5.3.3 Price prospect

In consideration of the above and also the present progress of agricultural development being pursued under the Third Five Year Plan, it is anticipated that the national demand of food will surpass the domestic supply, and continuous supplementation will be needed to a certain extent by the importation of foreign products for the time being.

Based on the production/marketing situation foreseen in the above, economic forecast costs and prices of agricultural commodities were studied. In this context, the following conditions are also taken into consideration:

(1) Major crops, such as maize, paddy, oil-seeds, etc. will be imported supplementally, and hence, the prices of these crops are estimated on the basis of import substitution.

(2) Cotton and banana production will have a marketable surplus. Thus their prices are estimated on export substitution bases.

(3) Prices of vegetables are estimated directly from the current prices taking into account the price escalation forecast in the short range for 1990.

(4) Because of the limited assembling and manufacturing in Tanzania, the prices of farm inputs except the improved seeds and miscellaneous consumables are estimated on import substitution bases.

(5) The other costs related to the crop production are also estimated by applying the price escalation in the short range to the current prices.

In setting the prospective costs and prices on the agricultural commodities, shadow price factor (SPF) is also studied to assess economic variability of the proposed agricultural development realistically. In addition, conversion between international market prices and farm gate prices is made, making full reference to "The Price Prospects for Primary Commodities" prepared by IBRD, January, 1980. As for the financial costs and prices, the present market prices are fully referred.

Based on the current external trade in Tanzania[/1], the shadow price factor is estimated at 1.09, as shown in Table VI-45. Then, the current exchange rate of US$1.0 equal to Shs 8.18 (as of the end of March, 1980) in terms of the financial price factor is converted to a rate at US$1.0 equal to Shs 9.16 in terms of the economic price factor. The Table VI-46 is the summary of the past, current and projected international market prices of major agricultural commodities presented in 1977 constant US$. The Table VI-47 sets forth the international market prices of major primary commodities converted to the 1980 constant US$.

/1 ; Annual Trade Report of Tanzania, 1980; Tanzania customs & Excise Department.

As for the local commodities, such as seeds, sacks, farming equipment, instrument, etc., costs/prices are estimated based on the current market price and forecast inflation factors. In Tanzania, price escalation caused by inflation varied from 8 to 12% in the past trend, although an abnormal rate of 50% or more was recorded in the black market due mainly to the economic constriction during the years from 1978 to 1979. It is considered that the inflation of the Tanzania economy will be directly influenced by the international situation, unless relieved by the Government efforts. Taking into account the above conditions, forecast costs/prices of the local commodities and also the labour wages are estimated as shown in Table VI-48, making reference to the inflation prospects ranging from 7.5% in the short term for 1985 and in the long term for 1990/1.

Based on the constitutional factors affecting cost/price prospects, the prices of major agricultural commodities at the farm gate are estimated as shown in Tables from VI-49 to VI-62. In this estimation, all the costs and prices are studied in terms of the economic and financial prices. The economic prices are the price for the economic evaluation of the Project in view of its place in the national economy, and hence, such transfer payment as taxes, duties, indirect over head cost related to the market price, etc. are excluded from the estimation. The financial prices are the price for appraising the financial viability of the Project, thus all of the price factors are taken into the estimation. At present, all of the prices concerning agriculture are subsidized to a certain extent, but this condition is herein precluded from the estimation.

5.4 Gross and Net Returns of the Crop Production in The Future Conditions

Based on the price prospects studied in the above, the gross return, production cost and net return per ha. of each crop is estimated in both economic and financial bases as shown in Tables from VI-64 to VI-70. In this estimation, a farm labour cost is estimated only on the seasonal workers. Besides, to evaluate the incremental profit attributable to the Project, productive conditions in the future with and without the Project are also forecast for each product.

On the basis of the foregoing estimates of the crop production in the whole Lower-Moshi area, total gross and net return for each crop are estimated in terms of the conditions with and without the Project, so as to evaluate the incremental profit attributable to the Project (see Tables VI-71 and VI-73). The gross production values shown by the economic price are estimated at Shs 189.7 million (eqv. US$ 21.3 million) per annum in the whole Lower-Moshi area with the Project in contrast to Shs 94.0 million (eqv. US$10.5 million) per annum without the Project; hence, Shs 95.9 million (eqv. US$10.8 million) is obtained as the incremental gross value attributed to the Project.

/1 ; Inflation prospects studied by IBRD, January, 1980 (see Table VI-63).

Deducting the annual total production cost from the gross value, the net production values or primary profit are calculated at Shs 137.0 million (eqv. US$15.3 million) and Shs 66.9 million (eqv. US$7.5 million) respectively with and without the project. Thus, the annual incremental net value attributable to the Project is Shs 70.1 million (eqv. US$7.8 million). The primary income level per farm household is estimated at Shs 11,800 on average with the Project.

Annual Gross Production Values, Net Production Values and Incremental Net Values
(Values in economic prices)

(Unit: Shs)

Descriptions	Production Condition		Increment
	Without Project	With Project	
Gross Production Values	94,065,000	189,945,000	95,880,000
Total Production Cost	27,150,000	52,900,000	25,750,000
Net Production Value	66,915,000	137,045,000	70,130,000

The gross production value estimated in terms of the financial price is at Shs 65.4 million (eqv. US$8.0 million) per annum in the whole Lower-Moshi area with the Project and the net production value is at Shs 34.5 million (eqv. US$4.2 million). The primary income level per farm household is estimated at Shs 3,320 (eqv. US$406) on average. This value is 2.6 times growth from the present condition.

As far as the farm economy in the irrigation schemes is concerned, the primary income per farm household is at Shs 4,275 (eqv. US$523) in case of a typical paddy grower and almost same at Shs 4,320 (eqv. US$528) in case of a typical oil-seeds grower. The detailed estimation in each scheme is as shown in Tables from VI-74 to VI-76.

Table VI-1 GROSS DOMESTIC PRODUCT OF TANZANIA (at 1966 price)

	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	Ave.
Population (10^3)	12,578	12,900	13,236	13,585	13,951	14,333	14,733	15,388	15,872	16,371	
Growth rate (%)	2.5	2.6	2.6	2.6	2.7	2.7	2.8	4.4	3.1	3.1	2.9
GDP (Shs. million)	7,128	7,259	7,680	8,001	8,539	8,001	9,020	9,553	9,995	10,587	
Growth rate (%)	5.2	1.8	1.7	4.2	6.7	-6.3	12.7	5.9	4.6	5.9	4.2
GDP/Capita (Shs.)	567	563	580	589	612	558	612	621	630	647	
Growth rate (%)	2.7	-0.7	3.0	1.6	3.9	-8.8	9.7	1.5	1.5	2.7	1.7

Source: FAO Production yearbook 1976-1978.
The economic survey 1977-1978 Table 3.

Table VI-1

Table VI-2

GROSS DOMESTIC PRODUCT AT FACTORY COST BY INDUSTRIAL ORIGIN

(At 1966 Prices)

(Percentages)

Industry	1968	1969	1970	1971	1972	1973	1974	1975	1976*	1977*
1. Agriculture, hunting, Forestry and fishing	43.2	42.6	41.7	39.6	40.1	39.3	36.7	37.7	38.7	38.6
2. Mining and Quarrying	1.9	1.3	1.9	1.9	1.4	1.0	1.0	0.8	0.8	0.8
3. Manufacturing and Handicrafts	8.6	9.3	9.8	10.0	10.0	10.1	10.0	9.4	9.6	9.6
4. Electricity and water Supply	1.0	1.1	1.2	1.2	1.2	1.3	1.4	1.5	1.4	1.4
5. Construction	4.3	4.0	4.3	4.7	4.7	4.7	4.6	4.1	3.7	3.5
6. Wholesale and Retail Trade, Restaurants, Hotels	12.8	12.6	12.8	12.1	11.6	11.8	11.8	11.2	10.9	10.8
7. Transport, Storage and Communications	8.7	8.9	9.5	10.2	10.2	10.3	10.6	10.4	10.3	10.2
8. Finance, Insurance, real estate and business services	9.9	10.0	9.7	9.8	10.6	10.2	10.3	9.8	9.6	9.5
9. Public Administration and other services	10.7	10.5	11.6	11.9	12.5	13.1	15.1	16.6	16.3	17.0
10. Less imputed bank service charges	1.2	1.3	1.4	1.4	1.5	1.5	0.8	1.5	1.3	1.4
11. GDP at factory cost	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: The economic survey 1977-1978 Table 4.

Table VI-3

FOOD CROP PRODUCTION (Unit: 10^3 tons)

	1971	1972	1973	1974	1975	1976	1977	1978
Maize	715	863	603	566	825	897	968	1,000 F
Paddy	193	171	204	154	150	172	194	202 F
Sorghum	149	191	248	128	280	260	240 F	250 F
Millet	130	128	171	63	160	130	150 F	160 F
Wheat	84	98	78	39	46	58	71 F	65 F
Sugarcane	1,134	1,150	1,295	1,311	1,276	1,213	1,297 F	1,361 F
Cassava	3,150	3,250	3,350	3,500	3,800	3,900	4,000 F	4,076 F

Source: FAO Production Yearbook 1973 - 1978

Note : F = FAO Estimates

Table VI-3

Table VI-4

ANNUAL PRECIPITATION AND LAND UTILIZATION KILIMANJARO

Annual precipitation	Area (thousands of ha)	%	Area	Land use for agriculture	Vulnerability to drought	Remarks
Over 1,000 mm	123.6	9	Southern & eastern slopes of Mt. Kilimanjaro (97.54 ha)	Coffee, bananas	Little	
			North & south Pare mountain areas (26.14 ha)	Vegetables		
1,000 - 700 mm	257.8	19	Areas along main roads around Moshi	Maize, beans	Some	
			East & west sides of north & south Pare			
700 - 500 mm	498.0	38	Other areas	Maize, beans, wheat, sugar cane sisal	Great	Paddy and cotton are cultivated by means of irrigation.
Below 500 mm	446.6	34	South & west of Arusha--Dar es Salaam Railway	Cattle grazing	Maximum	
			Kibo Peak			
Total	1,326.0	100				

Source: Kilimanjaro Region Integrated Development Plan 1977, JICA.

Table VI-4

Table VI-5

TENDENCY OF POPULATION INCREASE KILIMANJARO REGION

Year	Hai	Moshi Rural	Moshi Town	Rombo	Mwauga/ Same	Total
1967	112,500	247,200	27,000	114,100	149,700	650,500
1979	156,700	285,100	74,000	154,600	208,100	878,500
No of Households (as of 1979)	29,200	56,700	15,300	26,900	37,100	165,200
No of Farm-house-holds (as of 1979)	27,800	53,800	4,200	26,100	36,400	148,300
Population increase rate (1967 - 1979)	2.8	1.2	8.8	2.6	2.8	2.5
Estimated population 2000	279,800	366,300	434,900	265,000	371,600	1,479,100

Source: Preliminary result of population census 1967;
Central Statistics Bureau Publication.
Regional Water Department Office, Kilimanjaro 1979.

Table VI-6

SUMMARY OF TRDB LOANS GIVEN ACCORDING TO SECTORS

T.Shs.'000

Type of Sector	1972-73			1973-74			1974-75			1975-76			1976-77		
	No.of Loans	Value of Loans	Per-cent-age	No.of Loans	Value of Loans	Per-cent-age	No.of Loans	Value of Loans	Per-cent-age	No.of Loans	Value of Loans	Per-cent-age	No.of Loans	Value of Loans	Per-cent-age
Agricultural Inputs	71	61962	57.6	140	85930	53.5	62	141800	69.8	71	38369	38.2	190	52000	68.4
Farm Machinery	6	2012	1.9	6	1319	0.8	16	4100	2.0	7	1031	1.0	1	293	0.4
Rural Transport	7	8590	8.0	17	30371	18.9	20	15700	7.7	5	1136	1.1	5	5241	6.8
Storage	2	1900	1.8	2	456	0.2	1	200	0.1	19	1429	1.4	23	668	0.9
Crop Development	5	24482	22.7	4	12795	8.0	1	100	0.1	-	-	-	1	500	0.7
Livestock	7	7760	7.2	16	25795	16.1	22	37600	18.5	27	57651	57.4	11	14720	19.0
Fisheries	3	862	0.8	4	1312	0.8	3	1100	0.5	-	-	-	4	574	0.7
Small-scale Industries	2	54	-	30	2717	1.7	51	2600	1.3	28	849	0.9	3	2404	3.1
Others	-	-	-	-	-	-	-	-	-	1	30	-	-	-	-
TOTAL	103	107622	100.0	219	160695	100.0	176	203200	100.0	158	100495	100.0	238	77300	100.0

Source: Country Review Paper of Tanzania. FAO Rome, 1978

Table VI-7 SUMMARY OF TRDB LOANS GIVEN ACCORDING TO TYPE OF BORROWER AND TERM OF LOAN T.Shs. '000

Type of Borrower	1972/73			1973/74			1974/75			1975/76			1976/77		
	No.of Loans	Value of Loans	Per-Cent-age.	No.of Loans	Value of Loans	Per-Cent-age	No.of Loan	Value of Loans.	Per. Cent-age	No.of loans	Value of Loans	Per-Cent-age.	No.of loans	Value of Loans	Per-Cent-age.
Cooperative Unions	29	32323	30.0	17	25498	15.9	13	11100	5.5	4	1005	1.0	-	-	-
Cooperative Societies	7	30284	28.1	56	34401	21.4	16	39100	19.2	46	21306	21.2	1	13100	16.9
Ujamaa Village Cooperative Societies	54	20423	19.0	113	32256	20.1	94	82400	40.5	79	19911	19.8	2.6	33300	43.1
District Dev. Corporations	5	4485	4.2	19	27043	16.8	32	13200	6.5	13	8643	8.6	6	4100	5.3
Parastatals/ Companies	5	7168	6.7	6	22497	14.0	11	35900	17.7	14	42330	42.1	12	19500	25.2
Associations	2	12929	12.0	3	18829	11.7	2	21300	10.5	2	7300	7.3	3	7300	9.5
Partners	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Individuals	1	10	-	5	171	0.1	8	200	0.1	-	-	-	-	-	-
TOTAL	103	107622	100.0	219	160695	100.0	176	203200	100.0	158	100495	100.0	238	77300	100.0
Loan by type															
Short term	76	86444	-	144	96725	-	62	141900	-	71	38369	-	191	53430	-
Medium-term	18	11519	-	57	35719	-	90	23546	-	41	3046	-	15	8513	-
Long-term	9	9660	-	18	26251	-	24	37800	-	46	59081	-	32	15394	-
TOTAL	103	107623	-	219	160695	-	176	203246	-	158	100496	-	238	77337	-

Source: Country review paper of Tanzania FAO Rome 1978, Table IV and VI.

Table VI-8 TANZANIA RURAL DEVELOPMENT BANK
LOAN PORTFOLIO ACCORDING TO REGIONS
AS OF 30TH JUNE, 1977

REGION	PERCENTAGE OF TOTAL LOAN PORTFOLIO
IRINGA	22.96
*TABORA/RUKWA	10.37
MBEYA	13.13
ARUSHA	8.65
WEST LAKE	7.84
RUVUMA	7.44
TANGA	6.12
MWANZA	6.71
KILIMANJARO	5.33
*COAST/DAR ES SALAAM	4.90
MOROGORO	2.40
MARA	2.14
MIWARA	0.90
SINGIDA	0.70
DODOMA	0.10
SHINYANGA	0.10
	100.00

Note: *Tabora Region had Mpanda District taken away and together with Sumbawanga District formed the new region of Rukwa in 1973.

Source: Country review paper of Tanzania FAO Rome 1978, Table VII.

Table VI-9(A) FARM OUTPUT-INPUT OF TYPICAL KIHAMBA-SHAMBA IN THE FARMING PATTERN

Crop Income

	Ha	Yield/ha (t)	Production (t)	Price/ton (Shs)	Amount (Shs)
Coffee	0.55	0.34	0.19	10,000	1,870
Banana	0.54	9.20	4.97	300	1,490
Maize	0.12	1.76	0.21	1,000	200
Beans	0.21	0.89	0.19	2,000	380
Begetables	0.08	5.13	0.41	2,000	820
Total	1.50				4,770
					say Shs 4,570

Crop Production Costs

Seeds	Ha	Rate/ha	Q'ty	Unit Price Shs	Amount Shs
Coffee	0.55	300 hos	165.00	1.50	248
Banana	0.54	-		-	
Maize	0.12	30 kg	3.60	1.00	4
Beans	0.21	50 kg	10.50	2.75	29
Vegetables	0.08	1.5 kg	0.12	280.00	34
Sub-total					315
Agro-chemicals					
Coffee	0.55	6 ℓt	3.30	18.00	59
Maize	0.12	2 ℓt	0.24	18.00	4
Vegetable	0.08	4 ℓt	0.32	18.00	6
Sub-total					69
Hired Labour					
Coffee	0.55	(3M/day x 30 days)		8.85	438
Sub-total					438
Total					822
					≐ Shs. 820

Con't Table VI-9(A)

Livestock Income

Meat	Head per household	Production efficiency	Shipping per year	Unit price (Shs)	Amount (Shs)
Cattle	3.2	0.2	0.64	1,200	768
Goats	3.4	0.25	0.85	150	128
Sheep	1.2	0.25	0.30	150	45
Sub total					941
Milk					
Cattle	3.2	(0.15 x 200)	96 /t	2.7	259
Goats	3.4	(0.35 x 17)	20 /t	2.7	54
Sheep	1.2	(0.35 x 17)	7 /t	2.7	19
Sub total					332
Total					1,273
				Say	1,270

Production Costs

Hired Labour (1.5 hour/day x 365 ÷ 8)	8.85	607
	Say ÷	610

Table VI-9(B) FARM OUTPUT-INPUT OF COTTON-MAIZE TYPE IN THE FARMING PATTERN

1. Crop Income

	Ha	Yield/ha (t)	Production (t)	Price/ton (Shs)	Amount (Shs)
Cotton	0.08	0.40	0.03	3,000	90
Banana	0.06	9.20	0.55	300	165
W. Maize [1]	0.70	1.76	1.23	1,000	1,230
D. Maize [2]	0.70	0.92	0.64	1,000.	640
W. Beans	0.11	0.89	0.10	2,000	200
Finger Millet	0.11	0.46	0.05	2,000	100
Vegetables	0.05	5.13	0.26	2,000	520
Total					2,945
					± Shs 2,950

2. Crop Production Costs

Seeds	Ha	Rate/ha	Q'ty	Price/kg (Shs)	Amount (Shs)
Cotton	0.08	-	-	-	-
Banana	0.06	-	-	-	-
W. Maize	0.70	30 kg	21.0	1.0	21
D. Maize	0.70	30 kg	21.0	1.0	21
W. Bean	0.11	50 kg	5.5	2.0	11
D. Millet	0.11	15 kg	1.7	2.0	3
Vegetables	0.05	1.5 kg	0.08	280.0	22
Sub-total					78
Agro-chemicals					
Cotton	0.08	4 ℓt	0.32	18.0	6
W. Maize	0.07	2 ℓt	1.40	18.0	25
Vegetables	0.05	4 ℓt	0.20	18.0	4
Sub-total					35
Hired Labour					
W. Maize	0.70	(4 M/day x 25 days)		8.85	620
W. Maize	0.70	(2 M/day x 25 days)		8.85	310
Sub-total					930
Total					1,043
					± Shs 1,040

Con't Table VI-9(B)

1. Livestock Income

Meat	Head per household	Production efficiency	Shipping per year	Unit price (Shs)	Amount (Shs)
Cattle	2.2	0.2	0.44	1,200	528
Goats	8.7	0.25	2.18	150	327
Sheep	0.7	0.25	0.18	150	27
Sub total					882
Milk					
Cattle	2.2	(0.15 x 200)	66 ℓt	2.7	178
Goats	8.7	(0.35 x 17)	62 ℓt	2.7	140
Sheep	0.7	(0.35 x 17)	4 ℓt	2.7	11
Sub total					329
Total					÷ Shs 1,210

2. Livestock Production Costs

Hired Labour (1 hour/day x 365 ÷ 8)	8.85	404
	÷ Shs	400

Table VI-10 PRODUCTION OF COFFEE IN KILIMANJARO REGION

District	Ha	1976/1977		1977/1978		1978/1979	
		ton	Shs 10^3	ton	Shs 10^3	ton	Shs 10^3
MOSHI	26,098	7,176	108,028	11,716	116,730	4,423	38,329
HAI	17,658	7,310	103,666	4,495	44,815	5,177	44,865
ROMBO	9,814	2,788	40,236	4,528	45,224	3,668	31,893
PARE	4,559	1,328	19,034	1,133	11,209	862	7,501
Total	58,129	18,602	270,964	21,872	217,978	14,130	122,588

Source: Coffee Authority of Tanzania, Northern Zone. Zonal Office Moshi, 1980

Table VI-11 PRODUCTION OF COTTON IN KILIMANJARO REGION

District	Ha	1976/1977		1977/1978		1978/1979	
		AR (t)	BR (t)	AR (t)	BR (t)	AR (t)	BR (t)
MOSHI	1,500	143	169	179	49	167	64
HAI	500	42	23	21	10	13	5
ROMBO	100	some	some	-	1	some	some
Total	2,100	185	192	200	60	180	69

Source: Tanzania Cotton Authority, Northern Zone. Zonal Office Moshi 1980

Table VI-10
Table VI-11

Table VI-12

PRODUCTION OF SISAL IN KILIMANJARO REGION

	1977		1978		1979	
MOSHI/HAI District	ton	Shs 10^3	ton	Shs 10^3	ton	Shs 10^3
LAMBO	311	673	454	1,056	375	956
HIMO/KIFARU	460	995	287	667	75	191
Sub-Total	771	1,668	741	1,722	450	1,147
SAME District						
KISAWANI/MWEMBE	171	370	63	146	-	-
KISANGARA	831	1,798	670	1,558	651	1,659
HASANI	382	826	427	993	366	933
NDNNGU	417	902	347	807	248	632
Sub-Total	1,801	3,896	1,507	3,504	1,265	3,224
Grand Total	2,572	5,564	2,248	5,226	1,715	4,371

Source: Tanzania Sisal Authority Northern Branch, Tanga, 1980

Table VI-12

Table VI-13 OIL-SEEDS PRODUCTION IN KILIMANJARO REGION

(Unit: kg)

LOCATION	PRODUCTION YEAR 1977/'78 Sun-flower	Caster bean	Simsim seeds	1978/'79 Sun-flower	Caster bean	Simsim seeds	1979/'80 Sun-flower	Caster bean	Simsim seeds
MOSHI DISTRICT									
Kilema Growers	16,986	63	-	-	-	-	-	-	-
Uchira Ujama	29,744	-	-	59,011	226	-	23,059	133	132
Kilema Rofo	33,138	387	136	41,500	1,239	-	13,713	119	-
Makuyuni Ujama	25,045	244	14	40,227	453	-	26,364	741	56
N. M. C.	4,615	6,879	-	-	-	-	-	-	-
Kiboroni	1,178	-	-	732	195	-	109	63	-
Shia Ujama	299		-	-	-	-	-	-	-
Ndagara	47		-	-	-	-	-	-	-
Kirua Vunjo	-	550	-	-	-	-	-	-	-
Chekereni Ujama	-	196	-	-	-	-	54	888	12
Kaloreni	168	-	-	-	-	-	-	-	-
Sango	-	-	-	426	34	-	11	-	-
Oria Kahe	-	-	-	-	47	-	-	-	-
Mutakuja	-	-	-	6	1,842	-	-	-	90
Mabogini	-	-	-	-	-	-	93	189	-
Sub-total	111,220	8,319	150	141,902	4,034	-	63,403	2,133	290
HAI DISTRICT									
Mbatakero	143	99	-	-	-	-	-	30	59
Oldonyoro	373	469	-	-	-	-	-	-	-
Mungushi	10,908	-	-	8,300	-	-	-	-	-
Shiri Njoro	58	131	-	-	-	-	156	-	-
Kawaya	-	495	-	-	264	-	-	118	-
Karansi Ujama	-	489	-	-	-	-	-	145	-
Naibili Ujama	-	693	-	-	535	-	-	225	-
Bomangi Ombe	-	-	-	154	-	-	-	-	-
Maelawate	-	-	-	192	-	-	-	-	-
Koboko	-	-	-	-	-	-	-	-	-
Saya Juu	-	-	-	675	-	-	-	-	-
Rundugai	-	-	-	-	-	-	-	-	-
Longoi	-	-	-	469	32	-	-	-	-
Kimashuku	-	-	-	241	-	-	-	-	-
Kikau	-	-	-	297	-	-	-	-	-
Kikau Chini	-	-	-	182	-	-	-	11	-
Kika	-	-	-	-	-	-	31	-	-
Sub-total	11,482	2,276	-	10,510	831	-	187	518	59
ROMBO DISTRICT									
Leto	-	-	-	-	-	-	-	62	-
Kilema Koot	-	-	-	-	-	-	69	-	-
Sub-total	-	-	-	-	-	-	69	62	-
TOTAL	122,702	10,594	150	152,412	4,865	-	63,659	2,713	349

Data source: Statistical data provided by the General Agricultural Production and Export (GAPEX).

Table VI-14

NUMBER OF SLAUGHTERED LIVESTOCK IN MOSHI URBAN AREA

(Unit: Head)

	1977					1978					1979				
	Cattle	Goat	Cattle	Goat	Sheep	Cattle	Goat	Cattle	Goat	Sheep	Cattle	Goat	Cattle	Coat	Sheep
	Midtown		Suburbs			Midtown		Suburbs			Midtown		Suburbs		
1.	478	761	100	2	200	313	411	144	68	44	473	496	167	102	14
2.	479	798	62	11	10	350	446	92	8	61	456	435	135	239	35
3.	587	1,164	18	39		385	506	145	79	99	547	540	171	282	22
4.	622	926	43	19		450	498	187	133	122	520	487	179	218	35
5.	652	1,122	100	90		528	810	213	352	103	592	665	210	279	63
6.	618	999	138	91		506	714	192	351	129	732	880	176	190	31
7.	646	965	137	138		543	698	161	285	47	668	710	179	203	24
8.	654	893	136	129		544	580	172	218	62	760	732	228	246	52
9.	610	623	249	246		512	535	148	91	68	684	688	212	268	34
10.	616	592	270	214		504	567	152	91	48	700	731	198	257	35
11.	412	452	148	64		464	491	142	101	52	676	676	205	205	44
12.	338	439	134	55		469	512	122	94	22	746	693	203	144	16
Total	6,712	9,734	1,535	1,098	-	5,568	6,768	1,870	1,871	857	7,554	7,733	2,263	2,633	405
Ave/Month	559	811	128	92	-	464	564	156	156	71	630	644	189	219	34
Total/Month															
Cattle					687					620					819
Goats					903					720					863
Sheep					-					71					34

Source: Central Market, Moshi 1980.

Table VI-15 FERTILIZERS SUPPLIED BY TANZANIA FERTILIZER COMPANY, TANGA, 1978-1980

Unit: ton

	SA	CAN	UREA	25:5:5	20:10:10	TSP	SOP	POTASH
TRDB	1,500					850		
Coffee Authority	100				200			
TPC	-		2,300			-		1,800
NAFCO	400					100		
TFA	250				100	25		
Tanneries & Others	50							
1980 Total	2,300		2,300		300	975		1,800
TRDB	767					165		
Coffee Authority	313	265			895			
TPC	496		1,672				610	
NAFCO	84							
TFA	173			41	67			
Tanneries & others								
1979 Total	1,833	26[illegible]	1,672	41	962	165	610	
TRDB	100							
Coffee Authority	686		7		1,389	36		4
TPC	8		1,596			3		37
NAFCO								
TFA	25							
Tanneries & others	91		2					2
1978 Total	910		1,605		1,389	39		43

Source: Tanzania Fertilizer Company, Tanga 1980.

Table VI-15

Table VI-16 MAIZE INPUTS SUPPLIED BY TRDB, KILIMANJARO 1978/79, 1979/80

Unit: ton

District	SEEDS			CHEMICAL	FERTILIZERS		
	HYBRID	UCA	KATUMANI	THIONEX	DAP	TSP	S.A
Hai	77	5	4	22		84	188
Moshi	145	13	23	471		607	722
Rombo	56	1	-	17		164	184
1979/80 Total	287	19	27	510		855	1,094
Hai	21	5	2	8		105	26
Moshi	70	11	9	27		384	139
Rombo	43	65	-	13	2	168	164
1978/79 Total	134	81	11	48	2	657	329

Source: Tanzania Rural Development Bank, Moshi Branch, 1980

Table VI-16

Table VI-17 MAJOR AGRICULTURAL INPUTS SUPPLIED BY T.F.A., KILIMANJARO

Unit: kg

	1976/77	1977/78	1978/79
Fertilizers			
T P S compound	29,950	19,200	19,950
15 : 15 : 15 compound	200	21,550	1,750
20 : 10 : 10	203,600	45,950	58,000
Seeds			
Maize (Hybrid)	56,480	410,810	58,850
Katumani	-	90	3,370
Tomato	-	2	4
Cabbage		20	-

Source: Tanzania Farmers Association. Kilimanjaro, Moshi, 1980

Table VI-17

Table VI-18 ESTIMATED ANNUAL AVERAGE FOOD CROP PRODUCTION

KILIMANJARO REGION

Crop	Cultivated area (ha)	Yield/ha (t)	Production (t)
Maize	36,800	1.2	44,160
Millet	5,800	1.0	5,800
Wheat	8,700	1.4	12,180
Barley	600	3.1	1,860
Paddy	3,500	1.3	4,550
Red beans	4,500	0.8	3,600
Mixed beans	1,400	0.9	1,260
Cowpeas	500	0.7	350
Sweet potatoes	1,000	2.2	2,200
Irish potatoes	2,000	4.8	9,600
Cassava	300	8.0	2,400
Vegetable	1,700	4.5	7,650
Banana	35,400	9.2	325,680

Note: Elaborated by farm survey 1979.

Table VI-19 CROP BALANCE OF NATIONAL MILLING COOPORATIVE MOSHI BRANCH June 1977-May 1978

Unit: ton

	Stored 1976/77	Inflow: Purchased within Region	Inflow: Import from outside	Inflow: Total inflow	Outflow: Export for other region	Outflow: Sold within region	Outflow: Total outflow	Balance
Maize	7,097	23,174	3	23,177	11,438	9	11,447	18,827
Wheat	132	5,878	7	5,885	5,946	17	5,963	54
Cassava	-	4	-	4	-	3	3	1
Sorghum	1	111	-	111	-	11	11	101
Millet	50	-	-	-	-	1	1	49
Finger millet	10	12	3,384	3,396		3,048	3,048	358
Beans	155	3,448	-	3,448	1,819	284	2,103	1,500
Cow pea	1	296	-	296	32	2	34	262
Lentles	-	19	-	19	12	4	16	3
Peas	20	47	-	47	-	-	-	76
Butter bean	1	11	-	11	-	-	-	12
Dried peas								some
Soy beans	1							some
Paddy	80	762		762	788	2	790	52
Rice (Thai)	7	983	(3,191)	4,174	967	(3,122)	4,089	92
Rice USA	3		458	458		457	457	4
Rice USA	-		1,293	1,293	704	237	941	352

Source: National Milling Cooporative Moshi Branch, 1978.

Table VI-20 VILLAGES AREAS IN THE LOWER-MOSHI AREA

Administration Unit	Administrative Area (ha)	Lower-Moshi Area (ha)
Kilimajaro Region		
Moshi District		
East Hai Division		
Mabogini Ward		
- Mabogini village	2,580	2,580
- Chekereni village	1,730	1,730
- Matakuja village	500	500
- New land village	600	600
West Old Moshi Ward		
- Msaranga/ Mandaka village	4,040	2,780
West Vunjo Division		
West Kilema-Vunjo Ward		
- Yam Makka village	4,140	2,820
East Kilema-Vunjo Ward		
- Uchira village	4,160	2,390
Kahe Ward		
- Rau Ya Kati village	870	870
- Oria village	2,310	2,310
- Mangaria village	3,010	3,010
- Kitereni village	1,500	1,500
- Kisangesangeni village	1,700	1,700
- Ghona village	2,760	2,760
- Kiomu village	1,060	1,060
- Kochakindo village	1,790	1,790
Kilema South Ward		
- Kilema Pofo village	2,890	1,540
East Vunjo Division		
Makuyuni Ward		
- Himo village	860	860
- Lotima village	1,830	1,830
- Makuyuni village	2,150	2,150
Mwanga District		
Muunga Division		
Kileo Ward		
- Kileo village	7,140	7,140
Total 20 villages	47,620	41,920

Note: The statistical village area is not available in the Project area, and hence, the above figures in each village are estimated by the use of base map (1/50,000). Village boundaries are confirmed with each village office.

Table VI-21 TOTAL POPULATION AND POPULATION DENSITY IN LOWER-MOSHI AREA

Name of Village	Physical Area (km^2)	Total Population (person)	Population Density (person/km^2)
Mabogini	25.8	2,850	110.5
Chekereni	17.3	2,840	160.2
Mutakuja	5.0	860	172.0
New Land	6.0	1,120	186.7
(Sub-total)	(54.1)	(7,670)	(141.8)
Msaranga/Mandaka	40.0	3,930	97.3
Yam Makaa	41.4	2,330	56.3
Uchira	41.6	2,780	66.8
Kilema Pofo	28.9	3,710	128.4
Rau Ya Kati	8.7	1,500	172.4
Oria	23.1	4,300	186.1
Mangaria	30.1	1,020	33.9
Kitereni	15.0	1,920	128.0
Kisangesangeni	17.0	1,230	72.3
Ghona	27.6	1,410	51.1
Kiomu	10.6	2,420	228.3
Kochakindo	17.9	1,460	81.6
(Sub-total)	(151.0)	(15,260)	(101.1)
Himo	8.6	1,140	132.6
Lotima	18.3	1,830	100.0
Makuyuni	21.5	1,590	74.0
(Sub-total)	(48.4)	(4,560)	(94.2)
Kileo	71.4	3,690	51.7
Total Average	476.2	43,930	92.2

Data source: Village census (Demography as of October, 1979)
Figures are collected from each village office.

Physical area and Total population are collected whole over the village.

Table VI-22 POPULATION AND HOUSEHOLD AND AVERAGE FAMILY SIZE IN LOWER-MOSHI AREA

(as of October, 1979)

Name of Village	Adult		Children/1		Total Population	No. of Households	Average Family Size
	Male	Female	Male	Female			
Mabogini	670	450	930	800	2,850	600	4.75
Chekereni	390	610	840	1,000	2,840	500	5.68
Mutakuja	350	380	60	70	860	500	1.72
New Land	360	280	240	240	1,120	430	2.60
Msaranga/Mandaka	1,070	1,040	900	920	3,930	760	5.17
Yam Makaa	580	550	610	590	2,330	420	5.55
Uchira	540	680	760	800	2,780	630	6.62
Kilema Pofo	1,510	1,460	360	380	3,710	530	7.00
Rau Ya Kati	300	310	410	480	1,500	370	4.05
Oria	1,140	850	1,250	1,060	4,300	1,060	4.05
Mangaria	230	240	310	240	1,020	250	4.08
Kitereni	450	420	560	490	1,920	270	7.11
Kisangesangeni	340	480	140	270	1,230	380	3.24
Ghona	350	400	310	350	1,410	260	5.42
Kiomu	430	470	720	800	2,420	260	9.31
Kochakindo	310	220	510	420	1,460	250	5.84
Himo	360	270	230	280	1,140	200	5.70
Lotima	400	490	470	470	1,830	270	6.78
Makuyuni	360	350	440	440	1,590	340	4.68
Kileo	1,230	1,280	550	630	3,690	490	7.53
Total Average	11,370	11,230	10,600	10,730	43,930	8,710	5.04

Data source: Village census (Demography as of October, 1979)
Vigures are provided by each village office and District Ujamaa Village Corporative, Moshi.

All figures are rounded to nearest fens digit.

/1: Under 14 years old

Table VI-23 AVERAGE WORKING POPULATION PER FAMILY
(as of October, 1979)

Name of Village	Total No. of Households	Total Population	No. of Working Per. Male	Female	Total	Working Per/ Family
Mabogini	600	2,850	590	400	990	1.65
Chekereni	500	2,840	370	600	970	1.94
Mutakuja	500	860	300	340	640	1.28
New Land	430	1,120	340	270	610	1.42
Msaranga/Mandaka	760	3,930	980	960	1,940	2.55
Yam Makaa	420	2,330	510	490	1,000	2.38
Uchira	630	2,780	460	620	1,080	1.71
Kilema Pofo	530	3,710	1,480	1,440	2,920	5.51
Ray Ya Kati	370	1,500	260	290	550	1.49
Oria	1,060	4,300	1,050	780	1,830	1.73
Mangaria	250	1,020	200	220	420	1.68
Kitereni	270	1,920	430	410	840	3.11
Kisangesangeni	380	1,230	290	460	750	1.97
Ghona	260	1,410	320	380	700	2.69
Kiomu	260	2,420	410	460	870	3.35
Kochakindo	250	1,460	290	210	500	2.00
Himo	200	1,140	350	260	610	3.05
Lotima	270	1,830	360	450	810	3.00
Makuyuni	340	1,590	340	290	630	1.85
Kileo	490	3,690	1,130	1,190	2,320	4.73
Total Average	8,710	43,930	10,460	10,520	20,980	2.41

Data source: Village census (Demography as of October, 1979)

The working population is defined as adult persons, whose ages between 15 and 64 years old.

Table VI-24

CREDIT FOR MAIZE CULTIVATION FOR MOSHI DISTRICT

Item	1978/79		1979/80	
	Q'ty (kg)	Shs.	Q'ty (kg)	Shs.
Seeds				
Hybrid	69,615	169,860.60	145,190	354,263.60
UCA	10,600	20,140.00	12,550	23,845.00
Katumani	9,120	17,328.00	22,700	43,130.00
Fertilizer				
DAP	75 (bags)	8,137.50	-	
S/A	7,672 (bags)	416,205.00	14,435 (bags)	1,010,450.00
TSP	2,780 (bags)	211,141.00	12,149 (bags)	607,450.00
Chemical				
Thionex	26,690	186,563.10	47,080	329,089.20
Total		1,029,375.20	2,317,684.70	2,368,227.80

Source: TRDB, Moshi 1980.

Table VI-25 ANNUAL CROP PRODUCTION AND MARKETABLE SURPLUS IN LOWER-MOSHI AREA

Major Crops	Gross Production (tons)	Home Consumption/1 (tons)	Marketable Surplus
Maize	15,700	7,900	7,800
Cotton	260	30	230
Paddy	900	900	-
Pulses	450	450	-
Other cereals	300	300	-
Vegetables	1,000	400	600
Oil-seeds	60	-	60

Source: Annual Statistical Data provided by N.M.C. GAPEX, T.C.A. and the Central Market of Moshi Township.

/1: Amount of the home consumption includes the seed reserves for next cropping.

Table VI-26 ANNUAL PRODUCTION OF LIVESTOCK IN LOWER-MOSHI AREA

Major Products	Total Population (heads)	Annual Slaughtering or Milking Rate (% or lit./year)	Annual Production (heads or liters)
Meat			
- Cattle	25,490	20	5,100
- Sheep	9,750	25	2,440
- Goats	26,820	25	6,710
Milk			
- Cattle	3,820	200	764,000
- Sheep	3,410	17	57,970
- Goats	9,380	17	159,460

Note: Annual Slaughtering rate is estimated based on the information obtained by the field economic survey.

Total heads for milking animals are estimated, making reference to the livestock investigation and study in Arabic and African countries made by IDA, 1975. In this study, it is clarified that an annual offtake of cattle is at 15% of the total population, and at 35% for sheep and goats.

Annual milking rate is collected by the farm economic survey in the Lower-Moshi area.

Table VI-27 PRICE OF SEEDS, FERTILIZER AND AGRO-CHEMICALS

(Shillings per unit)

	Unit	1977/78	1978/79	1979/80
Maize Seeds/1				
Hybrid	1 kg	-	-	2.44
UCA	1 kg	-	-	1.90
Kalumani	1 kg	-	-	1.90
Fertilizer/2				
Ammonium sulphate	50 kg/bug	58.80	58.75	54.25/1
TSP	50 kg/bug	82.35	82.50	75.95/1
DAP	50 kg/bug		-	108.50/1
Agro-Chemicals/2				
Thiodan 25%	1 t	23.50	23.50	18.00
Hostathion 25%	1 t	56.10	30.00	35.00
Thiotnex	1 kg	-	-	6.99
Tangatox	Tin	-	90.00	90.00
Cotoran	1 t	-	62.60	-
Nangatox	1 t	16.25	-	-

Source: /1 Tanzania Rural Development Bank Moshi
/2 Tanzania Cotton Authority Moshi

Table VI-28 FARM GATE PRICE OF AGRICULTURAL CROPS

(Unit: Shiling per kg.)

Crops	1978/79	1979/80
Coffee 1/	10.00	10.00
Cotton AR 2/	2.40	3.00
Cotton BR	1.20	1.30
Maize 3/	0.85	1.00
Paddy	1.20	1.50
Rice	2.60	2.60
Wheat	1.25	1.35
Cassova Grade I	0.65	0.65
Cassava Grade II	0.50	0.50
Finger millet	2.00	2.00
Sorghum	1.00	1.00
Millet	1.00	1.00
Beans Grade I	3.50	3.50
Beans Grade II	2.75	2.75
Cowpeas	3.25	3.25
Peas	1.50	1.50
Lentle beans	3.50	3.50
Pigeon peas	3.00	3.00
Butter beans	3.00	3.00
Bambarra nut	2.00	2.00
Sunflower (Black)	1.70	1.70
Sunflower (Jupiter)	1.50	1.50
Sunflower (Nyingine)	1.30	1.30
Soybeans	2.30	2.30
Ground nut		2.50

Source: 1/ Coffee Authority, Moshi
2/ Cotton Authority, Moshi
3/ National Milling Cooperative, Moshi

Table VI-29 PRICE OF FRUITS AND VEGETABLES 1979/80

Fruits	(Unit Shillings per fruit)	
	Farm Gate	Market-Moshi
Orange	0.15	0.50
Rough lemon	0.10	0.15
Lime	0.10	0.15
Banana	0.05	0.10
Pineapples	4.00	7.00
Pawpaw	0.50	2.00
Mangoes	0.25	0.50
Avocado	0.20	0.50
Pears (per kg)	1.50	2.00
Vegetables	**Unit Shilling per kg.**	
Beans fresh	1.00	2.00
Peas fresh	3.00	5.00
Chickpeas	2.00	4.50
Cowpeas	2.00	4.00
Pigeonpeas	2.00	4.00
Beans dried	2.00	4.50
Cabbage	2.00	4.00
Tomatoes	1.00	3.00
Onions	4.00	5.00
Spinach	0.50	1.50
Carrots	3.00	6.00
Cucumber	1.00	2.00
Pepper, Sweet	2.00	4.00
Pepper, hot	1.50	2.00
Cauliflower	2.00	4.00
Okra	3.00	5.00
Eggplant	2.00	4.00
Cooking banana	0.25	0.50
Potatoes, Irish	1.00	3.00

Source: Market Information Service, KILIMO, Moshi

Table VI-30 LOCATION OF BUYING POSTS AND GODOWN CAPACITY
(As of 1979)

Location of Buying Post	Capacity of Godown (Tons)
Chekereni	180
Mutakuja	180
Uchira	300
Kilema/Makuyuni	270
Lotima	100
New land	100
NAFCO Kahe	30,000

Source: Information provided by NMC and TCA, Moshi.

Table VI-31 PRICE OF LIVESTOCK PRODUCTS IN 1979/80

Major Products	Farm Gate Prices
Meat	
- Cattle	1,200 Shs/head
- Goats	150
- Sheep	150
Milk	
- Cattle	2,700 Shs/k(
- Goats	2,700
- Sheep	2,700

Source: Statistical data provided by the Economic and Trading Department, Moshi Town-Ship Council (1979/80)

Table VI-32 NET RETURN OF CROP PRODUCTION - PRESENT CONDITION

DESCRIPTION		Crop: Paddy			Crop: Maize (Rainfed)			Crop: Maize (Irrigated)			Crop: Finger-Millet		
		Q'TY	FINANCIAL		Q'TY	FINANCIAL		Q'TY	FINANCIAL		Q'TY	FINANCIAL	
			Unit Price	Amount		Unit Price	Amount		Unit Price	Amount		Unit Price	Amount
		(kg/Ha)	(Shs/kg)	(Shs)	(kg/Ha)	(Shs/kg)	(Shs)	(kg/Ha)	(Shs/kg)	(Shs)	(kg/Ha)	(Shs/kg)	(Shs)
(1) Unit Yield		1,400	1.50	2,100	920	1.00	920	1,750	1.00	1,750	460	2.00	920
(2) Farm Inputs													
. Seeds		90	1.50	135	30	1.00	30	25	1.00	25	0.5	1.00	0.5
. Fertilizers	Urea	50	1.10	55	49	1.10	54	50	1.10	55	-		
	T.S.P.	50	1.52	76	-	-	-	50	1.52	76	-		
. Chemicals	Fungicide	-	-		-	-	-	-	-	-	-		
	Insecticide	some	23.50	24				some	23.50	24	-		
	Harbicide	-	-	-	-	-	-	-	-	-	-		
(3) Machinery													
. Tractor	Ploughing		400/Ha	400		350 /Ha	350		350/Ha	350		350/Ha	350
	Harrowing		100/Ha	100		-	-		-	-	-	-	-
. Sprayer				5						5	-	-	-
. Thresher			-	-		-	-			-	-	-	-
(4) Materials													
. Sacks		16 Nos.	7.0	112	10 Nos.	7.0	70	19 Nos.	7.0	133	5	7.0	35
. Others		1% of above		9	1% of above		5	1% of above		7	1% of above		4
(5) Labours		15 M-D	8.85	133	10 M-D	8.85	89	15 M-D	8.85	133	55 M-D	-	-
(6) Total cost				1,049			598			808			389.5
(1) - (6) Net Return				1,051 (128$)			322 (39$)			942 (115$)			530.5 (65$)

Table VI-33 NET RETURN OF CROP PRODUCTION - PRESENT CONDITION

DESCRIPTION		Crop: Cotton Q'TY (kg/Ha)	FINANCIAL Unit Price (Shs/kg)	FINANCIAL Amount (Shs)	(Subsidized Rates) (Shs)	Crop: Pulses Q'TY (kg/Ha)	FINANCIAL Unit Price (Shs/kg)	FINANCIAL Amount (Shs)	Crop: Sunflower Q'TY (kg/Ha)	FINANCIAL Unit Price (Shs/kg)	FINANCIAL Amount (Shs)
(1) Unit Yield (Seed cotton)		400	2.57	1,028	1,028	490	2.75	1,347.5	320	1.50	480
(2) Farm Inputs											
. Seeds		25	2.57	64	-	50	2.75	137.5	5	1.50	8
. Fertilizers	Urea	25	1.09	27	13.5	-	-	-	25	1.10	28
	T.S.P.	50	1.52	76	38	-	-	-	50	1.52	76
. Chemicals	Fungicide	1	24.80	25	12.5	-	-	-	-		-
	Insecticide	5	23.50	118	59	-	-	-	some	23.50	24
	Harbicide	-	-	-		-	-	-	-		-
(3) Machinery											
. Tractor	Ploughing		350/Ha	350	350		350 Ha	350			
	Harrowing	-	-	-	-	-	-	-		-	-
. Sprayer			10/Ha	10	10	-	-	-			5
. Thresher		-	-	-	-	-	-	-		-	-
(4) Materials											
. Sacks		4	7.0	28	-	6 Nos.	7.0	42	8 Nos.	7.0	56
. Others		1% of above		7	5	1% of above	-	5	1% of above		2
(5) Labours		10 M-D	8.85	89	89	60 M-D	-	-	5 M-D	8.85	44
(6) Total cost				794	577			534.5			243
(1) - (6) Net Return				234 (29%)	451 (55%)			813 (99%)			237 (29%)

Table VI-34

GROSS AND NET PRODUCTION RETURNS IN WHOLE LOWER-MOSHI AREA
(Present Condition)

Major Products	Total Croped Area (ha)	Unit Yield (ton/ha)	Total Production (tons)	Unit Price (Shs/kg)	Gross Return (Shs)	Unit Production Cost (Shs)	Total Production Cost (Shs)	Net Return (Shs)	Net Return (Shs/farm household)
Maize									
- Irrigated	2,370	1.75	4,148	1.00	4,148,000	808	1,914,960	2,233,040	282.7
- Rainfed	12,805	0.92	11,781	1.00	11,781,000	598	7,657,390	4,123,610	239.7
Cotton	640	0.40	256	2.57	658,000	794	508,160	149,840	19.0
Pulses									
- Irrigated	775	0.89	690	2.75	1,898,000	535	414,625	1,483,375	187.8
- Rainfed	120	0.43	52	2.75	143,000	535	64,200	78,800	10.0
Paddy	655	1.40	917	1.50	1,376,000	1,049	687,095	688,905	87.0
Vegetables	200	5.13	1,026	4.00	4,104,000	9,230	1,846,000	2,258,000	285.8
Banana	495	9.00	4,455	0.25	1,113,750	560	277,200	836,550	105.9
Other Crops	590	0.46	271	2.00	542,000	389.5	229,805	312,195	39.5
Total	18,650				25,763,750		13,599,435	12,164,315	1,257.4

Table VI-35

ANNUAL LIVESTOCK PRODUCTION AND NET RETURN

PRODUCTS	ANNUAL PRODUCTION	UNIT PRICE	GROSS RETURN	PRODUCTION COST	NET RETURN
Meat					
- Cattle	5,100 head	1,200 Shs/head	6,120,000 Shs	2,844,000 Shs	3,276,000 Shs
- Goats	2,440	150	366,000	158,000	208,000
- Sheep	6,700	150	1,005,000	395,000	610,000
Milk					
- Cattle	760 kℓ	2,700 Shs/kℓ	2,052,000 Shs	1,185,000 Shs	867,000 Shs
- Goats	58	2,700	156,600	79,000	77,600
- Sheep	160	2,700	432,000	158,000	274,000
Total			10,131,600		5,312,600

Table VI-36 FLOODED AREA AND DAMAGED ACREAGES (Regular flooding)

Name of Villages	Total Flooded Area	Damages Caused by Submergence			Damages Caused by Out-Washing		
		Paddy Field	Upland Field	Other Land	Paddy Field	Upland Field	Other Land
Msaranga/ Mandaka	1,080	-	100	-	-	980	-
Tam Makaa	1,000	-	60	-	-	940	-
Uchira	400	-	-	-	-	400	-
Kisange-sangeni	1,100	30	250	820	-	-	-
Kitereni	1,040	-	-	-	-	420	620
Ghona	60	-	-	-	-	-	60
Mabogini	10	10	-	-	-	-	-
Rau ya Kati	330	-	260	70	-	-	-
Oria	600	-	70	530	-	-	-
Mangaria	2,150	60	370	1,340	-	80	300
Total	7,770	100	1,110	2,760	-	2,820	980

Table VI-37 FLOODED AREA AND DAMAGED ACREAGES (The 1979 Flooding)

Name of Villages	Total Flooded Area	Damages Caused by Submergence			Damages Caused by Out-Washing		
		Paddy Field	Upland Field	Other Land	Paddy Field	Upland Field	Other Land
Msaranga/ Mandaka	1,410	100	330	-	-	980	-
Tam Makaa	1,060	-	120	-	-	940	-
Uchira	450	-	50	-	-	400	-
Kisange-sangeni	1,700	30	350	1,320	-	-	-
Kitereni	1,290	10	190	50	-	420	620
Ghona	60	-	-	-	-	-	60
Mabogini	100	100	-	-	-	-	-
Rau ya Kati	870	120	680	70	-	-	-
Oria	2,310	-	870	1,440	-	-	-
Mangaria	2,740	60	370	1,930	-	80	300
Total	13,990	420	2,960	4,810	-	2,820	980

Note: Figures are shown by ha in gross.

Table VI-38 ACTUAL CROP DAMAGES BY 1979 FLOODING

Name of Villages	Damages by Submergence							Damages by Out-Washing	Potential Damages
	Paddy			Upland Crops				Upland Crops	Other Land
	(a&b)	(c)	(d)	(a)	(b)	(c)	(d)		
Msaranga/ Mandaka	-	50	40	100	150	50	-	880	-
Yam Makaa	-	-	-	10	100	-	-	850	-
Uchira	-	-	-	-	45	-	-	360	-
Kisange-sangeni	-	-	25	-	-	-	315	-	1,120
Kitereni	-	-	10	70	100	-	-	380	570
Ghona	-	-	-	-	-	-	-	-	50
Mabogini	50	40	-	-	-	-	-	-	-
Rau ya Kati	-	120	-	-	450	160	-	-	60
Oria	-	-	-	-	-	530	250	-	-
Mangaria	-	-	50	-	-	-	330	70	-
Total	50	210	125	180	845	740	895	2,540	1,800

Table VI-39 ACTUAL CROP DAMAGES BY REGULAR FLOODING

Name of Villages	Damages by Submergence							Damages by Out-Washing	Potential Damages
	Paddy			Upland Crops				Upland Crops	Other Land
	(a&b)	(c)	(d)	(a)	(b)	(c)	(d)		
Msaranga/ Mandaka	-	-	-	60	30	-	-	490	-
Yam Makaa	-	-	-	-	55	-	-	470	-
Uchira	-	-	-	-	-	-	-	200	-
Kisange-sangeni	-	-	25	150	75	-	-	-	700
Kitereni	-	-	-	-	-	-	-	210	120
Ghona	-	-	-	-	-	-	-	-	50
Mabogini	10	-	-	-	-	-	-	-	-
Rau ya Kati	-	-	-	40	150	50	-	-	-
Oria	-	-	-	-	-	-	65	-	-
Mangaria	-	-	50	-	-	200	130	40	-
Total	10	-	75	250	310	250	195	1,410	870

Note: Where the figures of (a) (b) (c) and (d) are the rating of production decrease caused by the flooding as presented in the Section 4.5.2.

Figures of other land having potential damage are remarked based on the land classification presented in Annex III.

All of figures are shown by ha in net.

Table VI-40

DAMAGED CROP PRODUCTION AND GROSS VALUES ESTIMATED

Crop & Rating of Damages	Damages by Regular Flooding			Damages by 1979 Flooding		
	Damaged Acreages (ha)	Damaged Production (tons)	Damaged Values (Shs)	Damaged Acreages (ha)	Damaged Production (tons)	Damaged Values (Shs)
Paddy:						
- (a & b); not damaged	10	-	-	50	-	-
- (c) ; moderately damaged	-	-	-	210	90	135,000
- (d) ; highly damaged	25	18	27,000	125	85	127,500
Sub-total	35	18	27,000	385	175	262,500
Upland crops:						
- (a) ; not damaged	250	-	-	180	-	-
- (b) ; moderately damaged	310	160	160,000	845	440	440,000
- (c) ; highly damaged	250	220	220,000	740	650	650,000
- (d) ; completely damaged	1,605	2,810	2,810,000	3,435	6,010	6,010,000
Sub-total	2,465	3,190	3,190,000	5,200	7,100	7,100,000
Potential damages on Other land:	870	1,520	1,520,000	1,800	3,150	3,150,000
Total	3,370	-	4,737,000	7,385	-	10,512,500

Note: Damages of upland crops and potential damages on other land (unreclaimed land) are estimated by applying the condition of maize cultivation.
An annual flood damages = Shs 4,737,000 + (Shs 10,512,000 - 4,737,000) x 1/50
= Shs 4,852,500

Table VI-41

POPULATION FORECAST FOR 1985, 1990, 1995 AND 2000

(Whole Lower-Moshi area)

YEAR	ANNUAL GROWTH RATE/1	TOTAL POPULATION/2	POPULATION/3
1979 (Present)	2.70	87,000	39,800
1980	2.70	89,300	40,700
1985	2.60	102,100	46,700
1990	2.60	116,000	53,100
1995	2.50	131,100	60,000
2000	-	147,200	67,350

Note: /1: Anticipated annual growth rate is estimated making reference to the population forecast for 2000 made by IBRD, January, 1980.

/2: Total population consist of settled and unsettled (seasonal migrants) persons in the whole Lower-Moshi area.

/3: Population is only estimated for the settled persons in the whole Lower-Moshi area.

Table VI-42 FOOD CONSUMPTION AND ITS NUTRITIVE ANALYSES

MAJOR FOOD	CONSUMPTION PER CAPITA (gr/day)	NUTRIENT Starch (gr)	Protein (gr)	Fat (gr)	CALORIES (cal)
Maize	320	222	32	15	1,075
Rice	(50)	(38)	(3)	(0.4)	(175)
Pulses	90	49	1.8	2	292
Sub-total		(309) 271	(36.8) 33.8	(17.4) 17.0	(1,542) 1,367
Sweet potatoe or cassava	(40)	(11.1)	(0.5)	(0.1)	(48)
Banana	650	139	8.4	2.6	565
Total		(459.1) 410	(45.7) 42.2	(20.1) 19.6	(2,155) 1,932
Milk	90cc	-	11.4	10.1	140
Meat	80	0.2	17	5	117
Oil	20	-	-	20	176.8
Sugar	60	58.1	0.5	-	226
Grand-total		(517.4) 468.3	(74.6) 61.1	(55.2) 54.7	(2,815) 2,590

Note: Figures of food consumption per capita are obtained by the field interview with farmers (120 families) in the Lower-Moshi area.

Figure in parentheses are not regular consumption. Rice is generally taken at the ceremony and tuber crops are only seasonal supplementation.

Nutrient and calorie analyses are made, making reference to the standard nutritive of major consumables defined by WHO.

Table VI-43

IMPORT AND EXPORT BALANCE OF FOOD AND OIL PRODUCTS

Unit: US$ x 10^3 in current price

Major Products	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
1. Import Values:										
Cereals	6,090	4,830	13,090	4,630	108,720	108,360	-	142,700	232,000	189,600
Maize	2,010	1,630	9,120	1,750	49,270	39,510	-	2,310	5,040	4,040
Rice	240	270	450	1,030	1,270	550	-	14,180	17,680	82,830
(Sub-total)	(8,340)	(6,730)	(22,660)	(7,410)	(159,260)	(148,420)	(-)	(159,190)	(254,720)	(276,470)
Oil-seed cakes	60	280	90	520	700	56				
Oil-seeds	340	30	10	20	30	520				
Animal oil	1,030	730	2,790	2,120	2,210	4,420				
Seed oil	660	480	250	560	970	1,670				
Palm oil	600	380	1,590	960	1,460	1,990				
(Sub-total)	(2,690)	(1,900)	(4,630)	(3,640)	(4,640)	(8,080)				
Total	11,030	8,630	27,290	11,050	163,900	156,500				
2. Export Values:										
Cereals	2,990	4,160	1,110	1,650	100	450				
Maize	2,100	2,580	-	-	-	400				
Rice	100	800	800	650	20	20				
(Sub-total)	(5,190)	(7,540)	(1,910)	(2,300)	(120)	(870)				
Oil seed cakes	6,620	6,370	7,710	12,370	8,450	9,240	-	2,460	2,410	2,720
Oil seeds	6,710	7,420	6,480	7,720	6,790	3,960	-	2,250	2,510	2,480
(Sub-total)	(13,330)	(13,790)	(14,190)	(20,090)	(15,240)	(13,200)	(-)	(4,710)	(4,920)	(5,200)
Total	18,520	21,330	16,100	22,390	15,360	14,070				
3. Import and Export Balance	7,490	12,700	-11,190	11,340	-148,540	-142,430				

Source; FAO, Trade Year Book, 1975 and 1979

Table VI-44

EXTERNAL TRADE OF MAJOR FOOD PRODUCTS

(Unit: metric tons)

Major Products	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
1. Importation:										
Cereals	6,780	5,740	18,360	4,280	43,070	46,100	-	123,200	172,100	110,000
Maize	25,630	22,820	134,940	21,870	253,550	232,690	-	24,200	50,000	35,000
Rice	1,750	2,000	3,000	2,960	2,000	1,100		52,100	48,100	25,000
Oilseed cakes	680	2,410	730	1,590	2,910	190				
Oilseeds	1,300	140	50	60	90	1,210				
Seed oil	1,600	940	810	1,030	1,170	1,670				
Palm oil	2,170	1,090	4,710	2,530	2,290	3,000				
Animal oil	3,860	2,480	8,910	5,410	3,280	6,960				
2. Exportation:										
Cereals	3,170	4,290	1,010	1,580	75	830				
Maize	24,420	29,470	-	-	-	7,940				
Rice	490	4,180	6,570	7,520	60	100				
Oilseed cakes	84,950	87,010	116,750	88,350	84,640	93,890		(-)	(-)	(-)
Oilseeds	20,870	39,340	29,060	23,400	13,210	9,950		124,000	121,000	132,000
Coconut oil	5,630	5,090	3,230	3,210	4,830	1,420		(-)	(-)	(-)

Source: F.A.O Trade Year Book, 1975 and 1979

Table VI-44

Table VI-45 CALCULATION OF STANDARD CONVERSION RATE AND SHADOW PRICE FACTOR

Major Commodities	Total Amount (CIF.Shsx10^6)	Share of Total (%)	Tax & Duty (%/CIF)
1. Import portion:			
Food and livestock	497.11	5.72	22.4
- Animal & animal products	113.02	1.28	25.0
- Cereals & flour	267.00	3.03	9.4
- Fruits & vegetables	7.37	0.08	50.0
- Sugar & honey	68.97	0.79	50.0
- Cocoa, tea, etc	40.75	0.47	40.0
Beverages & Tobacco	5.87	0.07	75.0
Crude Materials,	182.48	2.07	20.0
Mineral oil & Fuel	972.77	11.05	10.0
Animal & vegetable oil	148.86	1.69	10.0
Chemicals	1,017.66	11.56	30.0
Manufactured goods	1,764.75	20.06	25.0
Machinery & Equipment	3,842.76	43.70	almost free
Miscellaneous goods	356.26	4.05	10.0
Other commodities not classified	9.18	0.10	10.0
Total	8,797.70	100.00	11.87
2. Export Portion:	3,631.70	100.00	almost free

Note: Source: Annual Trade Report on Tanzania, 1978.

(to be continued)

3. Calculation of Shadow Price Factor (SPF):

$$SPF = \frac{Ef \cdot X (1 - S) + Im \cdot M (1 + t)}{Ef \cdot X + Im \cdot M}$$

where: Ef ; Elasticity of foreign exchange for trade of agricultural products

Im ; Price elasticity of domestic demand and supply

$$\text{Then, } SPF = \frac{0.5 \times 3{,}631.7 (1 - 0) + 0.6 \times 8{,}797.7 (1 + 0.1187)}{0.5 \times 3{,}631.7 + 0.6 \times 8{,}797.7}$$

$$\doteq 1.09$$

Note: Figures shown in Ef; (0.5) and Im; (0.6) are the elasticity factors preliminarily estimate, making reference to the IBRD price projection, 1980.

Table VI-46 PRICE FORECAST FOR MAJOR AGRICULTURAL COMMODITIES (PRICE IN 1977 CONSTANT US$)

YEAR	BEEF	BANANA	RICE	MAIZE	SOYBEANS	GROUNDNUT (Shelled)	SUNFLOWER (Pellets)	COTTON (Lints)	COFFEE	UREA	T.S.P.
1955	109¢/kg	464$/t							373¢/kg		
56	95	455							409		
57	99	462							364		
58	106	426							287		
59	120	381							245		
1960	119	365	328$/t	114$/t	235$/t	503$/t	176$/t	167¢/kg	232		
61	108	352	356	119	281	496	170	170	210		
62	92	338	403 2	136	256	437	207	166	202		
63	101	428	376	144	281	439	227	165	199		
64	132	426	356	144	276	469	221	163	261		
1965	154	386	341	138	285	507	204	155	244	234$/t	102$/t
66	153	373	405	147	304	459	200	150	225		
67	144	378	563	122	267	429	195	161	206	166	97
68	148	389	525	128	270	425	201	175	221		
69	142	402	483	139	259	521	202	157	223	166	97
1970	145	378	334	136	265	523	195	154	260	109	158
71	163	295	276	125	265	523	181	164	211		
72	175	307	285	109	266	495	192	157	209		
73	214	260	563	158	457	620	342	219	216	150	157
74	143	233	697	170	351	768	190	185	185	400	384
1975	67	271	399	132	241	496	148	135	158	217	222
76	78	277	273	129	249	457	176	188	341	121	98
77	76	275	272	95	280	551	175	163	531	127	97
78	75	248	314	87	231	536	135	140	316	125	84
79	129	248	253	88	227	431	137	130	291	132	111
1980	128	240	320	119	207	368	130	125	250	135	128
1985	104	230	368	132	245	415	165	165	210	177	150
1990	104	220	380	135	290	450	205	170	230	186	152

Note:

(1) Beef: World indicator price

(2) Banana: Central and South America F.O.B.

(3) Rice: Thai 5% broken, F.O.B. Bangkok

(4) Maize: US No.2 yellow, F.O.B. Gulf ports

(5) Soybeans : US, C.I.F. Rotterdam

(6) Groundnut: Any origin, shelled, C.I.F. Rotterdam

(7) Sunflower: Pellet (37-38% oil), Argentina, C.I.F. Rotterdam

(8) Urea: F.O.B. Europe

(9) T.S.P. (Triple-Superphosphate): F.O.B. Rotterdam

(10) Cotton: Northern Europe C.I.F.

Reference: Price Prospects for Major Primary Commodities, Jan., 1980, IBRD

Table VI-47

INTERNATIONAL MARKET PRICE OF MAJOR AGRICULTURAL COMMODITIES CONVERTED TO 1980 CONSTANT PRICE

Unit: US$/t

MAJOR COMMODITIES	1977	1978	1980	1990
1. Food products				
- Beef	760	869	1,854	1,506
- Banana	275	287	333	318
- Rice	272	364	533	550
- Maize	95	101	191	195
- Beans	-	440	467	532
2. Oil seeds				
- Soybeans	280	268	300	420
- Groundnut	551	621	533	651
- Sunflower	175	156	188	296
3. Other products				
- Coffee	5,310	3,660	3,040	3,330
- Cotton (lint)	1,630	1,620	2,390	2,460
4. Fertilizer				
- Urea	127	145	256	269
- T.S.P.	97	97	217	220
5. Agro-chemicals				
- Fungicides	-	2,560	2,720	3,100
- Insecticides	-	2,520	2,710	3,090
- Herbicides	-	3,230	3,430	3,910

Note: (1) Figures except beans and agro-chemicals are converted from the prices estimated by IBRD, making reference to the inflation index (see Table VI-49)

(2) Figures of beans and agro-chemicals are estimated based on the CIF Tanzania in 1978.

Reference: Price Prospects for Major Primary Commodities, Jan., 1980, IBRD

Annual Trade Report of Tanzania, Dec., 1978, the Statistical Branch, Tanzania Customs & Excise Dept

Table VI-48 PROSPECTIVE COST/PRICE OF LOCAL MATERIALS AND LABOUR WAGES

(Farm gate Price for 1990)

Descriptions	Financial	Economic
1. Machinery charges (Shs/ha):		
- Ploughing (upland field)	350	440
- Ploughing (paddy field)	400	500
- Harrowing (upland field)	80	100
- Harrowing (paddy field)	100	125
- Paddling (paddy field)	100	125
- Spraying	35	45
2. Materials (Shs)		
- Sacks for production (90 kg in capacity)	7.0	12.2
3. Labour wages	8.85	15.6

Note: Future Cost/Price is estimated by applying the price escalation factor (see Table VI-63).

Table VI-49 FARM-GATE PRICE (1990) ESTIMATED
(AT 1980 CONSTANT PRICE)

(Unit: Shs./kg)

MAJOR COMMODITIES	1979/'80 Current Price	1990 Financial Price	1990 Economic Price
1. Farm Products			
- Maize	1.00	1.00	3.51
- Paddy	1.50	1.50	4.59
- Beans	2.75	2.75	5.46
- Soybeans	2.30	2.30	6.25
- Sunflower	1.50	1.50	3.45
- Banana	0.50	0.50	0.87
- Cabbage	4.00	4.00	8.37
- Tomatoe	3.00	3.00	6.28
- Onion	5.00	5.00	10.46
- Seed cotton	2.57	2.57	5.16
- Groundnut (un-shelled)	2.50	2.50	5.15
2. Farm Inputs			
- Urea	1.09	1.09	4.98
- T.S.P.	1.52	1.52	4.28
- Fungicides	24.80	24.80	31.68
- Insecticides	23.50	23.50	31.52
- Herbicides	29.61	29.61	39.85

Note: Prices of vegetable in 1990 are estimated based on the price escalation factor forecasted by IBRD

Other prices on major commodities are collected by cost/price conversion made in Table VI-50 - Table VI-62

Table VI-50 CALCULATION OF 1990 ECONOMIC FARM-GATE PRICE OF MAIZE (IMPORT SUBSTITUTION)
(at 1980 Constant Price)

	DESCRIPTION (Cost/Price Factors)	(US$/t)
1.	Primary price (FOB) at Florida	195
2.	Transportation cost to Tanga port	190
3.	CIF price, Tanga port	385
		(Shs./t)
4.	Converted CIF price, Tanga port (1)	3,434
5.	Import tax (10%)	-
6.	Wharfage (1.5% of FOB/CIF price)	51
7.	Unloading/loading cost	45
8.	Handling & storing cost	206
9.	Store-gate price at Tanga	3,736
10.	Transportation cost to Moshi (2)	32
11.	Store-gate price at Moshi	3,768
12.	Handling & storing cost (3)	-226
13.	Processing cost (4)	-
14.	Mill-gate price	3,542
15.	Price converted to/from primary product (5)	-
16.	Transportation cost to/from Farm (6)	-30
17.	Farm-gate price	3,512

Note: (1) Border price is converted at the shadow rate of US$1.0=Shs.8.92 (shadow price factor: 1.09 as estimated in Table VI-45)

(2) Railway distance of 351 km.

(3) The cost is estimated at 6% of store-gate price.

(4) Estimated based on the actual cost in 1979/'80.

(5) Converted at the milling rate of - %.

(6) Transportation by lorry at Shs.1.5/ton/km (short distance tariff). Distance between Farm and Mill is estimated about 30 km on average.

Table VI-51 CALCULATION OF 1990 ECONOMIC FARM-GATE PRICE OF RICE (IMPORT SUBSTITUTION)
(at 1980 Constant Price)

DESCRIPTION (Cost/Price Factors)	(US$/t)
1. Primary price (FOB) at Bangkok	550
2. Transportation cost to Tanga port	200
3. CIF price, Tanga port	750
	(Shs./t)
4. Converted CIF price, Tanga port (1)	6,690
5. Import tax (5%)	-
6. Wharfage (1.5% of FOB/CIF price)	100
7. Unloading/loading cost	45
8. Handling & storing cost	401
9. Store-gate price at Tanga	7,236
10. Transportation cost to/from Moshi (2)	32
11. Store-gate price at Moshi	7,268
12. Handling & storing cost (3)	436
13. Processing cost (4)	-258
14. Mill-gate price	7,446
15. Price converted to/from primary product (5)	4,616
16. Transportation cost to/from Farm (6)	-30
17. Farm-gate price	4,586

Note: (1) Border price is converted at the shadow rate of US$1.0=Shs.8.92 (shadow price factor: 1.09 as estimated in Table VI-45)

(2) Railway distance of 351 km.

(3) The cost is estimated at 6% of store-gate price.

(4) Estimated based on the actual cost in 1979/'80.

(5) Converted at the milling rate of 62% (1.6129).

(6) Transportation by lorry at Shs.1.5/ton/km (short distance tariff). Distance between Farm and Mill is estimated about 30 km on average.

Table VI-52 CALCULATION OF 1990 ECONOMIC FARM-GATE PRICE OF SEED-COTTON (EXPORT SUBSTITUTION)
(at 1980 Constant Price)

	DESCRIPTION (Cost/Price Factors)	(US$/t)
1.	Primary price (FOB) at Northern Europe	2,460
2.	Transportation cost from Tanga port	-210
3.	CIF price, Tanga port	2,250
		(Shs./t)
4.	Converted CIF price, Tanga port (1)	20,070
5.	Import tax (- %)	-
6.	Wharfage (1.5% of FOB/CIF price)	-301
7.	Unloading/loading cost	-45
8.	Handling & storing cost	-1,204
9.	Store-gate price at Tanga	18,520
10.	Transportation cost from Moshi (2)	-32
11.	Store-gate price at Moshi	18,488
12.	Handling & storing cost (3)	-1,109
13.	Processing cost (4)	-78
14.	Mill-gate price	17,301
15.	Price converted to primary product (5)	5,190
16.	Transportation cost from Farm (6)	-30
17.	Farm-gate price	5,160

Note: (1) Border price is converted at the shadow rate of US$1.0=Shs.8.92 (shadow price factor: 1.09 as estimated in Table VI-45)

(2) Railway distance of 351 km.

(3) The cost is estimated at 6% of store-gate price.

(4) Estimated based on the actual cost in 1979/'80.

(5) Converted at the milling rate of 30%.

(6) Transportation by lorry at Shs.1.5/ton/km (short distance tariff). Distance between Farm and Mill is estimated about 30 km on average.

Table VI-53 CALCULATION OF 1990 ECONOMIC FARM-GATE PRICE OF BEANS (IMPORT SUBSTITUTION) (at 1980 Constant Price)

DESCRIPTION (Cost/Price Factors)	(US$/t)
1. Primary price (FOB) at Tanga port	
2. Transportation cost to/from Tanga port	
3. CIF price, Tanga port	532
	(Shs./t)
4. Converted FOB/CIF price, Tanga port (1)	4,745
5. Import tax (10%)	-
6. Wharfage (1.5% of FOB/CIF price)	71
7. Unloading/loading cost	45
8. Handling & storing cost	284
9. Store-gate price at Tanga	5,145
10. Transportation cost to/from Moshi (2)	32
11. Store-gate price at Moshi	5,177
12. Handling & storing cost (3)	310
13. Processing cost (4)	-
14. Mill-gate price	5,487
15. Price converted to/from primary product (5)	-
16. Transportation cost to/from Farm (6)	-30
17. Farm-gate price	5,457

Note: (1) Border price is converted at the shadow rate of US$1.0=Shs.8.92 (shadow price factor: 1.09 as estimated in Table VI-45)

(2) Railway distance of 351 km.

(3) The cost is estimated at 6% of store-gate price.

(4) Estimated based on the actual cost in 1979/'80.

(5) Converted at the milling rate of - %.

(6) Transportation by lorry at Shs.1.5/ton/km (short distance tariff). Distance between Farm and Mill is estimated about 30 km on average.

Table VI-54 CALCULATION OF 1990 ECONOMIC FARM-GATE PRICE OF SOYBEANS (IMPORT SUBSTITUTION)
(at 1980 Constant Price)

	DESCRIPTION (Cost/Price Factors)	(US$/t)
1.	Primary price (FOB) at Florida (converted from CIF Rotterdam)	420
2.	Transportation cost to/from Tanga port	190
3.	FOB/CIF price, Tanga port	610
		(Shs./t)
4.	Converted FOB/CIF price, Tanga port (1)	5,441
5.	Import tax (10%)	-
6.	Wharfage (1.5% of FOB/CIF price)	82
7.	Unloading/loading cost	45
8.	Handling & storing cost	326
9.	Store-gate price at Tanga	5,894
10.	Transportation cost to/from Moshi (2)	32
11.	Store-gate price at Moshi	5,926
12.	Handling & storing cost (3)	355
13.	Processing cost (4)	-
14.	Mill-gate price	6,281
15.	Price converted to/from primary product (5)	-
16.	Transportation cost to/from Farm (6)	-30
17.	Farm-gate price	6,251

Note: (1) Border price is converted at the shadow rate of US$1.0=Shs.8.92 (shadow price factor: 1.09 as estimated in Table VI-45)

(2) Railway distance of 351 km.

(3) The cost is estimated at 6% of store-gate price.

(4) Estimated based on the actual cost in 1979/'80.

(5) Converted at the milling rate of - %.

(6) Transportation by lorry at Shs.1.5/ton/km (short distance tariff). Distance between Farm and Mill is estimated about 30 km on average.

Table VI-55 CALCULATION OF ECONOMIC 1990 FARM-GATE PRICE OF GROUNDNUT (IMPORT SUBSTITUTION)
(at 1980 Constant Price)

DESCRIPTION (Cost/Price Factors)	(US$/t)
1. Primary price (FOB) at Florida (converted from CIF Rotterdam)	651
2. Transportation cost to/from Tanga port	190
3. FOB/CIF price, Tanga port	841
	(Shs./t)
4. Converted FOB/CIF price, Tanga port (1)	7,502
5. Import tax (10%)	-
6. Wharfage (1.5% of FOB/CIF price)	112
7. Unloading/loading cost	45
8. Handling & storing cost	450
9. Store-gate price at Tanga	8,109
10. Transportation cost to/from Moshi (2)	32
11. Store-gate price at Moshi	8,141
12. Handling & storing cost (3)	488
13. Processing cost (4)	-
14. Mill-gate price	8,629
15. Price converted to/from primary product (5)	5,177
16. Transportation cost to/from Farm (6)	-30
17. Farm-gate price	5,147

Note: (1) Border price is converted at the shadow rate of US$1.0=Shs.8.92 (shadow price factor: 1.09 as estimated in Table VI-45)

(2) Railway distance of 351 km.

(3) The cost is estimated at 6% of store-gate price.

(4) Estimated based on the actual cost in 1979/'80.

(5) Converted at the milling rate of 60%.

(6) Transportation by lorry at Shs.1.5/ton/km (short distance tariff). Distance between Farm and Mill is estimated about 30 km on average.

Table VI-56 CALCULATION OF 1990 ECONOMIC FARM-GATE PRICE OF SUNFLOWER (IMPORT SUBSTITUTION)
(at 1980 Constant Price)

DESCRIPTION (Cost/Price Factors)	(US$/t)
1. Primary price (FOB) at Argentina (converted from CIF Rotterdam)	296
2. Transportation cost to/from Tanga port	190
3. FOB/CIF price, Tanga port	486
	(Shs./t)
4. Converted FOB/CIF price, Tanga port (1)	4,335
5. Import tax (10%)	-
6. Wharfage (1.5% of FOB/CIF price)	65
7. Unloading/loading cost	45
8. Handling & storing cost	260
9. Store-gate price at Tanga	4,705
10. Transportation cost to/from Moshi (2)	32
11. Store-gate price at Moshi	4,737
12. Handling & storing cost (3)	284
13. Processing cost (4)	-47
14. Mill-gate price	4,974
15. Price converted to/from primary product (5)	3,482
16. Transportation cost to/from Farm (6)	-30
17. Farm-gate price	3,452

Note: (1) Border price is converted at the shadow rate of US$1.0=Shs.8.92 (shadow price factor: 1.09 as estimated in Table VI-45)

(2) Railway distance of 351 km.

(3) The cost is estimated at 6% of store-gate price.

(4) Estimated based on the actual cost in 1979/'80.

(5) Converted at the milling rate of 70% (1.4285).

(6) Transportation by lorry at Shs.1.5/ton/km (short distance tariff). Distance between Farm and Mill is estimated about 30 km on average.

Table VI-57 CALCULATION OF 1990 ECONOMIC FARM-GATE PRICE OF BANANA (EXPORT SUBSTITUTION)
(at 1980 Constant Price)

DESCRIPTION (Cost/Price Factors)	(US$/t)
1. Primary price (FOB) at Central & South America	318
2. Transportation cost to/from Tanga port	-190
3. FOB price, Tanga port	128
	(Shs./t)
4. Converted FOB price, Tanga port (1)	1,141
5. Import tax (- %)	-
6. Wharfage (1.5% of FOB/CIF price)	-17
7. Unloading/loading cost	-45
8. Handling & storing cost	-68
9. Store-gate price at Tanga	1,011
10. Transportation cost to/from Moshi (2)	-32
11. Store-gate price at Moshi	979
12. Handling & storing cost (3)	-58
13. Processing cost (4)	-19
14. Mill-gate price	902
15. Price converted to/from primary product (5)	-
16. Transportation cost to/from Farm (6)	-30
17. Farm-gate price	872

Note: (1) Border price is converted at the shadow rate of US$1.0=Shs.8.92 (shadow price factor: 1.09 as estimated in Table VI-45)

(2) Railway distance of 351 km.

(3) The cost is estimated at 6% of store-gate price.

(4) Estimated based on the actual cost in 1979/'80.

(5) Converted at the milling rate of - %.

(6) Transportation by lorry at Shs.1.5/ton/km (short distance tariff). Distance between Farm and Mill is estimated about 30 km on average.

Table VI-58 CALCULATION OF 1990 ECONOMIC FARM-GATE PRICE OF UREA (IMPORT SUBSTITUTION)
(at 1980 Constant Price)

	DESCRIPTION (Cost/Price Factors)	(US$/t)
1.	Primary price (FOB) at Europe	269
2.	Transportation cost to/from Tanga port	210
3.	FOB/CIF price, Tanga port	479
		(Shs./t)
4.	Converted FOB/CIF price, Tanga port (1)	4,272
5.	Import tax (10%)	-
6.	Wharfage (1.5% of FOB/CIF price)	64
7.	Unloading/loading cost	45
8.	Handling & storing cost	256
9.	Store-gate price at Tanga	4,637
10.	Transportation cost to/from Moshi (2)	32
11.	Store-gate price at Moshi	4,669
12.	Handling & storing cost (3)	280
13.	Processing cost (4)	-
14.	Mill-gate price	4,949
15.	Price converted to/from primary product (5)	-
16.	Transportation cost to/from Farm (6)	30
17.	Farm-gate price	4,979

Note: (1) Border price is converted at the shadow rate of US$1.0=Shs.8.92 (shadow price factor: 1.09 as estimated in Table VI-45)

(2) Railway distance of 351 km.

(3) The cost is estimated at 6% of store-gate price.

(4) Estimated based on the actual cost in 1979/'80.

(5) Converted at the milling rate of - %.

(6) Transportation by lorry at Shs.1.5/ton/km (short distance tariff). Distance between Farm and Mill is estimated about 30 km on average.

Table VI-59 CALCULATION OF 1990 ECONOMIC FARM-GATE PRICE OF T.S.P. (IMPORT SUBSTITUTION)
(at 1980 Constant Price)

DESCRIPTION (Cost/Price Factors)	(US$/t)
1. Primary price (FOB) at Florida	220
2. Transportation cost to Tanga port	190
3. CIF price, Tanga port	410
	(Shs./t)
4. Converted CIF price, Tanga port (1)	3,657
5. Import tax (10%)	-
6. Wharfage (1.5% of FOB/CIF price)	54
7. Unloading/loading cost	45
8. Handling & storing cost	219
9. Store-gate price at Tanga	3,975
10. Transportation cost to Moshi (2)	32
11. Store-gate price at Moshi	4,007
12. Handling & storing cost (3)	240
13. Processing cost (4)	-
14. Mill-gate price	4,247
15. Price converted to/from primary product (5)	-
16. Transportation cost to Farm (6)	30
17. Farm-gate price	4,277

Note: (1) Border price is converted at the shadow rate of US$1.0=Shs.8.92 (shadow price factor: 1.09 as estimated in Table VI-45)

(2) Railway distance of 351 km.

(3) The cost is estimated at 6% of store-gate price.

(4) Estimated based on the actual cost in 1979/'80.

(5) Converted at the milling rate of - %.

(6) Transportation by lorry at Shs.1.5/ton/km (short distance tariff). Distance between Farm and Mill is estimated about 30 km on average.

Table VI-60 CALCULATION OF 1990 ECONOMIC FARM-GATE PRICE OF INSECTICIDES (IMPORT SUBSTITUTION)
(at 1980 Constant Price)

	DESCRIPTION (Cost/Price Factors)	(US$/t)
1.	Primary price (FOB) at North Europe	
2.	Transportation cost to/from Tanga port	
3.	CIF price, Tanga port	3,090
		(Shs./t)
4.	Converted CIF price, Tanga port (1)	27,562
5.	Import tax (10%)	-
6.	Wharfage (1.5% of FOB/CIF price)	413
7.	Unloading/loading cost	45
8.	Handling & storing cost	1,653
9.	Store-gate price at Tanga	29,673
10.	Transportation cost to Moshi (2)	32
11.	Store-gate price at Moshi	29,705
12.	Handling & storing cost (3)	1,782
13.	Processing cost (4)	-
14.	Mill-gate price	31,487
15.	Price converted to/from primary product (5)	-
16.	Transportation cost to Farm (6)	30
17.	Farm-gate price	31,517

Note: (1) Border price is converted at the shadow rate of US$1.0=Shs.8.92 (shadow price factor: 1.09 as estimated in Table VI-45)

(2) Railway distance of 351 km.

(3) The cost is estimated at 6% of store-gate price.

(4) Estimated based on the actual cost in 1979/'80.

(5) Converted at the milling rate of - %.

(6) Transportation by lorry at Shs.1.5/ton/km (short distance tariff). Distance between Farm and Mill is estimated about 30 km on average.

Table VI-61 CALCULATION OF 1990 ECONOMIC FARM-GATE PRICE OF FUNGICIDES (IMPORT SUBSTITUTION)
(at 1980 Constant Price)

DESCRIPTION (Cost/Price Factors)	
	(US$/t)
1. Primary price (FOB) at North Europe	
2. Transportation cost to Tanga port	
3. CIF price, Tanga port	3,100
	(Shs./t)
4. Converted CIF price, Tanga port (1)	27,652
5. Import tax (10%)	-
6. Wharfage (1.5% of FOB/CIF price)	425
7. Unloading/loading cost	45
8. Handling & storing cost	1,703
9. Store-gate price at Tanga	29,825
10. Transportation cost to Moshi (2)	32
11. Store-gate price at Moshi	29,857
12. Handling & storing cost (3)	1,791
13. Processing cost (4)	-
14. Mill-gate price	31,648
15. Price converted to/from primary product (5)	-
16. Transportation cost to Farm (6)	30
17. Farm-gate price	31,678

Note: (1) Border price is converted at the shadow rate of US$1.0=Shs.8.92 (shadow price factor: 1.09 as estimated in Table VI-45)

(2) Railway distance of 351 km.

(3) The cost is estimated at 6% of store-gate price.

(4) Estimated based on the actual cost in 1979/'80.

(5) Converted at the milling rate of - %.

(6) Transportation by lorry at Shs.1.5/ton/km (short distance tariff). Distance between Farm and Mill is estimated about 30 km on average.

Table VI-62 CALCULATION OF 1990 ECONOMIC FARM-GATE PRICE OF HERBICIDES (IMPORT SUBSTITUTION)
(at 1980 Constant Price)

	DESCRIPTION (Cost/Price Factors)	(US$/t)
1.	Primary price (FOB) at North Europe	
2.	Transportation cost to/from Tanga port	
3.	CIF price, Tanga port	3,910
		(Shs./t)
4.	Converted CIF price, Tanga port (1)	34,877
5.	Import tax (10%)	-
6.	Wharfage (1.5% of FOB/CIF price)	523
7.	Unloading/loading cost	45
8.	Handling & storing cost	2,092
9.	Store-gate price at Tanga	37,537
10.	Transportation cost to Moshi (2)	32
11.	Store-gate price at Moshi	37,569
12.	Handling & storing cost (3)	2,254
13.	Processing cost (4)	-
14.	Mill-gate price	39,823
15.	Price converted to/from primary product (5)	-
16.	Transportation cost to Farm (6)	30
17.	Farm-gate price	39,853

Note: (1) Border price is converted at the shadow rate of US$1.0=Shs.8.92 (shadow price factor: 1.09 as estimated in Table VI-45)

(2) Railway distance of 351 km.

(3) The cost is estimated at 6% of store-gate price.

(4) Estimated based on the actual cost in 1979/'80.

(5) Converted at the milling rate of - %.

(6) Transportation by lorry at Shs.1.5/ton/km (short distance tariff). Distance between Farm and Mill is estimated about 30 km on average.

Table VI-63

ANNUAL CHANGE IN INFLATION INDICES, 1960-1990

YEAR	INTERNATIONAL PRICE INDEX (%)
1960 - '70	1.3
1970 - '73	13.0
1973	20.3
1974	24.6
1975	15.3
1976	1.8
1977	7.9
1978	15.9
1979	13.2
1980	10.4
1980 - '85	7.5
1985 - '90	6.0

Note: Index of CIF US$ prices of industrialized countries' manufactured exports to developing countries.

Reference: Price Prospects for Major Primary Commodities, IBRD, January, 1980

Table VI-64

NET RETURN OF CROP PRODUCTION - CONDITIONS WITHOUT THE PROJECT -

DESCRIPTION	Crop: Paddy					Crop: Maize (Rainfed)					Crop: Maize (Irrigated)				
	Q'TY	FINANCIAL		ECONOMIC		Q'TY	FINANCIAL		ECONOMIC		Q'TY	FINANCIAL		ECONOMIC	
		Unit Price	Amount	Unit Price	Amount		Unit Price	Amount	Unit Price	Amount		Unit Price	Amount	Unit Price	Amount
	(kg/Ha)	(Shs/kg)	(Shs)	(Shs/kg)	(Shs)	(kg/Ha)	(Shs/kg)	(Shs)	(Shs/kg)	(Shs)	(kg/Ha)	(Shs/kg)	(Shs)	(Shs/kg)	(Shs)
(1) Unit Yield	1,500	1.50	2,250	4.59	6,885	1,250	1.00	1,250	3.51	4,387	2,000	1.00	2,000	3.51	7,020
(2) Farm Inputs															
· Seeds	90	1.50	135	4.59	413	30	1.90	57	3.51	105	25	1.90	48	3.51	88
· Fertilizers															
Urea	50	1.09	55	4.98	249	50	1.09	55	4.98	249	100	1.09	109	4.98	498
T.S.P.	50	1.52	76	4.28	214	50	1.52	76	4.28	214	90	1.52	137	4.28	385
· Chemicals															
Fungicide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Insecticide	some	23.5	23	31.52	32	some	23.5	23	31.52	32	5	23.5	117	31.52	158
Herbicide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(3) Machinery															
· Tractor															
Ploughing		400/Ha	400	500/Ha	500		350/Ha	350	440/Ha	440		350/Ha	350	440/Ha	440
Harrowing		100/Ha	100	125/Ha	125	-	-	-	-	-	-	-	-	-	-
· Sprayer		35/time/Ha	35	45/time/Ha	45		35/time/Ha	35	45/time/Ha	45		35/time/Ha	35	45/time/Ha	45
· Thresher	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(4) Materials															
· Sacks	16 Nos.	7.0	112	12.2	195	14 Nos.	7.0	98	12.2	171	22 Nos.	7.0	154	12.2	268
· Others	1% of above		9		18	1% of above		7		12	1% of above		10		19
(5) Labouers employed	15 M-D	8.85	133	15.6	234	10 M-D	8.85	88	15.6	156	15 M-D	8.85	133	15.6	234
(6) Total cost			1,078		2,025			789		1,424			1,093		2,135
(1) - (6) Net Return			1,172 (149%)		4,860 (544%)			461 (56%)		2,963 (332%)			907 (111%)		4,885 (547%)

Table VI-65 NET RETURN OF CROP PRODUCTION - CONDITIONS WITHOUT THE PROJECT -

DESCRIPTION	Crop: Cotton Q'TY (kg/Ha)	FINANCIAL Unit Price (Shs/kg)	FINANCIAL Amount (Shs)	ECONOMIC Unit Price (Shs/kg)	ECONOMIC Amount (Shs)	Crop: Finger-Millet Q'TY (kg/Ha)	FINANCIAL Unit Price (Shs/kg)	FINANCIAL Amount (Shs)	ECONOMIC Unit Price (Shs/kg)	ECONOMIC Amount (Shs)
(1) Unit Yield	950	2.57	2,441	5.16	4,902	460	2.00	920	1.76	810
(2) Farm Inputs										
· Seeds	25	-	-	5.16	129	0.5	2.00	1	1.73	1
· Fertilizers										
Urea	50	1.09	55	4.98	249	-	-	-	-	-
T.S.P.	50	1.52	76	4.28	214	-	-	-	-	-
· Chemicals										
Fungicide	1	24.8	25	31.68	32	-	-	-	-	-
Insecticide	5	23.5	117	31.52	158	-	-	-	-	-
Herbicide	-	-	-	-	-	-	-	-	-	-
(3) Machinery										
· Tractor										
Ploughing		350/Ha	350	440/Ha	440		350/Ha	350		
Harrowing	-	-	-	-	-	-	-	-	-	-
· Sprayer		35/time/Ha	70	45/time/Ha	45	-	-	-	-	-
· Thresher	-	-	-	-	-	-	-	-	-	-
(4) Materials										
· Sacks	10 Nos.	7.0	70	12.2	122	5	7.0	35	12.2	61
· Others	1% of above		8		14	1% of above		4		1
(5) Labourer employed	15 M-D	8.85	132	15.6	234	-	-	-	-	-
(6) Total cost			903		1,637			390		63
(1) - (6) Net Return			1,535 (188$)		3,265 (366$)			530 (65$)		747 (83$)

Table VI-66

NET RETURN OF CROP PRODUCTION - CONDITIONS WITHOUT THE PROJECT -

DESCRIPTION	Crop: Pulses					Crop: Sunflower				
	Q'TY	FINANCIAL		ECONOMIC		Q'TY	FINANCIAL		ECONOMIC	
		Unit Price	Amount	Unit Price	Amount		Unit Price	Amount	Unit Price	Amount
	(kg/Ha)	(Shs/kg)	(Shs)	(Shs/kg)	(Shs)	(kg/Ha)	(Shs/kg)	(Shs)	(Shs/kg)	(Shs)
(1) Unit Yield	500	2.75	1,375	5.46	2,730	750	1.50	1,125	3.45	2,587
(2) Farm Inputs										
· Seeds	50	2.75	137	5.46	273	5	1.50	8	3.45	12
· Fertilizers										
Urea	-	-	-	-	-	25	1.09	27	4.98	125
T.S.P.	-	-	-	-	-	50	1.52	76	4.28	214
· Chemicals										
Fungicide	-	-	-	-	-	-	-	-	-	-
Insecticide	-	-	-	-	-	some	23.5	164	331.52	32
Herbicide	-	-	-	-	-	-	-	-	-	-
(3) Machinery										
· Tractor										
Ploughing		350/Ha	350	440/Ha	440		80/Ha	80	-	-
Harrowing	-	-	-	-	-	-	-	-	-	-
· Sprayer	-	-	-	-	-	-	35/time/Ha	35	45/time/Ha	45
· Thresher	-	-	-	-	-	-	-	-	-	-
(4) Materials										
· Sacks	6 Nos.	7.0	42	12.2	73	8 Nos.	7.0	56	12.2	98
· Others	1% of above		5		8	1% of above		4		5
(5) Labourers employed	-	-	-	-	-	-	-	-	-	-
(6) Total cost			534		794			450		351
(1) - (6) Net Return			841 (103$)		1,936 (217$)			675 (82$)		2,236 (250$)

Table VI-67

NET RETURN OF CROP PRODUCTION - CONDITIONS WITH THE PROJECT

DESCRIPTION	Crop: Paddy					Crop: Maize					Crop: Cotton				
	Q'TY	FINANCIAL		ECONOMIC		Q'TY	FINANCIAL		ECONOMIC		Q'TY	FINANCIAL		ECONOMIC	
		Unit Price	Amount	Unit Price	Amount		Unit Price	Amount	Unit Price	Amount		Unit Price	Amount	Unit Price	Amount
	(kg/Ha)	(Shs/kg)	(Shs)	(Shs/kg)	(Shs)	(kg/Ha)	(Shs/kg)	(Shs)	(Shs/kg)	(Shs)	(kg/Ha)	(Shs/kg)	(Shs)	(Shs/kg)	(Shs)
(1) Unit Yield	4,500	1.50	6,750	4.59	20,655	2,500	1.00	2,500	3.51	8,775	1,500	2.57	3,855	5.16	7,740
(2) Farm Inputs															
. Seeds	60	1.50	90	4.59	275	15	1.90	29	3.51	53	25	-	-	5.16	129
. Fertilizers															
Urea	180	1.09	196	4.98	896	220	1.09	240	4.98	1,095	70	1.09	142	4.98	349
T.S.P.	90	1.52	137	4.28	385	90	1.52	137	4.28	385	90	1.52	152	4.28	385
. Chemicals															
Fungicide	2	24.8	50	31.68	63	1	24.8	25	31.68	32	2	24.8	50	31.68	63
Insecticide	12.5	23.5	294	31.52	394	12.5	23.5	294	31.52	394	7	23.5	294	31.52	229
Herbicide	30	29.6	888	39.85	1,195	-	-	-	-	-	-	-	-	-	-
(3) Machinery															
. Tractor															
Ploughing	-	400/Ha	400	500/Ha	500	-	350/Ha	350	440/Ha	440		350/Ha	350	440/Ha	440
Harrowing	2 times	100/Ha	100	125/Ha	250	-	80/Ha	80	100/Ha	100		80/Ha	80	100/ha	100
. Sprayer	4 times	45/time/Ha	45	45/time/Ha	180	3 times	35/time/Ha	105	45/time/Ha	135	4 times	35/time/Ha	140	45/time/Ha	180
. Thresher	-	25.0	25	29.0	29		10.0	10	12.5	13	-	-		-	
(4) Materials															
. Sacks	50 Nos.	7.0	675	12.2	610	28 Nos.	7.0	196	12.2	342	17 Nos.	7.0	119	12.2	207
. Others	10% of above		290		478	10% of above		147		299	10% of above		133		207
(5) Labourers employed	40 M-D	8.85	354	15.6	624		-	-			40 M-D	8.85	354	15.6	624
(6) Total cost			3,544		5,879			1,613		3,288			1,814		2,904
(1) - (6) Net Return			3,206 (392$)		14,776 (1,656$)			887 (108$)		5,487 (615$)			2,041 (249$)		4,836 (542$)

Table VI-68 NET RETURN OF CROP PRODUCTION - CONDITIONS WITH THE PROJECT -

DESCRIPTION	Crop: Vegetable (Cabbage) Q'TY (kg/Ha)	FINANCIAL Unit Price (Shs/kg)	FINANCIAL Amount (Shs)	ECONOMIC Unit Price (Shs/kg)	ECONOMIC Amount (Shs)	Crop: Dry Onion Q'TY (kg/Ha)	FINANCIAL Unit Price (Shs/kg)	FINANCIAL Amount (Shs)	ECONOMIC Unit Price (Shs/kg)	ECONOMIC Amount (Shs)
(1) Unit Yield	10,000	2.00	20,000	8.37	83,700	5,500	4.00	22,000	10.46	57,530
(2) Farm Inputs										
. Seeds	1.5	150	225	552	828	1.5	280	420	250	375
. Fertilizers										
Urea	220	1.09	240	4.98	1,095	90	1.09	98	4.98	448
T.S.P.	110	1.52	167	4.28	470	150	1.52	228	4.28	642
. Chemicals										
Fungicide	1	24.8	25	31.68	32	2	24.8	50	31.68	63
Insecticide	12.5	23.5	294	31.52	394	7	23.5	165	31.52	220
Herbicide	-	-	-	-	-	-	-	-	-	-
(3) Machinery										
. Tractor										
Ploughing		350/Ha	350	440/Ha	440		350/Ha	350	440/Ha	440
Harrowing		80/Ha	80	100/Ha	100		80/Ha	80	100/Ha	100
. Sprayer	3 times	35/time/Ha	35	45/time/Ha	135	3 times	35/time/Ha	70	45/time/Ha	135
. Thresher	-	-	-	-	-					
(4) Materials										
. Sacks	110 Nos.	7.0	770	12.2	1,342	14 Nos.	7.0	98	12.2	171
. Others	10% of above		218		484	10% of above		156		259
(5) Labourers employed	35 M-D	8.85	310	15.6	546	35 M-D	8.85	310	15.6	546
(6) Total cost			2,714		5,866			2,025		3,399
(1) - (6) Net Return			17,286 (2,113$)		77,834 (8,726$)			19,975 (2,442$)		54,131 (6,068$)

Table VI-69

NET RETURN OF CROP PRODUCTION - CONDITIONS WITH THE PROJECT

DESCRIPTION	Crop: Pulses (beans)					Crop: Sunflower					Crop: Soybeans				
		FINANCIAL		ECONOMIC			FINANCIAL		ECONOMIC			FINANCIAL		ECONOMIC	
	Q'TY	Unit Price	Amount	Unit Price	Amount	Q'TY	Unit Price	Amount	Unit Price	Amount	Q'TY	Unit Price	Amount	Unit Price	Amount
	(kg/Ha)	(Shs/kg)	(Shs)	(Shs/kg)	(Shs)	(kg/Ha)	(Shs/kg)	(Shs)	(Shs/kg)	(Shs)	(kg/Ha)	(Shs/kg)	(Shs)	(Shs/kg)	(Shs)
(1) Unit Yield	1,000	2.75	2,750	5.46	5,460	750	1.50	1,500	3.45	2,587	1,200	2.30	2,760	6.25	7,500
(2) Farm Inputs															
. Seeds	25	2.75	69	5.46	137	5	1.50	8	3.45	17	50	2.30	115	6.25	312
. Fertilizers															
Urea	-					50	1.09	120	4.98	249	50	1.09	55	4.98	249
T.S.P.	90	1.52	137	4.28	385	50	1.52	137	4.28	214	90	1.52	137	4.28	385
. Chemicals															
Fungicide	-	-	-	-	-	1	24.8	25	31.68	32	-	-	-	-	-
Insecticide	5	23.5	117	31.68	158	5	23.5	165	31.52	158	12.5	23.5	294	31.52	394
Herbicide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(3) Machinery															
. Tractor															
Ploughing		250/Ha	250	440/Ha	440							350/Ha	350	440/Ha	440
Harrowing		80/Ha	80	100/Ha	100		80/Ha	80	100/Ha	100		80/Ha	80	100/Ha	100
. Sprayer	1 time	35/time/Ha	35	45/time/Ha	45	2 times	35/time/Ha	75	45/time/Ha	90	2 times	35/time/Ha	70	45/time/Ha	90
. Thresher		5.75/Ha	6	5.75/Ha	6	-	-	-	-	-		6.72/Ha	7	6.72/Ha	7
(4) Materials															
. Sacks	8 Nos.	7.0	56	12.2	98	8 Nos.	7.0	56	12.2	98	13 Nos.	7.0	91	12.2	159
. Others	10% of above		85		137	10% of above		62		96	10% of above		120		213
(5) Labourers employed		-	-			-	-				15 M-D	8.85	133	15.6	234
(6) Total cost			935		1,506			723		1,054			1,452		2,583
(1) - (6) Net Return			1,815 (222%)		3,954 (443%)			777 (95%)		1,533 (172%)			1,308 (160%)		4,917 (551%)

Table VI-70 NET RETURN OF CROP PRODUCTION - CONDITIONS WITH THE PROJECT

Crop: Groundnut

DESCRIPTION	Q'TY	FINANCIAL		ECONOMIC	
		Unit Price	Amount	Unit Price	Amount
	(kg/Ha)	(Shs/kg)	(Shs)	(Shs/kg)	(Shs)
(1) Unit Yield (Un-shelled)	2,000	2.54	5,080	5.15	10,300
(2) Farm Inputs					
. Seeds	90	4.20	378	5.15	463
. Fertilizers					
Urea	70	1.09	76	4.98	349
T.S.P.	90	1.52	137	4.28	385
. Chemicals					
Fungicide	1	24.8	25	31.68	32
Insecticide	12.5	23.5	294	31.52	394
Herbicide	-	-	-	-	-
(3) Machinery					
. Tractor					
Ploughing		350/Ha	350	440/Ha	440
Harrowing		80/Ha	80	100/Ha	100
. Sprayer	3 times	35/time/Ha	35	45/time/Ha	135
. Thresher	-	-	-	-	-
(4) Materials					
. Sacks	13 Nos.	7.0	91	12.2	159
. Others	10% of above		147		246
(5) Labourers employed	15 M-D	8.85	133	15.6	234
(6) Total cost			1,746		2,937
(1) - (6) Net Return			3,334 (407$)		7,363 (825$)

Table VI-71

GROSS AND NET RETURN OF CROP PRODUCTION IN WHOLE LOWER-MOSHI AREA

(Without the Project: Economic Price Base)

Major Products	Total Cropped Area (Ha)	Unit Yield (ton/Ha)	Total Production (ton)	Unit Price (Shs/kg)	Gross Return (10^3 Shs)	Unit Production Cost (Shs/Ha)	Total Production Cost (10^3 Shs)	Net Return (10^3 Shs)
Maize								
- Irrigated	2,370	2.00	4,740	3.51	16,635	2,135	5,060	11,575
- Rain-fed	12,805	1.25	16,000	3.51	56,160	1,424	18,230	37,930
Cotton	640	0.95	608	5.16	3,135	1,637	1,050	2,085
Pulses								
- Irrigated	120	0.90	108	5.46	590	1,133	140	450
- Rain-fed	775	0.50	385	5.46	2,100	794	620	1,480
Paddy	655	1.50	983	4.59	4,510	2,025	1,330	3,180
Vegetables	200	5.00	1,000	10.46	10,460	3,399	680	9,780
Other crops	590	0.46	271	1.76	475	63	40	435
Total	18,155				94,065		27,150	66,915

Table VI-72

GROSS AND NET RETURN OF CROP PRODUCTION IN WHOLE LOWER-MOSHI AREA

(With the Project: Economic Price Base)

Major Products		Total Cropped Area (Ha)	Unit Yield (ton/Ha)	Total Production (Ton)	Unit Price (Shs/kg)	Gross Return (10^3 Shs)	Unit Production Cost (Shs/Ha)	Total Production Cost (10^3 Shs)	Net Return (10^3 Shs)
Maize	(1)	740	2.50	1,850	3.51	6,495	3,288	2,430	4,065
	(2)	1,370	2.00	2,740	3.51	9,620	2,135	2,920	6,700
	(3)	9,400	1.25	11,750	3.51	41,245	1,424	13,385	27,860
Cotton		595	1.50	895	5.16	4,620	2.904	1,725	2,895
Pulses	(1)	595	1.00	595	5.46	3,250	1,506	895	2,355
	(2)	510	0.50	255	5.46	1,395	794	400	995
Oil-seeds		1,715	2.00	3,430	5.15	17,665	2,937	5,035	12,630
Other Cereals		500	0.46	230	1.76	405	63	30	375
Vegetables		300	5.50	1,650	10.46	17,260	3,399	1,020	16,240
Paddy	(1)	4,170	4.50	18,765	4.59	86,130	5,879	24,515	61,615
	(2)	270	1.50	405	4.59	1,860	2,025	545	1,315
Total		20,165				189,945		52,900	137,045

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

Table VI-73

GROSS AND NET RETURN OF CROP PRODUCTION IN WHOLE LOWER-MOSHI AREA
(With the Project: Financial Price Base)

Major Products		Cropped Area (Ha)	Unit Yield (ton/Ha)	Total Production (ton)	Unit Price (Shs/kg)	Gross Values (10^3 Shs)	Unit Production Cost (Shs/Ha)	Total Production Cost (10^3 Shs)	Net Return (10^3 Shs)	Net Return/ House-hold (Shs)
Maize	(1)	740	2.50	1,850	1.00	1,850	1,613	1,190	660	68.0
	(2)	1,370	2.00	2,740	1.00	2,740	1,093	1,500	1,240	127.8
	(3)	9,400	1.25	11,750	1.00	11,750	789	7,420	4,330	211.2
Cotton		595	1.50	893	2.57	2,300	1,814	1,080	1,220	125.8
Pulses	(1)	595	1.00	595	2.75	1,640	935	560	1,080	111.3
	(2)	510	0.50	255	2.75	700	534	270	430	44.3
Oil-seeds		1,715	2.00	3,430	2.50	8,580	1,746	2,990	5,590	576.3
Other Cereals		500	0.46	230	2.00	460	390	200	260	26.8
Vegetables		300	5.50	1,650	4.00	6,600	2,025	610	5,990	617.5
Paddy	(1)	4,170	4.50	18,765	1.50	28,150	3,544	14,780	13,370	1,378.4
	(2)	270	1.50	405	1.50	610	1,078	290	320	33.0
Total		20,165				65,380		30,890	34,490	3,320.4

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 reinfed condition

Paddy (1) Production under the advanced irrigation
(2) Production under the traditional irrigation

Table VI-73

Table VI-74(1) GROSS AND NET PRODUCTION RETURN IN EACH SCHEME AREA

(Without the Project : Economic Price Base)

Major Production	Total Cropped Area (ha)	Unit Production Cost (Shs)	Total Production Cost (Shs x 10^3)		Production (tons)	Unit Price (Shs/kg)	Gross Return (Shs x 10^3)	Net Return (Shs x 10^3)
1. UPPER MABOGINI SHEME (150 ha)								
Paddy (1)	150	2,025	300	(1.5)	225	4.59	1,030	730
			300				1,030	730
2. MABOGINI SCHEME (850 ha)								
Paddy (1)	90	2,025	180	(1.5)	135	4.59	620	440
Maize (1)	425	2,135	910	(2.0)	850	3.51	2,980	2,070
" (2)	180	1,424	260	(1.25)	225	3.51	790	530
Cotton	45	1,637	70	(0.95)	43	5.16	220	150
Pulses	95	794	80	(0.5)	18	5.46	260	180
Vegetables	35	3,399	120	(5.0)	175	10.46	1,830	1,710
			1,620				6,700	5,080
3. RAU YA KATI SCHEME (450 ha)								
Paddy (1)	120	2,025	240	(1.5)	180	4.59	830	590
Maize (1)	140	2,135	300	(2.0)	280	3.51	980	680
" (2)	10	1,424	10	(1.3)	13	3.51	50	40
Cotton	30	1,637	50	(0.96)	29	5.16	150	100
Pulses	50	794	10	(0.5)	25	5.46	140	100
Vegetables	40	3,399	140	(5.0)	200	10.46	2,090	1,950
			780				4,240	3,460
4. CHEKERENI SCHEME (850 ha)								
Paddy (1)	10	2,025	20	(1.5)	15	4.59	70	50
Maize (1)	120	2,135	260	(2.0)	240	3.51	840	580
" (2)	310	1,424	440	(1.25)	388	3.51	1,360	920
Cotton	185	1,637	300	(0.95)	176	5.16	910	610
Pulses	75	794	60	(0.5)	38	5.46	210	150
Vegetables	40	3,399	140	(5.0)	200	10.46	2,090	1,950
			1,220				5,480	4,260
5. MIWARENI PUMP LIFT SCHEME (2,000 ha)								
Paddy (1)	25	2,025	50	(1.52)	38	4.59	170	120
Maize (1)	280	2,135	600	(2.0)	560	3.51	1,970	1,370
" (2)	960	1,424	1,370	(1.25)	1,200	3.51	4,210	2,840
Pulses	80	794	60	(0.5)	40	5.46	220	160
Cotton	100	1,637	160	(0.95)	95	5.16	490	330
Oil-Seeds	some	-	-		-	-	-	-
Vegetables	20	3,399	70	(5.2)	100	10.46	1,050	980
			2,310				8,110	5,800

- Continued

Table VI-74(2)

Major Production	Total Cropped Area (ha)	Unit Production Cost (Shs)	Total Production Cost (Shs x 10^3)	Production	(tons)	Unit Price (Shs/kg)	Gross Return (Shs x 10^3)	Net Return (Shs x 10^3)
6. MAKUYUNI SCHEME (500 ha)								
Maize (1)	345	2,135	740	(2.0)	690	3.51	2,420	1,680
Oil-Seeds	some	-	-	-	-	-	-	-
Cotton	155	1,637	250	(0.95)	147	5.16	760	510
Pulses	20	794	20	(0.5)	10	5.46	50	30
Vegetables	20	3,399	70	(5.0)	100	10.46	1,050	980
			1,080				4,280	3,200
7. GHONA AND KILEO SCHEME (500 ha)								
Maize (1)	300	2,135	640	(2.0)	600	3.51	2,110	1,470
" (2)	120	1,424	170	(1.25)	150	3.51	530	360
Pulses	20	794	20	(0.5)	10	5.46	50	30
Cotton	45	1,637	70	(0.95)	43	5.16	220	150
Oil-Seeds	some							
Vegetables	5	3,399	20	(5.0)	25	10.46	260	240
			920				3,170	2,250
8. NORTH GROUND WATER SCHEME (60 ha x 14 sub-schemes)								
Maize (2)	715	1,424	1,020	(1.25)	894	3.51	3,140	2,120
Pulses	40	794	30	(0.5)	20	5.46	110	80
Cotton	45	1,637	70	(0.95)	43	5.16	220	150
Oil-Seeds	some							
Vegetables	30	3,399	100	(5.0)	150	10.46	1,570	1,470
			1,220				5,130	3,820
9. EAST GROUND WATER SCHEME (30 ha x 6 sub-schemes)								
Maize (2)	140	1,424	200	(1.25)	175	3.51	610	410
Pulses	10	794	10	(0.5)	5	5.46	30	20
Cotton	30	1,637	50	(0.96)	29	5.16	150	100
			260				790	530
Total			9,710				38,840	29,130

Note: Paddy (1) rainy season cropping
Paddy (2) dry season cropping
Maize (1) irrigated

Table VI-75(1) GROSS AND NET PRODUCTION RETURN IN EACH SCHEME AREA

(With the Project : Economic Price Base)

Major Products	Total Cropped Area (ha)	Unit Production Cost (Shs)	Total Production Cost (Shs x 10^3)	Production (tons)	Unit Price (Shs/kg)	Gross Return (Shs x 10^3)	Net Return (Shs x 10^3)
1. UPPER MABOGINI SCHEME (150 ha)							
Paddy (1)	150	5,879	880	(4.5) 675	4.59	3,100	2,220
" (2)	50	5,879	290	(4.5) 225	4.59	1,030	740
			1,170			4,130	2,960
2. MABOGINI SCHEME (850 ha)							
Paddy (1)	750	5,879	4,410	(4.5) 3,375	4.59	15,490	11,080
" (2)	250	5,879	1,470	(4.5) 1,125	4.59	5,160	3,690
			5,880			20,650	14,770
3. RAU YA KATI SCHEME (450 ha)							
Paddy (1)	400	5,879	2,350	(4.5) 1,800	4.59	8,260	5,910
" (2)	130	5,879	760	(4.5) 585	4.59	2,690	1,930
			3,110			10,950	7,840
4. CHEKERENI SCHEME (850 ha)							
Paddy (1)	770	5,879	4,120	(4.5) 3,150	4.59	14,460	10,340
" (2)	220	5,879	1,290	(4.5) 990	4.59	4,540	3,250
			5,410			19,000	13,590
5. MIWARENI PUMP LIFT SCHEME (2,000 ha)							
Paddy (1)	900	5,879	5,290	(4.5) 4,050	4.59	18,590	13,300
" (2)	470	5,879	2,760	(4.5) 2,115	4.59	9,710	6,950
Maize (1)	280	3,288	920	(2.5) 700	3.51	2,460	1,540
Pulses	220	1,506	330	(1.0) 220	5.46	1,200	870
Cotton	220	2,904	640	(1.5) 330	5.16	1,700	1,060
Oil-Seeds	320	2,937	940	(2.0) 640	5.15	3,300	2,360
Vegetables	120	3,399	410	(5.5) 660	10.46	6,900	6,490
			11,290			43,860	32,570
6. MAKUYUNI SCHEME (500 ha)							
Maize (1)	120	3,288	390	(2.5) 300	3.51	1,050	660
Oil-Seeds (1)	150	2,937	440	(2.0) 300	5.15	1,550	1,110
" (2)	130	2,937	380	(2.0) 260	5.15	1,340	960
Cotton	100	2,904	290	(1.5) 150	5.16	770	480
Pulses	100	1,506	150	(1.0) 100	5.46	550	400
Vegetables	40	3,399	140	(5.5) 220	10.46	2,300	2,160
			1,790			7,560	5,770

- Continued

Table VI-75(2)

Major Products	Total Cropped Area (ha)	Unit Production Cost (Shs)	Total Production Cost (Shs x 10^3)	Production (tons)		Unit Price (Sha/kg)	Gross Return (Shs x 10^3)	Net Return (Shs x 10^3)
7. GHONA AND KILEO SCHEME (500 ha)								
Paddy	150	5,879	880	(4.5)	675	4.59	3,100	2,220
Maize (1)	80	3,288	260	(2.5)	200	3.51	700	440
Pulses	70	1,506	110	(1.0)	70	5.46	380	270
Cotton	70	2,904	200	(1.5)	105	5.16	540	340
Oil-Seeds								
(1)	100	2,937	290	(2.0)	200	5.15	1,030	740
" (2)	120	2,937	350	(2.0)	240	5.15	1,240	890
Vegetables	40	3,399	140	(5.5)	220	10.46	2,300	2,160
			2,230				9,290	7,060
8. NORTH GROUNDWATER SCHEME (60 ha x 14 sub-schemes)								
Maize (1)	210	3,288	690	(2.5)	525	3.51	1,840	1,150
Pulses	165	1,506	250	(1.0)	165	5.46	900	650
Cotton	170	2,904	490	(1.5)	255	5.16	1,320	830
Oil-Seeds								
(1)	250	2,937	730	(2.0)	500	5.15	2,580	1,850
" (2)	490	2,937	1,440	(2.0)	980	5.15	5,050	3,610
Vegetables	80	3,399	270	(5.5)	440	10.46	4,600	4,330
			3,870				16,290	12,420
9. EAST GROUND WATER SCHEME (30 ha x 6 sub-schemes)								
Maize (1)	50	3,288	160	(2.5)	125	3.51	440	280
Pulses	35	1,506	50	(1.0)	35	5.46	190	140
Cotton	35	2,904	100	(1.5)	53	5.16	270	170
Oil-Seeds								
(1)	50	2,937	150	(2.0)	100	5.15	520	370
" (2)	105	2,937	310	(2.0)	210	5.15	1,080	770
Vegetables	10	3,399	30	(5.5)	55	10.46	580	550
			800				3,080	2,280
Total			35,550				134,810	99,260

Note: Paddy (1) rainy season cropping
Paddy (2) dry season cropping
Maize (1) irrigated

Table VI-76 INCREMENTAL NET PRODUCTION RETURN IN EACH SCHEME AREA

	Name of Scheme	Conditions		
		Without Project ($Shsx10^3$)	With Project ($Shsx10^3$)	Increment ($Shsx10^3$)
1.	UPPER MABOGINI SCHEME	730	2,960	2,230
2.	MABOGINI SCHEME	5,080	14,770	9,690
3.	RAU YA KATI SCHEME	3,460	7,840	4,380
4.	CHEKERENI SCHEME	4,260	13,590	9,330
5.	MIWALENI PUMP LIFT SCHEME	5,800	32,570	26,770
6.	MAKUYUNI SCHEME	3,200	5,770	2,570
7.	GHONA AND KILEO SCHEME	2,250	7,060	4,810
8.	NORTH GROUNDWATER SCHEME	3,820	12,420	8,600
9.	EAST GROUNDWATER SCHEME	530	2,280	1,750
	Total	29,130	99,260	70,130

Fig. VI - 1

ADMINISTRATIVE BOUNDARIES OF VILLAGES IN THE LOWER MOSHI AREA

No	Name of Village	No	Name of Village
①	Mabogini	⑪	Kiterení
②	Chekereni	⑫	Kisangesangeni
③	Mulakuja	⑬	Ghona
④	Newland	⑭	Kiomu
⑤	Msarango – Mandoka	⑮	Kochakindo
⑥	Yam Makao	⑯	Kilema Pofo
⑦	Uchira	⑰	Himo
⑧	Rau ya Kati	⑱	Lotima
⑨	Oria	⑲	Makuyuni
⑩	Mangaria	⑳	Kileo

ANNEX VII

ENGINEERING DESIGN

FEASIBILITY REPORT

ON

THE LOWER-MOSHI AGRICULTURAL DEVELOPMENT PROJECT

ANNEX VII ENGINEERING DESIGN

CONTENTS

LIST OF TABLES

LIST OF FIGURES

VII. ENGINEERING DESIGN

1. Irrigation and Drainage Systems

1.1 Design Criteria

1.1.1 Irrigation system

(1) Irrigation system capacity

The canalization system includes main canal, secondary canal, tertiary canal and on-farm irrigation ditch. A main canal delivers water from an intake or pump station outlet to secondary canals. A secondary canal commands several irrigation rotation blocks which are served by tertiary canals. The tertiary canal commands more than one rotation block of 20 ha.

The design capacity of irrigation system is carefully determined so that (i) the head works such as an intake structure or a pump station has a capacity taking water continuously for 24 hours from the rivers and (ii) the system can be easily and efficiently operated for intermittent irrigation water supply.

(a) Intake structure pump station and main canal

The design capacity of intake structure, pump station and main canal is determined on 24-hour operation basis even in case of the upland intermittent irrigation, to assure the uniform offtaking to all the schemes in the river system.

Therefore the discharge capacity is determined from the peak water requirement as calculated in Table VII-1.

(b) Secondary canal

Continuous supply operation will be practiced in the paddy field without storage pond. Within a command area of a secondary canal, the rotation operation will be made. Therefore, the same unit water requirement as the main canal is applied in the secondary canals for the paddy field.

As for the upland field, a night storage pond is needed. It is proposed to provide on the reaches of a secondary canal to economize on canal construction, and due to topographical conditions. The secondary canal has two kinds of capacity. The sections upstream of a storage pond is based on 24-hour operation, supplied directly from a main canal, and the sections downstream of a pond increases in their capacities in proportion to 18-hour operation.

(c) Tertiary canal

The capacity of the tertiary canal is based on rotation irrigation operation. The paddy field is operated with 10 days rotation, 24 hours day within a rotation block of 20 ha. Therefore, the unit discharge capacity of a tertiary canal commanding upto 20 ha will be 37 ℓ/s.

The upland field irrigation will be made with intermittent rotation irrigation of 18 hours in a day. Further more probable change in growing crops in the tertiary command area will occur. Therefore, the crop showing the maximum requirement in the proposed cropping pattern is selected for determination of the tertiary canal capacity.

The system capacity in each scheme are summarized in Table VII-1.

(2) Canal lining

The surface water available for irrigation is scarce in the Project area. The problem of whether canals are to be lined, and if needed, to what extent is important in establishing of the Project design criteria. In this context, the canal seepage loss measurement was carried out in the irrigation canals and traditional furrows in the Project area. The results show that the seepage rates are comparatively high, ranging between 7 and 14 $m^3/sec/10^6m^2$ of canal wetted area as shown in Table VII-2. The seepage rate of the concrete-lined canal, in general, is 0.5 to 1.0 $m^3/sec/10^6m^2$. As for the soil physical characteristics, the mechanical test results indicate that soils have low resistance for erosion. The canal lining, therefore, will be very effective in view of water saving and canal protection. However, not all tertiary canals will be watering over their full length at one time, it will be over a half length because of intermittent irrigation. With practical considerations, therefore, it would be considered not desirable to line tertiary canals at least in early days of this scheme. With the project works, main and secondary canals are to be lined with plain concrete.

(3) Velocity and canal section

(a) Permissible velocity

The maximum permissible velocity in lined canals is established for avoiding the possibility of lifting the lining. The velocity head is sometimes converted to the pressure head and this acts on the lining as up-lift force. For the earth canals, erosion control is considered in the permissible velocity:

Maximum velocity
- Lined canal : 1.2 m/s
- Earth canal : 0.6 "

Minimum velocity : 0.3 "

(b) Roughness coefficient

The roughness coefficients of the canals for determination of their hydraulic properties by Manning's formula are as follows:

Lined canal : 0.015
Earth canal : 0.030

(c) Free board

The design discharge of the project canal is comparatively small, less than 1.1 m^3/sec. In consideration of the scale of canals, the following minimum free board heights are taken in the design and the typical cross sections are adopted to the project canal as shown in Fig. VII-1. The canal type to be adopted is selected by use of Fig. VII-4.

- Minimum free board height from full water supply level to the top of concrete lining : 0.20 m
- Embankment height from the top of concrete lining
  - for concrete canal height more than 1.00 m : 0.30 m
  - for concrete canal height less than 1.00 m : 0.20 m
- Minimum free board for earth canal : 0.20 m

(d) Canal base width/water depth ratio

Deep canal sections are applied in the Project, in consideration of the hydraulically efficient cross section and support of canal subgrade by the ground.

(e) Side slope

The side slopes of 1:1.5 for both lined canals and earth canals are used.

(f) Lining

The lining is constructed with cast-in-site plain concrete of 8 cm in thickness.

(g) Embankment

The top width of canal embankment on both banks is to be 1.0 m for sections with the capacities more than 1.0 m^3/s. For other sections with capacities less than the above, the width of 0.5 m is given. The embankment up to the height of 4 m will be constructed with the side slope of 1:1.5 as calculated in Table VII-3.

(4) Intake structure

Four intake structures are newly provided in the Rau river system and two existing structures locating in the Himo river are contemplated to be improved. The proposed intake structure consists of a concrete diversion weir, intake, scouring sluice, stilling basin and other ancillary works necessary for controlling the river flow. The general design considerations of a weir are as follows:

In the Njoro river, two intake structures are provided for the upper Mabogini and Mabogini schemes. The crest level is set so as to divert the design discharge when the river water is low. The site selected is comparatively deep and the river slope is steep. The flood discharge of the Njoro river is very small as estimated in ANNEX I. On the both banks, the low embankments just upstream of the weir are constructed to prevent the overflow of the river water in the flood season.

In the Rau river, two intake structures are provided for Rau Ya Kati and Chekereni schemes. Along the middle reaches of the Rau river, the flood protective embankment is constructed to enclose the irrigation schemes, to mitigate flood damage as explained in Section 2 of this ANNEX. The head reaches of the main canals will extend from the diversion weir and cross with the embankment. Those section of head reaches are to be protected from passing over of the flood flow with masonry works.

All the diversion weirs are provided with concrete stilling basins long enough for dissipating flowing-down energy over the weir crest. On both banks in the upstream and downstream section, masonry stone protection is provided for river side slope protection.

(5) Canal related structures

A number of canal structures such as turnouts, checks, culverts, drops, spillways, syphons and measuring devices are required in conjunction with the canals. Herein mentioned are the general characteristics and adopted design criteria of those structures.

(a) Turnout

Turnout structures are constructed to distribute the required water from a parent canal to a branching canal. The pressure flow type turnout is introduced. The slide gate is provided at the entrance of the structure. The rectangular box barrel or circular barrel to cross the road or canal embankment is adopted depending on the discharge. The rectangular box barrel is applied for discharge more than 0.5 m^3/s.

(b) Check structure

Check structures are provided to raise the upstream water level of the structure during the period of low discharge and efficiently feed a branching canal. The structures also help to absorb fluctuation of water supply by storage function. The check structure also functions to cut water flow and drain out water through a spillway when so required.

The following are the types and their structural features.

(i) Box Barrel Type: This is applied for the discharge more than 0.7 m^3/s. The structure is provided with a rectangular slide gate at the entrance and with the rectangular concrete box barrel. Discharge adjustment is made by a control gate.

(ii) Pipe Barrel Type: This is applied for the discharge less than 0.7 m^3/s. The conduit is constructed with precast concrete pipes and the slide gate is provided at the entrance of a conduit.

(c) Culvert

Structures for farm road crossing are of culvert type in this area. Two type of culverts are designed, i.e., a rectangular barrel section type and a circular barrel section type, depending on the canal discharge. The length of crossing portion is so determined as to provide space enough for easy crossing by traffic.

(d) Drop

Drops to be provided are of vertical drop type, since a vertical drop dissipates efficiently the energy by charging a free flow nappe into a stilling pool when the discharge and head difference between upstream and downstream sections are small. All the drops are provided with the control gate to prevent racing of water.

(e) Spillway

Spillways are constructed for the purpose of flushing off a whole quantity of flow or of spilling out a part of flow during operation and maintenance, or of protecting canals and structures from damage and breakage.

According to the function of the spillway, the following two types are adopted for the project canal.

(i) Side Overflow Spillway: This is provided for spilling out a part of the excess water. This is a side overflow spillway, consisting of a side overflow section, a gradually varied rectangular section, a pipe conduit and an impact box, if needed.

(ii) Wasteway: This is of combined type with side overflow spillway and wasteway structures. This performs the functions of spilling out a part of the excess water and flushing off a whole discharge from the canal. This consists of a side overflow crest, a rectangular channel with gradually varied section, an inlet channel, a pipe conduit and an impact box, if needed.

(f) Syphon

Concrete syphon structures are contemplated to pass under the rivers, railway and roads. The velocity in syphon barrel is taken to be 1.5 to 2.0 times the velocity in the upstream canal. Two types of syphon barrel (box type and concrete pipe type) are contemplated depending on the design discharge. The box barrel type is applied for the discharge more than 1.0 m^3/s.

(g) Farm pond

Diversion of water from rivers or other water sources is contemplated to be made on the 24-hour basis in view of efficient water intake and economical use of water source. The water supply to upland fields, however, is set on the 18-hour basis at the peak demand period. Then, the night storage reservoir is needed in the irrigation system for the upland fields. Two plans for the night storage reservoir are considered in the irrigation system; one is the provision of farm ponds and the other is the use of canal sections with expansion for a storage function. In the latter case, the lined canal construction cost will be much more expensive, and the daily water level fluctuation in the canal will cause interference in efficient irrigation water supply management. It is proposed to provide farm ponds in the irrigation system for upland fields.

The storage capacities and locations of farm ponds are determined by the following considerations: In order to save the canal construction cost, the canals that are operated on the continuous 24-hour

basis have to be considered to the major extent. Then the farm ponds, in general, are provided on the secondary canal, not on the main canal. But if the farm pond is provided from each head of the secondary canal, the high water level in the main canal is required, resulting in expensive construction of main canal. Then the farm pond is proposed to be constructed at the middle reach of the secondary canal, and the area located upstream of the pond will be diverted directly from the main or the secondary canal with the continuous 24-hour flow.

The storage capacities needed are dominated by the peak water requirements for the respective schemes.

Scheme	Maximum Unit Water Requirement (ℓ/sec/ha)	Minimum Unit & Storage Capacity (m^3/ha/day)
Miwaleni scheme	0.91	20/1
Makuyuni scheme	0.88	19/1
Ghona scheme	0.96	21/1
North groundwater scheme	(60 ℓ/s of well production)	22/2
East groundwater scheme	(30 ℓ/s of ")	22/2

In order to save as much irrigation water as possible, all the farm pond are proposed to be lined with in-site plain concrete of 10 cm thickness. For the effective operation of the farm ponds, the following structures are required on the farm pond.

(1) inlet structure

(2) Outlet structure with constant downstream water level gate

(3) Side overflow type spillway

(h) Division box

Division boxes will be constructed on the tertiary canals for diverting their flows to other tertiary canals or farm ditches. Division boxes are provided at an interval of approximately 200 m for paddy field and of 150 m to 100 m for upland field depending on the field layout. Most of structural part will be of precast construction. Types of division boxes are broadly classified into three depending on the directions of diversion and the numbers of outlet as follows:

Note: /1: Maximum unit water requirement (m^3/sec/ha) x 6 hr x 3,600 sec

/2: Well production (m^3/sec/ha) x 6 hr x 3,600 sec

(1) Type A: This has three outlets. One is provided on the straight line of the tertiary canal. The others are on the both sides of it.

(2) Type B: This has two outlets. One is provided on the straight line of the tertiary canal. The other is set at right angles to it on the opposite side of the farm road.

(3) Type C: This has two outlets. One is provided on the straight line of the tertiary canal. The other is set at right angles to it on the farm road side.

The structure consists of precast concrete box precast concrete pipes for crossing the road or access to the fields, and steel slide gates. The drop function is given to the outlet where excess energy exists.

1.1.2 On-farm works

The on-farm works consist of tertiary facilities such as tertiary irrigation canal, drainage canal and farm road, and field facilities, and land grading and consolidation. The typical field layouts for both upland and paddy fields are proposed in ANNEX IV. The tertiary canal is so constructed as to command at least the one irrigation block of 20 ha.

As for the farm plot sizes of the upland fields, three sizes of plot are proposed depending on the general land slope;

Land Slope	Plot Size
Mild slope area	140 m x 180 m, 2.5 ha
Medium slope area	100 m x 200 m, 2.0 ha
Steep slope area	100 m x 100 m, 1.0 ha

Within the above size of plots, the land grading will be performed. As the furrow irrigation method will be adopted for the Project, cross slope adjustment will be allowed to the minimum extent.

In the paddy field, in general, the tertiary canal of approximately 1,000 m in length will be provided for commanding the irrigation block of 42 ha as shown in Fig. IV-8. As quarternary facilities, quarternary ditches, drains and road are contemplated in the irrigation block. These facilities contact directly to each field plot of 0.3 ha. This plot is sub-divided into 3 sub-fields of 0.1 ha by border ridges. Land levelling will be made within these sub-fields. Surface soil treatment will not be considered in the levelling works in view of economy.

1.1.3 Drainage system

(1) Drainage system capacity

The drainage canal system consists of main, secondary and tertiary drainage canals and field drains to remove the excess water in the fields, and catch drains to collect the runoffs from the outside basins.

The capacities of the drainage canals to be provided in the paddy fields are determined by use of the unit drainage requirements (l/sec/ha) as estimated in ANNEX IV. In case of runoff coming from outside the scheme area, the drainage canal capacities are increased by adding it. In the upland fields, the drainage water requirements are estimated at each junction point of drainage canals by use of McMath formula as presented in ANNEX IV.

(2) Canal section

The drainage canal sections are determined by the following assumptions:

Type	:	Trapezoidal earth canal
Permissible velocity		
Maximum velocity	:	0.6 m/sec
Minimum velocity	:	0.3 m/sec
Roughness coefficient for use of Manning's formula	:	0.03
Side slope	:	1:1.5

The typical cross section of drainage canals is as shown in Fig. VII-2. Selection of canal type and determination of hydraulic properties of drainage canals are carried out by use of Fig. VII-5.

(3) Related structure

The structures related to the drainage networks are culverts and drops. Two types of drainage culverts are provided, depending on their design capacities; rectangular barrel type and precast concrete pipe barrel type. The former is applied for the crossing portions with capacities more than 1.0 m^3/sec. The drops are of vertical drop type with rectangular cross section. The drop will be of wet rubble masonry construction. The upstream and downstream sections are protected also with wet rubble masonry.

1.2 Irrigation System - Surface Water Development

1.2.1 Rau River System

The development plan of the Rau river system located in the Lower-Moshi area consists of four irrigation schemes to be served from the Rau and the Njoro rivers. As mentioned in ANNEX V, the prospective land use plan in this river system indicates that the paddy cultivation is to be introduced to the maximum extent within the availability of irrigation water. In this context, the assessment of available irrigation water is made separately for the Njoro river and the Rau river by means of water balance as detailed in ANNEX IV. The results show that the Njoro river assures the irrigation for 1,000 ha in the rainy season, and for 400 ha in the dry season, and the Rau river provides the water for 1,300 ha in the rainy season and for 550 ha in the dry season. In view of the geographical location of irrgable land and water sources, soil and the existing land use in the Rau river system, the irrigable land is divided into four blocks and four irrigation schemes are delineated. The general features of four schemes are described hereunder.

(1) Upper Mabogini Irrigation Scheme

The Upper Mabogini irrigation scheme is selected in the existing paddy field of 150 ha, located on the left bank of the lower reaches of the Njoro river. Irrigation to the field is made through many intakes made of banana leaves only in the rainy season when the riverflow of the Njoro is high.

The area is surrounded by the Njoro river, the Rau river and the Rau river forest on the west, east and north, respectively. The Njoro and the Rau Rivers join at the lower end of the area. The elevation of the area ranges from EL.757 m to EL.749 m, sloping at an average gradient of 1/300 towards the southeast. In the rainy season, the low-lying area along the Rau river is sometimes damaged by the Rau river flood.

In order to supply the water to the existing paddy field of 150 ha. which is served by many intakes, a unified intake structure on the Njoro river is proposed at the upper end of the scheme area.

The dependable riverflow of the Njoro can assure the irrigation of 150 ha in the rainy season and of 50 ha in the dry season as mentioned in ANNEX IV.

The Project works consist of construction of an intake structure, irrigation, drainage and farm road systems and on-farm works. Irrigation water of maximum 0.2 m^3/sec is diverted from the Njoro river through the proposed intake structure and the canal system.

The intake structure is of floating type concrete weir. The crest elevation of the weir is set at EL.757.2 m. to take water effectively when the riverflow is low. The scouring sluice with a controlling gate is provided at the left side of the weir to control sedimentation.

The intake will be constructed just upstream of the scouring sluice. A concrete stilling basin is constructed in the downstream of the weir.

The canal system consists of a main canal, secondary canals, tertiary canals and a number of on-farm ditches. The main and secondary canals with length of 1.05 Km in total are lined with thin concrete. The drainage canals are provided to evacuate the excess water in the fields from the field drains through tertiary and secondary drains in turn to the Njoro and the Rau rivers. The farm roads are arranged so as to provide access to the field. Tertiary roads, in principle, run alongside the tertiary canals, and further, to link with each irrigation block, additional tertiary canals are provided.

To prevent the inflow of the Rau river flood, a flood protection dike is constructed along the left bank of the Rau river from the lower end to the intake site as mentioned in the succeeding section. The on-farm development works is carried out on the existing paddy field of 150 ha.

The general layout of the scheme is as shown in the attached drawing. The irrigation areas, canal capacities and lengths of each section are presented in the irrigation system diagram in Fig. VII-6. The drainage diagram showing the drainage area, capacities and lengths of drainage canals proposed are presented in Fig. VII-8. The general features of the scheme are as shown in Table VII-4.

(2) Mabogini Irrigation Scheme

The Mabogini irrigation scheme lies on the right bank of the Njoro and the Rau rivers. The area is presently served with the existing Uru Chini irrigation canal. The canal system has so deteriorated that it is not well operated. A water right of 10 cusec (0.28m^3/sec), extracted from the Njoro river has been granted to the existing Uru Chini scheme. Further the sugarcane field (Rau river sugar estate), extending just downstream of the confluence of the Rau and the Njoro rivers, has a water right of 2 cusec (0.057 m^3/sec). The water for the field is diverted from the head reaches of the Uru Chini main canal. Adjacently to the Uru Chini main canal, the existing paddy fields of 50 ha extend. The water for them are taken from the Njoro river through three traditional intakes.

With the Project work, the above mentioned Uru Chini scheme area, the existing paddy fields and the sugarcane field are incorporated into a single irrigation system, by unifying the intake structure to be constructed on the Njoro river.

The scheme area is bounded with the Njoro river and the Rau river on the north and east, respectively. The southern and western edges reach to the extent of the available water of the Njoro river. According to the water balance study made in ANNEX IV, the irrigation area of the scheme is determined to be 850 ha in the rainy season and of 350 ha in the dry season. The intake site is selected near the existing Uru Chini intake to efficiently divert the water to the scheme area.

The Project works consist of rehabilitation of the existing Uru Chini main canal, construction of the intake structure, irrigation, drainage and farm road systems, on-farm works and the flood protection embankment. Maximum water of 1.08 m^3/sec is introduced from the Njoro river through the intake structure, and canal system into the scheme area of 850 ha.

The intake structure is of floating type concrete weir. The crest elevation of the weir is set at EL.752.8 m so that the water can be taken efficiently when the riverwater is low. The scouring sluice to be provided with a controlling gate is constructed at the right side of the weir just downstream of the intake. The stilling basin in the downstream section of the weir is protected with concrete.

The irrigation canal system consists of a main canal, secondary canals, tertiary canals, and many on-farm ditches. The main canal runs alongside the Njoro river for 0,5 Km, and offtakes the water to the secondary canal for the existing paddy field and the sugar estate. The main and secondary canals with the total length of 13.5 Km are concrete-lined. A main farm road provided alongside the main canal is connected with the proposed Chekereni trunk farm road at Mabogini village. Secondary and tertiary farm roads, in general, are constructed alongside secondary and tertiary irrigation canals, respectively. The drainage water occurring in the western part from the trunk road is transported through the drainage system to the wasteway to be constructed on the border of TPC and finally to the natural stream. On the east, the drainage water is discharged into the Rau river passing drainage suice to be provided under the flood protection dike.

The general layout of the scheme is as shown in the attached drawing. The irrigation areas, canal capacities and canal lengths are as shown in Fig. VII-6. The drainage areas, drainage canal capacities and lengths are as presented in Fig. VII-8. The general features of the scheme are as shown in Table VII-5.

(3) Rau Ya Kati Irrigation Scheme

The Rau Ya Kati irrigation scheme is situated on the right bank in the middle reaches of the Rau river. There exist two traditional furrows in the area, irrigating paddy, maize, banana, coffee, etc., by use of the Rau riverflow. The existing canal system is very primitive and not provided with water control facilities, and the water supply is not well managed. The Rau Ya Kati scheme is contemplated to unify two traditional furrows to make efficient water use and management.

The scheme area is a narrow strip surrounded with the Rau river, railway, sugar estate field, and the existing Chekereni main canal. The elevation of the area ranges between EL.742 m at the upper edge and EL.726 m at the lower edge sloping at an average of 1/300 toward the southeast.

The proposed intake site is selected so that the water diversion to the area can be guaranteed when the riverwater is low. The site is situated 1.2 Km downstream from the confluence of the Njoro and the Rau rivers.

The irrigation area is determined to be 450 ha in the rainy season and of 180 ha in the dry season according to the water balance study as mentioned in ANNEX IV.

The Project works consist of construction of an intake structure, irrigation, drainage and farm road systems, on-farm development works and flood protection embankment. Irrigation water of 0.58 m^3/sec of maximum is diverted to the scheme area of 450 ha from the Rau river through the proposed intake structure and irrigation canal system.

The intake structure is of the floating type concrete weir. The crest elevation is set at EL.742.4 m. The scouring sluice with the width of 1.0 m is provided with a controlling gate on the right side of a weir to control sedimentation and to maintain the low flow stream toward the intake. The stilling basin in the downstream of the weir is protected with concrete to dissipate the excess energy of the flow over the weir crest by hydraulic jump.

The irrigation canal system consists of a main canal, secondary canals, tertiary canals and on-farm ditches. The main canal runs first along the flood protection dike for about 1.7 km on its head reaches. After separating from the dike, the main canal takes its alignment on the traditional furrow. The main and secondary canals are lined with concrete for 6.7 km in total.

A main farm road to be provided alongside the main irrigation canal is connected with the village road and then to the Chekereni trunk farm road. Secondary and tertiary roads are, in principle, provided along the secondary and tertiary canals.

The drainage water in the area is introduced to the Rau river. The drainage canals are so arranged as to gather the drainage water at the lower end and to limit the number of the drainage outlets to the Rau river as much as possible. With on-farm works, land levelling is needed for the existing paddy field and the upland field.

The general layout of the scheme is as shown in the attached drawing. The irrigation areas, canal capacities and lengths are as shown in Fig. VII-7. The drainage diagram shows the drainage area, drainage canal capacities and length as presented in Fig. VII-9. The general features of the scheme are as shown in Table VII-6.

(4) Chekereni Irrigation Scheme

The Chekereni irrigation scheme is located on the right bank of the Rau river in the southern edge of the Lower Moshi area. There are two existing irrigation canals having water rights. One is the Chekereni Ujamaa village canal which was constructed in 1973. The other is the former Kahe sisal estate canal, so-called Gynja Canal, which is used by the villagers. A water right of 5 cusec (0,142 m^3/sec) extracted from the Rau River is granted to the Chekereni canal, and of 3.75 cusec (0,106 m^3/sec) to the Gynja canal as mentioned in ANNEX IV.

The Kilimanjaro Agricultural Development Center (KADC) Project is under implementation in the Chekereni village, where a pilot farm is contemplated for demonstration and extension of the improved irrigation farming for the Lower Moshi area. The plan of the KADC project shows that the water supply to the pilot farm is made via the existing Chekereni canal with the present canal capacity. Therefore, with this scheme, the water supply to the pilot farm has to be assured. On the other hand, the Gynja canal takes the water from its intake located just downstream of the existing Chekereni intake; however, the facilities are mostly deteriorated. The Chekereni irrigation scheme is formulated so as to incorporate the existing Chekereni system and the Gynja system into a efficient irrigation system.

The scheme area is bounded with the existing Chekereni canal, the Rau river, and the NAFCO lead canal and fields on the north, east and south, respectively. The western edge reaches to the extent of the available water of the Rau river. The water balance study made in ANNEX IV indicates that the irrigation area of the scheme is 850 ha in the rainy season and 370 ha in the dry season. To efficiently supply water to the area, the intake site is selected 0.5 Km upstream of the existing Chekereni intake.

The Project works consist of rehabilitation of the existing Chekereni and Gynja canals, construction of the intake structure, irrigation, drainage and farm road systems, on-farm works and the flood protection dike. Maximum water of 1.11 m^3/sec is diverted from the Rau river through the intake structure and canal system into the scheme area of 850 ha.

The intake structure is of floating type concrete weir, the crest elevation of the weir is determined at EL.725.5 m. The scouring sluice to be constructed on the right side of the weir is provided with a controlling gate of 1.0 m width. The stilling basin in the downstream of the weir is protected with concrete.

The irrigation canal system consists of a main canal, secondary canals, tertiary canals and many on-farm ditches. The main canal takes alignment from the existing Chekereni canal. At its head reaches, the water is diverted to the area commanded by Gynja canal. A pilot farm of about 80 ha of the KADC Project is served with the main canal. The main and secondary canals are concrete-lined with a total length of 10.8 Km. The main farm road to be provided alongside the main canal crosses the Chekereni trunk farm road at the Chekereni village. Secondary roads and tertiary roads to be provided alongside secondary and tertiary canals are connected each other. On the western area of the scheme, the drainage water is introduced through the drainage system in the area into a lead drain to be constructed on the border of TPC and transported outside the Project area. The drainage water occurring in the eastern area is discharged into the Rau river through the drainage sluice to be provided under the flood protection embankment.

The general layout of the scheme is given in the attached drawing. The irrigation system diagram shown in Fig. VII-7 presents the irrigation areas, canal capacities and lengths. The drainage diagram showing the drainage area, canal capacity and lengths are presented in Fig. VII-9. The general features of the schemes are as shown in Table VII-7.