CHAPTER 5 BASIC DESIGN

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5.1 Design for Facilities and Equipment

5.1.1 Basic Concepts

The design for facilities and equipment on the project for improvement of the post-harvest facilities was carried out based on the following basic concepts, in addition to considering the local conditions:

(1) Installation and operation of facilities improved for the project should make full use of the current marketing system, organizations, and channels.

(2) Facilities and equipment should be designed so as to improve paddy quality, minimizing post-harvest losses (there is no standard on paddy quality in Tanzania).

(3) Paddy should be handled in bags throughout, and the bags should be neatly stacked in the godown. Paddy will not be stored in bulk.

(4) Bagged paddy should be handled mainly by manual labour. Loading and unloading paddy and stacking bags in the godown should be done by manual labour. Preparation processes, however, such as drying, husking, milling and weighing should be mechanized with conveying facilities.

(5) Facilities should be designed so that they may be operated safely with flexibility, taking into account current labour customs and level of technology.

(6) Equipment of special types should be avoided as far as possible in order to reduce costs and to simplify procurement of spare parts.

5.1.2 Determination of Basic Items

Basic items such as the volume of crop to be handled, harvesting period and quantity to be collected were determined through survey in the project area, and through discussions with the RDD's office and Japanese experts of KADC.

(1) Object Crop and Area to be Covered by the Post-harvest Facilities

Object crop and area to be covered by the proposed the post-harvest facilities are the paddy produced in the Rau River System (including Upper Mabogini, Lower Mabogini, Rau Ya Kati and Chekereni), amounting to 1,120 ha (1,120 ha in rainy season, 820 ha in dry season). There are some upland crops produced in the area such as maize, pulses and so on, but these upland crops are processed properly at present. Therefore these upland crops are not included in the object crops of the project.

(2) Paddy Yield and Production

In the project area, modernized paddy farming system has been just started. Therefore, firm data on unit yields of paddy are not yet obtainable for the project area. For this reason, it is difficult to calculate directly the anticipated unit yield of paddy, which will be related to the future project works. However, as stated in Section 3.5.4, the results of the yield survey on paddy conducted by KADC are available. According to these results, the yield of paddy in the project area ranges between 4 to 7 tons/ha. On the other hand, the average yield of dry season paddy in 1986 was estimated at 6.6 tons/ha (moisture content of 14 %). This average yield includes harvest and transport losses, immature rice and foreign matter such as straw, leaves, etc. Based on these data, the yield in the project area was estimated at 5 tons/ha (moisture content of 14 %) excluding the losses, immature rice and foreign matter. The production of paddy in the project area may be calculated as follows:

Item	Area (ha)	Unit Yield (tons/ha)	Production (tons)
Rainy season paddy	1,120	5.0	5,600
Dry season paddy	820	5.0	4,100
Total	1,940	-	9,700

(3) Harvest Period of Paddy

Based on the standard farming practices recommended by KADC, the harvest period of paddy in the project area will be as shown below:

Rainy season paddy : June and July (60 days)
Dry season paddy : December and January (60 days)

(4) Quantity of Paddy to be Collected

The quantity of paddy to be collected for the facilities constructed by the project may be estimated as follows:

Item	Rainy Season Paddy	Dry Season Paddy	Total
(1) Gross production (tons)	5,600	4,100	9,700
(2) Seeds			
- Area (ha)	1,120	820	1,940
- Seed rate /1 (kg/ha)	40	40	40
- Seeds required (tons)	40	30	70
(3) Farmer's home-consumption			
- Per-capita consumption of rice (milled rice, kg/person)	40	40	80
- Population (persons)	17,400	17,400	17,400
- Milling rate (%)	62	62	62
- Consumption converted to unhulled rice (tons)	1,120	1,120	2,240
(4) Surplus (tons) (1) - (2) - (3)	4,440	2,950	7,390
(5) Unhulled rice to be collected/2 (tons)	3,550	2,360	5,910
(Rounded)	(3,600)	(2,400)	(6,000)

/1 It includes extra 10 kg/ha.

/2 80% of production surplus is assumed to be collected.

Surplus paddy in the Rau River System area is reckoned as 7,390 tons/year (including 4,440 tons of rainy season paddy and 2,950 tons of dry season paddy), after subtracting seed rice and farmers' home-consumption from gross production. Rice consumption per capita is forecast to be 80 kg/year in calculating home-consumption.

According to the interview survey to the farmers, present rice consumption per capita is 20 kg/year in Mabogini Village, and 110 kg/year in Chekereni Village, exceeding the national average which ranges from 15 to 20 kg/year. It is natural that rice will become a staple food as paddy fields become the focus of farming after the completion of the Rau River System, whereas previously the farmers lived on maize, bananas and pulses. Farmers'

home-consumption of rice in the project area is predicted to increase sharply after completion of the project up to almost the same level as that of the Ndungu area, Kilimanjaro Region, where paddy is the main crop and 80 kg/year is consumed per capita.

It is forecast that 80% of the surplus paddy will be collected, and the remaining 20% distributed to the surrounding area, though not through KNCU as it will be unhulled. In 1986, 1,027 tons or 30% out of 3,380 tons of total dry season paddy were collected by KNCU, and a great part of the remaining 70% was distributed by private traders. Nevertheless, the ratio of collected paddy is predicted to rise to 80%, with the strengthened collection system and transportation after the completion of the project.

(5) Quantity to be Processed by the Milling Facilities

At present the marketing system has two channels for paddy produced in the Rau River System area. One is compulsory delivery to NMC (10 bags/plot: 750 kg/0.3 ha), and the other is free sale by KNCU. KNCU is responsible for collecting for both routes. Paddy collected by KNCU is sent to NMC unhulled, and NMC entrusts rice milling to private dealers as it has no drying and milling facilities of its own. NMC has, however, requested milled rice, because existing private facilities do not have sufficient capacity to deal with all the paddy expected after the completion of the Rau River System. Therefore, taking into account the aforesaid conditions, the amount of paddy to be processed in the proposed milling facilities will be all of the paddy collected by the project.

(6) Determining Operating Conditions

Operating conditions were determined to make it possible to buy the product quickly and to provide milled paddy stably, and based on current labour customs:

- Operating period for collecting : 75 days per cropping season, including harvest and receiving period (60 days) and extra days for preparation by farmers.
- Operating days for collecting : 75 days x 80% = 60 days
- Operating period of milling house: 150 days per cropping season
- Operating days of milling house : 150 days x 80% = 120 days

- Operating hours of milling house :

Customary working hours are 7 hours a day. Actual operating hours estimated as 5 hours based on the supposition that the working ratio is 70%, are not suitable from the economic view point because the scale of facilities should be larger. It would be hard on the workers if workers were obliged to work overtime to solve this problem. Considering the above and for the purpose of creating employment opportunities, operating hours were decided to be 10 hours on a two-shifts basis. The drying machine would be operated for 24 hours a day as necessary. Receiving, which is related to outside facilities, would be on a one-shift basis.

(7) Appropriate Level of the Mechanization

Taking into account the operation and administration levels on the receiving side, and the present marketing condition of paddy, the appropriate level of mechanization to be introduced in the project will not be set as high as automatic control, improvement in rice quality by introduction of a wet-type polishing machine, color separator, etc., as in Japan. However, a certain level of mechanization is required to reduce processing loss, to improve milling ratio and to secure safety in operating machinery.

5.1.3 Setting of Work Flow and Optimum Scale of the Post-Harvest Facilities

Work flow related to the post-harvest facilities is illustrated in Fig. 7, covering from transport of paddy to the buying posts and receiving facility to shipping of rice. These elements and their optimum scales are described below:

(1) Transport Vehicles

Transport vehicles will be used to convey bagged paddy, which has been weighed and purchased at the buying posts, to the receiving facility of the milling house.

The buying post will be operated by cooperative societies and will be placed in each area; Upper Mabogini, Lower Mabogini, Rau Ya Kati, Chekereni and Oria. The buying post will be located beside a road in the center of the area for efficient transport. The locations are shown in "General Layout of the Project Area" at the beginning of the report. At present, paddy is picked up by a truck with trailer from each farmer's field, and purchased after adjusting the weight according to paddy's moisture content at the buying posts. This buying procedure will be followed by the project, but some improvements will be made to make it

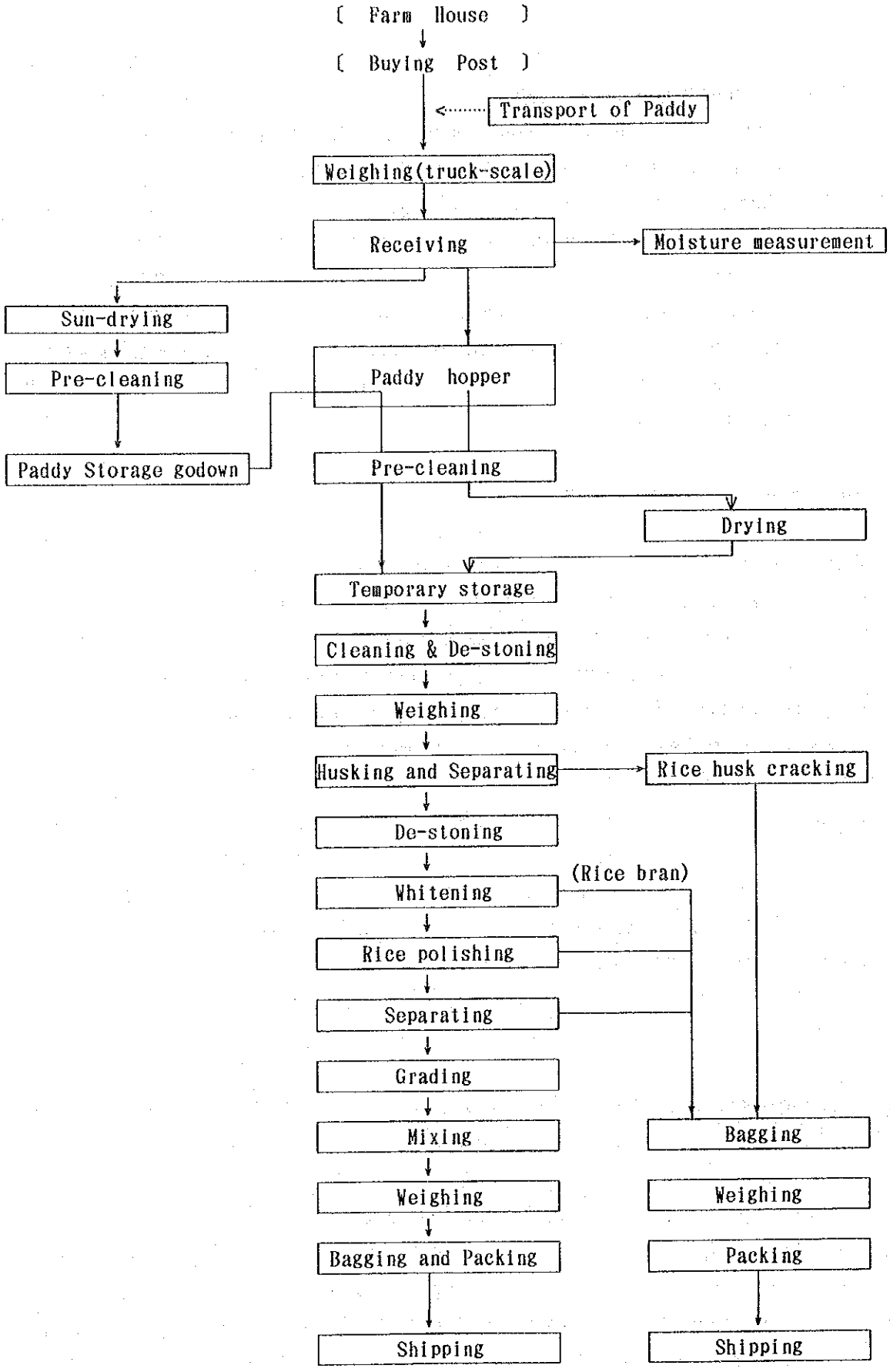


Fig. 7 WORK FLOW ON POST-HARVEST FACILITIES

easier to receive and classify paddy, and to control its quality. Improvements will be required such as attaching labels to show the moisture content and variety of rice as well as the name of buying post of paddy, date of inspection and weighing.

The quantity of paddy to be transported will be 6,000 tons, consisting of 3,600 tons of rainy season paddy and 2,400 tons of dry season paddy, adjusted to cleaned dried paddy, with a moisture content of 14%. This will be equivalent to 3,970 tons of wet paddy in rainy season (moisture content 22%), and to 2,490 tons of semi-dry paddy in dry season (moisture content 17%).

(2) Receiving Facility

The main components of the receiving facility will be weighing and classification of paddy transported from buying posts by truck, checking of dispatch slips and preparation of receiving slips. A truck-scale (or weigh bridge) will be used to certify the quantity transported from the buying posts.

Transported paddy will be classified by moisture content, and sampled and checked whenever necessary. Paddy at a high moisture level will be sent to a mechanical drying process. Semi-dry paddy will be sent to a sun-drying floor and dried paddy will be put into the milling process or stored. The conveyance of paddy in these facilities will be by hand carts.

The paddy quantity to be dealt with in the receiving facility is estimated below:

Item	Rainy Season Paddy		Dry Season Paddy	
	Dry Paddy	Wet Paddy	Dry Paddy	Semi-dry Paddy
1) Quantity of collected paddy (tons)	3,600	3,970	2,400	2,490
2) Operating period (days)	75		75	
3) Workable days (days)	60		60	
4) Average receiving quantity per day (tons/day))	60	67	40	42
5) Max. receiving quantity per day (tons/day)	75	84	50	53
6) Operating hours per day (hours/day)	7		7	
7) Operation efficiency (%)	70		70	
8) Max. receiving quantity per hour (tons/hour)	15	17	10	11

The maximum receivable quantity at the wet season harvest time is estimated at 84 tons/day or 17 tons/hour of wet paddy. One half of the transported paddy will be sent to sun-drying floor, and the other half to the drying machine through the paddy hopper and pre-cleaner.

The maximum receivable quantity of semi-dry paddy transported in dry season, of which the moisture content is from 15% to 18% (average 17%), will be 53 tons/day or 11 tons/hour. As for drying in dry seaon, the average receivable quantity (40 tons/day) will be dried on a sun-drying floor, and only when the paddy is too much to dry by sunlight, will the drying machine be used and for up to about 10 tons/day.

(3) Drying Facilities

Sun-drying is enough for usual drying of paddy, because sunshine hours are long enough and annual precipitation days are small in the project area. However, double cropping will be practised in the project area, and paddy at a high moisture level will be transported into the facility when rainy season paddy is harvested. Accordingly, mechanical drying will have to be introduced in order to avoid deterioration of the wet paddy.

For the above conditions two (2) drying facilities will have to be provided in the project; a concrete floor for sun-drying and a drying machine. The proposed capacity of the drying machine and sun-drying floor is 40 tons, half of daily maximum receiving quantity, for each facility.

Work on the sun-drying floor would consists of opening bags and tipping rice on the floor and spreading it 5 cm deep, repeated stirring so that it may be dried uniformly without cracking; to removal of immature paddy and foreign matter by a pre-cleaner and then bagging for storage. Paddy dried by machine will be sent directly to the milling process.

(4) Milling Facility

The proposed capacity of the milling process is estimated at 3 tons/hour as follows:

- Quantity of collected paddy (rainy season paddy)	3,600	tons
- Operating period (per cropping season)	150	days
- Workable days	120	days
- Processing capacity per day	30	tons
- Operating hours per day (Two-shifts basis)	14	hours

- Operation efficiency 70 %
- Processing capacity per hour 3 tons/hour

The work flow of the milling process will be as follows:

Temporary storage → Pre-cleaning → Weighing → Husking & Separating →
De-stoning → Whitening → Rice polishing → Separating → Grading

1) Temporary storage
   Paddy dried or stored in the godown will be stored temporarily before being sent for milling.

2) Pre-cleaning
   Foreign matter such as gravel and iron fragments, and immature rice will be removed.

3) Weighing
   Paddy being sent for milling will be weighed so as to clarify the paddy quantity to be processed and total rice outturn. According to the results of weighing, milling machinery may be adjusted if necessary.

4) Husking and separating
   Paddy will be husked into brown rice and hulls. Paddy which remains unhulled will be again processed.

5) De-stoning
   Gravel mixed in the paddy will again be excluded.

6) Whitening
   Brown rice will be whitened by removing bran.

7) Rice polishing
   Whitened rice will be polished, and rice bran will be excluded.

8) Separating
   Small brokens of rice and rice bran will be removed.

9) Grading

Milled rice will be graded according to the degree of cracking. There is no price variation by mixing ratio of cracked rice and no quality standard to regulate it at present in Tanzania. However, to reduce loss during the milling process, and to improve the quality of the milled rice, it is necessary to distinguish rigidly broken rice from unmilled one, and thus to improve the milling ratio.

(5) Weighing and Bagging Facilities

1) Mixing

Rice graded by kernel length will be mixed by a certain percentage and will be sent to the next process.

2) Weighing and packing

Rice will be bagged according to the weight by which rice will be consigned, namely 50 kg or 100 kg.

3) Disposal of goods

Rice which has been processed and bagged will be dispatched after temporary storage. There may be times when rice may stay for several days.

(6) By-products Processing Facilities

At present, in order to use by-products such as husks and brans derived by the process of separating and milling, livestock feedstuff is produced in Moshi town area, by mixture with maize, molasses and other products. It is proposed that husks be shattered by smasher and sold as an admixture of feedstuffs in order to make the best use of by-products. The husk smasher's capacity will be commensurate with the paddy quantity to be processed, being 6 tons per day (30 tons/day x 20 %). Bran will be shipped as it is after bagging and weighing. The shipping quantity of bran is estimated at 2.4 tons per day (30 tons x 80 % x 10 %).

(7) Multi-purpose Godown

The scale of the multi-purpose godown, will be designed according to the required capacity for paddy calculated as the difference between the collected quantity of wet season paddy and the shipped quantity during the period of milling. Storage of fertilizers and agro-chemicals would also be taken into account. The storage capacity for paddy will be

estimated on the basis of the following conditions:

- Quantity of collected paddy (rainy season paddy)	3,600	tons
- Collecting period	75	days
- Operation period of milling	150	days
- Workable days of milling	120	days
- Milling quantity per day (unhulled rice)	30	tons

Fertilizers will have to be prepared one month before each cropping. The application amount of nitrogenous and phosphatic fertilizers will be 150 kg/ha and 80 kg/ha, respectively. Potassic fertilizer will not be used. Nitrogenous fertilizer will be 400 tons (8,000 bags) converted to urea, phosphatic fertilizers 200 tons (4,000 bags) converted to triple super phosphate, and 600 tons (12,000 bags) in total for rainy season paddy. The maximum storage capacity for agro-chemicals is 2,240 liters, based on the average application amount of 2 liters/ha. Seeds are usually stored by the farmers for their own use, so only for renewal seeds will be stored in the multi-purpose godown. Seeds will be renewed once every 4 years, and 12 tons (1,120ha x 40kg/ha ÷ 4 years) and 9 tons (820ha x 40kg/ha ÷ 4 years) of seeds will be stored in rainy seaon and dry seaon.

The quantities of the above items to be stored are shown below with the time scale.

Item	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Cropping period	1,120 ha					820 ha						
Harvest period	(800ha)				60days(1,120ha)						60 days	
Collecting period	75 days 2,400 tons					75 days 3,600 tons						
Milling period	150 days					150 days						
Milling days	120 days					120 days						
Unhulled rice to be milled	1,200 tons	1,200 tons				1,800 tons	1,800 tons					
Maximum quantity of paddy storage	1,200 tons					1,800 tons						
Quantity of fertilizer storage						436 tons					596 tons	
Quantity of agro- chemicals					1,604 liters						2,240 liters	
Quantity of seeds storage	9 tons					12 tons						

As shown in the above figures, the maximum storage quantity for paddy is 1,800 tons at the end of August. As for fertilizer the maximum quantity is 600 tons in December, when rainy season paddy will start to be cropped. Maximum storage quantity for seed paddy is 12 tons for rainy season paddy and 9 tons for dry season paddy. Seed produced in the previous rainy season will be applied for the next rainy season, and seeds in the previous dry season for the next dry season so that the germination percentage may not fall by dormancy. Accordingly long-term storage will not be necessary.

(8) Additional Facilities for Operation and Maintenance

KNCU will be in charge of operation and maintenance (O&M) for the post-harvest facilities. Since KNCU's office is located in Moshi town it is required to provide another office for administrative and technical staff at the site of the facilities. The O&M department will have sections for general affairs, accounts, collecting and shipping, and drying and milling under the control of a manager. 16 persons will be required for the office (Ref. Table 6).

5.1.4 Proposed Equipment

(1) Paddy Transport Vehicles

The carrying capacity of the rice transport vehicles (trucks) will be 6 tons, since they will be operated along secondary main farm roads, with a width of 5 m. The number of required trucks has been estimated based on the paddy quantity to be collected, and the transport distance from each buying post in rainy seaon, when more paddy is produced. The controlled area, quantity to be collected, distance to milling house, daily transport quantity and numbers of required trucks are shown in Table 4.

On an average day five (5) trucks go and return twelve (12) times to convey 67 tons of wet paddy in total, on the other hand six (6) trucks go and return fifteen (15) times for 84 tons of paddy at the maximum. Accordingly six (6) trucks will be required and they will be common cargo-trucks. The truck-body should have a hood, which can be put on and off easily, to keep off the rain since the paddy may be transported on rainy days.

(2) Equipment for Receiving Facility

Equipment for the receiving facility will comprises a truck-scale (weighbridge), a hopper, a bucket elevator, a pre-cleaner, grain moisture meters, bag triers and bag paddy

Table 4 ESTIMATE OF TRUCK NUMBERS

Buying Posts	Upper Mabogini	Lower Mabogini	Rau Ya Kati	Chekereni	Oria	Total
Cropping area (ha)	200	270	285	263	102	1,120
Collected quantity /1 (tons)	700	960	1,010	940	360	3,970
Daily transported quantity /2 (tons)	12	16	17	16	6	67
Daily maximum transported quantity /3 (tons)	15	20	21	20	8	84
Number of round trip /4 (times)	2	2.7	2.8	2.7	1	11.2
Maximum number of round trip /5 (times)	2.5	3.3	3.5	3.3	1.3	13.9
Distance to milling house (km)	10	6	3	3	3	-
Truck identification (A - F) x Number of round trip /6						
Average	A x 2	B x 2 E x 1	C x 3	D x 3	E x 1	5 trucks 12 times
Maximum 15 times	A x 2	B x 2, E x 1 F x 2	C x 3	D x 3	E x 1 E x 1	6 trucks

/1 Quantity is shown converted to wet paddy, of which moisture content is 22% in view of safety.

/2 Quantity on an average day.

/3 Fluctuation on quantity is estimated.

/4 Number of times on an average day.

/5 Fluctuation on quantity is estimated.

/6 From Upper Mabogini and Lower Mabogini an identical truck will be operated only twice a day as it is far. From other areas it will be operated 2/3 times a day.

transport carts. The dimensions and numbers of these items are as follows.

1) Truck-scale (weighbridge)
15 tons truck-scale based on a tare weight of 5 tons and a load weight of 6 tons. Measured weight on the truck-scale will be recorded manually.

2) Hopper and bucket elevator
One hopper and bucket elevator will be provided. Received paddy will be put into the hopper from bags, and will be sent to the pre-cleaner by the bucket elevator. The hopper's capacity will be 2 tons, and the proposed capacity of the whole system will be 10 tons/hour, as shown below. Proposed capacity per day is 40 tons/day, on the assumption that one half of the 80 tons/day of maximum quantity will be sent straight to sun-drying floor.

- Proposed maximum dealing capacity per day	40 tons/day
- Operating hours per day	7 hours
- Workable operating hours per day	5 hours
- Work efficiency of equipment	80%
- Proposed capacity	10 tons/hour

3) Pre-cleaner
Paddy should be cleaned before mechanical drying up to the extent that machine operation will not be disturbed. One pre-cleaner with 10 tons/day as proposed capacity will be installed.

4) Grain moisture meters and bag triers
Three (3) resistance type of electric moisture meters will be proposed. They will be used mainly because rapid moisture determination is possible. One (1) moisture meter of the infrared lamp type will be provided for checking the accuracy of the resistance type. Bag triers will be used to sample paddy.

5) Carts
Carts will be used for paddy transportation in receiving facility. Four (4) carts are necessary as shown below:

- Daily maximum quantity for transportation	40 tons
- Cart load	500 kg/cart
- Average time per a cycle	15 minutes

- Workable operating hours 5 hours
- Carts required 4 carts

(3) Equipment for Drying Facilities

1) Drying machine

Ventilated drying at normal temperature will be used for mechanical drying, taking into account the difficulty in getting fuel and the shortage of technicians required for high-temperature drying. Extra heat, however, will be used when required so that the load will be higher than outdoor temperature by 10°C during the night, early morning and at rainy times, when the relative humidity is high. The type of machine will be a recirculating batch dryer with supplemental heat source, taking the following conditions into account; (i) handled paddy is at a high moisture level (22%), (ii) drying is quick and uniform, (iii) quick loading and unloading is possible, (iv) relatively small-scale facilities and buildings are enough and (v) high operation technique is not necessary.

The dryer operates at normal temperature and removes 0.3% of moisture/hour. Therefore, 27 hours are required to reduce moisture to 14%. However, it will takes 5 hours to send 40 tons of paddy to the drying machine through the pre-cleaner, and also 5 hours to unload paddy from the drying machine. Thus, it will take more than 30 hours (nearly 2 days) for one (1) cycle of the drying machine, and proper rotational operation will be 0.5 cycle/day to coordinate with the work of receiving. Accordingly, four (4) drying machines each with a capacity of 20 tons will be installed, and two (2) of them will be operated once every 2 days.

As mentioned in Section 5.1.3 (2), about 10 tons/day of extra paddy beyond the capacity of the sun-drying floor out of dry season paddy will be dried by machines. Paddy will be assigned to one machine which will take 2 days to be dried by ventilation at normal temperature.

A light oil burner will be used as the supplement heat source since it is much easier to procure light oil in bulk than lamp oil. However, it will be necessary to store light oil before harvest of rainy season paddy since it may be impossible to get oil because of bad road conditions during rainy seaon.

About 24,000 liters (10 liters/hr/machine x 10 hrs/day x 60 days x 4 machines) of

light oil will be need to be stored. Two (2) fuel storage tanks, of 12,000 liters capacity each, will be installed.

In the event of interruption of the electricity supply while paddy at a high moisture content is being dried by machine, the paddy should be taken out of the machine to prevent damage to the paddy. For this purpose a diesel generator of 16 kVA capacity will be installed.

Paddy conveyors appended to the drying machine to load and unload paddy will be required in addition to the above equipment.

2) Sun-drying floor

The area of sun-drying floor required is estimated at about 3,000 m^2. The floor will be divided into four (4) sections so that trucks may approach easily as mentioned at Section 5.2.7 "Architectural Plan, (3)" .

- Drying period : 2 days
- Maximum processing capacity : 84 tons/day ÷ 2 x 2 days = 80 tons/day (rounded)
- Thickness of spread paddy : 5 cm
- Apparent specific gravity of paddy : 0.55
- Required floor area : 80 tons/day - 0.55 - 0.05 m = 3,000 m^2
- Actual area : (33 m x 24 m) x 4 sections = 3,168 m^2

3) Pre-cleaner (for sun-drying floor)

Sun-dried paddy should be cleaned before storage to remove foreign matter. The proposed capacity of the pre-cleaner is as follows:

- Required processing capacity per day : 40 tons/day
- Operation hours : 7 hours
- Workable hours : 4 hours
- Required processing capacity per hour : 10 tons/hour
- Work efficiency : 80%
- Proposed capacity of pre-cleaner : 13 tons/hours

Based on the above conditions, two (2) pre-cleaners each with a capacity of 6 tons/hour will be prepared. The pre-cleaners will be mounted on flatcars so that

they may be mobile on the floor. A bucket elevator will be fixed to the pre-cleaners so as to make it easy to put paddy, which is in bulk, into the pre-cleaners.

4) Waterproof sheet

Paddy on the sun-drying floor will be piled in heaps and covered with waterproof sheets at night and when it rains. Four (4) sheets, of 86 m^2 each, will be required on the supposition that paddy in each section will be piled into separate heap.

- Paddy quantity on one section of the floor 20 tons
- Shape of paddy heap

height		:	1 m
width	(upper)	:	3 m
	(lower)	:	5 m
length	(upper)	:	9 m
	(lower)	:	11 m

- Sheet size : 7.2 m x 12 m (standard size)
- Required quantity of sheet : 86 m^2 x 4 sheets

5) Transportation carts

Paddy after drying, cleaning, and bagging will be transported to the godown by carts. Six (6) carts will be necessary as shown below.

- Daily maximum quantity for transportation : 40 tons
- Cart loadage : 500 kg/cart
- Average time per a cycle : 20 minutes
- Workable hours : 5 hours
- Carts required : 6 carts

(4) Equipment for Milling Facility

Two (2) lines of machinery for the process from dehusking to bran removal and rice polishing will be furnished, so that all processes need not be stopped in the case of some breakdown or repair of machinery. Machinery will be placed with enough space for safe operation and for ease of repair.

1) Paddy storage tank

This is a balancing tank to store paddy temporarily before the milling process. Two (2) tanks of 20 tons capacity will be required, corresponding to the daily output of

the drying machines.

2) Destoner

Paddy that has already been pre-cleaned will be passed through the de-stoner. Separation will be accomplished by specific gravity, and the proposed capacity is 4 tons/hour to be commensurate with the capacity in the milling process.

3) Hopper scale

This is a device to record the quantity of de-stoned paddy to be passed through the milling process. One (1) scale with a capacity of 4 tons/hour will be installed.

4) Discharge adjusting tank

This is a tank to adjust the paddy discharge so as to as provide a certain amount of paddy, as measured by the hopper scale, to the rice mill. Two (2) tanks with a capacity of 4 tons, equivalent to paddy processed in one hour, will be prepared. The tank will distribute the paddy into 2 (two) branches, as two (2) lines of machinery are set up for the process up to bran removal and rice polishing.

5) Husker

Huskers of rubber roll type will be fixed. The capacity of one (1) mill will be 2 tons/hour, as two (2) lines of machinery, of which capacity is 4 tons/hour in total, are proposed.

6) Separator

The capacity of one (1) separator will be 2 tons/hour.

7) Brown rice tank

This is an adjusting tank to let brown rice flow constantly. Two (2) tanks with a capacity of 2 tons each will be required.

8) Destoner

This is a device to exclude gravel mixed with brown rice by specific gravity. Two (2) machines with a capacity of 2 tons/hour each will be fixed.

9) Whitener and rice polisher

Almost all varieties of paddy to be handled will be of the Indica type and mainly of IR-line. Taking the variety of paddy into consideration, a whitener which has two (2) processes, an abrasive process as first stage and a friction process as second

process, will be provided. In addition, a rice polisher of a friction type will be installed as a third stage. Two (2) machines, each with a capacity of 1.6 tons/hour will be provided.

10) Separator

Whitened rice will be divided into three (3) groups: perfect grains, mixed grains and small brokens, and attached bran will be removed. One (1) rotary sifter with a capacity of 3 tons/hour will be required.

11) Length separator

Mixed grains separated by the rotary sifter will be separated into perfect grains, large brokens and small brokens. One (1) separator with a capacity of 2 tons/hour will be installed.

12) Conveyor and collecting device

Besides the above milling facilities, conveyance equipment such as a belt conveyor and a bucket elevator and cyclone for bran collecting are required.

(5) Equipment for Weighing and Bagging Facilities

1) Whitened rice tank

Whitened rice tanks are required to store whole grains, large brokens and small brokens separately. The capacity will be 3 tons, 1.5 tons and 1.5 tons each.

2) Blender

One (1) blender, by which head rice and each size of broken rice will be blended in a certain ratio for marketing, will be installed under the above-mentioned tanks.

3) Tank for shipping

A tank will be required through which blended rice will be sent constantly to the packing and shipping process. It will have a capacity of 3 tons.

4) Weighing meter

This is a meter to weigh rice according to the quantity by which rice will be packed. One (1) scale-shutter with a capacity from 50 kg to 100 kg will be installed.

5) Sewing machine

This is a sewing machine to sew the opening of bags in which rice to be shipped is

packed. One (1) machine with a capacity of 50 bags/hour will be installed.

(6) Equipment for By-product Processing Facilities

1) Husk smasher

This is a machine to crack husks, which are a by-product, into the size between 2.5 mm and 3 mm so they may be used in a roughage mixture for livestock. The husk smasher's capacity is estimated below. One (1) unit with a capacity of 750kg/hour will be installed.

- Husk produced per day : 30 tons/day x 20% = 6 tons/day
- Husk produced per hour : 6 tons/day ÷ 10 hours/day = 600 kg/hour
- Work efficiency of equipment : 80%
- Proposed capacity of smasher : 750 kg/hour

2) Platform scale

Two (2) platform scales that can weight up to 150 kg will be installed for the bagged husk product. The bags will be sewn manually.

(7) Attached Facilities

A dust collecting facility is required consisting of a fan, cyclone, shoot and duct, and electric facility such as switch board and materials such as electric cable and a control panel.

One main control panel is required to show the work flow, with indicator lamps for the main motors, on and off switches and safety lamps for each item of machinery, ammeters for main item of machinery, etc. In control of machinery, automatic control systems will be used as little as possible taking into account the difficulty in operation and maintenance, and direct manual control systems will be used as far as possible instead. However, certain automatic systems will have to be introduced into the husking and polishing processes such as adjustment of rubber rolls, etc. taking work efficiency and operational safety into consideration.

Based on these concepts, in making of the equipment plan, controls will be provided in accordance with the following equipment plans (see Fig. 8):

Number on the Work Flow /1	Expected Function	Necessity of the Function	Indication to the Control Panel
3	Overflow shoot attached	When 4 becomes full, paddy will be overflowing and returned to 3.	Not indicated
12	- Do -	- Do -	- Do -
8	Each machine (4 units) attached level.	When 8 becomes full, ready for drying. Earlier processes, 5, 6 and 7 will be half, if 8 kept going.	Indicated by "full" lamp, warning alarm
11	Each tank attached level.	Earlier process will be half, if 11 kept going.	Indicated by "full" lamp, warning alarm
17	- Do -	- Do -	- Do -
34, 35, 36	- Do -	- Do -	- Do -
19	According to roll defacements wear, the distance between rolls will be automatically adjusted.	To attain a fixed husking ratio	Not indicated
19	When tanks of 19 become empty, roll adjustment will not be operated.	To avoid defacements of rolls	Not indicated
19, 17	When tanks of 19 become full, gates of 17 will be closed.	For improvement of work efficiency and to protect buckets of 18.	Not indicated
21	When tanks of 21 become full, gates of 19 will be closed.	For improvement of work efficiency.	Not indicated
All machines after 18	Unless all switches of the conveyers are "on", other machines will not be set in motion.	To avoid wrong operations	Not indicated
All machines	Unless alarm buttons are pushed before start, the machines will not be set in motion.	For safety of workers	Not indicated

/1 Work flow is shown on the following Fig.-8.

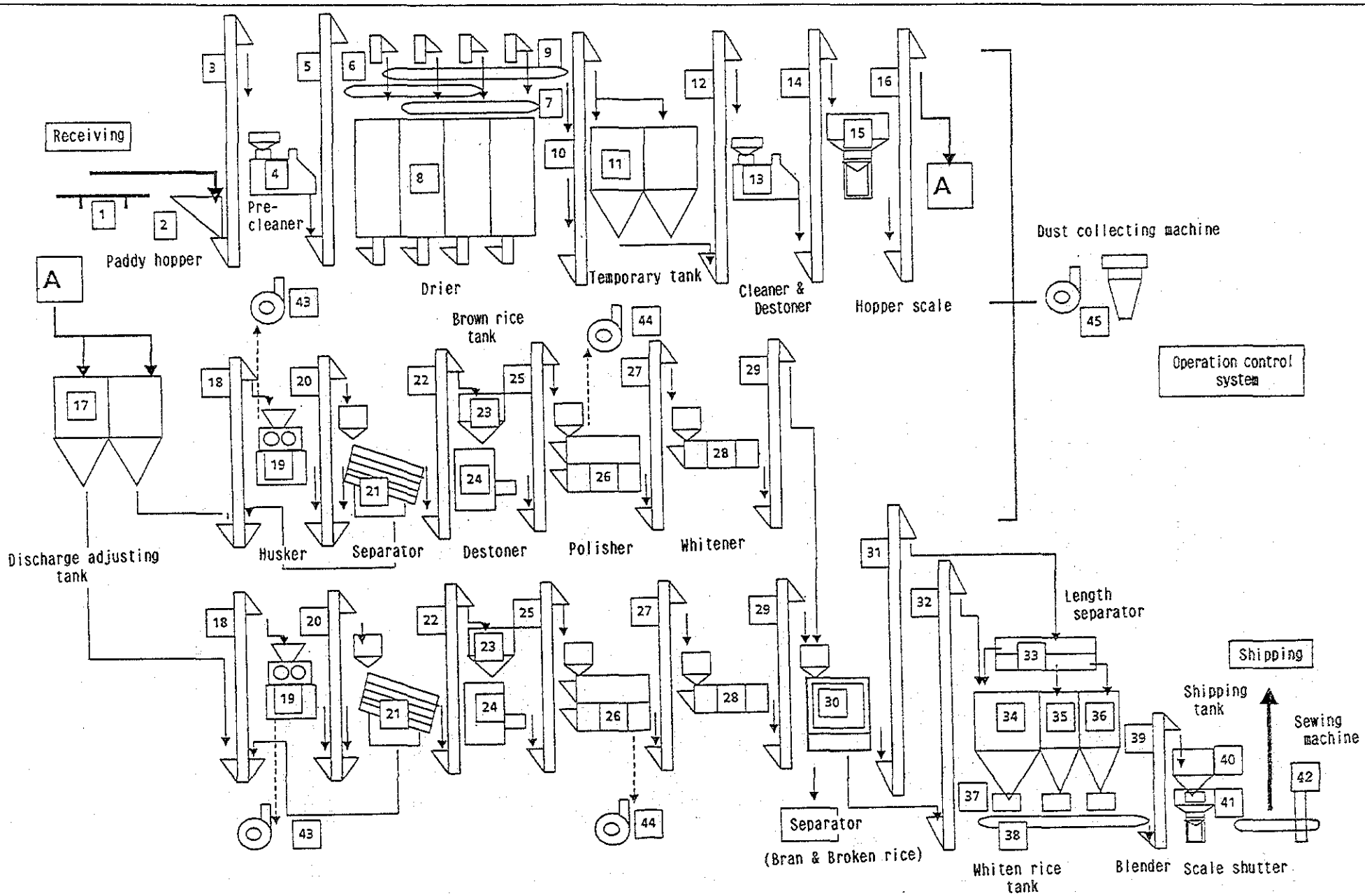


Fig. 8 WORK FLOW OF DRYING AND RICE MILLING FACILITIES

(8) Spare Parts

Spare parts for trucks, for drying and milling facilities such as rubber roll, screen, grinder, inside roll and belt and for other machines spares such as belts and bearings will be provided for 2 (two) years of operation and maintenance.

5.2 Architectural Design

5.2.1 Basic Concepts

(1) Object and Content

As already explained, the project is concerned with the planning and design of the post-harvest facilities at a scale conforming of the collectable amount of farm products of paddy fields covered by this project, and the buildings required for proper operation and maintenance.

The related buildings consist of; 1) rice mill house, 2) multi-purpose godown, 3) sun-drying yard, 4) administration office and 5) facilities for loading/unloading, garage, outdoor facilities, etc.

(2) Design Concepts

1) As for the technical standards for designing of the buildings, Tanzanian technical guidance for loads will apply to the design loads, and for the rest, relevant Japanese standards will be applied.

2) In planning, local conditons such as climate, customs, traditional practices should be taken into consideration as much as possible for easy and cheap maintenance.

3) Domestic materials and construction methods should be utilized. However, in general, the availability of materials in the Tanzanian market is uncertain in volume, in kind and in cost. Therefore, such materials in the said situations are proposed to be imported from Japan.

5.2.2 Grade of Buildings

On the setting grade of buildings, the following items should be taken into consideration:

1) Functions rendered, comfort, economical aspects
2) Durability and cleanliness required
3) Economy and easy maintenance
4) Easy construction

Considering to the proposed buildings on the basis of the above mentioned concepts, they will be divided into grade (A) and grade (B).

Grade (A)	:	Facilities with long spans and high eaves
Structure	:	Steel structure
Roof	:	Colored formed iron sheet
Walls	:	- Do -
Wainscot	:	Reinforced concrete
Floor	:	- Do -
Foundations	:	- Do -
Grade (B)	:	Facilities construct by customary methods
Structure	:	Reinforced concrete and wooden truss
Roof	:	Colored formed iron sheet
Walls	:	Concrete block
Floor	:	Reinforced concrete
Foundations	:	- Do -

Based on the above, the facilities are classificated as follows:

Facilities	Grade
Ricemill house	(A)
Multi-purpose godown	(A)
Office	(B)
Measuring house	(B)
Guard house	(B)
Lavatory	(B)
Garage	-
Sun-drying floor	-

5.2.3 Settlement of Proper Scale

Each facility floor area and scale will depend on machinery size and arrangement, working and storage space, and number of staff. The proper scale of the facilities are as

follows (computation of scale being shown in Table 5):

(1) Scale of Facilities

Ricemill house	1,047.7 m^2
Multi-purpose godown	1,297.2 m^2
Sun-drying floor	3,168.0 m^2
Office	198.0 m^2
Measuring house	7.5 m^2
Guardhouse	12.0 m^2
Lavatory	14.0 m^2
Garage	126.0 m^2

(2) Computation of scale

Computations of scale are shown in Table 5 following. The floor area of the office, however, is based on the following design criteria:

1) Cleark	:	5 - 7 m^2/person
2) Chief of a section	:	11.1 m^2
3) Manager	:	30.0 m^2
4) Council room	:	40.0 m^2
5) Kitchen	:	5.0 m^2
6) Lavatory	:	15.0 m^2
7) Entrance, corridor	:	33% of total floor area

Table 5 COMPUTATION TABLE OF PROPER SCALE FOR POST-HARVEST FACILITIES

Scale of Facilities	Formula	Basic Data			Remarks
I. Ricemill house 1,047.7 m^2					
(1) Milling (2 machine x 2 units) 341.0 m^2					Depends on layout drawing of machines
(2) Driers 121.9 m^2					Depends on layout drawing of machines
(3) Dried paddy storage and desposal of load 153.8 m^2	(axb÷c÷d)÷2 /1 +e	a: milling capacity b: milling house c: storage amount d: average stacking height e: passages etc.	: : : : :	3.0 t/h 10 hr/day 0.5 t/m^3 /3 1 m 123.8 m^2 /2	/1 storage for half day /2 depend on layout of machines /3 specific gravity: 0.5
(4) Cleaed rice storage 226.2 m^2	(a x 5day /1 ÷b÷c)÷d	a: product capacity of b: storage capacity c: average height d: working and passage space	: : : :	20t/day 0.7 t/m^3 /2 1.5 m 130.0 m^2 /3	/1 storage for 5 days /2 specific gravity: 0.7 /3 depend on layout drawing of machines
(5) Control room 30.7 m^2					control panel 2.5 x 0.6 1 board 2 persons
(6) Store for parts and tools 30.7 m^2					2 years supply of spare parts for milling machine: 11 m^3 2 years supply of spare parts for truck: 7 m^3 Total 18 m^3
(7) Processing and storage for chaff 89.3 m^2	a ÷ b x 3 /1 +c	a: processing capacity b: storage amount c: average stacking height d: machine space and working space	: : : :	6 t/day 0.1 t/m^3 /2 5.5 m 56.3 m^2	/1 storage for 3 days /2 specific gravity: 0.1
(8) Processing and storage for bran 54.1 m^2	a ÷ b x 3 /1 +c	a: processing capacity for bran b: storage amount c: average stacking height d: machine space and working space	: : : :	2.4 t/day 0.6 t/m^3 /2 1.0 m 42.1 m^2	/1 storage for 3 days /2 specific gravity: 0.6

(to be continued)

II. Multi-purpose godown
1,297.2 m^2

(1) Paddy storage (1,800 t) 966.0 m^2	a+b+c+d	a:	max. storage capacity	:	1,800 t	/1 specific gravity: 0.5
		b:	storage amount	:	0.5 t/m^3 /1	/2 24 stacks
		c:	average stacking height	:	5.5 m /2	/3 estimated on the basis of the drawing
		d:	passage etc.	:	294.3 m^2 /3	
(2) Product materials storage 277.9 m^2						
Ferrtilizer storage (600 t) 237.6 m^2	a+b+c+d	a:	max. storage capacity	:	600 t	/1 specific gravity: 0.7
		b:	storage amount/ floor area	:	0.7 t/m^3 /1	
		c:	average stacking height	:	5.5 m	
		d:	passage etc.	:	80.2 m^2	
Agro-chemicals storage 16.3 m^2						storage amount: 2,240 lit.
Seed storage 24.0 m^2	a+b+c+d	a:	max. storage capacity	:	12 t	/1 specific gravity: 0.5
		b:	storage amount/ floor area	:	0.5 t/m^3 /1	
		c:	average stacking height	:	5.5/2 m	
		d:	passage etc.	:	15.2 m^2	
(3) Miscellaneous storage /1 53.3 m^2						/1 Space for tools, carts cleaner (1.85 x 3.4) x 2unit, shovel x 20, rake x 40, etc.
III. Sun-drying floor 3,168 m^2 (33m x 24m) x 4 board	(a+b+c) x d + e	a:	required volume of disposal/day	:	37.5 t	
		b:	bulck specific gravity of paddy	:	0.55	
		c:	layer thickness of paddy for drying	:	0.05 m	
		d:	required day for disposal of drying per time	:	2 days	/1 14% of effective floor area
		e:	access space	:	441 m^2 /1	
IV. Office 198.0 m^2						
(1) Office (general affairs) 48.3 m^2	a x b	a:	number of persons to be admitted	:	9	/1 see design criteria 1) required floor area: 5-7 m^2
		b:	required floor area	:	5-7 m^2 /1	

(to be continued)

(2) Office (accountants) 20.7 m^2	a x b	a: number of persons to be admitted	:	3	/1 same as (1)
		b: required floor area	:	5-7 m^2 /1	
(3) Manager & secretasry 28.8 m^2	a x b	a: number of persons to be admitted	:	1	/1 see design criteria 3) manager: 30 m^2
		b: c floor area	:	29.6 m^2 /1	
(4) Meeting room 20.7 m^2		a: number of persons to be admitted	:	16	/1 see design criteria 4) 10-40 persons: 40 m^2
(5) Office (head of processing) 13.8 m^2	a x b	a: number of persons to be admitted	:	1	/1 see design criteria 2) section head: 11.1 m^2
		b: required floor area	:	11.1 m^2 /1	
(6) Office (head of shipping) 13.8 m^2	a x b	a: number of persons to be admitted	:	1	/1 same as (5)
		b: required floor area	:	11.1 m^2	
(7) Kitchen 3.24 m^2		a: effective floor area	:	148.5 m^2 /1	/1 see design criteria 5) less than 250 m^2: 5 m^2
(8) Labatory 12.0 m^2		a: number of persons to be admitted	:	16	/1 see design criteria 6) around 10 persons: 15 m^2
(9) Entrance . corridor 36.66 m^2		a: total area of rooms	:	148.5 m^2 /1	/1 see design criteria 7) 33% of total area of rooms
V. Measuring house 7,5 m^2	a x b + c	a: number of persons to be admitted	:	1	/1 same as office (1)
		b: required floor area per a person	:	5-7 m^2 /1	
		c: spare for measuring machine, etc.	:	1.5 m^2	
VI. Guardhouse 12,0 m^2					
VII. Labaratory 14.0 m^2					
VIII. Garage 126.0 m^2	a x b	a: number of trucks to be admitted	:	6 units	/1 Truck (6 t) x 6 nos 1 unit: 7.5 x 2.5m
		b: required floor area	:	18.8 m^2 /1	

5.2.4 Site Planning

(1) Outline of the Site

The proposed site is located in Chekereni Village, 15 km from Moshi town, along the Kahe road which is a trunk road running south-east from Moshi town. The Rau River System has been developed along the Kahe road, and the site is situated almost at the center of the above mentioned area, facing KADC across a new sub-road. The area is 725 meters above the sea level, is almost flat and at present cultivated as a maize field. The site is about 3.1 ha in area, a corner lot facing two crossing roads, being 210 meters in length along the trunk road, and 146 meters in width.

(2) Surroundings of the Site

The site is rectangular in shape having ratio of length to width of about 1.4 : 1, and of ample size. The facilities will cover 5,870 m^2 in total, which is about 20 percent of the site area and considered a moderate occupation rate for such facilities. The trunk road is 16.5 m in width, which provides good access to the site by truck. No land reclamation is required as the site has already been utilized as a base camp for a construction project.

(3) The Site Planning

As mentioned above, the trunk road runs along the north-east side of the site and the main gate to the site will be prepared around the center of the site. Since the front road is dusty, the projected facilities will be located away from the road.

Water and electricity supplies are already available to the proposed facilities. New telephone line will be conducted to the site from existing lines which are only 200 m. As there is no public drainage system around the site, rain and waste water drainage will be basically disposed of within the site as is common practice in Tanzania.

5.2.5 Layout Planning

The post-harvest facilities will consist of receiving, drying, milling of paddy, and storing and shipping of milled rice to the market. In planning, consideration should be given the flow of grain in the premises as well as the rice milling functions. Accordingly, the following should be considered to be basic points when planning:

1) Each building will be properly located in the premises as defined by the movement of grain through receiving, drying, storing, processing and shipping.

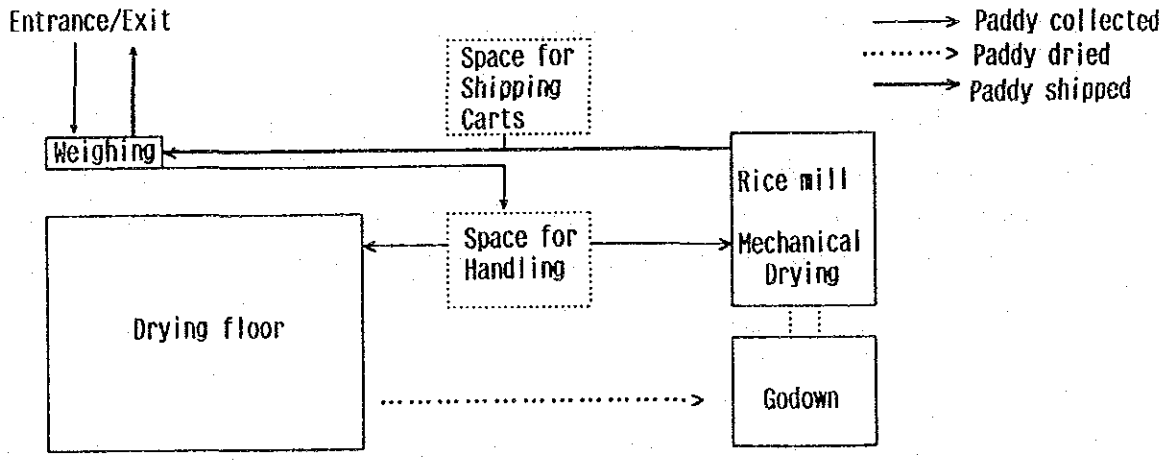
2) The axis of each building will be aligned parallel to the front road so as to utilize the entire area efficiently, making for less dead space. By doing so, it will give each building the advantag of not to just face west.

3) A compact arrangement of each facility will shorter distances for movement of goods as well as of workers.

4) The perimeter zone of the premises will be left vacant by concentration of the facilities in the center part to reduce entry of dust from outside, and to reduce the factory noise heard outside.

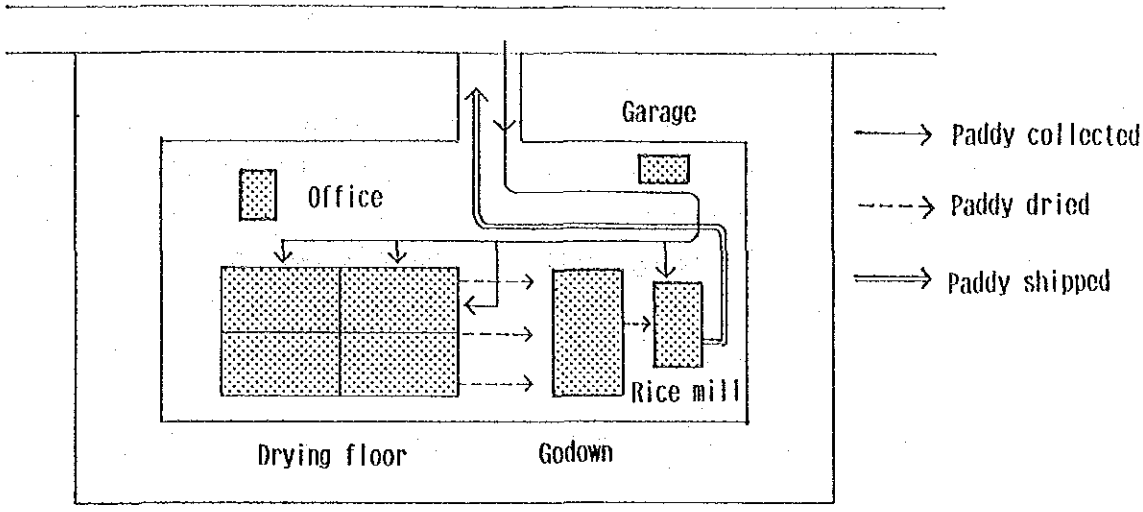
5) The buildings for related facilities will be constructed separately giving consideration to the differences of the characteristics of the various machinery to be installed, e.g. the degree of occurrence of noise and dust. Floor planning and building height will be arranged with due consideration to the functions of the various buildings.

The functional flow of the layout based on the above mentioned concepts has been sketched out as follows:

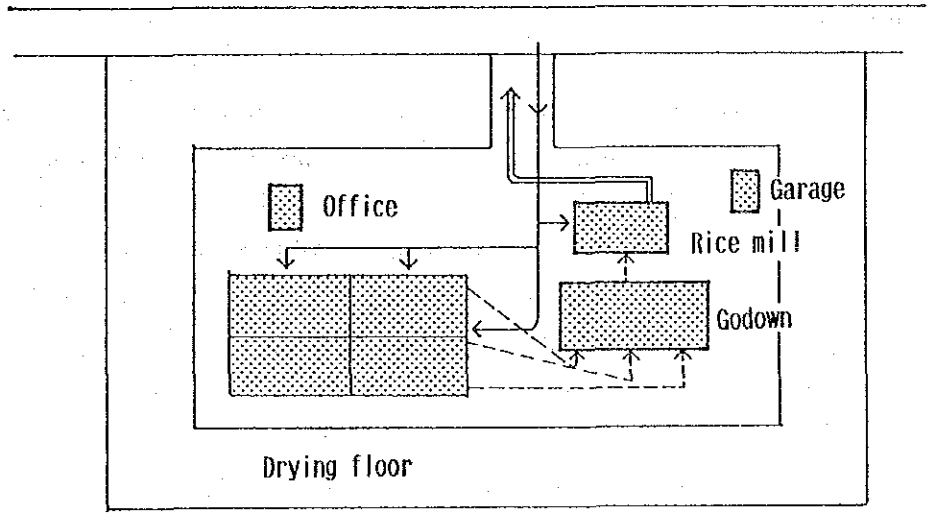


Following to the above sketch, alternatives of layout plans have been worked out as shown below:

Alt. A



Alt. B



These two are typical arrangements. The alternative A is arranged for the flow of goods in a straight line; in this the flow of goods means from sun-drying floor, to godown, to milling house. In alternative B, movement from the sun-drying yard to godown is far more complicated than that with alternative A. Accordingly, alternative A will be recommended as the final plan. The proposed layout plan is as shown in the Basic Design Drawing No.1.

5.2.6 Architectural Planning

(1) Rice Mill House

1) The required facilities in the rice mill plant include paddy drying machines, and a by-products processing facility for husks and bran in addition to rice milling facilities. In arranging this equipment, proper location and space saving will be given priority to taking adequate working flow into account.

2) Loading and unloading will be clearly separated to avoid congestion.

3) The by-products processing facility will be located at the end of the building as it is a subordinated one.

4) Near the openings for receiving and shipping of products working space will be reserved for storage.

5) Section and elevation planning

A raised floor system will be adopted since half of the inflow will be coming in by truck, the other half coming from the godown having the same raised floor, besides, all of loading will also be by trucks with a high deck. The raised floor will be 90 cm in height above the ground to coordinate with that of the deck of trucks. This will have other advantages such as avoiding the need for the receiving pit to be deep under the ground, keeping the floor dry and clean, prevention rodent damage, etc.

The height of the building will be determined as appropriate for the machinery to be installed. As for the appearance of the building, as it is solely functional in its use, consideration will be given to arrangement of the windows as regularly as possible without any special architectural treatment.

(2) Multi-purpose Godown

1) The multi-purpose godown will mainly be used for storing dried paddy. It will also store fertilizer, chemicals and seeds. These will be stored separately from each other with partition wall because of the difference in kinds and maintenace.

2) For loading and unloading of paddy in the warehouse, the "first-in, first-out" method will be adopted by arranging entrances on one long side and exits on the opposite side. Carriage of dried paddy will always be from the sun-drying floor to godown and then from godown to rice mill plant. Therefore, by locating the godown between sun-drying floor and rice mill plant, the movement of grain will be in one direction which will make for convenient storage.

3) Storage of farm inputs such as fertilizers will be located at the end of the godown, with entrances on the gable side so as not to disturb the routine work for storage of dried paddy.

4) Section and elevation planning

The floor area and height of the godown will be designed based on traditional practices in similar buildings in Tanzania. The height of eaves was determined to be 7.0 m, which includes the height of 24 bag layers (5.5 m) and working space above the stack (1.5 m). As for the floor level, a raised floor will be adopted for rodent protection, damp-proofing and cleanliness of the floor. Height of floor will be 90 cm above the ground, as for the rice mill plant.

For elevation of the building, as it is solely functional in its use, no special architectural treatment will be given, and the arrangement of openings in the wall will be regular for simplicity.

(3) Sun-drying Floor

1) The sun-drying floor, if too large would be inconvenient for operation. Accordingly, the yard will be divided into 4 blocks so as to enable trucks to access any side of each block easily.

2) The floor will be made of concrete to maintain a clean surface, good drainage and efficient drying.

3) The sun-drying floor will be provided with rising curbs around the edges in order to prevent trucks entering on the floor, and spilling of grain and dust.

4) The concrete floor will be sloped toward the edges from the center for smooth drainage.

(4) Administration Office

1) Possible patterns of floor planning are; finger plan, box plan, center corridor plan, side corridor plan and cluster plan. Among these, a cluster plan will be best for a small scale building such as this. By adopting this pattern, the occupation ratio of the area of rooms to that of the building will be rather high.

2) Each room will be arranged to face outside so as to enable it to receive natural light and natural ventilation.

3) General rooms will be allocated to the front of the building and rooms for senior staff to the rear. The manager's room will be attached to the secretary's room following local customs.

4) Section and elevation planning

The office building will be planned as a single storey building considering that it is rather small scale building having less than 200 m^2 in floor area. Aiming it's smartness of the appearance of the building and stressing its functional aspect, no special treatment will be given and the windows openings will be regularly arranged. The building will have rather deep eaves to avoid strong sunlight from coming into the rooms and to give the building more or less a clear-cut look.

(5) Other Buildings

1) Measuring house

The measuring house will be located behind the truck scale, which will have an observation window for checking incoming and outgoing cargoes. The weighing meter will be installed in the house.

2) Guard house

Guard house will located by the entrance gate and will have openings in its walls for watching and guarding.

3) Lavatory (Toilet)

The lavatory will be located to the rear side of the premises. It will have sections for both male and female. A storage for cleaning equipment will be included.

4) Garage (Truck shelter)

A shelter with a canopy will be provided on the premises for trucks for crop transportation.

5.2.7 Structural Design

(1) Design Concepts

Steel structures will be adopted for the raised buildings with long spans such as the plant house and the godown because of its surpassing strength, light weight, easy erection and low cost. The foundations, floor slab and wainscot of these buildings will be of reinforced concrete. For the general buildings such as office, reinforced concrete block structures will be used. For foundations and columns, reinforced concrete will be used. For walls, concrete blocks will be used. The roof truss will be of timber.

(2) Design Criteria

Technical guidelines prevailing in Tanzania will be applied to loads for structural design. Structural calculations other than for load conditions will be based on Japanese standards which have been authorized internationally.

1) Earthquake loads

$Vpd = Ka \times Kp \times Wpd$

where, Vpd : Design value of the lateral loads acting on the part considered
Ka : Design ground acceleration factor (0.050)
Kp : Partial horizontal force factor for the part considered (1.3)
Wpd : Design value of the weight of the part considered

2) Wind force

$d = 0.06 \times V^2$ (kg/m^2)

where, d : Wind pressure
V : Velocity of wind
37 m/s (3 m high)
45 m/s (10 m high)

3) Design loads

a) Dead load

- Reinforced concrete : 2.4 t/m^3

- Structural steel : 7.85 t/m^3
- Concrete blocks : 1.9 t/m^3
- Cement mortar : 2.0 t/m^3

b) Live loads

- Roof : 50 kg/m^2
- Floor (office) : 300 kg/m^2
  (godown) : 3,000 kg/m^2
  (factory) : Actual loads

4) Structural materials

Allowable strength and quality of structural materials should be as follows:

Reinforcement bar	:	Deformed bar SD 30 (JIS) or equivalent
Concrete	:	Fc 180 kg/cm^2 (4 weeks strength)
Cement	:	Portland cement
Structural steel	:	SS 41 (JIS) or equivalent

(3) Load Bearing Capacity of Ground

The load bearing capacity of the ground was assessed after examining the results of the cone penetrometer test and a hand auger test carried out on the field survey as well as the geological boring data at a point near the site (reference Annex 7). The results of the cone penetrometer test suggest that the load bearing capacity of the subsoil is fairly large. However, considering a high content of clay in the soil, it was decided that the design load bearing capacity of the ground should be taken as 10 ton/m^2 at 1 meter below ground level.

5.2.8 Finishing Scheme

(1) Design Concepts

On selecting finishing materials in this plan attention will be given to various points as follows:

1) To minimize kinds of finishing materials
2) To select durable materials, corrosion resistant or waterproof materials as required
3) To select materials which are easy to maintain, such as washable or materials
4) To select materials as are common in Tanzania, when applied to general buildings.

(2) Finishing Schedule

Building Grade (A)

Building	:	Rice mill plant, multi-purpose godown
Floor	:	Concrete trowel finish
Base	:	Cement mortar
Wainscot	:	Cement mortar
Walls	:	Colored formed iron sheet
Roof	:	- do -
Doors	:	Steel doors
Windows	:	Aluminum window with insect screen net and steel grille

Building Grade (B)

Building	:	Office, etc.
Floor	:	Terrazzo block or cement mortar as required
Base	:	Vinyl asbestos base
Wall	:	Emulsion paint on cement mortar
Ceiling	:	Plywood, oil paint finish
Roof	:	Colored formed iron sheet
Joinery	:	Wooden doors, aluminium windows

(3) Pavement of Road in Premises

Crushed stone pavement will be applied from the standpoint of easy repair in future.

5.2.9 Building Service Facilities

(1) Design Concepts

The grade of building service facilities will be comparable with those of similar existing buildings and also appropriate to the equipment to be installed and activities in the buildings, together with the following criteria:

1) To be economical, especially energy saving
2) To ensure easy operation and safety
3) Easy maintenance
4) Easy installation

(2) Electric System (See Fig. 9)

1)	Power characteristics	:	3-phase, 4 wires, 230/400 V, 50 Hz
2)	Power supply	:	11,000 V
3)	Power receiving	:	Transformer 11,000/400 V
4)	Distribution line	:	Overhead line system
5)	Electrical facilities		
	Motor power supply	:	To rice mill plant, godown
	Ventilation	:	No mechanical ventilation to be provided. Natural air convection is expected through windows and ventilators installed on the roof.
	Indoor lighting	:	Fluorescent or incandescent lamps as required
	Electric outlets	:	As required
	Duct for telephone line	:	Install in the office
	Outdoor lighting	:	Fluorescent lamps

(3) Plumbing System (See Fig. 10)

1)	Water supply to site	:	From city water main 6"Ø PVC pipe
2)	Water supply system	:	Gravity supply with an elevated water tank
3)	Water treatment	:	None
4)	Waste drainage	:	Soil, to be treated in a septic tank and disposed of by soakaway Waste water, to be conducted to outdoors and disposed of in a soakaway
5)	Rain water drainage	:	Conducted into storm drainage ditches

(4) Gas Supply System : None

(5) Airconditioning and Ventilation System

1)	Airconditioning	:	None Climate in this area is mild.

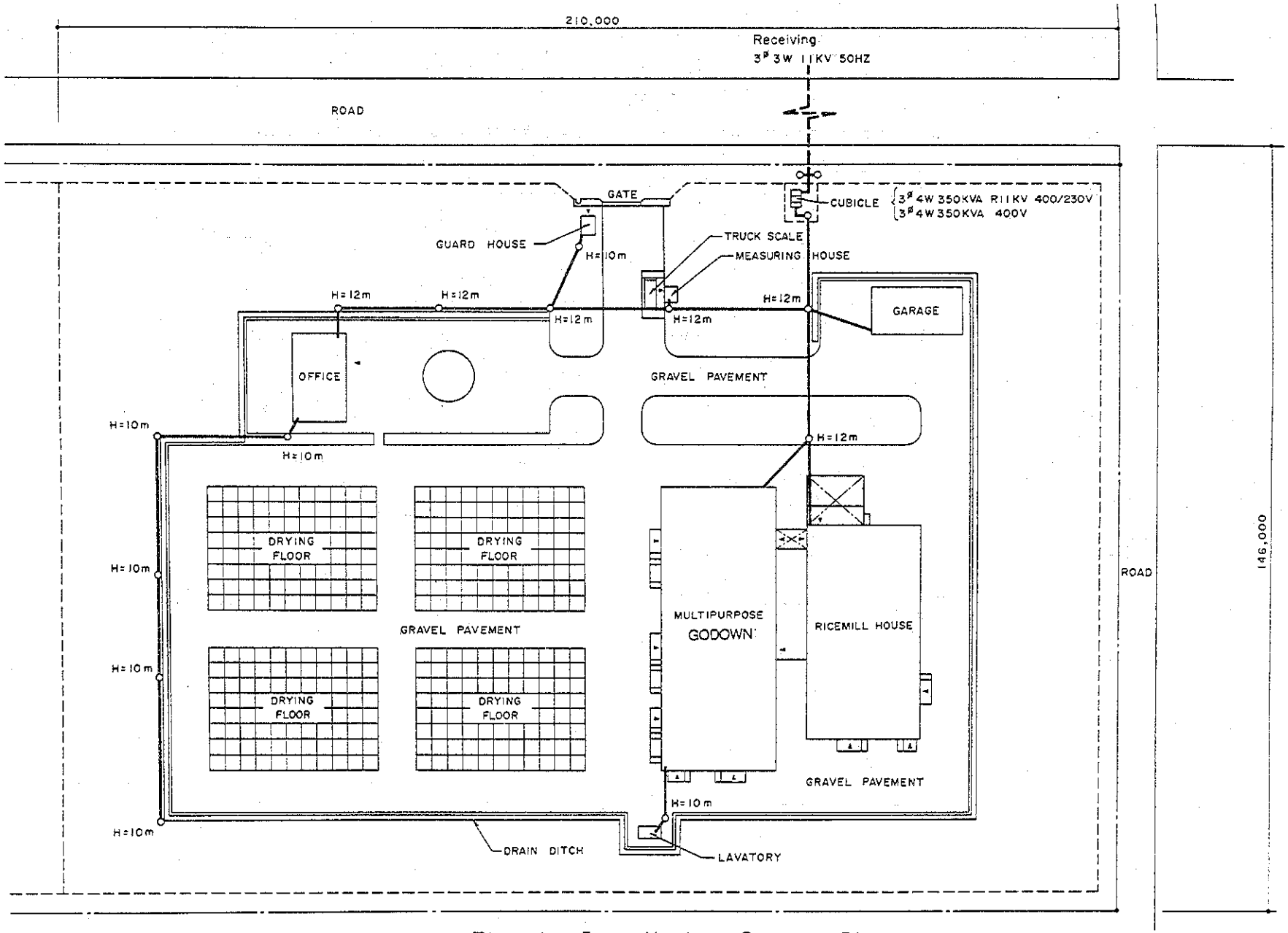


Fig. 9 Electric Installation System Diagram

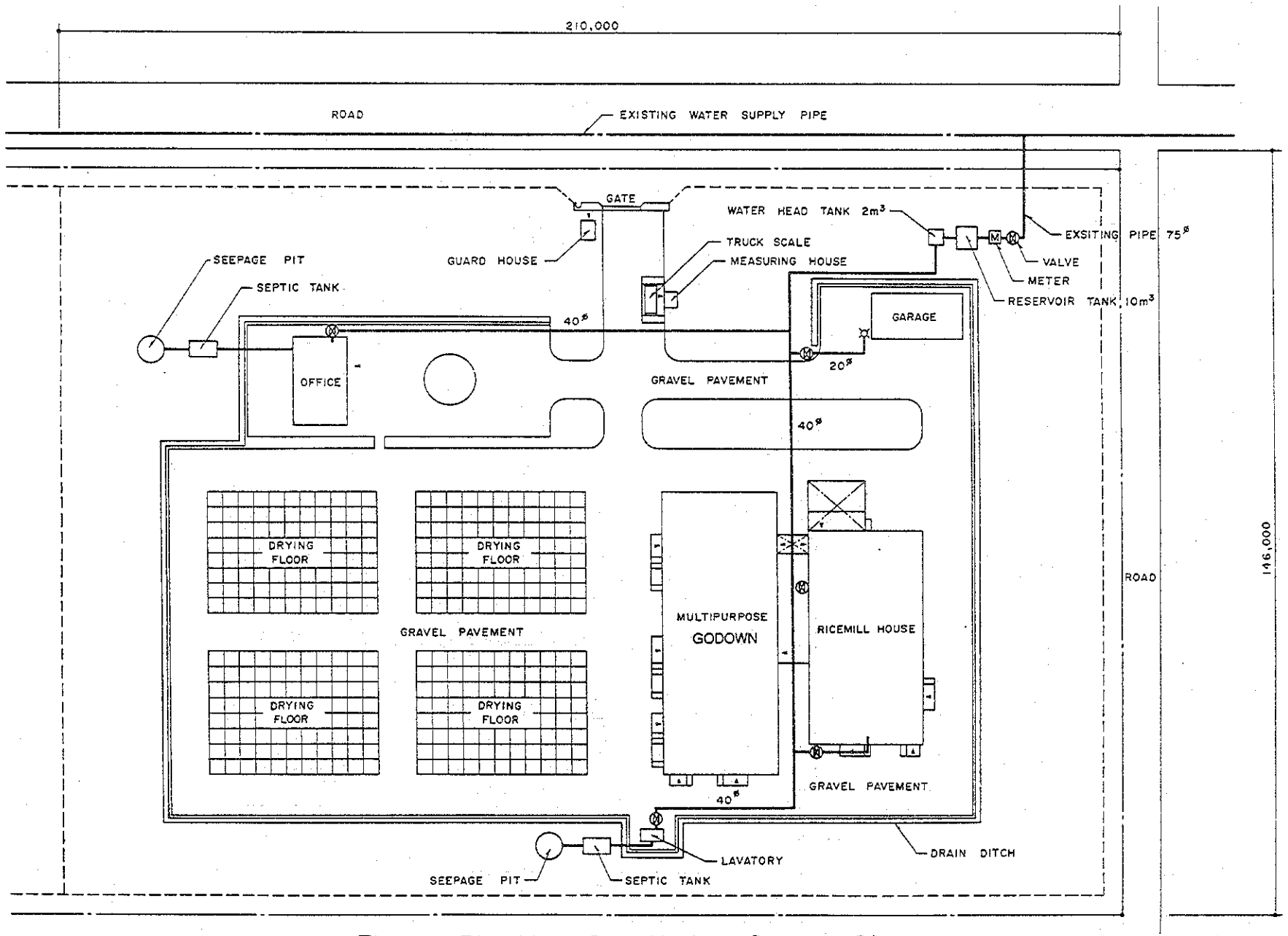


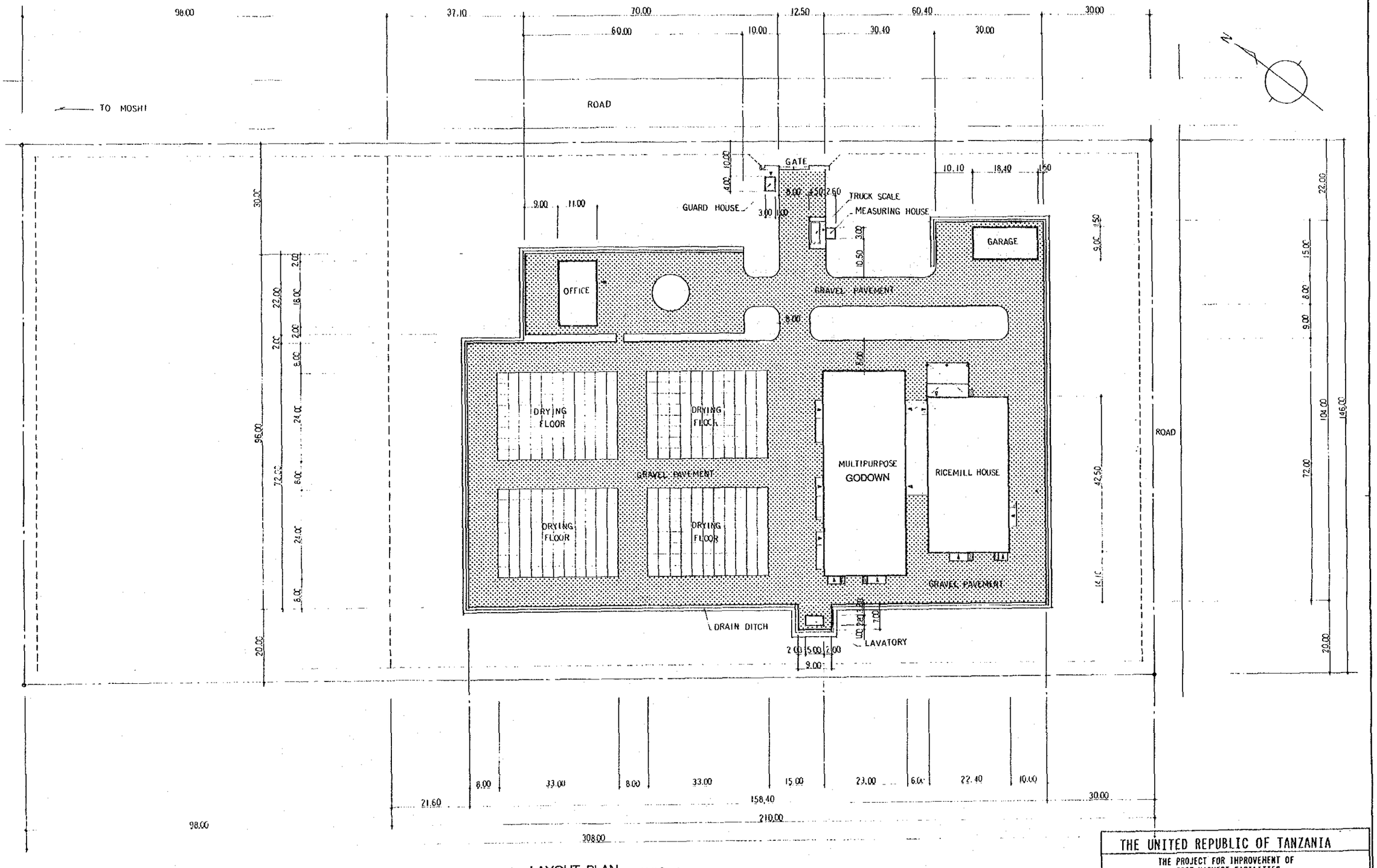
Fig. 10 Plumbing Installation System Diagram

5.3 Basic Design Drawings

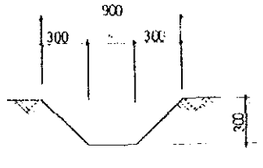
Basic design drawings including layout plan, plan, elevation and section are as shown in Drawing No.1 - No.9.

List of Basic Design Drawings

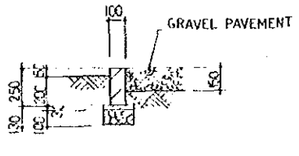
Basic Design Drawing-	1	Layout Plan
"	-2	Rice Mill House - Plan
"	-3	Rice Mill House - Section
"	-4	Rice Mill House - Elevation
"	-5	Multi-purpose Godown - Plan
"	-6	Multi-purpose Godown - Section, Elevation
"	-7	Administration Office & Guard House - Plan, Section, Elevation
"	-8	Garage, Measuring House, Lavatory, Sun-drying Floor - Plan, Section, Elevation
"	-9	Exterior & Interior Finish Schedule



LAYOUT PLAN SCALE - A



DRAIN DITCH SCALE - B

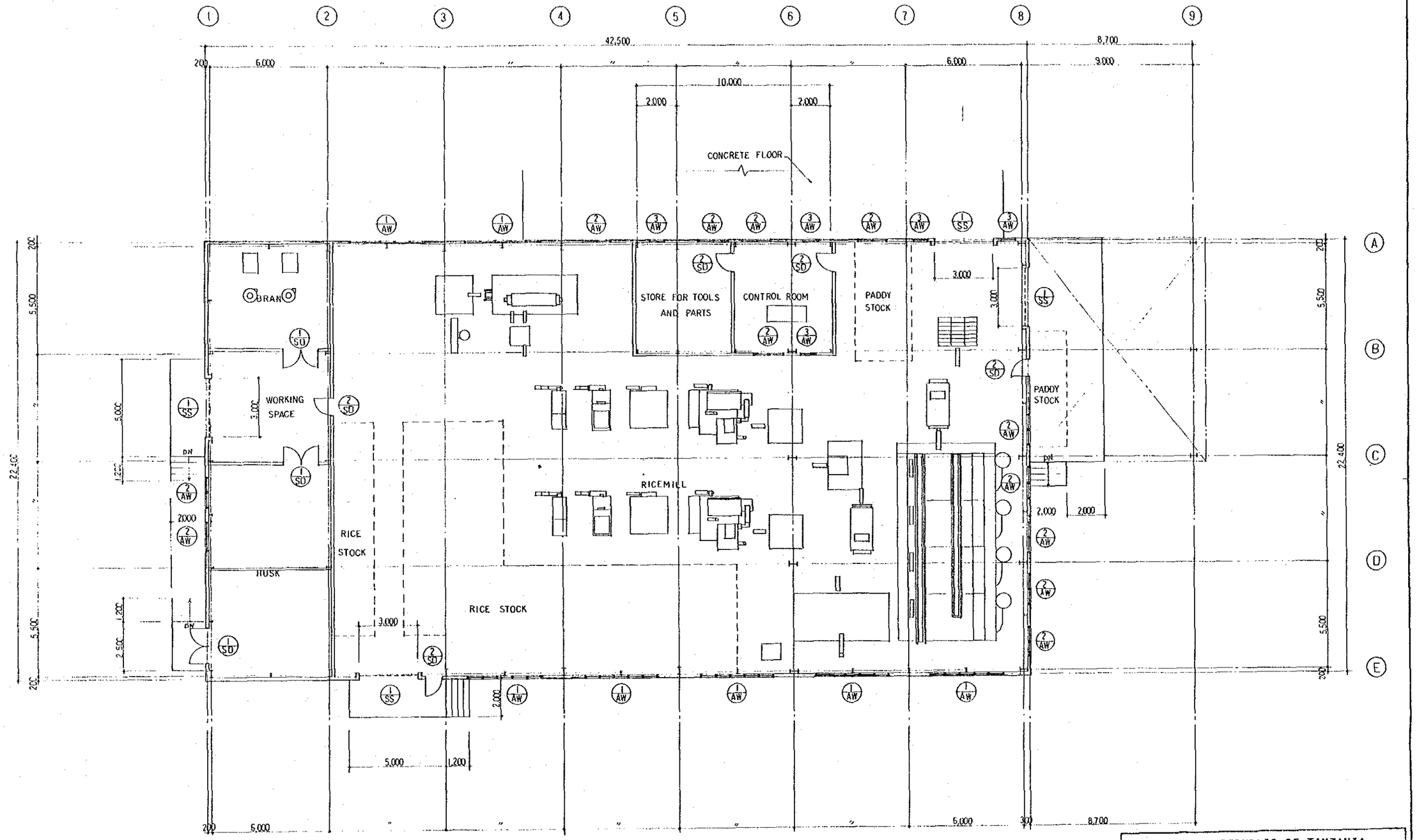


CURB AND PAVEMENT SCALE - B

SCALE - A 0 10 20 30 40 50M

SCALE - B 0 0.5 1.0 1.5 2.0M

THE UNITED REPUBLIC OF TANZANIA	
THE PROJECT FOR IMPROVEMENT OF POST-HARVEST FACILITIES IN KILIMANJARO REGION	
TITLE OF DRAWING: LAYOUT PLAN	
Date	Drawing No. 1
JAPAN INTERNATIONAL COOPERATION AGENCY	



PLAN
(1,047.7 m²)

RICEMILL HOUSE

SCALE 0 5 10M

THE UNITED REPUBLIC OF TANZANIA

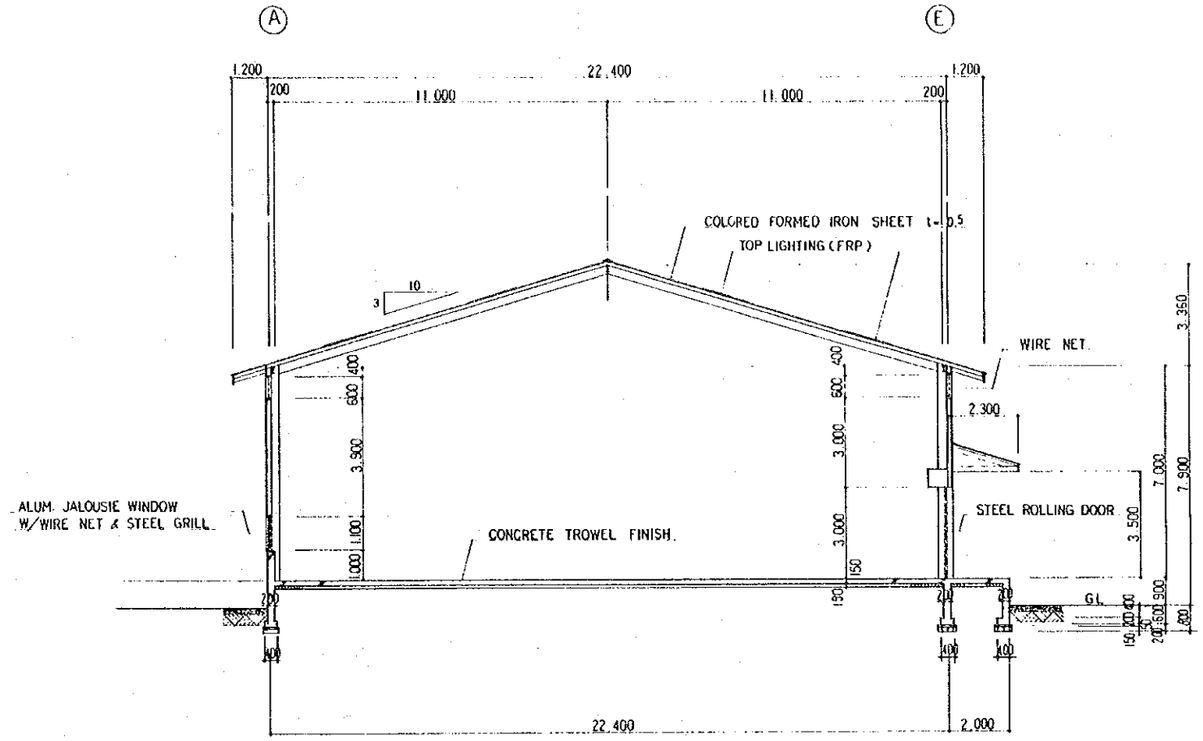
THE PROJECT FOR IMPROVEMENT OF POST-HARVEST FACILITIES IN KILIMANJARO REGION

TITLE OF DRAWING

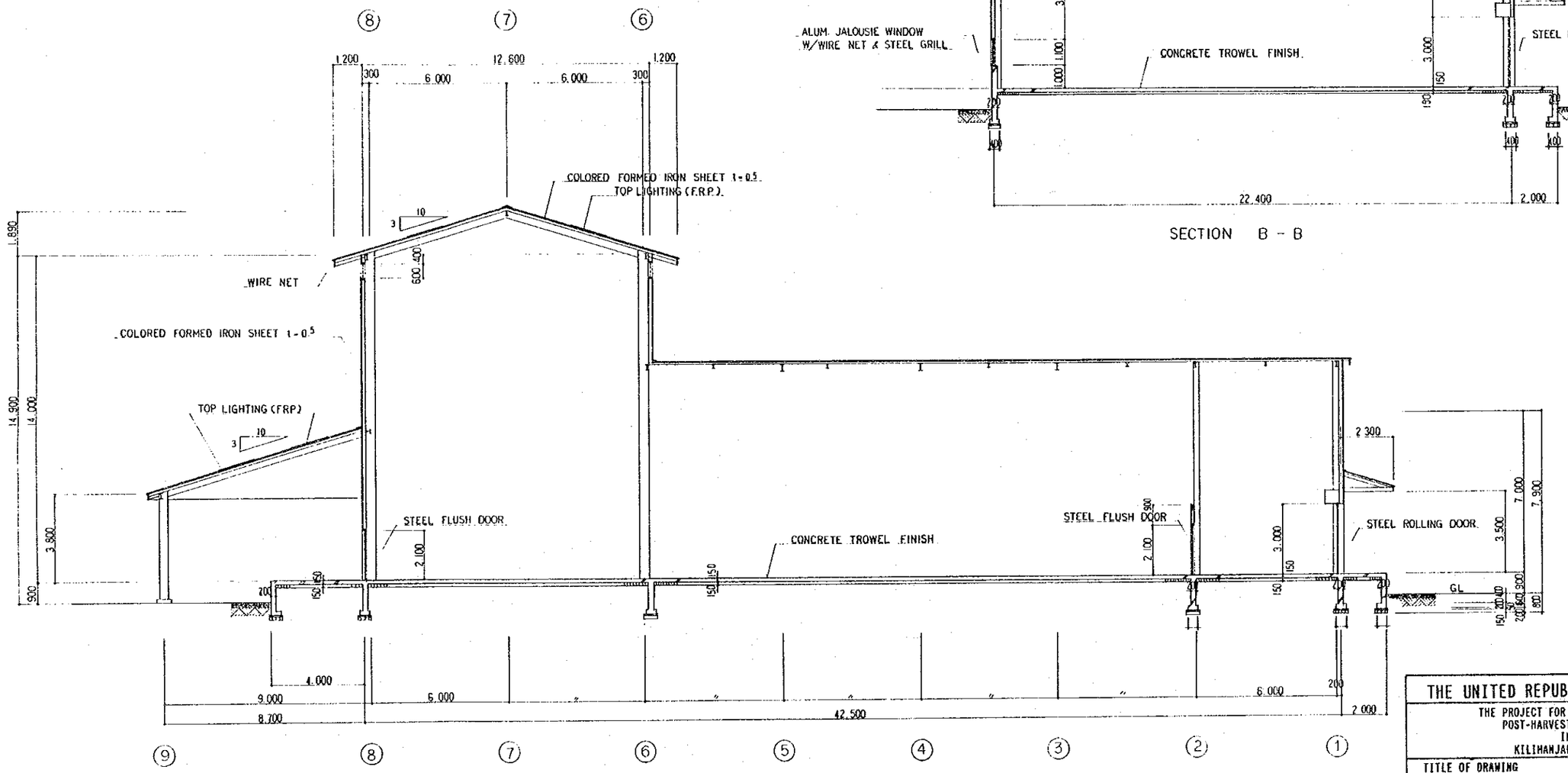
RICE MILL HOUSE - PLAN

Date		Drawing No.	2

JAPAN INTERNATIONAL COOPERATION AGENCY



SECTION B - B

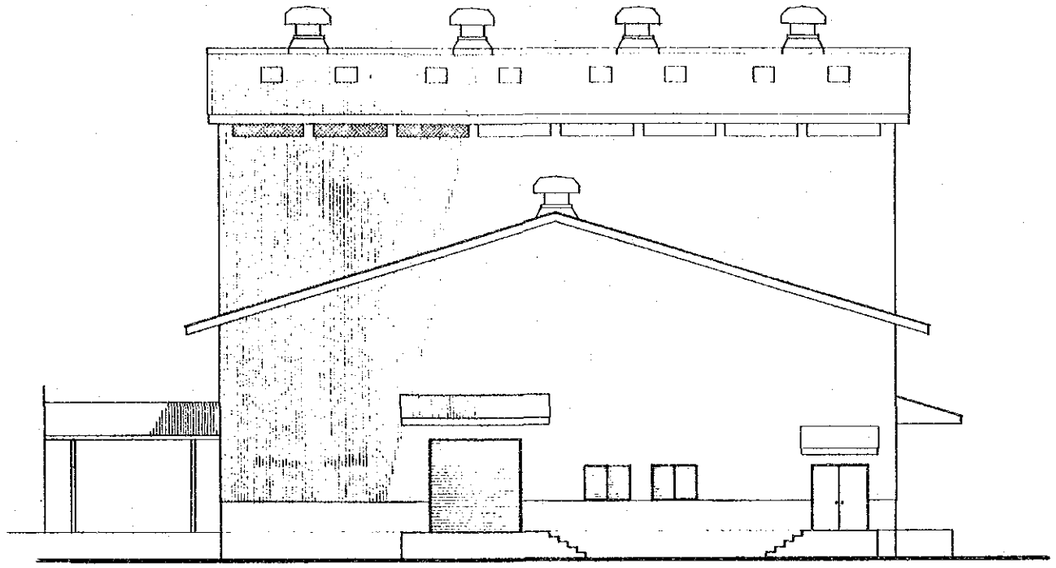


SECTION A - A

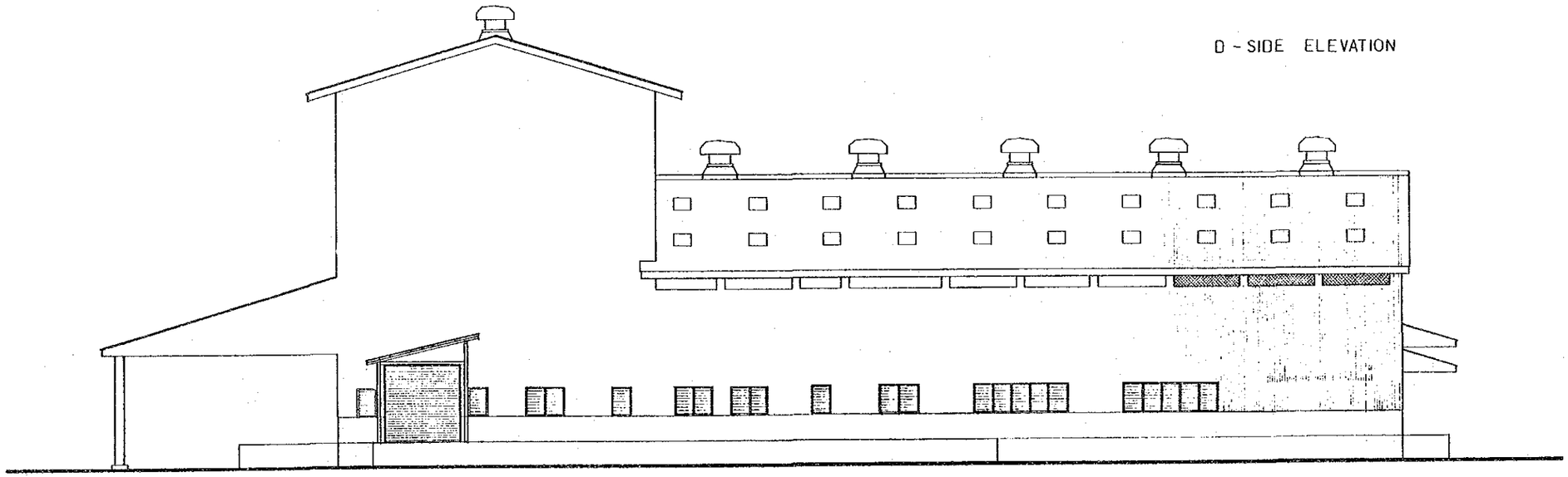
RICEMILL HOUSE

SCALE 0 5 10M

THE UNITED REPUBLIC OF TANZANIA	
THE PROJECT FOR IMPROVEMENT OF POST-HARVEST FACILITIES IN KILIMANJARO REGION	
TITLE OF DRAWING	RICE MILL HOUSE - SECTION
Date	Drawing No. 3
JAPAN INTERNATIONAL COOPERATION AGENCY	



D - SIDE ELEVATION

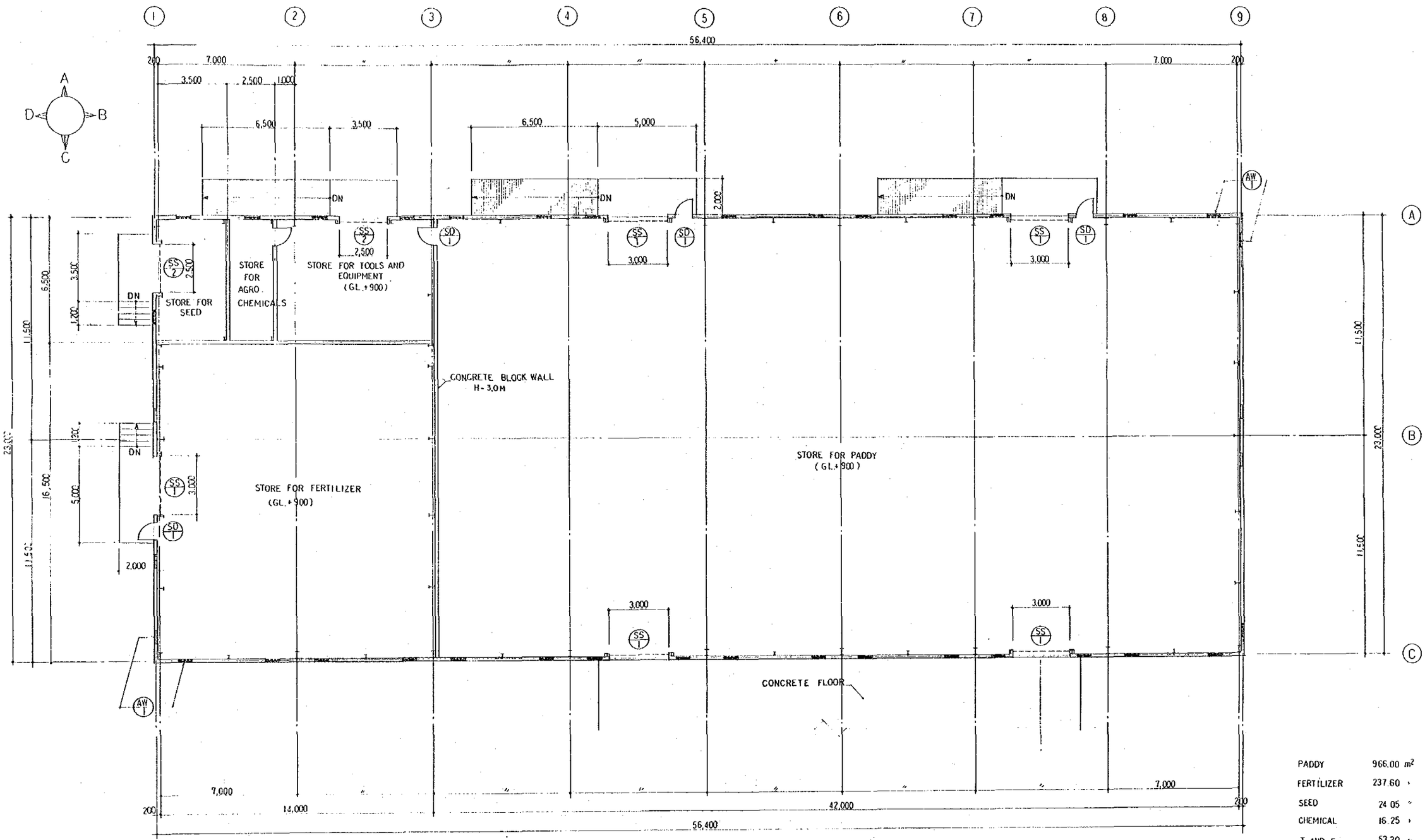


A - SIDE ELEVATION

RICEMILL HOUSE

SCALE 0 5 10M

THE UNITED REPUBLIC OF TANZANIA	
THE PROJECT FOR IMPROVEMENT OF POST-HARVEST FACILITIES IN KILIMANJARO REGION	
TITLE OF DRAWING	
RICE MILL HOUSE - ELEVATION	
Date	Drawing No. 4
JAPAN INTERNATIONAL COOPERATION AGENCY	



PADDY	966.00 m²
FERTILIZER	237.60 〃
SEED	24.05 〃
CHEMICAL	16.25 〃
T. AND E.	53.30 〃

PLAN
(1,297.2 m²)

MULTIPURPOSE GODOWN

SCALE 0 5 10M

THE UNITED REPUBLIC OF TANZANIA

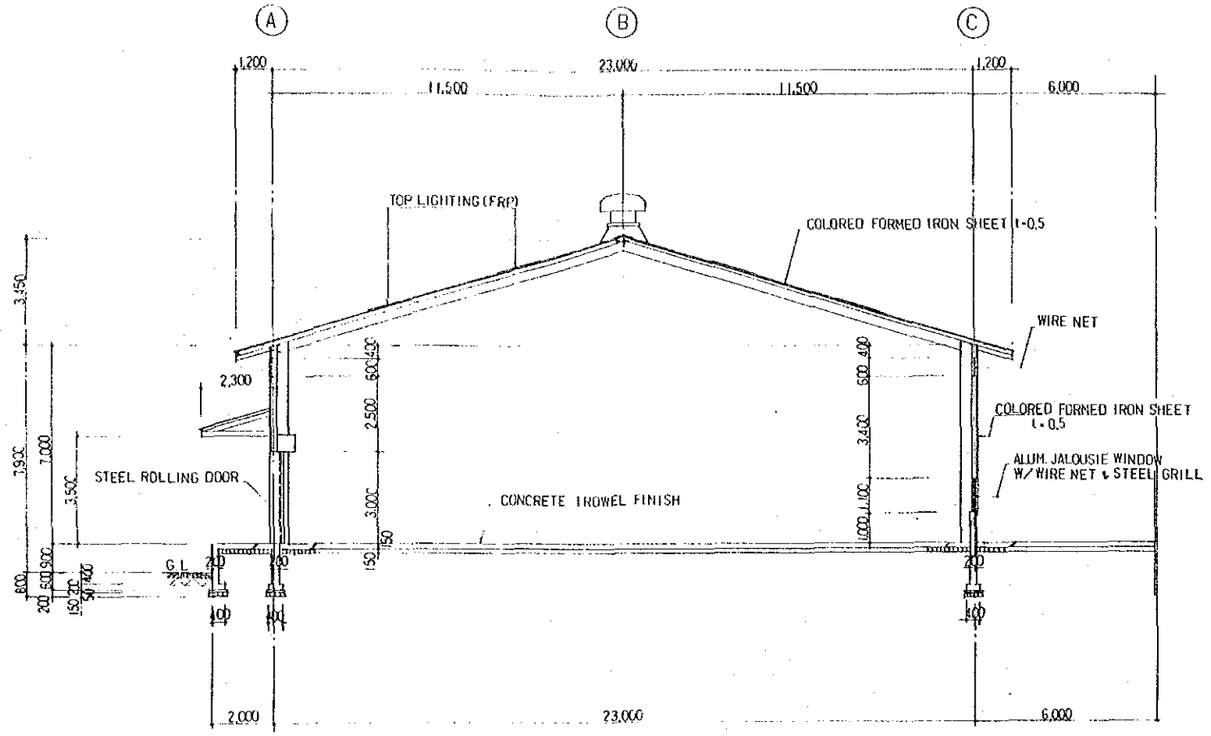
THE PROJECT FOR IMPROVEMENT OF POST-HARVEST FACILITIES IN KILIMANJARO REGION

TITLE OF DRAWING

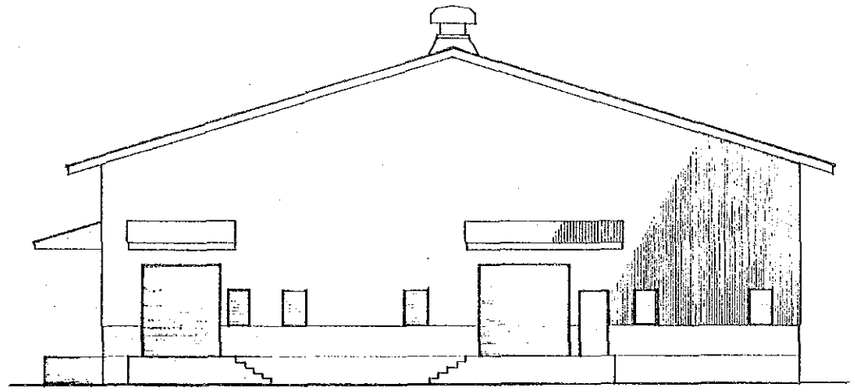
MULTIPURPOSE GODOWN - PLAN

Date		Drawing No.	5

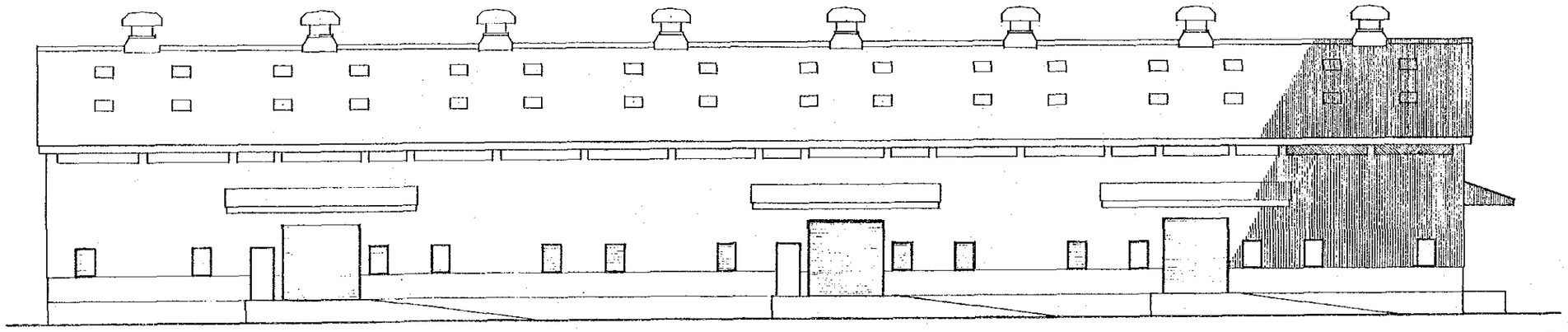
JAPAN INTERNATIONAL COOPERATION AGENCY



SECTION A–A



D-SIDE ELEVATION



A-SIDE ELEVATION

MULTIPURPOSE GODOWN

SCALE 0 5 10M

THE UNITED REPUBLIC OF TANZANIA

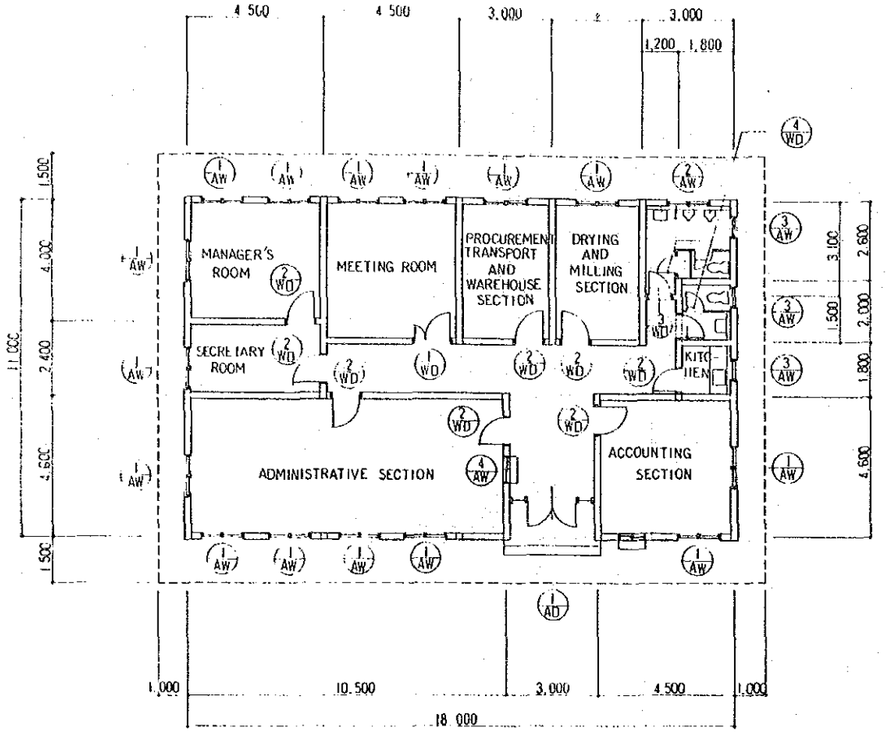
THE PROJECT FOR IMPROVEMENT OF POST-HARVEST FACILITIES IN KILIMANJARO REGION

TITLE OF DRAWING

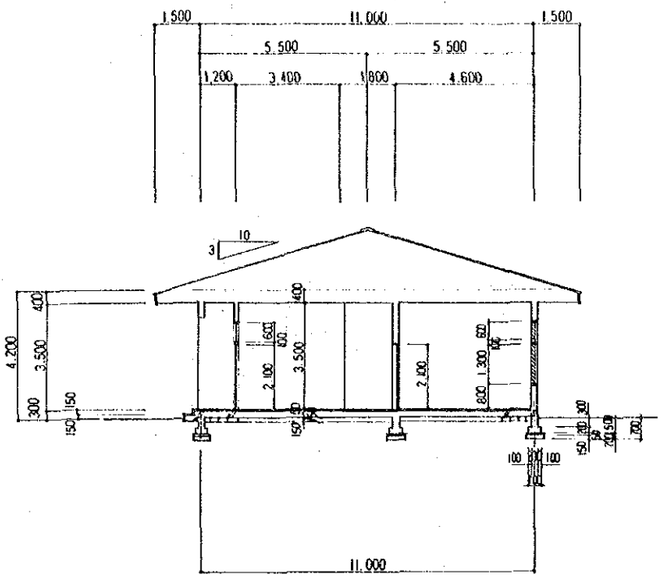
MULTIPURPOSE GODOWN
- SECTION, ELEVATION

Date		Drawing No.	6

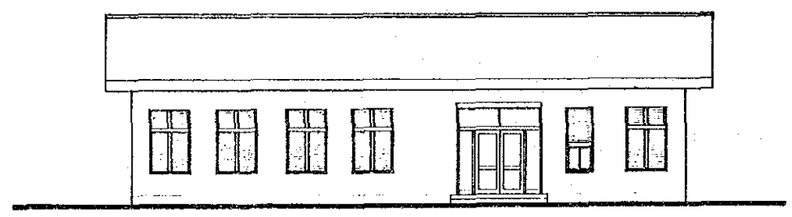
JAPAN INTERNATIONAL COOPERATION AGENCY



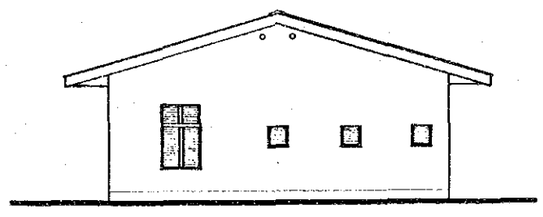
PLAN
(198 m²)



SECTION

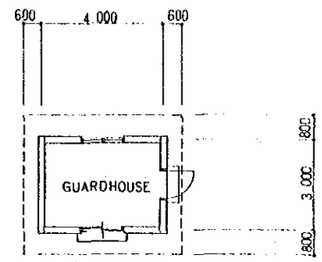


FRONT ELEVATION

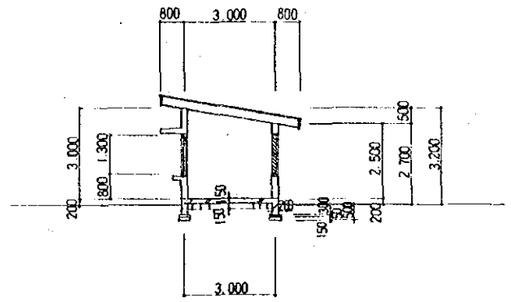


SIDE ELEVATION

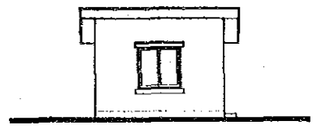
OFFICE



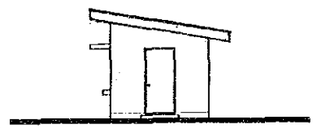
PLAN
(12 m²)



SECTION



FRONT ELEVATION

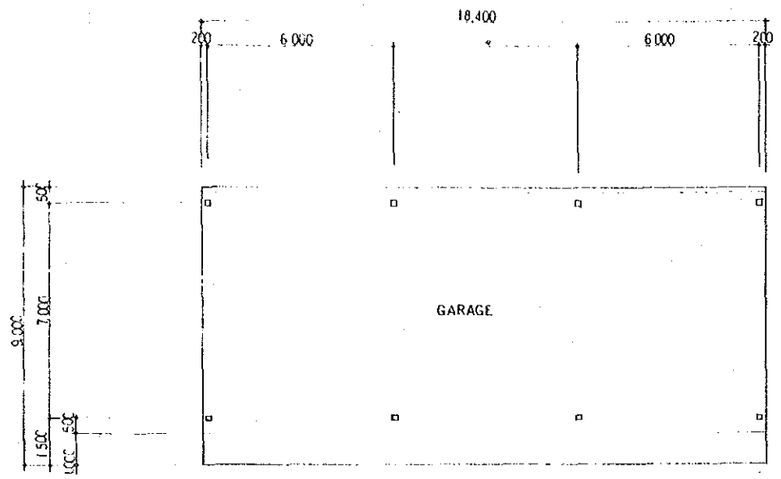


SIDE ELEVATION

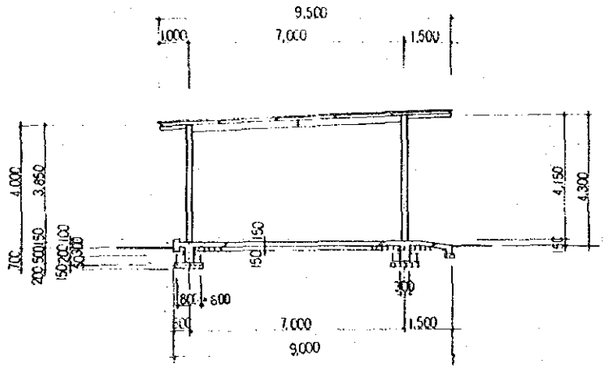
GUARDHOUSE

SCALE 0 5 10M

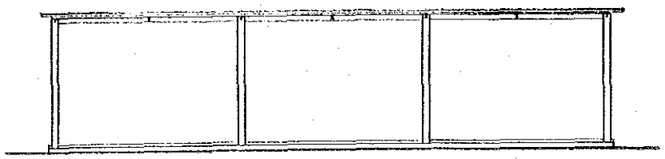
THE UNITED REPUBLIC OF TANZANIA	
THE PROJECT FOR IMPROVEMENT OF POST-HARVEST FACILITIES IN KILIMANJARO REGION	
TITLE OF DRAWING: OFFICE AND GUARDHOUSE	
Date	Drawing No. 7
JAPAN INTERNATIONAL COOPERATION AGENCY	



PLAN
(165.6m²)

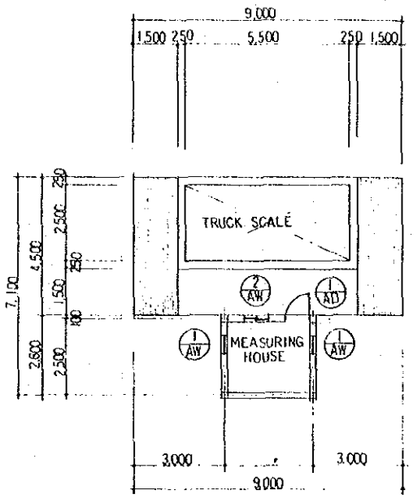


SECTION

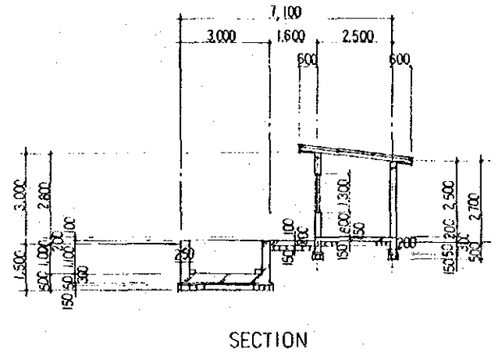


ELEVATION

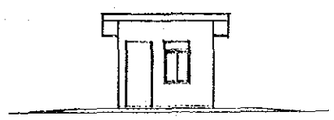
GARAGE
SCALE-A



PLAN
(7.5m²)

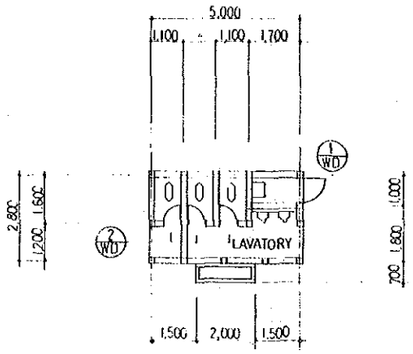


SECTION

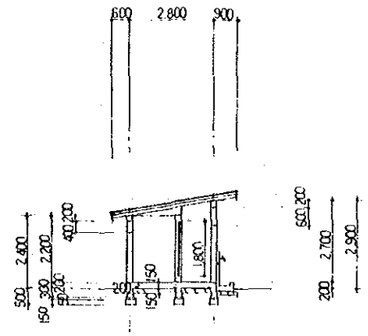


ELEVATION

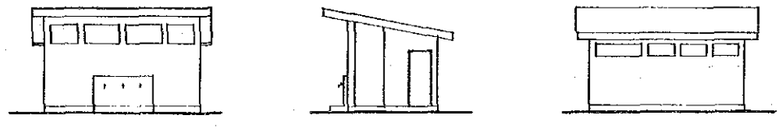
TRUCK SCALE AND MEASURING HOUSE
SCALE - A



PLAN
(14m²)

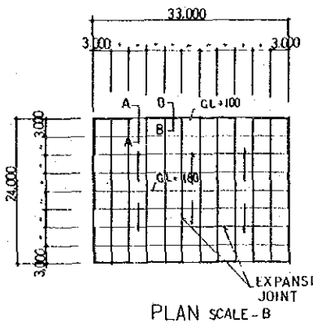


SECTION

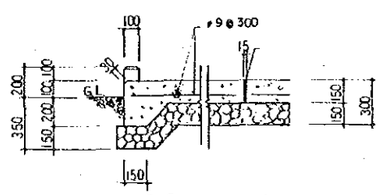


ELEVATIONS

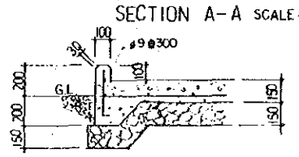
LAVATORY
SCALE - A



PLAN SCALE-B



SECTION A-A SCALE-C



SECTION B-B SCALE-C

DRYING FLOOR
(792×4 = 3,168m²)

SCALE - A 0 5 10M
SCALE - B 0 10 20 30 40 50M
SCALE - C 0 0.5 1 1.5 2M

THE UNITED REPUBLIC OF TANZANIA	
THE PROJECT FOR IMPROVEMENT OF POST-HARVEST FACILITIES IN KILIMANJARO REGION	
TITLE OF DRAWING	GARAGE, TRUCK SCALE AND MEASURING HOUSE, LAVATORY AND DRYING FLOOR
Date	Drawing No. 8
JAPAN INTERNATIONAL COOPERATION AGENCY	

INTERIOR FINISH SCHEDULE

BUILDINGS	ROOMS	FLOOR: Terrazzo	FLOOR: Cement mortar	FLOOR: Concrete trowel finish	SKIRTING WAINSCOT: Terrazzo	SKIRTING WAINSCOT: Vinyl asbestos	SKIRTING WAINSCOT: Cement mortar	SKIRTING WAINSCOT: HEIGHT	WALL: Vinyl emulsion paint on cement mortar	WALL: Cement mortar	CEILING: Oil paint on plywood	CEILING: HEIGHT	NOTES
MULTIPURPOSE GODOWN	STORE FOR PADDY			○			Ⓥ	1,000	○				Steel surface ; Oil paint finish
	STORE FOR FERTILIZER			○			Ⓥ	1,000	○				Do
	STORE FOR SEED			○			Ⓥ	1,000	○				Do
	STORE FOR AGRO CHEMICALS			○			Ⓥ	1,000	○				Do
	STORE FOR TOOLS AND EQUIPMENT			○			Ⓥ	1,000	○				Do
RICEMILL HOUSE				○			Ⓥ	1,000	○				Steel surface ; Oil paint finish
	CONTROL ROOM			○			Ⓥ	1,000	○				Do
	STORE FOR TOOLS AND PARTS			○			Ⓥ	1,000	○				Do
	PROSSECING FOR HUSK			○			Ⓥ	1,000	○				Do
	BRAN			○			Ⓥ	1,000	○				Do
				○			Ⓥ	1,000	○				Do
GARAGE	GARAGE			○									Steel surface ; Oil paint finish
OFFICE BUILDING	ENTRANCE HALL , CORRIDOR	○				○		100	○		○	3,500	
	OFFICE ROOM (1/2/3/4)	○				○		100	○		○	3,500	Counter (Terrazzo block finish) (1/2)
	MEETING ROOM	○				○		100	○		○	3,500	
	MANAGER'S ROOM	○				○		100	○		○	3,500	
	SECRETARY ROOM	○				○		100	○		○	3,500	
	KITCHEN	○				○		100	○		○	3,550	Kitchen sink , Cupboard .
	LAVATORY (M / W)	○			○			1,400	○		○	3,550	
GUARDHOUSE	GUARDHOUSE			○			Ⓥ	100	○		○		Counter (Terrazzo block finish)
MEASURING HOUSE	MEASURING ROOM			○			Ⓥ	100	○		○		
	TRUCK SCALE		○	○						○			
LAVATORY	LAVATORY		○				Ⓥ	1,400	○		○		
	CLEANER CLOSET		○				○	100	○		○		

REMARKS

Ⓥ Vinyl emulsion paint finish

GENERAL NOTES

EXTERIOR FINISH SCHEDULE

STEEL CONSTRUCTION

ROOF	Colored formed iron sheet t = 0.5
	Top lighting (F.R.P.)
WALL	Colored formed iron sheet t = 0.5
SKIRTING , WAINSCOT	Acrylic emulsion paint on cement mortar
EAVES FASCIA	Colored iron sheet t = 0.5
DOOR AND WINDOW	Steel rolling door, Steel door
	Aluminium door & window
STEP	Concrete trowel finish
STEEL SURFACE	Oil paint finish
Roof ventilation	Steel made. Oil paint finish.

CONCRETE BLOCK CONSTRUCTION

ROOF	Colored formed iron sheet t = 0.5
WALL	Acrylic emulsion paint on cement mortar
SKIRTING	Cement mortar
EAVES FASCIA	Oil paint on wooden board
EAVES SOFFIT	Acrylic emulsion paint on waterproof plywood
DOOR AND WINDOW	Aluminium door & window
	Wooden flush door (LAVATORY)
STEP	Concrete trowel finish
ENTRANCE PORCH	FLOOR : Terrazzo

THE UNITED REPUBLIC OF TANZANIA

THE PROJECT FOR IMPROVEMENT OF POST-HARVEST FACILITIES IN KILIMANJARO REGION

TITLE OF DRAWING

EXTERIOR AND INTERIOR FINISH SCHEDULE

Date | Drawing No. 9

JAPAN INTERNATIONAL COOPERATION AGENCY

5.4 List of Facilities and Equipment

List of facilities and equipment and equipment to be improved by the project are shown below.

Item	Specification	Q'ty
1. Paddy Transport Vehicle	6-tons truck	6 units
2. Equipment for Receiving Facilities		
- Truck-scale	15 tons	1 set
- Hopper	2 tons, attached a duct collecting machine	1 set
- Bucket elevator	10 tons/hr.	1 set
- Pre-cleaner	10 tons/hr. - Pre-cleaner	1 set
- Grain moisture meter (electric resistance type)	Range 11 to 30%, Precision 0.5%	3 sets
- Grain moisture meter (infrared lamp type)	Range 0 to 100%, Precision 0.1%	1 unit
- Bag trier		5 units
3. Equipment for Drying Facilities		
- Drying machine	20 tons, Batch type circulation system	4 sets
- Transport equipment attached to the drying machine	Bucket elevator, belt conveyor	1 set
- Diesel generator	16 kVA	1 unit
- Fuel tank	12,000 liters	2 sets
- Pre-cleaner for sun-drying floor	6 tons/hr.	2 sets
- Waterproof sheet for sun-drying floor	7.2 x 12 m, 86 m^2	4 sheets
- Carts	500 kg/unit (including carts for receiving facilities)	10 units
4. Equipment for Milling Facilities		
- Paddy storage tank	Capacity; 20 tons	2 units
- Destoner	4 tons/hr.	1 unit
- Hopper scale	50 kg/cycle	1 unit
- Discharge adjusting tank	Capacity; 4 tons	1 unit
- Husker	2 tons/hr., rubber roll type	2 units
- Separator	2 tons/hr., shaking type	2 units

Item	Specification	Q'ty
- Brown rice tank	Capacity; 2 tons	2 units
- Destoner	2 tons/hr., specific gravity sorting type	2 units
- Rice polisher	1.6 tons/hr., dual purpose type (grinding and friction types)	2 units
- Whitener	1.6 tons/hr., grinding type	2 units
- Separator	3 tons/hr., Revolving shifter type	1 unit
- Length separator	2 tons/hr., Cylinder separator	1 unit
- Conveyor		1 set
- Bucket elevator		1 set
- Collecting machine for rice bran		1 set
5. Equipment for Weighing and Packing Facilities		
- Whitened rice tank	Capacity; 3 tons x 1, 1.5 tons x 2	1 set
- Blender	Attached discharge adjusting machine	3 sets
- Shipping tank	Capacity 3 tons	1 set
- Weighing meter	Scale shutter (Range 50 to 100 kg)	1 set
- Sewing machine	50 bugs/hr.	1 set
6. Equipment for By-product Processing Facilities		
- Husk smasher	750 kg/hr. (with cyclone, auger)	1 set
- Platform scale	150 kg	2 units
7. Attached Facilities		
- Dust collecting facility	Fan, cyclone, gravity chute, duct	1 set
- Electric facility/Control panel	Switch board, control panel, material for electrical installations	1 set
8. Spareparts		
- Spareparts for truck	For two (2) years' O&M	1 set
- Rubber roll	For paddy to be disposed in the two (2) years' O&M; 12,000 tons capacity	240 sets
- Screen for rice milling machine	- Do -	36 sets
- Grinding for rice milling machine	- Do -	72 units
- Inside roll of rice mill	- Do -	6 units
- Others	Belt, bearing, etc.	1 set

CHAPTER 6 IMPLEMENTATION PROGRAM

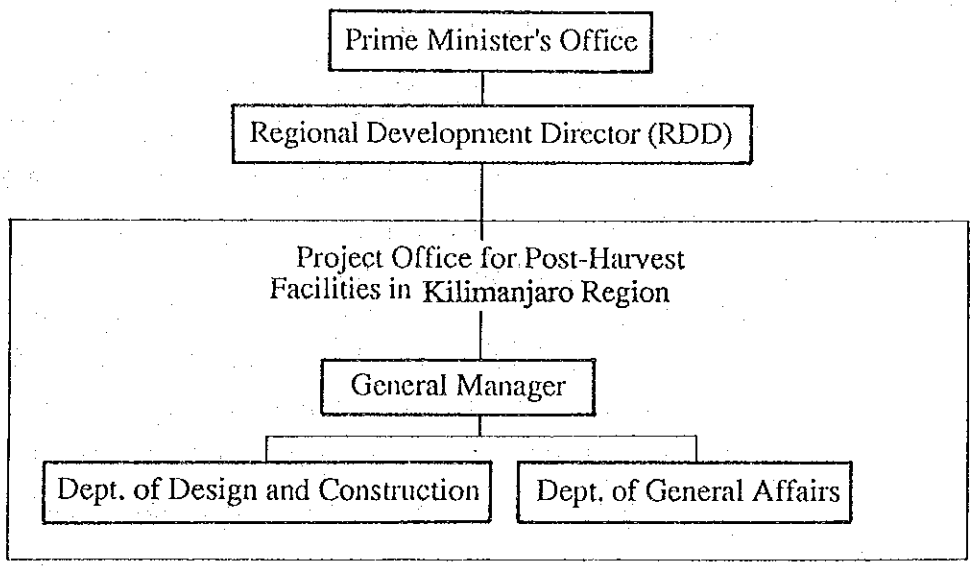
CHAPTER 6 IMPLEMENTATION PROGRAM

6.1 Organization for Project Execution

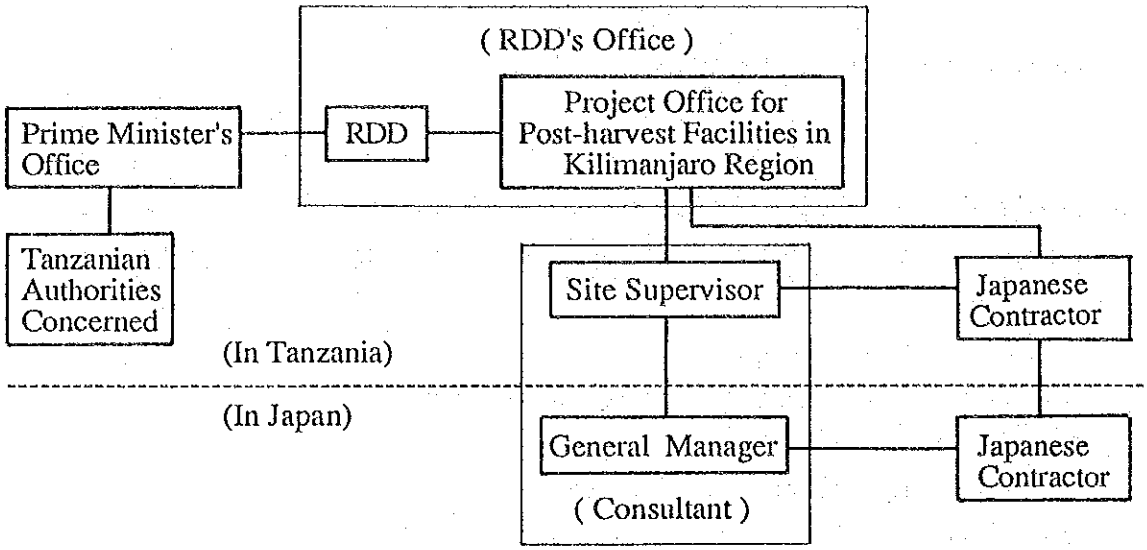
The executing agency of the project is the Kilimanjaro Regional Development Director's office (the RDD's office), the Government of Tanzania. The RDD's office will be authorized to execute the following work items for implementation of the project:

1) Execution of all construction,
2) Execution of contracts for consultancy services for construction,
3) Approval of design,
4) Tendering and evaluation of tenders,
5) Approval of all payments,
6) Administration of all contracts,
7) Acceptance of completed works, and
8) Liaison and coordination with other government agencies.

The representative of the Government will be the Regional Development Director (the RDD). For successful implementation of the project, it is proposed to establish an executing organization tentatively called the Project Office for the post-harvest facilities in Kilimanjaro Region, under control of the RDD. Operational works pertaining to the project will be actually taken in charge by this project office. The organizational structure of the proposed project office under the RDD's office is shown below.



In addition, the overall organization for project implementation including the Japanese side is outlined as follows:



Division of the responsibilities for the project works among the Government of Tanzania, Japanese Consultant and Japanese Contractor is summarized as follows:

- The government of Tanzania will be responsible for the lead-in of water and electricity supplies, etc. prior to commencement of construction of the facilities by the main contractor. Also, from a client's standpoint, the Government and its main executing body, the RDD, will be responsible for ordering of design, supervision and construction works, payment of construction cost and taking-over of the completed facilities.

- The Japanese Consultant, entrusted by the Government of Tanzania, will be responsible for implementation of the detailed design, tendering, cooperation with the client in selecting the main contractor, supervision of the construction works, approval of payments, inspections for taking-over of the completed facilities and reports to the relevant organizations.

- The Japanese Contractor, after contract signing, will be responsible for construction of facilities, manufacture, transport and installation of the granted equipment such as milling plant, etc. in accordance with the contract documents. Also, before delivery of the completed facilities, the Contractor will be responsible for the execution of necessary inspections by the Consultant. Then after receiving the Consultant's

approvals, the Contractor will deliver the facilities to the Government of Tanzania following the prescribed procedure.

6.2 Construction Plan

6.2.1 Construction Plan

(1) Construction Method

The main buildings to be constructed under the project are steel-framed structures with high eaves and long spans. The construction works will include such special works as the installation of rice mill plant, in which local contractors in Tanzania have no experience. Thus, it is not expected that local contractors could undertake these construction works smoothly. Taking these conditions into account, in the course of implementation of these special construction works, short assigments of additional experts corresponding with each required specialty will be considered in order to provide technical guidances to the local staff.

(2) Construction Works and Procurement of Equipment

The components of the construction works of the project will be buidling construction, manufacture, provision and installation of rice mill plant. With respect to building construction, it is usual that this work should be carried out by a contractor with building materials to be obtained from Tanzania or Japan and labourers from Tanzania. On the other hand, the rice mill plant is expected to be manufactured in Japan, transported to Tanzania and installed at the site.

The construction of the rice mill plant buildingwill include installation of such facilities as a receiving pit for the grain, fuel tanks for drying facilities, dust collecting system, processing facilities for by-products, control system for all machinery installed, etc. Therefore in the course of the construction of the building, there will need to be coordination with the installation works of the rice mill facilities not only on technical matters but also on the construction schedule.

(3) Work Period

Based on the conditions (1) and (2) above, and taking into account the scale of

construction works and present conditons in the project area, the appropriate work period is judged to be within one year. Thus, no division of the construction works is proposed.

With regard to the influence of rainy season in establishing the work period work progress in the main rainy season (the two months of April and May) is evaluated to be 70% of that in the remaining period of the year. Only limited temporary buildings will be required at the site such as labour quarters, stores, workshops, etc. The construction equipment and materials to be used for preparatory works will be hired or procured from local contractors as much as possible, and will be brought-in from Japan only if necessary.

6.2.2 Detailed Design and Construction Supervision

Immediately after the Exchange of Notes (E/N), the Consultant will enter into a contract with the RDD on the consultancy services, close discussion with the RDD on the detailed design work and then carrying it out. At the same time, the RDD will undertake such works as land preparation of the site, lead-in of services, etc. which areto be executed by the Tanzanian side, and urgently required before commencement of the main construction works. The design work will be undertaken by the Consultant either at the construction site in Tanzania or in Japan. The RDD's approvals will be needed for the design documents before tendering. The work items of detailed design and construction supervision to be required for implementation of the project are summarized below:

(1) Study and Survey

- Discussion and arrangements on the detailed design with the Government of Tanzania based on the basic design.

- Survey of the construction site, and confirmation of the location.

- Study of present conditions of construction to be necessary for the preparation of the detailed design, cost estimate and construction plan.

(2) Detailed Design and Preparation of Documents Related to Tendering

- Detailed design and preparation of tender drawings.
- Preparation of documents related to tendering.
- Confirmation of construction cost based on the detailed design.

- Approval of the detailed design and tender documents by the Government of Tanzania.

(3) Construction Supervision

After signing of the construction contract, the Consultant's representative will go to the construction site to organize the start of construction. The Consultant's chief engineer will be posted at the construction site during the period required for supervision services and will supervise the construction at site. The Consultant's chief engineer will regularly report on construction progress and related matters to the concerned agencies of the Government of Tanzania as well as to the Embassy of Japan and JICA in Tanzania and will coordinate all construction-related matters with the concerned officials of the project. In addition, the Consultant will dispatch to the country several kinds of engineers for a short time to supervise the construction.

The Consultant, on supervision services, will pay particular attention to Tanzania's national surroundings, customs, traditions and capability of workers to effect smooth construction and completion of the work within the given period. The construction program will be carefully scheduled to take into account the capability of local workers and the period of delivery of construction materials and equipment to be imported from Japan.

The principal activities to be carried out by the Consultant's personnel are given below:

1) Assistance services in tendering and contracting
   Assist in prequalification of tenderers, tendering, evaluation of tenders and drafting of contract.

2) Examination and approval of shop drawings
   Inspect, examine and approve shop drawings, samples, catalogues, etc. and inspect equipment at the manufacturer's plant.

3) Inspection of construction works
   Ensure that construction complies with the contract in terms of schedule, construction methods and quality. Inspect and approve field works.

4) Approval of payments
   Approve payment claims based on the progress of the works.

5) Reporting

Prepare regular progress reports on all matters concerning construction for information of the concerned agencies of the Tanzanian Government and Japanese Government.

6) Handing over of completed works

Hand over to the Government of Tanzania the completed works after examination of the works and after confirmation of fulfilment of all contractual obligations. Upon acceptance of the works by the Government, the Consultant's project manager will be discharged.

6.3 Scope of the Works

The scope of the Project for Improvement of the Post-Harvest Facilities in Kilimanjaro Region under the Japan's Grant Aid Program will consist of the construction of the post-harvest facilities, to serve 1,120 ha of paddy fields of in the Rau River System area. The details are given in Chapter 5.

The Government of Tanzania will undertake the following:

(1) Construction Works

1) To secure, clear and reclaim the site for the post-harvest facilities and building facilities,

2) To lead-in electricity supply, a water supply and a telephone line to the site mentioned above,

3) To construct a gate, fence and landscape gardening on the premise, and

4) To furnish furnitures and fixtures.

(2) Administrative Works

1) To furnish data necessary for the detailed design,

2) To bear commission for the banking services based on the Banking Arrangement,

3) To ensure prompt unloading, tax exemption and customs clearance at the port of disembarkation in Tanzania for the equipment, material and vehicle required for the project,

4) To ensure tax exemption for the Consultant and the contractor engaged in the project execution,

5) To issue visa, traffic certificates and other certificates necessary for execution of the project to the Consultant and the contractor,

6) To ensure contractual payments to the Consultant and the contractor,

7) To bear expenses required for proper and effective maintenance and use of the facilities and equipment after completion of the project, and

8) To bear all the expenses necessary for the execution of the project other than those to be borne by the grant aid.

6.4 Implementation Schedule

A tentative implementation time schedule including all those activities discussed above is illustrated in the Fig.-11. Immediately after the Exchange of Notes (E/N) with respect to construction, a contract with the Consultant will be concluded. Then the detailed design, preparation of tender documents, tendering, tender evaluation and contract for execution will be executed. Construction of the project is planned to be completed in 10.5 months including the procurement period of construction materials and equipment.

6.5 Procurement and Transportation Plan

6.5.1 Procurement of Equipment

It is planned that the construction materials proposed be procured in Tanzania as far as possible. However, materials which will cause difficulty in respect to quality and procurement in Tanzania will be procured from Japan.

No construction materials or transportation equipment required for special purposes will be imported from any country other than Japan.

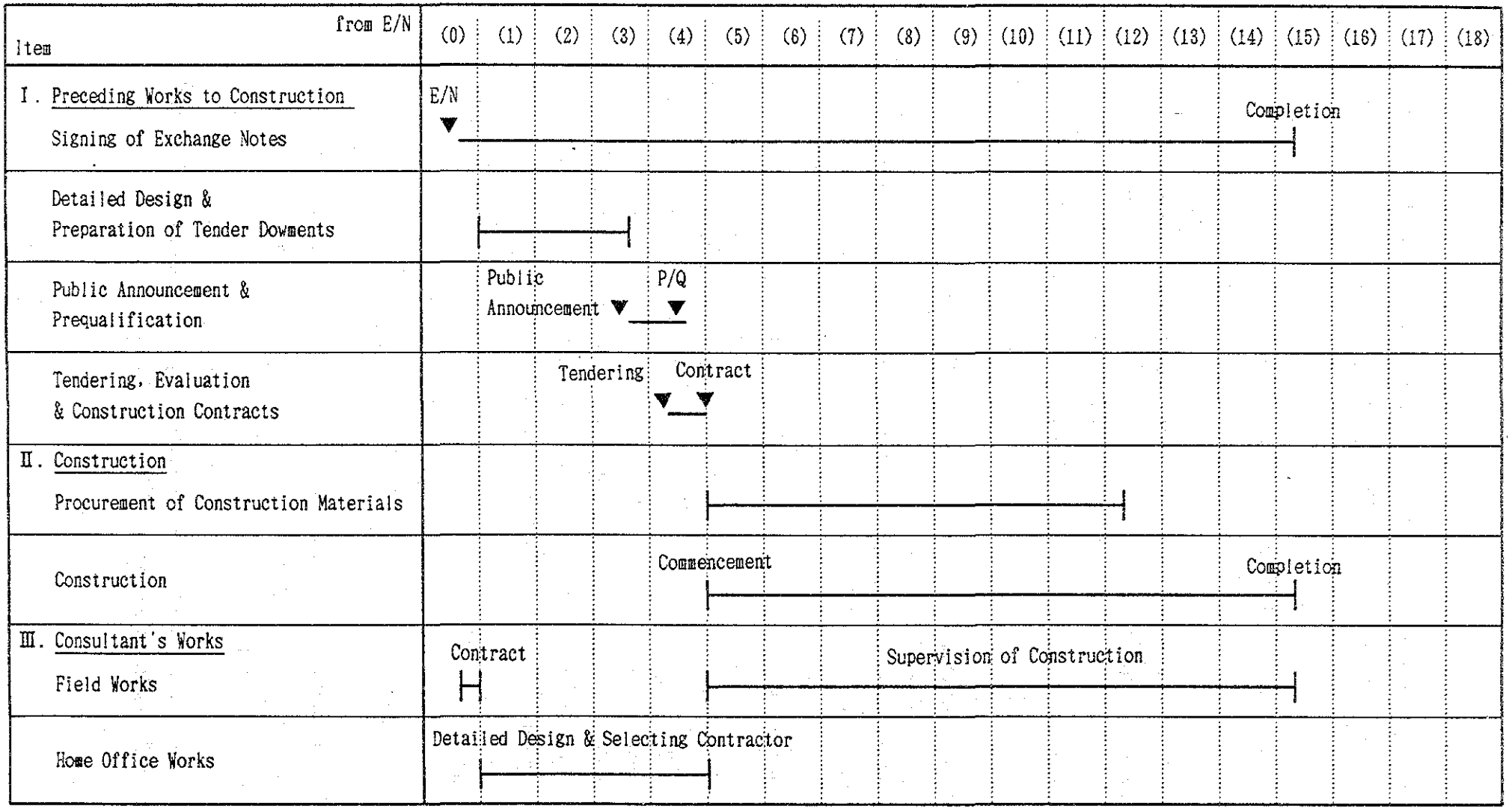


Fig. 11 TENTATIVE IMPLEMENTATION SCHEDULE

(1) Construction Material

Materials procurable in Tanzania are fuel and oil, electricity, cement, materials for road pavement, concrete blocks for buildings, aggregate materials, bricks and timber except plywood.

(2) Granted Equipment

The rice mill plant, drying machine, trucks and their ancillary equipment will be imported from Japan, because these are not procurable in Tanzania.

6.5.2 Transportation of Equipment

Cargoes from Japan for this project will be landed at Tanga port and then delivered by road or rail to the construction site, as shown below:

1) Transportation by rail

Tanga —Railway (350 km)— Moshi ==Road (15 km)== Site

2) Transportation by road

Tanga ==Road (390 km)== Moshi ==Road (15 km)== Site

Marine transportation of cargoes from Japan to Tanga takes one and half months. Taking into consideration the period required for procurement and loading in Japan, unloading and customs formalities at Tanga port and inland transportation to the construction site, the transportation period for cargoes from Japan to the site is estimated to be three (3) months.

6.6 Cost Estimate

(1) Total Project Cost

The total project cost, to be allotted by Japan and Tanzania together is estimated at about

¥600 million.

(2) Project Cost to Japan

The total project cost to Japan is estimated at about ¥598 million, including the costs of construction works, procurement of equipment and design and supervision works.

(3) Construction Cost to Tanzania

The preliminary construction cost to be allotted to Tanzania is estimated at Tsh. 0.75 million (equivalent to ¥1.815 million at the exchange rate of ¥2.42 to Tsh. 1.00) as detailed in the following table. In this, the costs for land preparation, which is considered to be already done, and for lead-in of electricity and water which are already available, are not included.

Preliminary Cost of Construction Works
to be Executed by the Government of Tanzania

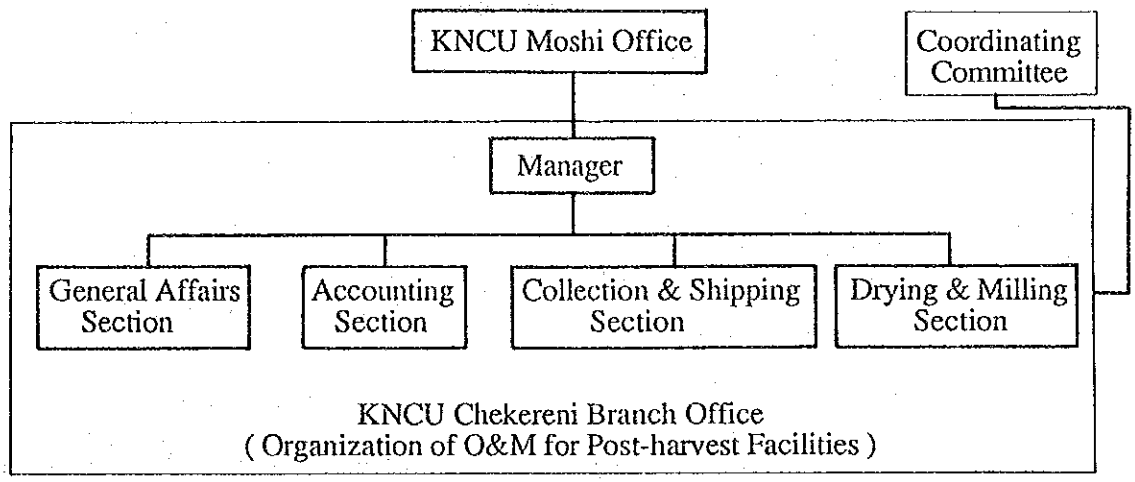
	Work Item	Amount (Tsh.)
1.	Preparatory and Reclamation of Size	0
2.	Electricity Supply - lead-in	0
3.	Water Supply - lead-in	0
4.	Telephone Connection	300,000
5.	Installation of Fence	300,000
	- Fence	270,000
	- Gate	30,000
6.	Landscape Gardening	150,000
	- Tree planting	80,000
	- Grass planting	70,000
	Total	750,000

CHAPTER 7 OPERATION AND MAINTENANCE PLAN

CHAPTER 7 OPERATION AND MAINTENANCE PLAN

7.1 Organization of Operation and Maintenance

Operation and maintenance (O&M) of the post-harvest facilities will be practised by KNCU under contract with the RDD's office. Therefore, it is necessary for KNCU to establish a Chekereni branch office (tentative name) at the construction site in order to undertake the O&M. The proposed organizational structure of the Chekereni branch office is shown below:



The operational works of the facilities, especially the collecting and drying works are closely connected with the harvesting period of paddy. Thus, in order to smoothly practise these works, it is proposed to establish a coordinating committee between KNCU and the organizations concerned with the paddy cropping plan in the area of the Rau River System. The components of the committee are KNCU, the RDD's office, KADC and RADO.

7.2 Operational Works and Staffing

As stated earlier the organization of O&M will be divided into the following four (4) sections under a manager; genral affairs, accounts, collection and shipping, drying and milling sections. The main responsibilities of these sections are shown below:

(1) General Affairs Section

- Personnel and documentation

- General affairs, security, etc.

(2) Accounts Section
- Accounts
- Cashier

(3) Collection and Shipping Section
- Purchase of paddy from cooperative societies
- Transport of paddy from buying posts to the post-harvest facilities
- Measuring of paddy by truck scale
- Measuring of moisture contents of paddy
- Receiving and handling of paddy according to the rate of moisture contents
- Operation and management of godown
- Shipping of milled rice, rice bran and chaff

(4) Drying and Milling Section
- Mechanized drying
- Sun drying
- Milling of paddy
- Mixing measuring and packing of milled rice
- Processing of rice bran
- Repairs of the facilities

The staff required for operating and management of these works is 55 technicians, engineers and officers including the manager, and 45 permanent labourers, thus 100 persons in total. The details are shown in Table 6. In addition, about 18,300 man-days of temporary-hired labourers are required annually for operation of the post-harvest facilities, as shown below:

Work Items	Annual Work Capacity (ton)	Work Capacity per Labourer (ton/man-day)	Temporary-hired Labourers (man-day)
1) Receiving and handling	6,000	2	3,000
2) Sun drying	3,000	1	3,000
3) Storage			
- Storing of paddy	6,000	2	3,000
- Storing of fertilizers/1	596	2	300
4) Shipping of rice, bran and chaff	6,000	1	6,000
5) Receiving by hopper	6,000	2	3,000
Total			18,300

/1 Storing of seed and agro-chemicals will be practised by permanent labourers.

Table 6 REQUIRED NUMBER OF STAFF AND PERMANENT LABOURERS

Items	Engineers/Clerks			Permanent
	Senior	Middle	Junior	Labourers
1) Manager	1 *	-	-	-
- Secretary	-	1 *	-	-
- Messenger boy	-	-	-	1
2) Collection & Shipping Section	1 *	-	-	-
Transport (Driver)	-	-	5	5
Measuring (Truck scale)	-	-	1	1
Testing of moisture contents	-	-	1	1
Receiving & handling of goods	-	1	-	1
Godown	-	1	4	5
Shipping	-	-	1	1
3) Drying & Milling Section	1 *	-	-	-
Sun-drying	-	-	1	6
Mechanized drying	-	1	5	-
Rice milling	-	2	4	-
Mixing, weighing & packing	-	-	2	10
Processing of bran & chaff	-	-	2	10
Facilities adjustments	-	1	1	2
4) Accounting Section	1 *	1 *	1 *	-
5) General Affairs Section	1 *	-	-	-
Personnel	-	1 *	1 *	-
Documents	-	1 *	1 *	-
General affairs	-	1 *	-	-
- General affairs	-	-	1 *	-
- Guards	-	-	6	-
- Typists	-	-	2 *	-
- Messenger boys	-	-	-	2
Total	5	11	39	45

Remarks: *; Staff to be assigned to the administration office.

7.3 Equipment for Operation and Maintenance

In addition to the granted equipment referred to in Section 5.4, the following equipment is needed for O&M of the post-harvest facilities. This equipment will be procured by KNCU, the agency for O&M.

(1) Equipment for Rice Mill

1)	Adjustment tools	:	tools for inspection, adjustment and repair such as screwdrivers, cutting pliers, wrench, etc.
2)	Fire extinguishers	:	to be provided in godown, rice mill and office.
3)	Miscellaneous tools	:	shovel, rake, broom, winnower, etc., for solar drying and palette for storing of paddy.
4)	Office supplies	:	desk, chair, typewriter, strongbox, cabinet, etc.
5)	Other equipment	:	first-aid medicines, cleaning equipment, sprayers, etc.

(2) Equipment for Buying Posts

1)	Platform scales	:	measuring scale 150 kg x 10 units (2 units for each post)
2)	Moisture contents meters	:	electric resistance type x 10 units (2 units for each post)
3)	Others	:	equipment such as strongbox, desk, chair, waterproof sheet, etc, and building

7.4 Operation and Maintenance Cost

(1) Consumable Supplies for Operation and Maintenance

Consumable supplies which will be required annually for O&M of the post-harvest facilities are estimated as follows. The details are shown in Table 7 .

1)	Electricity	:	471,500 kWh/year
2)	Light oil	:	28,200 liters/year
3)	Bags	:	104,700 bags/year
4)	Others	:	Lubricating oil, threads for sewing machines, office supplies, etc.

(2) Operation and Maintenance Cost

Components of the O&M cost are: personnel expenses, wages of hired labourers, expenses for consumables, repairing expenses, administration expenses and other expenses. Annual O&M cost is estimated to be about Tsh. 17.7 million, as shown in the following table. The O&M cost per 1 kg of milled rice is estimated to be Tsh. 4.54. The details are shown in Table 8.

Items	Amount (Tsh.1,000/year)
Personnel	1,617
Wages of hired labour (temporary labourers)	1,007
Consumables	11,144
Repairs	3,106
Administration & other expenses	844
Total	17,718
Unit cost per 1 kg of milled rice (Tsh./kg)	(4.54)

The selling price of milled rice of KNCU with the project, including the cost of paddy, levies to cooperative societies and KNCU, depreciation cost for the facilities and buildings, interest, taxes, etc. and the above-mentioned O&M cost, is estimated to be about Tsh. 35.69 /kg, as shown in Table 9. This selling price of rice is same as the present one, Tsh. 35.69/kg (selling price of KNCU at dry season, 1986 in the Rau River System area). The expenses mentioned above are calculated on the basis of actual prices in April 1987, not including price escalation.

Table 7 CONSUMABLE SUPPLIES FOR OPERATION AND MAINTENANCE

Items	Annual Quantity	Remarks
1) Required Electric Power	471,500 kWh	
Dryer	84,000 kWh	Required electric power per hour: 80 kWh/4 units Operation hours per cycle (80 tons) - Rainy season: 37 hours - Dry season : 20 hours Annual operation hour: 1,050 hours - Rainy season: 920 hours (1,990 t ÷ 80 tons/cycle x 37 hours) - Dry season: 130 hours (500 t ÷ 80 tons/cycle x 20 hours) Out of total amount of 2,490 tons of paddy to be dried in wet season, 2,490 tons, 1,990 tons are treated by sun drying, and the remaining 500 tons are treated by mechanized drying. Annual required electric power: 84,000 kWh (1,050 hours x 80 kWh)
Rice mill	326,400 kWh	Required electric power per hour: 160 kWh Operation hours per day - Rainy season: 10 hours - Dry season: 7 hours Operation days: 120 days in both rainy and dry seasons Annual operation hours: 2,040 hours (10 hours x 120 days + 7 hours x 120 days) Annual required electric power: 326,400 kWh (2,040 hours x 160 kWh)
Illumination for Rice mill	30,240 kWh	9 kWh x 14 hours/day x 240 days
Management office	8,400 kWh	4 kWh x 7 hours/day x 300 days
Godown & Others	22,460 kWh	5% of the above total

Items	Annual Quantity	Remarks
2) Fuel (Light Oil)	28,200 liters	
Dryer	24,000 liters	Rainy season: 24,000 liters (10 liters/hour/unit x 10 hours/day x 60 days x 4 units) Dry season: No heating is required because operation hours can be set during daytime when relative humidity is low.
Trucks	4,200 liters	Total running distance: 12,700 km - Rainy season: 7,100 km - Dry season: 5,600 km Required fuel: 3 km/liter Annual required fuel: 4,200 liters (12,700 km ÷ 3 km/liter)
3) Bags/1	104,700 bags	
For milled rice	78,000 bags	3,900 t ÷ 50 kg/bag No recovery of bags.
For unmilled rice	26,700 bags	6,000 t ÷ 75 kg/bag Bags are recovered, and renewed every 3 years.
4) Others	1 set	Including lubricating oil, stationery, threads for sewing machines, etc.

Note: /1; Bags for rice bran and rice chaff will be provided by fodder traders.

Table 8 ANNUAL OPERATION AND MAINTENANCE COST

Items	Quantity	Unit Cost (Tsh.)	Amount (Tsh.1,000)
(1) Personnel /1			1,617
1) Senior engineers & officers	5 persons	4,800 / month	288
2) Engineers & officers	11 persons	3,000 / month	33
3) Junior engineers & clerks	39 persons	1,500 / month	702
4) Permanent labourers	45 persons	1,100 / month	594
(2) Wages of Hired Labourers	18,300 persons	55/person/day	1,007
(3) Consumable Equipment			11,144
1) Electricity			
- Base rate	12 months	250 /months	3
- Required power	471,500 kWh	8.5 /kWh	4,008
2) Light oil	28,200 liters	15 /liter	423
3) Bags	104,700 bags	62 /bag	6,491
4) Others (lubricating oil, stationery, etc.)			219
(4) Cost of Repairs /2			3,106
(5) Administration Cost & Other Expenses /3			844
Total			17,718
O&M cost per 1 kg of milled rice		(Tsh./kg)	(4.54)

Remarks: O&M cost is estimated on the basis of the price in April 1987.

/1; Including 10 % for various allowances.
Source: KNCU

/2; 3% of construction cost of the rice mill facilities;
Tsh. 103,531,000 x 0.03 = Tsh. 3,106
excluding cost of spare parts for two years.

/3; Including O&M costs for water supply, indoor electricity, buildings, etc.
(5% of item 1 to 4)

Table 9 RETAIL PRICE STRUCTURE OF RICE HANDLED BY KNCU
(PRESENT AND WITH PROJECT CONDITIONS)

	Items	Present Condition /1 (Tsh./kg)	With Project Condition (Tsh./kg)
(1)	Purchasing cost of paddy /2	20.77	20.77
(2)	Levy of primary cooperative society /3	0.96	0.96
(3)	Levy of KNCU /3	1.24	1.24
(4)	Bags and transportation cost	3.26	- /5
(5)	Transportation cost for cash and insurances of crop and cash	0.26	0.26
(6)	Marketing loss (2 % of (1))	0.41	0.41
(7)	Handling charges /4	0.14	- /5
(8)	Milling charges	4.59	- /5
(9)	Interests, taxes and administration costs	2.36	2.36
(10)	Others (5 % of (1) - (10))	1.70	1.30
(11)	O&M costs	-	4.54
(12)	Depreciation costs /6	-	3.85
	Total (KNCU retail price)	35.69	35.69

/1; Present retail price is determined on the basis of the price in 1986 dry season paddy cropping (price at April, 1987)
Source: KNCU, Revised Price Computation for Paddy/Rice from the Lower Moshi Irrigation Project, 1st April, 1987
/2; Tsh. 13.5/kg (paddy purchase price) ÷ 65 % = Tsh. 20.77/kg
/3; Becoming revenues of cooperative society and KNCU.
/4; Costs for loading and unloading of paddy or rice at transportation
/5; Included in O&M costs, item No. (11)
/6; Depreciation costs are estimated as follows:
1) Annual depreciation costs

Facilities:	Tsh. 103,531,000*	x 90% *** ÷	8 years =	Tsh. 11,647,000/year
Buildings:	Tsh. 130,542,000**	x 90% *** ÷	35 years =	Tsh. 3,357,000/year
	Total			Tsh. 15,004,000/year

* : Excluding cost of spare parts for two year.
** : Including costs of construction of the buildings, design and supervision works and construction allotted to the Government of Tanzania.
*** : Residual value ; 10%

2) Depreciation costs for milled rice per 1 kg
Tsh. 15,004,000/year ÷ 3,900,000 kg/year = Tsh. 3.85/kg

CHAPTER 8 PROJECT EVALUATION

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8.1 Project Benefits

The project benefits to be expected from the implementation of the Project of Improvement of the Post-Harvest Facilities in Kilimanjaro Region are evaluated as direct and indirect benefits as follows.

(1) Direct Benefits

1) Stabilization of rice supply

One of the main objectives of agricultural development in the Rau River System area is to stabilize the supply of rice by increasing rice production in the area. Increased rice production is already being achieved since dry season crop in 1986, with a unit yield of 6.6 tons per hectare or 3,380 tons of total production. Stabilization of the rice supply, however, has not yet been achieved mainly due to inadequate the post-harvest facilities even though there have been some improvements since 1984 through institutional revisions of KNCU and NMC. The main reason for delay in further improvement has been the shortage of funds in KNCU. The improvement of facilities proposed through the project is expected to greatly contribute to stabilizing the rice supply.

2) Improvement of living conditions

It is expected that the improvement of facilities will enable KNCU and NMC to increase the supply of low priced rice to consumers. The price of rice supplied through KNCU or NMC is usually only 30 - 50% of the price of rice supplied through merchants. The project, as a result, will contribute to improving and stabilizing the living conditions of the people in the area.

3) Reduction of losses

The normal marketable surplus of paddy in the Rau River System area is estimated to be about 7,400 tons per annum, yet the post-harvest facilities for the collection, transportation, processing and storage of products are still in a state of severe

shortage as described in the preceding chapters. As a result of the deficiency in the facilities, especially in collection and storage, losses of paddy at the production stage due to the accumulation of undelivered paddy have become a serious problem. It is expected that, thanks to the implementation of the project, post-harvest losses of grain will be minimized.

4) Stabilization of rice farming

With the implementation of the project, a profitable marketing system will be established to secure a smooth outflow of surplus paddy at a reasonable price without forcing farmers to sell products at a cheap price. This will give farmers incentives to manage rice farming more efficiently and will result in stabilization of agricultural activities in the area.

(2) Indirect Benefits

1) Reinforcement of cooperatives

The Government of Tanzania puts stress on the promotion of the Cooperative Union/Cooperative Society system as one of its most important agricultural policies. In Kilimanjaro Region, two Cooperative Unions called KNCU and VCU were established in 1984. The KNCU, which has its head office in Moshi town, deals in collecting and selling farm products, but the operation for rice is not well established mainly due to poor the post-harvest facilities. Actual operation and management of the post-harvest facilities to be improved by the project will be entrusted to KNCU under the control of the RDD's office, Kilimanjaro Region. As the result of implementation of the project, the rice operation activity of KNCU will be reinforced substantially, in accordance with the cooperative system reinforcement policy of the Government of Tanzania.

2) Demonstration effects

The Government of Tanzania has implemented the agricultural development project in the Rau River System and the strengthening of KADC with assistance from the Government of Japan. As a result, the Rau River System area has become an important rice production centre in the Region with the effective extension activities of KADC. Implementation of the post-harvest facilities

improvement project in addition to the above two projects will create an integrated rice production system comprising paddy field development, extension work on rice growing and production, processing and storage. Such an integrated system is expected to have beneficial demonstration effects as a model for the development of agriculture in the country.

3) Extension of post-harvest technology

In Kilimanjaro Region, there are several agricultural development projects including about 7,400 ha in total development area in the Lower Moshi and Mkomaji Valley areas (excluding the Ndung Agricultural Development Project area), about 5,000 ha in the Hai and Rombo area, and about 6,000 ha in the Ruvu River System and Lake Jipe area. As these agricultural development projects progress, improvement of the post-harvest facilities and techniques will become important aspects in the near future. Consequently the post-harvest facilities implemented by the proposed project will provide a useful model for the facilities required for these envisaged projects and for the extension of post-harvest technology.

4) Increase in employment opportunities

Employment opportunities will be increased by the implementation of the facilities not only during the construction stage but also during operation and maintenance. About 55 technical and clerical staff, about 45 permanent labourers, and about 18,300 man-days of casual labour will be required per annum for operation and maintenance of the facilities.

5) Stabilization of social welfare condition

The implementation of the proposed project will contribute to stabilization of social welfare in the area through the steady supply of low priced rice, giving farmers incentives for rice farming and increasing employment opportunities in the area.

8.2 Project Viability

From the following standpoints, it is concluded that implementation of the project is highly viable.

(1) Implementation System

The implementation organization of the project is the RDD's office. The RDD's office is already experienced as an implementation organization of Japan's grant aid projects ; KADC and KIDC projects. Thus, the RDD's office is well-familiar with the proceedings of Japan's grant aid projects. It is judged, therefore, that there will be no problem in the implementation system of this project.

(2) Operation and Maintenance System

In operating the project, it is required that the operational organization has high administrative abilities in the various aspects of the operational work from the collection and milling of the paddy to shipping of the milled rice. KNCU, the operational organization of the project, already has functions as a marketing organization of farm products in rural areas, undertaking various activities such as the operation of godowns, transport carriers, cotton ginning factories, etc. Thus, it is judged that KNCU has sufficient abilities as stated before. In addition, as a part of the government's policies to promote and strengthen the farmers' cooperatives, four (4) consulting advisers are presently assigned to KNCU. Taking into account these conditions, it is judged that KNCU can function well as the operational organization of the project.

(3) Operational Techniques

The type of rice mill presently owned by KNCU is called a steel-huller type, which is different in its function and structure from what is to be introduced by this project. Therefore, initially KNCU will require assistance in operation of the newly introduced facilities. However, the rice mill facilities of KADC located next to the construction site are of Japanese make and have a function and structure similar to what is to be introduced by the project, and it is expected that KADC's Tanzanian experts will be able to assist in operation and maintenance of the facilities.

(4) Financial Viability of Operation and Maintenance

The operation and maintenance costs of the project are estimated at Tsh. 4.54per 1 kg of milled rice. This amount is small enough to be absorbed in the price difference between the buying price of paddy, Tsh. 20.77/kg (equivalent of milled rice), and the retail price

of milled rice, Tsh. 35.69/kg, as presently offered by KNCU. Therefore, it is judged that KNCU has the financial capacity to pay the O & M costs. Thus, the project is financially feasible.

(5) Urgent Necessity of the Project

Taking into consideration the fact that construction of the Rau River System, which comprises the object area of the project, has already been completed and paddy production in the area is getting into full swing, it is judged that the project should be implemented as soon as possible.

CHAPTER 9 CONCLUSION AND RECOMMENDATION

CHAPTER 9 CONCLUSION AND RECOMMENDATION

As a result of the field survey in Tanzania and home analysis work in Japan, it was clarified that very considerable direct and indirect project benefits can be expected from implementation of the proposed project. As described in CHAPTER 8, the expected benefits will be the stabilized supply of rice by KNCU and NMC, reduction of post-harvest losses, stabilization of rice farming, reinforcement of the cooperative system, demonstration effects, extension of post-harvest technology, increase in employment opportunities, and stabilization of social welfare conditions. In addition, the Regional Government of Kilimanjaro identifies the project as a leading model scheme for future agricultural development in the region.

It was confirmed that there is no organizational problem in the RDD's office, which will take charge of project implementation. KNCU will be the organization responsible for actual operation and maintenance of the facilities under the control of the RDD's office and consequently it is considered that there will be no problem regarding promotion of the project.

Taking into consideration the background and objectives of the project, the expected project benefits and the national economic conditions of Tanzania, it is concluded that the necessity for implementation of the proposed project is extremely significant and that the scope of the project is favorable and appropriate for grant aid from the Government of Japan. It is desirable that the project be implemented as soon as possible since the Rau River System has been completed and production is now getting into full swing.

In order to realize smooth implementation of the project and to ensure adequate operation and maintenance of the project facilities, the following actions are recommended to be taken by the Government of Tanzania. At the same time, the construction of five (5) new buying posts in the project area is also recommended.

1) Appointment of responsible organizations for the construction work of the project such as a construction office, management committee, etc.

2) Timely implementation and completion of the construction works for which the Government of Tanzania will be responsible.

3) Construction of five (5) new buying posts in the project area.

4) Strengthening of the organization which will be responsible for operation and management of the project facilities.

5) Preparation of an adequate number of staff for operation and maintenance of the project facilities.

6) Establishment of a technical assistance system including the other related organizations.

ANNEXES

ANNEX 1 MEMBERS OF STUDY TEAM

POSITION	NAME	HOME POST
Team Leader	Yasuyuki SAKAI	Chief Instructor, Agricultural Technical Training Center, Ministry of Agriculture, Forestry and Fisheries.
Coordinator	Noriaki NIWA	First Basic Design Study Division, Grant Aid Planning and Study Department, JICA.
Post-Harvest Facilities Planner	Akio MAEDA	Nippon Koei Co., Ltd.
Architecture, Design	Sumio SHINOHARA	Nippon Koei Co., Ltd.
Equipment Planner	Tadaharu MURONO	Nippon Koei Co., Ltd.

ANNEX 2 ITINERARY OF THE STUDY TEAM

Date		Schedule	Action
April			
3	FRI	Leave Tokyo	Travel
4	SAT	Amsterdam	Travel
5	SUN	Dar es Salaam	Arrive at Dar es Salaam
6	MON	Dar es Salaam	Courtesy call to Embassy of Japan, JICA, OPM, MALD and MFEAP
7	TUE	Kilimanjaro (Moshi)	Courtesy call to RDD, KADC; Meeting with Japanese experts (KADC)
8	WED	Moshi	Meeting with Japanese experts (KADC), Discussion with RDD, field reconnaissance (Lower Moshi Project Area, construction site and milling facilities of KADC)
9	THR	Moshi	Discussion with RDD
10	FRI	Moshi	Discussion with RDD, Signing of the Minutes of Discussion, Data collection (NMC, KNCU)
11	SAT	Moshi	Data arrangement
12	SUN	Moshi	Messers. Sakai, Niwa and Maeda leaving for Dar es Salaam
13	MON	Moshi	Data collection (RDD's office, contractor of Lower Moshi Project), Survey on construction site; Messrs. Sakai and Niwa Leaving for Tokyo
14	TUE	Moshi	Data collection (NMC, KNCU), Leaving Mr. Maeda arriving Kilimanjaro (Moshi)
15	WED	Moshi	Survey on local contractors, Data collection, Survey on electric supply (TANESCO); telephone facilities (TPTC); climate conditions (Moshi Meteological Station)
16	THR	Moshi	Data collection (RDD's Office, KADC), Survey on supply of electricity, water etc.
17	FRI	Moshi	Field survey (Lower Moshi Project Area)
18	SAT	Moshi	Survey on godowns at Arusha
19	SUN	Moshi	Preparation of field note, Field survey

Date		Schedule	Action
20	MON	Moshi	Analysis of collected data, Field survey
21	TUE	Moshi	Data collection (Moshi District Office, KADC) Field survey
22	WED	Moshi	Report to RDD, Data collection (KRTC, TAFCO, Moshi Town Office), Hearing from construction traders about construction costs, construction conditions, Survey on transportation conditions
23	THR	Moshi	Data collection (KNCU), Survey on construction materials' market
24	FRI	Dar es Salaam	Leave for Dar es Salaam
25	SAT	Dar es Salaam	Leave for Tokyo
26	SUN	London	Travel
27	MON	London	Travel
28	TUE	Tokyo	Arrive at Tokyo

ANNEX 3 LIST OF PERSONNEL CONTACTED

(1) Office of the Prime Minister and First Vice President

Mr. Ben G. Moses	: Deputy Principal Secretary

(2) Ministry of Finance, Economic Affairs and Planning

Mr. Choma	: Finance Management Officer, External Finance Division

(3) Ministry of Agriculture and Livestock Development

Mr. Mhagama	: Commissioner of Planning and Marketing
Mr. M.L. Rimisho	: Commissioner of Agriculture

(4) Regional Development Director's Office, Kilimanjaro

Mr. G.N. Mgendi	: Regional Development Director (RDD)
Mr. J.J. Mpiza	: Regional Planning Officer
Mr. A.P. Mkwawa	: Regional Administrative Officer
Mrs. R. Benne	: Act. Regional Planning Officer
Mr. B. Lusewa	: Regional Agricultural Officer
Mr. Y.Z. Msuya	: Regional Cooperative Officer
C.P.A. Nyangala	: Project Manager, Lower Moshi Agricultural Development Project
Mr. E.E. Kasyanju	: Resident Engineer, Lower Moshi Agricultural Development Project

(5) Kilimanjaro Agricultural Development Center (KADC)

Mr. G.R. Moshi	: Project Manager, KADC
Mr. G.W. Chonjo	: Head of Paddy Section
Mr. R.K. Makange	: Machinery Section

(6) National Milling Corporation (NMC), Moshi Branch Office

Mr. C.S. Nyambo	: General Manager
Mr. W. Kilibaha	: Branch Accountant
Mr. J.S.T. Rusandazangabo	: Operation Officer

(7) Kilimanjaro Native Cooperative Union (KNCU)

Mr. S.K. Chuwa	: Commercial Manager
Mr. Jeremiah W.A. Kiluwa	: Senior Commercial Officer
Mr. Ossi K. Louko	: Management Adviser (KNCU/Nordic Project)

(8) Embassy of Japan

H.E. Yasushi Kurokoochi	: Ambassador Extraordinary and Plenipotentiary
Mr. Sousuke Ito	: Counselor
Mr. Syougo Takeuchi	: First Secretary

(9) JICA Office

Dr. Yoshinori Sano	: Resident Representative
Mr. Syunsuke Iizuka	: Vice-Resident Representative
Mr. Hiroshi Murakame	: Assistant Resident Representative

(10) Kilimanjaro Agricultural Development Project (KADP)
(Japanese Expert)

Mr. Junji Inoue	: Leader
Mr. Shingi Takahashi	: Development Planning Expert
Mr. Yoshikatu Seko	: Irrigation and Drainage Expert
Mr. Motonori Tomitaka	: Upland Crop Expert
Mr. Kouichi Sato	: Agricultural Machinery Expert
Mr. Ryouji Tanakura	: Agricultural Mancinery Expert
Mr. Kazuo Torii	: Coordinator

(11) Moshi Towm Council

Mr. Tesha	: Director
Mr. Kuyonga	: Chief Engineer
Mr. Huka	: Quantity Surveyor
Mrs. Masumbuko	: Legal Advisor

(12) Tanzania Electric Supply Company Ltd. (TANESCO)

Mr. Burhani	: Technical Manager

(13) Maji Office

Mr. Sip Massawe	: District Water Engineer

(14) Tanzania Post and Telecommunication Corporation (TPTC)

Mr. Yatera	: Acting Director
Mr. Mahando	: Telecommunication Expert

(15) Kilimanjaro Regional Trading Co. (KRTC)

Mr. Mwakalinga	: Assistant Marketing Officer

ANNEX 4 MINUTES OF DISCUSSION

MINUTES OF DISCUSSIONS
ON
THE BASIC DESIGN STUDY
ON
THE PROJECT FOR IMPROVEMENT OF THE
POST-HARVEST FACILITIES
IN
THE UNITED REPUBLIC OF TANZANIA

In response to the request of the Government of the United Republic of Tanzania, the Government of Japan has decided to conduct a basic design study on the Project for improvement of the Post-harvest facilities in Kilimanjaro Region (hereinafter refferred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (JICA)

JICA sent to Tanzania the Basic Design Team headed by Mr. Yasuyuki SAKAI, Chief Instructor, Agricultural Technical Training Center, Ministry of Agriculture, Forestry and Fisheries (hereinafter referred to as "the Team"). The Team had a series of discussions on the Project with the Officials concerned of the Government of the United Republic of Tanzania headed by Mr. Godwin N. MGENDI, Regional Development Director, Kilimanjaro Region and carried out field survey.

As a result of the discussion and survey, both sides agreed to recommend to their respective Governments that the major points of understanding reached between them, attached herewith, should be examined towards the realization of the Project.

Moshi, April 10th, 1987

Yasuyuki Sakai

Mr. Yasuyuki SAKAI
Leader, Basic Design
Study Team
Japan International
Cooperation Agency

Mr. Godwin N. MGENDI
Regional Development Director
Kilimanjaro Region

ATTACHMENT

1. The objective of the Project is to construct the post-harvest facilities which covers Rau River System (Upper Mabogini area, Lower Mabogini area, Rau Ya Kati area and Chekereni area) with a view to support and encourage farmers' activities for agricultural production.

2. The site of the Project is located in Chekereni village, along the trunk road from Moshi to Chekereni Village, immediate north of KADC.

   (Site map is attached as ANNEX I)

3. Regional Development Director's office, Kilimanjaro Region is responsible for the implementation of the Project and act as coordinating body to other relevant organizations.

4. The Team will convey the request of the Government of the United Republic of Tanzania to the Government of Japan to take necessary measures to cooperate in implementing the Project and bear the cost for the Project within the scope of Japanese Economic Cooperation Program in grant form.

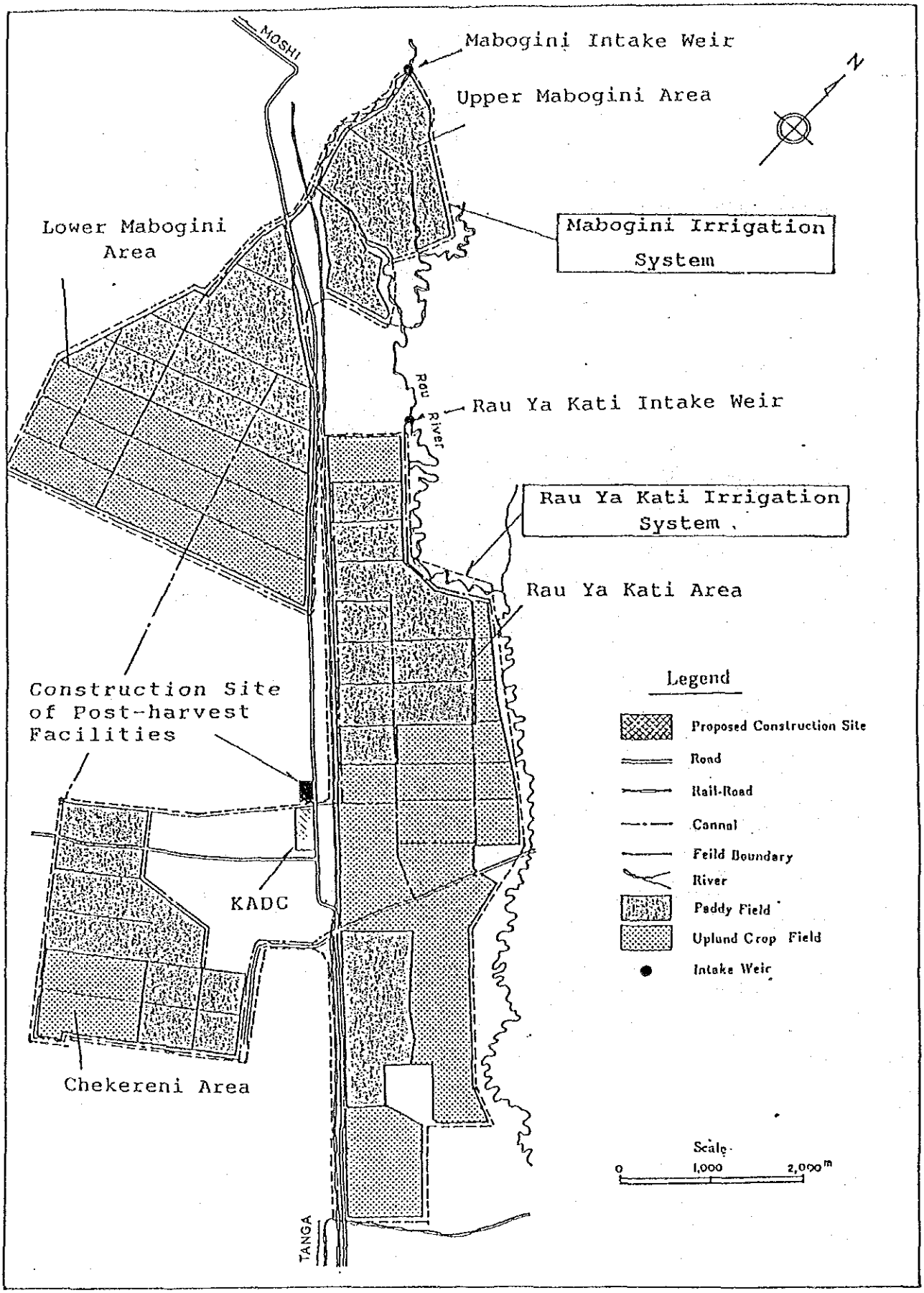
   (List of main facilities and equipment requested by the Government of the United Republic of Tanzania for Japan's Grant Aid is attached as ANNEX II)

5. The Government of the United Republic of Tanzania will take necessary measures listed in ANNEX III on condition that Japan's Grant Aid would be extended to the Project.

6. The Government of the United Republic of Tanzania has understood Japan's Grant Aid System explained by the Team.

7. The Government of the United Republic of Tanzania strongly requested technical support of KADC (Kilimanjaro Agricultural Development Center) to the operation and maintenance of the post-harvest facilities. The Team will convey and recommend the request to the Government of Japan.

ANNEX I SITE MAP



ANNEX II

MAIN FACILITIES AND EQUIPMENT REQUESTED BY THE GOVERNMENT OF THE UNITED REPUBLIC OF TANZANIA FOR JAPAN'S GRANT AID

1. Rice processing Facilites with building for:
   1) receiving
   2) drying
   3) milling
   4) weighing/packing
   5) processing of by-products (bran and husks)

2. Multi Purpose Godown
3. Transportation Equipment
4. Office for Operation & Maintenance

ANNEX III

MEASURES TO BE UNDERTAKEN BY THE GOVERNMENT OF THE UNITED REPUBLIC OF TANZANIA

1. To secure the site for the Project.

2. To clear and reclaim the site prior to the commencement of construction work.

3. To provide facilities for distribution of electricity, water supply, telephone, drainage and other incidental works leading and up to the site.

4. To bear commissions to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement.

5. To ensure prompt unloading, tax exemption and custom clearance at the port of disembarkation.

6. To exempt Japanese nationals concerned from customs duties, internal taxes and other fiscal levies which may be imposed in the United Republic of Tanzania with respect to the supply of products and services under the verified contracts.

7. To provide and accord Japanese nationals concerned with necessary permission, licences and other authorization required for the Project.

8. To bear all the expenses other than those to be borne by the grant aid necessary for the execusion of the Project.

9. To maintain and use properly and effectively the facilities constructed and equipment purchased under the grant aid.

ANNEX 5 METEOROLOGICAL DATA AT CHEKERENI STATION

(1) Monthly Mean Temperature

(Unit : ℃)

Month / Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1982	23.9	25.6	25.1	23.3	22.8	20.7	20.4	19.9	21.5	23.0	24.1	22.9
1983	22.2	23.0	24.0	24.0	22.9	21.4	20.1	20.0	21.2	23.1	25.6	24.5
1984	24.9	24.7	25.3	24.2	22.4	21.4	20.0	19.7	21.7	23.3	24.6	24.5
1985	25.0	24.2	24.7	24.0	22.0	20.8	20.2	20.4	22.1	22.9	24.0	24.5
1986	23.8	25.1	25.0	23.8	22.1	20.6	19.9	20.2	22.1	24.7	25.1	24.8
Average	24.0	24.5	24.8	23.9	22.4	21.0	20.1	20.0	21.7	23.4	24.7	24.2

(2) Monthy Maximum Temperature

(Unit : ℃)

Month / Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1982	33.8	35.6	35.1	31.3	27.7	27.6	26.9	27.2	29.1	30.6	31.8	31.7
1983	33.5	34.6	34.7	32.6	28.9	27.5	27.7	28.5	29.7	32.0	33.9	33.2
1984	33.7	35.0	34.6	32.1	28.9	27.2	26.2	26.6	30.3	31.9	32.1	32.2
1985	33.6	32.2	33.9	30.9	27.6	26.8	27.1	27.6	30.4	30.6	31.3	31.4
1986	32.5	34.8	34.3	31.3	27.5	26.2	26.8	28.6	30.3	33.2	32.8	32.3
Average	33.4	34.4	34.5	31.6	28.1	27.1	26.9	27.7	30.0	31.7	32.4	32.2

(3) Monthly Minimum Temperature

(Unit : ℃)

Month / Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1982	19.6	20.5	22.1	21.6	20.3	18.9	18.1	17.9	18.9	18.6	18.7	18.0
1983	17.9	18.6	20.5	20.7	19.9	18.0	17.1	16.7	16.9	18.2	19.1	18.4
1984	18.2	18.5	19.6	19.7	17.7	16.3	16.1	15.1	13.4	16.0	17.0	16.5
1985	17.1	17.4	19.1	19.6	18.3	17.0	17.1	17.4	18.1	17.5	20.0	20.3
1986	20.2	18.9	21.5	21.6	20.5	17.7	16.9	16.9	18.4	21.2	21.8	21.3
Average	18.6	18.8	20.6	20.6	19.3	17.6	17.1	16.8	17.1	18.3	19.3	18.9

(4) Monthly Evaporation (Pan ϕ 20cm)

(Unit : mm)

Month / Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1982	9.4	11.0	11.2	5.8	3.2	3.5	3.7	4.8	6.5	6.3	7.2	7.0
1983	9.7	9.8	9.7	6.7	4.0	3.6	4.9	5.8	7.0	8.2	10.6	9.1
1984	9.4	11.1	10.5	6.4	4.8	4.7	3.8	4.7	8.0	8.9	8.7	8.2
1985	9.6	7.4	9.5	5.6	3.4	3.8	4.4	5.3	8.0	8.4	8.1	7.5
1986	7.6	10.6	8.4	5.1	3.1	3.6	4.7	6.5	8.3	10.4	9.4	6.9
Average	9.1	10.0	9.9	5.9	3.7	3.8	4.3	5.4	7.6	8.4	8.8	7.7

(5) Monthly Relative Humidity

(Unit : %)

Month / Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1982	65	59	65	66	73	70	65	72	61	71	72	76
1983	75	72	70	75	80	80	79	77	71	69	63	71
1984	66	64	65	74	76	73	77	75	70	68	68	67
1985	64	73	71	76	78	77	74	70	66	65	70	70
1986	73	64	70	78	81	77	71	74	66	65	67	71
Average	69	66	68	74	78	75	73	74	67	68	68	71

(6) Monthly Precipitation and Number of Rainy Days

Unit: ㎜(Precipitation), days(Rainy days)

Year	Item	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Totla
1982	Precipitation	12.8	8.4	4.1	75.7	267.3	56.7	35.9	7.8	23.8	137.6	119.3	43.9	793.3
	Rainy Days	4	2	3	12	22	7	3	3	3	12	10	8	89
1983	Precipitation	11.4	27.7	12.4	129.5	116.0	16.7	4.8	—	1.7	4.3	2.7	89.0	416.2
	Rainy Days	4	1	2	10	17	3	2	0	1	3	1	8	52
1984	Precipitation	11.0	5.8	14.8	228.5	45.5	29.8	49.4	4.0	4.0	5.5	54.4	57.0	509.7
	Rainy Days	3	3	4	16	13	5	5	5	4	4	13	N.A.	75
1985	Precipitation	43.0	138.9	86.0	58.0	100.5	6.0	12.0	1.0	0.5	20.1	46.0	55.5	567.5
	Rainy Days	3	11	5	12	10	4	2	1	1	4	8	9	70
1986	Precipitation	86.5	58.5	11.0	99.2	159.8	1.2	-	7.8	-	11.5	7.8	154.2	597.5
	Rainy Days	7	1	7	15	17	2	0	3	0	2	3	9	66
Average	Precipitation	32.9	47.9	25.7	118.2	137.8	22.1	20.4	4.1	6.0	35.8	46.0	79.9	576.8
	Rainy Days	4	4	4	13	16	4	2	2	2	5	7	9	70

ANNEX 6 RESULTS OF SAMPLING DATA ON PADDY YIELD IN PILOT FARM AND PROJECT AREA

(PILOT FARM)

DATE	PLOT NO.	VARIETY	NO. OF HILLS	GAIN AT FIELD WT kg	STRAW AT FIELD WT kg	MOISTURE CONTENT %	AREA m^2	GRAIN WT AT 14% M.C.kg	YIELD ton/ha	ACTUAL YIELD ton/ha	
1/12/86	A1	IR 54	326	9.10	22.20	18.5	12.0	8.62	7.18	2.18	7.25
17/11/86	A2	IR 54	312	12.24	17.550	20.9	12.3	11.26	9.15	2.55	8.50
17/11/86	A3	IR 36	225	9.81	17.65	15.5	13.0	9.64	7.45	1.99	6.63
21/11/86	A4	IR 54	237	12.15	23.30	16.3	12.0	11.82	9.85	2.70	9.00
20/11/86	A5	IR 54	233	9.90	21.50	20.8	10.3	9.12	8.85	2.73	8.69
21/11/86	A6	IR 54	420	12.87	28.60	19.5	12.0	12.04	10.03	2.63	8.75
25/11/86	A7	IR 54	405	11.70	21.30	18.0	12.0	11.15	9.29	2.50	8.35
25/11/86	A8	IR 54	206	7.83	23.20	18.2	11.0	7.45	6.78	2.06	6.88
26/11/86	A9	IR 54	207	8.28	17.70	19.4	12.0	7.76	6.47	1.91	6.37
24/11/86	A10	IR 20	213	8.2	17.10	17.4	12.0	7.95	6.65	1.73	5.75
3/12/86	B1	IR 20	196	7.47	18.80	17.6	12	7.13	6.00	1.35	4.50
24/11/86	B2	IR 54	274	9.81	20.90	18.6	12	9.74	7.74	2.40	8.00
29/11/86	B3	IR 54	160	6.66	14.20	19.9	8.6	6.20	7.21	2.44	8.04
22/11/86	B4	IR 54	244	8.64	17.30	18.8	12	8.16	6.80	2.44	8.13
23/11/86	B5	IR 54	208	6.66	13.60	18.5	9.9	6.31	6.37	2.10	7.00
18/11/86	B7	IR 54	180	7.20	16.4	20.7	7.6	6.64	7.27	2.40	8.00
22/11/86	B8	IR 54	136	6.75	14.3	20.7	7.6	6.22	8.18	2.18	7.25
29/11/86	C1	IR 54	228	11.70	19.6	18.2	10.0	11.13	8.27	2.46	8.19
29/11/86	C3	IR 54	231	9.54	22.4	18.3	12.0	9.06	7.55	2.18	7.25
29/11/86	C4	IR 54	152	4.86	10.0	18.4	7.5	4.61	6.15	2.40	8.00
1/11/86	C5	IR 54	127	6.66	13.4	17.8	7.5	6.36	8.49	2.40	8.00
29/11/86	C6	IR 54	135	7.02	13.0	19.5	7.5	6.57	8.76	2.69	8.63
22/11/86	C7	IR 54	245	9.09	19.0	18.7	12.0	8.59	7.16	2.63	8.75
22/11/86	C8	IR 54	242	12.15	17.4	18.6	12.8	11.50	8.98	2.21	7.38

(PILOT FARM)

DATE	PLOT NO.	VARIETY	NO. OF HILLS	GAIN AT FIELD WT kg	STRAW AT FIELD WT kg	MOISTURE CONTENT %	AREA m^2	GRAIN WT AT 14% M.C.kg	YIELD ton/ha	ACTUAL YIELD ton/ha	
3/12/86	D1	IR 20	292	7.92	17.3	18.1	12.0	7.54	6.28	1.95	6.50
18/11/86	D2	IR 54	236	9.63	18.1	19.4	12.0	9.02	7.52	2.48	8.25
18/11/86	D3	IR 54	185	8.24	17.5	21.8	12.0	7.49	6.24	2.48	8.25
18/11/86	D4	IR 54	177	6.03	12.5	19.6	12.0	5.64	4.70	2.03	6.75
17/11/86	D5	IR 54	207	8.37	16.1	18.7	12.0	7.91	6.60	1.95	6.50
22/11/86	D6	IR 54	180	9.54	13.0	18.8	11.3	9.00	7.96	2.06	6.66
22/11/86	D7	IR 54	263	8.55	17.7	18.8	13.2	8.07	6.12	1.88	6.25
25/11/86	D9	IR 54	257	7.83	17.7	17.7	12.0	7.49	6.24	1.65	5.50
25/11/86	D10	IR 54	246	8.37	15.4	17.4	12.0	8.04	6.70	1.73	5.75
17/11/86	D11	IR 20	333	7.56	18.9	18.9	12.0	7.13	5.94	1.13	7.50
17/11/86		IR 36	288	7.65	18.4	18.4	12.0	7.26	6.05	1.13	7.50
28/11/86	E1	IR 54	299	10.71	19.5	16.4	12.0	10.41	8.68	2.65	7.50
27/11/86	E2	IR 54	281	8.82	16.8	19.1	12.0	8.30	6.91	2.33	7.75
21/11/86	E4	IR 54	264	9.63	16.8	20.1	12.0	8.95	7.46	2.21	7.38
21/11/86	E5	IR 54	278	10.44	21.8	18.5	12.0	9.90	8.24	2.31	7.69
18/11/86	E6	IR 54	209	8.01	18.9	17.6	12.0	7.67	6.40	2.18	7.25
26/11/86	E7	IR 54	250	9.99	26.7	18.3	12.0	9.50	7.91	2.40	8.00
21/11/86	E8	IR 20	220	13.68	24.7	20.1	12.7	12.71	10.00	2.34	7.81
26/11/86	E9	IR 54	270	8.73	27.7	21.9	12.0	7.93	6.61	2.18	7.25
17/11/86	E10	IR 54	332	8.06	17.0	19.00	12.0	7.60	6.33	2.04	6.80
27/11/86	E11	IR 20	239	8.91	21.0	22.7	22.0	8.01	6.67	1.80	6.00
3/12/86	F1	IR 20	204	6.66	15.1	18.8	12.0	6.29	5.24	1.80	6.00
3/12/86	F3	IR 20	301	9.90	18.4	17.3	12.0	9.52	7.93	1.65	5.50
3/12/86	F4	IR 20	317	8.46	22.0	20.5	11.9	7.82	6.57	1.80	6.00
3/12/86	F5	IR 20	211	5.85	17.4	18.6	12.0	5.54	4.62	1.56	5.19
28/11/86	F6	IR 20	199	6.75	32.3	18.0	12.0	6.44	5.36		5.63
26/11/86	F7	IR 20	308	10.89	23.9	20.5	12.0	10.07	8.39	2.36	7.80
26/11/86	F8	IR 20	194	8.91	22.5	18.5	12.0	8.44	7.04	2.36	7.80
25/11/86	F9	IR 20	183	9.90	22.9	18.1	12.0	9.43	7.86	1.91	6.38

(PROJECT AREA)

DATE	BLOCK	PLOT NO.	VARIETY	MOISTURE CONTENT %	NO.OF HILLS	GRAIN AT FIELD WT. kg	STRAW AT FIELD WT. kg	AREA m^2	YIELD ton/ha	AV.YIELD ton/ha
19.11.86	MS.1-1	211	IR 54	25.0	230	9.72	25.2	12	7.06	
〃	MS.1-1	211	IR 54	21.0	255	10.26	22.6	12	7.85	7.46
19.11.86	MS.1-1	422	IR 54	19.0	282	11.16	25	12	8.75	7.35
〃	MS.1-1	422	IR 54	20.6	307	7.74	15.1	12	5.95	
24.11.86	MS.1-1	109	IR 54	19.7	185	6.75	19.9	12	5.25	
〃	MS.1-1	109	IR 54	23.5	258	7.56	23.6	12	5.60	5.43
24.11.86	MS.6-3	207	IR 54	24.5	200	7.74	24.6	12	5.66	
〃	MS.6-3	207	IR 54	25.9	156	4.67	14.5	12	3.35	4.51
24.11.86	MS.6-3	104	IR 54	22.2	240	9.72	27.21	12	7.33	
〃	MS.6-3	104	IR 54	22.5	214	8.37	18.9	12	6.29	6.8
25.11.86	MS.6-3	213	IR 54	25.3	222	8.55	19.5	12	6.20	
〃	MS.6-3	213	IR 54	27.3	256	10.44	7.65	12	7.33	6.10
〃	MS.6-3	213	IR 54	25.5	221	6.62	12.62	12	4.77	
25.11.86	MS.6-3	115	IR 54	23.5	192	6.88	12.72	12	5.10	
〃	MS.6-3	115	IR 54	25.4	210	9.44	18.20	12	6.82	5.96
25.11.86	MS.2-2	402	IR 54	19.1	270	7.65	18.72	12	5.99	5.45
〃	MS.2-2	402	IR 54	25	266	6.75	14.62	12	4.90	
3.12.86	MS.6-2	402	IR 54	19.1	221	13.68	33.7	12	10.72	
〃	MS.6-2	402	IR 54	21.7	217	11.88	31.6	12	9.01	9.87
4.12.86	MS.6-1	107		16.5	231	7.65	21.55	12	6.18	
5.12.86	MS.6-1	710		18.9	250	99	18.0	12	7.77	5.30
〃	MS.6-1	710		19.3	231	3.6	6.7	12	2.82	
5.12.86	MS.6-2	406	IR 54	19.3	204	8.59	17.6	12	6.71	
〃	MS.6-2	406	IR 54	19.4	232	7.97	20.2	12	6.22	6.47

(PROJECT AREA)

DATE	BLOCK	PLOT NO.	VARIETY	MOISTURE CONTENT %	NO.OF HILLS	GRAIN AT FIELD WT. kg	STRAW AT FIELD WT. kg	AREA m^2	YIELD ton/ha	AV.YIELD ton/ha
26.12.86	MS.4-1	505	IR 54	23.5	258	8.7	14.3	12	6.45	6.03
26.12.86	MS.4-2	505	IR 54	25	230	7.7	24	12	5.60	
26.12.86	MS.5-2	507	IR 54	25.5	225	10.08	21.6	12	7.27	6.30
〃	MS.5-2	507	IR 54	24.3	327	8.64	16.0	12	6.33	
29.12.86	MS.2-2	318	IR 54	17.1	303	8.28	15.9	12	6.65	5.92
〃	MS.2-2	318	IR 54	17.2	271	6.48	12.6	12	5.19	
29.12.86	MS.6-1	507	IR 20	13.1	196	6.21	10.9	12	5.22	5.83
〃	MS.6-1	507	IR 20	14.1	331	7.74	11.0	12	6.44	
31.12.86	MS.2-1	409	IR 54	24.4	176	9	18.2	12	6.59	4.15
	MS.2-1	409	IR 54	22.4	170	3.6	9.3	12	2.70	
31.12.86	MS.1-3	607	IR 54	19.5	258	6.3	14.5	12	4.91	4.28
	MS.1-3	607	IR 54	16.5	300	4.5	14.6	12	3.64	
1. 1.87	MS.1-3	505	IR 54	18.7	271	8.55	18.5	12	6.73	7.51
〃	MS.1-3	505	IR 54	18	268	10.44	21	12	8.29	
5. 1.87	MS.4-2	202	IR 20	17.9	252	6.03	12.4	12	4.79	
	MS.4-2	202	IR 20	18.5	169	6.21	15.0	12	4.90	4.85
6. 1.87	MS.4-2	408	IR 20	18.2	257	7.74	10.3	12	6.13	
〃	MS.4-2	408	IR 20	14.5	224	2.7	3.8	12	2.23	4.18
7. 1.87	MS.3-1	112	IR 54	19.2	183	6.12	14.0	12	4.79	
	MS.3-1	112	IR 54	19.5	217	10.62	32	12	8.28	6.54
7. 1.87	MS.1-2	605	IR 54	209	292	11.16	31.1	12	8.55	7.71
〃	MS.1-2	605	IR 54	20.9	329	9	35.3	12	6.89	
8. 1.87	MS.3-1	109	IR 54	19.7	273	9.36	26.4	12	7.28	6.83
	MS.3-1	109	IR 54	17.7	205	8.01	32.8	12	6.38	
9. 1.87	MS.3-1	115	IR 54	15.60	229	8.28	23.60	12	6.77	5.76
	MS.3-1	115	IR 54	17.60	257	5.94	14.9	12	4.74	
14. 1.87	MS.3-2	103	IR 54	17.76	241	8.46	17.2	12	6.74	7.19
	MS.3-2	103	IR 54	17.3	199	9.54	24.2	12	7.64	
14. 1.87	MS.3-2	102	IR 54	20.5	237	8.19	23.3	12	6.30	6.52
	MS.3-2	102	IR 54	19.5	253	8.64	18.9	12	6.73	90.1

ANNEX 7 RESULTS OF SURVEY ON BEARING CAPACITY

Design bearing capacity of the construction site should be determined by synthetic examinations based upon the results of field survey and the existing boring data carried out near the construction site.

1. Results of survey using cone penetrometer

Equipment used : cone penetrometer, section area of top cone 3.23 cm^2

Survey site : 2 points within the construction site (see the following map), 2 times of survey were carried out at each site

Results of survey

Depth from GL	Survey Site No.1					
	1st Time			2nd Time		
	Gauge	Q	qa (t/m^2)	Gauge	Q	qa (t/m^2)
10	-			-		
20	-			-		
30	91	40	18.6	113	50	23.2
40	80	35	16.3	142	62	28.8
50	84	37	17.2	128	56	26.0
60	95	42	19.5	125	55	25.5
70	93	42	19.0	135	59	27.4
80	134	59	27.4	142	62	28.8
90	181	80	37.2	171	75	34.8
100	not measurable			not measurable		
110						
120						

Depth from GL	Survey Site No.2					
	1st Time			2nd Time		
	Gauge	Q	qa (t/m^2)	Gauge	Q	qa (t/m^2)
10	-			-		
20	-			-		
30	72	32	14.9	75	33	15.3
40	188	83	38.5	140	62	28.8
50	not measurable			178	78	36.2
60				not measurable		
70						
80						

Therefore,

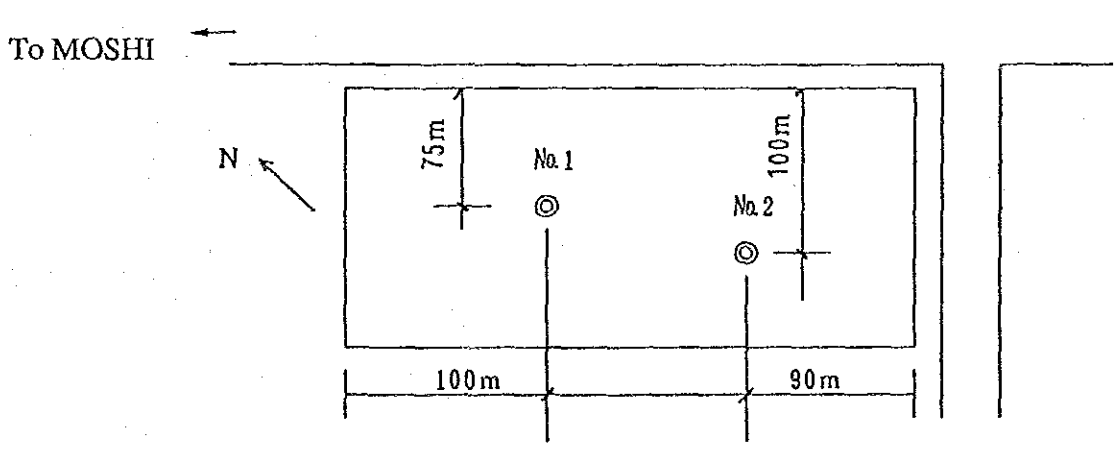
$$qa = a \times \frac{Q}{A}$$

qa : Equivalent Allowable Bearing Capaicty, kg/cm^2, safety factor 3

Q : Maximum Penetrating Resistence of Cone, number on gauge x 0.44

A : Area of Cross Section of Cone

a : Conversion Factor for Allowable Bearing Capacity, 0.15 - 0.20 (in this case, 0.15 applied)



LOCATION OF SURVEY SITE

2. Result of survey using hand auger (survey sites are the same as where the cone penetrometer survey was carried out).

Survey Site No.1

Depth	0 - 70 cm	Clay, Sand, Silty Loam
	70 - 100 cm	Gravelly Sandy Clay
	more than 100 cm	too hard to excavate

Survey Site No.2

Depth	0 - 40 cm	Sandy Clay
	40 - 70 cm	Gravelly Sandy Clay (hard)
	more than 70 cm	too hard to excavate

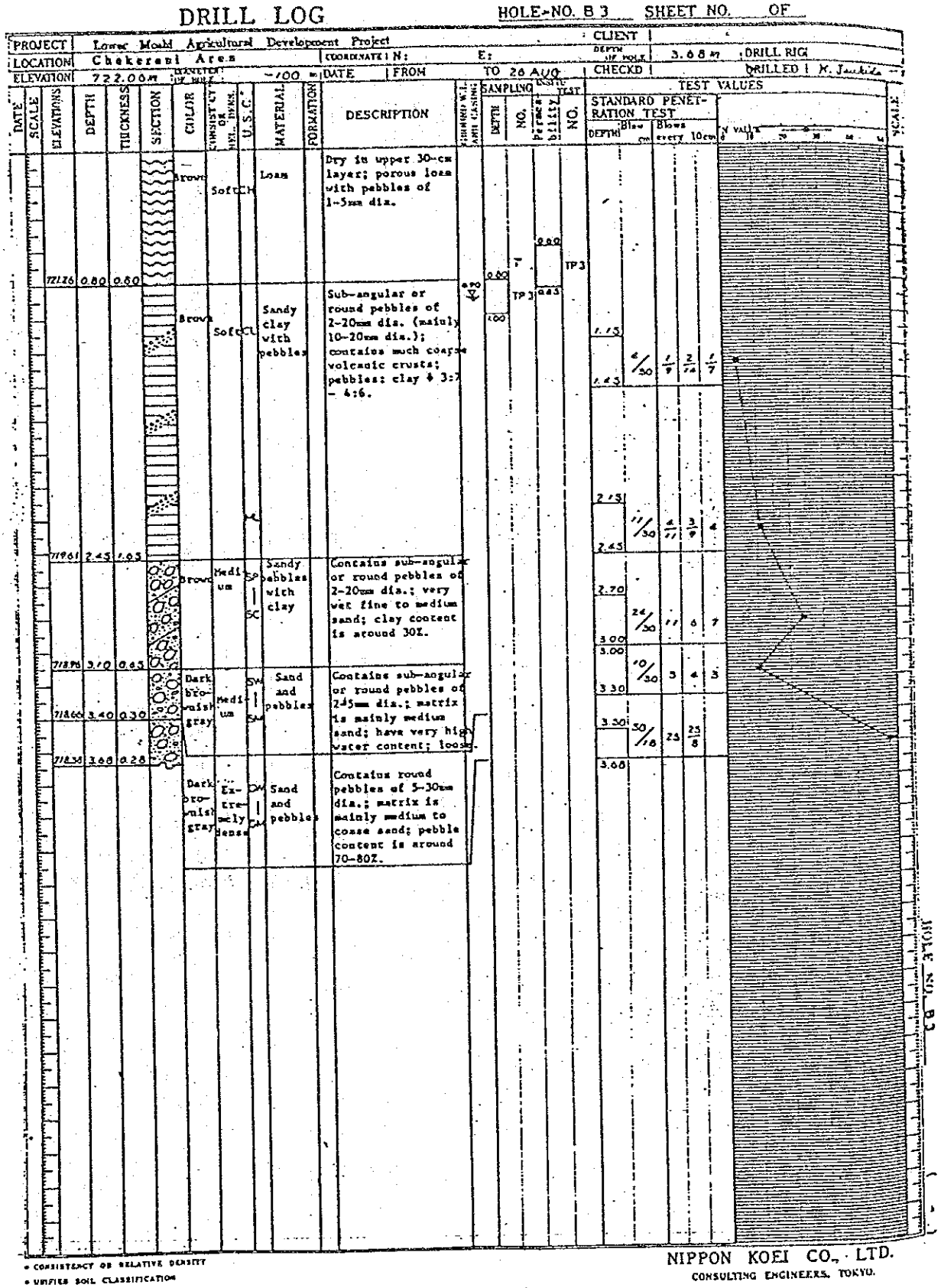
3. Boring data

According to boring data carried out at a place about 1 km SE of the construction site, geological conditions were as follows:

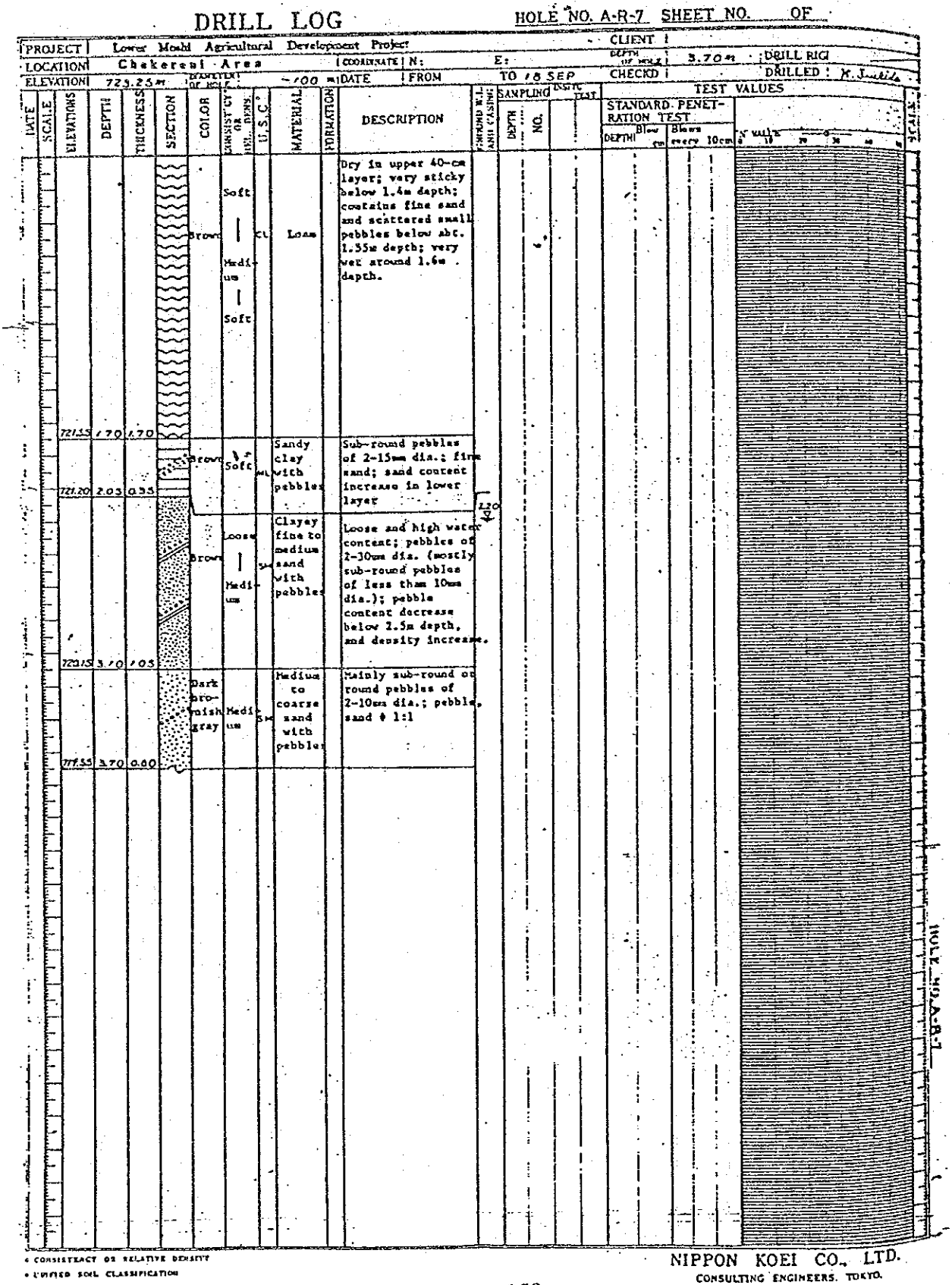
Depth	Geological Conditions	N Value
0 - 80 cm	Loam	-
80 - 245 cm	Gravelly Sandy Clay	5 - 10
245 - 310 cm	Clay Gravel	10 - 25
310 - 368 cm	Gravel	10 - 50

Also see attached data sheets.

Boring Data (1/2)



Boring Data (2/2)



DRILL LOG

HOLE NO. A-R-7 SHEET NO. OF

PROJECT: Lower Mosul Agricultural Development Project — CLIENT:

LOCATION: Chakeresi Area — COORDINATE: N: E: — DEPTH OF HOLE: 3.70m — DRILL RIG:

ELEVATION: 723.25m — DIAMETER OF HOLE: ~100 m/m — DATE: FROM TO 18 SEP — CHECKD: — DRILLED: K. J...

DATE	SCALE	ELEVATIONS	DEPTH	THICKNESS	SECTION	COLOR	CONSIST'CY OR REL. DENS.	U.S.C.*	MATERIAL	FORMATION	DESCRIPTION	STRENGTH W.L. AT TIME OF CASING	SAMPLING DEPTH	SAMPLING NO.	INSITU TEST	STANDARD PENETRATION TEST DEPTH	STANDARD PENETRATION TEST Blow cm	STANDARD PENETRATION TEST Blows every 10cm	TEST VALUES N VALUE	STRATA
		721.55	1.70	1.70		Brown	Soft — Medium — Soft	CL	Loam		Dry in upper 40-cm layer; very sticky below 1.4m depth; contains fine sand and scattered small pebbles below abt. 1.55m depth; very wet around 1.6m depth.									
		721.20	2.03	0.35		Brown	Soft	ML	Sandy clay with pebbles		Sub-round pebbles of 2-15mm dia.; fine sand; sand content increase in lower layer									
		720.15	3.10	1.05		Brown	Loose — Medium	SM	Clayey fine to medium sand with pebbles		Loose and high water content; pebbles of 2-30mm dia. (mostly sub-round pebbles of less than 10mm dia.); pebble content decrease below 2.5m depth, and density increase.		2.20							
		719.55	3.70	0.60		Dark brownish gray	Medium	SM	Medium to coarse sand with pebbles		Mainly sub-round or round pebbles of 2-10mm dia.; pebble, sand ≒ 1:1									

HOLE NO. A-R-7

* CONSISTENCY OR RELATIVE DENSITY

* UNIFIED SOIL CLASSIFICATION

NIPPON KOEI CO., LTD.
CONSULTING ENGINEERS. TOKYO.

ANNEX 8 COUNTRY DATA

I. BASIC INDICATORS

1. Name of Country	:	United Republic of Tanzania
2. Capital	:	Dar es Salaam
3. Data of Independence	:	February 9, 1961 (Tanganyka)
	:	December 10, 1963 (Zanzibar)
4. Area of Territory	:	945,100 km^2
5. Population	:	21.2 million persons (estimate in 1985)
6. Population Density	:	22.4 person/km^2 (in 1985)
7. Population Growth Rate	:	3.4% per annum
8. Life Expectancy	:	52 years old (in 1983)
9. Political Conditions		
(1) Form of government	:	Constitutional Republican Form
(2) Form of national assembly	:	the Single-Chamber System of National Council
(3) Political party	:	only one party is recognized, namely, Chama Cha Mapinduzi; CCM (which means the revolutionally party)
(4) Sovereign (President)	:	Al Hassan Mwinyi (took the position on Nov. 5, 1985)
10. Religious Conditions	:	Traditional Animism, Christianity and Moslem are accepted. Proportion of the believers of each religion to total population is 40, 30, 30%, respectively.
11. Languages	:	Swahili is the official language. English is also prevalent.
12. Racial Conditions	:	African Negro takes 98% of total population, and others are Indian, Arab and a few White. African Negros are predominently of two groups, namely, Bantu and Nilotic, 95% of the total population is Bantu.
13. Education		
(1) Education System	:	Divided into primary school (6 years), secondary school (4 years of 1st curriculum

and 2 years of 2nd curriculum), university (3 years) and various professional training schools.

Number of schools, teachers and pupils by each system in 1983 are as shown below;

Kinds of School	No. of Schools	No. of Teachers	No. of Pupils
Primary School	10,044	85,476	3,552,923
Secondary School	70	2,213	71,219
University	1	752	3,877
Professional Training School	40	967	10,568

Source: Ministry of Education, Tanzania

(2) Primary school enrolment : 90% (the proportion of the population of the age-group of 7 to 13 years old)

(3) Adult literacy : 79% (in 1980)

14. Geographical Conditions

Tanzania is composed of a continental part (Tanganyika) and two islands on the Indian Ocean, anmely Zanzibar and Pemba, and located between latitude 1°S and 11°45'S and between longitude 29°20'E and 40°38'E. The geography of the country is characterized as follows; eastern lowlands, central highlands and western mountainous area. Climatic conditions are largely divided into tropical oceanic climate in the eastern coastal area and both Zanzibar and Penba islands, savanna climate in the central highlands, temperate constant-spring climate in north Mt. Kilimanjaro area, and tropical forest climate on the western lake-shore area of Tanganyika.

Annual rainfall varies by region. In the western lake shore region, for example, annual rainfall is expected to be 750 mm at the minimum. On the other hand, in the central highland region, rainfall varies year. In the coast region of the Indian Ocean and both islands, about 500 mm of annual rainfall is expected. The rainy season is divided into the great one (April to May) and the small one (November to February).

II. SOCIO-ECONOMIC INDICATORS

1. Trend of Gross Domestic Product (GDP)

Item	1980	1981	1982	1983	1984	1985
GDP At Market Price (Million Tsh.)		50,839	60,508	65,976	75,658	91,576
GDP At Market Price (Million US$)		6,140	6,520	5,922	4,948	5,242
GDP At Factor Cost						
- at current price (Million Tsh.)	38,657	45,193	54,845	60,702	68,761	
- at constant (1976) (Million Tsh.)	12,217	12,013	12,248	12,177	12,489	
- real increase (%)	3.1	-1.7	2.0	-0.6	2.6	
GDP per caput						
- GDP at market price (Tsh.)		2,704	3,151	3,332	3,691	4,320
- GDP at market price (US$)		327	340	299	241	247
- GDP at factor price						
at current price (Tsh.)	2,136	2,404	2,857	3,066	3,354	
at constant (1976) (Tsh.)	675	639	638	615	609	
real increase (%)		-5.3	-0.2	-3.6	-1.0	
Population (Million)	18.1	18.8	19.2	19.8	10.5	21.2
Exchange Rate to US$1.00 (Tsh.)	8.20	8.28	9.28	11.14	15.29	17.47

Source: Bank of Tanzania

2. Gross Domestic Product by Industrial Origin (at 1976 constant price)

(Unit: Tsh. Miliion)

Item	1982		1983		1984	
Agricutlure	5,570	(45)%	5,620	(46)%	5,773	(46)%
Mining & Quarrying	97	(1)	91	(1)	93	(1)
Manufacturing	741	(6)	676	(6)	586	(5)
Electricity & Water	214	(2)	210	(2)	223	(2)
Construction	465	(4)	313	(3)	294	(2)
Commerce	1,239	(10)	1,234	(10)	1,227	(10)
Transport	847	(7)	738	(6)	822	(7)
Finance	1,008	(8)	1,026	(8)	1,055	(8)
Public Administration & Defence	2,067	(17)	2,269	(18)	2,416	(19)
Total	12,248	(100)	12,177	(100)	12,489	(100)

Source: Bank of Tanzania

3. Currency Unit, Trend of Exchange Rate to U.S. Dollar

(1) Currency Unit : (Tanzania Shilling Tsh.)

(2) Trend of Exchange Rate to U.S. Dollar

(Unit: Tsh.)

Item	1982	1983	1984	1985	1986
Exchange Rate to US$1.00	9.28	11.14	15.29	17.47	27.64*

* Average as of Sep. 1986.

Source: Bank of Tanzania

4. Consumer Price Rate

(Unit: %)

Item	1981	1982	1983	1984	1985
Annual Inflation Rate	25.0	28.9	27.1	36.0	27.0

1970 = 100

Source: IMF Data

5. Trade Structure

(1) Trend of Foreign Trade

(Unit: Tsh.mn)

Item	1980	1981	1982	1983	1984	1985*
Export (f.o.b)	4,192	4,807	4,230	4,139	5,661	5,440
Import (c.i.f)	10,308	10,047	10,519	8,877	11,953	15,552
Balance	-6,116	-5,240	-6,289	-4,738	-6,292	-10,112

* Estimate

Source: International Financial Statistics, IMF

(2) Main Commodities Traded (1984)

1) Exports

Item	Amount (Tsh.Mn.)	Ratio (%)
Coffee	2,216	39.1
Cotton	713	12.6
Cashewnuts	439	7.8
Tea	330	5.8
Sisal	146	2.6
Cloves	136	2.4
Tobacco	110	1.9
Diamonds	71	1.3
Others	1,500	26.5
Total	5,661	100.0

2) Imports

Item	Amount (Tsh.Mn.)	Ratio (%)
Machinery & equipment	3,843	32.1
Mineral fuel	2,404	20.1
Manufactured Goods	2,115	17.7
Chemicals	1,561	13.1
Food	1,111	9.3
Others	919	7.7
Total	11,953	100.0

Source: Ministry of Planning and Economics. Tanzania

(3) Main Trading Partners

1) Export to:

(Unit: %)

Country	% of Total Value 1982	1983
West Germany	15.6	17.0
UK	12.3	13.9
Netherland	6.9	7.9
Switzerland	-	6.3
Italy	7.5	5.5
Algeria	2.5	4.5
Japan	7.1	4.5
India	6.7	-
France	1.3	3.4
Hong Kong	4.3	2.8
USA	4.9	2.7
Finland	1.5	2.2
Blgaria	-	2.1

Source: UN Trade Statistics

2) Imports from:

(Unit: %)

Country	% of Total Value 1982	1983
United Arab Emirates	6.0	14.8
UK	11.6	13.4
West Germany	11.8	12.2
Japan	8.5	10.8
India	-	5.2
Belgium	4.5	5.0
Netherland	6.4	4.8
Libya	-	4.7
Italy	3.3	4.6
USA	3.6	3.4
Iran	-	3.3
Sweden	3.3	2.7
Bahrain	4.9	2.4

Source: UN Trade Statistics

6. Economically Active Population, Wage Employment, Wage Earnings

(1) Economically Active Population: Economically active population by sex and age group in 1978 is shown below.

(Unit: Persons)

Age Group	Total			Males			Females		
	①Total Population	②Active Population	②/① (%)	①Total Population	②Active Population	②/① (%)	①Total Population	②Active Population	②/① (%)
0-9	5,981,924	1,239		2,949,200	824		3,032,724	415	
10-14	2,101,447	67,298	3.2	1,066,645	21,361	2.0	1,034,802	45,937	4.4
15-19	1,719,280	744,465	43.3	841,340	275,735	32.8	877,940	468,730	53.4
20-24	1,329,098	1,134,703	85.4	586,580	496,337	84.6	742,518	638,366	86.0
25-29	1,313,874	1,220,525	92.9	610,325	585,025	95.9	703,549	635,500	90.3
30-34	962,335	916,609	95.2	457,537	446,882	97.7	504,798	469,727	93.1
35-39	886,152	853,919	96.4	439,515	433,176	98.6	446,637	420,743	94.2
40-44	670,194	647,943	96.7	321,487	317,107	98.6	348,707	330,836	94.9
45-49	632,342	612,781	96.9	320,391	316,894	98.9	311,951	295,887	94.9
50-54	470,663	449,938	95.6	233,611	229,418	98.2	237,052	220,520	93.0
55-59	380,433	360,304	94.7	205,252	201,271	98.1	175,181	159,033	90.8
60-64	347,771	312,668	89.9	172,414	165,309	95.9	175,357	147,359	84.0
65-69	240,865	204,589	84.9	124,810	116,335	93.2	116,055	88,254	76.0
70-74	194,131	148,941	76.7	103,046	90,884	88.2	91,085	58,057	63.7
75-	282,102	169,183	60.0	154,933	112,577	72.7	127,169	56,606	44.5
Total	17,512,611	7,845,105	44.8	8,587,086	3,809,135	44.4	8,925,525	4,035,970	45.2

(Source: Yearbook of Labour Statistics, 1986, ILO)

(2) Wage Employment by Sector

(Unit: 1,000persons)

Sector	1974	1980	1981	1982	% of share 1982	% of change 1974/82
Agriculture	124.0	130.1	119.5	137.1	20.3	10.6
Mining & quarring	4.8	5.9	6.6	7.4	1.1	54.2
Manufacturing	64.9	105.8	104.3	120.9	17.9	86.3
Utilities	16.1	19.5	24.0	22.3	3.3	38.5
Construction	72.8	48.7	45.6	52.7	7.8	-27.6
Commerce	25.3	38.1	34.6	39.8	5.9	57.3
Transport & Communication	45.2	58.3	52.2	62.8	9.3	38.9
Finance	7.4	13.9	17.5	16.2	2.4	118.9
Public Services	123.7	182.0	209.4	216.1	32.0	74.7
Total	484.2	602.3	613.7	675.3	100.0	39.5

(Source: Economic Survey 1982, Government of Tanzania)

(3) Wage Earnings

(Unit: TSh./month)

Item	1980	1981	1982	1983
Minimum monthly wage	480	600	600	600
Average monthly wage	768	827	691	1,275
Sector				
Agriculture	422	456	491	529
Manufacturing	792	850	916	984
Construction	579	615	662	703
Transport	1,113	1,289	1,389	1,529
Commerce	920	1,023	1,182	1,231
Government	740	799	663	932

(Source : Bureau of Statistics,Government of Tanzania)

7. Balance of Payment

(Unit: US$Mn.)

Item	1980	1981	1982	1983	1984	1985
Export (f.o.b)	505.4	563.4	413.0	378.8	366.7	340.9
Import (c.i.f)	1,219.9	1,173.6	1,094.6	818.8	839.3	972.0
Trade balance	-714.5	-610.2	-681.6	-440.0	-472.6	-631.1
Services (net)	19.1	70.0	38.9	23.2	12.5	21.0
(receipts)	(178.9)	(195.8)	(117.3)	(108.1)	(107.4)	(129.0)
(payments)	(159.8)	(125.8)	(78.4)	(84.9)	(94.8)	(108.0)
Official transfers(net)	106.9	107.5	93.7	84.4	96.5	104.5
Private transfers(net)	21.8	22.5	25.4	18.9	62.1	130.0
Current account balance	-566.7	-410.2	-523.6	-313.5	-301.5	-375.6
Long-term capital(net)	166.3	179.9	240.5	134.0	123.7	96.0
Short-term capital(net)	60.5	100.7	57.6	101.8	109.8	-32.0
Capital account balance	226.8	280.6	298.1	235.8	233.5	64.0
Errors & omissions	48.6	34.8	-48.9	-171.3	-182.5	-115.5
Counterpart items	7.0	6.0	...	...	...	...
Exceptional financing	110.1	111.9	91.7	60.6	49.0	100.0
Overall balance	-174.2	23.1	-182.7	-188.4	-201.5	-327.1
Net foreign assets	22.0	18.5	18.5	-26.3	-19.0	...
Payment arrear	152.2	4.6	164.2	214.7	220.5	...

(Source : Bank of Tanzania.Government of Tanzania)

8. Public External Debt

(Unit: US$Mn.)

Item	1980	1981	1982	1983	1984
Total, incl. undisbursed	2,982.0	3,133.9	3,234.5	3,380.9	3,186.4
Disbursed only	2,010.7	2,188.6	2,390.6	2,584.2	2,593.7
Official creditors :	1,576.8	1,734.5	1,890.7	2,096.8	2,132.1
-Multilateral	562.5	681.8	795.6	885.0	997.1
-Bilateral	1,014.4	1,052.7	1,211.8	1,211.8	1,135.1
Private creditors :	433.8	454.1	487.5	487.5	461.5
-Suppliers	210.7	203.3	189.8	189.8	171.4
-Financial markets	223.1	250.8	297.7	297.7	290.2
Debt service :	75.7	73.8	65.4	65.4	71.3
-Principal	38.8	40.2	29.8	29.8	41.0
-Interest	37.0	33.6	35.6	35.6	30.3
Debt service ratio (%)	10.7	8.1	11.2	14.1	...
Disbursed debt/GNP (%)	41.1	40.5	46.9	58.9	68.0

(Source : World Debt Tables, World Bank)

9. Public Finance

(Unit: TSh.Mn.)

Item	1981/82	1982/83	1983/84	1984/85	1985/86
Revenue	10,101	11,819	13,995	18,855	20,160
Tax revenue	9,078	11,252	13,407	18,231	19,300
Non-tax reveue	1,023	567	588	624	860
Expenditure	19,182	18,442	20,894	25,699	27,403
Recurrent Expenditure	13,980	14,062	16,174	20,376	21,782
Development Expenditure	5,196	4,359	4,733	5,308	5,606
Lending	6	-21	-21	15	15
Overall Deficit	-9,081	-6,623	-6,891	-6,844	-7,243
Fund procurement					
Grant	1,656	1,593	1,234	1,892	1,685
Net foreign borrowing	1,204	970	230	608	-9
Net domestic borrowing	5,008	4,472	5,581	4,260	5,567
Adjustment	1,213	-412	-154	84	—

(Source : IMF 資料)

10. Expenditure by Purpose

(Unit: TSh.Mn.)

Item	1981/82	1982/83	1983/84	1984/85
Public debt	3,300.1	4,337.3	3,012.5	4,556.2
General services	3,168.2	3,198.1	3,919.2	6,297.7
Social services of which:	6,299.8	5,736.0	7,413.2	6,131.5
(% of education)	(39)	(44)	(39)	(33)
(% of health)	(16)	(18)	(15)	(16)
Economic services of which:	6,101.6	5,341.8	6,912.6	7,539.2
(% of agriculture)	(23)	(28)	(33)	(30)
(% of infrastructure)	(44)	(39)	(36)	(28)
Others	485.1	4,415.8	2,072.5	3,677.8
Total	19,354.8	23,029.0	23,330.0	28,202.4

(Source : Bank of Tanzania.Government of Tanzania)

11. Trade with Japan

(1) Trend of Trade

(Unit: US$Mn.)

Item	1979	1980	1981	1982	1983
Exports to Japan	28.6	23.2	18.6	18.0	18.4
Imports from Japan	71.9	113.3	93.4	90.6	75.2
Balance	-43.3	-90.1	-74.8	-72.6	-56.8

(Source: Statistics of Japanese Custom)

(2) Main Commodities Traded (1983)

(Unit: US$ 10^3)

Exports to Japan		Imports from Japan	
Item	Amount	Item	Amount
Coffee	13,325	Rice *	12,558
Cord and Nets	1,881	Steel coil	12,383
Cloves	690	Automobils	7,615
Shrimps	616	Steel Plates	4,501
Sisal	600	Communication Equipment	1,360

* Defered payments based on official assistance

(Source: Statistics of Japanese Custom)

12. Gross Official Foreign Reserves

(Unit: US$Mn.)

Item	1981	1982	1983	1984	1985
Foreign Reserves	52.8	39.1	62.5	38.3	38.8

(Source: IMF Data)

III. NATIONAL DEVELOPMENT PLAN

1. National Development Plan

(1) Past National Development Plans

- First 3-year Plan	(1961-1963)
- First 5-year Plan	(1964-1968)
- Second 5-year Plan	(1969-1973)
- Third 5-year Plan	(1974-1980)
- Fourth 5-year Plan	(1981-1986)
- National Economic Survival Program (NESP)	(1981/81)
- Structural Adjustment Program (SAP)	(1982-1985)

Although the Government of Tanzania had implemented the First, Second and Third 5-year Plan since the middle of 1960's, the Forth 5-year Plan was suspended and introduced the National Economic Survival Program (NESP) in 1981 as an urgent countermeasure, to cope with the rapid economical decline towards the end of 1970's. The Government further took the Structural Adjustment Program (SAP) for the rehabilitation of national economy. However, the anticipated result was not realized sufficiently, because of the extreme lack of foreign exchange.

(2) Current National Development Plan

The Economic Recovery Program (ERP) was launched in 1986 for the period 1986-1990. In the ERP, the target annual growth rate of GDP was set at 4.5% on an average to be attained by the following manner:

- Achievement of food self-sufficiency through increased agricultural production.
- Gaining of foreign exchange by the means of export promotion,
- Rehabilitation of major social infrastructure,
- Amelioration of the rate of operation in existing factories, and
- Improvement of the condition of revenue and expenditure of the national finance.

Increase of agricultural production both for food crops and export crops was given first priority in the program. In order to attain the target, a development fund of US$143 million was projected to be invested mainly in; i) strengthening of extension services and research

works, ii) stabilization of farm inputs supply, iii) acceleration of irrigation development, iv) promotion of estate development and v) rehabilitation of foundatio for production of export crops.

2. National Budget

The national budget in 1986/87 is as shown below:

(Tsh. million)

Expenditure	Total	55,596	Revenue	Recurrent	33,620
	Recurrent (increase by 82% of 1985/86)	39,736		Grants & loans for foreign donors	17,333
	Development (increase by 183% of 1985/86)	15,860		Non-bank borrowing	2,143
				Bank borrowing	2,500

Source: Daily News, 20 June, 1986.

This budget was constructed as the first year's national budget for the period of ERP, and was set to increase by about 100% over that of Tsh. 27,403 million in 1985/86. The large budget increase reflects the devaluation in April 1986 recommended by IMF. The amount of Tsh. 17,333 million, which is larger than the estimated development expenditure, was requested in grants and loans from foreign donors.

Such countries as Sweden, West Germany, Holland, Norway and Japan are the donor countries, together with international organizations like IDA.

Agriculture takes the largest share of the development budget with 28.2%, followed by economic services (24.1%) and social services (19.3%), while industry is accorded a low priority at 8%.