

2. IDENTIFICATION OF PROBLEMS

Major existing problems in the agricultural sector are summarized as follows:

- (1) Overpopulation and shortage of land in highland areas, or the coffee-banana belt, on the slopes of Mt. Kilimanjaro, forcing migration to lower areas where there is less rainfall.
- (2) Water supply in areas with little rainfall. The extension of cultivated land will be possible only with reliable sources of water. Hence the urgency of exploitation and effective use of water.
- (3) There is much room to increase the productivity of existing cultivated land. The use of more and better input materials such as chemical fertilizers, pesticides, insecticides, improved seeds and varieties, etc., as well as better farm management are necessary.
- (4) Improvement in labour productivity. Mechanization of cultivation in lowland areas and provision of more convenient means of commuting between kihamba and shamba are important in this respect.
- (5) Lack of forage. A decrease in wild grass during the dry season is the greatest bottleneck of livestock farming in the region. Also the competition of concentrated feed with food crops for human beings presents a problem.
- (6) The number of cows in highland areas cannot be increased very much because of the limited amount of land for cultivation of cattle feed.
- (7) Cattle diseases stand in the way of increased production in livestock farming.
- (8) A shortage of trained manpower, particularly for the provision of extension services. In order to solve the problems stated in (2), (3), (4), (6) and (7), the assistance of skilled manpower is definitely required.

3. THE MEDIUM-AND LONG-TERM DEMAND AND SUPPLY PICTURE FOR CROPS

The nonsugar per-capita calorie intake of the region is estimated to have been 1,580 calories in 1975. With sugar included, the figure is 2,190 calories. This level of intake is a little better than that in other regions although not entirely satisfactory.

The figure of 1,580 calories would seem to be too low an estimate, perhaps due to underestimation of maize and meat production in the statistics. Raising the level of self-sufficiency in connection with per-capita calorie intake should be one of the criteria of food production in the region. Hence the target nonsugar per-capita calorie intake of 2,200 calories for 1985. The daily per-capita intake of protein in the region in 1975 is estimated to have been 38.2 g : 25.4 g of vegetable protein and 12.7 g of animal protein. The target for 1985 is 55 g.

Future food production also has to cope with increase in population, which is expected to be 38% over the 1975 population by 1985. In addition, it is desirable that food production be greater than what is necessary to meet local requirements so as to be able to help out other regions facing food shortages.

The nation is facing a shortage of foreign exchange, in the earning of which export crops play an important role. Increased production of such crops is therefore another important part of the development plan.

The following are crop production goals for meeting these requirements.

The production goals set above are based on the technical and financial feasibility of increase of production over the short run. The nutrition level set in the present report is expected to be achieved by 1985 even taking into account the increase of population.

The average annual growth of food crop production in the planned period of 10 years is estimated to 5.0%, and that of cash crops 4.2%. The income of farmers should grow faster than these production growth rates thanks to price increases to be expected from improvement of quality and to rationalization of production and marketing.

The crop production goals in the present report are rather conservative in comparison to those of existing plans. Achievement of even them, however, will require considerable efforts in the light of existing conditions in the region.

(Table - 40)

	Production in normal year (i) (tons)	Production (tons)		Increase (%)		
		1980	1985	1980/75	1985/75	Average
Cash crops						
Coffee (ii)	20,518	24,960	30,370	22	48	4.0
Cotton	1,196	1,930	3,100	61	159	10.0
Sugar	49,103	62,660	76,100	25	55	
Sisal	6,986	7,000	7,000	0	0	0.0
Seed beans	770	980	1,250	27	62	5.0
Pyrethrum	95	150	250	61	159	10.0
Cardamon	19	30	50	61	160	10.0
Food crops						
Bananas	305,809	363,300	431,480	19	41	3.5
Maize	45,466	73,200	117,760	61	159	10.0
Beans	2,904	3,890	5,200	34	79	6.0
Finger millet	3,800	5,080	6,810	34	79	6.0
Paddy	6,332	11,160	19,670	76	211	12.0
Wheat	9,359	13,750	20,200	47	116	8.0
Cassava	3,125	4,140	5,600	34	79	6.0
Irish potatoes	8,830	12,970	19,050	47	116	8.0
Sweet potatoes	3,965	5,310	7,100	34	79	6.0
Vegetables	3,034	4,060	5,430	34	79	6.0
Citrus fruits	83	130	210	61	159	10.0

- Remarks: (i) Production in normal year is the product of the annual average yield (kg/ha) during the period from 1966 to 1975 and the cultivated area in 1975. The adoption of the ten-year average yield is due to the unusually low agricultural production from 1973 to 1975 owing to the droughts during the period.
- (ii) Only production by smallholders is included. The increase of cultivated land and the further improvement of cultivating technology by commercial farms may be difficult.

4. DEVELOPMENT STRATEGY AND MEASURES

4.1 Crops

In order to realize the target figures for crop production of the previous section, development strategy for crop production has to be carefully established. The increase in crop production can be achieved by an increase of yields in the existing land and by the expansion of cultivated land.

Emphasis is placed generally on increase of yields for greater results with less investment in the short run. Inevitably entailed are greater input and better management. However, extension of cultivated land is also important because the creation of more employment opportunities is an urgent need of the region. Extension of cultivated land depends upon the availability of water since it will be possible for the most part only in areas with little rainfall. The exploitation and efficient utilization of water is a key to the successful expansion of agricultural land. In selecting the crops to be planted, moreover, the amount of water available should also be taken into consideration.

In addition, the provision of necessary inputs, infrastructure such as transportation facilities, and skilled manpower have to be assured.

From the viewpoint of agricultural technology, measures to be taken for each major crop are pointed out below.

(1) Cash crops

(i) Coffee

In spite of an insufficient supply of coffee and rising prices in world markets at present, a great increase in production should not be planned as prices in world markets will not remain so high in the long run. In order, however, to cope with international competition for the time being, efforts have to be directed to reduction of production cost and to improvement of quality in order to get higher prices. Such efforts should be made as soon as possible while prices are still high because it is certain that the international competition in terms of both quality and prices will become severe again when Brazil regains its production capacity damaged by frost in 1975. The following measures which TCB has recommended already should be further strengthened:

- (a) Replacement of old or diseased trees with young plants;
- (b) Use of pesticides for improvement of quality and quantity; and
- (c) Promotion of centralized pulping to improve quality, taking into account the fact that better management of central pulperies is essential to the participation of more farmers, who otherwise will do their pulping themselves.

Also, this opportunity should be taken to build more warehouses.

(ii) Cotton

From the angles of domestic consumption and export, cotton is an important crop from which fibers, cooking oil and oil cakes are made. It also contributes to the expansion of industries such as spinning, weaving, oil extraction, and feed production. Cotton is a valuable cash crop to smallholders in lowland areas. Therefore the largest growth rate is given to cotton in the present plan in spite of technical difficulties in cotton production. However, cotton is vulnerable to drought, diseases and pests, and insects. The production increase can be realized more by increase in yield than by expansion of planted area. Irrigation and adequate extension services are necessary to improve the yield. TCA's service staff should be strengthened. The prices at the farmer's gate seem to be unattractive when compared to those of other crops. This has to be examined carefully.

(iii) Sugar

Sugar plays an important role both as an export product and in home consumption. However, rapid expansion of planted area will not be easy since irrigation facilities are inadequate. Some of the newly exploited water sources will be allocated to the expanded sugar cane area within the context of the overall water development plan of the region. It should be noted that efficient use of water can be made by estate farms like TPC and NAFCO. With expansion of irrigation, it will not be difficult to achieve the targets for sugar production set in the present report.

(iv) Sisal

It is not desirable to increase the cultivated area of sisal in view of the unfavourable market prospects. However, sisal is drought resistant and requires less labour and fertilizers than other crops. Moreover, the region's climate suits it well. The prospects for development of markets for products other than ropes, for paper for example, should be examined at the national level. However, it is recommended that the present level of production be maintained for the planning period through a 20% decrease in cultivated area and an increase in productivity for lower production costs. The unused land should be planted to maize and cassava after examination of the soil and provision of guidance in cultivation techniques.

(2) Food crops

(1) Bananas

Bananas are the largest food crop in the region in terms of production and calorie value per hectare, about 50% of the calorie intake in the region being accounted for by them. Their leaves and canes are used to feed fowls. However, the planting of bananas is limited to areas where there is much rainfall or a high level of subsurface water. There is therefore little leeway for extending the planted area. This is why bananas have been given the lowest production growth rate. What increase there will be due to an increase in yield, which can be achieved through better varieties, proper spacing in the case of interplanting with coffee, and malting.

(ii) Maize

An annual production growth rate of 10% is planned for Kilimanjaro, which is a target that will require a considerable effort. The increased production will be realized mainly by increasing yield and extending planted area, particularly in lowland and upper lowland area. In the extension of planted area priority will be given to locations where irrigation will be available: about 3,000 ha of newly reclaimed irrigated land in the Moshi and Pangani Basin areas. In order to decrease irrigation costs, double cropping is recommended. Also, yield can be raised by increasing irrigated area, efficient use of water, improvement of cultivating techniques, and greater use of improved seeds (hybrid and composite seeds), fertilizers, insecticides, etc.

(iii) Beans

The production of beans should be encouraged since beans are harvested in a shorter period than other crops, they fix nitrogen in the soil, their seeds are 20% protein, and their market price is relatively attractive to farmers. Since smallholders interplant beans with maize, measures to increase production are closely connected with those for maize.

(iv) Paddy

The highest production growth rate planned in the present report is that for paddy. The reasons are: (1) the planted area doubled during a recent 10-year period; (2) rice is the second largest crop in the region in terms of calorie value per hectare (next to banana) and quantity of protein per hectare (next to wheat); and (3) the yield is very high with well-managed irrigation, and, as verified by the Japanese team, paddy production is profitable. At present paddy is produced mostly in the southeastern part of Moshi Town and in the Mkomaji Valley of the Pare District. These areas will remain the paddy production centers, with priority being given to increase of yield rather than to expansion of irrigated land. In the areas mentioned above, double cropping involving combination of paddy with other crops such as maize, vegetables, etc., is recommended. Such crop rotation protects against soil exhaustion and diseases and insects in the soil. Also, paddy can be cultivated in swamps, which are not suitable for other crops. Irrigation and land levelling are indispensable to paddy cultivation, and wider application of good cultivation techniques is essential for a rapid increase in production. It is desirable that paddy projects presently under way be further strengthened. When production increases to a certain extent, a plan for extraction of bran oil is worth considering.

(v) Wheat

Wheat yields the most protein per hectare of any crop in the region. It is and will continue to be produced mostly on large estates like NAFCO and private farms in the Hai District. Production varies largely according to annual rainfall, and expansion of planted area will not be easy. Therefore the target figures set in the present report will have to be achieved through employment of more advanced cultivation technology and improvement of farm management.

(vi) Root crops

Irish and sweet potatoes are planted in areas with relatively high rainfall, while cassava is planted in lowland areas since it is drought-resistant. A system in which Irish potatoes are planted in forest glades for three years after woods are cut has been established in West and North Kilimanjaro as a system that is beneficial to both agriculture and forestry. The cultivation of sweet potatoes provides the largest yield among root crops when the soil contains proper moisture. Although the yield is large in comparison to other crops, the merits of sweet potatoes as a staple food are somewhat inferior to those of other root crops. Irish potatoes and cassava are supplementary staple foods, the former yielding the largest quantity of protein per hectare among root crops. As the production of root crops increases, their storage and transportation will present a problem. In the future the production of dried chips and starch is also recommended.

(vii) Vegetables and fruits

Vegetable and fruit production will have to keep pace with population growth. However, variety and quality are more important than quantity. Priority should be given to cabbages, tomatoes, onions, carrots, rod of beans or peas (cow peas, string beans, garden peas) and citrus fruits. These vegetables and fruits are planted in rainy and cool highland or irrigable lowland areas according to the weather and soil conditions suitable for each crop. Increase in production will be achieved by increasing yield in highland areas and increasing both yield and cultivated area in lowland areas. Yield can be increased with selected varieties, improved seed, use of fertilizers, and protection from diseases, pests and insects. Products of good quality will bring an increase in farmers' income, and improvement of quality will entail selection of varieties which consumers prefer, intensive management, and wider use of good cultivating techniques. Also storage, transportation, processing, and market facilities should be improved for the benefit of both producers and consumers.

4.2 Livestock

(1) Feed

Alleviation of the feed problem, one of the major obstacles to an increase in livestock production, will depend on successful use of pasture and successful exploitation of agricultural by-products and other hitherto unutilized resources.

(i) Concentrated feed

In order to secure enough protein-rich feed for domestic animals to maximize their productive ability, it is necessary to utilize as feed agricultural by-products and those miscellaneous grains not used as food grains. At present the following can be used as feed.

(a) Baggas and molasses

By-products of sugar manufacturing, baggas and molasses make a satisfactory feed if mixed with each other in the ratio of 1 to 1.5-2.0. The mixture is in the form of powder, is not sticky, and does not become stiff. Easy to blend and manufacture, the mixture would make an ideal feed for use in the dry season. It can be preserved in an excellent state for about 4 months.

(b) Ground corn cobs

A mixture of corn cobs, molasses, and a protein-enriching feed in the ratio of 70%, 5% and 25%, respectively, would also make a satisfactory feed. Such materials as corn bran, blood powder and fish powder may be used as the protein-enriching feed.

(c) It is desirable to promote production of starch in areas where plants with rootstocks such as cassava, potatoes and sweet potatoes are extensively cultivated, since starch as well as dried chips of rootstock wastes may be used as a feed. It would also be possible to make use of such by-products as cottonseed wastes as storable feedstuffs.

(ii) Roughage

The shortage of roughage during the dry season is one of the major causes of drastic deterioration of livestock nutrition. In order to secure a sufficient amount of roughage during the dry season, it is essential to put wild grasses to more rational use than they are at present and to take measures to improve natural pasture at the earliest possible opportunity. One thing that can be done in this respect is to improve haymaking. Also worth pursuing is cultivation of feed grasses of the pulse family on fallow lands of estates for the production of hay. This last scheme is also an effective means of improving soil fertility.

(a) Selection of grasses suitable for each district

It is necessary to disseminate the seeds of grasses that are found to be excellent by experimentation and research institutions and to offer guidance with respect to their cultivation. The feed grasses listed below would seem to be good prospects in this respect. The relevant data concerning them was collected in lowland areas of Rombo and Pare.

These grasses take root easily if the seeds are sown on pasture land after it has been well grazed. They are suitable for areas with annual rainfall between 600 and 700 millimeters, the growing period being only 4 months in summer. The vertical varieties give better yields than the others.

- Siratro (*P. atropur pureus*)

Perennial and highly resistant to drought, this grass grows well when cultivated intermingled with gramineae grasses. It is suitable for cultivation in areas with an annual rainfall of 600 to 1,700 mm.

- Pangola grass (*D. decumbens*)

- Green panic (*P. maximum var trichoglum*)

Highly resistant to drought, this grass grows well in places with an annual rainfall of 500 to 1,000 mm. The yield can be increased by application of nitrogenous fertilizer.

(b) Opening of common grazing lands in highland areas

It is necessary to develop common grazing land in each locality adjacent to forest reserves, to jointly take care of the animals prior to their mating, and also to jointly make hay and thereby to facilitate the development of a cooperative organization in each village. (See the section on "Measures for promotion of dairy farming" below.)

(c) Opening of common mowing lands in lowland areas

It is necessary to establish common mowing land in each locality as a means of facilitating effective utilization of available grasses, improvement of natural pasture, the making of hay. In order to make this possible it is of vital importance to prepare an organizational framework that encourages active participation of peasants and to provide machinery for hay-making. Availability of water is also an important factor that needs to be taken into consideration in the development of mowing grounds. In the exploitation of water resources, priority should of course be given to efforts to increase production of food. But it is also important to see to it that water resources be utilized in such a way as to facilitate preservation of livestock resources.

(2) Improvement of productive capacity of livestock

Improvement of productive capacity depends above all else on successful improvement of breeds and/or crossbreeding. And for this, it is of vital importance to consolidate relevant organizational frameworks and to train experts who can give guidance in improved techniques.

(3) Sanitation of livestock

It can be easily imagined that epidemic diseases and chronic diseases cause serious economic loss. Investigation and early diagnosis of these diseases for their prevention would bring a significant increase in livestock production. At present, however, there is no facility that

can make accurate diagnosis of these diseases, not enough experts for affording guidance, and a lack of adequate transportation for the few experts that there are. It is thus essential to establish a facility in each locality that can deal with the problem and reinforce the system of extension services.

(4) Distribution of products

It is necessary to see to it that producers are given adequate incentive to produce in terms of distribution of their products. As livestock production increases in the future, accompanied by an increase in the volume of products shipped out of the region or exported out of the country or further processed within the region, the distribution networks leading to consumption centers will have to be improved, and related facilities such as butcheries and livestock markets will have to be expanded. Such improvement and expansion should be started on before too long.

(5) Measures for promotion of dairy farming in highland areas

Agriculture is so intensive in these areas that there is hardly any land available for stock farming. Also, production of roughage is seriously limited, making it virtually impossible to increase production of livestock products by increasing the number of cattle. Priority, therefore has to be given to efforts for qualitative improvement of the livestock through crossbreeding and for improvement of the productive capacity of livestock through improvement of nutrition and breeding and raising techniques. In order to increase production of milk, it is essential to increase the fertility ratio, to introduce better breeds of cows, to improve the milk yielding capability and to increase the quantity of grasses produced. And in order to increase the fertility ratio, it is essential to establish a system that assures crossbreeding of appropriate breeds of cows at appropriate times and to establish and gradually expand communities concentrating on stock farming. The Hai, Moshi and Rombo districts should each have common grazing grounds adjacent to forest reserves on which to build such stock farming communities. Advantages of using a pasture include the following.

- (i) Young dairy cows and milk producing goats that have grown mature enough to be crossbred and those awaiting new rounds of sexual excitement after delivery are put to pasture.
- (ii) Improvement of nutrition and examination of health conditions can be readily undertaken prior to crossbreeding.
- (iii) The cow is crossbred with a bull which exactly corresponds to its degree of improvement and is brought back to its owner's farm as soon as its conception is confirmed.
- (iv) Grazing helps improvement livestock, improving the fertility ratio and preventing epidemics of diseases of sexual organs.
- (v) Grazing facilitates technical guidance and encourages community-wide activities for greater stock farming production.
- (vi) Grazing grounds can serve as experimentation stations or centers in an effective way.

5. PROJECTS PROPOSED IN THE AGRICULTURAL SECTOR

Fourteen agricultural projects have been selected for attainment of the development objectives stated in the previous section as evaluated on the basis of the following criteria (except four livestock projects):

- Output
- (1) food sufficiency and nutrition improvement
 - (2) foreign exchange earnings or savings
 - (3) reduction of income gap between districts
 - (4) mitigation of overpopulation in highland areas
 - (5) improvement of welfare
 - (6) gestation period of project
 - (7) overall economic benefit
 - (8) ratio of economic benefit to investment
- Input
- (1) investment
 - (2) foreign exchange consumption
 - (3) manpower requirements
 - (4) water requirements
 - (5) other resource requirements
 - (6) difficulty of project implementation

The results of such evaluation are shown in the following table. Also, the description of the projects, the estimated cost of the agricultural projects, and the detailed description and cost of three projects (No.1, No.2 & No.10) are attached.

Rating of Agricultural Projects

(Table - 41)

Name of Project	Output								Input					
	Food Sufficiency and Nutrition Improvement	Foreign Exchange Earning or Saving	Reduction of District Income Gap	Mitigation of Over-population in Upper Areas	Improvement of Inhabitants' Welfare	Gestation period of Project	Overall Economic Benefit	Ratio of Economic Benefit to Investment	Investment	Foreign Exchange Consumption	Kanpower Requirement	Water Requirement	Requirement of Other Resources	Difficulty in Project Implementation
1. Lower Moshi Area Rural Development	A	C	D	A	A	A	A	A	C	B	D	D	D	C
2. Promotion of Irrigation Schemes	A	C	A	A	B	A	A	A	D	C	C	D	D	B
3. Extension Service Project - Agricultural Technical Center	A	C	C	C	C	C	A	B	C	B	C	C	C	C
4. Agricultural Mechanical Service Center	C	B	B	D	C	B	B	C	E	C	C	A	D	C
5. Seed Multiplication Farm Project	A	C	C	D	C	B	C	C	A	A	B	A	A	B
6. Rice Production Project	A	D	B	C	C	A	A	A	A	A	A	C	B	A
7. Vegetable Production Project	A	B	C	D	C	B	C	B	A	A	A	A	B	A
8. Cotton Production Project	D	A	B	C	C	A	C	A	A	A	B	B	B	BB
9. Coffee Nursery Project	D	A	D	D	C	B	B	B	B	A	A	A	B	A
10. Survey for Water Development	A	C	A	A	A	D	A	C	C	C	C	D	D	B

Remarks: Grading - Output A > B > C > D
 Input A < B < C < D

5.1 Description of Agricultural Projects

It goes without saying that water is the most important factor in the agricultural development of the region. Hence the top priority that has been given to irrigation projects among the agricultural projects proposed in the present report.

These irrigation projects are:

- Project (1) - 1
- Project (1) - 2
- Project (1) - 3

The reason why the irrigation programme has been divided into three different projects is that the extent to which the basic conditions of the various projects is that the extent to which the basic conditions of the various project areas are known varies from project area to project area. Among these basic conditions are the amounts of surface and underground water, the amounts that can be used, the present state of irrigation, and soil conditions. For some areas, these conditions are already quite clear, and in the case of some other areas surveys will have to be carried out to determine them. In the case of areas included in Project (1)-3, in particular, information on such conditions is far from adequate, and therefore, with respect to them, surveys will have to be carried out expeditiously before project implementation.

(1) Lower Moshi Area Rural Development Project

(i) Objectives

The southeastern part (Kahe Basin) of the Moshi District has the most abundant water resources of all lowland areas of the region, with surface water available from the Rau and Mue rivers and the Miwaleni and Soko springs. In addition, it has become clear as the result of recent surveys* that there are considerable water resources throughout the district.

At present, such water resources are harnessed to a considerable extent by the estate owned and operated by the T.P.C. (Tanganyika Planting Company), NAFCO (the former Kenaf Farm), villages, and individual farmers. If new water resources are exploited and the water resources presently available are utilized more efficiently, it should be possible without too much difficulty to increase local farm production considerably. Moreover, the project area is located near Moshi and has relatively good transportation facilities, which makes for high investment efficiency.

Furthermore, this development project will contribute toward adequate supply of perishable foods to Moshi and labour to the industrial sector and play some role in mitigating overdensity of population in highland areas.

* Underground Water Survey, Agricultural Development Project
Kilimanjaro Region, Tanzania JICA 1976

It is also expected that the project will provide a new model for integrated regional development, composed mainly of several core villages, not only through development for greater agricultural production but also through infrastructural development.

(ii) Outline of Plan

In the first phase of the project (6 years) agricultural production will be increased by extension of farmland by improvement of the existing irrigation system (intakes and channels) and farms for more efficient utilization of the water resources now available.

In addition to the above, various improvement schemes are proposed for development of this district, as referred to in Project 3 and subsequent projects.

Needless to say, the system for supply of water for drinking and other domestic uses will also be improved.

The second phase of the Project will start before the first phase work is finished and will put particular stress upon infrastructural development, including roads, power supply, sanitation and schools, during the period of overlap with the first phase.

The plans for each phase are as follows:

1st Phase:

- (a) Improvement of necessary facilities and farmland for exploitation and utilization of new water resources.
- (b) Improvement of existing intakes and channels for effective utilization of water resources available at present.
- (c) In addition to items (a) and (b) above, the project encompasses some aspects of other related projects, for instance, extension service, agricultural and mechanical service and rice, vegetable and cotton production as proposed in Project 3 and subsequent projects.

2nd Phase:

- (a) Infrastructural improvements will be in the order in which the villages complete the agricultural project.
- (b) First priority will be given to improvement of the road network within the district, including the road to Moshi and the feeders connected with trunk roads.
- (c) The project will be implemented by the following organization:
 - The Regional Development Director will act as the highest responsible organ for implementation of the project.
 - A Project Office will be established within the Regional Office to promote the planning and other work of the project.
 - The Project Office will be organized by officials concerned with farming, irrigation, and other related affairs.

- The Project Office will be represented by the Regional Finance and Planning Officer as the highest responsible person.

(iii) Project Areas

The project areas include Mandaka, Upper Miwaleni, Lower Miwaleni, Kitereni, Soko, Chekereni, Ntakuja, Mabogini and Musaranga.

Cultivated area	2,120 ha
Area to be newly cultivated	1,000 ha
Newly irrigable area	2,040 ha

(iv) Input

1st Phase (6 years for agricultural development)

Staffing: Manager	1
Experts (civil engineers)	6
Assistants	16
Administrative officers	2

Equipment and materials: Civil construction equipment
Boring machinery
Cement, etc.

(v) Effect

Increase in annual farm production by 10,142 tons of maize and 1,840 tons of paddy after first phase of the project.

(vi) Financial requirements

New investment budget (for agricultural development in 6-year first phase).

Construction cost for improvement of intakes, channels, and farm-land: 44,000,000 shs.

Annual working expenses (after completion of project): to be borne by Project 3 and subsequent projects.

(vii) Phasing of Programme

1st Phase	1977	1978	1979	1980	1981	1982
Status survey on water and land utilization	██████████					
Planning & designing	██████████					
Work performance		██████████	██████████	██████████	██████████	██████████
Agricultural guidance		██████████	██████████	██████████	██████████	██████████

2nd Phase	1977	1978	1979	1980	1981	1982
Present status survey		██████████				
Planning			██████████			
Design and improvement work for main roads			██████████	██████████		
Design and construction work for other infrastructural development				██████████	██████████	██████████

(viii) Problems

- Availability of funds
- Development priorities of the different sectors

(2) Promotion of Irrigation Scheme

(i) Objectives

The Pangani Basin and the Mkomaji Valley have been selected as project areas for more effective use of water resources now available and exploitation of new water resources, the immediate aim being to increase farm production substantially and to attract surplus population from densely populated districts.

For areas where no definite plan can be worked out for development of water resources for irrigation until the method of utilization is clearly determined after investigation of incoming and outgoing conditions of water, a project (Project 10) has been planned for the purpose of such investigation.

(ii) Outline of Plan

Facilities and lands will be improved for irrigation purposes in each project area as described in the following item.

Along with implementation of the projects, necessary technical guidance and assistance will be provided for encouragement of agriculture under Project 3 and subsequent projects, thus insuring the overall effect of implementation.

(iii) Project Areas

(a) Pangani Basin

Existing farmland to be improved in Kiriya, Mama, Ruvu, Mferujini and Jitengeni: 1,440 ha

Area to be newly cultivated: 1,760 ha

(b) Mkomaji Valley

Existing farmland to be improved in Kalimae, Gonja, Ndungu and Kifrio: 3,200 ha

(iv) Input

Staffing: Irrigation officers 5

Assistants 15

Other factors: Construction equipment, cement, etc.

(v) Effect

Annual increase in production is expected to be as follows after completion of the project.

Pangani Basin: 10,231 t increase in maize production
Newly receivable population 14,600

Mkomaji Valley: 5,120 t increase in maize production and 5,600 t increase in paddy production
Newly receivable population 8,000

(vi) Financial requirements (new investment budget)

Construction cost 68,900,000 shs.

Working expenses: To be borne by Project 3 and subsequent projects.

(vii) Phasing of Programme

	1978	1979	1980	1981	1982	1983	1984
Survey & planning	██████████						
Designing		██████████					
Construction work			██████████	██████████	██████████	██████████	
Technical guidance			██████████	██████████	██████████	██████████	

A separate project will be carried out to survey water resources in the project areas. If it becomes clear that a sufficient margin is still left in the balance of water supply and demand, a project aimed mainly at cultivation of new farmland will be commended for the second phase in each case.

(viii) Problems

- (a) The river water and soil in the Pangani Basin are of extremely high alkalinity (greater than pH9.0), having a high sodium content.

Therefore, cultivation by irrigation on land of such nature may result in accumulation of salt if the amount of irrigation water is insufficient, ruining the land in the long run.

- (b) The project areas appear to have favorable conditions from the standpoint of utilization of water resources. Actually, however, they are considerably handicapped in many respects from the standpoint of infrastructural development for the benefit of the local community, which may require a substantial amount of investment.

(3) Water Development for Agriculture

(i) Objectives

In recent years expansion of farmland in lowland areas has been proceeding at a rapid pace. The regionwide rate of irrigation at present is about 15%, as compared to 4% for Tanzania as a whole. With future increase of cultivated acreage, however, the region will have to exploit new water resources and rationalize water utilization.

The project aims at collection of necessary data for formulation of a water utilization plan by means of a detailed survey on exploitability of new water resources, on available quantities from existing water resources, and on the possibility of improvement of existing irrigation channels in the Mt. Kilimanjaro area, the lower Hai area, the lower Rombo area, the north Pare area, and the west Pare area.

Of these areas, there is already considerable cultivation by irrigation in those lying in Lower Hai: Rundugai, Kawayu, and Kikulewa. Surveys of these areas should therefore be completed as soon as possible for early project implementation.

(ii) Outline of Plan

In order to achieve the above objectives, surveys will be made of ground water, feasibility of small dam construction and the amount of water available therefrom, availability of water from Lake Chala, hydrology, irrigation and drainage systems, irrigation channel loss, and soil condition, including topographic mapping.

(iii) Project Area (survey area)

Mt. Kilimanjaro area	350 km ²
Lower Hai area	50 km ²
Lower Rombo area	40 km ²
North Pare area	50 km ²
West Pare area	20 km ²

(iv) Input

Manpower:	Hydrologists	2
	Irrigation engineer	1
	Hydro-geologist	1
	Soil scientist	1
	Assistants	15

Facilities, etc.: Survey office
Vehicles for survey
Instruments and materials

(v) Effect

Securing of adequate water resources for expansion of irrigation acreage and increase in food production.

(vi) Financial Requirement and Resources

Equipment, materials and fixtures for survey and planning
3,000,000 shs.

Survey cost 8,400,000 shs.

(vii) Phasing of Programme

	77/78	78/79	79/80
1. Mt. Kilimanjaro area	████████████████████		
2. Lower Hai	████████████████████		
3. Lower Rombo	████████████████████	████████████████████	
4. North Pare	████████████████████	████████████████████	
5. West Pare		████████████████████	

(4) Extension Service Project--Agricultural Technical Center

(i) Objectives

In order to raise the level of farm production, it will certainly be effective to increase yield per hectare as well as to extend farmland area.

For this purpose it is necessary to promote the rapid spread of new improvement technology, as achieved by the research efforts of universities or institutes. It is also important to provide educational activities for improvement of living conditions on farmsteads in terms of diet, sanitation, clothing and child care. It is planned to promote such educational activities by provision of the necessary organization, manpower, and materials.

(ii) Outline of Plan

This project envisions the establishment of a Technical Center equipped with all of the facilities, materials, and fixtures needed in connection with activities for the purpose of achieving more widespread use of new technology. Its activities will include the following:

(a) Establishment of an agricultural technology center with the following main functions:

- Preparation and distribution of leaflets or films for improvement of agricultural technology and living conditions and provision of guidance on circuit tours.
- Establishment of model test farm for introduction of new technology developed by universities and research institutes.
- Planning and guidance making use of display farms for main crops.
- Technical guidance by model seed multiplication farm.
- Proposal to the regional government to promote the spread of improvement technology.

(b) Establishment of display model farm

(c) Provision of necessary equipment and materials for educational activities.

(iii) Project Area

The whole region.

(iv) Input

Staffing: Twenty persons, including 16 experts

Facilities, etc.: Center building and annex facilities such as lecture hall, garage, machine shed, working area, and storehouse.

Model test farm (3 ha) and annex facilities, including equipment and fixtures, all within the premises of the Center.

Display farms to be provided at 16 locations, each 0.5 ha in area.

Vehicles 8 motor-bicycles
 2 patrol cars

Movie projector
Simple test instruments
Cooking utensils

(v) Effect

Productivity on the test farm after introduction of new technology can be expected to increase by 30-40% in 5 years. With guidance for improvement of living conditions, nutritive conditions will be improved and the rate of disease will decline.

(vi) Financial Requirements and Resources

Total new investment budget for 4-year period

Technical center (including training and annex facilities)	12,000,000 shs.
Test farm, equipment, etc.	1,500,000 shs.
Vehicles and other machinery	2,000,000 shs.

Annual working expenses after completion of the project

Payroll cost (for increase in total number of employees)	172,800 shs.
Test and display farms	240,000 shs.
Vehicle maintenance and operation	600,000 shs.
Total	1,012,800 shs.

Note: Project organization will be as follows:

- (a) The Technical Center will be supervised directly by the Regional Development Director. The Regional Agricultural Development Officer will concurrently assume the post of the Superintendent of the Center.
- (b) The District Agricultural Development Officer in each district will assume full responsibility for display farms in accordance with the planning and guidance of the Technical Center.

(vii) Phasing of Programme

	1st year	2nd year	3rd year	4th year	5th year
Planning & designing	██████████				
Building construction		██			
Test farm operation			██	██████████	██████████
Display farm operation			██	██████████	██████████
Educational activities				██	██████████

(viii) Problems

- Availability of skilled experts for staffing of the center.
- Selection of location of center.
- Coordination with existing training facilities.

(5) Agricultural Mechanical Service Center

(i) Objectives

As already pointed out (p.48), the use of oxen in agriculture should continue to be encouraged as a priority national policy. Nevertheless, it is a fact that a large portion of the total acreage on which maize, a main crop of the region, is cultivated is ploughed by tractor. Moreover, 70% of such ploughing is done by individuals from outside of the region. It will therefore be necessary to rationalize this kind of ploughing.

Tractor ploughing and ploughing by oxen both have their advantages and drawbacks, and the roles of tractors and oxen in ploughing are different. Therefore, cultivators should be encouraged to use both so that each can make up for the other's weaknesses.

With establishment of a Mechanical Service Center, it will be possible to plant maize and paddy rice in time for the rainy season, and deep ploughing will make it possible to increase crop yield. Moreover, foreign exchange savings can be expected from the rational use and maintenance of the many tractors now in operation.

(ii) Outline of Plan

- (a) There will be one or two such centers in each district. For the time being, two centers each will be provided in the Moshi and Pare districts, and a total of ten centers will be provided in the Rombo and Hai districts.
- (b) The work will include mainly ploughing, harrowing, ridging, and pest control.
- (c) Each center will be provided with a repair shop which will take care not only of the large machinery owned by the center but of other smaller machinery and tools used by farmers.
- (d) Farming work and repair work will be done at reasonable rates.
- (e) Each center will have a training course for tractor operators.
- (f) All the regional centers will be managed and supervised at the sole responsibility of the Regional Agricultural Development Officer while each district center will be managed at the responsibility of the District Agricultural Development Officer.
- (g) Experts assigned to the Technical (Project 3) Center will provide technical guidance and cooperation.
- (h) The total number of tractors owned by the center will be nearly doubled during the second phase.

(iii) Project Area

The whole region

(iv) Input

Manpower:	Officers	6 (additional)
	Drivers	78
	Others	60

Facilities, etc.:

Machinery--60 tractors, including necessary attachments, and other repair machines

Facilities-- center buildings
(Offices, repair shop, shed, and oil store-room)

(v) Effect

Estimated increase of production due to completion of farm work at the right time and season. 170,000 shs.

Foreign currency savings due to prolongment of service life of equipment and parts by means of good maintenance and repair practices. 1,200,000 shs.

(vi) Financial Requirements and Resources

New construction cost:

Planning and design	100,000 shs.
Building construction	1,800,000
Equipment and attachments	6,000,000
Repair tools, etc.	1,200,000
Total	9,100,000 shs.

The cost of the 20 units of equipment now in use can be deducted from the total investment estimated above.

Annual working expenses for the first phase after completion of the project:

Expenditures	4,903,200 shs.
Payroll costs	943,200
Cost of depreciation equipment and facilities	780,000
Operation & maintenance	3,180,000
Tractor operation	1,500,000
Repairs, etc.	1,200,000
Office expenses	480,000
Income	4,903,200 shs.
Income from ploughing work (200 shs. per ha, 300 ha by each of 60 tractors)	3,600,000
Income from harrowing work (90 shs. per ha, 180 ha by each of 60 tractors)	972,000
Income from repair work	331,200

(vii) Phasing of Programme

	1978	1979	1980	1981	1982
Planning & designing	██████████				
Construction		██████████	██████████		
Operation			████████████████████		

(viii) Problems

- Availability of financing sources for construction.
- Availability of able managerial personnel.
- Availability of parts or other imported items.

(6) Seed Multiplication Farm Project

(i) Objectives

The project calls for multiplication of superior seeds for major farm products, as recommended by the regional government, in order to standardize grades and increase total production. Such selected seeds will be distributed to farmers in general and to large farmlands covering a total of 1,200 ha, where such seeds will be actually used for cultivation of crops. Also contemplated is demonstration of such crop cultivation to farmers in nearby areas.

(ii) Outline of plan

- (a) The crops taken up in this project will be beans, rice, sorghum, finger millet and vegetables. Maize is not included because its seeds are supplied under a national program and are of mixed type.
- (b) Each district will be provided with at least 3 multiple seed farms (30 ha each), where crops and seeds suitable to the district will be produced.

The seeds multiplied at those farms will be supplied to farmers or co-operatives of farmers at charge or as subsidies in kind.

- (c) The quantity of crops and seeds of selected grade to be produced will be determined as recommended and planned.
- (d) A Regional Seed Center (5 ha) will be provided for production of the seeds to be originally sowed at the multiple seed farm of each district. Those original seeds will be distributed, free of charge, to each seed farm.
- (e) The order of priority in rationing original seeds will be: Ujamaa, villages, schools, and display farms.
- (f) The Regional Agricultural Development Officer will assume full responsibility for the planning and guidance aspects of the development scheme of the whole region and for management of the Regional Seed Center, while the District Agricultural Development Officer will manage the multiple seed farm of his district.

(g) Experts assigned to the Agricultural Technical Center (Project 3) will provide technical guidance.

(h) The vegetable garden now in operation will be included in the plan of this project.

(iii) Project Area

The whole region.

(iv) Input

Manpower: R.A.O. 1 (concurrently with present post)
 D.A.O. 4 (" " " ")

Others: Regional Seed Center
 District Multiple Seed Farms (30 ha each) 4

Each district is to be provided with 3 seed farms, each with an average area of 10 ha.

(v) Effect

Seeds are to be produced on a total of 120 ha in quantities sufficient to supply a total farmland area of about 5,000 ha in the last year of the project. Crop production is expected to increase 15-20% by using such selected superior grade seeds, for an increase in annual income of 750,000-1,000,000 shs.

(vi) Financial Requirements and Resources

New investment costs (4-year total)

Surveys	10,000 shs.
Construction (Office, working area and warehouse)	520,000 "
Farmland improvement (125 ha)	250,000 "
Equipment and materials	260,000 "
Total	1,040,000 "

Annual operation costs after completion of project: 437,500 shs. (150,000 shs. from sales of seeds and 287,500 shs. in government subsidies)

(vii) Phasing of Programme

	1978	1979	1980	1981	1982
Planning & design	██████████				
Construction	████████████████████				
Operation	██				
Seed rationing	██				

(viii) Problems

- Recognition by the general farmers of the results that can be obtained superior-grade seeds.
- Determination of selected grade for each crop as recommended by either the region or the district.
- How to handle, major crops such as maize and bananas in future.

(7) Rice Production Project

(i) Objectives

The total area of rice fields has more than doubled in the past 5 years. With further increase of exploitable irrigation area, the prospects for rice production in the near future are encouraging.

According to the results of the tests conducted at Miwaleni by the Japanese survey team, rice production earns 3,798 shs. per ha, while maize production earns 2,360 shs. per ha. With further increase of irrigable area in the region, rice has good prospects for increase in production as a rotation crop.

(ii) Outline of Plan

The following measures will be taken to increase the production of rice to 12,000 t by 1980 on 4,500 ha, or 1,000 ha more than the present acreage.

- (a) Improvement of rice fields (Projects 1 & 2) 3,800 ha
- (b) Promotion of spread of improved cultivation technology (Project 3)
- (c) Establishment of display farms (Project 3) 10
- (d) Subsidies in kind of improved seeds for 7 years 1,000 ha
- (e) Subsidies in kind of fertilizers and chemicals for 7 years 1,000 ha
- (f) The overall scheme will be carried out at the responsibility of the Regional Agricultural Development Officer, while each local site will be managed by the District Agricultural Development Officer. Experts assigned to the Technical Center will provide guidance and advice.
- (g) The improved seed, fertilizer, and chemical subsidies are to extend over a period of seven years, during which time the cultivations should come to realize how effective such inputs can be. Hopefully, thereafter they will be more than willing to continue them at their own expense. The same applies in the case of the vegetable and cotton projects.

(iii) Project Area

Mainly in lower Moshi and the Mkomaji Valley of the Pare District.

(iv) Input

Manpower: Regional A.F.O. 1
District A.F.O. 2
Each of these posts will be held along with present posts.

Others: Field improvement 3,800 ha
Display farms 10 areas, 0.3 ha each
Seeds For 1,000 ha 30 tons
Fertilizers For 1,000 ha 480 tons
Chemicals For 1,000 ha 60 tons

(v) Effect

If the project area (1,000 ha) produces 3.5 tons per ha (1.8 ton at present) and non-project areas (3,500 ha) 2.5 tons per ha, the total increase is expected to be about 4,150 tons (worth 4,150,000 shs.). Furthermore, the display farms will have a demonstrative effect for promotion of wider use of new technology among the farmsteads in the neighbourhood.

(vi) Financial Requirements and Resources

New investment:

Field improvement (to be obtained from funds appropriated for Projects 1 and 2) 14,025,000 shs.
Survey and planning 10,000 shs.

Working expenses (after completion):

Operation cost (office expenses) 10,000 shs.
Display farms (10) (to be appropriated from Project 3 fund) 30,000 shs.
Seeds 30,000 shs.
Fertilizers 300,000 shs.
Chemicals 256,000 shs.
Total: 596,000 shs.
(not including display farms)

(vii) Phasing of Programme

	1977	1978	1979	1980	1981
Planning	-----				
Display farms	-----				
Operation (ha)		200	400	700	1,000

(8) Vegetable Production Project

(i) Objectives

The project is for increase of production of and improvement of quality of vegetables in order to meet increasing demand for raw and processed vegetables, thus stimulating the spread of new technology among nearby farm steads.

(ii) Outline of Plan

- (a) Of the total of 2,000 ha of vegetable cultivation, 200 ha are to be devoted to this project, mainly for production of tomatoes, cabbages, onions, and carrots.
- (b) Display farms 8 (2 in each district)
- (c) Subsidies for superior seeds for 7 years 200 ha
- (d) Subsidies for fertilizers and chemicals for 7 years 200 ha
- (e) Promotion of collective transportation and sales of vegetable products 8 trucks
- (f) Planning and management of the whole project will be done by the Regional Agricultural Development Officer, with each District Agricultural Development Officer having local responsibility in his district.

Experts assigned to the Agricultural Technical Center will provide technical guidance.

(iii) Project area

The whole region

(iv) Input

Manpower:	R.A.O.	1 (Regional Agricultural Officer)
	D.A.O.	4 (District Agricultural Officer)
	Drivers	8 (additional)
Others:	Display farms	8 (0.1 ha each)
	Seeds	2 tons
	Fertilizers	192 tons
	Chemicals	18 tons
	Vehicles for collective transport	8 trucks (2 in each district)

(v) Effect

The revenue increase from the project area (200 ha) in the final year is expected to be 200,000 shs. and the increase from non-project area may reach 750,000 shs.

(vi) Financial Requirements and Resources

New investment cost (4-year total):

Survey & planning	20,000 shs.
Irrigation system	1,500,000 shs. (to be financed from Project 1 and 2 funds)
Vehicle purchase	480,000 shs. (8 trucks)

Working expenses (Annually after completion):

Operation cost	20,000 shs.
Display farms	20,000 shs. (to be financed from Project 3)
Seeds	20,000 shs. (full cost)
Fertilizer	120,000 shs. (half cost)
Chemicals	85,000 shs. (half cost)
Payroll cost	86,400 shs. (12 drivers)
Vehicle operating cost, etc.	240,000 shs.
Total:	571,400 shs. (not including display farm cost)

(vii) Phasing of Programme

	1978	1979	1980	1981
Planning & designing				
Display farms		4	8	8
Operation (ha)		50	100	200

(viii) Problems

- Understanding of demand trends for different kinds of vegetables so as to avoid sharp decline in prices.
- Feasibility of process plant construction in second Phase.

(9) Cotton Production Project

(i) Objectives

Cotton is one of the major export items of the country and is valuable domestically for the edible oil extracted from its seeds and for its strained lees, which are used as livestock feed.

In addition to the various incentives already given to cotton product by the Tanzania Cotton Authority (T.C.A.), the regional government will move toward improvement of irrigable farm, increased use of chemicals and strengthened technical guidance for increased cotton production in order to earn more foreign exchange and help farms improve their level of income.

(ii) Outline of Plan

The following measures will be taken mainly in lowland to increase cultivated area and yield:

- Farm improvement (Projects 1 & 2)
- Rationing of superior-grade seeds (Project 4)
" " " (T.C.A.)
- Technical guidance for cultivation (Project 3)
- Subsidies of fertilizers and chemicals for 7 years (T.C.A.)
- Display farm (Project 3)

(f) The project will be implemented at the full responsibility of the Regional Agricultural Development Officer. In each district the District Agricultural Development Officer will be responsible for implementation of the project in cooperation with T.C.A. officials. Experts assigned to the Agricultural Technical Center will provide technical guidance.

(iii) Project Area

Moshi and Pare districts

(iv) Input

Manpower: R.A.O. 1
D.A.O. 1 in each district

The posts above will be held together with present posts

Others: Improvement of irrigation farms	500 ha (Projects 1 & 2)
Seeds	25 tons
Fertilizers	240 tons
Chemicals	47 tons
Farms	8 (0.1 ha each) (4 each in Moshi and Pare districts)

(v) Effect

The future increase in the year of completion is expected to be 2,000 tons in total (about 1,000 tons at present), 500 kg per hectare in the 1,000 ha project area and 300 kg per hectare in the 5,000 ha non-project area.

(vi) Financial Requirements and Resources

New investment cost:

Farm improvement	1,500,000 shs. (to be financed from Projects 1 & 2)
Survey and planning	10,000 shs.

Working expenses:

Operation cost	20,000 shs. (Moshi & Pare)
Fertilizers	150,000 shs.
Chemicals	200,000 shs.
Display farms	20,000 shs. (financed from project 3)

Total:	370,000 shs. (not including cost of display farms under other projects)
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(vii) Phasing of Programme

	1978	1979	1980	1981	1982
Planning	██████████				
Farm improvement		████████████████████			
Operation (ha)		200	500	1,000	

(viii) Problems

- Farmers must first be persuaded of the profitability of cotton cultivation since the prices they receive are not always favorable.
- Coordination between Regional Officer guidance and T.C.A. guidance.

(10) Coffee Nursery Project

(i) Objectives

Since there is very little potential for further expansion of cultivated area for an increase in coffee production, efforts must be made to improve productivity. Also, quality of coffee must be improved for competitiveness with the products of other countries in world markets.

Therefore, in addition to the various incentives already provided for coffee plantation by the Tanzania Coffee Board (T.C.B.), necessary measures must be taken on the regional level for increase of nursery area as well as for supply of good nurslings to smallholders for greater production and improvement of product quality.

(ii) Outline of Plan

The trees presently producing coffee are for the most part 30-40 years old, and many of them are low in productivity and resistance to disease. This is one of the main reasons why production has declined, and quality deteriorated.

For renewal of coffee trees, the expansion of nursery area that is taking place at present will be continued under the following scheme:

- The existing 20 nurseries with a total area of 10 ha (0.5 ha each) will be supplemented with 40 new nurseries with a total area of 20 ha.
- The target for production per hectare of young coffee trees is 200,000. The target for the last year is therefore 2,000,000 trees [$200,000 \times 30 \text{ ha} \times 1/3$ (1/3 rotation)]. Nurslings to be planted are to be 9 months old.
- Additional expansion of nurseries will be carried out under the 5-year plan.
- The Lyamungu Research Institute will cooperate in the operation of the nursery.

(iii) Input

Manpower: Present level of personnel.

(iv) Effect

Replacement will be at the rate of 2,000 trees per hectare each year. Average annual production per hectare is expected to increase from the present 800 kg to 900 kg. As the result of such increase, the annual net incremental income is expected to be 6 million shs.

(v) Financial Requirements

New investment cost (for all 20 ha during 5-year period):

Nursery expansion	160,000 shs. (40 new nurseries)
Tools	40,000 shs. (sprays and small tools)
Total	200,000 shs.

Working expenses:

Wages	307,700 shs.
Chemicals & fertilizer	60,000 shs.
Seeds and other materials	33,000 shs.
Total	400,700 shs.

(vi) Phasing of Programme

	1st year	2nd year	3rd year	4th year	5th year
Planning & designing	████████				
Construction		████████████████████			

(vii) Problems

- Securing irrigable land for nursery.
- Smallholders must be persuaded of profitability of transplantation of young trees.

(11) Livestock Technical Guidance Institute

(i) Objectives

This institute is engaged in the popularization of techniques of livestock sanitation and livestock breeding control in order to contribute to increase in production on the basis of the experimental data obtained in the centers of Projects 12, 13 and 14, to be referred to below.

(ii) Outline of the Plan

The institute offers, on behalf of the regional authorities, technical guidance with respect to livestock sanitation, breeding control and feed production as follows.

Livestock sanitation -- With the use of a livestock sanitation car, the institute undertakes medical examinations, takes measures for prevention of epidemics, and disseminates relevant knowledge and techniques.

Breeding control -- Dissemination of breeding techniques (including those of medical insemination).

Feed production -- With the use of its experimentation farm of 1 to 2 hectares, the institute demonstrates how to cultivate high-quality pasture grasses, how to harvest of the seeds, and how to store the grasses.

(iii) Project Area

The entire region, and especially Himo, Ubaa, Mwanga, Same and Rombo.

(iv) Input

Manpower:	Directors	1 x 5 = 5
	Experts	3 = 3
	Field Assistants	3 x 5 = 15
	Total	23

Facilities and equipment:

Institute buildings and accessory buildings

Instruments necessary for medical examination and treatment and prevention of diseases

Equipment necessary for technical guidance on breeding

Equipment necessary for feed crop cultivation

Demonstration farm, 1-2 ha

Vehicles, etc.

(v) Effect

This project, in combination with Projects 12, 13 and 14, is expected to help reduce the loss due to diseases of animals and to increase the productive capability, thereby pushing up annual livestock production by 5 to 6%.

(vi) Financial Requirements

Institute buildings and accessory buildings	800,000 shs.
Equipment for sanitation	710,000
Equipment for breeding control and feed crop cultivation	130,000
Sanitation car, motor cycles, tractors, etc.	520,000
Total	2,160,000 shs.

(vii) Phasing of programme

	1st year	2nd year	3rd year	4th year	5th year
Planning & design	██████████				
Construction		████████████████████			
Operation			████████████████████		

(12) Beef Cattle Center

(i) Objectives

This center is meant to contribute to increase of livestock production through improvement and propagation of breeding stock for meat production (including beef cattle, goat and swine), and through various experiments for the improvement of breeding techniques.

(ii) Outline of the Plan

- (a) Production and distribution of the breeding stock and the young
- (b) Experiments and investigations concerning improvement of livestock breeding for the sake of meat production
- (c) Experiments and tests concerning improvement of feed crops, cultivation, and storage of pasture and wild grasses
- (d) Experiments and demonstration of the feed-lot breeding method
- (e) Scale of breeding - 50 beef cattle, 50 sheep, 50 goats and 25 pigs

(iii) Project Area

All of the region, with emphasis on the Moshi and Pare districts.

(iv) Input

Manpower:	Director	1 x 2 = 2
	Experts	2 x 2 = 4
	Field Assistants	8 x 2 = 16
	Total	22

Facilities and equipment:

- Center building and accessory buildings
- Cow house of the loose barn type, 330 m²
- Swine house, 342 m²
- Sheep house, 133 m²
- Other facilities and equipment

(v) Effect

Promotion of improvement of livestock and increase in meat production.

(vi) Financial Requirements

Center buildings and livestock houses	2,008,000 shs.
Accessory buildings and facilities	220,000
Vehicles and other items	320,000
Total	2,548,999 shs.

(vii) Phasing of Programme

	1978	1979	1980	1981
Planning & design	<u> </u>			
Construction		<u>(1)</u>	<u>(1)</u>	
Operation		<u> </u>	<u> </u>	<u> </u>

(13) Dairy Farming Center

(i) Objectives

In line with the plan for propagation of dairy cattle and goats for milk production, this center is meant to contribute to promotion of stock farming through improvement and propagation of breeding dairy as well as through various experiments for improvement of dairy farming techniques.

(ii) Outline of Plan

- (a) Production and distribution of the breeding stock and the young
- (b) Experiments and investigations concerning improvement of the techniques for breeding dairy cattle and goats for milk production
- (c) Experiments and investigations concerning improvement of feed crops and pasture growing methods
- (d) Experiments and demonstration of dairy farming techniques
- (e) Scale of breeding: 50 cows and 50 goats

(iii) Project Area

Two locations centering around Moshi and Rombo districts.

(iv) Input

Manpower:	Director	1 x 2 = 2
	Experts	2 = 2
	Field assistant	3 x 2 = 6
	Total	10

Facilities and equipment

Center building and accessory buildings

Cow house, 476 m²

Goat house, 133 m²

Other buildings, 270 m²

Other facilities, vehicles, etc.

(v) Effect

Improvement and propagation of dairy livestock and increase in the production of milk

(vi) Financial Requirements

Center buildings and accessory buildings	703,200 x 2 = 1,406,000 shs.
Facilities and equipment	171,000 x 2 = 342,000
Vehicles and other items	320,000 x 2 = 640,000
Total	2,388,400.-

(vii) Phasing of Programme

	1978	1979	1980	1981
Planning & design	<u> </u>			
Construction		<u>(1)</u>	<u>(1)</u>	
Operation		<u> </u>	<u> </u>	<u> </u>

(14) Project for Poultry Yard

(i) Objectives

This poultry yard is meant to contribute to promotion of fowl raising through raising of breeding fowls, hatching eggs and fostering chickens in order to cope with the increase in demand for eggs and broilers.

(ii) Outline of the Plan

- (a) Improvement of breeding fowls and production and distribution of improved chicks for egg production and for broiler production
- (b) Experiments and investigations concerning improvement of breeding methods
- (c) Experiments and demonstration of breeding techniques
- (d) Scale of breeding - 2,000 breeding fowls and hatching of 226,000 eggs per year

(iii) Project Area

All the region, centering around the Hai and Rombo districts.

(iv) Input

Manpower:	Director	1 x 2 = 2
	Experts	2 = 2
	Field assistants	3 x 2 = 6
	Total	10

Facilities & equipment:

Poultry Yard building

Henhouse for breeding fowls, 465 m²

Hatchery, 121 m²

Brooding house, 159 m²

Breeding facilities, vehicles, etc.

(v) Effect

Regional self-sufficiency in the supply of chickens and dissemination of fowl breeding techniques.

(vi) Financial Requirements

Poultry yard buildings and accessory buildings	599,200 shs.
Breeding facilities	114,000
Vehicles, etc.	320,000
Total	1,033,200

(vii) Phasing of Programme

	1978	1979	1980
Planning & design	████████████████████		
Construction		████████████████████	
Operation			████████████████████

Estimated Cost of Agricultural Projects (Development Expenditure) (Unit : shillings)

(Table - 42)

	Totals	1977/78	78/79	79/80	80/81	81/82	82/83	83/84	84/85
1. Lower Moshi Area Rural Development	44,000,000	990,000	2,780,000	5,600,000	8,400,000	9,650,000	9,290,000	5,230,000	2,060,000
2. Promotion of Irrigation Schemes	68,900,000	2,400,000	2,400,000	6,410,000	12,820,000	13,580,000	13,580,000	12,820,000	4,890,000
3. Extension Service Project - Agricultural Technical Center	15,500,000	-	1,300,000	5,000,000	4,800,000	2,700,000	1,700,000	-	-
4. Agricultural Mechanical Service Center	9,100,000	-	100,000	4,500,000	2,000,000	1,850,000	650,000	-	-
5. Seed Multiplication Farm Project	1,040,000	-	200,000	560,000	280,000	-	-	-	-
6. Rice Production Project	10,000	-	10,000	-	-	-	-	-	-
7. Vegetable Production Project	500,000	-	20,000	240,000	240,000	-	-	-	-
8. Cotton Production Project	10,000	-	10,000	-	-	-	-	-	-
9. Coffee Nursery Project	215,000	-	15,000	50,000	50,000	50,000	50,000	-	-
10. Survey for Water Development	8,400,000	2,750,000	3,000,000	2,650,000	-	-	-	-	-
Totals	147,675,000	6,140,000	9,835,000	25,010,000	28,590,000	27,830,000	25,270,000	18,050,000	6,950,000

Estimated Cost of Agricultural Project (Recurrent Expenditure) (Unit : shillings)

(Table - 43)

	1977/78	78/79	79/80	80/81	81/82	82/83	83/84	84/85	Remarks
1. Lower Koshi Area Rural Development	-	-	-	-	-	-	-	-	
2. Promotion of Irrigation Schemes	-	-	-	-	-	-	-	-	
3. Extension Service Project - Agricultural Technical Center	-	150,000	256,400	592,800	952,800	1,012,800	1,012,800	1,012,800	
4. Agricultural Mechanical Service Center	-	-	-	-	-	-	-	-	Independent Profit.
5. Seed Multiplication Farm Project	-	-	107,500	197,500	287,500	287,500	287,500	287,500	Excluding income from the sale of seeds
6. Rice Production Project	-	122,200	239,400	419,200	596,000	596,000	596,000	596,000	
7. Vegetable Production Project	-	-	239,450	458,900	571,400	571,400	571,400	571,400	
8. Cotton Production Project	-	-	80,000	195,000	370,000	370,000	370,000	370,000	
9. Coffee Nursery Project	-	-	79,250	158,500	237,750	317,000	317,000	317,000	
10. Survey for Water Development	-	-	-	-	-	-	-	-	
Total	-	272,200	1,002,000	2,021,900	3,015,450	3,154,700	3,154,700	3,154,700	

5.2 Detailed Description of Irrigation Projects

(1) Lower Moshi Area (Kahe Basin)

(i) Mandaka

Objectives:	Irrigation and farmland consolidation
Area:	Existing area, 480 ha (1,200 acres) Planned area, 480 ha (1,200 acres)
Crops:	Rice, maize, and beans
Water source:	Njoro river Useable amount, 0.912 m ³ /sec ('69/'70, probability 1/5) Necessary amount, 24 cusec (0.648 m ³ /sec)
Project outline:	Water utilization will be rationalized by arranging and unifying intakes and trunk waterways. At the same time, productivity will be improved by changing fields for rice to those for maize, beans, and other crops, consolidating farms so as to enable minimum water control and fertilization control by consolidation of ridges of all farmland and correction of reverse-flow fields.
Main works	4 intakes (to be constructed by unifying existing ones)
Cost:	1,200 x @4,000/- = 4,800,000/-
Economic effect:	Investment, 10,135,809/- B/C ratio, 2.11
Construction period:	Survey and planning, 1 year Design, 1 year Construction, 5 years

(ii) Upper Miwaleni

Objective:	Irrigation
Area:	Existing area, 0 Planned area, 400 ha (1,000 acres)
Crops:	Maize, beans, cotton, and vegetables
Water source:	Underground water Useable amount, 14 cusec (0.378 m ³ /sec) necessary amount, 14 cusec

Project outline: Abundant ground water in Kahe Basin can be utilized as water source. Irrigation water of about 14 cusec can be obtained by newly providing 12 bore holes. Farmland of about 1,000 acres will be created using this water source. As this area is damaged frequently by floods, productivity will be improved by carrying out drainage improvement work simultaneously.

Main works: Bore holes (D = 300 mm, L = 100 m) at 12 places where electricity is available

Cost: 1,000 x 7,000/- = 7,000,000/-
(Installation cost of power facilities)

Economic effect: Investment, 9,626,513/-
B/C ratio, 1.38

Construction period: Survey and planning, 1 year
Design, 1 year
Construction, 5 years

(iii) Miwaleni

Objective: Irrigation

Area: Existing area, 80 ha (200 acres)
Planned area, 280 ha (700 acres), including 80 ha (200 acres) of improved area

Crops: Maize, beans, cotton, and vegetables

Water source: Useable amount, 10 cusec
Necessary amount, 10 cusec

Project outline: Abundant underground water in Kahe Basin will be utilized as water source. About 10 cusec of irrigation water will be obtained by providing 6 new bore holes. About 700 acres of farmland will be created using this water source.

Main works: Bore holes (D = 300 mm, L = 100 m) at 6 places

Cost: 200 x 4,000/- + 500 x 7,000/- = 4,300,000/-

Economic effect: Investment, 5,669,853/-
B/C ratio, 1.32

Construction period: Survey & planning, 1 year
Design, 1 year
Construction, 5 years

(iv) Lower Miwaleni

Objective: Irrigation

Area: Existing area, 200 ha (500 acres)
Planned area, 600 ha (1,500 acres)

Crops: Maize, beans, cotton, and vegetables

Water sources: Rau River: useable amount, 5 cusec
 Miwaleni springs: useable amount, 20 cusec
 necessary amount, 21 cusec

Project outline: Irrigation area will be expanded by improving intakes and trunk waterways and pumping water from Miwaleni springs.

Main works: Intake (repairing), 1
 Pumping plant, 1
 Trunk waterway, L = 7 km

Cost: $500 \times 4,000/- + 1,000 \times 5,000/- = 7,000,000/-$

Economic effect: Investment, 12,674,382/-
 B/C ratio, 1.81

Construction period: Survey and planning, 1 year
 Design, 1 year
 Construction, 5 years

(v) Kiterini

Objective: Irrigation

Area: Existing area, 40 ha (100 acres)
 Planned area, 200 ha (500 acres)

Crops: Maize, beans, cotton, and vegetables

Water sources: Mua river: useable amount, 2 cusec
 Underground water: useable amount, 6 cusec
 necessary amount, 7 cusec

Project outline: Irrigation area will be expanded by repairing of intakes and trunk waterways and by utilizing 5 wells

Main works: Intake (repairing), 1
 Trunk waterway, L = 3 km
 Bore holes (D = 300 mm, L = 100 m), 3

Cost: $100 \times 4,000/- + 400 \times 7,000/- = 3,200,000/-$

Economic effect: Investment, 3,651,314/-
 B/C ratio, 1.14

Construction period: Survey and planning, 1 year
 Design, 1 year
 Construction, 5 years

(vi) Soko

Objectives: Irrigation and drainage

Area: Existing area, 80 ha (200 acres)
Planned area, 200 ha (700 acres)

Crops: Rice, maize, beans, and cotton

Water source: Soko springs
Useable amount, 16 cusec
Necessary amount, 10 cusec

Project outline: Irrigation area will be expanded by the repairing and construction of intakes, trunk waterways, and trunk drainage channels. At the same time, farmland will be consolidated, and productivity will be raised. The base of agricultural production in comprehensive village development will thereby be strengthened.

Main works: Intake, 1
Trunk waterway, L = 4 km
Trunk drainage, L = 5 km
Farmland consolidation, A = 700 acres

Cost: $200 \times 4,000/- + 500 \times 5,000/- = 3,300,000/-$

Economic effect: Investment, 4,380,879/-
B/C ratio, 1.33

Construction period: Survey and planning, 1 year
Design, 1 year
Construction, 5 years

(vii) Chekereni & Ntakuja

Objective: Irrigation

Area: Existing area, 80 ha (200 acres)
Planned area, 320 ha (800 acres)

Crops: Rice, maize, beans, and cotton

Water sources: Rau River: useable amount, 3 cusec.
Underground water: useable amount, 8 cusec;
necessary amount, 11 cusec

Project outline: At present there is an Ujamaa village here. But it is necessary to expand cultivated acreage by expanding irrigated acreage through repair of intakes and trunk waterways and utilization of underground water.

Main works: Intake, 1
Trunk waterway, L = 3 km
Bore holes, (D = 300 mm, L = 100 m) 6

Cost: $200 \times 4,000/- + 600 \times 6,000/- = 4,400,000/-$

Economic effect: Investment, 6,227,515/-
B/C ratio, 1.42

Construction period: Survey & planning, 1 year
Design, 1 year
Construction, 5 years

(viii) Mabogini

Objective: Irrigation

Area: Existing area, 120 ha (300 acres)
Planned area, 160 ha (400 acres)

Crops: Rice, maize, beans, and cotton

Water source: Njaro springs: useable amount, 4 cusec.
Underground water: useable amount, 3 cusec;
necessary amount, 7 cusec

Project outline: Irrigation area will be expanded by repairing intakes and trunk waterways and by utilizing underground water

Main works: Intake, 1
Trunk waterway, L = 1 km
Bore holes (D = 300 mm, L = 100 m), 2

Cost: $200 \times 4,000/- + 200 \times 6,000/- = 2,000,000/-$

Economic effect: Investment, 3,202,039/-
B/C ratio, 1.60

Construction period: Survey and planning, 1 year
Design, 1 year
Construction, 5 years

(ix) Misaranga & Mandaka

Objectives: Flood control & irrigation

Area: Existing area, 0
Planned area, 200 ha (500 acres)

Crops: Maize and beans

Water source: Rainwater

Project outline: Open levees will be constructed on rivers and farm roads 0.6 to 1 meter wide or sidelong ridges provided every 100 meters parallel to contour line. Flood damage will be prevented by storing flooded water in each lot of farmland. This water will increase

ground moisture and at the same time make irrigation more effective.

Main works: Construction of banks, L = 4 km

Cost: 500 x 4,000/- = 2,000,000/-

Economic effect:

Construction period: Survey and planning, 1 year
Design, 1 year
Construction, 5 years

(x) Kileo

Objective: Irrigation

Area: Existing area, 0
Planned area, 200 ha (500 acres)

Crops: Maize, cotton, and beans

Water source: Kileo spring: useable amount, 9 cusec;
necessary amount, 7 cusec

Project outline: 500 acres of farmland will be created by constructing a pumping plant on the Kileo River.

Main works: Pumping plant, 1
Trunk waterway, L = 3 km
New farmland, A = 200 ha (500 acres)

Cost: 500 x 6,000/- = 3,000,000/-

Economic effect: Investment, 4,772,466/-
B/C ratio, 1.59

Construction period: Survey & planning, 1 year
Design, 1 year
Construction, 5 years

(xi) Makuyuni

Objectives: Irrigation

Area: Existing area, 0
Planning area, 200 ha (500 acres)

Crops: Maize, cotton, and beans

Water source: Himo river: useable amount, 10 cusec;
necessary amount, 7 cusec

Project outline: 500 acres of farmland will be created by utilizing surface water from the Himo River.

Main works: Intake, 1
Trunk waterway, L = 4 km
New farmland, 200 ha (500 acres)

Cost: 500 x 6,000/- = 3,000,000/-

Economic effect: Investment, 4,772,466/-
B/C ratio, 1.59

Construction period: Survey and planning, 1 year
Design, 5 years

(xii) Kahe-Moshi Line

Objectives: Agricultural roads

Area: 3,840 ha (9,600 acres)

Crops:

Water sources:

Project outline: Agricultural management, storage and distribution will be rationalized by the construction of roads linking six agricultural complexes in the Kahe Basin.

Main works: Trunk road, L = 30 km

Cost:

Economic effect:

Construction period: Survey and planning, 1 year
Design, 1 year
Construction, 5 years

5.3 Promotion of Irrigation Scheme (Mkomaji Valley)

(1) Kishiwani

Objective: Irrigation

Area: Existing area, 400 ha (1,000 acres)
Planned area, 400 ha (1,000 acres)

Crops: Rice, maize, and cotton

Water source: Kishiwani River: useable amount, 10 to 30 cusec;
necessary amount, max. of 20 cusec and
average of 14 cusec

Project outline: Construction and improvement of intakes and water-
ways, construction of ridges, repairing of water-
ways, and improvement of reverse flow fields, ration-
alization of water use, improvement of cultivation
techniques and double cropping (rice and other
crops) will be undertaken for an increase in
productivity.

Main works: Waterway, L = 10 km
Consolidation of farmland, A = 1,000 acres

Cost: 1,000 x 4,000/- = 4,000,000/-

Economic effect: Investment, 8,466,508/-
B/C ratio, 2.12

Construction period: Survey and planning, 1 year
Design, 1 year
Construction, 5 years

Remarks: A plan is afoot to construct a Kishiwani dam. When
it is completed, the supply of water will be stabi-
lized in the dry season, and irrigated acreage
will be further expanded.

(2) Gonja

Objective: Irrigation

Area: Present area, 400 ha (1,000 acres)
Planned area, 400 ha (1,000 acres)

Crops: Rice, maize, and cotton

Water source: Hinglili River: useable amount, 10 to 25 cusec;
necessary amount, max. of 20 cusec and average of
14 cusec

Project outline: Construction and improvement of intakes and waterways, construction of ridges, repairing of waterways, and improvement of reverse flow fields, rationalization of water use, improvement of cultivation techniques and double cropping (rice and other crops) will be undertaken for an increase in productivity.

Main works: Waterway, L = 10 km
Consolidation of farmland, A = 1,000 acres

Cost: 1,000 x 4,000/- = 4,000,000/-

Economic effect: Investment, 8,466,508/-
B/C ratio, 2.12

Construction period: Survey & planning, 1 year
Design, 1 year
Construction, 5 years

(3) Ndungu

Objective: Irrigation

Area: Existing area, 400 ha (1,000 acres)
Planned area, 400 ha (1,000 acres)

Crops: Rice, maize, and cotton

Water sources: Goma River: useable amount, 10 to 30 cusec;
necessary amount, max. of 20 cusec and average of 14 cusec.

Project outline: Construction and improvement of intakes and waterways, construction of ridges, repairing of waterways, and improvement of reverse flow fields, rationalization of water use, improvement of cultivation techniques, and double cropping (rice and other crops) will be undertaken for an increase in productivity.

Main works: Waterway, L = 5 km
Consolidation of farmland, A = 1,000 acres

Cost: 1,000 x 4,000/- = 4,000,000/-

Economic effect: Investment, 8,466,508/-
B/C ratio, 2.12

Construction period: Survey & planning, 1 year
Design, 1 year
Construction, 5 years

(4) Kufurio

Objective: Irrigation

Area: Existing area, 1,600 ha (4,000 acres)
Planned area, 1,600 ha (4,000 acres)

Crops: Rice, maize, and cotton

Water sources: Seseni River, Kalimae Dam, 100 cusec;
necessary amount, max. of 80 cusec and average of 56 cusec.

Project outline: Construction and improvement of intakes and waterways, construction of ridges, repairing of waterways, and improvement reverse flow fields, rationalization of water use, improvement of cultivation techniques, and double cropping (rice and other crops) will be undertaken for an increase in productivity.

Main works: Waterway, L = 10 km
Consolidation of farmland, A = 1,600 ha

Cost: 4,000 x 4,000/- = 16,000,000/-

Economic effect: Investment, 33,866,032/-
B/C ratio, 2.12

Construction period: Survey & planning, 1 year
Design, 1 year
Construction, 6 years

5.4 Promotion of Irrigation Scheme (Pangani Basin)

(1) Kiriya

Objective:	Irrigation
Area:	Existing area, 120 ha (300 acres) Planned area, 400 ha (1,000 acres)
Crops:	Maize, beans, cassava, and cotton
Water sources:	Pangani River, Nyumba ya Mungu Dam Useable amount, 15 cusec Necessary amount, 15 cusec
Project outline:	Reclamation of agricultural land at places where soil can be improved and water from the Pangani River is available, improvement of existing irrigation facilities, and consolidation of farmland for the purpose of rationalization of water utilization and raising of productivity.
Main works:	Intake, 1 Waterway, L = 6 km Reclamation of farmland, 700 acres Consolidation of farmland, 300 acres
Cost:	$300 \times 4,000/- + 700 \times 5,000/- = 4,700,000/-$
Economic effect:	Investment, 7,933,132/- B/C ratio, 1.69
Construction period:	Survey & planning, 1 year Design, 1 year Construction 5 years

(2) Marua

Objectives:	Irrigation
Area:	Existing area, 120 ha (300 acres) Planned area, 800 ha (2,000 acres)
Crops:	Maize, vegetables, and bananas
Water sources:	Pangani River, Nyumba ya Mungu Dam Useable amount, 30 cusec Necessary amount, 29 cusec
Project outline:	Reclamation of agricultural land at places where soil can be improved and water from the Pangani River is available, improvement of existing irrigation facilities, and consolidation of farmland for the purpose of rationalization of water utilization and raising of productivity.

Main works: Pumping plant, 1
 Waterway, L = 10 km
 Reclamation of farmland, 300 acres
 Consolidation of farmland, 1,700 acres

Cost: $300 \times 4,000/- + 1,700 \times 5,000/- = 9,700,000/-$

Economic effect: Investment, 18,103,905
 B/C ratio, 1.87

Construction period: Survey & planning, 1
 Design, 1 year
 Construction, 5 years

(3) Ruva Mferujini

Objective: Irrigation

Area: Existing area, 720 ha (1,800 acres)
 Planned area, 1,200 ha (3,000 acres)

Crops: Maize, cotton, cassava, sweet potatoes, bananas, and beans

Water sources: Pangani River, Nyumba ya Mungu Dam
 Useable amount, 43 cusec
 Necessary amount, 43 cusec

Project outline: Reclamation of agricultural land at places where soil can be improved and water from the Pangani River is available, improvement of existing irrigation facilities, and consolidation of farmland for the purpose of rationalization of water utilization and raising of productivity.

Main works: Waterway, L = 12 km
 Reclamation of farmland, 1,200 acres
 Consolidation of farmland, 1,800 acres

Cost: $1,800 \times 4,000/- + 1,200 \times 5,000/- = 13,200,000/-$

Economic effect: Investment, 22,719,037/-
 B/C ratio, 1.72

Construction period: Survey & planning, 1 year
 Design, 1 year
 Construction, 5 years

(4) Jetengeni

Objective: Irrigation

Area: Existing area, 280 ha (700 acres)
 Planned area, 800 ha (2,000 acres)

Crops: Maize, cotton, and cassava

Water sources: Pangani River, Nyumba ya Mungu Dam
 Useable amount, 30 cusec
 Necessary amount, 29 cusec

Project outline: Reclamation of agricultural land at places where soil can be improved and water from the Pangani River is available, improvement of existing irrigation facilities, and consolidation of farmland for the purpose of rationalization of water utilization and raising of productivity.

Main works: Intake, 1
 Waterway, L = 9 km
 Reclamation of farmland, 1,300 acres
 Consolidation of farmland, 700 acres

Cost: $700 \times 4,000/- + 1,300 \times 5,000/- = 9,300,000/-$

Economic effect: Investment,
 B/C ratio,

Construction period: Survey & planning, 1 year
 Design, 1 year
 Construction, 5 years

5.5 Survey for Water Development

(1) Mt. Kilimanjaro Area Investigation

Objective:	Survey for rationalization of water use and improvement of drainage
Area:	350 km ²
Crops:	Coffee, banana, maize, etc.
Water sources:	Sarya, Kware, Kikafu, Weru-Weru, Karanga, Rau, Mue, and Himo rivers
Project outline:	In coffee and banana raising areas of the Mt. Kilimanjaro area irrigation is based on traditional furrows. Basic surveys for rationalization of water utilization should therefore be carried out, and studies should be made of possibilities and means of rationalization of water use in highland areas and extension of water use in lowland and upper lowland areas by consolidation of waterways, water utilization systems, and water control systems.
Main works:	Surveys on water use, run-off, loss of water channels, drainage, irrigated acreage, cultivated acreage, water use control, necessary amount of water, soil, and sites for small dams.
Cost:	400,000/-
Implementation period:	2 years

(2) Lower Hai Investigation

Objective:	Survey on useable amount of water
Area:	50 km ²
Crops:	Maize, beans, etc.
Water sources:	Underground water and springs
Project outline:	Surveys on water sources, soil, and other factors will be conducted for the purpose of development of lowland areas of the Hai District.
Main works:	Surveys on hydrology, run-off, underground water, and soil
Cost:	300,000/-

Implementation
period: 2 years

(3) Lower Rombo Investigation

Objectives: Survey on useable amount of water

Area: 40 km²

Crops: Maize, beans, etc.

Water sources: Lake Chala and Lume River

Project Outline: Surveys on water sources such as small dams at Lake Chala and on soils will be conducted for the purpose of developing lowland areas of the Rombo District.

Main works: Surveys on water, topography, geology, flow, and soil

Cost: 800,000/-

Implementation
period: 3 years

(4) North Pare Investigation

Objectives: Survey on useable amount of water

Area: 50 km²

Crops: Maize, beans, etc.

Water source: Lake Jipe

Project outline: Surveys on the possibility of building small dams and on soil will be conducted for the purpose of developing the north Pare area.

Main works: Surveys on hydrology, water run-off, topography, geology, and soil

Cost: 600,000/-

Implementation
period: 3 years

(5) West Pare Investigation

Objective: Survey on useable amount of water

Area: 20 km²

Crops: Maize, beans, etc.

Water sources: Makanya River

Project outline: Surveys on sites of small dams and soil will be conducted for the purpose of developing the west Pare area.

Main works: Surveys on hydrology, water run-off, topography, geology, and soil

Cost: 300,000/-

Implementation period: 2 years

(6) Topographical Mapping

Objectives: Surveys, planning, and designing

Area: Area in operation, 40 km²
Surveying area, 500 km²

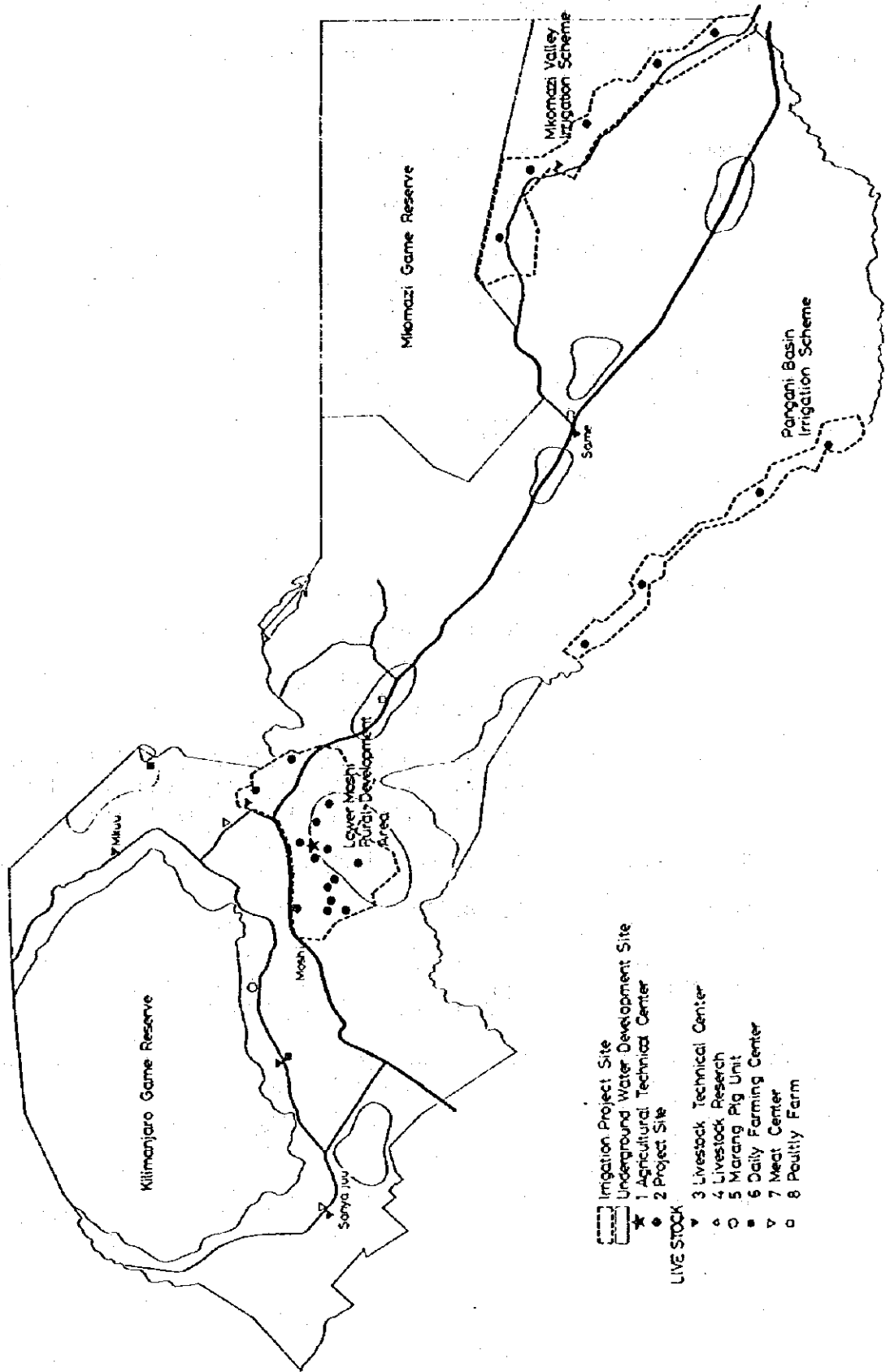
Project outline: Topographical maps will be prepared by aerial surveys of topographically complicated cultivated land in operation and surveying areas.

Main works: Aerial surveying and mapping

Cost: 6,000,000/-

Implementation period: 3 years

Agricultural Development Plan



Breakdown of Cost of Irrigation Projects (Lower Moshi area Rural Development)

(Table - 44)

(unit : shilling)

Items	Area(ha)	1977/78	78/79	79/80	80/81	81/82	82/83	83/84	84/85
(1) Mandaka Irrigation Scheme	480								
Survey, planning and designing		480,000	240,000	240,000					
Implementation		4,320,000		430,000	860,000	1,080,000	1,080,000	870,000	
Totals		4,800,000	240,000	430,000	860,000	1,080,000	1,080,000	870,000	
(2) Upper Mwaleni Irr. Scheme	400								
Survey, planning and designing		200,000	220,000						
Implementation		6,800,000	680,000	1,360,000	1,700,000	1,700,000	1,360,000		
Totals		7,000,000	900,000	1,360,000	1,700,000	1,700,000	1,360,000		
(3) Mwaleni Irr. Scheme	280								
Survey, planning and designing		150,000	150,000						
Implementation		4,150,000	800,000	950,000	800,000	800,000	800,000		
Totals		4,300,000	950,000	950,000	800,000	800,000	800,000		
(4) Lower Mwaleni Irr. Scheme	600								
Survey, planning and designing		300,000	150,000	150,000					
Implementation		6,700,000	800,000	950,000	1,300,000	1,300,000	1,300,000	1,300,000	800,000
Totals		7,000,000	950,000	1,100,000	1,300,000	1,300,000	1,300,000	1,300,000	800,000
(5) Kiterini Irr. Scheme	200								
Survey, planning and designing		100,000	50,000	50,000					
Implementation		3,100,000	50,000	310,000	310,000	620,000	770,000	770,000	630,000
Totals		3,200,000	100,000	360,000	310,000	620,000	770,000	770,000	630,000
(6) Soko Irr. Scheme	280								
Survey, planning and designing		150,000	80,000	70,000					
Implementation		3,150,000	30,000	320,000	320,000	640,000	780,000	780,000	630,000
Totals		3,300,000	110,000	390,000	320,000	640,000	780,000	780,000	630,000

Breakdown of Cost of Irrigation Projects (Lower Moshi area Rural Development)

(Table - 45)

(unit : shillings)

Items	Area(ha)	Total	1977/78	78/79	79/80	80/81	81/82	82/83	83/84	84/85
(7) Chekoreni & Ntakuja Irr. Scheme	320									
Survey, planning and designing		50,000	50,000							
Implementation		4,350,000	430,000	870,000	1,080,000	1,080,000	1,080,000	890,000		
Totals		4,400,000	50,000	870,000	1,080,000	1,080,000	1,080,000	890,000		
(8) Mabogini Irrigation Scheme	160									
Survey, planning and designing		50,000	50,000							
Implementation		1,950,000	200,000	400,000	490,000	490,000	490,000	370,000		
Totals		2,000,000	50,000	400,000	490,000	490,000	490,000	370,000		
(9) Musaranga & Mandaka Flood Control	200									
Survey, planning and designing		100,000	50,000	50,000						
Implementation		1,900,000		190,000	380,000	480,000	480,000	480,000	370,000	
Totals		2,000,000	50,000	190,000	380,000	480,000	480,000	480,000	370,000	
(10) Kileo Irr. Scheme	200									
Survey, planning and designing		100,000	50,000	50,000						
Implementation		2,900,000		290,000	580,000	730,000	730,000	730,000	570,000	
Totals		3,000,000	50,000	290,000	580,000	730,000	730,000	730,000	570,000	
(11) Makuyuni Irr. Scheme	200									
Survey, planning and designing		100,000	50,000	50,000						
Implementation		2,900,000		290,000	580,000	730,000	730,000	730,000	570,000	
Totals		3,000,000	50,000	290,000	580,000	730,000	730,000	730,000	570,000	
Grand totals	3,320	44,000,000	990,000	2,780,000	5,600,000	8,400,000	9,650,000	9,290,000	5,230,000	2,060,000

Breakdown of Cost of Irrigation Projects (promotion of irrigation scheme of Mkomaji Valley area)

(Table - 46)

(unit : shilling)

Items	Area(ha)	Total	1977/78	78/79	79/80	80/81	81/82	82/83	83/84	84/85
(1) Kishiwani Irr. Scheme	400									
Survey, planning and designing		200,000	100,000	100,000						
Implementation		3,800,000			380,000	760,000	950,000	950,000	760,000	760,000
Totals		4,000,000	100,000	100,000	380,000	760,000	950,000	950,000	760,000	760,000
(2) Conja Irr. Scheme	400									
Survey, planning and designing		200,000	100,000	100,000						
Implementation		3,800,000			380,000	760,000	950,000	950,000	760,000	760,000
Totals		4,000,000	100,000	100,000	380,000	760,000	950,000	950,000	760,000	760,000
(3) Ndungu Irr. Scheme	400									
Survey, planning and designing		200,000	100,000	100,000						
Implementation		3,800,000			380,000	760,000	950,000	950,000	760,000	760,000
Totals		4,000,000	100,000	100,000	380,000	760,000	950,000	950,000	760,000	760,000
(4) Kifurio Irr. Scheme	1,600									
Survey, planning and designing		800,000	400,000	400,000						
Implementation		15,200,000			1,520,000	3,040,000	3,040,000	3,040,000	3,040,000	1,520,000
Totals		16,000,000	400,000	400,000	1,520,000	3,040,000	3,040,000	3,040,000	3,040,000	1,520,000
Grand totals	2,900	28,000,000	700,000	700,000	2,660,000	5,320,000	5,890,000	5,890,000	5,320,000	1,520,000

Breakdown of Cost of Irrigation Projects (promotion of irrigation scheme of Pangani Valley area)

(Table - 47)

Items	Area(ha)	Total	1977/78	78/79	79/80	80/81	81/82	82/83	83/84	84/85
(1) Kiriya Irrigation Scheme	400									
Survey, planning and designing		400,000	200,000	200,000						
Implementation		4,300,000			430,000	860,000	860,000	860,000	860,000	430,000
Totals		4,700,000	200,000	200,000	430,000	860,000	860,000	860,000	860,000	430,000
(2) Marua Irr. Scheme	800									
Survey, planning and designing		800,000	400,000	400,000						
Implementation		8,900,000			890,000	1,780,000	1,780,000	1,780,000	1,780,000	890,000
Totals		9,700,000	400,000	400,000	890,000	1,780,000	1,780,000	1,780,000	1,780,000	890,000
(3) Ruvu Mferujini Irr. Scheme	1,200									
Survey, planning and designing		1,200,000	600,000	600,000						
Implementation		12,000,000			1,200,000	2,400,000	2,400,000	2,400,000	2,400,000	1,200,000
Totals		13,200,000	600,000	600,000	1,200,000	2,400,000	2,400,000	2,400,000	2,400,000	1,200,000
(4) Jetengeni	800									
Survey, planning and designing		800,000	400,000	400,000						
Implementation		8,500,000			850,000	1,700,000	1,700,000	1,700,000	1,700,000	850,000
Totals		9,300,000	400,000	400,000	850,000	1,700,000	1,700,000	1,700,000	1,700,000	850,000
Grand totals	3,200	36,900,000	1,600,000	1,600,000	3,370,000	6,740,000	6,740,000	6,740,000	6,740,000	3,370,000

Breakdown of Cost of Survey Projects (Survey for Water Development)

(Table - 48)

(unit : shilling)

Items	Area(km ²)	Total	77/78	78/79	79/80	80/81	81/82	82/83	83/84	84/85
(1) Kilimanjaro Mountain Area Investigation	350	400,000	200,000	200,000						
(2) Lower Hai Investigation	50	300,000	150,000	150,000						
(3) Lower Rombo Investigation	40	800,000	200,000	300,000	300,000					
(4) North Pare Investigation	50	600,000	200,000	200,000	200,000					
(5) West Pare Investigation	20	300,000		150,000	150,000					
(6) Topographical Mapping	540	6,000,000	2,000,000	2,000,000	2,000,000					
Total		8,400,000	2,750,000	3,000,000	2,650,000					

