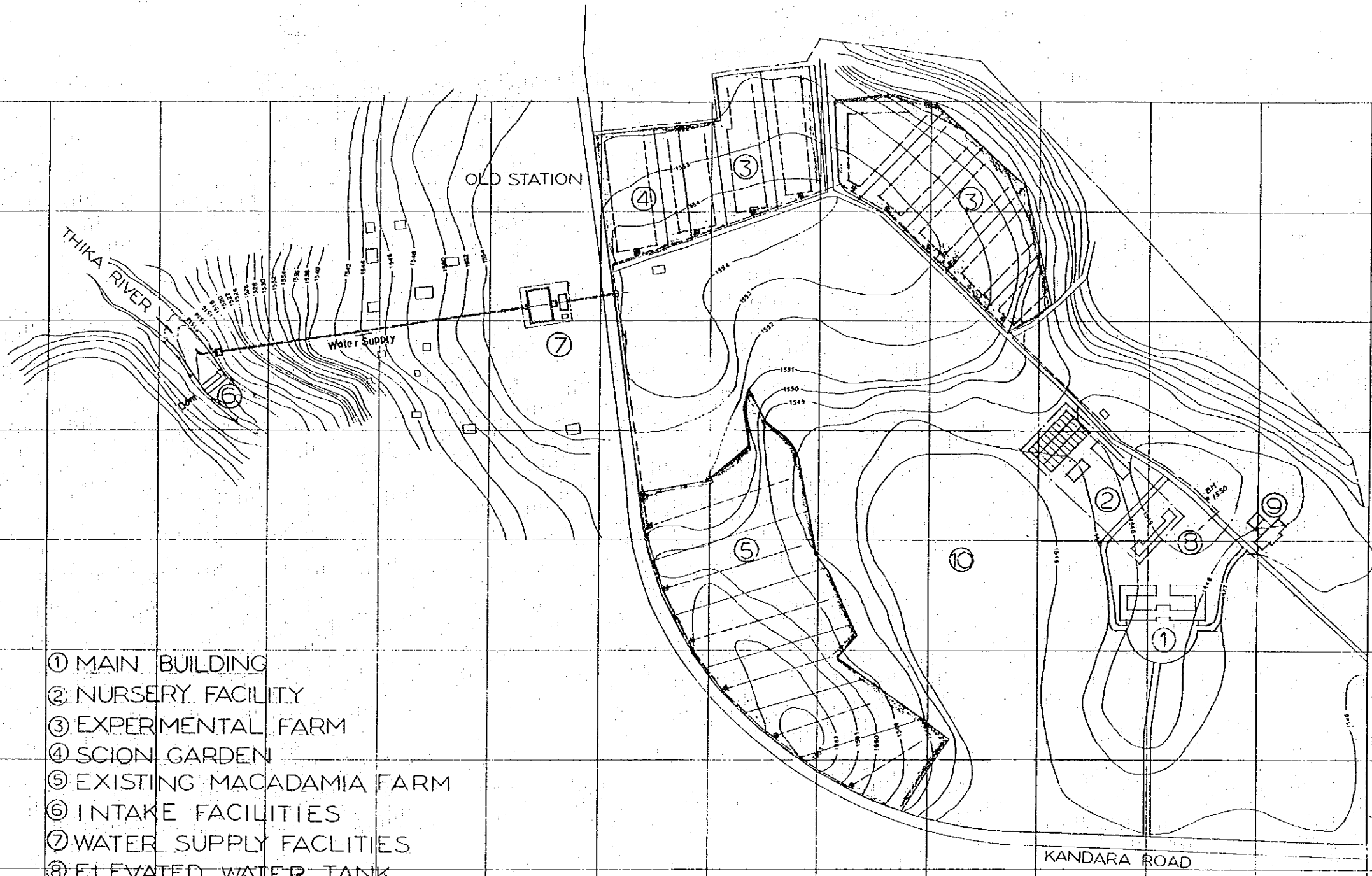
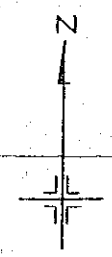
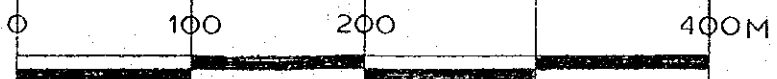


# D-101 GENERAL SITE PLAN

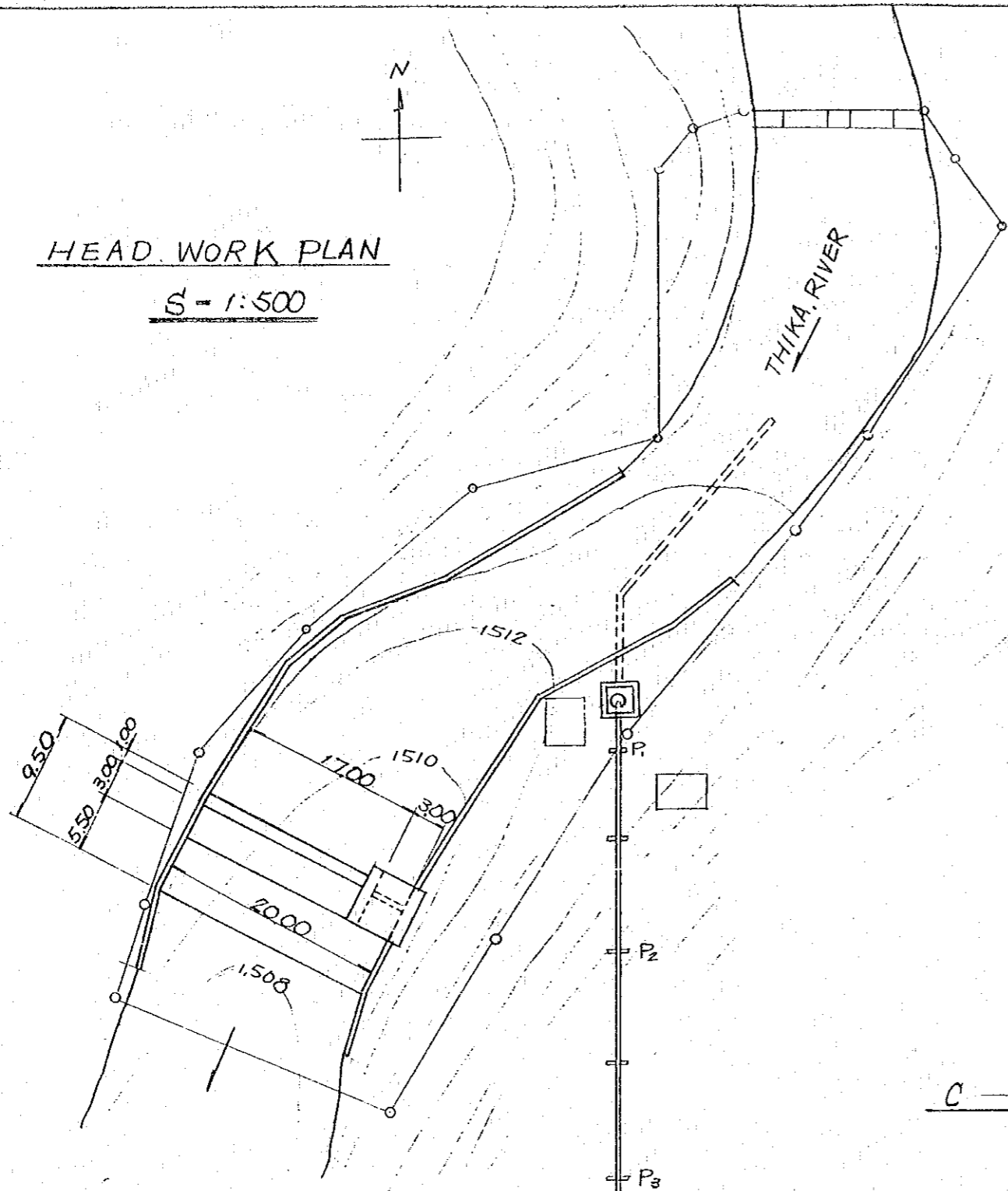


- ① MAIN BUILDING
- ② NURSERY FACILITY
- ③ EXPERIMENTAL FARM
- ④ SCION GARDEN
- ⑤ EXISTING MACADAMIA FARM
- ⑥ INTAKE FACILITIES
- ⑦ WATER SUPPLY FACILITIES
- ⑧ ELEVATED WATER TANK
- ⑨ HOSTEL
- ⑩ LOWLAND

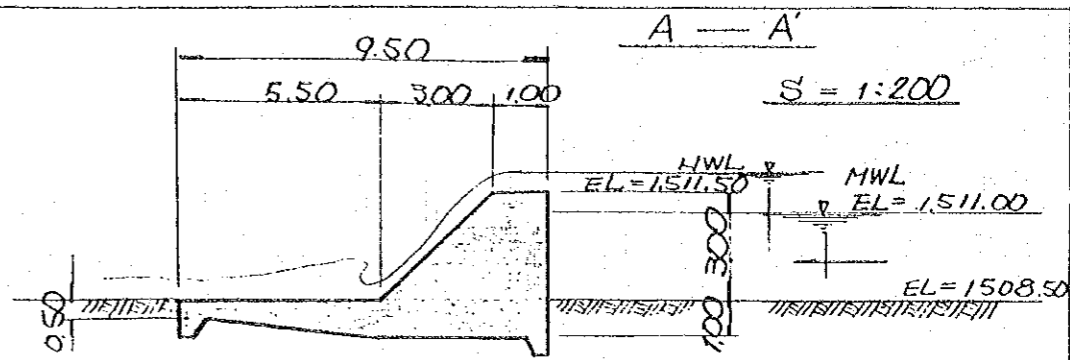


HEAD WORK PLAN

S = 1:500

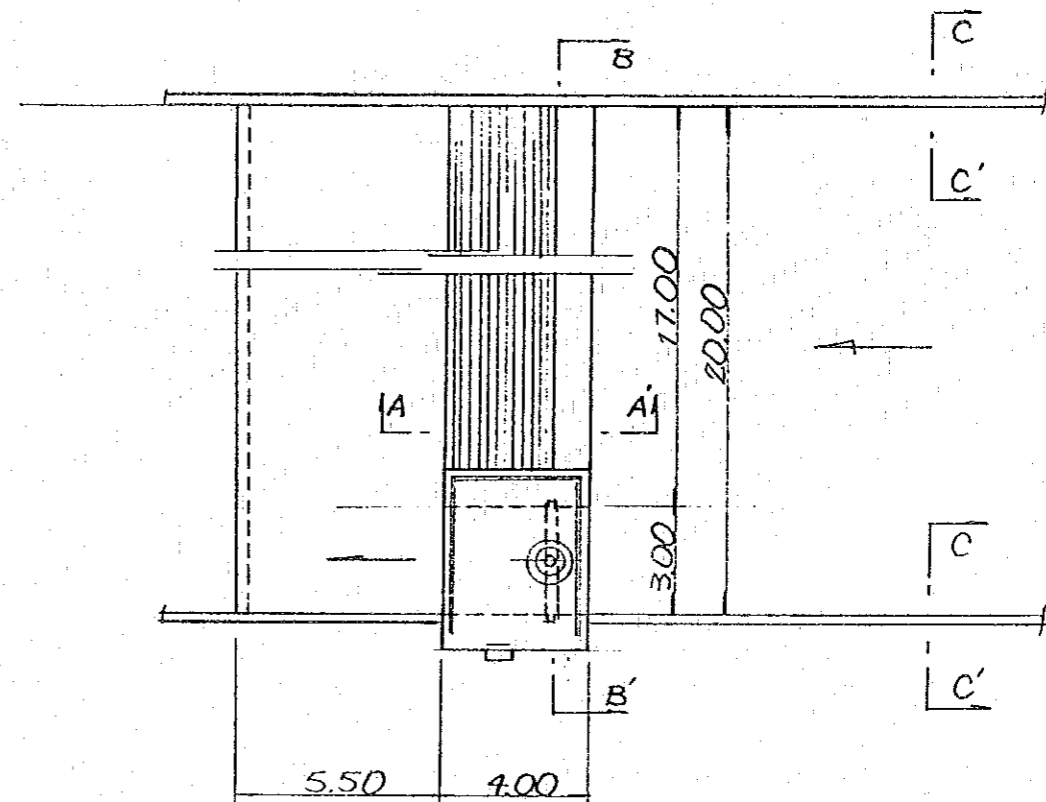


D-102 INTAKE WEIR

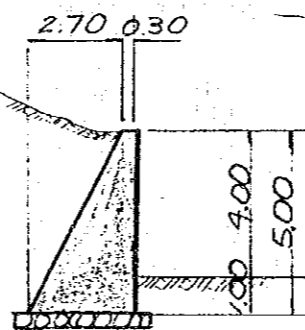


PLAN

S = 1:200

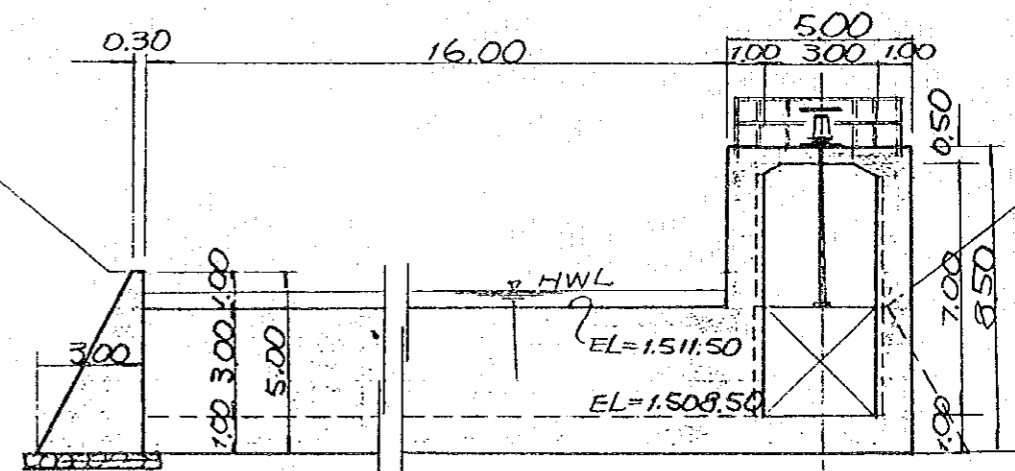


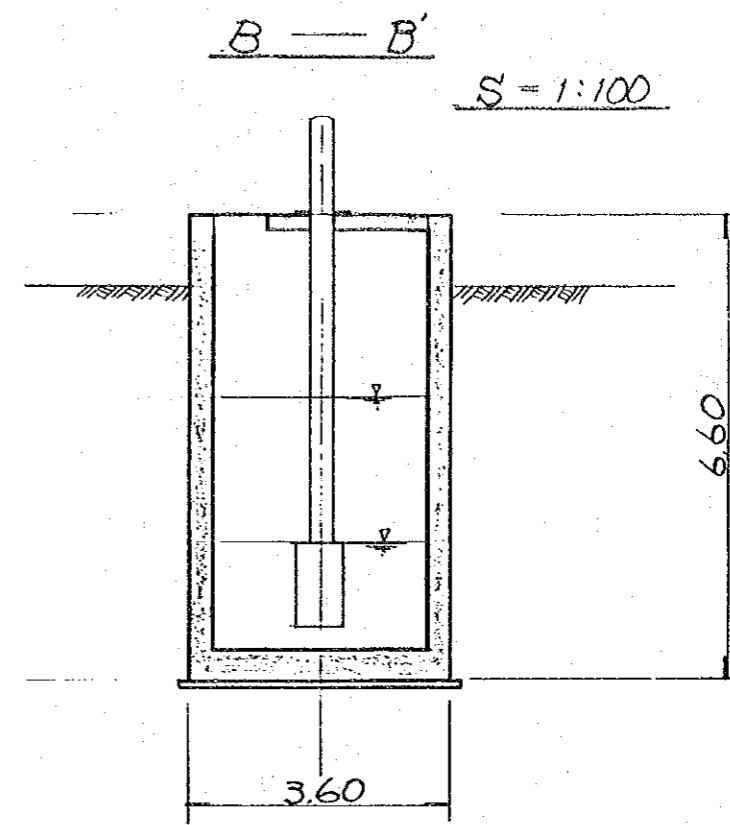
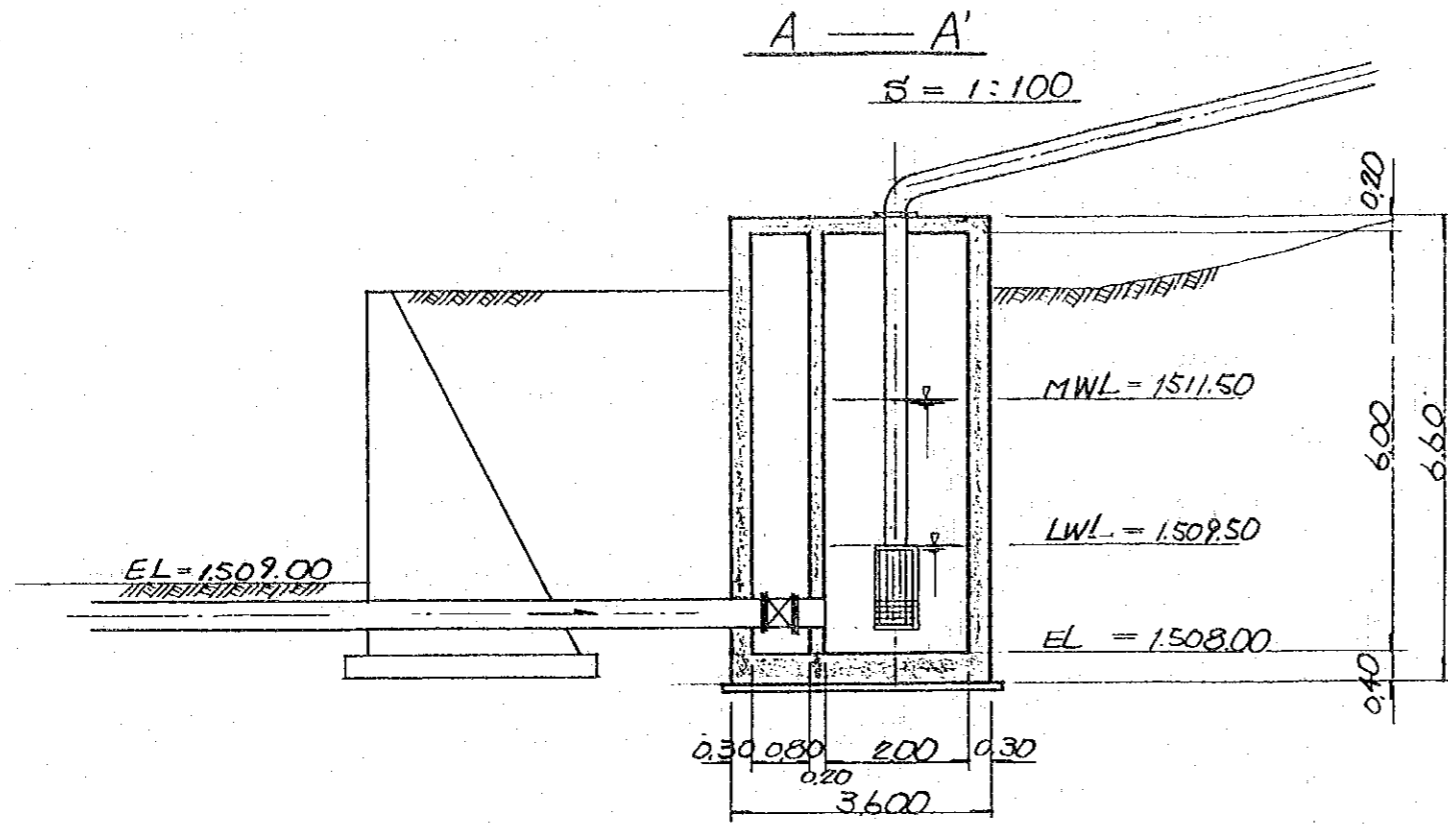
C - C'



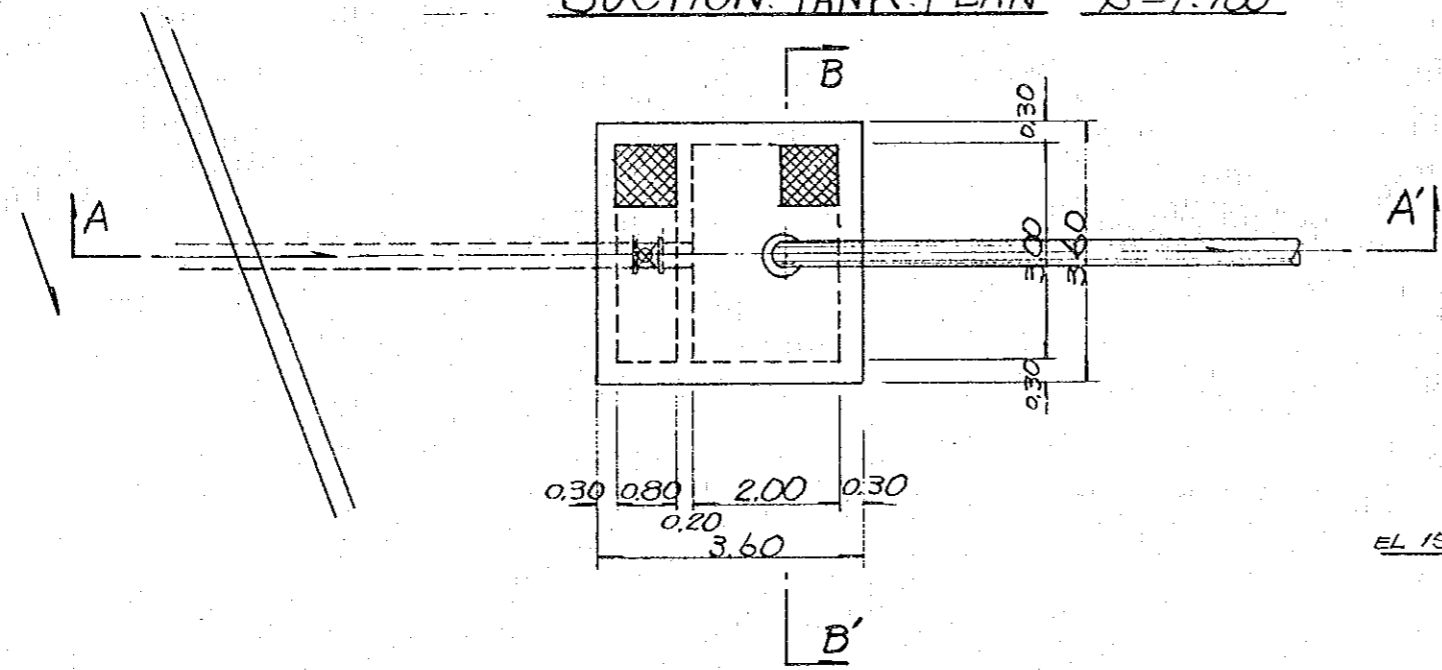
B - B'

S = 1:200

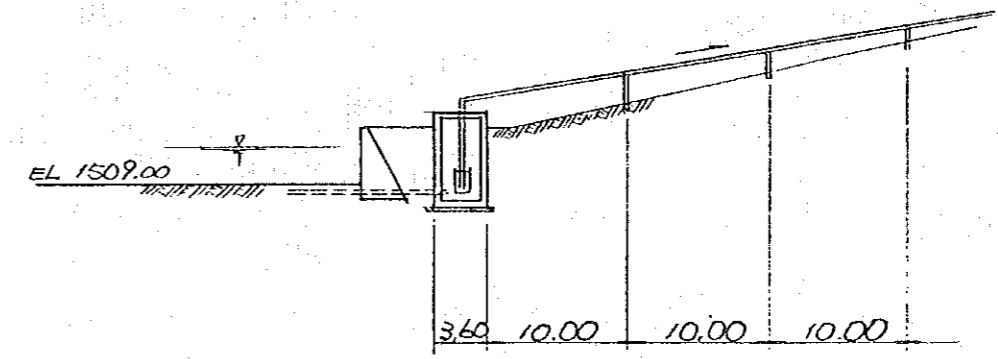




SUCTION TANK PLAN S = 1:100

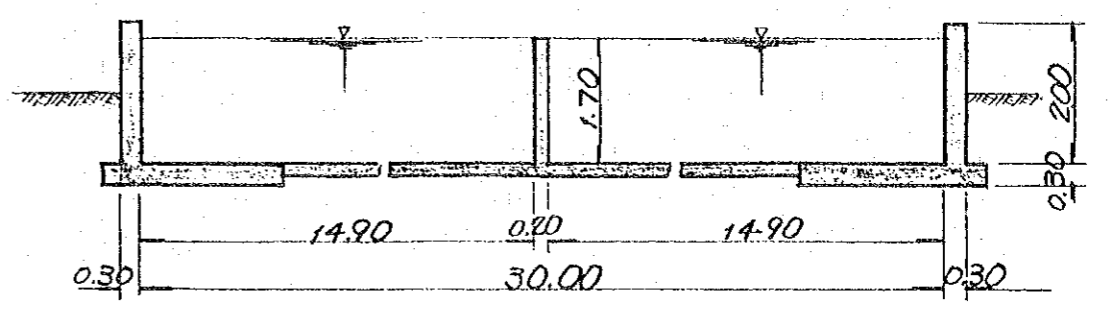
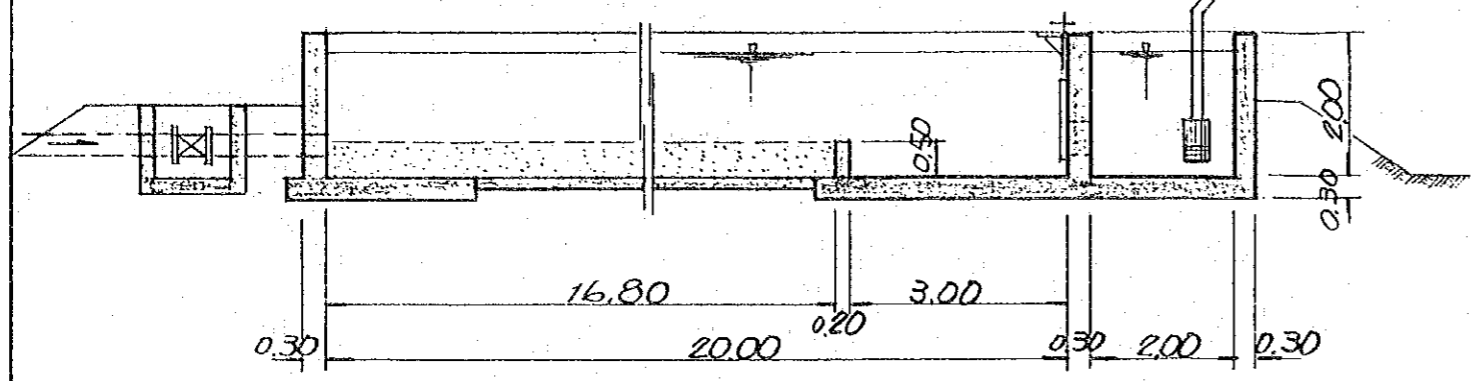


CROSS SECTION

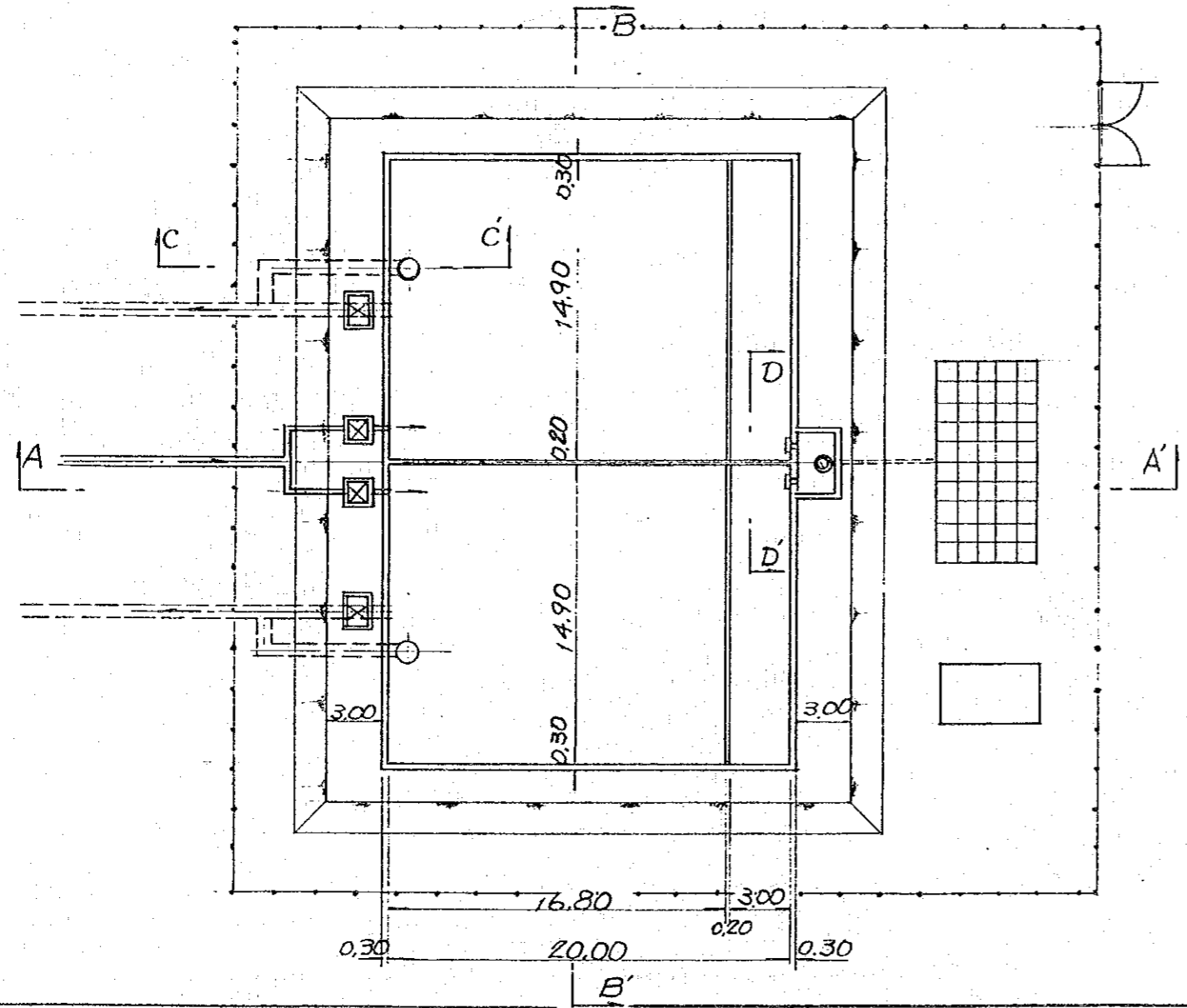


D-103 INTAKE TANK

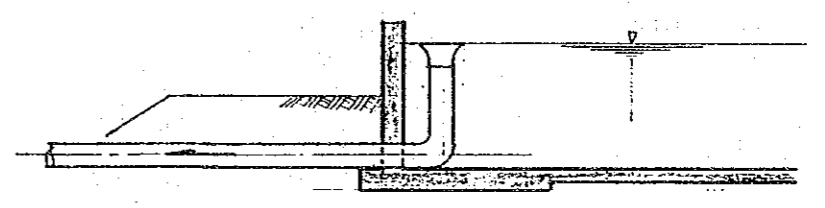
A — A D-104 SETTLING TANK B — B  
 S = 1:100 S = 1:100



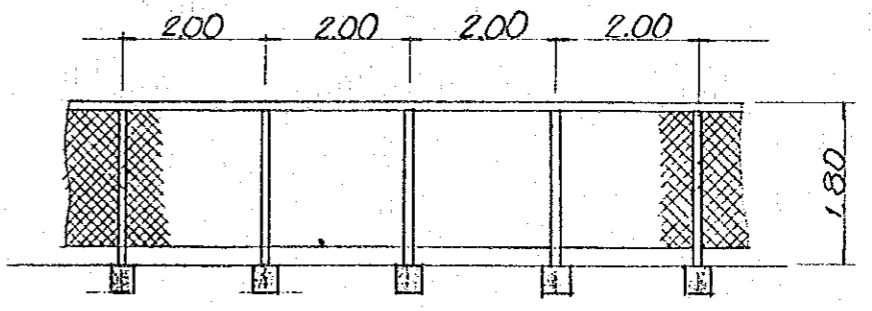
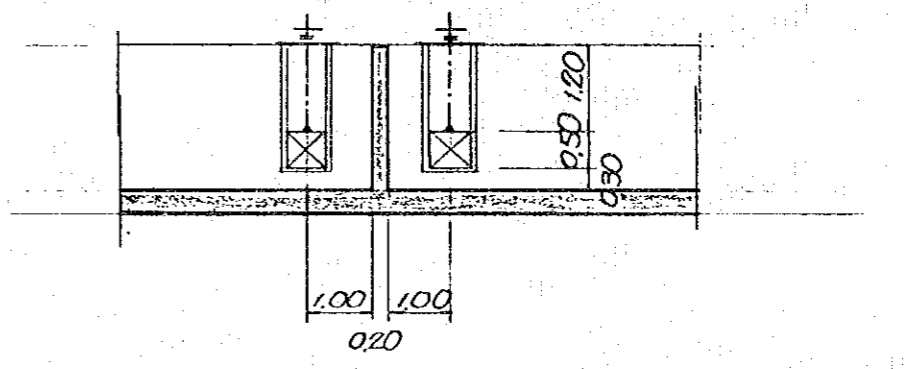
PLAN S = 1:300

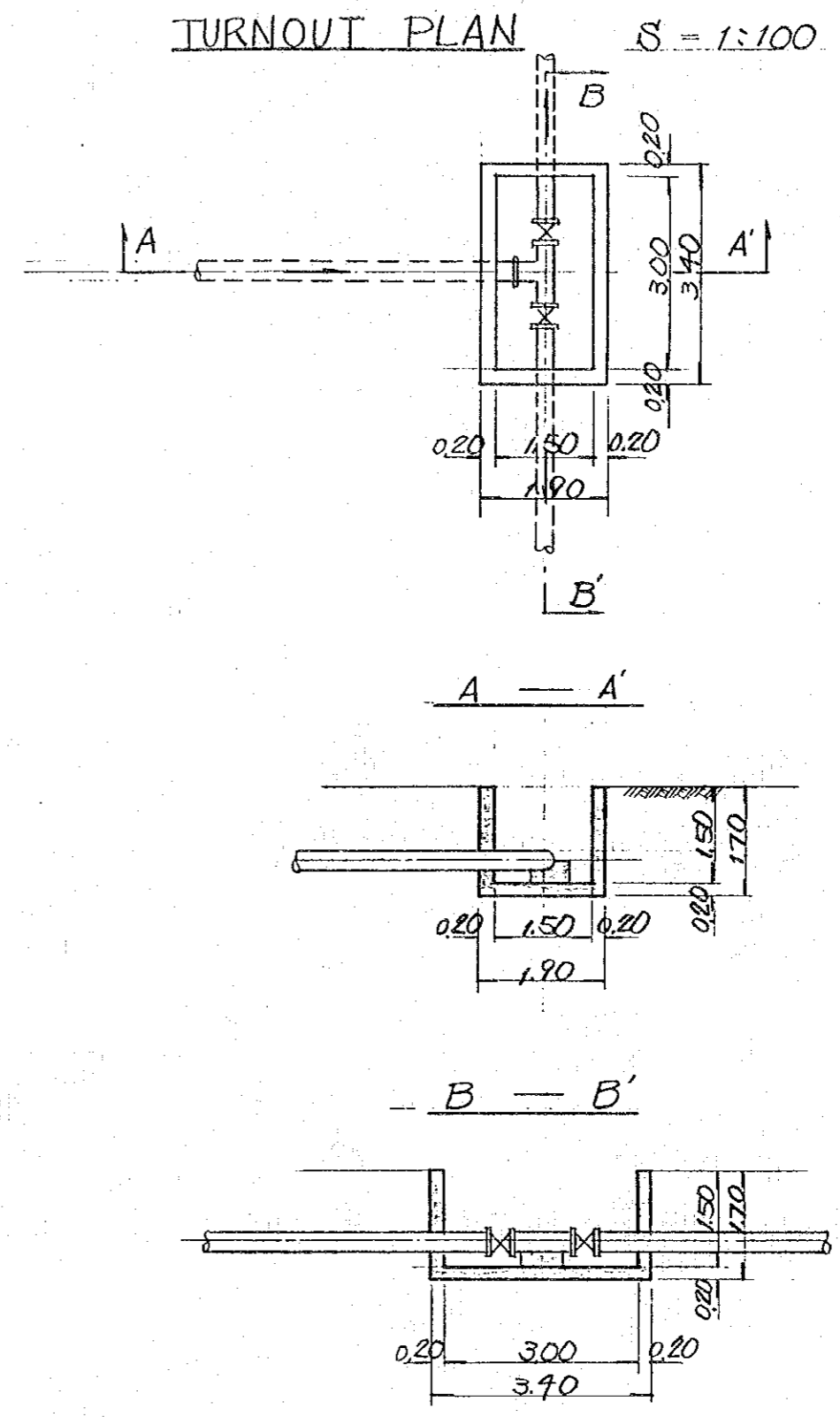
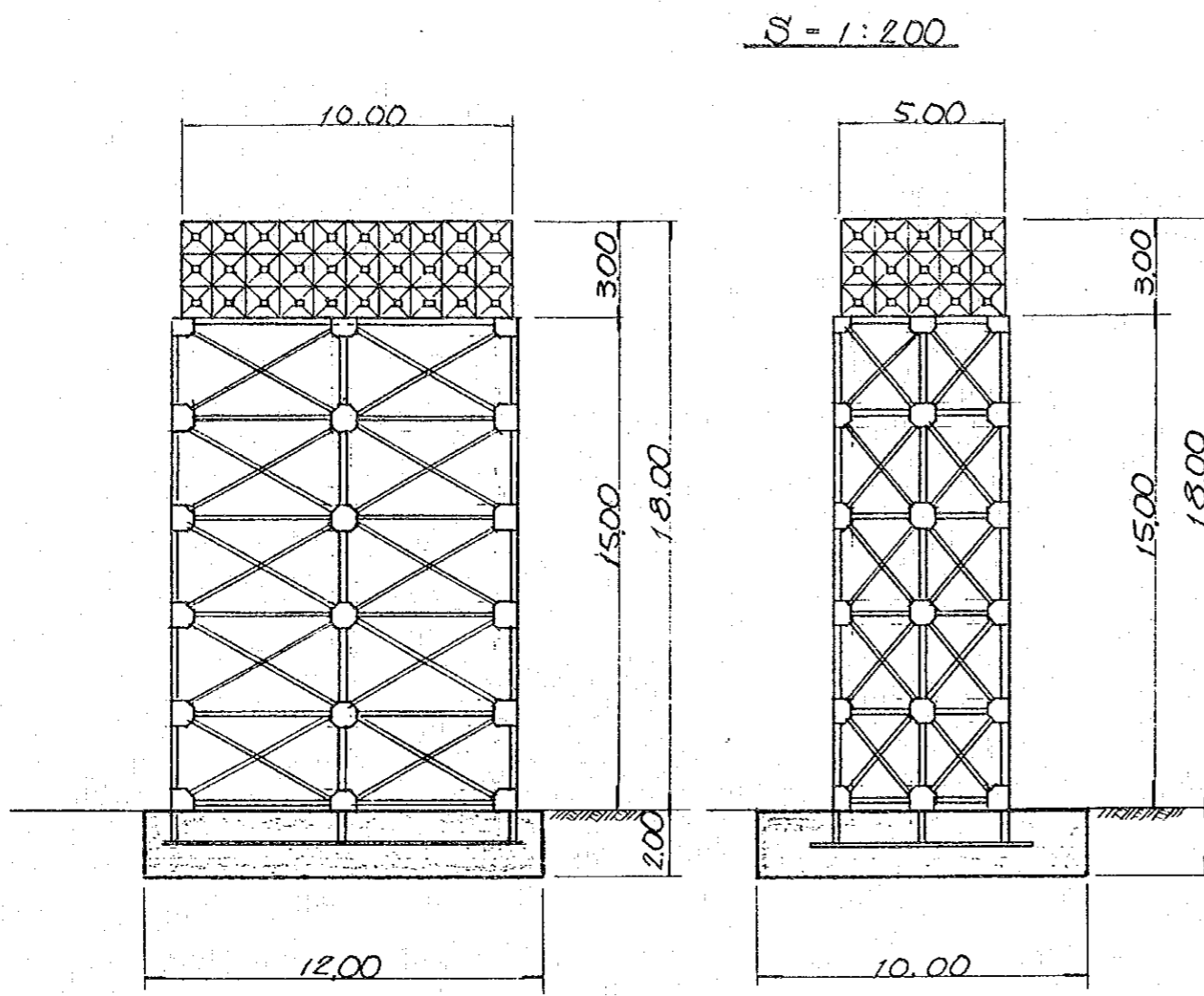


C — C'

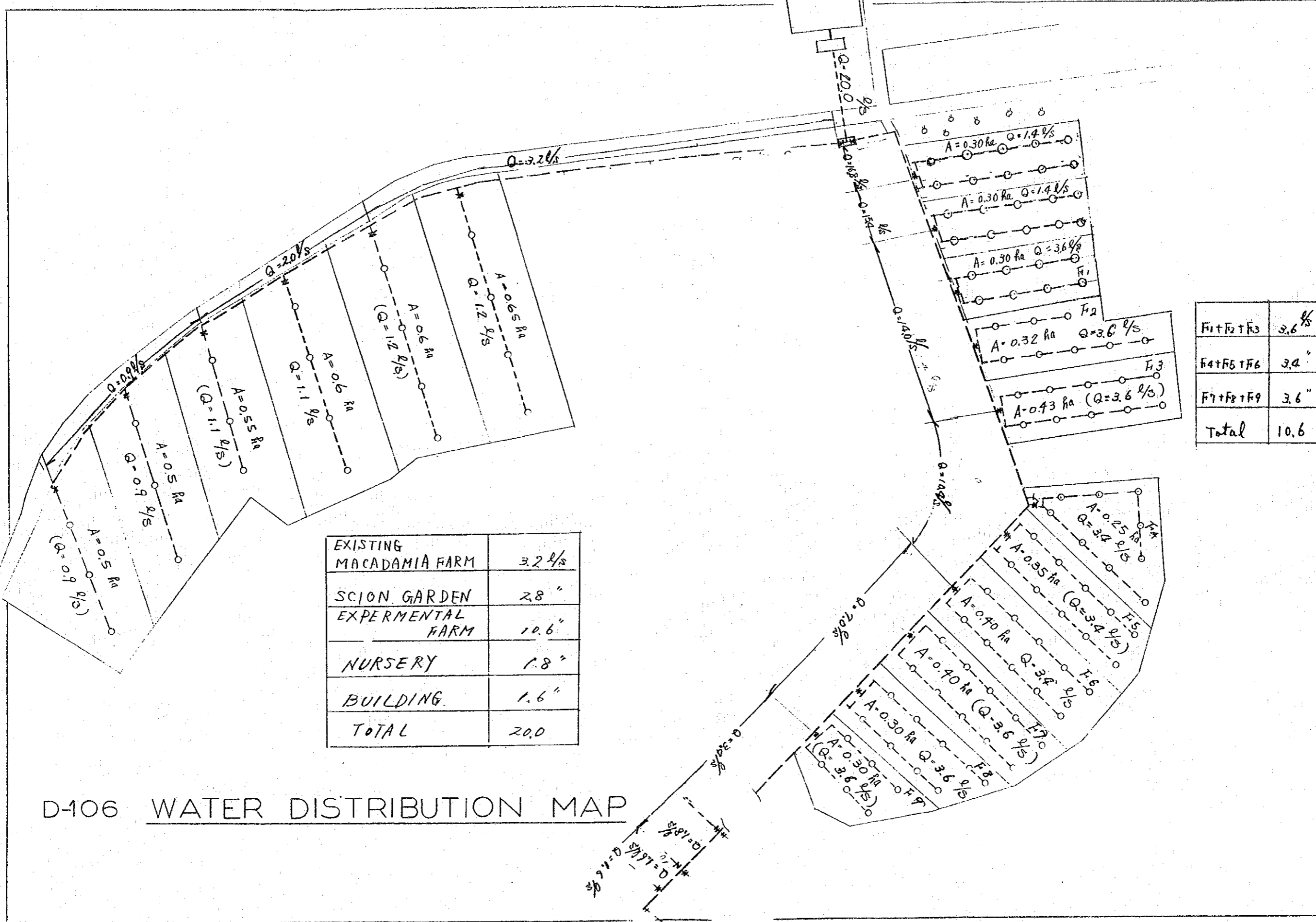


D — D'





D 105 ELEVATED WATER TANK

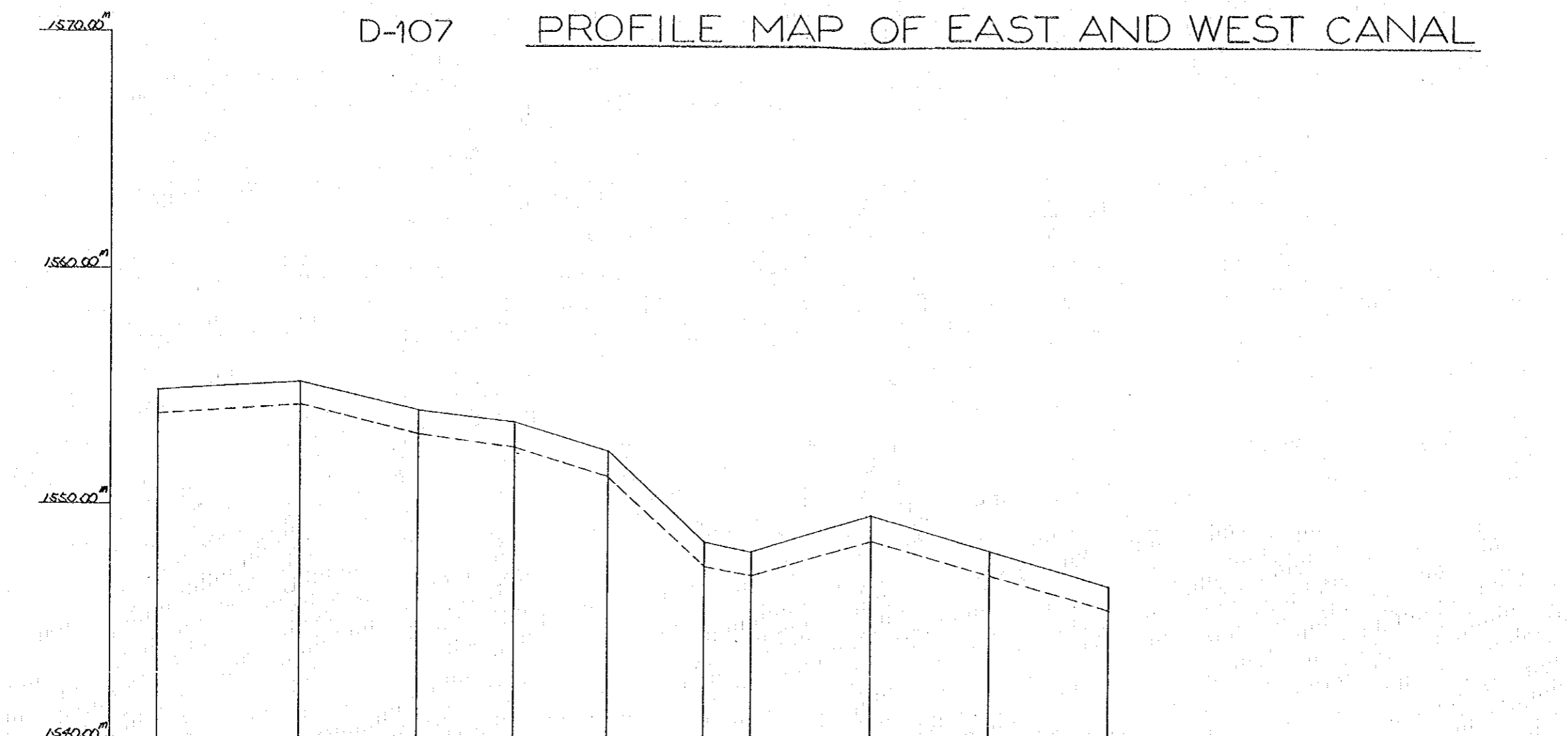


F1+F2+F3	3.6 l/s
F4+F5+F6	3.4 "
F7+F8+F9	3.6 "
Total	10.6

EXISTING MACADAMIA FARM	3.2 l/s
SCION GARDEN	2.8 "
EXPERIMENTAL FARM	10.6 "
NURSERY	1.8 "
BUILDING	1.6 "
TOTAL	20.0

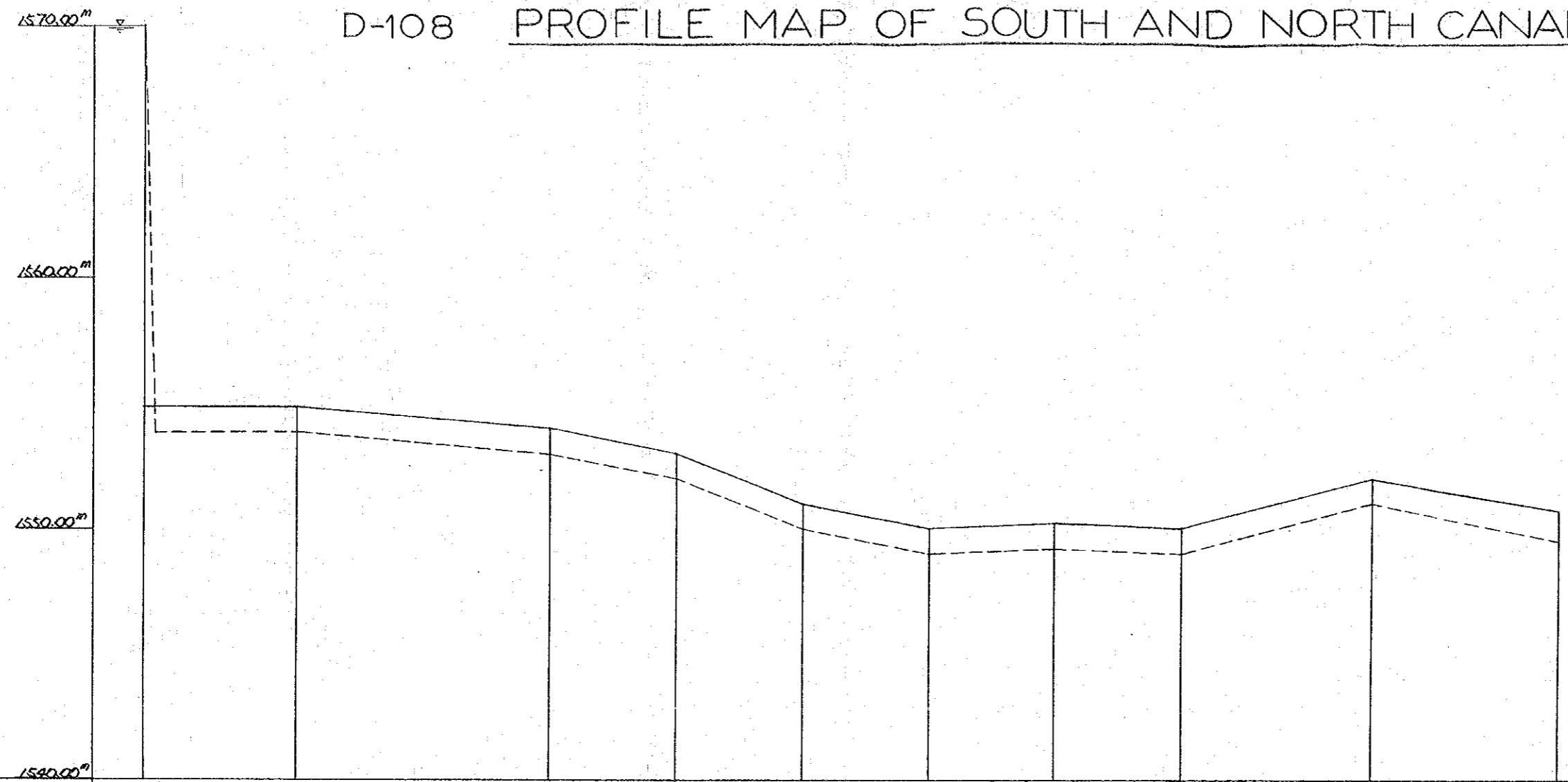
D-106 WATER DISTRIBUTION MAP

D-107 PROFILE MAP OF EAST AND WEST CANAL



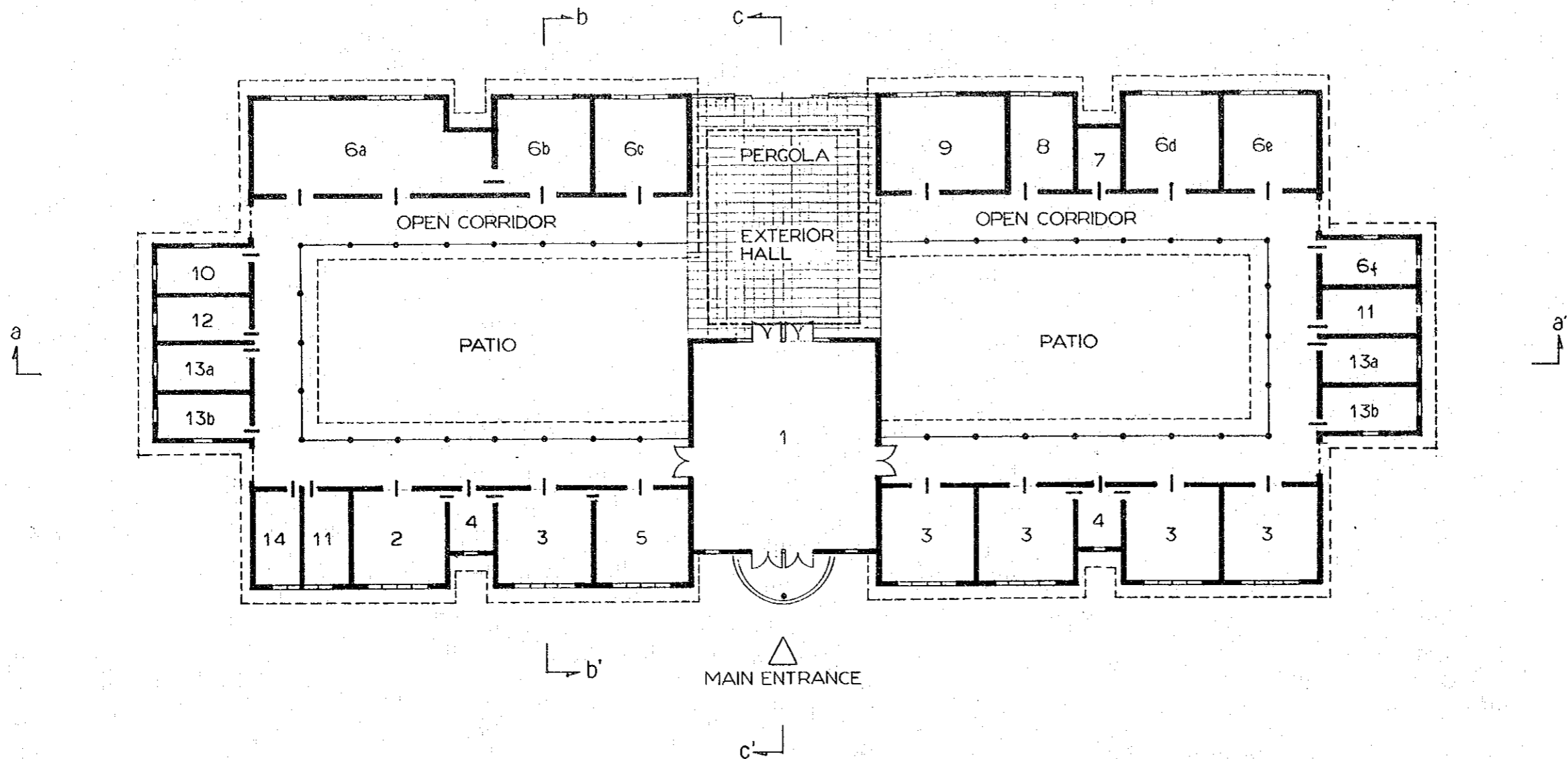
DESIGN DISCHARGE		$14.8 \frac{1}{s}$ $L_1 = 120.0^m$	$1.54 \frac{1}{s}$ $L_2 = 100.0^m$	$1.49 \frac{1}{s}$ $L_3 = 80.0^m$	$1.84 \frac{1}{s}$ $L_4 = 80.0^m$	$2.0 \frac{1}{s}$ $L_5 = 80.0^m$		$3.4 \frac{1}{s}$ $L_6 = 340.0^m$		
SLOPE										
CANAL EL.										
GROUND HEIGHT										
ACCUMULATE DISTANCE	0.0	120.0	220.0	300.0	380.0	460.0	500.0	600.0	700.0	800.0
DISTANCE	0.0	120.0	100.0	80.0	80.0	80.0	40.0	100.0	100.0	100.0
STATION	No. 0	No. 1 +20	No. 2 +20	No. 3 +80	No. 4 +80	No. 5 +80	No. 6 +80	No. 7 +200	No. 8 +200	No. 9 +200

# D-108 PROFILE MAP OF SOUTH AND NORTH CANAL



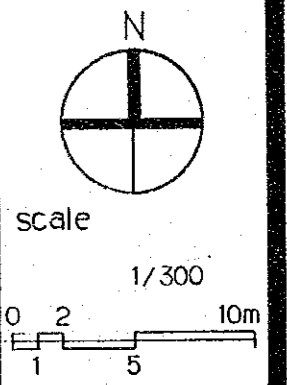
DESIGN DISCHARGE	200% L = 600		3.2 $\frac{m^3}{s}$ R <sub>1</sub> = 2500 m		20% R <sub>2</sub> = 1000 m		0.90 $\frac{m^3}{s}$ R <sub>3</sub> = 1500 m		
SLOPE									
CANAL EL		1554.80	1553.20	1552.00	1550.00	1549.20	1552.00	1549.70	
GROUND HEIGHT	(W.L.) 1570.00	1554.80	1554.00	1553.00	1552.00	1550.20	1552.00	1550.70	
ACCUMULATE DISTANCE	0.0	0.0	100.0	150.0	200.0	250.0	300.0	350.0	400.0
DISTANCE	0.0	60.0	0.0	50.0	50.0	50.0	50.0	75.0	75.0
STATION	1+0	1+0.6	1+0.2	1+0.3	1+0.4	1+0.5	1+0.6	1+0.7	1+0.8





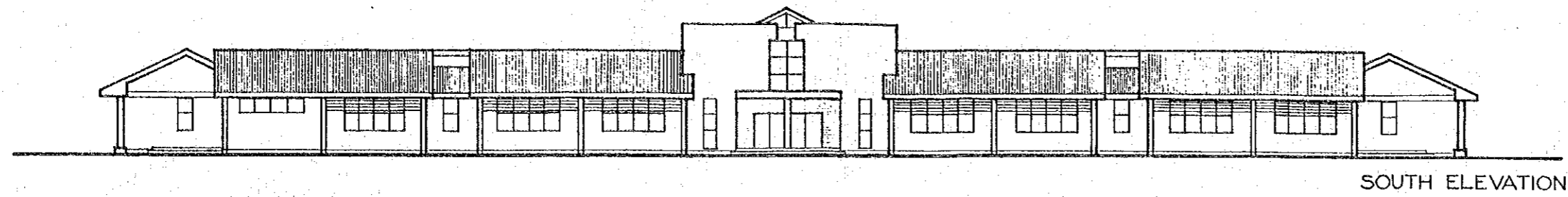
# MAIN BUILDING PLAN

- |                                |                   |
|--------------------------------|-------------------|
| 1. ENTRANCE/EXHIBITION HALL    | 9. CLASS ROOM     |
| 2. OFFICE (ACCOUNT/G.AFFAIRS)  | 10. SAMPLE ROOM   |
| 3. OFFICE (MANAGER/RESEARCHER) | 11. STORAGE       |
| 4. SECRETARY ROOM              | 12. ELECT. ROOM   |
| 5. MEETING ROOM                | 13a. TOILET (MEN) |
| 6a. LABO. (PROCESSING)         | 13b. " (WOMEN)    |
| 6b. " (BREEDING RESEARCH)      | 14. TELE. ROOM    |
| 6c. " (AGRONOMY)               |                   |
| 6d. " (PLANT PATHOLOGY)        |                   |
| 6e. " (SOIL & PLANT NUTRITION) |                   |
| 6f. " (ENTOMOLOGY)             |                   |
| 7. TEMPERATURE CONTROL ROOM    |                   |
| 8. LIBRARY/DATA ROOM           |                   |

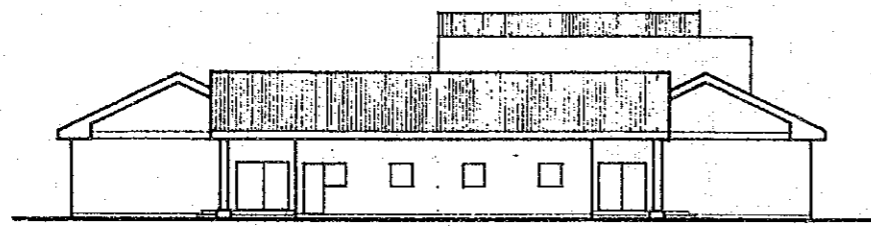


MAIN BUILDING PLAN

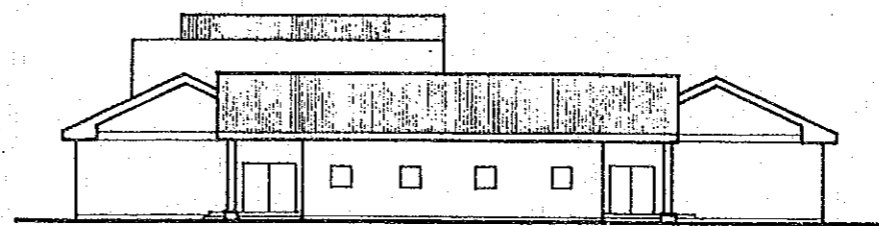
No. D-201



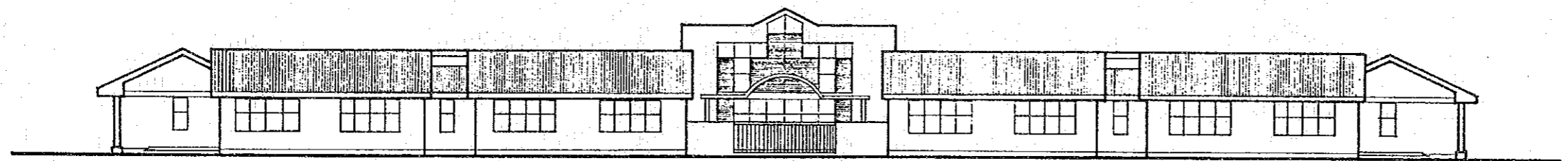
SOUTH ELEVATION



WEST ELEVATION

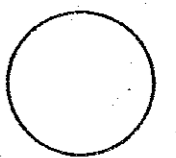


EAST ELEVATION



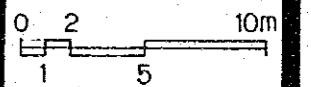
NORTH ELEVATION

# MAIN BUILDING ELEVATION



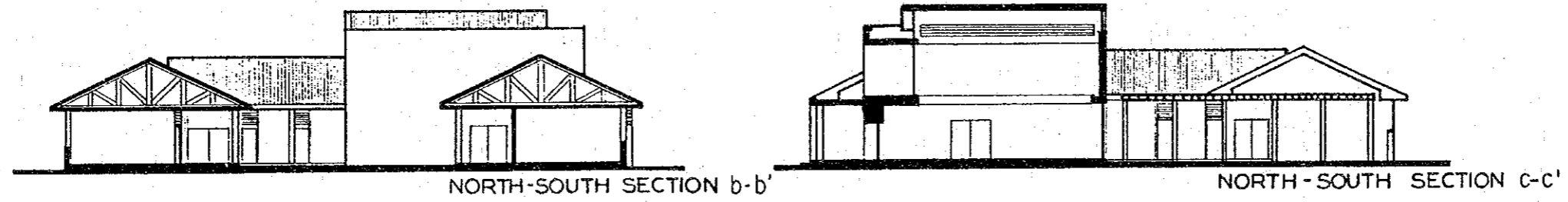
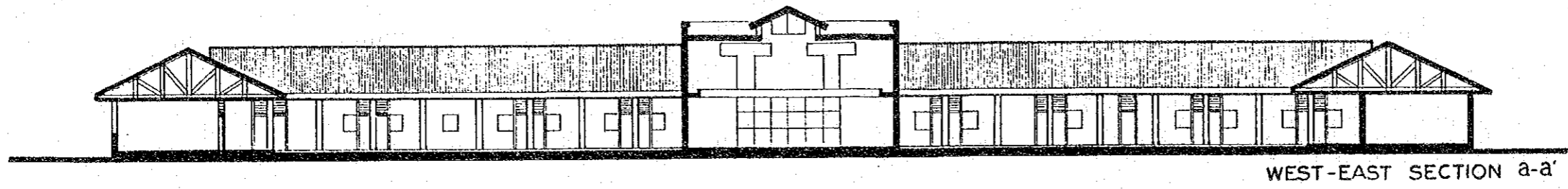
scale

1 / 300

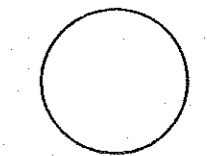


MAIN BUILDING  
ELEVATION

No. D-202

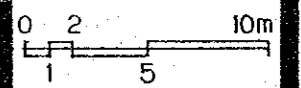


MAIN BUILDING SECTION



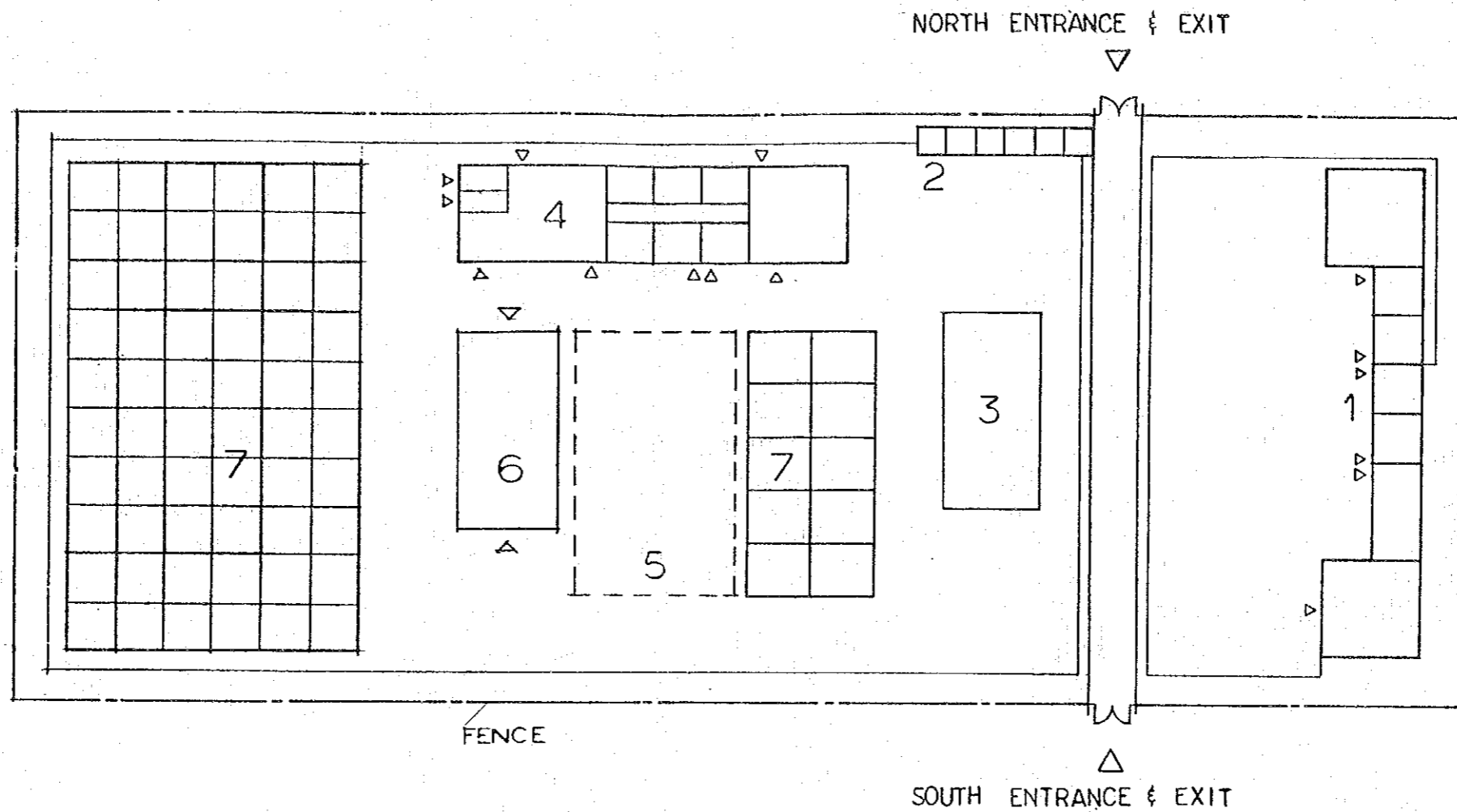
scale

1/300



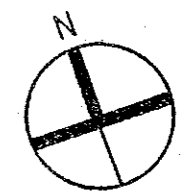
MAIN BUILDING SECTION

No. D-203



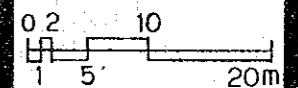
1. FARM BUILDING
2. SOIL STORAGE
3. SEEDBED
4. NURSERY WORKSHOP
5. ROOTSTOCK AREA
6. GREENHOUSE
7. SHADEHOUSE

## NURSERY PLOT PLAN



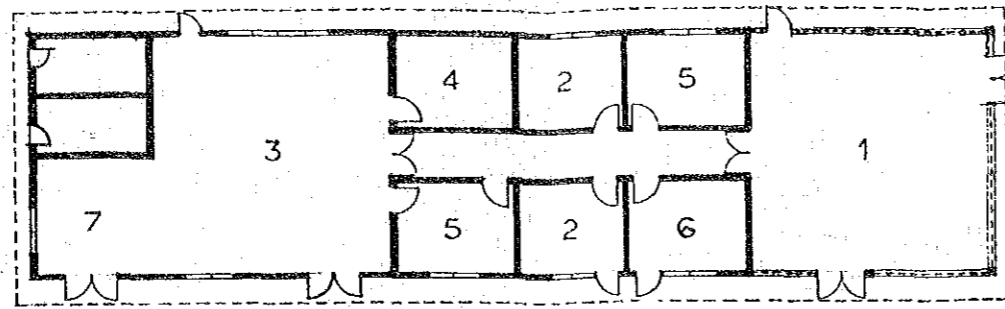
scale

1/600



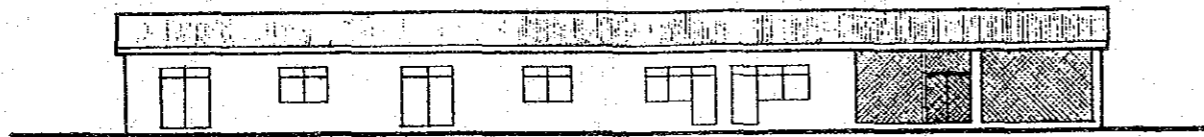
NURSERY  
PLOT PLAN

No. D-204



PLAN

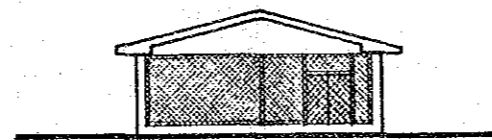
- 1. PREPARATION (TRANS PLANT)
- 2. OFFICE
- 3. GRAFTING
- 4. COLD ROOM
- 5. TOOL STORAGE
- 6. STORAGE
- 7. SPRAY AREA
- 8. TOILET



SOUTH ELEVATION



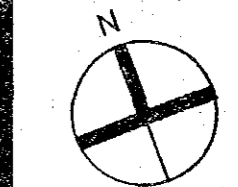
WEST ELEVATION



EAST ELEVATION

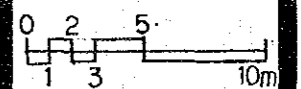


SOUTH-NORTH SECTION



scale

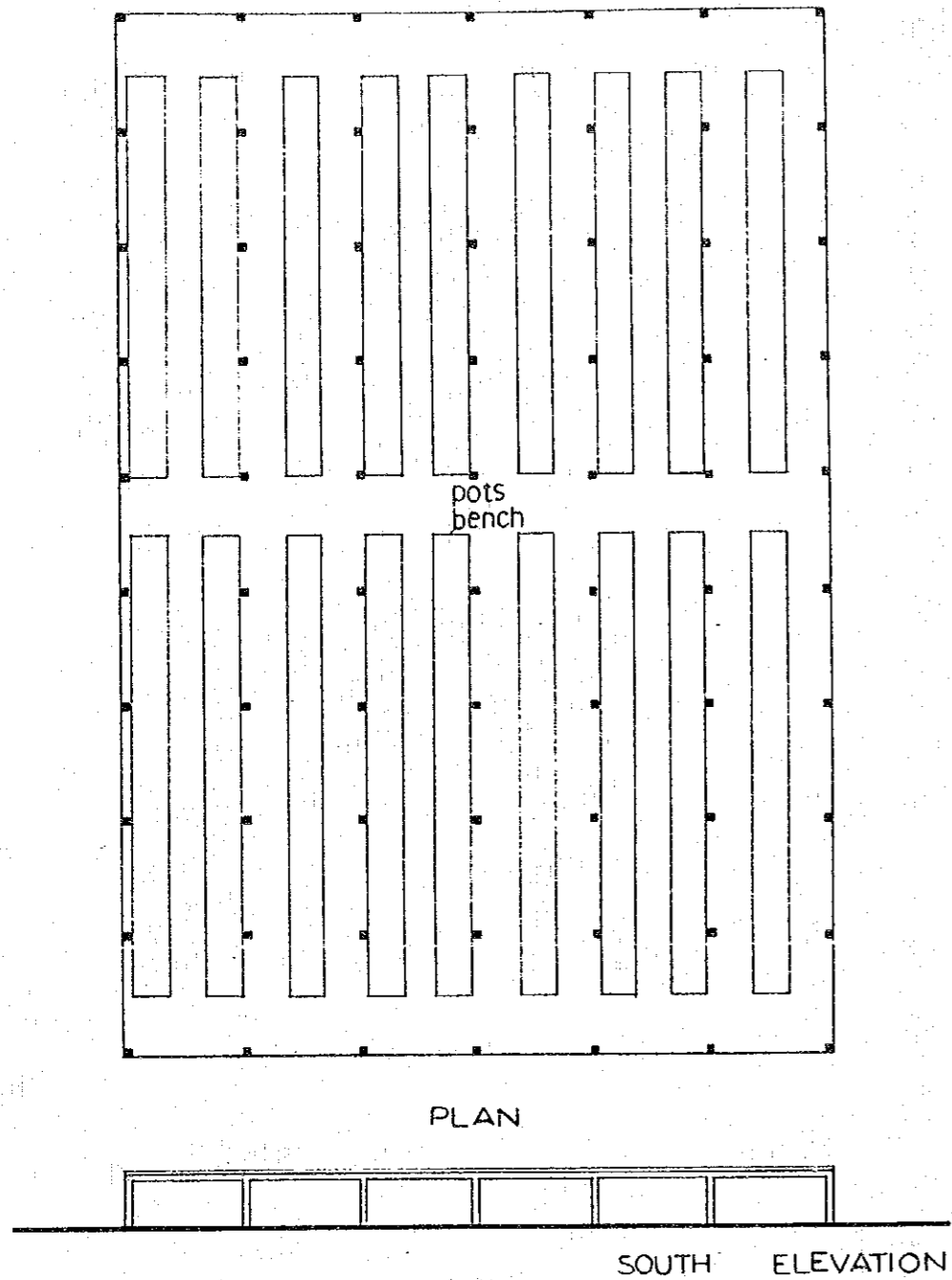
1/300



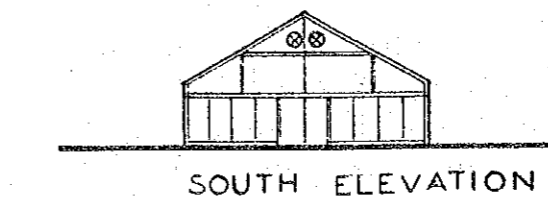
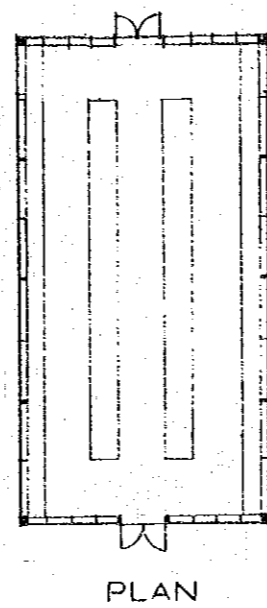
# NURSERY WORKSHOP

NURSERY  
WORKSHOP

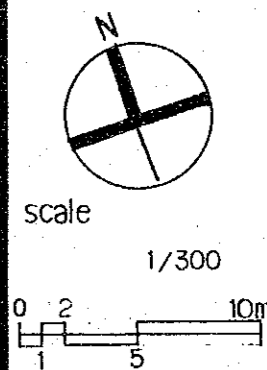
No. D-205



SHADE HOUSE

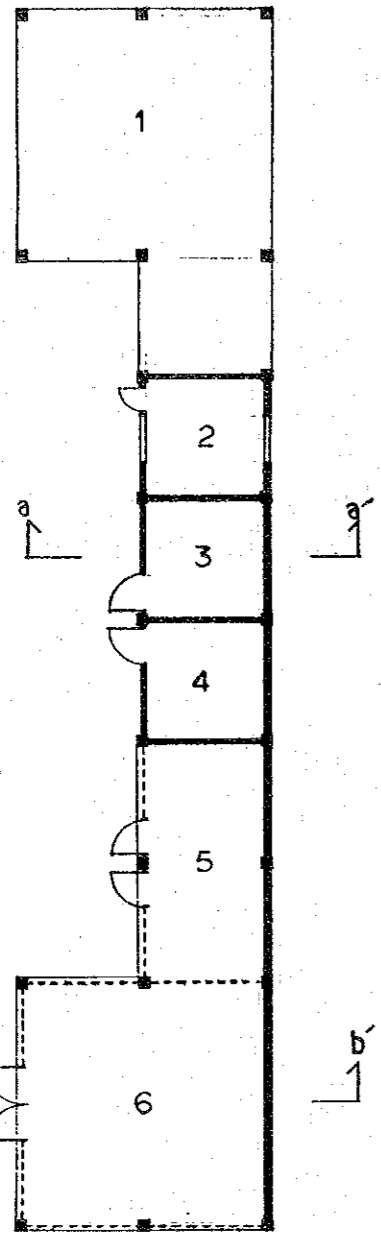


GREEN HOUSE

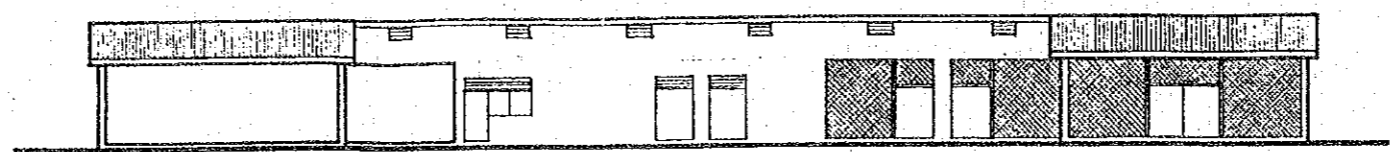


SHADE HOUSE  
GREEN HOUSE

No. D-206



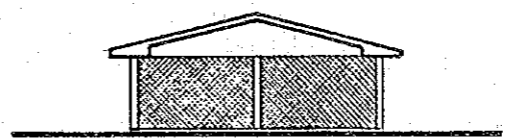
FARM BUILDING PLAN



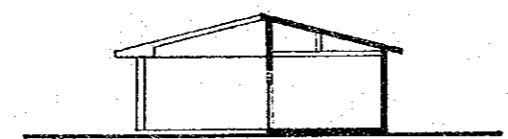
WEST ELEVATION



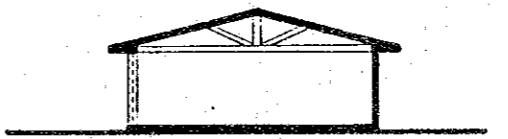
NORTH ELEVATION



SOUTH ELEVATION



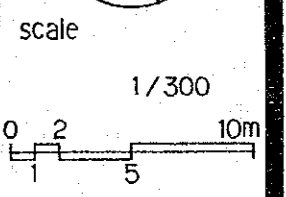
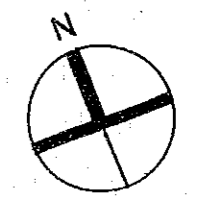
WEST - EAST (a) SECTION



WEST - EAST (b) SECTION

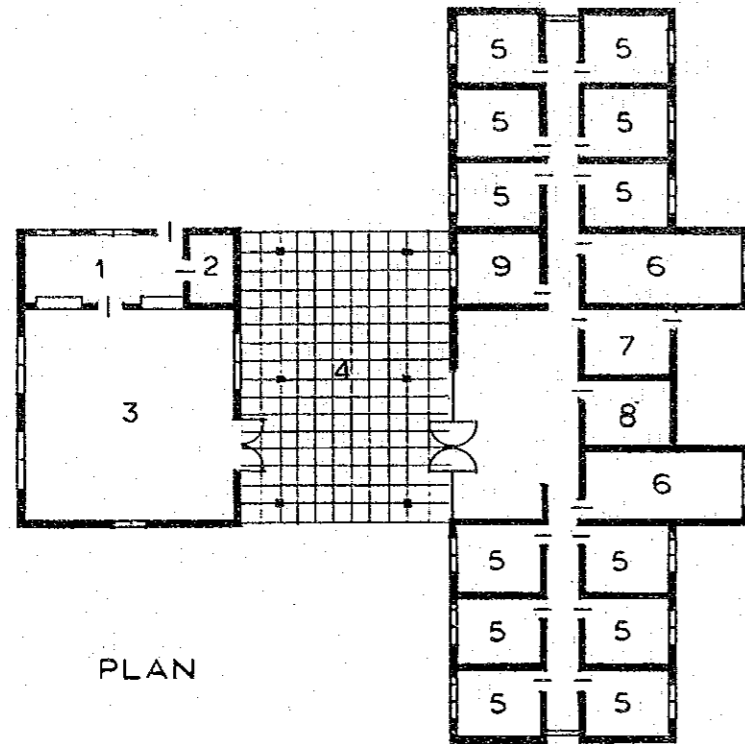
- 1 GARAGE ( FARM MACHINERY )
- 2 OFFICE
- 3 STORAGE ( CHEMICALS )
- 4 STORAGE ( FERTILIZERS )
- 5 STORAGE ( EQUIPMENTS )
- 6 REPAIR SHOP

# FARM BUILDING



FARM BUILDING

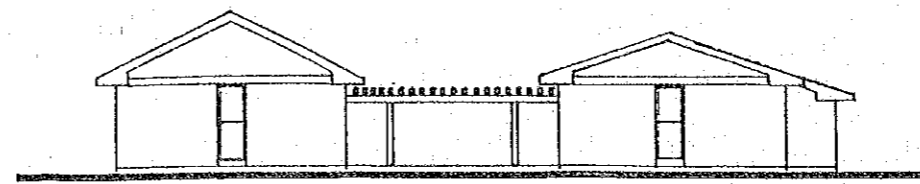
No. D-207



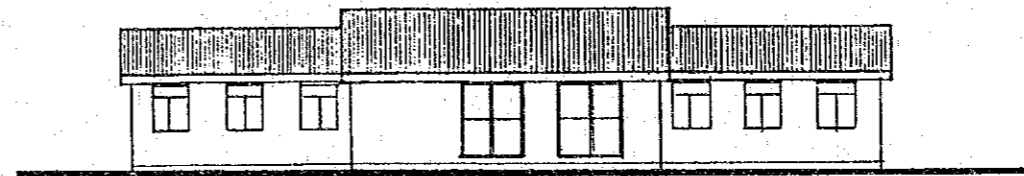
PLAN

1. KITCHEN
2. STORAGE
3. DINING
4. TERRACE
5. BEDROOM (FOR 2 BEDS)
6. RESTROOM / SHOWER
7. STORAGE
8. LAUNDRY
9. OFFICE

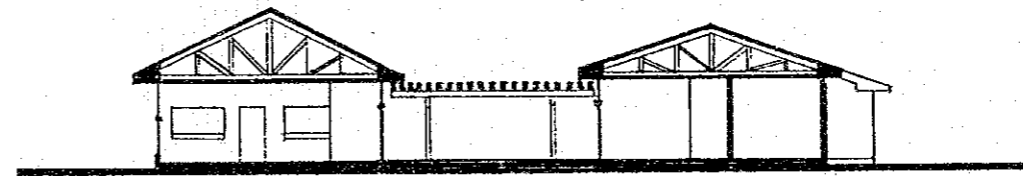
HOSTEL (FOR 24 PERSONS)



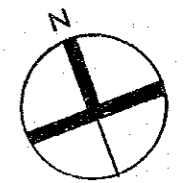
SOUTH ELEVATION



WEST ELEVATION

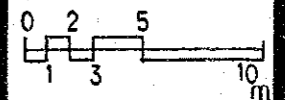


WEST EAST SECTION



Scale

1/300

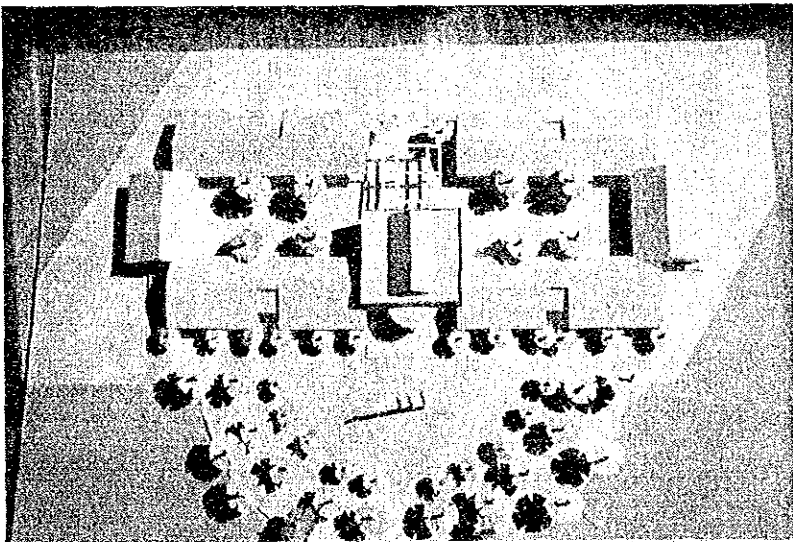
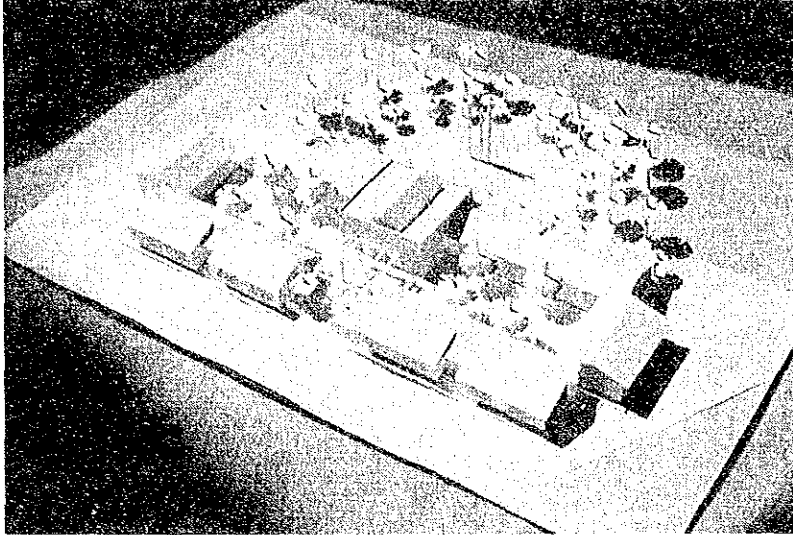


HOSTEL

NO. D-208







PHOTOS : MAIN BUILDING  
STUDY MODEL



**CHAPTER VI**

**PROJECT IMPLEMENTATION PLAN**



## CHAPTER VI: PROJECT IMPLEMENTATION PLAN

### 6.1 Implementation System

Project implementation will proceed under the general direction of the Kenyan Ministry of Agriculture and Livestock Development, and Ministry of Works, Housing and Physical Planning in regard to the Project design and construction.

The Kenyan Ministry of Finance and Planning will be responsible for exchange of notes between both governments. The conclusion of a contract between the Ministry of Works, Housing and Physical Planning and a Japanese Consultant as well as subsequent detailed design and construction of the Project, can only proceed after exchange of notes.

Based on the Consultant's design, the Kenyan Ministry of Agriculture and Livestock Development will invite tenders for Project implementation from Japanese firms. The successful tenderer selected by the Government of Kenya will conclude a contract with the same and commence Project construction and procurement.

### 6.2 Implementation Plan

#### 6.2.1 Detailed Design

During the detailed design period, the Consultant will proceed with the detailed design, including preparation of the tender documents and evaluation in Japan. The Consultant's engineer(s) and/or architect will visit Kenya to discuss detailed design tender documents and tender evaluation and to obtain the approval of the same.

#### 6.2.2 Project Construction

The Consultant will supervise Project construction work as a Department Representative on behalf of the Kenyan Government. During the construction period covering 12 months, a Consultant construction supervisor in charge of civil or building works, will reside on location in Kenya. The same will leave the Project site on occasion to make reports and hold discussions with the head office of the Ministry of Agriculture and Livestock Development and/or Ministry of Works, Housing and Physical Planning in Nairobi.

### 6.3 Major Undertakings of Both Governments

#### 6.3.1 Major Undertakings of the Japanese Government

For realization of the Project, Japanese Grant Aid will cover cost of construction of building and facilities and provision of materials and equipment required and specified in this report.

#### 6.3.2 Major Undertakings of the Kenyan Government

##### (1) General

1) With regards to products imported into Kenya for this Project, the unloading, customs clearance and tax exemption proceedings will be assured by the Kenyan Government.

2) The products and services to be provided for the Project will be exempt from tariffs, internal tax and other official levies imposed by the Government of Kenya.

3) The Japanese nationals who provide products and services for the Project will be given due consideration in terms of entree permits, etc. to facilitate execution of their services.

4) All acts to be executed in compliance with Kenyan law such as applications, approvals, etc. which are required for the Project will be readily processed in Kenya.

5) For the construction materials, etc. required under the Project which are to be purchased in Kenya, arrangements will be made so that the same can be purchased at official prices set by the Government and delivered in time.

6) A budget which is necessary for the operation and maintenance of facilities after the completion of the Project will be secured.

##### (2) Land Preparation

1) Demolition or relocation of surface and underground obstacles will be carried out.

2) Land preparation, including top soil removal, cutting and banking will be carried out.

(3) Utilities

1) Electric power

Purchase and installation of transformers and power connections during the construction period and of permanent connections will be carried out.

2) Telephone

Installation of temporary telephones during the construction period and connection of the external line up to the permanent MDF (Main Distribution Frame) will be carried out.

(4) Site Improvement

Site improvement will include the following:

- Fence
- Gates and gatehouse
- Windbreaks
- Landscape

(5) Furniture

Provision of furniture will be undertaken including, but not limited to, the following: office, classroom, library, lobby and dining furniture, fixtures and office machines.

- Desks, tables, chairs, side drawers, cabinets, shelves sofa sets, etc., in office rooms, meeting room, classroom, library, laboratories and researcher's rooms
- Receptionist's desk, tables, chairs, sofas, etc., in the entrance hall of the main building and hostel
- Shelves, working tables in workshops
- Carpets, curtains, blinds
- Beds, desks, chairs, dressers, etc. in hostel
- Dining tables, chairs, shelves, kitchen utensils, tableware, etc. in kitchen and dining room of hostel

(6) Other Facilities

Since the following facilities will not be included in the grant aid by the Government of Japan, the cost of construction shall be borne by the Government of Kenya:

- Farm road
- Staff housing
- Fuel station/car wash



- Outdoor toilet
- Car shed
- Outdoor lighting
- Paving/walkway except nursery facility area
- Vehicles except one micro-bus and pick up

#### 6.4 Local Cost Estimate

A rough cost estimate for the items to be borne by the Government of Kenya does not include the items described in (6) above.

#### ITEMS TO BE BORNE BY THE GOVERNMENT OF KENYA

Item	Estimated Cost in Kenyan Shs
1. Clearing and levelling	588,000
2. Electricity up to transformer and service line to main switch	
- main facility (including transformer)	100,000
- river water supply (ditto)	50,000
3. Telephone line up to MDF	50,000
4. Furniture	580,000
5. Fence	240,000
6. Gate and Gatehouse	160,000
7. Windbreaks	530,000
8. Landscaping	22,000
<b>Total</b>	<b>2,320,000 KShs</b>

#### 6.5 Project Implementation Schedule

The overall Project schedule is divided into 2 parts: (i) basic design study under technical cooperation; and (ii) detailed design and construction work under the grant aid program.

The following items are essential components of the Project Implementation Schedule which is presented on the following page:

- 1) Review and approval of the basic design report, detailed design and documents, by the Ministry of Agriculture and Livestock Development and/or the Ministry of Works, Housing and Physical Planning, must be completed within a reasonable period to allow the Consultant and/or Contractor to adhere to the Work Schedule.

2) Any approval required for construction, execution of land preparation (top soil removal, cutting and banking), power and telephone connections for construction, etc. must be completed by and on the account of the Government of Kenya before commencing the Contractor's Construction Work.

PROJECT IMPLEMENTATION SCHEDULE

MONTH	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
BASIC DESIGN SURVEY																								
<div style="text-align: center;"> <u>BASIC DESIGN</u> </div>																								
<div style="text-align: center;"> * EXCHANGE OF NOTES </div>																								
<div style="text-align: center;"> <u>DETAILED DESIGN</u> </div>																								
<div style="text-align: center;"> <u>TENDER AND CONTRACT</u> </div>																								
<div style="text-align: center;"> <u>CONSTRUCTION</u> </div>																								
<div style="text-align: center;"> <u>LAND PREPARATION</u>  BY GOVERNMENT OF KENYA </div>																								
							1	2	3	4	5	6	7	8	9	10	11	12						



**CHAPTER VII**

**PROJECT EVALUATION**



## CHAPTER VII: PROJECT EVALUATION

### 7.1 Direct Effects

Since 1977, research and experiments on macadamia nuts such as selection of high yielding clones and grafting technology has been implemented on a minor scale at the National Horticultural Research Station with insufficient conditions and facilities. However, according to recent results of research activities, the macadamia nut has attracted attention as a hopeful cash crop for small-scale farmers and/or export crop, and accordingly, the Government of Kenya intends to promote the nut development.

On the other hand, establishment of basic cultivation practices, grafting and nursery technology are urgently required before mass production of quality seedlings and extension to farmers. Accordingly, establishment of the Project will be expected to contribute directly to the promotion of agricultural production and also to the fulfillment of the urgent needs mentioned previously with regards to the economic development of Kenya.

### 7.2 Economic Benefit

Attributing a precise level of benefits to this type of project is very difficult, as it is not possible to determine what proportion of benefits is due to research and experiment alone, what is due to training alone and what is due to purchased inputs and other factors. In practice, it is the combination of a number of factors that brings the desired benefits with a project, components such as research, experiments, training, etc. acting as a catalyst. It is also difficult to calculate acceptance rates for various practices. Moreover, because activities of the Project will vary according to district, agro-ecological zone and level of farmer's expertise, it is very difficult to estimate future yield and production increases. Since extension activities rely primarily on the existing extension structure, the incremental cost per hectare and per farm family is low. Thus, even small production increases in the objected districts would generate a high rate of return.

The average yield levels per macadamia tree of small farmers are only 5kg as compared to 40kg in the Hawaiian Islands. At present,

Government targets are replacement of 1,000,000 trees with quality varieties and for the time being, 1,500 tons of kernels from 6,000 tons of unshelled nuts. In this case, the revenue of foreign currency will be about US\$4.5 million at present export price. In view of the expected research results of the Project, such income estimates are quite conservative.

### **7.3 Training of Technical Personnel**

According to the training program of the Project, about 750 persons in total such as extension workers (officers), selected farmers and other related personnel will be trained in cultivation and grafting techniques of nuts, especially macadamia within 5 years.

As a result it is expected that these technical personnel will contribute to agricultural production in Kenya, particularly of fruit production and seedling propagation not only of nut trees such as almond, pecan, oyster nuts, etc., but also of other kinds of fruit trees.

**CHAPTER VIII**

**CONCLUSION AND RECOMMENDATIONS**





## CHAPTER VIII: CONCLUSION AND RECOMMENDATIONS

### CONCLUSION

To realise the aims of the Government through the Project entitled "Improvement of the National Horticultural Research Station", the Nut Development Unit will play a key role in successful implementation of nut development in Kenya. Since 1977, research and experiments on nut development have been implemented with Japanese technical cooperation but with insufficient conditions and facilities.

It is expected that the Grant Aid Program of the Government of Japan will produce beneficial results, aiding the Project through improvement of conditions and facilities for nut development activities.

According to project planning, the Government target for new planting and replacement of low yielding nut varieties with 1,000,000 trees of high yielding varieties within 10 years would be attainable. As a result, small holders will receive some surplus from their farm income through nut cultivation, while the Government can obtain foreign exchange from exported products in this sector.

About 750 technical personnel in total will be trained within five (5) years in nut tree cultivation and grafting techniques at the Unit. It is expected that these technical personnel will contribute to agricultural production in Kenya in general, and in particularly with regards to fruit production and seedling propagation not only of nut trees but also of other kinds of fruit trees, in spite of a shortage of technical personnel in this field at present.

### RECOMMENDATIONS

A technical cooperation program for the Project will be recommended for smooth and effective operation of the Unit upon its establishment. Recommended experts for the program would be in the fields of breeding, grafting, agronomy, etc. Furthermore, plant protection, soil and plant nutrition experts would also be considered.

The Unit could be operational within five years, the duration of the first stage of the Project. However, activities will be limited compared to the wide extension area with suitable soils and weather

conditions for nut cultivation. Therefore, after the initial stage of the Project, certain sub-centers should be established in some districts for expansion of Project activities.

The location of the sub-centers will be selected in extension districts which have an annual rainfall of more than 1,200mm and are located in temperate areas, a condition necessary for nut cultivation, especially for macadamia nuts.

**TABLES & FIGURES**



TABLE II-1 CENTRAL GOVERNMENT OPERATIONS, 1978/79 - 1983/84  
(K£ million)

	1978/79	1979/80	1980/81	1981/82	Provisional Budget 1982/83	1983/84
Current Revenue	510.6	611.0	716.9	786.8	817.4	921.0
Current Expenditure	<u>475.1</u>	<u>546.4</u>	<u>699.2</u>	<u>751.6</u>	<u>764.4</u>	<u>904.2</u>
Current Surplus	35.5	64.6	17.7	35.2	53.0	16.8
Development Expenditure	222.5	234.9	286.6	317.5	248.4	266.5
(Cash adjustment)	<u>(-25.0)</u>	<u>(27.8)</u>	<u>(-21.9)</u>	<u>(23.4)</u>	<u>(-39.1)</u>	<u>( -- )</u>
Overall Deficit	-162.0	-142.5	-290.8	-258.9	-235.2	-249.7
Financing	<u>162.0</u>	<u>142.5</u>	<u>290.8</u>	<u>258.9</u>	<u>235.2</u>	<u>249.7</u>
Grants	13.3	19.1	22.6	44.3	48.6	88.2
Foreign Borrowing	61.3	74.7	138.2	58.4	75.0	77.3
Drawings	( . . )	( . . )	(174.9)	(111.9)	(150.4)	(162.2)
Amortization	( . . )	( . . )	(-36.7)	(-56.5)	(-75.4)	(-85.0)
Domestic Borrowing	87.4	48.7	130.1	159.0	111.7	84.3
Non Bank	(32.1)	(40.6)	(51.4)	(74.4)	(63.2)	(33.2)
Bank	(55.3)	(8.1)	(78.7)	(84.7)	(48.4)	(51.1)
Memorandum Items						
(1) Tax ratio	19.4	21.0	21.6	20.8	17.8	..
(2) Total Revenue/GDP (%)	32.1	31.9	34.9	32.9	26.1	29.0
(3) Total Deficit/GDP (Bank)	7.4	5.8	10.3	8.0	6.0	6.2
(4) Total Deficit/GDP (IMF)	6.8	5.0	9.5	6.0	4.8	4.0

Source: Ministry of Finance

TABLE II-2 CENTRAL MONETARY AUTHORITIES: FOREIGN EXCHANGE RESERVES, 1978-1982

Unit: KSh'000

		Central Bank of Kenya				General Account with IMF				
As at end of	SDR's	Foreign Reserves	Foreign Liabilities (other than to IMF)	Total Net Foreign Reserves of Central Bank	Total Net Foreign Reserves of Central Government	Total Net Foreign Reserves of Central Monetary Authorities	Sub Scriptio n	IMF holding of Kenya Currency	Net use of Fund Credit	Counter- part Liability SDR Account
1978	5,293	129,909	3,294	131,908	1,420	133,328	33,327	58,583	-25,256	6,721
1979	39,821	197,766	4,877	232,710	1,829	234,538	33,327	85,636	-52,309	10,781
1980	9,730	176,362	2,224	183,868	3,097	186,965	49,991	123,565	-73,574	14,467
1981	5,615	119,180	2,297	122,498	3,933	126,431	61,842	166,494	-104,652	22,102

Source: Economic Survey 1983

Table II-3 Major Agriculture Research Institutions and Program in Kenya

Institution	Location	Objectives & Programmes
Kenya Agricultural Institute (KARI)	Muguga (Central)	<ul style="list-style-type: none"> <li>a) Crop production plant protection and quarantine, in future, crop improvement and dryland farming;</li> <li>b) Animal production; dairy cattle breeding and production</li> <li>c) Veterinary: research and vaccine production for vinderpest, and East Cost Fever;</li> <li>d) Forestry: silvicultural techniques, pest and disease control for plantation species</li> </ul>
National Agricultural Research Station	Kitale (Rift v.)	<ul style="list-style-type: none"> <li>a) Breeding and agronomy of maize and improved pastures</li> <li>b) Soil testing</li> </ul>
National Plant Breeding Station	Njoro (Rift v.)	<ul style="list-style-type: none"> <li>a) Breeding and agronomy of wheat, barley, tritital oats and oilseeds</li> <li>b) Development of technology for smallholder wheat production</li> <li>c) Soil testing</li> </ul>
National Horticultural Research Station	Thika (Central)	<ul style="list-style-type: none"> <li>a) Breeding and agronomy of horticultural crops (vegetables, fruits, dry beans, roots and tubes)</li> <li>b) Horticultural seed production; supply of plant materials</li> <li>c) Sericulture</li> </ul>



Table II-3 Major Agriculture Research Institutions and Program in Kenya

Institution	Location	Objectives & Programmes
National Agricultural Laboratories	Kabete (Nairobi)	<ul style="list-style-type: none"> <li>a) Soil chemistry and testing</li> <li>b) Kenya Soil Survey</li> <li>c) Plant protection (pathology, entomology, and pesticide analysis)</li> <li>d) Irrigation and drainage, water management</li> </ul>
National Drying Farming Research Station	Katumani (Eastern)	<ul style="list-style-type: none"> <li>a) Integrated farming systems for marginal areas development of adapted varieties of millet, sorghum, maize, peas, and beans;</li> <li>b) Integrated farm livestock, agro-forestry</li> </ul>
Costal Agricultural Research Station	Mtwapa (Coast)	<ul style="list-style-type: none"> <li>a) Crop research for coastal zone; coconut, maize, cashew, cassava, tubes, and some cotton sugarcane, grain-legume and livestock research</li> </ul>
Coffee Research Foundation	Ruiru (Main Station) Kisii, Koru, Meru (Substation)	<ul style="list-style-type: none"> <li>a) Coffee research in areas of breeding plant protection, soil fertilitz, agronomy, agricultural economics and extension work</li> </ul>
Tea Research Foundation	Kericho (Rift v.)	<ul style="list-style-type: none"> <li>a) Tea research in areas of botamy, agronomy, chemistry and all related subjects</li> </ul>

Table II-3 Major Agriculture Research Institutions and Program in Kenya

Institution	Location	Objectives & Programmes
National Sugar Research Station	Kibos (Western)	a) Sugar research, selection, agronomy, irrigation and soil testing
National Potato Research Station	Tigani (Central)	a) Potato research, selection, agronomy and plant protection
International Laboratory for Research in Animal Diseases (IIRAD)	Nairobi (HQ)	a) Animal disease, primarily trypanosomiasis and East Cost Fever
International Centre for Research on Agro-Forestry (ICRAF)	Nairobi (HQ)	a) Land use systems and development of agro-forestry systems
International Centre of Insect Physiology and Ecology (ICIPE)	Nairobi (HQ)	a) Basic research on insects of agricultural and medical importance

TABLE II-4 GOVERNMENT BUDGET FOR MACADAMIA NUTS PROJECT IN 1982/83

Unit: K£'000

Head	Sub-Head	Item	Title	Approved Estimates 1981/82	Estimates 1982/83	External Receipts 1981/82	External Receipts 1982/83	Sources of External Receipts
		100	Transport Operating Expenses	3,400	3,750			
		110	Travelling and Accommodation Expenses	2,000	1,500			
	084	153	Farm Inputs	3,000	3,000			
		190	Miscellaneous Other Charges	1,500	1,500			
		220	Plant and Equipment	1,500	2,000			
		250	Maintenance of Stations	1,000	1,500			
			Total 237-084	K£ -	13,250			Japan Technical Aid

Source: Development Estimates for the Year 1982/83

TABLE II-5 PLANTED MACADAMIA TREES IN KENYA

Province	District	1964	1965	1966	1967	1968	1969	1970	1971	Total
<u>Central</u>	Kiambu	500	1,000	1,500	9,500	12,500	14,200	15,300	8,000	62,500
	Muranga	10,000	5,000	4,000	18,000	13,200	-	49,000	38,000	137,200
	Nyeri	5,000	6,000	15,000	35,400	12,500	23,000	4,900	5,800	107,600
	Kirinyaga	-	-	-	11,400	10,000	25,000	-	-	-
<u>Eastern</u>	Embu	3,000	5,000	2,000	14,300	10,000	23,000	22,000	14,500	98,200
	Mackakos	300	500	500	-	15,000	37,000	26,800	18,100	99,300
	Kitui	-	-	-	-	-	-	1,200	-	1,200
	Meru	10,000	20,000	10,000	33,000	37,500	113,000	16,500	10,000	250,000
<u>Rift Valley</u>	-	-	-	10,000	-	-	-	-	-	10,000
<u>Nyanza</u>	-	-	-	-	-	-	-	1,000	5,000	6,000
<u>Western</u>	-	-	-	-	-	-	-	1,500	-	1,500
Total Accum.	28,800	37,500	33,000	131,600	110,700	235,200	138,200	715,000	99,400	814,400
		66,300	99,300	230,900	341,600	576,800	715,000	814,400		

Source: Ministry of Agriculture 1971

TABLE II-6 PURCHASES OF RAW MACADAMIA NUTS

DISTRICT/ SECTOR	1979	1980	1981	1982	1983
MURANG'A	58	49	46	50	48
NYERI	132	155	185	190	170
MERU	157	185	220	250	240
KIRINYAGA	174	204	243	265	266
EMBU	150	175	210	240	230
MACHAKOS	41	49	46	50	60
KIAMBU	25	30	35	25	36
FACTORY	91	126	175	215	195
TOTAL (ton)	828	973	1,160	1,285	1,245
PRODUCER PRICE PER KILOGRAM (shs)	1.90	2.10	2.20	2.30	2.80
EXPORT (ton)	165	160	180	240	215

Source: Kenya Nut Co. LTD. 1984

TABLE III-1 TRAINING PROGRAM

1. Main Area of Extension

- (1) Central P. : Kiambu/Muranga/Nyeri/Kirinyaga
- (2) Eastern P. : Embu/Meru/Machacos
- (3) Coast P. : Taita-Tabeta
- (4) Rift V. P. : Kitale
- (5) Nyanza P. : Kisii
- (6) Western P. : Kakamega/Bungoma

Total 12 Districts

2. Training Courses at Center

- (1) A course (One week)
  - Provincial Crop Officers (PCO) 6 x 2 = 12
  - District " " (DCO) 12 x 2 = 24
  - Total 36
- (2) B course (Two weeks)
  - Divisional Extension Officers (DEO) 12 x 5-6 = 64
  - Total 64
- (3) C course (Three weeks)
  - Locational Extension Officers (LEO) 12 x 10 = 120
  - District Horticultural Officers (DHO) Total 120
- (4) D course (One week)
  - Farmers Training Center Offices (FTC) 12 x 4 = 48
  - Total 48
- (5) E course (Temporary)
  - Selected Farmers/Others 12 x 40 = 480
  - Total 480

3. Training Schedule

	Months												Years					Total	Remarks	
	J	F	M	A	M	J	J	A	S	O	N	D	1st	2nd	3rd	4th	5th			
A PCO/DCO-													-	9	9	9	9	36		
B DEO													-	-	16	16	16	16	64	
C LEO/DHO														24	24	24	24	24	120	
D FTC/D.N														-	12	12	12	12	48	
E Selected Farmers (Temporary)														96	96	96	96	96	432	Total 748

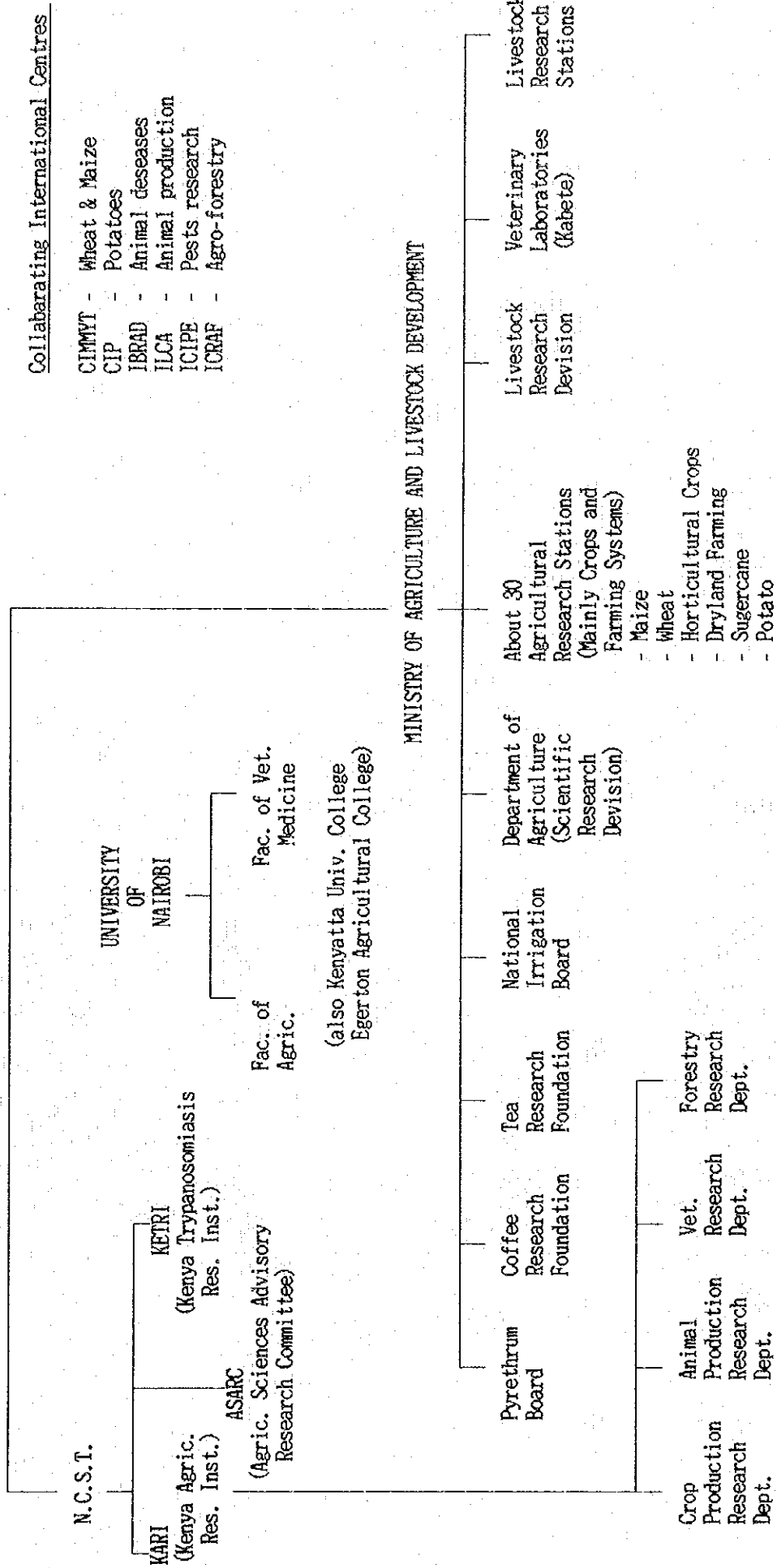
FTC: Farmers Training Center  
 D.N: District Nursery

TABLE III-2 ESTIMATED OPERATION AND MAINTENANCE COST (Ksh '000)

(A)	<u>Staff Salaries</u>	<u>Grade</u>	<u>No.</u>	<u>Unit cost</u>	<u>Base cost</u>
	Manager	(L)	1	60	60
	Researcher (AO)	(K)	7	50	350
	Asst. Res. (TO)	(G/H)	7	30	210
	Tech. Asst. (TA)	(F)	9	30	270
	Subordinate (SS)	(A/B)	20	15	300
<hr/>					
	Excutive Asst	(G/H)	1	30	30
	Clerical Officer	(D/F)	2	16	32
	Accountant Clerk	(D/E)	2	14	28
	Copy typist	(E)	3	16	48
	Watchmen/Tel.ope/ Driver	(C)	7	15	105
	Messenger	(B)	2	8	16
	Hostel Inspector	(F)	1	20	20
	Cook	(E)	2	16	32
	Sweeper	(B)	2	8	16
<hr/>					
	Sub-total	-	66	-	1,517
	Housing allowance	(15%)	-	-	228
	<u>Total</u>	-	-	-	<u>1,745</u>
(B)	Research and Experiment				
	Plant and equipment				100
	Farm and equipment				40
	Laboratory materials				100
	Fuel for machinery				50
	Books and information				30
	<u>Total</u>				<u>320</u>
(C)	Training				
	Travel allowance (100 persons)				200
	Grafting materials				30
	Teaching materials				15
	Fuel for vehicles				40
	<u>Total</u>				<u>285</u>
(D)	Operation and Maintenance				
	Electricity				120
	Travel allowance for staff				90
	Transportation/Communication				40
	Stationary (L.S.)				15
	Maintenance of Centre				80
	Miscellaneous other charges				60
	<u>Total</u>				<u>405</u>
	<u>Grand Total</u>				<u>2,755</u>

Fig. II-1 PRESENT ORGANIZATION AGRICULTURAL RESEARCH IN KENYA

AGRICULTURAL RESEARCH IN KENYA



Collaborating International Centres

- CIMMYT - Wheat & Maize
- CIP - Potatoes
- IBRAD - Animal diseases
- ILCA - Animal production
- ICIPE - Pests research
- ICRAF - Agro-forestry



FIG. III-1

RAINFALL MAP IN SOUTHWEST KENYA

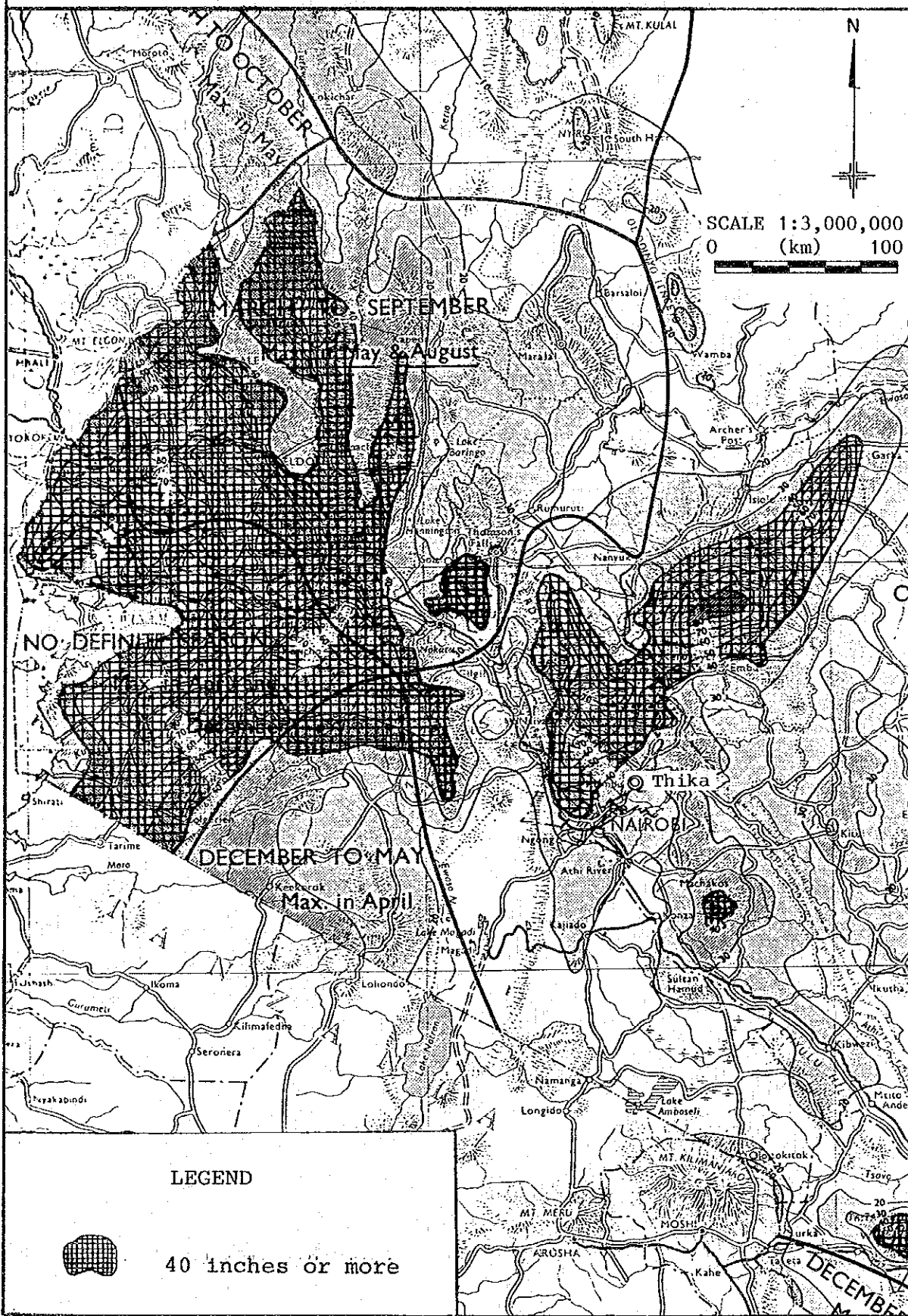
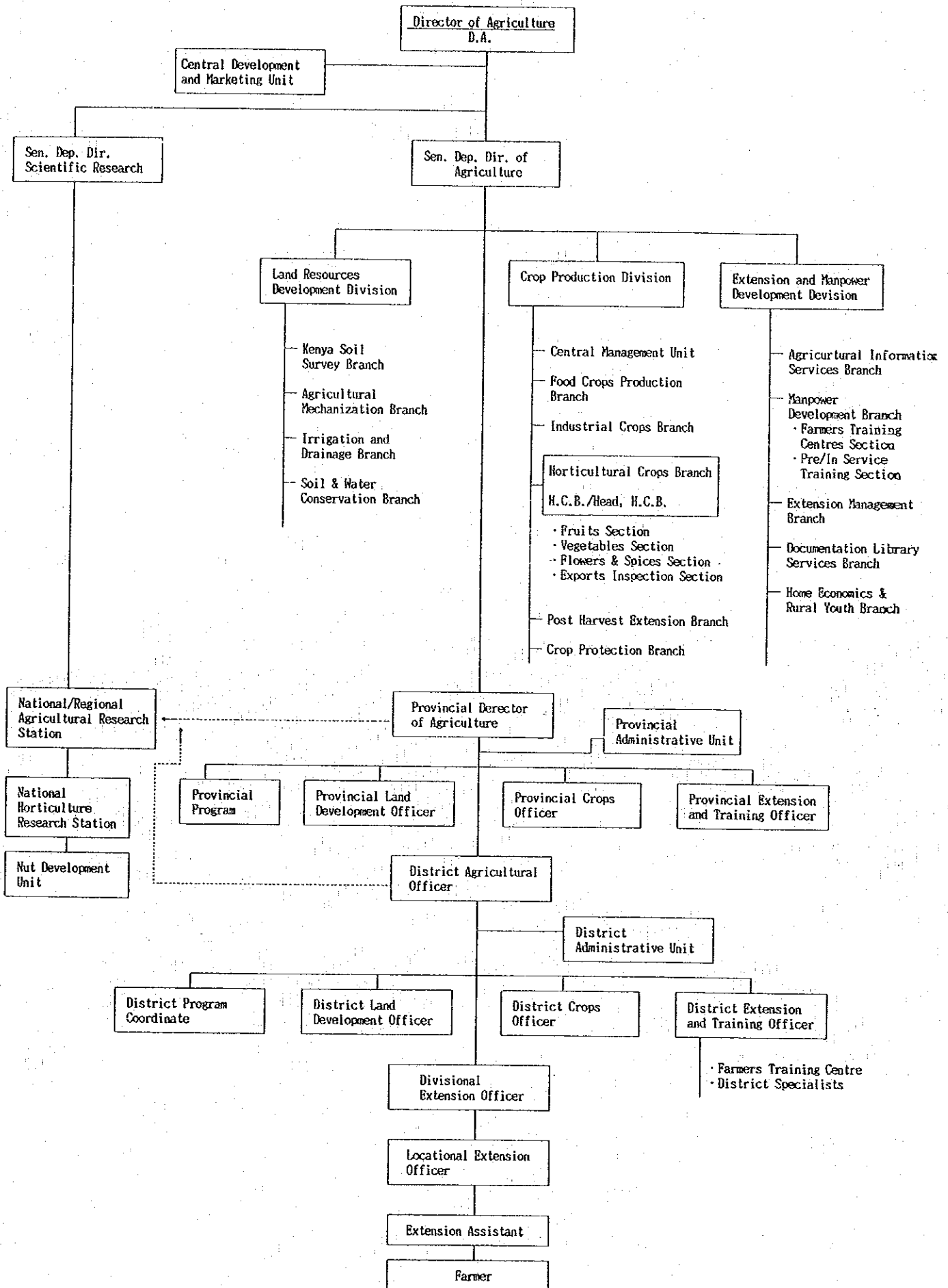
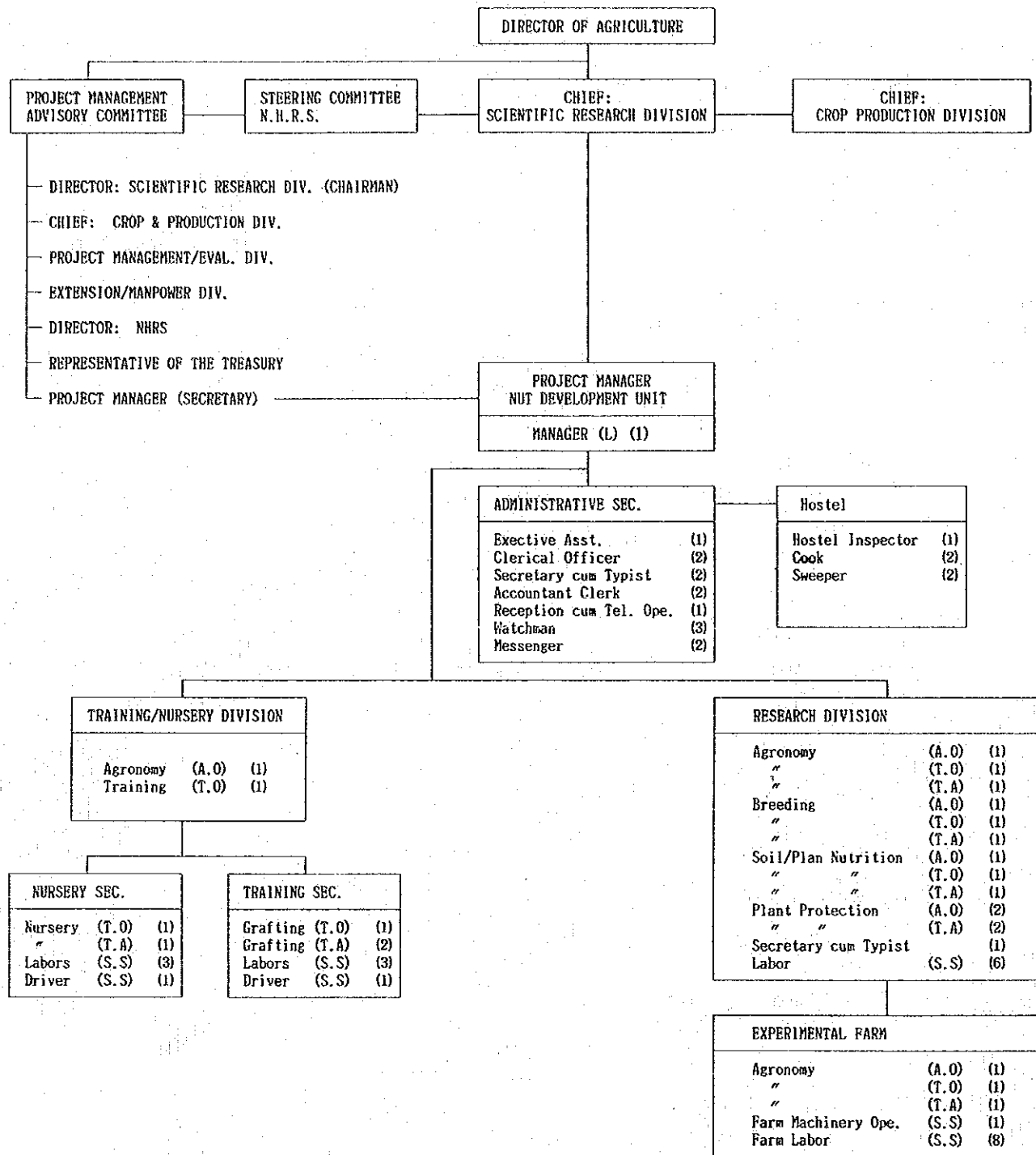


Fig. III-2 Organization of Agricultural Department



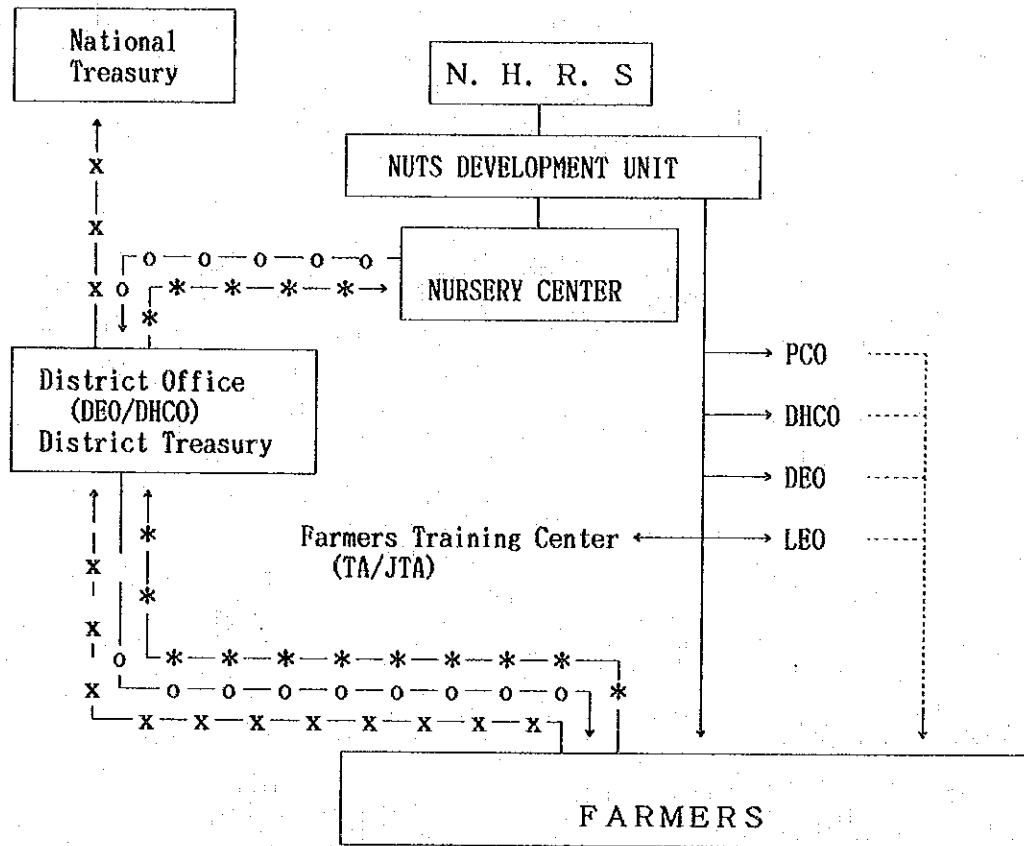
ORGANIZATION AND MANNING



Total Number of Staff					
Executive Asst.	1	Hostel Inspector	1	L.	1
Clerical Officer	2	Cook	2	A.O	7
Accountant Clerk	2	Sweeper	2	T.O	7
Secr. cum Typist	2	Sub-total	5	T.A	9
Recep. cum Tel Ope.	1			S.S	20
Watchman	3			Driver	3
Messenger	2			Typist	1
Sub-total	13			Sub-total	48
		Total	66		

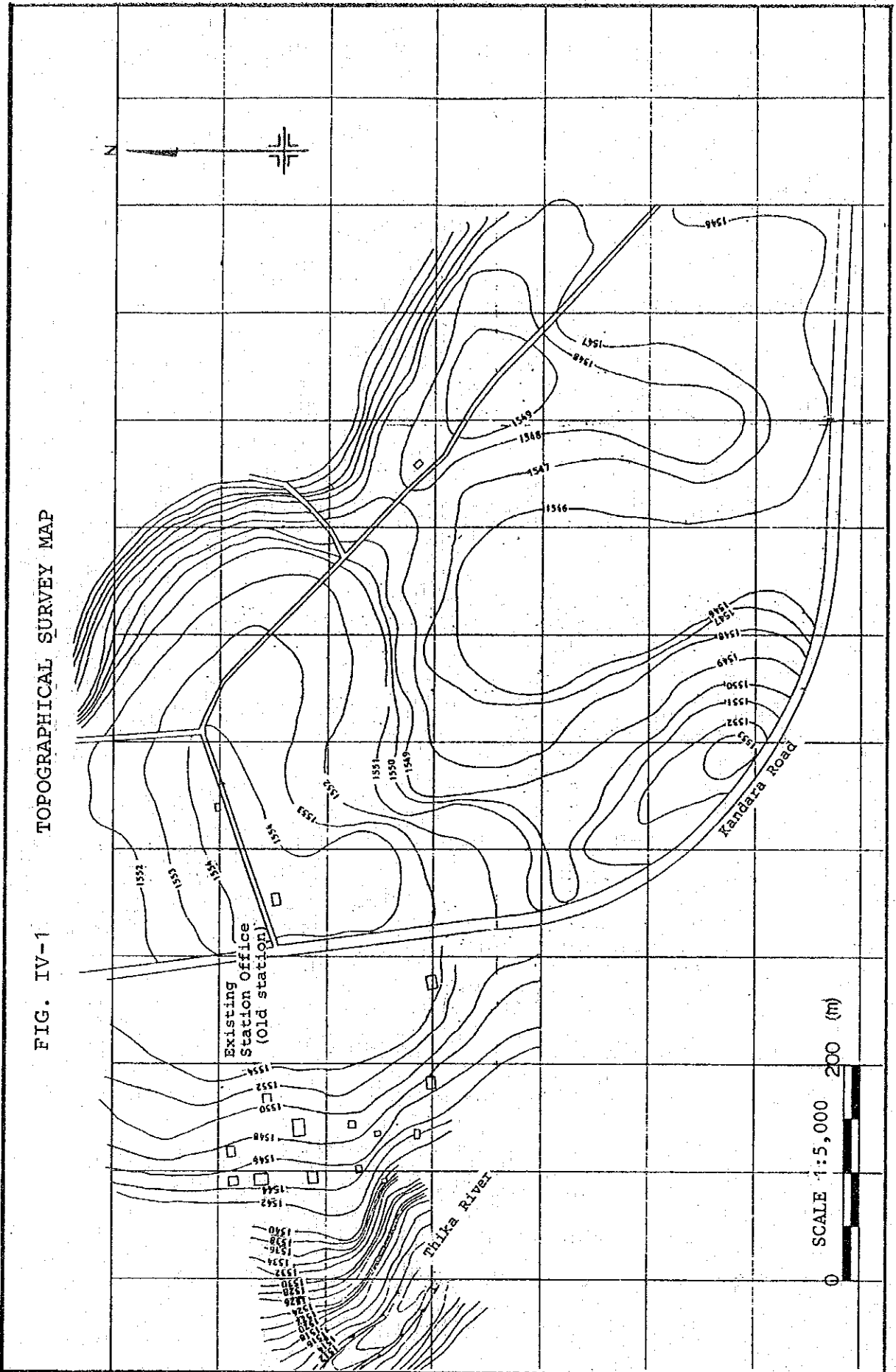
Fig. III-4

TRAINING AND SEEDLING FLOW DIAGRAM



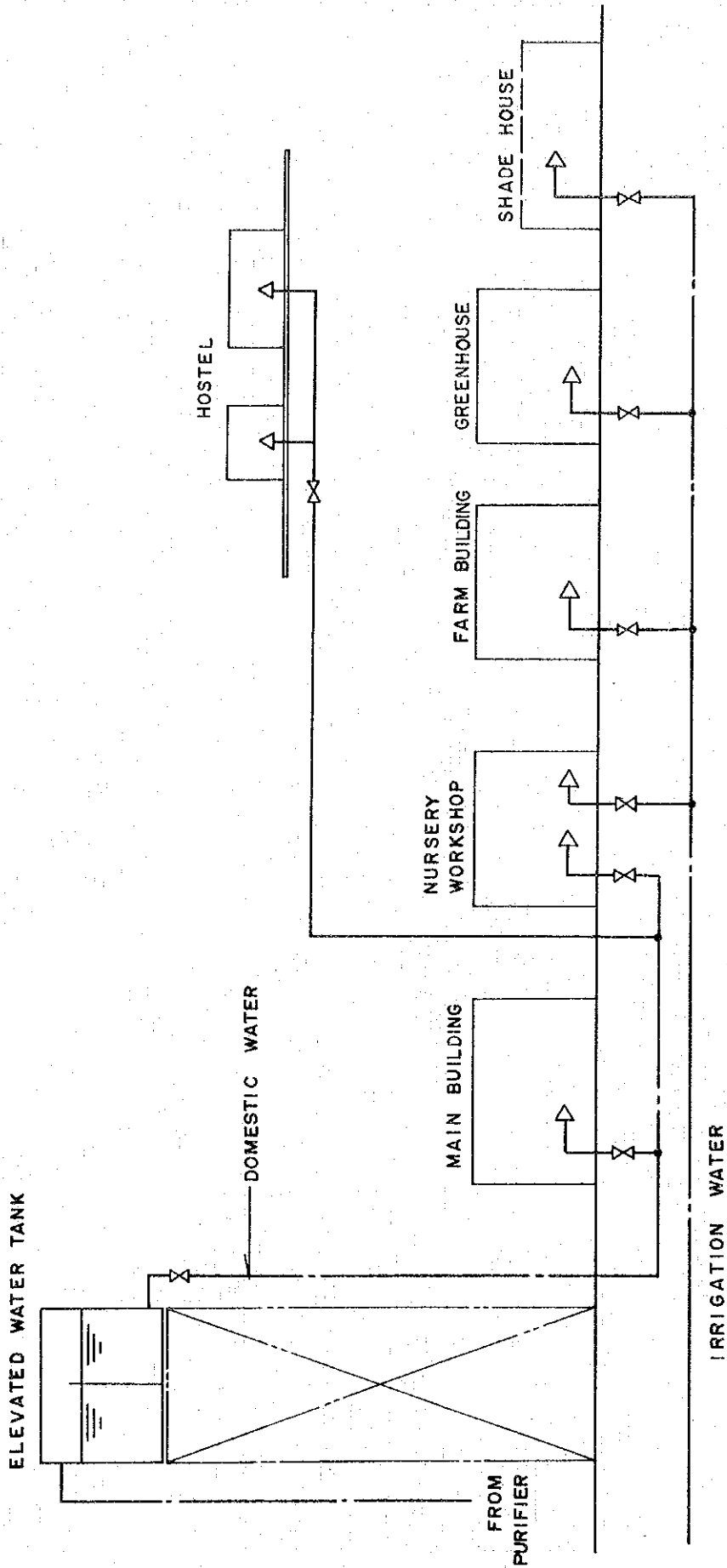
- PCO : Provincial Crop Officer
- DHCO: District Horticulture Crop Officer
- DEO : District Extension Officer
- LEO : Locational Extension Officer
- TA : Technical Assistant
- JTA : Junior Technical Assistant

FIG. IV-1 TOPOGRAPHICAL SURVEY MAP



# WATER SUPPLY SYSTEM

FIG. V-1



SEWAGE SYSTEM

FIG. V-2

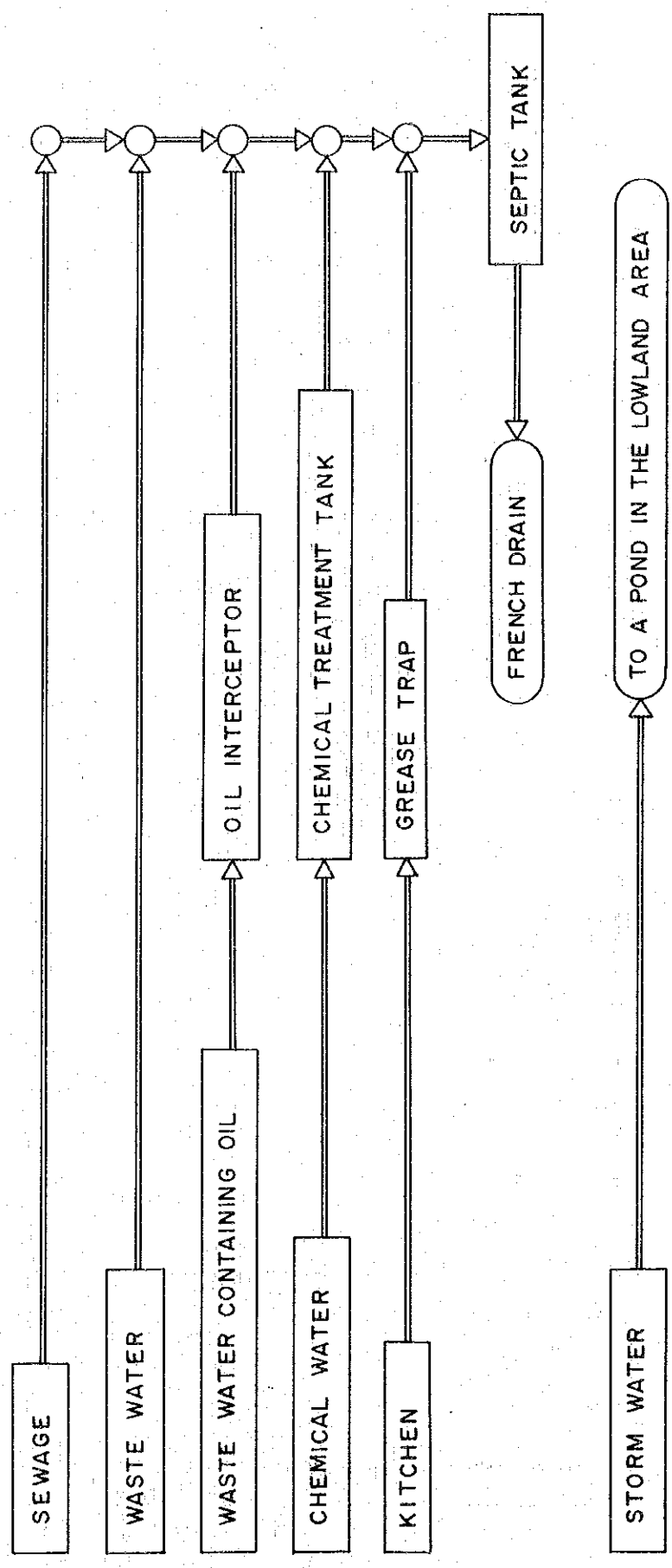


FIG. V-3

# SINGLE LINE DIAGRAM

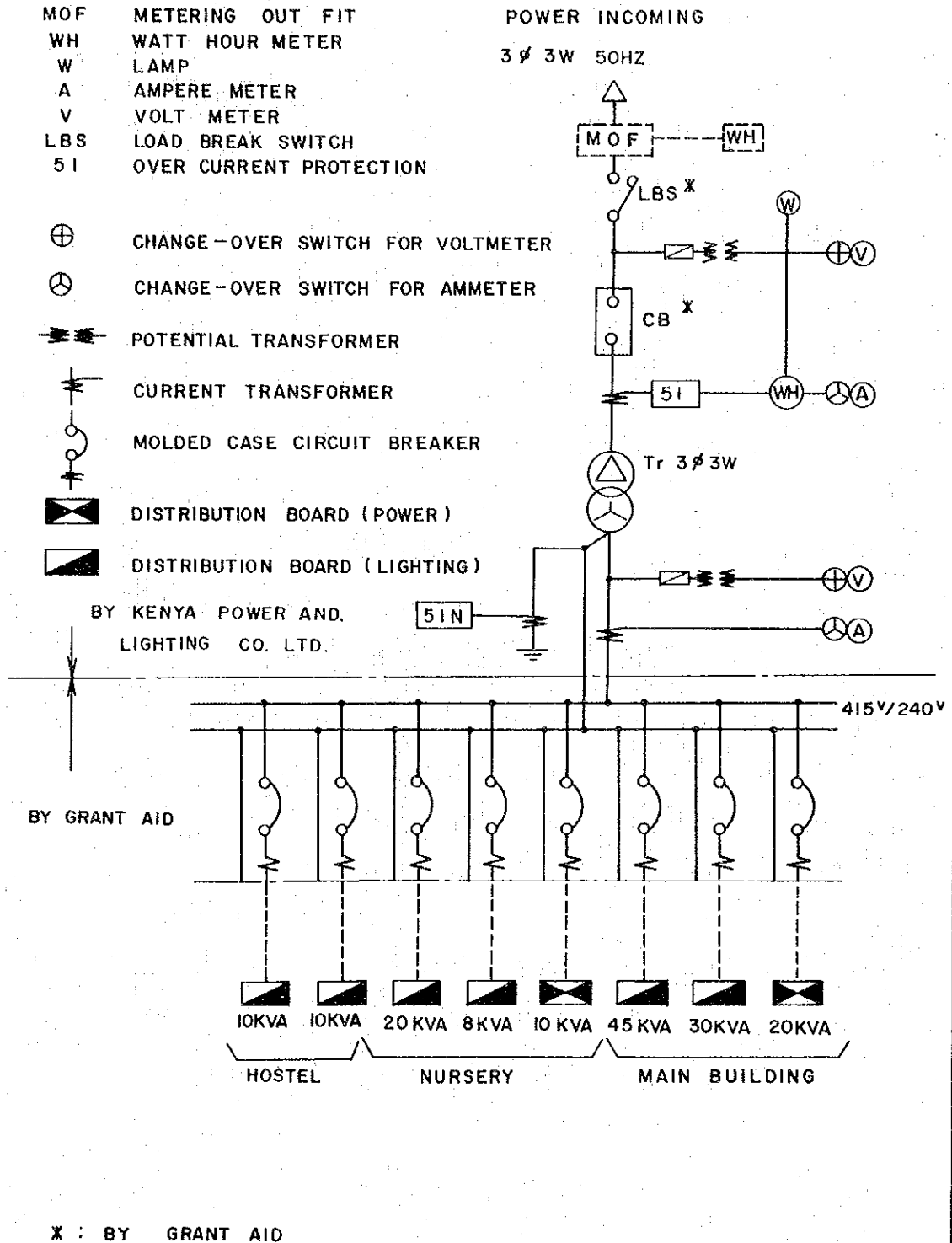
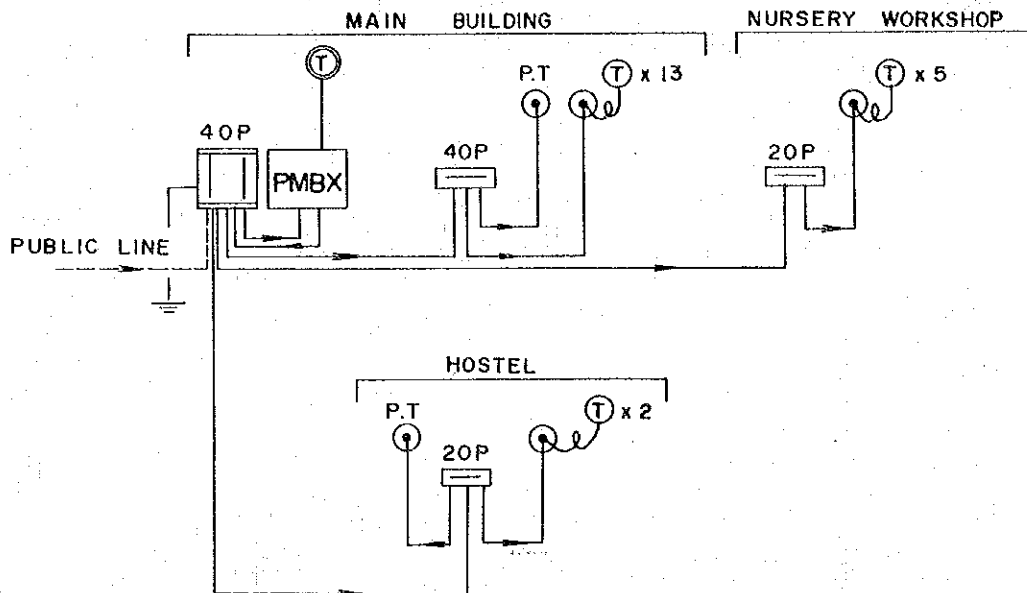




FIG. V-4

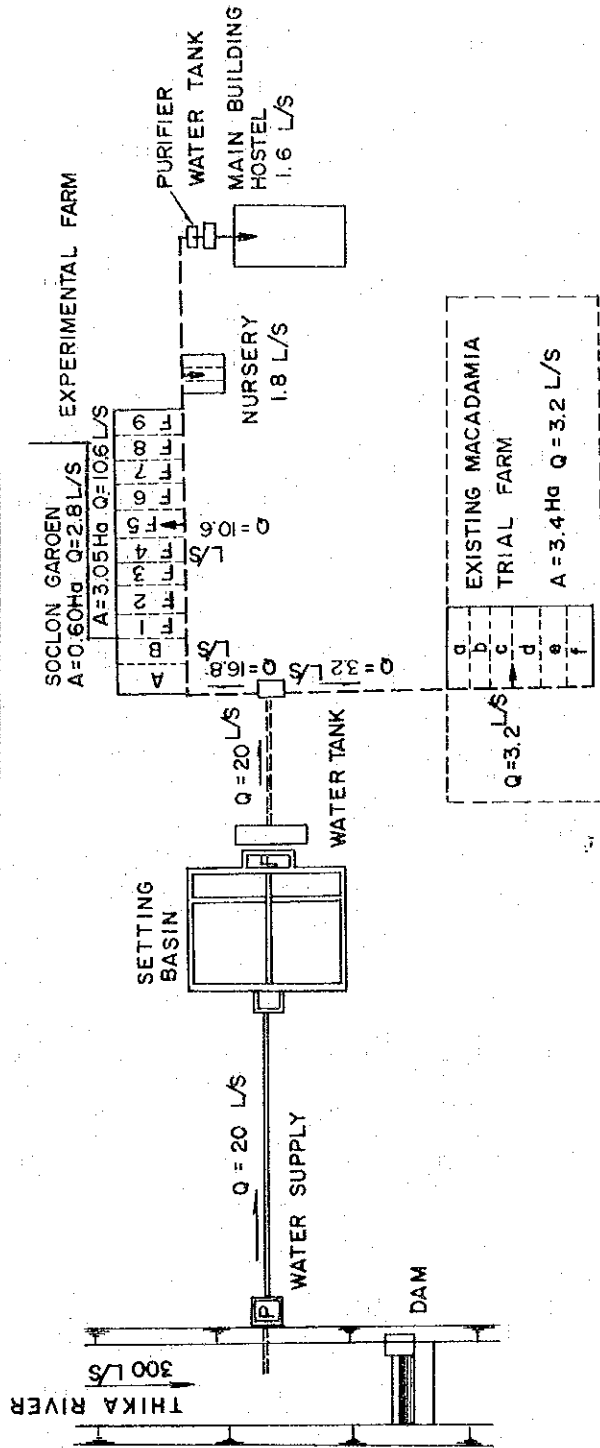
## TELEPHONE WIRING AND PIPING SYSTEM



- MAIN DISTRIBUTING FRAME
- TERMINAL BOARD
- PMBX PRIVATE BRANCH EXCHANGER
- OUTLET BOX ( EXTENSION TELEPHONE )
- P.T. OUTLET BOX ( PUBLIC TELEPHONE )
- EXTENSION TELEPHONE
- EXTENSION TELEPHONE ( MASTER )

# WATER DISTRIBUTION DIAGRAM

FIG. V-5



NAME	AREA (Ha)	IRRIGATION REQUIREMENT L/SEC	REMARKS
EXISTING MACADAMIA TRIAL FARM	3.40	3.2	
SCION GARDEN	0.60	2.8	
EXPERIMENTAL FARM	3.05	10.6	CATCH CROPS
NURSERY	0.35	1.8	
BUILDING LOTS		1.6	
<b>TOTAL</b>	<b>7.40</b>	<b>20.0</b>	



## **APPENDIXES**



Telegrams: "MINAG", Nairobi  
Telephone: Nairobi 720030  
When replying please quote  
Ref. No. OF/TA/76/14



KILIMO HOUSE  
CATHEDRAL ROAD  
P.O. Box 30028, NAIROBI  
25th Jan. 19 84

MINUTES OF DISCUSSIONS ON BASIC DESIGN STUDY FOR THE  
PROJECT FOR IMPROVEMENT OF THE NATIONAL HORTICULTURAL  
RESEARCH STATION IN THE REPUBLIC OF KENYA

In response to the request made by the Government of the Republic of Kenya for the Project for Improvement of the National Horticultural Research Station in Thika, in the Republic of Kenya ( hereinafter referred to as " the Project"), the Government of Japan, through Japan International Cooperation Agency (JICA), has dispatched a survey team headed by Dr. Yutaka MACHIDA, Chief of Second Breeding Laboratory, Fruit Tree Research Station, Japanese Ministry of Agriculture, Forestry and Fisheries ( hereinafter, referred to as "the Team") to conduct the basic design study on the Project from 17th January to 16th February, in 1984.

The Team has carried out a field survey and had a series of discussions with Kenya authorities concerned of the Project.

As a result of the survey and discussions, the Team and Kenya authorities concerned have agreed to recommend to their respective Governments that the result of the survey and discussions attached herewith should be examined toward the realization of the Project.

*Y. Machida*

Dr. Yutaka Machida  
Head of Japanese Survey Team.

NAIROBI 25TH JANUARY, 1984

*A.K. Kiriro*

A.K. KIRIRO

for: PERMANENT SECRETARY

MINISTRY OF AGRICULTURE AND LIVESTOCK DEVELOPMENT

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P.O. Box 30028, NAIROBI

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and date

\_\_\_\_\_ 19

ATTACHMENT

1. The objective of the Japanese Grant Aid Programme is to provide necessary buildings, facilities and equipment for establishing a nut development center ( hereinafter referred to as "the Center"), mainly Macadamia Nut, in the National Horticultural Research Station in Thika.
2. The purpose of the Project is to improve the activities of the National Horticultural Research Station by means of establishment of the Center.
3. The Center is directly under the Director of Agriculture in the Ministry of Agriculture and Livestock Development. The organization chart of the Center is shown in ANNEX I
4. The Executing body for the implementation of the Project in Kenyan side are the Crop Production Division and the Scientific Research Division on behalf of the Permanent Secretary, Ministry of Agriculture & Livestock Development.
5. The proposed site of the Project is the land in the National Horticultural Research Station in Thika (hereinafter referred to as "the Project Site"). The Project Site is shown in ANNEX II. The zoning plan of the Center is shown in ANNEX III.
6. The objectives of the Center are:
  - 6.1 To serve as a center for production and distribution of improved nut seedlings, especially Macadamia Nut.

MINISTRY OF AGRICULTURE AND LIVESTOCK DEVELOPMENT

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\_\_\_\_\_ 19 \_\_\_\_\_

- 6.2 To serve as a training center for promoting manpower to improve and develop nuts cultivation, especially Macadamia Nut.
- 6.3 To serve as a research center for breeding, agronomy, soils, plant nutrition and plant protection of nut crops, mainly Macadamia Nut.
7. The Team will convey to the Government of Japan the desire of the Government of the Republic of Kenya that the former takes necessary measures to cooperate by providing the buildings and other items listed in ANNEX IV within the scope of Japanese economic cooperation programme in grant form.
8. The Team will convey to the Government of Japan the desire of the Government of the Republic of Kenya that Technical Cooperation Programme is needed for the smooth and effective operation of the Center on and after the establishment.
9. The Kenyan authorities concerned have understood and confirmed Japan's Grant Aid System explained by the Team which includes a principle of use of Japanese consultant firm and a Japanese general contractor for implementation of the Project.
10. The Kenyan authorities concerned have confirmed the Government of the Republic of Kenya will take necessary measures as listed in ANNEX V on condition that the grant aid by the Government of Japan is extended to the Project.



MINISTRY OF AGRICULTURE AND LIVESTOCK DEVELOPMENT

(4 of 11)

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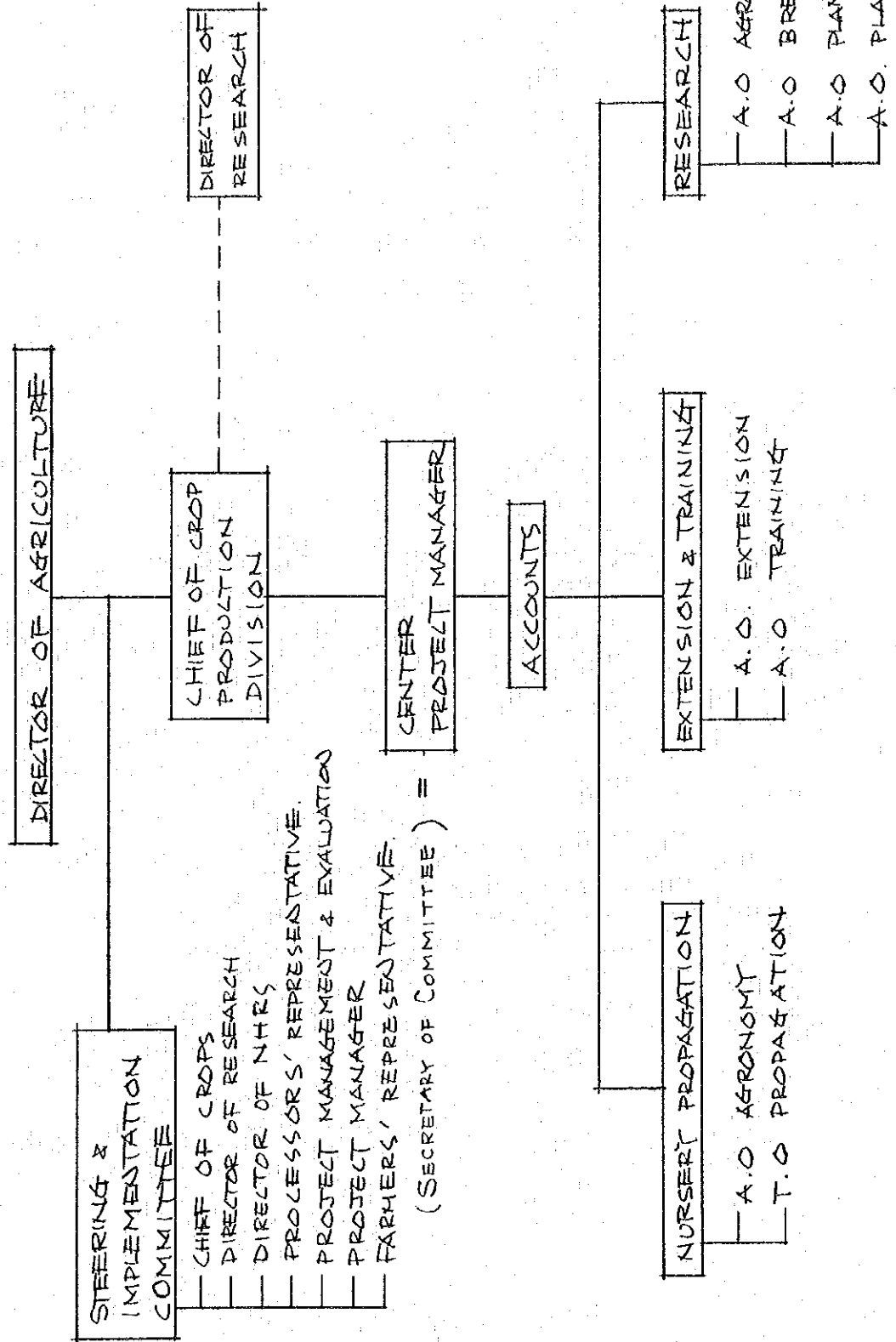
\_\_\_\_\_ 19 \_\_\_\_\_

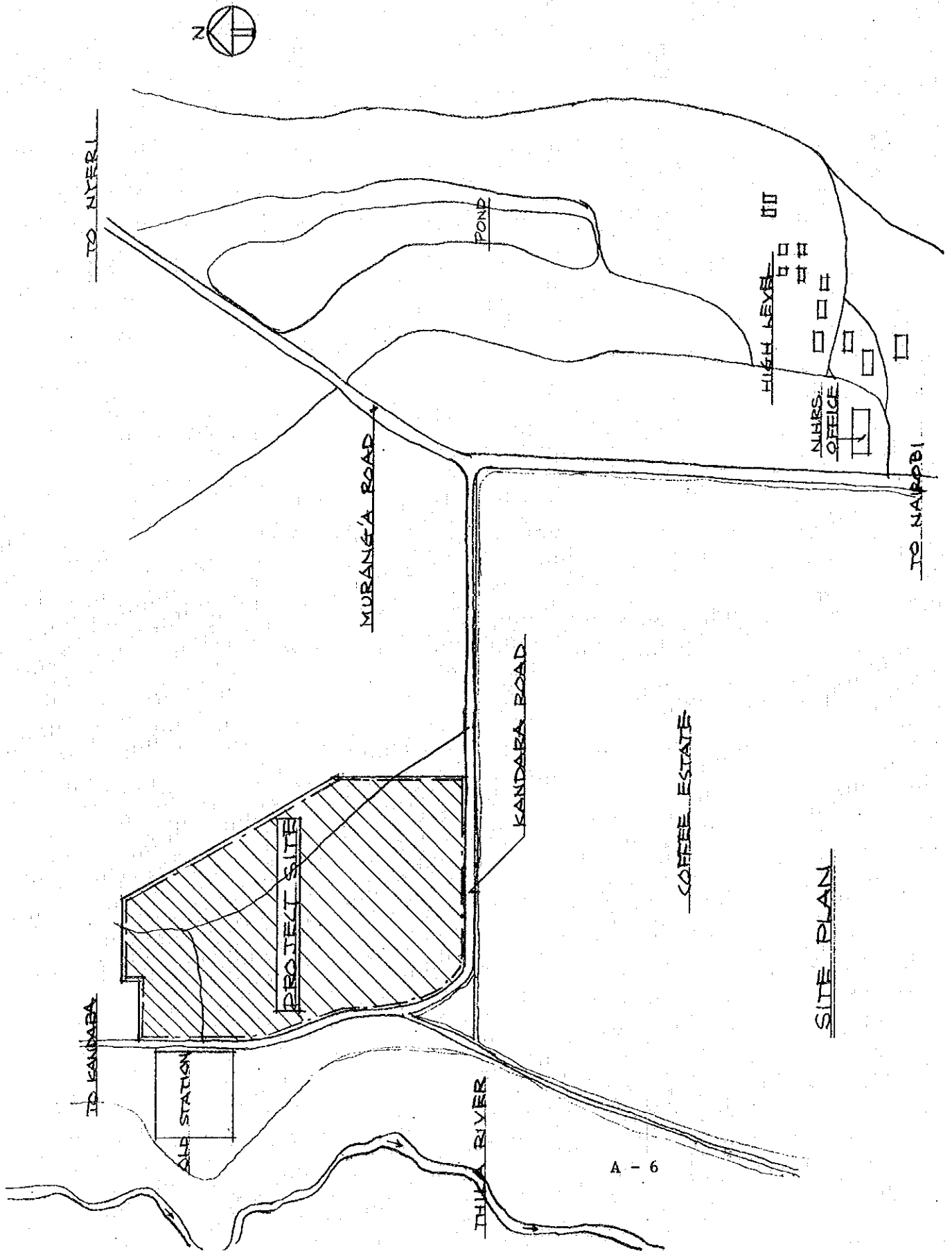
ATTACHMENT cont.

11. The Kenya Government side requests the Team to consider advising the former on the estimated local costs and external costs of the project as soon as possible.

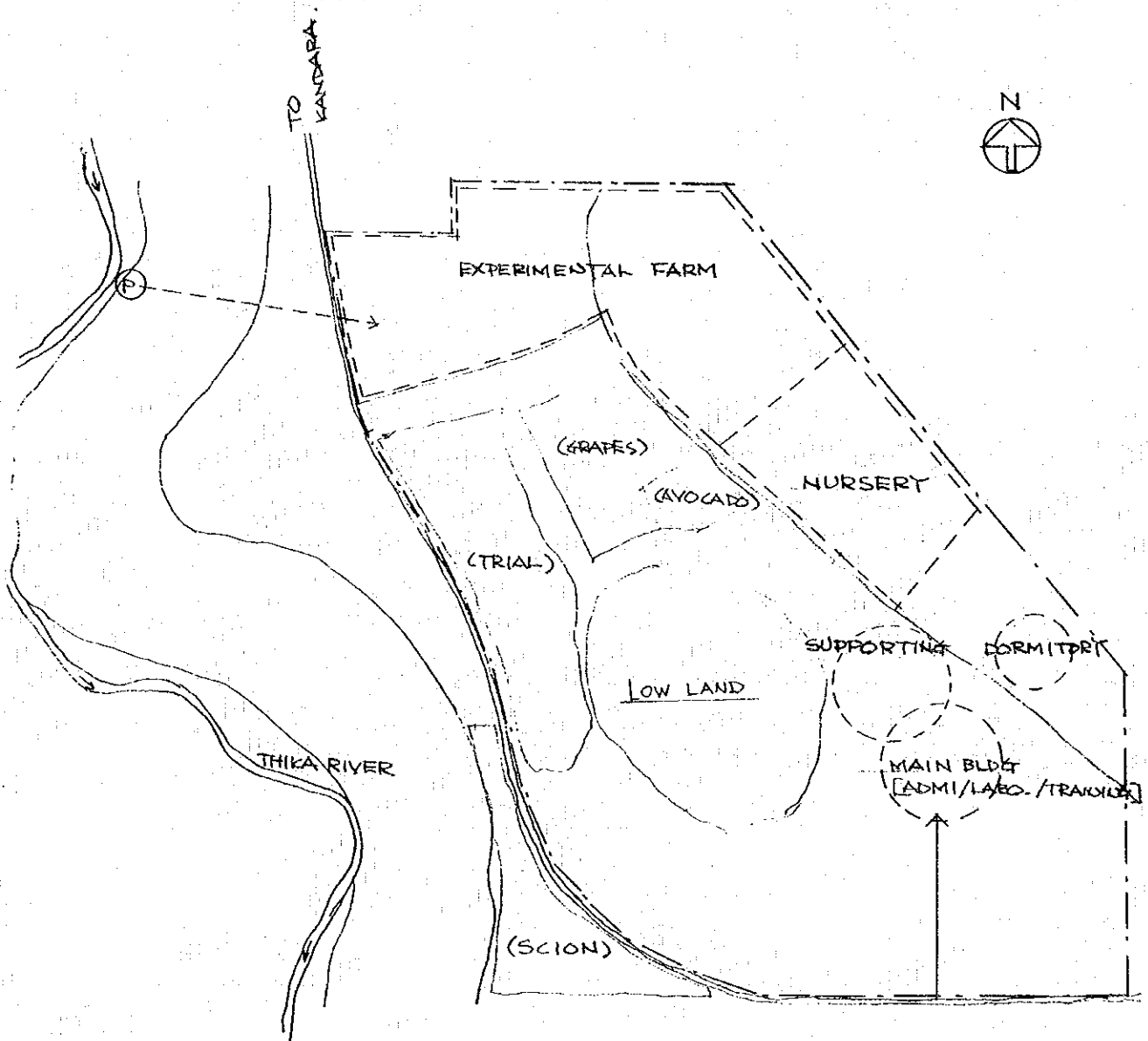
ANNEX I

ORGANIZATION OF THE CENTER





SITE PLAN



ZONING PLAN OF THE CENTER

S: 1/5000

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and date

\_\_\_\_\_ 19\_\_\_\_

ANNEX IV

Items requested by the Government of the Republic of Kenya the cost of which will be borne by the Government of Japan:-

1. Main Building

(Administration)

Director's room  
other offices

(Training)

Class room for 50 persons  
Class room for 16 persons  
Store room for teaching materials.

(Research)

Laboratories for  
Breeding/processing  
Agronomy  
Soils/Plant Nutrition  
Plant Protection  
Cold room  
Sample room  
~~Small library~~  
Small Library

2. Annex Building ( supporting facility)

Store for equipment/chemicals/fertilizers  
Repair shop  
Garage for farm machinery

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ANNEX IV (conti.)

3. Nursery
  - Grafting facility
  - Green houses
  - Shed houses
4. Experimental Farm ( about 4 ha)
5. Irrigation and drainage system ( including Intake structure from Thika River for Experimental Farm)
6. Clean water supply system
7. Some necessary equipment
8. Special fence against wild animals.
9. Dormitory
10. Others

MINISTRY OF AGRICULTURE AND LIVESTOCK DEVELOPMENT

(10 of 11)

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and date

19 \_\_\_\_\_

ANNEX V

Following arrangements are required to be taken by the Government of the Republic of Kenya.

1. To carry out site preparation such as clearing and leveling before commencement of construction works.
2. To construct the gate and general fence in and around the site and develop the landscape in the site. To construct wind-break.
3. To provide facilities for distribution of electricity, water supply, drainage, telephone lines and other incidental facilities to the site.
4. To furnish general furnitures ( office tables and chairs, cabinet and others) except those which are laboratory and training uses.
5. To bear the commissions (Advising commission of Authority to Pay and Payment commission) to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement.
6. To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in Kenya with respect to the supply of the products and services under the verified contracts.
7. To ensure prompt unloading and customs clearance at ports of disembarkation in Kenya.

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\_\_\_\_\_ 19 \_\_\_\_\_

ANNEX V ( conti. )

8. To accord Japanese national whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into Kenya and stay therein for the performance of their work.
9. To maintain and use properly as effectively these facilities constructed and equipment purchased under the Grant.
10. To bear all the expenses other than those to be borne by the Grant, necessary for construction of the facilities as well as for the transportation and the installation of the equipment.



**TEAM MEMBER LIST**  
(January 15 - February 17, 1984)

Name	Designation	Organization
MACHIDA, Yutaka	Team Leader	Fruit Tree Research Station, Ministry of Agriculture, Forestry and Fisheries, Japan
ONODA, Katsuji	Coordinator	Basic Design Division, Grant Aid Department, Japan International Cooperation Agency
KOBAYASHI, Keisaku	Consultant Team Leader, Agronomist	Chuo Kaihatsu Corporation
OCHI, Hiroataka	Irrigation Engineer	" " "
SOEJIMA, Masao	Architect	" " "
SASABE, Keiji	Hydrologist	" " "

**STUDY TEAM ITINERARY**  
(January 15 - February 17, 1984)

A: Dr. Machida, Mr. Onoda  
 B: Mr. Kobayashi, Mr. Soejima  
 C: Mr. Ochi  
 D: Mr. Sasabe  
 MALD: Ministry of Agriculture and Livestock Development  
 MOW : Ministry of Works, Housing and Physical Planning

Date	Stay		
Jan. 15 (Sun)		(A)	Leave Tokyo
16 (Mon)		(B.C)	Leave Tokyo
17 (Tue)	Nairobi	(A.B.C)	Arrive Nairobi
18 (Wed)	"	(A.B.C)	Courtesy call to Embassy of Japan, JICA and Dpt. Director of Agri., Meeting w/MALD on Grant System and Inception Report
19 (Thu)	"	(A.B.C)	Meeting w/Ministry of Finance Meeting w/MALD
20 (Fri)	"	(A.B.C)	Nairobi - Thika Field survey on the Project Site
21 (Sat)	"	(A.B.C)	Nairobi-Thika Field Survey on existing facility
23 (Mon)	"	(A.B.C)	Meeting w/MALD on Project framework etc.
24 (Tue)	Nairobi Thika	(A.B) (C)	Meeting w/MALD Nairobi - Thika
25 (Wed)	"	(A.B) (C)	Preparation of minutes Land survey
26 (Thu)	"	(A.B)	Exchange of signatures on the minutes
		(C)	Land survey
27 (Fri)	Nairobi Thika	(A) (B) (C)	Leave Nairobi Visit USAID, IBRD, MOW Land survey

Date	Stay		
28 (Sat)	Nairobi Thika	(B) (C)	Collect data & information Land survey
30 (Mon)	"		"
31 (Tue)	Nairobi Thika	(D) (B) (C)	Arrive Nairobi Collect data & information Land survey
Feb. 1 (Wed)	Nairobi	(B)	Collect data & information Visit KARI (Muguga), Forest Nursery (Ngong), NDFRS (Katumani), ICRAF (Machacos), NAL, AIC and soil survey (Kabete), etc. Visit Central Province Office & District Agricultural Offices (Kiriyaanga, Muranga, Nyeri, Kiambu) Meeting w/MOW
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.	Thika	(C.D)	Land survey, Water resource survey, Collect data on hydrology, hydraulics, meteorology and infrastructures
11 (Sat)			
13 (Mon)	Nairobi	(B.C.D)	Courtesy call to Embassy of Japan, JICA
14 (Tue)	"	(B.C.D)	Meeting w/MALD on the study
15 (Wed)	"	(B.C.D)	Farewell luncheon, Visit Kenya Nuts Co. (KNC)
16 (Thu)		(B.C.D)	Visit KNC Nursery, Leave Nairobi
17 (Fri)		(B.C.D)	Arrive Tokyo

\* \* \* \* \*

**CONTACT LIST**

(January 15 - February 17, 1984)

## 1. Ministry of Agriculture and Livestock Development

KILIMO HOUSE P.O BOX 30028 Nairobi TEL: 720030/1-9

A. K. KIRIRO	Deputy Secretary of Finance
G. M. KIMARI	Deputy Director of Agriculture
F. P. MUEMA	Head Officer, Horticultural Crops Branch
N. N. KAMINCHA, Mrs	Senior Agricultural Officer, Horticultural Crops Branch
J. J. ADALA	Senior Research Officer
C. N. GATHUNGU	Deputy Director, National Horticultural Research Station,
S. GACHANJA	Senior Research Officer, National Horticultural Research Station, Thika
M. M. NZUBE	Under Secretary (Administration)
J. ECHESSA	Senior Planning Officer
K. AYA, Mrs	Deputy Director, Agricultural Information Center
B. W. NGUNDO, DR.	Deputy Director, Agricultural Research Dept., Kenya Agricultural Research Institute (KARI)
DAVID N. MUNGAI	Agroclimatologist, Kenya Soil Survey
P. K. KUSEWA	Director, Katumani Dry Land Farming Research Station

## 2. Ministry of Finance and Planning

C. N. MWANGEMI Senior Assistant Secretary

## 3. Ministry of Environment and Natural Resources

MATIRU	Conservator of Foresty Information and Extension Services, Forest Department
LEOPARD M. MWEKE	Forest Assistant, Forest Dept.
E.E.R. ANTÃO	Forester, Forest Dept.

## 4. Ministry of Works, Housing and Physical Planning

MOW P.O. Box 30260 Nairobi TEL: 721022

K. N. DUNN	Chief Architect
G. N. GITONGA	Chief Quantity Surveyor
R. BROWN	Chief Architect
J. TAYLOR	Chief Structural Engineer
J. A. LINTURIRI	Chief Plumbing Engineer
D. Q. NYAMUNGA	Chief Electrical Engineer
K. M. WANGAI	Cost Planning Officer
D. O. OMOLO	Electrical Engineer
J. OHARA	Architect

#### 5. Other Authorities

KABAYA	Chief Engineer, Ministry of Water Development, Muranga
RUARAKA	Survey field HQ
PETER K. NJOGU	Horticultural Crops Officer, Kirinyaga District Office
C. NDUNGU MBURU	Land Development Officer, Central Province Office
J. K. KANJAGUA	District Agricultural Officer, Muranga District Office
JOHN GITHUKA	Registry In Charge, Kiambu District Office

#### 6. Other Organisations

KEVIN CLEAVER	Section Chief, Central Agriculture Regional Mission in East Africa (R.M.E.A.) The World Bank (IBRD)
WAMBO KURIRA	International Council for Research in Agroforestry (ICRAF)
D. K. AUDERE	Project Manager, ICRAF
T. DARNHOFER, DR	Agro-climatologist, ICRAF
P. G. VON CARLOWITZ, DR.	Senior Forestry Expert, ICRAF
A. DAVID LUNDBERG	Chief, Agriculture Division, USAID
S. MASE	Director, Japan Trade Center (JETRO)
Y. SATO	Managing Director, Kenya Nut Co. LTD.
J. SAKABE	Farm Manager, KNC.

\* \* \* \* \*

7. Embassy of Japan

R. HAGIO                      First Secretary, Embassy of Japan to Kenya

8. JICA Nairobi Office

S. YANAI                      Resident Representative in Kenya

T. NAGASHIMA                  Deputy Resident Representative

9. JICA Experts

S. HIRAMA                      JICA Expert

T. IWASAKI                     JICA Expert

\* \* \* \* \*

Telegrams: "MINAG", Nairobi  
Telephone: Nairobi 720030  
When replying please quote



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P.O. Box 30028, NAIROBI

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and date \_\_\_\_\_

\_\_\_\_\_ 19 \_\_\_\_\_

AGREED MINUTES BETWEEN MINISTRY OF AGRICULTURE AND BASIC DESIGN TEAM  
ON ESTABLISHMENT OF NUT DEVELOPMENT CENTRE AT NATIONAL HORTICULTURAL  
RESEARCH STATION, THIKA, FROM 17/7/84 TO 24/7/84

The Government of Japan has sent, through the Japan International Cooperation Agency (JICA) a team to the Republic of Kenya from July 15th to July 26th 1984 for the purpose of presenting and explaining the Draft Final Report of the Basic Design Study (the Report) on the Improvement Project of National Horticultural Research Station (the Project).

The team held meetings with the officials concerned of the Ministry of Agriculture and Livestock Development (MALD), and the National Horticultural Research Station (NHRS) to explain and to discuss the report. The main items which were discussed and confirmed by both parties at the meetings are as follows:

1. The Kenyan side principally approved the Report and appropriate alterations agreed by both sides during the discussion will be incorporated in the Final Report.
2. The Final Report (10 copies in English) on the Project will be submitted to the Government of the Republic of Kenya at the end of September, 1984.
3. Both sides confirmed that the Kenyan side understood the system of Grant Aid Programme to be extended by the Government of Japan, Especially the arrangements to be taken by the Government of Kenya (as agreed in Minutes of Discussion on the project dated on January 25th, 1984), with the approval of the Ministry of Finance and Planning,

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and date

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2

4. Through discussions, both parties confirmed and adjusted the items as per annex I and II

July 25th, 1984

Nairobi, Kenya.

A handwritten signature in black ink, appearing to read 'T. Imazu', written over a horizontal line.

Takeshi IMAZU  
Leader,  
Japanese Team, JICA

A handwritten signature in black ink, appearing to read 'S.N. Muturi', written over a horizontal line.

S.N. Muturi  
Director of Agriculture  
for: Permanent Secretary  
Ministry of Agriculture &  
Livestock Development  
KENYAN SIDE



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and date

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#### ANNEX I

1. The objective of the Project is to establish the Nuts Research Unit (the Unit) at the National Horticultural Research Station for encouraging and promoting the research and development of Macadamia and other nuts with a view to strengthen Kenya's capacity for Undertaking research and development of macadamia and other nuts.
2. The Unit will also conduct training on nuts cultivation and provide high quality planting material which will be produced through research and training activities for distribution.
3. The Unit will provide the technical support for the multiplication of additional seedlings at the nursery centres to be established elsewhere by the Government of Kenya to produce the targetted number of 100,000 seedlings per year.
4. The Project Manager will be responsible for the activities of the Unit to the Director of Agriculture through the Director of National Horticultural Research Station and the Director of Scientific Research Division.
5. The Unit will give technical support to the extension and development of the nut industry under the direction of the Chief, Crop Production Division of the Ministry of Agriculture.
6. It was noted that while the Government of Kenya had requested for a hostel (dormitory) as per minutes of discussion dated 25th January

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and date

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1984 (appendix 1-1 of the Draft Final Report of the Basic Design Study), it was noted that the request had not been included in the draft document.

The team explained that a hostel for trainees was considered but not allowed to be covered by the Grant Aid from the Government of Japan, but the Kenyan side requested the team strongly to convey the Kenyan desire that the Government of Japan reconsider to provide the hostel under the Grant.

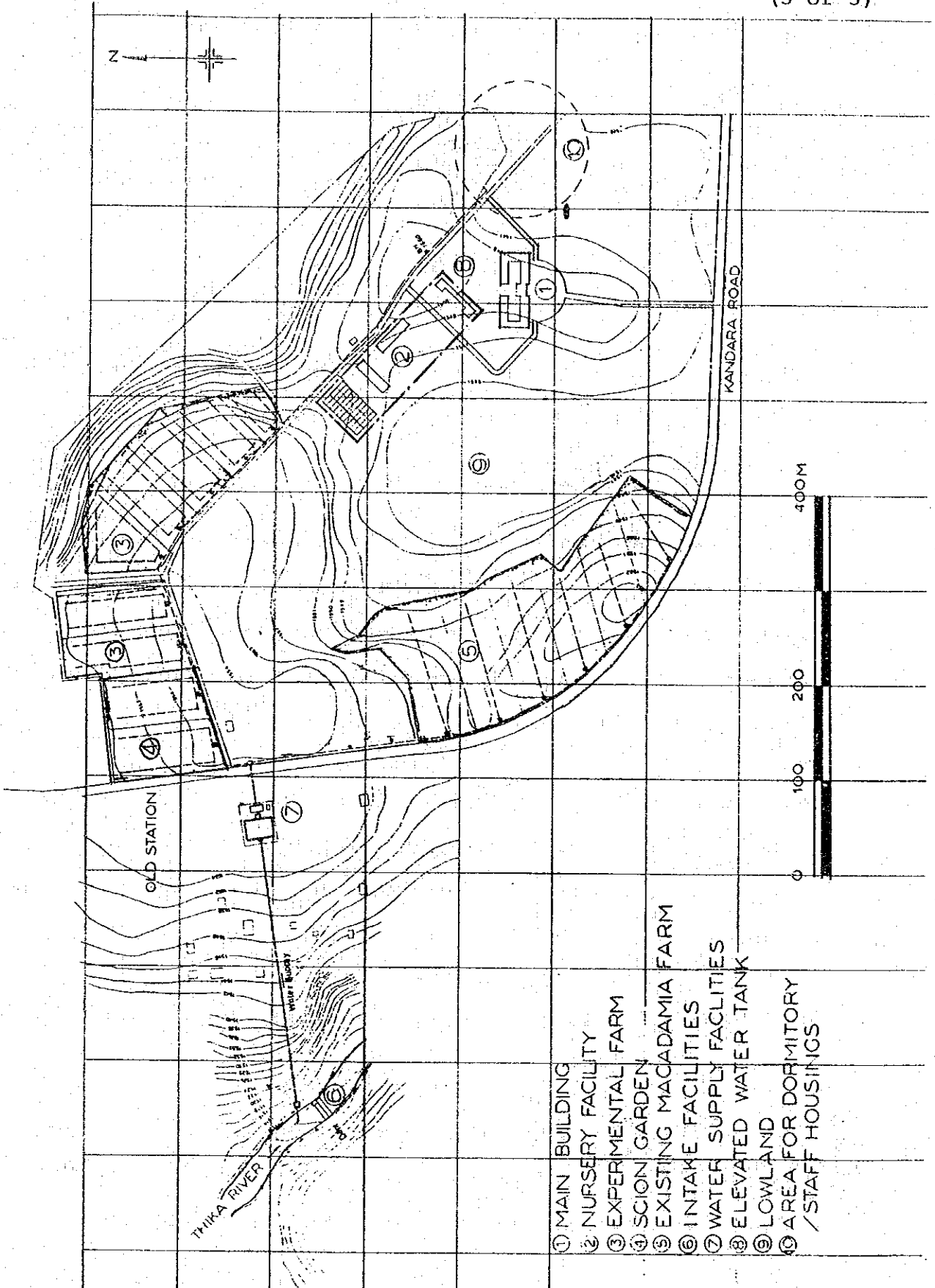
The team informed the Kenyan side that the desire of the Government of Kenya will not be accepted by the Government of Japan, but they will convey the desire of the Government of Kenya to the Government of Japan.

7. The tentative development plan of the Unit site is shown in Annex II.

A handwritten signature in cursive script, possibly reading 'J. M. M.' or similar.

A handwritten signature in cursive script, possibly reading 'J. M. M.' or similar.

ANNEX II GENERAL SITE PLAN



**TEAM MEMBER LIST**  
(July 15 - July 26, 1984)

Name	Designation	Organization
IMAZU, Takeshi	Team Leader	Basic Design Division, Grant Aid Department, Japan International Cooperation Agency
KOTOBUKI, Kazuo	Technical Advisor	Fruit Tree Research Station, Ministry of Agriculture, Forestry and Fisheries, Japan
KOBAYASHI, Keisaku	Consultant Team Leader, Agronomist	Chuo Kaihatsu Corporation
OCHI, Hirotaka	Irrigation Engineer	Chuo Kaihatsu Corporation

**STUDY TEAM ITINERARY**  
(July 15 - July 26, 1984)

Date	Stay	
Jul. 15 (Sun)		Leave Tokyo - Arrive Paris
16 (Mon)		Leave Paris
17 (Tue)	Nairobi	Arrive Nairobi Courtesy call to Embassy of Japan
18 (Wed)	"	Courtesy call to MALD Submission of Draft Final Report Field survey on the Project Site
19 (Thu)	"	Visit Factory and Nursery of the Kenya Nut Company Meeting w/MALD
20 (Fri)	"	Meeting w/MALD
23 (Mon)	"	Meeting w/Ministry of Finance Meeting w/MALD
24 (Tue)	"	Meeting w/MALD Preparation of minutes
25 (Wed)	"	Exchange of signatures on the minutes Leave Nairobi
26 (Thu)	"	Arrive Tokyo

**CONTACT LIST**  
(July 15 - July 26, 1984)

1. Ministry of Agriculture and Livestock Development

D. NAMU	Permanent Secretary
W. E. ADERO	Chief, Crop Production Division
F. P. MUEMA	Head, Horticultural Crop Branch
N. N. KAMINCHA	Senior Agri. Officer, Horticultural Crop Branch
A. E. O. CHABEDA	Asst. Director, Agricultural Research Division
J. J. ADALA	Senior Research Officer, Agricultural Research Division
C. N. GATHUNGU	Deputy Director, NHRS

2. Ministry of Finance and Planning

C. N. MWANGEMI	Senior Assistant Secretary
----------------	----------------------------

3. Embassy of Japan

O. NAKANO	First Secretary, Embassy of Japan to Kenya
-----------	--

4. JICA Nairobi Office

S. YANAI	Resident Representative in Kenya
T. NAGASHIMA	Deputy Resident Representative

5. JICA Experts

S. HIRAMA	JICA Expert
T. IWASAKI	JICA Expert

6. Kenya Nut Company Ltd.

J. K. NJERU	General Manager
Y. SATO	Managing Director
J. SAKABE	Farm Manager

REPORT OF PROF. R.A. HAMILTON\*

## I. INTRODUCTION

In accordance with a request from the Government of Kenya for assistance in Macadamia nut production, the Food and Agriculture Organization of the United Nations under the United Nations Development Programme (Technical Assistance Sector) appointed Mr. R.A. Hamilton as Macadamia Nut Specialist. Mr. Hamilton served in Nairobi from 18-28 June and 15-27 July 1971. His terms of reference were: to examine the present research, field trials and expansion plans for Macadamia nut in Kenya. To advise on the most suitable areas for the crop and to advise on lines of research and requirements for such research with special reference to grafting or other ways of vegetative propagation. To advise on the establishment of processing and marketing.

With an estimated planted acreage of seven to eight hundred thousand acres of macadamia trees planted in the country, there is an urgent need for this information. In some instances young trees are starting to produce with as yet no provision for marketing and processing the nuts.

The survey part of the mission was carried out in a travel programme arranged with the advice and cooperation of the Research Section, the Planning Section and the Horticultural Crops Development Authority in the Ministry of Agriculture. Field trips were arranged to districts where macadamias were being grown or where it was considered possible that they might be grown. Processing problems and possibilities, propagation practices, the problem of which species to grow, lines of research and development for the future were studied and analysed and recommendations made. Quality determinations on representative samples of nuts were made through the cooperation of the East Industrial Research Organization.

## 2. BACKGROUND

There is very little research or technical information on problems of production, processing and marketing macadamia nuts in Kenya. There are still no variety trials in production in spite of the fact that seedling macadamia trees have already been planted in Kenya.

Although seedling macadamia trees grow well in highland areas where there is an excess of 55in of rainfall well distributed throughout most of the year, the present population of seedling trees planted which are relatively low in production, kernel recovery and kernel quality probably

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\* Source: FAO. Report to the Government of Kenya of Macadamia Nut Growing, Marketing, Processing and Research Problems, based on the work of R.A. Hamilton, Rome, 1971, United Nations Development Programme. Report No. TA 2996.

do not provide the basis for a profitable macadamia nut growing industry in Kenya. Nuts produced in present seedling plantings are highly variable in size, shape, shell thickness and oil content compared to those from improved clonal varieties of M. integrifolia. The average kernel weight of M. tetraphylla nuts is only about half that of kernels of selected clonal varieties of M. integrifolia.

It is considered possible that by careful and efficient handling and processing procedures, about 60 percent by weight of kernels from nuts produced by present seedling plantings could be utilized. It should however be made clear that the potential production and income from existing seedling plantings is only about 13 percent of that from comparable orchards of improved clonal varieties of M. integrifolia.

The important problem of which of the two species should be planted has not been fully investigated or resolved. Present plantings consist almost entirely of Macadamia tetraphylla seedlings with a small proportion of seedlings of Macadamia integrifolia and hybrids of the two species.

The productivity of seedling orchards and the processing quality and market acceptance of nuts produced has been investigated only superficially. Because of the large acreage and investment involved, it is important to define and study those problems in detail.

The problem of which of the two macadamia species to plant in the future needs careful study, a definite decision and wide publicity. Nuts of the two species have considerable differences in flavour, texture, composition. Their processing qualities also differ enough so that kernels of M. tetraphylla and M. integrifolia should be processed separately and at different temperatures. Storage life of the two species is also different.

A few improved clones of M. integrifolia have already been imported into Kenya but there are no variety trials of either species yet in production. Variety trials of as many improved commercial varieties as possible are important. It has been well established that production and quality of nuts from seedling trees are inferior and more variable than those obtained from selected clonal varieties.

Development in planting seedlings has preceded research in macadamia production in Kenya. Through reassessment and evaluation methods of solving problems which have become evident in attempting to market and process of problems, research priorities and macadamia nuts are now pertinent if not imperative.

### 3. RECOMMENDATIONS

1. If it is decided to seriously consider continuing the development and growing of macadamia nuts as a commercial crop in Kenya, it is imperative that a decision be reached as soon as possible to top or replace the major part of the highly variable seedling trees now grown. This should be with improved clonal varieties of M. integrifolia, although M. tetraphylla is presently the predominant species in Kenya. There are no proven commercial varieties of M. tetraphylla since this species has



never been grown successfully as a commercial crop. World processing of macadamia nuts is presently based almost entirely on nuts from selected clones of M. integrifolia.

2. It is believed that the choice of M. tetraphylla as a suitable species of orchard planting to establish a new commercial crop in Kenya was probably a mistake. It would be risky and perhaps disastrous to continue to rely on M. tetraphylla seedlings as a source of macadamia nuts for development of a large scale commercial processing industry.

3. It should be made clear and fully understood that the bulk of macadamia nuts presently produced in Kenya are not of the same type and species as those of commercial clones of Macadamia integrifolia grown and processed in other countries for the world market. Nuts of the two species involved are not fully comparable in uniformity, flavour, quality and oil content.

4. Planting material presently available to farmers consists mostly of heterogeneous unselected M. tetraphylla seedlings, highly variable in productivity, growth characteristics and nut and kernel quality. These seedlings grow well enough to be satisfactory as rootstocks of selected clones of M. integrifolia. M. tetraphylla seedlings should not, however, be considered as approved nursery stock suitable for orchard planting. Size, shape, quality and shell thickness of nuts, as well as productivity of individual trees, is too variable to expect satisfactory results in an orchard or produce adequate yields of nuts suitable for commercial processing.

5. Present seedling plantings in Kenya, in addition to their considerable potential value as rootstocks for superior clones of M. integrifolia, can also provide basic information of considerable value in determining the adaptation of macadamia in Kenya. This in turn should be of considerable assistance in deciding on the most logical areas in which to locate new plantings of improved commercial varieties. Both M. integrifolia and M. tetraphylla require similar environmental conditions for optimum growth and fruiting, and the rainfall, temperature and soil requirements of both species are similar enough so that information on performance of either species could be readily interpreted in terms of climatic adaptation of the other species.

6. In order to grow macadamia successfully for commercial processing in Kenya, a comprehensive research scheme should be formulated and activated as soon as possible. The experimental programme should include variety selection and testing, propagation and nursery practices, fertilization and cultural research. The experimental programme should be supported on a long time basis and adequately staffed and financed. Variety testing and cultural research should be done in those areas of the country which appear most suitable for growing this crop.

7. At the same time, although there is definitely a calculated risk involved, grafting and topworking of existing seedling trees should be done on as large a scale as practicable, using standard commercial M. integrifolia varieties from Hawaii and Australia. This should be done rapidly as necessary scion-wood can be grown or obtained elsewhere. Seedling macadamia trees presently being planted and grown in the country