ATTACHMENT-G.2

THE MOSHI DISTRICT COUNCIL

(REGULATION OF AGRICULTURE

IN

LOWER MOSHI IRRIGATION DEVELOPMENT PROJECT)

BY-LAWS, 1955

ATTACHMENT-2

Government Notice No. 310 published on 16/6/95

THE LOCAL GOVERNMENT (DISTRICT AUTHORITIES) ACT, 1982

NO. 7 OF 1982

BY-LAWS

Made under section 148

THE MOSHI DISTRICT COUNCIL (REGULATION OF AGRICULTURE IN THE LOWER MOSHI IRRIGATION DEVELOPMENT PROJECT) BY-LAWS, 1995

1. These Regulation may be cited as the Moshi District Council (Regulation of Agriculture in Lower Moshi Irrigation Development Project) By-laws, 1995 and shall come into operation on such date when approved by the Minister responsible for Local Government.

2. The purpose of these by-laws is to effect efficient and rational operation and maintenance of the facilities, agricultural land and water sources created under the Lower Moshi Irrigation Project, thereby contributing to the enhancement of agricultural production in the project area.

3. In these by-laws:

"Council" means the Moshi District Council.

(a) "Project" means the Lower Moshi Agricultural Development Project situated in Moshi District, Kilimanjaro Region.

(b) "Project Facilities" means facilities constructed under the project comprising of:

(i) Main and Secondary drains and their related structures.

(ii) Intake Weirs, Main and Secondary Irrigation Canals and their related structures, including water gates and any other items attached to or installed in those structure.

(iii) Trunk Farm Road, main and secondary farm roads and their related structures.

(iv) Flood dikes, and their related structures including gates and other items attached to or installed in those structures.

(v) Warehouse, residential quarters and utility facilities related to the buildings.

(vi) Tertiary irrigation canals, drains, roads and their related structures.

(vii) Watercourses, field drains, field roads and the related structures.

(c) "Major Project Facilities" means the facilities mentioned in items (I) to (v) of para (b) above.

(d) " Terminal Project Facilities" means the facilities mentioned in items (iv) to (vii) of para (b) above.

(e) "Agricultural Land" means any land for agricultural use which are located within the boundary of the Project and served by the Project Facilities.

(f) "Project Office" means an office established for the purpose of the operation and maintenance of the Project.

(g) "Project Manager" means any person appointed to supervise the project Office and execute the operation and maintenance of the project Facilities.

(h) "Project Beneficiaries" means any person or community holding Agricultural Land within the project area.

(i) "CHAWAMPU" means Chama cha Wakulim wa Mpunga formed by the Project Beneficiaries under the Cooperative Societies Act, 1991.

4. The duties of the Project Office shall include the following:

(a) Operation and maintenance of the major Project Facilities.

(b) Providing the Project Beneficiaries with full technical assistance.

5.- (1) The Project beneficiaries shall execute farming operations strictly in accordance with the irrigation plans, cropping schedules and other rules set out by the Project Office and approved by the Council and CHAWAMPU.

(2) Irrigation water created by the Project and conveyed with the Use of the Project Facilities shall not be delivered to any land except that entitled to receive it.

(3) The agricultural Land shall be entitled to receive irrigation water in accordance with the predetermined irrigation schedule.

(4) Supply of irrigation water to the agricultural Land shall be made for 24 hours a day throughout the irrigation periods, except the time or period that the Project Office may determined.

(5) The Project office shall have a right to change the irrigation schedule or to stop the supply of irrigation water to any Agricultural Land in consideration of weather conditions of Agricultural Land or in accordance with the provisions of these By-laws.

(6) The Project Beneficiaries shall not be entitled to receive the supply of irrigation water exceeding the amount allocated to them in the irrigation schedule unless they have obtained prior approval of the Project Office on the increase of water supply.

6.- (1) CHAWAMPU shall collect from the Project Beneficiaries all water charge according to the Water Management Act 1974.

(2) The water charges for one cropping season shall be collected before the commencement of the cropping season.

(3) In case any Project beneficiaries fails to pay water charges pursuant to the provision of Rule 6 (1) - (2)

hereof, the project Office shall immediately cease the supply of irrigation water to the Agricultural Land owned by such Project Beneficiaries and shall not resume the supply until the water charges with interest for the same have been paid.

7. In case it is necessary to prevent any Project Facilities from imminent danger caused by floods, storms or erosions, the Project Office shall have a right to make temporary use of any agricultural Land, trees and any other things of the Project Beneficiaries.

8. Any Project beneficiary shall not alter the form an nature of the Agricultural Land without written approved by the Council.

9. Any Agricultural Land shall be utilized strictly in accordance with the cropping plan and schedule prepared by the Project Office and approved by CHAWAMPU.

10. Any Project Beneficiary who is unable to cultivate the Agricultural Land shall petition for the impracticalness of farming to the Project Office before the commencement of the cropping season and such petition shall be accepted with or without conditions.

11. The Project Office shall have a right to inspect at anytime the conditions of the operation and maintenance of the Terminal project Facilities and the use of the Agricultural Land and shall report to the Council the results thereof.

12. It is strictly prohibited to graze or cause grazing of livestock within the project Area.

(a) If anybody graze or to be grazed any livestock within the Project Area, shall be guilty of an offense.

13. Heavy duty plants or vehicles weighing more the three tons are not allowed within the Project Terminal Facility Area.

14. It is prohibited to use unrecommended chemicals and paddy seeds in the Agricultural Land of the project.

15. Nobody is allowed to take bath or wash clothes in the project canals.

16. Every Project Beneficiary has to pay cultivation and any other charges as may have been determined by the CHAWAMPU before the start cropping schedule.

17. Every Project Beneficiary shall sell to CHAWAMPU portion of the paddy production from the

Agricultural Land as may be determined by the CHAWAMPU.

18. Any Project Beneficiary who contravenes any of the provisions of these By-laws shall be guilty of an offense and may be liable to punishment.

(a) In case of first offender, a fine not exceeding three thousands shillings or imprisonment for a term not exceeding one year or both fine and imprisonment.

(b) In case of second offender or subsequent violation of these regulations, in addition to the penalty, described in regulation 18 (a), the offender may be barred from the cultivation of the Agricultural Land for a period not exceeding three years.

19. Any person or any Project Beneficiaries who takes water without authorization, or break irrigation rule 5 may be sentenced to a fine not exceeding three thousand shillings or six months imprisonment or both fine and imprisonment.

20- (a) Any person who moves, stains, breaks or removes any sign set up for the purpose of exceeding the operation and maintenance of the project Facilities shall be guilty of an offense and may be punished to pay a fine not exceeding three thousands shillings or one year imprisonment or to both fine and imprisonment.

(b) Any Project Beneficiary who is found guilty of an offense under regulation 19 and is a second offender may have his Agricultural Land confiscated by the Council.

(c) Any Project Beneficiary who contravenes the provisions of regulation 12 and is a second offense, in addition to any penalty may, with the approval of the council be ordered to keep his livestock outside the Project area.

The Official seal of the Moshi District Council was affixed to these By-laws in pursuance of resolution passed at a meeting duly convened and held on eleventh day of March, 1994 and the same was affixed in the presence of: -

M. LEMNGE,
Chairman

E. Kapilima,
District Executive Director

I APPROVE

Dodoma
14th March, 1995

HON. CLEOPA DAVID MSUYA
Prime Minister and First Vice-President

ANNEX-H

FARMERS'INTERVIEW, WOMEN IN DEVELOPMENT AND PUBLIC MEETING

ANNEX - II

FARMERS' INTERVIEW, WOMEN IN DEVELOPMENTAND PUBLIC MEETING

Table of Contents

List of Tables

List of Attachment

1. FARMERS' INTERVIEW SURVEY

1.1 Introduction

The farmers' interview survey was undertaken in support of the Lower Moshi Integrated Agriculture and Rural Development Project(the Project), to generate baseline information on the socio-economic condition of the target beneficiaries in the Study area.

A total of 100 farmer-households living in the Study area were involved in the survey using the key-informant interview method. The detailed specification of the purpose of the Study, however, served as its own delimitation as it precluded an attempt to conduct an in-depth study in view of material time constraints as well as those imposed by the overall parameters of the Study in terms of coverage and sampling, among others.

1.2 Major Findings from the Results of Farmers' Interview Survey

1.2.1 Profile of Household Members

The average number of members per household in the three areas: namely existing, extension and expanded area, is 7 persons. The number of female members is slightly higher than the number of male members. The level of formal educational of respondents is quite low. Some 84 % of the respondents have achieved primary school level only (90 % in extension area, 83 % in existing area, and 75 % in the expanded area). Only 11 % have achieved education at the junior secondary level.

1.2.2 Economic Profile

There are large differences in the level of income reported by the interviewed households. The range of annual income reported by individual household vary from as low as (Tsh.) 18,000 to as high as (Tsh.) 4,800,000. In average, the annual income is (Tsh.) 387,000 in the existing irrigated area, (Tsh.) 540,000 in the expanded area, and (Tsh.) 440,000 in the extension area. The incomes for most of the respondents households comes from a combination of crop and livestock sale, and from non-farming activities, such as employment of some members of the household. The main source of income vary with location, and by household within a location. Crop sale is major sources of income for some households in the existing area, while livestock production and/or non-farming activities are the major source of income for many of the interviewed households in the extension area. In some villages such as Njoro, Matakuja, and Oria the respondents reported very little or no income from homestead and livestock activities.

The family assets commonly owned by the interviewed households are bicycles (81 %), radio (69 %), radio cassette (41 %). Very few households have electrical appliances because most houses are not provided of electricity service.

Expenditures on food items represent from 58 % to 62 % of the total living expenses of households in the Study area. Expenses in buying rice and corn are the major part of total expenditure on food items. Other food items that represent large part of the total living expenses are meat, eggs, and fish. Also, the reported expenses on liquor and beverages represent a high percentage of total expenditure on food items. The average of expenses on liquor and beverages reported by household members in the expanded area is significantly higher than those for the existing and extension areas.

The three non-food items that take the largest percentage of total living expenditure are clothing, education, and medicines. Other items of relative importance in the total living expenditure are ceremonies, transport and communication, and fuel wood. The reported

amounts of expenses on loan repayment represent a small percentage of total living expenditure.

A comparison of average annual total income and total living expenditure indicates that most of the households expend in excess of their reported incomes. This seemingly deficit may be because they do not considered as income the agricultural and livestock products used for household consumption.

1.2.3 Scale and Pattern of Agriculture and Livestock Production

The average total land area reported by the interviewed households is 7.3 acres (2.9 ha) for the extension area, 4.1 acres (1.6 ha) for the expanded area, and 3.4 acres (1.4 ha) for the existing area. The reported sizes of irrigated farm land vary in the range from 0.5 to 12 acres (0.2 to 4.8 ha) in the existing area, and from 1.0 to 6.0 acres (0.4 to 2.4 ha) in the extended area. In the existing area there are some households that have irrigated land area as large as 12 acre,but most households have small areas of 1.5 acres or less. Therefore, the average size of irrigated paddy field is larger for households of the expanded area (2.5 acres or 1 ha) than that of households of the existing area (1.8 acres or 0.7 ha). The average land area per household dedicated to cultivation of rainfed upland crops is larger in the existing area (2.3 acres or 0.9 ha) than that of households in the expanded area (1.5 acres or 0.6 ha).

Almost all the farmer's households have the customary right of using the that they till or use for pasturing. Only 2 farmers of the expanded area reported that they are renting land.

The main crops cultivated by most farmers in the existing and extended irrigated areas are paddy and maize. Some farmers plant beans, soybean, groundnut, and sunflower at small scales in the irrigated lands. Maize is the main crop for most farmers in the extension area under rainfed condition. The average area planted to rice is 1.0 acre per household in the existing area and 1.8 acre per household in the extended area. The average area planted to maize is 8.7 acres per household in the existing area, 1.0 acre per household in the extended area, and 3.1 acres per household in the extension area.

There are large differences in the yield of paddy rice reported by individual respondent farmers. The reported yields of paddy rice in the existing and expanded areas varied in the range between 500 kg/acre (1.2 ton/ha) to as high as 5,000 kg/acre (12.5 ton/ha). The estimated average yield of paddy rice is 1,930 kg/acre (4.8 ton/ha) for the existing area and 1,665 kg/acre (4.2 ton/ha) for the expanded area. The reported yields of irrigated maize in the existing and expanded areas varied in the range between 240 kg/acre (0.6 ton/ha) to as high as 2,500 kg/acre (6.2 ton/ha). The estimated average yield of irrigated maize is 830 kg/acre (2.1 ton/ha) for the existing area and 950 kg/acre (2.4 ton/ha) for the expanded area. The reported yields of rainfed maize in the extension area vary in the range from 90 kg/acre (0.2 ton/ha) to 1,800 kg/acre (4.5 ton/ha). The estimated average yield of rainfed maize in the extension area is 580 kg/acre (1.5 ton/ha).

There are significant variations in the date of planting rice depending on location. For example, in Mandaka the common planting date for rice is January for first cropping season and July for the second cropping season, and harvesting take place from April to May, and from November to December, respectively. The most common planting date for the majority of farmers in the entire Study area are in May and harvest from September to October for the first cropping season. For the second cropping season planting is done in September and harvesting is in January. The common planting date of maize is in March and harvesting is done in August.

The variety of rice most commonly planted is IR 54. The rate of rice seeds planted per acre varies greatly depending on the location. The average rate of rice seeds used by farmers in the Study are is 22 kg/acre (54 kg/ha). Most rice farmers apply fertilizer twice or three times in each cropping season. The average rate of fertilizer application is 120 kg/acre (300 kg/ha) of

urea, and 40 kg/acre (100 kg/ha) of ammonium sulfate. Although farmers reported difficulty in acquiring pesticides as one of the main problems, most rice farmers apply insecticides 3 times per cropping season. The average rate of insecticides applied is 1.0 liter/acre (2.5 liter/ha).

The varieties of maize commonly used vary depending on location, but the commonly planted varieties are Taxpi and Malawai. The average rate of maize seeds used by farmers in the study area is 12 kg/acre (30 kg/ha). The majority of farmers in the Study area do not apply fertilizers to maize fields. The average rate of fertilizers applied to maize fields by a relatively small percentage of farmers in the existing area are 58 kg/acre (145 kg/ha) of urea and 20 kg/acre (50 kg/ha) of ammonium sulfate. In the extended area the reported rate of fertilizer is 135 kg/acre (337 kg/ha) of urea and 19 kg/acre (47 kg/ha) of ammonium sulfate; While in the extension area the rate of fertilizers applied to maize is only 7 kg/acre (18 kg/ha) of urea.

Drought is the most common causes of damage to all kind of crops. Others important causes of crop damages are pest and diseases. In addition to these cause of crop damages, farmers cited the difficulties in obtaining farming inputs such as fertilizers and pesticides as some of the main problems affecting their agriculture production. In the extension area the low yield of crops is cited as one important problem by a high percentage of farmers.

There is a noticeable lack of agricultural machinery in the study area. Most farmers have simple hand tools as farming equipment. Average use of mechanical power for rice cultivation are 0.6 day/acre (1.5 day/ha) for plowing, 0.3 day/acre (0.75 day/ha) for threshing, and 0.4 day/acre (1.0 day/ha) for transporting of produce. Farming activities depend largely on hired labor. The average labor used for paddy cultivation is 55 man-day/acre (138 man-day/ha) in the existing area and 50 man-day/acre (125 man-day/ha) in the extended area. The reported largest use of labor is for irrigation 35 man-day/acre (87 man-day/ha), followed by weeding 9 man-day/acre (23 man-day/ha), transplanting 7 man-day/acre (18 man-day/ha), and harvesting 5.4 man-day/acre (14 man-day/ha).

Average use of mechanical power for maize cultivation are 1.7 day/acre (4.25 day/ha) for plowing, 0.8 day/acre (2.0 day/ha) for threshing, and 1.8 day/acre (4.5 day/ha) for transporting of produce. The average labor used for maize cultivation is 113 man-day/acre (282 man-day/ha) in the existing area, 73 man-day/acre (182 man-day/ha) in the extended area, and only 11 man-day/acre (28 man-day/ha) in the extension area. The reported largest use of labor for maize cultivation in the existing area is for weeding 37 man-day/acre (92 man-day/ha), followed by seeding 18 man-day/acre (46 man-day/ha), harvesting 17 man-day/acre (42 man-day/ha), grass cutting 16 man-day/acre (40 man-day/ha), and drying-bagging 15 man-day/acre (38 man-day/ha).

The crops preferred by a large percentage of farmers for future development in the three areas are in order of preference : Paddy by almost 100 % of farmers, maize by 87 % of farmers, vegetables by 48 % of farmers, groundnut by 35 % of farmers, and soybean by 29 % of farmers. Farmers intention for the improvement of farming activities are, in order of importance: to acquire irrigation water, intention expressed by 96 % of interviewed farmers; to improve irrigation facilities by 62 % of farmers; to prevent pests and diseases, 59 % of farmers; to improve farming practices, 31 % of farmers; to strengthen extension service, expressed by 29 % of interviewed farmers; and to improve system for supply of farm inputs, is the intention of 23 % of interviewed farmers.

The farm gate prices of rice vary in the range from 106 Tsh/kg to 188 Tsh/kg, and the estimated average farm gate price of rice is 150 Tsh/kg for both, the existing and extended areas. There are large differences in the farm gate prices of maize reported by interviewed farmers. The reported prices of maize vary in the range from as low as 45 Tsh/kg up to as high as 250 Tsh/kg, and the estimated average farm gate prices of maize are 81 Tsh/kg in the existing area, 67 Tsh/kg in the expanded area, and 114 Tsh/kg in the extension area.

Livestock production is an important economical activity for many households in the Study area, especially in the extension area where a large percentage of interviewed households reported relatively large number of livestock. Livestock production is the main source of income for approximately 18 % of the households, and the only source of income for other 5 % of interviewed households in the entire study area. Cattle and goat husbandry are the main types of livestock production at economic scale in the study area. Pigs, chicken, and other kinds of livestock are raised in small number, mainly for home consumption.

Livestock production is very small in some village where most of the farmers are engaged in rice production, such as Njiro in the expanded area. The number of cattle per household vary in the range from 1 up to 25 heads per household. The estimated average number of cattle per household is 5 in the existing area, 4 in the extended area, and 8 in the extension area. The number of goats per household also vary in the range from 1 up to 25 heads per household. The estimated average number of goats per household is 5 in the existing area, 3 in the extended area, and 7 in the extension area.

1.2.4 Agricultural Support Services and Farmers' Organizations

The agricultural support services are generally associated with the various assistance provided by the government at the national and local levels. As far as receiving such services are concerned, farmers of the Study area indicated the significant benefit from the existing research, extension and training activities of KADP, principally from the introduction of rice variety suitable for the area.

Almost all farmers in the Study area do not attain agricultural credit. Out of the one hundred (100) interviewed farm households, only two (2) farmers reported attaining agricultural loan. The reason for using agricultural loan for the 2 farmers is for purchasing farm inputs. The amount borrowed by one of the farmers was in the range from Tsh 10,000 to 50,000, and between Tsh 50,000 to 100,000 for the other farmer. The farmer borrowing the smaller amount took the loan from the bank with an interest rate of 10 %, while the farmers borrowing the largest amount took the loan from a non bank source and the interest rate was not clarified.

A large majority of farmers interviewed, about 70 % in the existing area and 85 % in the expanded area, said that they are not satisfied with the quantity of irrigation water received during the last year cropping season. About similar percentage in the existing area and 100 % in the expanded area said that they did not receive enough water. The three main problems cited by farmers are, in order of frequency : (1) illegal usage of water by farmers, (2) the organization do not distribute water equally, and (3) damages in the canals.

There are different types of farmers organization within the Study area, such as agricultural cooperatives for marketing of agricultural produce, and water user associations for O&M of irrigation systems. More than 95 % of farmers in both, the existing and the extended areas indicated that the main purpose of their organization is the O&M of irrigation systems. The main problems of the water user organization identified by interviewed members are in order of frequency cited: lack of fund for the O&M of irrigation systems, no clear by laws of farmers activities, low participation of farmers in the O&M organization. Approximately 50 % of farmers said that the water is not distributed uniformly, and indicated the following main reasons: (1) closure of canals by farmers using stones and other materials, (2) illegal farm water intakes, and (3) because poor maintenance of canal systems. About half of the farmers said that they have problems on irrigation scheduling and the half said they do not have problems on irrigation scheduling. The main causes of problems for irrigation scheduling are because irrigation water is not available at the right time, and because the water supply is unstable.

A majority (65 %) of farmers in the existing and expanded areas have been engaged in the O&M activities of their respective canals before starting the irrigation supply. Also, the large

majority of farmers in both areas think that cleaning and minor repair of canals are among their responsibilities. Most farmers have seeing the canals being damaged by other farmers during periods of water shortage. The majority of farmers said that they clean the drainage canals every season.

About 80 % of respondents in the existing area said that they know about irrigation service charges and 20 % did no know. But in the extended area about 80 % of the respondents said they did not know about irrigation service charges. About 25 % of farmers in the existing area said that the irrigation service fees are moderate, other 25 % said that the fees are expensive, and about 35 % said that the irrigation service fees are very expensive. In the expanded area there was not answer to the question about cost of irrigation fees. Approximately 88 % of farmers in the existing area said that they are willing to pay the irrigation service fees. About the same percentage of farmers said that they have paid the irrigation fees. Among those that have not paid the irrigation fees, about 5 % said that they do not have money. The 5 main reasons for no paying irrigation fees mentioned by interviewed farmers are, in order of frequency, because: (1) not receiving enough water, (2) their income is not enough to pay, (3) do not receive water on time, (4) O&M fees are too much, and (5) they get very little harvest.

A slightly higher majority (52 %) of farmers interviewed in the existing area said that they do not agree with the turnover of O&M of irrigation facilities from the government to the water users association, and about 40 % said that they agree with the turnover of O&M of irrigation facilities to the water users. About 33 % said that if the government provide advise and technical assistance it is possible to turnover the O&M of irrigation facilities to the water organization. Some 22 % said that the water user organization can not operate and maintain the entire irrigation system, but may operate and maintain part of the system. Another 21 % of farmers interviewed said that their organization can not operate and maintain the irrigation system.

In the existing area about 77 % of farmers participate in cooperatives for marketing farming inputs and agricultural products, and about 23 % of farmers do not participate in marketing cooperatives. In the extended area only some 65 % of farmers participate in marketing cooperatives and 35 % are do not participate. In the extension area about 45 % of interviewed farmers participate in marketing cooperatives and the remaining 65 % is do not participate. Among the activities that farmers want be undertaken by their cooperative are in order of frequency: supply of farm inputs, service of farm machinery, transportation of products, extension service, and marketing information service.

In relation to the availability of main social infrastructures in the study area, there is installed electricity lines in the communities of Chekerine, Mebogiri, and Oria. But as a whole in the study area, the large majority of households (80 % in the existing area, 70 % in the expanded area, and 85 % in the extension area) do not have supply of electricity into their houses. At the center of each rural community there are installed water pumps. Approximately only 50 % of rural families are supplied with water for domestic use. The households located in the peripheral areas of the villages fetch their drinking water from the canals, rivers, or some distant wells.

1.3 Summary Tables of the Farmers' Interview Survey

The results of farmers' interview survey are given in Tables H.1.1 to H.1.17.

2 WOMEN IN DEVELOPMENT

2.1 Introduction

This Study of women in development(WID) was carried out to analyze the present situation of women residing in the Project area. The study was conducted in Lower Moshi area on five villages of Oria, Chekereni, Mabogini, Rau Ya Kati and Kaloleni. A total of 40 respondents wee interviewed, these includes village leaders, women, agricultural extension workers and community development workers.

The objective of the study was to examine the role played by women in the socio-economical development and to asses factors which hinders women development and to propose solutions to combat the situation, and to incorporate them in the Project objectives.

Women in the Study area constitute half the number of the population. They are responsible for agricultural works at all seasons. However, according to traditional laws and customs existing in the area women are not allowed to own, purchase or inherit properties, though they are the main producers.

The situation of women in the Study area is worse both socially and economically. Literacy rate for women and infant mortality rate in Kilimanjaro region in 1978 were 67% and 7.6%, respectively (Site area is not available).

Main crops growing in the Study area are paddy, maize, beans, sunflower and cow pea.

2.2 Women Workload

The study revealed that women works longer hours than men. Women perform 60 to 80% of agricultural work.

The table below shows women workload per day;

Daily Work Schedule of Women In Lower Moshi Area

Time	Acting	Hours
5.00 - 6.00	Waking up, washing, cooking, eating, feeding cattle , milking	1.00
6.00 - 6.45	Walking to the fields(1-2kms)	0.45
6.45 - 15.00	Working in the fields	8.45
15.00 - 16.30	Collecting firewood and return home	1.30
16.30 - 17.00	Fetching water(approximately 1km to source)	0.30
17.00 - 19.00	Lighting fire/cooking meal for family	2.00
19.00 - 20.00	Serving meal and eating	1.00
20.00 - 21.00	Washing children, herself, and dishes	1.00
21.00 -	To bed	

Source: Regional Community Development Office, Kilimanjaro

The table shows activity schedule performed daily by women especially in the farming seasons. She works at least 17 hours a day. She doesn't have any chance to participate in other activities such as attending to public meeting, training, group discussion, etc. This tight activity schedule is the major setbacks towards women development.

It was envisaged that men considers a hard working woman as a guarantee for success, prospecting and the welfare of the whole family, and a lazy woman as a failure, ruin and decline of the whole family.

2.3 Present Condition in the Study Area

2.3.1 The Role of Men and Women in Farm Work/Side Work

The study revealed that women are heavily engaged in agriculture and livestock activities. Women are the main productive forces in the Study area, and involved in all production activities on the farm and at all stages.

In the agricultural activities they mostly engaged in planting, sowing, weeding, manuring and harvesting. They are also responsible for transporting crops on their heads from the farm to home, storage, processing and preparation of food. The table below shows the participation of men and women in agricultural production.

Division of Labor in Agricultural Activities between Men and Women in the Study Area

Agriculture	Men	Women	Boys	Girls
Cleaning(Farm preparation)	*	*		
Hoeing/Cultivation	*	*	*	*
Seeding		*		*
Weeding		*	*	*
Carrying manure to the farm		*		
Carrying harvest to storage	*	*	*	*
Preserving crop		*		*
Processing crop		*		*
Subsistence farming(gardening)		*		*

Source: Community Development Department, 1996

Due to insufficient income obtained from the agriculture activities, some men are engaging to other activities in and outside the village to supplement the meager income in order to meet the living expenses. The activities includes employed as civil servants to government, parastatals and private organizations, petty traders, etc.

There are few women engaged in activities similarly to men and mostly includes clerical works, receptionist, nurses, teachers, petty traders, etc. These are only 5% of all total population.

2.3.2 Source of Water for Household

(1) Work load of women/girls in water collection

Women carry the burden of water collection for family use. The source of water available in the Study area are domestic and public taps, irrigation canals, well, river and springs. However, those with water supplied to their houses are few about 10%. Those who do not have water supplied to their houses spend an average of half to one hour daily collecting water for their family.

This represent a great deal of energy and time of women who are taking responsibility for sustaining the security of their families and production from the land.

(2) Daily requirement of water

Quantity of water needed daily per person is estimated by WHO to be 30 liters, by Tanzania Standard 25 liters. Women perceived their daily family need to be 18-20 liters(one

large bucket). The average family size is approximately six persons who requires 6 buckets per day.

The consequences for women and children's labor time and energy spent collecting water are severe, tiredness, and ill health of women, lack of time to attend to other duties required of them like care of children, cooking, etc.

The water collected are sometimes not clean, dirty especially water from the irrigation canals, rivers, and ponds which sometimes result to outbreaks of cholera and other water borne diseases.

As it is women and girls primary fetch the water (occasionally assisted by boys) children and particularly girls will be affected by low performance in schools due to tiredness and time spent collecting water that could otherwise be spent on study.

2.3.3 Women's Contribution to Agriculture

95% of all women in the Study Area engaged in agriculture activities, the remaining are dealing with petty traders, art crafts and wage earners employed in small holdings. Despite women's major contribution to both food and cash crop production for local consumption, the survey revealed that they do not reap the direct rewards of their work load.

In the Study Area, land ownership is governed by customary law and practices; men according to this arrangement are heads of families and owners of the land; women only enjoy residual rights. To a very large extent this situation has contributed to the subordinate position of women and to under development of the economy.

Women can only own land if they can buy or lend it from farmers. The price of land is very prohibitive depending on the development and the area it situated; An acre ranges from Ths. 200,000 to Ths.1,000,000.

The study (existing the Project area only) revealed that 393 women possess paddy fields out of 6,742 total women population which is 6% of the total women population.

The table below shows the situation.

Paddy Farmers by Gender

Village		Male	Female	Total
Mabogini	*P	2,003	2,104	4,107
	**F	601	185	786
Rau Liver	*P	760	998	1,758
	**F	284	58	342
Chekereni	*P	1,310	1,340	2,650
	**F	412	138	550
Oria	*P	2,200	2,300	4,500
	**F	186	12	198
Total	*P	6,273	5,742	13,015
	**F	1,483	393	1,876

*Note: *P=Population, **F= Farmer*

Source: CHAWAMPU, 1997

The above table entails that only 27% of women possess paddy fields. The reasons why few women possess land can be explained as follows:

(a) Customary laws and traditions prohibit women to own or inherit especially clan land.

(b) Those few have managed to buy land from farmers.

(c) Most women do not have enough money to bought or lend land.

2.3.4 Participation of Women in the Cooperatives

In the Study area, there is a paddy farmer organization(CHAWAMPU). The organization consists of 783 members out of which 136 are females that constitute 17% of the total members. No any woman is holding leadership posts to this farmers' organization from the headquater to branches. Of the rest of the women in the Study area who are not members of CHAWAMPU, some women are eager to recognize themselves and form socio- economical groups to generate income and meet their daily family requirement.

Cooperative organization play an important role , the first one is to provide agricultural inputs to farmers and the second one to seek markets for the agricultural products. There is a need to sensitive women to join cooperatives and to hold necessary leadership posts. It is, therefore, recommended that;

(a) A WID section be established to CHWAMPU.

(b) Encourage women to compete with men in acquiring necessary posts in CHAWAMPU.

2.3.5 Women and Public Participation

The study envisaged that heavy workload and child care responsibilities prevent women from participation in public meeting, training etc. and that they need first to get permission to their husband before attending.

Some taboos and customs are the factors contributing to low participation of women in public arenas as they regard women as inferior to their male counterparts.

2.3.6 Education and Technical Skills

In the Study area, about 70% of women have completed primary educational level, 20% have attended adult education classes and the rest 10% are illiterate. Each village has a primary school. In Kahe ward there is one private secondary school operated by WAZAZI (parent organization) and accommodated both sexes. The following is the educational facilities of kilimanjaro region and attendance by gender.

Provision of Education in the Kilimanjaro Region by Gender, 1995

Type of Facility	Number	Attendance by Gender			
		Female		Male	
		Nos.	%	Nos.	%
Child care(from 3-7 years)	150	12,785	(Both sexes)		
Primary Schools	696	105,542	49.5	107,342	50.5
Secondary Schools					
-Public	18	-	-	-	-
-Private	62	-	-	-	-
Teachers Colleges	4	-	-	-	-
Folk Development Colleges	3	-	48.7	-	51.3
Vocational College	1	-	16.7	-	83.3
Adult education Centers	-	1,344	58.7	947	41.3

Source: Regional Education Office/Community Development Office, 1995

National the average total percentage of illiterate adults is 16; Female illiterate is 18.5% and male is 13.1% as shown below;

Percentage of Illiterate Adults

Year		1975	1981	1985	1992
Total	(%)	39	21	10	16
Female	(%)	44	27	12	19
Male	(%)	34	15	7	13

Source; Ministry of Education and Culture, 1993

Agriculture extension workers used to train farmers on modern farming methods, women are also attending to this training although their attendance are low compared with men due to burden work they performed everyday on which there is no room for them to participate effectively in public areas.

2.4 Changes Expected to Occur to Women after Project Implementation

Major changes expected will be increase of paddy production, changing from upland crop cultivation to rice production, and improvement of rural infrastructures. These changes can effect women development both socially and economically.

(1) Socially;

(a) Improving living standard of women in particular and community in general,

(b) Changes of negative attitudes towards women,

(c) Reduced women workload through application of appropriate technology and improvement of rural infrastructures, and

(d) Adequate water supply both domestic and irrigation.

(2) Economically;

(a) Increase of income and enable women to have purchasing power to meet their daily family needs, and

(b) Effective participation of women in the Project and increase food production.

2.5 Women Development Plan

2.5.1 Objectives of Women Development Plan

Women are vital and plays an important role in society in bringing up development. This plan for women development is designed purposely to emancipate women from oppressions and discriminations and enable them to participate effectively through the implementation of the Project.

The objectives of the plan are as follows;

(a) To draw up priorities and strategies in order to;

1) reduce women's heavy workload,

2) elimination of all forms of discrimination against women, and

3) empower women socially and economically.

(b) To ensure full participation and involvement of women in the Project activities.

(c) To identify obstacles hinders women development and propose measures/solution to combat them.

2.5.2 Priorities and Strategies

Priorities and strategies of the women development plan are shown in Table II.2.1.

3 PUBLIC MEETINGS

3.1 General

Public meetings were held under the sponsorship of GOT with the assistance of JICA Study team. The objectives of the public meetings were to explain and discuss about the development plan of the Project. Farmers' intentions and requests manifested through the meeting have been reflected upon the report as far as possible.

The total number of public meetings hold are eight (8) times. Of which one meeting is for women only in obedience to MAC's suggestion (Ref. Minutes of Meeting on 17 Nov. 1997). The meetings were held according to the following implementation schedule and program:

(1) Schedule

Date	Target Village	Place	Attendants Invited
Dec. 22 (A.M.)	Chekereni village	Village office	All beneficiaries
Dec. 22 (P.M.)	Mabogini village	Primary school	All beneficiaries
Dec. 23 (A.M.)	Rau & Oria villages	CHAWAMPU office	All beneficiaries
Dec. 23 (P.M.)	Above 4 villages	CHAWAMPU office	All women
Dec. 31(A.M).	Mutakuja	Village office	All beneficiaries
Jan. 2 (A.M)	Mandaka Mnono	Village office	All beneficiaries
Jan. 2 (P.M)	Kaloleni	Primary school	Village leaders
Jan. 3 (P.M)	Mvuleni	Primary school	All beneficiaries

(2) Program

(a) Opening address and explanation of public meeting

(b) Explanation of the Project

1) Background of the Project
2) Objectives of the Project
3) Outline of the Development Plan
   a) Problems and constraints to agricultural development
   b) Basic approach to development plan
   c) Outline of the Project
      - Water source development plan
      - Agriculture development plan
      - Irrigation and drainage development plan
      - Rural infrastructure development plan
      - Operation and maintenance development plan
      - Strengthening plan of CHAWAMPU
4) Beneficiaries' Duties

(3) Discussion with farmers for the proposed development plan

(4) Collection of farmers request and suggestions

3.2 Outline of Public Meetings

The meetings were held under the chairmanship of Acting District Commissioner of Moshi District. After that explanation and discussion were made by using Swahili language.

Explanation was made by Director KADP on the basis of the Explanation Note prepared by the Study team (Attachment-I). In order to take the full understanding of attendants, a leaflet showing outline of the plans in Swahili was distributed to all village leaders, and the development areas and location of the main facilities were presented by the use of the project layout map. After the explanation, discussions were made by the attendants according to the agenda.

The total attendants of the eight meetings were about 2,100 farmers These attendants consisted of the farmers, women, and leaders of the villages. The details of the attendance are as follows:

Village	Attendants
Chekereni	550
Mabogini	300
Rau & Oria	300
Women's meeting	70
Mutakuja	300
Muvleni	300
Mandaka Mnono	200
Kaloleni	10

Before finishing the explanation, beneficiaries' opinion was assessed by asking the following questions to which they were supposed to say "Yes" or "No" by just raising their hands.

(a) Do you accept the development plan of the Project narrated to you ?

(b) Do you accept farmers' duties outlined and presented to you ?

The opinions of all attendants were of one hundred percentage "yes" to both questions.

3.3 Results of Public Meetings

Discussion was done through allowing beneficiaries to ask questions, suggestions, criticism or corrections to the proposed development plan. Many speakers did firstly to express thanks to GOJ for having supported the exiting Project. Useful suggestions and requests with their well understandings of the Project were obtained through the meetings. The major suggestions and requests are summarized as follows:

(1) Suggestions

(a) Small-scale hydropower generations should be managed by the farmers themselves through CHAWAMPU instead of TANESCO.

(b) Environment is polluted by the rice husks from the paddy milling machine, so the Project is requested to consider how to process rice husks into charcoal briquettes, compost manure, livestock feeding etc.

(c) A new main road should be constructed at Bogini Juu sub-village to join Mabogini and Kaloleni in order to facilitate communication between Lower Moshi area and Moshi Municipal.

Municipal.

(d) The drying yard for paddy milling machine is too small, there s a need to expand the area.

(e) A new paddy milling machine is requested to supplement the existing one when the Project will be produced at its maximum.

(f) Farmer should not live in the paddy fields but in the residential areas allocated by the village governments.

(g) CHAWAMPU should search new rice markets for realizing more high selling prices.

(h) Maize is a staple food, therefore, shouldn't be neglected. Farmers considers to grow maize in either of the crop seasons.

(2) Requests

(a) Water for domestic use is insufficient, therefore the Project is requested to assist in supplying tap water to the households.

(b) The Project should assist in establishing basic medical services especially first aid services within KADP.

(c) The Chekereni village farm which was formally used as a pilot farm to multiply maize seed and grow water melons and maize has become saline. The farmers would like the area to be turned into paddy fields.

(d) The Project to construct necessary bridges to easen communication and transportation of paddy.

(e) The plot near Usagara farm was not registered in the Project map. It is now requested to be considered and included in the Project.

(f) Cultivation charges are extremely high, and increasing every year. CHAWAMPU should explain clearly the reasons.

In addition to the above, the following specific suggestions and requests are made by women in the Women's Public Meeting:

(1) Suggestions

(a) The village government under assistance of KADP and CHAWAMPU should allocate land to women organized in groups or worked individual.

(b) A woman who her husband possess paddy field should be allowed to join CHAWAMPU as a member.

(c) Communities should be sensitized on gender issues to become aware on women right.

(2) Requests

(a) The Project should provide agricultural implements i.e. boots , mechanical weeders, harvesters and/or threshing machines.

(b) Request short training courses on:

- Agriculture
- Leadership
- Business management and administration
- Project planning and management
- Cooperative education
- Health and Sanitation
- Environmental conservation
- Application of appropriate technologies
- Gender issues
- Study tours
- Construction of women community centers
- Construction of water tapes to the households
- Procurement of milling machines

Tables

Table H.1.1 Respondents according to Education

Village	Primary School	Junior Secondary	Senior Secondry	University	None	Total
Chekereni	8	2	0	0	0	10
Mabogini	7	3	0	0	0	10
Rau Kati	10	0	0	0	0	10
Oria	8	1	1	0	0	10
Existing areatotal	33	6	1	0	0	40
Mandaka Mnono	7	1	1	0	1	10
Njoro Kwa Goa	8	0	1	0	1	10
Expanded area total	15	1	2	0	2	20
Chekereni(Extension area)	10	0	0	0	0	10
Oria(Extension area)	8	2	0	0	0	10
Mvuleni	9	1	0	0	0	10
Mtakuja	9	1	0	0	0	10
Extension area total	36	4	0	0	0	40
Ground total	84	11	3	0	2	100
%	84	11	3	0	2	100

Table H.1.2 Household Member according to Gender

	Male											Female											Ground Total	
Family's Number	1	2	3	4	5	6	7	8	9	10	S.total	1	2	3	4	5	6	7	8	9	10	S.total	No.	No./Family
Chekereni	7	6	2	5	2	1	3	2	5	5	38	2	3	5	5	3	0	8	4	2	2	34	72	7.2
Mabogini	7	3	2	3	4	4	3	2	4	3	35	4	3	4	3	2	4	4	1	3	0	28	63	6.3
Rau Kati	2	8	9	4	3	2	3	4	7	3	45	5	6	3	5	2	2	3	3	2	3	34	79	7.9
Ona	3	2	4	2	1	6	5	6	3	5	37	6	2	6	2	3	2	3	3	3	3	33	70	7.0
Existing area total	19	19	17	14	10	13	14	14	19	16	155	17	14	18	15	10	8	18	11	10	8	129	284	7.1
Mandaka Mnono	3	5	3	4	3	1	1	3	2	2	27	2	3	2	1	4	1	4	5	1	6	29	56	5.6
Njoro Kwa Goa	5	2	3	5	5	4	4	4	0	2	34	5	4	3	2	8	7	3	9	5	3	49	83	8.3
Extended areatotal	8	7	6	9	8	5	5	7	2	4	61	7	7	5	3	12	8	7	14	6	9	78	139	7.0
Chekereni	2	2	1	3	6	4	4	3	2	2	29	2	5	2	3	2	2	4	5	3	3	31	60	6.0
Ona	2	5	3	2	4	6	6	3	6	3	40	1	6	2	4	3	2	2	3	6	3	32	72	7.2
Mvuleni	6	4	2	3	3	3	4	2	6	4	37	2	3	1	4	2	2	5	3	6	3	31	68	6.8
Mtakuja	2	2	11	5	2	2	4	4	2	5	39	4	6	3	3	4	5	3	4	4	5	41	80	8.0
Expansion area total	12	13	17	13	15	15	18	12	16	14	145	9	20	8	14	11	11	14	15	19	14	135	280	7.0
Ground total	39	39	40	36	33	33	37	33	37	34	361	33	41	31	32	33	27	39	40	35	31	342	703	7.0
%											51.4											48.6%		

Table H.1.3 Land Holding and Tenurial Status

(Unit: acre)

Village	Paddy irrigated (Including Upland irrigated)												Upland non -irrigated											
	1	2	3	4	5	6	7	8	9	10	Total	A/F**	1	2	3	4	5	6	7	8	9	10	Total	A/F**
Chekereni	0.6	1.2	2.5	1.5	2.7	1.4	1.5	1.0	5.3	0.8	18.4	1.8	0.0	0.0	0.0	0.0	1.5	1.5	0.0	0.0	0.0	0.0	3.0	0.3
Mabogini	0.5	3.0	0.3	0.5	3.0	0.8	1.5	0.8	2.3	2.0	14.7	1.5	4.0	7.0	3.0	0.0	3.0	3.0	2.0	3.0	6.0	0.0	31.0	3.1
Rau Kati(8*)	1.8	12.0	1.0	n.a	0.5	0.8	n.a	0.8	1.5	3.4	21.8	2.7	2.0	10.0	2.0	n.a	5.0	0.0	n.a	3.0	0.3	2.5	24.8	3.1
Oria(9*)	0.8	0.3	0.8*	2.5*	1.8*	1.5	2.0	0.6*	n.a	0.8	10.3	1.1	4.0	3.0	3.0	4.0	2.0	2.0	2.0	3.0	n.a	2.0	25.0	2.8
Existing area total	3.7	16.5	3.8	2.0	6.2	4.5	5.0	2.6	9.1	7.0	65.2	1.8	10.0	20.0	8.0	4.0	11.5	6.5	4.0	9.0	6.3	4.5	83.8	2.3
Mandaka Mnono(8*)	n.a	n.a	3.5	6.0	1.5	1.3	1.0	3.0	4.0	3.0	23.3	2.9	n.a	n.a	0.0	0.0	1.5	6.0	0.0	0.0	7.0	1.0	15.5	1.9
Njoro Kwa Goa(8*)	n.a	2.0	1.0	1.0	5.0	n.a	2.0	2.0	1.5	2.0	16.5	2.1	n.a	7.0	0.0	0.0	0.0	n.a	1.5	3.0	0.0	0.0	11.5	1.4
Expanded area total	n.a	2.0	4.5	7.0	6.5	1.3	3.0	5.0	5.5	5.0	39.8	2.5	n.a	7.0	0.0	0.0	1.5	6.0	1.5	3.0	7.0	1.0	27.0	1.5
Chekereni(9*)	0.0	0.0	0.0	0.0	n.a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	4.0	2.8	2.8	n.a	1.5	2.3	3.5	1.3	3.0	22.2	3.0
Oria	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	5.0	4.0	2.3	6.0	4.0	13.0	3.5	8.0	4.0	55.8	5.6
Mvuleni	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	5.5	3.0	5.0	7.0	4.0	4.0	5.0	14.0	5.3	57.8	5.8
Mtakuja(8*)	n.a	n.a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	n.a	n.a	4.0	10.0	3.0	6.0	11.0	0.0	2.0	10.0	36.0	4.5
Extension area total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0	14.5	13.8	20.1	16.0	15.5	30.3	12.0	25.3	22.3	171.7	4.6
Ground total	3.7	18.5	8.3	9.0	12.7	5.8	8.0	7.6	14.6	12.0	105.0	2.0	22.0	41.5	21.8	24.1	29.0	28.0	35.8	24.0	38.6	27.8	282.5	3.0

Village	Homestead (unit : acre)												Other(including grassland) (unit: acre)											
	1	2	3	4	5	6	7	8	9	10	Total	A/F**	1	2	3	4	5	6	7	8	9	10	Total	A/F**
Chekereni	0.0	0.0	0.5	0.5	0.5	0.5	0.5	0.0	0.0	0.5	3.0	0.3	3.3	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	6.0	12.3	1.2
Mabogini	0.3	0.3	0.3	0.3	0.0	0.0	0.5	0.5	0.3	1.0	3.5	0.4	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.2
Rau Kati(8*)	0.5	0.5	1.0	n.a	3.0	1.0	n.a	0.5	0.0	0.8	7.3	0.9	0.0	0.0	0.0	n.a	0.5	0.0	n.a	0.0	0.0	0.0	0.5	0.1
Oria(9*)	6.0	1.0	2.0	0.5	0.5	0.6	0.0	0.2	n.a	0.0	10.8	0.1	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	n.a	0.0	0.5	0.1
Existing area total	6.8	1.8	3.8	1.3	4.0	2.1	1.0	1.2	0.3	2.3	24.6	0.7	3.3	0.5	0.0	2.0	0.5	0.0	3	0.0	0.0	6.0	15.3	0.4
Mandaka Mnono(8*)	n.a	n.a	0.0	0.5	2.0	2.5	0.3	7.0	0.0	1.0	13.3	1.7	0.0	0.0	2.5	5.5	0.0	0.0	0.0	0.0	0.0	0.0	8.0	1.0
Njoro Kwa Goa(8*)	n.a	0.3	0.0	0.0	0.0	n.a	0.0	0.0	0.0	0.3	0.0		3.3	0.5	2.5	7.5	0.5	0.0	3.0	0.0	0.0	6.0	23.3	2.9
Expanded area total	n.a	0.3	0.0	0.5	2.0	2.5	0.3	7.0	0.0	1.0	13.6	0.9	3.3	0.5	5.0	13.0	0.5	0.0	3.0	0.0	0.0	6.0	31.3	1.7
Chekereni(9*)	0.5	0.5	0.0	0.5	n.a	0.5	0.5	0.8	0.3	0.5	4.0	0.4	6.5	1.0	0.0	0.0	1.0	0.0	6.0	0.0	0.0	14.5	29.0	2.9
Oria	1.0	0.5	0.0	1.0	3.0	1.0	1.5	0.5	0.0	0.0	8.5	0.9	8.0	0.0	2.0	0.0	n.a	0.0	0.0	0.0	0.0	0.0	10.0	1.1
Mvuleni	0.3	0.5	0.0	0.0	0.0		10.0	0.5	1.0	0.3	12.5	1.3	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.1
Mtakuja(8*)	n.a	n.a	25.0	0.5	0.3	0.3	5.0	3.0	0.5	2.0	36.5	4.6	n.a	n.a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Extension area total	1.8	1.5	25.0	2.0	3.3	1.8	17.0	4.8	1.8	2.8	61.5	1.6	14.5	1.0	2.0	1.0	1.0	0.0	6.0	0.0	0.0	14.5	40.0	1.1
Ground total	8.6	3.6	28.8	3.8	9.3	6.4	18.3	13.0	2.1	6.1	99.7	1.1	21.0	2.0	7.0	16.0	2.0	0.0	12.0	0.0	0.0	26.5	86.5	0.9

Note * : * = an actual respondent number

: ** = acre/family

Table H.1.4 Number of Livestock by Family

(Unit: head)

Village	Cattle												Goats												Sheeps Total	
	1	2	3	4	5	6	7	8	9	10	Total	H/F*	1	2	3	4	5	6	7	8	9	10	Total	H/F*	Total	H/F*
Chekereni	1	3	4	15	2		8		2	8	78	7.8	6		5		1	6	7		4	6	35	3.5		0.0
Mabogini	10			1	1	20			6		56	5.6	15		15		3		7		5		45	4.5	0	1.0
Rau Kati	2	8	3	5	5	4	1	1			53	5.3	1	4		6	4	4	4	2	2		27	2.7	0	0.5
Oria			3	3				2		2	16	1.6	18	4	12	14	9		4	4	3	19	87	8.7	3.3	0.8
Existing area total	13	11	10	24	8	24	9	3	8	10	203	5.075	40	8	32	20	17	10	22	6	14	25	194	4.9	23	0.5
Mandaka Mnono	2	4	9	10	3	6		2	4	1	73	7.3	5	11	1	22					12	4	55	5.5	0	0.7
Njoro Kwa Goa	1										2	0.2	7										7	0.7	0	1.1
Expanded area total	3	4	9	10	3	6	0	2	4	1	75	3.75	12	11	1	22	0	0	0	0	12	4	62	3.1	0	1.8
Chekereni	1	4	2			5	3	2		3	30	3	4	4	2			6	6	8	4	3	37	3.7	0	0.8
Oria		4	12		1		9		15	2	84	8.4		6			4		10	30		13	63	6.3	6.6	2.0
Mvuleni		3		18	9		9	1	15	6	115	11.5		5	7	25	7	6	24	10	18	30	132	13.2	11	2.9
Mtakuja		4	25	12				1		25	108	10.8	13	10		18	2	2		3		8	56	5.6	2.2	0.3
Extension area total	1	15	39	30	10	5	21	4	30	36	337	8.425	17	25	9	43	13	14	40	51	22	54	288	7.2	19.8	1.5
Ground total	17	30	58	64	21	35	30	9	42	47	615	6.15	69	44	42	85	30	24	62	57	48	83	544	5.4	101	1.0

(Unit: head)

Village	Chickins												Ducks												Hogs	
	1	2	3	4	5	6	7	8	9	10	Total	H/F*	1	2	3	4	5	6	7	8	9	10	total	H/F*	Total	H/F**
Chekereni				20		2	170			8	200	20.0				10			16				26	2.6	0	0.0
Mabogini		20				12	1	5	12	3	53	5.3						8	2	6			16	1.6	0	0.0
Rau Kati	10	15			4	5	10				44	4.4					4						4	0.4	0	0.0
Oria			8	25	2			20		2	57	5.7				5							5	0.5	3	0.3
Existing area total	10	35	8	45	6	19	181	25	12	13	354	8.9	0	0	0	15	4	8	18	6	0	0	51	1.275	3	0.3
Mandaka Mnono	2		4		10	8		1	15	8	48	4.8					7						7	0.7	0	0.0
Njoro Kwa Goa	5	6		10				10		15	46	4.6		8	1	4			10				23	2.3	0	0.0
Expanded area total	7	6	4	10	10	8	0	11	15	23	94	4.7	0	8	1	11	7	0	10	0	0	7	30.7	1.535	0	0.0
Chekereni	2	2		2		14			10		30	3.0							2				2	0.2	0	0.0
Oria	80			20	10	5	8	20	20	100	263	26.3										18	18	1.8	6	0.6
Mvuleni		8		2	8		20			25	63	6.3								4			4	0.4	10	1.0
Mtakuja	15						6	11		4	36	3.6											0	0	2	0.2
Extension area total	97	10	0	24	18	19	34	31	30	129	392	9.8	0	0	0	0	0	0	2	4	0	18	24	0.6	18	1.8
Ground total	114	51	12	79	34	46	215	67	57	165	840	8.4	0	8	1	26	11	8	30	10	0	25	105.7	1.057	21	2.1

Note: * = head of livestock / family

Table H.1.5 Inventory of Farm Machinery and Equipment

Village	4W. Tractor	2W. Tractor	For tractor				Plough for animal	Knapsack sprayer	Pickup/ Truck
			Plough	Harrow	Cultivator	Trailor			
Chekereni	0	0		0	0	0	0	1	1
Mabogini	0	0	0	0	0	0	0	0	0
Rau Kati	1	0	3	0	0	1	0	0	0
Oria	0	0	0	0	0	0	0	0	0
Existing area total	1	0	3	0	0	1	0	1	1
Mandaka Mnono	0	0	0	0	0	0	0	0	1
Njoro	0	0	0	0	0	0	0	0	0
Expanded area total	0	0	0	0	0	0	0	0	1
Chekereni	0	0	0	0	0	0	0	0	0
Oria	1	2	3	1	1	0	0	0	0
Mvuleni	0	0	0	0	0	0	0	0	0
Mtakuja	0	0	0	0	0	1	1	0	2
Extension area total	1	2	3	1	1	1	1	0	2
Grand Total	2	2	6	1	1	2	1	1	4

Table H.1.6 Social Infrastructure

Village	Availability of Electricity			Availability of Domestic Water						
	Yes	No	Total	Yes	No	(canal	well	river	other)	Total
Chekereni	5	5	10	7	3	3				10
Mabogini	3	7	10	9	1		1			10
Rau Kati		10	10	8	2	1		1		10
Oria		10	10		10	2	6		2	10
Existing area total	8	32	40	24	16	6	7	1	2	40
Mandaka Mnono	1	9	10	1	9	2		6	1	10
Njoro Kwa Goa	5	5	10	8	2				2	10
Extended area total	6	14	20	9	11	2	0	6	3	20
Chekereni		10	10	7	3	3				10
Oria	6	4	10	7	3	1	2			10
Mvuleni		10	10	3	7	2	5			10
Mtakuja		10	10	1	9	5	3	1		10
Extension area total	6	34	40	18	22	11	10	1	0	40
Grand Total	20	80	100	51	49	19	17	8	5	100

Table H.1.7 Home Facilities and Equipment

Village	Bicycle	Motorcycle	Radio	Radio Caset	T.V	Oil cooker	Electric cooker	Refrigel-lator	Electric fan	Sewing machine
Chekereni	9		4	4			2			3
Mabogini	7		7	5	1	2				
Rau Kati	8		7	4						3
Oria	11		10	5		4				2
Existing area total	35	0	28	18	1	6	2	0	0	8
Mandaka Maono	5		5	3		3	2			1
Njoro Kwa Goa	6	2	11	4	2	8		3	4	3
Extended area total	11	2	16	7	2	11	2	3	4	4
Chekereni	8		7	4		2	1	2	4	1
Oria	11		7	9	2	7				7
Mvuleni	16		11	3		3				
Mtakuja	10	1	4	3		1				1
Extension area total	45	1	29	19	2	13	1	2	4	9
Grand Total	81	2	69	41	5	29	5	5	8	21

Table H.1.8 Income & Living Expenses (Summary)

	Existing area					Expanded area			Extension area				
Name of Village	Chekereni	Mabogini	Lau Kati	Oria	Average	Mandaka	Njoro	average	Chekereni	Oria	Mvleni	Mtakuja	Average
No. of Family	7.2	6.3	8.0	7.0	7.1	5.6	8.3	7.0	6.0	7.2	6.8	8.0	7.0
1) Income from homestead	14,280	2,640	26,500	6,800	12,555	122,520	0	61,260	14,048	47,600	71000	6650	34,825
2) Income from livestock	164,230	89,500	54,775	25,500	83,501	356,800	0	178,400	91,480	56,000	26620	1000	43,775
3) Non-farm income	122,200	197,771	660,000	184,000	290,993	290,400	437,300	363,850	222,000	454,933	316750	466180	364,966
4) Living expenses	864,398	1,062,863	942,788	793,140	915,797	908,008	1,237,402	1,072,705	817,776	921,457	1,073,246	1,171,341	995,955
1. Food	504,304	624,593	587,816	520,325	559,259	517,688	833,730	675,709	499,710	551,505	717084	766014.4	633,578
Rice	93,750	102,460	179,304	77,732	113,312	73,540	144,750	109,145	98,190	81,212	67320	57180	75,976
Casava	14,400	1,500		3,020	4,730	12,480	11,520	12,000	0	15,480	0	1728	4,302
Yam	0	16,800		480	4,320	4,680	2,400	3,540	0	8,190	0	0	2,048
Maize & other cereals	100,096	76,153	95,632	101,653	93,383	70,884	116,440	93,662	65,340	119,523	122644	132282.4	109,947
Vegetable & fruits	11,040	46,260	50,320	39,240	36,715	34,640	47,000	40,820	32,640	34,980	28000	42664	34,571
Meat & eggs	78,400	80,400	86,400	88,320	83,380	84,240	147,280	115,760	99,600	99,080	111280	112040	105,500
Fishes	40,674	61,680	39,440	44,160	46,489	47,520	68,660	58,090	37,920	86,760	108960	182400	104,010
Liquor & beverages	66,760	79,080	29,700	52,320	56,965	85,360	115,920	100,640	68,070	27,040	81720	90840	66,918
Salt &sugar	44,704	78,540	46,200	57,300	56,686	33,600	82,440	58,020	35,190	52,800	86520	77900	63,103
Others	54,480	81,720	60,820	56,100	63,280	70,744	109,320	90,032	62,760	56,980	110640	68980	74,840
2. Tobacco & cigarettes	1,200	15,330	4,392	600	5,381	3,600	20,282	11,941	7,200	19,800	10392	13720	12,778
3. Soap & shampoo	18,080	27,752	18,720	15,160	19,928	21,840	37,560	29,700	20,520	15,910	24900	30360	22,923
4. Electric charge	10,000	18,840	0	0	7,210	816	23,080	11,948	4,800	25,840	0	0	7,660
5. Fuel wood	17,694	25,048	29,280	3,360	18,846	9,144	40,520	24,832	24,816	26,680	35040	47400	33,484
6. Furnishing & equipment	1,800	7,200	20,000	3,600	8,150	0	3,000	1,500	1,200	9,800	6600	4500	5,525
7. Maintenance of house	12,600	0	600	1,300	3,625	16,800	10,000	13,400	7,200	5,200	35900	0	12,075
8. Clothing	69,020	103,200	41,100	54,100	66,855	99,500	75,000	87,250	65,300	58,480	72620	88580	71,245
9. Medical expenses	55,900	90,100	43,200	33,800	55,750	63,800	40,400	52,100	62,640	60,870	31900	57700	53,278
10. education	59,880	84,020	109,800	87,185	85,221	94,700	81,680	88,190	54,350	61,222	80790	101922	74,571
11. Recreation	3,000	7,000	12,000	950	5,738	15,000	2,100	8,550	0	5,600	300	0	1,475
12. Celemonial expenses	53,000	17,920	45,000	6,200	30,530	37,400	15,600	26,500	20,200	16,980	17400	38300	23,220
13. Trans & comunication	31,420	31,960	26,120	15,860	26,340	21,120	29,000	25,060	39,140	35,480	28020	16720	29,840
14. TV & radio	12,000	3,300	1,920	28,000	11,305	1,500	23,500	12,500	3,900	1,000	100	1000	1,500
15. Remittance to relatives	14,200	600	240	10,600	6,410	4,800	1,500	3,150	2,800	21,300	12000	4725	10,206
16. Loan payment	0	6,000	240	6,000	3,060	0	0	0	4,000	3,200	0	0	1,800
17. Others	300	0	2,360	6,100	2,190	300	450	375	0	2,590	200	400	798

Table H.1.9 Farming Problems and Farmer's Intention for Farming Improvement

Village	Problems																
Items*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Chekereni	3		3	10	6	1		2	1	1	1	2	7	1	1	1	3
Mabogini	2		1	10	5		1			1	4	3	6	1	1	1	2
Rau Kati		1	1	10	4		2			2	3	2	5				
Ona	2		2	10	7		1	1		1	3	2	5	2	3	3	3
Existing area total	7	1	7	40	22	1	4	3	1	5	11	9	23	4	5	5	8
Mandaka Mnono	4		1	10	6		1		2	3	5	5	7	2	1		
Njoro Kwa Goa	3	1	1	7	6		1	5	1		3	3	7	4	4	2	2
Extended area total	7	1	2	17	12	0	2	5	3	3	8	8	14	6	5	2	2
Chekereni	4		1	10	2				1	1	1	1					1
Ona	4		3	9	5	1	3	1	1				4	2	1	1	1
Mvuleni	2			10	8	2		2		3	2	2	5	2	2	2	1
Mtakuja	2			10	3			2		3	2	2	2				
Extension area total	12		4	39	18	3	3	5	2	7	5	5	11	4	3	3	3
Ground total	26	2	13	96	52	4	9	13	6	15	24	22	48	14	13	10	13

Fermer's intension for farming improvement																	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
10	4	2	5	1	1	3	3	2	1		2	1	3			
9	9		7	1			1		4	3	1	2	1		1	1
10	7		7	1	1					1		1				
10	8		8	2	1	2	3	1	2	5	2	5	3		1	3
39	28	2	27	5	3	5	7	3	7	9	5	9	7	0	2	4
10	6		7		1	4	2	2	2	5	4	5	2		1	
9	6	1	8	1	2	4	4	3	3	4	4	6	3	1		3
19	12	1	15	1	3	8	6	5	5	9	8	11	5	1	1	3
9	5		2			2			3	2						
10	7		7	2	2	3	3	2	1	3	3	5	2	1		1
10	5		5		2	2	2	2	4	5		4	2	2	2	2
9	5		3			3			3	3						
38	22	0	17	2	4	10	5	4	11	13	3	9	4	3	2	3
96	62	3	59	8	10	23	18	12	23	31	16	29	16	4	5	10

Note: In the line of items*, each number in columns is as follows:

Problems

(1):Low yield of crops
(2):Levelling problem of paddy field
(3):Drainage problem
(4):Drought damages
(5):Damage of pests and diseases
(6);weed damages
(7);Damages by wild animal
(8);difficulty for hireing mecanical power
(9);Labour shortage
(11);Difficulties for obtaining seeds
(12);Difficulties for purchasing agro chemical
(13);Difficulties for purchasing fertilizer
(14);Expensive of farm inputs
(15);Lack of farm road
(16);Marketing problems for products
(17); Lack of storage facilities
(17);Loan problems

Items for farming improvement

(1);To acquire irrigation water
(2);To improve irrigation facilities
(3);To drain out excess water
(4);To prevent pests & diseases
(5);Toprevent damage by wild animal
(6);Toprevent weed damage
(7);Toimprove supplyingsystem of farm imputs
(8);Toimprove farm road
(9);To improve transpotation of products
(10);To introduce improved varieties
(11);To improve farming practices
(12);To introducemechanized farming
(13);To strengthen extension services
(14);To improve agricultural credit
(15);Toconstruct drying floor
(16);To construct processing facilities
(17);To construct storage facilitiea

Table H.1.10 Farmer's Intension for Crops Development

Village	Rainy Season															Dry Season													
Items*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Chekereni	10	9		1		1				1		3	2		3	10	6		1		1									2
Mabogini	10	9		1		1				2	2	5	1		7	9	4										2			4
Rau Kati	10	9		2		3				2		2	1		3	7	5										1	1		3
Ona	10	10		2		5			2	4	5	6		1	7	8	7		2		3				3	2	2		1	7
Existing area total	40	37	0	6	0	10	0	0	2	9	7	16	4	1	20	34	22	0	3	0	4	0	0	0	3	2	5	1	1	16
Mandaka Mnono	10	9		2						1		1			3	7	6		1						1		2			3
Njoro Kwa Goa	10	5				2				4	1	1			3	8	4				1				3	1	1			3
Extended area total	20	14	0	2	0	2	0	0	0	5	1	2	0	0	6	15	10	0	1	0	1	0	0	0	4	1	3	0	0	6
Chekereni	9	9		3	3	2				2	2	3	1	1	7	6	3		2	1	3									4
Ona	10	8		2	3	1		1	1	4	1	3			5	6	3		2		3		1		1		1	2		5
Mvuleni	10	10		4	1	4				5	1	4	1	1	4	9	5		1	1	1				2	1	1	1		3
Mtakuja	10	9	1	4		2			1	4	3	7	1		6	8	5		3		1							1		4
Extension area total	39	36	1	13	7	9	0	1	2	15	7	17	3	2	22	29	16	0	8	2	8	0	1	0	3	1	2	4	0	16
Ground Total	99	87	1	21	7	21	0	1	4	29	15	35	7	3	48	78	48	0	12	2	13	0	1	0	10	4	10	5	1	38

Note: Question is that if irrigation water is available sufficiently, which crop do you want to cultivate in future?

In the column of items* is as follows:

(1); Paddy
(2); Maize
(3); Sorghum
(4); Cassava
(5); Yam
(6); Sweet potatoes
(7); Mango beens
(8); Bush beens
(9); Green gram
(10);Soybean
(11); Sesame
(12); groundnut
(13); Lentil
(14); Cawpea
(15); Vegetables

Table H.1.11 Agricultural Credit Situation

Items*	Did you have loan		If yes, Reason						Loan amount				From whom did you borrowed							Interest Rte	Did you Pay its debt	
	No	Yes	1	2	3	4	5	6	1	2	3	4	1	2	3	4	5	6	7	8		Yes	No
Chekereni	10																					
Mabogini	10																					
Rau Kati	10																					
Oria	9	1	1								1									1	?	1
Existing area total	39																					
Mandaka Mnono	10																					
Njoro Kwa Goa	10																					
Extended area total	20																					
Chekereni	9	1	1							1				1							10%	1
Oria	10																					
Mvuleni	10																					
Mtakuja	10																					
Extension area total	39																					
Ground Total	98	2	1							1	1			1						1		2

Note: In the column of items, each number is as follows;

Reason:

(1);Loan for purchasing farm inputs
(2);Loan for hiring machinery power
(3);Loan for purchasing farm machinery
(4);Loan for purchasing livestock
(5);Loan for living
(6);others

Debt amount

(1);Less than Shs10,000
(2);10001 - Shs 50000
(3);50001 - Shs 100000
(4);Over Shs 100001

From whome

(1);Bank
(2);Middlemen/broker of farm produce
(3);Merchant
(4);Rice miller
(5);Land owner
(6);Relatives
(7);Other farmer
(8);Others

Table H.1.12 Operation and Maintenance of Existing Irrigation System

Items*	14.1		14.2		14.3										14.5							14.6								14.7(1)		14.7(2)		14.7(3)		14.7(4)		14.7(5)				14.8	
	Yes	No	Yes	No	1	2	3	4	6	7	8	10	11	0	Yes	No	1	2	5	6	7	Yes	No	1	2	4	5	6	7	8	Yes	No	Yes	No	Yes	No	Yes	No	a	b	c	d	Yes	No
Chekereni		8		8		2					5		5		1	5	3	2	2	1		1	5			1	1				5	1	5		4	1	2	3	2	5		5		
Mabogini	2	5	3	4	2	4	1			2	3	1	2		2	4	1	3	1	2		6	2	1		6	6	3	3		4	3	7		5	2	5	2	3	4		6	1
Rau Kati		7	1	6		1			1		3		4		4	3	2		2	2		5	2	1		5	3				7		6	1	5	2	5	2	2	6		5	2
Oria		8		8	2	2			3		6	1	4		3	5	2	3	1	3	2	3	5			2	3	1			8		8		7	1	8		2	8		8	
Existing area total	2	28	4	26	4	9	1	0	4	2	17	2	15	0	10	17	8	8	6	8	2	15	14	2		14	13	4	3		24	4	26	1	21	6	0	20	7	9	0	23	0	24	3
Mandaka Mnono		9		9		5	2	2	4	3	4		3		1	6	4	6	1	3											9		9		9		6	3	6	1		9	
Njoro Kwa Goa		8		8		3	3		2	1	3		2		5	3	2	3		1		1				1	1		1	1	5	3	8		8		5	3	4	1		5	3
Extended area total	0	17	0	17	0	8	5	2	6	4	7	0	5		6	9	6	9	1	4	0	1	0	0	0	1	1	0	1	1	14	3	17	0	0	17	0	0	11	6	10	0	2	0	14	3
Chekereni	n.a																																										
Oria	n.a																																										
Mvuleni	n.a																																										
Mtakuja	n.a																																										
Sub total	n.a																																										
Ground total	2	45	4	43	0	4	17	6	2	10	6	24	2	20	0	16	26	14	17	7	12	2	16	14	2	0	15	14	4	4	1	0	38	7	0	43	1	0	38	6	0	31	13	0	19	0	25	0	0	38	6

Note:

14.1= Can you satisfy with quantity of water received at last season?

14.2= Did you receive irrigation water on time?

14.3= What problems do you have?

1; Leakage of pound, gates and pipes.

2; Damages of canal.

3; Not operating or broken pump.

4; Not operating or broken gates.

6; Weeds, soil and inert matter gathered in canal.

7; Intake facilities, diversion and other structure are damaged.

8; Illegal water usage by the farmes.

10;Water is controlled by specific farmers.

11;Farmers organization doesn't distribute water equally.

14.5= Do you think irrigation water is distributed uniformly among farmers?

If "No", what are the reason?

1; Illegal water path.

2; Close the canal partially by putting stone, soil etc.

5; Water passing to drainage canal due to damage of canal bank.

6; There are soil and weed in the canal because of not cleaning.

7; Other

14.6= Do you have any problems on irrigation schedule?

If "Yes", what are the reasons?

1; Can't cultivate crop within the period decided by WUA due to labour shortage

2; Can't cultivate crop according to irrigation schedule decided by WUA due to farm input problem

4; Not irrigation water is available in right time.

5; Because unstable irrigation water supply.

6; Because of delayed water supply by WUA.

7; Don't know irrigation scedule du to no information

8; Don't like irrigation scedule.

14.7-1= Have you been engaged in any O&M work before starting irrigation supply?

14.7-2= Do you think cleaning and minor repairing are your responsibilities?

14.7-3= Have you investigated irrigation facilities during irrigation period?

14.7-4= Did you look some farmers damage irrigation facilities during water shortage?

14.7-5= If you observe a minor damage of canal, what will you do?

a; Repairing by myself.

b; Not repairing by myself.

c; Informed to the project office.

d; Leave to waste of irrigation water.

14.8= Do you clean the drainage canal every season to keep law water level?

Table H. 1. 13 Existing Farmer's Organization for O&M Irrigation Facilities

Items*	15.1				15.2						15.3 (1)		15.3 (2)		15.3 (3)					15.3 (4)		15.3 (5) If "Yes"							15.3 (6)		15.3 (7)				15.3 (8)								Add(1)		Ado(2)		Add(3)						
	1	2	3	4	5	1	2	3	4	5	6	Yes	No	Yes	No	a	b	c	d	e	Yes	No	No	Yes	a	b	c	d	e	f	g	h	Yes	No	Yes	No	a	b	c	d	e	f	g	h	i	Yes	No	Yes	No	a	b	c	d	e	f	g	h
Chekereni	10	5						7	3			8	2	8	2			1	2	4	2	10			10	6	5	5	2	3	4		8	2	9	1		1	1	5	4			4	3		8	2	9	1	4	10	4	2	1	1	2	
Mabogini	10	7	1			4	2	2	2	3		9	1	9	1				3	2	5	8	2		10	8	7	7	1	1	3	1	7	3	10			1	2	3	4		1	5	4	1	2	7	6	3	5	6	4	1	3		2	
Kau Kati	10	4			1	3		2	2	2		8	2	8	2				2	2	4	9	1	1	9	7	6	5	1	1	1	1	9	1	8	2	2		3		7	3		1	5	4		2	8	5	5	6	10	9		1	1	2	
Orta	8	7	1	2	3		2	4	4	4		7	1	7	1				3	2	2	8		2	6	6	6	5	1	2	3		8		8			5	1	3			2	6	6		4	4	5	4	6	7	5	1	1	3		
Existing area total	38	23	2	2	0	4	7	4	15	11	9	32	6	32	6	0	0	1	10	10	13	35	3	0	3	35	27	24	22	5	7	11	2	32	6	0	35	3	2	1	0	10	4	18	11	0	4	20	17	1	16	21	0	25	13	21	33	22	4	6	5	6	0
Mandaka Mnono	8							7	4				8		8									1								1			1	1	1																					
Njoro Kwa Gea	8				1	1		3	5	1		1	8		8					1	1			1								1	0	0	0	1	1	1	0																			
Expanded area total	16	0	0	0	1	1	0	10	9	1		1	16	0	16	0	0	0	0	1	1	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	1	1	0																			
Ground Total	54	23	2	2	0	5	8	4	25	20	10	33	22	32	22	0	0	1	10	10	14	36	3	0	4	35	27	24	22	5	7	11	2	33	6	0	35	4	3	2	0	10	4	18	11	0	4	20	17	1	16	21	0	25	13	21	33	22	4	6	5	6	0

Note: There are no existing farmer's organization in the extension area.

15.1= What are the purpose of the organization in your irrigation area
- 1: O&M of irrigation facilities,
- 2: Cooperative purchasing farm inputs, and shipping of products,
- 3: Loan arrangement to the farmer
- 4: Social activities to the village people

15.2= What are problems for activities of the organization
- 1: Almost no function to O &M the irrigation facilities,
- 2: Farmers have no interest to the organization activities,
- 3: No leaders
- 4: No fund to operate and maintain irrigation facilities,
- 5: No definitive article and by law for farmers activities,
- 6: No participation to the farmer's organization

15.3= Irrigation service charge
- (1)= Do you know irrigation service charge?
- (2)= Do you know the amount of irrigation service charge?
- (3)= How do you think about amount of charge?
  - a: Very cheep, b: Cheep, c: Moderate, d: Expensive, e: Very expensive
- (4)= Do you like to pay irrigation service charge?
- (5)= Do you know the necessity for irrigation service charge? If "Yes",
  - a: Repair and maintenance cost of all irrigation facilities are covered by the irrigation service charge.
  - a: Repair and maintenance cost of canals are covered by the irrigation service charge.
  - c: A part of salary of organization's staff are covered by service charge.
  - d: It is same with tax.
  - e: Loan repayment for construction cost of facilities have been covered by the irrigation service charge.
  - f: It is the depreciation costs of irrigation facilities.
  - g: It is one of the income of organization for O&M of irrigation facilities.
  - h: Others
- (6)= Do you agree to pay irrigation service charge with present basis?
- (7)= Have you paid irrigation service charge? If "No",
  - a: Because of no money.
  - b: Because its amount is very expensive,
  - c: I can't go to the office for payment due to long distance to the office.
- (8)= At present, CAWAMPU has a problem that many farmers do not pay its irrigation service charge. What is the difficulty to pay the service charge on time?
  - a: Very low harvest,
  - b: Farmers think no need to pay.
  - c: Our income is not enough to pay,
  - d: O&M charge are very much.
  - e: O&M of field canal must be done by CAWAMPU at field level.
  - g: Not receiving enough water.
  - h: Not receiving water on time,
  - i: Others

Addition (1)= If Government will turnover all of operation and maintenance of irrigation facilities to your farmer's organization, do you agree on its turnover?

Addition (2)= Do you participate to its organization?

Addition (3)= What do you think about O&M of the irrigation facilities by the farmers organization?
- a: Such organization can't operate and maintain all of the facilities.
- b: If Government makes advice and technical support to Opation, it is possible.
- c: The organization can't operate and maintain all the facilities, but part of facilities will be possible.
- d: O&M costs are covered by irrigation service charge. But it is difficult to collect from the members. Thereby, its turnover is impossible.
- e: If Government collect service charge from farmers, the organization can operate and maintain the facilities.
- f: The O&M of facilities will be difficult technically, even if Government makes its advice and technical support.
- g: Anyhow, Government should be operate and maintain all of the facilities, because it is government's duty.
- h.: Others

Table H.1.14 Establishment of O &M Farmer's Organization and Marketing Organization

Items*	16.1		16.2		16.3 (1)		16.3 (2)		16.3 (3)									17.1		17.3(1)		17.3(2)								
	Yes	No	Yes	No	Yes	No	Yes	No	0	a	b	c	d	e	f	g	h	Yes	No	Yes	No	a	b	c	d	e	f	g	h	i
Chekereni																		9	1	10		10	10	1	7	7	7		3	5
Mabogini																		6	4	9	1	9	9		6	5	5		2	7
Rau Kati																		5	5	7	3	7	5		5	4	3		1	3
Oria																		2	8	5	5	5	5		4	2	2			1
Existing area total																		22	18	31	9	31	29	1	22	18	17	0	6	16
Mandaka Mnono																		3	7	6	4	6	5		6	5	4		2	4
Njoro Kwa Goa																		1	9	7	3	7	7	1	5	5	7	1	1	3
Expanded area total																		4	16	13	7	13	12	1	11	10	11	1	3	7
Chekereni	2		2		2		2				2	1						5	5	6	4	6	6		3	2	4		1	5
Oria	2	1	2	3	2		2				2							4	6	5	5	5	5	1	3	3	3	2	4	3
Mvuleni																		1	9	3	7	3	3		1				1	3
Mtakuja																		2	8	4	6	4	3		3		1		2	3
Extension area total	4	1	4	3	4	0	4	0	0	0	4	1	0	0	0	0	0	12	28	18	22	18	17	1	10	5	8	2	8	14
Ground total	4	1	4	3	4	0	0	4	0	0	0	4	1	0	0	0	0	0	38	62	0	62	38	62	58	3	43	33	36	3	17	37

Note:

16.1= Do you think you havesome respobnsibility for O&M of the irrigation facilities?

16.2= Do you know "farmer's organization for O&M of irrigation facilities"?

16.3 (1)= If Government propose tp establish such organization in the irrigation area,
Do you agree on its establishment?

16.3 (2)= Do you participate to its organization?

16.3 (3)= What do you think about O&M of the irrigation facilities by the organization?

a: Such organization can't operate and maintain all of the facilities.

b: If Government makes advice and technical support to Opation, it is possible.

c: The organization can't operate and maintain all the facilities, but part of facilities will be possible.

d: O&M costs are covered by irrigation service charge. But it is difficult to collect from the members. Thereby, its turnover is impossible.

e: If Government collect service charge from farmers, the organization can operate and maintain the facilities.

f: The O&M of facilities will be difficult technically, even if Government makes its advice and technical support.

g: Anyhow, Government should be operate and maintain all of the facilities, because it is government's duty.

17.1= Do you know farmer's organization for marketing of product and farm inputs?

17.3 (1)= Do you participate to this organization?

17.3 (2)= What activities do you want to this organization?

a: Farm input supply

b: Farm machinery service

c: Hiring service of draft cattle

d: Transportation services for products

e: information service for marketing

f: Extension services

g: supply of draft cattle

h: Cooperative shipping of products

i: Cooperative purchsing of farm inputs.

Table H.1.15 Crop Production (Summary)

Crop	Paddy												
	Existing area					Extended area			Extension area				
	Chekereni	Mabogin	Lau kati	Oria	Average	Mandaka	Njoro	Average	Chekerebn	Oria	Mvleni	Mtajuku	Average
1.Date of seedling													
2.Date of harvesting													
3.Cultivated area(acre)	0.7	1.0	1.3	1.2	1.0	1.3	2.3	1.8	0.0	0.0	0.0	0.0	0.0
4.Total production(kg)	651	1867	3632	2186	2083.9	1971	3984	2977.5					
- Kg/acre	1052	2616	1982	2088	1934.4	1705	1624	1664.7					
5. To whome sold?													
6. Selling price(Tsh/Kg)	106.3	163.7	149	188.5	151.9	126.6	167.2	146.9					
7.Crop Damage													
a.Drought	9	4	5	8	6.5	7	8	7.5					
b.Flood	0	0	0	0	0.0	2	1	1.5					
c.Poor drain	0	0	1	2	0.8	1	0	0.5					
d.Pests	4	5	3	4	4.0	6	6	6.0					
e.Diseases	3	2	3	2	2.5	4	4	4.0					
f.Baird	2	2	1	0	1.3	4	3	3.5					
g.Rat	0	0	0	0	0.0	0	0	0.0					
h.Wild animal	0	0	0	0	0.0	1	0	0.5					

Crop	Maize												
	Existing area					Extended area			Extension area				
	Chekereni	Mabogin	Lau kati	Oria	Average	Mandaka	Njoro	Average	Chekerebn	Oria	Mvleni	Mtajuku	Average
1.Date of seedling													
2.Date of harvesting													
3.Cultivated area(acre)	1.4	2.7	27.8	3.0	8.7	1.4	0.7	1.0	1.7	2.4	4.1	4.4	3.1
4.Total production(kg)	1364	2448	16500	1682	5498.5	1055	800	927.5	623	2040	2660	1307	1657.4
- Kg/acre	1218	877	634	608	834.1	850	1046	948.0	467	937	669	256	582.1
5. To whome sold?													
6. Selling price(Tsh/Kg)	76.7	72.5	83.8	92.5	81.4	63.8	70.0	66.9	63.3	233.3	78.3	81.7	114.1
7.Crop Damage													
a.Drought	7	5	8	6	6.5	5	3	4.0	8	7	9	9	8.3
b.Flood	0	1	1	0	0.5	2	0	1.0	0	1	1	0	0.5
c.Poor drain	0	0	0	0	0.0	0	0	0.0	0	0	1	0	0.3
d.Pests	3	5	9	4	5.3	3	3	3.0	4	6	8	4	5.5
e.Diseases	2	1	0	1	1.0	1	2	1.5	3	3	3	2	2.8
f.Baird	0	0	0	0	0.0	0	0	0.0	0	0	1	0	0.3
g.Rat	0	0	0	0	0.0	0	0	0.0	0	1	1	0	0.5
h.Wild animal	0	1	0	1	0.5	1	0		0	3	0	0	0.8

Table H.1.16 Farming Practices (Summary of Paddy)

Crop	Paddy												
	Existing Area					Extended Area			New Extension Area				
	Chekereni	Mahogin	Lau Kati	Ona	Average	Mandaka	Najoro	Average	Chekereni	Ona	Mvleni	Mtakuja	Average
Cultivated area (acre)	0.74	0.95	1.33	1.17	1.05	1.28	2.30	1.79	0.00	0.00	0.00	0.00	0.00
1. Seed													
-Seed rate (Kg)	14.2	12.5	40.6	23.2	22.63	30.1	54.0	42.05					
-Purchasing price (Tsh/kg)	256	230	110	209	201.33	250	128	188.75					
-From whome								0.00					
a. Market(Dealer)	1	0	0	0	0.25	1	0	0.50					
b. Other farmer	6	1	1	6	3.50	0	0	0.00					
c. Own seed	1	5	3	2	2.75	8	10	9.00					
d. Other(Coop.Government.	1	3	1	0	1.25	0	0	0.00					
2.Fertilizer													
-How many time	2.5	2.9	2.6	3.0	2.75	2.4	2.5	2.47					
-Total quantity supplied													
a. Urea(Kg)	90.0	113.0	180.0	116.5	124.88	94.4	329.6	212.02					
b. Ammonium Sulfate(kg)	39.4	37.5	20.0	63.3	40.05	16.7	0.0	8.33					
c. Other(kg)	0.0	0.0	0.0	25.0	6.25	0.0	0.0	0.00					
3. Agro Chemical													
- How many time	3.2	2.6	1.4	2.4	2.39	1.8	2.4	2.10					
- Total quantity sprayed													
a. Herbicide(lit.)	0.00	0.05	0.00	0.00	0.01	0.00	0.00	0.00					
b.Insecticide(lit.)	0.47	0.57	2.72	0.73	1.12	0.59	1.74	1.16					
c.Other(lit.)	0.11	0.05	0.00	0.00	0.04	0.10	0.00	0.05					
4. Mechanical power requirement(days)													
(1) Ploughing & harrowing	0.26	0.88	0.52	1.00	0.66	0.20	0.00	0.10					
(2) Threshing	0.22	0.80	0.00	0.38	0.35	0.80	0.60	0.70					
(2) Transport prodcts	0.36	0.57	0.30	0.39	0.40	0.90	0.89	0.90					
5.Labour requirement(man-days)													
(1) Grass cutting	3.89	4.00	3.10	6.13	4.28	2.10	7.10	4.60					
(2) Proughing	0.00	0.00	0.00	1.00	0.25	11.10	19.10	15.10					
(3) Seedling	1.33	0.60	0.90	0.63	0.86	0.70	4.10	2.40					
(4) Transplanting	7.11	11.80	4.30	4.50	6.93	4.70	7.00	5.85					
(5) Fertilizing	2.00	1.10	1.20	2.00	1.58	1.60	1.50	1.55					
(6) Spraying	2.58	1.28	1.00	2.38	1.81	1.70	1.37	1.53					
(7) Weeding	12.89	6.30	12.00	5.25	9.11	5.70	17.90	11.80					
(8) Irrigating	23.44	27.20	8.10	35.25	23.50	42.40	34.30	38.35					
(9) Harvesting	8.78	5.80	3.70	3.38	5.41	5.60	4.80	5.20					
(10) Drying/ bagging	5.00	2.10	1.10	2.75	2.74	2.80	3.30	3.05					
(11) Transport	0.89	0.20	0.30	0.50	0.47	0.00	1.00	0.50					

Table H.1.17 Farming practices (Summary of Maize)

Crop	Maize												
	Existing area					Extended area			Extension area				
	Chekereni	Mabogin	Lau Kati	Oria	Average	Mandaka	Najoro	Average	Chekereni	Oria	Mvleni	Mtakuja	Average
Cultivated area (acre)	1.40	0.02	0.03	0.03	0.37	0.01	0.65	0.33	1.68	4.70	4.10	4.70	3.80
1. Seed													
-Seed rate (Kg)	12.3	2.3	2.8	2.8	5.04	1.3	6.0	3.64	15.8	22.5	29.5	810.0	219.45
-Purchasing price (Tsh/kg)	768	841	1020	650	819.78	1190	1133	1161.67	810	470	1260	920	865.00
-From whome													
a. Market(Dealer)	2	5	4	4	3.75	3	2	2.50	2	3.00	3	4	3.00
b. Other farmer	1	0	0	0	0.25	1	0	0.50	2	0.00	0	1	0.75
c. Own seed	3	3	5	3	3.50	3	1	2.00	2	4.00	5	5	4.00
d. Other(Coop,Government,	4	2	1	3	2.50	1	1	1.00	3	1.00	2	0	1.50
2.Fertilizer													
-How many time	0.3	1.1	0.3	0.0	0.43	0.0	0.3	0.15	0.1	0.4	0.5	0.1	0.28
-Total quantity supplied													
a. Urea(Kg)	12.5	37.5	31.0	5.0	21.50	6.3	83.3	44.79	5.6	50.0	50.0	3.0	27.14
b. Ammonium Sulfate(kg)	0.0	25.0	0.0	5.0	7.50	12.5	0.0	6.25	0.0	0.0	0.0		0.00
c. Other(kg)	0.0	0.0	0.0	0.0	0.00	0.0	0.0	0.00	0.0	0.0	2000.0		500.00
3. Agro Chemical													
- How many time	0.2	1.9	1.5	1.9	1.38	1.1	1.0	1.06	1.1	0.8	0.6	0.3	0.70
- Total quantity sprayed		0	0			0			0	0.00	0		0.00
a. Herbicide(lit.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
b.Insecticide(lit.)	0.13	0.85	0.69	0.70	0.59	0.39	0.67	0.53	0.74	1.06	0.41	0.45	0.66
c.Other(lit.)	0.10	0.10	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4. Mechanical power requirem	0.00	0.00	0.00										0.00
(1) Ploughing & harrowing	0.21	0.60	0.80	0.95	0.64	0.44	3.00	1.72	0.63	0.52	0.80	0.77	0.68
(2) Threshing	0.40	0.70	0.00	0.10	0.30	0.00	1.00	0.50	0.50	0.00	0.23	0.60	0.33
(2) Transport prodcts	0.39	0.58	0.90	0.88	0.68	0.31	0.00	0.16	0.95	0.60	0.60	0.97	0.78
5.Labour requirement(man-day	0.00	0.10	0.10				0.67						0.00
(1) Grass cutting	4.70	2.40	6.30	11.00	6.10	2.25	0.00	1.13	4.33	4.40	2.00	9.10	4.96
(2) Proughing	0.20	0.00	0.00	0.60	0.20	2.50	1.00	1.75	0.33	5.40	0.20	0.40	1.58
(3) Seedling	3.80	10.70	7.70	5.10	6.83	2.75	0.00	1.38	4.67	5.40	9.40	6.80	6.57
(4) Transplanting	0.00	0.70	0.00	0.00	0.18	0.00	0.67	0.33	0.00	0.00	0.00	0.00	0.00
(5) Fertilizing	0.70	1.40	0.90	0.30	0.83	0.25	0.33	0.29	0.11	0.35	0.80	0.10	0.34
(6) Spraying	0.83	1.80	0.73	1.90	1.31	0.75	5.00	2.88	1.11	1.10	1.70	0.30	1.05
(7) Weeding	11.10	13.80	17.30	12.00	13.55	5.75	8.00	6.88	11.89	14.10	13.50	14.00	13.37
(8) Irrigating	0.50	0.30	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.70	0.00	0.10	0.20
(9) Harvesting	4.60	5.60	7.20	7.70	6.28	3.88	4.00	3.94	2.44	5.20	11.10	8.70	6.86
(10) Drying/ bagging	9.60	5.00	4.10	3.90	5.65	4.25	5.33	4.79	5.33	5.10	5.30	9.90	6.41
(11) Transport	0.89	0.40	1.30	0.60	0.80	1.63	0.00	0.81	0.94	0.50	2.50	1.95	1.47

Table H.2.1 Priorities and Strategies (1/2)

Area	Priorities	Impact Objective	Strategies
1. Women's Workload	1. Introduction of appropriate technologies. a. Improved/efficiency energy conserving stoves; b. Utilization of timber saw dusts and rice husks for brequest making c. Establishing of local tree nurseries in the homesteads.	Conservation on fuel	* Promotion of appropriate technologies biogas, improved stoves, grinding mills. * Training of community members in appropriate technologies. * Promote women's participation in manufacture of technologies. * Train women in manufacture installation utilization of different
	2. Introduction/enhancement of child care and health centers	Lessened women's burden	* Community mobilization. * Creation of awareness on the importance of child care centers and health services.
2. Education and Training	1. Training and education on women's right, agriculture, health, etc. 2. Food security.	* Improve agricultural production * Sharpen women's ability and skills and increase efficiency.	* Training in management , planning, business administration and entrepreneurship skills. * Training in farming methods. * Study tour visits. * Preparation of gender sensitive training materials and participatory methods * Provide cooperative education.
3. Water	1. Irrigation water	* Increase food production	* Constructing irrigation facilities under the Project
	2. Safe drinking water	* Alleviate women from the hardship incurred in fetching water * Reduce the incidence of water borne diseases * Use excess water for kitchen, gardens to produce nutritious foods	* Introduction of ate harvesting techniques * Construction water supply facilities under the Project

Table H.2.1 Priorities and Strategies (2/2)

Area	Priorities	Impact Objective	Strategies
4. Food Production		* Application of modern farming technologies * Change peoples attitudes towards land ownership to the women.	* Construction of intakes * Protect water source * Construction of new water canals * Mobile women farmers organizations
5. Improve women's Income	Fight poverty	* Improve the economic status of Women * Promote/establish viable women projects * Promote entrepreneurial capabilities. * Encourage women to form socio-economical groups	* Help women to produce more in agriculture * Help women to set up business * Help women in small scale business get a wider market for their products. * Identification of viable economic projects. * Improve women business mind.
6. Decision making and Leadership	* Establishment of Women pressure groups	* To force action on sensitive issues. * To sensitize leadership at all levels. * To compel access to and control over resources (land, water right, loans etc.) for women.	* Sensitization and mobilization of women * Encourage women to compete with men in the election of leaders at all level * Encourage women to utilize their abilities in making decision which affect their lives
7. Cooperative/Organization and Credit Scheme	* Encourage women to join cooperatives and organization * Enable women to have access to loans both cash and for agricultural inputs.	* Women to join cooperatives and/or organization	* Sensitize community that women also have ability to hold leadership posts.

ATTACHMENT-H.1

EXPLANATION NOTE

ON

LOWER MOSHI INTEGRATED AGRICULTURE

AND

RURAL DEVELOPMENT PROJECT

Explanation Note
on
Lower Moshi Integrated Agriculture and Rural Development Project

1. HISTORICAL BACKGROUND OF THE PROJECT

In the Third Fifth Development Plan, the Government of Tanzania (GOT) decided to lay stress on rural development, and requested the Government of Japan (GOJ) to cooperate in rural development in the Kilimanjaro Region. In reply to this request, GOJ carried out the Master Plan Study on Kilimanjaro Region Development in 1977. In succession, GOI implemented the Kilimanjaro Agricultural Development Center Project(KADC) from 1978 to 1986, the construction of Lower Moshi Irrigation Development Project which completed in 1987, and the technical cooperation under the Kilimanjaro Agriculture Development Project(KADP) from 1986 to date, etc.

Under these continuous cooperation programs extended by GOJ, agricultural production has been remarkably increased, as the farming practice centering on irrigated paddy cultivation has been extended in the existing Lower Moshi Project area. The average crop yield of paddy per ha from 1985 to 1992 attained 6.7 tons, largely contributing to income increase of local farmers. However, due mainly to the constant water shortage of irrigation water in the existing Project area, the cropped areas in the existing Project area has gradually declined year by year and has fallen to 647 ha only in 1994 which is about half of that at the peak time of 1,508 ha in 1990.

With the above background, GOT requested to GOJ in 1995 to conduct a feasibility study on the Lower Moshi Integrated Agriculture and Rural Development Project with a potential area of about 6,000 ha consisting existing Lower Moshi Irrigation Project area and its surrounding areas. The GOJ responded to this request and entrusted to the Japan International Co-operation Agency (JICA) to implement the feasibility study. The scope of work (S/W) on the feasibility study was agreed upon between GOT and JICA on October of 1996. According to this S/W, JICA organized the Study Team consisted of 13 experts and has commenced the feasibility study since last March of this year.

2 OBJECTIVE OF THE STUDY

The major objective of the Study is to carry out a feasibility study for formulation of the optimum integrated agriculture and rural development plan for the potential area of about 6,000 ha including the existing Lower Moshi irrigation Project area in order to effectively accelerate the extension of irrigation technique developed in the existing Lower Moshi Project area and the raising of living standards of farmers.

3 WORKS PERFORMED TO DATE

The Study consists of two Phases, namely Phase-I and phase-II. The Phase-I Study started from the beginning of April to the end of October 1997, and the Phase-II Study started from the beginning of November 1997 to the end of May in next year. The Phase-I Study includes field investigation, data collection, geological boring, soil survey, water quality analysis, farmers' interview survey etc., and all the results of Phase-I study works are compiled in the Interim report. The interim report includes the following major items;

(a) Present condition of the study area

(b) Problem and constraints to agricultural development

(c) Basic approach to development plan

(d) Development Plan

- Water source development plan
- Agricultural development plan
- Irrigation and drainage development plan

- Rural infrastructure development plan
- Water management and O&M plan
- Strengthening plan of O&M executing agencies and farmers organization

The outline of the above development plans explained from now are, therefore, not final in nature and those plans will be reviewed and finalized on the basis of subsequent works of the Phase-II study.

4 Problems and Constraints to Profitable Agricultural Development

Constraints Common

(1) Restricted cropping season due to climatic conditions
(2) Possibility of occurrence of cool temperature injury to rice
(3) Low and unstable upland crops productivity
(4) Not yet established quality rice seed supply system
(5) Less intensive farming practices for upland crops
(6) No or less experience in irrigated rice farming of new beneficiaries
(7) Needs for soil and water management to avoid salt accumulation
(8) Poor financial status of farmers for purchasing of farm inputs
(9) Limitation of grazing lands for animals
(10) Not yet rooted cooperative activities

Technical Problems and Constraints in Existing Lower Moshi Area

(1) Constant water shortage
(2) Weak organization
(3) Insufficient number of capable staff
(4) Poor maintenance work
(5) No observation of irrigation calendar by Upper Mabogini area
(6) No proper filing system
(7) Shortage of O&M equipment

Institutional Problems and Constraints

(1) Low participation rate of CHAWAMPU
(2) Existence of many offenders of irrigation calendar
(3) Organizational weakness
(4) Lack of solidarity as a rural community

5 Basic Approach to Development Plan

Objective

(1) Establishment of regional agricultural development with less gap in rural infrastructure
(2) Increase and stabilization of agricultural productivity
(3) improvement of living standard

Basic approach to the optimum development plan

(1) Hardware aspects

(a) Exploitation of new water source

(b) Construction of irrigation and drainage facilities

(c) Provision of rural infrastructures such as rural roads, washing places and animal drinking places

(2) Software aspects

(a) Introduction of double cropping of paddy which is more beneficial

(b) Strengthening and provision of the following agricultural activities centered by the existing Lower Moshi Project:

- Farmers organizations such as CHAWAMPU and water users group
- Water management, operation and maintenance works
- Agricultural supporting services, farming practices, etc.

6 The Plan on the Lower Moshi Integrated agriculture and rural Development

(1) Water Source Development Plan

Basic concepts

(a) The first priority shall be placed upon the maximum use of the existingwater source of Njoro and Rau rivers.

(b) The water deficit after the maximum use of the existing water source shall be supplemented through exploitation of new water source.

(c) The exploitation of new water source shall be made so as to make the gravity irrigation possible.

Water source development plan

(a) Water source:

Existing; Rau and Njoro river (Intakes' discharge is the same as they are)
New; Kikuletwa river ;

(b) The plan;Rainy cropping; 9m3/sec., Drycropping 5m3/sec.

Intake discharge: Qmax=9.0m3/sec.
Cropping : Rainy season; Paddy 100% of Project area
: Dry season; Paddy about 50% of Project area.
Max irrigable area: rayny season; Paddy about 5,000 ha
:Dry season; Paddy 2,500 ha

Note:
This water source development is closely related to the water right of the Kikuletwa river, so that final decision will be made through discussion with the government agencies concerned in Phase-II field works.

(2) Agricultural Development Plan

Objective

(a) Efficient and sustainable use of water and land resources

(b) Increase of food crop production by provision of irrigation and drainage facilities

(c) Expansion of irrigated rice cultivation

(d) Contribution to the ultimate national objective of rural development, alleviation of rural poverty and improvement of the living standard of rural people

(5) Introduction of integrated approaches towards the development by the rational use of the facilities and services established by GOT under the cooperation of GOJ

Proposed Land Use Plan and Cropping Patten

(a) Development of the entire Project area as Paddy fields.

(b) Introduction of rice cultivation in the entire Project area in rainy season (Feb./March-June/July) and about 50% of the Project area in dry season(Aug./Sept.-Dec./Jan.).

(c) Introduction of alfalfa(fodder & soil amelioration crop) in rotation with rice in the later period of dry season(Oct.-Jan.) to maintain soil permeability.

(d) Introduction of rice variety other than IR54 to reduce the possibility of serious outbreak of pest & diseases due to continuous cultivation of a single variety of rice.

(3) Irrigation and Drainage Development Plan

Basic Development Concept

(a) Design of irrigation and drainage systems, considering administrative boundaries in canal layout and putting an attention upon to the respective conditions of the Expanded Area and New Extension Area.

(b) Application of newly-estimated irrigation water requirement based on the actual measurements, soil conditions and irrigation method.

(c) Farmers' participation in the Project in order to implant them with a sense that the Project will be implemented for them.

(d) Easy O&M of irrigation and drainage facility.

Proposed Development Plan

(a) Existing Lower Moshi Project Area

1) Rehabilitation of existing irrigation and drainage facilities.
2) Change of existing upland crop field into paddy field through land leveling.

(b) Expanded Area

1) Improvement of existing canals.
2) Construction of canal structure.
3) Construction of drainage facilities.

(c) New Extension Area

1) Construction of irrigation and drainage facilities.
2) Land leveling.

(4) Rural Infrastructure Development Plan

Overall development concepts

(a) Application of the same criteria as for the Existing Lower Moshi Project Area.

(b) Maximum use of existing facilities.

(c) Coincidence with respective development plans at village, district, regional and central levels if any.

(d) Simple structure for easy operation and maintenance by villagers.

(e) Appropriate scale in account of the future population increase, etc.

Preliminary design features

Area	Rural Road	Domestic water Facility
Existing Lower Moshi Area	No new Construction	Further demands will be studied in light of city water supply plan.
Expanded Area	Main road: Secondary road Tertiary road: Bridges: Culverts:	Water facility for domestic use: Livestock trough:
New Extension Area	Main road: Secondary road: Tertiary road: Access road: Culverts:	Water facility for domestic us: Livestock trough:

Small-scale hydropower Generation

Max. design discharge : 9 m3/s
Max. rated Capacity : 3,200kW

(5) O&M Plan

Basic concept for water management and O & M plan

(a) In pursuance of the GOT policy for irrigation development, the responsibility of water management and O &M of irrigation facilities will be transfered to farmers' organization.
Livestock trough

(b) However, such transfer of responsibility to farmaers' organization is very difficult immediately because the present farmers' organizations, particularly CHAWAMPU, have faced serious constraints.

(c) The proposed plan, therefore, will take a stage-wise approch; First Stage is a preparatory stage for handing over the responsibility; Second stage, the water management, O&M works, and agricultural machinery services etc. implemented under KADP's jurisdiction will be handed over to farmers will be handed over to farmers' organizations after the full completion of the preparatory works.

Proposed plan

(a) Basically, water management and O &M activities in the First stage will be done by KADP and CHAWAMPU as they are. However, both organizations will be strengthened under the following direction:

- During the preparatory period, KADP shall make its best effort to strengthen/establish farmers' organizations, to transfer thetechnical and managerial know-how to the farmers organization for operating and maintaining the Project, and to establish necessary legal framework for the smooth and effective operation of the project. In order to execute these works effectively, KADP shall be strengthened in terms of organization, necessary equipment and staffing.

- CHAWAMPU should be strengthened particularly in terms of O&M activity and agricultural marketing. With regard to O&M activity, CHAWAMPU shall establish a Water Management and O&M section. Under the Section, a Supervisor responsible for water management and O&M shall be stationed in each village office. When beneficiaries offend against Moshi District by-laws, CHAWAMPU through the related village office shall have the right to stop supply of water into tertiary block concerned.

(6) Farmers' Duties

Under the development plan mentioned now, the following duties should be born by the beneficiaries(farmers):

(a) All farmers must paticipate to CHAWAMPU.

(b) All farmers must observe the cropping calender, O&M works and other activities that will be dicided by CHAWAMPU through the consultation with KADP.

(c) All farmers must pay the water charge and other costs that will be needed for operating and maintaining the Project.

(d) All farmers must take part in the following works under the farmers' participation program(free of charge):

1) Construction of small drain in irrigation block.
2) Execution of sod facing for small canals.
3) execution of further land leveling through land preparation activities.

ANNEX-I

ENVIRONMENTAL STUDY

ANNEX - I

ENVIRONMENTAL STUDY

Table of Contents

List of Tables

List of Figures

List of AttachmentS

ANNEX - I ENVIRONMENTAL STUDY

1. INTRODUCTION

Environmental aspects of the Project, such as impacts on natural and social environment in and around the Project area, proper directions of environmental conservation, protective / mitigation measures and environmental monitoring systems, were examined and proposed through the Initial Environmental Examination (IEE) during April to May, 1997 (the Phase 1) as well as the Environmental Impact Assessment (EIA) during November to December (the Phase 2). Annex-I consists of the detailed results of these both environmental studies, being re-produced based on their final reports.

Chapter 2 shows the findings of the IEE, including Project description, site description, examination results of potential environmental impacts, conclusion and recommendations.

Chapter 3 describes the results of EIA, which were carried out by the University College of Lands & Architectural Studies (UCLAS) in Dar es Salaam under supervision and instruction of the JICA Study Team. Its main parts consist of prediction and assessment of environmental impacts.

Chapter 4 includes the details of the environmental conservation plan consisting of preventive/mitigative countermeasures against environmental impacts as well as environmental monitoring. They have been proposed in the above EIA report, from technical, institutional and financial points of view.

Chapter 5 mentions conclusion and recommendations to the Tanzanian counterpart agencies for environmental conservation, based on the overall results of the environmental study for the Project.

The other materials of this Annex-I such as Tables, Figures, Attachments, etc. are to support the main contents of the annex for easy understanding and reference.

2. INITIAL ENVIRONMENTAL EXAMINATION (IEE)

2.1 Project Description (PD)

Summarized PD is shown in Table I.2.1. The followings are more detailed description on the proposed Project's technical context and main development activities.

2.1.1 Title of Project

"Lower Moshi Integrated Agriculture and Rural Development Project"

2.1.2 Background and Objectives of Project

Agriculture in Tanzania serves as a main sector in its economy, which occupies about 50 % of the Gross Domestic Product and approximately 75 % of the export earning. About 84 % of its working population is engaged in the agriculture sector. In the "Rolling Plan and Forward Budget (RPFB) 1994/95 - 1996/97", the Government of Tanzania (GOT) targets strengthening of stable food supply system centering :

(1) Increase of agriculture products at private sector level including small holders;
(2) Increase of products of cash crops for import;
(3) Improvement of storage facility and marketing ; and
(4) Rehabilitation and improvement of the existing infrastructures

The implementation of the "Lower Moshi Agriculture Development Project" (Lower Moshi Project) started in 1982 under financial assistance of the Government of Japan (GOJ) and was completed in 1987. GOJ further provided the Lower Moshi Project area with the technical cooperation entitled the "Kilimanjaro Agriculture Development Project" (KADP) from 1986 to 1993, to establish and extend farming practice and water management.

The Lower Moshi Project has borne the excellent results more than targeted in crop production, however concurrently it has brought the severe constant water shortage for the project area due to the excessive transfer of project effect to the surrounding area. In order to cope with the problem, it is urgently necessary to execute the comprehensive implementation of an irrigation development project including exploitation of the new water sources and construction of rural area. The major objectives are :

- To extend irrigation technique developed in the Lower Moshi Project area ; and
- To elevate living standard of farmers,

for the potential area of about 6,000 ha including the existing irrigation area located at the southern part of Lower Moshi in Kilimanjaro region.

2.1.3 Outline of Project

(1) General Conditions of Project Site

The Project area extends over the low and flat topography about 3 to 15 km southeast of Moshi city, the capital of Kilimanjaro region located at the foot of the Mt. Kilimanjaro, northeast of Tanzania. Kilimanjaro region is adjacent to the boarder of Kenya to the north, the Tanga region to the southeast, the Arusha region to the east, and administratively consists of five (5) districts such as the Moshi district, Hai district,

Lombo district, Mwanga district and Same district, including ten (10) villages and Tanganyika Planting Company (TPC).

The Project area is on an alluvial plain along the both banks of the Rau river, and is bounded by the left bank of the Rau river on the east, the sugar plantation of the TPC on the west and north, and by a plantation farm of the National Agriculture & Food Corporation (NAFCO) on the south.

The irrigation and drainage facilities in the existing Lower Moshi area was constructed in 1987, and now modern irrigation farming is being executed there. While, the surrounding existing paddy fields reclaimed by farmers themselves are not yet provided with any satisfactory irrigation and drainage facilities. In the potential extension area, maize, beans, sunflower, vegetables and so on are cultivated by traditional farming practice under rainfed condition (Figure I.2.1).

The existing Lower Moshi Project area is suffered from water shortage by arbitrary water tapping for irrigation to the surrounding already expanded area reclaimed by farmers themselves. In addition to this, the unit irrigation requirement has become large especially at the starting time of irrigation, due to less water holding capacity by cracks occurring under dry condition, which accelerates the expansion of untillable area and also the larger unit irrigation requirement year by year.

The stretch of the Kikuletwa river mainstream around the planned new intake wire flows eastward, cutting deep escarpments in the volcanic plateau. The plateau on the left bank belongs to the Hai District of the Kilimanjaro Region, and part of it is being used as agricultural land. The right bank belongs to the Kiteto District of the Arusha Region, and is a wilderness covered by shrubbery.

(2) Beneficial Area and Population

The Project area is 6,000 ha, consisting of the existing Lower Moshi Project area of 2,300 ha, surrounding expanded area of 1,450 ha, and potential extension area of 2,250 ha, and the proposed sites for new water source facility and headreach.

As in 1995, population and households in the Project area are 63,500 and 10,800 respectively. Out of them, population and households of the four (4) villages farming on the existing Lower Moshi Project area are summarized in Table I.2.2.

(3) Executing Agency

Ministry of Agriculture and Cooperatives (MAC)

(4) Concerned Environmental Agency

(a) National Environment Management Council (NEMC)
(b) Environment Division, Vice President's Office
(c) Environment Unit, Irrigation Department, MAC
(d) Natural Resources Regional Office of Kilimanjaro

2.1.4 Components and Designed Scale of Project

(1) Main components of Project

(a) Existing Lower Moshi Project area

1) Rehabilitation and improvement of existing facility including increase of flow capacity and upgrading of existing water management system.
2) Execution of double cropping of paddy to 1,100 ha of paddy field.
3) Conversion from upland crop field of 1,200 ha to paddy field and introduction of double cropping of paddy.

(b) Surrounding existing expanded area and potential extension area
1) Development of irrigation system based on the effective use of limited irrigation water and well-planned water management system.
2) Introduction of double cropping of paddy to 1,450 ha of the surrounding expanded area and 2,250 ha of the potential extension area.

(c) Rural infrastructure development
1) Establishment of an optimum road network in the Project area by upgrading inspection roads along a head reach and canals and linking each area by them, aiming at easy transport of agricultural products in the Project area to Moshi city and other markets.
2) Elevation of the quality of rural life by providing a headreach channel and canals with a facility for domestic water in the Project area and the drinking places for livestock.

(d) Development of new irrigation water sources
1) Construction of a new intake weir in the proper upstream of the Kikuletwa river.
2) Construction of a headreach channel and its maintenance road from the new intake weir to the existing Lower Moshi canal system.

And also, suitable cropping patterns will be worked out putting attention upon the following items:

(a) Available farm labors to the introduction of double cropping of paddy ;
(b) Cool temperature in July and August ;
(c) Mechanized agriculture in the future ;
(d) Needs of cash crops and maize of staple food to farmers ;
(e) Coordination with other farm management plans such as post-harvesting facility, extension services and marketing ; and
(f) Introduction of new varieties as countermeasures against insect and diseases which may occur in the future.

(2) Type of Project

The Project is mainly for rehabilitation of the existing irrigated area in principle, but it also includes new agricultural development such as expansion of irrigated farmland with an additional network of irrigation system as well as construction of a new weir and headreach channel.

(3) Designed Scale

The Project aera is a agricultural potential area of 6,000 ha including the existing developed agricultural area located southeast of Moshi city in the Kilimanjaro region, consisting of :

(a) The existing Lower Moshi Project area of 2,300 ha ;
(b) Surrounding expanded area of 1,450 ha ;

(c) Potential extension area of 2,250 ha ; and
(d) The proposed sites for new water source facility and headreach channel

2.2 Site Description (SD)

This section describes social and natural situations of on-sites and off-sites under the proposed Project. Outline of this section is summarized in Table I.2.3.

2.2.1 Social Conditions of Project Site

(1) Land Tenure and Land Use Systems

Tenure regimes are still heavily influenced by "customary tenure systems" where land is communally owned, user rights are administered within the clan, and transfers to outsiders are rare. The distinguishing feature of different tenure regimes may thus revolve around restrictions on the individual holder's ability to transfer land (only among family members, within the lineage or community, or to outsiders ; and with or without approval from other lineage or community members), which also tends to coincide with the mode of transmittal (inheritance, gifts or bequests, and sale). Governmental control may at one time have been exercised through the village allocation mechanism, but by 1991, this mechanism was firmly in the hands of local authorities.

Smallholder farms hold their land, almost entirely, under customary tenure or deemed right of occupancy. Subject to continuous use, and the approval of the village or other communal authorities, this right is held in perpetuity. Most of the large farms, however, are held under a granted right of up to 99 years, subject to land-use conditions.

The National Agricultural Policy of 1983, the most recent official pronouncement on land tenure policy, attempts to reduce tenure insecurity within the framework of village-based tenure. This principle applies equally to the peasant farmer, the village community and the private or public commercial farmer. The Policy outlines a system under which villages are allocated land under a 999 year lease, with the power to sublease any part of their land to individuals, enterprises or institutions for shorter periods of between 33 and 99 years. Such leases can not be sold.

(2) Economic Activities

The agriculture centering crop cultivation such as maize and paddy, and livestock is predominant, and there are no remarkable industries in the Project area. Average annual farm income of paddy cultivation farmers in the existing Lower Moshi Project area, is US$ 992 which is about ten times average annual national income in Tanzania. On the other hand, gross farm income by maize is US$ 102 per ha which is very low as compared with US$ 7,349 per ha by paddy. This income gap is due to availability of ago-infrastructures.

The present marketing system of agriculture products is controlled by a private sector and cooperative associations under the liberalization policy of market launched since 1988. In the existing Lower Moshi Project area, it is general that cooperative association sells paddy wholesaler at field without cooperative shipment of paddy. Also, middlemen living near the existing Lower Moshi Project area purchase paddy and mill rice in the area, and then sell them to wholesaler. After milling rice, it is transported and sold to market places such as Dar es Salaam and Zanzibar.

On the plateaus on both banks around the Hai district along the Kikuletwa river, from where water is planned to be taken for the proposed Project, residents raise livestocks and poultry - beef cattle, dairy cattle, goats, sheeps and chickens. A limited number of residents utilize primitive fishing methods to catch mudfish ("kambale"), tilapia ("perego"), "kuyu" and "pau" from the Kikuletwa River. On the right bank, charcoal is being produced from the "mgunga" tree. The majority of the residents, then, are engaged in agriculture and livestock raising. In general, the produce and fish are sufficient for subsistence. When there are surpluses, they are traded at neighboring villages.

Estimated total number of fishermen around the Nymba ya Munga (NYM) dam reservoir, which locates in the downstreams of the proposed Project area, is about 364 households even only for the Kilimanjaro-region side. Used fishing devices/gears include beach seine net ("Kokoro") which is currently totally prohibited, gill net, hooks and basket traps ("Migono"). Fish-catch trends at the reservoir is as below :

Year	Catches (ton)
1970	28,508
1974	2,282
1977	5,005
1986	3,886
1987	4,818
1988	1,666
1989	1,643
1996	607

(Sources : Department of Fisheries, Kilimanjaro Regional Natural Resource Office)

This decline of fish catch could be attributed to :

- siltation in the reservoir,
- fishing pressure (over-fishing) due to use of beach seine nets ("Kokoro"), and
- prohibition of the beach seine nets themselves

(3) Traditional Systems

The Water Utilization Act of 1974 declares that all water rights are vested in the Government, sets conditions on the use of water, and authorizes a Principal Water Officer and a Central Advisory Water Board to be responsible for allocation of water rights for "National Basins" and Regional Water Officers and Regional Advisory Water Boards for "Regional Basins". Ministry of Water, Energy & Minerals administers the law, granting rights for each withdrawal of water for use in domestic, industrial, hydropower, livestock, irrigation, or mining activities.

The mountainsides of Mt. Kilimanjaro and Mt. Pare have developed, over the centuries, into fertile agricultural zones, and there are small-scale irrigation canal networks - traditional furrow systems - laid out to distribute irrigation water in the region. A number of these furrow systems have formal river water rights registered at the water resource office in Moshi. Most of the systems, however, are customarily operated for agriculture under the local communities.

The headworks and all the gates installed at the main canals and secondary canals in the Lower Moshi area are directly controlled by KADP, and other gates by watermen of Chawampu. Chawampu also operates and maintains all the canals except field canals. In the surrounding expanded area, farmers' organization has been established for water

management and operation and maintenance of facility, but is not managed in the systematic manner like the Lower Moshi Project.

At present, the Lower Moshi Project area and the surrounding expanded area envisage the severe water shortage, so that strict water management is carried out. On the other hand, in spite that there occurs water conflict on irrigation water between the existing Lower Moshi area and the surrounding expanded area, any organization and institution to convince both areas have not yet been established so far, and smooth and effective water allocation has not been made accordingly due to lack of technical guidance and financial problem.

It is reported that the water from the Kikuletwa river is used mainly for domestic uses including drinking and for cattle feeding. However, around the new intake-weir construction site, there is no conflicting authorized water-use project involving water rights. Parts of this downstream section along the river are used by some residents for bathing or for small-scale, primitive fishing. At present, only authorized water use is for hydro-power generation at the Nymba ya Munga (NYM) dam. Other than this, no authorized water rights or established water-use projects for its downstream section exist.

The NYM dam, locating in the downstreams of the proposed Project area, was constructed back in 1965 primarily for generation of electricity, but at the same time its reservoir has been used for commercial inland fishery . It has an area of about 180 sq. km with maximum length of 32 km, width of 15 km and depth of 41 m. Types of fish available (i.e. species composition) are about 7 families which constitute 20 species. The population is dominated by Tilapia sp. Others are *Clarias mossambicus, Synodontis panetulatus, Labeo sp*, etc.

(4) Characteristics of Local Residents

Tribes living in and around the Project area are Chaga, Masai, Pare, Sanpa, and Arusha. Number of the Masai people are relatively limited, and they usually live raising livestocks in the northwestern part from the Project area, without severe conflicts with the other cultivating tribes.

(5) Health and sanitation

According to the Health Office of Moshi Rural District, several kinds of water-borne diseases have been prevailing in and around the Project area before and after commencement of the existing Lower Moshi project, as below :

(a) Typhoid fever,
(b) Cholera (Vibrio Cholera),
(c) Bilharzia (Schistosomiasis, "Kichocho"),
(d) Malaria,
(e) Amebic dysentery, and
(f) Guinea worms (This is reported but no data so far.)

A recent occurrence trend of water-borne diseases for a few villages in the Project area is shown in Table I.2.4. Each village in and around the Project area has one or two dispensaries. The Kawaya dispensary of the Hai district has reported that it sees an average of 800 new patients a month, with a reexamination or reattendance ratio of approximately 50 percent.

Sewer collection systems in the Moshi city leak into groundwater. When coupled

with lack of proper sanitation and industrial control, these subsurface contaminants enter urban streams and other water sources for the poor villages in and around the Project area. This has resulted in outbreaks of cholera, typhoid and dysentery.

(6) Population

As in 1995, population and households in the agricultural on-site of the proposed Project, are 63,500 and 10,800 respectively. Detailed information for some related villages are shown in Table 1.2.2.

As for population of its off-site area, although the exact statistical data could not be identified, the population density of the left bank plateau of the Kikuletwa river, part of the Hai district is 50 to 60 per square kilometer. And it is reported that there are two or three thousand people living on the right bank plateau in very scattered villages of the Masai. On the other hand, according to estimation by the Department of Fisheries, Kilimanjaro Regional Natural Resource Office, total number of fishermen around the Nymba ya Munga (NYM) dam reservoir is about 364 households even only for the Kilimanjaro-region side.

(7) Transportation Road

The network of unpaved roads around the Project area seems unsystematically arranged, while road density is also insufficient. Bridges over rivers and streams are particularly inadequate, producing transportation bottlenecks during the flood season.

2.2.2 Natural Conditions of Project Site

(1) Climate

All the Project area is located within the "zone with predominantly bimodal rainfall" categorized in World Bank's main report titled Tanzania Agriculture Sector Memorandum (Oct. 1993).

Climate in the Project area is characterized by three seasons : wet season from March to May, dry season from June to October and small wet season from November to February. The rainfall data observed at the Moshi meteorological station shows that the average annual rainfall from 1984 to 1993 is 905 mm, although it largely ranges from 431 mm in 1987 to 1,304 mm in 1990. Topographic characteristic caused by foot of the Mt. Kilimanjaro creates a high correlation between precipitation and altitude. Annual precipitation reaches 2,000 mm at maximum between El. 1,600 m and El. 1,800 m, but declines toward top and bottom. It becomes 200 mm around top and 400 mm around the Nyumba Ya Mungu dam.

According to the observation data of temperature and humidity at the Moshi meteorological station, mean monthly temperature varies from 21°C to 27°C throughout a year. Mean daily temperature from October to April exceeds 30°C, and minimum one comes to near 16°C which occurs in April to August. Humidity is 63 % on an average in a year, with a peak in March. Potential evaporation is largely fluctuated from about 4 mm per day between May and July to about 8 mm per day between January and March, and exceeds 2,000 mm per year.

(2) Geography

The Project area generally has a gently undulating topography with land slopes

ranging from 0.5 % near the Moshi town and 0.2 % close to the NAFCO. The highest elevation in the area is about 800 m at the northern site and the lowest is about 700 m at the southwestern site above mean sea level. The both banks of the Kikuletwa river are volcanic plateaus, located on Mt. Kilimanjaro's southern slope, which is also an area of vast, gently undulating plains.

(3) Hydrology and Drainage

The Himo, Mue and Rau rivers which are tributaries of the Ruvu river, flow down southwardly across the Project area. There are twelve seasonal rivers between the Rau and Mue rivers. On the other hand, there exist the Kikuletwa river and its tributary, the Sanya river, and the Kikafu river branched off from the Karanga river, the Weruweru and Rongoi rivers in the western part of the Project area. Among these rivers, the Kikuletwa river which flows into the Nyumba Ya Munngu (NYM) dam after confluence with the Kikafu river, is expected as new water source for the Project area. The catchment area of the Kikuletwa river is estimated to be about 2,200 km^2 at the planned water source facility site. The Ruvu river also flows into the NYM dam. The Pangani river originating in the dam pours itself into the Indian Ocean. Figure I.2.2 shows hydrological system around the proposed Project area.

The Rau river rises in Mt. Kilimanjaro near its Kibo peak, flows down southwards along the mountain slope, then changes its course southeastwards near Moshi city and flows meanderingly till it joins the Ruvu river. The slope of the river is 1/5 to 1/30 on the mountain slope and 1/200 to 1/400 near the Project area. The catchment area of the river is estimated at 122 km^2 at the crossing point with the Moshi-Taveta Road. The annual discharges for the recent ten years range 11 to 71 million m^3, averaging 35 million m^3.

The Njoro river, a tributary of the Rau, originates from a series of springs scattered in the east of Moshi city, flows southeastwards and joins the Rau near Mabogini village, about 7 km southeast of Moshi city. The river has a catchment area of 15 km^2 at the confluence with the Rau. The flow of the river is relatively constant throughout the year with a minimum of 0.9 m^3/sec in March and a maximum of 1.2 m^3/sec. The mean discharge is estimated at about 34 million m^3.

There is an annual average discharge of approximately 13 m^3/sec at the runoff gauging station (No. 1DD-54) on the Kikuletwa river. Because the base-flow discharge is large, the runoff duration of the river is very advantageous for a water-use project. Groups of springs (Chemka, Ngulu, Rundungai, etc.), having abundant water, are distributed along the Kikuletwa river mainstream and the tributaries, including the Sanya and Kware rivers. Particularly in the dry season, this spring water contributes greatly to the discharge of the Kikuletwa river.

With regard to the location of the Project, there is likelihood of the ground water table to be high. Presence of water springs in the Rau Forest Reserve and several springs of Rundungai, Chemka, etc. could be good indicator of the presence of ground water. The Tanganyika Planting Company (TPC), which is situated adjacent to the Project area, pumps underground water for irrigation.

There are groundwater aquifers of quite variable yields from productive volcanic alluvium near Mt. Kilimanjaro. Before 1978, emphasis was on construction of deep wells to tap protected, lower aquifers. By 1980 many boreholes and water systems were inoperative because of maintenance problems with the diesel pumps. Since that time, shallow aquifers have been emphasized for water supply despite their vulnerability to

pollution.

(4) Soil

Soils on the foot of Mt. Kilimanjaro are volcanic origin. They are generally quite fertile with relatively high humus contents, low phosphate absorption ratio, and high base saturation. The fact that farmers in the existing Lower Moshi area have achieved high yield of paddy by applying urea only proves the high soil fertility in the area. According to FAO soil classification, the soils in the proposed Project area can be broadly divided into three, such as :

(a) Dystric Cambisols
Soils are derived from alluvium of the Rau river and located all over the Project area. The soils are dark brown to reddish brown in color, silt to silty clay in texture, and slightly acid to neutral. Most of the existing Lower Moshi Project area is covered by these soils.

(b) Mollic Gleysols
Soils are observed in the depression of old river course of the Rau river. They are clayey to silty clay in texture and slightly affected by salt. These soils are mostly distributed in the Rau Ya Kati area.

(c) Etric Gleysols
Soils are observed in the low-lying area along the Rau river and also found in upper Mabogini area. The texture is clayey and the soils are free from salinity.

(5) Vegetation

Being in a plane, almost all the proposed Project area is under cultivation with scattered trees and ample grazing land, except a forest area extended along the Rau river.

Vegetation that exists (especially in non-cultivated areas) are dominated by shrubbery and thorny trees. Dominantly are *Acacia tree sp, Balanites aegyptiaca, Solanum sp.* and *Adansonia digitata.* Remnants of *Adansonia digitata* and *Acacia sp.* can be seen in cultivated fields. Scattered planted trees can be seen around homestead houses, schools, institutions and dispensaries. Trees planted are mainly for ornamental, fruit trees and very few for timber and firewood after the trees have been cut and collected respectively. In the outside of the proposed Project area, many kinds of crops are cultivated due to mild weather condition. These crops include maize, beans and cotton.

The plateau on the left bank of the Kikuletwa river around the newly planned intake weir, which is part of Rundugai village in the Hai district, is - except in areas used for paddies and crop fields - covered by thorny plants and bushes, known as "Kikwata" and "Mwerera". There is no agricultural activity on the right bank, which is part of the Kiteto district of the Arusha Region. This bank is wild and uninhabited, and covered by the same bushes found on the left bank.

(6) Valuable Fauna/Flora and Nature

Very few animals have remained in the proposed Project area due to human activities. Thus, either they have been poached or have migrated to other places. Flora and fauna species seen there are common types. No species requiring special preservation have been seen.

Animals which can be seen in the far right bank of Kikuletwa river (in the Simanjiro district) are Grass gazelle, Impala, Thompson gazelle, Ories and Lesser kudu. Others include wild pigs, deer, lions and hyenas. It is reported that people and livestock are sometimes endangered from attack of these wild animals.

A limited number of residents along Kikuletwa river utilize primitive fishing methods to mudfish - *Clarias mossambicus* ("Kambale"), *Synodontis punctulatus* ("Ngorongoro") and Lakeo sp ("Ningu"). Crocodiles are reported to be present in riverbanks of the Kikuletwa where the water velocity is low, specifically at river confluence and at the constructed weir. Also in some springs like Chemka spring crocodiles are reported - in May of 1996 a girl aged 18 was drowned by a crocodile at the Chemka spring while she was swimming.

Downwards, the Kikuletwa pours its water to the Nyumba ya Mungu (NYM) reservoir. In and around that reservoir the ecosystem is characterized by human activities and aquatic medium. Fish population in Nyumba ya Munga Dam is dominated by Tilapia sp. They include *Tilapia pangani, T. jipe, T. esculenta* and *T. rendalii.* In fact it's reported that there are about 20 species of fish from seven families. In addition to these there are also crocodiles, few hippos and other aquatic flora and fauna in and around the water reservoir.

(7) Water Pollution at Moshi City

The Water Utilization Act of 1974 was amended in 1981 to provide for water pollution control and to establish standards for effluent discharges and receiving waters. In 1988, this was finally implemented with the creation of a Central Water Board with executive powers for specifying pollution control measures and for enforcement. These statutory powers have not enabled the government to regulate water quality effectively because of problems in enforcing the Act. Penalties have been very low, and there is little incentive to install control measures. Government efforts are also hampered by resource allocations inadequate to support aggressive policing and data collection efforts.

In fact, an industrial pollution discharge inventory indicates that the priority areas of concentration include Moshi city. Most of the industries discharge untreated wastewater.

Within the proposed Project area, no data on water quality and standards are available at the moment. However, the Water Department could produce data on water from the main intake from which piped water is sent to the villages.

2.2.3 Remarkable Social and Natural Features

(1) Special Reserve Area

There are two forest reserves adjacent to the proposed Project area : Rau Forest Reserve and Kahe II Forest Reserve. Any development activities and tree felling are prohibited in the forest reserve. Sanya Lelatema Game Controlled Area covers the right bank area of the Kikuletwa river including the proposed weir site and the airport located in the west of the study area. In contrast to forest reserve, cultivation and development activities are allowed in the game controlled area. Kilimanjaro region has Kilimanjaro National Park and Kilimanjaro Forest Reserve. Both area restricts the entrance of general public. (Figure I.2.3)

(a) Rau Forest Reserve

This forest is located southeast of Moshi town and northeastern side of the existing Lower Moshi Project and surrounding expanded area. It harbors many springs that supply water for the Mabogini intake weir and the surrounding expanded area. Some springs supply water to the Rau river to which Rau ya Kati intake weir has been constructed.

1) Type of the forest : lowland rain forest
2) Area : 620 ha
3) Management : It is under the Central Government where it is entrusted to the Ministry of Natural Reserves & Tourism through its Forest & Beekeeping Division. Regionalwise, it is under the Kilimanjaro Catchment Forest Office.
4) Objectives of the forest :
   - catchment purposes (to reserve many springs)
   - forest reserves (flora and fauna)
   - environmental protection (wind and water erosion)
   - scientific studies, and
   - game controlled area (colubus monkeys, ordinary monkeys, pigs, birds, etc.)
5) Prohibited actions : Usually in a forest reserve no any human activities are allowed, i.e. no cultivation, no tree-cutting, no grazing nor camping. However, developing activities and scientific research can be done if official permit is given. These include road or rail construction crossing the forest reserve, camping for research purpose, excavation of soils for tree-nursery establishment, hanging of bee-hives, and hunting if the same forest serve as a game controlled area as well.

(b) Kahe II Forest Reserve

This forest is adjacent to the Project area south of Rau Forest Reserve. It is also a lowland rain forest, and has an area of 202 ha. Its management is as for Rau Forest Reserve. Since it is situated below the Project area, its direct influence to the Project area is minimal in terms of water source. However, this forest breaks strong winds that blow towards the Project area and hence to minimize water loss in the atmosphere.

(c) Problems encountered in managing Rau & Kahe II Forest Reserves

These valuable forests are surrounded by farms and human residences. Moreover, they are close to town where charcoal and wooded-made items are highly needed. As such, the following problems have been encountered :

1) encroachment,
2) illegal tree-felling, fodder collection as well as herbs for medicinal purposes,
3) tress passing,
4) other externalities like brewing of illicit liquor and homage for thieves, and
5) lack of manpower to carry out strong patrols in and around the forests

(d) Sanya Lelatema Game Controlled Area

Game controlled areas are established under the Wildlife Conservation Act, 1974 of the United Republic of Tanzania. Within a game Controlled area, no person shall, save with the permission in writing of the direction of wildlife, hunt, capture, kill or wound any animal - including fish, in any game controlled areas. However, development activities, such as cultivation, residing, grazing, etc. are allowed unlike in a forest reserve where such activities are prohibited. Sanya Lelatema Game Controlled Area has a total area of 800 km^2. It covers both Kilimanjaro (Hai district) and Arusha (Sinanjiro district) Regions. Its management falls under regional authorities. Thus for Kilimanjaro Region, Regional Game Officer (RGO) has a full command on controlled area. RGO is assisted by the District Game Officer (DGO). These officers are again assisted by available staff in order to administer rules and

regulations pertaining game controlled areas.

(2) Socially Fragile Area

The NYM dam was constructed primarily to create a reservoir for the generation of hydro-electric power. The resulting lacustrine environment was suitable for tilapia fish which had been present in the river. Their population increased rapidly, taking advantage of the greater availability of food, space and other resources. This led to the early establishment of a fishery to exploit the rich potential. Fishermen from as far as Songea in Southern Tanzania and Kisumu in Kenya settled in the numerous villages which sprang up around the lake.

NYM reservoir's annual maximum sustainable yield (MSY) has been estimated to be 3,776.5 tonnes at an optimum effort of 487 canoes.

(3) Naturally Fragile Area

The NYM reservoir (Figure I.2.4) is generally shallow with the depth increasing gradually to a maximum of 41 m at the damsite. At the southern dam end, the lake is narrow and deep but towards the northern end, it broadens to a maximum of 15 km. At the reservoir, the main rainy season lasts from March to May or June. The increased water input from the inflow rivers and surface runoff raises the lake level during April to June. It would therefore be expected that breeding activity would increase during the wet season. The ecosystem around the reservoir comprises apart from aqueous stimulated vegetation, crocodiles and few hippos. These occasionally cause damage to human, cattle and goats around there.

A chemical analysis of its major inflows, the Ruvu and Kikuletwa rivers, suggested that the impounded water was rich in mineral salts and plant nutrients. During the filling up process, additional nutrients were released by leaching from hitherto unflooded soils and the decomposition of submerged organic matter. Limnochemical and phytoplankton studies made in 1974 indicated that the lake had entered a phase of stabilization in which the primary factors which continued to influence its character were morphology, water balance and quality of the water inflow. At that time, the water of the lake was found to be rich in nutrient irons such as nitrates and phosphates with a high sodium bicarbonate content from the Kikuletwa River. The nutrients were not considered to be limiting as supported by the high population density of phytoplankton, dominated by diatoms and blue-green algae.

The biomass of the phytoplankton is largely dependent on chemical composition and retention time of the lake. The drawdown, wave and wind action, together with the influx of nutrients from the two inflow rivers would probably maintain primary production at high level.

2.2.4 Other Remarks

(1) Experiences of Severely Negative Environmental Impacts in and around Project Sites

In general, Kilimanjaro zone is seen to be of crucial importance on irrigation development in view of :

(a) increasing problems of sediment accumulation in irrigation schemes, recent examples being Mombo and Kitivo Irrigation Schemes ;

(b) increased flood risks and reduced base flows ;
(c) poor irrigation water management leading to reduced irrigation areas, waterlogging and salinity ; and
(d) allied problems with hydro-power generation.

These problems are clearly due to a combination of catchment degradation and infrastructural shortcomings. These together with increasing demands for water will soon become a limiting factor on the development of new schemes and the sustainability of hitherto sound schemes

Experienced or present environmental problems accruing in the past or existing projects, such as (1) Kilimanjaro Agriculture Development Center Project, (2) Lower Moshi Irrigation Development Project, (3) Lower Moshi Agricultural Development Project, and (4) Kilimanjaro Agricultural Development Project, are as follows :

a) Social aspect
- mararia and schistosomiasis
- unstable water allocation
- no or poor irrigation & drainage facility out of Lower Moshi Project area
- inadequate water management system
- unmatured agricultural product and farmers organization
- low unit yield/productivity in outside area of Lower Moshi Project
- unmatured supporting system for agricultural productivity
- poor rural infrastructure
- poor loan and credit services

b) Natural aspect
- shortage of irrigation water
- husk accumulation and its poor treatment at the existing rice mill

The cropped area in the Project area, which reached the maximum area of 1,525 ha in 1990, has decreased to 650 ha in 1994. This is due to water shortage caused by arbitrary topping at upstream of the Rau river.

The lower portion of the existing Lower Moshi area is susceptible to salinization. It is estimated that over 80 ha of the pilot plot has been affected by saline. Saline is evidenced by presence of indicator plants, "minywanywa" (Cupressus sp.) that dominate the area. But also white layer of saline can be seen along the road. Similarly darkish color of the soils, which results from the reaction between salt elements (NaOH) and organic matters, are seen enormously in the said area. The portion of land which was left for upland-crop cultivation has been abandoned for such purpose because of saline. It is now used for grazing.

2.3 Examination on Potential Environmental Impacts

Based on the given information in Section 2.1 as well as the surveyed social and natural data described in Section 2.2, an initial environmental examination (IEE) was conducted for the proposed "Lower Moshi Integrated Agriculture and Rural Development Project". This chapter explains procedures, methodology and examination results of the IEE.

2.3.1 Objectives and Procedure of Initial Environmental Examination (IEE)

(1) Objectives

IEE is generally a quick environmental study at the starting point of development projects It is usually carried out during either the master-plan or the early feasibility-study stages, in order to ignore a large development mis-direction from environmental point of view and to efficiently save time and money at the following full environmental study, "Environmental Impact Assessment" (EIA). In fact, the Project proposed herewith is now in the first phase of its feasibility study. The next are major technical objectives of IEE :

(a) To identify development activities of the proposed Project (Section 2.1) ;
(b) To survey the present conditions of both the natural and socio-economic aspects in and around the Project sites (Section 2.2) ;
(c) To predict, in a brief and relatively rough manner, potential impacts on environment of the proposed Project activities (Section 2.3) ;
(d) To scope the identified negative impacts on social and natural aspects in terms of impacted environmental items, location, affected population, etc. so that contents of the following full EIA for the Project could be prepared if necessary (Section 2.3) ; and
(e) To recommend whether an EIA study is further required or not, and to formulate its Terms of Reference (TOR) if required (Section 2.4).

(2) Procedural Background

To achieve the goal of "sustainable development", the National Environmental Action Plan (NEAP, adopted by the Government of Tanzania in June 1994) lists "environmental impact assessments (EIAs) as one of five (5) priority policy instruments. There is now an acute need to reach agreement on a single strategy document that will lay the foundations for coordinated, multi-sectoral action.

The authorized standard and guidelines of IEE / EIA are thus not available in Tanzania, although "Environmental Impact Assessment Guidelines for Tanzania" (Draft) is now under proposal and review by the central Government. Therefore, IEE could not help but be conducted in accordance with the existing Japanese guidelines for environmental studies, "Guideline for Environmental Consideration on Agricultural & Rural Development Projects" (Dec. 1992) as well as "Guideline on Environmental Consideration for Main Project Studies" (July, 1992) authorized by JICA which is a sponsor of the on-going feasibility study for the proposed Project.

However, the present IEE for the proposed Project was conducted not only by means of the JICA guidelines, but also with agreement of responsible staff at the National Environment Management Council so that IEE contents and procedures could even meet policies described in the drafted Tanzanian guideline.

Table I.2.5 and Figure I.2.5 show procedural position of each step for environmental consideration to implement development projects, being defined by the Japanese and Tanzanian sides respectively. According to the draft Tanzanian procedure flow in Figure I.2.5, the present IEE could be regarded as "Preliminary Assessment" after "Classification".

(3) Methodology

Collection and analysis of the existing data / information available in addition to quick filed survey were major methods for the present IEE.

IEE was thus carried out by making reference with the existing data and information relevant to the natural and social environmental aspects in the proposed Project on- and off-sites. Then, final examination on potential environmental impacts and on their scoping were implemented mainly based on the results of environmental studies executed for the similar projects / locations as well as the executing consultant's technical experiences, from various points of view.

2.3.2 Environmental Items and Ecological Regions

Environmental items subject to Initial Environmental Examination (IEE) were largely divided into social and natural items, and the both item categories were classified in more detail in accordance with "Guideline for Environmental Consideration on Agricultural & Rural Development Projects" (Dec. 1992, JICA), as described in Sections (1) and (2) below. These itemized environmental subjects could be regarded as mostly common with recommended ones in internationally authorized guidelines as well as "Environmental Impact Assessment : Guidelines for Tanzania (Draft)".

And each item were examined in environmental impacts of the proposed Project, areawisely for each ecological region presented in Section (3) below, because environmental impacts are significantly depend upon ecological characteristics of each project sites, especially water courses and topography.

(1) Social Environment

The following is a list of detail items concerned with social-environment aspects to be examined for the Project's impacts. Among others, the next two (2) impact phenomena were paid more attention to, since they were the most popular impacts of the similar development projects in the past :

- Conflicts among cultivation right, water right and conventional water right ; and
- Spreading malaria, schistosomiasis, and other water-borne diseases caused by the irrigation development

(a) Socioeconomic Issues

1) Social Aspects
   a) Planned agricultural settlement
   b) Involuntary resettlement
   c) Substantial changes in way of life
   d) Conflict among communities and peoples
   e) Impacts on indigenous, ethnic minorities and nomads
   f) Others
2) Demographic issues
   a) Population increase
   b) Drastic change in population composition
   c) Others
3) Economic activities
   a) Relocation of bases of economic activities
   b) Occupational change, loss of labor opportunity

c) Increase in income disparities
d) Others

4) Institutional and custom related issues
a) Adjustment and regulation of water or fishing rights
b) Changes in social and institutional structures
c) Changes in existing institutions and customs
d) Others

(b) Health and Sanitary Issues

1) Increased use of agrochemicals
2) Outbreak of endemic diseases
3) Prevalence of epidemic diseases
4) Residual toxicity of agrochemicals
5) Increase in domestic and other human wastes
6) Others

(c) Cultural Issues

1) Impairment of historic remains and cultural assets
2) Damage to aesthetic sites
3) Impediment of mineral resources exploitation
4) Others

(2) Natural Environment

The following is a list of detail items concerned with natural-environment aspects to be examined for the Project's impacts. Among others, the next four (4) impact phenomena were paid more attention to, since they were the most popular impacts of the similar development projects in the past :

- Influence to river maintenance flow due to the increase of diversion discharge ;
- Deterioration of water quality due to the increased usage of agro-chemicals and fertilizer ;
- Soil erosion especially in flow-concentrated area and sedimentation and salt concentration ; and
- Influence to conservation for water resources

(d) Biological and Ecological Issues

1) Deterioration or degradation of vegetation
2) Negative impacts on important or indigenous fauna and flora
3) Degradation of ecosystem with biological diversity
4) Proliferation of exotic and/or hazardous species
5) Encroachment on wetland and peat swamp
6) Encroachment on tropical forests
7) Destruction or degradation of mangrove forests
8) Degradation of coral reef
9) Others

(e) Soil and Land Resources

1) Soil Resources
a) Soil erosion

b) Soil salinization
c) Deterioration of soil fertility
d) Soil contamination by agrochemicals
e) Others

2) Land Resources
a) Devastation of desertification of land
b) Devastation of hinterland
c) Ground subsidence
d) Others

(f) Hydrology and Air & Water Quality Issues

1) Hydrology
a) Changes in surface water hydrology
b) Changes in groundwater hydrology
c) Inundation and flood
d) Soil sedimentation
e) Riverbed degradation
f) Impediment of inland navigation
g) Others

2) Water quality and temperature
a) Water contamination and deterioration of water quality
b) Water eutrophication
c) Sea water intrusion
d) Low irrigation water temperature
e) Others

3) Atmosphere
a) Atmospheric pollution
b) Others

(3) Ecological Regions

In order to closely examine environmental impacts on the Project-related areas of different ecological natures, the on- and off-sites of the Project were divided into six (6) ecological regions as shown in Figure I.2.6. They are :

Ecological Region 1	Project irrigation sites consisting of the existing Lower Moshi area, expanded area, potential extension area, related villages, village facilities and the Rau River ;
Ecological Region 2	Construction site and direct upstream of the planned intake weir in the Kikuletwa River ;
Ecological Region 3	Construction trail of the planned diversion canal from the new intake wire to the existing Mabogini intake weir ;
Ecological Region 4	Downstream area along the Kikuletwa River from the new intake weir to its inflow point at Nyumba ya Mungu (NYM) Dam Reservoir ;
Ecological Region 5	Downstream area of the Rau River from the irrigation drain end to its inflow point at NYM Dam Reservoir ; and
Ecological Region 6	In and around the NYM Dam Reservoir

2.3.3 Results of IEE

For all the six (6) ecological regions and for all the environmental items from social and natural points of view, environmental impacts were examined. And overall examination results were output using checklist matrixes through Tables I.2.6 to I.2.17.

Impacts were evaluated during both the Project construction and post-construction stages, using the three kinds of marks meaning the following impact degree :

O = Significant impact is unquestionably induced by the Project.
X = There is no possibility of any significant impact being induced by the Project.
? = Some significant impact is likely but unclearly to be induced by the Project.

The following sections explain the significant negative impacts for each ecological region predicted through IEE, being classified into "problems due to the Project location", "problems associated with the construction stage", and "problems related to the Project operation".

(1) Problems Due to the Project Location

(a) Ecological region 1 (Direct agricultural development sites)

1) Socio-economic issues
   a) Involuntary resettlement :
      Some houses in the expanded and proposed extension areas should be removed for the Project activities of construction of irrigation and other agricultural facility.
2) Soil and land resources
   a) Soil salinization :
      Soil salinization has already occurred in and around the Project sites.

(b) Ecological region 2 (Intake weir construction site and its direct upstream)

There will be no significant negative impacts due to its location.

(c) Ecological region 3 (Construction sites of the diversion canal)

1) Socio-economic issues
   a) Involuntary resettlement :
      There is possibility to remove houses or cultivated area along the canal and maintenance road route, especially close to the Moshi city.

(d) Ecological region 4 (Downstream of the new weir)

There will be no significant negative impacts due to its location.

(e) Ecological region 5 (Downstream of the Rau river)

There will be no significant negative impacts due to its location.

(f) Ecological region 6 (The NYM dam reservoir)

There will be no significant negative impacts due to its location.

(2) Problems Associated with Construction Stage

(a) Ecological region 1 (Direct agricultural development sites)

1) Socio-economic issues
   a) Population increase :
      Population in and around the development sites will naturally increase due to the original high birth-rate. But the population will increase artificially due to inflow of construction workers, as well.
   b) Drastic change in population composition :
      Construction workers will be generally young and male, which changes the local population composition.

(b) Ecological region 2 (Intake weir construction site and its direct upstream)

There will be no significant negative impacts due to its location.

(c) Ecological region 3 (Construction sites of the diversion canal)

There will be no significant negative impacts due to its location.

(d) Ecological region 4 (Downstream of the new weir)

There will be no significant negative impacts due to its location.

(e) Ecological region 5 (Downstream of the Rau river)

There will be no significant negative impacts due to its location.

(f) Ecological region 6 (The NYM dam reservoir)

There will be no significant negative impacts due to its location.

(3) Problems Related to the Project Operation

(a) Ecological region 1 (Direct agricultural development sites)

1) Socio-economic issues
   a) Conflict among communities and peoples :
      Social conflict among the related communities will most likely happen in terms of water right and production arrangement, if their control systems will be enoughly taking care of the local people's interest and participatory opportunities.
   b) Adjustment and regulation of water rights :
      Regulation and control management should be enforced to realize fair system for the local farmers for irrigation water use.
   c) Changes in social and institutional structures :
      As increase of production and irrigated area as well as improvement of rural living standards, a new social and institutional framework should be established and kept for continuation of such social welfare.
2) Health and sanitary issues
   a) Increased use of agrochemicals :
      As irrigated land is extended, there will be possibility of increased application of agrochemicals during production activities.

b) Prevalence of epidemic diseases :
Before and after the existing Lower Moshi project, water-borne diseases such as mararia and schistosomiasis have prevailed. With water surface increased, their patients will increase in and around the Project sites.

c) Residual toxicity of agrochemicals :
As irrigated land is extended, there will be possibility of increased application of agrochemicals during production activities.

d) Increase in human wastes :
A huge pile of rice husk left at the existing rice mill has already been a major problem. Increased rice production as result of the Project will further degrade this waste situation if without some proper method to treat or utilize the rice husk.

3) Hydrology and water quality issues

a) Changes in ground water hydrology :
Groundwater level will rise due to the extension of irrigated land. But its adverse impacts and extent on ground water hydrology is unclear at present, when data of groundwater is lacking.

b) Water contamination and deterioration of water quality :
Water pollution due to wastewater from the Moshi city and irrigation drainage with increased agrochemicals in the future is questionable.

(b) Ecological region 2 (Intake weir construction site and its direct upstream)

1) Biological and ecological issues

a) Proliferation of hazardous species
Some inundated area at the new weir can be a good habitat for crocodiles living in the Kikuletwa river upstream, which will make another dangerous place for local people and livestocks.

(c) Ecological region 3 (Construction sites of the diversion canal)

1) Socio-economic issues

a) Conflict among communities and peoples :
Water thief from the canal and feeling of unfair will easily happen, causing community conflicts among the local society.

2) Health and sanitary issues

a) Prevalence of epidemic diseases :
Increase of water surface will be chances to prevail water-borne diseases including mararia and schistomiasis.

b) Increase in domestic wastes :
Domestic wastes will be thrown away into the canal, especially around the existing village area. It will disturb the canal's function and deteriorate water quality of the canal, affecting the surrounding people and livestocks.

3) Biological and ecological issues

a) Proliferation of hazardous species :
Intrusion of crocodiles into the new canal is possible.

4) Soil and land resources

a) Soil erosion :
The construction works will strip vegetation causing additional soil erosion where land slope is steep. It will damage the new diversion canal itself.

(d) Ecological region 4 (Downstream of the new weir)

1) Biological and ecological issues

a) Proliferation of hazardous species :
As water flow of the Kikuletwa river becomes weak, crocodiles will increase.

(e) Ecological region 5 (Downstream of the Rau river)

1) Water quality issues
a) Water contamination and deterioration of water quality :
Water quality will be more deteriorated because of increased application of agrochemicals upstreams. But it is questionable whether such water pollution will be purified enoughly through the two Forest Reserves or it will adversely affect these Forest Reserves' ecosystem in contrary.

(f) Ecological region 6 (The NYM dam reservoir)

1) Socio-economic issues
a) Relocation of bases of economic activities :
It is questionable to how much extent water decrease and pollution due to the Project activities damage fishery in the Reservoir.
b) Occupational change :
It is questionable to how much extent water decrease and pollution due to the Project activities damage fishery in the Reservoir.
c) Adjustment of fishing right :
The Reservoir water is used for power generation as well as inland fishery.
2) Biological and ecological issues
a) Negative impacts on important fauna :
It is questionable to how much extent water decrease and pollution due to the Project activities damage fishery in the Reservoir.
b) Degradation of ecosystem :
It is questionable to how much extent water decrease and pollution due to the Project activities damage fishery in the Reservoir.
3) Hydrology and water quality issues
a) Changes in surface water hydrology :
It is questionable to how much extent water decrease and pollution due to the Project activities damage fishery in the Reservoir.
b) Riverbed degradation :
It is questionable to how much extent water decrease and pollution due to the Project activities damage fishery in the Reservoir.
c) Water contamination and deterioration of water quality :
It is questionable whether water pollution caused upstreams will be purified enoughly within the Reservoir or it will adversely affect fish species damaging the inland fishery.
d) Water eutrophication :
How much water eutrophication will happen due to water decrease, and such eutrophication is bad or good for fish breeding, are questionable.

2.4 Conclusion and Recommendations

2.4.1 Conclusion of IEE

Tables I.2.18 and I.2.19 summarize the significant negative impacts on the social and natural environment of the proposed Project, based on the IEE study mentioned in Section 2.3. Some impacts have become definite (marked with 'O') through the present examination, while the other ones are likely but still in question (marked with '?'). The

table also mentions possible countermeasures against each definite or questionable impacts, which are thinkable only at this initial stage of the feasibility study on the proposed development Project.

The most impacted areas due to the Project are the Ecological Region 1 (Direct agricultural development sites) and the Ecological Region 6 (The NYM dam reservoir), from the both social and natural environmental points of view. However, the other four (4) ecological regions will be more or less affected adversely, as well.

2.4.2 Recommendations

(1) Recommendation for EIA

According to the Tanzanian project screening criteria mentioned in the draft Environmental Impact Assessment Guideline which has not yet had an authorized power, any irrigation development project is supposed to be go directly to full EIA study. But the current IEE commanded to the feasibility study team of the proposed Project by the JICA could function as scoping procedure of impacts within the EIA framework.

As clarified in the IEE result, some significant negative impacts will be definitely or most likely brought about by the proposed Project, without introduction of appropriate mitigation measures before its implementation. Therefore, an EIA study is strongly recommended to be carried out continuously in the following phase of the present feasibility study of JICA, regardless that the Tanzanian project screening criteria for EIA is available or not.

(2) Recommendation for Planning Stage

Based on the IEE results, the following institutional or technical consideration is also recommended to be included during the remaining feasibility study of the proposed Project. The concerned experts involved in the study are thus required to pay due attention to the below items to be built in their development plans, in order to prevent and mitigate any significant negative impacts from the Project implementation.

(a) Involuntary resettlement
- Selection of settlement area based on desires and aspirations of the affected people,
- Adequate provisions for housing and social infrastructures,
- Compensation including establishment of economic means and infrastructures, and
- Establishment of supporting systems for production and daily living activities of the affected people

(b) Conflict among communities and peoples
- Sufficient consideration of social environment of the Project area,
- Aspiration of related peoples,
- Conformity with surrounding environment, and
- Monitoring of concerns or opinions of related peoples

(c) Population increase and drastic change in population composition
- Aspirations of host populations,
- Improvement or establishment of socio-economic infrastructures corresponding to an expected population increase, and
- Careful monitoring of possible deterioration of social fabric or value upheaval as a result of rapid population increase

(d) Relocation of bases of economic activities and occupational change
- Due consideration of present economic environment in affected areas,
- Introduction of sufficient compensation and support measures for the affected population, and
- Monitoring of concerns or aspirations of related peoples

(e) Adjustment of water or fishing rights
- Adjustment or provisions based on due consideration of aspirations of the affected population, and
- Modification of development plan

(f) Changes in social and institutional structures
- Due consideration of aspirations of affected peoples, existing institutions and customs,
- Establishment of adequate support measures,
- Introduction of staged development, and
- Monitoring of outbreaks of conflict among peoples caused by induced re-organization of society

(g) Increased use and residual toxicity of agro-chemicals
- Defining criteria on agro-chemicals with high residual toxicity,
- Employment of strict regulations on use and marketing of the defined,
- Monitoring of application of the said regulations on agro-chemical use and marketing,
- Formulation of cropping pattern considering ecological effects to prevent infestation of pests and diseases, and
- Establishment and extension of pest and disease control measures

(h) Outbreak of endemic diseases and prevalence of epidemic diseases
- Velocity control of canal water and lining methods to kill disease vectors, and
- Dissemination of information on health and sanitation

(i) Increase in domestic and other human wastes
- Introduction of waste disposal measures or facilities

(j) Impacts on important fauna and flora, and degradation of ecosystem
- Establishment and management strengthening of conservation areas,
- Due consideration to local populations and those depending on the ecosystem for livelihood,
- Introduction of conservation measures,
- Modification of the Project, and
- Relocation of subject species

(k) Proliferation of hazardous species
- Technical measures to avoid crocodiles, and
- Dissemination of information on risks from crocodiles

(l) Soil erosion
- Formulation of physical and agronomic soil conservation measures,
- Appropriate land use planning,
- Modification of the Project,
- Examination on construction methods and period or season,
- Introduction of necessary restrictive measures, and
- Restrictions on land use

(m) Soil salinization

- Attention to impacts to lower reaches in irrigation and drainage planning,
- Alteration of land use,
- Formulation of cropping pattern including time required for desalinization, and
- Introduction of salt tolerant crops

(n) Changes in surface water hydrology
- Careful planning on hydrology and construction works, considering physical environment and downstream water use

(o) Changes in groundwater hydrology
- Water saving irrigation and pipe drainage system

(p) Riverbed degradation, water pollution and eutrophication
- Erosion control measures,
- Extension of appropriate fertilizer and agro-chemical application and waste disposal, and
- Careful attention to closed water body,

2.4.3 Terms of Reference (TOR) for EIA

EIA will be carried out based on the abovementioned results of the IEE and the decision of GOT and related agencies on its need. It will be carried out for establishment of social and natural environmental conservation plans including future monitoring system and measures to mitigate significant negative impacts.

The TOR for EIA (ATTACHMENT-1.2) for the proposed Project is in a form of EIA report contents and in accordance with proposal in the JICA's environmental guidelines.