3. AGRICULTURE DEVELOPMENT PLAN

3.1 Basic Development Concepts

The existence of high potential for irrigated agriculture development in the Study Area has been proved by the past integrated development efforts of GOT and the Japanese Government. Aiming to rationally exploit this potential and to ensure efficient and sustainable use of land, water and human resources for agriculture development in the Area and for improvement of the living standards of rural people, the basic concepts for agriculture development and area-wise specific approaches to the development are established by incorporating the lessons learnt from the past experiences in agriculture development in and around the Study Area as follows:

(1) Basic Concepts for Agriculture Development

- To envisage integrated agriculture development approaches well synchronised with engineering and institutional development;
- To take area-wise approaches to ensure that development approaches will duly address the specific development constraints of the Project Area;
- To introduce paddy-based cropping pattern(paddy-paddy or paddy-other crops) for establishing profitable agriculture and for ensuring sustainable agriculture and to establish the Area as the national technical centre for small scale irrigated paddy farming in the lowlands;
- To formulate agriculture development plan by paying due attention to soil and water management to prevent soil degradation and by paying due attention to animal husbandry;
- To use the existing paddy fields in the Existing Lower Moshi Project Area as the nucleus area of the whole Project Area and make the best use of the Area for extension and training purposes; and
- To strengthen and expand supporting services based on actual needs and well synchronised with progress of development to ensure maximum utilisation of the Project Area at an earliest possible stage after the construction.

(2) Area-wise Specific Development Approaches

(a) Existing Lower Moshi Project Area

The introduction of paddy-based cropping pattern in the entire area is planned. The subject area will not encounter any serious technical constraints in the agricultural land use when irrigation water supply is ensured. The majority of farmers in the Area have experiences in paddy cultivation, including those in existing upland fields who obtained such experiences as farm labourers. However, the programming of supporting services on actual need basis directed to farmers in the upland fields is essential by making the best use of the existing paddy fields for extension and training purposes.

(b) Expanded Area

Drainage conditions present constraints for agriculture development in the Expanded Area. In addition, the urban development plan of Moshi Municipality will restrict the development in the Kaloleni area located in Moshi Urban District. Accordingly, the development approaches to the area are: 1) to improve or develop drainage systems, 2) to expand irrigated area in Mandaka area through the rehabilitation/upgrading of irrigation system and the introduction of improved water management system and 3) to formulate the development plan for the Kaloleni area respecting the urban development plan of Moshi Municipality (proposed site of the oxidation pond for sewerage treatment).

(c) New Extension Area

When irrigation water supply is ensured, no serious technical constraints for agriculture development will be encountered in the area except for the southern part of the area which is affected by salt accumulation. The salt accumulated areas are presently utilised for grazing land and the requirements for grazing land, especially for the Maasai pastoralists in Mtakuja, as well as land suitability of the areas are to be considered in the formulation of the development plan in the area. In addition, no irrigation farming is practised in the entire area and the primary constraint for irrigated agriculture will be farmers' capability to adopt irrigation farming technology. The approaches for agriculture development in the area are, therefore, 1) to introduce a paddy-based cropping pattern within the availability of irrigation water supply, 2) land use plan based on land suitability and taking requirements for grazing land into account and 3) to programme special supporting services to beneficiary farmers.

The study on the agriculture development in the Study Area has been made on an area-wise basis paying due attention to the development constraints and the basic development concepts and approaches. The proposed development plan is formulated as presented in the following section.

3.2 Proposed Land Use Plan

3.2.1 Basic Approaches

The basic approaches for the agriculture land use planning and the delineation of the target area for the envisaged irrigated agriculture development(the Project Area) have been studied taking into account 1) land suitability for irrigation farming, 2) present land use, 3) results of irrigation and drainage study, 4) requirement of grazing land, and 5) the urban development plan for the Kaloleni area as follows;

- Exclusion of strongly salt affected areas covered with Eutric Cambisols, Saline/Sodic Phase which are assessed currently not suitable for irrigation farming from the Project Area;
- Consideration of present land use which reflects existing needs for specific land use as grazing land;
- Results of irrigation and drainage study including irrigation water availability, rational alignment of irrigation canals and flood protection ;
- Location of the proposed site of the oxidation pond in the urban development plan of Moshi Municipality; and
- Future expansion of village yards under the implementation of the Project in the New Extension Area.

3.2.2 Proposed Land Use Plan

In accordance with the basic development concepts for agriculture development and the basic approaches for the land use planning, the area-wise proposed land use plan in the Study Area and the Project Area is formulated as shown in Tables E.3.1 and E.3.2, Figure E.3.1 and as presented below.

(1) ExistingLower Moshi Project Area

The utilisation of the entire farmlands in the area as irrigated paddy fields is planned by converting the existing upland fields. The proposed land use under "with Project" is shown in the following table.

Land Use	Study Area/Project Area (ha in gross)		
	Present	With Project	Change
Irrigated Paddy Fields	1,492	2,654	+ 1,162
Irrigable Upland Fields	1,162	0	- 1,162
Total	2,654	2,654	-

(2) Expanded Area: Mandaka Area

The expansion of irrigated areas from the present 330 ha to 424 ha in the Project Area is aimed at by converting upland fields within the irrigation command area and through the rehabilitation and upgrading of existing irrigation and drainage system. Upland fields(173 ha) and paddy fields(13 ha) located in the riparian area enclosed by the proposed flood protection dike are excluded from the Project Area.

Land Use	Present/Study Area	With Project/Study Area (ha in gross)		Change
		Project Area	Outside Project Area	
Irrigated Paddy Fields	330	424	13 1/	+ 107
Rainfed Upland Fields	280	0	173	- 107
Total	610	424	186	-

1/: Present paddy fields in the proposed riparian area

(3) Expanded Area: Kaloleni Area

Some 60 ha of lands in Kaloleni have been allocated for the proposed oxidation pond for sewerage treatment by the Moshi Municipal Authority. The proposed site is located close to the southern end of the Kaloleni area. Accordingly, only the existing paddy fields located to the north of the proposed site are included as the target area for the development.

Land Use	Present/Study Area	With Project/Study Area (ha in gross)		Change
		Project Area	Outside Project Area 1/	
Irrigated Paddy Fields	180	118	62	0
Rainfed Upland Fields	70	0	70	0
Total	250	118	132	-

1/: The area located to the south of the proposed site for the oxidation pond

(4) New Extension Area

The target area is the least developed area in the Study Area and maximum introduction of the irrigated paddy cultivation within the availability of water resources is envisaged to maximise beneficiary areas in the area. However, the strongly salt affected areas of 980 ha which are assessed currently not suitable for irrigation farming are excluded from the Project Area and the continuation of the present land use of the areas as grass land/grazing land and upland fields is planned. In addition, the southern parts of the area, mostly occupied with the said salt affected areas, and the non-irrigable area to the north of the proposed diversion channel are also excluded from the Project Area as the results of irrigation study. Further, the present village yards(150 ha) and the surroundings of the villages which are set aside for the future expansion of village yards are not included in the Project Area. Accordingly, 2,613 ha or 53 % of the area are developed into paddy fields under the Project.

Land Use	Present/Study Area	With Project/Study Area(ha in gross)		Change
		Project Area	Outside Project Area	
Irrigated Paddy Fields	0	2,613	0	+ 2,613
Rainfed Upland Fields	3,810	0	1,267	- 2,543
Grass Land/Grazing Land	970	0	900	- 70
Village Yards	150	0	150	0
Total	4,930	2,613	2,317	-

As a whole, about 70 % or 5,809 ha of the Study Area are delineated as the Project Area(the gross irrigation command area) and the Project aims at increasing the area of irrigated paddy fields by 3,882 ha in gross from the present level, by converting 3,812 ha of upland fields and 70 ha of grass land/grazing land. The overall proposed land use plan for the entire Study Area and Project Area in comparison with the present land use is summarised below;

Land Use	Present/Study Area	With Project/Study Area (ha in gross)		Change
		Project Area	Outside Project Area	
Irrigated Paddy Fields	2,002	5,809	75	+ 3,882
Irrigable Upland Fields	1,162	0	0	- 1,162
Rainfed Upland Fields	4,160	0	1,510	- 2,650
Grass Land/Grazing Land	970	0	900	- 70
Village Yards	150	0	150	0
Total	8,444	5,809	2,635	-

Based on the irrigation study, the net irrigation command area(irrigated paddy fields) in the Project Area under "With-Project" is estimated to be 4,700 ha or about 80 % of the gross area and the increase of the same is 1,046 ha in the Existing Lower Moshi Project Area, 69 ha in the Expanded Area, 2,090 ha in the New Extension Area and 3,200 ha in total from the present level or the same account for 314 % of the present irrigated paddy fields in the Area as follows;

Area	Project Area	Project Area/With-Project		Change
	Present(net)	Gross Area	Net Area	in Net Area
Existing Project Area	1,104 (100%)	2,654	2,150 (195%)	+ 1,046
Expanded Area	391 (100%)	542	460 (118%)	+ 69
New Extension Area	0	2,613	2,090	+ 2,090
Total	1,495 (100%)	5,809	4,700 (314%)	+ 3,205

3.3 Proposed Cropping Pattern

3.3.1 Agro-climatic Conditions

Under irrigated conditions, the climatic conditions in the Study Area generally present a favourable environment for crop growth throughout the year except for the low temperature injury problem for paddy plant in winter, to which special attention should be paid. The minimum temperature from June to October sometimes falls below 14℃ and the recorded minimum in the past 15 years was 9.5℃ in August 1996. Since the start of paddy cultivation in KADC in 1982, occurrence of low temperature injuries was reported twice by the JICA expert. The first was observed in the Trial Farm of KADC in 1984 and the second was in the 2nd season crops in 1988 in the Existing Lower Moshi Project Area. In both cases, the low temperatures before the flowering stage, during July and August, were considered as the cause of cool temperature injury. In addition, the slight low temperature injury was reported by farmers in 1992 and 1996. However, the effects of the past low temperature injuries on paddy yields in the Area were slight to moderate as a whole and the yield survey in the second season of 1988 showed a yield range of 4.0 to 7.3 t/ha and an average yield of 5.7 t/ha as indicated in Table E.3.3.

Cool temperature injuries generally show varied symptoms of paddy plant depending on growth stages affected and common phenomena are stunting, delayed heading, high spikelet sterility and irregular maturity. Stunting at seedling stage is a common symptom of cool injury in seedlings. Delayed heading is induced by delayed growth due to cool weather conditions. Spikelet sterility is caused when paddy plant encounters low temperature, 15 - 20℃, during the booting stage to the heading stage. Irregular maturity is a common feature of cool temperature damage. The cool temperature injuries observed in the Trial Farm and the Existing Lower Moshi Project Area showed a symptom of high spikelet sterility and were caused by low temperature in July - August. It is generally accepted that the critical period for cool injury is about 20 days, from 15 days before heading to 5 days after heading.

For the determination of paddy cropping calendar under the Project, the most decisive factor other than water availability is low temperature in the winter season. Accordingly, to study the proposed paddy cropping calendar, the daily minimum temperatures from June to October in the past 15 years from 1982 to 1996 were examined as shown in Tables E.3.3 and E.3.4 shows the number of days in a decade with the minimum temperature lower than 17℃, generally accepted critical temperature for inducing low temperature injuries and indicates the possibility of occurrence of low temperature injury from June to October and the higher possibility in July and August.

Accordingly, the paddy cropping calendar is to be so determined that the paddy growing season does not coincide with the period of cool temperature in July and August as far as possible, especially the critical period of about 20 days, from the booting stage to 5 days after heading, should preferably not fall within July and August. In contrast, no serious climatic constraints for upland crops will be encountered throughout the year under irrigated conditions.

3.3.2 Crop Selection

In the cropping pattern under the Project, the cultivation of paddy and alfalfa as a soil amelioration crop are proposed in accordance with the basic development concepts for agriculture development. The considerations made in the selection of crops are as follows;

(1) Paddy

The importance of paddy as a food crop substantially increased in the past two decades and it is the second most popular staple food and now consumed by about 60 % of the population particularly in the urban communities. It is estimated that the per capita consumption of paddy increased from about 15 kg/year in the 1970s to about 35 kg/year in the 1990s(1993-95 Paddy Almanac, IRRI, 1994). The annual population growth of 2.3 % in Tanzania, changes in traditional eating habits and rapid urbanisation will further expand the demand for paddy and, therefore, will become a strong pressure to increase production of paddy and bring about a substantial increase of paddy import in the future if failed to meet the future increase of demand for the crop domestically. From agronomic and economic view points, stability, high potential and high profitability of production of paddy have been proved in the Existing Lower Moshi Project Area and no other crops will be produced by small holders in large scales gaining an economic advantage over paddy. Accordingly, the selection of paddy as a main crop and the introduction of double cropping of it in the entire Project Area are proposed and the establishment of the Area as the national technical center for small scale irrigated paddy farming in the lowlands is aimed at as set forth as one of the basic concepts for the agriculture development in the Project.

(2) Alfalfa

In order to prevent soil degradation due to irrigation with water containing slight to moderate amount of soluble salts and to ensure sustainable use of land resources, the introduction of alfalfa in the cropping pattern as an annual crop which has dual purposes of soil amelioration and supply of protein rich feed resources is proposed as one of measures for soil management. The introduction is planned to start from 5th to 7th cropping after the stabilisation of percolation losses except for existing paddy fields. The cultivation of it is planned from the 1st year in the Existing Lower Moshi Project Area for the production of seed resources required in the Project Area.

(3) Maize

In the National Irrigation Development Policy, irrigation development for maize production is not suggested by stating that "there is little justification for investing in irrigation as a means of increasing the nation's self-sufficiency or security in maize(at least in the public sector)"(The National Irrigation Development Plan, 1994, MOA, p.34). Accordingly, the introduction of maize is not planned in the cropping pattern under the Project. Findings obtained at the public meetings and interviews with village representatives under the present Study indicate farmers general intentions to grow maize in paddy fields after the development of the Project, primarily to produce the staple food for family consumption every year by simply allocating a part of their paddy fields for maize cultivation. Maize requirements per household are estimated at about 600 kg/year (5.0 family members/house hold x 120 kg/year/member) and an area required to meet such consumption will be around 0.15 to 0.2 ha under irrigation. However, under the proposed irrigation plan and the operation and management system of the Project, it is not practical to introduce maize in a part of every plot or in a part of every tertiary block , which means that farmers can grow maize only once every several seasons; for example in case when 25 % of total cropped areas are to be planted with maize, a farmer can grow it only once in every 4 years, which will not suffice farmers intentions to produce maize for the family consumption every year.

3.3.3 Proposed Cropping Pattern

On the basis of the study on agro-climatic conditions in the previous section and the paddy cropping calendar being introduced successfully in the Existing Lower Moshi Project Area and in accordance with the basic development concepts in 3.1, the proposed land use plan in 3.2 and the results of irrigation study, the proposed cropping pattern at the full development stage is formulated as shown in Figure E.3.2. The pattern plans paddy cultivation at 100 % cropping intensity(4,700 ha) in the rainy season, the same at 50 % intensity (2,350 ha) in the dry season and alfalfa cultivation in rotation with paddy in 20 %(940 ha) of the whole area in the latter part of the dry season. The cultivation of alfalfa is planned in rotation with paddy once in every 5 years. Aiming at the equal distribution of project benefit to all the Project Area, the introduction of the same cropping pattern to the Existing Lower Moshi Project Area, Expanded Area and New Extension Area is planned as follows;

	Paddy		Alfalfa	
Project Area	Rainy Season	Dry Season	Dry Season	Annual
Existing Project Area	2,150 ha (100%)	1,075 ha (50%)	430 ha (20%)	3,655 ha (170%)
Expanded Area	460 ha (100%)	230 ha (50%)	92 ha (20%)	782 ha (170%)
New Extension Area	2,090 ha (100%)	1,045 ha (50%)	418 ha (20%)	3,553 ha (170%)
Project Area Total	4,700 ha (100%)	2,350 ha (50%)	940 ha (20%)	7,990 ha (170%)

The increases of the cropped area and cropping intensity from the present level at the full development stage are shown in Table E.3.5 The annual increases of cropped area of paddy from the present level are 2,445 ha in the Existing Lower Moshi Project Area, 36 ha in the Expanded Area, 3,135 ha in the New Extension Area and 5,616 ha in total of the Project Area. The cropping intensity of paddy will increase by 89 % in the rainy season, by 32 % in the dry season and by 121 % annually. The overall annual cropping intensity will increase from the present 104 % to 170 % or the increase of annual cropped area of 2,800 ha, from the present 5,191 ha to 7,990 ha under the Project.

3.4 Anticipated Crop Yields and Crop Production Plan

3.4.1 Anticipated Crop Yields and Crop Production

The crop yields under the with-project conditions are estimated on the basis of the past crop cut survey records in the Existing Lower Moshi Irrigation Project Area in case of paddy, however that of alfalfa is estimated based on the yield level at NAFCO neighbouring the Study Area in the south where it is cultivated as a perennial crop under basin irrigation and with application of chemical fertiliser as other reference experiences around the Area are not available.

(1) Anticipated Crop Yields

(a) Paddy

The past records of paddy cut survey by KADP are presented in Tables E.3.6. As shown in the table, the recent yield levels at the Existing Lower Moshi Project Area are 6.6 t/ha(average of 5 years from 1992 to 1996). The crop cut results of 2 seasons in 1997 were over 8.0 t/ha, when climatic conditions were favourable and water supply conditions were sufficient through the curtailment of cropped area or with the good distribution of rainfall. This indicates the high potential yield of paddy(IR54) under the sufficient irrigation water supply. The sunshine hours at the ripening stage in the rainy season cropping is considerably lower than those in the dry season cropping as shown in the figure given in the proposed cropping pattern(Figure E.3.2), which may indicate the higher potential yield in the dry season. The tendency of somewhat lower yields of the rainy season cropping is also recognised in the past crop cut records although the insufficient supply of irrigation water might have been the cause of lower yield in many

cases. In the proposed farming practices in the following section, however, the introduction of other varieties than IR54 having high yielding properties with the same growth duration or somewhat shorter growth duration of 120-130 days is proposed. The cultivation of paddy varieties of shorter growth duration may result in yield levels of lower than that of IR54 in the field level because the capability of paddy plant for compensating for unfavourable growth conditions in the early growth stage is usually lower in a variety of shorter growth duration.

On the basis of the above understandings, the target yields of paddy in the Existing Lower Moshi Project Area and New Extension Area are conservatively set at 6.5 t/ha in the rainy season and 7.0 t/ha in the dry season, similar yield levels to the present yields in Existing Lower Moshi Project Area. The same in the Expanded Area are estimated at 6.0 t/ha in the rainy season and 6.5 t/ha in the dry season, increase of 2.5 t/ha and 2.0 t/ha from the present level respectively, because imperfect soil drainability will still remain as a negative factor for paddy production even after the implementation of drainage improvement works under the Project.

(b) Alfalfa

In NAFCO, the crop is cultivated at the salt affected areas as a perennial forage crop and generally 3 times of harvesting a year at every flowering stage are practised. The current yield levels are estimated at 10 to 12 t/year. Under the project, it is cultivated as an annual crop and will be harvested at about 3.5 months after sowing in order to make fields ready for land preparation of the rainy season paddy cultivation as shown in Figure E.3.2. The target yield of alfalfa is conservatively set at 3.0 t/ha under the Project even though soil conditions in the Project Area are far better than those of NAFCO.

(2) Anticipated Crop Production

On the basis of the anticipated crop yields, the anticipated crop productions at the full development stage are estimated as presented in Table E.3. 7 in comparison with the present crop productions in the Project Area(details given in Table E.3.12) and as shown below.

Crops	Present	With-Project	Increment
Paddy (ton)	7,700	46,700	+ 39,000
Maize (ton)	5,800		- 5,800
Alfalfa (ton)		2,800	+ 2,800
Total Food Crops	13,500	46,700	+ 33,200

As shown in the table, the production of paddy will reach to some 46,700 t/year or the increase of some 39,000 t/year from the present level will be achieved under the Project. The annual incremental production of food crops amounting to 33,200 tons is anticipated, which will largely contribute to the national food security in Tanzania.

3.4.2 Crop Production Plan

(1) Yield Build-up Period

The yield build-up periods of paddy are examined area-wisely as follows;

(a) Existing Paddy Field in the Existing Lower Moshi Project Area

The target yields for this area will be achieved in the 1st year under the Project as such yield levels are already obtained in the area under the favourable irrigation supply.

(b) Current Upland Fields in the Existing Lower Moshi Project Area

Table E.3.6 shows the yields of paddy(results of crop cut survey) in the initial stage of development in the Existing Lower Moshi Project Area. The table indicates that the yield levels similar to the present target yields were already achieved in 1987 when paddy cultivation started for the first time in the entire Existing Lower Moshi Project Area. Although most of the farmers in the Existing Lower Moshi Project Area had experiences in irrigation farming under traditional furrow system prior to the development of the project, the introduction of well adopted high yielding variety, the introduction of communal nursery system, tractor hiring services and dissemination of recommended modern/intensive paddy farming practices prior to the project by KADC and after the project by KADP and framers capability to adapt such farming practices are enumerated as reasons for the attainment of high yields from the initial stage of the project.

In the subject current upland fields, most of the farmers have experiences in intensive paddy farming practices adapted in the Existing Lower Moshi Project Area being employed as casual labours and a part of the farmers have paddy fields. Therefore, it is expected that the adaptation of recommended farming practices will be faster than experienced in other areas or countries if an intensive practical training on management of irrigated paddy farming is carried out, agriculture supporting services, especially tractor hiring services, similar to those rendered to the Existing Project Area in the initial stage are introduced and a district regulation similar to the present District By-laws is enacted, which impose the adaptation of recommended farming practices on beneficiary farmers.

(c) New Extension Area

There exist no irrigation facilities in the area and farmers have limited experiences in management of irrigated farming and irrigation water although most of them have experiences in intensive paddy farming practices employed as casual labours in the Existing Lower Moshi Project Area. The soil conditions are similar to the Existing Lower Moshi Project Area and the attainment of high yields from the initial stage is expected as experienced in the Existing Lower Moshi Project Area. However, the yield build-up period is largely depending on farmers adaptation rate of intensive farming practices. Therefore, for the earlier adaptation of recommended practices, the improvement of management and practical skills of farmers through field training making the best use of the Existing Lower Moshi Project Area for extension and training purposes is considered essential in the area in addition to the supporting services and measures discussed in the previous paragraph.

(d) Expanded Area

In the area, farmers having paddy fields with favourable drainage conditions usually obtain high yield level over 6.0 t/ha in the dry season. With the improvement of irrigation and drainage conditions under the Project and the adaptation of recommended farming practices, the attainment of the target yields will be achieved at an earlier stage when the adaptation of recommended farming practices such as communal nursery system and the improvement of water management are strongly promoted together with the introduction of supporting services similar to other areas.

On the basis of the above understandings, the yield build-up periods under the Project are area-wisely assumed as follows;

Area/Season	1st year	2nd Year	3rd Year	4th Year	5th Year	6th Year	7th Year
Existing Lower Moshi Project Area							
1. Existing Paddy Field							
Rainy Season (t/ha)	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Dry Season (t/ha)	7.0	7.0	7.0	7.0	7.0	7.0	7.0
2. Current Upland Field							
Rainy Season (t/ha)	4.5	5.5	6.0	6.5	6.5	6.5	6.5
Dry Season (t/ha)	5.0	5.5	6.0	6.5	7.0	7.0	7.0
Extension Area							
Rainy Season (t/ha)	-	5.0	5.5	6.0	6.5	6.5	6.5
Dry Season (t/ha)	4.0	5.0	5.5	6.0	6.5	7.0	7.0
Expanded Area							
Rainy Season (t/ha)	4.0	4.5	5.0	5.5	6.0	6.0	6.0
Dry Season (t/ha)	5.0	5.5	6.0	6.5	6.5	6.5	6.5

The target yield of alfalfa is assumed to be obtained from the 1st year as the target is set based on rather conservative estimation.

(2) Build-up Period of Cropping Intensity

The high percolation and lateral seepage losses of irrigation water in the initial stage of development is one of the major reasons which restricts the attainment of the target cropping intensity in irrigation development projects as experienced in the Existing Lower Moshi Project Area. From the past experiences, the time required for the stabilisation of field daily water requirement is considered to be 5 to 6 cropping seasons. Considering the time required for the stabilisation of daily field water requirements and the adaptation rate of farmers, the build-up periods of cropping intensity of paddy are assumed as shown in Table E.3.8, E.3.9 and E.3.10 and as explained below.

(a) Existing Paddy Field in the Existing Lower Moshi Project Area

The target cropping intensity of paddy will be achieved from the 1st year. However, according to the implementation schedule of construction works, irrigation water supply in the entire area even in the dry season is expected for the initial 3 years before the start of irrigation in the entire New Extension Area. Accordingly, the cropping intensity of 90 % in the rainy season and 70 % in the dry season in the 1st year, the same of 90 % and 80 % in the 2nd year and the same of 100 % and 80 % in the 3rd year is assumed. The cropping intensity from the 4th year will reach the target of 150 %(rainy season 100 % and dry season 50 %).

(b) Current Upland Fields in the Existing Lower Moshi Project Area

The attainment of the target cropping intensity of paddy is assumed to be in the 4th year. However, similar to the same reason to the existing paddy fields, the cropping intensity of 80 % in the rainy season and 70 % in the dry season in the 1st year, the same of 90 % and 70 % in the 2nd year and the same of 100 % and 70 % in the 3rd year is assumed. The cropping intensity from the 4th year will reach the target of 150 %(rainy season 100 % and dry season 50 %).

(c) New Extension Area

The attainment of the target cropping intensity of paddy is assumed to be in the 4th year. The build-up of intensity is assumed to be: 40 % in the dry season of the 1st year, 70 % in the rainy season and 50 % in the dry season in the 2nd year and the same of 90 % and 50 % in the 3rd year is assumed. The cropping intensity from the 4th year is assumed to be 150 %(rainy season 100 % and dry season 50 %).

(d) Expanded Area

The most of the area are existing paddy fields and the attainment of the target cropping intensity from the 1st year is assumed(rainy season 100 % and dry season 50 %).

The introduction of alfalfa should better be on compulsory basis and the target cropping intensity of the crop(20%) is assumed from the 1st year.

(3) Crop Production Plan

In accordance with the estimated build-up periods of crop yields and cropping intensity and the implementation schedule of project construction works, the area-wise crop production plans under the Project are prepared as shown in Table E.3.8, E.3.9 and E.3.10 and the same for the entire Project Area is given in Table E.3.11. As shown in the tables, the full development will be achieved in 2006 in the Existing Lower Moshi Project Area, in 2007 in the expanded Area, and in 2009 in the New Extension Area. Therefore, the full development of the whole Project Area will be achieved in 2009. Time series crop production plan is summarised in the following table.

(unit: 1000 tons)

Year	Rainy Season Paddy	Rainy Season Paddy	Annual Paddy	Alfalfa
2001	-	8.7	8.7(19%)	-
2002	10.6	10.7	21.3(96%)	0.17(6%)
2003	14.3	12.1	26.5(57%)	0.17(6%)
2004	16.6	12.1	28.7(62%)	0.17(6%)
2005	23.4	14.0	37.4(80%)	1.40(50%)
2006	29.4	14.9	42.0(90%)	1.46(52%)
2007	30.3	15.4	44.7(96%)	2.82(100%)
2008	30.3	15.9	46.2(99%)	2.82(100%)
2009	30.3	16.3	46.7(100%)	2.82(100%)

3.5 Proposed Farming Practices

3.5.1 Proposed Farming Practices

The farming practices for irrigated paddy recommended by KADP (Table E.2.5) have been successfully practised with the average yield of over 6 t/ha in the Existing Lower Moshi Project Area. Accordingly, the application of the said practices in the entire Project Area as the basic farming practices is recommended. However, the introduction of other varieties than IR 54 in rotation is to be promoted urgently in order to avoid huge crop losses because of the outbreak of a certain pest or disease induced by the continuous cultivation of a single variety. Some essential issues to be considered in the introduction of the said recommended practices are as follows;

(1) Variety

The selection of other varieties than IR54 is urgently required as mentioned earlier. The primary selection criteria for such varieties are: high yielding capacity comparable to IR54, resistance to pests and diseases, tolerance of low temperature and variety with growth duration of 120- 130 days, a bit shorter than IR54. For the seasonal replacement of paddy variety aiming at the prevention of the outbreak of a certain pest and disease, at least two other recommended varieties should better be selected in the Project Area and the use of more than two varieties in the rainy season and more one variety in the dry season are proposed. During the KADC/KADP Project, the wide range of varietal selections were conducted by the JICA experts and three varieties, IR50, IR56 and Tolerirana, were selected as promising varieties other than IR54 by KADP as shown in Table E.2.7. As the capacity of KATRIN is rather limited and they have no specific recommended high yielding varieties to the Lower Moshi area at present, the immediate start of verification trials of such varieties and varieties recently obtained from IRRI by KADP and KATC is considered essential. In addition, the selection of varieties resistant to Yellow Mottle Virus and the stocking of seed resources of the varieties are also necessary.

(2) Nursery and Transplanting

The introduction of communal nursery system and line planting(regular planting) as is practised in the Existing Lower Moshi Project Area should be aimed at in the entire Project Area in order to ensure the observance of cropping schedule and of the recommended planting density by new beneficiaries.

(3) Land Preparation

The use of a 4 wheel tractor will be essential in the newly developed paddy fields for ensuring: 1) proper land levelling, 2) observance of cropping schedule by new beneficiaries, 3) implementation of efficient water management and rational use of irrigation water and 4) to secure a target cropping intensity .The strengthening of tractor hiring services of KADP to cover the entire Project Area should preferably be examined under the Project.

(4) Fertilisation

The soils in the Project Area generally have high mineral fertility and contain high available phosphate and exchangeable potassium. Further, the water of the Kikuletwa river contains high potassium ions of nearly 20 ppm(results of water analysis taken in Phase I Survey), which means K2O supply of over 200 kg through irrigation in one cropping season. Accordingly, an application of potassium fertiliser will not be effective in the Project Area. However, the application of phosphate fertiliser will be necessary to avoid deplenishing of available phosphate resources in the soils. In addition, the effectiveness of Urea in soils with pH > 7 is usually inferior to that of Ammonium Sulphate due to denitrification. Fertiliser trials on nitrogen sources and effects of phosphate application are required for the review of the current recommended fertiliser level.

(5) Plant Protection

The establishment of plant protection system is another essential task to be handled by KADP as the substantial increase of cropping intensity of paddy will build the danger of the outbreak of pests and diseases. The close cooperation with research institutes as KATRIN for the development of practices for controlling possible pests and diseases in and around the Project Area.

(6) Harvesting

One of the varietal characteristics of IR54 favoured by farmers is high shattering property of it and on the contrary it is a main reason why farmers dislike cultivation of IR56, one promising variety selected by KADC/KADP(hard beating works are necessary for threshing of the variety). However, harvesting losses of IR54 in the Existing Lower Moshi Project Area are considered substantial due to its high shattering property. The selection of varieties having lower shattering property compared with IR54 may result from the varietal selection. The introduction of pedal threshers will give solution to the shattering problems, which should be demonstrated through the operation of demonstration farms of such varieties.

The farming practices for alfalfa should be established through the verification trials, especially on seeding methods, variety, irrigation method and fertilisation. The tentative recommended practices are prepared based on the experiences in NAFCO as follows;

Land Preparation	Disc harrowing
Variety	Hairy Perubian
Sowing	Drilling(50-70cm) or broad casting
Seeding rate	7.5 - 10 kg/ha
Fertiliser	Urea 50 kg/ha, TSP 50 kg/ha
Irrigation	Basin or border irrigation
Harvesting	Cutting and bailing manually

Presently, seed prices of alfalfa is extremely high and seed multiplication by KADP at the introduction stage and self-multiplication by farmers after the introduction is necessary as proposed in Annex G.

3.5.2 Machinery Requirements

In the proposed farming practices, the utilisation of 4 wheel tractors for land preparation works as is practised in the Existing Lower Moshi Project Area is proposed in order to ensure the proper land levelling and observance of cropping schedule by farmers, the implementation of efficient water management and the rational use of irrigation water. The number of tractors required for land preparation works at the full development stage are estimated at 72 units when all land preparation works in the entire Project Area are performed by the tractor hiring services of KADP as shown below.

Cropped Area 1/: 4,700 ha(cropping intensity 100%)
Requirements 2/ 3/: 4,700 ha / (1.2 ha/day/unit x 60 days)/0.9 = 72 units

1/: Cropped area in rainy season when demand for tractor services is highest.
2/: Average operation capacity of 1.2ha/day/unit based on KADP experiences
3/: No. of operation days in the season assumed at 60 days & operation efficiency assumed at 90%

The strengthening of tractor hiring services by KADP is proposed to meet an expansion of needs for tractors services as the financial capability of farmers is limited and the financial background and management skills of CHAWAMPU have not been well established yet to operate such hiring services by themselves. (The detail proposal for the strengthening plan is discussed in Annex G.)

3.5.3 Labour Requirements

Labour requirements per ha for paddy and for alfalfa under the with-project conditions are estimated as shown in Table E.3.13. On the basis of the unit labour requirements, the labour balances by a 10-days for a typical farm of holding size of paddy field 1.0 ha are examined as shown in Table E.3.14. The labour balance study indicate the occurrence of labour shortages in transplanting and harvesting periods in the rainy season when the entire paddy field is under cultivation. The labour shortage in transplanting is estimated at 11 mandays and that in harvesting is 18.5 mandays. Such shortages of labour will have to be sufficed through labour exchange among villagers or by employing casual labours within or from the outside of the Project Area.

On the other hand, the labour balances under with-project by area and for the whole Project Area are shown in Table E.3.15. The results indicate the sufficiency of labour supply within the Project Area as a whole. The promotion of labour exchange will substantially replace the requirements for casual labours from outside of the Project Area.

The incremental labour requirements at the full development stage from the present level are estimated to 646,000 mandays per year as shown in Table E.3.15 and E.3.16, which indicates the huge increase of job opportunities for people in and around the Project Area.

3.6 Post-harvest Facilities

Presently most of paddy produced in the Project Area are sold to traders after harvest generally at fields except for a portion kept for family consumption or else. Such marketing practices of farmers will continue as the activity of traders or business minded individuals became substantially active in and around Moshi since the privatisation of marketing of farm products. Further, it is expected that such business minded individuals or private sectors will positively participate in the marketing operation of expanding paddy products under the Project and marketing constraints of farm products in terms of volume will not be encountered in the future. However, the requirements for drying yards and storage facilities for short time storing prior to shipment will be high in order to avoid degradation of quality of paddy during transportation. It is strongly recommended to promote timely participation of private sectors in such procurement, drying and marketing operations of paddy.

On the other hand, the results of farmer interview survey under the present study revealed the farmers' expectation to the expansion of sales and marketing functions of agriculture cooperatives because in terms of marketing prices, the concentration of harvesting season due to climatic conditions or irrigation schedule usually results in disadvantage for farmers in bargaining with traders. However, the participation of cooperatives in such business activities will not be so prosperous unless the substantial improvement of management skills of the cooperatives is performed so as to compete with business minded individuals or experienced private firms.

In the present study, the requirements of small scale rice mills in the Study Area to handle the increasing rice consumption in the Area after the development and the operation of KPHC under the Project have been examined as the issues on post-harvest facilities in the following section.

(1) Requirements of Small Scale Rice Mills

Presently, rice milling for family consumption is exclusively done by small scale mills in and around villages in the Study Area. With the Project, the needs for such small scale rice milling units will increase with the expansion of rice consumption in the Area. Assuming 50 kg of per capita consumption, milling of all requirements for family consumption in the Area and continuous operation of the existing rice mills(14 units), the requirements of small scale rice mills at the full development stage are estimated as follows;

Estimated population at full development stage(2015)	37,600
Estimated annual consumption in the Study Area	1,880 t/year
Estimated annual milling requirements in the Study Area 1/	2,900 t/year
Actual milling capacity of existing mills in the Area 2/	1,750 t/year
No. of additional small scale mills 3/	9

1/: Assumed to be: 1,880 t / 0.65(recovery rate) = 2,900 t/year
2/: Assumed to be: 14 units x 500 kg/day(actual capacity) x 250 operation days/year
3/: Assumed to be: (2,900 - 1,750) / 125 t/year(capacity of mill) = 9

The estimated requirements will be fulfilled by business minded individuals as is the case in the Existing Lower Moshi Project Area or CHAWAMPU may have interest in such operation.

(2) Operation of KPHC

The rice mill plant of KPHC is presently operated at below its capacity. With the expansion of paddy production in the Project Area, the substantial increase of handling volumes of the plant is expected and will become necessary to share the increasing demand for processing of paddy. The milling capacity of the plant is about 30 t/day and 750 t/month at 1 shift operation. The manager of the plant expressed the possibility to double the monthly capacity by the introduction of an operation system of 2 shifts.

Assuming the operation period of 5 months/season, the seasonal milling capacity under 2 shifts operation is estimated at 6,000 to 7,500 tons of paddy as follows;

Milling Capacity/Day:	60 t/day at 2 shifts operation
Monthly Operation Days:	20 - 25 days/month
Milling Capacity/Month:	1,200 - 1,500 t/month
Operation Months/Season:	5 months
Seasonal Milling Capacity:	6,000 - 7,500 tons of paddy

Recently, the plant processes about 2,400 tons of paddy received from the outside of the Existing Lower Moshi Project Area. Assuming that such volume of paddy is supplied continuously from the outside in the future(about 1,000 t/5 months) and that the remaining capacities of some 5,000 to 6,500 tons per season are directed to the processing of paddy produced in the Existing Lower Moshi Project Area, the processing volume by KPHC will account for about 35 to 45 % of the production of paddy in the rainy season and some 65 to 85 % of the same in the dry season at the full development stage in the Area. The annual processing volumes will be nearly equal to 45 to 60 % of paddy produced in the Area under the Project.

Assuming that about 6,000 tons of paddy per season including supply from the outside of the Project Area are planned to be processed in 5 months, the requirements for drying yards and storage facilities are estimated in Table E.3.17. As shown in the Table, the current drying and storage capacities of the KPHC rice mill will become insufficient and have to be expanded as follows;

Facilities	Present Capacity	Capacity Required 1/	Expansion Required
Drying Yard	80 t/day ; 3,200 m2	133 t/day; 5,300 m2	53 t/day; 2,100 m2
Godown	1,800 t	2,300 t	500 t

1/: Capacity required to handle 6,000 t per season;

In addition to such major facilities, the expansion of other facilities will become necessary with the expansion of handling volume. Further, the participation in the procurement and marketing operations of rice as is envisaged by KPHC and the introduction of services to the satisfaction of producers such as transportation from fields to drying yards or purchasing paddy at fields are considered essential. The expansion of handling volume will improve the financial status of KPHC, therefore, the due consideration of the management of KPHC and KNCU for the subject is highly expected to share the increasing demand for rice processing in the Project Area.

The problem of husk disposal could be solved by finding isolated areas for burning and by imposing such additional handling charges on beneficiaries until an economic disposal measure in situ is developed and introduced.

3.7 Animal Husbandry under With-project Conditions

Under the Project, over 90 % of the areas categorised as the grass land/grazing land and utilised for grazing purpose in the southern part of the Study Area are excluded from the Project Area. Therefore, there will be little negative impacts on those who utilise the lands as grazing lands, mainly the Maasai pastoralists domiciling in Mtakuja village. Rather, some of the Maasai people are beneficiaries of the Project as they are different from the typical pastoralists and are engaging in farming.

While, the conversion of upland fields of some 2,500 ha or about 65 % of upland fields in the Study Area to irrigated paddy fields will result in the reduction of lands for grazing in the dry season, from September to February, as fallow upland fields are main grazing grounds in the season and grazing in irrigated fields will be prohibited under the Project as is the case in the Existing Lower Moshi Project Area. Grazing capacity of farm lands in the dry season(fallow lands) are estimated at 4 to 6 ha to one animal unit by District Livestock Development Office and the decrease of about 2,500 ha of lands available for grazing in the dry season is roughly equal to the decease of grazing capacity for 400 to 600 animal units.

However, the huge expansion of production of animal feed resources, paddy straw and the production of high protein leguminous feed, alfalfa, are anticipated under the Project. The increase of the production of such feed resources at the full development stage in the Project Area are estimated as follows;

(unit:ton)

Feed Resources 1/	Present	With-Project	Increment
Production of Paddy Straw 2/	7,700	46,700	+ 39,000
Production of Maize Stalk 2/	7,300	0	- 7,300
Production of Alfalfa	0	2,800	+ 2,800
Total	15,000	49,500	+ 34,500

1/:Dry matter basis; 2/:Assuming grain:straw ratio & grain:stalk ratio = 1:1&1:1.5

Assuming daily feeding rate of 25 kg/day of dry grasses per animal unit as estimated by District Livestock Development Office, the incremental production of feed resources are roughly estimated to be equal to annual feed supply for 3,800 animal units, which will bring about the substantial improvement of productivity of animal husbandry in the Project Area when these resources are efficiently utilised for animal feeding.

For the productivity increase of animal husbandry in the Study Area, the improvement of feeding system in the dry season is considered essential, from the present grazing system depending on poor vegetation in fallow upland fields to zero-grazing system, the system presently prevailing in the Area in the rainy season, as well as the improvement of genetic resources and the strengthening of veterinary services. The introduction of zero-grazing system utilising paddy straw and other feed resources throughout a year will brought about the production of substantial volume of farmyard manure. The dressing of crop residues in the form of farmyard manure is one of the important soil management practices to maintain soil permeability as discussed in Chapter 3 of Annex D. Accordingly, the improvement of animal feeding system together with the introduction of soil management practices utilising farmyard manure will be one of the important extension targets of KADP and DALDO in the Project Area.

Tables

Table E.2.1 Present Land Use in the Study Area

Subject Area	Gross Area (ha)										Net Area				Remarks
	Land Use Category								Total		Land Use Category				
	Irrigated Paddy Field		Irrigable Upland Field		Rainfed Upland Field 1/		Grass Land/ Grazing Land	Village Yard			Irrigated Paddy Field	Irrigable Upland Field	Rainfed Upland Field	Total	
	Area	(%)	Area	(%)	Area	(%)			Area	(%)					
Existing Lower Moshi Project Area															
- Upper Mabogini	228	11	-	-	-	-	-	-	228	3	180	-	-	180	Actual net area
- Lower Mabogini	377	19	467	40	-	-	-	-	844	10	293	420	-	713	Upland:gross x 90% Paddy:actual area
- Rau Ya Kati	442	22	361	31	-	-	-	-	803	10	284	325	-	609	Upland:gross x 90% Paddy:actual area
- Chekereni	312	16	100	9	-	-	-	-	412	5	244	90	-	334	Upland:gross x 90% Paddy:actual area
- Oria	133	7	234	20	-	-	-	-	367	4	103	211	-	314	Upland:gross x 90% Paddy:actual area
Total	1,492	75	1,162	100	-	-	-	-	2,654	31	1,104	1,046	-	2,150	
Expanded Area															
- Mandaka Mnono	330	16	-	-	280	7	-	-	610	7	300	-	250	550	Gross x 90%
- Kaloleni	180	9	-	-	70	2	-	-	250	3	160	-	60	220	Gross x 90%
Total	510	25	-	-	350	8	-	-	860	10	460	-	310	770	Gross x 90%
New Extension Area	-		-	-	3,810	92	970	150	4,930	58	-	-	3,430	3,430	Gross x 90%
Total Area	2,002	100	1,162	100	4,160	100	970	150	8,444	100	1,564	1,046	3,740	6,350	
Study Area %	24	-	14	-	49	-	11	2	100	-					

Total Net Irrigable Area within Existing Lower Moshi Irrigation System

Within Exisitng Lower Moshi Irrigation Project				2,150ha
Outside of ExisitngLower Moshi Irrigation Project	Pilot Farm 80 ha	Kahe Sisal Estate 70 ha	Outside Total	150ha
			System Total	2,300 ha

File:ET-1

1/: Including scattering housing yards

Table E.2.2 Cropped Area and Cropping Intensity in Paddy Fields by Irrigation System (1985 - 1996) - 1/2

Year	Season	Crops If	Mabogini System Paddy Field: 473 ha Cropped Area (ha)	Mabogini System Paddy Field: 473 ha Intensity (%)	Rau System Paddy Field: 631 ha Cropped Area (ha)	Rau System Paddy Field: 631 ha Intensity (%)	Existing Project Area Total Total Paddy Field: 1,104 ha Cropped Area (ha)	Existing Project Area Total Total Paddy Field: 1,104 ha Intensity (%)	Existing Project Area Total Total Paddy Field: 1,104 ha Yield (t/ha)	Existing Project Area Total Total Paddy Field: 1,104 ha Estimated Production (t)	Remarks
1985	Annual	Paddy	94	20			94	-	7.0	658	Cultivation only in Mabogini
1986	Annual	Paddy	592	125			592	-	7.1	4,203	Cultivation only in Mabogini
1987	Annual	Paddy	393	83	491	78	884	80	6.7	5,923	Cultivation started in the entire area
1988	Annual	Paddy	556	118	729	116	1,285	116	6.3	8,096	3 cropping seasons introduced
1989	Annual	Paddy	611	129	823	130	1,434	130	5.5	7,887	
1990	Annual	Paddy	635	134	873	138	1,508	137	6.5	9,802	Highest cropping intensity in the past
1991	Annual	Paddy	473	100	662	105	1,135	103	6.8	7,718	System maintenance in 1st & 2nd season
1992	Rainy Season	Paddy	0	0	0	0	0	0		0	No cultivation due to water shortage
		Fallow	473	-	631	-	1,104	-			
	Early Dry Season	Paddy	180	38	257	41	437	40	7.9	3,452	
		Fallow	293	-	374	-	667	-			
	Late Dry Season	Paddy	204	43	250	40	454	41	7.8	3,541	
		Fallow	269	-	381	-	650	-			
	Annual	Paddy	384	81	507	80	891	81	7.8	6,994	
1993	Rainy Season	Paddy	135	29	183	29	318	29	6.3	2,003	Cropped area limited due to water shortage
		Fallow	338	-	448	-	786	-			
	Early Dry Season	Paddy	134	28	259	41	393	36	5.9	2,319	
		Fallow	339	-	372	-	711	-			
	Late Dry Season	Paddy	140	30	127	20	267	24	6.7	1,789	
		Fallow	333	-	504	-	837	-			
	Annual	Paddy	409	86	569	90	978	89	6.2	6,111	
1994	Rainy Season	Paddy	0	0	0	0	0	0		0	No cultivation due to water shortage
		Fallow	473	-	631	-	1,104	-			
	Early Dry Season	Paddy	173	37	249	39	422	38	5.3	2,237	Low yield due to insufficient water
		Fallow	300	-	382	-	682	-			
	Late Dry Season	Paddy	100	21	125	20	225	20	6.8	1,530	
		Fallow	373	-	506	-	879	-			
	Annual	Paddy	273	58	374	59	647	59	5.8	3,767	

Table E.2.2 Cropped Area and Cropping Intensity in Paddy Fields by Irrigation System (1985 - 1996) - 2/2

Year	Season	Crops 1/	Mahogini System Paddy Field: 473 ha		Rau System Paddy Field: 631 ha		Existing Project Area Total Total Paddy Field: 1,104 ha				Remarks
			Cropped Area (ha)	Intensity (%)	Cropped Area (ha)	Intensity (%)	Cropped Area (ha)	Intensity (%)	Yield (t/ha)	Estimated Production (t)	
1995	Rainy Season	Paddy	80	17	0	0	80	7	6.2	496	No cultivation in Rau due to water shortage
		Fallow	393	-	631	-	1,024	-			
	Earl Dry Season	Paddy	109	23	164	26	273	25	6.2	1,693	
		Maize	147	31	222	35	369	33			Maize cultivation allowed in fallow land
		Total	256	54	386	61	642	58			
		Fallow	217	-	87	-	304	-			
	Late Dry Season	Paddy	90	19	86	14	176	16	6.1	1,074	
		Fallow	383	-	545	-	928	-			
	Annual	Paddy	279	59	250	40	529	48	6.2	3,262	Lowest crop. intensity of Paddy since 1987
		Maize	147	31	222	35	369	33			
		Total	426	90	472	75	898	81			
1996	Rainy Season	Paddy	127	27	116	18	243	22	5.4	1,312	
		Fallow	346	-	515	-	861	-			
	Earl Dry Season	Paddy	93	20	202	32	295	27	7.1	2,095	
		Maize	199	42	313	50	512	46			Maize cultivation allowed
		Total	292	62	515	82	807	73			
		Fallow	181	-	116	-	297	-			
	Late Dry Season	Paddy	120	25	158	25	278	25	6.6	1,835	
		Fallow	353	-	473	-	826	-			
	Annual	Paddy	340	72	476	75	816	74	6.4	5,242	
		Maize	199	42	313	50	512	46			
		Total	539	114	789	125	1,328	120	-	5,242	
1997	Rainy Season	Paddy	54	11	78	12	132	12	8.5	1,122	
		Fallow	419	-	553	-	972	-			
	Earl Dry Season	Paddy	169	36	208	33	377	34	8.5	3,205	
		Maize	208	44	345	55	553	50			
		Total	377	80	553	88	930	84			
		Fallow	96	-	78	-	174	-			
Average of 1992 to 1996	Rainy Season	Paddy	68	14	60	9	128	12	5.9	762	
		Fallow	405	-	571	-	976	-			
	Earl Dry Season	Paddy	138	29	226	36	364	33	6.5	2,359	
		Maize	173	37	268	42	441	40			
		Total	311	66	494	78	805	73			-
		Fallow	162	-	137	-	300	-			
	Late Dry Season	Paddy	131	28	149	24	280	25	7.0	1,954	
		Fallow	342	-	482	-	824	-			
	Annual	Paddy	337	71	435	69	772	70	6.6	5,075	
		Maize	173	37	268	42	441	40			
		Total	510	108	703	111	1,213	110	-	5,075	

1/ Maize cultivation allowed for the first time in 1995

Source: KADP

File:ET-2

Table E.2.3 Cropped Area and Cropping Intensity by Locations in Paddy Fields in the Existing Project Area(1985-1996)-1/2

Year	Season	Crops 1/	Upper Mabogini Paddy Field: 180 ha		Lower Mabogini Paddy Field: 293 ha		Rau Ya Kati Paddy Field: 284 ha		Chekereni Paddy Field: 244 ha		Oria Paddy Field: 103 ha		Exisitng Project Area Total Total Paddy Field: 1,104 ha			
			Cropped Area (ha)	Intensity (%)	Cropped Area (ha)	Intensity (%)	Cropped Area (ha)	Intensity (%)	Cropped Area (ha)	Intensity (%)	Cropped Area (ha)	Intensity (%)	Cropped Area (ha)	Intensity (%)	Yield (t/ha)	Estimated Production (t)
1985	Annual	Paddy	94	52	-	-	-	-	-	-	-	-	94	9	7.0	658
1986	Annual	Paddy	180	100	412	141	-	-	-	-	-	-	592	54	7.1	4,203
1987	Annual	Paddy	360	200	193	66	372	131	203	83	103	100	1,231	112	6.7	8,248
1988	Annual	Paddy	184	102	355	121	364	128	262	107	103	100	1,268	115	6.3	7,988
1989	Annual	Paddy	190	106	394	134	343	121	339	139	115	112	1,381	125	5.5	7,596
1990	Annual	Paddy	318	177	387	132	377	133	335	137	99	96	1,516	137	6.5	9,854
1991	Annual	Paddy	180	100	294	100	119	42	167	68	33	32	793	72	6.8	5,392
1992	Rainy Season	Paddy	0	0	0	0	0	0	0	0	0	0	0	0		0
	Early Dry Season	Paddy	71	39	109	37	122	43	77	32	59	57	438	40	7.9	3,460
	Late Dry Season	Paddy	49	27	155	53	112	39	94	39	12	12	422	38	7.8	3,292
	Annual	Paddy	120	67	264	90	234	82	171	70	71	69	860	78	7.9	6,752
1993	Rainy Season	Paddy	107	59	29	10	76	27	75	31	12	12	299	27	6.3	1,884
	Early Dry Season	Paddy	45	25	89	30	125	44	77	32	58	56	394	36	5.9	2,325
	Late Dry Season	Paddy	49	27	91	31	61	21	75	31	12	12	288	26	6.7	1,930
	Annual	Paddy	201	0 112	209	0 71	262	0 92	227	0 93	82	0 80	981	89	6.3	6,138
1994	Rainy Season	Paddy	0	0	0	0	0	0	0	0	0	0	0	0		0
	Early Dry Season	Paddy	80	44	93	32	99	35	146	60	59	57	477	43	5.3	2,528
	Late Dry Season	Paddy	100	56	0	0	49	17	43	18	33	32	225	20	6.8	1,530
	Annual	Paddy	180	100	93	32	148	52	189	77	92	89	702	64	5.8	4,058

Table E.2.3 Cropped Area and Cropping Intensity by Locations in Paddy Fields in the Existing Project Area(1985-1996)-2/2

Year	Season	Crops 1/	Upper Mabogini Paddy Field: 180 ha		Lower Mabogini Paddy Field: 293 ha		Rau Ya Kati Paddy Field: 284 ha		Chekereni Paddy Field: 244 ha		Oria Paddy Field: 103 ha		Exisitng Project Area Total Total Paddy Field: 1,104 ha			
			Cropped Area	Intensity	Cropped Area	Intensity	Cropped Area	Intensity	Cropped Area	Intensity	Cropped Area	Intensity	Cropped Area	Intensity	Yield	Estimated Production
			(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(t/ha)	(t)
1995	Rainy Season	Paddy	0	0	0	0	0	0	0	0	0	0	0	0		0
	Early Dry Season	Paddy	80	44	109	37	76	27	55	23	33	32	353	32	6.2	2,189
		Maize	54	30	93	32	118	42	71	29	33	32	369	33	2.5	923
		Total	134	74	202	69	194	68	126	52	66	64	722	65	-	3,111
	Late Dry Season	Paddy	38	21	52	18	39	14	35	14	12	12	176	16	6.1	1,074
	Annual	Paddy	118	66	161	55	115	40	90	37	45	44	529	48	6.2	3,262
		Maize	54	30	93	32	118	42	71	29	33	32	369	33	2.5	923
		Total	172	96	254	87	233	82	161	66	78	76	898	81	-	4,185
1996	Rainy Season	Paddy	87	48	40	14	51	18	40	16	25	24	243	22	5.4	1,312
	Early Dry Season	Paddy	0	0	93	32	98	35	71	29	33	32	295	27	7.1	2,095
		Maize	38	21	172	59	135	48	133	55	45	44	523	47	2.5	1,308
		Total	38	21	265	90	233	82	204	84	78	76	818	74	-	3,402
	Late Dry Season	Paddy	72	40	49	17	68	24	57	23	33	32	279	25	6.6	1,841
	Annual	Paddy	159	88	182	62	217	76	168	69	91	88	817	74	6.4	5,248
		Maize	38	21	172	59	135	48	133	55	45	44	523	47	2.5	1,308
		Total	197	109	354	121	352	124	301	123	136	132	1,340	121	-	6,556
Average of 1992 to 1995	Rainy Season	Paddy	39	22	14	8	25	14	23	13	7	4	108	10	5.9	639
		Fallow	141	-	279	-	259	-	221	-	96	-	996	-	-	-
	Early Dry Season	Paddy	55	31	99	55	104	58	85	47	48	27	391	35	6.4	2,519
		Maize	46	26	133	74	127	70	102	57	39	22	446	40	2.5	1,115
		Total	101	56	231	128	231	128	187	104	87	49	837	76		3,634
		Fallow	79	-	62	-	54	-	57	-	16	-	267	-	-	-
	Late Dry Season	Paddy	62	34	69	39	66	37	61	34	20	11	278	25	7.0	1,933
		Fallow	118	-	224	-	218	-	183	-	83	-	826	-	-	-
	Annual	Paddy	156	86	182	101	195	108	169	94	76	42	778	70	6.5	5,092
		Maize	46	26	133	74	127	70	102	57	39	22	446	40	2.5	1,115
		Total	202	112	314	175	322	179	271	151	115	64	1,224	111	-	6,207

1/: Maize cultivation in paddy fields allowed from 1955

File: ET-3

Table E.2.4 Present Cropped Area and Crop Production in the Study Area

Subject Area	Land Use Category Net Area(ha)	Estimated Cropped Area & Cropping Intensity 1/ Season	Crops	Cropped Area (ha)	Intensity (%)	Crop Yield (t/ha)	Estimated Production (t)	Remarks
Existing Lower Moshi Project Area	1. Irrigated Paddy Field 1,104 ha	Rainy Season	Paddy	140	13	5.9	826	2/
			Maize	440	40	2.0	880	3/
		Rainy Season Total		580	53	-	1,706	
		Early Dry Season	Paddy	360	33	6.5	2,340	2/
		Late Dry Season	Paddy	280	25	7.0	1,960	2/
		Dry Season Total		640	58	6.7	4,300	
		Annual	Paddy	780	71	6.6	5,126	
			Maize	440	40	2.0	880	
			Total	1,220	111	-	6,006	
	2. Irrigable Upland Field 1,046 ha	Rainy Season	Maize	1,046	100	2.0	2,092	
Overall of Existing Area	2,150 ha	Rainy Season	Paddy	140	7	5.9	826	
			Maize	1,486	69	2.0	2,972	
			Total	1,626	76	-	3,798	
		Dry Season	Paddy	640	30	7.0	4,300	
			Maize	0	0	-	-	
			Total	640	30	-	4,300	
		Annual	Paddy	780	36	6.6	5,126	
			Maize	1,486	69	2.0	2,972	
			Total	2,266	105	-	8,098	
Expanded Area 1. Mandaka Mnono	1. Irrigated Paddy Field 300 ha	Rainy Season	Paddy	300	100	3.5	1,050	
		Dry Season	Paddy	210	70	4.5	945	
		Annual	Paddy Tot	510	170	3.9	1,995	
	2. Rainfed Upland Field 250 ha	Rainy Season	Maize	250	100	2	500	
	Mandaka Area Total 550 ha	Rainy Season	Paddy	300	55	3.5	1,050	
			Maize	250	45	2.0	500	
			Total	550	100	-	1,550	
		Dry Season	Paddy	210	38	4.5	945	
			Maize	0	0	-	-	
			Total	210	38	-	945	
		Annual	Paddy	510	93	3.9	1,995	
			Maize	250	45	2.0	500	
			Total	760	138	-	2,495	
2. Kaloleni	1. Irrigated Paddy Field 160 ha	Rainy Season	Paddy	160	100	3.5	560	
		Dry Season	Paddy	80	50	4.5	360	
		Annual	Paddy Tot	240	150	3.8	920	
	2. Rainfed Upland Field 60 ha	Rainy Season	Maize	60	100	2	120	
	Kaloleni Area Total 220 ha	Rainy Season	Paddy	160	73	3.5	560	
			Maize	60	27	2.0	120	
			Total	220	100	-	680	
		Dry Season	Paddy	80	36	4.5	360	
			Maize	0	0	-	-	
			Total	80	36	-	360	
		Annual	Paddy	240	109	3.8	920	
			Maize	60	27	2.0	120	
			Total	300	136	-	1,040	
Overall of Expanded Area	770 ha	Rainy Season	Paddy	460	60	3.5	1,610	
			Maize	310	40	2.0	620	
			Total	770	100	-	2,230	
		Dry Season	Paddy	290	38	4.5	1,305	
			Maize	0	0	-	0	
			Total	290	38	-	1,305	
		Annual	Paddy	750	97	3.9	2,915	
			Maize	310	40	2.0	620	
			Total	1,060	138	-	3,535	
New Extension Area	1. Rainfed Upland Field 3,430 ha	Rainy Season	Maize	3,260	95	1.2	3,912	
Study Area Total	6,350 ha	Rainy Season	Paddy	600	9	4.1	2,436	
			Maize	5,056	80	1.5	7,504	
			Total	5,656	89	1.8	9,940	
		Dry Season	Paddy	930	15	6.0	5,605	
			Maize	0	0	-	0	
			Total	930	15	6.0	5,605	
		Annual	Paddy	1,530	24	5.3	8,041	
			Maize	5,056	80	1.5	7,504	
			Total	6,586	104	2.4	15,545	

1/ Minor upland crops represented by maize 2/ Average from1992 to 1996 3/ Average from 1995 to 1996 File:ET-4

Table E.2.5 Prevailing Farming Practices in the Study Area:Irrigated Paddy

Farm Activities	DAS	Recommended Practices by KADP	Prevailing Farming Practices in the Existing Lower Moshi Project Area	Prevailing Farming Practices in The Expanded Area
Seed Preparation	- 3 to - 1	Selection by salt solution(SG1.15) Soaking in water for 24 h Incubation to enhance evenly germination	Soaking in water for 24 h Incubation for 48 h	Soaking in water for 24 h Incubation for 48 h
Sowing	0	Variety: IR 54 Seeding rate: 33 kg/ha	Variety: IR 54 Seeding rate: 45 kg/ha	Variety: IR 54 Seeding rate: 55 kg/ha
Nursery	1 - 25	Communal Nursery Area: 400 m2/ha Fertilizer:10-14 days after sowing Urea 5kg/400m2	Communal nursery Area: 400 m2/ha 3 beds(1.5x27m) /plot(0.3ha) Fertilization practiced partly	Nursery preparation individually Area: 500 m2/ha Small seed beds Fertilization not practiced
Land Preparation	15 - 23	Field clearing(grass cutting etc.) Irrigate 1 day before puddling Direct puddling by rotary tiller 2 - 3 times/1 day before planting	Field clearing(grass cutting etc.) Irrigate 1 day before puddling Direct puddling by rotary tiller 2 - 3 times/1 day before planting	Land clearing(grass cutting) Manual ploughing & puddling Few farmers use machinery
Basal Dressing	24	N 75 kg + TSP 90 kg/ha	No basal dressing practiced	No basal dressing practiced
Transplanting	25	Age of seedlings: 20 - 30 days Regular planting/line planting 2 - 3 plants/hill; depth 2 - 3cm	Age of seedlings: 20 - 30 days Regular planting/line planting 2 - 3 plants/hill; depth 2 - 3cm	Age of seedlings: 35 - 45 days Regular planting/line planting 2 - 3 plants/hill
Planting Distance		20 x 20cm; 250,000 hills/ha	20 x 20cm; 250,000 hills/ha	20 x 20cm; 250,000 hills/ha
1st Weeding	40	15 DAT Hand weeding	15 DAT Hand weeding	15 DAT Hand weeding
1st Top Dressing	40	15 DAT N 37.5 kg/ha	15 DAT Urea 160 kg/ha 1/	15 DAT Urea 135 kg/ha 1/
1st Insect Control	40	15 DAT Diazinon (0.5 l/ha)	15 DAT Diazinon (0.5 l/ha)	15 DAT Diazinon (0.5 l/ha)
2nd Weeding	80	55 DAT Hand weeding	55 DAT Hand weeding	55 DAT Hand weeding
2nd Top Dressing	80	At panicle initiation stage(55 DAT) N 37.5 kg/ha	55 DAT Urea 80 + SA 50 kg/ha 1/	55 DAT Urea 70 kg/ha 1/
2nd Insect Control	80	55 DAT Diazinon (0.5 l/ha)	55 DAT Diazinon (0.5 l/ha)	55 DAT Diazinon (0.5 l/ha)
3rd Insect Control	95	55 DAT Diazinon (0.5 l/ha)	55 DAT Diazinon (0.5 l/ha)	55 DAT Diazinon (0.5 l/ha)
3rd Top Dressing	-	Not recommended	80 DAT Urea 80 + SA 50 kg/ha 1/	80 DAT Urea 70 kg/ha 1/
Fungicide		In case of outbreak of disease	Not practiced	Not practiced
Water Management	40 - 140	Follow irrigation schedule	4 days interval Follow irrigation schedule	Follow irrigation schedule
Bird Scaring	115-145	Bird scaring	Bird scaring	Bird scaring
Harvesting	145	Drain water 1 week before harvest; about 35days after flowering	Drain water 10 days before harvest; about 35days after flowering	Drain water 10 days before harvest; about 35days after flowering
Threshing/Drying	-	Clean threshed paddy and dried to moisture content 14%	Beating manually Winnowing dried paddy for storage	Beating manually Winnowing dried paddy for storage
Disposal of Crop Residues		Chopped and spread over a field	Burned after spreading over a field Partly as used as cattle feed	Burned in a field Partly as used as cattle feed

Notes: DAS Days after sowing; DAT Days after transplanting; SA Sulphate of Ammonium
1/: 3 top dressings are common but timing differs depending on famers

File: ET-5

Table E.2.6 Prevailing Farming Practices in the Study Area: Maize

Farm Activities	DAS	Recommended Practices	Prevailing Farming Practices in Existing Lower Moshi Project Area & Expanded Area	Prevailing Farming Practices in New Extension Area
Land Preparation		Beforeonset of rainy season (February - March) by tractor Depth of tillage: 15-20cm Ridging or without ridge	Displowing once by tractor Flat seed beds without ridge	Displowing once by tractor Flat seed beds without ridge
Sowing	0	Early planting to ensure silking taking place in the wet season Variety: CG4141/4142(hybrid) Tuxpeno(composite) Seeding Rate: 25 kg/ha	Commonly use self-multiplied seeds Partly use purchased new seeds Variety: CG 4141 followed by Tuxpeno Seeding Rate: 25 kg/ha	Self-multiplied seeds common Use of purchased seeds seldom Variety: Tuxpenofollowed by CG4141 Seeding Rate: 25 kg/ha
Planting Density		80 x 50 cm; 2 plants/hill 50,000 plants/ha	Line planting practiced 75 x 60, 80 x 40, 90 x 30 cm More than 2 plants/hill No thining out	Line planting practiced 75 x 60, 80 x 0, 90 x 30 cm More than 2 plants/hill No thining out
Basal Dressing		Urea 150 + TSP 100 kg/ha	Fertilization commonly practiced Urea 25 kg/ha in average	Fertilization not practiced
1st Weeding		Hand weeding by hoe	Hand weeding by hoe	Hand weeding by hoe
Insect Control		Endosulfan, Fenitrothion	Commonly 1 time per season Endosulfan: 4 kg/ha	Commonly 1 time per season Endosulfan: 4 kg/ha
2nd Weeding		Hand weeding by hoe	Hand weeding by hoe	Hand weeding by hoe
Top Dressing		Urea kg/ha	Top dressing not practiced	Fertilization not practiced
Fungicide		When outbreak of disease	Not used	Not used
Harvesting		Mannual	Mannual	Mannual
Shelling/Drying		Mannual Dried in the sun or open cribs	Mannual Sundrying mostly in the field	Mannual Sundrying mostly in the field
Storage		Control of insects during storage	No insect control practiced during storage	No insect control practiced during storage
Disposal of Crop Residues		Left to decay in a field or fed to animal	Used for animal feed in grazing in a field or left decomposed	Used for animal feed in grazing in a field or left decomposed

Notes: DAS Days after sowing

File: ET-6

Table E.2.7 Varietal Characteristics of Paddy and Maize

1. Characteristics of Recommended Paddy Varieties by KADP in Exisitng Lower Moshi Project Area

Character	Varieties				
	IR 50	IR 54	IR 56	ITA 173	Tolerirana
1 Plant Height (cm)	60 - 50	70 - 90	60 - 80	65 - 80	105 - 110
2 Growth Duration	120 - 140	140 - 150	120 - 130	130 - 140	120 - 140
3 Tillering	Medium	Medium	High	Medium	Low
4 Spikelets Number	High	High	Medium	High	Medium
5 1,000 Grain Weight (g)	18 - 20	22 - 25	22 - 25	23 - 27	27 - 30
6 Grain Size	Short/Slender	Long/Slender	Long/Slender	Long/Oval	Oval
7 Productivity	High	Very High	Very High	Very High	Medium
8 Shattering Habit	High	High	Low	Medium	High
9 Fertilizer Response	Responsive	Responsive	Medium	Responsive	Medium
10 Lodging	Resistant	Resistant	Resistant	Resistant	High
11 Reaction to Photo-period	Weakly	Weakly	None	None	None
12 Low Temperature Tolerance	Weakly	Weakly	None	None	Moderate

Varieties	Findings of KADC/KADP	Farmers Preference
IR 50	High yielding & high quality, some torelrance to low temperature Need verification in farmers fields	Low to moderate
IR 54	High yielding & high quality, easy in manual threshing	High
IR 56	Hard in manual threshing, susceptible to low temperature	Low to moderate due to low shattering
ITA 173	Not promising, susceptible to low temperature	-
Tolerirana	Very susceptible to stem borer, moderate tolerance to low temperature, low tillering capacity	Low

Source: KADP

2. Characteristics of Recommended Maize Varieties in The Study Area

Character	Varieties				
	CG4141 Hybrid	C 4142 Hybrid	PAN 695 Hybrid	Tuxpeno Composite	ICW 1/ Composite
1 Plant Height (cm)	200-250	200-250	200-250	200-250	200-250
2 Growth Duration(days)	110-140	120	120-130	110-130	110-130
3 Productivity	High	High	High	Medium	Medium
4 Grain Size	Large	Large	Large	Medium	Medium
5 Drought Tolerance	Tolerant	Tolerant	Tolerant	Tolerant	Tolerant
6 Lodging Tolerance	Tolerant	Tolerant	Tolerant	Tolerant	Medium
7 Potential Yield(t/ha)	7.5	7.5-8.8	7.5	5.5	6.0
8 Expected Yield at Farmer Le	5.4	5.4	5.4	4.0	4.0

1/: Honga Composite White

Source: Extension Training Guide, MAC, 1990, Tanzania Farmers' Association Ltd., District Agriculture Extension Office

File:ET-7

Table E. 2. 8 Inventory on Farm Machinery and Post Harvest Facilities in and around the Study Area

1. Farm Machinery Possessed in the Study Area

Village/Agencies	4 Wheel Tractor			Sprayer			Thresher			Corn Sheller		
	No.	Capacity	Ownership	No.	Capacity	Ownership	No.	Capacity	Ownership	No.	Capacity	Ownership
Mabogini	11	-	private	about 1 units/every 5 paddy farmers		private	0			8	100 kg/hr	private
Rau Ya Kati	4	-	private	about 70 units		private	0			0		
Chekereni	2		1 village 1 private	about 100 units		private	0			0		
Oria	2	-	private	about 20 units		private	0			0		
Mandaka Mnono	2	-	private	about 1 units/every 3 paddy farmers		private	0			0		
Kaloleni	0			about 1 units/every 5 paddy farmers		private	0			0		
Mtakuja	0			7	-	private	0			0		
Mvuleni	0			4	-	private	0			0		
Total in Study Area	19				-		0			8		
KADP	28	HP 40 & 50	KR-II		-			-			-	

Source: Interview with village chairman, KADP & field survey

File: ET-8

2. Post Harves Facilities in & around the Study Area

Village/Agencies	Rice Mill			Oil extraction mill			Drying yard			Storage Facilities & Major Use		
	No.	Capacity	Ownership	No.	Capacity	Ownership	No.	Capacity	Ownership	No.	Capacity	Ownership
Post Harves Facilities Owned Individually or by Village in The Study Area												
Mabogini	9	(kg/hr) 100-200	private	0			attached to rice mills 7	-	private	attached to rice mills 4	avg. 2t	private
Rau Ya Kati	0			0			1	-	private	0		
Chekereni	3	(kg/hr) 100-200	1 village 2 private	0			attached to rice mills 3	-	1 village 2 private	storing food aid/seldom used 1	200m3	village
Oria	2	(kg/hr) 100-200	private	0			attached to rice mills 1	-	private	0		
Mandaka Mnono	0			0			1	-	private	0		
Kaloleni	0			0			0			0		
Mtakuja	0			0			0			storing food aid/seldom used 1	150m3	village
Mvuleni	0			0			0			0		
Total	14			0			13			6		
Post Harves Facilities Owned by Cooperatives in the Study Area												
CHAWAMPU		-			-			-		1 1	760 m3 350 m3	in Chekereni in Mabogini
KNCU		-			-			-		1	1,500 m3	in Mabogini
KPHC		-			-		1		in Chekereni	1	3,168 m3	in Chekereni
Major Storage Facilities for Grains and Cereals in Moshi Urban Area 1/												
TFA (Tanzania Farmers' Association)					-			-		2	7,000 m3	
N.M.C (National Milling Corporation) 2/					-			-		8	17,000 m3	
T.H.B (Tanzania Housing Bank) 2/					-			-		6	9,000 m3	
KRTC (Kilimanjaro Regional Trading Company) 2/					-			-		1	3,500 m3	
KNCU (Kilimanjaro Native Co-operation Union)					-			-		6	21,000 m3	
T.C.C.C (Tanzania Coffee Curing Company)					-			-		6	16,000 m3	
Total					-			-		29	73,500 m3	

1/: Only those registered in District Agricultural Office, capacities are estimated figures
2/: N.M.C, T.H.B & KRTC are now defunct and the facilities are used by someone else.
Source: Interview with village chairman, District Agriculture Office & field survey

File: ET-8

Table E.2.9 Labour Requirements per Ha: Present Conditions

Paddy: Existing Lower Moshi Project Area Unit:mandays

Farming Practices	Month in Order					Total	
	- 1st	1st	2nd	3rd	4th	No.	%
1 Field Cleaning	16					16	10
2 Nursery	3					3	2
3 Canal Cleaning	2					2	1
4 Land Preparation						0	0
5 Transplanting		27				27	17
6 Field Management		2	2	1	1	6	4
7 Weeding(2 times)		15	15			30	19
8 Fertilization(3 times)		1	1	1		3	2
9 Pesticide Application(3 times)		1	2			3	2
10 Bird Scaring				5	30	35	23
11 Harvesting/Transporting					30	30	19
Monthly Total	21	46	20	7	61	155	100

Paddy: Expanded Area - Wet Season Unit:mandays

Farming Practices	Month in Order					Total	
	- 1st	1st	2nd	3rd	4th	No.	%
1 Nursery	3					3	2
2 Land Preparation	40					40	24
3 Transplanting		30				30	18
4 Field Management		2	2	2	1	7	4
5 Weeding(2 times)		10	10			20	12
6 Fertilization(3 times)		1	1	1		3	2
7 Pesticide Application(3 times)		1	2			3	2
8 Bird Scaring				5	30	35	21
9 Harvesting/Transporting					24	24	15
Monthly Total	43	44	15	8	55	165	100

Paddy: Expanded Area - Dry Season Unit:mandays

Farming Practices	Month in Order					Total	
	- 1st	1st	2nd	3rd	4th	No.	%
1 Nursery	3					3	2
2 Land Preparation	40					40	24
3 Transplanting		30				30	18
4 Field Management		3	3	2	1	9	5
5 Weeding(2 times)		10	10			20	12
6 Fertilization(3 times)		1	1	1		3	2
7 Pesticide Application(3 times)		1	2			3	2
8 Bird Scaring				5	30	35	21
9 Harvesting/Transporting					27	27	16
Monthly Total	43	45	16	8	58	170	100

Maize: Existing Lower Moshi Project Area & Expanded Area Unit:mandays

Farming Practices	Month in Order						Total	
	1st	2nd	3rd	4th	5th	6th	No.	%
1 Land Preparation	7						7	11
2 Planting	10						10	15
3 Weeding		12	8				20	31
4 Fertilization		2					2	3
5 Pesticide Application		1					1	2
6 Harvesting						15	15	23
7 Shelling/Packing						10	10	15
Monthly Total	17	15	8	0	0	25	65	100

Maize: New Extension Area Unit:mandays

Farming Practices	Month in Order						Total	
	1st	2nd	3rd	4th	5th	6th	No.	%
1 Land Preparation	7						7	12
2 Planting	10						10	17
3 Weeding		12	8				20	34
4 Fertilization							0	0
5 Pesticide Application		1					1	2
6 Harvesting						13	13	22
7 Shelling/Packing						8	8	14
Monthly Total	17	13	8	0	0	21	59	100

File:ET-9

Table E.2.10 Labour Requirements in the Study Area

Unit: 1000 mandays

Crops/Area	Cropped Area(ha)	Month												Total
		Jan.	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Paddy Cultivation														
Existing Lower Moshi														
Rainy Season Cropping	70	1.5	3.2	1.4	0.5	4.3								10.9
	70		1.5	3.2	1.4	0.5	4.3							10.9
Early Dry Season Cropping	180					3.8	8.3	3.6	1.3	11.0				27.9
	180						3.8	8.3	3.6	1.3	11.0			27.9
Late Dry Season Cropping	140	8.5								2.9	6.4	2.8	1.0	21.7
	140	1.0	8.5								2.9	6.4	2.8	21.7
Total Existing Project	780	11.0	13.2	4.6	1.9	8.5	16.3	11.9	4.9	15.2	20.4	9.2	3.8	120.9
Expanded Area														
Rainy Season Cropping	230	10.1	3.5	1.8	12.7								9.9	38.0
	230	9.9	10.1	3.5	1.8	12.7								38.0
Dry Season Cropping	145						6.2	6.5	2.3	1.2	8.4			24.7
	145							6.2	6.5	2.3	1.2	8.4		24.7
Total Expanded Area	750	20.0	13.6	5.3	14.5	12.7	6.2	12.8	8.8	3.5	9.6	8.4	9.9	125.2
Total Labour Requirements for Paddy Cultivation	1,530	31.0	26.8	9.9	16.4	21.2	22.6	24.6	13.7	18.7	29.9	17.7	13.7	246.1
Maize Cultivation														
Existing Lower Moshi Project Area	372		6.3	5.6	3.0	0.0	0.0	9.3						24.2
	743			12.6	11.1	5.9	0.0	0.0	18.6					48.3
	371				6.3	5.6	3.0	0.0	0.0	9.3				24.1
Total Existing Project	1,486	0.0	6.3	18.2	20.4	11.5	3.0	9.3	18.6	9.3	0.0	0.0	0.0	96.6
Expanded Area	78		1.3	1.2	0.6	0.0	0.0	2.0						5.1
	155			2.6	2.3	1.2	0.0	0.0	3.9					10.1
	77				1.3	1.2	0.6	0.0	0.0	1.9				5.0
Total Expanded Area	310	0.0	1.3	3.8	4.3	2.4	0.6	2.0	3.9	1.9	0.0	0.0	0.0	20.2
New Extension Area	815		13.9	10.6	6.5	0.0	0.0	17.1						48.1
	1,630			27.7	21.2	13.0	0.0	0.0	34.2					96.2
	815				13.9	10.6	6.5	0.0	0.0	17.1				48.1
Total New Extension Area	3,260	0.0	13.9	38.3	41.6	23.6	6.5	17.1	34.2	17.1	0.0	0.0	0.0	192.3
Total Labour Requirements for Maize Cultivation	5,056	0.0	21.5	60.3	66.3	37.5	10.1	28.4	56.7	28.3	0.0	0.0	0.0	309.1
Total Labour Requirements for Crop Cultivation	6,586	31.0	48.3	70.2	82.6	58.7	32.7	53.0	70.4	47.0	29.9	17.7	13.7	555.2
Available Labour Forces in The Study Area 1/	-	256.0	256.0	256.0	256.0	256.0	256.0	256.0	256.0	256.0	256.0	256.0	256.0	3,072.0
Monthly Labour Balance	-	225.0	207.7	185.8	173.4	197.3	223.3	203.0	185.6	209.0	226.1	238.4	242.3	2,516.8

1/: Available labour forces in related villgaes 10,675 x 24 days work/month = 256,000 mandays

File:ET-10

Table E.2.11 Volume of Processed Rice by Month in KPHC(1996)

Month	Rice Received (ton)	Proportion to Total (%)	Rice Processed		
			Volume (ton)	Proportion to Total (%)	Proportion to Capacity 1/ (%)
January	568	11.5	633	14.0	84
February	549	11.1	427	9.5	57
March	367	7.4	389	8.6	52
April	41	0.8	34	0.8	5
May	454	9.2	400	8.9	53
June	533	10.8	393	8.7	52
July	364	7.4	415	9.2	55
August	221	4.5	286	6.3	38
September	66	1.3	142	3.1	19
October	534	10.8	299	6.6	40
November	753	15.3	549	12.2	73
December	478	9.7	548	12.1	73
Annual	4,928	100.0	4,515	100.0	55

1/: Proportion to monthly capacity of rice mill(750 t) & annual capacity of 8,250 t (11 months operation)
Source: KPHC

Table E.2.12. Rice Received by KPHC by Origin(1996)

Month	Rice Received from				Total (ton)
	Existing Lower Moshi Project Area		Outside of Existing Lower Moshi Project Area		
	Volume (ton)	Proportion (%)	Volume (ton)	Proportion (%)	
January	25	4.4	543	95.6	568
February	473	86.2	76	13.8	549
March	208	56.7	159	43.3	367
April	2	4.9	39	95.1	41
May	45	9.9	409	90.1	454
June	259	48.6	274	51.4	533
July	149	40.9	215	59.1	364
August	57	25.8	164	74.2	221
September	38	57.6	28	42.4	66
October	520	97.4	14	2.6	534
November	621	82.5	132	17.5	753
December	129	27.0	349	73.0	478
Annual	2,526	51.3	2,402	48.7	4,928

Source: KPHC

Table E.2.13. Total Revenue and Expenditure of KPHC(1996)

Items	Amount (1000Tsh.)	Remarks
I. Total Revenue	70,660	
Revenue from Milling	67,725	4515t x 15Tsh/kg
Revenue from Polishing	2,935	147t x 20Tsh/kg
II. Total Expenditure	86,648	
Depreciation	21,705	
Electricity	13,144	
Repair/maintenance	11,183	
Salary/Wage	6,885	
Others	33,731	
Balance(I - II)	-15,988	

Source: KPHC

File:ET-11-13

Table E.3.1 Proposed Land Use Plan (Summary)

Project Area/Land Use Category	Study Area: 8,444 ha(gross)			Proposed Project Area: 5,809 ha(gross)							Incremental Area (Future - Present)	
	Present Land Use			Present Land Use			Future Land Use under With-Project					
	Gross Area (ha)	Within Project Area (ha)	Outside of Project Area (ha)	Gross Area (ha)	(%)	Net Area (ha)	Gross Area (ha)	(%)	Net Area (ha)	(%)	Gross Area (ha)	Net Area (ha)
1. Existing Lower Moshi Project Area												
Project Area: 2,654 ha(gross)												
Irrigated Paddy Fields	1,492	1,492	0	1,492	26	1,104	2,654	46	2,150		1,162	1,046
Irrigable Upland Fields	1,162	1,162	0	1,162	20	1,046					-1,162	-1,046
Rainfed Upland Fields											0	0
Total	2,654	2,654	0	2,654	46	2,150	2,654	46	2,150	46	0	0
2. Expanded Area												
Project Area: 542 ha(gross)												
Irrigated Paddy Fields	510	435	75	435	7	391	542	9	460		107	69
Irrigable Upland Fields											0	0
Rainfed Upland Fields	350	107	243	107	2	96					-107	-96
Total	860	542	318	542	9	487	542	9	460	10	0	-27
3. New Extension Area												
Project Area: 2,613 ha(gross)							2,613	45	2,090	44	2,613	2,090
Irrigated Paddy Fields											0	0
Irrigable Upland Fields											-2,543	-2,289
Rainfed Upland Fields	3,810	2,543	1,267	2,543	44	2,289					-70	-70
Grass Land/Grazing Land	970	70	900	70	1	70					0	0
Village Yard	150	0	150	0								
Total	4,930	2,613	2,317	2,613	45	2,359	2,613	45	2,090	44	0	-269
Project Area Total												
Project Area Total: 5,809 ha(gross)												
Irrigated Paddy Fields	2,002	1,927	75	1,927	33	1,495	5,809	100	4,700	100	3,882	3,205
Irrigable Upland Fields	1,162	1,162	0	1,162	20	1,046	0		0		-1,162	-1,046
Rainfed Upland Fields	4,160	2,650	1,510	2,650	46	2,385	0		0		-2,650	-2,385
Grass Land/Grazing Land	970	70	900	70	1	70	0		0		-70	-70
Village Yard	150	0	150	0	0	0	0		0		0	0
Total	8,444	5,809	2,635	5,809	100	4,996	5,809	100	4,700	100	0	-296

1/: Including proposed site for oxidation pond 60 ha: paddy field 40 ha & upland field 20 ha

File: ET-14

Table E.3.2 Proposed Land Use Plan (Detail)

Subject Area & Land Use Category	Study Area: 8,444 ha (gross)			Proposed Project Area: 5,809 ha (gross)						
	Present Land Use			Present Land Use			Future Land Use under With-Project			
	Gross Area (ha)	Within Project Area (ha)	Outside of Project Area (ha)	Gross Area (ha)	(%)	Net Area (ha)	Gross Area (ha)	(%)	Net Area (ha)	(%)
1. Existing Lower Moshi										
Project Area										
Upper Mabogini										
Irrigated Paddy Field	228	228	0	228		180	228		180	
Irrigable Upland Field	0	0	0	0		0	0		0	
Sub-total	228	228	0	228	4	180	228	4	180	4
Lower Mabogini										
Irrigated Paddy Field	377	377	0	377		293	844		713	
Irrigable Upland Field	467	467	0	467		420	0		0	
Sub-total	844	844	0	844	15	713	844	15	713	15
Rau Ya Kati										
Irrigated Paddy Field	442	442	0	442		284	803		609	
Irrigable Upland Field	361	361	0	361		325	0		0	
Sub-total	803	803	0	803	14	609	803	14	609	13
Chekereni										
Irrigated Paddy Field	312	312	0	312		244	412		334	
Irrigable Upland Field	100	100	0	100		90	0		0	
Sub-total	412	412	0	412	7	334	412	7	334	7
Oria										
Irrigated Paddy Field	133	133	0	133		103	367		314	
Irrigable Upland Field	234	234	0	234		211	0		0	
Sub-total	367	367	0	367	6	314	367	6	314	7
Existing Project Area Total										
Irrigated Paddy Field	1,492	1,492	0	1,492		1,104	2,654		2,150	
Irrigable Upland Field	1,162	1,162	0	1,162		1,046	0		0	
Total	2,654	2,654	0	2,654	46	2,150	2,654	46	2,150	46
2. Expanded Area										
Mandaka Mnono										
Irrigated Paddy Field	330	317	13	317		285	424		360	
Rainfed Upland Field	280	107	173	107		96	0		0	
Sub-total	610	424	186	424	7	381	424	7	360	8
Kaloleni										
Irrigated Paddy Field 1/	180	118	62	118		106	118		100	
Rainfed Upland Field 1/	70	0	70	0		0	0		0	
Sub-total	250	118	132	118	2	106	118	2	100	2
Expanded Area Total										
Irrigated Paddy Field	510	435	75	435		391	542		460	
Rainfed Upland Field	350	107	243	107		96	0		0	
Total	860	542	318	542	9	487	542	9	460	10
3. New Extension Area										
Irrigated Paddy Field	0	0	0	0		0	2,613		2,090	
Rainfed Upland Field	3,810	2,543	1,267	2,543		2,289	0		0	
Grass Land/Grazing Land	970	70	900	70		70	0		0	
Village Yard	150		150			0	0		0	
Total	4,930	2,613	2,317	2,613	45	2,359	2,613	45	2,090	44
Study Area Total										
Irrigated Paddy Field	2,002	1,927	75	1,927	33	1,495	5,809	100	4,700	100
Irrigable Upland Field	1,162	1,162	0	1,162	20	1,046	0		0	
Rainfed Upland Field	4,160	2,650	1,510	2,650	46	2,385	0		0	
Grass Land/Grazing Land	970	70	900	70	1	70	0		0	
Village Yard	150	0	150	0	0	0	0		0	
Total	8,444	5,809	2,635	5,809	100	4,996	5,809	100	4,700	100

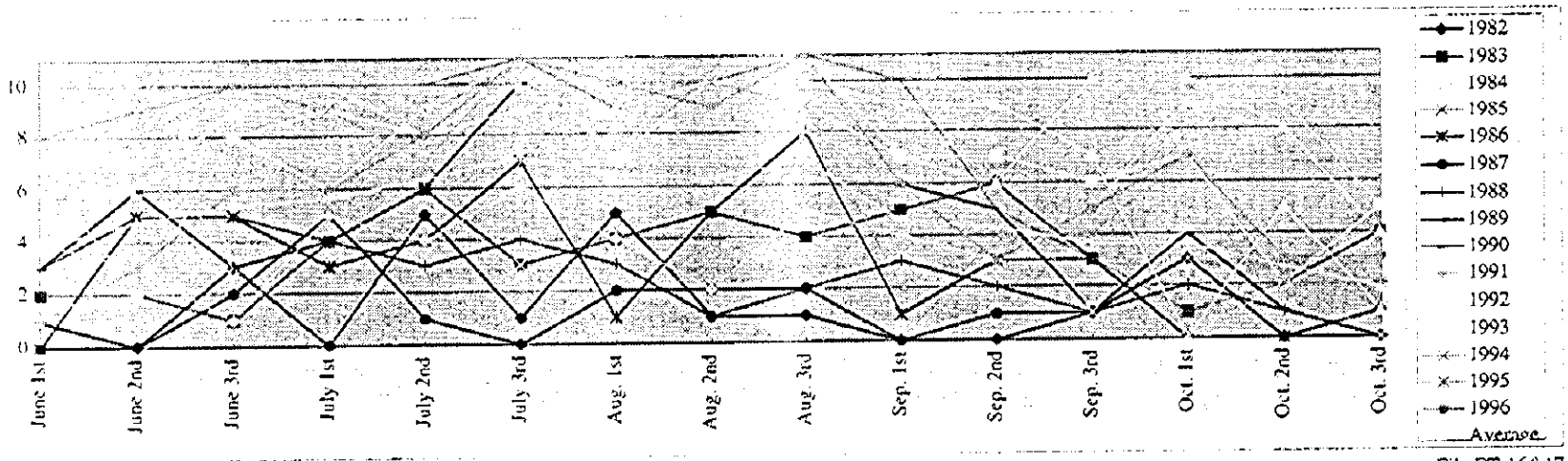
1/: Include proposed site for oxidation pond 60 ha: paddy field 40 ha & upland field 20 ha

File: ET-15

Table E.3.3 Number of Days with Minimum Temperature below 17℃ in Each Decade of A Month(1982-1996)-1

Year	June 1st	June 2nd	June 3rd	July 1st	July 2nd	July 3rd	Aug. 1st	Aug. 2nd	Aug. 3rd	Sep. 1st	Sep. 2nd	Sep. 3rd	Oct. 1st	Oct. 2nd	Oct. 3rd	Rice Yield in 2nd Season 1/
1982	1	0	3	0	5	1	5	1	1	0	0	1	3	0	1	-
1983	2	2	1	4	6	3	4	5	4	5	6	3	1	2	4	-
1984	6	6	9	10	8	10	10	10	11	7	6	10	10	8	4	-
1985	6	7	3	3	7	3	3	2	2	0	4	4	7	3	1	-
1986	0	5	5	3	4	7	1	5	8	1	3	3	0	0	0	-
1987	0	0	2	5	11	0	2	2	2	0	1	1	0	0	0	-
1988	3	5	5	4	3	4	3	1	2	3	2	1	2	1	0	5.7 (4.0-7.3)
1989	3	6	3	4	6	10	10	10	11	6	5	1	4	1	0	6.2 (5.1-7.5)
1990	8	9	10	10	10	11	9	10	11	10	5	3	1	2	2	8.4 (4.7-10.9)
1991	4	3	1	5	4	6	4	2	5	4	3	5	9	9	5	6.1 (2.8-7.7)
1992	7	2	8	6	9	11	7	10	9	7	7	6	7	2	5	7.5 (5.8-8.9)
1993	5	7	8	9	8	9	9	10	10	9	9	7	0	5	1	5.9
1994	6	9	7	7	9	10	10	7	8	9	6	1	0	2	0	5.3
1995	5	8	10	9	7	11	10	10	9	2			3	2	2	6.2
1996	1	3	6	6	8	11	10	9	11	6	3	5	7	3	3	7.1
Average	3.8	4.8	5.4	5.7	6.3	7.1	6.5	6.3	6.9	4.6	4.3	3.6	3.6	2.7	1.9	-

1/: average yield (yield range of rice) in the Existing Lower Moshi Project Area (source KADP)



File:ET-16&17

Table E.3.4 Number of Days with Minimum Temperature below 17℃ in Each Decade of A Month(1982-1996)-2

Year	Temp. ℃	June 1st	June 2nd	June 3rd	June Total	July 1st	July 2nd	July 3rd	July Total	August 1st	August 2nd	August 3rd	August Total	September 1st	September 2nd	September 3rd	September Total	October 1st	October 2nd	October 3rd	October Total
1982	< 17	1	0	3	4	0	5	1	6	5	1	1	7	0	0	1	1	3	0	1	4
	14 - 15	1		1	2		1		1	1			1				0				0
	< 14				0		1		1	2		1	3				0				0
	Lowest(℃)	14.4	19.2	14.6	-	17.5	13	16.8	-	13.9	16	14	-	17.1	17.2	15.8	-	15.5	17.5	15.7	-
	Min. Avg	19.2	19.6	14.6	18.9	18.9	16.8	18.5	18.1	17	18.2	18.5	17.9	19.1	19.5	18.4	19	18.3	18.8	18.7	18.6
1983	< 17	2	2	1	5	4	6	3	13	4	5	4	13	5	6	3	12	1	2	4	7
	14 - 15			1	1		1	1	2	3	1		4	1	1		2			2	2
	< 14				0			0	1	2	1	1	4	2		2	4				0
	Lowest(℃)	15.9	16.9	15	-	15.4	14.5	14.4	-	14	12.8	13.4	-	13.2	14.5	13.5	-	16.4	16	15	-
	Min. Avg	18.2	18	17.9	18	17	16.9	17.2	17.1	16.9	16.1	17	16.7	16.5	16.8	17.5	16.9	18.8	18.3	17.6	18.2
1984	< 17	6	6	9	21	10	8	10	28	10	10	11	31	7	6	10	23	10	8	4	22
	14 - 15	2	1	3	6	3	2		5	1			1			2	2	3	4		7
	< 14		1		1		1		1			11	11	7	6	8	21	3	1		4
	Lowest(℃)	14.5	13	14.5	-	14.5	13	16	-	15	15.1	13.5	-	12.5	12.7	13	-	14	13.5	16	-
	Min. Avg	16.3	16.6	15.9	16.3	15.7	16	16.5	16.1	15.9	16.2	13.5	15.1	13.4	12.9	13.8	13.4	15	15.4	17.4	16
1985	< 17	6	7	3	16	3	7	3	13	3	2	2	7	0	4	4	8	7	3	1	11
	14 - 15	1			1		1	1	2	2	1	1	4		2		2				0
	< 14	1			1		1		1								0		2		2
	Lowest(℃)	13.3	15.2	15.3	-	15.3	13.8	14.9	-	15	14.7	14.5	-	17.3	14.7	16	-	15.5	13	16	-
	Min. Avg	16.5	16.8	17.9	17.1	17.4	16.2	17.6	17.1	17.3	17.3	17.6	17.4	18.5	17.7	18.2	18.1	16.9	17.3	18.3	17.5
1986	< 17	0	5	5	10	3	4	7	14	1	5	8	14	1	3	3	7	0	0	0	0
	14 - 15				0				0		1	3	4		1		1				0
	< 14			2	2	2	2	3	7	1	2	2	5		1	1	2				0
	Lowest(℃)	17.5	15.4	11.4	-	12.5	12	13	-	12.8	12.1	12.2	-	16	13	15	-	19.4	19.5	20.4	-
	Min. Avg	19.2	17.5	16.5	17.7	17.6	17.3	16	16.9	18.4	16.7	15.8	16.9	19	17.6	18.5	18.4	20.5	20.9	22.1	21.2
1987	< 17	0	0	2	2	5	1	0	6	2	2	2	6	0	1	1	2	0	0	0	0
	14 - 15			1	1	4			4				0				0				0
	< 14				0		1		1				0				0				0
	Lowest(℃)	17.1	19.4	14.8	-	14.4	14	19	-	17	16.8	15.5	-	18.9	16.8	17	-	20.2	19	20.3	-
	Min. Avg	20	20.4	17.8	19.4	17.1	18.8	19.2	18.4	18.5	18.3	18.4	18.4	19.7	19.4	20.2	19.8	21.2	21.1	21.7	21.3
1988	< 17	3	5	5	13	4	3	4	11	3	1	2	6	3	2	1	6	2	1	0	3
	14 - 15			1	1		1		1		1		1				0	2			2
	< 14				0	3		1	4				0	2	2		4				0
	Lowest(℃)	17	16	15	-	14	15	13	-	16	14.7	17	-	13.2	13	12	-	15	17	18.6	-
	Min. Avg	18.3	17.5	17.1	17.6	16.8	17.8	17.5	17.4	18.3	18.8	18.5	18.5	17.4	18.5	18.8	18.3	19.4	20.5	20	20
1989	< 17	3	6	3	12	4	6	10	20	10	10	11	31	6	5	1	12	4	1	0	5
	14 - 15				0		1	1	2	2		1	3	1	1		2	1			1
	< 14		2	1	3	1			1	1			1				0				0
	Lowest(℃)	16.5	12	11.5	-	14	15	14.5	-	13	15.5	15	-	14.5	15	16	-	14.9	17	18	-
	Min. Avg	18.2	16.5	18.1	17.6	17.1	16.7	16.4	16.7	15.5	16.3	16.1	16	16.9	17	17.6	17.1	17.4	18.3	18.7	18.1
1990	< 17	8	9	10	27	10	10	11	31	9	10	11	30	10	5	3	18	1	2	2	5
	14 - 15				0			3	3	1			1				0	1		2	3
	< 14		1	2	3	2	6	3	11		1	2	3		1	2	3				0
	Lowest(℃)	16	14	10.7	-	11.5	10.3	11	-	15	14	13	-	15.5	13	13	-	14.5	15	14.5	-
	Min. Avg	17	15.3	15.1	16.1	15.1	13.5	14.6	14.4	16.3	15.8	15.7	15.9	16.4	16.7	16.8	16.6	17.8	17.8	19.2	18.3
1991	< 17	4	3	1	8	5	4	6	15	4	2	5	11	3	3	5	12	9	9	5	23
	14 - 15	1	1		2	2	1	1	4	2			2	1	1	2	4	3	1	1	5
	< 14	1	2	1	4	1	1	2	4	2	2	2	6	1			1	6	8	3	17
	Lowest(℃)	14	13.7	13.7	-	13.8	13.7	13	-	11.6	12.6	13.5	-	12.3	15	14.7	-	12	10.5	12.5	
	Min. Avg	17.4	17.2	17.7	17.4	17.1	17.1	16.6	16.9	15.9	16.9	16.4	16.4	16.8	17.8	17.1	17.3	14.2	13.7	17.4	15.1
1992	< 17	7	2	8	17	6	9	11	26	7	10	9	26	7	7	6	20	7	2	5	14
	14 - 15	4	1	3	7	2	3	2	7	1	1	2	4	2			2	4		1	5
	< 14	2			2	4	2	7	13	1	3	2	6	2		2	4	3	1	1	5
	Lowest(℃)	13.8	15.4	14.5	-	11.2	13.2	12.5	-	12.5	10	13.9	-	12	15.8	13	-	12.7	13	14	-
	Min. Avg	15.6	17.3	16.1	16.3	13.9	15.6	13.6	14.4	16.3	14.9	15.9	15.8	16.2	16.8	16.9	16.6	15.5	18.2	16.9	16.8
1993	< 17	5	7	8	20	9	8	9	26	9	10	10	29	9	9	7	25	0	5	1	6
	14 - 15	2	1	1	4	2		2	4	1			1		3	2	5		1		1
	< 14	1			1	3		5	8		1	1	2	4	1	3	8				0
	Lowest(℃)	14	15	14.6	-	11	16	10	-	15	13	12.5	-	12	13.2	12	-	17.2	15	16	-
	Min. Avg	16.6	16.7	16.7	16.7	14.6	16.8	14.2	15.4	16.6	16.1	17.6	16.2	15.1	15.6	15.6	15.4	18.2	17.4	18.5	18
1994	< 17	6	9	7	22	7	9	10	26	10	7	8	25	9	6	1	16	0	2	0	2
	14 - 15		1	1	2	1	2		3		2		2		1		1				0
	< 14	2	4		6		4	4	8			4	4			1	1				0
	Lowest(℃)	12.5	10.5	15	-	15	10.5	13	-	16	15	13.2	-	16.5	14.5	13	-	18.5	16	18.5	
	Min. Avg	16.6	14.8	16.7	16	16.8	14.1	15.2	15.3	16.5	16.5	15.5	16.8	16.8	16.3	17.8	17	19.2	18.6	19.1	18.9
1995	< 17	5	8	10	23	9	7	11	27	10	10	9	29	2	0	0	2	3	2	2	7
	14 - 15	2	1	4	7	1		2	3	3		2	5				0	1			1
	< 14		2	5	7	7		4	11	2		4	6	2			2				0
	Lowest(℃)	14.5	14	13	-	11.5	16	12.5	-	13	16.5	10.5	-	12.8				14.6	16	17	-
	Min. Avg	16.8	15.8	14.3	15.6	13.5	16.9	14.8	15.0	15.4	16.7	14.2	15.5					17.5	18.0	18.5	18.0
1996	< 17	1	3	6	10	6	8	11	25	10	9	11	30	6	3	5	14	2	3	3	13
	14 - 15			1	1	1	2	2	5	3	2	1	6				0	1	1	1	3
	< 14				0	2		2	4	4	1	1	6			4	4				0
	Lowest(℃)	16.9	16.5	14.5	-	10.0	15.0	12.3	-	9.5	14.0	14.0	-	15.7	16.0	11.0	-	15.0	15.0	15.5	-
	Min. Avg	18.4	17.8	16.8	17.7	15.8	16.0	15.5	15.7	14.0	16.0	16.2	15.4	17.4	17.4	13.4	16.5	16.3	17.3	17.5	17.1
Average for 15 years 1982 - 1996	< 17	3.8	4.8	5.4	14.0	5.7	6.3	7.1	19.1	6.5	6.3	6.9	19.7	4.6	4.3	3.6	12.5	3.6	2.7	1.9	8.1
	16 - 17	1.8	2.1	2.7	6.6	1.6	2.3	2.5	6.5	2.7	2.8	2.6	8.1	2.3	1.7	1.1	5.1	0.9	0.8	0.5	2.2
	15 - 16	0.7	1.5	0.9	3.1	1.3	1.7	1.5	4.6	1.5	2.1	1.6	5.1	0.7	1.1	0.5	2.2	0.9	0.6	0.6	2.1
	14 - 15	0.9	0.3	1.1	2.3	1.1	1.0	1.0	3.1	1.3	0.6	0.7	2.6	0.3	0.7	0.4	1.5	1.1	0.5	0.5	2.0
	< 14	0.5	0.8	0.7	2.0	1.7	1.3	2.1	5.0	0.9	0.8	2.1	3.8	1.3	0.8	1.6	3.8	0.8	0.8	0.3	1.9
	Lowest(℃)	15.2	15.1	13.9	-	13.4	13.7	13.7	-	14.0	14.2	13.7	-	14.6	14.7	13.9	-	15.7	15.5	16.5	-
	Min. Avg	17.6	17.3	16.6	17.2	16.3	16.4	16.2	16.3	16.6	16.7	16.5	16.6	15.9	17.1	17.2	16.8	17.7	18.1	18.8	18.2

File E.T-16&17

Table E.3.5 Cropped Area and Cropping Intensity in the Project Area under With-Project and Present Conditions

With-Project Conditions

Area/Net Farm Land(ha)	Crops	Rainy Season		Dry Season		Annual	
		Cropped Area (ha)	Intensity (%)	Cropped Area (ha)	Intensity (%)	Cropped Area (ha)	Intensity (%)
Existing Lower Moshi Project Area 2,150 ha	Paddy	2,150	100	1,075	50	3,225	150
	Maize						
	Alfalfa			430	20	430	20
	Subtotal	2,150	100	1,505	70	3,655	170
New Extension Area 2,090 ha	Paddy	2,090	100	1,045	50	3,135	150
	Maize						
	Alfalfa			418	20	418	20
	Subtotal	2,090	100	1,463	70	3,553	170
Expanded Area 460 ha	Paddy	460	100	230	50	690	150
	Maize						
	Alfalfa			92	276	92	276
	Subtotal	460	100	322	326	782	426
Project Area Total 4,700 ha	Paddy	4,700	100	2,350	50	7,050	150
	Maize	0	0	0	0	0	0
	Alfalfa	0	0	940	20	940	20
	Total	4,700	100	3,290	70	7,990	170

Present Conditions

Area/Net Farm Land(ha)	Crops	Rainy Season		Dry Season		Annual	
		Cropped Area (ha)	Intensity (%)	Cropped Area (ha)	Intensity (%)	Cropped Area (ha)	Intensity (%)
Existing Lower Moshi Project Area 2,150 ha	Paddy	140	7	640	30	780	36
	Maize	1,486	69			1,486	69
	Alfalfa						
	Subtotal	1,626	76	640	30	2,266	105
New Extension Area 2,289 ha	Paddy						
	Maize	2,175	95			2,175	95
	Alfalfa						
	Subtotal	2,175	95	0	0	2,175	95
Expanded Area 487 ha	Paddy	391	80	263	54	654	134
	Maize	96	20			96	20
	Alfalfa						
	Subtotal	487	100	263	54	750	154
Project Area Total 4,996 ha 1/	Paddy	531	11	903	18	1,434	29
	Maize	3,757	75	0	0	3,757	75
	Alfalfa	0	0	0	0	0	0
	Total	4,288	86	903	18	5,191	104

1/: Including grass land of 70 ha

Incremental (With - Present)

Area	Crops	Rainy Season		Dry Season		Annual	
		Cropped Area (ha)	Intensity (%)	Cropped Area (ha)	Intensity (%)	Cropped Area (ha)	Intensity (%)
Existing Lower Moshi Project Area	Paddy	2,010	93	435	20	2,445	114
	Maize	-1,486	-69	0	0	-1,486	-69
	Alfalfa	0	0	430	20	430	20
	Subtotal	524	24	865	40	1,389	65
New Extension Area	Paddy	2,090	100	1,045	50	3,135	150
	Maize	-2,175	-95	0	0	-2,175	-95
	Alfalfa	0	0	418	20	418	20
	Subtotal	-85	5	1,463	70	1,378	75
Expanded Area	Paddy	69	20	-33	-4	36	16
	Maize	-96	-20	0	0	-96	-20
	Alfalfa	0	0	92	276	92	276
	Subtotal	-27	0	59	272	32	272
Project Area Total	Paddy	4,169	89	1,447	32	5,616	121
	Maize	-3,757	-75	0	0	-3,757	-75
	Alfalfa	0	0	940	20	940	20
	Total	412	14	2,387	52	2,799	66

File: ET-18

Table E.3.6 Cropping Intensities and Yields of Paddy in the Initial Stage of Development in the Existing Lower Moshi Project Area(1985-1991)

Year	Season	Mabogini System Paddy Field: 473 ha		Rau System Paddy Field: 631 ha		Existing Project Area Total Total Paddy Field: 1,104 ha				Remarks
		Cropped Area (ha)	Intensity (%)	Cropped Area (ha)	Intensity (%)	Cropped Area (ha)	Intensity (%)	Average Yield (t/ha)	Estimated Production (t)	
1985	Rainy									
	Dry	94	20			94	-	7.0	658	Cultivation started in
	Annual	94	20			94	-	7.0	658	dry season in Mabogini
1986	Rainy	119	25			119	-			
	Dry	473	100			473	-			Cultivation only
	Annual	592	125			592	-	7.1	4,203	in Mabogini
1987	Rainy	271	57	142	23	413	37	6.7		
	Dry	122	26	349	55	471	43	6.7		Cultivation started
	Annual	393	83	491	78	884	80	6.7	5,923	in the entire area
1988	1st	249	53	183	29	432	39	7.2		
	2nd	134	28	328	52	462	42	5.7		
	3rd	173	37	218	35	391	35	6.1		3 cropping seasons
	Annual	556	118	729	116	1,285	116	6.3	8,096	introduced
1989	1st	199	42	300	48	499	45	4.6		Severe water shortage
	2nd	235	50	282	45	517	47	6.2		
	3rd	177	37	241	38	418	38	5.7		
	Annual	611	129	823	130	1,434	130	5.5	7,887	
1990	1st	229	48	302	48	531	48	5.5		
	2nd	233	49	320	51	553	50	8.4		
	3rd	173	37	251	40	424	38	5.6		Highest cropping
	Annual	635	134	873	138	1,508	137	6.5	9,802	intensity in the past
1991	1st	0	0	332	53	332	30	7.1		System maintenance
	2nd	402	85	0	0	402	36	6.1		in 1st & 2nd season
	3rd	71	15	330	52	401	36	7.3		
	Annual	473	100	662	105	1,135	103	6.8	7,718	
1992	1st	0	0	0	0	0	0		0	No cultivation due to
	2nd	180	38	257	41	437	40	7.9	3,452	water shortage
	3rd	204	43	250	40	454	41	7.8	3,541	
	Annual	384	81	507	80	891	81	7.8	6,994	
Average	1st	68	14	60	10	128	12	5.9	762	
1992-1996	2nd	138	29	226	36	364	33	6.5	2,359	
	3rd	131	28	149	24	280	25	7.0	1,954	Water shortage problem
	Annual	337	71	435	69	772	70	6.6	5,075	getting severe
1997	1st	54	11	78	12	132	12	8.5	1,122	Area reduced to water availability
	2nd	169	36	208	33	377	34	8.5	3,205	Favorable conditions throughout
	3rd									both seasons
	Annual	223	47	286	45	509	46	8.5	4,327	

Source: KADP crop cut survey results

File ET-19

Table E.3.7 Crop Production in the Project Area under With-Project and Present Conditions

With-Project Conditions

Area/Net Farm Land(ha)	Crops	Rainy Season		Dry Season		Annual	
		Cropped Area (ha)	Production (t)	Cropped Area (ha)	Production (t)	Cropped Area (ha)	Production (t)
Existing Lower Moshi Project Area 2,150 ha	Paddy	2,150	13,975	1,075	7,525	3,225	21,500
	Maize						
	Alfalfa			430	1,290	430	1,290
	Subtotal	2,150	13,975	1,505	8,815	3,655	22,790
New Extension Area 460 ha	Paddy	2,090	13,585	1,045	7,315	3,135	20,900
	Maize						
	Alfalfa			418	1,254	418	1,254
	Subtotal	2,090	13,585	1,463	8,569	3,553	22,154
Expanded Area 2,090 ha	Paddy	460	2,760	230	1,495	690	4,255
	Maize						
	Alfalfa			92	276	92	276
	Subtotal	460	2,760	322	1,771	782	4,531
Project Area Total 4,700 ha	Paddy	4,700	30,320	2,350	16,335	7,050	46,655
	Maize	0	0	0	0	0	0
	Alfalfa	0	0	940	2,820	940	2,820
	Total	4,700	30,320	3,290	19,155	7,990	49,475

Present Conditions

Area/Net Farm Land(ha)	Crops	Rainy Season		Dry Season		Annual	
		Cropped Area (ha)	Production (t)	Cropped Area (ha)	Production (t)	Cropped Area (ha)	Production (t)
Existing Lower Moshi Project Area 2,150 ha	Paddy	140	826	640	4300	780	5,126
	Maize	1,486	2,972			1,486	2,972
	Alfalfa						
	Subtotal	1,626	3,798	640	4,300	2,266	8,098
New Extension Area 2,289 ha	Paddy						
	Maize	2,175	2,610			2,175	2,610
	Alfalfa						
	Subtotal	2,175	2,610	0	0	2,175	2,610
Expanded Area 487 ha	Paddy	391	1368	263	1184	654	2,552
	Maize	96	192			96	192
	Alfalfa						
	Subtotal	487	1,560	263	1,184	750	2,744
Project Area Total 4,996 ha 1/	Paddy	531	2,194	903	5,484	1,434	7,678
	Maize	3,757	5,774	0	0	3,757	5,774
	Alfalfa	0	0	0	0	0	0
	Total	4,288	7,968	903	5,484	5,191	13,452

1/: Including grass land of 70 ha

Incremental (With - Present)

Area	Crops	Rainy Season		Dry Season		Annual	
		Cropped Area (ha)	Production (t)	Cropped Area (ha)	Production (t)	Cropped Area (ha)	Production (t)
Existing Project Area	Paddy	2,010	13,149	435	3,225	2,445	16,374
	Maize	-1,486	-2,972	0	0	-1,486	-2,972
	Alfalfa	0	0	430	1,290	430	1,290
	Subtotal	524	10,177	865	4,515	1,389	14,692
New Extension Area	Paddy	2,090	13,585	1,045	7,315	3,135	20,900
	Maize	-2,175	-2,610	0	0	-2,175	-2,610
	Alfalfa	0	0	418	1,254	418	1,254
	Subtotal	-85	10,975	1,463	8,569	1,378	19,544
Expanded Area	Paddy	69	1,392	-33	311	36	1,703
	Maize	-96	-192	0	0	-96	-192
	Alfalfa	0	0	92	276	92	276
	Subtotal	-27	1,200	59	587	32	1,787
Project Area Total	Paddy	4,169	28,126	1,447	10,851	5,616	38,977
	Maize	-3,757	-5,774	0	0	-3,757	-5,774
	Alfalfa	0	0	940	2,820	940	2,820
	Total	412	22,352	2,387	13,671	2,799	36,023

File:ET-20

Table E.3.8 Crop Production Plan under the Project:Existing Lower Moshi Project Area

Subject Area / Net IrrigationCommand Area	Crops	Items	Year / Season															
			2001		2002			2003			2004			2005			2006 and on		
			Dry	Annual	Rainy	Dry	Annual	Rainy	Dry	Annual	Rainy	Dry	Annual	Rainy	Dry	Annual	Rainy	Dry	Annual
1. Existing Paddy Fields 1,104 ha	Paddy	Cropping Intensity(%)	70	70	90	80	170	90	80	170	100	50	150	100	50	150	100	50	150
		Cropped Area(ha)	773	773	994	883	1,877	994	883	1,877	1,104	552	1,656	1,104	552	1,656	1,104	552	1,656
		Yield(t/ha)	7.0	7.0	6.5	7.0	6.7	6.5	7.0	6.7	6.5	7.0	6.7	6.5	7.0	6.7	6.5	7.0	6.7
		Production(t)	5,410	5,410	6,458	6,182	12,641	6,458	6,182	12,641	7,176	3,864	11,040	7,176	3,864	11,040	7,176	3,864	11,040
	Alfalfa	Cropping Intensity(%)				5	5		5	5		5	5		20	20		20	20
		Cropped Area(ha)				55	55		55	55		55	55		221	221		221	221
		Yield(t/ha)				3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0
		Production(t)				165	165		165	165		165	165		663	663		663	663
	Rice+ Alfalfa	Cropping Intensity(%)	70	70	90	85	175	90	85	175	100	55	155	100	70	170	100	70	170
		Cropped Area(ha)	773	773	994	938	1,932	994	938	1,932	1,104	607	1,711	1,104	773	1,877	1,104	773	1,877
2. Existing Upland Fields 1,046 ha	Paddy	Cropping Intensity(%)	70	70	80	70	150	90	70	160	100	50	150	100	50	150	100	50	150
		Cropped Area(ha)	732	732	837	732	1,569	941	732	1,674	1,046	523	1,569	1,046	523	1,569	1,046	523	1,569
		Yield(t/ha)	4.5	4.5	4.5	5.0	4.7	5.5	5.5	5.5	6.0	6.0	6.0	6.5	6.5	6.5	6.5	7.0	6.7
		Production(t)	3,295	3,295	3,766	3,661	7,427	5,178	4,027	9,205	6,276	3,138	9,414	6,799	3,400	10,199	6,799	3,661	10,460
	Alfalfa	Cropping Intensity(%)													20	20		20	20
		Cropped Area(ha)													209	209		209	209
		Yield(t/ha)													3.0	3.0		3.0	3.0
		Production(t)													627	627		627	627
	Rice+ Alfalfa	Cropping Intensity(%)	70	70	80	70	150	90	70	160	100	50	150	100	70	170	100	70	170
		Cropped Area(ha)	732	732	837	732	1,569	941	732	1,674	1,046	523	1,569	1,046	732	1,778	1,046	732	1,778
Existing Lower Moshi Project Area Total 2,150 ha	Paddy	Cropping Intensity(%)	70	70	85	75	160	90	75	165	100	50	150	100	50	150	100	50	150
		Cropped Area(ha)	1,505	1,505	1,830	1,615	3,446	1,935	1,615	3,550	2,150	1,075	3,225	2,150	1,075	3,225	2,150	1,075	3,225
		Average Yield(t/ha)	5.8	5.8	5.6	6.1	5.8	6.0	6.3	6.2	6.3	6.5	6.3	6.5	6.8	6.6	6.5	7.0	6.7
		Production(t)	8,705	8,705	10,224	9,843	20,067	11,636	10,210	21,846	13,452	7,002	20,454	13,975	7,264	21,239	13,975	7,525	21,500
		Production(%) 1/					93			102			95			99			100
	Alfalfa	Cropping Intensity(%)				3	3		3	3		3	3		20	20		20	20
		Cropped Area(ha)				55	55		55	55		55	55		430	430		430	430
		Yield(t/ha)				3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0
		Production(t)				165	165		165	165		165	165		1,290	1,290		1,290	1,290
	Paddy+ Alfalfa	Cropping Intensity(%)	70	70	85	78	163	90	78	168	100	53	153	100	70	170	100	70	170
		Cropped Area(ha)	1,505	1,505	1,830	1,670	3,501	1,935	1,670	3,605	2,150	1,130	3,280	2,150	1,505	3,655	2,150	1,505	3,655

File:ET-21C

1/: % to the full development stage

Table E.3.9 Crop Production Plan under the Project:New Extension Area

System Net Area	Crops/Items	Year / Season																							
		2003			2003			2004			2005			2006			2007			2008			2009 and on		
		Rainy	Dry	Annual	Rainy	Dry	Annual	Rainy	Dry	Annual	Rainy	Dry	Annual	Rainy	Dry	Annual	Rainy	Dry	Annual	Rainy	Dry	Annual	Rainy	Dry	Annual
New Extension Area: Net Irrigation Command Area 2,0900 ha																									
System-I	Paddy																								
181 ha	Cropping Intensity(%)		80	80	100	80	180	100	80	180	100	50	150	100	50	150	100	50	150	100	50	150	100	50	150
	Cropped Area(ha)		145	145	181	145	326	181	145	326	181	91	272	181	91	272	181	91	272	181	91	272	181	91	272
	Yield(t/ha)		4.0	4.0	4.5	5.0	4.7	5.5	5.5	5.5	6.0	6.0	6.0	6.5	6.5	6.5	6.5	7.0	6.7	6.5	7.0	6.7	6.5	7.0	6.7
	Production(t)		579	579	815	724	1,539	996	796	1,792	1,086	543	1,629	1,177	588	1,765	1,177	634	1,810	1,177	634	1,810	1,177	634	1,810
	Paddy																								
	Cropping Intensity(%)											20	20		20	20		20	20		20	20		20	20
	Cropped Area(ha)											36	36		36	36		36	36		36	36		36	36
	Yield(t/ha)											3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0
	Production(t)											108	108		108	108		108	108		108	108		108	108
System-II	Paddy																								
1,909 ha	Cropping Intensity(%)								40	40	70	50	120	90	50	140	100	50	150	100	50	150	100	50	150
	Cropped Area(ha)								764	764	1,336	955	2,291	1,718	955	2,673	1,909	955	2,864	1,909	955	2,864	1,909	955	2,864
	Yield(t/ha)								4.0	4.0	4.5	5.0	4.7	5.5	5.5	5.5	6.0	6.0	6.0	6.5	6.5	6.5	6.5	7.0	6.7
	Production(t)								3,054	3,054	6,013	4,773	10,786	9,450	5,250	14,699	11,454	5,727	17,181	12,409	6,204	18,613	12,409	6,682	19,090
	Alfalfa																								
	Cropping Intensity(%)																	20	20		20	20		20	20
	Cropped Area(ha)																	382	382		382	382		382	382
	Yield(t/ha)																	3.0	3.0		3.0	3.0		3.0	3.0
	Production(t)																	1,146	1,146		1,146	1,146		1,146	1,146
	Paddy																								
	Cropping Intensity(%)		7	7	9	7	16	9	43	52	73	50	123	91	50	141	100	50	150	100	50	150	100	50	150
	Cropped Area(ha)		145	145	181	145	326	181	908	1,089	1,517	1,045	2,562	1,899	1,045	2,944	2,090	1,045	3,135	2,090	1,045	3,135	2,090	1,045	3,135
	Average Yield(t/ha)		4.0	4.0	4.5	5.0	4.7	5.5	4.2	4.4	4.7	5.1	4.8	5.6	5.6	5.6	6.0	6.1	6.1	6.5	6.5	6.5	6.5	7.0	6.7
	Production(t)		579	579	815	724	1,539	996	3,851	4,846	7,099	5,316	12,415	10,626	5,838	16,464	12,631	6,361	18,991	13,585	6,838	20,423	13,585	7,315	20,900
Total	Production(%) 1/			3			7			23			59			79			91			98			100
2,090 ha	Alfalfa																								
	Cropping Intensity(%)											2	2	0	2	2	0	20	20	0	20	20	0	20	20
	Cropped Area(ha)											36	36	0	36	36	0	418	418	0	418	418	0	418	418
	Production(t)											108	108	0	108	108	0	1,254	1,254	0	1,254	1,254	0	1,254	1,254
	Paddy + Alfalfa																								
	Cropping Intensity(%)		7	7	9	7	16	9	43	52	73	52	124	91	52	143	100	70	170	100	70	170	100	70	170
	Cropped Area(ha)		145	145	181	145	326	181	908	1,089	1,517	1,081	2,598	1,899	1,081	2,980	2,090	1,463	3,553	2,090	1,463	3,553	2,090	1,463	3,553

1/: % of the full development satage

File:ET-22C

Table E.3.10 Crop Production Plan under the Project:Expanded Area

System/ Net Area	Crops/Items	Year /Season																		
		2002			2003			2004			2005			2006			2007 and on		
		Rainy	Dry	Annual	Rainy	Dry	Annual	Rainy	Dry	Annual	Rainy	Dry	Annual	Rainy	Dry	Annual	Rainy	Dry	Annual
Kaloleni	Paddy																		
100 ha	Cropping Intensity(%)	100	50	150	100	50	150	100	50	150	100	50	150	100	50	150	100	50	150
	Cropped Area(ha)	100	50	150	100	50	150	100	50	150	100	50	150	100	50	150	100	50	150
	Yield(t/ha)	4.0	5.0	4.3	4.5	5.5	4.8	5.0	6.0	5.3	5.5	6.5	5.8	6.0	6.5	6.2	6.0	6.5	6.2
	Production(t)	400	250	650	450	275	725	500	300	800	550	325	875	600	325	925	600	325	925
	Alfalfa																		
	Cropping Intensity(%)											20	20		20	20		20	20
	Cropped Area(ha)											20	20		20	20		20	20
	Yield(t/ha)											3.0	3.0		3.0	3.0		3.0	3.0
	Production(t)											60	60		60	60		60	60
Mandaka	Paddy																		
360 ha	Cropping Intensity(%)				100	50	150	100	50	150	100	50	150	100	50	150	100	50	150
	Cropped Area(ha)				360	180	540	360	180	540	360	180	540	360	180	540	360	180	540
	Yield(t/ha)				4.0	5.0	4.3	4.5	5.5	4.8	5.0	6.0	5.3	5.5	6.5	5.8	6.0	6.5	6.2
	Production(t)				1,440	900	2,340	1,620	990	2,610	1,800	1,080	2,880	1,980	1,170	3,150	2,160	1,170	3,330
	Alfalfa																		
	Cropping Intensity(%)														20	20		20	20
	Cropped Area(ha)														72	72		72	72
	Yield(t/ha)														3.0	3.0		3.0	3.0
	Production(t)														216	216		216	216
Total	Paddy																		
Expanded Area	Cropping Intensity(%)	22	11	33	100	50	150	100	50	150	100	50	150	100	50	150	100	50	150
460 ha	Cropped Area(ha)	100	50	150	460	230	690	460	230	690	460	230	690	460	230	690	460	230	690
	Average Yield(t/ha)	4.0	5.0	4.3	4.1	5.1	4.4	4.6	5.6	4.9	5.1	6.1	5.4	5.6	6.5	5.9	6.0	6.5	6.2
	Production(t)	400	250	650	1,890	1,175	3,065	2,120	1,290	3,410	2,350	1,405	3,755	2,580	1,495	4,075	2,760	1,495	4,255
	Production(%) 1/			15			72			80			88			96			100
	Alfalfa											4	4	0	20	20	0	20	20
	Cropping Intensity(%)											20	20	0	92	92	0	92	92
	Cropped Area(ha)											60	60	0	276	276	0	276	276
	Production(t)																		
	Paddy + Alfalfa																		
	Cropping Intensity(%)	22	11	33	100	50	150	100	50	150	100	54	154	100	70	170	100	70	170
	Cropped Area(ha)	100	50	150	460	230	690	460	230	690	460	250	710	460	322	782	460	322	782

1/: % to the full development stage

File:ET-23C

Table E.3.11 Crop Production Plan under the Project:Whole Project Area

Project Area / Net Command Area	Crops/Items	Year / Season																										
		2001			2002			2003			2004			2005			2006			2007			2008			2009 and on		
		Rainy	Dry	Annual	Rainy	Dry	Annual	Rainy	Dry	Annual	Rainy	Dry	Annual	Rainy	Dry	Annual	Rainy	Dry	Annual	Rainy	Dry	Annual	Rainy	Dry	Annual	Rainy	Dry	Annual
Existing Lower Moshi Project Area 2,150 ha	Paddy																											
	Cropping Intensity(%)		70	70	85	75	160	90	75	165	100	50	150	100	50	150	100	50	150	100	50	150	100	50	150	100	50	150
	Cropped Area(ha)		1505	1505	1,830	1,615	3,445	1,935	1,615	3,550	2,150	1,075	3,225	2,150	1,075	3,225	2,150	1,075	3,225	2,150	1,075	3,225	2,150	1,075	3,225	2,150	1,075	3,225
	Yield(t/ha)		5.8	5.8	5.6	6.1	5.8	6.0	6.3	6.2	6.3	6.5	6.3	6.5	6.8	6.6	6.5	7.0	6.7	6.5	7.0	6.7	6.5	7.0	6.7	6.5	7.0	6.7
	Production(t)		8,705	8,705	10,224	9,843	20,067	11,636	10,210	21,846	13,452	7,002	20,454	13,975	7,264	21,239	13,975	7,525	21,500	13,975	7,525	21,500	13,975	7,525	21,500	13,975	7,525	21,500
	Alfalfa																											
	Cropping Intensity(%)					3	3		3	3		3	3		20	20		20	20		20	20		20	20		20	20
	Cropped Area(ha)					55	55		55	55		55	55		430	430		430	430		430	430		430	430		430	430
	Yield(t/ha)					3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0
	Production(t)					165	165		165	165		165	165		1,290	1,290		1,290	1,290		1,290	1,290		1,290	1,290		1,290	1,290
	Total Cropping Intensity(%)		70	70	85	78	163	90	78	168	100	53	153	100	70	170	100	70	170	100	70	170	100	70	170	100	70	170
	Total Cropped Area(ha)		1,505	1,505	1,830	1,670	3,500	1,935	1,670	3,605	2,150	1,130	3,280	2,150	1,505	3,655	2,150	1,505	3,655	2,150	1,505	3,655	2,150	1,505	3,655	2,150	1,505	3,655
New Extension Area 2,090 ha	Paddy																											
	Cropping Intensity(%)					7	7	9	7	16	9	43	52	73	50	123	91	50	141	100	50	150	100	50	150	100	50	150
	Cropped Area(ha)					145	145	181	145	326	181	908	1,089	1,517	1,045	2,562	1,899	1,045	2,944	2,090	1,045	3,135	2,090	1,045	3,135	2,090	1,045	3,135
	Yield(t/ha)					4.0	4.0	4.5	5.0	4.7	5.5	4.2	4.5	4.7	5.1	4.8	5.6	5.6	5.6	6.0	6.1	6.1	6.5	6.5	6.5	6.5	7.0	6.7
	Production(t)					579	579	815	724	1,539	996	3,851	4,847	7,099	5,316	12,415	10,626	5,838	16,464	12,631	6,361	18,992	13,585	6,838	20,423	13,585	7,315	20,900
	Alfalfa																											
	Cropping Intensity(%)														2	2		2	2		20	20		20	20		20	20
	Cropped Area(ha)														36	36		36	36		418	418		418	418		418	418
	Yield(t/ha)														3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0
	Production(t)														108	108		108	108		1,254	1,254		1,254	1,254		1,254	1,254
	Total Cropping Intensity(%)					7	7	9	7	16	9	43	52	73	52	124	91	52	143	100	70	170	100	70	170	100	70	170
	Total Cropped Area(ha)					145	145	181	145	326	181	908	1,089	1,517	1,081	2,598	1,899	1,081	2,980	2,090	1,463	3,553	2,090	1,463	3,553	2,090	1,463	3,553
Expanded Area 460 ha	Paddy																											
	Cropping Intensity(%)				22	11	33	100	50	150	100	50	150	100	50	150	100	50	150	100	50	150	100	50	150	100	50	150
	Cropped Area(ha)				100	50	150	460	230	690	460	230	690	460	230	690	460	230	690	460	230	690	460	230	690	460	230	690
	Yield(t/ha)				4.0	5.0	4.3	4.1	5.1	4.4	4.6	5.6	4.9	5.1	6.1	5.4	5.6	325.0	5.9	6.0	6.5	6.2	6.0	6.5	6.2	6.0	6.5	6.2
	Production(t)				400	250	650	1,890	1,175	3,065	2,120	1,290	3,410	2,350	1,405	3,755	2,580	1,495	4,075	2,760	1,495	4,255	2,760	1,495	4,255	2,760	1,495	4,255
	Alfalfa																											
	Cropping Intensity(%)																	4	4		20	20		20	20		20	20
	Cropped Area(ha)																	20	20		92	92		92	92		92	92
	Yield(t/ha)																	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0
	Production(t)																	60	60		276	276		276	276		276	276
	Total Cropping Intensity(%)				22	11	33	100	50	150	100	50	150	100	50	150	100	54	154	100	70	170	100	70	170	100	70	170
	Total Cropped Area(ha)				100	50	150	460	230	690	460	230	690	460	230	690	460	250	710	460	322	782	460	322	782	460	322	782
Project Area Total 4,700 ha	Paddy																											
	Cropping Intensity(%)		32	32	41	39	80	55	42	97	59	47	106	88	50	138	96	50	146	100	50	150	100	50	150	100	50	150
	Cropped Area(ha)		1,505	1,505	1,930	1,810	3,740	2,576	1,990	4,566	2,791	2,213	5,004	4,127	2,350	6,477	4,509	2,350	6,859	4,700	2,350	7,050	4,700	2,350	7,050	4,700	2,350	7,050
	Average Yield(t/ha)		5.8	5.8	5.5	5.9	5.7	5.6	6.1	5.8	5.9	5.5	5.7	5.7	6.0	5.8	6.0	6.3	6.1	6.2	6.5	6.3	6.5	6.7	6.6	6.5	7.0	6.6
	Production(t)		8,705	8,705	10,624	10,672	21,296	14,341	12,109	26,450	16,568	12,143	28,711	23,424	13,985	37,409	27,181	14,858	42,039	29,366	15,381	44,747	30,320	15,858	46,178	30,320	16,335	46,655
	Production(%) 1/			19			46			57			62			80			90			96			99			100
	Alfalfa																											
	Cropping Intensity(%)					1	1	0	1	1	0	1	1	0	10	10	0	10	10	0	20	20	0	20	20	0	20	20
	Cropped Area(ha)					55	55	0	55	55	0	55	55	0	466	466	0	486	486	0	940	940	0	940	940	0	940	940
	Production(t)					165	165	0	165	165	0	165	165	0	1,398	1,398	0	1,458	1,458	0	2,820	2,820	0	2,820	2,820	0	2,820	2,820
	Production(%) 1/						6			6			6			50			52			100			100			100
	All Crops																											
	Cropping Intensity(%)		32	32	41	40	81	55	44	98	59	48	108	88	60	148	96	60	156	100	70	170	100	70	170	100	70	170
	Cropped Area(ha)		1,505	1,505	1,930	1,865	3,795	2,576	2,045	4,621	2,791	2,268	5,059	4,127	2,816	6,943	4,509	2,836	7,345	4,700	3,290	7,990	4,700	3,290	7,990	4,700	3,290	7,990

1/: % to the full development stage

File:ET-24C

Table E.3.12 Crop Production Plan under Present Conditions: Whole Project Area

Project Area / Net Area	Crops	Crops/Items	Rainy Season 1st Season	Dry Season 2nd Season	Dry Season 3rd Season	Annual
Existing Lower Moshi Project Area		Paddy				
1. Existing Paddy Fields 1,104 ha	Paddy	Cropping Intensity(%)	13	33	25	71
		Cropped Area(ha)	140	360	280	780
		Yield(t/ha)	5.9	6.5	7.0	6.6
		Production(t)	826	2,340	1,960	5,126
	Maize	Cropping Intensity(%)	40	-	-	40
		Cropped Area(ha)	440	-	-	440
		Yield(t/ha)	2.0	-	-	2.0
		Production(t)	880	-	-	880
2. Existing Upland Fields 1,046 ha	Maize	Cropping Intensity(%)	100	-	-	100
		Cropped Area(ha)	1046	-	-	1,046
		Yield(t/ha)	2.0	-	-	2.0
		Production(t)	2,092	-	-	2,092
Total Existing Lower Moshi Project Area 2,150 ha	Paddy	Cropping Intensity(%)	7	17	13	36
		Cropped Area(ha)	140	360	280	780
		Yield(t/ha)	5.9	6.5	7.0	6.6
		Production(t)	826	2,340	1,960	5,126
	Maize	Cropping Intensity(%)	69	-	-	69
		Cropped Area(ha)	1,486	-	-	1,486
		Yield(t/ha)	5.9	-	-	2.0
		Production(t)	2,972	-	-	2,972
	Paddy + Maize	Cropping Intensity(%)	76	17	13	105
		Cropped Area(ha)	1,626	360	280	2,266
Expanded Area						
1. Existing Paddy Fields 391 ha	Paddy	Cropping Intensity(%)	100	67		167
		Cropped Area(ha)	391	263		654
		Yield(t/ha)	3.5	4.5		3.9
		Production(t)	1,369	1,184		2,552
2. Existing Upland Fields 96 ha	Maize	Cropping Intensity(%)	100	-		9
		Cropped Area(ha)	96	-		96
		Yield(t/ha)	2.0	-		2.0
		Production(t)	192	-		192
Total Expanded Area 487 ha	Paddy	Cropping Intensity(%)	80	54		134
		Cropped Area(ha)	391	263		654
	Maize	Cropping Intensity(%)	20	-		20
		Cropped Area(ha)	96	-		96
	Paddy + Maize	Cropping Intensity(%)	100	54		154
		Cropped Area(ha)	487	263		750
New Extension Area 2,289 ha	Maize	Cropping Intensity(%)	95	-		95
		Cropped Area(ha)	2,175	-		2,175
		Yield(t/ha)	1.2	-		1.2
		Production(t)	2,610	-		2,610
Project Area Total 4,996 ha 1/	Paddy	Cropping Intensity(%)	11	18		154
		Production(t)	2,195	5,484		7,678
		Cropped Area(ha)	531	903		1,434
	Maize	Cropping Intensity(%)	75	-		116
		Production(t)	5,774	-		5,774
		Cropped Area(ha)	3,757	-		3,757
	Paddy + maize	Cropping Intensity(%)	86	18		104
		Cropped Area(ha)	4,288	903		5,191

1/: Including present grass land of 70 ha

File:ET-25

Table E.3.13 Labour Requirements per Ha: With-Project Conditions

Existing Project Area & New Extension Area: Rainy Season Paddy Unit:mandays

Farming Practices	Month in Order					Total
	- 1st	1st	2nd	3rd	4th	
1 Field Cleaning	16					16
2 Nursery	3					3
3 Canal Cleaning	2					2
4 Land Preparation						0
5 Transplanting		27				27
6 Field Management		2	2	1	1	6
7 Weeding(2 times)		15	15			30
8 Fertilization(3 times)		1	1	1		3
9 Pesticide Application(3 times)		1	2			3
10 Bird Scaring				5	30	35
11 Harvesting/Transporting					30	30
	21	46	20	7	61	155

Existing Project Area & New Extension Area: Dry Season Paddy Unit:mandays

Farming Practices	Month in Order					Total
	- 1st	1st	2nd	3rd	4th	
1 Field Cleaning	16					16
2 Nursery	3					3
3 Canal Cleaning	2					2
4 Land Preparation						0
5 Transplanting		27				27
6 Field Management		2	2	1	1	6
7 Weeding(2 times)		15	15			30
8 Fertilization(3 times)		1	1	1		3
9 Pesticide Application(3 times)		1	2			3
10 Bird Scaring				5	30	35
11 Harvesting/Transporting					35	35
Monthly Total	21	46	20	7	66	160

Expanded Area: Rainy Season & Dry Season Paddy Unit:mandays

Farming Practices	Month in Order					Total
	- 1st	1st	2nd	3rd	4th	
1 Field Cleaning	16					16
2 Nursery	3					3
3 Canal Cleaning	2					2
4 Land Preparation						0
5 Transplanting		27				27
6 Field Management		2	2	1	1	6
7 Weeding(2 times)		15	15			30
8 Fertilization(3 times)		1	1	1		3
9 Pesticide Application(3 times)		1	2			3
10 Bird Scaring				5	30	35
11 Harvesting/Transporting					30	30
	21	46	20	7	61	155

Alfalfa Unit:mandays

Farming Practices	1st	2nd	3rd	4th	5th	Total
1 Land Preparation	5					5
2 Planting	10					10
3 Field Management	1	1	1	1		4
4 Weeding						0
5 Fertilization	1					1
6 Pesticide Application						0
7 Harvesting				12		12
8 Bailing				8		8
Monthly Total	17	1	1	21	0	40

File:ET-26

Table E.3.14 Labour Balance in Paddy Farming of Typrical Paddy Farm (1.0 ha) under With-Project Conditions

Cropping Intensity: Rainy Season 100% Paddy; Dry Season 50% Paddy

1. Rainy Season Paddy: Cropped Area 1.0 ha

Unit:mandays

	Labour Requirements per Season															
	January			February			March			April			May			
Farming Practices	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	Total
1. Field Clearing		8	8													16
2. Nursery	1	1	1													3
3. Canal Cleaning			2													2
4. Land Preparation																0
5. Transplanting				27												27
6. Field Management				1	1		0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5	6
7. Weeding						15			15							30
8. Fertilization							1		1		1					3
9. Pesticide Application						1		1		1						3
10. Bird Scaring												10	10	10	5	35
11. Harvesting/Transporting															30	30
Total	1	9	11	28	1	16	1.5	1.5	16	1.5	1.5	10.5	10.5	10.5	35.5	155
Available Labour Forces 1/	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	255
Labour Balance	16	8	6	-11	16	1	15.5	15.5	1	15.5	15.5	6.5	6.5	6.5	-18.5	100

2. Dry Season Paddy: Cropped Area 0.5 ha

Unit:mandays

	Labour Requirements per Season															
	January			February			March			April			May			
Farming Practices	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	Total
1. Field Clearing			8													8
2. Nursery	1	1	1													3
3. Canal Cleaning			2													2
4. Land Preparation																0
5. Transplanting				13.5												13.5
6. Field Management				0.5	0.5		0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5	5
7. Weeding						7.5			7.5							15
8. Fertilization							1		1		1					3
9. Pesticide Application						1		1		1						3
10. Bird Scaring												10	10	10	5	35
11. Harvesting/Transporting															15	15
Total	1	1	11	14	0.5	8.5	1.5	1.5	8.5	1.5	1.5	10.5	10.5	10.5	20.5	102.5
Available Labour Forces 1/	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	255
Labour Balance	16	16	6	3	16.5	8.5	15.5	15.5	8.5	15.5	15.5	6.5	6.5	6.5	-3.5	152.5

1/: Available Labour Forces per Family: **2.1 labour forces/family x 8 days per decade(10 days) = 17 mandays per decade**

File:ET-27

Table E.3.15 Labour Requirements under With-Project Conditions in the Project Area

Unit: 1,000 mandays

Crops/Net Area(farm land)	Cropped Area(ha)	Month												Annual
		Jan.	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Labaour Requirements under Present Conditions 4,926 ha (Table E - xxxx)	5,191	28.0	44.4	64.6	75.6	54.0	31.2	50.2	66.3	45.0	29.1	16.8	12.2	517.4
With-Project Conditions														
Existing Lower Moshi Project Area (2,150 ha)														
Paddy Cultivation:Rainy Season	1,075	22.6	49.5	21.5	7.5	71.0								172.0
	1,075		22.6	49.5	21.5	7.5	71.0							172.0
Paddy Cultivation:Dry Season	538							11.3	24.7	10.8	3.8	35.5		86.1
	537								11.3	24.7	10.7	3.8	35.4	85.9
Alfalfa Cultivation	215	4.5									3.7	0.2	0.2	8.6
	215	0.2	4.5									3.7	0.2	8.6
Total Existing Lower Moshi Project Area	3,655	27.3	76.5	71.0	29.0	78.5	71.0	11.3	36.0	35.5	18.2	43.1	35.9	533.2
Expanded Area (460 ha)														
Paddy Cultivation:Rainy Season	230	4.8	10.6	4.6	1.6	14.0								35.7
	230		4.8	10.6	4.6	1.6	14.0							35.7
Paddy Cultivation:Dry Season	115							2.4	5.3	2.3	0.8	7.6		18.4
	115								2.4	5.3	2.3	0.8	7.6	18.4
Alfalfa Cultivation	46	1.0									0.8	0.0	0.0	1.8
	46	0.0	1.0									0.8	0.0	1.8
Total Expanded Area	782	5.8	16.4	15.2	6.2	15.6	14.0	2.4	7.7	7.6	3.9	9.2	7.7	111.8
New Extension Area (2,090 ha)														
Paddy Cultivation:Rainy Season	1,045	21.9	48.1	20.9	7.3	69.0								167.2
	1,045		21.9	48.1	20.9	7.3	69.0							167.2
Paddy Cultivation:Dry Season	522							11.0	24.0	10.4	3.7	34.5		83.5
	523								11.0	24.1	10.5	3.7	34.5	83.7
Alfalfa Cultivation	209	4.4									3.6	0.2	0.2	8.4
	209	0.2	4.4									3.6	0.2	8.4
Total New Extension Area	3,553	26.5	74.4	69.0	28.2	76.3	69.0	11.0	35.0	34.5	17.7	41.9	34.9	518.3
Total With Project Conditions	7,990	59.7	167.3	155.1	63.5	170.4	154.0	24.7	78.7	77.6	39.7	94.2	78.5	1,163.3
Incremental Labour Requirements With-Project - Present	2,799	31.7	122.9	90.5	-12.2	116.4	122.8	-25.5	12.4	32.6	10.6	77.4	66.3	645.9
Available Labour Forces in The Study Area 1/		256.0	256.0	256.0	256.0	256.0	256.0	256.0	256.0	256.0	256.0	256.0	256.0	3,072.0
Monthly Labour Balance		196.3	88.7	100.9	192.6	85.6	102.1	231.3	177.3	178.5	216.3	161.8	177.5	1,908.7

1/: Available labour forces in related villages 10,675 x 24 days work/month = 256,000 mandays/month

File:ET-28

Table E.3.16 Labour Requirements under Present Conditions in the Project Area

Unit: 1,000 mandays

Crops/Area	Cropped Area(ha)	Month												Total
		Jan.	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Paddy Cultivation														
Existing Lower Moshi														
1st Season Cropping	70	1.5	3.2	1.4	0.5	4.3								10.9
	70		1.5	3.2	1.4	0.5	4.3							10.9
2nd Season Cropping	180					3.8	8.3	3.6	1.3	11.0				27.9
	180						3.8	8.3	3.6	1.3	11.0			27.9
3rd Season Cropping	140	8.5								2.9	6.4	2.8	1.0	21.7
	140	1.0	8.5								2.9	6.4	2.8	21.7
Total Existing Project	780	11.0	13.2	4.6	1.9	8.5	16.3	11.9	4.9	15.2	20.4	9.2	3.8	120.9
Expanded Area														
Rainy Season Cropping	196	8.6	2.9	1.6	10.8								8.4	32.3
	195	8.4	8.6	2.9	1.6	10.7								32.2
Dry Season Cropping	132						5.7	5.9	2.1	1.1	7.7			22.4
	131							5.6	5.9	2.1	1.0	7.6		22.3
Total Expanded Area	654	17.0	11.5	4.5	12.3	10.7	5.7	11.6	8.0	3.2	8.7	7.6	8.4	109.2
Total Labour Requirements for Paddy Cultivation	1,434	28.0	24.8	9.1	14.2	19.3	22.0	23.5	12.9	18.3	29.1	16.8	12.2	230.1
Maize Cultivation														
Existing Lower Moshi Project Area	372		6.3	5.6	3.0	0.0	0.0	9.3						24.2
	743			12.6	11.1	5.9	0.0	0.0	18.6					48.3
	371				6.3	5.6	3.0	0.0	0.0	9.3				24.1
Total Existing Lower Moshi Project	1,486	0.0	6.3	18.2	20.4	11.5	3.0	9.3	18.6	9.3	0.0	0.0	0.0	96.6
Expanded Area	24		4.1	3.6	1.9	0.0	0.0	6.0						15.6
	48			8.2	7.2	3.8	0.0	0.0	12.0					31.2
	24				4.1	3.6	1.9	0.0	0.0	6.0				15.6
Total Expanded Area	96	0.0	4.1	11.8	13.2	7.4	1.9	6.0	12.0	6.0	0.0	0.0	0.0	62.4
New Extension Area	543		9.2	7.1	4.3	0.0	0.0	11.4						32.0
	1,088			18.5	14.1	8.7	0.0	0.0	22.8					64.2
	544				9.2	7.1	4.4	0.0	0.0	11.4				32.1
Total New Extension Area	2,175	0.0	9.2	25.6	27.7	15.8	4.4	11.4	22.8	11.4	0.0	0.0	0.0	128.3
Total Labour Requirements for Maize Cultivation	3,757	0.0	19.6	55.5	61.4	34.7	9.2	26.7	53.4	26.7	0.0	0.0	0.0	287.3
Total Labour Requirements for Crop Cultivation	5,191	28.0	44.4	64.6	75.6	54.0	31.2	50.2	66.3	45.0	29.1	16.8	12.2	517.4

File:ET-29

Tbale E.3.17 Requirements for Drying Yards and Storage Facilities in Case of Processing 6,000 t/season in 5 months by KPHC

	Month												
	May	June	July	August	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	Total
Harvesting Season	Rainy Season						Dry Season						
	(10%)	(45%)	(45%)				(10%)	(45%)	(45%)				
1. Production in Existing Lower Moshi Project Area (t) 1/	1,400	6,300	6,300				800	3,600	3,600				22,000
2. KPHC Hundling Volume (t) 2/	1,000	2,000	2,000				600	2,200	2,200				10,000
3. Volume from Outside Project Area (t) 3/	200	200	200	200	200	200	200	200	200	200	200	200	2,400
4. Total Hundling Volume (2 + 3) (t)	1,200	2,200	2,200	200	200	200	800	2,400	2,400	200	200	200	12,400
5. Monthly Proceesing Capacity (t) 4/	1,500	1,500	1,500	1,500	1,500	200	1,500	1,500	1,500	1,500	1,500	1,500	-
6. Monthly Processing Volume (t)	1,200	1,500	1,500	1,500	300	200	800	1,500	1,500	1,500	700	200	12,400
7. Volume to Be Stored: Paddy (t) 5/	0	700	1,400	100	0	0	0	900	1,800	500	0	0	-
8. Volume to Be Stored: Rice (t) 6/	390	490	490	490	490	100	70	260	490	490	230	70	-
9. Requirements of Storage Capacities Stored (6+7) (t)	390	1,190	1,890	590	490	100	70	1,160	2,290	990	230	70	-
10. No. of Days for Drying (days) 7/	15	20	20	20	20	18	18	18	18	18	15	15	-
11. Volume to Be Dried per Day (7 / 9)(t)	80	110	110	10	10	11	44	133	133	11	11	11	-
12. Requirements of Drying Yard (m2) 8/	3,200	4,400	4,400	400	400	444	1,778	5,333	5,333	444	444	444	-

1/: Monthly production volumes assumed as shown

2/: KPHC handling volumes of paddy produced in Existing Project Area are assumed as shown

3/: Paddy brought in from outside from the Project Area assumed as shown

4/: Assumed as shown and maintenance wrorks in October

5/: Monthly hundling volume - processing volume + left over from previous month

6/: Assumed 50% of processed rice to be stored for 2 weeks

7/: No. of days in a month for drying operation

8/: Capaciy of existing drying yard: 80t/day/3,200m2

Fiel:ET-30

Figures

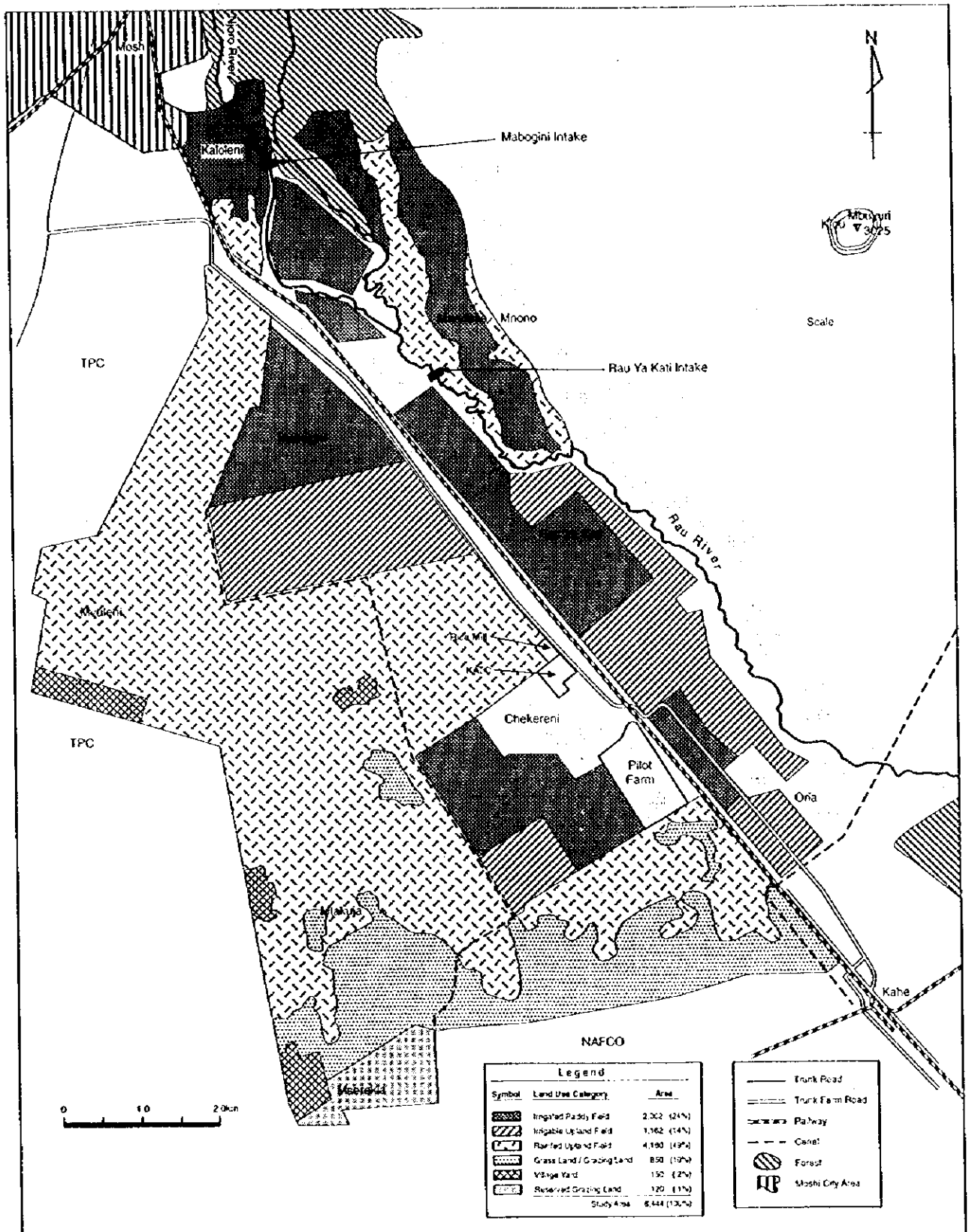


Figure E.2.1
Present Land Use Map

The Feasibility Study on Lower Moshi Integrated Agriculture and Rural Development Project in the United Republic of Tanzania

Japan International Cooperation Agency

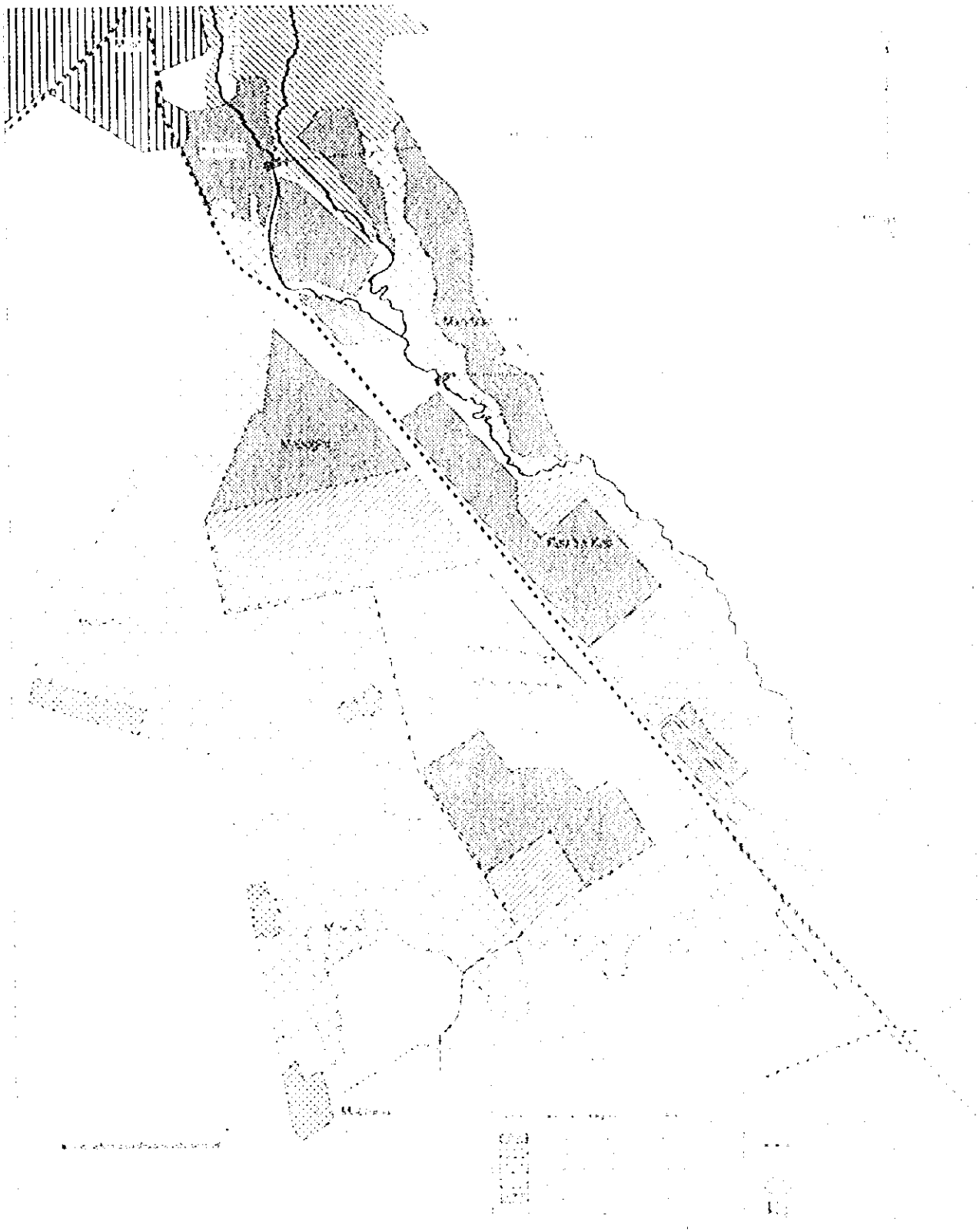
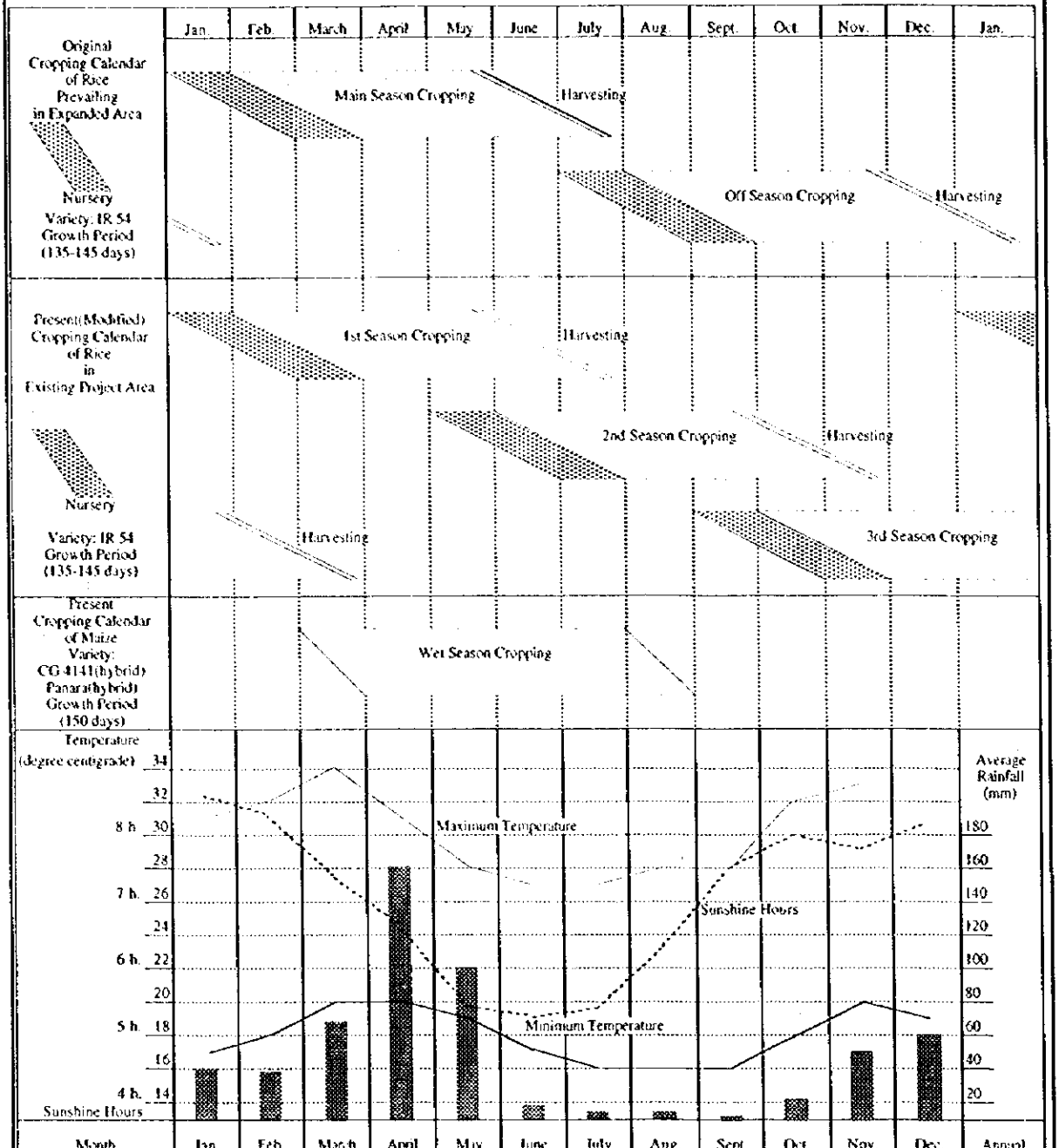


Figure E.2.1
Present Land Use Map



Month	Jan.	Feb.	March	April	May	June	July	Aug.	Sept	Oct.	Nov.	Dec.	Annual
Av. Rainfall (mm) 1/	40	38	68	161	100	18	10	10	6	21	30	60	560
Mean Temperature 1/	23	23	25	24	22	21	20	20	20	24	25	25	-
Av. Max. Temp. 1/	31	32	34	31	28	27	27	28	28	32	33	33	-
Av. Min. Temp. 1/	17	18	20	20	19	17	16	16	16	18	20	19	-
Sunshine Hours 2/	8.6	8.4	7.7	6.7	5.4	5.3	5.4	6.3	7.5	8.0	7.8	8.2	84.0

Source of meteorological data: 1/: Chekereni, KADP(1981 - 1996), 2/: TPC, 1977 - 1996)

File: IR-F352

Figure E.2.2
Presently Prevailing Cropping Calender in the Study Area

The Feasibility Study on Lower Moshi Integrated Agriculture and Rural Development Project in the United Republic of Tanzania

Japan International Cooperation Agency

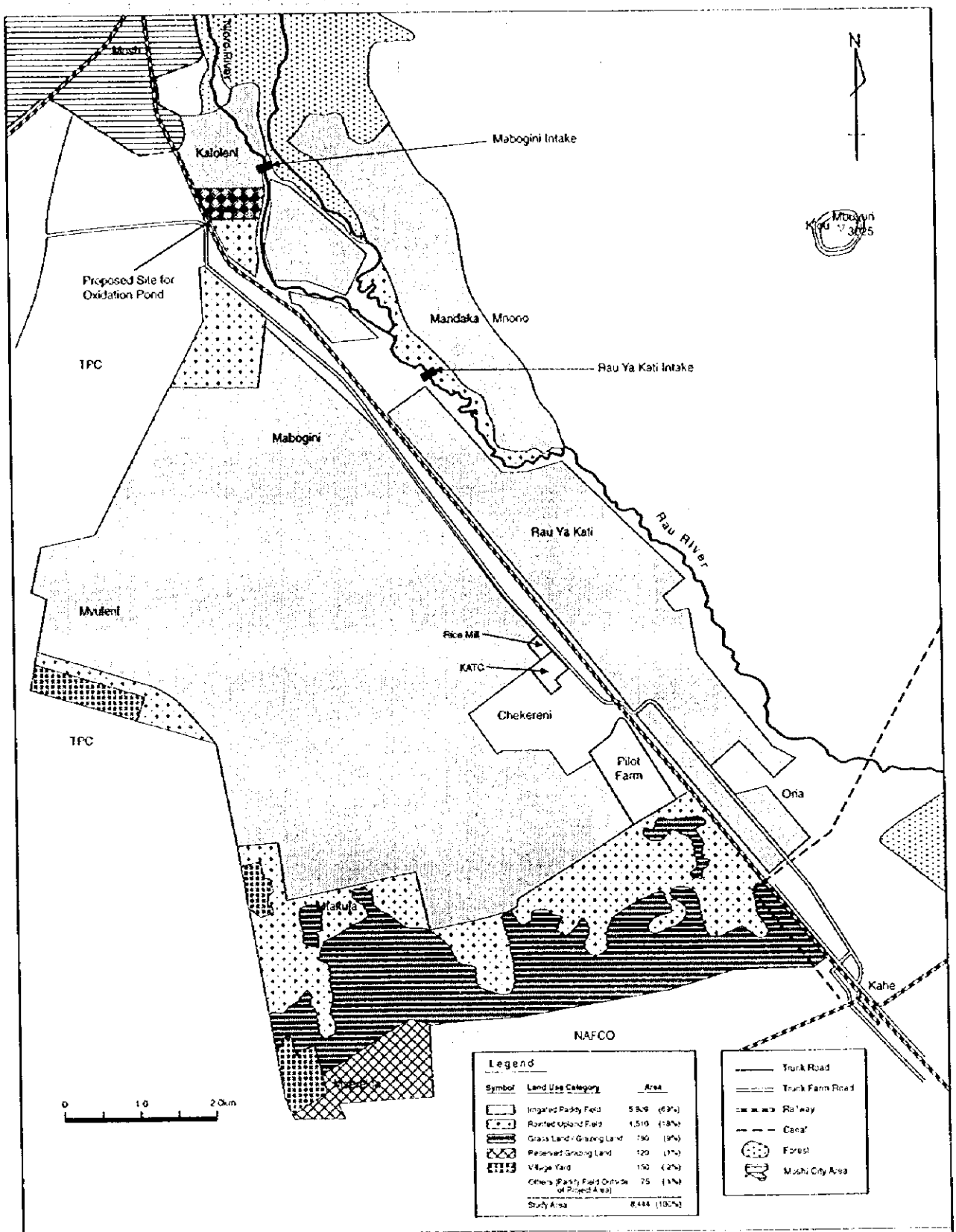
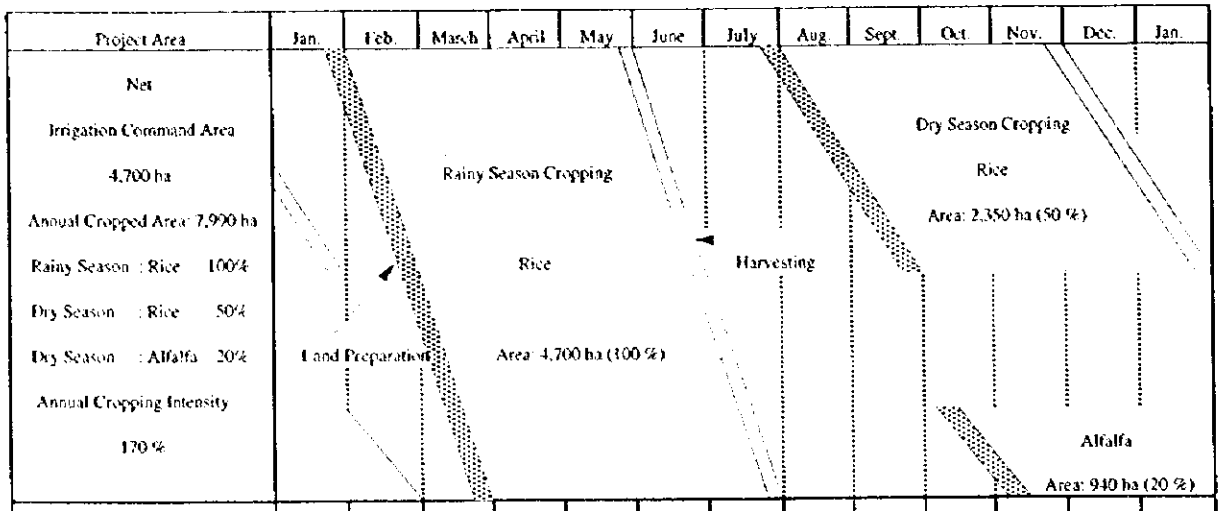
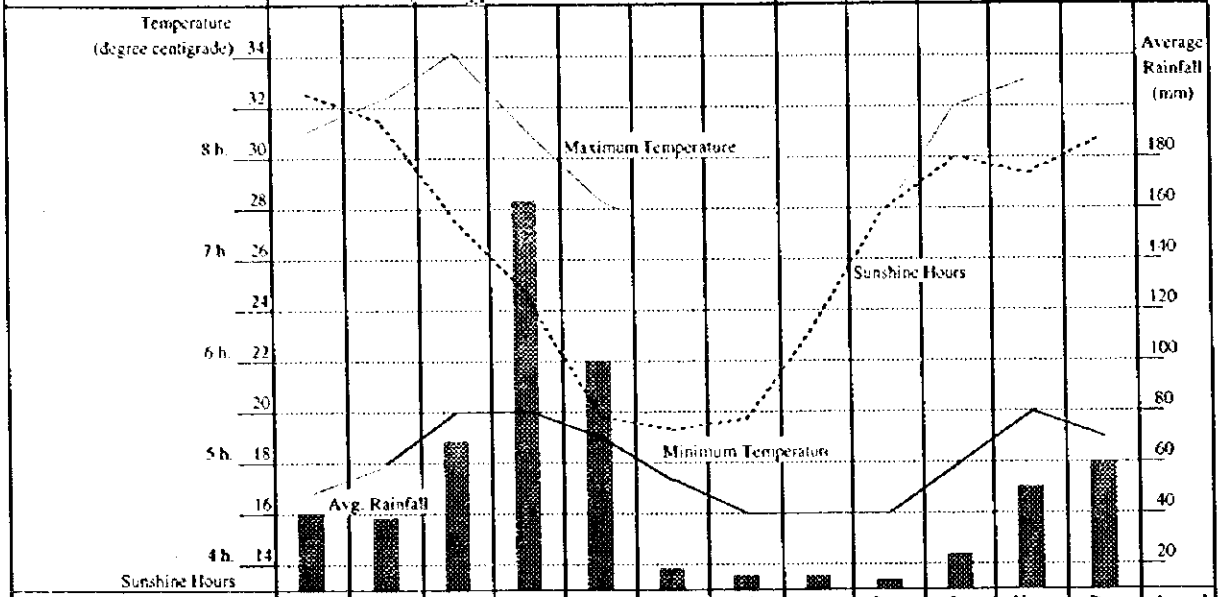


Figure E.3.1
Proposed Land Use Map

The Feasibility Study on Lower Moshi Integrated Agriculture and Rural Development Project in the United Republic of Tanzania

Japan International Cooperation Agency





Month	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Av. Rainfall (mm) 1/	40	38	68	161	100	18	10	10	6	21	30	60	560
Mean Temperature 1/	23	23	25	24	22	21	20	20	20	24	25	25	-
Av. Max. Temp. 1/	31	32	34	31	28	27	27	28	28	32	33	33	-
Av. Min. Temp. 1/	17	18	20	20	19	17	16	16	16	18	20	19	-
Sunshine Hours 2/	8.6	8.4	7.7	6.7	5.4	5.3	5.4	6.3	7.5	8.0	7.8	8.2	84.0

Source of meteorological data: 1/: Chekereni, KADP(1981 - 1996), 2/: TPC, 1977 - 199(

File: EF-4B

Figure E.3.2
Proposed Cropping Pattern

The Feasibility Study on Lower Moshi Integrated Agriculture and Rural Development Project in the United Republic of Tanzania

Japan International Cooperation Agency