3.3 Proposed Cropping Pattern

3.3.1 Selection of crops

In planning the future agricultural production programme in the proposed irrigable area, the following basic considerations were taken into the selection of crops.

(1) Production of paddy rice will be planned to not only meet the regional demand but also contribute to the national demand, as much as possible.

(2) Production of maize and pulses will be planned basically to meet home-consumption and also to contribute to the regional economy with some marketable surplus.

(3) Production of cotton will be planned to meet the present capacity of the gin in Moshi.

(4) Production of vegetables, such as cabbage, onion, tomatoes, etc. will be planned to meet the demand of Moshi township which will be increase substantially by 1990 through industrialization and urban development.

(5) Production of oil seeds, such as soybeans, groundnuts, sunflower, sesame, etc. will be planned not only to contribute to the farm economy and regional economy, but also to contribute to the development of agro-industries, such as oil-mills, under the industrialization plan.

In selection of crops and planning of crop production above, introduction of improved pasture for livestock production is conceptionally precluded from the project because of its low economic viability and the low efficiency of water utilization. As for the livestock grazing in the proposed irrigable area, it is anticipated that sufficient amounts of by-products will be available through the crop production planned above.

3.3.2 Proposed cropping pattern

In scheduling the most adoptable cropping calendar for the proposed irrigable area, the following conditions were thoroughly studied:

The climate in the Lower-Moshi area, generally characterized by warm and relatively dry as well as sufficient sunshine hours, is very favourable for cultivation of the proposed crops. In practice, however, it is considered that the heavy precipitation in April will severely restrict effective farm operation, such as soil preparation, seeding and plant protection. Attention shall also be paid to the minimum temperature in the winter season of July and August which ranges from 16°C on average with 9.4°C as the recorded minimum in recent years. According to our test results on paddy rice cultivation made in Sudan, low temperature ranging between 15°C and 17°C is a critical factor for the

generative growth of paddy. Thus, for the proposed paddy ciltivation, the winter season of July and August shall be excluded from the growing season. With regard to the cereal crops, no significant variation on yield conditions is observed in the year-round cultivation which is now being practiced by NAFCO Kahe located nearby the proposed irrigable area.

In order to maximize the potential productivity and profitability of the proposed crop cultivation, high yielding varieties of each crop are to be introduced as much as possible instead of local varieties which prevail in the area. The high yielding varieties proposed have been recently developed and/or multiplied in Tanzania. Their specific growing terms and potential yield as examined in the Mivaleni Experimental Sub-station and/or other places in Tanzania are summarized in Table V-12.

In due consideration of the above and also taking into account the present cropping pattern, the proposed cropping calendar for each crop is as shown below.

Proposed Cropping Calendar

Crops	Rainy Season		Dry Season	
	(Seeding)	(Harvest)	(Seeding)	(Harvest)
Maize	February	July	-	-
Paddy	March	July	September	January
Pulses	March	July	-	-
Oil seeds	March	July	August	December
Vegetable	February	June	August	December
Cotton	March	September to November		

Based on the basic considerations on the planning of crop cultivation set forth in the preceding section, the cultivation area for each crop is estimated for the 1.0 ha unit farm size 1/. Out of the crops proposed for the irrigable area, paddy rice should be as fully cultivated in the paddy field in the rainy season and also in the dry season as much as is possible. For the irrigated upland field, the production programme was formulated to meet the minimum requirements of home consumption and to maximize the production area for cash crops, thus enabling the maximum profit from the project. Using this principle, the acreage of each crop is estimated as follows:

1/: 1.0 ha is an average farm size in 1990 estimated based on the prospective increase of households within the next 10 years. The total number of households in 1990 will be about 9,400 as studied in 5.1, Annex VI.

(1) Maize, which is a main food crop. Production should meet the home consumption of farm families with a surplus of at least 30% of the total production to meet national demand. Thus,

Family size in 1990 x consumption/capita/year x 1.30
+ unit yield per ha under advanced conditions
= 5.65 persons x 85 kg x 1.30 + 2,500 kg/ha
= 0.249 (about 0.25 ha per household)

(2) Pulses, which is also a local food crop. Production should, at least, meet the home consumption of farm families. Thus,

Family size in 1990 x consumption/capita/year
+ unit yield per ha under advanced conditions
= 5.65 persons x 25 kg + 700 kg/ha
= 0.202 (about 0.2 ha per household)

(3) Cotton, which is a cash crop being cultivated under irrigated conditions by traditional furrows. For contributing to the present capacity of the gin, about 600 ha of cotton should be cultivated continously. Thus, the cultivated area per household is estimated at about 0.15 ha.

(4) Vegetables, which are mostly cash crops. The production should meet the demand of Moshi township in 1990, in which about 140,500 persons are forecast in the Expansion Plan of Moshi town (1976). Thus,

(Population (1990) in Moshi + Population (1990) in Lower-Moshi) x consumption targeted by government/ capita/year + unit yield/ha + total farm households to be included in the irrigable area + cropping intensity
= (140,500 + 53,100) persons x 12.5 kg + 800 kg/ha + 3,000 + 2.0
= 0.05 ha (per household)

(5) Oil-seeds, such as soybeans, groundnuts, sunflower and sesame are the main cash crops in this plan. Thus, the remaining area in the rainy season will be used for oil seed production. In the dry season, available irrigation water will also be used for cultivation of this crop.

Based on the suitable cropping calendar and the land allocation conceptionally made above, the proposed cropping patterns in each irrigation scheme are formulated as shown in Figure . In addition, the future land use by crop with the project is forecast for the whole Lower-Moshi area and tabulated in Table .

In the proposed cropping pattern, it is estimated that the duration of the works, such as seeding of upland cropping, transplanting of paddy and harvesting, is about one month with due consideration made for the capacity of the family labour force and manual operation practices.

In order to introduce these new cropping patterns into the project area successfully, it is vital to provide strong agricultural supporting services including training of both the field extension workers and farmers, by all government agencies concerned. In this connection, it is recommended to use the Kilimanjaro Agricultural Development Center (KADC) and Pilot Farm which has been designed in Chekereni village and for which some facilities are even under construction.

3.4 Proposed Farming Practices

In order to expect higher returns per ha with the irrigation development, improved farming techniques should be introduced into the project areas. The proposed farming practices and farm inputs to be applied were studied to find the most practical way of introduction which would be acceptable to the farmers, and consideration of the following factors was made:

(1) The soil and land to be improved through on-farm development, such as drainage work, flood control, land grading or shaping, etc.,

(2) Land holding size which will decrease slightly in the near future due mainly to the projected increase in the number of farm household,

(3) Availability of labour force in and around the project area,

(4) Familiarity of the farmer with irrigation practices and modern farming techniques,

(5) The farm mechanization plan being conducted by the Agricultural Development offices, in both the Region and Districts, and

(6) The desire of farmers in the Lower-Moshi area.

The land productivity in the project areas will be greatly improved by the control of seasonal flooding, drainage improvement, and the construction of technical irrigation facilities including the land grading and shaping works. Besides, the present poor road network will be improved together with the construction of the irrigation and drainage facilities.

As mentioned before, the average land holding per farm household will be relatively decreased to 1.0 ha by the forecast increase of farm families through natural population growth. The farm family will also increase to 5.65 persons on average, of which 3 persons might be able to work.

The familiarity of the farmers with modern irrigation farming techniques is low at present. However, most of farmers have experience with traditional irrigation farming through operation of traditional

furrows and also have had more or less, experience to cultivate the proposed products, although farming practices are still very traditional. In addition, farmers have a strong desire to introduce improved farming with proper irrigation and land consolidation, according to the field interview in the Lower-Moshi area.

With regard to the farm mechanization, the present situation of machinery is examined for its role in effective soil preparation. Because the soils have a hard consistency when dry and a strong stickiness and plasticity when wet, a powerful tractor will be required for the preparation of soils. In addition, mechanization of plant protection and threshing work (primary processing of production such as paddy threshing, shelling of corn and pulses) will be also required to realize the optimum operation of these practices, saving manpower and achieving a high quality of the production. For these purposes, it is recommended to introduce a small-scale power dust/sprayer, auto-thresher and sheller to benefit the farmer technically and economically.

Based on the above discussion, it is planned that farming will be practiced basically by manual operations with small-scale farming equipment and instruments such as weeders, knap-sack type mist cum dusters, etc. According to the analysis of seasonal labour requirements in the unit farm (1.0 ha), the labour force in the unit farm household will in most case be sufficient for growing the high yielding varieties of crops even under manual operation, except for a small shortage of manpower at peak times, such as transplanting of paddy and harvesting of the crops as shown in Tables V-14 and V-15.

Seasonal labour could be employed from the surrounding area to supplement the shortage of farmly force. Due to very low labour opportunity in the region, this temporary employment will contribute to the rural economy as well.

3.4.1 Soil preparation

Soil preparation for all of the proposed crops will be made by the use of tractors which are employed from the Agricultural office, Moshi district, as under the present management system. At present, disc-plowing is a common practice in the soil preparation and harrowing is very rare. In the proposed plan, both disc-plowing and one to two times of harrowing are recommended for upland farming to stabilize seedling establishment and to effectively operate the irrigation.

In the case of paddy rice cultivation, harrowing cum puddling of soil is required after the ploughing, to make the land level for even distribution of irrigation water and for protecting the young seedlings from being submerged.

Prior to the harrowing in both upland and paddy farming, application of basic fertilizers should be practiced to prepare a fertile soil foundation for the seedlings. For this, about 1/3 of total requirement of urea and triple-super phosphate is applied by hand.

3.4.2 Seeding

There are two seeding techniques for the proposed farming. One of the techniques is to prepare the seedlings in a nursery bed, and thereafter, transplant the seedlings to the main field. This practice will be applied for cultivation of paddy rice and vegetables.

In case of the paddy rice cultivation, about 60 kg per ha, of seeds are to be sown on about 250 m^2 of nursery bed and grown for 25 days in the nrusery. The seeding rate of 60 kg/ha herein estimated is rather high as compared with that in rice producing countries. However, there are no certified seeds available because seed multiplication programme has not started yet. Thereafter preparation of the seedlings, transplanting to the main field, will be practiced by regular planting in a 15 cm x 30 cm space or planting 2 to 3 seedling per one hill.

In case of vegetable cultivation, kinder seedlings are to be grown first in small beds which should have shade roofing, and then, transplanted to a nursery bed with suitable space. Transplanting to the mainfied will be made about 30 days after seeding by regular planting in 30 to 45 cm x 60 to 100 cm space. The specific rate of seeding per ha is estimated as shown in Table V-16.

The other farming technique is direct seeding to the main field. This technique will be applied to upland crops, such as maize, pulses, cotton, oil-seeds, etc. The specific rate of seeding to be applied for each crop is also summarised in Table V-16.

In the direct seeding method, thinning and control of seedlings will be required after establishing the seedlings on each hill.

3.4.3 Fertilization

Proper application of fertilizers is essential for realization of the anticipated crop production in the project area. The soils are quite deficient in plant nutrients especially organic carbon, nitrogen and phosphate. Therefore, it is necessary that these chemical elements be supplemented by the use of fertilizer.

Based on the test results on crop fertilization made in the Miwaleni Experimental Sub-station, the chemical fertilizer requirements are preliminarily estimated for each crops as shown in Table V-16. Considering the present soil conditions, most suitable kind of chemical fertilizers would be urea for paddy field and ammonium sulphate for upland field as the nitrogen source, and triple-super phosphate (T.S.P) to supply the element of phosphorus. Generally, an application of potassium is not required in the project area for either paddy or upland crops. Sufficient potash is supplied naturally from the soils.

As for the fertilization particularly by urea and ammonium sulphate, the split-application method is recommended to favorably control the growing conditions of crops.

3.4.4 Plant protection

As for plant protection, intensive application of insecticides and fungisides is required for control and protection of the crops from the damage caused by insects, pests and diseases. At present, damage of crops caused by insects and diseases is not serious. Although the plant protection is not practiced yet, most of farmers are using local crop varieties which have a tolerance to diseases. However, when the high yielding varieties of crops are introduced, it will be necessary to properly apply chemicals.

Suitable dosage of each chemical is estimated as shown in Table V-16, based on the life-cycle of insects and growing stages of the crops. Selection of the applicable chemicals is made with reference to the presently marketed chemicals in Tanzania.

For application of chemicals to the field, the knap-sack type, motor driven mist-cum-duster is planned to be used. The working capacity of this equipment will be 3 to 5 ha per hour, and it will be easily managed by small farmer groups.

In order to operate the proposed plant protection works, it is strongly recommended to organize a systematic plant protection programme through farmer cooperatives or associations. Individual protection is not recommended because insects and diseases are not limited to the individual form which will be re-infected unless protection is undertaken on as wide an area as possible.

3.4.5 Weed control

Weed control is one of the essential farming practices in the proposed crop production programme. At present, many chemicals (so-called herbicides) have been developed for weeding purposes, and their efficiency are highly accepted particularly for saving labour. However, these chemicals are harmful not only for human beings, but also to livestock production and the natural environment. The proposed practice for weeding will be, therefore, performed by the use of the traditional instruments.

Only for paddy rice cultivation, use of some small amount of herbicides is planned so as to control not only the weed but also Bilharzia which is now slightly infecting the lowlying area.

3.4.6 Harvesting and threshing

For the proposed farming, manual harvesting is planned, based on the large capacity of the labour force in and around the Lower-Moshi area. However, improved threshing practices are recommended to realize the marketable quality of crops. Thus mechanical threshing is preferable for the improved varieties of crops over traditional hand threshing. Based on this, it is proposed to introduce a treadle thresher or sheller for pulses, oil-seeds and maize, and auto-thresher for paddy rice, during the initial stage of this development.

Making reference to the crop experiment in the Miwaleni Experimental Sub-station and practical operation at NAFCO, the farm inputs, labour requirements and machinery use for one hector operation for each crop are estimated as shown in Tables from V-14 to V-16.

As for the agricultural conditions without the project, it is foreseeable that most of the farming will still be practiced in the traditional manner, although some dosage of fertilizers and chemicals are increasing gradually under the national campaign to increase maize production and the farmers' credit programme being promoted by the Government. The estimated crop production without the project is tabulated in the Table V-17.

3.5 Anticipated Crop Yield

The research and trial cultivation of upland crops are being carried out by the Miwaleni Experimental Sub-station under the direction of Lyamungu Agricultural Research Center. Although systematic study and experiment on paddy rice have not started yet in Tanzania, numbers of rice project have been implemented in Tanzania.

According to the crop experiment made by the Miwaleni Experimental Sub-station, the soils of the project area show a good response to crop production with application of sufficient irrigation and proper fertilization. The average yield of maize was about 4.5 tons of dry grain/ha with economically reasonable amounts of nitrogen (150 kg/ha) and of phosphate (50 kg/ha). An adaptability and productivity test on soybean and groundnut also reveal high suitability by an average yield of 2.5 tons/ha and 2.0 tons/ha, respectively, under fertilization with 60 kg/ha of N and 25 kg/ha of P_2O_5.

In the practical operation seen at NAFCO in Kahe, major crops such as maize and groundnut were grown under advanced irrigation and proper fertilizing conditions. According to the production records of this farm, average unit yield of high yielding varieties of maize was about 2.6 tons/ha with the application of fertilizers at 100 kg/ha of N and 50 kg/ha of P_2O_5. The average yield of groundnut was about 2 tons of unshelled production per ha with application of about 60 kg/ha of N and 30 kg/ha of P_2O_5.

Based on paddy rice cultivation seen in the rice project in Tanzania, more than 5 ton of paddy per ha has been continuously obtained year and year under the conditions advanced with good irrigation and soil management.

From the above figures, it is conservatively estimated that the target yields would be 2.5 tons/ha for maize, 4.5 tons/ha for paddy, 1.2 ton of grain/ha (eqv. 2.0 tons/ha of unshelled product) for oilseeds such as soybean and groundnut, 1.5 tons of speed cotton/ha for cotton, 1.0 ton/ha for common beans. These target yields are used as the bases for estimating the anticipated project benefits.

Forecast crop yield with and without the project is summarized in Table V-18.

3.6 Anticipated Crop Production

Based on the crop yields discussed above, anticipated annual crop production and increments in the whole Lower-Moshi area are estimated in Table V-19, and summarized below.

Annual Crop Production and Incremental Production

(Unit: tons)

Major Products	Without Project	With Project	Incremental Production
Maize	20,750	16,340	-4,410*
Paddy	980	19,170	+18,190
Pulses	450	1,055	+605
Oil-seeds	Some	3,430	+3,430
Cotton	610	890	+280
Vegetable	1,000	1,650	+650

* Note: The reason for a decline in maize production is the use of a certain amount of maize fields for paddy production. Figure of oil-seeds is shown by unshelled product.

Table V-1

PRESENT CONDITION OF LAND USE IN LOWER-MOSHI AREA

NAMA OF VILLAGE	GROSS AREA (ha)	AGRICULTURAL LAND						VILLAGE YARD (ha)	NON-AGRICULTURAL LAND			
		Upland Field		Paddy Field	Estate Farm (ha)	Grass Land (ha)	Total (ha)		Swamp (ha)	Bushes (ha)	Wild Palm (ha)	Forest (ha)
		Irrigable (ha)	Rainfed (ha)	Irrigable (ha)								
Mabogini	2,580	600	1,460	240	-	110	2,410	100	-	-	-	70
Chekereni	1,730	200	1,060	10	-	370	1,640	90	-	-	-	-
Mutakuja	500	70	380	-	-	30	480	20	-	-	-	-
New Land	600	50	280	-	-	250	580	20	-	-	-	-
Msaranga/ Mandaka	2,780	150	2,150	250	-	120	2,670	10	-	-	-	100
Yam Makaa	2,820	120	2,070	-	-	370	2,560	40	40	160	-	20
Uchira	2,390	100	1,840	-	-	350	2,290	10	-	10	-	80
Kilema Pofo	1,540	150	1,020	-	80	10	1,260	10	-	270	-	-
Rau Ya Kati	870	260	260	120	100	70	810	10	-	-	-	50
Oria	2,320	70	800	-	-	450	1,320	150	100	460	-	290
Mangaria	3,010	30	340	60	-	640	1,070	10	40	210	830	850
Kitereni	1,500	230	470	10	-	330	1,040	20	-	-	400	40
Kisangesangeni	1,700	50	300	30	-	440	820	10	50	720	-	100
Ghona	2,760	300	990	-	20	580	1,890	20	-	550	300	-
Kiomu	1,060	100	110	-	-	760	1,000	10	-	50	-	-
Kochakindo	1,790	40	50	-	-	1,080	1,170	10	80	150	380	-
Himo	860	230	570	-	-	40	840	20	-	-	-	-
Makuyuni	2,150	170	530	-	140	1,280	2,120	30	-	-	-	-
Lotima	1,830	500	740	-	-	540	1,780	50	-	-	-	-
Kileo	7,140	270	650	20	840	1,220	3,000	250	1,200	2,110	460	120
Total	41,930	3,690	16,070	740	1,180	9,070	30,750	890	1,510	4,690	2,370	1,720

Note: All of the figures are collected by the photo-interpritation (aerial-photograph; 1/25,000 shot in August, 1979 under technical cooperation of the Japanese Government.)

Table V-2 AVERAGE HOLDING OF FARM LAND

NAME OF VILLAGE	TOTAL GROSS ACREAGE OF FARM LAND (ha)	TOTAL FARM HOUSEHOLD Settled (ha)	TOTAL FARM HOUSEHOLD Unsettled (ha)	AVERAGE SIZE OF HOLDING (ha/family)
Mabogini	2,300	600	890	1.55
Chekereni	1,270	500	520	1.25
Mutakuja	450	500	-	0.90
New Land	330	430	-	0.76
Msaranga/Mandaka	2,550	(530)	1,170	1.50
Yam Makaa	2,190	(300)	1,530	1.20
Uchira	1,940	(360)	1,580	1.00
Kilema Pofo	1,170	(280)	590	1.35
Rau Ya Kati	640	370	-	1.72
Oria	870	1,060	-	0.82
Mangaria	430	250	-	1.72
Kitereni	710	270	410	1.05
Kisangesangeni	380	380	-	1.00
Ghona	1,290	260	910	1.10
Kiomu	210	260	-	0.80
Kochakindo	90	250	-	0.36
Himo	800	200	740	0.85
Makuyuni	700	270	310	1.20
Lotima	1,240	340	690	1.20
Kileo	920	490	-	1.87
Total/Average	20,480	7,900	9,340	1.19 (≒ 1.20 ha)

Note: The figures in parenthesis are estimated according to the total households in village census with the certain proportion (%) of the land which is included into the study area.

The number of unsettled household is estimated based on the information obtained from the village offices.

Table V-3 POPULATION OF LIVESTOCK
(AS OF APRIL, 1979)

NAME OF DISTRICT AND/OR VILLAGE	POPULATION OF LIVESTOCK (HEADS)		
	Cattle	Sheep	Goats
1. KILIMANJARO REGION			
- Hai District	64,450	42,260	53,950
- Moshi District	134,530	43,980	452,120
- Rombo District	33,920	48,190	95,380
- Muuanga District			
- Same District	196,690	116,310	186,160
Total	429,590	250,740	787,610
2. LOWER-MOSHI AREA			
- Mabogini village	480	450	1,730
- Chekereni village	110	100	130
- Mutakuja village	210	60	190
- New Land village	690	640	1,020
- Msaranga/Mandaka village	980	380	520
- Yam Makaa village	1,090	280	450
- Uchira village	780	270	770
- Kilema Pofo village	2,030	850	2,210
- Rau Ya Kati village	2,130	1,900	4,130
- Oria village	1,550	840	510
- Mangaria village	1,050	260	820
- Kitereni village	1,680	190	790
- Kisangesangeni village	1,310	110	440
- Ghona village	1,360	280	1,480
- Kiomu village	1,200	340	1,680
- Kochakindo village	710	700	1,060
- Himo village	560	70	260
- Makuyuni village	2,200	890	3,170
- Lotima village	1,740	770	2,600
- Kileo village	3,630	970	2,860
Total	25,490	9,750	26,820

Note: Total head of cattle in the Lower-Moshi area corresponded to 18.9 % of that in Moshi District and 5.9 % of that in whole Kilimanjaro Region. Other sheep and goats are respectively 22.2%/3.9% and 5.9%/3.4%.

Data source: Statistics on livestock population, as of April, 1979, prepared by Regional Water Department, Moshi

Table V-4

AVERAGE DOSAGE OF FARM INPUTS

(Present Conditions)

(Unit: kg/ha)

Description	Major Crops						
	Maize (Irrigated)	Maize (Rainfed)	Paddy	Finger-Millet	Cotton	Pulses	Sunflower
Seeds	25	30	90	0.5	25	50	5
Fertilizers							
- Nitrogen	50	49	50	-	25	-	25
- Phosphrous	50	-	50	-	50	-	50
Chemicals							
- Fungicides	-	-	-	-	1	-	-
- Insecticides	some	-	some	-	5	-	some
- Harbicides	-	-	-	-	-	-	-
Other Materials (Shs)	140	75	121	39	35	47	58

Note: Figures of fertilizers are converted to the urea for nitrogen and triple-super-phosphate for, phosphorous element.

Figures of other materials are shown by Shillings estimated on sacks for production, depreciation cost of farming instrument, etc.

Table V-5 PRESENT LABOUR REQUIREMENT FOR EACH CROP PRODUCTION

Descriptions	Major Crops							
	Maize (irrigated)	Maize (Rainfed)	Paddy	Pulses	Cotton	Vegetables	Finger-Millet	Sun-flower
Seeding	90	90	20	50	90	100	50	90
Transplanting	-	-	100	-	-	250	-	-
Weeding & thinning	60	50	70	50	70	150	50	60
Fertilization	40	-	40	-	40	50	-	35
Plant protection	10	-	10	-	10	15	-	5
Harvesting	120	95	120	80	200	150	90	95
Threshing	100	80	150	75	150	-	80	80
Irrigation operation	50	-	60	-	50	60	-	50
Total	470	315	570	255	560	775	270	415
(eqv. Man-Day)	(95)	(65)	(115)	(50)	(110)	(155)	(55)	(85)

Note: Figures are obtained by field interview with 210 farmers in the Lower-Moshi area.
Figures are shown by man-hours and converted to Man-days at 5 working hours per day.

Table V-6

UNIT YIELD OF MAJOR CROPS
(LOWER-MOSHI AREA)

(Unit: Tons/hr)

NAME OF VILLAGE	MAIZE (Irrigated)	MAIZE (Rainfed)	COTTON	BEANS (Irrigated)	BEANS (Rainfed)	PADDY (Irrigated)	VEGETABLES (Onion)	TOMATOE	MYLLET
Mabogini	1.8	0.9	0.25	0.7	0.5	1.75	4.50		0.45
Chekereni	1.8	1.0	0.44	0.75	0.5	1.20	5.00		0.50
Mutakuja	1.75	0.8	0.27	0.85	0.5	-	5.00		0.35
New Land	1.75	0.8	0.25	0.80	0.5	-	5.00		0.35
Msaranga/Kandaka	-	1.25	0.25	0.9	0.45	1.35	4.50		0.55
Yan Nakkaa	1.50	0.9	0.37	0.9	0.40	1.00	4.75		0.50
(Miwaleni Ex-Farm)	(4.50)	-	-	(1.50)	(-)	(3.00)	20.0 cabbage 7.5 onion 12.5 egg plant		(-)
Uchira	1.25	0.95	0.43	0.80	0.40	-	5.50		0.55
Kilima Pofo	1.5	0.75	0.45	0.75	0.45	-	4.00		0.45
(N.A.F.CO)	3.0-2.5	(-)	(-)	0.9 Groundnut shell 1.0 Canadia red beans			(-)		(-)
Rau Ya Kati	1.5	1.05	0.25	0.85	0.50	1.15	5.50		0.50
Oria	1.8	0.95	0.55	0.75	0.45	-	5.50		0.50
Mangaria	1.8	1.00	0.2	0.65	0.40	0.85	4.00		0.45
Kitereni	1.8	0.80	0.2	0.70	0.35	0.95	4.50		0.40
Kesangesangeni	1.0	0.75	0.2	0.85	0.40	1.05	5.00		0.40
Ghona	1.5	0.75	0.2	0.95	0.35	-	5.50		0.45
Kiomu	1.5	0.70	0.4	0.95	0.35	-	5.50		0.45
Kochakindo	1.5	0.60	0.25	0.95	0.35	-	5.00		0.40
Himo	1.5	0.65	0.49	0.95	0.40	-	5.00		0.35
Makuyuni	2.0	0.7	0.49	1.25	0.35	-	6.50		0.35
Lotima	2.3	0.7	0.49	1.25	0.40	-	6.50		0.35
Kileo	1.75	0.7	0.40	0.95	0.35	1.15	5.00		0.40
Total Average	1.75	0.92	0.40	0.89	0.43	1.40	5.13		0.46

Data source: Information collected from village offices and by interview with farmers.

Table V-7 PRODUCTION OF MAIZE

NAME OF VILLAGE	RAINY SEASON CROPPING Irrigated (tons)	RAINY SEASON CROPPING Rainfed (tons)	DRY SEASON CROPPING Irrigated (tons)	TOTAL (tons)
Mabogini	770	840	60	1,670
Chekereni	180	970	20	1,170
Mutakuja	80	270	-	350
New Land	40	200	-	240
Msaranga/Mandaka	-	1,850	-	1,850
Yam Makaa	140	1,520	10	1,670
Uchira	80	1,390	-	1,470
Kilema Pofo	20	520	-	540
Rau Ya Kati	230	270	20	520
Oria	60	750	10	820
Mangaria	50	300	-	350
Kitereni	320	260	-	580
Kisangesangeni	40	160	-	200
Ghona	320	480	-	800
Kiomu	130	40	-	170
Kochakindo	50	30	-	80
Himo	80	430	-	510
Makuyuni	210	340	20	570
Lotima	860	560	60	1,480
Kileo	390	300	10	700
Total	4,050	11,480	210	15,740

Note: Figures are estimated based upon the cropping acreages and unit yield in each village as shown in Table V-6 and V-10.

Table V-8 COTTON AND BEAN PRODUCTION IN LOWER-MOSHI AREA

NAME OF VILLAGE	COTTON (tons)	BEANS		TOTAL (tons)
		Rainy Season (tons)	Dry Season (tons)	
Mabogini	7.5	62.5	17.5	80.0
Chekereni	39.6	35.0	22.5	57.5
Mutakuja	5.4	25.0	-	25.0
New Land	7.5	10.0	-	10.0
Msaranga/Mandaka	1.3	18.0	-	18.0
Yam Makaa	3.7	12.0	4.5	16.5
Uchira	10.8	22.0	4.0	26.0
Kilema Pofo	63.0	13.5	-	13.5
Rau Ya Kati	5.0	35.0	8.5	43.5
Oria	16.5	14.0	3.8	17.8
Mangaria	-	4.0	-	4.0
Kitereni	5.0	12.3	-	12.3
Ghona	9.0	10.5	-	10.5
Kiomu	2.0	8.8	-	8.8
Kochakindo	-	3.5	-	3.5
Kisangesangeni	-	14.0	4.3	18.3
Himo	-	10.0	-	10.0
Lotima	51.5	14.0	18.8	32.8
Makuyuni	29.4	5.3	18.8	24.1
Kileo	-	10.5	4.8	15.3
Total	257.2	339.9	107.5	447.4

Note: The production of crops are estimated based on the figures in Tables V-6 and V-10.

Table V-9 PRODUCTION OF PADDY RICE, VEGETABLES AND OTHER CROPS

NAME OF VILLAGE	PADDY RICE (tons)	VEGETABLES (tons)	OTHER CROPS (tons)
Mobogini	420	135	9
Chekereni	12	150	5
Mutakuja	-	25	2
New Land	-	25	-
Msaranga/Mandaka	243	113	83
Yam Makaa	-	24	15
Uchira	-	55	28
Kilema Pofo	-	20	14
Rau Ya Kati	138	220	10
Oria	-	55	18
Mangaria	48	-	2
Kitereni	10	-	12
Kisangesangeni	26	25	10
Ghona	-	28	11
Kiomu	-	28	7
Kochakindo	-	-	2
Himo	-	-	7
Makuyuni	-	33	18
Lotima	-	65	12
Kileo	23	25	12
Total	920	1,026	277

Note: The production of each crops are estimated based upon the cropping acreages and unit yield as shown in Tables V-6 and V-10.

Paddy rice production is shown by unhusked dry grains. Production of vegetables is converted to dry onion base and production of other crops is converted to finger-millet base.

Table V-10

CULTIVATED AREA BY CROP UNDER PRESENT CONDITIONS

NAME OF VILLAGE	GROSS ACREAGE OF FARM LAND (ha)	NET CULTIVATED AREA (ha)	MAIZE Irrigated (ha)	MAIZE Rainfed (ha)	COTTON (ha)	BEANS (ha)	COFFEE (ha)	PADDY RICE (ha)	VEGETABLES (ha)	BANANA (ha)	OTHER CROPS (ha)	TOTAL CROPPED AREA (ha)	CROPPING INTENSITY (%)
Mabogini	2,300	1,730	390 (35)	935	30	125 (25)	-	240	25 (5)	20	20	1,850	106.9
Chekereni	1,270	1,080	90 (10)	970	90	70 (30)	-	10	25 (5)	40	10	1,350	125.0
Mutakuja	450	450	45 (-)	335	20	50 (some)	-	-	5 (-)	-	5	460	102.2
New Land	330	330	20 (-)	255	30	20 (some)	-	-	5 (-)	some	some	330	100.0
Msaranga/Mandaka	2,550	2,300	100 (-)	1,480	5	40 (-)	-	180	25 (-)	320	150	2,300	100.0
Kam Makaa	2,190	1,860	90 (5)	1,685	10	30 (5)	-	some	5 (-)	some	30	1,860	100.0
Uchira	1,940	1,650	60 (-)	1,465	25	55 (5)	-	-	5 (5)	some	50	1,670	101.2
Kilema Pofo	1,170	880	10 (-)	690	140	30 (-)	-	-	5 (-)	some	30	905	102.8
Rau Ya Kati	640	580	140 (10)	260	20	70 (10)	(15)	120	35 (5)	50	20	755	130.2
Oria	870	830	30 (5)	785	30	35 (5)	-	-	10 (some)	10	35	945	113.8
Mangaria	430	390	25 (-)	300	some	10 (-)	-	50	some (-)	some	5	390	100.0
Kitereni	710	600	180 (-)	320	25	35 (-)	-	10	some (-)	some	30	600	100.0
Kisangesangeni	380	340	40 (some)	210	some	35 (5)	-	25	5 (-)	-	25	345	101.5
Ghona	1,290	970	215 (some)	640	45	30 (-)	-	-	5 (-)	10	25	970	100.0
Kiomu	210	190	85 (some)	55	5	25 (-)	-	-	5 (-)	some	15	190	100.0
Kochakindo	90	90	35 (some)	45	some	10 (-)	-	-	some (-)	some	5	95	105.5
Himo	800	760	50 (-)	665	some	25 (-)	-	-	some (-)	5	20	765	100.6
Makuyuni	700	630	95 (10)	480	60	15 (15)	(some)	-	5 (-)	10	35	725	115.1
Lotima	1,240	1,120	350 (25)	795	105	35 (15)	-	-	10 (some)	15	50	1,400	125.0
Kileo	940	690	215 (5)	435	some	30 (5)	-	20	5 (some)	15	30	760	110.1
Total	20,500	17,470	2,265 (105)	12,805	640	775 (120)	(15)	655	180 (20)	495	590	18,665	106.8

Note: All of the figures are estimated with compromizing the reference available, such as village statistics (demography as of October, 1979), village fillings on crop production in past 5 years, and field data obtained by investigation, and statistical data provided by the Cotton Authority, Moshi.

Figures in parenthesis are the acreages on dry season cropping.
Coffee in Rau Ya Kati village is grown under the Banana trees.

Table V-11

FUTURE LAND USE IN LOWER-MOSHI AREA
(WITH THE PROJECT)

(Unit: Ha)

VILLAGE	GROSS AREA	UP-LAND FIELD			PADDY FIELD		ESTATE FARM	GRAZING RESERVE	VILLAGE YARD	NON-AGRICULTURAL LAND
		Irrigable			Irrigable					
		Advanced 1/	Traditional 2/	Rainfed	Advanced 1/	Traditional 2/				
Mabogini	2,580	35	365	860	1,040	-	-	110	100	70
Chekereni	1,730	170	-	470	630	-	-	370	90	-
Mutakuja	500	-	70	380	-	-	-	30	20	-
Newland	600	-	50	280	-	-	-	250	20	-
Msaranga-Mandaka	2,780	480	-	1,820	-	250	-	120	10	100
Mam Makaa	2,820	610	-	1,460	120	-	-	370	40	220
Uchira	2,390	590	-	1,290	60	-	-	350	10	90
Kilema Pofo	1,540	-	200	970	-	-	80	10	10	270
Rau ya Kati	870	60	120	-	460	-	100	70	10	50
Oria	2,320	-	-	700	170	-	-	450	150	850
Mangaria	3,010	-	70	300	-	60	-	640	10	1,930
Kitereni	1,500	550	100	50	-	10	-	330	20	440
Kisanpesangeni	1,700	-	-	50	860	-	-	340	10	440
Ghona	2,760	290	250	690	60	-	20	580	20	850
Kiomu	1,060	210	-	-	60	-	-	730	10	50
Kochakindo	1,790	-	90	-	-	-	-	1,080	10	610
Himo	860	-	450	350	-	-	-	40	20	-
Makuyuni	2,150	170		530	-	-	140	1,280	30	-
Lotima	1,830	400		840	-	-	-	540	50	-
Kileo	7,140	120	550	190	60	20	840	1,220	250	3,890
Total	41,930	3,685	2,315	11,230	3,520	340	1,180	8,910	890	9,860

Note: 1/: Advanced irrigable lands are the upland or paddy fields which will be provided perenial irrigation system under the conditions with the Project.

2/: Traditional irrigable lands are the upland or paddy fields which have the traditional furrow irrigation system, but are excluded from the Project works because of low economic viability due to unfavorable soil and topographic conditions.

Table V-12 SPECIFIC GROWING TERMS AND POTENTIAL YIELD OF EACH PROPOSED CROP

Proposed Crops & Varieties	Specific Growing Terms (days)	Potential Yield Specified (tons/ha)
Maize		
- U.C.A	150 to 160	3 to 4
- I.C.W	120 to 150	2.5 to 3
- Hibrid-632	150 to 160	3.5 to 4
- Katmani	100 to 110	1.8 to 2.0
- Local varieties	140 to 150	1.5 to 2.0
Pulses (common beans)		
- Canadian Wonder	90 to 110	1.2 to 2.0
- Kidney Darkred	90 to 95	1.0 to 1.5
- Santa Ana	90 to 100	1.5 to 2.0
- California red	80 to 95	1.2 to 1.5
Paddy rice		
- IR varieties	110 to 120	5.0 to 6.5
- Local varieties	145 to 160	1.5 to 2.0
Soybeans		
- Bossie	90 to 110	2.5 to 3.0
- Hokkaido	85 to 100	2.0 to 3.0
- P_2L_2	90 to 110	2.5 to 3.0
- Kent	100 to 110	2.5 to 3.5
Sunflower		
- Black	110 to 120	1.2 to 2.0
- Jupiter	110 to 120	1.0 to 1.5
- Nyingine	100 to 110	1.0 to 1.5
Groundnut		
- Prevailing in Tanzania	110 to 120	1.5 to 1.5
Cotton		
- Prevailing in Tanzania	240 to 270	1.2 to 1.5

Note: - Figures on crops except paddy, cotton sunflower and groundnut are obtained from the Miwaleni Agricultural Experimental Sub-Station.

- Figures of paddy are the general specification defined by IRRI, Philippines.

- Figures of cotton, sunflower and groundnut are the highest results obtained in the Lower-Moshi area.

Table V-13

FUTURE LAND USE BY MAJOR CROPS IN LOWER-MOSHI AREA
(WITH THE PROJECT)

NAME OF VILLAGES	GROSS ACREAGE OF FARM LAND 1/	NET CULTIVATED AREA	MAIZE (1)	MAIZE (2)	MAIZE (3)	COTTON (1)	PULSES (1)	PULSES (2)	OIL-SEEDS (1)	OTHER CEREALS (3)	VEGE-TABLES (1)	BANANA (2)	COFFEE (2)	PADDY RICE (1)	PADDY RICE (2)	ANNUAL TOTAL CULTIVA-VATION AREA	CROPPING INTENCITY
Mabogini	2,300	1,730	-	270	520	-	-	125(25)		20	-	30	-	900(300)	-	2,190	1.27
Chekereni	1,270	1,080		-	480	-	-	-		10	-	40	-	550(170)	-	1,250	1.16
Mutaknja	450	450	-	70	375	-	-	50(some)		5	-	-	-	-	-	500	1.11
Newland	330	330	-	50	260	-	-	20(some)		some	-	some	-	-	-	330	1.00
Msaranga-Mandaka	2,550	2,300	105	-	1,230	85	85		125(245)	150	20(20)	320	-	-	180	2,565	1.12
Yam Makaa	2,190	1,860	130	-	1,205	105	105		155(120)	30	30(30)	some	-	100(50)	-	2,060	1.11
Uchira	1,940	1,650	135	-	1,030	105	105		150(125)	50	25(25)	some	-	50(30)	-	1,830	1.11
Kilema Pofo	1,170	880	-	150	700	-	-	30(-)		30	-	some	-	-	-	910	1.03
Rau ya Kati	640	580	-	110	-	-	-	70(10)		20	-	50	15	400(130)	-	805	1.39
Oria	870	830	-	-	635	-	-			35	-	10	-	150(50)	-	880	1.06
Mangaria	430	390	-	-	320	-	-	10(-)		10	-	some	-	-	60	400	1.03
Kitereni	710	600	120	85	30	95	95		140( )	some	25(25)	some	-	-	10	625	1.04
Kisangesangeni	910	825	-	-	50	-	-			25	-	-	-	750(390)	-	1,215	1.47
Ghona	1,290	970	60	100	570	50	50	30(-)	65(110)	some	15(15)	10	-	50( )	-	1,125	1.16
Kiomu	270	250	50	-	-	35	35		55(80)	15	10(10)	some	-	50( )	-	340	1.36
Kochakindo	90	90	-	40	45	-	-			5	-	some	-	-	-	90	1.00
Himo	800	760	-	50	665	-	-	25(-)		20	-	5	-	-	-	765	1.01
Makuyuni	700	630	35		440	30	30	15(15)	45(40)	35	5(5)	10	some	-	-	705	1.12
Lotima	1,240	1,120	85		750	70	70	35(15)	105(90)	10	15(15)	15	-	-	-	1,275	1.14
Kileo	940	690	20	445	95	20	20	30(5)	30(35)	30	5(5)	15	-	50( )	20	825	1.19
Total	21,090	18,015	740	1,370	9,400	595	595	440(70)	870(845)	500	150(150)	505	15	3,050(1,120)	270	20,685	1.15

Note: 1/: Exclusive of the saizal an suger cane estate (total 1,180 ha)

(1): Advanced Irrigation
(2): Traditional Irrigation
(3): Rainfed

Table V-14

LABOUR REQUIREMENT PER HA. (WITH PROJECT)

Major Crops

Descriptions	Maize	Cotton	Paddy	Groundnut	Soybean	Sunflower	Vegetables
Nursery works	-	-	85	-	-	-	110
Field preparation	90	100	100	95	90	100	250
Planting	90	90	260	100	90	90	250
Thinning & weeding	150	150	140	150	140	150	300
Plant Protection & upkeeping	30	45	100	45	45	45	45
Irrigation operation	60	60	70	60	60	60	80
Harvesting	110	620	100	200	250	110	500
Primary processing	100	450	120	110	100	100	70
Total (M-Hr.)	630	1,515	975	760	775	655	1,605
Total (M-D)	125	305	195	150	155	130	320

Note: Figures of M-D (man-days) are converted from M-Hr (man-hours) by applying normal working hours of 5 hr/day.

Table V-15 SEASONAL LABOUR BALANCE ON TYPICAL UNIT FARM OPERATION (1.0 Ha)

(Unit: man-hours)

Crops (Ha)		JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.
1. Crop operation the upland field:													
Maize	(0.25)	22.5	25.5	18.0	20.5	10.5	3.0	27.5	25.0	-	-	-	-
Pulses	(0.20)	-	18.0	20.0	18.0	18.0	7.0	20.0	10.0	-	-	-	-
Cotton	(0.15)	7.5	7.5	15.5	16.5	14.0	5.5	3.0	33.0	50.0	53.0	27.5	-
Oil-seeds /1	(0.35)	15.0	16.5	34.5	32.0	31.0	31.0	8.5	87.5	17.5	-	-	-
Oil-seeds /2	(0.45)	-	-	-	-	-	40.5	45.0	41.0	40.0	11.0	112.5	22.5
Vegetables	(0.05)	30.5	16.0	15.5	8.5	8.5	25.0	3.5	5.5	12.5	15.5	8.5	8.5
Total	(1.45)	75.5	83.5	103.5	95.5	82.0	112.0	107.5	202.0	120.0	79.5	148.5	31.0
2. Crop operations in the paddy field:													
Paddy /3	(1.0)		50.0	70.0	350.0	170.0	169.0	100.0	70.0				
Paddy /4	(0.4)	40.0	30.0						20.0	30.0	140.0	70.0	70.0
Total	(1.40)	40.0	80.0	70.0	350.0	170.0	169.0	100.0	90.0	30.0	140.0	70.0	70.0

3. Labour capacity per average farm family:

3 persons/family x 20 days/month x 5 hours/day

= 300 hours/month

Note: /1 ; oil-seeds in wet season cropping

/2 ; oil-seeds in dry season cropping

/3 ; paddy in wet season cropping

/4 ; paddy in dry season cropping

Table V-16

PROPOSED DOSAGE OF FARM INPUTS
(With the Project)

(Unit: kg/ha)

Description	Major Crops									
	Maize	Paddy	Cotton	Pulses	Sunflower	Soybeans	Groundnut	Dry Onion	Vegetable	Tomatoe
Seeds	15	60	25	25	5	50	90	1.5	1.5	0.1
Fertilizers										
- Nitrogen	220	180	130	-	110	50	70	90	220	110
- Phosphorous	90	90	100	90	90	90	90	150	110	210
Chemicals										
- Fungicides	1	2	2	-	1	-	1	2	1	3
- Insecticides	12.5	12.5	12.5	5	7	12.5	12.5	7	12.5	12.5
- Herbicides	-	30	-	-	-	-	-	-	-	-
Other Materials (Shs)	729	1,229	537	281	345	469	532	499	2,039	2,862

Note: Figures are estimated, making reference to the crop experiment in Miwaleni Experimental Sub-station, practical form operation in NAFCO Kahe, and the results obtained in the advanced irrigation Project in Tanzania.

Table V-16

Table V-17 FUTURE CROP PRODUCTION (WITHOUT THE PROJECT)

(Unit: kg/ha)

Descriptions	Major Crops						
	Maize		Cotton	Paddy	Pulses	Oil-seeds	Vegetables
	(Irrigated)	(Rainfed)					
Prospective Crop Yield	2,000	1,250	950	1,500	500	500	5,000
Farm Inputs:							
- Seeds	25	30	25	90	50	5	1.5
- Fertilizers;							
Nitrogen	100	50	65	50	-	25	50
Phosphorous	90	50	50	50	-	50	50
- Chemicals							
Fungicides	-	-	1	-	-	-	-
Insecticides	5	some	5	some	-	some	some
- Other materials[1] (Shs)	319	204	152	238	91	108	400
- Labour requirement (Man-day)	75	70	160	100	60	75	155

Note: - Figures except other materials are shown in kg/ha

- Figures of other materials are shown in shillings estimated on sacks for production, depreciating cost of farming instruments, etc.

- Prospective conditions in the above are approximated making reference to the national maize campaign, and farmers' credit programme being under implementation.

Table V-18 ANTICIPATED CROP YIELD COMPARISON (WITHOUT AND WITH PROJECT)

(Unit: tons/ha)

Major Crops	Crop Yield without Project (Traditional)	Crop Yield with Project (Advanced)	Incremental Crop Yield
Maize	2.0	2.5	0.5
Pulses	0.5	1.0	0.5
Cotton	0.95	1.5	0.55
Paddy	1.5	4.5	3.0
Sunflower	0.5	0.75	0.25
Soybeans	-	1.2	
Groundnut	-	2.0(unshelled)	
Onion	5.0	5.5	0.5
Cabbage	-	10.0	

Note:- Crop yield under the conditions without the Project is estimated based on the highest crop yield in the Lower-Moshi area recorded in the recent years.

- Prospective Crop yield under the advanced conditions to be attributed to the Project is estimated, making reference to the crop experiment results in Miwaleni Experimental Sub-station, production record in NAFCO Kahe, and other crop records reported in Tanzania.

Table V-19(1) ANTICIPATED ANNUAL CROP PRODUCTION IN LOWER-MOSHI AREA (WITH PROJECT) (Unit: tons)

Name of Villages	Maize (1)	Maize (2)	Maize (3)	Cotton (1)	Pulses (1)	Pulses (2)	Oil-seeds (1)	Other Cereals (3)	Vegetables (1)	Paddy Rice (1)	Paddy Rice (2)
Mabogini	-	540	650	-	-	135	-	9	-	5,400	-
Chekereni	-	-	600	-	-	-	-	5	-	3,240	-
Mutakuja	-	140	469	-	-	45	-	2	-	-	-
Newland	-	100	325	-	-	18	-	some	-	-	-
Msaranga/ Mandaka	262	-	1,537	127	85	-	740	69	220	-	270
Yam Makaa	325	-	1,506	157	105	-	550	14	330	675	-
Uchira	338	-	1,288	157	105	-	550	23	275	360	-
Kilema Pofo	-	300	875	-	-	27	-	14	-	-	-
Panya Kati	-	220	-	-	-	72	-	9	-	2,385	-
Oria	-	-	794	-	-	-	-	16	-	900	-
Mangaria	-	-	400	-	-	9	-	5	-		90
Kitereni	300	170	37	143	95	-	280	some	275		15
Kisangesangeni	-	-	63	-	-	-	-	12	-	5,130	-
Ghona	150	200	712	75	50	27	350	some	165	225	-
Kiomu	125	-	-	53	35	-	270	7	110	225	-
Kochakindo	-	80	56	-	-	-	-	2	-	-	-
Himo	-	100	831	-	-	23	-	9	-	-	-
Makuyuni	87	-	550	45	30	27	170	16	55	-	-
Lotima	213	-	938	105	70	45	390	4	165	-	-
Kileo	50	890	119	30	20	32	130	14	55	225	30
Total	1,850	2,740	11,750	892	595	460	3,430	230	1,650	18,765	405

Note: (1) Conditions: advanced irrigation with the Project.
(2) Conditions: traditional irrigation without the Project.
(3) Rainfed conditions without the Project.

Figures of oil-seeds are shown by unshelled product.

Table V-19(2) ANTICIPATED ANNUAL CROP PRODUCTION IN LOWER-MOSHI AREA (WITHOUT PROJECT) (Unit: tons)

	Maize (1)	Maize (2)	Cotton	Pulses	Paddy	Vegetable	Other Crops
Mabogini	850	1,169	28	75	360	150	9
Chekereni	200	1,213	86	50	15	150	5
Mutakuja	90	419	19	25	-	25	2
New Land	40	319	28	10	-	25	-
Msaranga/ Mandaka	200	1,850	5	20	270	125	69
Yam Makaa	190	2,106	9	17	-	25	14
Uchira	120	1,832	24	30	-	50	23
Kilema Pofo	20	862	133	15	-	25	14
Rau Ya Kati	300	325	19	40	180	200	9
Oria	70	981	28	20	-	50	16
Mangaria	50	375	-	5	75	-	2
Kitereni	360	400	24	18	15	-	14
Kisangesangeni	80	262	-	20	38	25	11
Ghona	430	800	43	15	-	25	12
Kiomu	170	69	5	12	-	25	7
Kochakindo	70	56	-	5	-	-	2
Himo	100	831	-	12	-	-	9
Makuyuni	210	600	57	15	-	25	16
Lotima	750	994	100	25	-	50	23
Kileo	440	544	-	18	30	25	14
Total	4,740	16,007	608	447	983	1,000	271

Note: (1); Traditional irrigated conditions

(2); Rainfed conditions

Table V-20 (1) ANTICIPATED CROP PRODUCTION IN EACH SCHEME

Major Crops	Without Project		With Project	
	Cropped Area (ha)	Annual Production (tons)	Cropped Area (ha)	Annual Production (tons)
1. UPPER MABOGINI SCHEME (150 ha):				
Paddy (1)	150	225	150	675
Paddy (2)	-	-	50	225
2. MABOGINI SCHEME (850 ha):				
Paddy (1)	90	135	750	3,375
Paddy (2)	-	-	250	1,125
Maize (1)	425	850	-	-
Maize (2)	180	225	-	-
Cotton	45	40	-	-
Pulses	95	50	-	-
Vegetables	35	175	-	-
Sugarcane	(70)		(70)	
Orchard	(30)		(30)	
3. RAU YA KATI SCHEME (450 ha):				
Paddy (1)	120	180	400	1,800
Paddy (2)	-	-	130	585
Maize (1)	140	280	-	-
Maize (2)	10	10	-	-
Cotton	30	30	-	-
Pulses	50	25	-	-
Vegetables	40	200	-	-
Orchard	(50)		(50)	
4. CHEKERENI SCHEME (850 ha):				
Paddy (1)	10	15	700	3,150
Paddy (2)	-	-	220	990
Maize (1)	120	240	-	-
Maize (2)	310	390	-	-
Cotton	185	175	-	-
Pulses	65	30	-	-
Vegetables	40	200	-	-
Orchard	(70)		(70)	
(Pilot Farm)	(80)		(80)	

- continued

Note: Paddy (1), rainy season cropping; Paddy (2), dry season cropping; Maize (1), irrigated; Maize (2), rainfed.

Table V-20 (2)

Major Crops	Without Project: Cropped Area (ha)	Without Project: Annual Production (tons)	With Project: Cropped Area (ha)	With Project: Annual Production (tons)
5. MIWALENI PUMP LIFT SCHEME (2,000 ha):				
Paddy (1)	25	40	900	4,050
Paddy (2)	-	-	470	2,115
Maize (1)	280	560	280	700
Maize (2)	965	1,210	-	-
Pulses	80	40	220	220
Cotton	100	95	220	330
Oil-seed	some		320	640
Vegetables	20	100	120	660
6. MAKUYUNI SCHEME (500 ha):				
Maize (1)	345	690	120	300
Oil-seeds (1)	some		150	300
Oil-seeds (2)	some		130	260
Cotton	155	145	100	150
Pulses	20	10	100	100
Vegetables	20	100	40	220
Orchard	(10)		(10)	
7. GHONA AND KILEO SCHEME (500 ha):				
Paddy (1)	-	-	150	675
Maize (1)	300	600	80	200
Maize (2)	120	150	-	-
Pulses	20	10	70	70
Cotton	45	40	70	105
Oil-seeds (1)	some		100	200
Oil-seeds (2)	-	-	120	240
Vegetables	5	25	40	220
Orchard	(10)		(10)	
8. NORTH GROUNDWATER SCHEME (60 ha x 14 sub-schemes):				
Maize (1)	-	-	210	525
Maize (2)	715	890	-	-
Pulses	40	20	165	165
Cotton	45	45	170	255
Oil-seeds (1)	some		250	500
Oil-seeds (2)	-	-	490	980
Vegetables	30	150	80	440
9. EAST GROUNDWATER SCHEME (30 ha x 6 sub-schemes):				
Maize (1)	-	-	50	125
Maize (2)	140	175	-	-
Pulses	10	5	35	35
Cotton	30	30	35	50
Oil-seeds (1)	-	-	50	100
Oil-seeds (2)	-	-	105	210
Vegetables	-	-	10	55

Note: Figure of oil-seeds is shown by unshelled product.

Table V-21 ANNUAL CROP PRODUCTION TO BE INCREMENTED BY PROJECT

(Unit: tons)

Major Crops	Without the Project	With the Project	Incremental Production
Maize (1)		1,850	
(2)	4,740	2,740	
(3)	16,010	11,750	
	20,750	16,340	-4,410
Cotton	610	890	280
Pulses (1)		595	
(Beans) (2)		460	
	450	1,055	605
Paddy (1)		18,770	
(2)		400	
	980	19,170	18,190
Oil-Seeds	some	3,430	3,430
Other Cereals	270	230	-40
Vegetables	1,000	1,650	650

Note: where; Maize (1) Production under the advanced irrigation
(2) Production under the traditional irrigation
(3) Production under the rainfed condition
Pulses (1) Production under the advanced irrigation
(2) Production under the rainfed condition
Paddy (1) Production under the advanced irrigation
(2) Production under the traditional irrigation

Figure of oil-seed is shown by unshelled product.

The reason for a decline in maize production is the use of a certain amount of maize fields for paddy production.

Fig. V-1(1) CROPPING PATTERN FOR RAU RIVER SYSTEM

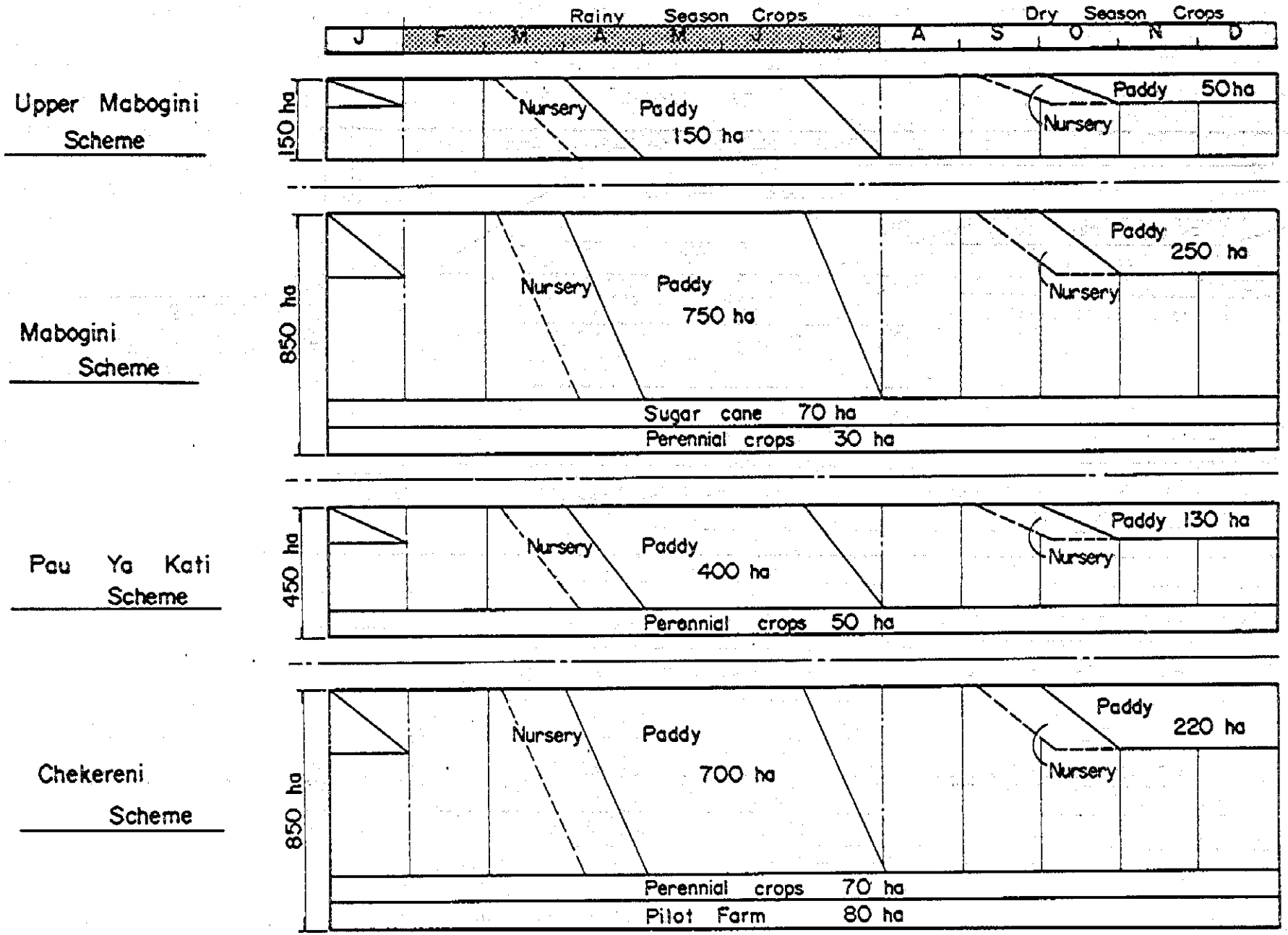


Fig. V-1(1)

Fig. V-1(2) CROPPING PATTERN FOR MIWALENI SPRING SYSTEM

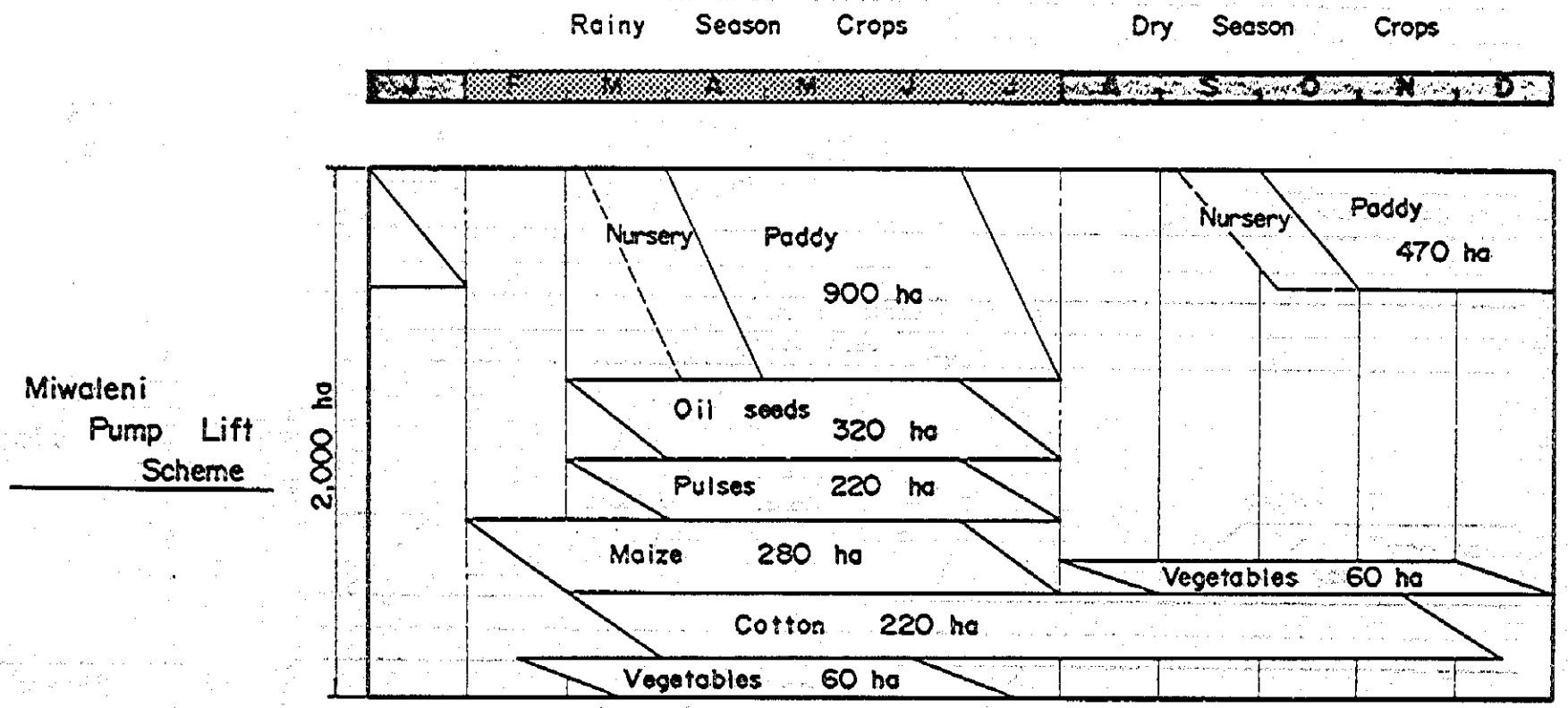
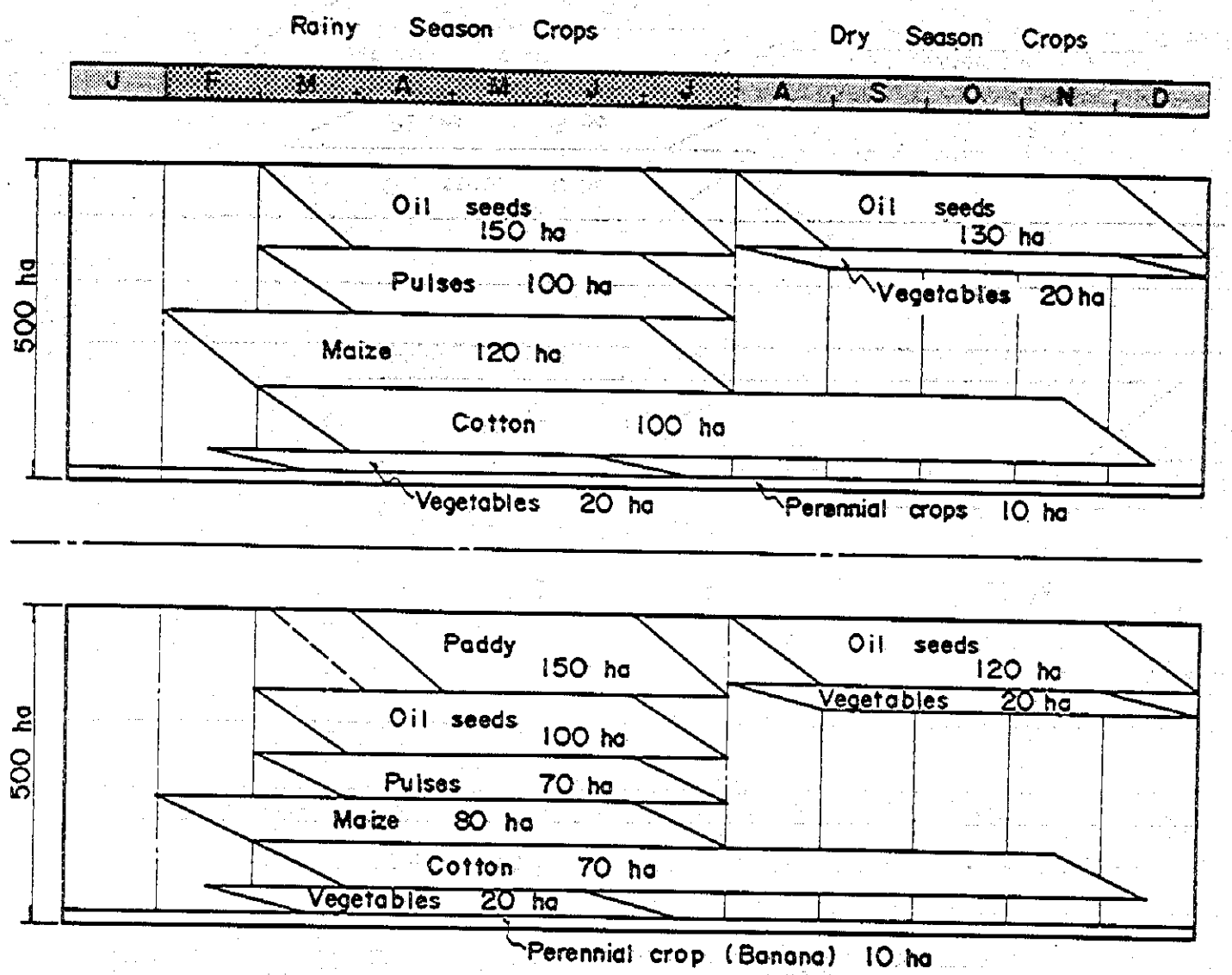
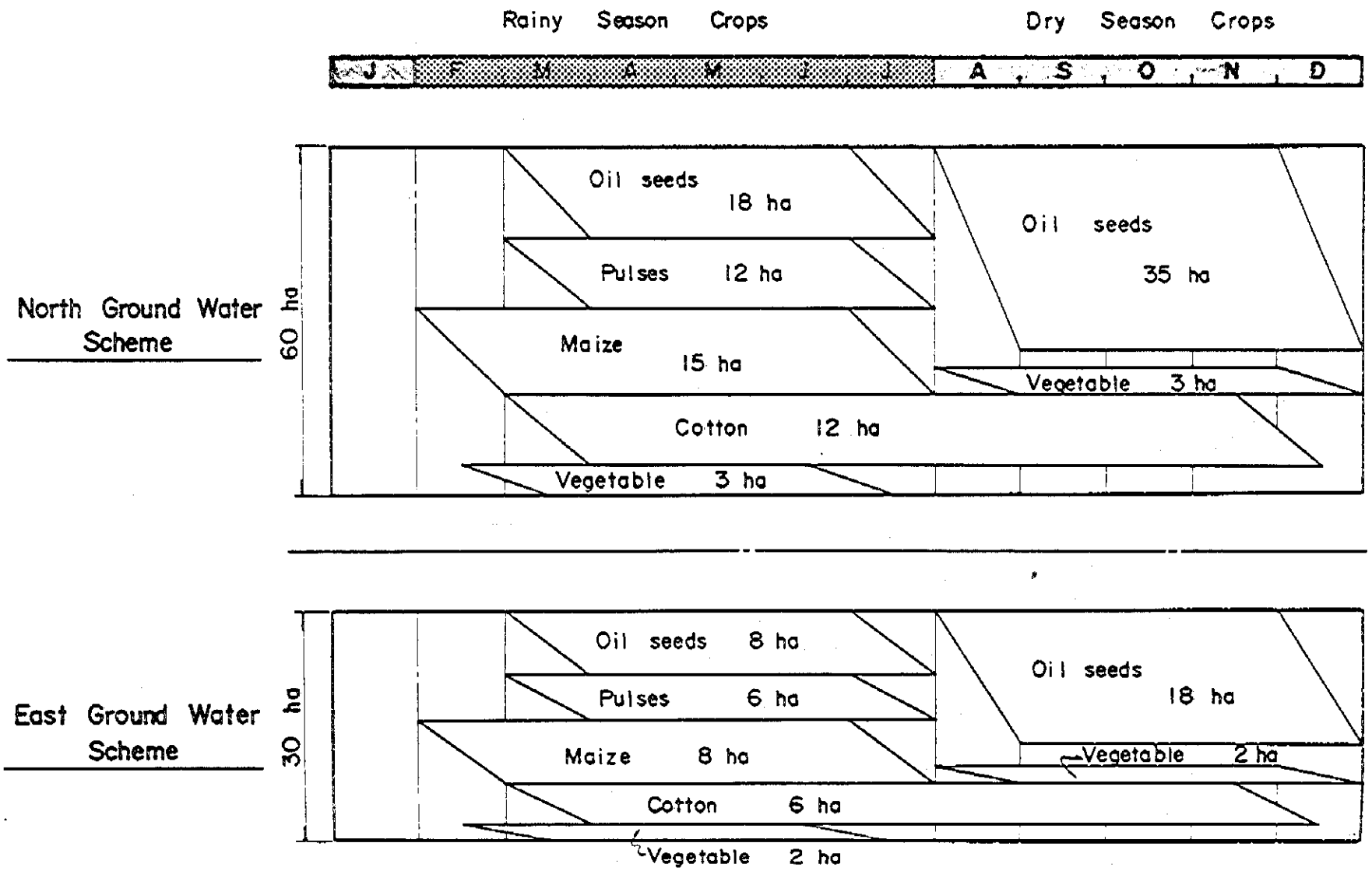


Fig. V-1 (3) CROPPING PATTERN FOR HIMO RIVER SYSTEM



(Fig.)V-1(4) CROPPING PATTERN FOR GROUNDWATER SCHEME



ANNEX VI

AGRICULTURAL ECONOMY

FEASIBILITY REPORT

ON

THE LOWER-MOSHI AGRICULTURAL DEVELOPMENT PROJECT

ANNEX VI. AGRICULTURAL ECONOMY

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ANNEX VI

AGRICULTURAL ECONOMY

1. General

Study on the agricultural economy was made to clarify the present socio-economic conditions in the Lower-Moshi area as a base for assessing the future conditions attributable to the Project. For this purpose, the data and information were collected concerning the present demography, agricultural setting, activities of agricultural supporting services, marketing and price of major agricultural commodities, etc. The data and information were obtained mainly from the Kilimanjaro Regional Development Offices and Moshi District Development Office concerned as well as the branch offices of the National Milling Board (called Parastatals) in Moshi. Some special information such as transportation cost, insurance, taxes and duties related to the transportation as well as import and exports, regular handling charges, etc. was collected from the Zonal offices concerned in Tanga city. In addition a field interview with the farmers and village officials was made in order to obtain practical information particularly on the farming expenditures as well as living allowance, marketing of agricultural products, etc.

Based on the data and information collected above, the present agricultural setting was analyzed with particular emphasis on assessment of a present situation of the farm economy, seasonal flood damage, necessity of agricultural production increases and prospective potential of socio-economic development.

To evaluate the future agricultural development plan, the following study was also made:

(1) Prospective increase of population and farm households in the Lower-Moshi area as well as Moshi township

(2) Marketability and profitability of the agricultural production

(3) Price prospect for agricultural commodities

In evaluation of the farm economy in the future with and without the Project, a price escalation caused by inflation and a shadow price factor were particularly taken into account, so as to set forth a realistic viability of the development plan. In this context, these conditions were studied, making reference to the Price Prospect for Major Primary Commodities prepared by IBRD (Januasy, 1980) and the economic statistics in Tanzania (1978).

2. National Economic Background

2.1 Economic Indices

The United Republic of Tanzania consists of Mainland, Zanzibar island and Peruba island with the total land of 945,050 km^2. The total population was estimated at 16.7 million in 1978 and the population density was 18 persons per km^2. Annual population increase was about 2.9 during 1968-1977 on average.

The economy of the Tanzania has grown very steadily during the last decade and the Gross Domestic Production (GDP) attained about Shs. 10,587 million (US$1,323 million equivalent). The GDP grew at an annual rate of 4.2 per cent during 1968-1977. Per capita GDP is estimated at Shs. 647 in 1977 on the bases of 1966 constant price (See Table VI-1).

The Balance of Trade position in 1977 was worse than in 1976. The value of exports was Shs. 4,536 million which is an increase of Shs. 397 million or 10 percent over 1976 figure. However, the value of imports was Shs. 6,199 million which is an increase of 14.3 percent as compared with the 1976 imports figure of Shs. 5,421 million. In consequence, the country's balance of trade had a deficit of Shs. 1,663 million in 1977 compared with the deficit of Shs. 1,312 million in 1976.

The major imports in 1977 were industrial machinery, transport equipment, crude petroleum and petroleum products. About 50 per cent of expenditure on imports was accounted for by those four items. In all, 18.2 per cent of all the imports were consumer goods; 45.5 per cent intermediate goods; 10.6 per cent were transport equipment and 25.4 per cent were machines and other industrial imports.

The agricultural sector is still largest sector in the economy dominating 38.6 percent of GDP. The industrial sector (including mining and quarring, manufacturing and handicrafts, electricity and water supply and construction) shares 15.3 percent of which manufacturing and handicrafts is the largest, while services shares 27.9 percent of GDP. In terms of the employment structure, about 60 percent of the labour/force is absorbed by the agriculture sector, while about 15 percent of labour force is in industrial sector. More than 20 percent of the labour force is estimated working in services sector (See Table VI-2).

In the agricultural sector, food crops including maize, paddy, sorghum, millet, wheat, dry beans and other leguminous crops produced approximately 2.1 million tons in total. Maize is the most important main food grain produced in the country. Total production of maize was about 1,000 thousand tons or 47 percent of the total food crops produced in 1978. The production has been increasing steadily during past 10 years except the stagnation period around 1973/74 (See Table VI-3).

Production of food grains which had declined drastically in 1973/74 and 1974/75, made a recovery in 1975/76. Unprecedented large quantities of food grains had to be imported in 1974 and in the first half of 1975 to met the domestic shortfall. The main grains imported

were maize, rice and wheat. In calendar year 1974 these imports amounted about 446,400 tons at a total cost of Shs. 783.1 million. Although food production situation started to improve in 1976/77 and will become even better in 1977/78, it is still necessary for the country to import maize, rice and wheat worth Shs. 230 million to supplement Tanzanian farmer's own production.

In the agricultural sector, cash crops including coffee, sisal, cotton, cashewnut, clove, tea, tobacco and other crops of about 260 thousand tons in total in 1977 were exported. Coffee, Sisal and Cotton are major foreign currency earners in the agricultural sector. However, in the 1969 to 1974 period, large production increase in the coffee crop had to be controlled by the Government in order to cope with World market trends. Therefore production was set to increase at 6 percent annum which represented only a small increase compared to the period between 1964-1969. Coffee production declined from 45.8 thousand tons in 1971 to 44.7 thousand tons in 1974. During 1976/77 production increased to reach 48.7 thousand tons.

Sisal production fell from 143.4 thousand tons in 1974 to 104.8 thousand tons in 1977, continuing a downward trend that started since 1971. This decrease was partly due to the fall in the acreage covered by sisal crop. Cotton output was still decrease still in 1977 producing a ratio of 1.7 per cent to the 1964 production. This decrease was due to less acreage put under cotton in 1975 compared to 1974. Also due to the adverse food situation experienced in 1974, farmers concentrated more on the production of food crops than cotton.

2.2 The Five Year Development Plans

Tanzania has placed a high priority on agriculture and rural development in the national development strategy in keeping with needs of the population. In the long term plan, the Government set the following objectives for the 1980.

1. increasing per capital income to Shs. 900/- per year;

2. attainment of self sufficiency in high level manpower requirements;

3. betterment of living standards of the populace and increasing the life expectancy to 50 years;

The objectives were to be achieved, stage by stage, through medium term (5-year) plans, of which the First plan, Second plan and Third plan covered the periods from 1964 to 1969, 1969 to 1974 and 1976 to 1981 respectively. In addition to the objectives set forth in the long term Plan. The first plan aimed to raise the annual GDP growth rate of 6.7 and to increase investment and the Second plan emphasized the implementation of the principles outlined in the Arusha Declaration. Those principle are:

i. self reliance - development through maximum mobilization of domestic resources, particularly through the mobilization of the people.

ii. social equality - the spreading of the benefits of development widely through society to avoid wide disparities in income and wealth.

iii. to encourage the development of economic activities undertaken through collective and cooperative efforts.

iv. economic cooperation with other African States.

The plan also aimed at achieving a GDP growth rate of 6.5 per cent per annum.

The results of the implementation of the First and the Second Five Year Plans showed that the decline in the production of crop was one of major reasons for not attaining the projected GDP growth rates. The decline resulted from a combination of various factors: drought, insufficient investment and faulty allocation of such investment which paid little or no heed to the suitability of certain areas for the production of particular crops. This was especially the case with respect to food crops. In order to achieve a higher growth rate of the economy, increasing work efficiency and productivity should be more significant than that achieved in the two plans.

In addition to the main objectives of the previous two plans the Third Five Year Plan lays emphasis on the self sufficiency in food requirement, proper and efficiency utilization of natural resources, development of economic and social infrastructure including technical education, supply of water and electricity, communication, building and storage facilities, medical services, village planning, strengthening work organization and etc.

Projected growth rates of GDP in various sectors of the economy between 1976/77 and 1980/81 are as follows:

Sector	Percentage Growth Rate/Year
Agriculture	5.1
Mining	9.3
Industry	9.3
Water and Electricity	10.3
Works	6.4
Transport and Communications	6.5
Other Sector	5.6
Average	6.0

To achieve this average rate of GDP growth and the various sectoral growth rates,it is estimated that the required investment expenditure would be Shs. 22,585 million. The targeted average growth rate of 6 per cent reflects economic development in the past years.

However, from a sectoral allocation of Shs. 26,978 million for the period, the average growth in GDP should exceed 6 per cent per year. The Third Five Year Development Plan period the sectoral distibution of investment is as follows:

Sector	Amount (Shs.1,000)	Percentage Share
Agriculture	3,331,840	12.35
Livestock	630,306	2.34
Natural resources	416,701	1.54
Mining	923,296	3.42
Industry	7,196,496	26.68
Commerce and tourism	576,664	2.14
Water	1,472,742	5.46
Construction	2,679,740	9.93
Power	1,352,790	5.01
Communication and transport2	2,204,735	8.17
Education and culture	1,717,347	6.37
Health	778,119	2.88
Administration and others	3,697,575	13.71
Total	26,978,301	100.00

In order to achieve the national objective of attaining self-sufficiency in food by 1981, the Government set out Production targets for food crops during the Third Five Year Development Plan as shown in following figures. These targets take into consideration nutritional requirements.

Crops	Average Production 1970-1972 (10^3t)	Demand (Target) (10^3t)	Increase above 1970-1972 Ave. (%)	Average Production 1972/73-1976/77 (10^3t)
Maize	866	1,360	57	864
Paddy	194	315	62	252
Wheat	43	127	165	54

The area under maize is estimated to be one million hectares and the production average 700,000 - 800,000 tons per annum depending on the weather. The 1973/74 drought reduced maize harvests by 30 per cent compared to the previous seasons. During the Third Plan the targets is to produce 1.3 million tons of maize by 1981. This represents an increase of 57 per cent above the base year of 1970/72. On the average, rice production between 1970-1972 has been estimated at 127,000 tons per annum equivalent 200,000 tons of paddy. About 150,000 hectares are estimated to be under paddy with an average yield of 1,340 kg per hectare. The target is to produce 315,000 tons of paddy by 1981.

2.3 Agricultural Marketing

Tanzania operates a single marketing channel called"parastatal" (state-owned or controlled marketing board or corporation) as the principal focus of the system. The cooperatives (Primaries and regional cooperative unions) act as agents of the parastatals in collecting marketable surplus and selling processed Products in the regions. The number of parastatals and their crop responsibility has changed frequently in recent years; currently, for maize and beans the relevant parastatal is the National Milling Corporation (NMC), for cotton, the Tanzania Cotton Authority (TCA), and for oil crops such as groundnut, sunflower, caster beans so on, the General Agricultural Products Export Corporation (GAPEX).

In collecting produce from the regions, parastatals typically take title to the goods and make payment when the goods are delivered to the warehouse of the regional cooperative union or directly to the parastatal's own warehouses. The unions, borrowing from the National Bank of Commerce for Working Capital, provide for cash payments to producers through member primary cooperative societies.

The parastatal's buying and selling prices are set by the Central Government under approval of the economic committee of the Cabinet. Producer prices for a particular harvest are set in advance of the planting season and, starting with 1973/74, are uniform, within low and high priority zones, over the entire country. Parastatals' buying prices vary among regions according to differences in costs of collection and handling; their selling prices are uniform.

Producer may sell small quantities of food crops outside official channels, often at prices considerably in excess of official producer prices. Unofficial and illegal trading in food crops also continues. At present, official consumer prices for maize, meal and flour are maintained at low levels, in relation to the parastatals' (eq. NMC's) full costs, and the NMC, which would otherwise incur losses in production of maize,is compensated by the Government on an ad hoc basis.

For cotton, on the other hand, operations are sufficiently buoyant to support a 10 per cent ad valorem export tax used as subsidies to offset producers for purchased inputs. Input prices are also set centrally but not on a uniform country-wide basis. Input subsidy schemes are undertaken from time to time to increase agriculture production. The Tanzania Cotton Authority currently provides a subsidy of 50 per cent of the cost of inputs used in cotton production.

3. The Kilimanjaro Region

3.1 General Features

3.1.1 Location, Climate, Lands

The Kilimanjaro Region which (excluding Dar es Salaam) is the smallest region in country with an area of 13,210 km^2 is located in northern Tanzania. The region is bordered by Kenya in the northeast, Tanga region in the southeast and Arusha Region in West. In terms of topography, the Kilimanjaro Region can be roughly divided into two areas: highlands and lowlands. The type of farming is distinctive in each of these areas reflecting the difference in rainfall according to elevation. More particularly, the highland which are situated for the most part at altitudes of 1,100 m or more above sea level, are relatively abundant in rainfall and not so hot, making it possible to plant coffee, a typical export crop of Tanzania, and bananas, a stable food crop of the inhabitants, and support a very high population density. On the other hand in the lowlands which are for the most part below 1,100 m and have little rainfall, drought-resistant crops are cultivated because of the high temperature. The mixed cultivation of maize and beans is representative, and cattle grazing is also practiced.

The rainfall and land utilization of each agricultural area is summarized in Table VI-4. Whereas coffee and bananas are cultivated in highland areas with an annual rainfall of 1,000 mm of more, maize, cotton and other crops are cultivated in lowland areas with an annual rainfall of less than 1,000 mm. In the dry season, irrigation is badly needed. However, lowland areas have little or no irrigation facilities, and almost all farmland depends on rain water. Thus, even in areas with an annual rainfall of 700 mm to 1,000 mm, crop yield vary widely from year to year. In areas with less than 700 mm rainfall, where stable production of crops without irrigation is difficult, paddy, cotton and other crops are often cultivated by using water from rivers and springs.

The land of the Kilimanjaro Region is divided into agricultural land and non-agricultural lands consisting of national park, game reserve, forest reserve, dam, lake, permanent and seasonal swamp, steep slope, existing urban area and etc. The region is summarized by land category as below.

District	Agricultural land	Game Res.and Forest	Water Surface	Other land use	Totals
Hai	60,200	59,000	2,300	89,500	211,000
Moshi	54,100	27,100	16,000	79,200	176,400
Rombo	35,500	90,900	300	16,900	143,600
Mwanga/ Same	44,900	224,300	60,900	459,900	790,000
Region	194,700	401,300	79,500	645,500	1,321,000

As stated in the above table, the entire area of the Kilimanjaro Region is about 1,320,000 hectares. Out of this total 194,700 hectares, or about 15 per cent are used for agricultural production purposes at present.

3.1.2 Administrative Organization

In 1970 the Rombo District split off from the old Kilimanjaro District, and in 1973 the old Kilimanjaro District was divided into the Moshi and Hai Districts;in addition, the Pare District was also divided into Mwanga and Same Districts in 1979. Accordingly, todays Kilimanjaro Region consists of 5 Districts, 19 Divisions, 75 wards and 419 villages. The regional capital is Moshi town, which was populated at about 74,000 in 1979 and which also serves as the administrative center of Moshi District. The centers of the Hai, Rombo, Mwanga and Same Districts are located at Sanya Jun, Mkuu, Mwanga and Same, respectively. About 80 per cent of traditional villages have been registered and the registered village is the smallest unit in the administrative organization.

The Kilimanjaro Regional Development Director (KRDD) has primary responsibility for the regional development and is composed of Planning, Finance and Personnel Departments. Keeping close contact with the Regional Commissioner, the KRDD is responsible for all aspects of external liaison, direction, expenditure, budgeting and accounting for the Agriculture, Commerce and Industry, Education, Health, Construction, Water, Land development and Natural resources Sections at the regional level. At the district level, the District Development Director (DDD) has the same responsibility and organization structure as that of KRDD. Administrative affairs below the jurisdiction of DDD are directed though the Division, ward and village in accordance with regional policy.

3.1.3 Demography

The population of the Kilimanjaro Region is estimated at about 878,500 or 5.3 per cent of the total national population. Since Most of this population is concentrated on the slopes of Kilimanjaro mountain at altitudes between 800 and 2,000 m, this makes one of the highest population densities in the country. The situation of distribution of population and population density are as follows.

	Hai	Moshi	Rombo	Mwanga/ Same	Region
Land with human settlement(km^2)/1	1,516	1,532	504	5,960	9,512
Population/2	156,700	359,100	154,600	208,100	878,500
Persons/km^2	103.4	234.4	306.7	34.9	92.4

Source; /1: Kilimanjaro Region Intergrated Development Plan 1977.

/2: Statistical data provided by Regional Water Department office, Kilimanjaro, 1979.

The trend of population has been examined on the basis of the population census 1967 and data on population from the Regional Water Office Kilimanjaro 1979. The population of the Kilimanjaro Region increased at a rate of 2.5 per cent annually in the period between 1967 and 1979. In general the rates are somewhat lower than those of the whole Tanzania. The annual population growth rates of Hai, Moshi, Rombo and Mwanga/Same Districts are 2.8, 2.3, 2.6 and 2.8 per cent respectively. Breakdown of population and number of households is given in Table VI-5.

3.1.4 Industries

In a very broad way, categories of industrial establishments can be identified in the Kilimanjaro Region as follows:

- Agro-industrial factories
- Local consumer oriented industries
- Cottage industries

The agro-industries are ones operated as part of the associated agriculture or closely integrated with it. The main units listed by category are the following.

Factores	No. of Establishment	No. of Employee
Sugar	1	4,500
Sisal bug	1	1,880
Coffee	2	700
Cotton	1	20
Sawmill & Wooden Toys	4	130
Milling	6	130
Cooking oil	1	30
Total	16	7,390

As far as the Kilimanjaro Region is concerned, the most important industries are sugar, sisal and cotton factories.

Local small industries are consumer oriented manufacturing or food processing units concentrated in urban centers. Products of this category are highly varied and include leather work , footwear, furniture, tinsmithy-household goods, bakery, sweets, coffee or salt grinding so on. This category also includes repair establishments. Data relating to the number of establishments and employees are summarized below.

Factories	No. of Establishment	No. of Employee
Commerce	32	520
Manufacturing	39	510
Transport and Storage	11	230
Construction	10	120
Mining & Quarrying	1	40
Total	93	1,420

There are large number of units of cottage industries throughout all parts of the Kilimanjaro Region. They are based on local agricultural as well as non-agricultural raw materials. The units are more numerous in rural areas than in the towns and usually employ family labour. The range of products is very large. The intensity of labour use is high and capital inputs are small. Generally, the units located in rural villages, process agricultural commodities produced locally. Thus there are some villages in mountainous areas that specialize in bamboo, liana and sedges weaving and wood working for household goods.

3.1.5 Education

Although the number of school education facilities can be considered sufficient, their quality is far from adequate. They suffer from an acute shortage of qualified teaching staff as well as a lack of instruction materials. The school enrollment was 70 per cent of the total age group in 1967, but in recent years, percentage of enrollments have reached about 80 per cent in the whole region. This figure is much higher than that of national average of about 60 per cent.

As an attempt to augment existing agricultural extension service which are responsible for passing on to the farmers the results of experimental works,Kilimanjaro was selected as the site for the first Farmers' Training Center to be built in Tanzania. It is at Msinga, about 13 km from Moshi Town. Since the center opened, in 1962, it renders great service for the modernization of agriculture not only for the Kilimanjaro Region,but also all over the northern zone for Tanzania agriculture.

3.1.6 Medical and Health Service

Although accessibility of obtaining medical treatment is very good on average in the region, the distribution of hospital, dispensary and other health service facilities show extremely large disparity by area. In some low altitude areas, particularly in the lower Moshi, Mwanga and Same areas, there are many villages without dispensaries, and medical personnel. Diseases spreading throuout in these areas include Measles, Malaria, Bilharzia, Diarrhoea and Typhoid at present.

Measles in a baby or child are very troublesome for farm families who suffer from a shortage of hands and Diarrhoea and Typhoid are epidemic diseases. Both diseases are largely caused by extremely contaminated drinking water and are the major causes for the high infant mortality rate in the rural area.

The extreme shortage of modern health care is one of the main reasons for the low standard of the public health of the region. Although small dispensaries were recently constructed in a few areas, these are not yet effectively being operated due to the lack of required medical service facilities and medical personnel. Even if they were well equipped, they would be in no sense sufficient for the whole rural population of about 800,000 in the Kilimanjaro Region.

3.1.7 Transportation

The Kilimanjaro Region is relatively well served by a road network which links the population clusters and also provides easy communication with the surrounding areas. A main artery of the regional road network is the Dar as Salaam/Tanga-Moshi-Arusha highway and a highway branching from Tanga-Moshi highway at the Kilema Pofo, 23 km west from Moshi town. The condition of highways within the region is paved and well maintained under the supervision of the National Transport Corporation (NTC), Moshi Branch. But means of land transport for the Kilimanjaro Region in the Tanga or Dar es Salaam direction is limited to only bus or Jeep type of vehicle due to the roughness of the highway. Passenger transport service is rendered by mainly the Dar es Salaam Motor Transport Company and the National Bus Company (KAMATA). The road network of the Kilimanjaro Region is summarized below.

Unit: km

	Trunk road	Main road (Territorial)	Local	Total
Paved road	208	15	102	325
Earth road	-	-	358	358
Total	208	15	460	683

The railway line from Tanga to Moshi reached Moshi in 1911 during the German colonial period. A connection to Mombasa-Nairobi railway was built in 1916 from Kahe. The Moshi-Arusha line was constructed during the British colonial time and was opened in 1929. Today the importance of railway transport is increasing, especially for freight transport. Freight transport is made by three type of wagons: small wagons of 14 tons, big wagons of 39 tons and open wagons of 36 ton capacities. Trains run once daily to Arusha and Dar es Salaam, twice daily to Tanga. The Kahe-Voi line (From Kahe in Moshi to Vol in Kenya) is closed at present.

Moshi, capital of Kilimanjaro Region has an airfield inside the township boundary. Now, the airfield is used only by small planes. Domestic and international air traffic use the Kilimanjaro International Airport located between Moshi and Arusha which serves both towns. Moshi airfield plays an important role for emergency measures such as hospital Doctor Service and so on.

3.2 Agricultural Services

3.2.1 Agricultural Research

Agricultural research is organised around twelve major centers each of which is responsible for several crops; and it is carried out both by governmental and parastatal agencies in Tanzania. All agricultural research programmes, irrespective of exactly who is in-charge, are controlled by the Ministry of Agriculture. The research network covers the major agro-economic zones and all important crops. The annual national research conferences serves as policy advisory committees, as co-ordinating links between individual research institute and also as a forum for the exchange of information between research workers, regional agricultural development officers and other extension staff.

There are the zonal agro research institutes each of which control research sub-stations. There are five major agro research institutes which are responsible for general research, and three essentially commodity research stations principally responsible for tea, tobacco, sisal and coffee respectively. Apart from these foregoing stations, the Faculty of Agriculture, Forestry and Veterinary Services undertakes basic as well as some applied research, and the Bureau of Resource Assessment and Land Use Planning (BRALUP) and the Economic Research Bureau (ERB) undertake land use and economic research respectively.

Out of three essentially commodity research stations of the country, Lyamungu Agricultural Research Institute in Hai District, is the one Located in the Kilimanjaro Region. Since this institute was originally established for coffee experimentation, its main activities still centers on coffee research, engaging more than half of its 100 staff members. It also has facilities for the training of about 30 coffee extension officers at a time. Lyamungu Institute has 5 sub-stations within its jurisdiction: Tengeru, Miwaleni, W. Kilomanjaro, Basuto and Sambwa. Miwaleni sub-station is located at the center of the lower Moshi area and carries out research mainly on food crop cultivation techniques.

3.2.2 Training

The Government training programme is already geared to meet the production needs of the villages. One long term target is to provide a formally trained Assistant Field Officer for each development village. The training content has likewise been changed to fit the multi-disciplinary nature of the extension service. While originally veterinary and agricultural assistant field officers were trained separately and often in separate institutions, now the two courses have been combined into one, and all the agricultural and veterinary extension workers have to go through the same course. These two year Agro-Veterinary courses are run at "certificate" level to produce AFO's.

The Folk Development Colleges under the jurisdiction of Ministry of National Education are also run to train rural village leadership. Short courses lasting 2 - 3 months are offered to anyone

over 19 year of age. Training,in practical operations in all phases of agricultural,accounts for most of the training time. There are two such colleges in the Kilimanjaro Region. Msinga Collage in Kibosho, Moshi District provides a training course for coffee-banana farmers and a College located in Same, Same District has a course for lowland farmers.

There are many religious organization in the Kilimanjaro Region. They also provide several kinds of the agricultural training courses and have produced a great number of trained people. For instance, the YMCA Farm Training School has been set up to train village leaders. It is a two-year school, which anyone who has completed the seven year primary school education is qualified to enter. Emphasis is put on acquisition of basic agricultural knowledge. The meal fee of 1,100 Shs. per year is supplemented by subsidies from the YMCA and proceeds from the sale of farm products.

3.2.3 Agricultural extension

The extension system is four-tiered. There are provisions for extension agents at village level, then at ward level, then at district level and finally at regional level. The supervisory chain works from regional down to village level. The extension system gross manpower resources include some 3,000 professionally trained Assistant Field Officers who generally are expected to man wards, and some 3,500 Field Assistants with minimal formal training who often run the villages. Between them,these two cadres are supposed to cover upwards of 7,000 development villages in the country. About half of the staff work under the parastatal extension programme and the other half work in the general extension service, directly under District or Regional administration.

Recently the government has taken measures to strengthen the capacity of the extension service by creating a village executive cadre known as village managers. This cadre are responsible to village concils and do actual project implemention on behalf of the village assembly, after the projects have been agreed upon. Officers appointed into this cadre have been drawn from many Ministries including Agriculture, Education, Cooperative and Rural Development etc. Many of these village managers are generally of high calibre and are diploma and graduate level staff.

The total Agricultural Extension staff engaged in the Kilimanjaro Region is some 250. Out of them, about 60 - 70 persons work in administration in the District Development Offices and Regional Development Office as the senior officials. The remaining approx. 185 extension staff are working at the villages. An average comanding area per extension worker in the region will come to approximately 1,100 hectares, and the number of farm households per extension worker were counted as 890. These figures are considerably larger in comparison with an average of that in developing countries. The number should be increased to at least two times the present number of field extension workers in the region.

3.2.4 Agricultural credit

After many changes, a traditional credit service system during the colonial period in Tanzania was reorganized into the National Development Credit Agency and the National Cooperative Bank in 1964. The National Development Credit Agency placed particular emphasis on financing the cooperative movements which were a development priority in the year immediately following independence. It was considered that lending through cooperatives would bring about some economies of scale in the financing and supply of inputs to farmers, and effect savings in the administrative costs of credits. At the same time, the National Cooperative Bank was formed to mobilize saving from the cooperative movement. However, operational problems continued to plague the credit system as follows;

a. inadequate staffing and lack of skills which resulted in financing of projects which turned out to be technically and/or financially unsound

b. political interference in the sanction of loans and in effecting their repayment,

c. lack of credit education to make borrowers accept the meaning and responsibility of credit

With the nationalization of the major means of production and of the banking system in 1967, it become imperative to rationalize further the institutional credit structure at the same time. The National Cooperative Bank was merged into the newly created National Bank of Commerce. The Tanzania Investment Bank was created to take care of industrial financing and the Tanzania Rural Development Bank (replacing the National Development Credit Agency) was created to assume responsibility for rural credit.

The Tanzania Rural Development Bank in 1971 was expected to provide a more dynamic mechanism for promoting rural development through the financing of production, processing, storage and transport of products of agriculture, forestry, fishing and other productive activities pursued in rural areas and primarily serving the rural population. This financial institutional structure has persisted to this moment.

The Tanzania Rural Development Bank began vigorous efforts to finance long-term projects with larger values per loan than agricultural inputs loans. The falling off of average value per loan in the period 1974/75 to 1976/77 was largely due to the fact that the regional cooperative unions which were borrowing for re-lending to a number of villages in their area, were abolished in May, 1976. This meant that instead of having one loan given through a cooperative, we now have several loans given to villages. But the abolition of regional cooperative unions did not mean automatic replacement by villages as users of credit. The cooperatives, despite all their problems had some well established administrative and management systems which facilitated the administration of credit. The villages more recently established under the villagization programme,do not have good management systems. Efforts are in hand

to fill the gap by expanding the zonal staffing of the Tanzania Rural Development Bank and by hastening the organisational structures of the village communities themselves. The government has recently posted fairly senior government servants to villages as village managers whose major job is to run and organise village activities under the general direction of the village council.

Types of Borrowers:

The TRDB has dealt with a large variety of borrowers as shown in Table VI-6. The proportion of loans to the cooperative unions has steadily declined until at the time of their abolition they were getting only about 1% of the loans. As regards loan usage, a large proportion of loans given to cooperative societies and Ujamaa Villages have been for agricultural inputs, farm machinery, storage and rural transport, while loans given to Parastatals and public companies have been for rural transport, ranching and dairy development.

The Ujamaa Villages registered as multi-purpose cooperative societies constituted an important group of borrowers prior to 1976/77. The Villages registered under the Villages and Ujamaa Villages Act of 1975 are deemed to be multi-purpose cooperative societies. It is anticipated that loans to these villages, for village communal activities as well as for passing on to individuals residing in the villages will increase in future as the management of the villages gets consolidated.

Performance by Subsectors:

The Tanzania Rural Development Bank gives credit to many rural based activities broadly categorised under eight subsectors as follows:-

i) Agricultural inputs
ii) Farm Machinery
iii) Rural Transport
iv) Storage
v) Farm Development
vi) Livestock
vii) Small-Scale Industry and Commercial Ventures
viii) Fisheries

i) Agricultural Inputs:

Table VI-7 of the Appendix shows that well over half of the total value of loans annually which have gone to agricultural inputs are for tabacco and maize production. During the period 1971/77 about T.Shs. 311.200 million were approved for tobacco production credit. Credits for agricultural inputs are usually provided in kind and for this reason the work of procurement and transport of the physical inputs rests with The Tanzania Rural Development Bank. In addition, government programmes supported by the World Bank and other agencies in support of integrated rural development in a number of regions, will also stimulate credit needs for agricultural inputs.

ii) Farm Machinery:

Credit for this purpose is usually given for purposes of acquiring tractors and agricultural implements, oxen and ox ploughs. During the period 1971/72 to 1974/75 there was a great spurt in loan demand for acquisition of tractors by Ujamaa villages. Although there was a great potential for tractor use in Ujamaa Villages, the actual use was hampered by lack of skilled drivers and mechanics, spare parts, repairs and maintenance facilities and under-utilisation of tractors. As the costs of tractors and fuel soared,tractors became unviable investments in Ujamaa Villages considering their technical and managerial efficiency. For example, in 1975 it was estimated that in order to breakeven, a village using a tractor had to be able to produce about 30 bags per acre of maize, a very rare performance in the majority of villages. Loans under this category have therefore been modest, not exceeding Shs. 10 million, during the six year period.

iii) Rural Transport:

With a rapid rise in rural activities,demand for rural transport for both passengers and goods has risen fast. Vehicles were needed to move crops from farmer buying posts to stores and godowns. Vehicles are also needed to move manufactured goods including agricultural inputs from towns to rural areas. This demand has been reflected in the significant loan amounts for this sector. The administration of transport credit has posed a problem to Tanzania Rural Development Bank since most of its big borrowers were faced with management problems and poor capital bases. It is expected that the establishment of regional transport companies with the support of the World Bank would go a long way towards strengthening transport management in the country and would facilitate a smooth flow of funds from the Tanzania Rural Development Bank and of their recovery.

iv) Storage:

The development of agricultural activities in the villages calls for increases in storage facilities. Prior to 1975/76 the co-operatives were responsible for building godowns in selected places to cater for a number of villages. These investments have been financed largely through levies rather than through loans. Hence the small volume of loans to this sub-sector.

v) Farm Development:

This has included almost exclusively credit extended for establishment of crops like small-holder tea, district development corporations' farm development, sisal development etc. It was expected that the establishment of district development corporations would give a boost to farm development. Unfortunately due to inefficiency in the management of district development corporations coupled with poor capital or equity base, most farm development projects financed by TRDB could not take-off successfully.

vi) Livestock:

Considerable World Bank credit has been channelled through TRDB for the development of ranching and dairy farms. Dairy development has responded quite satisfactorily while ranch development has received a number of setbacks mainly due to managerial problems in the Ujamaa ranches. The loan portfolio has accordingly grown rapidly over the period under review. Poultry development is expected to feature in future loans to the sub-sector.

vii) Small Scale Industries and Commercial Ventures:

Under this sector the Tanzania Rural Development Bank has been financing saw-mills, maize mills, fruit canning and salt making. The largest element has been the maize mills. The need for maize mills will undoubtedly increase as the villages increase their maize production. But it appears that village development also offers opportunities for establishing other small scale manufacturing/repairing units to support and supplement their agricultural activities.

viii) Fisheries:

This sector has great potential although it was expected that the total financing by Tanzania Rural Development Bank during the period would be of the order of Shs.14 million, whereas actual lending did not exceed Shs. 3,885,000. This was due to ineffective management of potential borrowers like District Development Corporations and Fishing Cooperatives. The creation of the Tanzania Fisheries Corporation may bring about a change in the situation as it is expected to provide the much needed technical and management assistance to small fishing units.

Loans by Type:

A classification of loans provided by the Tanzania Rural Development Bank by term is given in Table VI-6. Short-term loans are usually recovered within twelve months. Such loans have averaged over 50% of the total number of loans while their value has averaged over 60% during the period. This type of loan is expected to grow faster in future as village production programmes pick up more speed.

Medium term loans cover loans for farm machinery, transport, fishing boats and their accessories. The repayment period is between 1 and 5 years. This is the second largest of the group and it is dominated by the transport sector followed by farm machinery.

The long-term loan category covers livestock, storage, farm development and small-scale industries. The Tanzania Rural Development Bank has increased its efforts to identify long-term development projects, but the success of this portfolio will depend upon the management efficiency and the future economic viability of the products being financed.

Loans by Region:

Table VI-8 brings out the divergence in the flow of funds from The Tanzania Rural Development Bank between different regions, the regions with a strong cash crop economy have received larger assistance than the others. As at the end of June 1977, 63% of the loan portfolio was accounted for by five regions. The regions which have been taking a major shre of loan approvals every year since the Bank was established are Tabora, Iringa, Mbeya, Arusha and Ruvuma.

It should be observed that rural credit, to a large extent, flows into areas which are better endowed with fertile soils, rainfall etc. Moreover, credit is also extended by some crop authorities, e.g. cotton, coffee - these two cover wide areas of northern, and north western Tanzania.

3.3 Agricultural Economic Condition

3.3.1 Land tenure, farm size, farming pattern and income

There are two main types of land tenure in the Kilimanjaro Region. The Kihamba on the slopes of the mountain is a specialised, almost free-holding type of tenure of the kind usually found only where perennial crops are grown. This Kihamba land is the real home of the people where houses are built and banana and coffee planted. It can be inherited, or bought and sold, the price depending on the quality and quantity of the coffee and banana and the facilities for irrigation.

In addition, most farmers have an area of Shamba on the lowest slope of the mountain on land not yet taken for Kihamba, which they use with the permission of the local authority. There, they cultivate annual crops such as maize, cotton sorghum and millet and they also cut their supplies of grass for cattle fodder. One particularly noticeable feature of this system of land use is the carrying up from the lowlands (often by women as head loads) of vast quantities of cut grass. The more closely the lower lands are cultivated (as inevitably they must be to satisfy a growing population), the greater still will become the problem of cattle fodder and the only solution, which is already being adopted in some cases, is for production in Kihamba land of more and better cattle fodder and the planting of improved grasses in the available grassland below.

The average size of farm on Kihamba land varies from less than 0.5 hectares to 3.5 hectares and a recent survey gives the average present size of a typical Kihamba plot as ranging from 0.5 hectares to 1.0 hectare as shown below.

Distribution of Kihamba Landholdings

Size of holding (Ha)	Distribution in Kilimanjaro Region	Distribution in Tanzania
below 0.5	9	-
0.5 - 1.0	55	7
1.0 - 1.5	16	25
1.5 - 2.0	10	56
2.0 - 3.0	6	4
above 3.0	4	8
Totals	100 %	100 %

These small plot of land support a very dense population, the normal homestead consisting of anything from two to sixteen people with an average figure of 7.5. The banana grown in the Kihamba provids a stable food, the fodder for the cattle, thatching material for the house and an essential ingredient of beer.

Small owner agricultural lands located mainly at the highland belt about 110km long and 8 km to 13 km wide at altitudes from 1,000 m to 1,500 m above sea level. Small owner agricultural land is an area with satisfactory rainfall, good water resources and good soil

with high production potential. The situation on the large scale agricultural land, lying on the vast lowland is rather different. The potential of the soil is in general poor and water shortage is the major obstacle to cultivation of crops.

In the Moshi area there exist different two farming patterns. One is Kihamba - Shamba type with an average farm size of 1.5 hectares in the upper Moshi area and other one is rather small-scale of cotton and maize type with an average farm size of one hectare in the lower Moshi area. The farming Kihamba - Shamba pattern averages 0.55 hectares of coffee and 0.54 hectares of banana. The Kihamba farmer's own farm lands in the mountainous areas(an average of 0.4 hectares) are cultivated with maize and beans etc. like the Shamba in the lower Moshi areas according to the village authorities concerned. Farmers who inhabit the lower Moshi area cultivate cotton and maize and they have an extremely low standard living at present.

Comparative analysis of farm income-cost structure between Kihamba - Shamba type of farming pattern and cotton-maize type of farming pattern was made on the basis of obtained data from respective crop authorities, 1979. Results of analysis are summarized as shown below.

Crop production value	4,770	2,950
Livestock production value	1,210	1,270
Total	5,980	4,220
Crop production cost	820	1,040
Livestock production cost	400	610
Total	1,220	1,650
Net farm income	4,760	2,570

Average family size of Kihamba - Shamba type is 5.1 and that of cotton-maize type is 5.04. The scale of livestock raising is 2.2 cattle, 8.7 goats, 0.7 sheep for the Kihamba - Shamba type and 3.2 cattle, 3.4 goats, 1.2 sheep for cotton-maize type of farms. An average income per capita from Kihamba - Shamba type amounts to Shs. 933, and that of cotton-maize type comes to Shs. 510. It is clear that the farm income per capita in lower Moshi area is only half of that in upper Moshi area. Breakdown of farm income is given in Table VI-9.

3.3.2 Crop production

The Kilimanjaro Region is one of the richest regions in Tanzania, producing as its main African grown cash crop some 14,000 to 22,000 tons of a mild quality arabica coffee annually. The value of this crop is approximately Shs. 123 to 271 million. The Chagga people are banana eaters and bananas are grown mixed with the coffee. It may be said that bananas are a more important crop than coffee, because they are the mainstay of the people.

The Kilimanjaro Region also produce about 190 tons of AR class and 100 tons of BR class seed cotton with a value of about Shs. 456 thousand for AR class, and Shs.120 thousand for BR class; ie, Total Shs.676 thousand. This crop is confined to the lower areas and is largely grown under limited irrigation. Pyrethrum, a relatively new crop in the region, is being grown on the edge of the forest reserve at West Kilimanjaro and Usseri. Production is low at the moment but promiss to expand considerably in near future.

Agricultural production from estates is considerable. The Tanganyica Planting Company (TPC) at Arusha Chini produce annually some 45,000 tons of sugar and is the largest and most progressively run sugar estate in the territory. Sisal production decreased from over 5,000 tons in 1961 to 2,600 tons in 1977, 2,200 tons in 1978 and 1,700 tons in 1979 due to price decline during the Second Five Year Development Plan. The West Kilimanjaro Wheat farmers, growing 2 crops per year, produce about 12,000 tons with 8,700 hectares. Over 40,000 tons of maize are produced annually. The production of coffee, cotton, sisal, oil crops and food crops by district in the Kilimanjaro Region are as shown in Tables VI-10, 11, 12 and 13.

3.3.3 Livestock production

Livestock contributed significantly to the resources of the domestic income. The estimated livestock population of some 430,000 of small Zebu cattle, 251,000 sheep and 788,000 goats is concentrated in the cultivated area of the region with the following approximate distributions:

District	Cattle	Sheep	Goats
Hai	64,450	42,260	53,950
Moshi	134,530	43,980	452,120
Rombo	33,920	48,190	95,380
Mwanga/Same	196,690	116,310	186,160
Total	429,590	250,740	787,610

Livestock productivity is low caused by inadequate disease control, frequent prolonged drought, inadequate supplies of quality fodder crops due to competition for cereal and food crops and inadequate supplies of irrigation water, lack of trained extension services, lack of organized credit facilities and the problems faced by the tenant farmers in providing adequate and acceptable guarantees for loans. With these constraints annual production of cattle is estimated at 10 per cent and milk yield at about 200 litres per lactation. Production of sheep and goats including unrecorded domestic slaughtering, is estimated at 35 per cent, and the milk yield at 17 litres per lactation. Meat yield is estimated at 140 kg for small Zebu cattle, 15 kg for goats and 12 kg for sheep on an average.

Livestock marketing in the Kilimanjaro Region is poorly developed. Animals are sold in primary markets, and outlying villages

often make up a small herd for sale at the nearest market, sometime two or three days trek away. Cattle traders are the main buyers although trade is done with butchers on account. Livestock sales are made by independent bargaining between sellers and buyers. Road transport is used extensively to move animals to larger urban markets. There are considerable numbers of local slaughter houses in the region. One public slaughter house exists in the Moshi town and it is administered by the Economy and Trade Section, Moshi Town Council. Some 500 to 600 head of cattle, and 600 to 800 goats are slaughtering per month at present. With this large consumption of meat, hides and skins form an important local industry and in addition considerable numbers are manufactured into leather in a tannery at Himo about 29 km in West from Moshi town on the Mombasa Road. The inventory of the number of slaughtered animals in the Moshi urban area from 1977 to 1979 period is as shown in Table VI-14.

3.3.4 Agricultural input supply

In order to increase agricultural production, the basic input needs of the farmers must be met in time, at a reasonable price, and at convenient places. It was with this objective that the cooperative unions, several crop authorities and many Branches of Tanzania Rural Development Bank have been established with a view to consolidating the development, collecting and selling as well as basic input supply service activities which relate to major agricultural crops.

In Tanzania, improved seeds of maize are produced by the Tanzania Seed Company Limited (TSCL) and multiplication of these seeds are made by NAFCO as extension seeds. These extension seeds are distributed from village cooperatives through the Tanzania Farmers Association (TFA) or Tanzania Rural Development Bank Close cooperation with the National Milling Cooperative. In 1978/79 crop season, TRDB, (Kilimanjaro) distributed maize seeds to the village cooperatives, some 134 tons of hybrid, 81 tons of UCA variety, 11 tons of Katumani variety; ie, total 226 tons of maize seeds. On the other hand, the same crop season, about 60 tons of hybrid and 3 tons of Katumani Variety, total 63 tons of maize seeds were distributed to the maize growers in the region by the TFA, (Kilimanjaro). TRDB Kilimanjaro said that approximately 333 tons of the maize seeds are requested by 126 village cooperatives with about 13,000 hectares of the maize cultivation areas in the region for 1979/80 crop season. Cotton research stations have been successful in producing and distributing higher quality cotton seeds to cotton growers through TCA's extension network.

In Tanzania, approximately 70-80 thousand tons of fertilizers are supplied by Tanga Fertilizer Company and some 40-50 thousands town are imported annum at present. Most fertilizer used in the Kilimanjaro Region is supplied and made by Tanga. The large consignees of fertilizers in the region are Tanzania Rural Development Bank, coffee Authority, TPC, NAFCO, Tanzania Farmers Association, Tannery Factories etc. These consignees received about 4,000 tons in total volume for 1978 crop season, 5,500 tons for 1979, 7,700 tons for 1980 from Tanga Fertilizer Company. These total volumes consist of S. Ammonum, CAN,

urea, compound fertilizer (25:5:5 and 20:10:10), Triple-super-phosphate, SOP and potash. Urea and potash are applied mainly for sugarcane cultivation and S. Ammonum and Triple-super-phosphate are used for maize production. Some small amount of imported chemical fertilizers are used by cotton growers.

Agricultural chemicals for cotton and coffee cultivation are supplied through each Cotton and Coffee Authority. The chemicals for maize, the Tanzania Rural Development Bank provide and distribute to farmers in line with the national policy for maize development programme. Thiodan, Hostathion, DDT-Rogoro, DDT-Sevin are major agricultural chemicals for cotton, Blue-copper and Finitrothion are commonly used for coffee diseases and thionex application is prevailent for maize in the region.

Imported agricultural tools and implements are supplied by village shops through the depots of the Kilimanjaro Regional Trading Company (KRTC). In the period of 1978-1979, the imported hand tools supplied by KRTC were mainly hoes, shovels, axes, mattocks etc., and for agricultural machineries and equipment the tractors and their attachments occupied the largest part of total values. Considerable number and amount of wood-works and iron-works(such as handles grips, long-handle ladles, small shovels and axes) are supplied by rural producers through local markets or TFA's shops, but infact no record on these marketed products is available. Breakdowns of the agricultural input supply in the Kilimanjaro Region are given in Tables VI-15, 16, 17.

3.3.5 Crop budget of the Kilimanjaro region

Almost 100 percent of cash crop productions are directly sold to the crop authorities by the growers. Thus, the present status of cash crop productions in the region are very clear. However, the estimation of food crop production is extremely difficult due to shortage of available data. In this chapter the annual average production of major food crops in the region is estimated on the basis of the figures based on field survey and information from the crop authorities. Results are shown as "annual average production" under the mark "A" in the following tabulation. Under the mark "B", items of "purchased within region" and "sold within region" show the quantities of each product purchase or sold by NMC within the Kilimanjaro Region, similarly, items of "imported from outside" and "exported to outside" means the inflow and outflow of the crop products of the Kilimanjaro Region through NMC in 1978 fisical year. Details of the estimated annual average crop production and crop balance of National Milling Corporation Moshi Branch, 1977/78 are given in Tables VI-18 and VI-19.

unit = tons

Crop	A	B			
	Annual average production	Purchased within region	Sold within region	Imported from outside	Exported to outside
Maize	44,160	23,170	10	-	11,440
Millet	5,800	-	-	-	-
Finger millet	-	-	3,050	3,380	-
Wheat	12,180	5,880	20	10	5,950
Barley	1,860	-			-
Paddy	4,550	760			790
Red beans	3,600	3,450	280		1,820
Mixed beans	1,260	80			10
Cowpeas	350	300			30
Banana	325,700	-			
Rice (Local)	-	980			790
Rice (Foreign)	-		3,820	4,940	700

The figures in the preceding table indicate that largest annual average production of food crops in the region is about 326,000 tons of banana followed by 44,000 tons of maize, 12,000 tons of wheat, 5,200 tons of pulses(consisting of redbeans, mixed beans and cowpeas,) and 4,550 tons of paddy. In 1978, out of these productions, NMC purchased 23,170 tons (or 52 percent) of Maize, 5,880 tons (or 48 percent) of wheat, 3,450 tons (or 96 percent) of redbeans, 2,320 tons (or 51 percent), 760 tons of paddy plus 980 of milled rice equivalent to about 1,560 tons of paddy (totalling 2,320 tons of paddy) etc.
In the same year, NMC imported 3,380 tons of finger millet, 10 tons of wheat, 4,940 of milled rice from outside of the region. Out of total inflow to the NMC's storage, 10 tons of maize, 3,050 tons of finger millet, 20 tons of wheat, 280 tons of redbeans and 3,820 tons of milled rice were sold to the consumers within the region. The products of millet, barley and mixed beans were not sold to NMC. These products might be consumed by producers for their own home use.

A large part of banana products can be assumed to flow out to the other regions. According to field investigation on the nutritional intake of inhabitants in the Moshi rural area, about 650 grams of raw banana per capita per day are consumed. The present population of the Kilimanjaro Region is approximately 878,500. From these figures, total annual consumption of banana products can be roughly estimated at round about 210,000 tons. Perhaps, the 115,700 ton difference volume between the 325,700 tons of annual average production and 210,000 tons of domestic consumption is used for exchange into other nutrition resources.

Based on the same investigation mentioned above, inhabitants in the Moshi area usually eat 370 grams of food grain per day per capita including paddy grain. The total consumption of such food grains in the region would require approximately 118,600 tons in a year. As the annual average production of food grains in the region are estimated at about 68,600 tons defficiency of food grains comes to 50,000 tons. Pahaps, some part of the banana surplus or imported foodstuff or balance in nutrition intake of inhabitants themselves makes up a good part of this defficiency.

In consideration of the above situation, approximately 3,000 tons of finger millet, which might be consumed for fermenting the local beer, and nearly 4,000 tons of milled rice were imported to supplement farmers own production in the region. At present, paddy is produced mostly in the area along Rau River in southeastern part of Moshi Town and in the Mkomaji Valley of the Pare District. A tract of land along with Rau River has a long history of paddy production and it should be calculated as part of the paddy area. The possibility of the development paddy field and productivity of paddy yield are given in detailed explanation in Annex III.

4. The Lower-Moshi Area

4.1 Administration and Demography

The Lower-Moshi area is administratively divided into 20 villages (See Fig. VI-1.) of which some 19 villages are organized in Moshi District and one in Mwanga District as shown in Table VI-20. All of these villages have been traditionally established by spontaneous transmigrant since long ago, but only put in the national registration in the recent years of 1970 to 1977. In this registration, five villages, i.e. Chekereni, Kiomu, Mangaria, Makuyuni and Uchira are organized into "Ujamaa Village"/1 under the national policy reaffirming Tanzania's commitment to the socialist society in the Arusha Declaration in 1967.

People inhabiting the Lower-Moshi area are mostly of Wa-Chagga and Pare and Wa-Kahe tribes. According to the village census (demography as of October, 1979) provided by the District Ujamaa Village corporative office in Moshi and village offices concerned, the population which has been settled in all the 20 villages is about 43,930 in total. The population by sex group (male and female) is almost balanced at 21,970 and 21,260, respectively. The population of teenager consist of about 1,760 male and 1,820 female. As shown in Table VI-21, population density varies widely between villages ranging between 50 persons/km^2 and 230 persons/km^2 according to the historical variance and availability of arable land in each village.

Total household or number of families are about 8,700 in all 20 villages. Out of total households, about 7,900 (or 90%) is part of the study area. An average family size is about 5.04 persons per household, of which some 2.4 persons are considered to be able to work (see Tables VI-22 and VI-23). All of the work age population is engaged in agriculture with the exception of some officials and specialized bar-owners in each village. Some shops and technical services such as blacksmith, repair-shop of bicycles, grain mills, etc. are also found in village but they are mostly managed as side businesses.

Other than the above settlement, a considerable number of farmers who are seasonal migrants from the Highland areas/2 also profit directly from the crop cultivation in the Lower-Moshi area with traditional cultivation rights. With regard to this seasonal migrants, no statistical data is available at present, however, greater than 9,300 farm families are coming, all over the area. Generally, they cultivate the land only in the rainy season and the land acreage does not exceed one hectar per farm household.

/1: Ujama village as a mean of effecting self-reliance and a community approach to the rural development.

/2: Highland is the characterized zonal area in Kilimanjaro where coffee and banana plantation have been developed extensively.

4.2 Activity of Agricultural Supporting Services

Crop research, especially on the food crops, and technical demonstration of such crop cultivation are being made by the Miwaleni Experimental Sub-station which is located at the center of Lower-Moshi area. In the course of the above programme at present, such technical demonstration as introduction of high yielding varieties, use of fertilizers and agro-chemicals is made at several places using the yards of the primary schools and also the farms of leading farmers under the national maize campaign and the regional agricultural development programme particularly for cereal crops and oil-seeds.

In addition, agricultural extension programme is carried out by field extension workers under direction of the District Agricultural Development office. Also, technical guidance to the cotton growers is conducted by the Tanzanian Cotton Authority. The extension workers are, however, still substantially under-staffed particularly at the field level. At present, the number of field extension workers and their facilities are not sufficient to cover the whole Lower-Moshi area. These factors make contact with farmers difficult and severely limit the impact of the extension workers.

With regard to financial assistance to the farmers, two types of public credit are underpropagation in the Lower-Moshi area. One of the credits is under a program by the Tanzanian Cotton Authority. This credit is applied only for cotton growers. Through this credit, fertilizers and chemicals are sold at a subsidized prices. Conditions of credit are set with one year grace period and at an interest rate of 8% per year.

The other credit is issued by the Rural Development Bank under the rural development programme and the national maize campaign. This credit system was established by the Government in 1964, although it has been only established for two years in the Kilimanjaro Region. In the Lower-Moshi area, the credit is only arranged for the farmers who grow high yielding varieties of maize under the traditional irrigation. In this credit, maize seeds, fertilizers and chemicals are supplied at the specific rate of 10 kg/ac for seed, 50 kg/ac for ammonium sulphate, 50 kg/ac for triple-super-phosphate, and some for insecticides. In the opening year of 1978, about Shs.1,029,400 in total was issued and in the second year of 1979 Shs.2,368,200 in the whole Moshi district. (see Table VI-24)
In the third year, the credit to the farmers is now being arranged and as of March, 1980, the amounts had increased sharply. As far as the Lower-Moshi area is concerned, the borrowing of credit is still small, covering only a few percent of the total farmers at present.

4.3 Agricultural Production and Marketing

4.3.1 Crop production

As stated in the Annex V, various kinds of crops have been introduced in the Lower-Moshi area, although the unit yield is low because of unfavorable soil moisture conditions due to lack of irrigation water. The gross production of major crops are estimated at about 15,700 tons of maize, 260 tons of seed cotton, 650 tons of common beans, 900 tons of paddy rice, 1,000 tons of vegetables (converted to an onion base), 300 tons of other cereals, and 60 tons of oil-seeds. In addition, such minor crops as sweet potatoes, cassava, etc. are also produced in small amounts mainly for home consumption.

According to the statistical data provided by the regional agencies of the National Milling Board (i.e. NMC, TCA, GAPEX, etc.), crop production surplus in the Lower-Moshi area is limited to only maize, cotton, oil-seeds and vegetables. The amount of this production purchased by the National Milling Board is about 7,800 tons of maize, 230 tons of seed cotton, 60 ton of oil-seeds. Also, about 600 tons of vegetables (such as cabbage, tomatoes, onions, etc.) are sold directly to the local market. The balance is used for home consumption, seeds for next cropping and a small part for the local market. The present annual crop production and marketable surplus are summarized in Table VI-25.

4.3.2 Livestock production

As presented in Annex V, stock grazing is another important cash source. At present, there are total about 25,690 cattle (mainly Zebu in nature), 9,750 sheep and 26,820 goats in the Lower-Moshi area. They mainly graze on wild grasses and partially on by-products from crop production. In general, therefore, productivity of these livestock is low, at 0.2 to 0.25% per annum for fatting and slaughter, and for milking at 200 liters/year for cattle and 17 liters/year for sheep and goats. The annual production of these livestocks are estimated as shown in Table VI-26.

Poultry in the Lower-Moshi area is, at present, very small part of farm economy and its production is at a low subsistence level.

4.3.3 Market system and prices of agricultural commodities

As presented in section 2.3, almost all of the agricultural commodities are traded through a single marketing channel. Under the principal focus of the national system, production is purchased by the National Milling Board (or other Parastatals) and farm inputs are supplied by the Rural Development Bank.

The farm inputs, such as seeds, fertilizers and agro-chemicals are supplied to the farmers through the farmers' credit programme. At present, in the Lower-Moshi area, introduction of the credit is still very small in most cases. Credit is only applied for cultivation

of the high yielding varieties of maize and cotton. Most of the farmers grow various crops without application of fertilizers and agro-chemicals. The prices of the farm inputs, which are subsidized to a large degree, are summarized as shown in Table VI-27.

Marketable surplus of the crop production except banana and vegetables is directly purchased by the regional agencies of the National Milling Board (Parastatals), namely maize by NMC, seed cotton by TCA, oil-seeds by GAPEX, etc. The regional agencies have set several buying posts in the Lower-Moshi area and each buying post has a godown facility with a capacity of about 100 to 300 tons. In addition, the agencies have main store-buildings and milling plants in Moshi. Transportation of production from buying post to store in Moshi and from Moshi to outside is managed by the agencies themselves using their own transportation facilities, such as trucks and railway wagons. The prices of crop production at the buying posts (or farm gates) set by the National Milling Board Committee for the crop season of 1979/80 are as shown in Table VI-28. The location of buying posts and capacity of godown at each location are summarized in Table VI-30.

Banana and vegetables are generally sold directly to the local market or to the central market in Moshi town by the farmers themselves. The prices of these productions are set under the free market system (see Table VI-29).

In the case of the marketing of livestock production, it is also priced under the free market system. Generally, farmers sell live animals to slaughter houses, which are managed by village and/or Moshi township, and thereafter, meat is sold directly to the consumer. Slaughter of livestock in case of Moshi town is controlled by the economy and trading section in the Moshi Town Council and by the village committee in case of the local market. Small surpluses of milk and eggs are sold individually. The price of livestock production fluctuates widely, season by season. Average prices in 1979/'80 are summarized in Table VI-31.

4.4 Present Condition of Farm Economy

The study on the present farm economy in terms of production return of each crop and livestock is made based on the data and information obtained by the farm economic survey and agricultural investigation in and around the Lower-Moshi area.

Based on the agronomic and farm economic data, the present condition of the financial balance of agricultural production is estimated as shown in Tables VI-32 and VI-33. The following is the summary of financial budget for the major products.

Financial Budget for Major Products

(Unit: Shs per ha.)

Major Products	Gross Return	Production Cost	Net Return
Crop Production:			
Maize			
- Irrigated	1,750	808	942
- Rainfed	920	598	322
Paddy rice	2,100	1,049	1,051
Pulses	1,347	534	813
Cotton	1,028	794	234
Vegetables	25,000	11,250	13,750
Other crops	460	390	70

Based on the financial balance of each crop and the total cultivated area in the whole Lower-Moshi area, gross production return and net production return are estimated at Shs 25,764,000 and Shs 12,164,000, respectively (see Table VI-34). These values correspond to about Shs 2,500 gross return and Shs 1,260 net return per farm household on average.

Livestock is another important product for cash earning in the Lower-Moshi area. The annual return of livestock production is estimated at Shs 10,131,600 in gross and Shs 5,312,600 in net return (see Table VI-35). These values correspond to about Shs 1,280 gross and Shs 670 net return per farm household on average.

Annual total net return obtained from both crop and livestock production is, then, estimated at Shs 17,476,600 for the whole Lower-Moshi area, and the net annual income level of farm households is at Shs 1,930. The annual net income per capita is at about Shs 380 (equivalent to about US$47).

4.5 Flood Damages Caused by Seasonal Flooding

4.5.1 Damaged area

Up to now, no systematic investigation and evaluation of the flood damages were made in the Lower-Moshi area, although attention should be paid to the fact that seasonal flooding is one of the biggest constraints on the present agricultural situation particularly in the lowlying area along the Rau and Mue rivers.

According to local opinions collected by the field interviews with the village officials and farmers, the unit yield of each crop sharply decreased to 50 to 80% of that in normal years after being inundated over a certain period of time. In addition, a torrents sometimes carry off a certain degree of arability of the agricultural land by gully and sheet erosion, and also spoil standing crops by strong out-washings.

According to the results of field investigation and thorough interpretation of the aerial photograph (1:25,000) and the detailed topographic map (1:5,000), it is estimated that the land being affected by the seasonal flooding, every year, is about 7,800 ha in total. Out of the total extent, about 1,100 ha of the land will be, more or less, submerged for 3 to 5 consective days at flood time, while about 2,900 ha will be deeply inundated for more than 120 consective days during the flood season from late March to July. The remaining 3,800 ha of the land, which mainly lies on the lower sloped area at the outskirts of the flood plain, will, more or less, be washed out by a rapid sheet flash flows from the seasonal flooding rivers.

The area affected by the 1979 flood is estimated to be 12,000 ha in total, of which some 8,200 ha of the land is deeply submerged for more than one month and some 3,800 ha of the land is seriously eroded out by the torrential flash floods from the seasonal flooding rivers. The flooded area estimated above is shown in Tables VI-36 and VI-37.

4.5.2 Evaluation of the flood damages

In the Lower-Moshi area, there are two types of flood damages. One is mainly caused by water standing or inundation for a certain long period of time; this is seen in the lowlying area extending along the Rau and Mue rivers. Damages attributed to this case are considered to be (1) production decrease, (2) interruption of the most suitable crop season and (3) decrease in the farmers' motivation. No damage to property except some part of the existing irrigation canal is reported, at present. The second type of flood damage is caused by flushing out by rapid sheet flows from the seasonally flooding rivers.

Based on the data and information obtained by field interview, the degree of the production decrease is broadly specified by applying the duration and depth of water standing as follows:

a) Almost no-damage; water stagnation less than 10 cm deep, and less than 3 consective days,

b) 20% to 30% production decrease; water stagnation ranging between 10 and 30 cm deep, and less than 5 consective days (no damage in case of paddy),

c) 50% production decrease; water stagnation ranging between 30 and 50 cm deep, and less than 5 consective days (20 to 30% decrease in case of paddy),

d) Completely damage to production; water stagnation ranging more than 50 cm deep, and more than 10 consective days (more than 50% decrease in case of paddy).

Interrupting the most suitable cropping season due to flooding is also one of the factors of production decrease. In the deep flooding area,farmers generally abandon the rainy season cropping and barely cultivate maize in the dry season after recession of a flood. In this case, normal production cannot be anticipated mainly because of shortage soil moisture due to lack of irrigation water in the dry season. The production rate decrease is estimated at about 50 to 80% of that in normal years. This high rate arises from both a decrease in the unit yield and in the cropping area.

Generally, low farmer motivation caused by seasonal flooding is measured as an intangible damage. In the Lower-Moshi area particularly in the Kisangesangeni area, large acreages of land still lie in waste without agricultural utilization, though the land has favorable soil conditions. This situation might be a tangible measurement of low farmer motivation caused by floodings.

Damage caused by rapid sheet flooding are directly measured by acreages where the crops are washed out. It is considered that the present low land arability or productivity is also attributable to this fooding.

According to the actual situation presented above, rating of the present flood damages is summarized in Tables VI-38 and VI-39, and damages of crop production and damaged gross values are estimated in Table VI-40. As seen in the Table VI-40, the damages caused by the common or regular flood would be Shs 4.8 million, equivalent to about 18 tons of paddy production and about 4,750 tons of maize production. In the case of the 1979 flood, the damages are estimated at about Shs 10.5 million, equivalent to about 260 tons of paddy and some 10,200 tons of maize production. From both figures, annual flood damages are estimated to be Shs 4.8 million. The annual flood damages correspond to about 20% of the gross return of the present crop cultivation in a normal year.

5. Forecast Development of Farm Economy with the Project

5.1 Forecast Increase of Population

Based on the past trend of population increase, the annual growth rate of the whole Kilimanjaro Region is estimated at 2.5% during the years from 1967 to 1979. Annual growth rate in each District is slightly higher than that of the whole Region, ranging between 2.6 and 2.8% at the same duration. However, in case of the rural area of Moshi, it is estimated at only 1.2%. By contrast, the population of Moshi township sharply increased with annual growth rate of 8.8% as seen in Table VI-5. In view of these figures it is considered that the majority of the adult population in the rural area of Moshi has been recently resettled to the Moshi township under the programme on the urban development.

In the Lower-Moshi area, the present settled population is about 39,800. The population estimated of more than 47,000 relates directly to the agricultural activities including the seasonal migrant farmers. Their population growth was 2.7% annually in the past and the present family size is 5.04 persons per household.

Based on the annual growth rates stated above, and also with reference to the natural population increase rate forecast for the years from 1981 to 2000 by IBRD, a population forecast is estimated for 1985, 1990, 1995 and 2000 in year stages, as shown in Table VI-41. As a result, the population to be engaged in agriculture in the whole Lower-Moshi area is about 116,000 (or 1.3 times the present population) in 1990, and about 147,200 (or 1.7 times the present population) in 2000. Out of the total population estimated, settled population in the Lower-Moshi area is about 53,100 in 1990 and 67,350 in 2000.

Forecast increase of farm households is estimated based on the present population of the teenage group. As stated in the preceding Section 4.1, the population of teenage group in the Lower-Moshi area includes about 1,760 males and 1,820 females. They will attain marrigeable age from now until 1990. Thus, above 1,800 new families will be added to the present farm households.

Based on the forecast increase of population and total households made in the above, it is estimated that average family size in 1990 will be about 5.65 persons per household, of which some 3 persons will be able to work.

As for estimate of the market growth, particularly for vegetables, the forecast growth of population is studied for Moshi township. In this context, the Expansion Plan of Moshi Township, which was established in 1976 and accepted by the Government, is directly and fully referred to. According to this reference, the forecast population in Moshi town will sharply increase to about 140,500 in 1990 mainly from settlement under the industrial development programme.

5.2 Forecast Change of the Land Holding Size

As presented in the Annex III and V, arable land in the Lower-Moshi area is quite limited to only about 1,800 ha in Kisangesangeni, Kiterení and Ghona villages due mainly to unfavorable soil and serious flood constraints. Thus, a sharp expansion of agricultural land cannot be expected in the future.

In consideration of the above, and also taking into account the forecast growth of population, it is anticipated that the present size of land holding will decrease year by year and will shrink to 1.0 ha per farm household on average by 1990.

5.3 Market and Price Forecast

5.3.1 Home consumption

Food consumption and its nutritive conditions per capita is studied to determine the actual requirement of food crops, and then, to estimate the marketable surplus in the future.

According to the field data obtained by the interview with 120 farm families, main crops in the Lower-Moshi area such as maize, and pulses are the main source of starch and protein, regularly supplemented by banabas, which are mainly from the plantation in the Highland area, and/or seasonally supplemented by the tuber crops as cassava and sweet potatoes, at present. Consumption of animal products is limited only to meat and milk. Consumption of eggs is still very small. Rice is only eaten at ceremonies in general. As seen in the Table VI-42, the present nutritive condition per capita is almost par with the standard in the developed countries, as far as the calorie level is concerned. Practically, however, it is rather overdone in starches but particularly short in oils and fat.

In the future, the contents of food consumption will gradually improve with the raising of the living standard attributable to the project. Particularly in the proposed irrigation scheme area, consumption of rice will become large, increasingly, with partial modification of the consumption of maize and pulses. Based on the nutritional balance made on the starch, vegetable oil and protein, and also taking into consideration the familiarity with local peoples for food crops, the requirement of food grains per capita per year is preliminarily estimated to be 80 to 85 kg for maize, 20 to 25 kg for pulses and 30 to 35 kg for rice. Oil-seeds will be consumed at about 20 kg per capita per year for supplementation of the present fat intake other than the fat taken from the animal products at present level.

5.3.2 Market prospect

Up to the present in Tanzania, the productive conditions of staple foods such as maize, wheat, sorghum, millet and beans, are still far from the reaching the target yield which has been anticipated in the Third Five Year Development Plan, although the total productions are gradually increasing mainly by expansion of the cropping area. In addition, production of oil-seeds is rather top-heavy due mainly to the attention paid to self-sufficiency in food crops (refer to Table VI-3). As a result, a large amount of capital is being spent for supplementation of food crops by foreign products as shown in Table VI-43.

According to statistical data projected by FAO, the importation of maize amounted to 230,000 to 250,000 tons until 1975, while sharply declining to 25,000 - 50,000 tons in recent years. In contrast, import of rice increased sharply from about 3,000 tons until 1975 to 25,000 - 50,000 tons in the last 3 years. In addition, cereals such as wheat, sorghum, millet, etc. are imported at about 100,000 to 170,000 tons which also sharply increased from that in the years before 1975, as shown in Table VI-44.

As far as the external trade of oil seeds is concerned, almost all of the raw production is exported to the European countries and some balance of processed oil is imported, though its amount is far short of meeting the domestic demand.

In the Kilimanjaro Region, production of food grains excluding fingermillet has been recently gone beyond the rural self-sufficiency needs, although partial shortage is found in Rombo, Mwanga and Same Districts. On the other hand, importation of rice amounted to a high 4,000 tons. In the future, it is considered that the demand for rice will increase particularly with the population increase in Moshi township being expanded by urban development. The vegetable oil production in the region is, at present, very small at only 60 tons of raw seeds per year, although crop environments are very favorable excluding the shortage of soil moisture due to lack of irrigation water. Therefore, the rural demand of vegetable oil is mostly supplemented by the importation.

In the future when the proposed irrigation development is completed, considerable amounts of crop production will be incremented in the Lower-Moshi area, say 18,200 tons of paddy rice, 1,700 tons of oil-seeds, 300 tons of seed cotton, and 650 tons of fresh vegetable and so on (see Table V-21). These crop production will cover the present shortage of rural demand and a certain amount of marketable surplus will contribute to not only the rural economy but also to the regional economy. Practically, however, very little contribution is anticipated to the national market and/or economy owing to small development due to limited availability of irrigation water in the area.