ANNEX D. IRRIGATION CANAL

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Through the workshop held on November 25 to 29 in 2002, farmers selected the issues of "Improvement of Irrigation Canal" as one of component of the Pilot Project. Name of the secondary canal to divert irrigation water for the Pilot Project area under the Laclo Irrigation System (LIS) is Inkero.

D.1 Present Conditions of Irrigation Facilities

1) Rehabilitation of Main Irrigation Canal on LIS

Rehabilitation works of main irrigation canal and related facilities on the LIS are under implementation by Urgent Irrigation Rehabilitation Project (UIRP) managing by UNOPS. The main canal in LIS has 13 secondary canals and 660 ha of total irrigation area. The UIRP aims to improve the condition of agriculture production through rehabilitation of irrigation facilities in Manatuto district.

The UIRP is divided into two phases, and phase I has already completed by the end of October 2001. After that, the phase Ⅱ works are on going to convey the irrigation water from Laclo river to the terminal on-farm areas. The Phase II works started from January 2003.

The following facilities of the LIS will be rehabilitated through the two phases;

Phase I:
- Protection dike along Sumasse river
- Repair works of main canal in lower reaches main
- Construction for WUA building
- Procurement of operation and maintenance (O&M) equipment

Phase II:
- Construction of Laclo free intake
- Reconstruction of Sumasse siphon
- Reconstruction of culvert
- Repair of upper reach main canal
- Repair of O&M roads
- Procurement of O&M equipment

2) Inkero Secondary Canal and On-Farm Facilities

The site of the Pilot Project is located in about two kilometer away from Manatuto town in the southern direction. For this area, the irrigation water is diverted at the left side of close by No.7 turnout set along the main irrigation canal.

The main irrigation canal and related facilities such as turnout are under rehabilitation as mentioned above. The URIP, however, does not deal with the rehabilitation works of secondary irrigation canal and on-farm facilities. The present condition of secondary irrigation canals are

not in well conditions due to the sedimentation of soil, overgrow the grass in the canal and so on. It could be considered that these conditions are caused by lack of routine maintenance works by farmers. And also, the clayey and silty soils are accumulated in the secondary irrigation canal.

There are eight pipe culverts crossing the road in the Pilot Project area. These facilities collect the irrigation water that comes from paddy field located in upper portion by plot-to-plot irrigation and convey it to lower portion. Conditions of them are also poor. There exists much sediment in the pipe by debris and/or trash due to lack of maintenance works.

Inkero secondary irrigation canal supplies water for about 45 ha of paddy field as one of part of LIS. Irrigation water is diverted from close by downstream of No.7 turnout that was reconstructed by the UIRP managed by UNOPS.

The length of the secondary canal is one kilometer from turnout to the fields of the Pilot Project. The canal size is about 0.7 m of width. Inkero secondary canal has also bulk sedimentation conveyed from Laclo river and grasses. The soil condition is very difficult for digging by manually because of clayey soil type. It seems that, therefore, farmers don't have the interesting in casual maintenance works of the canal.

3) Irrigation Methods in the Pilot Project Area

The Pilot Project is located on about two kilometer down stream from Laclo river intake that will be rehabilitated by UIRP as a part of the project. In the field of the Pilot Project area, two types of irrigation methods are practiced, that is, plot-to-plot irrigation and continuous irrigation methods. The small canals that are on-farm canals gather the irrigation water coming from higher area by plot-to-plot irrigation and conduct them to pipe culvert crossing the road as mentioned above.

D.2 Improvement of Inkelo Secondary Irrigation Canal

In the Pilot Project, the Study Team tried to improve the Inkero secondary irrigation canal that aligns from the main irrigation canal to the field around the Pilot Project. The principle and progress of the improvement of the canal are as follows;

- Survey and design were done by Study Team,
- Improvement works such as excavation of the sedimented soils were done by farmers themselves,
- Materials and tools for the improvement works such as excavation, digging of sedimented soils are procured by Study Team on the cost-sharing basis, and
- NGO's staff (CARE) assist farmers with the Study Team.

1) Survey Work

Following survey work to design the improvement plan of Inkero secondary canal was

done the Study Team;

- Survey period : from November 30 .to December 7 2002
- Survey items : Longitudinal and cross section survey
- Length of surveyed canal : L= 983 m
- Interval of cross section : @40 m, total 27 sections
- Working staff : Surveyor (1ps.) and assistant (2ps.) hired by the Study Team

2) Design Work of Canal Improvement

The Study Team did the design work for canal improvement. The design indicates mainly the depth of digging the existing Inkero secondary irrigation canal bed in order to divert irrigation water properly from main canal. The design drawings are referred to Drawing No. D-1 to D-4.

The dimensions for designing the canal are given below following the figures applied in the design in the UIRP report.

- Irrigated area : 45 ha
- Unit water demand : 5.05 litter/sec/ha
- Design discharge : 0.23 cu.m/sec

3) Improvement Works of Inkero Secondary Canal

After the designing the canal, the improvement work such as removing the sedimented soils in the canal was done by farmers as shown below;

- Period : From December 8 to December 20, 2002
- Item of works : Digging/desilting work, volume of desilting 250 cu.m
- Participants : Man powers are shouldered by farmers (15-20 farmers)
- Materials/Tools : Study Team procured materials/tools depending on result of workshop discussion with farmers as shown below;
  - · Shovel 30 nos.
  - · Hoe 17 nos.
  - · Aiswak (local call) 35 nos.
  - · Katana 35 nos.

D.3 Improvement Schedule for Canal Cleaning and On-Farm Facilities

1) Control of Sedimentation

River water of the LacLo and Sumasse rivers contain a huge sediments and naturally it will cause a serious sedimentation on the canal and paddy fields, resulting in adversely effect on the canal conveyance efficiency as well as deteriorate the soil fertility and so on. By way of

prevention of these situations, a scouring slice gate for the Laclo intake, a sand settling basin and flushing gate for the Sumasse siphon are equipped on the main canal by UIRP.

However, it is very difficult to prevent the secondary canal from sedimentation perfectly. Then, desiliting works will be needed on secondary canal and on-farm facilities such as pipe culvert setting for crossing the road as routine/periodical maintenance work.

2) Schedule for Canal Cleaning and On-Farm Maintenance

Farmers have maintained the secondary canal at starting time of cropping season. They spend one week for grass cutting and two weeks for the desilting work in the canal. However, these maintenance works are done only one time a year. All farmers have to participate in the maintenance work. He who does not attend on this duty has to pay the penalty such as contribution of livestock to community or to be stopped of irrigation water to his paddy field. They call it "Traditional Way".

The maintenance works are divided into two categories to keep the irrigation facilities operational and properly functioning at all times as shown below;

a) Routine Maintenance Works

The routine maintenance works are done during cropping season, and include cutting of grasses at canals, particularly its inner sections. The works also include desilting and removal of debris in the secondary canal.

b) Periodical Maintenance and Repair Works

The periodical maintenance and repair works are done prior to the start of or just after a cropping season. The works related to the secondary canal and related facilities include; i) re-shaping of the canal slope; ii) removal of silt or sediments inside the secondary canals; iii) removal of debris and other obstructions.

D.4 Operation and Maintenance Plan of Inkero Secondary Canal

1) Present Water Management along the Canal

There are about 40 farmers along the Inkero secondary canal. So far, they have discussed the way of share for irrigation water on starting time of land preparation season. They settle the order to intake the irrigation water to respective paddy field. This way might function well when the flow of irrigation water in the main canal is sufficiently, however, it causes a problem during the cropping season. Actually, the paddy fields where are located on the downstream reaches could not receive thee irrigation water sufficiently.

Farmers who has own land in the upstream reaches along the canal have advantage because of the location of his land is just upstream. The reverse also true, namely when his land lies on downstream reaches along the secondary canal has disadvantage for providing the irrigation water.

In addition, there are no division boxes along the Inkero secondary canal. Farmers provide temporally weirs using soil, grass, twig etc. to divert the irrigation water. Under these situations, it is difficult to distribute exactly the irrigation water based on their agreement decided by farmers themselves. The current water management has been undertaken roughly.

2) Provision of Division Box (refer to Drawing No. D-5)

The irrigation water use is basically freely along the secondary and tertiary canals, because the water delivery method at on-farm level is the plot-to-plot irrigation in the Pilot Project area as mentioned previously. Therefore, during the period of the irrigation water supply, the irrigation water would not reach fully to the terminal downstream area. Then, in the Pilot Project, Study Team tried to provide the division box to distribute the irrigation water properly.

For the provision of the division box, local materials such as sand, gravel, aggregate which are collectable materials from the Laclo river is selected to keep the function and sustainability of the division box. Farmers will be able to maintain and repair these division boxes easily.

D.5 Construction of Meeting House

Farmers and the Study Team planed to built a meeting-house to meet the requirements for training, warehouse to store materials/tools and drying paddy after harvesting, in connection with the Pilot Project.

1) Construction of the Meeting-House

a) Site of the Meeting-House

The Study Team discussed with farmers about the suitable site of the meeting-house through the workshop held on November 25 to 29, 2002. Then, farmers selected the site for construction of the meeting-house at the place of the end of Inkero secondary canal in the Pilot Project area. This is a private land, landowner is Mr. Sebastiao de Carvalho, and located beside the provincial road running from Dili to Baucau. The existing conditions of the site selected are used as a garden.

b) Procurement of Construction Materials

Considering the repair and maintenance of the meeting-house, the materials for

construction of the building were procured from Dili and Manatuto. The materials such as sand, gravel, aggregate etc. were procured from Manatuto area as much as possible. The transportation of construction materials was done on December 11, 2002, as shown below;

- From Manatuto : Sand, gravel, aggregate
- From Dili : Timber, cement, nail, iron sheet for roofing

c) Specifications (refer to Drawing No. D-6)

- Building area: : 56 sq.m (8m x 7m)
- Roof: : Corrugated tinplate roof (Iron sheet)
- Circumference: : Palm tree
- Floor: : Ground (in March 2003, floor was paved by concrete)

d) Participants for Construction

Construction work of the meeting-house was mainly implemented by carpenters hired by the Study Team. Farmers participated in some parts of the works such as transportation of materials, land leveling work after completion of building the main body etc.

e) Construction Period

Construction period is ten days from December 11 to 20, 2002.

2) Preparing of the Warehouse

The Study Team discussed with farmers about the warehouse. In consequence, the site of warehouse was selected as below:

a) Agricultural Machinery

Partial farm mechanization will be done as one of components of the Pilot Project. Agricultural machinery such as power tiller, trailer, thresher, rice mill etc. will be used in this component. Then, the warehouse is needed for storing these machines.

The Study Team had some options for selecting of the site of warehouse, that is, new construction, hiring the private house etc. However, the Study Team decided to utilize the warehouse constructed by "Mobile Brigade Project" in Manatuto. Then, the Study Team was permitted to use this warehouse. This warehouse is located at one kilometer from the Pilot Project area.

b) Materials and Tools

Improvement of irrigation canal was done as one of components of the Pilot Project. Some materials and tools such as cement, shovel, hoe etc. were prepared by the Study Team.

Then, the warehouse is needed for storing these materials/tools. In consequence of the discussion with farmers, the Study Team decided to provide the storage in the meeting-house.

In this connection, the Study Team gives the instruction to the farmers how to manage the materials and tools as shown below;

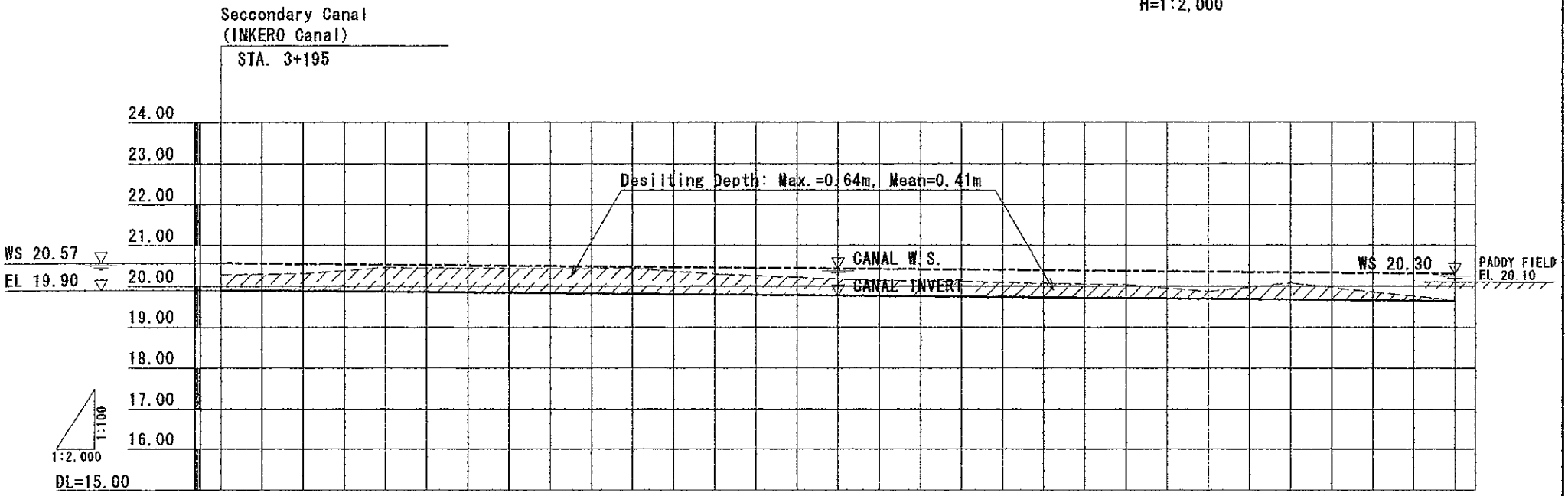
- Nominate responsible person
- Security management
- Book keeping of the material and tools

3) Construction of Dryer for Post-harvest

The Study Team discussed with farmers about the dryer for drying the harvested paddy, and the site of dryer was selected at near the meeting-house. However, since there exists no custom for farmers to dry the harvested paddy on the dryer, such dryer was not provide in the Pilot Project.

LONGITUDINAL PROFILE OF SECONDARY CANAL (INKERO)

SCALE: V=1: 100
H=1:2,000



STATION	DISTANCE (m)	EXISTING SECONDARY CANAL INVERT EL. (m)	DESILTING DEPTH (m)	PROPOSED SECONDARY CANAL INVERT EL. (m)	PROPOSED SECONDARY CANAL W.S. EL. (m)
0+000	0	20.29	0.39	19.90	20.57
0+040	40	20.31	0.43	19.88	20.55
0+080	80	20.47	0.61	19.86	20.53
0+120	120	20.45	0.60	19.85	20.52
0+160	160	20.44	0.61	19.83	20.50
0+200	200	20.45	0.64	19.81	20.48
0+240	240	20.30	0.51	19.79	20.46
0+280	280	20.22	0.45	19.77	20.44
0+320	320	20.14	0.39	19.75	20.42
0+360	360	20.12	0.38	19.74	20.41
0+400	400	20.07	0.35	19.72	20.39
0+440	440	20.04	0.34	19.70	20.37
0+480	480	19.87	0.19	19.68	20.35
0+520	520	20.08	0.42	19.66	20.33
0+560	560	19.86	0.21	19.65	20.32
0+600	600	19.65	0.02	19.63	20.30

PROPOSED SECONDARY CANAL INVERT GRADE: I=1/2200, L=600m

THE STUDY ON INTEGRATED AGRICULTURALS DEVELOPMENT OF EAST TIMOR	TITLE OF DRAWING: IMPLEMENTATION OF THE PILOT PROJECT - CANAL MAINTENANCE -
JAPAN INTERNATIONAL COOPERATION AGENCY	DRAWING No.: D - 1

LONGITUDINAL PROFILE OF SECONDARY CANAL (INKERO)

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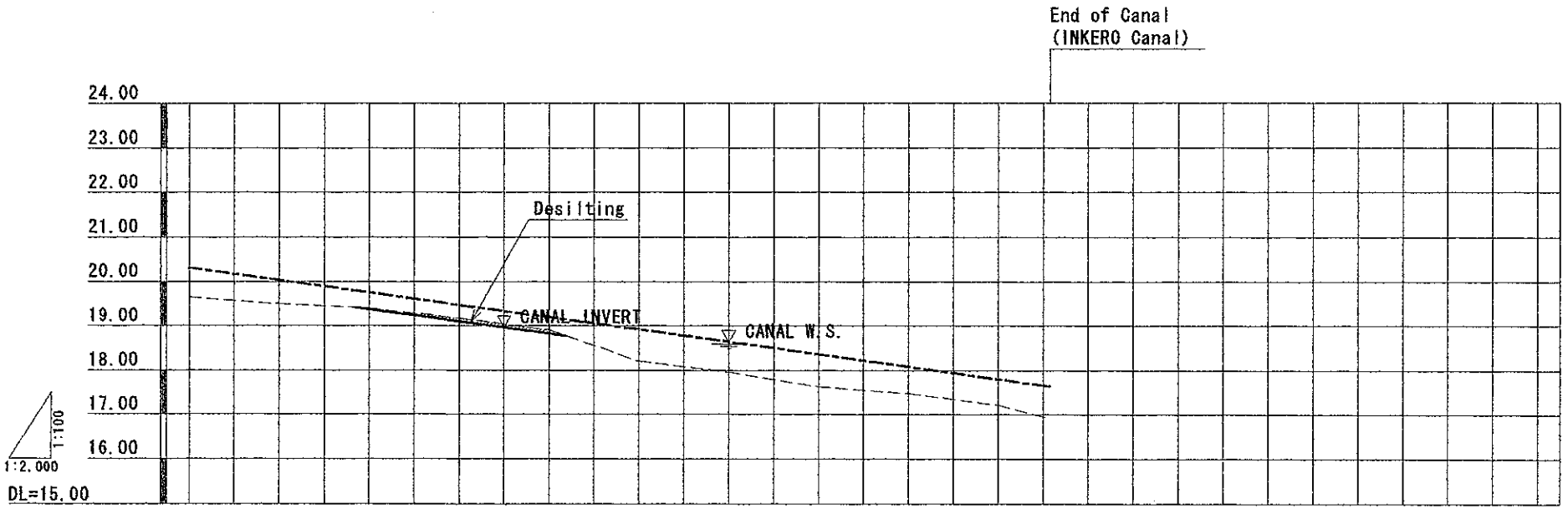

PROPOSED SECONDARY CANAL INVERT GRADE	I=1/150 L=383m										
PROPOSED SECONDARY CANAL W.S. EL. (m)	20.30	20.03	19.77	19.50	19.23	18.97	18.70	18.43	18.17	17.90	17.75
PROPOSED SECONDARY CANAL INVERT EL. (m)	19.65	19.50	19.37	19.10	18.82	18.21	17.96	17.63	17.48	17.22	16.92
DESILTING DEPTH (m)	—	—	0.03	0.07	0.08	—	—	—	—	—	—
EXISTING SECONDARY CANAL INVERT EL. (m)	19.65	19.50	19.40	19.17	18.90	18.21	17.96	17.63	17.48	17.22	16.92
DISTANCE (m)	600	640	680	720	760	800	840	880	920	960	983
STATION	0+600	0+640	0+680	0+720	0+760	0+800	0+840	0+880	0+920	0+960	0+983

THE STUDY ON INTEGRATED AGRICULTURALS DEVELOPMENT OF EAST TIMOR	TITLE OF DRAWING	IMPLEMENTATION OF THE PILOT PROJECT - CANAL MAINTENANCE -
JAPAN INTERNATIONAL COOPERATION AGENCY	DRAWING No.	D - 2

CROSS SECTION OF SECONDARY CANAL (INKERO)

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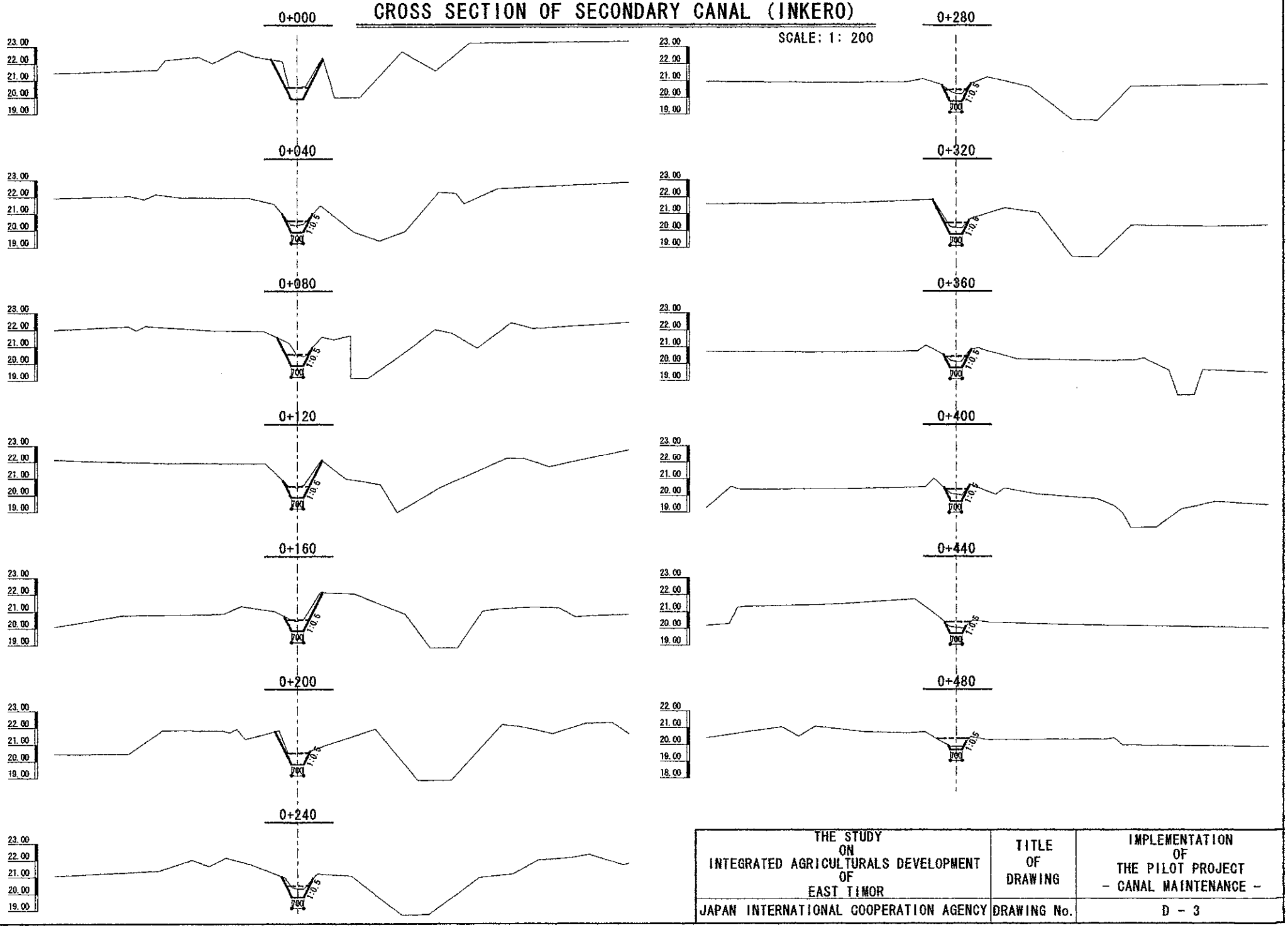

THE STUDY ON INTEGRATED AGRICULTURALS DEVELOPMENT OF EAST TIMOR	TITLE OF DRAWING	IMPLEMENTATION OF THE PILOT PROJECT - CANAL MAINTENANCE -
JAPAN INTERNATIONAL COOPERATION AGENCY	DRAWING No.	D - 3

CROSS SECTION OF SECONDARY CANAL (INKERO)

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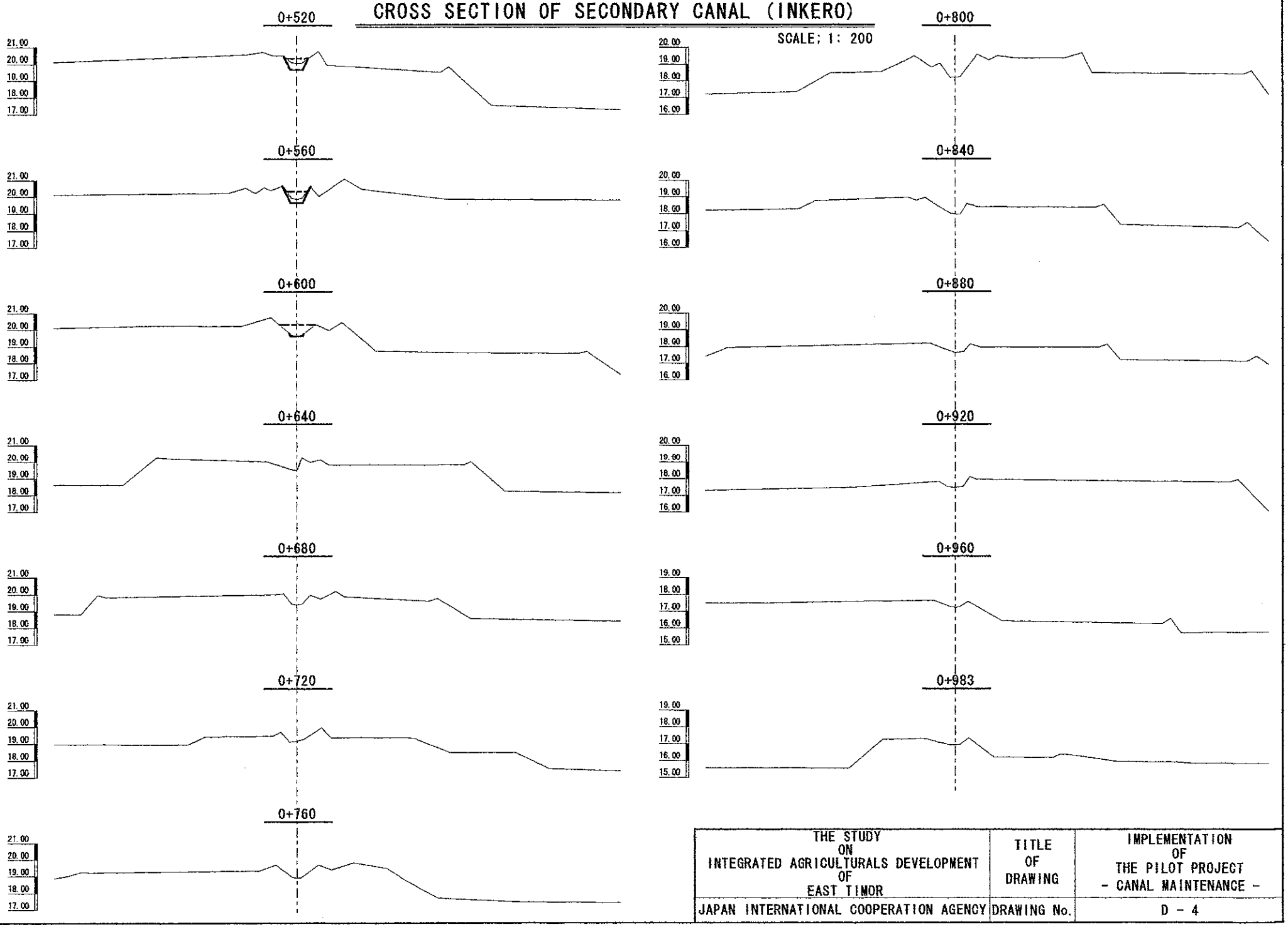
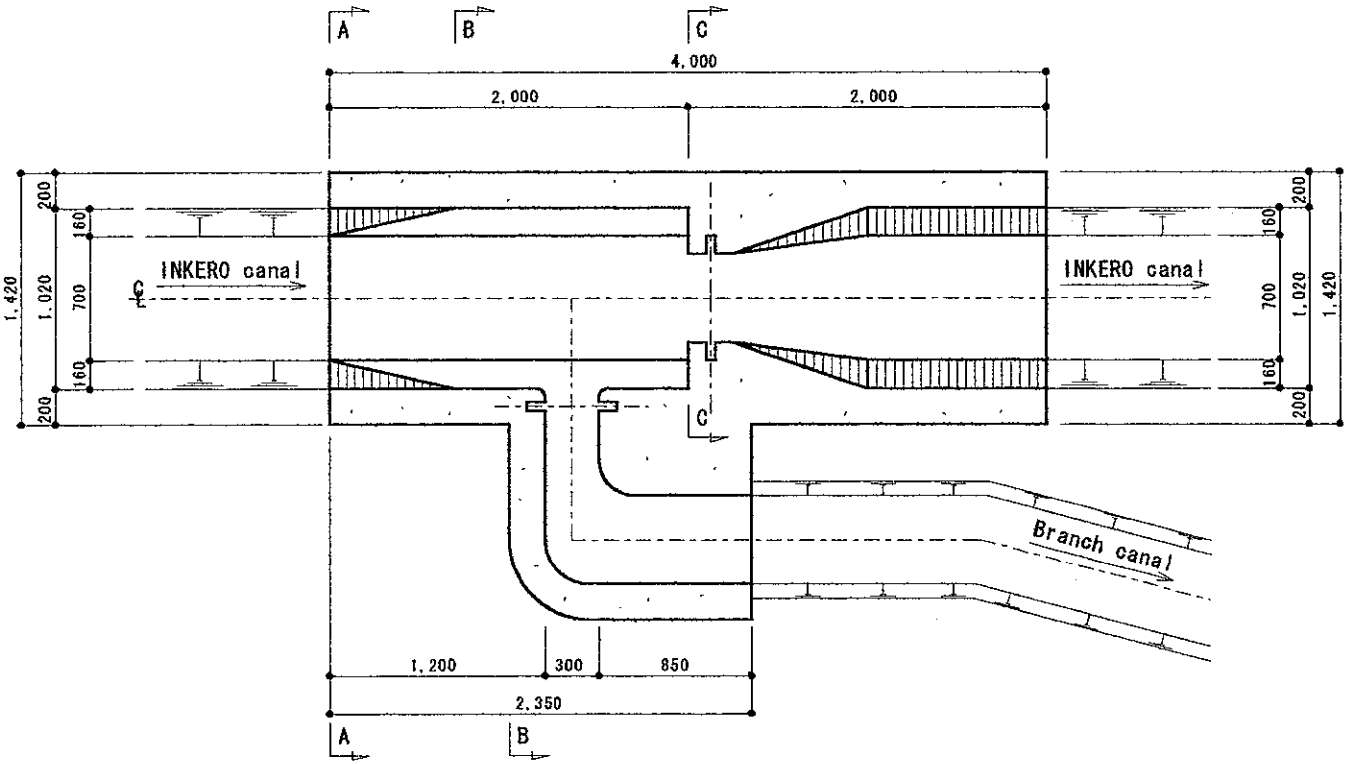


THE STUDY ON INTEGRATED AGRICULTURALS DEVELOPMENT OF EAST TIMOR	TITLE OF DRAWING	IMPLEMENTATION OF THE PILOT PROJECT - CANAL MAINTENANCE -
JAPAN INTERNATIONAL COOPERATION AGENCY	DRAWING No.	D - 4

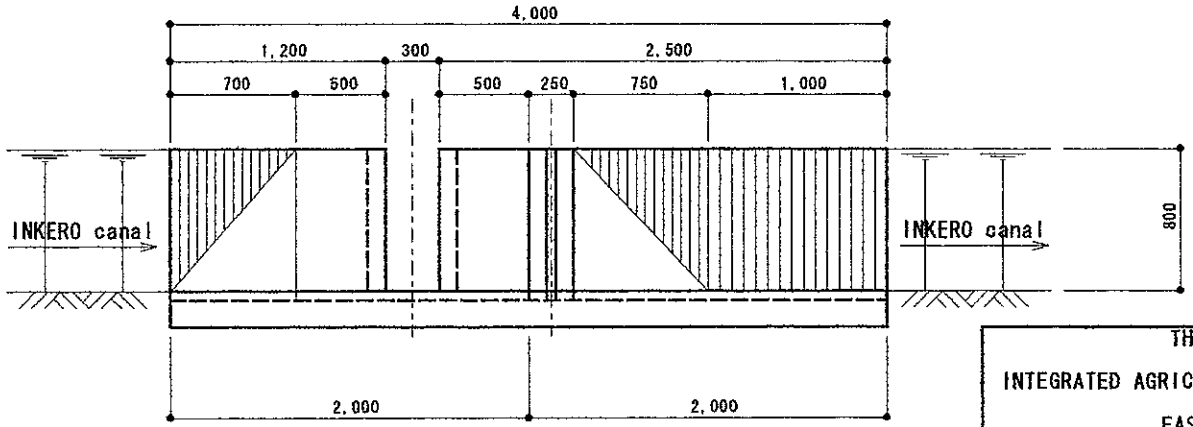
TYPICAL SECTION OF DIVISION BOX (INKERO)

SCALE: 1: 30

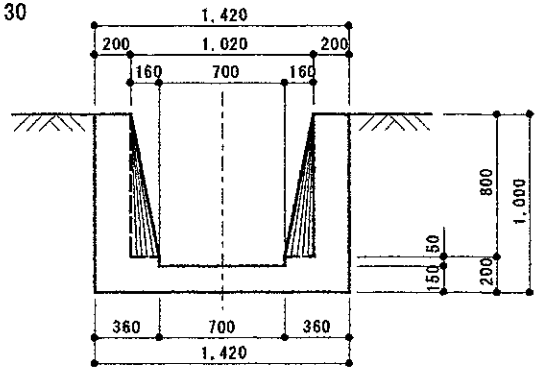
PLAN



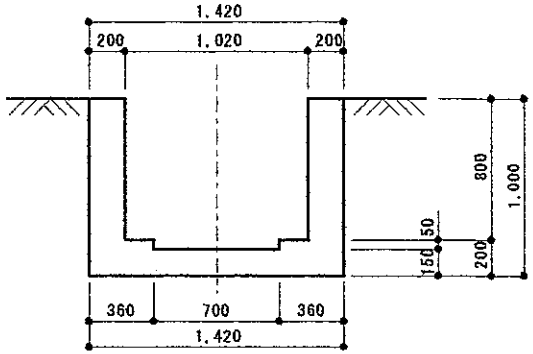
PROFILE



A - A



B - B



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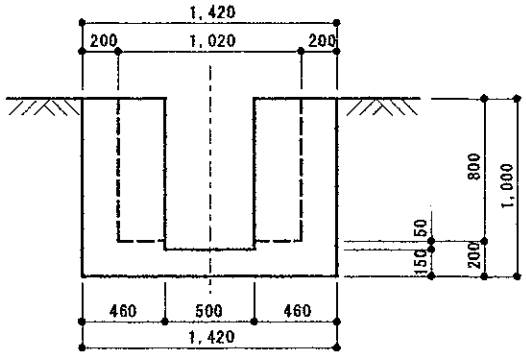


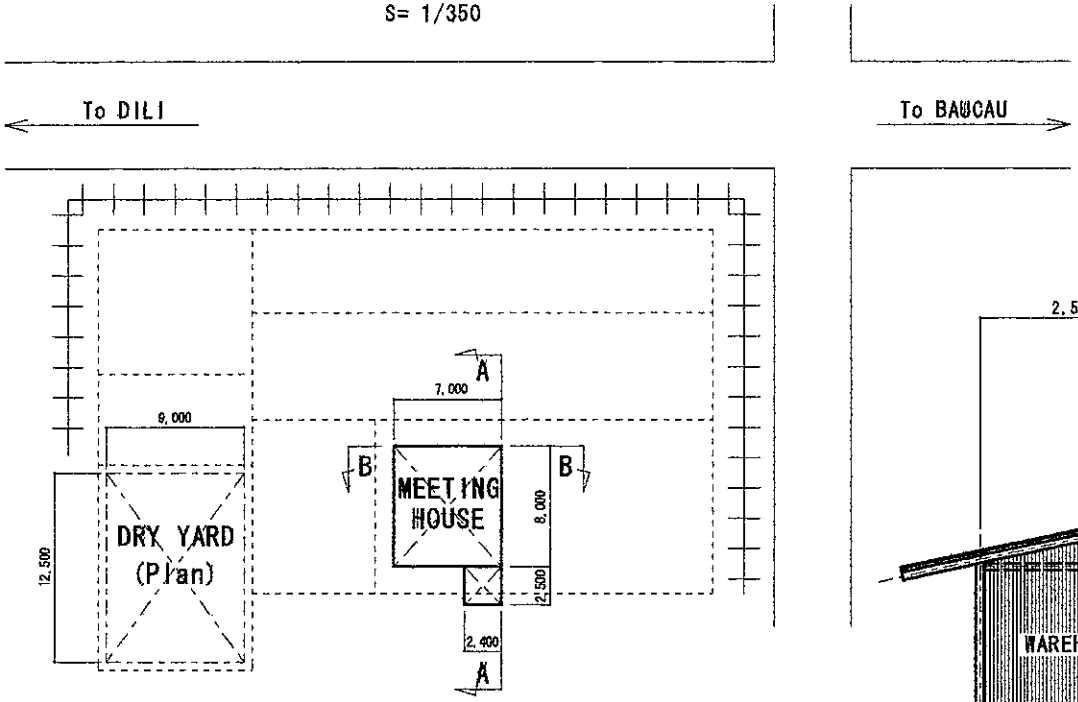
THE STUDY ON INTEGRATED AGRICULTURALS DEVELOPMENT OF EAST TIMOR	TITLE OF DRAWING	IMPLEMENTATION OF THE PILOT PROJECT - CANAL MAINTENANCE -
JAPAN INTERNATIONAL COOPERATION AGENCY	DRAWING No.	D - 5

TYPICAL SECTION OF MEETING HOUSE

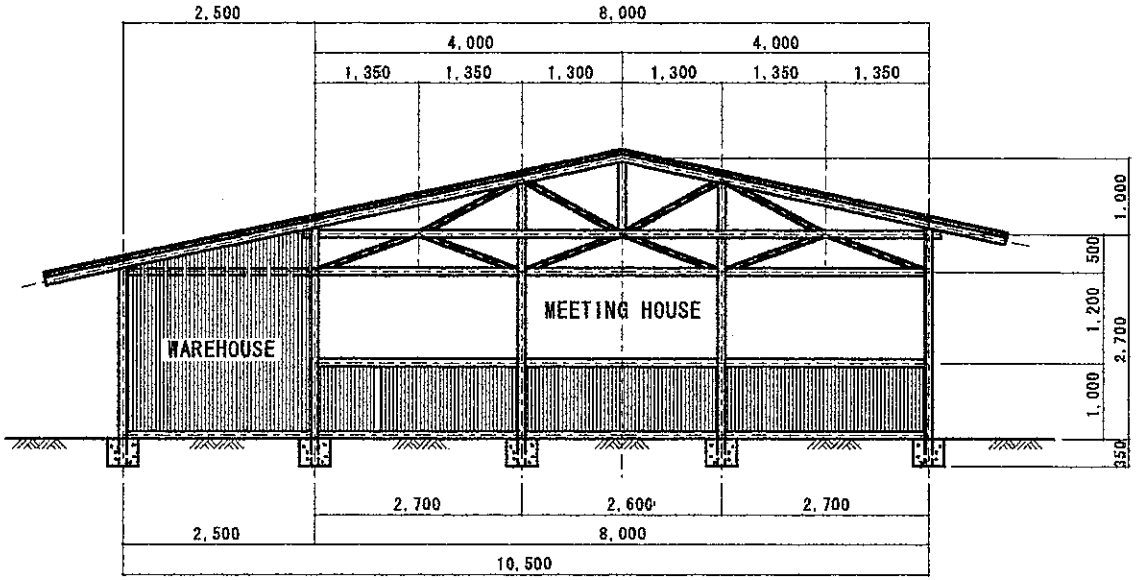
LOCATION MAP

S= 1/350

S= 1/ 70



A - A



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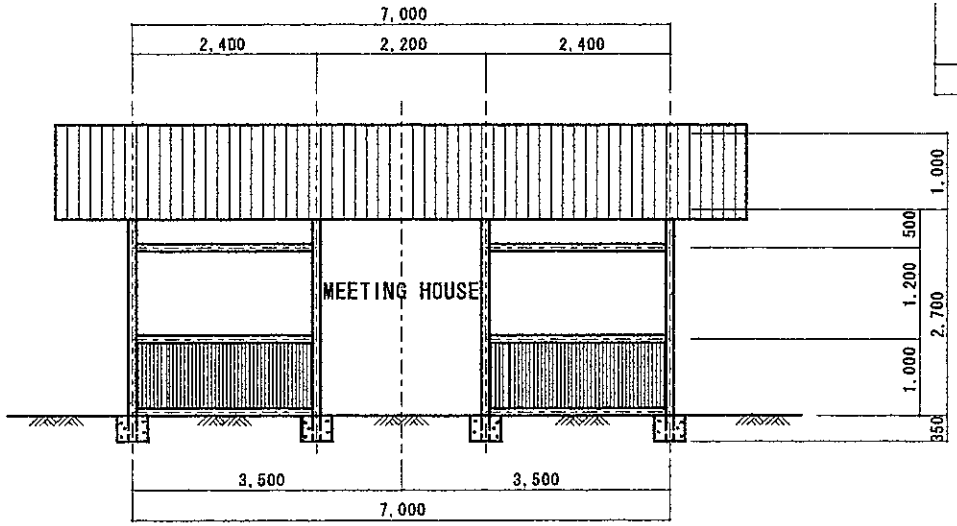
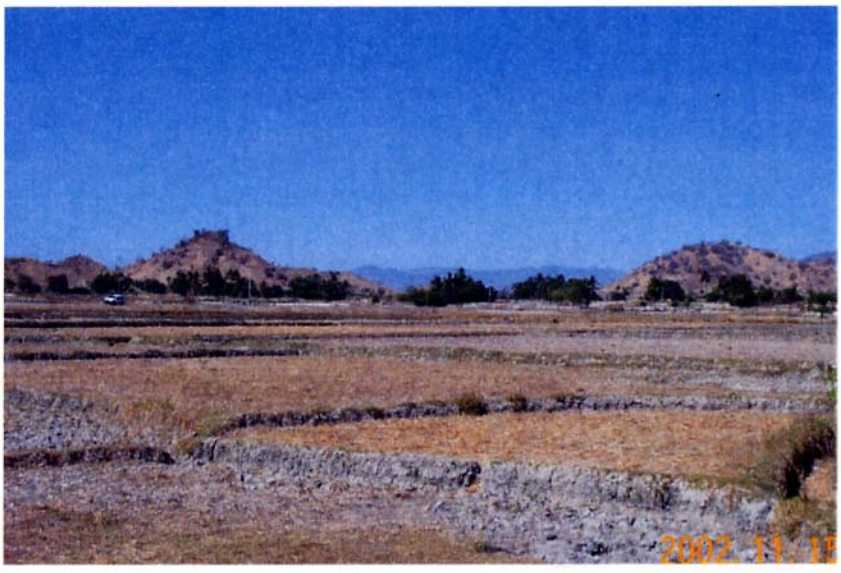


THE STUDY ON INTEGRATED AGRICULTURALS DEVELOPMENT OF EAST TIMOR	TITLE OF DRAWING	IMPLEMENTATION OF THE PILOT PROJECT - MEETING HOUSE -
JAPAN INTERNATIONAL COOPERATION AGENCY	DRAWING No.	D - 6

The Pilot Project Area

View of the pilot project area. This is located at 2 km from Manatuto town.

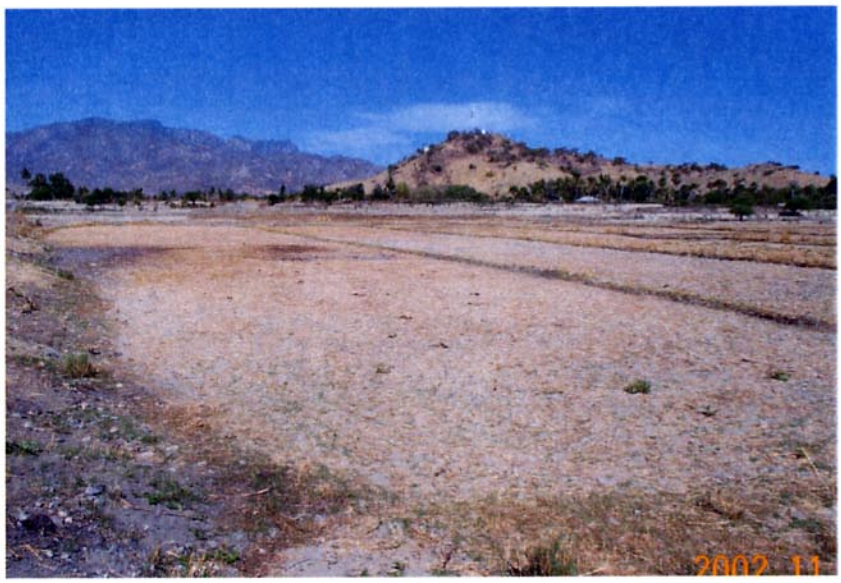
The Pilot Project Area



Paddy Field Condition

Paddy Field Condition

The irrigation system is plot-to-plot irrigation method.



Paddy Field Condition

Paddy Field Condition

The clayey and silty soil at the area irrigated. This type of soil gets hard after irrigation.

Secondary Canal condition

The secondary canal (*Inkerc* canal) is covered by grasses and sediments due to lack of maintenance work.

Secondary Canal Condition

Ancillary Facilities

View of the pipe culvert for road crossing. The entire is plugged a lot of sedimentation and debris.

Canal Cleaning

View of grass cutting by farmers concerned.

Canal Cleaning

Canal Maintenance

View of de-silting work along the *Inkero* canal.

Canal Maintenance

View of de-silting work along the *Inkero* canal.

Canal Maintenance

After de-silting work.

Canal Maintenance

After de-silting work.

The Meeting House

The site of meeting house proposed. This is located at the end of secondary canal(*Inkero* canal).

The Meeting House

View of under construction

The Meeting House

View of after construction