income
Present	27.3	1.5	12.6	16.2
Future				
Without project	21.8	1.5	12.6	10.7
With project				
Single crop	35.8	1.5	13.4	23.9
Double crop	69.4	-	26.5	42.9

Details are shown in Appendix-8.

Increase in the future gross farm income compared to the present income level is estimated to be 1.3 times in single cropping farms and 2.5 times in double cropping farms. The net farm income would also increase to 1.5 and 1.7 times the present level in single and double cropping farms, respectively. This shows that the farm budget will be remarkably improved by the Project. On the contrary, in case of without project condition, it is projected that the gross and net farm incomes will be reduced to 20% and 34% respectively from the present level due to the production decrease caused by functionless overage facilities. Although the double cropping is planned to extend to only 1,000 ha out of 5,860 ha in the Project, it is expected the double cropping of paddy will spread to all farms in future due to the desirable high income, and the farm income will be uplifted to the level of future double cropping.

(3) Improvement of rice quality

/1: Based on the estimated CIF price of rice in Monbasa (1995) : US\$ 345.8

In the Tebere and Mwea areas, it is projected that the drying floor of rice will be remarkably in short under the future without project condition. Taking into account of the fact that the rice unloaded in the collection center has high moisture ratio of 20% to 22%, it is considered this shortage of drying floor will lengthen the waiting period, promote outbreak of mold and insects and then deteriorate the rice quality.

The expansion of drying floor by the Project will ensure the progress of rice drying on schedule, terminate the process in short period, facilitate the unloading of rice in the Mwea rice mill, and, in result, avoid the deterioration of rice.

In addition to the direct effects of the Project mentioned above, the following indirect effects can be anticipated.

(1) Introduction of rice production technology in Kenya

Intensive use of farmland has been stressed as a task in Kenya whose population has increased remarkably. In particular, irrigation projects which require large amount of cost, introduction of farm technologies and well-organized supporting services enabling the introduction of technologies are essential to maximize the land productivity. In Kenya, the systems of farming practices and water management which aimed at double cropping of paddy as the national policy should be urgently established .

In the pilot farm, research and technology development on farming practices and water management for paddy will be set forth on its way through technical cooperation by Japan. Especially in small farms, rationalization of the mechanization of farm operation including selection and operation of the machinery will play an important role on introduction of future labor and cost-saving rice production. Trial operation and demonstration of water management in the pilot farm will have significant meanings because the water management system has not been established in Kenya. The technologies introduced in the pilot farm are expected to spread to the whole MIS area as well as other NIB scheme and rice farmers.

(2) Improvement of working environment

Rehabilitation of farm management roads along the canals, modernization of transportation means and farm maintenance by the Project will substantially improve the working environments and revitalize the agro-economic activities. Also the community hall to be constructed in the pilot farm will enable the local people to manage the facilities functionally and systematically.

CHAPTER 7
CONCLUSION AND RECOMMENDATION

CHAPTER 7 CONCLUSION AND RECOMMENDATION

As a result of the field surveys and study in Japan, the Study Team convinced that the Mwea Irrigation Settlement Scheme Development Project will bring a beneficial effect both directly and indirectly. In addition, the Project will contribute to a rise of living standard of farmers. It is concluded that the Project is favorable and appropriate for grant aid of the Government of Japan. The Kenyan authorities concerned are well organized with sufficient number of staff and financial resources to manage and control the Project.

As for the management of the pilot farm, an agreement on technical cooperation between the Governments of Kenya and Japan is expected to be made since it is indispensable for effective management.

The Study Team recommends that the Government of Kenya will undertake the following in order to implement the Project smoothly and to operate and maintain the project facilities satisfactorily.

- (1) To implement the construction works under the responsibility of the Government of Kenya, in particular extension of electricity, water supply and telephone circuits.
- (2) To arrange and prepare organizational system for the construction works of the Project.
- (3) To carry out the rehabilitation works excluded from the Project, i.e. rehabilitation of the existing irrigation canals with the design discharge of less than 2 m³/sec and desilting of the drainage canals, at the earliest time by using the O&M equipment to be provided under the Project.
- (4) To improve the reception centres according to the increase in paddy production in future.
- (5) To arrange financial budget and to educate and train required staff for the Project. Particularly operators and mechanics additionally required in accordance with the increase in number of agricultural machinery are to be recruited and trained.
- (6) To maintain and inspect the facilities, machinery and equipment adequately and regularly.

TABLES AND FIGURES

Table 3.1 Monthly Meteorological Records

Month	Temperature (°C)		Relative humidity (%)		Evaporation (mm/day)		Mean Wind Speed (km/day)	Sunshine Hours (hrs/day)	Radiation (cal/cm ² /day)	Rainfall		
	Max.	Min.	Max. a.m.	Min. p.m.	Mean	Piche				Pan (class A)	Depth (mm)	No. of Days
Jan.	29.4	14.9	66	40	53	-	7.1	134	9.2	645	21	2
Feb.	31.0	15.6	61	33	47	-	8.2	145	9.4	675	12	1
Mar.	31.6	17.2	68	35	52	-	8.2	154	8.4	639	94	5
Apr.	28.9	18.3	76	48	62	-	5.7	124	7.0	587	281	13
May	27.3	17.8	76	53	65	-	5.2	111	6.5	561	137	7
Jun.	25.8	16.5	76	51	64	-	4.7	94	5.4	491	12	1
Jul.	25.2	15.8	76	49	63	-	4.5	112	4.3	441	6	1
Aug.	26.1	16.0	74	45	60	-	5.1	139	4.6	471	7	2
Sep.	28.4	16.8	69	36	53	-	7.0	177	6.5	589	17	1
Oct.	29.4	17.5	71	40	56	-	6.6	143	7.2	602	142	7
Nov.	27.6	17.0	77	54	66	-	5.1	118	6.9	573	147	10
Dec.	27.6	15.9	72	51	62	-	5.6	126	7.3	600	50	3
Total	338.3	199.3	862	535	703	-	73.0	1,577	82.7	6,874	926	53
Average	28.2	16.6	72	45	59	-	6.1	131	6.9	573	77	4

Note: Number of rainy days is counted for daily rainfall of more than 5mm.

Table 5.1

Effective Rainfall (ER) and Farm Water Requirement (FWR)

(Unit: mm)

Month	Day	Long Rains Rice		Short Rains Rice	
		ER	FWR	ER	FWR
Jan.	1-10	-	-	0	19
	11-20	-	-	0	6
	21-31	-	-	-	-
Feb.	1-10	-	-	-	-
	11-20	0	10	-	-
	21-28	0	25	-	-
Mar.	1-10	21	43	-	-
	11-20	0	67	-	-
	21-31	15	75	-	-
Apr.	1-10	29	48	-	-
	11-20	38	39	-	-
	21-30	25	45	-	-
May	1-10	90	1	-	-
	11-20	25	28	-	-
	21-31	23	30	-	-
Jun.	1-10	0	29	-	-
	11-20	0	21	-	-
	21-30	0	13	-	-
Jul.	1-10	0	4	-	-
	11-20	-	-	0	7
	21-31	-	-	0	24
Aug.	1-10	-	-	14	33
	11-20	-	-	6	47
	21-31	-	-	0	65
Sep.	1-10	-	-	0	82
	11-20	-	-	0	83
	21-30	-	-	0	75
Oct.	1-10	-	-	0	63
	11-20	-	-	0	60
	21-31	-	-	43	26
Nov.	1-10	-	-	70	0
	11-20	-	-	38	25
	21-30	-	-	39	23
Dec.	1-10	-	-	9	40
	11-20	-	-	0	37
	21-31	-	-	0	30

Table 5.2

Unit Diversion Water Requirement

(Unit: lit/sec/ha)

Month	Day	Long Rains Rice	Short Rains Rice
Jan.	1-10	-	0.40
	11-20	-	0.13
	21-31	-	-
Feb.	1-10	-	-
	11-20	0.22	-
	21-28	0.65	-
Mar.	1-10	0.90	-
	11-20	1.42	-
	21-31	1.44	-
Apr.	1-10	1.01	-
	11-20	0.81	-
	21-30	0.96	-
May	1-10	0.01	-
	11-20	0.60	-
	21-31	0.57	-
Jun.	1-10	0.61	-
	11-20	0.45	-
	21-30	0.28	-
Jul.	1-10	0.09	-
	11-20	-	0.15
	21-31	-	0.46
Aug.	1-10	-	0.70
	11-20	-	0.99
	21-31	-	1.24
Sep.	1-10	-	1.72
	11-20	-	1.74
	21-30	-	1.58
Oct.	1-10	-	1.34
	11-20	-	1.27
	21-31	-	0.49
Nov.	1-10	-	0.00
	11-20	-	0.52
	21-30	-	0.49
Dec.	1-10	-	0.85
	11-20	-	0.79
	21-31	-	0.57

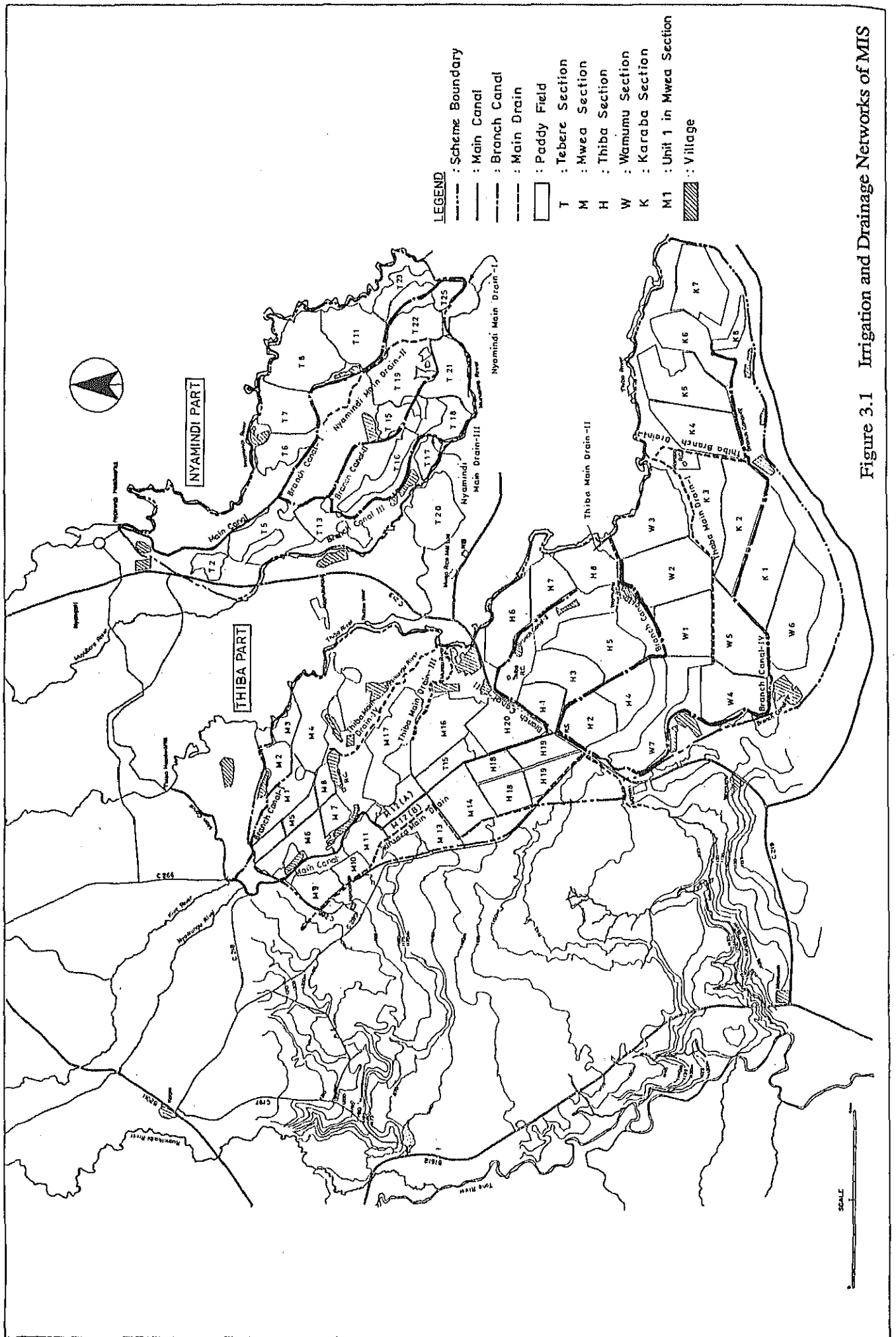


Figure 3.1 Irrigation and Drainage Networks of MIS

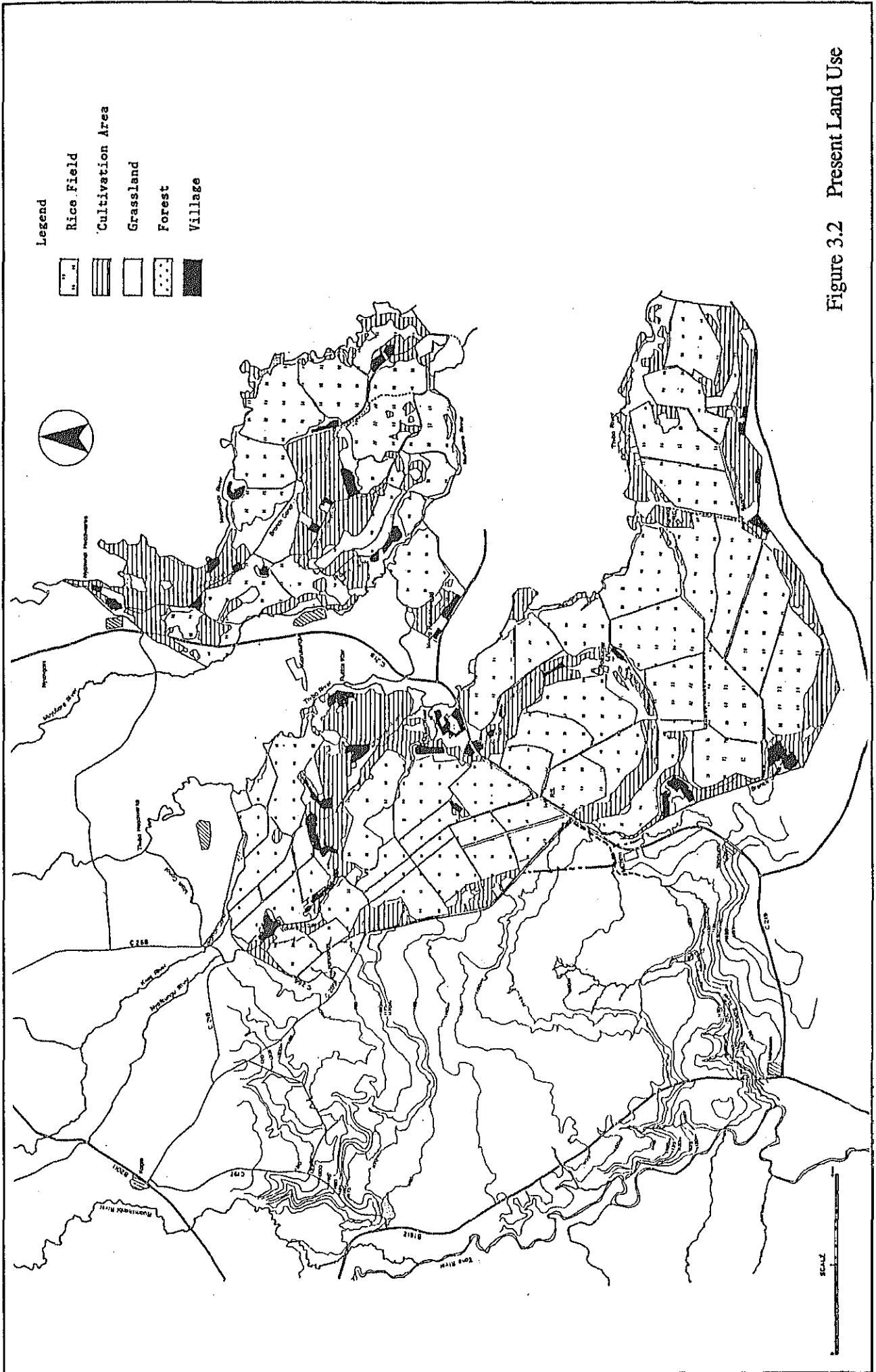


Figure 3.2 Present Land Use

LEGEND

- : Main Canal
- - - : Branch Canal
- : Main Feeder Canal
- : Main Drain
- - - : Collector Drain
- : Re-Use Point
- M : Mweo Section
- H : Thiba Section
- W : Wamumu Section
- K : Kacaba Section
- T : Tebers Section
- M1 : Unit I In Mweo Section
- : Name of Unit
- : Area of Paddy (ha)
- : Discharge (m³/s)
- : Name of Unit
- : Area of Surrounding Land (ha)
- : Discharge (m³/s)
- : Accumulated Area of Paddy (ha.)
- : Accumulated Area of H.C. (ha.)
- : Discharge (m³/s)
- () : Figure in Parenthesis means Irrigable Area By Re-Use of Drainage Water

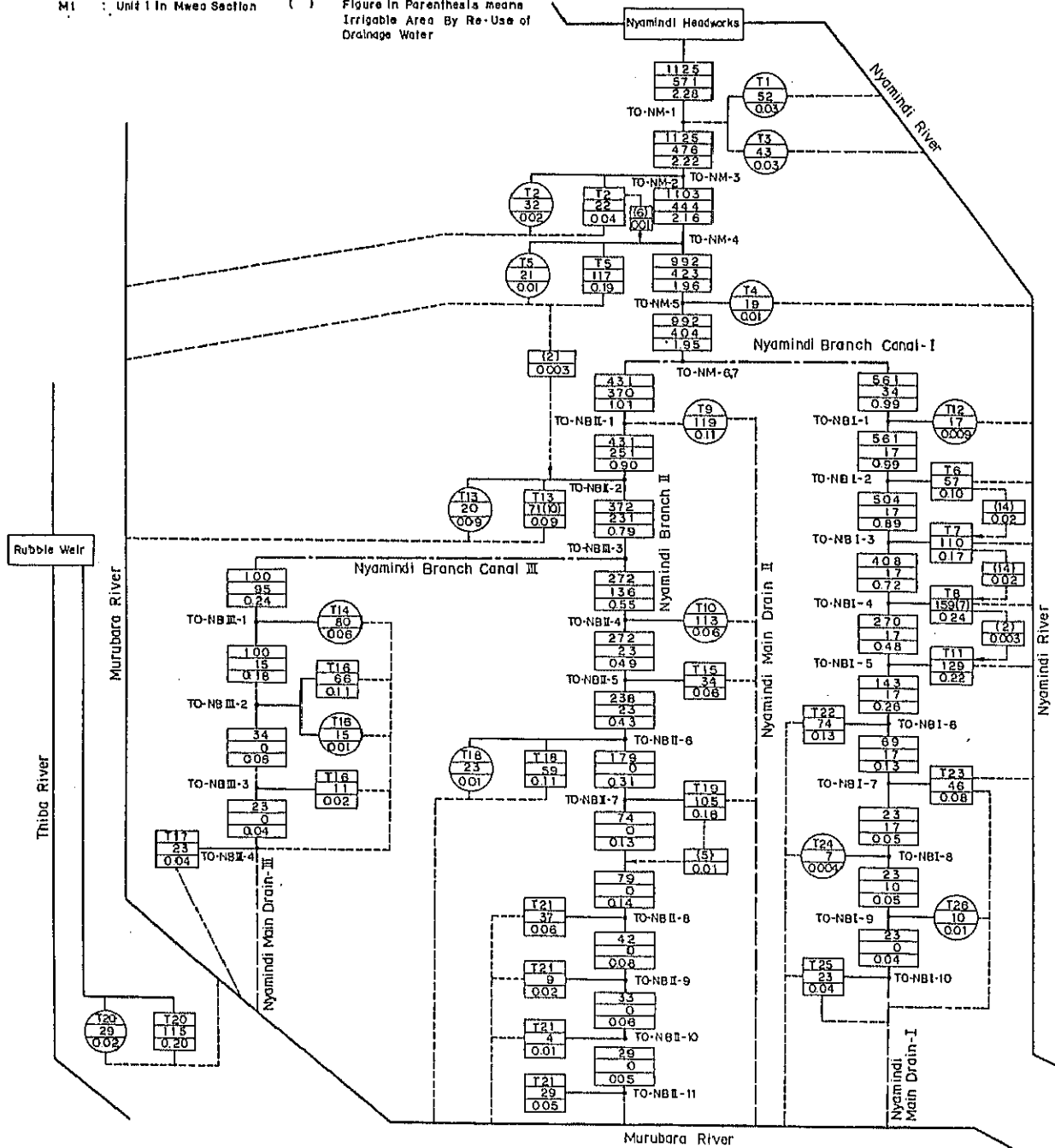


Figure 3.3 Irrigation Diagramme of MIS (1/2)

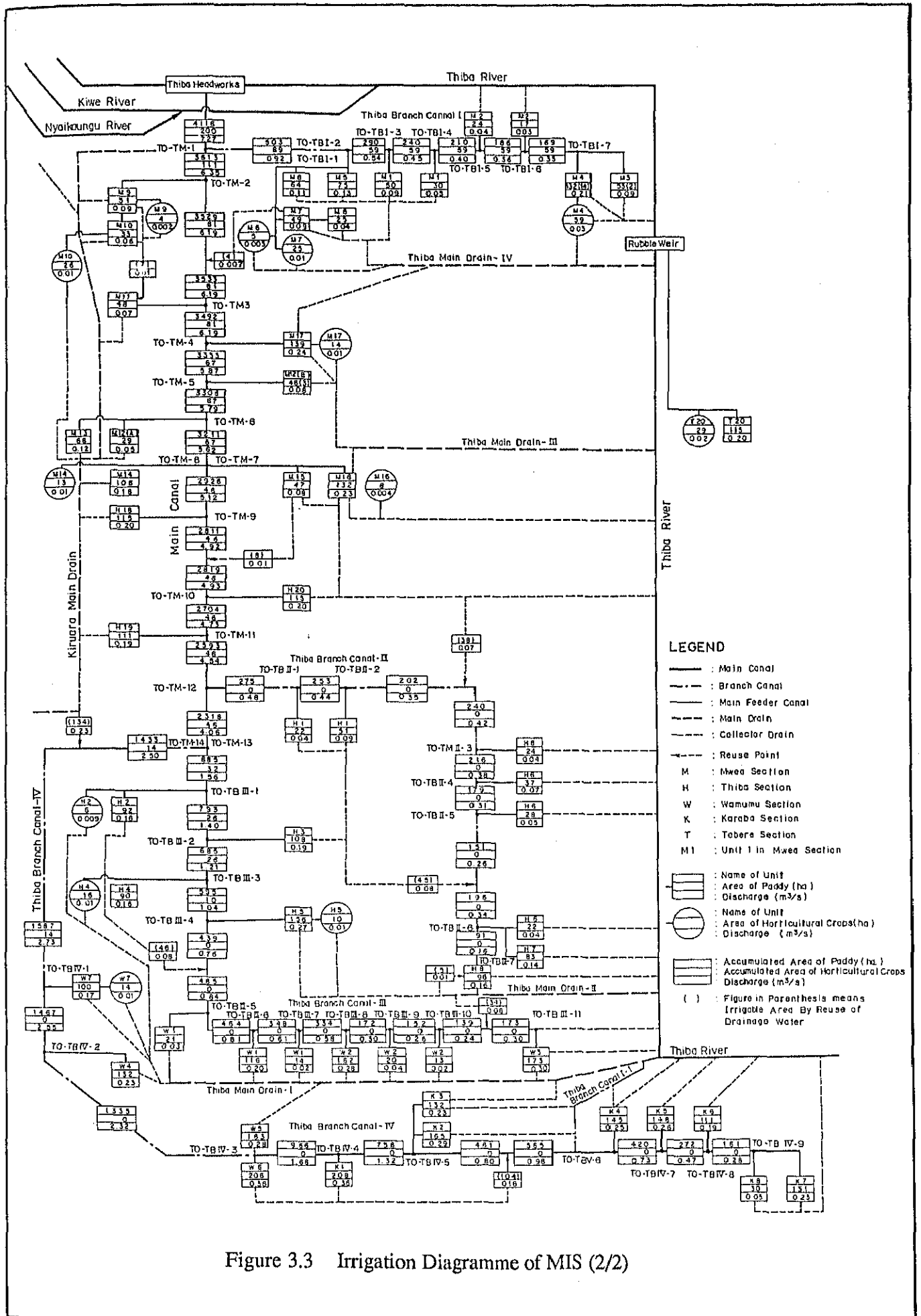
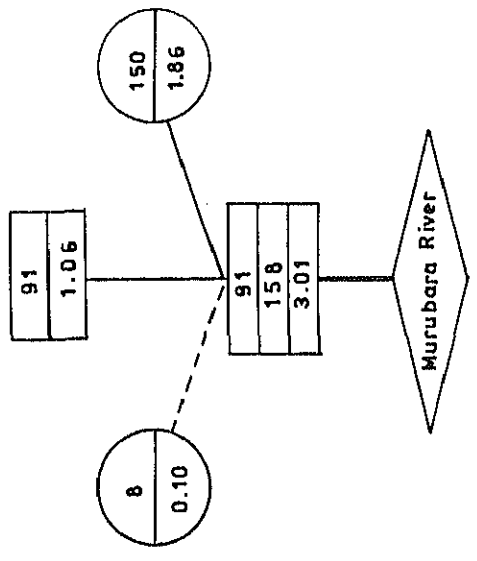
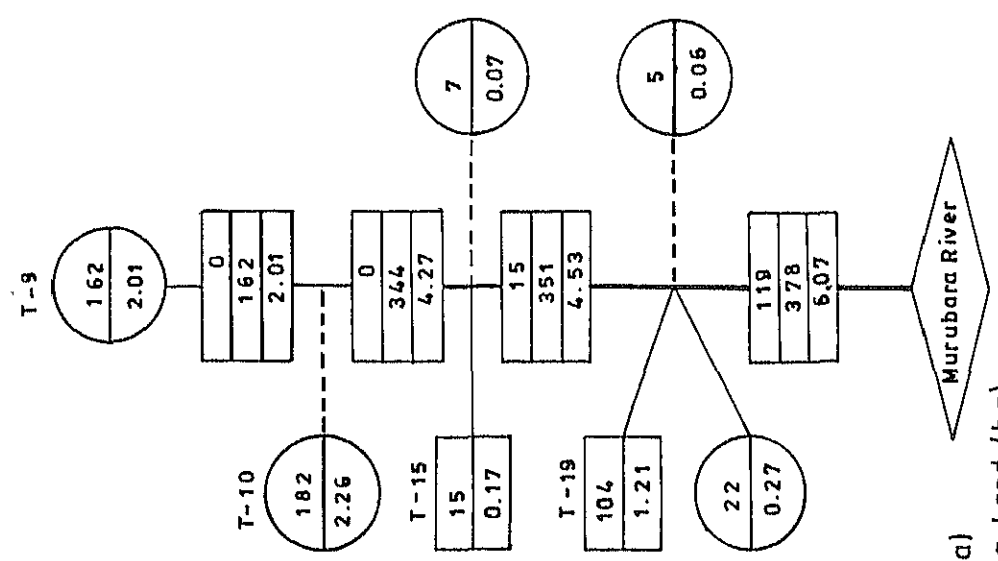


Figure 3.3 Irrigation Diagramme of MIS (2/2)

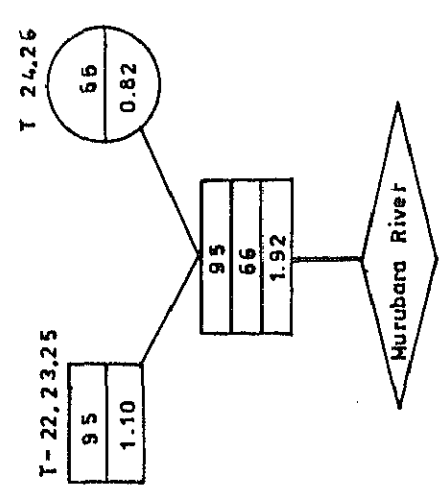
Nyamindi Main Drain - III



Nyamindi Main Drain - II



Nyamindi Main Drain - I



LEGEND

- : Main Drain
- - - : Collector Drain
- ▭ : Area of Paddy (ha)
- ▭ : Discharge (m³/s)
- : Area of Surrounding Land (ha)
- : Discharge Area (m³/s)
- ▭ : Accumulated Area of Paddy (ha)
- ▭ : Accumulated Area of Surrounding Land (ha)
- ▭ : Discharge (m³/s)

Figure 3.4 Drainage Diagramme of MIS (1/3)

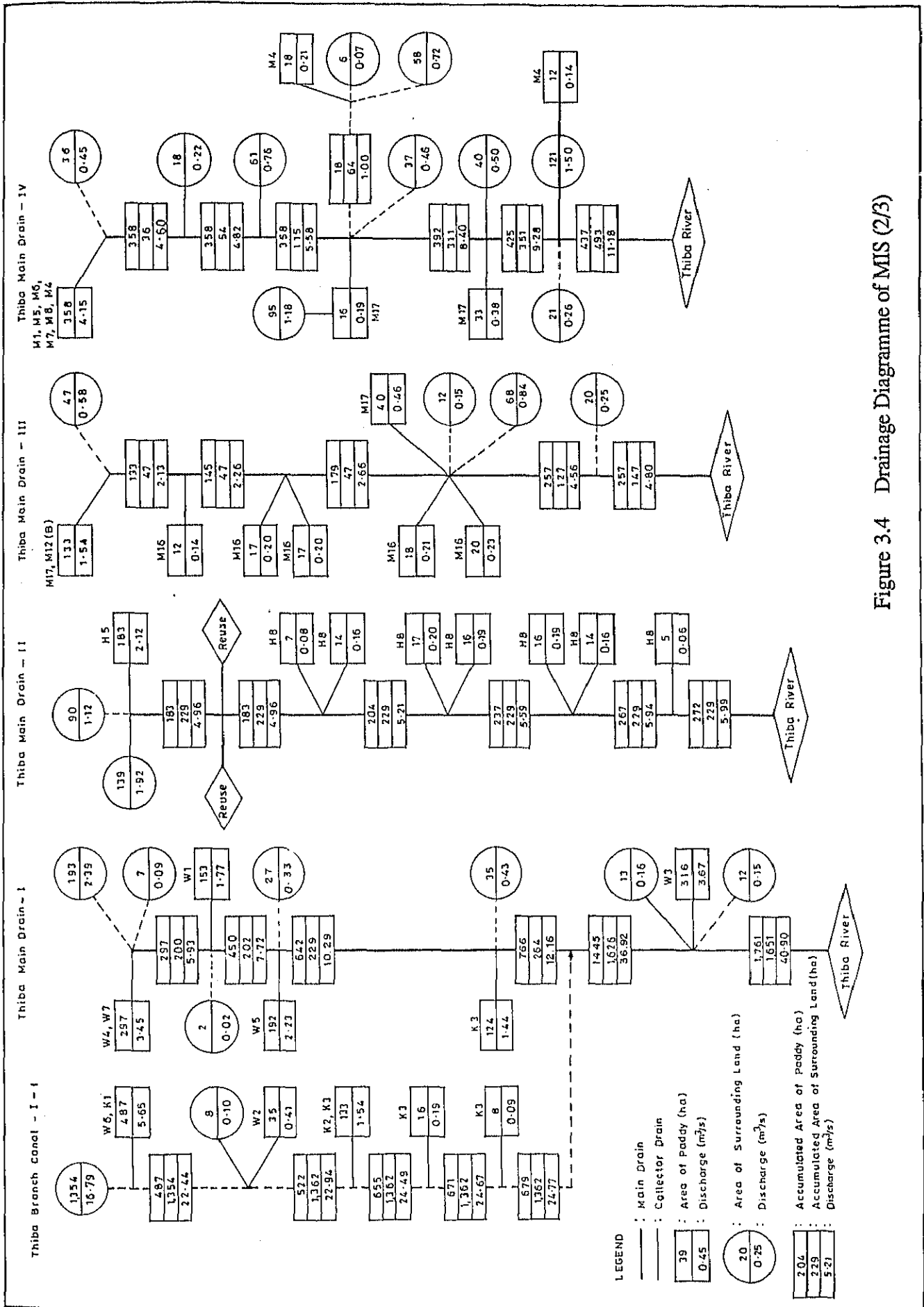


Figure 3.4 Drainage Diagram of MIS (2/3)

Kiruara Main Drain.

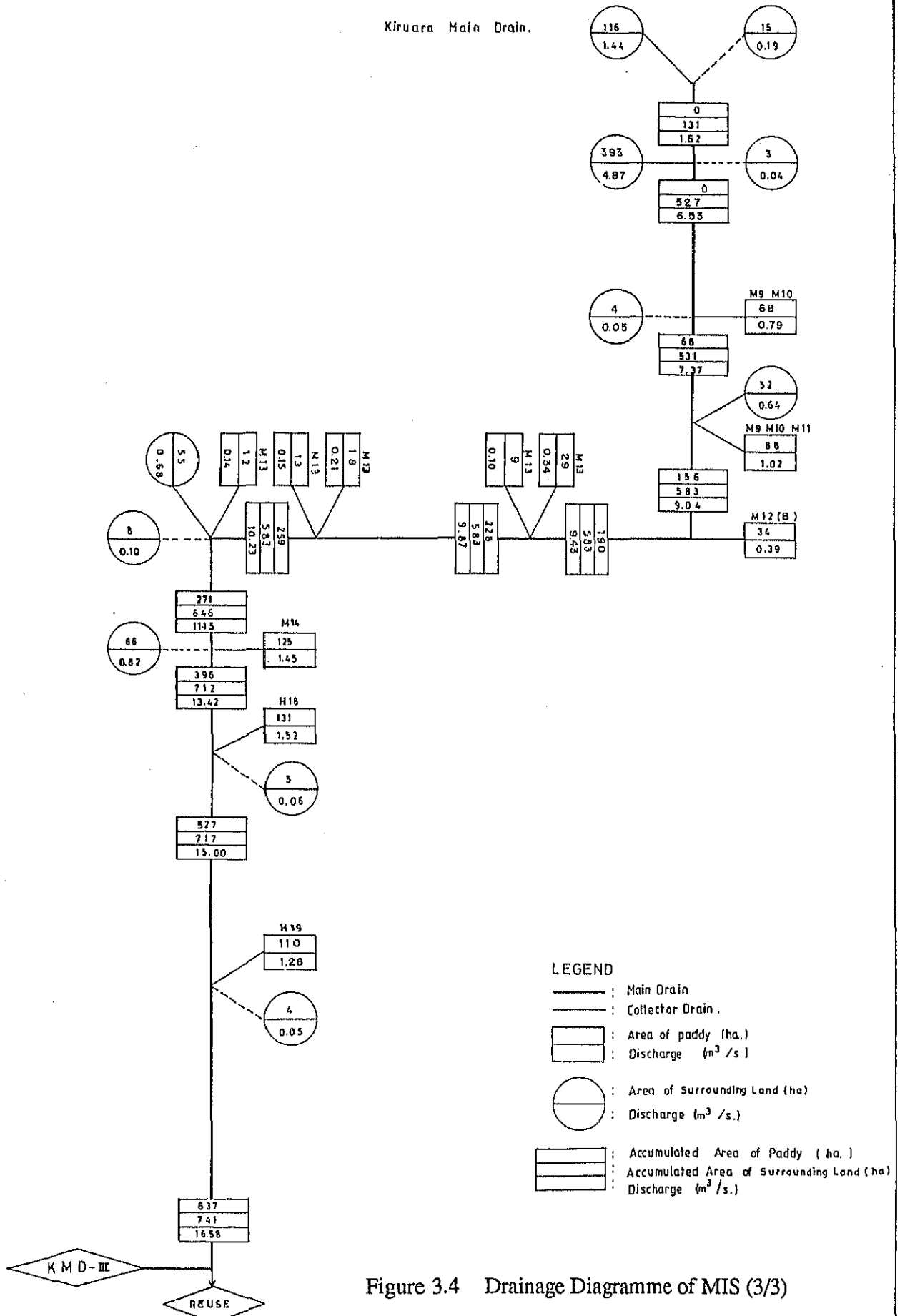


Figure 3.4 Drainage Diagramme of MIS (3/3)

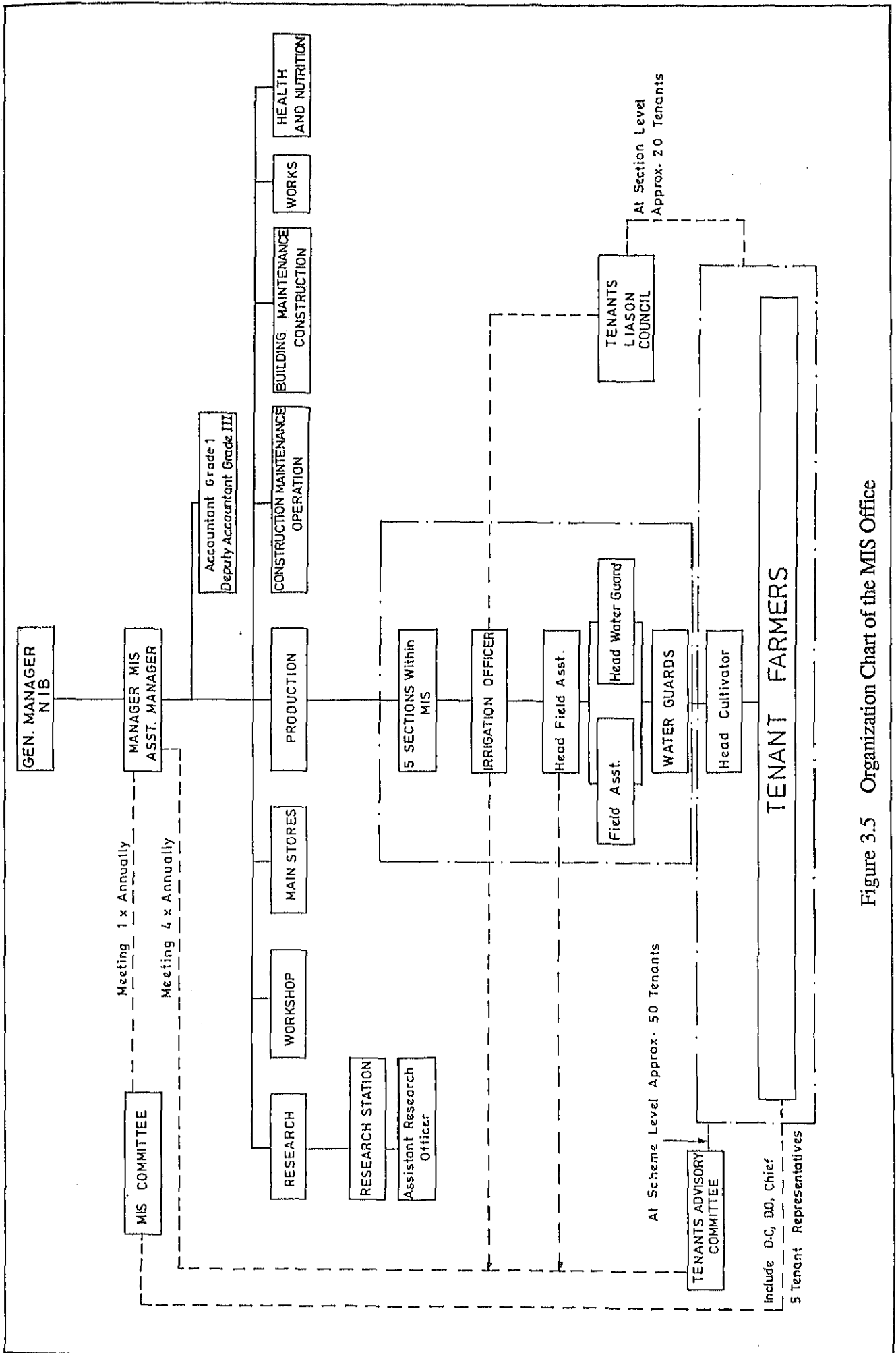
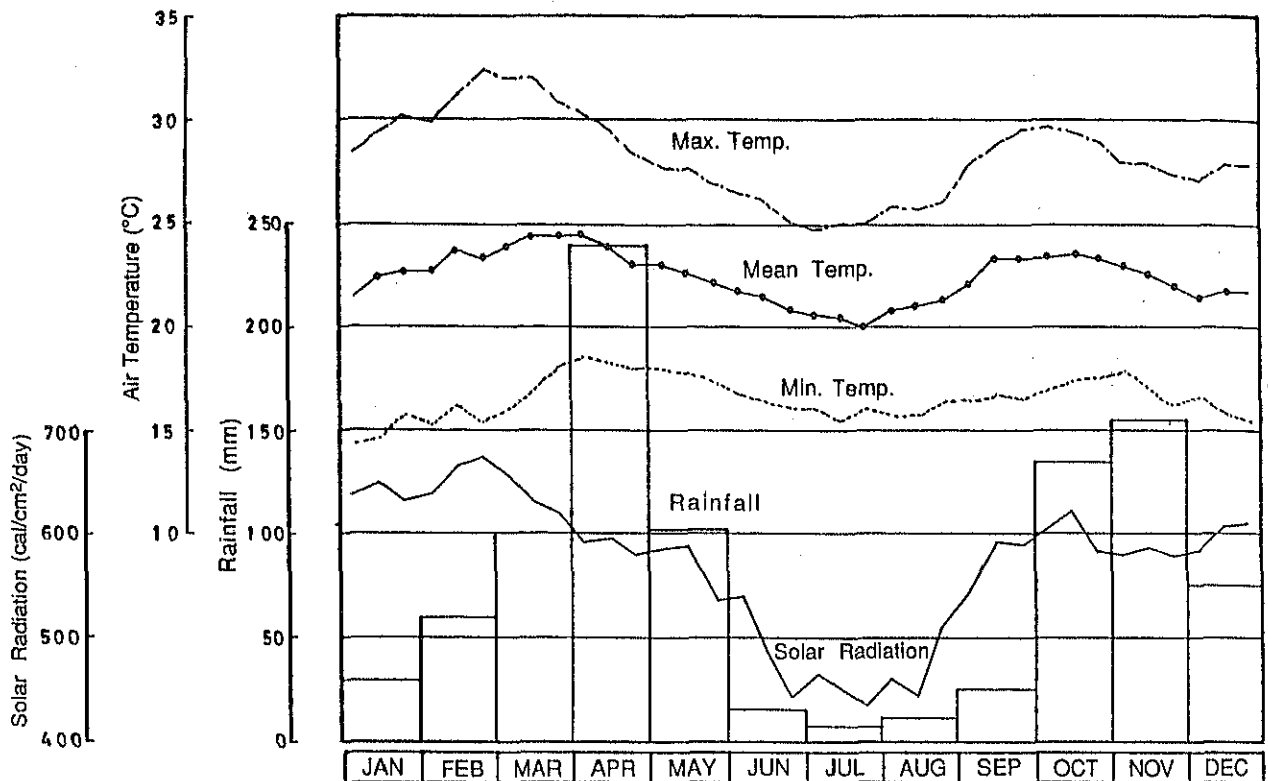
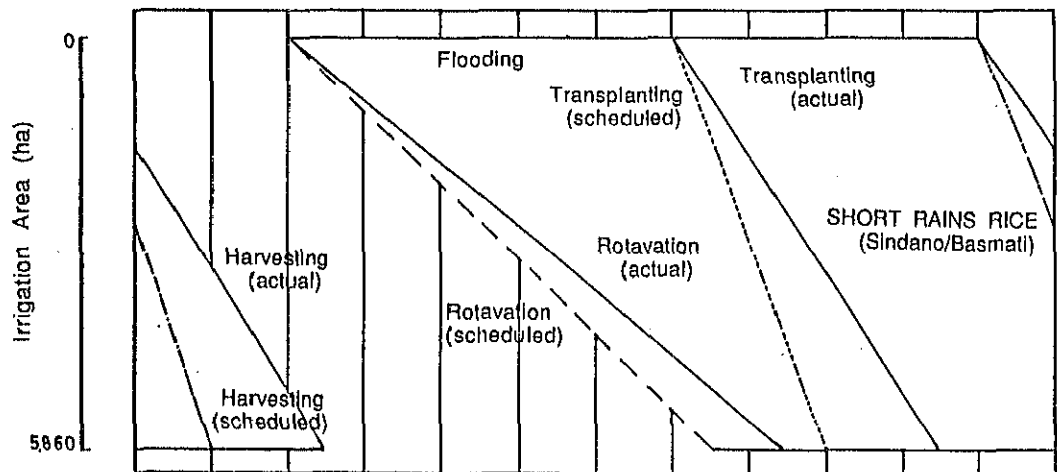


Figure 3.5 Organization Chart of the MIS Office



1. PRESENT CROPPING PATTERN



2. PROPOSED CROPPING PATTERN

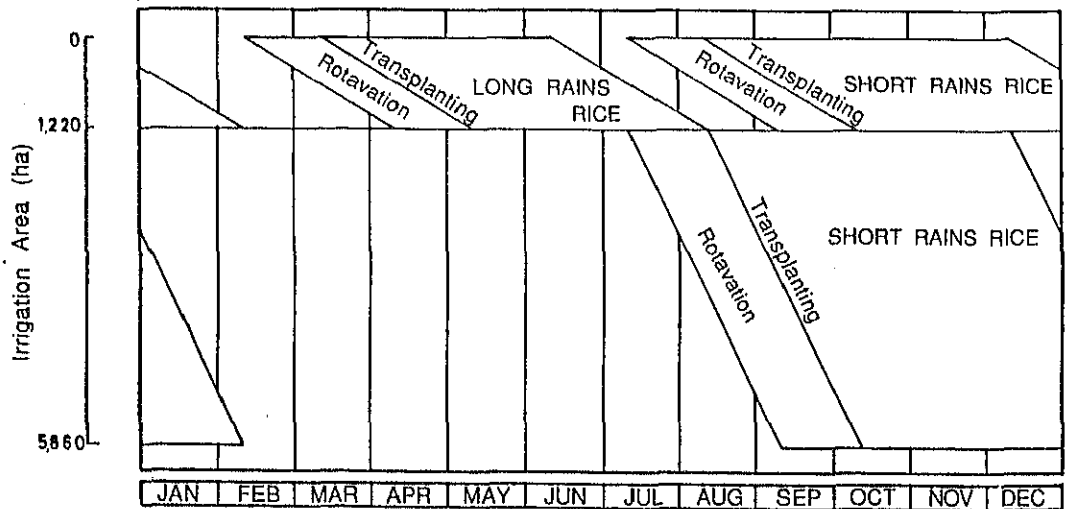


Figure 4.1 Present and Proposed Cropping Pattern

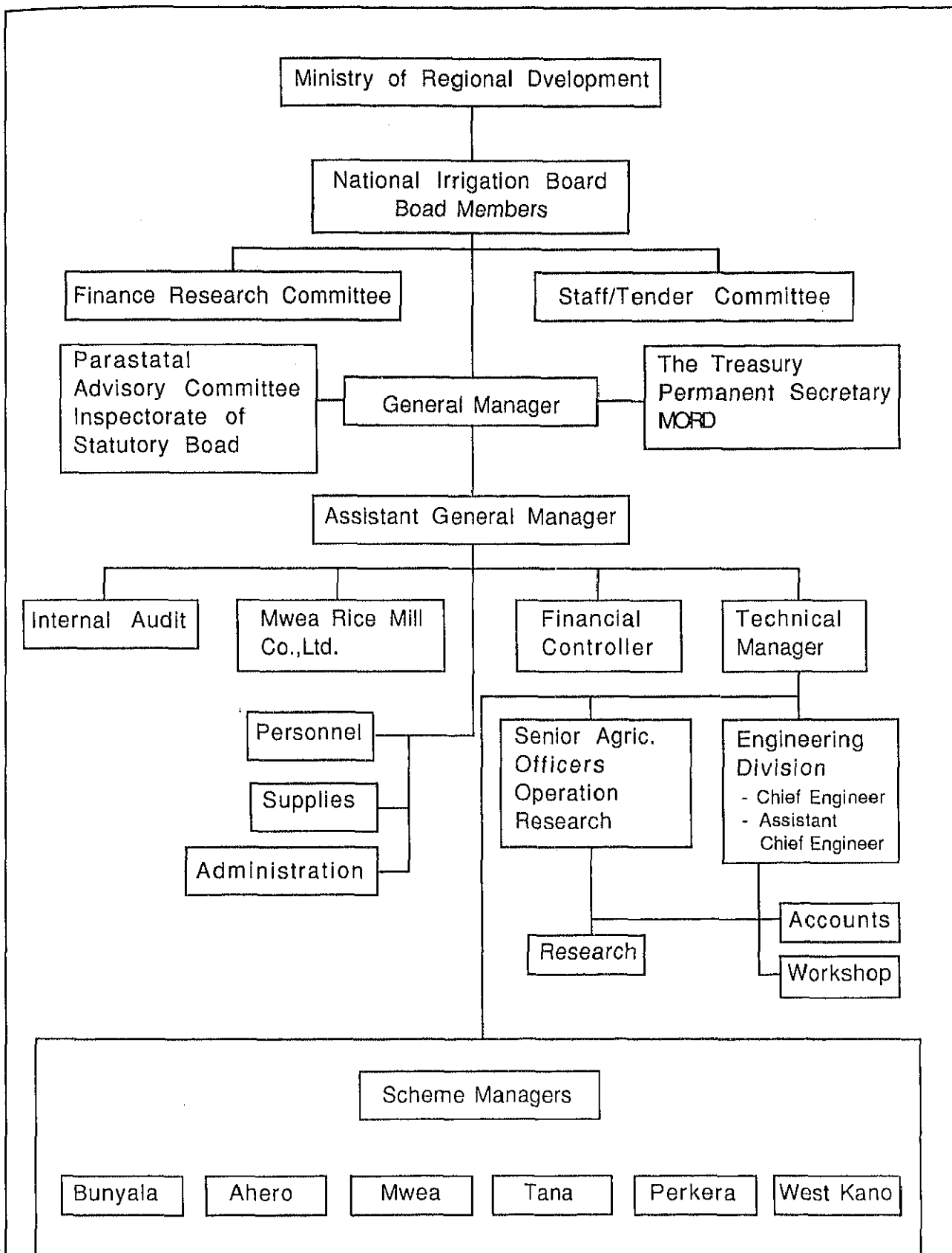


Fig. 4.2 ORGANIZATION CHART OF NIB

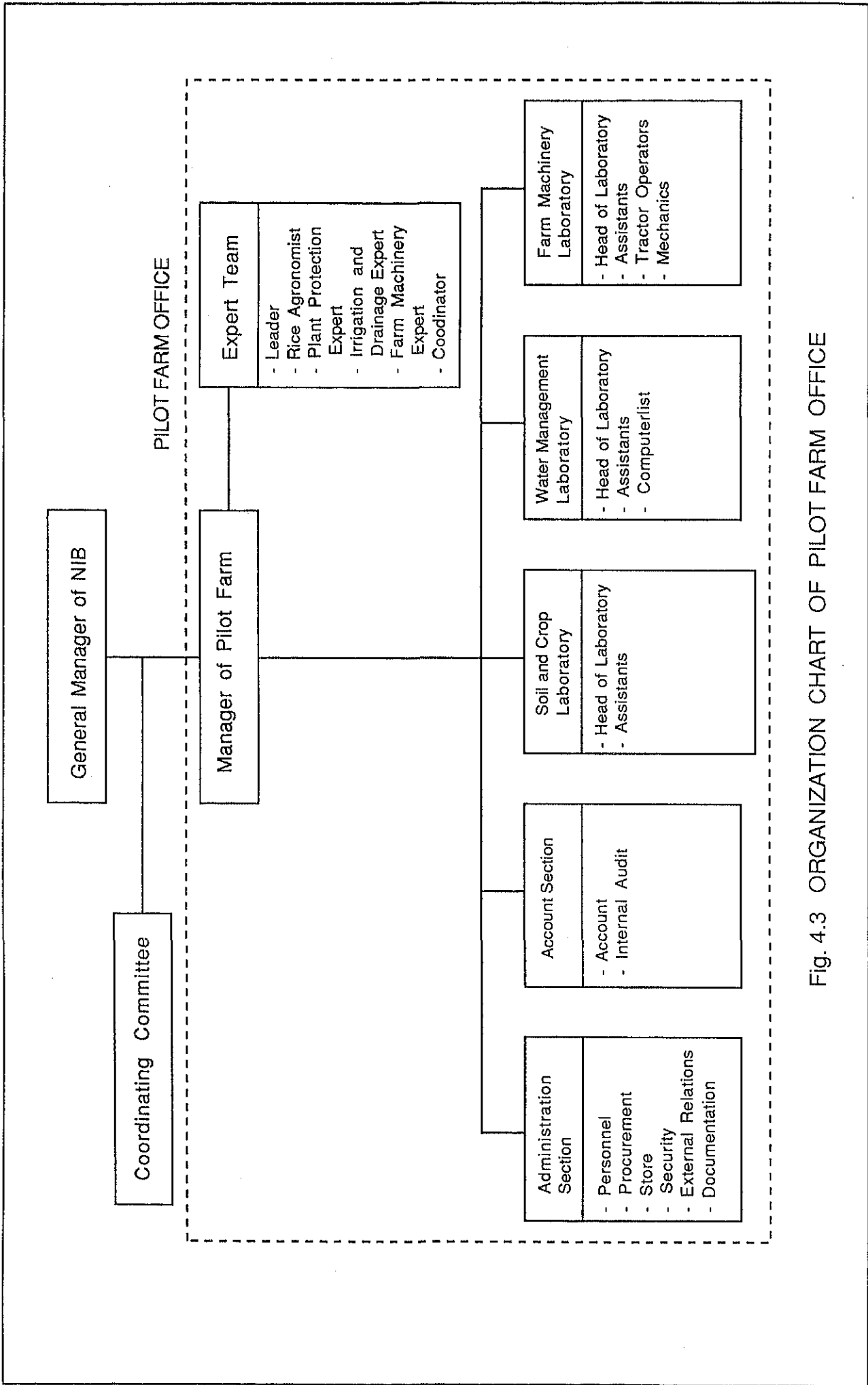
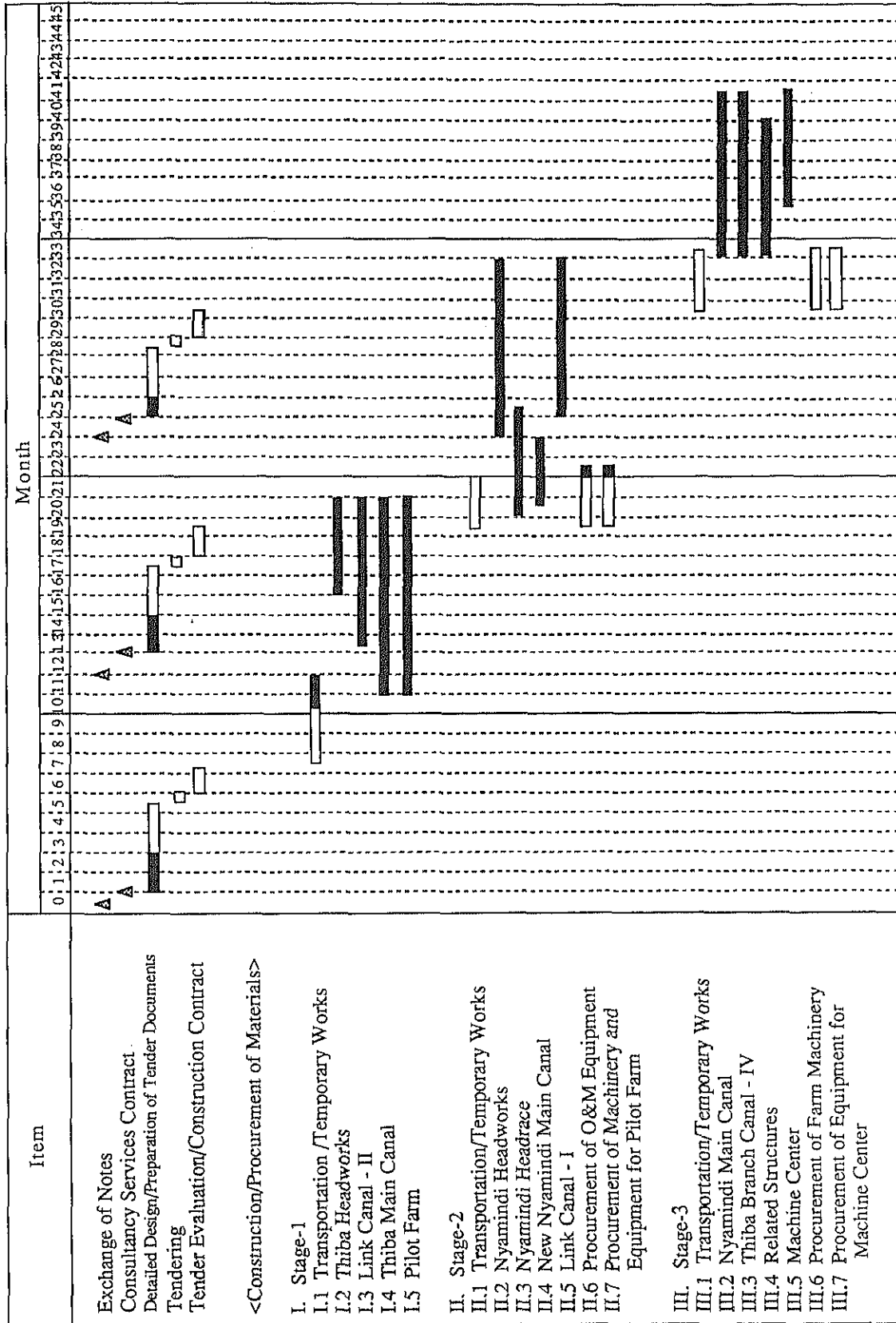


Fig. 4.3 ORGANIZATION CHART OF PILOT FARM OFFICE

FIG. 5.1 CONSTRUCTION SCHEDULE



Legend □ : Work in Japan ■ : Work in Kenya / Construction

APPENDICES

MEMBER LIST OF THE BASIC DESIGN STUDY TEAM

Position	Name	Home Post
Team Leader	Mr. Katsuhide KONDO	Ministry of Agriculture, Forestry and Fisheries
Grant Aid Cooperation Planner	Mr. Shin-ichi TERAMURA	Ministry of Foreign Affairs
Agricultural Development Planner	Mr. Takayoshi YAMAZAKI	Nippon Koei Co., Ltd.
Irrigation & Drainage Planner	Mr. Kiyotaka MIZUSHIMA	Nippon Koei Co., Ltd.
Facility Design Engineer	Mr. Teruo KAJIMOTO	Nippon Koei Co., Ltd.
Agriculture & Construction Machinery Planner	Mr. Masayuki KOHYAMA	Nippon Koei Co., Ltd.
Cost Estimation Expert	Mr. Masayuki KODAMA	Nippon Koei Co., Ltd.

ACTIVITIES OF THE STUDY TEAM

Date	Activities
Jan. 20 Fri.	Leave Tokyo (except Mr. Teramura)
21 Sat.	Leave London (Messrs. Kondo, Kajimoto and Kohyama), Frankfurt (Messrs. Yamazaki and Mizushima)
22 Sun.	Arrive in Nairobi
23 Mon.	Courtesy call to Embassy of Japan and JICA Office, Presentation of the Interim Report
24 Tue.	Courtesy call to Ministry of Regional Development and NIB, Discussion on the Interim Report
25 Wed.	Field survey
26 Thr.	Field survey
27 Fri.	Field survey, Team meeting
28 Sat.	Mr. Teramura leaves Nairobi Preparation for the meeting with NIB, Data collection (Mr. Kohyama), Preparation for surveying (Mr. Kajimoto)
29 Sun.	Mr. Teramura leaves London Data arrangement and preparation for the meeting with NIB, Data collection (Mr. Kohyama), Preparation for surveying (Mr. Kajimoto)
30 Mon.	Mr. Teramura arrives in Tokyo Meeting with NIB, Preparation of the Minutes of Discussion, Team meeting
31 Tue.	Meeting with NIB and signing of the Minutes of Discussion
Feb. 1 Wed.	Mr. Kondo leaves Nairobi Data collection, Field survey (Mr. Kajimoto), Discussion with NIB
2 Thr.	Mr. Kondo leaves London Data collection, Field survey (Mr. Kajimoto)
3 Fri.	Mr. Kondo arrives in Tokyo Discussion with NIB, Data collection, Field survey (Messrs. Kajimoto and Kohyama)
4 Sat.	Data collection, Field survey (Messrs. Mizushima, Kajimoto and Kohyama)
5 Sun.	- do -
6 Mon.	Discussion with NIB, Study on the survey results, Field Survey (Mr. Kohyama)
7 Tue.	Basic planning, Collection and arrangement of data, study of the survey results
8 Wed.	- do -
9 Thr.	Report the study results to NIB, Discussion on the basic plan
10 Fri.	Collection and arrangement of data, Facility designing
11 Sat.	Mr. Kohyama leaves Nairobi Collection and arrangement of data, Study of the survey results
12 Sun.	Mr. Kohyama leaves Frankfurt Collection and arrangement of data, Study of the survey results
13 Mon.	Mr. Kohyama arrives in Tokyo Collection and arrangement of data, Study of the survey results, Field survey (Mr. Yamazaki)
14 Tue.	Discussion with NIB, Collection and arrangement of data, Field survey (Mr. Kajimoto)
15 Wed.	- do -
16 Thr.	Report the study results to JICA Office, Data collection, Facility designing for pilot farm
17 Fri.	Preparation of the Field Note, Data collection, Facility designing for pilot farm
18 Sat.	Preparation of the Field Note, Data arrangement, Facility designing for pilot farm
19 Mon.	Courtesy call and report of the study results to NIB, Embassy of Japan, JICA Office
20 Tue.	Leave Nairobi
21 wed.	Leave London
22 Thr.	Arrive in Tokyo

LIST OF PERSONNEL CONTACTED

1. Ministry of Regional Planning

Mr. A. Vienna : Deputy Director

2. National Irrigation Board

Mr. J.K. Mbandi : General Manager
Mr. B.T.C. Bargoria : Deputy General Manager
Mr. Z.K. Shimba : Financial Controller
Mr. E.K. Cheserem : Chief Engineer
Mr. J.P. Olum : Assistant Chief Engineer
Mr. J.J. Njoka : Senior Agricultural Officer
Mr. J. Marete : Assistant Engineer
Mr. S.N. Kiguru : Mechanical Engineer
Mr. A.A. Mondhar : Scheme Manager for MIS

3. The Treasury

Miss. W.W. Ikua

4. The Embassy of Japan

H.E. Takashi Sengoku : Ambassador Extraordinary and
Plenipotentiary
Mr. Shisei Kaku : Counselor
Mr. Nobuyuki Horie : First Secretary

5. JICA Nairobi Office

Mr. Kenji Kumagishi : Resident Representative
Mr. Seiji Kaiho
Mr. Ryuji Matsunaga
Mr. Masayoshi Juro
Mr. Mitsuo Hirano

ON
THE DRAFT FINAL REPORT OF THE BASIC DESIGN STUDY
FOR
THE MWEA IRRIGATION SETTLEMENT SCHEME DEVELOPMENT PROJECT
IN
THE REPUBLIC OF KENYA

In response to the request of the Government of the Republic of Kenya for Grant Aid for the Mwea Irrigation Settlement Scheme Development Project (hereinafter referred to as "the Project"), the Government of Japan decided to conduct a basic design study on the Project and entrusted the study to the Japan International Cooperation Agency (JICA).

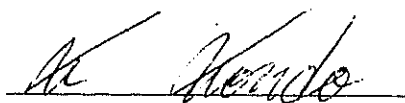
JICA sent the Basic Design Study Team headed by Mr. Katsuhide Kondoh, Deputy Director, Construction Department, Chugoku-shikoku Regional Agricultural Administration Bureau, Ministry of Agriculture, Forestry, and Fisheries, in January to February, 1989.

The Basic Design Study Team had a series of discussions on the Project with the officials concerned of the Government of the Republic of Kenya and carried out field survey.

As a result of the discussions and surveys, JICA prepared the Draft Final Report and dispatched a team to explain and discuss on the Draft Final Report from May 12 to 24, 1989.

Both sides had a series of discussions and have agreed to recommend to their respective Governments that the major points of understanding reached between them, attached herewith, should be examined towards the realization of the Project.

19 May 1989



Mr. Katsuhide Kondoh
Leader
JICA Study Team



Mr. Alfred Vienna
Leader
Kenya Team
M.O.R.D.

ATTACHMENT - 1

1. The Kenya side has agreed in principle to the basic design proposed in the Draft Final Report. Minor but appropriate alterations mutually agreed upon will be incorporated in the Final Report.
2. The Kenya side understood Japan's Grant Aid system and reconfirmed the measures to be taken by the Government of the Republic of Kenya for the realization of the Project as agreed upon in the Minutes of Discussions dated January 31, 1989, as per attached (Attachment - 2).
3. The Kenya side proposed to the JICA Team that six (6) expert houses and a lecturers' house be constructed at site near the MIS office. The JICA Team will convey the proposal to the JICA Tokyo and Ministries concerned.
4. The JICA Team and the Kenya side discussed the detailed construction schedule for stage - I and agreed on as described in Attachment - 3.
5. JICA will submit the Final Reports (10 copies in English) to the Kenya side in June, 1989.

ATTACHMENT-2

MINUTES OF DISCUSSIONS
ON THE PROJECT FOR
MWEA IRRIGATION SETTLEMENT DEVELOPMENT
IN
THE REPUBLIC OF KENYA

In response to paragraph 7 of the attachment to the Agreed Minutes of 21st October, 1988 and the request made by the Government of the Republic of Kenya, the Government of Japan decided to conduct a Basic Design Study for Grant Aid to the Mwea Irrigation Settlement Development Project. The Government of Japan entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as JICA). Accordingly JICA sent to the Republic of Kenya the Basic Design Study Team headed by Mr. Katsuhide Kondoh, Deputy Director, Construction Department, Chugoku-Shikoku Regional Agricultural Administration Bureau, Ministry of Agriculture, Forestry and Fisheries, from January 20th to February 23rd, 1989.

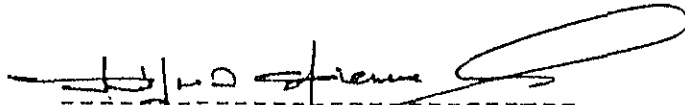
The study team had a series of discussions on the Project with officials of the Government of the Republic of Kenya and the National Irrigation Board, and also conducted a field survey in the proposed Project area. The Kenya team was headed by Mr. Alfred Vienna, Deputy Secretary, Ministry of Regional Development.

The composition of the JICA Basic Design Study Team and that of the Kenya Team is enumerated in Annex III to these Minutes.

As a result of this basic design study, both parties agreed to recommend to their respective Governments that the major points of understanding reached between them, and attached herewith as Annex I to these Minutes, should be examined towards the realization of the Project.



Mr. Katsuhide Kondoh
Leader
Basic Design Study Team
JICA



Mr. Alfred Vienna
Leader
Kenya Team
M.O.R.D

Dated this 31st day of January, 1989.
NAIROBI.

ANNEX I.

OBJECTIVES OF THE PROJECT

The objectives of the project are to rehabilitate and improve the facilities of the Mwea Irrigation Settlement Scheme (MIS) and to construct a Pilot Farm and Buildings for the stabilization and increased yield and production at the Scheme.

PROJECT TITLE

The Project is defined "Mwea Irrigation Settlement Scheme Development Project", which title should be used from now on.

PROJECT SITE



The Project site is Mwea Irrigation Settlement Scheme Area, as defined in the map attached as Annex II.

EXECUTING AGENCY OF THE PROJECT

For the purpose of implementing this Project it has been agreed that the National Irrigation Board (hereinafter referred to as NIB) will be responsible for execution of the Project.

SCOPE OF THE PROJECT

The scope of the Project will be determined on the basis of the recommendations of the JICA Basic Design Study and in conformity with the extent of the technical appraisal which will be conducted by the Government of Japan. The request made by the Government of the Republic of Kenya on the project components are as follows:-

- (a) Rehabilitation of existing irrigation facilities and infrastructure.
- Thiba Headworks.
 - Link Canal II and related structures.
 - Main canals, branch canals in part, and farm/operation roads along the canals.
 - Irrigation structures on the main canals and branch canals in part.
- (b) Construction of new irrigation facilities and infrastructure.
- New Nyamindi headworks.
 - New Nyamindi headrace.
- 
- 

- New Nyamindi main canal.
 - Link Canal I, and
 - Irrigation structures on the above canals.
- (c) Construction of Pilot Farm.
- Paddy fields and irrigation system, and
 - Related buildings, such as offices, warehouses, etc.
- (d) Construction of Buildings.
- Five (5) reception centers.
 - A machine centre.
- (e) Provision of Agricultural Machinery and Operational and Maintenance equipment.

6. UNDERSTANDING OF THE GOVERNMENT OF JAPAN

The Basic Design Study Team will convey to the Government of Japan the request of the Government of the Republic of Kenya that the Government of Japan will take the necessary measures to cooperate in the implementation of the Project within the range of the Japanese Grant Aid Programme.

7. UNDERSTANDING OF THE JAPANESE GRANT AID SYSTEM

The Kenya side has understood the Terms and Conditions of the Japanese Grant Aid System, as explained by the Japanese Team, which includes a condition for the use of a Japanese Consultancy Firm and Japanese General Contractors for the construction and supply of equipment and material.

8. OBLIGATIONS OF THE GOVERNMENT OF KENYA

The Government of the Republic of Kenya will be responsible, through NIB, for the providing the following services:-

- (a) To secure the lands for the proposed facilities in the project.
- (b) To clear and reclaim the above lands as required before commencement of the construction.
- (c) To rehabilitate the minor irrigation facilities for existing paddy field of 5,860 ha in MIS scheme area using the operation and maintenance equipment provided in the first stage of the Project.
- (d) To provide facilities for distribution of electricity, domestic water supply, and incidental works leading and up to the project site.


- (e) To provide the necessary administrative services and facilities to the technical assistance personnel provided by the Government of Japan under the Grant Aid Agreement for this project.

9. PRIVILEGES AND IMMUNITIES

Details of the privileges and immunities to be provided by the Government of the Republic of Kenya, will be specified in the Exchange of Notes between the Government of Japan and the Government of the Republic of Kenya, which will constitute the Project Agreement.

10. PREPARATION AND EXPLANATION OF DRAFT FINAL REPORT

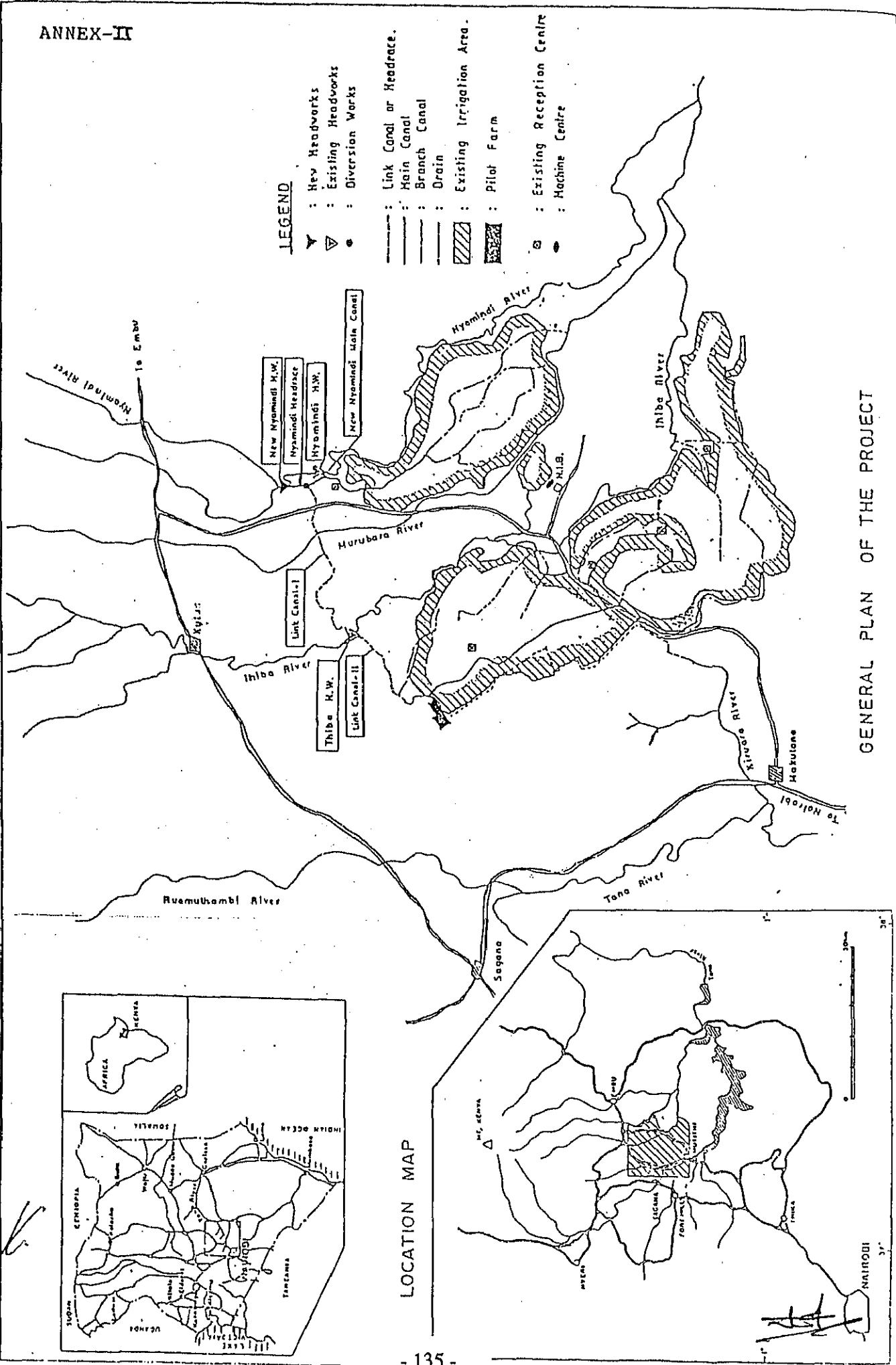
The Basic Design Study Team will prepare a final report on the project by early April, 1989, and will thereafter return to Kenya about mid April, 1989, to explain the report.



ANNEX-II

LEGEND

- ▽ : New Headworks
- ▽ : Existing Headworks
- : Diversion Works
- : Link Canal or Headrace.
- : Main Canal
- : Branch Canal
- : Drain
- ▨ : Existing Irrigation Area.
- ▩ : Pilot Farm
- ⊠ : Existing Reception Centre
- : Machine Centre



GENERAL PLAN OF THE PROJECT

LOCATION MAP

ANNEX III.

COMPOSITION OF PARTICIPANTS

A. JICA BASIC DESIGN STUDY TEAM

Mr. Katsuhide Kondoh Team Leader,
Ministry of Agriculture, Forestry and
Fisheries.

Mr. Shin-ichi Teramura Grant Aid Cooperation Planner,
Ministry of Foreign Affairs.

Mr. Takashi Yamazaki Agricultural Development Planner,
Nippon Koei Co., Ltd.,

Mr. Kiyotaka Mizushima Irrigation & Drainage Planner,
Nippon Koei Co., Ltd.,

Mr. Teruo Kajimoto Facility Design Engineer,
Nippon Koei Co., Ltd.,

Mr. Masayuki Kohyama Agriculture & Construction Machinery
Planner,
Nippon Koei Co., Ltd.,

B. Mr. Ryuji Matsunaga JICA Kenya Office.

C. GOVERNMENT OF KENYA TEAM

Mr. Alfred Vienna Team Leader,
Deputy Secretary, M.O.R.D.

Mr. J.P.K. Mbandi General Manager, NIB.

Mr. Z.B.K. Shimba Financial Controller/Secretary to the
Board, NIB.

Mr. Eric Cheserem Chief Engineer, NIB.

Mr. J.P. Olum Assistant Chief Engineer/Project
Co-ordinator, NIB.

Mr. S.N. Kiguru Mechanical Engineer, NIB.

Mr. S.N. Alukonya Senior Agricultural Officer, NIB.

Mr. J.J. Njokah Senior Agricultural Officer, NIB.

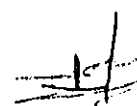
Mr. J.K. Marete Works Engineer, MIS/NIB.

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ATTACHMENT-3

1. Link Canal-II shall be dried up for rehabilitation of the canal during the period from the beginning of October, 1990 to the end of March, 1991.
2. Thiba Main Canal except for the small part of the canal shall be dried up for rehabilitation of the canal during the period from the middle of April, 1990 to the time of completion of the rehabilitation work.
3. NIB shall arrange and execute required diversion works for irrigation of areas commanded by the Thiba Main Canal during the construction period as mentioned in item 2. The Kenya side requested the JICA Team to arrange for the necessary pumping capacity during the reconstruction of the Main Canals. The precise requirement and cost will be determined by the Detailed Design Team.
4. NIB shall arrange and execute domestic water supply to villages in the area during the construction period of Link Canal-II.



PRESENT CONDITION OF FARM MECHANIZATION IN MIS SCHEME

1. Existing Farm Machinery

The number and present condition of the existing farm machinery are noted down in the table.

Farm Machinery	Nos.	Registration	Condition
A. Tractor			
1. Paddy Field Type; 55 HP	4	1980	To be repaired
2. Paddy Field Type; 65 HP	5	1981	To be repaired
3. Paddy Field Type; 60 HP	4	1982	Partly to be repaired
4. Paddy Field Type; 60 HP	7	1983	Partly to be repaired
5. Paddy Field Type; 60 HP	6	1986	Serviceable
B. Attachments			
1. Rotavator	34	1984	Serviceable
1. Disc Plough	1	1957	Serviceable
1. Disc Harrow	1	1966	Serviceable

2. Operation and Maintenance of Farm Machinery

(1) Daily Maintenance

Daily maintenance work is carried out during the rotavation period. Tractors and rotavators are checked and repaired if necessary by eight mechanics with a mobile workshop. The service is given at night after daily machinery work is finished and machines are gathered on farm road or in open space adjacent to paddy field. Items of the service are as follows:

- a) Greasing;
- b) Topping up oils on engine, hydraulic, etc;
- c) Cleaning and tightening all nuts and bolts;
- d) Cleaning cooling systems; and
- e) Checking and if necessary changing fuel and oil filters.

(2) Periodical Maintenance

Periodical maintenance work is carried out by the manufacturer of the tractors. The schedule and items of service are as follows:

- a) Bi-weekly service : i) changing gear box oil, engine oil and oil filters;

- ii) topping up differential oils; and
- iii) changing fuel filter.
- b) Monthly service : i) changing engine oil;
ii) changing gear box oils; and
iii) adjusting brake, clutch, and tappet.
- c) Annual service : changing clutch plate, brake pad, piston rings and
injector nozzle.

(3) Useful Life of Tractors and Attachments

- a) Tractor : 3 to 5 years
- b) Rotavator : 2 to 4 years
- c) Sprayer : manual sprayers ; 5 years
motorized sprayers ; 2 to 4 years

(4) Equipment of Workshop

- Mobile workshop
- Mobile crane (5 tons)
- Welding equipment
- Battery charger
- Air compressor

RESEARCH AND EXPERIMENT ON RICE IN MIS SCHEME

1. Organization

Research and experiment on rice cultivation in Kenya are exclusively undertaken by Ahero Irrigation Research Station (AIRS) which is located in Nyanza Province and belongs to NIB. AIRS has a branch station at Mwea, namely Mwea Irrigation Research Station (MIRS), which is responsible for research and experiment on rice in MIS. AIRS has the following staff:

a) Assistant Research Officer	:	1
b) Head Field Assistant	:	1
c) Field Assistant	:	2
d) Water Guard	:	2
e) Seed Selector	:	1
f) Store Clerk	:	1

2. Research and Experiment

The technical research programme of MIRS is designed and executed by the staff of AIRS. Main research subjects are as follows:

(1) Variety Selection

Experiment on variety selection has been focused on obtaining high yielding ability and improving grain quality. Other characteristics such as growth period, disease tolerance and cold tolerance have been regarded as minor ones since these are not critical factor under single cropping condition. Nevertheless, there has been a better understanding of the importance of them so as to facilitate double cropping.

(2) Optimization of Cropping Pattern

Considerable research has been conducted and consequently led MIS office to adopt the prevailing cropping calender given in Fig.4.1.

(3) Fertilization Trials

Previous research trials have identified the effect of the application of nitrogen and phosphorus. The criteria of fertilizer application in MIS has been formulated based on the result.

(4) Agro-chemicals

Emphasis has been put on control of stemborers. Appropriate pesticides (carbofuran, sumithion) have been identified through the research.

(5) Improvement of Farming Practices

Experiment on land preparation has made it possible to solve the problem of bogging down of tractor during puddling work. Optimization of the timing of drainage before harvesting and cultivation of upland crops during the fallow period have also been examined.

COUNTRY DATA

I. Basic Indicators

1. Official Name : Jamhuri ya Kenya (Swahili)
The Republic of Kenya (English)
2. Date of Independence : December 12, 1963
3. Land Area : 582,646 km²
4. Population
 - (1) Total Population : 21,217,000
 - (2) Density : 36.4 persons/km²
 - (3) Increase Rate : 4.1 % per annum
 - (4) Life Expectancy at Birth : 52.9 years
5. Capital : Nairobi
6. Other Major Cities : Mombasa, Kisumu, Nakuru
7. Political System
 - (1) Form of Government : Unitary Single Party Republic
 - (2) Form of Parliament : One Legislative House (National Assembly)
 - (3) Political Party : Kenya African National Union
 - (4) Head of State and Government : President, Daniel Teroitich arap Moi
(inaugurated in August 1978)
8. Religion : Christianity (about 60%), Animism and Moslem
9. Language : Official Language ; Swahili and English
Ethnic Language ; Kikuyu, Masai, Turkana,
Luo and etc.
10. Ethnic Composition : According to the population census in 1979,
98.5% of total population comprises black
African ethnic groups. The principal minorities
are the Asians (0.5%), the European (0.3%), the
Arabs (0.3%). The African population can be
divided into three broad linguistic and cultural
groups, i.e., Bantu (including Kikuyu, Luhya
and Kamba), Nirotic/Paranirotic (including Luo,
Kalenjin and Masai) and Cushitic (including
Somali). The largest ethnic group is Kikuyu
which constitutes 21 % of the population,
followed by Luhya (14%) and Luo (13%).
11. Education
 - (1) Schooling System : Primary School ; 8 years
Secondary School ; 4 years
University ; 4 years
Schooling is not compulsory but primary
education is offered free.

- (2) Literacy rate(in 1985) : Total population over 15 ; 59.2%
- Males ; 69.6%
- Females ; 49.2%
- (3) Enrollment in primary school : 97% of population at the age level (12-17) for primary school.

12. Geography : Kenya lies astride the equator between the Indian Ocean and Lake Victoria geographically between latitudes 4°N and 4°S and between longitudes 34°E and 41°E. The width from east to west and length from north to south are both about 800km. The land is gently sloping from coastal strip to the Western Highlands of which altitude is more than EL 1,500 m. The Rift Valley extends from south to the Lake Turkana in the north widening from 50 to 80 km. Kenya's principal rivers rise in the highlands and radiate eastward to the Indian Ocean or westward to Lake Victoria. The Tana and Athi Rivers flow into the Indian Ocean and the Nzoia, Nyandu and Sondu rivers flow into Lake Victoria.

13. Climate : Kenya has a varied climate resulting from its varied topography. Altitude is the major factor in variations of rainfall. It is relatively great in the area from central part to the western highland and on the coast. The northwestern, eastern and southern areas except the coast are arid or semi-arid. There are two rainy seasons, i.e., the long rainy season (March to May) and the short rainy season (September to October), though they are not distinct in some regions.

II. Socio-economic Data

1. Gross Domestic Product (GDP)

Items	1983	1984	1985	1986	1987*
Nominal GDP (KShs million)	76,404	84,380	96,207	116,635	132,294
(US\$ million)	5,719	5,854	5,855	7,188	8,040
Annual growth rate	12.8%	10.4%	14.0%	21.2%	13.4%
Real GDP (in 1982 price KShs million)	70,021	71,243	73,154	78,558	83,073
(in 1982 price US\$ million)	5,260	4,943	4,452	4,841	5,049
Annual growth rate	3.4%	1.7%	2.7%	7.4%	5.7%
Per capita GDP (KShs)	4,075	4,331	73,154	78,558	83,073
(US\$)	4,075	4,331	73,154	78,558	83,073

* provisional

Note : As for exchange rate, *IMF*, International Financial Statistics is referred to

Source : Central Bureau of Statistics (*CBS*), Economic Survey 1988
CBS, Statistical Abstract 1987

2. Industrial Structure

(1) GDP by Sector (at factor cost)

Sectors	1983	1984	1985	1986	1987*
Agriculture	31.9%	30.4%	30.1%	29.9%	29.6%
Forestry	1.5%	1.5%	1.5%	1.5%	1.5%
Fishery	0.4%	0.4%	0.5%	0.5%	0.5%
Primary Industry Total	33.8%	32.3%	32.1%	31.9%	31.6%
Mining and Quarrying	0.2%	0.2%	0.3%	0.3%	0.3%
Manufacturing	12.7%	13.1%	13.1%	13.1%	13.2%
Building and Construction	5.2%	5.0%	5.3%	4.9%	4.8%
Secondary Industry Total	18.1%	18.3%	18.7%	18.3%	18.3%
Electricity and Water	2.3%	2.3%	2.3%	2.3%	2.3%
Trade, Restaurant and Hotel	10.0%	10.5%	10.8%	11.1%	11.4%
Transport, Storage, and Communication	6.6%	6.5%	6.4%	6.3%	6.3%
Finance, Insurance and Real Estate	7.3%	7.6%	7.6%	7.6%	7.6%
Government Services	15.0%	15.3%	15.4%	15.5%	15.6%
Other Service	6.9%	7.2%	6.7%	7.0%	6.9%
Tertiary Industry Total	48.1%	49.4%	49.2%	49.8%	50.1%

* provisional

Source : calculated from the data in CBS, Economic Survey 1988

(2) Sectoral Distribution of Employment

Sectors	1983	1984
Agriculture	86%	81%
Industry	6%	7%
Service	9%	12%

Source : World Bank, World Development Report 1988

(3) Use of Resources

Items	1983	1984	1985	1986	1987*
GDP at market prices	100.0%	100.0%	100.0%	100.0%	100.0%
Surplus on Current Account	-0.4%	-1.4%	-1.1%	0.1%	5.0%
Total Consumption	79.3%	78.0%	81.0%	77.3%	80.4%
Private Consumption	60.1%	60.3%	63.1%	59.1%	61.0%
Public Consumption	19.2%	17.7%	17.9%	18.2%	19.4%
Gross Investment	21.1%	23.4%	20.1%	22.6%	24.6%
Domestic Saving	17.3%	19.3%	16.3%	19.9%	16.5%
Financing from Abroad	3.8%	4.1%	3.8%	2.7%	8.1%
Grant Aid	1.5%	2.1%	2.2%	2.1%	1.9%
Net Borrowing From Abroad	2.3%	2.0%	1.6%	0.6%	6.2%

* provisional

Source : calculated from the data in CBS, Economic Survey 1986,1988

3. Currency

(1) Currency Unit : Kenya Shilling (KShs)

(2) Exchange Rate to US Dollar

Annual Average	1982	1983	1984	1985	1986	1987	end of Nov. 1988
KShs per 1 US\$	10.922	13.312	14.414	16.432	16.226	16.454	18.208

Source : *IMF*, International Financial Statistics 1989 February

4. Consumer Price Index

Annual Average	1982	1983	1984	1985	1986	1987 average in Oct. 1988	
Index (1980=100)	134.7	150.2	165.4	187.0	194.4	204.5	229.2
Annual increase rate	20.5%	10.1%	13.1%	13.1%	4.0%	5.2%	12.1%(up to Oct.)

Source : *IMF*, International Financial Statistics 1989 February

5. External Trade

(1) Trade Balance

(Unit: KShs million)					
Items	1983	1984	1985	1986	1987*
Exports	13,043.6	15,538.2	16,228.6	19,737.0	15,798.0
Re-exports	382.0	441.8	526.6	577.6	729.0
Imports	18,112.4	21,944.2	23,920.0	26,757.8	28,617.6
Balance	-5,068.8	-6,406.0	-7,691.4	-7,020.8	-12,819.6

* provisional

Source : *CBS*, Economic Survey 1986,1988

(2) Share of Principal Exports

Items	1983	1984	1985	1986	1987*
Coffee	24.7%	26.2%	24.7%	25.1%	24.6%
Tea	18.9%	24.3%	23.6%	17.5%	20.75
Petroleum Products	19.0%	16.9%	14.4%	10.0%	12.1%
Pineapples (canned)	3.2%	3.3%	3.0%	2.5%	3.3%
Hides and Skins	1.0%	0.9%	1.2%	1.3%	2.1%
Soda Ash	1.1%	1.3%	1.7%	1.4%	1.7%
Cement	3.3%	2.4%	2.0%	1.4%	1.2%
Others	28.8%	24.7%	29.4%	40.8%	34.3%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

* provisional

Source : CBS, Economic Survey 1988
CBS, Statistical Abstract 1987

(2) Share of Principal Imports

Items	1983	1984	1985	1986	1987*
Industrial machinery	15.2%	15.8%	13.8%	17.7%	19.4%
Crude Petroleum	30.4%	26.7%	28.8%	15.5%	17.1%
Motor Vehicle and Chassis	3.6%	5.0%	5.3%	6.6%	7.5%
Iron and Steel	5.3%	5.7%	5.4%	4.8%	5.9%
Petrochemicals	2.4%	3.0%	3.1%	3.1%	3.9%
Fertilizers	2.8%	1.8%	1.9%	2.4%	2.7%
Pharmaceuticals	2.2%	1.8%	1.9%	2.4%	2.7%
Petroleum Products Refined	5.9%	3.3%	2.3%	2.1%	2.4%
Others	32.2%	37.4%	35.0%	44.1%	38.4%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

* provisional

Source : CBS, Economic Survey 1988
CBS, Statistical Abstract 1987

(3) Destination of Exports

Countries	1983	1984	1985	1986	1987*
United Kingdom	14.8%	18.3%	16.7%	14.5%	16.9%
West Germany	12.6%	12.6%	11.5%	13.8%	9.6%
Uganda	11.0%	8.7%	8.6%	7.4%	8.8%
Netherlands	5.0%	6.8%	6.5%	9.3%	7.2%
U.S.A.	6.0%	5.0%	6.7%	8.7%	5.4%
Tanzania	1.0%	1.3%	2.4%	2.8%	2.5%
Others	49.6%	47.3%	47.6%	43.5%	49.6%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

* provisional

Source : CBS, Economic Survey 1988

(4) Origin of Imports

Countries	1983	1984	1985	1986	1987*
United Kingdom	13.4%	13.9%	13.7%	15.6%	17.1%
United Arab Emirates	13.2%	11.3%	18.7%	9.5%	16.0%
Japan	9.5%	10.2%	10.0%	10.9%	10.9%
West Germany	7.8%	8.9%	8.0%	10.9%	8.3%
U.S.A.	6.3%	4.7%	5.5%	4.9%	7.1%
France	4.3%	5.1%	3.5%	11.5%	6.9%
Italy	1.75	3.1%	2.8%	3.7%	3.4%
Others	43.8%	42.8%	37.8%	33.0%	30.3%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

* provisional

Source : CBS, Economic Survey 1988

(5) Trade with Japan

(a) Exports to Japan (Japanese customs statistics in 1987)

(Unit: US\$ 1,000)

Items	Japanese Import	Share
Macadamia nut	2,497	20.5%
Sisal	1,857	12.9%
Coffee	1,415	9.8%
Tea	773	5.4%
Total Japanese Import from Kenya	14,400	100.0%

Source : Japan External Trade Organization

(b) Imports from Japan (Japanese customs statistics in 1987)

(Unit: US\$ 1,000)

Items	Japanese Export	Share
Motor Vehicle	102,403	49.2%
Steel	32,825	15.8%
Mechanical Appliance	25,407	12.2%
Electrical Machinery and Equipment	10,549	5.1%
Total	208,100	100.0%

Source : *Japan External Trade Organization*

6. Balance of Payments

(Unit: KShs million)

Items	1983	1984	1985	1986*	1987*
Current Account	-509.0	-1,726.0	-1,588.2	-718.0	-8,172.2
Trade Balance	-3,612.0	-4,522.0	-5,413.2	-4,646.2	-11,747.4
Other Goods, Service and Income	711.0	250.0	677.0	571.2	44.0
Unrequited Transfers	2,392.0	2,546.0	3,148.0	3,357.0	3,531.2
Long-term Capital Account	1,718.0	2,338.0	-884.0	1,674.2	4,676.2
Short-term Capital Account	190.0	1,136.0	752.4	519.0	1,801.4
Errors and Omissions	-273.0	139.0	-204.4	-15.2	177.2
Overall Balance	1,148.0	-645.0	-1,884.0	1,460.0	1,517.4

* provisional

Source : CBS, Economic Survey 1988

CBS, Statistical Abstract 1987

7. Reserves of International Liquidity (except Gold)

End of Year	1982	1983	1984	1985	1986	1987
US\$ million	376.0	389.8	390.8	413.3	255.8	262.9

Source : *IMF, International Financial Statistics 1989 February*

8. Government Finance

(Unit: KShs million)

Items	1983/84	1984/85	1985/86	1986/87*	1987/88*
Revenue and Income	18,472.4	20,391.8	24,186.4	28,175.2	32,190.8
External Grants	997.0	1,410.0	1,096.0	1,256.0	5,383.0
Expenditure	22,869.4	26,920.4	29,566.8	36,754.8	45,754.2
Current Expenditure	19,691.6	21,826.4	25,016.8	29,497.2	36,703.0
Capital Expenditure	2,666.2	4,355.4	3,540.0	6,304.4	8,466.0
Net Lending	511.6	738.6	1,010.4	953.2	585.2
Overall Balance	-3,400.0	-5,118.6	-4,284.4	-7,323.6	-8,180.4
Financing of Deficit					
Net External Loans	715.0	497.0	-1,900.0	29.0	1,226.0
Domestic Borrowing	3,125.0	1,751.6	4,083.0	6,592.8	3,450.2

* provisional

Note : Fiscal year starts on July 1 and ends on June 30

Source : CBS, Economic Survey 1988

9. External Debt

(1) Debt Outstanding and Disbursed

(Unit: US\$ million)

Items	1983	1984	1985	1986*	1987*
Debt Outstanding and Disbursed (DOD)	2,441	2,542	2,943	2,923	4,482
Official Creditors	1,864	2,107	2,527	3,038	3,703
Multilateral	1,049	1,143	1,386	1,668	2,048
IBRD	506	583	751	931	1,128
IDA	334	363	408	451	553
Bilateral	815	964	1,141	1,370	1,655
Private Creditors	577	435	396	634	778
Debt Ratio (DOD/GNP)	43.9%	43.3%	50.8%	53.0%	57.9%

* provisional

Source : World Bank, World Debt Tables 1987-88 edition

(2) Debt Service

(Unit: US\$ million)

Items	1983	1984	1985	1986*	1987*
Total Debt Service (TDS)	321	359	407	432	502
Official Creditors	142	190	233	281	328
Private Creditors	179	170	175	152	173
Principal Repayments	190	218	259	258	291
Official Creditors	65	92	121	147	175
Private Creditors	126	126	138	111	116
Interest Payments	131	141	148	175	211
Official Creditors	78	98	111	134	154
Private Creditors	58	43	37	41	57
Debt Service Ratio	21.1%	21.6%	25.5%	22.7%	28.8%

* provisional

Source : World Bank, World Debt Tables 1987-88 edition

III. National Development Plans

1. National Development Plans since Independence

- (1) The First Five-Year Development Plan
 - (a) Period : 1966 - 1970
 - (b) Objective : Expansion of national income and Kenyanization of the economy
 - (c) Target annual growth rate : 6.3%
 - (d) Actual annual growth rate : 6.3%

- (2) The Second Five-Year Development Plan
 - (a) Period : 1970 - 1974
 - (b) Objective : Balanced growth between agriculture and other sectors, and equal income distribution. A slogan of "Regional Development" was adopted
 - (c) Target annual growth rate : 6.7%
 - (d) Actual annual growth rate : 6.5%

- (3) The Third Five-Year Development Plan
 - (a) Period : 1974 - 1978
 - (b) Objective : A slogan of "Struggle against Poverty" was adopted
 - (c) Target annual growth rate : 7.4%
 - (d) Actual annual growth rate : 4.7%

- (4) The Forth Five-Year Development Plan
 - (a) Period : 1979 - 1983
 - (b) Objective : To create job opportunities for poor class, to improve national consumption structure, to improve social services such as education, health and water supply, to enforce international competitiveness through protecting and rearing the manufacturing sector. The slogan held was "Alleviation of Poverty".
 - (c) Target annual growth rate : originally targeted at 6.3% but revised and lowered twice to 4.7% finally
 - (d) Actual annual growth rate : 4.9%

- (5) The Fifth Five-Year Development Plan
 - (a) Period : 1984 - 1988
 - (b) Objective : The theme set forth was "Mobilization of Domestic Resources for Equitable Development". The objectives are to promote export, increase personal saving. In order to reduce fiscal deficit, raise of efficiency of government administration, reducing public investment and introduction of the benefit principle to public social services are to be executed.
 - (c) Target annual growth rate : 4.9% sectoral targets are as follows:

Sector	Target annual growth rate
Agriculture	4.6%
Forestry	5.0%
Fishery	6.1%
Mining and quarrying	2.7%
Manufacturing	5.9%
Building and construction	3.0%
Electricity and Water	6.0%
Transport, Storage and Communication	4.9%
Trade, Restaurants and Hotels	3.8%
Finance, Insurance, Real Estate and Business Services	6.1%
Ownership of Dwellings	6.0%
Other Services	6.5%
Public Service	4.8%
Non-monetary Economy	3.5%

(d) Actual annual growth rate : 4.4% (until 1987)

2. Long-term Development Plan

(1) Background

Since the independence, the Kenyan economy has experienced a lot of fluctuations such as two oil crises, soar and slump of prices of primary products including coffee and droughts in 1979, 1980 and 1984. Targets in above mentioned development plans were thus forced to be revised. Attained economic growth has been lower than the targets except that in the Second Five-Year Development Plan. In these circumstances, the Government formulated a long-term development plan and figured the desirable Kenyan economy in accordance with structural change in world economy.

- (2) Title of the Plan : Sessional Paper No.1 of 1986 on Economic Management and Renewed Growth
- (3) Period : 1974 - 2000
- (4) Basic Strategy :
- (a) To achieve an economic growth rate commensurate with population increase
 - (b) To create job opportunities, gratify basic human needs, assure sufficient food, balance the development between urban and rural areas
 - (c) To remove and improve constraints for economic development such as low saving rate, low productivity of investment and fiscal deficit
 - (d) To activate private sector, introduce vitality of private sector to public sector
- (5) Macro-economical Target :
- Annual growth rate of GDP ; 5.6%
 - Agriculture ; 5.0%
 - Manufacturing ; 7.2%
 - Trade and Commerce ; 5.4%
 - Government Expenditure ; 5.0%
 - Annual growth rate of per capita GDP ; 1.8%

FARM BUDGET ANALYSIS

In order to assess the effect of the Project on farm budget, a farm budget analysis was made on the basis of a farm household with 1.6 ha of land which is the standard size of settlement farm. The future farm budget under with and without project was forecasted in the analysis. The previous farm budget analysis in the Feasibility Study on the Mwea Irrigation Development Project (F/S) was fully referred to and revised taking into account the cropping pattern designed in this basic design study. The prices of crops and farm inputs were calculated at the market price level as of 1987 in the same manner as in F/S.

1. Assumptions in the Analysis

(1) Standard farm size

The standard size of a settled farm is 1.6 ha. Farmers additionally cultivate 0.2 ha of upland field on an average. This farm size will never change even after implementation of the Project since neither extension of farmland nor use of farm land for newly constructed facilities is planned.

(2) Unit yields of crops

The present unit yields of crops are 4.5 tons/ha for paddy (short rains rice), 1.1 tons/ha for maize and 5.0 tons/ha for beans. The yield of paddy is expected to increase to 6.0 tons/ha for both short rains and long rains rices as a result of the implementation of the Project. On the other hand, it was estimated that the yield will decrease to 3.5 tons/ ha due to the deterioration of the facilities and unsatisfactory operation and maintenance. As for the yields of upland crops, the future yields are forecast at 1.3 tons/ha for maize and 5.0 tons/ha for beans judging from the past trend and actual yields in other areas.

(3) Agricultural income and expense

Agricultural income is derived from the cultivated area, unit yields and farm gate prices of crops. Farm gate prices of crops in 1987 are as follows

Crop	Price
Rice	3,500 KShs/ton
Maize	2,000 KShs/ton
Beans	3,700 KShs/ton

Agricultural expense is based on the production cost estimated from the present farming practice, prices of farm inputs and the service charge of MIS (see Table A-1 and A-2). The service charge of MIS is 2,223 KShs per acre.

(4) Off-farm income

The result of the farm interview survey made in F/S was adopted. The off-farm income of farmers who will cultivate rice twice a year will be lost because of their full engagement in agriculture throughout a year.

2. Result of the Analysis

(1) Present farm budget

The present income and expense of a farmer of the standard size were estimated as shown in Table A-3. Disposable income of farmer is 16,200 KShs per year.

(2) Forecast future farm budget

Future farm budget was forecast for both cases with and without project conditions. The result is given Table A-4. Under without project condition, disposable income will be 2,900 KShs, while under with project condition it will be 23,900 KShs for single cropping farm and 42,900 KShs for double cropping farm.

(3) Conclusion

The implementation of the Project will bring a remarkable improvement of farm budget for both single cropping farm and double cropping farm. After completion of the Project, the farm income will increase by 31 % and 154 % respectively for farms with single cropping and those with double cropping. On the other hand, in case the Project is not implemented, the farm income will decrease by 20 %. Disposable income of farmer under with project condition will be 2.2 times (single cropping) and 4 times (double cropping) those under without project condition. In the project area, double cropping of rice was planned to be possible only for 1,000 ha out of 5,860 ha of total area of MIS scheme. However, it will extend to the whole area in the future and all the farmers in the scheme will thereby be able to enjoy higher income as mentioned above.

Table A-1 Production Cost of Rice under Without and With Project Conditions

Items	Unit	Unit Price (KShs/unit)	Quantity (unit/ha)	Value (KShs/ha)
I. Present Production Cost				
1. Farm input				
a) Seeds	kg	5.4	45	243
b) Fertilizers	: S.A(21%N) kg	3.1	250	775
	: TSP(46%P ₂ O ₅) kg	3.1	125	388
c) Agro-chemicals	: Carbofuran kg	70.7	3	212
	: Sumithion lit	117.3	2	235
d) Other materials	: Field Board l.s.	22	1	22
	: Gates l.s.	144	1	144
	<u>Sub-total</u>			<u>2,019</u>
2. MIS Service Charge	acre	2,223		5,494
3. Miscellaneous Cost	l.s.			139
	<u>Total</u>			<u>7,652</u> <u>(≐7,700)</u>
II. Future Production Cost (per one cropping)				
1. Farm Input				
a) Seeds	kg	5.4	45	243
b) Fertilizers	: S.A(21%N) kg	3.1	400	1,240
	: TSP(46%P ₂ O ₅) kg	3.1	125	388
c) Agro-chemicals	: Carbofuran kg	70.7	3	212
	: Sumithion lit	117.3	2	235
d) Other materials	: Field Board l.s.	22	1	22
	: Gates l.s.	144	1	144
	<u>Sub-total</u>			<u>2,484</u>
2. MIS Service Charge	acre	2,223		5,494
3. Miscellaneous Cost	l.s.			176
	<u>Total</u>			<u>8,154</u> <u>(≐8,200)</u>

Note: Family labour cost is not included.
 CAN ; Calcium Ammonium Nitrate
 SOP ; Sulfate of Potash

Table A-2 Production Cost of Non-Rice Crops

Items	Unit	Unit Price (KShs/unit)	Quantity (unit/ha)	Value (KShs/ha)
I. Maize				
1. Farm Inputs				
a) Seeds	: Hybrid Maize	kg	25	243
b) Fertilizers	: 20-10-10	kg	125	688
c) Agro-chemicals	: Sumithion	lit	1	117
<u>Sub-total(1)</u>				<u>1,047</u>
2. Land Preparation				
a) Rotavation		hr.	0	0
b) Handling		l.s.	0	0
<u>Sub-total(2)</u>				<u>0</u>
3. Miscellaneous Cost		(5% of (1)+(2))		<u>52</u>
<u>Total</u>				<u>1,099</u> <u>(=1,100)</u>
II. Beans				
1. Farm Inputs				
a) Seeds	: Hybrid Bean	kg	20	460
b) Fertilizers	: CAN(26%N)	kg	150	645
	: TSP(46%P ₂ O ₅)	kg	100	310
	: SOP(61%K ₂ O)	kg	40	272
<u>Sub-total(1)</u>				<u>1,687</u>
2. Land Preparation				
a) Rotavation		hr.	0	0
b) Handling		l.s.	0	0
<u>Sub-total(2)</u>				<u>0</u>
3. Miscellaneous Cost		(5% of (1)+(2))		<u>84</u>
<u>Total</u>				<u>1,771</u> <u>(=1,800)</u>

Note: Family labour cost is not included.

Table A-3 Farm Budget of An Average Farm under Present Condition

Items	Present Farm Budget
Average Farm Size (ha)	
Rice field	1.6
Upland field	0.2 ^{/1}
<u>Total</u>	<u>1.8</u>
(Unit: KShs.1,000)	
I. Gross Income	
1. Farm Income	
Rice	25.2
Maize	0.2
Beans	1.9
<u>Sub-total</u>	<u>27.3</u>
2. Non-Farm Income	1.5
<u>Total (I)</u>	<u>28.8</u>
II. Farming Expenses ^{/2}	
Rice(MIS Service Charge + Miscellaneous)	12.3
Maize	0.1
Beans	0.2
<u>Total (II)</u>	<u>12.6</u>
III. Disposable Income (I - II)	16.2

Note: ^{/1}: Excluding family labour cost

Table A-4 Farm Budget of An Average Farm under With and Without Project Conditions

Items	Without Project	With Project	
		Single Cropping of Rice	Double Cropping of Rice
Average Farm Size			
Rice field	1.6	1.6	1.6
Upland field	0.2	0.2	0.2
<u>Total</u>	<u>1.8</u>	<u>1.8</u>	<u>1.8</u>
(Unit: KShs.1,000)			
I. Gross Income			
1. Farm Income			
Rice	19.6	33.6	67.2
Maize	0.3	0.3	0.3
Beans	1.9	1.9	1.9
<u>Sub-total</u>	<u>21.8</u>	<u>35.8</u>	<u>69.4</u>
2. Non-Farm Income	1.5	1.5	-
<u>Total (I)</u>	<u>23.3</u>	<u>37.3</u>	<u>69.4</u>
II. Farming Expenses ^{/1}			
Rice	12.3	13.1	26.2
Maize	0.1	0.1	0.1
Beans	0.2	0.2	0.2
<u>Total (II)</u>	<u>12.6</u>	<u>13.4</u>	<u>26.5</u>
III. Disposable Income (I - II)	10.7	23.9	42.9

Note: /1: Excluding family labour cost

/2: Including the expenses for self consumed food