CHAPTER 3
IMPLEMENTATION PLAN

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3.1 Implementation Plan

3.1.1 Implementation Concept

(1) Land Tenure and Expropriation

The land in the Project area is under the jurisdiction of the Traditional Authority. The land expropriation will be made immediately after the commencement of the Project by the Land Allocation Committee chaired by the Traditional Authority. The commitment letters by the Traditional Authority for cooperation of the Project and land allocation are attached in Appendices-A5 and A6 respectively.

(2) Land Allocation

Land allocation of the Project will be made by the Land Allocation Committee chaired by the Traditional Authority. The Land Allocation will inform the relevant farmers of the implementation of the Project immediately after determination of the Project implementation, and register the farmers who intend to cultivate the land. The registered farmers will organize the Farmers Construction Committee through election. The Farmers Construction Committee will prepare a regulation on participation in construction work under the guidance of the Department of Irrigation. During the construction of the Project, the Committee will record the farmer who participate in the construction. About 2 months before the completion of construction work, the Committee will start the allocation of the land under the guidance of the Department of Irrigation, which will be made by the regulation of the participation in the construction work.

3.1.2 Implementation Conditions

(1) Implementation Method

The Project will be implemented with the following steps on the condition that the Project executed under the Japan's Grant Aid Scheme.

(i) The Department of Irrigation (DOI), Ministry of Irrigation and Water Development, will be the executing agency.

(ii) When the Exchange of Note (E/N) between the GOJ and GOM regarding the detailed design of the Project is signed, DOI will establish the Construction Office, which will take care of overall procedures necessary for the implementation of the Project. After the completion of the construction works, the Construction Office will be transformed to an O & M Office.

(iii) A Japanese consultant, recommended by JICA and entrusted by DOI after signing the contract, will carry out the detailed design and prepare the tender documents for the Project.

(iv) DOI will start the land acquisition, house compensation, and application required for tree cutting.

(v) Before signing of the E/N between GOJ and GOM regarding the Project implementation, DOI should make sure of the successful acquisition works by getting approval from the Land Allocation Committee. The Japanese consultant entrusted by DOI will start the procedure of tender after signing of contract of project supervision.

(vi) A Japanese contractor, after contract signing, will undertake the construction works and the consultant will carry out the construction supervision.

(vii) Prior to the commencement of construction, the Construction Office under DOI will hand over the Project area to the contractor. Therefore, the land acquisition and house compensation shall be completed by this time or DOI shall promise the date of hand over which shall not affect the committed construction period.

(viii) The Construction Office should guide the farmers in the construction works in order to keep the certain quality and schedule.

(ix) Upon completion of the construction work, the responsibility of O & M works will be transferred to the O & M Office.

(x) O & M Office should guide the farmers' organization on O & M works and transfer the project facilities stage by stage, to the farmers' organization, whose O & M works can be executed by themselves.

(2) Formation of the Construction

Some Japanese contractors have been engaged in the construction works of certain projects in Malawi under the Japan's Grant Aid. These contractors as main

contractor have trained the local contractors and employed them as subcontractor in the projects. Judging from the project scale and estimated number of labor, the main contractor can not execute the work with a sole subcontractor, and has to use several subcontractors. Therefore, the Project will be implemented by formation of a Japanese main contractor and several local subcontractors. The works are partially to be sublet to the subcontractors, and the subcontractors will execute the works by use of construction equipment and materials (cement, reinforcement bar, aggregate, gate, etc.) provided by the main contractor.

(3) Necessity of Japanese Experts for the Contractor

As the project construction was intended to use the local materials and local construction method as much as possible, there is little incentive to dispatch Japanese Expert for the assistance of general civil works. However, in order to construct headwork, farm plot and concrete lining, Japanese Experts are required to be dispatched for the following works.

- Expert for concrete piling and steel sheet piling works
- Expert for land leveling work of farm plot
- Expert for concrete work of canal lining

(4) Notes for the Construction

i) Construction during the Rainy Season

The rainy season in Malawi is concentrating in 6 months from November to April. During the rainy season, heavy earth works at the headworks will be impossible by the slope failures due to high rainfall intensity and much seepage water from the Namikokwe river. The construction of flood protection dike will not be scheduled in the rainy season due to occurrence of flood, and the excavation work of main and branch irrigation canals may not be possible due to swampy condition by high ground water table. In establishing the implementation plan, such conditions will be duly paid attention for smooth implementation of the Project.

ii) Measure for Environment Impact during the Construction

The possible environment impact will be (a) damage of inhabitant houses, (b) restoration of borrow areas of filling and pavement materials, and (c) accident of construction machine particularly dump truck.

In order to avoid the occurrence of physical and environmental damages in inhabitant houses, the specification shall be provided concerning the limit of the driving speed, spreading water to access road to prevent dust and so on.

On the borrow area of filling and pavement materials, an approval from the concerned agencies should be secured prior to commencement of use.

To avoid the accident by construction equipment, such measures will be taken as (a) limit of driving speed, (b) prohibition of private use, (c) regular safety assembly, and (d) deployment of traffic control officer.

3.1.3 Scope of Works

(1) Scope of Works to be Executed by the Japanese Side

- To carry out the detailed design and preparation of tender documents
- To undertake the construction of irrigation and drainage facilities, rural infrastructures and post-harvest facility as described in Chapter 2.3.

(2) Undertaking by GOM

- Provision of the necessary land for the construction of the Project facilities.
- Construction works through farmers' participation like sod facing on embankment slope of branch irrigation canals, inspection roads and rural road, excavation works of drainage canals in small scale portion (less than 1.00m of base width)
- Installation of fence for drain pit to be installed at rural water supply facility by Borehole Committees
- O & M guidance of the O & M Office to farmers' organization, and step by step transfer of the facilities to the farmers' organization upon fulfill of the requirement.

3.1.4 Consultant Supervision

(1) Detailed design and Tender Works

Prior to the implementation of the Project, the detailed design and tender works will have to be carried out. Immediately after the signing of the E/N, the consultant will be made contract with DOI, and the consultant will start the detailed design. The consultant should discuss the design and implementation schedule of the works with DOI at the detailed design stage.

The works involved in the detailed design are as follows;

i) Additional investigation / survey
   - Topographic survey of the land leveling area of 54 ha in gross area
   - Geological survey of the headworks and the main irrigation canal
   - Soil mechanical survey of the embankment materials and the headworks

ii) Detailed design
   - Review of the basic design through the additional investigation / survey
   - Review of the Project cost through the detailed design
   - Detailed design of the farm plot of 48 ha in net area through the topographical survey

iii) Preparation of the tender documents
   - Preparation of tender drawings
   - Preparation of the tender documents for the construction works

The tender for selection of a contractor for the construction works will be conducted after getting approval from DOI for the tendering process. The first step is the pre-qualification tender, and notice of this will be published in the major daily newspapers on construction and economy in Japan on behalf of DOI.

The pre-qualification documents will be distributed by the consultant to the applicants and the tender documents will be distributed by the consultant to the pre-qualified applicants.

The quoted tenders will be received by the consultant and opened in the presence of the representative of DOI. After the opening, the tender evaluation will be

carried out by the consultant in collaboration with the representative of DOI, and the draft contract will be prepared by the consultant based on the tender evaluation result.

(2) Construction Supervision

Once the contract has been concluded for the construction works, the consultant will clarify the construction method and time schedule from the contractor. The resident engineer of the consultant will be assigned to supervise the construction works with the commencement of the construction, and will regularly report the work progress to both JICA Malawi office and DOI. The resident engineer of the consultant will also coordinate the agencies concerned with the Project, including the contractor, for smooth implementation of the Project.

Since the Project comprises many kinds of work components, the consultant's construction engineer, in addition to the resident engineer, will be assigned to supervise the construction works for the headworks, land leveling of farm plot, borehole and post-harvest facility.

Through these arrangement, the Project works will be completed on schedule with good results.

The scope of the construction supervision is outlined below;

i) Evaluation and approval of the construction drawings
   - Evaluation and approval of the construction drawings, application for commencement of the works, sample of materials, specification of the equipment, etc. submitted by the contractor

ii) Construction progress and quality control
   - Checking and guidance on the construction plans and time schedule ; progress and quality control of the construction works and necessary inspection of the construction methods

iii) Approval on the payment to the contractor
   - Checking and evaluation of the performance of the works necessary for issuing payment certificates and completion certificate to the contractor.
   - Attendance at the handing-over of the completed facilities to DOI after confirming the completion of the works and fulfillment of the contract.

3.1.5 Procurement Plan

Of the equipment and materials to be used for the construction works, those available in Malawi will, in principle, be procured from the local market. Based on this basic concept, discussion was made concerning the availability of equipment and materials with the major local contractors, the Japanese contractor who is being in-charged of the Japan's Grand Aid Project in Lilongwe, and DOI. It was clarified that the equipment and materials for the general civil works will be available in Malawi, some of which were imported from South Africa. Particular materials such as steel sheet pile may not be available in Malawi, which would be imported by the local contractor. The equipment and materials for borehole including hand pump, which are recommended by the Department of Water, and post-harvest facility will be easily available in Malawi.

On the other hand, the construction equipment being used in Malawi are generally made in Europe and/or Japan, and imported from South Africa. Therefore, the construction equipment of the Project will be planed to be imported from South Africa.

3.1.6 Implementation Schedule

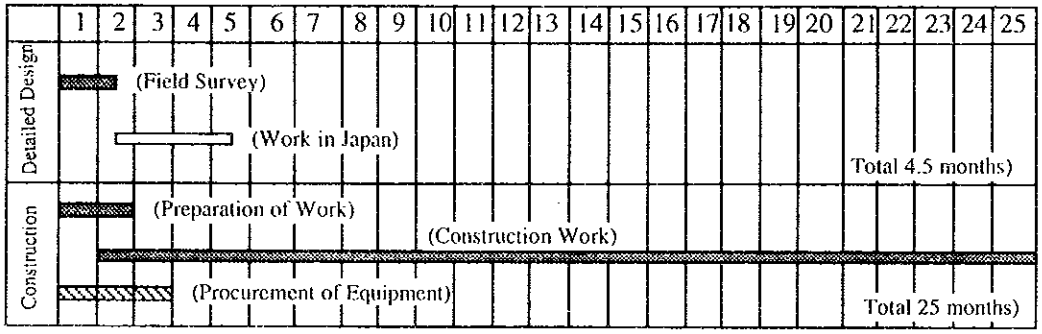
(1) Implementation Schedule of the Project

As stated in Chapter 2.3 Basic Design, the Project will be implemented by the following two phases;

- Detailed design : 4.5 months
- Construction works : 25 months

The implementation schedule is shown below;

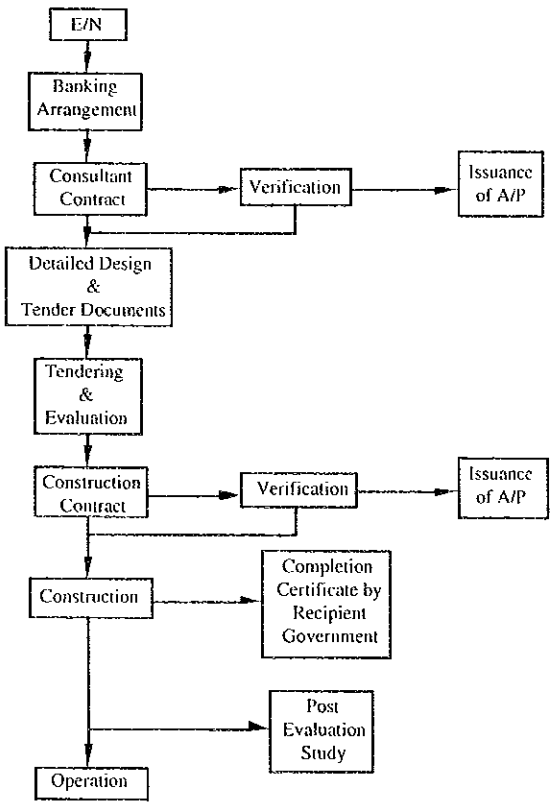
Implementation Schedule



(2) Implementation Procedure under Japan's Grant Aid System

The project shall be implemented as shown below taking into consideration the procedure of the Japan's Grant Aid system.

Procedure of Japan's Grant Aid System



Note. E/N : Exchange of Notes
A/P : Authorization to Pay

3.1.7 Obligation of Recipient Country

(1) Undertaking on Detailed Design and Implementation

For the implementation of the Project, the Government of Malawi will undertake the followings;

(i) To provide data necessary for the Project
(ii) To secure and clear the site required for the Project prior to the Project implementation
(iii) To bear commissions to the Japanese foreign exchange bank for its banking services based upon the Banking Arrangement for payment, namely the advising commission of the " Authorization to Pay " and payment commission
(iv) To ensure prompt unloading, tax exemption, customs clearance at the port of disembarkation in Malawi and prompt internal transportation therein of the materials and equipment for the Project purchased under the Grant Aid
(v) To exempt Japanese juridical and physical nationals engaged in the Project from custom duties, internal taxes and other fiscal levies which may be imposed in the Republic of Malawi with respect to the supply of the products and services under the verified contracts.
(vi) To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into Malawi and stay therein for the performance of their work
(vii) To provide necessary permission, licenses and other authorizations for implementing the Project, if necessary
(viii) To assign appropriate budget and staff members for proper and effective operation and maintenance of the facilities constructed under the Project
(ix) To maintain and use properly and effectively the facilities constructed under the Project
(x) To bear all the expenses, other than those to be borne by the Japanese Grant Aid with the scope of the Project
(xi) To coordinate and solve any issues related to the project which may be raised from third parties or inhabitants of the Project area during implementation of the Project

(2) Construction Organization

(a) Government Side

The Department of Irrigation of the Ministry of Irrigation and Water Development is the executing agency for the Project. The Department of Irrigation had previously belonged to the Ministry of Agriculture and Livestock Development, and became a wing of the Ministry of Irrigation and Water Development by combining with the Department of Water Development in October, 1996. The Department of Irrigation has 4 Sections of the Engineering Section, Field Section, Support Section and Extension & Agronomy Section as shown in Fig. 3-1. Of these Sections, the Engineering Section is in charge of design and construction works. The construction works for the Project shall be controlled by the Engineering Section of the Department of Irrigation.

The Project is the largest irrigation project in Malawi. In addition, the Project will be implemented under the farmers participation program. Taking into due consideration of these situations, it is proposed that the Construction Office shall be established under the Department of Irrigation for smooth execution of construction supervision. Fig. 3-2 shows the proposed organization of the Construction Office.

The Construction Office consists of 5 Sections of Technical Section 1, Technical Section 2, Guidance Section, Administrative Section and Financial Section. The Project Manager shall be responsible for execution of overall office management, coordination with ministries and agencies concerned, organization of tripartite meeting among the government, the consultant and the contractor, organization of meeting with the Farmers Construction Committee, and preparation of report and other necessary documents. The Technical Section 1 shall be responsible for construction supervision for the headworks and the irrigation system covering the upper Namikokwe area. The Technical Section 2 shall be responsible for construction supervision of the irrigation system covering the middle Namikokwe area and the irrigation system covering the lower Namikokwe area. The Guidance Section shall be responsible for providing technical support for farmers' construction works to be executed under the farmers participation policy, for keeping the satisfactory quality of the works and the time schedule. The Administrative Section shall be responsible for operation and maintenance of the Office. The Financial Section shall be responsible for accounting works such as

payment of salary to the staff and operation and maintenance costs for the Office. The duties of respective sections of the Office are given in Table 3-1.

(b) Farmers Side

Farmers' participation in construction works is one of important policy for the development of irrigation project in Malawi. The philosophy behind this farmers' participation is to realize the farmers that the project will be developed for them, which would lead them to do satisfactory operation and maintenance of the project. In Malawi, there is another philosophy that such farmers' participation is a key screening factor for land allocation to farmers. Therefore, it is essential to introduce the farmers' participation in the construction of the irrigation and drainage facilities in Malawi. In the light of such philosophy, the farmers' participation will be included in the implementation of the Project. Immediately after determination of the project implementation, the Land Allocation Committee chaired by the Traditional Authority, will inform relevant farmers of implementation of the Project, and register the farmers who intend to cultivate the land. The registered farmers will organize the Farmers Construction Committee through election, which is composed of 10 members. The Farmers Construction Committee will prepare a regulation on participation in construction work, prepare a work schedule, record participation conditions including frequency, control the farmers construction works under technical support by the Guidance Section of the Construction Office and demarcate the field plots together with the Department of Irrigation staff.

(c) Staffing

At present, there are 155 staff in the Department of Irrigation, of which 44 staff are assigned in the head office, and 18 staff in the Irrigation Section of Salima ADD. The present staff number does not reach to the authorized one. Even in the head office and the Salima ADD, 11 staff are less than the authorized one. The Department of Irrigation does not have any plan to increase the staff for the Project, but will increase the staff number up to the authorized one. Therefore, it is possible to assign the required staff to the Project by adjustment of staff within the Department of Irrigation since the required staff is not so many.

In Malawi, the experienced staff and engineers are limited. However, the Department of Irrigation has implemented similar projects in which total irrigable

area is about 1,800 ha. In addition, the Department of Irrigation has developed the government project of about 3,600 ha in total since 1968, and is presently executing the development of about 400 ha in total. From such facts, it is considered possible to assign the required experienced staff engineers for the Project .

(3) Farmers' Participation Works

In principal, the farm plot having 0.4 ha will be allotted to a household. Therefore total beneficiary farmers will be 2,000 households for 800 ha in the Project. As stated before, the land allocation will be carried out by the Land Allocation Committee chaired by Traditional Authority in line with the farmers' participation regulation. For the land allocation, more frequent participation in the construction is very important factor .

The following construction works are arranged for the farms' participation works in the Project in consideration of their technical ability, available manpower, time schedule, etc. The farmers' participation works should be progressed and completed in line with the construction schedule of the construction works to be carried out by the contractor.

(i) Types and volume of the farmers' participation works

The farmers' participation works are planned as follows;

- Sod facing works on embankment slope of branch irrigation canals of BC-1, BC-2, BC-2-1 and BC-3
- Sod facing works on embankment slope of inspection roads of IR-1, IR-2, IR-3, IR-4, IR-5 and IR-6
- Sod facing works on embankment slope of rural road of RR-1
- Excavation works of drainage canals in small scale portion (less than 1.00m of base width) of DC-1, DC-2, DC-2-1, DC-3 and DC-4

The detailed figures of above works are estimated in Tables 3-2 and 3-3, and summary of the respective farmers' participation works are given as follows;

Work item	Proposed construction time	Required manpower (man/day)
a) Sod facing works	Nov. 1998 - Apr. 1999	108
b) Excavation of drainage canal	May to Oct. 1998	122
	May to Oct. 1999	170

As estimated above, the maximum required manpower of 170 man/day in 6 months from May to October 1999 will have much surplus numbers compared with the total household of 2,000 numbers, and it deems one farmer may participate in the works once in 10 days. However, the frequent management of the Construction Office should be necessary in order to keep the quality and schedule of the works.

On the other hand, the farmers who will participate in their duty works have upland crop area in the development area of the Project, and they may join to the contractor's works for the purpose to earn their living expenses in substitute for that could be born from their land. According to the estimation mentioned above, the farmer in participating in their duty works may have chance to join to the contractor's works.

(4) Fencing Work of Rural Water Supply Facility

The fence around the drain pit of borehole should be provided to protect the area from animals. It may happen to permeate the bacteria into the borehole if the fence is poor. The Borehole Committee should be constructed the following fence in the respective 13 locations.

Nos. of fence	Nos. of borehole	Dimension	Specification
13	13	WxB= 3.6mx3.6m	Wooden made 1.0m height

3.2 Operation and Maitenance Plan

(1) Present Organization of Operation and Maintenance

Farmers organization will manage operation and maintenance of the project facilities, since the Department of Irrigation regards the Project as the smallholder irrigation development project paying importance upon the sprit of self-help by the beneficial farmers.

The Project includes the existing Mtandamula irrigation scheme covering 230 ha, for which operation and maintenance activities have been carried out by the farmers organization established by the 472 beneficial farmers in 1985/86. The farmers organization as shown in Fig. 3-3, is composed of one Land Allocation Committee, one Scheme Committee, 4 Block Committees, 21 Club Committees and farmers. The Land Allocation Committee consists of a chairman, a vice chairman, a secretary, a vice secretary and 6 members. The Traditional Authority (T.A.) becomes hereditarily the chairman. Other posts are selected from the Scheme Committee by the chairman. Total number of committee members is 10 persons.

The Scheme Committee is of 10 members consisting of a chairman, a vice chairman, a secretary, a vice secretary, a treasurer, a vice treasurer and 4 committee members. The Scheme Committee subordinates three specific Sub-Committees: Marketing Sub-Committee, Water Distribution Sub-Committee and Disciplinary Sub-Committee. Each Sub-Committee has 10 members as well. Under the Scheme Committee, 4 Block Committees are established to manage the agricultural activities for 41 ha to 71 ha. The Block Committee has the same structure and members with the Scheme Committee. The Block Committee manages the agricultural activities covering about 60 ha. The Club Committee, which is the lowest unit in the farmers organization, is in charge of credit.

This farmers organization is presently managed in line with the constitution which has not been yet approved by GOM.

(2) Proposed Organization of Operation and Maintenance

As mentioned before, all the completed facilities will be transferred to the farmers organization, but the continuous technical support by GOM is indispensable for smooth execution of the operation and maintenance activities by the farmers organization. It is

unlikely that the farmers organization could provide satisfactory management, operation and maintenance activities immediately after completion of construction work, because the present farmers organization is not familiar with such activities. Certain transition period is therefore required. During the transition period, GOM is requested to execute the training work as well as operation and maintenance works for farmers.

The Irrigation Section of the Salima ADD which functions as a branch office of the Department of Irrigation, shall provide technical support to the farmers organization. Fig. 3-4 shows the organization of the Salima ADD.

The Salima ADD having the Irrigation Section, plays a role of local agriculture office of the Ministry of Agriculture and Livestock Development. Therefore, the farm management and extension services to the farmers organization will be provided by the Salima ADD. The hierarchical relation between the Department of Irrigation and the Ministry of Agriculture and Livestock Development is shown in Fig. 3-5.

(a) Handing-over Schedule of the Completed Facilities from DOI to Farmers Organization

The Department of Irrigation will hand-over the completed facilities to the farmers organization in the following schedule taking into due consideration scale and importance of facilities:

(i)	Headworks	:	5 years
(ii)	Main canal system	:	3 years
(iii)	Branch canal system	:	2 years
(iv)	Feeder canal system	:	0 years
(v)	Drainage	:	3 years

However, these hand-over periods are merely yardstick. If the farmers organization is judged to be not still in a mature position to take over the facilities out the time of expiration of the above mentioned hand-over period, the period shall be extended. On the contrary, if the capability of farmers organization is fortunately judged to reach the satisfactory level earlier than expected, these facilities may be handed over earlier than the above mentioned hand-over period. Finally, handing-over time will be discussed and determined by the Handing-Over Committee in which a representative of the Department of Irrigation will be assigned as a chairman, and group village headmen and representatives of farmers as members.

(b) Proposed Organization of Operation and Maintenance during Handing-over Period

The Irrigation Section of the Salima ADD will be in charge of operation and maintenance of the project facilities during the handing-over period. Fig. 3-6 presents the proposed organization of operation and maintenance office including staffing at handing-over period. During this period, the operation and maintenance office will conduct training for framers on operation and maintenance works considering that these works shall be managed by farmers organization in future. In order to execute these works, the operation and maintenance office will comprise 5 sections such as an O & M section, a Monitoring Section, a Farmers Training Section, an Administrative Section and a Financial Section.

(c) Proposed Organization of Operation and Maintenance after Handing-Over Period

Based on the decision by the Handing-Over Committee as mentioned above, all the facilities will be transferred to the farmers organization. After transferring facilities, the operation and maintenance office will be closed, and then the Section Bwanje Valley will be newly established under the Irrigation Section of the Salima ADD to make continuous technical support to the farmers organization as per their demand. The required staff are one Irrigation Assistant, three Field Assistants and one Mechanic.

There is the farmers organization in the Mtandamula area of 230 ha, for the operation and maintenance of the existing irrigation system. As shown in Fig. 3-3, it consists of the Land Allocation Committee, Scheme Committee, Block Committees and Club Committees. The farmers organization for the Project is worked out based on the following basic concepts:

- The structure of the present farmers organization which is managing the Mtandamula existing irrigation system covering 230 ha, shall be in principle applied to the 800 ha canal system, with strengthening measures of the O & M activities.
- The main objective of the farmers origination is to operate and maintain the irrigation facilities, although other objectives such as marketing and credit services are also included in order to meet with the farmers' intention.

The proposed farmers organization which is formed based on the above basic concepts, is given in Fig. 3-7. In the proposed farmers organization, 3 Area Committees

will be established above the Block Committee, namely Upper Namikokwe Area Committee, Middle Namikokwe Area Committee and Lower Namikokwe Area Committee, considering the irrigation canal network. The command area of the Lower Namikokwe Area Committee will be almost the Mtandamula area. Above these Area Committees, the Main Committee will be established for controlling the Project. The Main and Area Committees will have 4 Sub-Committees such as Marketing Sub-Committee, Water Distribution Sub-Committee, Disciplinary Sub-Committee and O & M Sub-Committee. The Block Committee will be provided with Water Distribution Sub-Committee and O & M Sub-Committee for strengthening the operation and maintenance activities for the facilities.

(3) Operation Plan

(a) Initial Stage

The operation and maintenance office will conduct the project operation works such as collection of basic data, water management and farmers training which will become duties of the Monitoring Section, Water Distribution Section and Farmers Training Section, respectively.

The Monitoring Section shall collect and compile the basic data for preparation of irrigation schedule, such as rainfall data at Mtakataka (Registered No.14342012), discharge data of the Namikokwe and Nadzipokwe rivers, intake discharge and released discharge data at headworks, sediment conditions at settling basin and frequency of settling basin use in a year, frequency of scouring sluice use, cropped area and conveyance loss in canals.

The O & M Section shall prepare an irrigation calendar and distribute irrigation water. The irrigation calendar will indicate the intake discharge, diversion discharge at main canal to branch canals and branch canals to tertiary canals based on the seasonal variation. The O & M Section shall prepare the operation manual on intake gates, scouring sluice gates, turnout gates, check gates measuring device and water distribution, and shall simplify the calculation method of irrigation water requirement and system maintenance fee. These shall be transferred to the farmers organization together with the facilities. The O & M Section shall also estimate the system maintenance fee and request the farmers organization for payment, for which accounting treatment will be made by the Financial Section.

The Farmers Training Section shall prepare a guidance program for the farmers organization for proper operation and maintenance. Based on the program, the Farmers Training Section shall prepare the guidance papers and provide lectures and on-the-job-training for the farmers organization. In addition, the Farmers Training Section shall execute the training on administrative and accounting works, in cooperation with the Administration and Financial Sections. The Farmers Training Section shall contact with the Main Committee of the farmers organization on the execution of these training.

The detailed duties of each Section including maintenance works, are given in Table 3-4.

(b) Final Stage

Operation of project facilities will be studied and executed by respective Sub-Committees by the approval of the Main, Area and Block Committees. The duties on operation work for the respective Sub-Committees are mentioned below:

(i) Marketing Sub-Committee
- Prepare a cropping calendar.
- Arrange the cooperative purchasing system for agricultural inputs.
- Arrange the cooperative selling system for agricultural products.
- Arrange the loan for farmers.

(ii) Water Distribution Sub-Committee
- Prepare an irrigation calendar.
- Estimate intake discharge at headworks and diversion discharge at respective diversion points.

(iii) O & M Sub-Committee
- Estimate a system maintenance fee.

(iv) Disciplinary Sub-Committee
- Discipline farmers having the violated behaviors against the constitution.
- Settle disputes among farmers.

The detailed duties of each Sub-Committee including maintenance works, are given in Table 3-5.

(4) Maintenance Plan

(a) Initial Stage

Maintenance of the project facilities at the initial stage shall be executed by the O & M Section of the O & M Office. The major maintenance works area as follows:

(i) Regular maintenance works

The regular maintenance works refer to the day to day maintenance of irrigation and drainage facilities, comprising routine repair of embankments, clearance of debris at headworks, check of measuring device, filling of holes on the inspection roads, oiling of gates, etc.

(ii) Periodic maintenance works

The periodic maintenance works is defined as the repair of minor damages which do not cause immediate danger or malfunction to the canal system. Minor improvements if any are also included in the periodic maintenance.

(iii) Emergency repair

Repair of damaged facilities which would hamper the normal irrigation practices, shall be quickly and effectively carried out under the category of the emergency repair. Such damages might be resulted from flood, heavy rainfall, careless operation of gates, destruction by animals and vehicles, and so on.

(iv) Annual maintenance works

The annual maintenance work shall be executed at the fallow time, and in case of large work quantities, the work might be carried out by the contractor.

As for execution of such maintenance works, the O & M section and Farmers Training Section will contact with the O & M Sub-Committee on time for on-the-job-training.

(b) Final Stage

The O & M Sub-Committee of the Main, Area and Block Committees shall be responsible for maintenance work for the facilities. The O & M Sub-Committee of the Main Committee shall be responsible for the headworks and main canal system, the Area Committee for the branch canal system, and the Block Committee for the tertiary canal system. The O & M Sub-Committee will contact with the Section Bwanje Valley if encountering any problem.

(5) Operation and Maintenance Plan for Pumps, Ricemills and Roads

(a) Pumps

At present, domestic water in the project area is obtained from wells, river and the excavated holes in case no wells or rivers are available nearby. Such works are conducted by women which result in an increase of women's burden. Tapping water from a river would bring about the possibility of infection with bilharzia. Taking into consideration such negative situation for elevation of living standard, installation of pumps is included in components of the Project.

Based on the inventory survey on the existing wells in the 22 villages related to the Project, 13 new pumps will be installed. The operation and maintenance of pumps will be made by the Borehole Committee consisting of 10 members as shown in Fig. 3-8. The committee members shall be women more than 60% in number. The Committee will be supported by the Community Based Management Team that consists of the senior district officers despatched from the key Ministries of Irrigation and Water Development, and of Women, Children, Affairs and Community Services, and also by NGO. In the existing borehole, annual operation and maintenance cost is KW 5/family.

(b) Ricemills

A ricemill will be installed at every group village for the purpose of home consumption. Immediately after installation of ricemill, the beneficial farmers shall establish the Ricemill O & M Committee. It is composed of 10 members as shown in Fig. 3-9, and will be technically supported by the Mechanic Service Section of the Department of Irrigation.

(c) Roads

Four road plans are studied in the basic concept that 2 routes from the national roads to the project area shall be kept not to isolate the project area. As a result, D route will be used as one access but its rehabilitation is not included in the components of the Project since its maintenance by the Ministry of Works and Supplies is expected. Another access will be ensured by construction of new road from headworks to M10, especially considering access of relevant farmers living at the opposite side of the Namikokwe river for participation in the construction work and subsequent agricultural activities. The road from headworks to M10 will be constructed under supervision of the Construction Office together with construction of irrigation and drainage facilities. The constructed road as well as D route will be operated and maintained by the Dedza District Office of the Ministry of Works and Supply as shown in Fig. 3-10.

(6) Operation and Maintenance Cost

The operation and maintenance cost for the project facilities is estimated for the government and farmers sides at the initial and the final stages. The cost items to be considered are as follows:

(a) Government side

(i) Salary of government staff
(ii) Operation and maintenance cost for the O & M Office
(iii) Operation and maintenance cost for vehicles

(b) Farmers side

(i) Operation cost for the farmers organization
(ii) Maintenance cost for equipment
(iii) Material cost
(iv) Replacement cost for gates and screens

The estimated costs for the above items are summarized below, and detailed in Table 3-6.

(a) Initial Stage

(i)	Government side	:	KW 824,000 (KW 1,030/ha)
(ii)	Farmers side	:	KW 641,500 (KW 802/ha)

(b) Final Stage

(i)	Government side	:	KW 63,000 (KW 79/ha)
(ii)	Farmers side	:	KW 831,300 (KW 1,039/ha)

A capacity to pay of farmers is examined through farm budget analysis at both the initial stage and the final stage. Such a farm budget analysis is made for the Mtandamula area and the rainfed area in the project area based on the collected data and information during the Basic Design Study period. The analysis results indicate that the financial surplus is KW 11,546 for the Mtandamula area and KW 10,304 for the new area as shown in Tables 3-7 and 3-8, respectively. The farm economy, after sharing the O & M cost of the with-project condition, is shown below:

(a) Mtandamula area

(i) Farm economy at initial stage

- O & M per ha	:	KW 802
- O & M per 0.4 ha	:	KW 321
- Surplus		
Before	:	KW 11,546
After	:	KW 11,225

(ii) Farm economy at final stage

- O & M per ha	:	KW 1,039
- O & M per 0.4 ha	:	KW 416
- Surplus		
Before	:	KW 11,546
After	:	KW 11,130

(b) Rainfed area

(i) Farm economy at initial stage

- O & M per ha	:	KW 802

- O & M per 0.4 ha : KW 321
- Surplus
  - Before : KW 10,304
  - After : KW 9,983

(ii) Farm economy at final stage
- O & M per ha : KW 1,039
- O & M per 0.4 ha : KW 416
- Surplus
  - Before : KW 10,304
  - After : KW 9,888

From the above results, it is considered that the farmers in the project area will have an enough financial surplus for living after sharing the O & M cost of the with-project condition even under the present high inflation condition since it is about 4 times larger than the living expenses estimated at Feasibility Study time.

CHAPTER 4
PROJECT EVALUATION AND RECOMMENDATION

CHAPTER 4 PROJECT EVALUATION AND RECOMMENDATION

4.1 Project Effect

The implementation of the Project under the Grant Aid is judged viable for the following reasons:

a) The major beneficiaries are the small scale farmers and their family classified into the poor class, who are suffering from low farm income due to the insufficient development of irrigation facilities, unstable water supply, and low productivity. The numbers of beneficiaries who will directly benefit from the construction of irrigation and drainage facilities, rural water supply facilities, and rural road, will be at least 9,900.

b) Since the irrigation facilities are not developed in the Project site, the drought has led the lack of staple food of maize. The Project will contribute to the stabilizing of agricultural production through stable water supply by developing agricultural and social infrastructures, and thus increasing of living standard and social welfare in the Project area.

c) Since the Project is regarded as a farmers participation and self-management type, a part of construction works, as well as management, operation and maintenance works of the facilities after construction will be executed by the farmers' organization. Such activities will lead to the unity and activation of the farmers' organization, and consequently to the enhancement of social and economic activities in the rural areas.

d) DOI is the executing agency of the Project in Malawi, which has experiences of irrigation projects of about 1,800 ha in total similar to the Project in view of scale and self-management type. In addition, about 3,600 ha irrigation projects have been developed as the government management projects since 1968, and about 400 ha is now being developed. Judging from such experiences, DOI is capable of implementation of the Project as the executing agency. Management, operation and maintenance of the project facilities after construction will be satisfactorily executed by the farmers organization through the introduction of simple operational facilities as well as technical supporting by DOI and MALD.

e) It is expected that the Project will contribute to the accomplishment of the national irrigation development plan in the framework of the Statement of Development Policies (1987-1996), with which the Project is consistent aiming at elevating the agricultural production and living standard of smallholders through development of agriculture and social infrastructures.

f) The components of the Project are to construct the irrigation and drainage facilities, rural road, rural water supply facilities and post-harvest facilities, which is not aiming at earning commercial profits. Therefore, the Project is suitable for the Grant Aid concept.

4.2 Recommendation

It was concluded that the implementation of the Project was suitable and viable for Japan's Grant Aid as a result of field survey in Malawi and analyses in Japan, because the Project will significantly contribute to stable food production and stabilizing of public welfare in Malawi as well as improvement of economic status of smallholder farmers in line with the national development policies as already described.

The land in the Project areas is under the jurisdiction of the Traditional Authority (TA) in conformity to the conventional land tenure system, and land acquisition and land allocation will be handled by TA. Although the written commitments on land acquisition and allocation were obtained from the TA, it is recommended that DOI will give full attention and guidance to T/A for smooth implementation of the Project.

Due to the limited budgetary arrangement in Malawi, the Project is regarded as a farmers participation and self-management type, and the management and O & M works will be executed by the farmers' organization. Under such circumstances, the plan for operation and maintenance are to be realized in order to establish and strengthen the farmers' organization, and to hand over the Project facilities to the farmers' organization smoothly and viably under full guidance and assistance by the concerned government agencies.

Judging from the circumstances around the Project, it is expected that the Project will be implemented smoothly and effectively with due consideration to and realization of following commitment by the concerned parties.

(a) To carry out land acquisition for the construction office, temporary stockyard, quarry sites for pavement material, borrow pits as well as land allocation in line with the implementation schedule,

(b) To establish the efficient organization together with budgetary arrangement during the implementing period of the works and the transition period for handing over the completed facilities to farmers organization,

(c) To carry out the construction works under the farmers participation under the technical guidance of GOM in conformity with the implantation schedule of the Project,

(d) To provide training works as well as operation and maintenance works efficiently to the farmers organization during the implementing period and transition period, and

(e) To establish a technical supporting system to the farmers organization after handing-over the completed facilities.

APPENDICES

1 Memder List of Survey Team

1 Member List of Survey Team

Inception Report Explanation and Field Survey Team

Assignment		Name	Position
1. Team Leader	:	Junji TAKAHASHI	Development Specialist, Institute for International Cooperation, Japan International Cooperation Agency
2. Technical Advisor	:	Hiroshi IZUME	Irrigation Planning Officer, Regional Planning Division, Planning Department, Administration Office Fisheries
3. Project Coordinator	:	Tsutomu SHIMIZU	First Project Study Division, Grant Aid Project Study Department Japan International Cooperation Agency
4. Project Manager / Agricultural Development	:	Shigeyuki TANAKA	Nippon Koei Co., Ltd.
5. Irrigation & Drainage Planner	:	Kenji KYOIZUMI	Nippon Koei Co., Ltd.
6. Intake Planner	:	Eiji ICHION	Nippon Koei Co., Ltd.
7. Facility Designer	:	Kazunobu NABETA	Nippon Koei Co., Ltd.
8. Operation & Maintenance Planner	:	Hitoshi SHIMAZAKI	Nippon Koei Co., Ltd.

Inception Report Explanation and Field Survey Team

Assignment		Name	Position
1. Team Leader	:	Junji TAKAHASHI	International Cooperation, Japan International Cooperation Agency
2. Project Manager / Agricultural Development	:	Shigeyuki TANAKA	Nippon Koei Co., Ltd.
3. Irrigation & Drainage Planner	:	Kenji KYOIZUMI	Nippon Koei Co., Ltd.

2 Survey Schedule

2 Survey Schedule

Inception Report Explanation and Field Survey Team

No.	Date	Movement/Place/Agencies	Station	Activities/Name of Person
1.	Sep. 8 Sun.	Narita - Amsterdam	Amsterdam	Mr. Tanaka, Mr. Shimazaki, Mr. Kyoizumi, Mr. Ichion and Mr. Nabeta
2.	Sep.9 Mon.	Amsterdam	On board	- do -
3.	Sep.10 Tue.	Lilongwe	Lilongwe	- do -
4.	Sep.11 Wed.	JICA Malawi Office Lusaka - Lilongwe	Lilongwe	Explanation of the Inception Report Mr. Takahashi, Mr. Izume and Mr. Shimizu
5.	Sep.12 Thu.	JICA Malawi Office Ministry of Irrigation and Water Development Ministry of Finance, Ministry of Agriculture and Livestock Development Irrigation Department	Lilongwe	Courtesy Call Explanation and Discussion of the Inception Report
6.	Sep.13 Fri.	Lilongwe - Salima	Salima	Courtesy call, Explanation and Discussion of the Inception Report
7.	Sep.14 Sat.		Salima	Site observation
8.	Sep.15 Sun.		Salima	Site observation
9.	Sep.16 Mon.		Salima	Discussion on the Inception Report
10.	Sep.17 Tue.	Salima - Lilongwe	Lilongwe	Preparation of draft Minutes of Discussion
11.	Sep.18 Wed.		Lilongwe	Signing on the minutes
12.	Sep.19 Thu.	Lilongwe - London	Salima	Mr. Takahashi, Mr. Izume and Mr. Shimizu
13.	Sep.20 Fri.	London - Narita	Salima	Mr. Takahashi, Mr. Izume and Mr. Shimizu
14.	Sep.21 Sat.		Salima	Field survey
15.	Sep.22 Sun.		Salima	Field survey
16.	Sep.23 Mon.		Salima	Field survey
17.	Sep.24 Tue.		Salima	Field survey
18.	Sep.25 Wed.		Salima	Field survey
19.	Sep.26 Thu.		Salima	Field survey
20.	Sep.27 Fri.		Salima	Field survey
21.	Sep.28 Sat.		Salima	Field survey
22.	Sep.29 Sun.		Salima	Field survey
23.	Sep.30 Mon.		Salima	Field survey
24.	Oct.1 Tue.		Salima	Field survey
25.	Oct.2 Wed.		Salima	Field survey
26.	Oct.3 Thu.		Salima	Field survey
27.	Oct.4 Fri.		Salima	Field survey
28.	Oct.5 Sat.	Lilongwe - London	Salima	Mr. Shimazaki and Mr. Nabeta/Field survey
29.	Oct.6 Sun.	London - Narita	Salima	Mr. Shimazaki and Mr. Nabeta/Field survey
30.	Oct.7 Mon.		Salima	Field survey
31.	Oct.8 Tue.		Salima	Field survey
32.	Oct.9 Wed.	Salima - Lilongwe Department of Irrigation	Lilongwe	Reporting the result of field survey Courtesy call
33.	Oct.10 Thu.	JICA Malawi Office Lilongwe - Amsterdam	On board	Reporting the result of field survey Mr. Tanaka, Mr. Kyoizumi and Mr. Ichion
34.	Oct.11 Fri.	Amsterdam -	On board	Mr. Tanaka, Mr. Kyoizumi and Mr. Ichion
35.	Oct.12 Sat.	Narita	Narita	Mr. Tanaka, Mr. Kyoizumi and Mr. Ichion

Draft Basic Design Report Explanation Team

No.	Date	Movement/Place/Agencies	Station	Activities/Name of Person
1.	Nov. 25 Mon.	Narita - Amsterdam	On board	Mr. Tanaka and Mr. Kyoizumi
2.	Nov.26 Tue.	Amsterdam - Lilongwe	Lilongwe	Mr. Tanaka and Mr. Kyoizumi
3.	Nov.27 Wed.	Lusaka - Lilongwe	Lilongwe	Mr. Takahashi
4.	Nov.28 Thr.	JICA Malawi Office Ministry of Irrigation and Water Development Ministry of Finance, Ministry of Agriculture and Livestock Development Irrigation Department	Lilongwe	Courtesy Call Explanation and Discussion of the Draft Report
5.	Nov.30 Fri.	Lilongwe - Salima	Lilongwe	Courtesy Call Explanation and Discussion of the Draft Report
6.	Dec.1 Sat.		Salima	Internal Meeting
7.	Dec.2 Sun.	Salima - Lilongwe	Lilongwe	Mr. Takahashi, Mr. Tanaka and Mr. Kyoizumi
8.	Dec.3 Mon.		Lilongwe	Preparation of Draft Minutes of Meeting
9.	Dec.4 Tue.	JICA Malawi Office	Lilongwe	Signing on the minutes
10.	Dec.5 Wed.	Lilongwe - Lusaka	Lusaka	Mr. Takahashi, Mr. Tanaka and Mr. Kyoizumi
11.	Dec.6 Thu.	Embassy of Japan Lusaka -	On board	Reporting the result of the Survey
12.	Dec.7 Fri.	- London -	On board	Mr. Takahashi, Mr. Tanaka and Mr. Kyoizumi
13.	Dec.8 Sat.	Narita		Mr. Takahashi, Mr. Tanaka and Mr. Kyoizumi

3 List of Party Concerned in Malawi

3 List of Party Concerned in Malawi

1. Ministry of Irrigation and Water Development

Mr. K. Manjolo	Principal Secretary
Dr. C. P. Mzembe	Controller of Irrigation Services
Mr. Mphande	Deputy Controller of Irrigation Services
Mr. J. K. Chisenga	Principal Irrigation Officer
Mr. M. T. N. Mpitapita	Irrigation Officer
Mr. G. Nkhonjera	Irrigation Officer
Mr. Peter Kuester	Malawi-German Cooperation, Programme Coordinator

2. Ministry of Agriculture and Livestock Development

Dr. A. S. Kumwenda	Controller of Agricultural Services
Mr. D. C. Kamwendo	Chief Planning Officer
Mr. E. K. Mphande	Principal Economist, Planning Division
Mr. Clement C. Nyirongo	Principal Economist, Planning Division
Mr. C. Kanyinji	Economist, Planning Division

3. Salima ADD

Mr. E. P. Chingamba	Programme Manager
Mr. R. H. Padambo	Principal Irrigation Officer
Mr. F. J. Chakholoma	Deputy Programme Manager
Mr. B. C. Munthali	Senior Agricultural Extension Officer
Mr. B. W. Ngauma	Project Officer
Ms. A. B. Chiumia	Training Officer
Mr. G. R. Katapa	Ex. Development Officer, Mtakataka EPA
Mr. J. C. Nkomaula	Land Husbandry Officer
Mr. A. M. Mphamba	Assistant Project Officer
Mr. N. Y. Chauluntha	Assistant Irrigation Officer
Mr. C. J. Chamasowa	Assistant Irrigation Officer
Mr. R. G. Demba	Acting General Crops Officer
Mr. G. M. C. Mbubzi	Acting Visual Aids Officer
Mr. M. A. Hezekiya	Development Officer, Mtakataka EPA

4. Ministry of Finance

Mr, J. C. T. Nthani	Deputy Secretary (Bilateral)
Mr. John M. Mhango	Senior Assistant Secretary

5. TA Kachindamoto

Mr. Kachindamoto	Chief of TA
Mr. Mtembanji	Group Village Headman, Mtembanji

6. Ministry of Health & Population, Community Health Science Unit

Mr. Hmjbs Shaba	Programme Manager, Bilharzia Control
Mr. C. Ziba	Programme Manager, Malaria Control

7. European Union

Mr. Paul M. A. Schildkamp	Rural Development Advisor

4 Minutes of Discussion

MINUTES OF DISCUSSIONS
ON
THE BASIC DESIGN STUDY ON THE PROJECT
FOR
BWANJE VALLEY SMALLHOLDER IRRIGATION IN
THE REPUBLIC OF MALAWI

Based on the results of the Preliminary Study, the Japan International Cooperation Agency (JICA) decided to conduct a Basic Design Study on the Project for Bwanje Valley Smallholder Irrigation (hereinafter referred to as "the Project"), and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to the Republic of Malawi the Basic Design Study Team (hereinafter referred to as "the Team"), which is headed by Mr. JUNJI TAKAHASHI, Development Specialist, Institute for International Cooperation, JICA, and is scheduled to stay in the country from September 10 to October 10, 1996.

The Team held a series of discussions with officials concerned of the Government of Malawi and conducted field surveys at the study area.

In the course of the discussions and field surveys, both parties have confirmed the main items described on the attached sheets. The Team will proceed to further work and prepare the Basic Design Study report.

Lilongwe, September 18, 1996

Mr. JUNJI TAKAHASHI
Leader,
Basic Design Study Team,
JICA

Mr. K. MANJOLO
Principal Secretary,
Ministry of Irrigation and Water Development,
The Republic of Malawi

Mr. J. M. MHANGO
Senior Assistant Secretary,
Ministry of Finance,
The Republic of Malawi

ATTACHMENT

1. Objective

The objective of the Project is to increase agricultural production and improve the living conditions of the smallholder farmers in the project area, through the improvement of agricultural and social infrastructure.

2. Proposed Project Area

The project sites are located in the left bank of the Naminkhokwe river, Traditional Authority (hereinafter referred to as "TA") Kachindamoto, Dedza District, Central Region. The name of villages located in the Project area are listed in the ANNEX-I.

3. Responsible and Executing Organization

The responsible and executing organization of the Project is the Ministry of Irrigation and Water Development (hereinafter referred to as "the MIWD").

4. Items requested by the Government of Malawi

After discussions with the Team, the items described in ANNEX-II were finally requested by the Government of Malawi.

The final components of the Project, however, will be decided after further studies based on the information collected.

5. Japan's Grant Aid System

(1) The Government of Malawi has understood the Japan's Grant Aid system as described in ANNEX-III through the explanation by the Team.

(2) The Government of Malawi will take the necessary measures described in ANNEX-IV for the smooth implementation of the Project, on condition that the Japan's Grant Aid is extended to the Project.

6. Schedule of the Study

(1) The consultant members of the Team will proceed to conduct further studies in Malawi until October 10,1996.

(2) JICA will prepare a draft basic design report and dispatch a mission in order to explain its contents in early December 1996.

(3) In the event that the contents of the draft basic design report are accepted in principle, JICA will finalize the basic design study report, and send it to the Government of Malawi around February 1997.

7.Other Relevant Issues

(1) Farmers Group

Farmers group shall be organized by the beneficiaries of the Project based on the existing Mutandamula Irrigation Scheme Committee. The group shall be responsible for the operation and maintenance of the irrigation facilities constructed by the Project. The Salima Agricultural Development Division (hereinafter referred to as "the Salima ADD") shall take the initiative to organize the group and train the members of the group through its extension service. The establishment plan of the group such as time schedule, organization structure, members, activities and regulations shall be made by the Salima ADD and beneficiaries, and reported to the draft basic design explanation team which will be dispatched in early December 1996.

(2) Land Acquisition

The land of the Project area is classified into customary land and controlled by the local authority i.e. group village headmen and TA Kachindamoto. The MIWD shall obtain the TA's or group village headmen's commitment on the land acquisition necessary for the Project implementation by the letter. The letter shall be submitted to the Team by the end of September 1996.

(3) Land Allocation

The new irrigated land will be allocated after the construction of irrigation facilities by the land allocation committee. The MIWD shall make an allocation plan such as the establishment of the land allocation committee, a field block plan and a way of land allocation to the farmers in consultation with the local authority and the Team.

(4) Water Right

The MIWD shall take necessary action to secure the water right for the Project based on the water requirement which will be calculated in the draft basic design report.

(5) Government's Support

1) The MIWD shall allocate necessary budget and assign sufficient personnel to the Project in order to support beneficiaries for smooth operation and maintenance of the facilities constructed by the Project.
2) The MIWD shall train the beneficiaries through the Salima ADD's extension service in cooperation with the Ministry of Agriculture and Livestock Development.

3) The MIWD shall owe full support for the realizing successful execution of farmers' participation through the Salima ADD.

(6) Farmers' Participation

The beneficiary farmers shall participate in the construction of the Project facilities under technical guidance of the Irrigation Section of the Salima ADD.

(7) Compensation

The Government of Malawi shall compensate for the transfer of houses and the removal of planted trees if those are necessary for the construction of the facilities by the Project.

(8) Bilharzia Control

The MIWD shall take countermeasures for the control of bilharzia in the irrigated area of the Project in cooperation with the Community Health Service Unit of the Ministry of Health.

(9) Suspension of Crop Cultivation

The MIWD shall be responsible for arranging with the Ministry of Agriculture and Livestock Development for the suspension of crop cultivation in the Project area in order to ensure smooth execution of construction works.

(10) Development Center

The MIWD and the beneficiaries recognize the importance of the Development Center, and that funds will be requested from the Government of Japan separately from this project.

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ANNEX-I

The name of the villages located in the Project area

MTHEMBANJI Group Village	KAFULAMA Group Village	BWANARI Group Village	MCHANJA Group Village
①Dziko	①Maiwaza	①Madziatsasi	①Mchanja
②Mkondorire	②Mlongoti	②Nankumba	②Mdulambale
③Chatewa	③Maluza	③Msolo	③Kamwendo
④Mthembanji		④Fole	④Khoswe
⑤Mbangali		⑤Bwanari	⑤Mchembo
⑥Bwanamakowa			⑥Nbongwe
⑦Garuanenji			
⑧Mwasinja			

ANNEX II

Items requested by the Government of Malawi

Items	Quantity	Priority
I. Irrigation and Drainage Plan		
Irrigation area	Rehabilitation 230 ha. New 570 ha	
Project Facilities		
Headworks	1 Site	1
Main Irrigation Canals	6.7 km	1
Branch (Secondary) Canals	8.3 km	1
Tertiary Canals	55.7 km	1
Land Reclamation and Levelling	570 ha	1
Land Levelling	230 ha	2
Drainage Canals	12.2 km	1
Inspection Roads	12.8 km	1
Road / Flood Protection Dikes	7.0 km	1
Connecting Roads	2.4 km	2
II. Boreholes and Hand Pumps		2
III. Rice Mills and Maize Mills with Sheds		2
IV. Road Construction and Rehabilitation		
Road Construction	1.Intake point to M10 2.New irrigated are to route C	2
Road Rehabilitation	1.Route C (M5 - Muwasinja) 2.Route D (Mwasinja - Mtembanji)	3

ANNEX III

ON JAPAN'S GRANT AID PROGRAM

1. Japan's Grant Aid Procedures

(1) The Japan's Grant Aid Program is executed by the following procedures.

- **Application** (request made by a recipient country)
- **Study** (Preliminary Study / Basic Design Study conducted by JICA)
- **Appraisal & Approval** (Appraisal by the Government of Japan and Approval by the Cabinet of Japan)
- **Determination of Implementation** (Exchange of Notes between both Governments)
- **Implementation** (Implementation of the Project)

(2) Firstly, an application or a request for a project made by the recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to see whether or not it is suitable for Japan's Grand Aid. If the request is deemed suitable, the Government of Japan entrusts a study on the request to JICA (Japan International Cooperation Agency).

Secondly, JICA conducts the Study (Basic Design Study), using a Japanese consulting firm. If the background and objective of the requested project are not clear, a Preliminary Study is conducted prior to a Basic Design Study.

Thirdly, the Government of Japan appraises to see whether or not the Project is suitable for Japan's Grant Aid Program, based on the Basic Design Study report prepared by JICA and the results are then submitted for approval by the Cabinet.

Fourthly, the Project approved by the Cabinet becomes official when pledged by the Exchange of Notes signed by both Governments.

Finally, for the implementation of the Project, JICA assists the recipient country in preparing contracts and so on.

2. Contents of the Study

(1) Contents of the Study

The purpose of the Study (Preliminary Study / Basic Design Study) conducted on a project requested by JICA is to provide a basic document

necessary for appraisal of the project by the Japanese Government. The contents of the Study are as follows:

a) to confirm background, objectives, benefits of the project and also institutional capacity of agencies concerned of the recipient country necessary for project implementation.
b) to evaluate appropriateness of the Project for the Grant Aid Scheme from a technical, social and economical point of view,
c) to confirm items agreed on by both parties concerning a basic concept of the project,
d) to prepare a basic design of the project,
e) to estimate cost involved in the project.

Final project components are subject to approval by the Government of Japan and therefore may differ from an original request.

Implementing the project, the Government of Japan requests the recipient country to take necessary measures involved which are itemized on Exchange of Notes.

(2) Selecting (a) Consulting Firm(s)

For smooth implementation of the study, JICA uses (a) consulting firm(s) registered. JICA selects (a) firm(s) through proposals submitted by firms which are interested. The firm(s) selected carry(ies) out a Basic Design Study and write(s) a report, based upon terms of reference made by JICA.

The consulting firm(s) used for the study is(are) recommended by JICA to a recipient country after Exchange of Notes, in order to maintain technical consistency and also to avoid possible undue delay in implementation caused if a new selection process is repeated.

(3) Status of a Preliminary Study in the Grant Aid Program

A Preliminary Study is conducted during the second step of a project formulation & preparation as mentioned above.

A result of the study will be utilized in Japan to decide if the Project is to be suitable for a Basic Design Study.

Based on the result of the Basic Design Study, the Government would proceed to the stage of decision making process (appraisal and approval).

It is important to notice that at the stage of Preliminary Study, no commitment is made by the Japanese side concerning the realization of the Project in the scheme of Grant Aid Program.

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3. Japan's Grant Aid Scheme

(1) What is Grant Aid?

The Grant Aid Program provides a recipient country with non reimbursable funds needed to procure facilities, equipment and services for economic and social development of the country under the following principles in accordance with relevant laws and regulations of Japan. The Grant Aid is not in a form of donation or such.

(2) Exchange of Notes (E/N)

The Japan's Grant Aid is extended in accordance with the Exchange of Notes by both Governments, in which the objectives of the Project, period of execution, conditions and amount of the Grant, etc. are confirmed.

(3) "The period of the Grant Aid" means one Japanese fiscal year which the Cabinet approves the Project for. Within the fiscal year, all procedure such as Exchange of Notes, concluding a contract with (a) consulting firm(s) and (a) contractor(s) and a final payment to them must be completed.

(4) Under the Grant, in principle, products and services of origins of Japan or the recipient country are to be purchased.
When the two Governments deem it necessary, the Grant may be used for the purchase of products or services of a third country origin.
However the prime contractors, namely, consulting, contractor and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means Japanese physical persons or Japanese juridical persons controlled by Japanese physical persons.)

(5) Necessity of the "Verification"

The Government of the recipient country or its designated authority will conclude into contracts in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. The "Verification" is deemed necessary to secure accountability to Japanese tax payers.

(6) Undertakings required to the Government of the recipient country

In the implementation of the Grant Aid, the recipient country is required to undertake necessary measures such as the following:

a) to secure land necessary for the sites of the project and to clear and level the land prior to commencement of the construction work,

b) to provide facilities for distribution of electricity, water supply and drainage and other incidental facilities in and around the sites,
c) to secure buildings prior to the installation work in case the Project is providing equipment.
d) to ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid.
e) to exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts,
f) to accord Japanese nationals whose services may be required in connection with the supply of the products and services under the Verified Contracts, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.

(7) Proper Use

The recipient country is required to maintain and use facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for their operation and maintenance as well as to bear all expenses other than those to be borne by the Grant Aid.

(8) Re-export

The products purchased under the Grant Aid shall not be re-exported from the recipient country.

(9) Banking Arrangement (B/A)

a) The Government of the recipient country or its designated authority shall open an account in the name of the Government of the recipient country in an authorized foreign exchange bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by Government of the recipient country or its designated authority under the contracts verified.
b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an Authorization to pay issued by the Government of the recipient country or its designated authority.

ANNEX-IV

NECESSARY MEASURES TO BE TAKEN BY THE GOVERNMENT OF MALAWI IN CASE JAPAN'S GRANT AID IS EXTENDED.

1. To provide data and information necessary for the Project.

2. To secure the site for the Project.

3. To bear two kinds of commissions to the Japanese foreign exchange bank for its banking services based upon the Banking Arrangement (B/A) namely,
   - the advising commission of the "Authorization to Pay (A/P)" and
   - the payment commission.

4. To ensure prompt unloading and customs clearance at the port of disembarkation in Malawi and prompt internal transportation therein of the materials and equipment for the project purchased under the Grant Aid.

5. To exempt Japanese nationals or a staff from a third country engaged in the project from customs duties, internal taxes and other fiscal levies which may be imposed in Malawi with respect to the supply of the products and services under the verified contracts.

6. To accord Japanese nationals or a staff from a third country whose services may be required in connection with supply of the products and services under the verified contracts, such facilities as may be necessary for their entry into Malawi and stay therein for the performance of their work.

7. To provide necessary permissions, licenses, and other authorization for implementing the Project, if necessary.

8. To assign appropriate budget and staff members for smooth construction works and proper and effective operation and maintenance of the facilities constructed and equipment provided under the Grant Aid.

9. To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid.

10. To bear all the expenses other than those to be borne by the Grant Aid within the scope of the Project.

JT

MINUTES OF DISCUSSIONS
ON
THE BASIC DESIGN STUDY ON THE PROJECT
FOR
BWANJE VALLEY SMALLHOLDER IRRIGATION DEVELOPMENT
IN THE REPUBLIC OF MALAWI
(EXPLANATION ON THE DRAFT BASIC DESIGN)

In September 1996, the Japan International Cooperation Agency (JICA) dispatched the Basic Design Study Team on the Project for Bwanje Valley Smallholder Irrigation Development (hereinafter referred to as "the Project") to the Republic of Malawi. After the assessment of the data and information obtained through the study, JICA has prepared the Draft Basic Design on the Project.

In order to explain and consult with the officials concerned of the Government of Malawi on the components of the Draft Basic Design, JICA sent to the Republic of Malawi a Study Team (hereinafter referred to as "the Team") headed by Mr. JUNJI TAKAHASHI, Development Specialist, Institute for International Cooperation, JICA, which is scheduled to stay in the country from November 26 to December 4, 1996.

As a result of the discussions held between the Team and the officials concerned of the Government of Malawi, both parties have confirmed the main items described on the attached sheets.

Lilongwe, December 3, 1996

Mr. JUNJI TAKAHASHI
Leader,
Draft Basic Design Explanation Team,
JICA

Mr. K. MANJOLO
Principal Secretary,
Ministry of Irrigation and Water Development,
The Republic of Malawi

Mr. J. C. T. NTHANI
Deputy Secretary (Bilateral),
Ministry of Finance,
The Republic of Malawi

ATTACHMENT

1. Components of the Draft Basic Design

The Government of Malawi has agreed and accepted in principle the components of the Draft Basic Design proposed by the Team.

2. Japan's Grant Aid System

(1) The Government of Malawi has understood the Japan's Grant Aid system as described in ANNEX-I through the explanation by the Team.

(2) The Government of Malawi will take the necessary measures described in ANNEX-II for the smooth implementation of the Project, on condition that the Japan's Grant Aid is extended to the Project.

3. Schedule of the Study

JICA will complete the final report in accordance with the confirmed items, and send it to the Government of Malawi by March 1997.

4. Other Relevant Issues

(1) Government's Support

The Ministry of Irrigation and Water Development (MIWD) has confirmed the allocation of necessary budget and the deployment of sufficient personnel for smooth implementation of the Project.

(2) Land Acquisition

The land of the Project area is classified into customary land and controlled by the local authority i.e. group village headmen and TA Kachindamoto. The MIWD has obtained the TA's commitment on the land acquisition necessary for the Project implementation by the letter.

(3) Land Allocation

The new irrigated land will be allocated after the construction of irrigation facilities by the land allocation committee. The Salima ADD has committed that the formation of land allocation committee would be done after signing of Exchange of Notes (E/N). The local authority has confirmed the fair allocation of land for beneficiaries of the Project.

(4) Water Right

The MIWD shall take necessary action to secure the water right for the Project based on the water requirement which was calculated in the draft basic design report.

(5) Farmer's Group

The Salima ADD and beneficiaries of the Project have already made the establishment plan of the farmer's group. The planed group shall be organized based on the existing Mtandamula Irrigation Scheme Committee immediately after the confirmation of the Project implementation as per the attached commitment letter by the Salima ADD. The Salima ADD shall take the initiative to organize the group and train the members of the group through its extension service. The group shall be responsible for the operation and maintenance of the facilities constructed by the Project.

(6) Operation and Maintenance Organization of the Project

The MIWD has confirmed the responsible organization for the operation and maintenance of the facilities constructed by the Project as shown in the ANNEX III.

(7) Farmer's Participation

Both sides have confirmed the participation of the beneficiaries for sod facing works on embankment, excavation of the small drainage canals, and fencing around the drain pit of the boreholes.

(8) Compensation

The Government of Malawi shall compensate for the transfer of houses and the removal of planted trees, if these are necessary for the construction of the facilities by the Project.

(9) Suspension of Crop Cultivation

The MIWD shall be responsible for arranging with the Ministry of Agriculture and Livestock Development for the suspension of crop cultivation in the Project area in order to ensure smooth execution of construction works.

(10) Bilharzia Control

The MIWD shall take necessary measures for the control of bilharzia in the irrigated area of the Project in cooperation with the Community Health Service Unit of the Ministry of Health.

(11) Land Leveling and Foot Path

The Malawi side requested that the land leveling for sample plots be done by hand if not by machine in the whole project area. It was also requested that the foot path along tertiary canals be widened by 1 m so that ox-carts can be used to haul produce from the field.

ANNEX-I

ON JAPAN'S GRANT AID PROGRAM

1. Japan's Grant Aid Procedures

(1) The Japan's Grant Aid Program is executed by the following procedures.
- Application (request made by a recipient country)
- Study (Preliminary Study / Basic Design Study conducted by JICA)
- Appraisal & Approval (Appraisal by the Government of Japan and Approval by the Cabinet of Japan)
- Determination of Implementation (Exchange of Notes between both Governments)
- Implementation (Implementation of the Project)

(2) Firstly, an application or a request for a project made by the recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to see whether or not it is suitable for Japan's Grand Aid. If the request is deemed suitable, the Government of Japan entrusts a study on the request to JICA (Japan International Cooperation Agency).

Secondly, JICA conducts the Study (Basic Design Study), using a Japanese consulting firm. If the background and objective of the requested project are not clear, a Preliminary Study is conducted prior to a Basic Design Study.

Thirdly, the Government of Japan appraises to see whether or not the Project is suitable for Japan's Grant Aid Program, based on the Basic Design Study report prepared by JICA and the results are then submitted for approval by the Cabinet.

Fourthly, the Project approved by the Cabinet becomes official when pledged by the Exchange of Notes signed by both Governments.

Finally, for the implementation of the Project, JICA assists the recipient country in preparing contracts and so on.

2. Contents of the Study

(1) Contents of the Study

The purpose of the Study (Preliminary Study / Basic Design Study) conducted on a project requested by JICA is to provide a basic document necessary for appraisal of the project by the Japanese Government. The contents of the Study are as follows:

a) to confirm background, objectives, benefits of the project and also institutional capacity of agencies concerned of the recipient country necessary for project implementation,
b) to evaluate appropriateness of the Project for the Grant Aid Scheme from a technical, social and economical point of view,
c) to confirm items agreed on by both parties concerning a basic concept of the project,
d) to prepare a basic design of the project,
e) to estimate cost involved in the project.

Final project components are subject to approval by the Government of Japan and therefore may differ from an original request.

Implementing the project, the Government of Japan requests the recipient country to take necessary measures involved which are itemized on Exchange of Notes.

(2) Selecting (a) Consulting Firm(s)

For smooth implementation of the study, JICA uses (a) consulting firm(s) registered. JICA selects (a) firm(s) through proposals submitted by firms which are interested. The firm(s) selected carry(ies) out a Basic Design Study and write(s) a report, based upon terms of reference made by JICA.

The consulting firm(s) used for the study is(are) recommended by JICA to a recipient country after Exchange of Notes, in order to maintain technical consistency and also to avoid possible undue delay in implementation caused if a new selection process is repeated.

(3) Status of a Preliminary Study in the Grant Aid Program

A Preliminary Study is conducted during the second step of a project formulation & preparation as mentioned above.

A result of the study will be utilized in Japan to decide if the Project is to be suitable for a Basic Design Study.

Based on the result of the Basic Design Study, the Government would proceed to the stage of decision making process (appraisal and approval).

It is important to notice that at the stage of Preliminary Study, no commitment is made by the Japanese side concerning the realization of the Project in the scheme of Grant Aid Program.

3. Japan's Grant Aid Scheme

(1) What is Grant Aid?

The Grant Aid Program provides a recipient country with non reimbursable funds needed to procure facilities, equipment and services for economic and social development of the country under the following principles in accordance with relevant laws and regulations of Japan. The Grant Aid is not in a form of donation or such.

(2) Exchange of Notes (E/N)

The Japan's Grant Aid is extended in accordance with the Exchange of Notes by both Governments, in which the objectives of the Project, period of execution, conditions and amount of the Grant, etc. are confirmed.

(3) "The period of the Grant Aid" means one Japanese fiscal year which the Cabinet approves the Project for. Within the fiscal year, all procedure such as Exchange of Notes, concluding a contract with (a) consulting firm(s) and (a) contractor(s) and a final payment to them must be completed.

(4) Under the Grant, in principle, products and services of origins of Japan or the recipient country are to be purchased.
When the two Governments deem it necessary, the Grant may be used for the purchase of products or services of a third country origin.
However the prime contractors, namely, consulting, contractor and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means Japanese physical persons or Japanese juridical persons controlled by Japanese physical persons.)

(5) Necessity of the "Verification"

The Government of the recipient country or its designated authority will conclude into contracts in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. The "Verification" is deemed necessary to secure accountability to Japanese tax payers.

(6) Undertakings required to the Government of the recipient country

In the implementation of the Grant Aid, the recipient country is required to undertake necessary measures such as the following:

a) o secure land necessary for the sites of the project and to clear and level the land prior to commencement of the construction work,
b) to provide facilities for distribution of electricity, water supply and drainage and other incidental facilities in and around the sites,
c) to secure buildings prior to the installation work in case the Project is providing equipment,
d) to ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid,
e) to exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts,
f) to accord Japanese nationals whose services may be required in connection with the supply of the products and services under the Verified Contracts, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.

(7) Proper Use

The recipient country is required to maintain and use facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for their operation and maintenance as well as to bear all expenses other than those to be borne by the Grant Aid.

(8) Re-export

The products purchased under the Grant Aid shall not be re-exported from the recipient country.

(9) Banking Arrangement (B/A)

a) The Government of the recipient country or its designated authority shall open an account in the name of the Government of the recipient country in an authorized foreign exchange bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by Government of the recipient country or its designated authority under the cont acts verified.
b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an Authorization to pay issued by the Government of the recipient country or its designated authority.

ANNEX-II

NECESSARY MEASURES TO BE TAKEN BY THE GOVERNMENT OF MALAWI IN CASE JAPAN'S GRANT AID IS EXTENDED.

1. To provide data and information necessary for the Project.

2. To secure the site for the Project.

3. To bear two kinds of commissions to the Japanese foreign exchange bank for its banking services based upon the Banking Arrangement (B/A) namely,
   - the advising commission of the "Authorization to Pay (A/P)" and
   - the payment commission.

4. To ensure prompt unloading, tax exemption, and customs clearance at the port of disembarkation in Malawi and prompt internal transportation therein of the materials and equipment for the project purchased under the Grant Aid.

5. To exempt Japanese nationals or a staff from a third country engaged in the project from customs duties, internal taxes and other fiscal levies which may be imposed in Malawi with respect to the supply of the products and services under the verified contracts.

6. To accord Japanese nationals or a staff from a third country whose services may be required in connection with supply of the products and services under the verified contracts, such facilities as may be necessary for their entry into Malawi and stay therein for the performance of their work.

7. To provide necessary permissions, licenses, and other authorization for implementing the Project, if necessary.

8. To assign appropriate budget and staff members for proper and effective operation and maintenance of the facilities constructed under the Project.

9. To maintain and use properly and effectively the facilities constructed and equipment provided under the Project;

10. To bear all the expenses other than those to be borne by the Grant Aid within the scope of the Project.

ANNEX-III

OPERATION AND MAINTENANCE ORGANIZATION OF THE PROJECT

Component	O/M Organization
Irrigation and Drainage Facilities	Farmers' group with the assistance of Irrigation and Extension Sections of Salima ADD
Boreholes and Hand Pumps	Borehole committees assisted by MIWD, Ministry of Women, Children Affairs and Community Services, Ministry of Heath and NGO
Ricemills	Ricemill O&M commitees assisted by Mechanical Services Section of Department of Irrigation
Rural Roads	Dedza District Office of the Ministry of Works and Supply

FROM: THE PROGRAMME MANAGER, SALIMA ADD,
PRIVATE BAG 1, SALIMA.

TO: TO WHOM IT MAY CONCERN

LETTER OF COMMITMENT TO FORMATION OF FARMERS ORGANISATION IN PROPOSED BWANJE VALLEY IRRIGATION PROJECT.

I would like to express our commitment to facilitate:-

1) Formation of requisite farmers committee structures viz:
   - Main committee,
   - Land Allocation committee.,
   - Marketing - sub - committee,
   - Water distribution sub - committee,
   - Disciplinary sub - committee and
   - Rice mill sub - committee.
   - Operation and Maintenance sub - committee

2) Training and role definition of committee members.

3) Formation of committee constitutions

The activities will be undertaken after exchange of notes between the Governments of Malawi and Japan.

Signed.....
Project Officer Bwanje Valley Rural Development Project

Signed.....
Head of Agricultural Extension and Training

Signed.....
Programme Manager Salima ADD.

5 Other Relevant Data

5.1 Memorandum of Undertaking : Bwanje Valley Smallholder Irrigation Project

5.2 Commitment of Land Allocation to Farmers in Bwanje Valley Irrigation Project

5.1 Memorandum of Undertaking : Bwanje Valley Smallholder Irrigation Project

June 6, 1996

FROM : T A KACHINDAMOTO, DEDZA

TO : THE PROGRAMME MANAGER, SALIMA ADD,
PRIVATE BAG 1, SALIMA

cc : The District Commissioner, P O Box 140, Dedza.

The Secretary for Agriculture and Livestock Development,
P O Box 30134, Lilongwe 3.

The Secretary for Irrigation and Water Development,
Private Bag 390, Lilongwe 3

The Secretary for Works, Private Bag 316, Lilongwe 3.

MEMORANDUM OF UNDERSTANDING :
BWANJE VALLEY SMALLHOLDER IRRIGATION PROJECT

I, T A Kachindamoto, wish to confirm that my people and I are very interested with the proposed Bwanje Valley Smallholder Irrigation Development Project. The proposed project, if implemented, will help in alleviating poverty in the area which is due to low crop production caused by erratic rainfall.

I will support the implementation of the project through mobilisation of farmers in the area in order that they participate in the development activities as well as the O & M thereafter. I, therefore, hereby request that the proposed project be implemented as soon as possible.

Sign : .....
T A KACHINDAMOTO

.....
DISTRICT COMMISSIONER
(DEDZA)
(Witness)

5.2 Commitment of Land Allocation to Farmers in Bwanje Valley Irrigation Project

Ref. No JICA/1.............. Date: ....

TO WHOM IT MAY CONCERN

COMMITMENT OF LAND ALLOCATION
TO FARMERS IN BWANJE VALLEY IRRIGATION PROJECT

I, Traditional Authority Kachindamoto of Dedza District in Malawi hereby confirm that land in the Irrigation Project Area Falls under my jurisdiction . As such, I confirm that it will be allocated to beneficiaries of the project fairly.

SIGNED : ....Kachindamoto........

T.A. KACHINDAMOTO

1 - OCT 1996

T.A. KACHINDAMOTO

DATE : ....1/10/96.......................................

WITNESSED BY : ....
W. R. Y. NYIRENDA

for DISTRICT COMMISSIONER, DEDZA

DISTRICT COMMISSIONER
1 OCT 1996
P.O. BOX 140, DEDZA

P.O. BOX 140, DEDZA
1 OCT 1996
DISTRICT COMMISSIONER

6 References

6.1 Tables and Figures

6.2 Basic Design Drawings

6.1 Table and Figures

List of Tables

List of Figures

6.2 Basic Design Drawings

List of Drawings

No.	Dwg. No.	Title of Drawing		
	General			
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2	MP-02	General Layout of Irrigation, Drainage and Rural Road		
3	MP-03	Location Map for Rural Water Supply System and Post Harvest Facilities		
	Headworks			
4	HW-01	Plan and Profile		
5	HW-02	Plan		
6	HW-02	Structural Plan		(1/2)
7	HW-02	Structural Plan		(2/2)
8	HW-02	Control House, Elevation		
	Irrigation and Drainage Facilities			
9	ID-01	Irrigation Flow Diagram		
10	ID-02	Drainage Flow Diagram		
11	ID-3	Typical Cross Section		
12	ID-4	Longitudinal Profile	Main Canal	(1/3)
13	ID-5		Main Canal	(2/3)
14	ID-6		Main Canal	(3/3)
15	ID-7		Branch Canal - 1	(1/2)
16	ID-8		Branch Canal - 1	(2/2)
17	ID-9		Branch Canal - 2	(1/2)
18	ID-10		Branch Canal - 2	(2/2)
19	ID-11		Branch Canal - 2 - 1	
20	ID-12		Branch Canal - 3	(1/2)
21	ID-13		Branch Canal - 3	(2/2)
22	ID-14	Longitudinal Profile	Drainage Canal - 1	
23	ID-15		Drainage Canal - 1	(2/2)
24	ID-16		Drainage Canal - 2	(1/2)
25	ID-17		Drainage Canal - 2	(2/2)
26	ID-18		Drainage Canal - 2-1	
27	ID-19		Drainage Canal - 3	(1/2)
28	ID-20		Drainage Canal - 3	(2/2)
29	ID-21		Drainage Canal - 4	(1/2)
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41	RR-01	Typical Cross Section and Causeway		
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Tables

Table 2-1 Monthly Flow Discharge of Namikokwe River (1/3)

River name : Combination of Namikokwe River and Nadzipokwe River Area : 159.1 km2

Unit: m3/sec

	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Average
1953-54	*	*	*	*	*	*	*	*	*	*	*	*	*
1954-55	*	*	*	*	*	*	*	*	*	*	*	*	*
1955-56	*	*	*	*	*	*	*	*	*	*	*	*	*
1956-57	*	*	*	*	*	*	*	*	*	*	*	*	*
1957-58	*	*	*	*	*	1.831	0.799	0.588	0.390	0.261	0.258	0.053	0.809
1958-59	0.078	*	*	5.586	4.266	1.589	0.908	0.644	0.436	0.250	0.168	0.089	1.386
1959-60	0.697	1.752	2.087	4.354	7.556	2.448	1.361	0.906	0.657	0.419	0.247	0.106	1.883
1960-61	0.067	0.329	2.562	3.751	13.401	3.201	1.876	0.986	0.920	0.664	0.388	0.251	2.366
1961-62	0.422	1.777	4.892	7.697	4.339	4.094	2.046	1.453	1.040	0.688	0.353	0.206	2.417
1962-63	0.371	1.115	6.181	12.932	7.534	3.481	1.856	1.240	0.875	0.528	0.432	0.224	3.064
1963-64	0.899	1.471	3.999	6.523	2.354	1.271	0.955	0.709	0.536	0.351	0.189	0.123	1.615
1964-65	0.293	0.977	4.426	6.359	4.853	3.312	1.872	1.374	1.043	0.818	0.676	0.471	2.206
1965-66	0.249	0.637	1.670	6.337	5.336	1.453	1.003	0.587	0.385	0.270	0.229	0.082	1.520
1966-67	0.098	1.343	1.557	2.979	3.674	2.361	1.343	0.914	0.645	0.414	0.247	0.151	1.311
1967-68	1.788	4.795	21.640	10.991	42.885	15.435	6.177	4.355	3.211	2.554	1.793	1.082	9.726
1968-69	0.269	3.401	9.011	7.120	6.109	4.632	1.899	1.247	0.788	0.572	0.397	0.223	2.972
1969-70	0.206	5.295	6.413	2.184	2.271	1.573	0.772	0.515	0.377	0.262	0.140	0.094	1.675
1970-71	0.718	*	*	*	*	*	*	*	*	*	*	*	1.014
1971-72	*	*	*	*	3.731	*	*	0.828	0.693	0.536	0.293	0.157	1.134
1972-73	0.173	*	*	*	*	2.344	1.400	0.741	0.493	0.317	0.191	0.135	0.929
1973-74	0.059	*	*	10.518	5.227	8.537	*	*	*	*	*	*	5.717
1974-75	*	*	*	*	*	*	*	*	*	*	*	*	*
1975-76	*	*	*	*	*	*	3.026	1.728	1.087	0.798	0.467	0.300	1.524
1976-77	0.197	0.885	1.815	2.250	6.788	2.393	1.128	0.834	0.605	0.441	0.282	*	1.505
1977-78	0.784	*	*	*	*	*	*	1.690	1.264	0.798	0.478	0.301	1.933
1978-79	*	*	*	*	*	*	*	1.183	0.878	0.655	0.347	0.241	1.575
1979-80	*	4.336	2.875	2.926	1.223	2.359	1.093	0.688	0.494	0.330	0.202	0.254	1.501
1980-81	0.140	19.313	7.061	14.175	7.899	2.391	1.368	0.782	0.572	*	0.275	*	5.105
1981-82	*	*	*	*	*	*	*	*	*	*	*	*	2.916
1982-83	*	*	*	9.226	*	*	0.717	0.475	0.354	0.274	0.165	0.116	1.645
1983-84	0.110	2.505	2.478	*	*	2.233	1.059	0.766	0.538	0.335	0.197	0.124	1.149
1984-85	0.249	5.409	2.717	7.121	*	3.862	1.758	1.178	0.824	0.577	0.429	0.282	2.338
1985-86	0.430	16.569	14.527	*	*	4.337	2.072	1.342	0.937	0.652	0.435	0.418	4.152
1986-87	0.426	*	*	7.966	5.298	2.910	1.322	0.874	0.623	0.442	0.294	0.241	2.086
1987-88	0.125	0.879	8.475	9.193	6.419	2.457	1.237	0.792	0.549	0.367	0.252	0.281	2.586
1988-89	1.223	2.154	7.308	14.650	14.985	4.999	3.398	1.981	1.311	0.947	0.585	0.343	4.490
1989-90	0.449	7.995	9.468	4.955	2.795	1.930	1.197	0.650	0.468	0.359	0.246	0.146	2.555
1990-91	0.097	1.433	8.925	5.736	3.480	1.791	0.907	0.625	0.558	0.371	0.193	0.232	2.029
1991-92	0.126	1.467	2.422	0.578	2.166	0.760	0.337	0.286	0.228	0.171	0.117	0.063	0.727
1992-93	0.072	1.185	1.907	5.119	4.954	3.206	1.315	0.769	0.574	0.418	0.280	*	1.680
1993-94	0.378	0.251	1.396	2.556	0.980	0.969	0.351	0.258	0.219	0.166	0.111	0.084	0.643
1994-95	0.054	0.077	2.404	4.601	0.966	0.425	0.223	0.176	0.127	0.105	0.054	0.027	0.770
1995-96	0.032	0.314	1.863	*	*	*	*	*	*	*	*	*	0.736
Average	0.364	3.372	5.388	6.607	6.596	3.153	1.509	1.005	0.726	0.518	0.336	0.223	2.247

Source : Water Department, Ministry of Irrigation and Water Development

Table 2-1 Monthly Flow Discharge of Namikokwe River (2/3)

River name : Nadzipokwe — Station No.: 3.E.1

Area : 30.1 km2 — Unit: m3/sec

	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Average
1953-54	0.001	0.173	0.559	3.370	1.244	0.662	0.234	0.146	0.093	0.077	0.036	0.007	0.550
1954-55	0.019	0.027	1.147	3.388	2.405	0.834	0.336	0.225	0.146	0.185	0.100	0.036	0.737
1955-56	0.023	0.534	0.601	2.119	1.451	4.284	1.254	0.564	0.352	0.195	0.207	0.135	0.977
1956-57	0.148	0.910	2.577	4.214	2.239	2.841	1.158	0.469	0.239	0.149	0.046	0.016	1.250
1957-58	0.003	0.125	0.690	0.749	1.777	0.542	0.191	0.139	0.077	0.047	0.105	0.013	0.371
1958-59	0.033	0.128	0.249	1.111	0.845	0.397	0.202	0.133	0.072	0.031	0.017	0.001	0.268
1959-60	0.000	0.370	0.539	0.718	1.651	0.639	0.372	0.238	0.169	0.115	0.083	0.003	0.408
1960-61	0.000	0.067	0.951	1.283	4.680	0.994	0.525	0.339	0.254	0.181	0.084	0.057	0.785
1961-62	0.127	0.310	0.794	1.512	0.963	0.969	0.451	0.325	0.230	0.166	0.066	0.008	0.493
1962-63	0.070	0.413	2.024	3.724	1.979	0.893	0.526	0.357	0.269	0.192	0.118	0.069	0.886
1963-64	0.305	0.246	1.364	1.869	0.626	0.392	0.279	0.183	0.107	0.087	0.057	0.028	0.462
1964-65	0.171	0.434	1.156	1.565	1.571	0.942	0.728	0.633	0.561	0.496	0.418	0.316	0.749
1965-66	0.062	0.146	0.413	0.897	0.712	0.274	0.164	0.102	0.082	0.059	0.031	0.011	0.246
1966-67	0.020	0.364	0.458	0.690	0.982	0.410	0.360	0.238	0.164	0.107	0.072	0.032	0.325
1967-68	1.656	2.937	19.875	9.394	39.211	13.651	5.447	3.838	2.842	2.330	1.649	0.999	8.652
1968-69	0.043	1.435	4.108	2.100	1.773	0.928	0.523	0.358	0.250	0.167	0.106	0.068	0.988
1969-70	0.065	3.038	1.887	1.665	0.491	0.390	0.205	0.127	0.087	0.061	0.034	0.019	0.672
1970-71	0.442	2.574	2.424	1.357	0.970	0.463	0.240	0.160	0.097	0.053	0.038	0.036	0.738
1971-72	0.070	0.284	0.733	0.476	0.695	0.500	0.219	0.154	0.112	0.083	0.058	0.055	0.286
1972-73	0.063	1.712	0.465	0.729	0.604	0.963	0.643	0.182	0.116	0.078	0.043	0.026	0.469
1973-74	0.019	0.796	1.510	1.362	1.677	1.048	0.615	0.394	0.268	0.126	0.058	0.026	0.658
1974-75	0.037	0.128	0.333	0.309	1.862	0.338	0.134	0.077	0.053	0.033	0.025	0.022	*
1975-76	0.050	0.604	1.365	1.390	*	1.191	0.634	0.428	0.283	0.188	0.107	0.057	0.572
1976-77	0.041	0.165	0.690	0.496	1.059	0.461	0.251	0.159	0.106	0.064	0.032	*	0.320
1977-78	0.024	*	*	*	1.937	1.027	0.653	0.410	0.241	0.170	0.118	0.085	0.518
1978-79	*	*	*	*	2.050	0.799	0.445	0.311	0.262	0.183	0.093	0.065	0.526
1979-80	*	1.406	0.487	0.417	0.307	0.514	0.191	0.098	0.082	0.060	0.040	0.052	0.332
1980-81	0.039	9.359	1.946	2.547	3.111	0.499	0.274	0.190	0.131	0.098	0.074	0.033	1.525
1981-82	0.017	1.791	4.540	4.462	*	*	*	*	*	*	*	*	2.703
1982-83	*	0.718	0.600	1.095	0.619	0.303	0.195	0.136	0.112	0.096	0.060	0.038	0.361
1983-84	0.044	1.286	0.366	1.051	0.892	0.373	0.254	0.212	0.148	0.094	0.042	0.021	0.398
1984-85	0.066	1.017	0.827	1.007	1.893	0.773	0.425	0.310	0.259	0.183	0.142	0.098	0.583
1985-86	0.147	3.541	1.576	0.908	0.275	0.612	0.352	0.312	0.225	0.162	0.112	0.083	0.692
1986-87	0.078	0.204	0.994	1.019	0.677	0.496	0.281	0.210	0.155	0.114	0.073	0.061	0.363
1987-88	0.027	0.062	1.131	1.585	1.167	0.461	0.295	0.231	0.165	0.098	0.054	0.052	0.444
1988-89	0.055	0.386	4.548	3.320	3.022	1.027	0.584	0.387	0.286	0.234	0.117	0.056	1.169
1989-90	0.083	1.159	1.068	0.849	0.488	0.333	0.274	0.168	0.114	0.087	0.047	0.029	0.392
1990-91	0.022	0.106	1.314	0.714	0.495	0.278	0.186	0.139	0.119	0.074	0.041	0.031	0.293
1991-92	0.030	0.840	0.369	0.186	0.261	0.147	0.080	0.051	0.044	0.032	0.020	0.014	0.173
1992-93	0.006	0.089	0.564	0.517	0.526	0.305	0.197	0.145	0.104	0.095	0.069	*	0.238
1993-94	0.107	0.083	0.246	0.285	0.120	0.061	0.039	0.035	0.033	0.026	0.019	0.024	0.090
1994-95	0.015	0.011	0.319	0.348	0.118	0.046	0.025	0.021	0.012	0.011	0.007	0.002	0.078
1995-96	0.004	0.041	0.485	*	*	*	*	*	*	*	*	*	0.177
Average	0.112	1.037	1.714	1.492	2.280	0.931	0.472	0.322	0.235	0.175	0.117	0.074	0.774

Source : Water Department, Ministry of Irrigation and Water Development

Table 2-1 Monthly Flow Discharge of Namikokwe River (3/3)

River name : Namikokwe
Area : 129 km2

Station No.: 3.E.2
Unit: m3/sec

	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Average
1953-54	*	*	*	*	*	*	*	*	*	*	*	*	*
1954-55	*	*	*	*	*	*	*	*	*	*	*	*	*
1955-56	*	*	*	*	*	*	*	*	*	*	*	*	*
1956-57	*	*	*	*	*	*	*	*	*	*	*	*	*
1957-58	*	*	*	*	*	1.288	0.608	0.450	0.313	0.215	0.153	0.041	0.438
1958-59	0.045	*	*	4.475	3.422	1.192	0.706	0.511	0.364	0.219	0.151	0.089	1.117
1959-60	0.697	1.382	1.548	3.636	5.905	1.810	0.989	0.668	0.488	0.304	0.165	0.103	1.475
1960-61	0.067	0.262	1.611	2.467	8.721	2.207	1.351	0.646	0.666	0.483	0.304	0.194	1.582
1961-62	0.295	1.467	4.097	6.185	3.375	3.125	1.595	1.127	0.810	0.523	0.288	0.198	1.924
1962-63	0.301	0.702	4.157	9.208	5.555	2.587	1.330	0.882	0.606	0.337	0.314	0.155	2.178
1963-64	0.593	1.225	2.635	4.654	1.727	0.880	0.675	0.526	0.429	0.264	0.133	0.095	1.153
1964-65	0.122	0.543	3.271	4.794	3.283	2.370	1.144	0.741	0.481	0.322	0.258	0.156	1.457
1965-66	0.187	0.491	1.257	5.440	4.624	1.180	0.840	0.485	0.303	0.211	0.198	0.071	1.274
1966-67	0.079	0.979	1.099	2.289	2.692	1.951	0.983	0.677	0.481	0.307	0.175	0.119	0.986
1967-68	0.132	1.858	1.765	1.597	3.674	1.784	0.730	0.517	0.369	0.224	0.144	0.083	1.073
1968-69	0.225	1.966	4.903	5.021	4.336	3.704	1.376	0.889	0.538	0.405	0.291	0.155	1.984
1969-70	0.141	2.257	4.527	0.519	1.780	1.183	0.567	0.388	0.290	0.201	0.106	0.075	1.003
1970-71	0.276	*	*	*	*	*	*	*	*	*	*	*	0.276
1971-72	*	*	*	*	3.037	*	*	0.673	0.581	0.454	0.235	0.103	0.847
1972-73	0.111	*	*	*	*	1.381	0.756	0.559	0.377	0.240	0.148	0.109	0.460
1973-74	0.039	*	*	9.156	3.550	7.489	*	*	*	*	*	*	5.059
1974-75	*	*	*	*	*	*	*	*	*	*	*	*	*
1975-76	*	*	*	*	*	*	2.392	1.300	0.804	0.609	0.360	0.243	0.952
1976-77	0.156	0.720	1.124	1.754	5.729	1.932	0.877	0.675	0.499	0.377	0.250	0.117	1.184
1977-78	0.760	0.802	6.249	*	*	*	*	1.280	1.023	0.628	0.360	0.215	1.415
1978-79	*	3.905	*	*	*	*	*	0.871	0.616	0.472	0.253	0.176	1.049
1979-80	0.898	2.931	2.388	2.509	0.917	1.845	0.902	0.590	0.412	0.270	0.163	0.202	1.169
1980-81	0.101	9.954	5.114	11.628	4.788	1.892	1.094	0.592	0.440	*	0.201	*	3.580
1981-82	*	*	*	*	*	*	*	*	*	*	0.179	0.247	0.213
1982-83	0.675	*	*	8.131	*	*	0.522	0.339	0.242	0.178	0.105	0.078	1.284
1983-84	0.065	1.219	2.112	*	*	1.860	0.805	0.554	0.391	0.241	0.156	0.103	0.751
1984-85	0.183	4.393	1.890	6.115	*	3.090	1.332	0.868	0.565	0.394	0.286	0.184	1.754
1985-86	0.283	13.028	12.951	*	*	3.725	1.720	1.030	0.712	0.490	0.323	0.335	3.460
1986-87	0.348	*	*	6.947	4.621	2.414	1.041	0.664	0.468	0.328	0.221	0.180	1.723
1987-88	0.098	0.818	7.345	7.608	5.252	1.995	0.942	0.561	0.384	0.269	0.198	0.229	2.142
1988-89	1.168	1.768	2.760	11.330	11.964	3.972	2.814	1.594	1.025	0.713	0.468	0.286	3.322
1989-90	0.366	6.836	8.399	4.106	2.307	1.597	0.923	0.482	0.354	0.273	0.199	0.117	2.163
1990-91	0.074	1.327	7.611	5.022	2.985	1.513	0.721	0.486	0.439	0.297	0.152	0.201	1.736
1991/92	0.097	0.628	2.054	0.392	1.906	0.613	0.257	0.235	0.183	0.140	0.097	0.050	0.554
1992/93	0.066	1.096	1.343	4.601	4.427	2.901	1.118	0.624	0.469	0.323	0.211	0.128	1.442
1993/94	0.271	0.168	1.150	2.271	0.860	0.908	0.312	0.223	0.185	0.140	0.092	0.060	0.553
1994/95	0.039	0.066	2.085	4.253	0.848	0.379	0.198	0.155	0.114	0.094	0.046	0.025	0.692
1995/96	0.028	0.273	1.378	*	*	*	*	*	*	*	*	*	0.560
Average	0.272	2.252	3.586	5.041	3.934	2.159	1.020	0.672	0.483	0.332	0.211	0.145	1.473

Source : Water Department, Ministry of Irrigation and Water Development

Table 2-2 Diversion Water Requirement on 10-days Basis (1/2)

Unit : liter/sec./ha

Month		1957/58	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72	1972/73
	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nov	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dec	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
	1	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
Jan	2	1.04	0.85	1.39	0.69	0.69	0.69	0.83	0.69	0.72	1.00	0.72	0.69	0.69	0.92	0.72	0.90
	3	0.50	0.75	0.50	0.78	0.64	0.50	0.50	0.85	1.27	0.67	0.72	0.50	0.50	0.50	0.50	0.50
	1	0.45	0.34	0.74	0.34	1.08	0.34	1.04	1.07	0.87	0.90	1.39	0.41	0.60	0.96	0.34	0.87
Feb	2	0.34	0.54	0.63	0.34	0.34	0.34	0.34	0.34	0.34	0.95	0.34	0.90	1.39	0.34	1.21	0.65
	3	0.30	0.08	0.69	0.73	1.39	0.64	1.23	1.10	0.65	0.19	1.23	1.39	1.39	0.88	0.08	1.14
	1	0.74	0.36	0.84	0.36	1.41	0.75	1.41	0.36	0.92	1.27	0.88	0.71	1.41	1.17	1.05	1.41
Mar	2	1.23	1.28	0.37	0.65	0.74	0.49	1.16	1.16	1.42	0.37	1.12	0.87	1.42	1.16	1.42	1.11
	3	1.40	1.40	1.40	1.04	0.45	1.25	1.40	0.74	1.40	0.45	1.40	0.69	1.40	1.25	0.89	0.97
	1	0.42	1.26	1.26	1.26	1.11	1.26	1.26	1.26	1.26	1.26	1.11	1.26	1.26	1.26	1.26	0.22
Apr	2	1.29	1.29	1.05	1.09	1.29	1.29	1.29	1.29	1.29	1.29	0.85	1.07	0.82	1.29	0.97	1.29
	3	1.06	1.06	1.06	1.06	0.85	1.06	1.06	1.06	1.06	0.92	1.06	0.85	1.06	1.06	1.06	1.06
	1	0.55	0.37	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
May	2	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jun	2	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	3	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
	1	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
Jul	2	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
	3	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49
	1	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Aug	2	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
	3	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
	1	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Sept	2	0.42	0.42	0.27	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.10	0.42	0.42	0.42	0.42
	3	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oct	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum		1.40	1.40	1.40	1.26	1.41	1.29	1.41	1.29	1.42	1.29	1.40	1.39	1.42	1.29	1.42	1.41

Table 2-2 Diversion Water Requirement on 10-days Basis (2/2)

Unit : liter/sec./ha

Month		1973/74	1974/75	1975/76	1976/77	1977/78	1981/82	1983/84	1984/85	1985/86	1988/89	1989/90	1992/93	1993/94	1994/95	1995/96	Average	Maximum
Nov	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dec	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
Jan	1	0.69	0.81	0.69	0.69	0.69	0.77	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.70	0.81
	2	0.69	0.76	0.72	0.69	0.69	1.11	1.18	1.39	1.39	0.71	0.69	0.69	0.93	0.69	0.78	0.85	1.39
	3	0.63	0.60	0.65	0.50	0.50	0.71	1.34	1.28	1.34	0.50	1.32	1.26	0.57	1.33	1.07	0.77	1.34
Feb	1	0.34	0.76	0.34	0.98	0.34	0.57	0.34	0.70	1.14	0.34	0.54	0.80	0.34	1.04	0.34	0.67	1.39
	2	0.34	0.34	0.34	1.23	0.34	0.76	1.39	0.46	0.66	0.50	0.95	0.34	1.39	1.15	0.34	0.64	1.39
	3	0.54	0.22	1.04	0.08	0.58	1.18	0.51	1.39	1.10	0.66	1.12	0.22	1.39	0.73	0.08	0.77	1.39
Mar	1	0.75	0.36	0.36	0.49	0.36	1.00	0.44	0.96	1.08	0.36	1.41	0.76	1.41	1.18	0.36	0.85	1.41
	2	0.37	1.02	0.80	0.41	0.37	1.42	1.27	0.37	0.92	1.00	1.42	0.88	1.16	1.42	0.60	0.95	1.42
	3	1.15	0.99	1.19	1.27	0.89	1.27	1.05	0.45	0.78	1.02	0.96	1.05	1.24	1.10	1.40	1.08	1.40
Apr	1	1.01	0.95	0.57	1.26	0.67	1.15	1.26	0.26	1.10	1.26	1.26	1.26	1.26	1.26		1.09	1.26
	2	1.29	1.29	1.12	1.29	1.29	0.88	1.29	0.51	1.29	1.29	1.29	0.65	1.29	1.29		1.16	1.29
	3	1.06	1.06	0.49	1.06	1.06	1.06	1.06	0.76	0.90	0.93	1.06	1.06	1.06	1.06		1.00	1.06
May	1	0.38	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.39	0.55	0.55	0.55		0.53	0.55
	2	0.19	0.19	0.19	0.19	0.19	0.19	0.04	0.00	0.19	0.19	0.19	0.19	0.19	0.19		0.18	0.19
	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0
Jun	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0
	2	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04		0.04	0.04
	3	0.00	0.10	0.10	0.10	0.10	0.10	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10		0.10	0.10
Jul	1	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23		0.23	0.23
	2	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38		0.38	0.38
	3	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49		0.49	0.49
Aug	1	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78		0.78	0.78
	2	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86		0.86	0.86
	3	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87		0.87	0.87
Sept	1	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81		0.81	0.81
	2	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42		0.40	0.42
	3	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09		0.09	0.09
Oct	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0
	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0
Maximum		1.29	1.29	1.19	1.29	1.29	1.42	1.39	1.39	1.39	1.29	1.42	1.26	1.41	1.42	1.40		

Table 2-3 Irrigable Area

No.	Cropping Year	Rainy Season Cropping Irrigable Area(ha)	(Xi-Xo)	(Xi-Xo)^2	No.	Cropping Year	Dry Season Cropping Irrigable Area(ha)	(Xi-Xo)	(Xi-Xo)^2
1.	1968/69	3,035	1602.52	2,568,075.92	1.	1966/67	635	370.13	136,996.54
2.	1961/62	2,537	1104.52	1,219,968.27	2.	1988/89	607	342.13	117,053.23
3.	1988/89	2,424	991.52	983,115.36	3.	1968/69	410	145.13	21,062.84
4.	1958/59	2,279	846.52	716,599.05	4.	1960/61	398	133.13	17,723.71
5.	1964/65	2,122	689.52	475,440.23	5.	1977/78	395	130.13	16,933.93
6.	1977/78	2,007	574.52	330,075.23	6.	1984/85	339	74.13	5,495.32
7.	1985/86	1,826	393.52	154,859.36	7.	1964/65	322	57.13	3,263.89
8.	1966/67	1,708	275.52	75,912.23	8.	1961/62	293	28.13	791.32
9.	1983/84	1,415	-17.48	305.49	9.	1959/60	287	22.13	489.76
10.	1967/68	1,383	-49.48	2,448.10	10.	1962/63	271	6.13	37.58
11.	1962/63	1,345	-87.48	7,652.45	11.	1976/77	263	-1.87	3.50
12.	1992/93	1,298	-134.48	18,084.40	12.	1985/86	234	-30.87	952.93
13.	1963/64	1,197	-235.48	55,450.01	13.	1963/64	212	-52.87	2,795.19
14.	1960/61	1,148	-284.48	80,927.88	14.	1983/84	195	-69.87	4,881.76
15.	1976/77	1,148	-284.48	80,927.88	15.	1958/59	193	-71.87	5,165.23
16.	1965/66	1,116	-316.48	100,158.49	16.	1965/66	190	-74.87	5,605.45
17.	1969/70	1,104	-328.48	107,897.97	17.	1967/68	178	-86.87	7,546.32
18.	1989/90	856	-576.48	332,327.19	18.	1992/93	140	-124.87	15,592.41
19.	1959/60	820	-612.48	375,129.62	19.	1989/90	133	-131.87	17,389.58
20.	1957/58	805	-627.48	393,728.97	20.	1969/70	123	-141.87	20,126.97
21.	1984/85	789	-643.48	414,064.27	21.	1993/94	108	-156.87	24,608.06
22.	1993/94	395	-1037.48	1,076,361.14	22.	1957/58	98	-166.87	27,845.45
23.	1994/95	190	-1242.48	1,543,752.23	23.	1994/95	68	-196.87	38,757.63
			Total	11,113,261.74				Total	491,118.61

n= 23
Xo= 1432.48
1/a= 983.04
X= Xo+(1/a)*z

T	z	X
1/5	-0.5951	847.47
1/10	-0.9062	541.65
1/30	-1.2971	157.38
1/50	-1.4522	4.91

n= 23
Xo= 264.87
1/a= 206.65
X= Xo+(1/a)*z

T	z	X
1/5	-0.5951	141.89
1/10	-0.9062	77.60
1/30	-1.2971	-3.18
1/50	-1.4522	-35.23

Note: T:Return period
z:Normal variable
X:Probable maximum daily rainfall(mm)
n:Number of data
Xo:Average maximum daily rainfall (mm)

Table 2-4 Record of Maximum Flood Discharge

(m3/sec.)

Year	Date	Discharge		Total
		Namikokwe	Nadzipokwe	
1958/59	Mar.1	14.74	1.27	16.01
1959/60	Mar.28	29.16	0.84	30.00
1960/61	Mar.4	121.18	33.90	155.08
1961/62	Ja.17	14.25	0.80	15.05
1962/63	Feb.22	14.77	3.21	17.98
1963/64	Dec.23	13.24	0.86	14.10
1964/65	Jan.1	8.61	1.36	9.97
1965/66	Feb.20	20.47	1.27	21.74
1966/67	Feb.21	8.06	0.31	8.37
1967/68	Dec.18	34.51	0.20	34.71
1968/69	Jan.29	39.15	29.00	68.15
1969/70	Dec.17	15.37	4.04	19.41
1970/71	*	*	*	*
1971/72	*	*	*	*
1972/73	*	*	*	*
1973/74	*	*	*	*
1974/75	*	*	*	*
1975/76	*	*	*	*
1976/77	Jan.24	18.45	7.07	25.52
1977/78	*	*	*	*
1978/79	*	*	*	*
1979/80	Dec.24	41.84	7.00	48.84
1980/81	Dec.28	41.00	16.50	57.50
1981/82	Feb.7	130.16	20.02	150.18
1982/83	Feb.14	65.70	1.70	67.40
1983/84	*	*	*	*
1984/85	Feb.8	15.84	1.50	17.34
1985/86	Dec.24	117.13	0.61	117.74
1986/87	Feb.14	31.40	5.81	37.21
1987/88	Jan.25	79.02	1.22	80.24
1988/89	Jan.30	89.01	3.63	92.64
1989/90	Dec.30	44.04	6.50	50.54
1990/91	Dec.9	22.08	0.08	22.16
1991/92	Jan.18	6.27	0.24	6.51
1992/93	Feb.25	22.30	0.66	22.96
1993/94	Feb.6	7.10	0.44	7.54
1994/95	Feb.22	28.25	1.24	29.49

Source : Water Department, Ministry of Irrigation and Water Development

Table 2-5 Inventory of Existing Boreholes and Hand Pump

Name of Village Group	Data and Conditions of Existing Boreholes							Water Committee		Remark
	No	Name of Village	Registration Number	Construction Year	User of Village	Condition	Name of Pump	Establishment Year	Water Fee (year/household)	
MTHEMBANJI	1	Dziko	Not constructed	-	-	-	-	-	-	To be provided with borehole and pump
	2	Mkondorire	Not constructed	-	-	-	-	-	-	To be provided with borehole and pump
	3	Chatewa	Not constructed	-	-	-	-	-	-	To be provided with borehole and pump
	4	Mthembanji	BB 49	1988	Mthembanji	Not working	Meera	Existing	No collection	Plunger has fallen in borehole. To be provided with borehole and pump
	5	Mbangali	Not constructed	-	-	-	-	-	-	To be provided with borehole and pump
	6	Bwannamakowa	Not constructed	-	-	-	-	-	-	To be provided with borehole and pump
	7	Garuanenji	KB 223	1995	Gruanenji, Dziko	Working	Afridev	Not existing	-	Functional
	8	Mwasinja	SM 115	1994	Mwasinja	Not working	Afridev			Plunger has fallen in borehole. To be provided with borehole and pump
KAFULAMA	9	Maiwaza	PI 355	1993	Maiwasa	Working	Afridev	Existing	KW 2.0	Functional
	10	Mlongoti	PI 356	1993	Mlongoti	Working	Afridev	Existing	-	Requesting DOW to replace bearing at the cost of committee
	11	Maluza	Not constructed	-	-	-	-	-	-	To be provided with borehole and pump
BWANARI	12	Madziatsasi	FC 37	1995	Madziatsasi	Working	Afridev	-	-	Functional
	13	Nankumba	-	No pump	-	-	-	-	-	DOW will install pump.
	14	Msolo	Nil	-	-	-	-	-	-	To be provided with borehole and pump
	15	Fole	KG 209	1995	Fole	Working	Afridev	Existing	KW 5.0	DOW gave training to committee.
	16	Bwanali	M 149	No pump	-	-	-	-	-	DOW will install pump.
MCHANJA	17	Mchanja	KB 227	1994	Mchanja Mdulambale Nbongwe	Working	Afridev	Existing	KW 5.0	DOW gave training to committee.
	18	Mdulambale	Not constructed	-	-	-	-	-	-	To be provided with borehole and pump
	19	Kamwendo	CC 124 CU 65	1996 1994	Kamwendo, Khoswe Mchembo	Working	Afridev Afridev	Existing	KW 5.0	Functional
	20	Khoswe	Not constructed	-	-	-	-	-	-	To be provided with borehole and pump
	21	Mchembo	L 366	Before 1964	Mchembo	Working in many leakage	Not defined	Not existing	-	Pump is too old. User doesn't know committee. To be replaced with new borehole and pump
	22	Nbongwe	Not constructed	-	-	-	-	-	-	To be provided with borehole and pump

Table 2-6 Constructon Details of Existing Boreholes

Name of Village Group	No	Name of Village	Registration Number	Depth of Well (m)	Borehole Dia. (mm)	Casing & Screen Dia. (mm)	Depth of Screen Pipe (length) (m)	Yield (lit/min)	Depth of Pump Suction (m)
MTHEMBANJI	1	Dziko	No borehole						
	2	Mkondorire	No borehole						
	3	Chatewa	No borehole						
	4	Mthembanji	BB 49	-	-	-	-	-	-
	5	Mbangali	No borehole						
	6	Bwannamakowa	No borehole						
	7	Gamanenji	KB 223	38.43	152	152	9.13-38.43 (29.30)	54.70	30.50
	8	Mwasinja	SM 115	46.36	203	152	29.90-46.36 (16.46)	182.40	30.50
KAFULAMA	9	Maiwaza	PI 355	-	-	-	-	-	-
	10	Mlongoti	PI 356	-	-	-	-	-	-
	11	Maluza	No borehole						
BWANARI	12	Madziatsasi	FC 37	51.85	203	152	33.55-51.85 (18.30)	97.60	45.70
	13	Nankumba	Digged well but No number	-	-	-	-	-	-
	14	Msolo	No borehole						
	15	Fole	GK 209	51.85	203	152	13.72-51.85 (38.13)	30.40	42.70
	16	Bwanali	M 149	30.50	203	152	-	60.00	-
MCHANJA	17	Mchanja	KB 227	-	-	-	-	-	-
	18	Mdulambale	No borehole						
	19	Kamwendo	CC 124	35.50	203	152	6.50-35.50 (29.00)	1.50	-
		Kamwendo	CU 65	-	-	-	-	-	-
	20	Khoswe	No borehole						
	21	Mchembo	L 366	28.30	152	152	24.40-28.30 (3.90)	70.40	22.60
	22	Nbongwe	No borehole						

Source : Water Department, Ministry of Irrigation and Water Development

Table 2-7 Result of Water Quality Test of Existing Boreholes

Item	Unit	Maizawa Borehole PI 355	Garuanenji Borehole KB223	Mchembo Borehole L366	Kamwendo Borehole CC124	Madziatsasi Borehole FC 37	WHO Guideline	Malawi Bureau of Standards	Dept. of Water Temporary Guideline
Turbidity	NTU	0.6	1.6	1.6	0.86	1.2	5	5	25
pH value	-	7.2	7.6	7.8	7.6	6.9	6.5-8.5	6.5-8.0	6.0-9.5
Electric Conductivity	us/cm	750	672	484	707	398	-	-	-
Total Hardness	mg/L	350	192	229	146	152	500	500	800
Total Iron	mg/L3	0.05	0.06	0.17	0.11	0.55	1	1	3
Chloride	mg/L	109	41	2	14	1	600	600	750
Coliform Group	Count/100ml	0	53	0	2	0	0	0	50

Sampling Date : September 28, 1996

Table 2-8 Consumption Rate of Rice and Maize

Name of Village Group	Village			Average Consumption(Kg/Capita/year)		Remark (Popula. at P/S) (Nos)
	No	Name of Village	Population (Nos)	Paddy (kg/capita/year)	Maize (kg/capita/year)	
MTHEMBANJI			4,745	332,150	996,450	4,660
	1	Dziko	640	44,800	134,400	
	2	Mkondorire	510	35,700	107,100	
	3	Chatewa	535	37,450	112,350	
	4	Mthembanji	785	54,950	164,850	
	5	Mbangali	310	21,700	65,100	
	6	Bwannamakowa	225	15,750	47,250	
	7	Garuanenji	640	44,800	134,400	
	8	Mwasinja	1,100	77,000	231,000	
KAFULAMA			2,160	151,200	453,600	2,160
	9	Maiwaza	720	50,400	151,200	
	10	Mlongoti	885	61,950	185,850	
	11	Maluza	555	38,850	116,550	
BWANARI			3,000	210,000	630,000	3,040
	12	Madziatsasi	895	62,650	187,950	
	13	Nankumba	565	39,550	118,650	
	14	Msolo	565	39,550	118,650	
	15	Fole	645	45,150	135,450	
	16	Bwanali	330	23,100	69,300	
MCHANJA			3,240	226,800	680,400	3,240
	17	Mchanja	840	58,800	176,400	
	18	Mdulambale	625	43,750	131,250	
	19	Kamwendo	850	59,500	178,500	
	20	Khoswe	240	16,800	50,400	
	21	Mchembo	215	15,050	45,150	
	22	Ndongwe	470	32,900	98,700	

Source: Salima ADD

Note: Consumption of Paddy = 70 kg/capita/year
Consumption of Maize = 210 kg/capita/year

Table 2-9 Required Number of Ricemill Equipment

Description	Unit	Name of Village Group			
		Mthembanji	Kafulama	Bwanari	Mchanja
1 Consumption of rice	kg/month/capita	5.8	5.8	5.8	5.8
2 Population	Persons	4,745	2,160	3,000	3,240
3 Total consumption	kg/month	27,521	12,528	17,400	18,792
4 Required capacity of rice mill					
(1) Milling day 25days/month	kg/month	1,101	501	696	752
(2) Milling hour 8hrs./day	kg/day	138	63	87	94
5 Required capacity and Numbers of rice mill					
(1) Required capacity	kg/hr.	138	63	87	94
(2) Required nos. 100-120kg/hr.	no	1	1	1	1

Table 2-10 List of Basic Design Drawings

No.	Dwg. No.	Title of Drawing		
	General			
1	MP-01	Location Map		
2	MP-02	General Layout of Irrigation, Drainage and Rural Road		
3	MP-03	Location Map for Rural Water Supply System and Post Harvest Facilities		
	Headworks			
4	HW-01	Plan and Profile		
5	HW-02	Plan		
6	HW-02	Structural Plan		(1/2)
7	HW-02	Structural Plan		(2/2)
8	HW-02	Control House, Elevation		
	Irrigation and Drainage Facilities			
9	ID-01	Irrigation Flow Diagram		
10	ID-02	Drainage Flow Diagram		
11	ID-3	Typical Cross Section		
12	ID-4	Longitudinal Profile	Main Canal	(1/3)
13	ID-5		Main Canal	(2/3)
14	ID-6		Main Canal	(3/3)
15	ID-7		Branch Canal - 1	(1/2)
16	ID-8		Branch Canal - 1	(2/2)
17	ID-9		Branch Canal - 2	(1/2)
18	ID-10		Branch Canal - 2	(2/2)
19	ID-11		Branch Canal - 2 - 1	
20	ID-12		Branch Canal - 3	(1/2)
21	ID-13		Branch Canal - 3	(2/2)
22	ID-14	Longitudinal Profile	Drainage Canal - 1	
23	ID-15		Drainage Canal - 1	(2/2)
24	ID-16		Drainage Canal - 2	(1/2)
25	ID-17		Drainage Canal - 2	(2/2)
26	ID-18		Drainage Canal - 2-1	
27	ID-19		Drainage Canal - 3	(1/2)
28	ID-20		Drainage Canal - 3	(2/2)
29	ID-21		Drainage Canal - 4	(1/2)
30	ID-22		Drainage Canal - 4	(2/2)
31	ID-23		Flood Dike	(1/3)
32	ID-24		Flood Dike	(2/3)
33	ID-25		Flood Dike	(3/3)
34	ID-26	Bifurcation		
35	ID-27	Turnout		
36	ID-28	Irrigation Drop and Culvert		
37	ID-29	Cross Drain and Drainage Culvert		
38	ID-30	Drainage Drop		
39	ID-31	Foot Path Bridge		
40	ID-32	On-Farm Facilities		
	Rural Road			
41	RR-01	Typical Cross Section and Causeway		
42	RR-02	Longitudinal Profile	RR-1	
	Rural Water Supply			
43	RW-01	Typical Section of Borehole and Related Structures		
	Post Harvest Facility			
44	PH-01	Ricemill House		

Table 3-1 Duties of Respective Sections of Construction Office

(1) Project Manager
- Execute overall office management.
- Coordinate with ministries and government agencies.
- Keep close communication with Consultant and Contractor.
- Organize regular tripartite meeting among Government, Consultant and Contractor.
- Organize regular meeting with Farmers Construction Committee.
- Prepare necessary documents.

(2) Technical Section 1
- Execute quality control for concrete work, earth work and construction materials.
- Check quantity and progress control.
- Attend regular tripartite meeting.
- Check the finished work (dimension, elevation, etc.).
- Provide the Project Manager with necessary information, data and report.

(3) Technical Section 2
- Execute quality control for concrete work, earth work and construction materials.
- Check quantity and progress control.
- Attend regular tripartite meeting.
- Check the finished work (dimension, elevation, etc.).

(4) Guidance Section
- Prepare working schedule in cooperation with Farmers Construction Committee.
- Provide farmers with timely and appropriate technical guidance for construction .
- Execute quality control and progress control for the farmers works.
- Keep close communication with Farmers Construction Committee.
- Attend regular tripartite meeting.
- Adjust the progress of farmers works in the light of actual progress of the Contractor's work.
- Put careful attention upon relation between farmers and the Contractor, to avoid any dispute in construction work.
- Prepare a progress report .

(5) Administrative Section
- Perform the office secretarial and other services such as correspondence, typing, copying, filing, compiling, collecting, receiving, submitting, keeping, and distributing letters and documents.
- Manage recruiting personnel under approval of the Project Manager.

(6) Financial Section
- Estimate cost and prepare budget proposal.
- Make payment of salary for all local staff.
- Maintain office accounts and prepare annual office finance statement for auditing.
- Prepare a financial report.

Table 3-2 Construction Works by Farmers Participation : Drainage Canal

	Unit	Name of Drainage Canal					Remark
		DC-1	DC-2	DC-2-1	DC-3	DC-4	
Canal length	km	1.94	4.13	1.58	1.85	1.39	10.89
Excavation volume	m3	4,700	10,600	3,500	4,100	3,400	26,300
Requirement per unit work	man/day	0.75	0.75	0.75	0.75	0.75	
Required total man power	man/day	6,267	14,133	4,667	5,467	4,533	
Proposed construction time	-	May.- Oct 1999	May.- Oct 1999	May.- Oct 1998	May.- Oct 1998	May.- Oct 1998	120 days each season
Required man power	man/day	52	118	39	46	38	
Required man power in season	man/day		170			122	

Table 3-3 Construction Works by Farmers Participation : Sod facing

Branch Irrigation Canal

	Unit	Name of Branch Irrigation Canal				Remark
		BC-1	BC-2	BC-2-1	BC-3	
Canal length	km	4.92	4.33	0.73	4.8	14.78
Area of sodding	m2	17,700	16,200	2,000	22,300	58,200
Requirement per unit work	man/day	8.5	8.5	8.5	8.5	
Required total man power	man/day	2,082	1,906	235	2,624	
Proposed construction time	-	- Nov 1998 - Apr 1999 -				120 days
Required man power	man/day	17	16	2	22	
Required man power in season	man/day				57	

Inspection Road

	Unit	Name of Inspection Road						Remark
		IR-1	IR-2	IR-3	IR-4	IR-5	IR-6	
Road length	km	0.90	2.30	2.70	3.50	1.00	3.30	13.70
Area of sodding	m2	3,300	5,000	5,900	7,600	18,100	7,200	47,100
Requirement per unit work	man/day	8.5	8.5	8.5	8.5	8.5	8.5	
Required total man power	man/day	388	588	694	894	2129	847	
Proposed construction time	-	- Nov 1998 - Apr 1999 -						120 days
Required man power	man/day	3	5	6	7	18	7	
Required man power in season	man/day						46	

New Road

	Unit	Name of Road
		New road-1
Road length	km	2.30
Area of sodding	m2	5,000
Requirement per unit work	man/day	8.5
Required total man power	man/day	588
Proposed construction time	-	- Nov 1998 - Apr 1999 -
Required man power	man/day	5
Required man power in season	man/day	5

Table 3-4 Duties of Respective Sections of O & M Office (1/2)

(1) O & M Officer
- Execute overall office management.
- Coordinate with ministries and government agencies.
- Keep close communication with Farmers Organization.
- Prepare necessary documents.

(2) O & M Section
- Prepare annual operation and maintenance plan including cost.
- Collect and compile technical inventory for the project facilities.
- Prepare and keep irrigation network drawings and maps.
- Prepare seasonal irrigation schedule on the basis of cropping plan.
- Calculate the discharges required on main, branch and sub-branch canal and at the Namikokwe headworks.
- Review the above seasonal irrigation schedule and discharges required on respective canals and at the Namikokwe headworks.
- Carry out routine maintenance works for the Namikokwe headworks, canals, drains and related structures.
- Prepare tender documents in collaboration with Administration Section for repairs of project facilities
- Execute repairing of irrigation and drainage facilities by hired labors/contractor
- Make physical progress control and quality control of repairing works.
- Prepare reports on daily O & M patrol, periodic inspection, damages of project facilities.
- Prepare records and reports on regular maintenance, periodic maintenance, emergency repairs and annual maintenance.
- Prepare a progress report on operation and maintenance implementation.

(3) Monitoring Section
- Collect meteorological and rainfall data relating to the Project.
- Compile data on water level and discharge of Namikokwe river at the headwork site.
- Compile data on daily releasing discharge from the intake of Namikokwe headwork.
- Compile data on daily releasing discharge from the Namikokwe headworks to the downstream side.
- Compile data on settling basin operation.
- Compile data on scouring sluice gate operation.
- Collect data on planted crops, cropped area and crop yield in the project area.
- Collect data on canal conveyance losses of canals.
- Record of operation and maintenance costs.
- Estimate of scheme maintenance fee.
- Prepare a progress report on monitoring works.

(4) Farmers Training Section
- Prepare a guidance program to the farmers organization for proper operation and maintenance of project facilities.
- Prepare guidance papers on O & M works.
- Provide lectures for the farmers organization based on the guidance papers.
- Provide the on-the-job training for the farmers at the site, such as gate operation, measurement of discharge, cleaning of canals, etc.
- Execute the training on administrative and accounting works, in cooperation with the Administration and Financial Sections.
- Arrangement of project inspection tour.
- Organize the meetings between the farmers organization and the O & M Section or the Monitoring Section.

Table 3-4 Duties of Respective Sections of O & M Office (2/2)

(5) Administrative Section
- Prepare contract documents in collaboration with O & M Section for repairs of project facilities
- Perform the office secretarial and other services such as correspondence, typing, copying, filing, compiling, collecting, receiving, submitting, keeping, and distributing letters and documents.
- Manage recruiting personnel under approval of the Project Manager.
- Give the farmers organization lectures on administrative matters in cooperation with the Farmers Training Section.

(6) Financial Section
- Estimate cost and prepare budget proposal.
- Make payment of salary for all local staff.
- Maintain office accounts and prepare annual office finance statement for auditing.
- Give the farmers organization lectures on financial matters in cooperation with the Farmers Training Section.
- Prepare a financial report.

Table 3-5 Major Functions of Farmers Organization (1/3)

(1) Land Allocation Committee
- Allocate plots to farmers.
- Settle land disputes.
- Discipline farmers having violated the constitution which could not be settled at lower committees.

(2) Main Committee
- Prepare the constitution.
- Execute seasonal allocation of plots
- Organize and conduct meetings.
- Organize welfare activities.
- Collect the scheme maintenance fee for headworks and Main Canal
- Review the discussion results in the respective Sub-Committees, and inform the Area Committees and Block Committees and Club Committees of the review results.
- Supervise the Area Committees.

(a) Marketing Sub-Committee (in consultation with Salima ADD)
- Prepare crop calendar for whole area .
- Review the actually planted areas of crops based on the information from the Area Committees.
- Arrange the cooperative purchasing system for agricultural inputs based on the information from the Area Committees.
- Arrange the cooperative selling system of agricultural products based on the information from the Area Committees.
- Arrange loan for farmers based on the information from the Area Committees.
- Report the Main Committee on the results of the above.

(b) Water Distribution Sub-Committee (in consultation with Section Bwanje Valley)
- Prepare seasonal irrigation calendar.
- Calculate seasonal water demand of crops.
- Calculate seasonal canal discharge.
- Calculate seasonal released discharge at diversion points on each canal.
- Assign gate operators at headworks and Main Canal.
- Report the Main Committee on the results of the above.

(c) O & M Sub-Committee (in consultation with Section Bwanje Valley)
- Prepare the annual maintenance program for each canal system.
- Carry out daily and periodic patrols to headworks and Main Canal.
- Execute routine maintenance works for headworks and Main Canal.
- Discuss with the Section Bwanje Valley on large repairs.
- Prepare repair plan and allocate the works to each Area Committee.
- Prepare records on regular maintenance, periodic maintenance, emergency repairs for headworks and Main Canal.
- Calculate the scheme maintenance fee for headworks and Main Canal.
- Report the Main Committee on the results of the above.

(d) Disciplinary Sub-Committee
- Discipline farmers had the violated behaviors against the constitution.
- Settle disputes among farmers which could not be settled at the Area Committee.
- Report the Main Committee on the results of the above.

Table 3-5 Major Functions of Farmers Organization (2/3)

(3) Area Committee
- Organize and conduct meetings.
- Organize welfare activities.
- Collect the scheme maintenance fee for Branch Canals and drains
- Review the information from the Main Committee, and request its Sub-Committees to take necessary actions.
- Review the discussion results in the respective Sub-Committees, and report to the Main Committee.
- Supervise the Block Committees.

(a) Marketing Sub-Committee
- Compile the actually planted areas of crops based on the report from the Block Committee.
- Review the actually planted areas of crops.
- Calculate fertilizer volume.
- Check need of loan arrangement.
- Calculate agricultural products based on the report from the Block Committee.
- Report the Area Committee on the results of the above.

(b) Water Distribution Sub-Committee
- Assign the gate operators on Branch/Sub-Branch Canals.
- Execute water distribution based on the calculated released discharge.
- Report the Main Committee on the results of the above.

(c) O & M Sub-Committee
- Carry out daily and periodic patrols for Branch and Sub-Branch Canals.
- Execute routine maintenance works for Branch and Sub-Branch Canals.
- Discuss with the Main Committee on large repairs under the approval of Area Committee.
- Prepare records on regular maintenance, periodic maintenance, emergency repairs for Branch and Sub-Branch Canals.
- Calculate irrigation services charge for Branch and Sub-Branch Canals.
- Report the Area Committee on the results of the above.

(d) Disciplinary Sub-Committee
- Discipline farmers having had the violated behaviors against the constitution.
- Settle disputes among farmers which could not be settled at the Block Committee.
- Report the Area Committee on the results of the above.

Table 3-5 Major Functions of Farmers Organization (3/3)

(4) Block Committee
- Organize and conduct meetings.
- Compile agricultural practices at Block area based on the information from the Club Committees, and report to the Area Committee.
- Collect the scheme maintenance fee for feeder canals
- Review the information from the Main Committee, and request its Sub-Committees to take necessary actions.
- Review the discussion results in the respective Sub-Committees, and report to the Area Committee.
- Supervise the Club Committees.

(a) Water Distribution Sub-Committee
- Examine the actually planted areas and agricultural products.
- Execute water distribution based on the calculated released discharge.
- Examine whether the released discharge is enough or not, based on information from the Club Committees.
- Report the Block Committee on the results of the above.

(b) O & M Sub-Committee
- Carry out daily and periodic patrols for Feeder Canals.
- Execute routine maintenance works for Feeder Canals.
- Prepare records on regular maintenance, periodic maintenance, emergency repairs for Feeder Canals.
- Calculate irrigation services charge for Feeder Canals.
- Report the Block Committee on the results of the above.

(5) Club Committee
- Organize and conduct meetings.
- Monitor agricultural practices at respective Club area, and report to the Block Committee.
- Collect the scheme maintenance fee for club area.
- Examine whether the released discharge is enough or not, and report to the Block Committee.
- Identify and register the members.
- Appraise and recommend members for seasonal loans.
- Keep records of loans.
- Execute loan services and recovery.
- Discipline farmers having had the violated behaviors against the constitution.
- Organize women activities.

Table 3-6 Estimate on Operation and Maintenance Cost

Initial Stage		Final Stage	
Description	Amount in KW	Description	Amount in KW
(a) Government		(a) Government	
- Salary of government staff	510,000	- Salary of government staff	39,000
- Office running cost	220,000	- Office running cost	15,000
- Mobile running cost	94,000	- Mobile running cost	9,000
Total	824,000	Total	63,000
Cost per ha	1,030	Cost per ha	79
(b) Farmers		(b) Farmers	
- Farmers organization running cost	103,000	- Farmers organization running cost	206,000
- Maintenance by equipment	123,500	- Maintenance by equipment	185,300
- Material cost	50,000	- Material cost	75,000
- Replacement cost (annual basis)	365,000	- Replacement cost (annual basis)	365,000
Total	641,500	Total	831,300
Cost per ha	802	Cost per ha	1,039
Cost per 0.4 ha	321	Cost per 0.4 ha	416

Note:

(1) Salaries for government staff for O & M Office are estimated using the government rates.

(2) Office running cost is estimated by adding 50 % to the actual expenditures for the Salima ADD.

(3) Mobile running cost is estimated for three cars.

(4) Farmers organization running cost is estimated for meeting, stationary , transportation etc.

(5) Maintenance cost by equipment is estimated on the rental basis.

(6) Material cost is estimated by multiplying 0.1% of total material cost for structures.

(7) Replacement cost for gates and screens are estimated based on 20 years life time and 10 % of salvage value.

Note:

(1) Thirty % of total salaries for government staff for Section Bwanje Valley of Salima ADD is applied for this project.

(2) Thirty % of KW 50,000 of office running cost is applied for the project.

(3) Thirty % of KW31,200 of mobile running cost is applied .

(4) Farmers organization running cost is estimated for meeting, stationary , transportation etc.

(5) Maintenance cost by equipment is estimated on the rental basis.

(6) Material cost is estimated by multiplying 0.15% of total material cost for structures.

(7) Replacement cost for gates and screens are estimated based on 20 years life time and 10 % of salvage value.

Table 3-7 Farm Budget Analysis for Mtandamula Area

Description	Irrigated Paddy (Milled Rice)			Irrigated Maize			Rainfed Maize			Vegetables		
	Unit Yield (kg)	Unit Price (KW)	Amount (KW)	Unit Yield (kg)	Unit Price (KW)	Amount (KW)	Unit Yield (kg)	Unit Price (KW)	Amount (KW)	Unit Yield (kg)	Unit Price (KW)	Amount (KW)
(1) Gross Revenue	2,925.0	8.0	23,400.0	2,000.0	2.5	5,000.0	1,000.0	2.5	2,500.0			27,800.0
(2) Farm Inputs												
(a) Seeds	40.0	5.3	212.0	25.0	11.7	292.5	60.0	3.5	210.0			1,345.3
(b) Fertilizers												6,920.8
- Urea	190.0	7.1	1,349.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
- TSP	54.0	6.7	361.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sub-total			1,710.8			0.0			0.0			6,920.8
(c) Miscellaneous (5%)			96.1			14.6			10.5			413.3
(d) Total			2,018.9			307.1			220.5			8,679.4
(3) Net Return (KW)			21,381.1			4,692.9			2,279.5			19,120.6
(4) Cropped Area (ha)			0.4			0.03			1.0			0.03
(5) Net Return per Cropped Area (KW)			8,552.4			140.8			2,279.5			573.6
(6) Total Surplus												**11,546.3**

Note: (1) The calculation is executed in the same manner with the Feasibility Study.

(2) The price of irrigated paddy (milled rice) is estimated using the ratio of farm gate prices at F/S time and the current one.

(3) The prices of Urea and TSP for paddy and maize show the current price, but those for vegetables are assumed using the ration of exchange rate to US$ at F/S time and the current time (3.531).

(4) The gross revenue for vegetables is conservatively assumed two times of that at F/S time considering the inflation rate.

Table 3-8 Farm Budget Analysis for New Area

Description	Irrigated Paddy			Irrigated Maize			Rainfed Maize			Vegetables		
	Unit Yield (kg)	Unit Price (KW)	Amount (KW)	Unit Yield (kg)	Unit Price (KW)	Amount (KW)	Unit Yield (kg)	Unit Price (KW)	Amount (KW)	Unit Yield (kg)	Unit Price (KW)	Amount (KW)
(1) Gross Revenue	2,925.0	8.0	23,400.0	2,000.0	2.5	5,000.0	1,000.0	2.5	2,500.0			27,800.0
(2) Farm Inputs												
(a) Seeds	40.0	5.3	212.0	25.0	11.7	292.5	60.0	3.5	210.0			1,345.3
(b) Fertilizers												6,920.8
- Urea	190.0	7.1	1,349.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
- TSP	54.0	6.7	361.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sub-total			1,710.8			0.0			0.0			6,920.8
(c) Miscellaneous (5%)			96.1			14.6			10.5			413.3
(d) Total			2,018.9			307.1			220.5			8,679.4
(3) Net Return (KW)			21,381.1			4,692.9			2,279.5			19,120.6
(4) Cropped Area (ha)			0.36			0.03			0.83			0.03
(5) Net Return per Cropped Area (KW)			7,697.2			140.8			1,892.0			573.6
(6) Total Surplus												**10,303.6**

Note: (1) The calculation is executed in the same manner with the Feasibility Study.

(2) The price of irrigated paddy (milled rice) is estimated using the ratio of farm gate prices at F/S time and the current one.

(3) The prices of Urea and TSP for paddy and maize show the current price, but those for vegetables are assumed using the ration of exchange rate to US$ at F/S time and the current time (3.531).

(4) The gross revenue for vegetables is conservatively assumed two times of that at F/S time considering the inflation rate.