

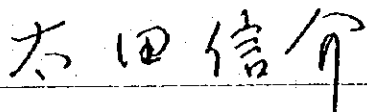
MINUTES OF THE JOINT EVALUATION
ON
THE JAPANESE TECHNICAL COOPERATION
FOR
THE MWEA IRRIGATION AGRICULTURAL DEVELOPMENT PROJECT
IN
THE REPUBLIC OF KENYA

With about six months left to the termination of cooperation period of " the Mwea Irrigation Agricultural Development Project (hereinafter referred to as "the Project") " on January 31, 1996, which started on February 1, 1991, as stated in the Record of Discussions, the Japanese Evaluation Team organized by Japan International Cooperation Agency (hereinafter referred to as "JICA"), headed by Mr. Shinsuke Ota, Managing Director, Agricultural Development Cooperation Department, JICA and the Kenyan Evaluation Team headed by Mr. B.T.C. Bargarua, General Manager, National Irrigation Board (hereinafter referred to as "NIB") , composed the Joint Evaluation Team (hereinafter referred to as "the Joint Team") in order to conduct an overall evaluation of the Project.

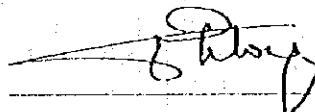
The Joint Team conducted interviews with the Japanese experts and the Kenyan counterpart personnel assigned to the Project, had a series of discussions with the Kenyan authorities concerned, made field surveys and exchanged views among themselves.

As a result, the Japanese Evaluation Team and the Kenyan Evaluation Team agreed upon forwarding to their respective Governments the summary of the evaluation which is referred to in the document attached hereto.

Nairobi,
September 13, 1995



Mr. Shinsuke Ota
Leader,
Japanese Evaluation Team
Japan International
Cooperation Agency,
Japan



Mr. S. M. Gitonga
Deputy General Manager,
National Irrigation Board
The Republic of Kenya

for Mr. B. T. C. Bargarua
Leader,
Kenyan Evaluation Team
The Republic of Kenya

**THE JOINT EVALUATION REPORT
ON
THE JAPANESE TECHNICAL COOPERATION
FOR
THE MWEA IRRIGATION AGRICULTURAL DEVELOPMENT PROJECT
IN
THE REPUBLIC OF KENYA**

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1. INTRODUCTION

Based upon the Record of Discussion (hereinafter referred to as "the R/D") signed by the leader of Japanese Implementation Survey Team and the Permanent Secretary, Ministry of Regional Development of The Government of The Republic of Kenya on November 27, 1990, the Government of Japan and the Government of The Republic of Kenya have been implementing the Mwea Irrigation Agricultural Development Project (hereinafter referred to as "The Project") since February 1, 1990. The Project is scheduled to be implemented for five(5) years and is to be completed on January 31, 1996.

The main objectives of the Project is to develop appropriate techniques of irrigation, and drainage, irrigated rice cultivation, agricultural machinery and farming system, and to transfer these techniques mainly to the staff of The Mwea Irrigation Settlement (hereinafter referred to as "MIS"), National Irrigation Board (hereinafter referred to as "NIB"), Ministry of Land Reclamation Regional and Water Development and the participating farmers, and thus contribute to the development of irrigated rice production in the Republic of Kenya, and promote agricultural development in the Mwea Area through the various activities of the Mwea Irrigation Agricultural Development Project (hereinafter referred to as "MIAD").

The followings are the main Project activities to which Japanese technical assistance has been given.

(1) Water Management

Investigation of water distribution in MIS as well as the pilot farm, development of appropriate water management techniques and establishment of experimental fields and other infrastructure in MIAD and the Pilot Farm.

(2) Irrigation and Drainage

Development of the appropriate irrigation and drainage facilities.

(3) Rice Cultivation

Selection of appropriate (high grain quality) varieties and improvement of appropriate cultivation techniques.

(4) Agricultural Machinery

Development of dry land cultivation technique and management of agricultural machinery.

(5) Training

Train personnel such as the key farmers, MIAD staff, MIS staff and NIB staff, and management of demonstration farm in the Project and to archive the appropriate farming system in Kenya.

Based upon the main objectives started in the R/D, concrete items and a tentative schedule of the Project activities were identified and agreed upon between the Government of Japan and the Government of the Republic of Kenya, and recorded as the Tentative Schedule of Implementation(hereinafter referred to as "TSI") was signed on November 19, 1991.

2. MEMBERS OF THE JOINT EVALUATION TEAM

(1) Japanese Members

Mr. Shinsuke Ota : Leader

Managing Director, Agricultural Development Cooperation Department,
Japan International Cooperation Agency

Mr. Kozo Inada : Water Management, Irrigation and Drainage Field

Deputy Director, Overseas Land Improvement Cooperation Office, Construction Department,
Agricultural Structure Improvement Bureau, Ministry of Agriculture, Forestry and Fisheries

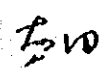
- Mr. Kazuhiko Kikuchi : Rice Cropping and Training Field
 Chief, International Exchange Programs Section, Office of Young Farmer's Affairs, Extension
 and Education Division, Agricultural Production Bureau,
 Ministry of Agriculture, Forestry and Fisheries
- Mr. Sunao Handa : Agricultural Machinery Field
 Senior Officer, Fertilizer and Machinery Division,
 Agricultural Production Bureau, Ministry of Agriculture, Forestry and Fisheries
- Mr. Jun Shobu : Cooperation Planning and Evaluation
 Senior Technical Officer, International Cooperation Division, Economic Bureau,
 Ministry of Agriculture, Forestry and Fisheries
- Mr. Hirofumi Hayashi : Coordination
 Staff, Planning Division, Agricultural Development Cooperation Department,
 Japan International Cooperation Agency

(2) Kenyan Members

- Mr. B.T.C. Bargarora : Leader
 General Manager, National Irrigation Board
- Mr. P. N. Omesa
 Senior Assistant Secretary, Ministry of Land Reclamation, Regional and Water Development
- Mr. S. K. Kiptorus
 Economist, Ministry of Land Reclamation, Regional and Water Development
- Mr. Johnstone Nyanumba
 Assistant Secretary, Assistant Desk Office - Japan, External Resource Department,
 Ministry of Finance
- Mr. S. M. Gitonga
 Deputy General Manager, National Irrigation Board
- Mr. A. A. Mohdhar
 Senior Scheme Manager, Mwea Irrigation Settlement
- Mr. A. A. Ali
 Deputy General Manager, National Irrigation Board
- Mr. Isaac Ogombe
 Chief Agricultural Officer, National Irrigation Board
- Mr. J. P. Olum
 Chief Engineering Officer, National Irrigation Board
- Mrs. K. A. Wepukhulu
 Chief Personnel Officer, National Irrigation Board
- Mr. Richard Mulwa
 Senior Agricultural Officer, National Irrigation Board
- Mrs. Cecilia N. Karithi
 Finance Manager, National Irrigation Board
- Mrs. Florence Mungai
 Legal Officer, National Irrigation Board

3. OBJECTIVES OF THE EVALUATION

- 3-1. To make a comprehensive and objective evaluation on the achievement of the Project with regard to the contents of the R/D, TSI and other concerned official agreements. The period of the Project subject to the evaluation is five (5) years from February 1, 1991 to January 31, 1996 (including scheduled activities and outcomes).
- 3-2. To feedback the results and lessons obtained from the evaluation of the Project to cooperation planning and implementation of other projects of similar cases in the future.

4. EVALUATION OF THE PROJECT

4-1. ITEMS OF THE EVALUATION

The joint team conducted an evaluation survey with regard to the following items:

1) Project inputs

(1) Inputs from Japan:

- a) Dispatch of experts
- b) Provision of machinery and equipments
- c) Acceptance of counterpart (hereinafter referred to as C/P) trainees
- d) Dispatch of survey teams
- e) Supplement of local cost expenditures
- f) Others

(2) Inputs from Kenya

- a) Provision of land, buildings and facilities
- b) Assignment of Kenyan C/P personnel
- c) Allocation of budget
- e) Others

2) Project activities, accomplishments; impacts and outstanding matters

3) Outcomes of The Project

4) Sustainability of the Project

5) Summary of the evaluation and recommendations

4-2. METHOD OF THE EVALUATION

(1) The evaluation was conducted in terms of the investigation of the accomplishment of the Project with regard to the items listed in the R/D and the TSI.

(2) The evaluation was carried out mainly by means of interviews and discussions with personnel concerned, and investigation of the project facilities.

5. RESULTS OF THE EVALUATION

5-1. ACCOMPLISHMENT IN TERMS OF THE INPUT

5-1-1 CONTRIBUTION OF JAPAN

(1) DISPATCH OF EXPERTS

A total of nine (9) long-term experts have been dispatched. Their expertise include Team leader, Coordinator, Training, Water Management, Rice Cultivation, Agricultural Machinery and Irrigation & Drainage which are as stated in the R/D.

Eighteen (18) short-term experts, which was also mentioned in the R/D, have been dispatched corresponding to the additional needs of The Project. Their expertise includes Breeding, Agricultural Economy, Water Balance Studies, Soil Analysis, Cultivation Plan, Audio Visual, Water Balance, Soil Mechanics, Entomology, Soil & Fertilizer, Water Distribution, Soil Physics, Irrigation & Drainage, Agricultural Machinery and Farm Economy Survey. List of experts is shown in Appendix 1 and 2.

(2) ACCEPTANCE OF COUNTERPART TRAINEES

Training of C/P started in fiscal year of (Japanese fiscal year starts on April 1st and ends on March 31st, and hereinafter referred to as "FY")1991. A total of twenty (20) C/P visited Japan to participate in technical training and two (2) are now under training in Japan.

They participated in training courses such as Irrigation & Drainage, Agricultural Extension, Water Management, Farm Mechanization, Rice Breeding, Rice Production, Soil Analysis and Distribution of Fruits & Vegetables. Almost all of the counterparts participated in intensive training courses to improve their expertise. Period of the training will be anywhere between one (1) month to ten (10) months. List of the trainees who visited Japan is shown in Appendix 3 - 1.

(3) PROVISION OF MACHINERY AND EQUIPMENTS

In order to facilitate The project activities in MIAD and the Pilot Farms, such as development of appropriate water management and irrigation & drainage techniques, Japan has provided machinery and equipments including surveying & experimental equipment, agricultural machineries and others.

All equipments and machinery provided or brought by the experts have contributed to develop and enhance the activities in the Project and it is also expected that they will contribute more for the future development. Most of these equipments were locally purchased for quick delivery and easy maintenance. Following list shows main machinery and equipments provided by Japan. Detailed list is shown in Appendix 3 - 2.

Fiscal Year	Main Machinery and Equipments	Total Amount (KShs)
1991	Tractor, Mini Bus, Computer, Power Thresher, Disc Plow, Disc Harrow, Rainfall Recorder, Drive Harrow, Tiller	10,108,021
1992	Hydraulic Excavator, Laboratory Apparatus, Truck, Dump Truck, Sample Seed Storage Cabinet	27,683,832
1993	Tractor, Trailer, Spectrophotometer, Cater Fractionating Aspirator, Spare Parts, Hydraulic Excavator and Bulldozer	22,614,619
1994	Tractor, Laboratory Equipments & Apparatus, Hydraulic Excavator and Bulldozer, Spare Parts	17,634,918
1995	Tractor, Laboratory Equipments & Apparatus, Hydraulic Excavator and Bulldozer, Spare Parts	12,881,347 (Estimated)
Total		90,922,737

* Japan Fiscal year starts April 1st to March 31st in the next year.

(4) LOCAL COST EXPENDITURE SUPPLEMENT PROGRAM

Japan granted portions of facility construction cost and project management cost, which should have been the responsibility of the Kenyan government, in order to implement the Project effectively and on schedule.

The supplemental grant includes following items, and list of Japanese expenditure is shown in Appendix 3 - 2.

a) Local Recurrent Cost Expenditure Support

The local recurrent cost expenditure have been granted to support technical cooperation activities of the Japanese experts since 1990. Items of the expenditure include cost of report, printing and procurement of parts of machinery and others.

b) Emergency Countermeasure Program

As a part of establishment of MIAD infrastructure, Japan constructed a machinery store (180m²), seed store (26m²), translucent roof of dry yard (144m²), and irrigation training facility (160m²).

c) Middle level Technician Training Program

Middle level Technician Training Program was held from 1992 to 1996 to support training course in order to provide report printing, material of irrigation and drainage, spare parts of machinery and others.

d) Technology Exchange Program

Two technology exchange programs were held in 1991 and 1993. One of them was with Tanzania. The other was with Thailand.

e) Farm Economy Survey

Japan implemented two surveys on farm economy in MIS from October to December in 1991 and from July to September in 1995.

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(5) DISPATCH OF SURVEY TEAMS

1) Consultation Survey Team

The consultation survey team was dispatched in November 1991 in order to create TSI of The Project. The team discussed details of the project activities with the authorities of the Government of The Republic of Kenya, and reached an agreement on the content of TSI, and signed by the both parties.

2) Technical Guidance Survey Team (Mid-Term Evaluation)

In the third year of the Project, June 1993, The Technical Guidance Survey Team (the mid- term evaluation) visited the Project site in order to evaluate the activities of the Project in previous three (3) years. A joint committee meeting was held during the visit of the team, and staff members of the Project presented their activities and achievements.

The team found that the Project proceeded almost as scheduled. As a result of the investigation, the team recommended a new full-time coordinator should have been dispatched so the R/D should have been amended to provide for the expert in charge of training and the Kenyan side should have submit that AI form for a new coordinator. The team also requested the Kenyan side to allocate enough budget continuously for the smooth implementation of the Project.

5-1-2 CONTRIBUTION OF KENYA

(1) Provision of Land, Buildings, and Facilities

Kenyan government provided required land, buildings, and facilities required for the Project as followings:

a) Land for MIAD and the Pilot Farm

The Land was provided as scheduled by Kenyan government without any problems.

b) Trainees' dormitory (1,000m²) and other facilities

Construction of trainees' dormitory was delayed due to the problems of budget allocation of The Kenyan government. The construction was completed in June 1995.

Meteorological

station and fuel store were completed during the Project period.

c) Counterpart Staff

The required counterparts were provided as table 1 And the detail is shown in Appendix 4 - 1.

Table 1

Field	Place	Number of counterpart
coordinator	Nairobi	1
officer in charge	Mwea	1
rice cultivation	Mwea	2
agricultural machinery	Mwea	1
irrigation and drainage	Mwea	1
water management	Mwea	1
training	Mwea	1

d) Supporting Staff

The required supporting staff were provided as table 2 and the detail is shown in

Appendix 4 - 2.

Table 2

Job	Place	Number of counterpart
field assistant	Pilot Farm	7
water guard	Pilot Farm	2
laboratory technician	MIAD office	1
tractor operator	Pilot Farm	2

e) Administration Staff

The required administration staff were provided as table 3 and the detail is shown in Annex 4 - 2.

Table 3

Job	Place	Number of counterpart
administrative officer	MIAD office	1
head field assistant	Pilot Farm	1
account assistant	MIAD office	1
store clerk	MIAD office	1
motor vehicle mechanic	MIAD office	1
house keeper	Guest House	1
copy typist	MIAD office	1
telephone operator	MIAD office	1
cook	Guest House	1
driver	MIAD office	11
watch man	MIAD office	11

(2) ALLOCATION OF BUDGET

Kenyan government contributed to the Project through the special budget allocation for construction of trainees' dormitory which required huge cost. Kenya also allocated budget for recurrent cost and other costs required for expenditures spent by the project is shown in Appendix 4 - 3.

5-2.PROJECT ACTIVITIES, ACCOMPLISHMENTS, IMPACTS AND OUTSTANDING MATTERS

5-2-1 WATER MANAGEMENT FIELD

1) DEVELOPMENT OF APPROPRIATE WATER MANAGEMENT TECHNIQUES

(1) Activities

a) The water management sections have been collecting Meteorological data from 14 stations(MIS and MIAD).

b) In a selected Model unit, canal and field level data was analyzed so as developed a water use simulation Model for existing wetland cultivation system.

c) Based on these results, 9 discharge checkpoints were decided for ensuring water distribution to sections and also three-level water supply method to each unit was developed and proposed to MIS. Moreover this plan need to be accompanied by organizational set up (including farmers organizations) to complement it so as to have practical water management.

d) Radio -Call communication network was also set-up to solve problems of communication

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within the organizations.

(2) Accomplishments and impacts

a) The MIAD water management section has acquired the necessary techniques of meteorology data collection to make a water distribution plan and finally systematic water management.

b) In 1994 short rain season, MIS operated the water management plan proposed by the MIAD water management section and succeeded in solving the problems of water shortage in the scheme especially in the lower sections. By this MIS realized the importance of the water management and a position of water management engineer, which was proposed by the MIAD water management section, was newly provided and fulfilled. Convinced by this, some farmers have begun offering cooperation with MIS staff for stable water supply.

(3) Outstanding matters

a) On-farm level water distribution plan has not been developed yet and farmers organization has not been established yet.

b) Water distribution techniques for multiple cropping in the existing paddy fields and other upland fields have not been developed yet.

c) In future, the personnel presently engaged in implementing the just started systematic water management should be increased for sustainability of this system.

5-2-2 IRRIGATION AND DRAINAGE FIELD

1) DEVELOPMENT OF APPROPRIATE MAINTENANCE METHOD ON IRRIGATION AND DRAINAGE FACILITIES, AND OF FIELD LEVEL TECHNIQUES ON IRRIGATION AND DRAINAGE

(1) Activities

a) MIS, in collaboration with the MIAD Irrigation & Drainage section, prepared an inventory of irrigation and drainage facilities (approximately 30,000) and the section drew up a list of the farmers on each feeder canal.

b) The section has been trying to develop a package of operation and maintenance method in MIS area. To start with, the section proposed use of a maintenance calendar to bring about the recognition among MIS staff and the farmers.

c) Considering the present technical problems of facility maintenance in MIS area, the MIAD irrigation & drainage section developed some improved techniques which are acceptable to the farmers.

(2) Accomplishments and impacts

a) The MIAD irrigation & drainage section has acquired the necessary techniques to prepare an executable operation and maintenance plan, through the experiences of facility registration and the development of the maintenance calendar.

b) Staff in other NIB irrigation schemes has begun to apply the inventory system. This fact illustrates its importance and usefulness have become widely understood.

c) Some of the on-farm level techniques developed for easy maintenance (e.g. repair of field bunds) are being applied to the farmers' field.

(3) Outstanding matters

It is necessary that a facility maintenance organization including the farmers should be established in MIS in collaboration with MIAD, in order to maintain the facilities in suitable condition.

5-2-3 RICE CULTIVATION FIELD

1) SELECTION OF APPROPRIATE VARIETY

(1) Activities

Variety selection using 568 rice varieties mainly from IRRI has been done during each two seasons (SR and LR) through pre-test, test, and field performance. One suitable aromatic variety (Kilombero) has been tested by line selection.

(2) Accomplishments and impacts

One of double cropping varieties (SB85) and five of high yielding varieties (M11, IR-18348-36, etc.) have been selected as suitable varieties. Although pure aromatic variety has not been found, selection technique has been transferred to the counterparts.

(3) Outstanding matters

The selected varieties should be tested in a large scale.

2) IMPROVEMENT OF RICE CULTIVATION TECHNIQUES

(1) Activities

Rice cultivation technique manual is being made. Rice cultivation system such as improvement of soil fertility, improvement of nursery technique, and double cropping technique using the existing variety BS217 in LR was verified and demonstrated on the MIAD pilot farm to improve the farmers' technique in MIS.

(2) Accomplishments and impacts

Improved cultivation system such as retransplanting for protection from missing hill and application of rice straw for soil fertility improvement has begun applied by the farmers who attended a MIAD training course.

Double cropping technique has been tried on 21 acre demonstration fields in 1995 LR season. This will be continued.

(3) Outstanding matters

Improved cultivation technique to the farmers in MIS should be extended more widely.

5-2-4 AGRICULTURAL MACHINERY FIELD

1) PERFORMANCE AND ADAPTABILITY TEST OF AGRICULTURAL MACHINERY

(1) Activities

a) Selection of machinery suitable for dry land cultivation was carried out by comparing two types of plows and disk plow was selected. Workability under different conditions was tested and it was found that utilization of organic matters is more effective.

b) Existing disk plow was improved as a ridger necessary for introducing upland crop in paddy field with black cotton soil.

c) MIAD has been assisting MIS in demonstrating dry-land cultivation.

(2) Accomplishments and impacts

a) It became possible to select various cropping patterns in the paddy field i.e. upland cropping or rice double cropping.

b) MIS has introduced dry land cultivation and become flexible in its operations i.e. using contracted private tractors and its own normal tractors.

(3) Outstanding matters

a) Implementation of dry land cultivation have the following difficulties;

- Much labor and cost needed due to weed
- Poor leveling
- Inefficiency due to lower rotation

- Difficult operation without soil improvement
- Poor workability in rain and after rain
- Poor workability due to water logging from neighboring plot and feeder canal
- Difficult to plow near bunds
- Costly and much time spending due to big soil blocks

2) OPERATION AND MAINTENANCE

(1) Activities

- a) The MIAD Project has trained both the MIAD and MIS operators on tractor operation and maintenance techniques.
- b) A film on dry land plowing techniques as well as video films on inspection, repair of machinery break down and preventive periodical overhaul techniques have been made by the counterparts.

(2) Accomplishments and impacts

- a) MIAD tractor operator reached high technical level and hence they work as good instructors to the MIS and upland farmers outside MIS working as contractors.
- b) Due to the achievements of high technique in prevention of machinery break downs and the fact that machines were new, very few machinery problems were realized and therefore no major tractor repairs have been done.

(3) Outstanding matters

- a) It is necessary to improve field level accuracy in paddy fields after the dry land preparation and therefore training is necessary for operators of MIS and upland farmers outside MIS working as contractors.
- b) Management of spare parts, oil, and fuel need to be improved as much as possible through discussions on the current system.

5-2-5 TRAINING FIELD

1) SETTLING ON TRAINING PLAN AND EXECUTION OF TRAINING AND DEVELOPMENT OF CURRICULA AND TEACHING MATERIALS

(1) Activities

- a) Based on training (trainees) requirements, syllabus and curricula for 11 training courses were formulated.
- b) Training has been targeted for all NIB senior staff, middle class technicians and key farmers, majority targeted at MIS, all in 3-6 days courses. Total participants reached 1,282 persons. (staff occupied 52% while farmers 48% in the share of total participants.)
- c) Each counterpart could successfully formulate teaching material and effectively teach participants as a lecturer. Verification trial was also carried out by the counterparts regarding it as live teaching material in the pilot farm.

(2) Accomplishments and impacts

- a) MIAD project could plan and implement the staff and farmers training in an organized manner for the first time, which was not executed before. According to satisfaction percentage in a post evaluation form by participants regarding each training course, overall satisfactory percentage by the participants reached 83.9%, and this figure shows good training results were attained through the training implementation. According to "farm economy survey" conducted by Dr. TSURUUCHI, number of farmers that are willing to grow crops at off season is increasing. This result also shows a kind of good training impact to farmers.
- b) Based on the result of a package of technologies in the pilot farm, which integrates plowing and drying of soil through dry land cultivation, and growing of legumes and organic matter incorporation, 23 acres of upland crops demonstration trial was established and good results were attained in 1995 LR.

(3) Outstanding matters

- a) Training courses were not organized according to participants' technical level.
On executing farmers training, high and low level farmers were mixed up in a same course. However, in future, more appropriate training planning should be necessary according to participants technical level.
- b) Regarding the staff training course, NIB is supposed to set up its own training program, as the matter was already handed over to NIB by MIAD.

5-3 OUTCOMES OF THE PROJECT

The Project has produced reports and technical manuals as apart of its accomplishments. Following list shows major outcomes of the Project.

(1) OUTCOMES OF WATER MANAGEMENT FIELD

- A) Technical report No. 1, August, 1991
- B) Recommendation for improvement of MIS water management
- C) Progress report, February, 1992
- D) Report on counterpart training in Japan; Irrigation water management course
- E) Report for MIAD, Kenya; Water Balance Analysis on Paddy Field Irrigation
- F) Progress report, August, 1993
- G) Proposed Water distribution plan for M.I.S.
- H) Report for MIAD project, Kenya, Water distribution management in MIS
- I) Progress report, March, 1994
- J) Progress report, June, 1994
- K) Progress of MIAD project activities
- L) M.I.S. water management report-1994
- M) Progress report, July, 1994 - February, 1995
- N) Discharge control for water distribution management in MIS

(2) OUTCOMES OF THE IRRIGATION AND DRAINAGE FIELD

- A) Technical Report, No. 1
- B) Progress report, February, 1992
- C) Progress report, August, 1993
- D) Progress report, 1 - progress report on verification trial -
- E) Report on: 1993 Irrigation and Drainage course II in Tsukuba International Agricultural Training Center (IATC) JICA
- F) Progress report, March, 1994
- G) Soil mechanical structure analysis in Mwea Irrigation Agricultural Development Project
- H) Progress report, June, 1994
- I) Progress report, June, 1994
- J) Design, construction, and installation of small concrete structures for irrigation and drainage
- K) Progress report, July, 1994 - February, 1995
- L) Report on the Mwea Irrigation Agricultural Development Plan in Kenya by Short-Term Assignment Expert of Land Improvement

(3) OUTCOMES OF THE RICE CULTIVATION FIELD

- A) Fundamentals of Rice Cultivation in the NIB Irrigation Schemes and some Comments on the Mwea Irrigation Agricultural Development Program
- B) Technical Report, No. 1
- C) Progress report, February, 1992
- D) Report on activities, item: soil analysis
- E) technical instruction report on rice breeding
- F) Final report, research planning short term expert

- G) Progress report I - progress report on verification trial -
- H) Progress report, August, 1993
- I) Report on rice disease and pest damage at Kisumu rice farm
- J) Report on rice disease and pest damage at MIAD project farm
- K) Standard of rice cultivation
- L) Report on activities, item: soil and plant analysis
- M) Progress report, March, 1994

(4) OUTCOMES OF THE AGRICULTURAL MACHINERY FIELD

- A) Technical report No. 1 August, 1993
- B) Progress report February, 1992
- C) Progress report, August, 1993
- D) Training report on farm mechanization II course held at Tsukuba International Agricultural Training Center in Japan
- E) Progress report, March, 1994
- F) Progress report, June, 1994
- G) Progress of MIAD project activities
- H) Progress report, July, 1994 - February, 1995

(5) OUTCOMES OF TRAINING FIELD

- A) Technical report No. 1. August, 1991
- B) Technical report No. 1 Farm economy survey
- C) Progress report, February, 1992
- D) Short term expert on audio visual technology
- E) Progress report - progress report on verification trial
- F) Progress report, August, 1993
- G) Progress report, March, 1994
- H) Progress report, June, 1994
- I) Progress report III
- J) Progress of MIAD project activities
- K) Report of the group training course in agriculture extension service for leader II
- L) Progress report, July, 1994 - February, 1995
- M) Summary report on farm economic survey in MIS
- N) Progress report II - results of cropping pattern verification trials of 1993 season and progress reports on 1994 cropping season
- O) Progress report, June, 1994
- P) Progress of MIAD project activities
- Q) Progress report, July, 1994 - February, 1995
- R) Classification of teaching notes for all the implemented course
- S) Syllabus formulation and evaluation procedures
- T) Annual evaluation meeting result reports

5-4. SUSTAINABILITY OF MIAD

The organization of MIAD was newly established one based on the agreement for the cooperation between Kenya and Japan in 1991 when the project started and it aims at the development of appropriate techniques for irrigated rice cultivation. The responsibility for its management and activities is on the NIB.

Satisfactory resources such as budget and personnel have been secured to pursue activities. Constant amount of budget has been allocated to MIAD from NIB in every year, and moreover, budget for applied research has been newly provided from other financial resource in 1995. Able senior staff working as counterparts for Japanese experts have been assigned.

In order to attain self-sustainability of MIAD, NIB should play a significant role in determining the position & orientation of MIAD and its activities. Also, the following aspects of its organization have to be focused and considered on the assumption that Japanese cooperation will end.

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(a) Budget

Since much portion of budget of MIAD is currently provided through Japanese cooperation, more budget will have to be provided.

(b) Personnel

Enough number of qualified personnel for the applied research of irrigated rice cultivation is crucial for MIAD.

(c) Position and orientation as an organization

It is important for MIAD to confirm its position in the structure of NIB's organization and its roles be placed on. Relationship between MIS and MIAD as well as Mwea Research Station and MIAD is crucial.

(d) Technical demand from farmers and MIS.

Since the ultimate goal of MIAD project is to develop a package of techniques acceptable to farmers and MIS, efforts to obtain the technical needs from the farmers and MIS are essential in order for MIAD to be sustainable. It is also important to come up with expectation of farmers and MIS for solving their technical problems.

6. SUMMARY OF THE EVALUATION AND RECOMMENDATIONS

6-1 SUMMARY OF THE EVALUATION

The Project, with close collaboration between Japanese experts and the counterparts has been producing a package of techniques for irrigated agriculture with high possibility of introduction both to MIS and the relevant farmers. Principal techniques developed are :

- (1) Water control and facility maintenance techniques easily practiced and corresponding to the new cultivation techniques,
- (2) Selection of appropriate varieties and improved cultivation techniques for both single and double cropping.
- (3) Dry land cultivation and soil improvement techniques required for the proposed new cropping pattern.

Diffusion of the methodologies to develop new techniques and the developed new techniques has successfully been carried out mainly by the counterparts assisted by the Japanese experts, making full use of the actual training plans formulated and the various training materials produced. In preparing training courses to different groups, training requirement was investigated and discussions among MIAD, MIS and NIB were held.

Through these joint activities and the training in Japan, the counterparts have been acquiring knowledge and techniques necessary for pursuing MIAD project. As observed in their explanations during our visit to the project site and the hearings, progress of technical transfer to the counterparts has been quite encouraging.

Although the accomplishments by the project has been satisfactory as a whole, some problems and uncertain factors might have been left and should be solved and clarified in the near future. These are explained in the following recommendations in detail.

Japan's comprehensive and integrated approach with various cooperation schemes has been quite effective. The proceeded feasibility study for the Mwea Irrigation Scheme and grant aid for rehabilitation of MIS facilities and for construction of pilot farm facilities have been playing very important role in carrying out the MIAD project. It is also expected the methodology transferred and the techniques developed by the project will be fully utilized and the MIAD will act as the important technical center, where an extension scheme of MIS, presently on its detailed design stage assisted by Japan (OECF) is realized.

6-2 RECOMMENDATIONS

(1) Development of techniques acceptable to the farmers

The ultimate goal of the Project is to develop a package of techniques acceptable to the farmers. Once technique is developed in the pilot farm, feed back and review of the results of its trial application to farmers through the extension by MIS is crucial to establish really practical techniques. Recognition of the ultimate goal and flexible attitudes towards realization of the goal are essential for the Project to be really successful.

(2) Communication among the organizations concerned

Since the Project is implemented under the initiative of NIB headquarters and with cooperation of MIS, adequate communication and mutual understandings among NIB headquarters, MIS and MIAD are very important. However the Joint committee were held only on the occasion the JICA survey teams for The Project were dispatched to Kenya in spite of the prescription of the R/D which states the committee has to be held at least once a year and whenever necessity arises. The Joint Evaluation Team recommend that the committee have to be held as the R/D prescribes. It is also recommended a quarterly meetings should be established among NIB headquarters, MIS and MIAD on implementation basis in order to discuss a plan of the activities and review it. Monthly meetings between MIS and MIAD staff have also been recommended.

(3) Economic study of new cropping systems

The project aims to introduce new cropping systems to MIS based on the result of research in the pilot farm. Whether farmers adopt them or not depends on the profitability of the new techniques. Also, financial consideration of MIS has to be examined in order for the new systems to be sustainable. For example, application of dry land cultivation should be studied from the view points of both farmers' and MIS's account with consideration of cattle plowing, marketability and productivity of crops, availability of water, and so on.

It is necessary to comprehend the intricate systems as a whole when it is actually introduced to fields. Though technical study has been under way by the experts in MIAD and MIS, economic study has not been done so far. Consequently, the study from economic point of view should be done.

(4) Future of the MIAD (sustainability)

In order for MIAD to be sustainable, enough resources, such as budget and number of qualified staff, will have to be enough secured to cover the resources presently provided by the Japanese side.

In addition, recognition of division of work between MIS and MIAD as well as Mwea Research Station and MIAD should be shared through regular discussions.

(5) Necessity of follow up cooperation

Since the activities of each section need to be highly coordinated to develop acceptable techniques for farmers, it is desirable for the follow up program to cover all sections.

Annex- 6 (Performance Matrix of MIAD PROJECT) shows the status of individual activities and problems to be solved during follow up period.

Cooperation field with higher necessity and to be covered by long term experts are:

- 1) irrigation and drainage
- 2) agricultural machinery
- 3) training

The long term experts may take care of remaining sections, e.g. water management and rice cultivation sections, which will be covered by short term experts.

Two years would be appropriate as follow up period and in the future.

APPENDIX 1

LIST OF JAPANESE LONG TERM EXPERTS

Year	1991	1992	1993	1994	1995	1996
Month	2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3					
Term	1991.2.1 Masato TAMURA (Coordinator and Training)	1993.10.10 (Training)				1996.1.31
Name	1991.2.1 Naoki UCHIYAMA (Water Management)	1993.1.31				
&	1991.4.17 Shigenobu MURAO (Team Leader)					1996.1.31
Field	1991.4.17 Toshinari OTA (Rice Cultivation)					1996.1.31
	1991.4.17 Akira YOSHIDA (Agricultural Machinery)				1995.4.16	
	1991.7.2 Yoshihiro OZAWA (Irrigation & Drainage)			1994.7.1		
			1993.1.21 Seiji TANAKA (Water Management)			1996.1.20
				1993.10.6 Tetsuya YOSHIMURA (Coordinator)		1996.2.3
				1994.6.15 Toshiaki NAMBA (Irrigation & Drainage)		1996.1.31

Japanese Fiscal Year: 1st April to 31st March in the next year

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LIST OF JAPANESE SHORT TERM EXPERTS

Year	1991	1992	1993	1994	1995	1996
Month	2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3
Term,	Aug. 1 — Aug. 29	KIKUO WASANO (Breeding)				
Name	Oct. 8 —	ASAO TANAKA (Agricultural Economy)				
&	Nov. 23 —	HISAYOSI INOUE (Water Balance Studies)				
Field	Jan. 25 —	MOTOHIKO KONDO (Soil Analysis)				
	Jul. 1 — Jul. 29	HARUMI SHINODA (Breeding)				
	Aug. 15 — Sep. 11	TADAKATU SASAKI (Cultivation Plan)				
	Jan. 4 —	MAR. 6 KATSUTOSHI SHINOZAKI (Audio Visual)				
	Jan. 10 —	FEB. 10 HISAYOSI INOUE (Water Balance)				
	Mar. 8 — Mar. 27	KIYOSHI HORII (Soil Mechanics)				
	Oct. 6 —	DEC. 27 SUSUMU MAKINO (Entomology)				
	Jan. 22 —	MAR. 19 MOTOHIKO KONDO (Soil & Fertilizer)				
	Feb. 22 —	MAR. 19 MASAKAZU MIZUTANI (Water Distribution)				
	Mar. 30 —	APR. 18 TSUNEO YAMASHITA (Soil Physics)				
	Seikou YOSHIDA (Irrigation & Drainage)	SEP. 7 — OCT. 29				
	Shuichi HASEGAWA (Soil Physics)	FEB. 15 — MAR. 15				
	Nobuyuki ABE (Agricultural Machinery)	APR. 8 —				
	Takayuki TSURUUCHI (Farm Economy Survey)	JUL. 5 — SEP. 9				
	Masakazu MIZUTANI (Water Distribution)	AUG. 6 — SEP. 9				

Japanese Fiscal Year: 1st April to 31st March in the next year

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KENYAN COUNTERPARTS TRAINING

Year	1991	1992	1993	1994	1995	1996
Month	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12
Term	Mar. 28 - Apr. 16	Apr. 16 A. A. MOHDHAR (Observation of Irrigation & Drainage Project)	Apr. 14 - Jul. 19	S. N. ALUKONYA (Agricultural Extension Service for Leader II)		
Name		Apr. 14 - M.A.Y. 5	Oct. 30	Mohammed ABDULLAHI (Irrigation Water Management)		
&			Feb. 7	Nov. 18		
Field		Simon Mwangi KAMUNDIA (Irrigation & drainage II)	Feb. 14	Nov. 18		
		Hebron Litsulisa ADOLI (Farm Mechanization II)	Feb. 14	Nov. 18		
	Mar. 30 - Apr. 18	B. B. BARGORIA (Observation of Irrigation & Drainage Project)				
	Mar. 30 - Apr. 18	S. M. GITONGA (Observation of Irrigation & Drainage Project)				
	Mar. 30 - Apr. 18	M. O. AGOT (Observation of Irrigation & Drainage Project)				
		Stephen Odede SHISANYA (Rice Breeding)	M.A.Y. 5	Nov. 4		
		J. P. OLLUM (Observation of Irrigation & Drainage Project)	Jun 7 - Jun 25			
			Said Jilo WAYU (Rice Production)	Feb. 26	Oct. 20	
		Norman Odongo AMANI (Agricultural Extension Service for Leader II)	M.A.Y. 10	Jul. 31		
		E. K. CHESEREM (Observation of Irrigation & Drainage Project)	Jul. 13	Aug. 6		
			Joseph Muryoro NJIRIMA (Rice Production)	Feb. 6	Oct. 28	
			Samuel Bundi MWAI (Farm Mechanization II)	Feb. 20	Nov. 24	
			Gitonga MUGAMBI (Rice Production)	Feb. 27	Oct. 27	
			Raymond Eston NJAGI (Soil Analysis)	Jun 27	Dec. 1	
			Cecilia Njoki KARIITHI (Observation of Irrigation & Drainage Project)	Jul. 23	Aug. 13	
			Giadys Mawero WABUKE (Rice Breeding)	Jul. 31	Oct. 31	
			Zaituni Issa KIOKO (Distribution of Fresh Fruits & Vegetable)	Sep. 4	Nov. 22	

* Japan fiscal year starts April to March in the next year.

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PROVISION OF EQUIPMENT

APPENDIX 3 - 2

Technical Equipment

PERIOD: from 1st February 1991 to 4th September 1995

PERIOD	1990/1991	1991/1992	1992/1993	1993/1994	1994/1995	1995/1996	TOTAL (Kshs)
AMOUNT (Kshs)	0.00	8,698,707.04	26,609,584.36	19,986,073.10	15,992,522.18	11,868,421.06	83,155,307.74

Carried Technical Equipment

PERIOD: from 1st February 1991 to 4th September 1995

PERIOD	1990/1991	1991/1992	1992/1993	1993/1994	1994/1995	1995/1996	TOTAL (Kshs)
AMOUNT (Kshs)	133,517.04	1,275,796.50	1,074,247.34	2,628,545.67	1,642,396.09	1,012,925.91	7,767,428.55

SUPPLEMENT OF LOCAL COST EXPENDITURE

PERIOD: from 1st February 1991 to 4th September 1995

PARTICULARS	PERIOD	1990/1991	1991/1992	1992/1993	1993/1994	1994/1995	1995/1996	TOTAL (Kshs)
Local Recurrent Cost		64,589.05	1,123,522.65	1,140,803.75	2,345,288.40	3,019,000.00	3,157,894.70	10,851,098.55
Expenditure Support								
Emergency Countermeasure Program			1,860,867.00	2,562,001.00	2,667,126.60			7,089,994.60
Middle Technichan Training Program			2,113,652.00	4,339,477.00	2,110,000.00	2,110,000.00	3,211,000.00	11,773,129.00
Technology Exchange Program			653,181.00		491,176.00			1,144,357.00
Farm Economy Survey			19,284.65				2,156,000.00	2,175,284.65
AMOUNT (Kshs)		64,589.05	1,795,988.30	5,115,322.75	9,735,942.40	7,796,126.60	8,524,894.70	33,033,863.80

Japanese Fiscal Year: 1st April to 31st March in the next year

to

LIST OF KENYAN COUNTERPARTS PERSONNEL

APPENDIX 4 - 1

Field/Name	1991		1992		1993		1994		1995		1996	
	Year	Month	Year	Month	Year	Month	Year	Month	Year	Month	Year	Month
Officer in Charge												
Stephen M. MWATHA		7	10	1	4	7	10	1	4	7	10	1
Moses O. AGOT												
Raphael K. WANJOGU												
Rice Cultivation												
Moses O. AGOT												
Raphael K. WANJOGU												
Stephen Odede SHISANYA												
Titus J. BERE												
Munene E. GAKUYA												
Gladys Mawero WABUKE												
Raymond Eston NJAGI												
Agricultural Machinery												
Hebron Litsuitsa ADOLI												
Samuel Bundi MWAI												
Irrigation & Drainage												
Simon Mwangi KAMUNDIA												
Joseph Munyoro NJIRIMA												
Water Management												
Mohammed ABDULLAHI												
Peter KIENDI												
Training												
Stanley N. ALUKONYA												
Gitonga MUGAMBI												
Said Jilo WAYU												
Coordinate												
S. M. GITONGA												
Kennedy EFETHA												
Zaituni Issa KIOKO												
Norman Odongo AMANI												

Period of Counterpart Location Period of Training in Japan

to

Staff Location

Section	Job Field	Number of Person
Administration	Officer	1
	Head Field Assistant	1
	Copy Typist	1
	Telephone Operator	1
	Guest House Keeper	1
	Store Clerk	1
	Sub-staff	1
	Account Assistant	1
	Motor Bike Mechanic	1
	Driver	11
	Watchman	11
	Cook	1
	Rice Cultivation	Field Assistant
Laboratory Technician		1
Sub-staff		1
Agriculture Machinery	Field Assistant	1
	Tractor Operator	2
Irrigation and Drainage	Field Assistant	1
Water Management	Field Assistant	1
	Water Guard	1
Training	Field Assistant	2

LIST OF KENYAN BUDGET ALLOCATION

APPENDIX 4 - 3

MIAD Project Expenditure

Period: from 1st July 1991 to 28th February 1995

PARTICULARS	1991/1992	1992/1993	1993/1994	1994/1995	TOTAL (Kshs)
Salaries and wages - Regular	907,114.15	1,284,621.00	2,234,236.50	2,479,387.20	6,905,358.85
Salaries and wages - Casuals	825,573.40	1,792,613.30	2,788,933.50	3,197,842.60	8,604,962.80
Travelling and Entertainment	255,835.45	267,368.30	308,887.00	358,454.00	1,190,544.75
Maintenance of Vehicles	18,721.70	91,575.05	171,995.05	148,712.05	431,003.85
Petrol, Oils, Diesel and Greases	613,772.10	1,145,981.10	1,993,554.30	1,486,154.40	5,239,461.90
Farm Inputs	27,017.15	138,074.15	460,150.00	144,117.55	769,358.85
Other Costs	892,560.40	1,083,201.00	1,650,453.00	1,765,788.70	5,392,003.10
TOTAL (Kshs)	3,540,594.35	5,803,433.90	9,608,209.35	9,580,456.50	28,532,694.10

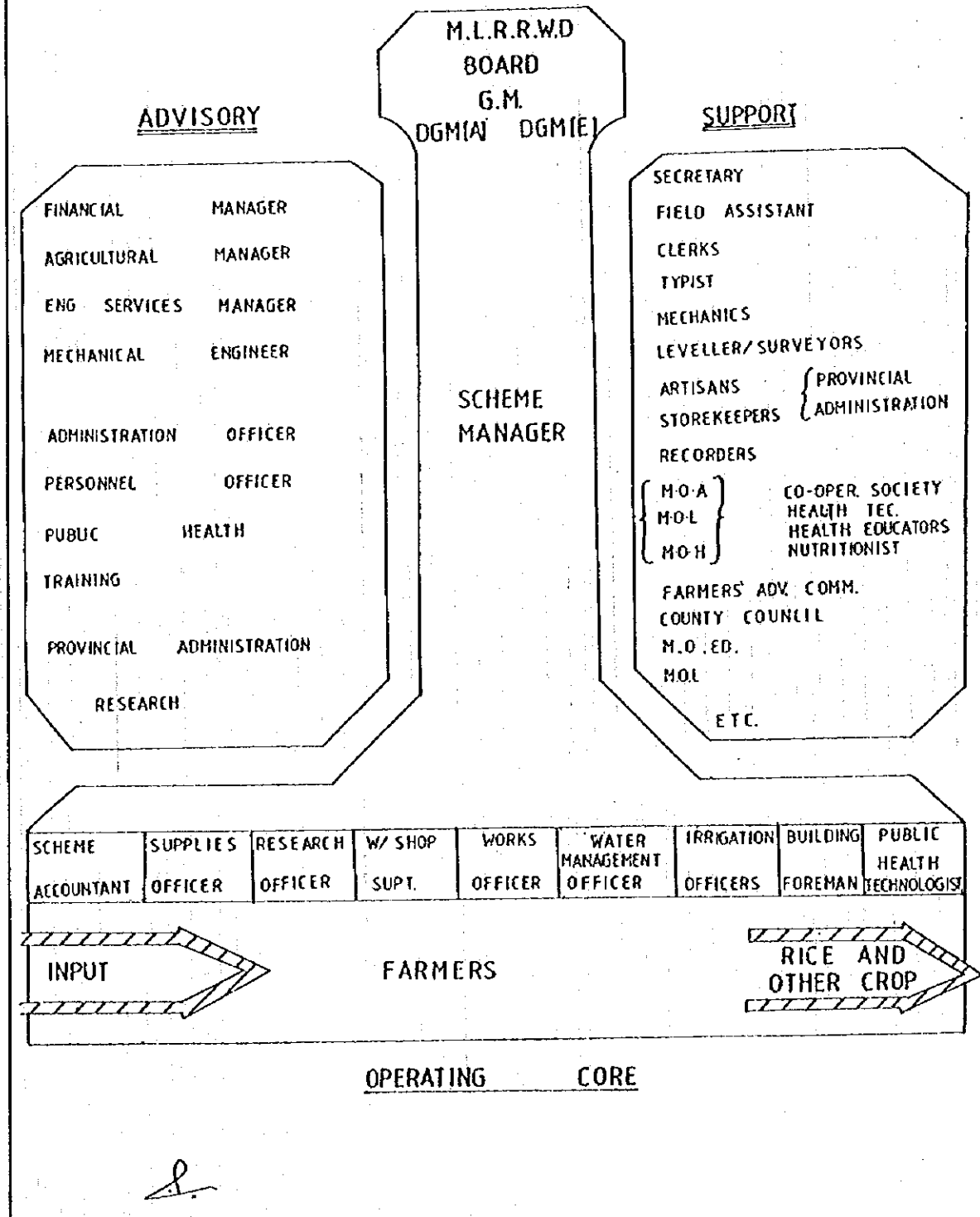
MIAD Project Income

PERIOD: from 1st July 1991 to 28th February 1995

PERIOD	REVENUE (Kshs)	THE SOURCE OF REVENUE FOR MIAD = REVENUE/EXPENDITURE
1991/92	61,730.40	0.02
1992/93	1,027,437.00	0.17
1993/94	1,324,875.40	0.14
1994/95	2,315,638.80	0.18
- TOTAL (Kshs)	4,729,681.60	0.13

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NATIONAL IRRIGATION BOARD MWEA IRRIGATION SETTLEMENT ORGANISATION STRUCTURE



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PERFORMANCE MATRIX OF MIAD PROJECT

- A — fully attained or applied
- B — partly attained or applied
- C — having difficulties or not yet applied
- — not applicable

Subjects of activities(TSI)	Actual Performance			Remarks
	MIAD Level	MIS Level	Farmers Level	
1. Water management				* Ref. Annex-1(outline map)
(1) Development of appropriate water management technique				
1) Meteorological investigation	A being continued	A being continued	-	*Ref. Annex-2(location of observation station)
2) Investigation of existing water distribution system at canal level				
3) Investigation of existing water management at field level	A	B	-	Activities necessary for the following ones, 5) and 6) 4) is based on the results of 1), 2), and 3).
4) Development of simulation on water use		MIS should research in different location with different condition.		Ref. Annex-3 (check point location)
5) Development of water distribution plan	A New water distribution plan prepared	B Feeder canal level plan has not completed.	-	Ref. Annex-4 (water requirement & work schedule of land preparation)
6) Development of operation/control techniques for irrigation & drainage facilities	A	B consider activities in '94(drought/year) by section level	C Feeder level organization is not yet set up	
- New organization for water management	A Concept is proposed.	B Appointed water management engineers	C Feeder level organization is not yet set up	* Ref. Annex-5,6 (Organization chart)

	(A) Adviser	B Radio call system is introduced	C	
- Communication network				
- Multiple-crop irrigation water management	B A plan on research level prepared	C not yet practiced	C not yet practiced	(Future problem) * Refer to Annex-7 (water requirement & work schedule of multiple-crop land preparation)

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To

Subjects of activities(TSI)	Actual Performance			Farmers Level	Remarks
	MIAD Level	MIS Level			
2. Irrigation and drainage (1) Development of appropriate maintenance method on irrigation & drainage facilities *					* TSI modified
1) Inventory					NIB staff in other irrigation scheme have introduced this registration technique.
- Irrigation facilities	A	A	-	-	* Ref. Annex-8 (inventory)
- drainage facilities	A	B C/P will follow up the registrations with MIS	-	-	To be completed by the end of the Project
- farm roads facilities	A	B C/P will follow up the registrations with MIS	-	-	- do -
- farmers list & location of their fields	(A) MIAD makes plan for making list.	A	A	A	
2) Maintenance organization	A	B MIS should reinforce the maintenance section	C Feeder level organization is not yet set up	C	Ref. Annex-9 (Proposed organization structure)
3) Maintenance calendar	A(*1)	C(*2) MIS and MIAD should prepare the practical maintenance program	C(*2) MIS and MIAD should prepare the practical maintenance program		(Future problem) *1 Ref. Annex-10 *2 Ref. Annex-11

<p>(2) Development of field level techniques on irrigation & drainage</p>				<p>-Techniques with low necessity for dry land plowing - Drainage techniques were developed concerning paddy fields in swamp area (Refer to (2), 2) [4] & [5]</p>
<p>1) Development of improved techniques for mechanized cultivation</p>	<p>A Several fields improvement techniques were developed. *</p>	<p>C [7] is executed at a few places.</p>	<p>C [6] is executed by a few farmers.</p>	<p>* For example; [1] tractor passages, [2] small concrete structures (concrete pipe, U type flume, etc.) [3] land leveling technique for newly reclaimed paddy fields, [4] drainage technique for underground water spring, [5] drainage technique on dry-paddy fields outlet, [6] Repair and maintenance technique for field bands, [7] Repair and maintenance technique for farm roads (black cotton soil), and etc. (others) [8] water fertilizer system, [9] Karmado made by local materials</p>
<p>2) Development of field improvement techniques</p>				

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Subjects of activities(TSI)	Actual Performance			Remarks
	MIAD Level	MIS Level	Farmers Level	
3. Rice cultivation				
(1) Selection of appropriate variety				
1) Double cropping variety	A SB85 is selected	C The new variety is not publicized.	C The new variety is not publicized.	The variety should be tested in a large scale
2) High yielding variety for single crop	A M11 and IR-183+8-36 are selected	C - do -	C - do -	- do -
3) Aromatic variety	B Selection technique transferred, but appropriate variety not selected.	C	C	Breeding is necessary as the next stage.
	Problem: Mix of varieties of Basmati through the process of seed multiplication is significant subject for rice production.			
(2) Improvement of rice cultivation techniques				
1) Soil amendment & soil fertility	A technique (application of rice straw fertilizer) developed	(B) Training is implemented.	B Adopted by 5% of farmers	
2) Improvement of general cultivation	A techniques (fertilizer application and nursery) developed	(B) Training is implemented	C Training is implemented	
3) Development of double cropping cultivation techniques	A techniques (fertilizer application and nursery) developed	B implemented in demo farm	C Training is implemented	

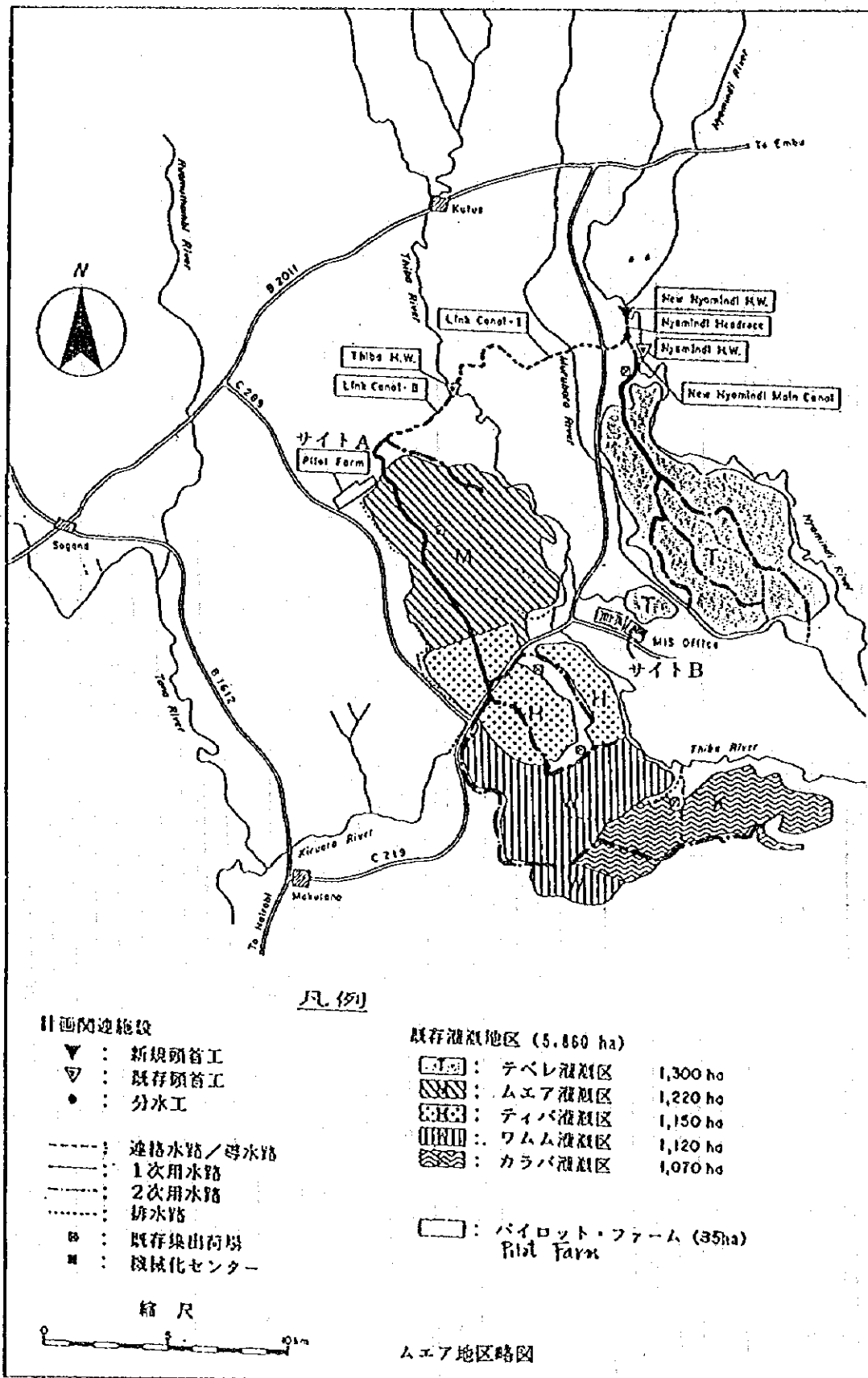
Subjects of activities(TSI)	Actual Performance			Remarks
	MIAD Level	MIS Level	Farmers Level	
4. Agricultural machinery (1) Performance & adaptability test of agricultural machinery				Alternative technique, dry land plowing, replaces wet land plowing.
1) Appropriate puddling operation				
2) Possibility of dry land plowing				
3) Development of mechanized double cropping operation				
- Selection of machinery	A Disc plow is selected. Ridging technique is improved by using one disc plow.	B Dry land plowing has been applied for 2 years.	C Even necessity is not understood	[upland farmers outside MIS working as contractors] B Technical level of operation is still low. *1 Ref. Annex-12 (ACHIEVEMENT OF DRY LAND CULTIVATION)
- Condition survey(soil)	A Relation between moisture and the workability under study. Soil improvement by introduction of organic matter is verified.	B Necessity is recognized(A); application is still problematic(B).		
- economic study	B Preliminary study is not implemented			
4) Machinery utilization test	A Applicability of many kinds of machines is studied			

(2) Operation and maintenance					
1) Proper usage of machine on farm	A C/P can make plan and utilize. *	-	-	-	* including demonstration farm
2) Driving operation	A Improvement of operation is observed (dry land plow).	(B) participate in training course	-	-	[upland farmers outside MIS working as contractors] B Technical level of operation is still low. * Durability of machine increases.
3) Inspection & adjustment	A Operators obtained technique of mechanics. *	-	-	-	
4) Repair of break-down & preventive periodical overhaul	B Periodical overhaul is not implemented	-	-	-	MIAD facilities are insufficient.
5) Management of parts, oil & fuel	C Management of parts is complicated	-	-	-	

A

Low

Subjects of activities(TSI)	Actual Performance			Remarks
	MIAD Level	MIS Level	Farmers Level	
5. Training Applicability of techniques is examined in each of 4 sections. Total number of trainee is 1282. * Ref. Annex-13 (Total number of trainee)				
(1) Settling on training plan & execution of training				
1) Studying on training requirement	A	Participate in discussion	Questionnaire is collected	NIB also participate
2) Settling on training plan	A	Participate in discussion	-	NIB also participate
3) Execution of training	A	Lectures are c/p. Japanese experts support.	participate(beneficiaries) Irrigation officers have been invited to observe training.	NIB participate (beneficiaries)
(2) Development of curricula & teaching materials				
1) Establishment of appropriate curricula	B	Curricula not suitable for the different levels of participants, especially, for the farmers	-	
2) Development of teaching materials such as text, slides & videos	A		-	
3) Establishment of training plots on pilot farm	A		demo-farm established and used to show new cultivation.	* Ref. Annex-14 (Crops farmers wish to grow)

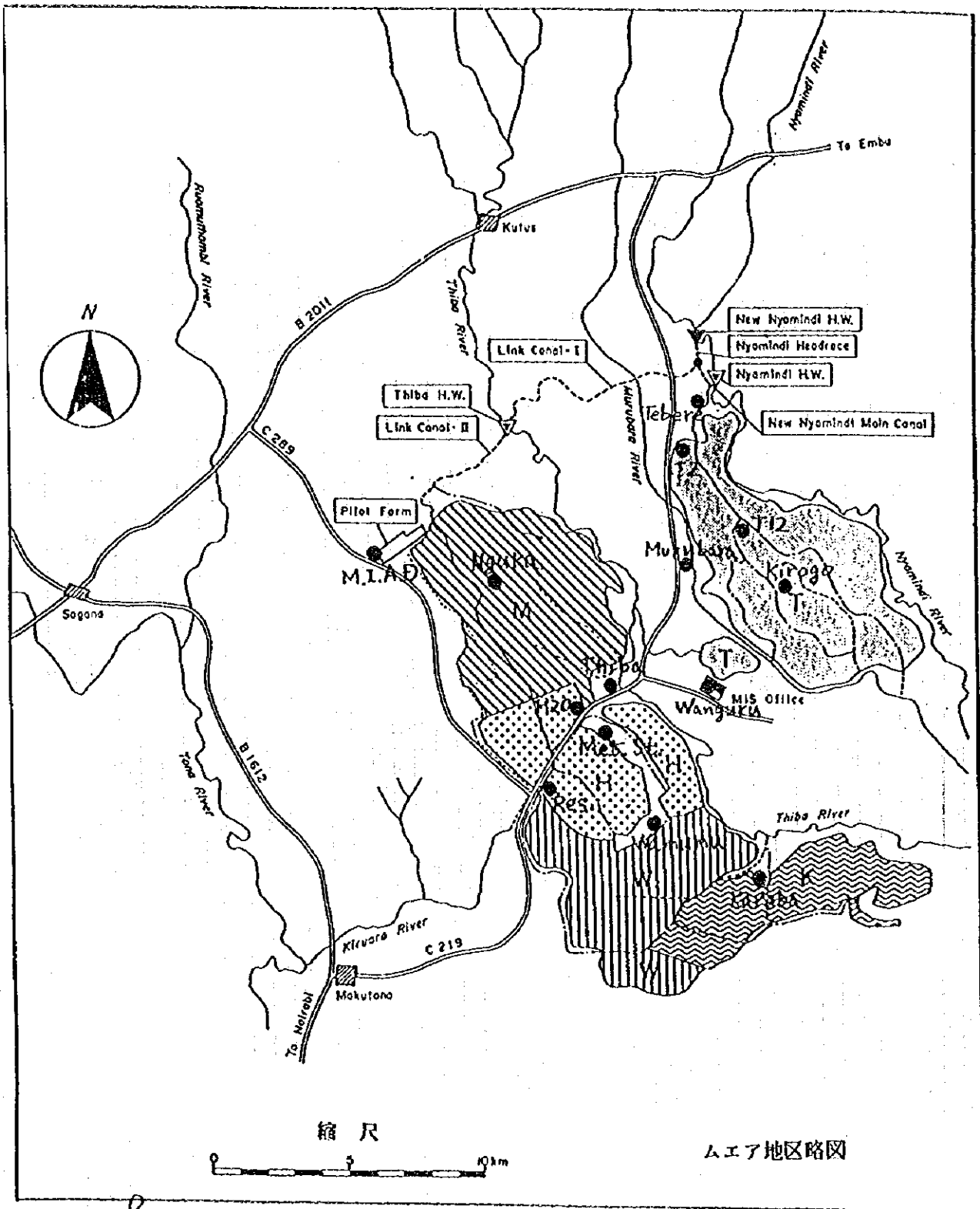


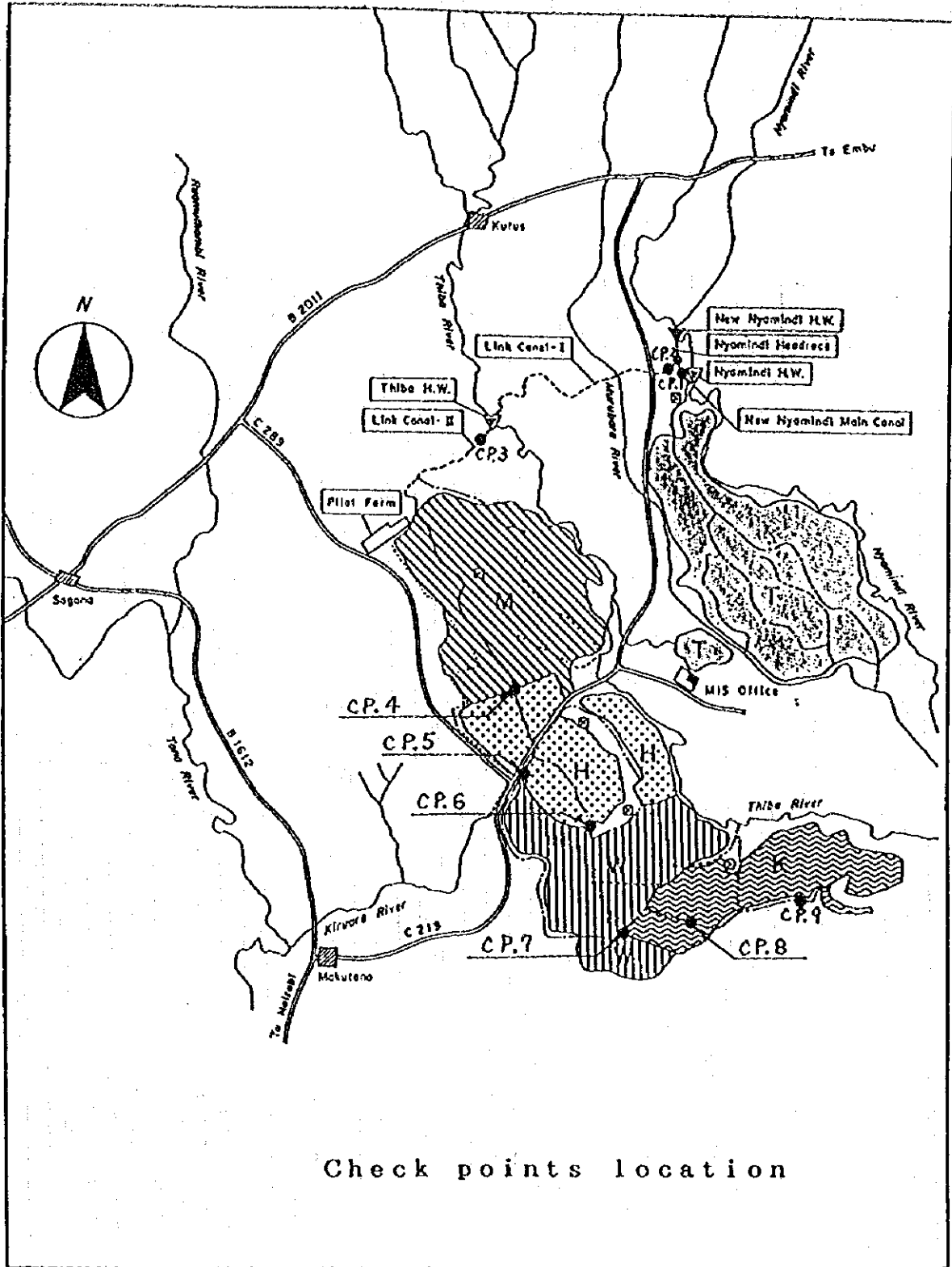
A.

46

LOCATION OF RAINFALL OBSERVATION STATIONS

ANNEX - 2

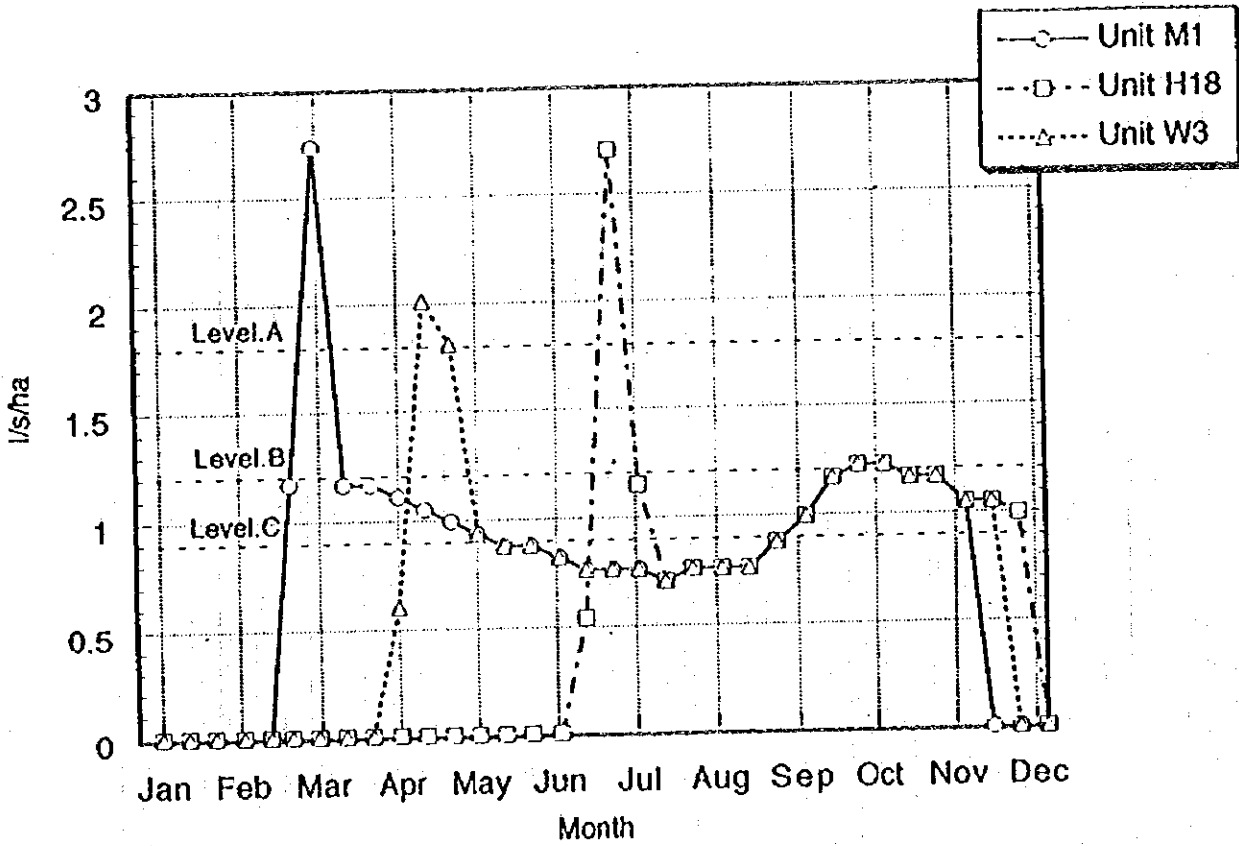




Check points location

p.

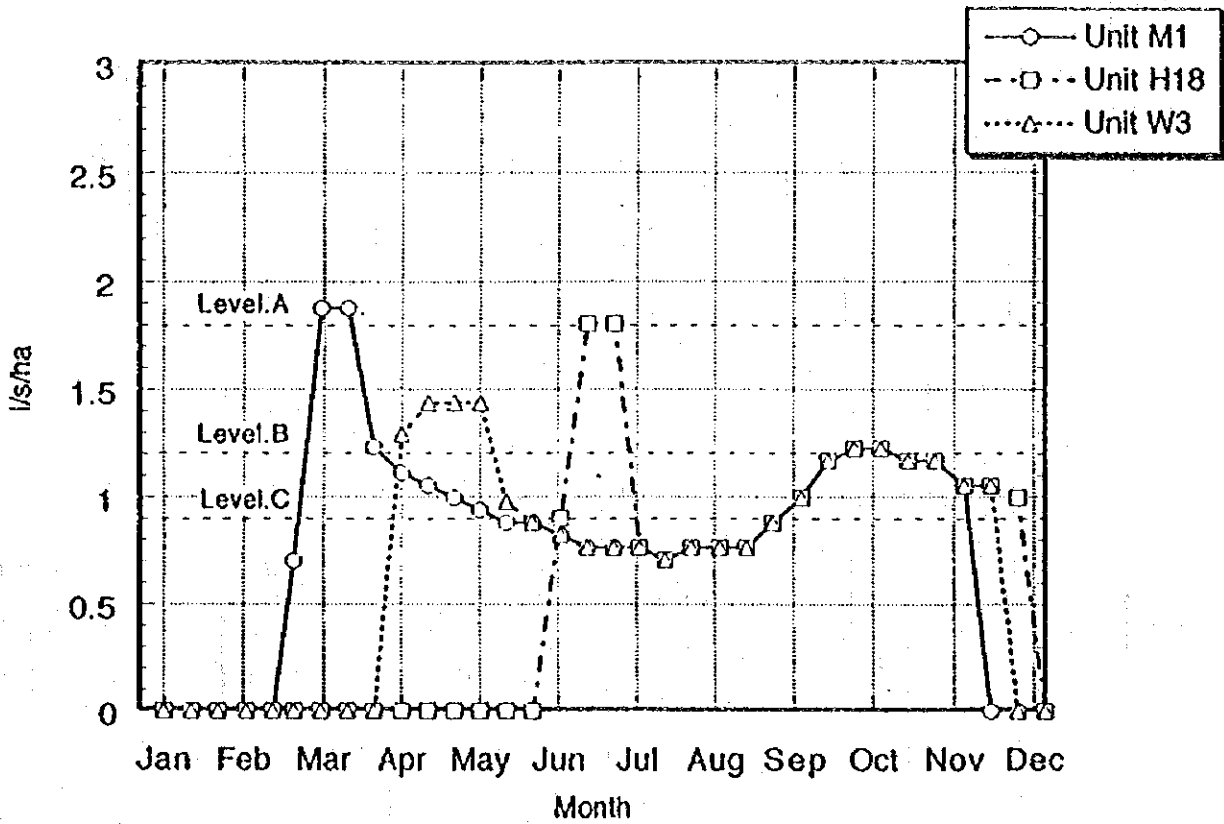
To 10



Unit Water Requirement by Wetland Preparation Using Four Tractors

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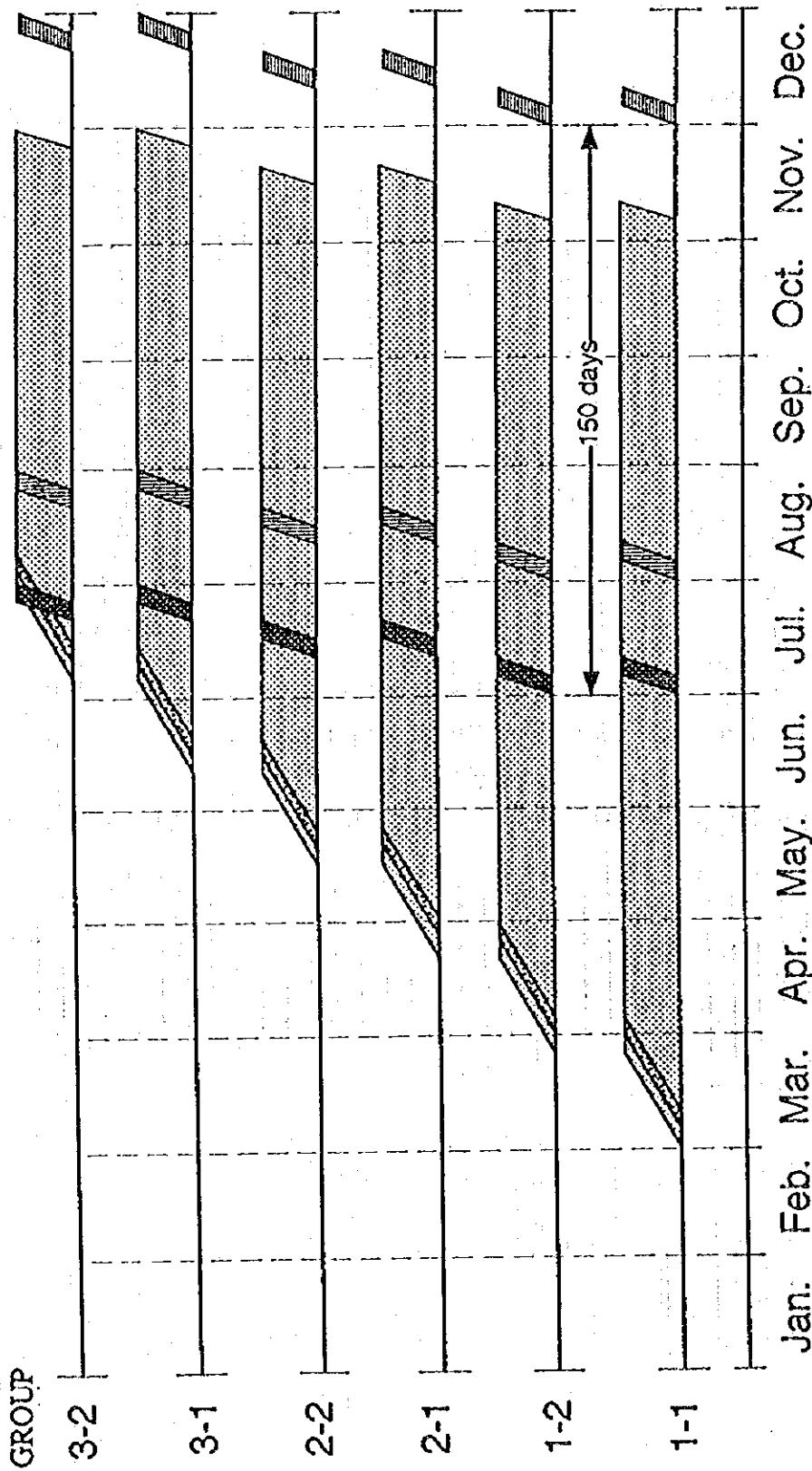
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Unit Water Requirement by Wetland Preparation Using Two Tractors

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LEGEND

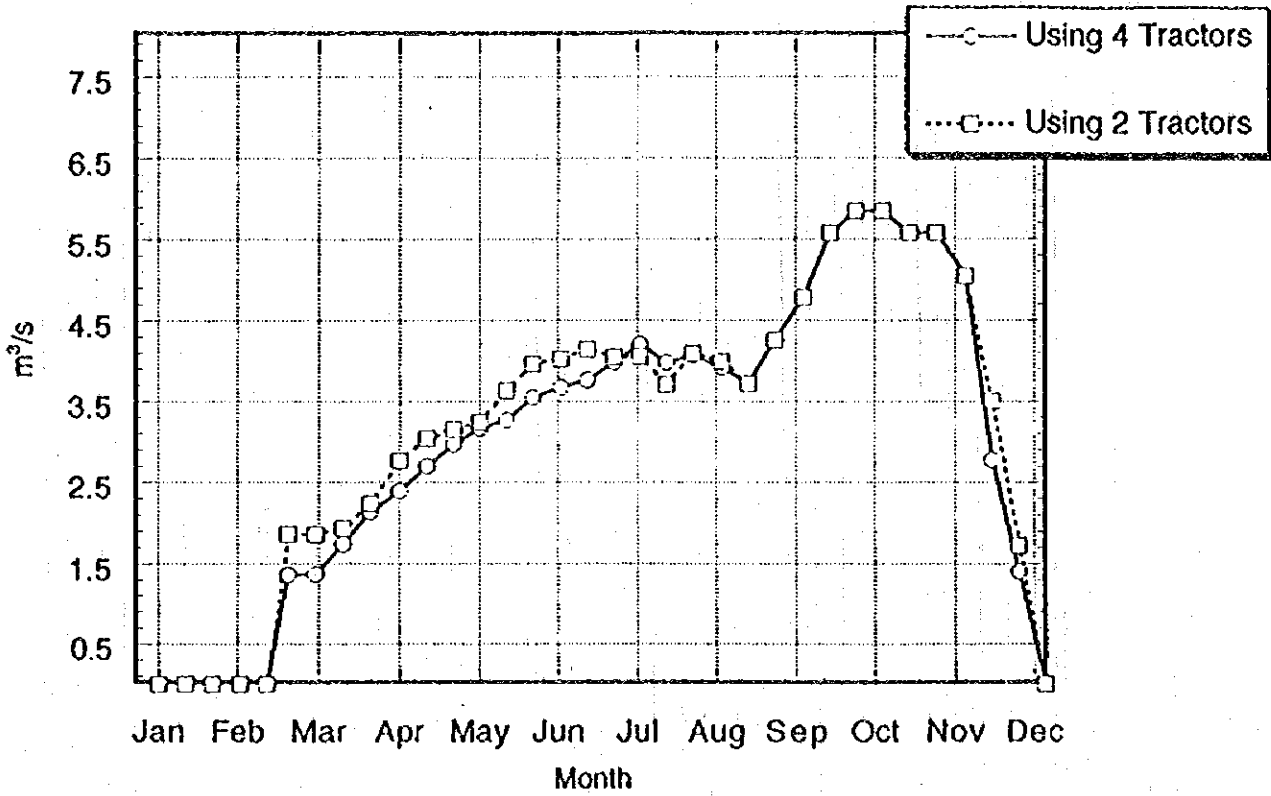
- Land Preparation
- Sowing
- Ponding
- Transplanting
- Harvesting

Work Schedule of Single Cropping with Wet Land Preparation

f.

f.

ANNEX - 4 (continued)



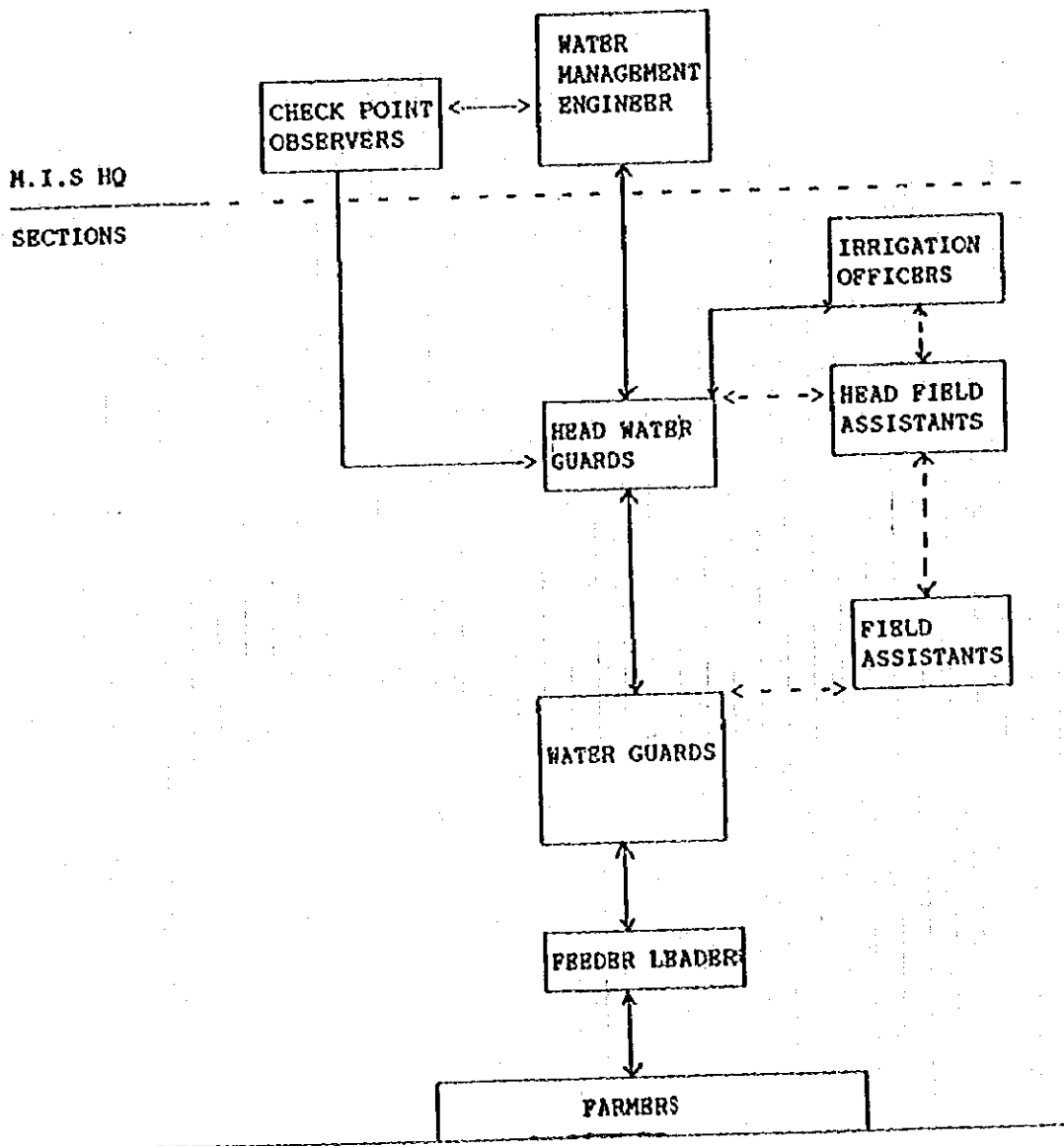
Water Requirement at Thiba Headworks In Case of Welland Preparation

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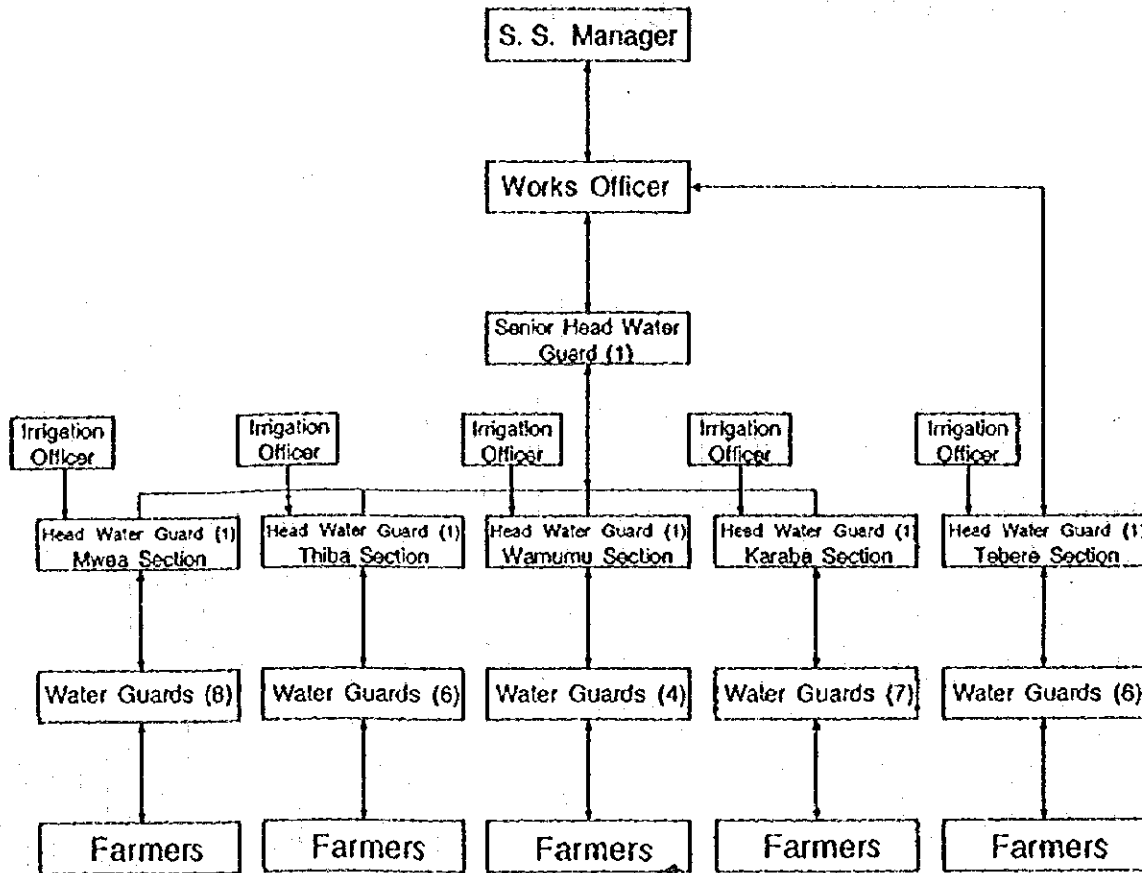
PROPOSED ORGANIZATION FOR IMPLEMENTING THE PLAN.

Organization chart.



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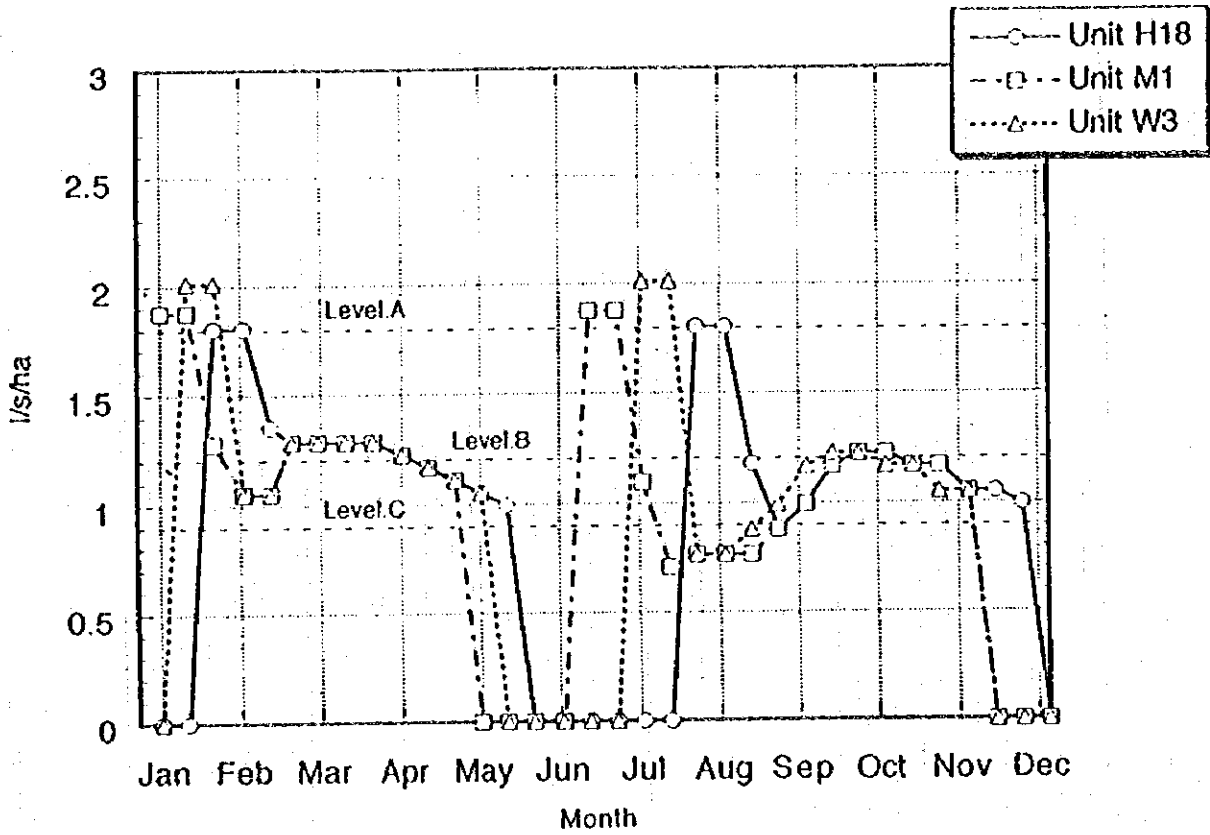


Note. The parenthesis shows the number of permanent personnel in charge.

PRESENT Organizational setup in MIS for water management

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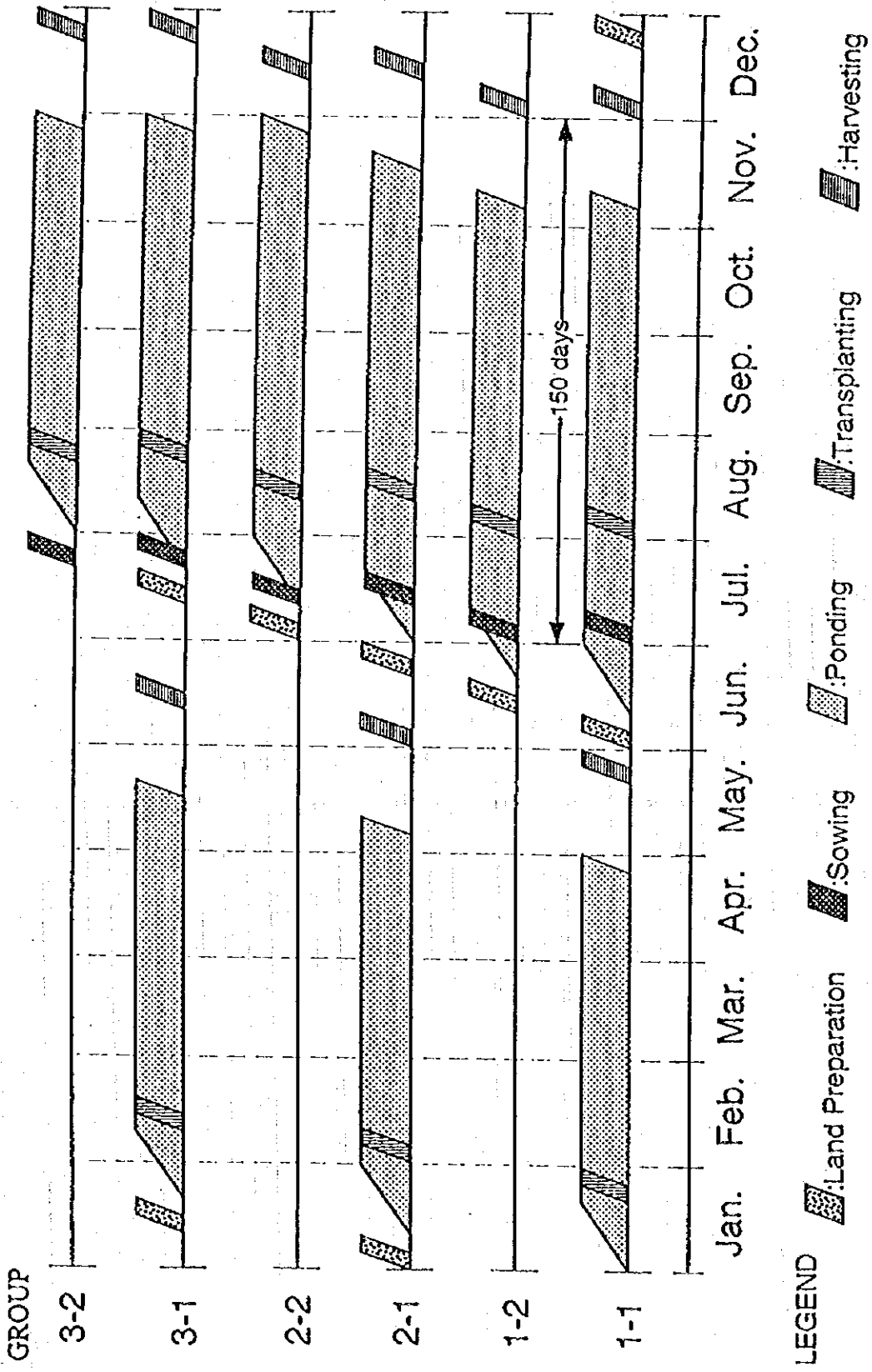
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Unit Water Requirement by Multiple Cropping Using Four Tractors

L.

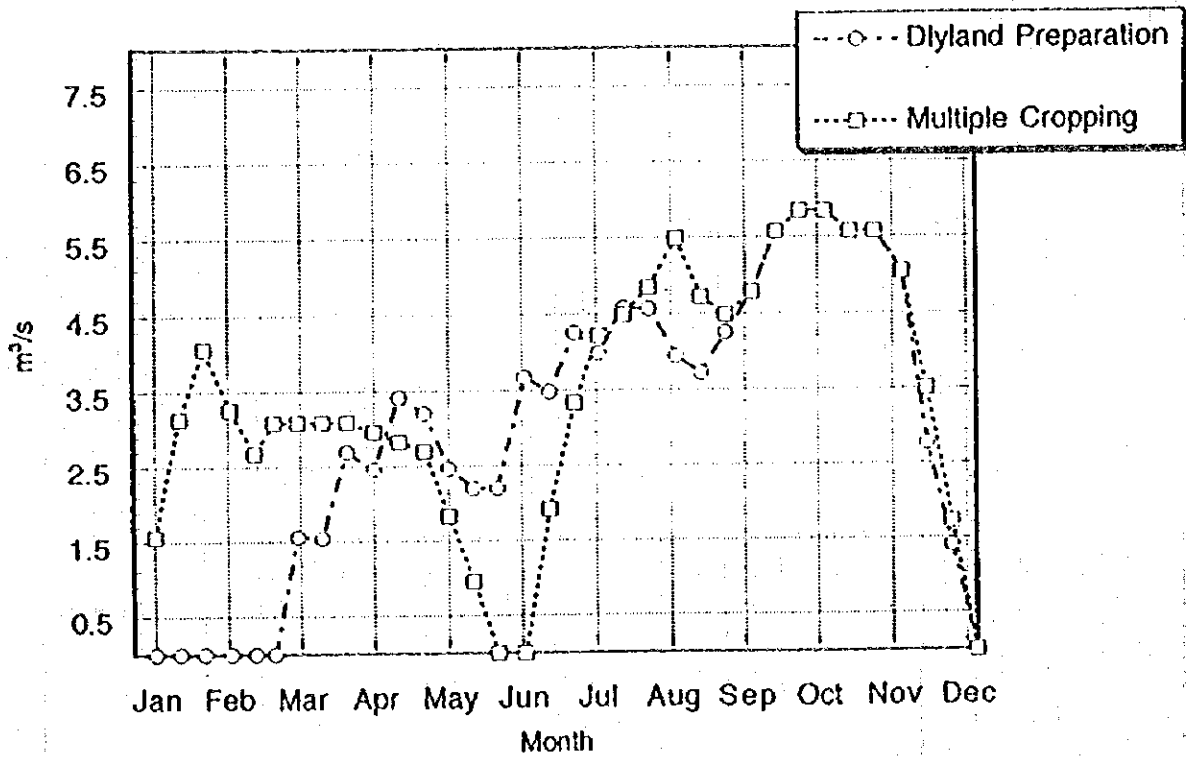
L.V.



Work Schedule of Multiple-crop with Dry Land Preparation

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**Water Requirement at Thiba Headworks
In Case of Dryland Preparation and Multiple Cropping**

2

TSA

SECTION OUTLINE & FACILITY LIST

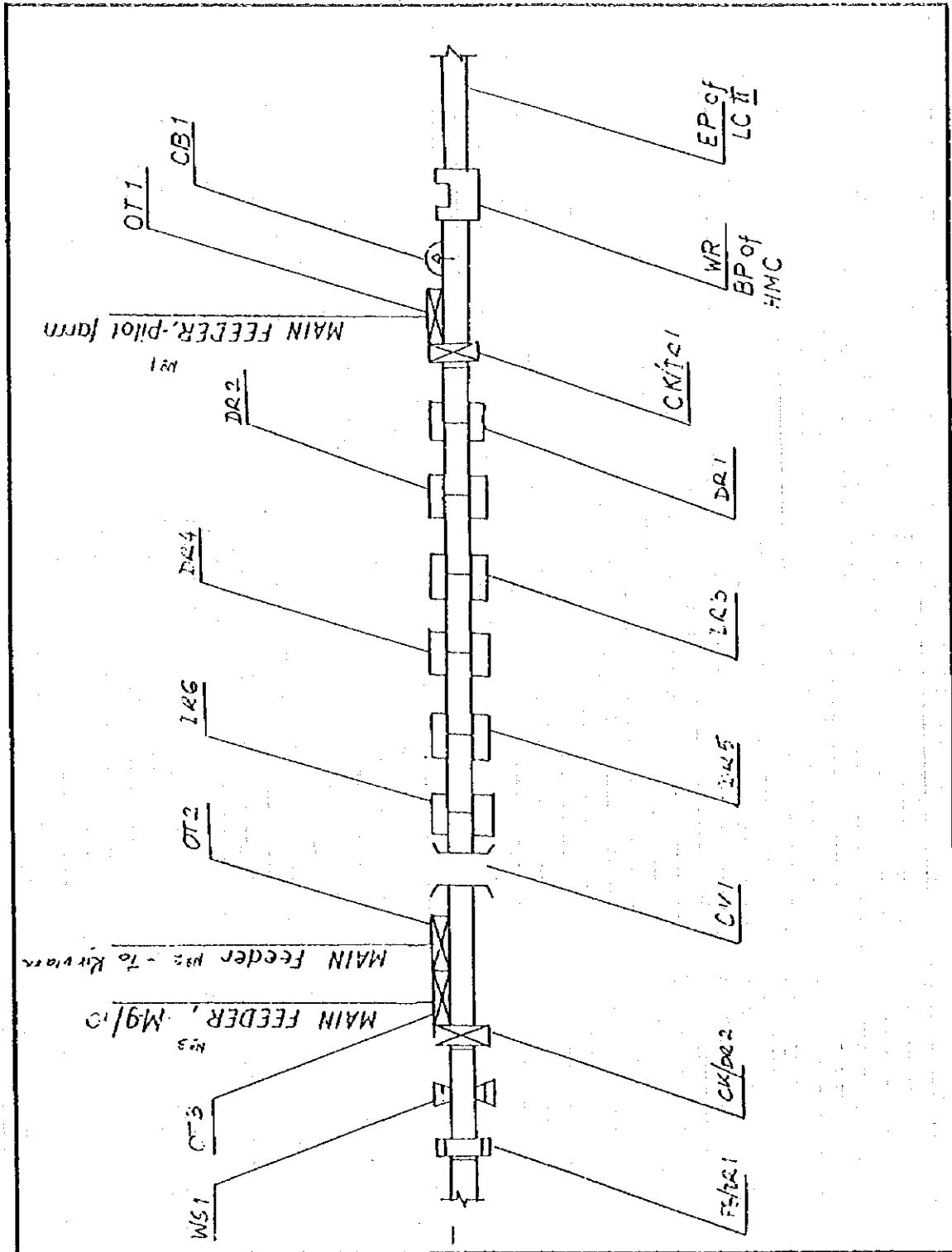
Section Outline

Scheme	MWEA	Section	THIEA MAIN CANAL
Outline	B.P : END POINT OF LINK CANAL II LENGTH, L = 8981.0 m E.P : AT BP OF BRANCH CANAL IV, RESEARCH STA. DESIGN DISCHARGE, $Q_{BP} = 7.27 \text{ m}^3/\text{sec}$, B = 5000, H = 1900, d = 1500 $Q_{EP} = 2.50 \text{ m}^3/\text{sec}$, B = 3000, H = 1400, d = 980 IRR AREA, A = 3805.0 ha.		

Facility List

Code Number	Classification	Facility Name
HMC - MF 1	IRRIGATION	MAIN FEEDER # 1 PILOT FARM
HMC - MF 2	IRRIGATION	MAIN FEEDER # 2, KIRWARA COMMUNITY
HMC - MF 3	IRRIGATION	MAIN FEEDER # 3, M-9, M-10
HMC - MF 4	IRRIGATION	MAIN FEEDER # 4, M-11
HMC - MF 5	IRRIGATION	MAIN FEEDER # 5, M-17
HMC - MF 6	IRRIGATION	MAIN FEEDER # 6, M-12
HMC - MF 7	IRRIGATION	MAIN FEEDER # 7, M-12A, M-13
HMC - MF 8	IRRIGATION	MAIN FEEDER # 8, M-15, M-16
HMC - MF 9	IRRIGATION	MAIN FEEDER # 9, M-14
HMC - MF 10	IRRIGATION	MAIN FEEDER # 10, H-18
HMC - MF 11	IRRIGATION	MAIN FEEDER # 11, H-20
HMC - MF 12	IRRIGATION	MAIN FEEDER # 12, H-19
HMC - BC II	IRRIGATION	BRANCH CANAL II, H-20
HMC - Sp 1	CONTROL	SPLITWAY # 1, H-19
HMC - BC III	IRRIGATION	BRANCH CANAL III, H-2
HMC - BC IV	IRRIGATION	BRANCH CANAL IV, H-2

ROUGH MAP

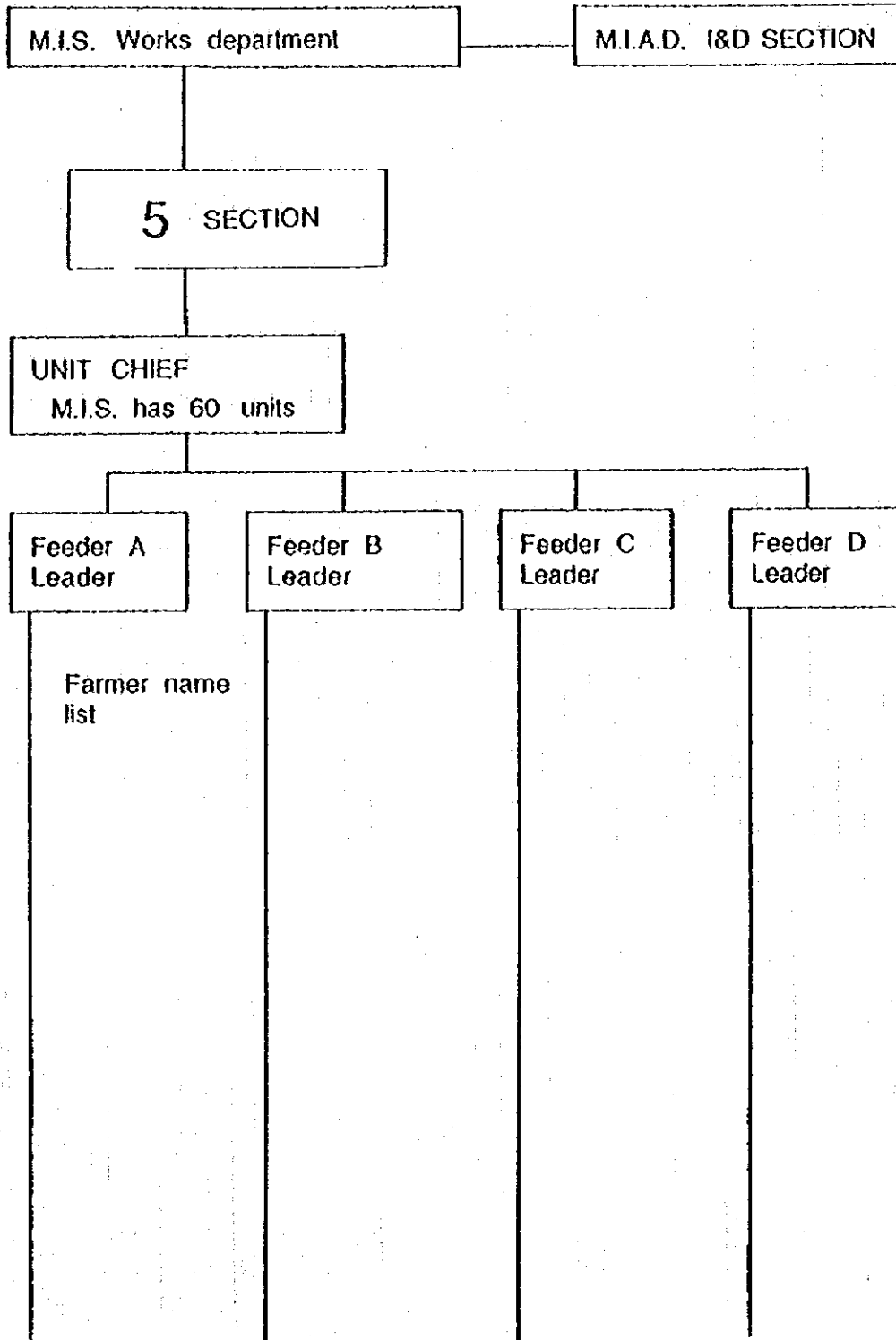


Code No	HMC	Facility	THIBA MAIN CANAL	Section	PILOT FARM/ THIBA
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2.

5/10



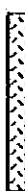
PROPOSED ORGANIZATION STRUCTURE



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MAINTENANCE CALENDER FOR PILOT FARM FACILITIES

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	REMARKS
JAN	canal 4 feeder canal 5 710 m																															FC 5
FEB	field drain 1 field drain 2 field drain 3 field drain 4 field drain 5 field drain 6 field 280 m 280 m 280 m 280 m 300 m 360 m																															
MAR	drain 7 field drain 8 field drain 9 field drain 10 400 m 560 m 740 m 740 m																															
APR	on road 1 on road 2 on road 3 on road 4 on road 5 300 m 300 m 350 m																															
MAY	on road 6 on road 7 casual MFC BFC1 BFC2																															
JUN	main feeder branch feeder canal branch feeder canal feeder canal 1 feeder canal 2 feeder canal 3 feeder canal 4 1200 m 1200 m 560 m 280 m 280 m 310 m 360 m																															
JUL	feeder canal 5 Farm Road 1 Farm Road 2 Farm Road 3 Farm Road 4 Farm Road 5 710 m 1010 m 740 m 470 m 720 m 300 m																															
AUG	farm road 1 farm road 2 farm road 3 farm road 4 farm road 5 1480 m 980 m																															
SEP	field drain 1 field drain 2 field drain 3 field drain 4 field drain 5 field drain 6 field drain 7 280 m 280 m 280 m 560 m 300 m 360 m 400 m																															
OCT	field drain 8 field drain 9 field drain 10 on road 1 on road 2 560 m 750 m 780 m 300 m 300 m																															
NOV																																
DEC	main feeder canal branch feeder canal 1 branch feeder canal 2 feeder canal 1 feeder canal 2 feeder canal 3 feeder 2170 m 1200 m 560 m 280 m 280 m 310 m																															
REGEND	 CLEANING OF IRRIGATION CANAL --- BY EXCAVATOR OR BY MANPOWER  CLEANING OF DRAINAGE --- BY EXCAVATOR OR BY MANPOWER  MAINTENANCE OF FARM ROAD --- BY BULLDOZER ; CARRYING MARRUM ---- BY DUMP-TRUCK																															

PROPOSED MAINTENANCE CALENDER FOR MIS I&D FACILITIES

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	REMARKS
Canals													
Main canal	Desilting				Weeding	Weeding				Weeding			Dredging once year by machine Weeding twice by farmers using farmers organization
Branch canal		Desilting			Weeding			Weeding					Before transplanting and during water deficit periods Organised at unit level. Weeding ---Farmers group . Desilting --- Machine (MIS)
Feeder canal	Weeding					Weeding & Desilting							Desilting and weeding by farmers Organized by feeder leader (feeder level) Throughout the cropping period
Drains													
Collect drains	Weeding				Weeding	Desilting		Desilting				Weeding	Before draining of fields and before flooding. Weeding ---Farmers group . Desilting --- MIS Machine
Catch drains	Weeding				Weeding	Desilting		Desilting				Weeding	Repair and maintenance before rain Dredging by MIS and weeding by farmers group .
Field drains	Weeding				Weeding							Weeding	Before flooding , transplanting and harvesting farmers weed and desilt drains in one operation
Roads													
Farm roads	Repair							Repair					Done during dry season by farmers and MIS . MIS supply murrum . Farmers spread murrum .
On farm roads	Repair											Repair	Throughout the year during the dry periods Unit leader organizes for the needs . Same as above.
Others repair													Culverts , bridges , gates etc during dry season by MIS as need arises .

10/10

ACHIEVEMENTS OF DRY LAND CULTIVATION IN PADDY FIELD

FOR	Field (acres)			Total
	MIAD	Demonstration	MIS	
1995 S.R. CROP				
MIAD	105.00	13.00	-	118.00
MIS	-	-	-	-
PRIVATE CONTRACTOR	-	-	798.00	** 798.00
TOTAL	105.00	13.00	798.00	916.00
1995 L.R. CROP				
MIAD	105.00	23.00	-	128.00
MIS	-	-	52.25	52.25
PRIVATE CONTRACTOR	-	-	2,028.00	*2,028.00
TOTAL	105.00	23.00	2,080.25	2,208.25
1994 S.R. CROP				
MIAD	105.00	-	6.00	111.00
MIS	-	-	-	-
PRIVATE CONTRACTOR	-	-	-	-
TOTAL	105.00	-	6.00	111.00
GRAND TOTAL (acres)				3,235.25
(ha)				1,309.27

* :Karaba Section - 2,028.00

** :Thiba Section - 798.00

2,826.00acres

TRAINING COURSES IMPLEMENTED AND NUMBER OF TRAINEES BENEFITED.

COURSE (Japan Fiscal Year)	1992/1993	1993/1994	1994/1995	1995/1996
SENIOR MANAGEMENT COURSE	17	29	42	25
WATER MANAGEMENT COURSE	35	29	18	-
TRACTOR OPERATORS COURSE	29	27	10	-
MECHANICS COURSE	30	27	8	-
WORKSHOP FOREMEN COURSE	7	9	15	-
FIELD ASSISTANTS COURSE	37	62	25	-
KEY FARMERS COURSE (MWEA)	35	78	85	90
OBSERVATION TOUR	67	-	60	-
MANAGEMENT COURSE	30	-	-	-
SENIOR ENGINEERS COURSE	-	13	13	-
KEY FARMERS COURSE (WESTERN)	-	30	28	30
FARMERS FIELD DAY COURSE	-	116	126	-
T O T A L	287	420	430	145

1995/96: Schedule

CROPS FARMERS WISH TO GROW IN (L.R OFF) SEASON. (FARMERS SELECTED UP TO THREE CROPS).

CROP	RICE			SOYA BEAN			GREEN GRAM			MAIZE			TOMATO			FRENCH BEAN			ONION		
	1	2	3	4	1	2	3	1	2	3	4	1	2	3	1	2	3	1	2	3	
ACRE	1	2	3	4	1	2	3	1	2	3	4	1	2	3	1	2	3	1	2	3	
SECTION																					
MWEA	14	29	2	24	9	-	-	11	-	1	1	-	-	12	7	-	-	5	-	-	
THIBA	8	8	1	23	11	1	2	4	1	2	1	-	-	4	1	-	-	2	-	-	
WANGU	12	16	3	17	12	1	4	7	-	-	2	1	-	3	2	-	-	3	-	-	
KARABA	16	16	3	13	-	-	-	12	2	2	4	2	-	5	1	-	-	7	-	-	
TEBERE	8	8	3	26	2	-	1	30	2	-	3	1	-	13	18	1	-	15	1	-	
TOTAL	58	77	12	103	34	2	7	64	5	4	11	5	-	37	27	1	-	32	1	-	
	178	(59%)		146	(49%)		73	(24%)		17	(6%)		39	(13%)		28	(9%)		33	(11%)	

Tavo

JICA