

HYDROLOGICAL PROCEDURE NO. 24

ESTABLISHMENT OF AGRO-HYDROLOGICAL STATIONS

1982



JABATAN PENGAIRAN DAN SALIRAN
KEMENTERIAN PERTANIAN MALAYSIA

HYDROLOGICAL PROCEDURE NO. 24

ESTABLISHMENT
of
AGRO-HYDROLOGICAL STATIONS

1982



BAHAGIAN PARIT DAN TALI AIR
KEMENTERIAN PERTANIAN, MALAYSIA

**ESTABLISHMENT
OF
AGRO – HYDROLOGICAL STATIONS**

Contributors:-
T. A. Richards
Tan Hoe Tim

Price:- \$ 3/-

Published and available from:-

**Publication Unit, Ministry of Agriculture
Jalan Mahameru, Kuala Lumpur**

1982

CONTENTS

	Page
1. INTRODUCTION	1
2. SELECTION OF SITE	1
3. INSTRUMENTS	2
4. LAYOUT OF STATION	3
5. CONSTRUCTION OF STATION	3
6. INSTALLATION OF INSTRUMENTS	3
7. OBSERVATIONS	4
8. MAINTENANCE OF INSTRUMENTS	5
9. OBSERVERS	5
APPENDIX A— DAILY READING FORM FOR AGRO—HYDROLOGICAL STATION	

1. INTRODUCTION

The acquisition of adequate agro-hydrological data is essential for the sound planning of agricultural projects. It is evident from past experience that such data were not available in areas where major agricultural development had been carried out. Since 1980, the Drainage and Irrigation Department (D.I.D.) has established agro-hydrological stations in major agricultural development areas in the country. Measurement of parameters such as rainfall, evaporation, temperature, humidity, wind run and sunshine duration, which are necessary for the assessment of water requirement of crops, is being carried out at these stations.

2. SELECTION OF SITE

Good location of the agro-hydrological station is very important and therefore due consideration should be given to the following criteria when selecting the site:-

- (i) The site of the station must be fully representative of the crop-soil-climate conditions of the project area for which the data will be used, and preferably within a cultivated area with a crop cover as large as possible.
- (ii) The site should be on level ground and not close to steeply sloping land. It should be free from obstructions (building, trees etc.) which would affect the observations. To maintain good exposure after selection of the site, planting of shrubs, trees, etc. in close proximity should be prohibited.
- (iii) Since it is intended to measure the parameters over a long period of time, the site should be permanent in nature; i.e. it should be on State or acquired land where there are no possibilities of either building being built or trees being planted in the vicinity in the future.
- (iv) The site selected should be well above the peak flood level and accessible during flood periods. This would ensure that the instruments are safe from floods and readings can be continuously taken without interruption.

- (v) The site should not be far from the dwelling of the observers. This would lead to good punctuality of observers and reliability of observations.
- (vi) The site should not be too close to a main road, but should be accessible by farm roads or field tracks.
- (vii) The ground at the site for the station and the surrounding area should have grass cover. If necessary, the grass cover at the site should be watered during dry spells and the grass regularly cut to maintain a uniform cover. *Under no circumstances should shrubs or other plants be allowed to grow within the station.*

3. INSTRUMENTS

A standard list of instruments to be installed in an agro-hydrological station is as follows:-

- (i) 203mm. dia. daily raingauge complete with accessories.
- (ii) D.I.D. standard aluminium U.S.Class "A" evaporation pan complete with accessories.
- (iii) Standard Stevenson screen containing:
 - (a) maximum and minimum thermometer,
 - (b) wet and dry bulb thermometer,
 - (c) Nakasa weekly thermohygrograph.
- (iv) Negretti & Zambra cup anemometer with counter (at 2 metres height).
- (v) Daily sunshine recorder - Campbell Stokes type complete with levelling device.

For stations established in non-padi areas, additional instruments are to be used for measuring the following parameters:-

- (i) Maximum and minimum soil temperature at 5cm. and 30 cm. depths.
- (ii) Soil moisture at 15cm. and 45cm. depths.
- (iii) Dew-point temperature.

4. LAYOUT OF STATION

It is essential that the layout of the station should be such that each instrument installed does not affect the exposure of other instruments; e.g. the Stevenson screen is not affecting rainfall collection in the raingauge, the shadow of the fence posts is not falling over the sunshine recorder, etc. The detailed layout of the instruments to be installed is shown in Fig. 1.

5. CONSTRUCTION OF STATION

Initially, the site should be cleared and shrubs, grass and other overgrowths should be weeded out. Then the site should be levelled with the aid of a spirit level. The construction of the fencing should be carried out according to the specifications and dimensions as shown in Fig. 2. Care should be taken during construction to refrain from throwing the excavated earth onto the levelled site. It is advisable to check the level of the site after construction of the fencing.

Grass should be planted uniformly inside the fenced area and extended to the outside of the fenced area to a distance of at least 1 metre in all directions. Hand watering should be done frequently until the grass takes roots and is regularly cut to maintain a uniform cover.

6. INSTALLATION OF INSTRUMENTS

All the instruments required for the agro-hydrological station forming part of the overall network design in the country, will be supplied and installed by the Hydrology Branch, D.I.D. Headquarters, Kuala Lumpur. It is important that the State Hydrological Officer or officer in charge of the project area should inform the Hydrology Branch immediately after completion of the construction of station and site preparation so that arrangement could be made for the final installation of the instruments. Fig. 3 shows a typical agro-hydrological station installed in Tanjong Karang Irrigation Project Area where padi is a major cultivated crop.

7. OBSERVATIONS

7.1 Use of Standard Observation Form JPT.34

As continuous daily observations of the instruments are the final outcome of the establishment of the agro-hydrological station, effort should be made to carry out the task at the stipulated time including public holidays. The readings of the parameters taken should be entered in a Standard Form JPT.34 entitled "Bacaan Harian bagi Stesen Agro-hidrologi" which is supplied by the Hydrology Branch, D.I.D. Headquarters or reproduced at the State D.I.D. Office as shown in Appendix A.

The readings on the left hand side of the Form are to be taken once a day at 7.00 a.m. The readings on the right hand side of the Form are to be taken three times a day at 7.00 a.m., 1.00 p.m. and 7.00 p.m. All columns are to be filled in by the observer except those columns marked with an asterisk (*) which shall be filled in at the Hydrology Branch, D.I.D. Headquarters.

7.2 Daily Rainfall and Evaporation Observations

Daily rainfall and evaporation observations at the agro-hydrological station should be taken independently of the other agro-hydrological parameters once a day at the standard time (i.e. 8.00 a.m.) in accordance with the standard D.I.D. procedure. Rainfall cards (JPT.6 Pin.2/78) together with the evaporation forms should be used and the completed monthly data submitted to the Hydrology Branch, D.I.D. Headquarters in the usual procedure as for other rainfall and evaporation stations using the respective station numbers assigned to each.

7.3. Field Book Records

All observations should be duplicated or recorded in a Field Book kept at the station. There should be one Field Book kept separately for each of the following observations:-

- (i) Rainfall records
- (ii) Evaporation records
- (iii) Other agro-hydrological records

Care should be taken while duplicating or transferring the values from agro-hydrological data form, rainfall data card and evaporation data form to the respective Field Books. The transferring of values should be done immediately after taking all readings i.e. at 7.00 p.m. each day. This would ensure that a correct set of readings is transferred each day. The duplication of data collected is necessary as a safeguard against the loss of original data during transmission.

8. MAINTENANCE OF INSTRUMENTS

The Hydrology Branch, D.I.D. Headquarters will assist the State Hydrological Officer in carrying out the maintenance, repair or calibration of the instruments. It is essential that the readings of the automatic recording instruments such as the thermohygrograph, be checked regularly with the readings of the manual instrument. If any appreciable error is noticed between the two sets of readings, then the causes of the error must be identified and the error rectified.

A stock of running charts, ink, recording cards and some spares (e.g. thermometers) should be kept at the station. A minimum of three month's requirement of these items should be kept and necessary replacement obtained once a year from the Hydrology Branch. *Under no circumstances should there be a discontinuity in the readings due to non-availability of such items.*

9. OBSERVERS

As stated in paragraph 7, observations are the product of the establishment of agro-hydrological station. Not only should the instruments give correct readings but the observers also should take the readings correctly and enter them in the correct places provided in the Forms. It is not uncommon to find the data collection in the field have been abandoned not due to faulty instruments but due to "faulty" observers. Therefore, it is essential that the observers should be trained properly, so that no errors will be made.

It is advisable to have two well-trained observers. In the absence of one observer, the other could take the readings so that there would be no "missing data". It is important that the observers have some basic education (L.C.E. qualification) and have initiative and good judgement. The observers should be able to detect "faulty readings" such as exceptionally high or low values and inform the officer concerned immediately. Observers should realise that they are performing a scientific experiment and should take all necessary precautions.

It may be necessary that one Technician working in the Project, located nearby to the agro-hydrological station, be assigned to be in charge of the observers. He should be well conversant with the instruments, standard forms used, parameters measured and also the "normally expected" values of the parameters. He should also be aware of the cause and effect of the parameters and the readings, so that errors could be checked and rectified. He should be responsible for checking the recorded daily forms and charts and forwarding the data weekly to the State Hydrological Officer. In case of any doubt, he should consult his superior officer on any matter related to this work.

The Technician should also be responsible for the maintenance of the station (i.e. cutting of grass, tidying up of the surrounding area, etc). He should promptly attend to problems encountered and reported by the observers and seek advice from the State Hydrological Officer, if required.

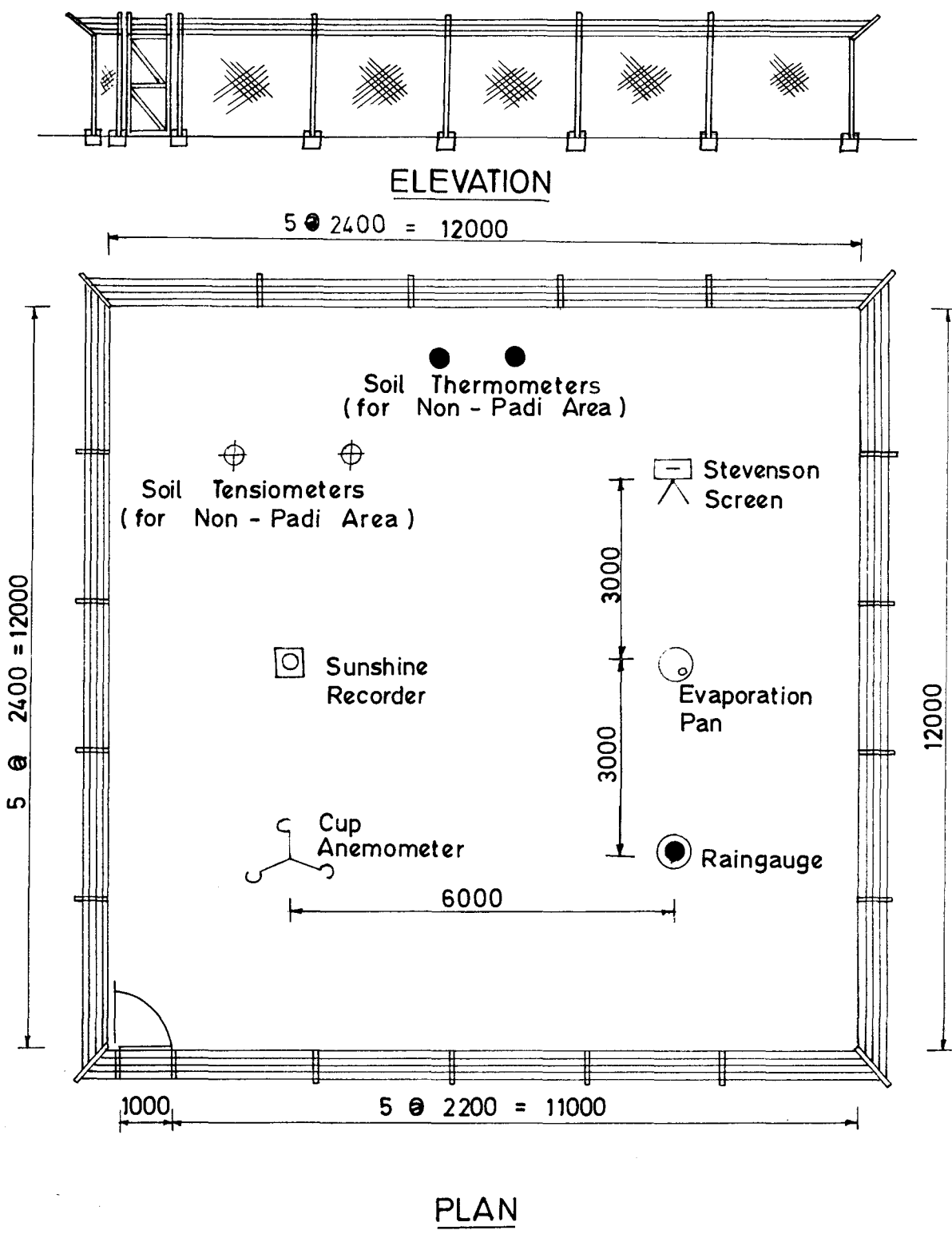


FIG. 1:- LAYOUT OF AGRO-HYDROLOGICAL STATION

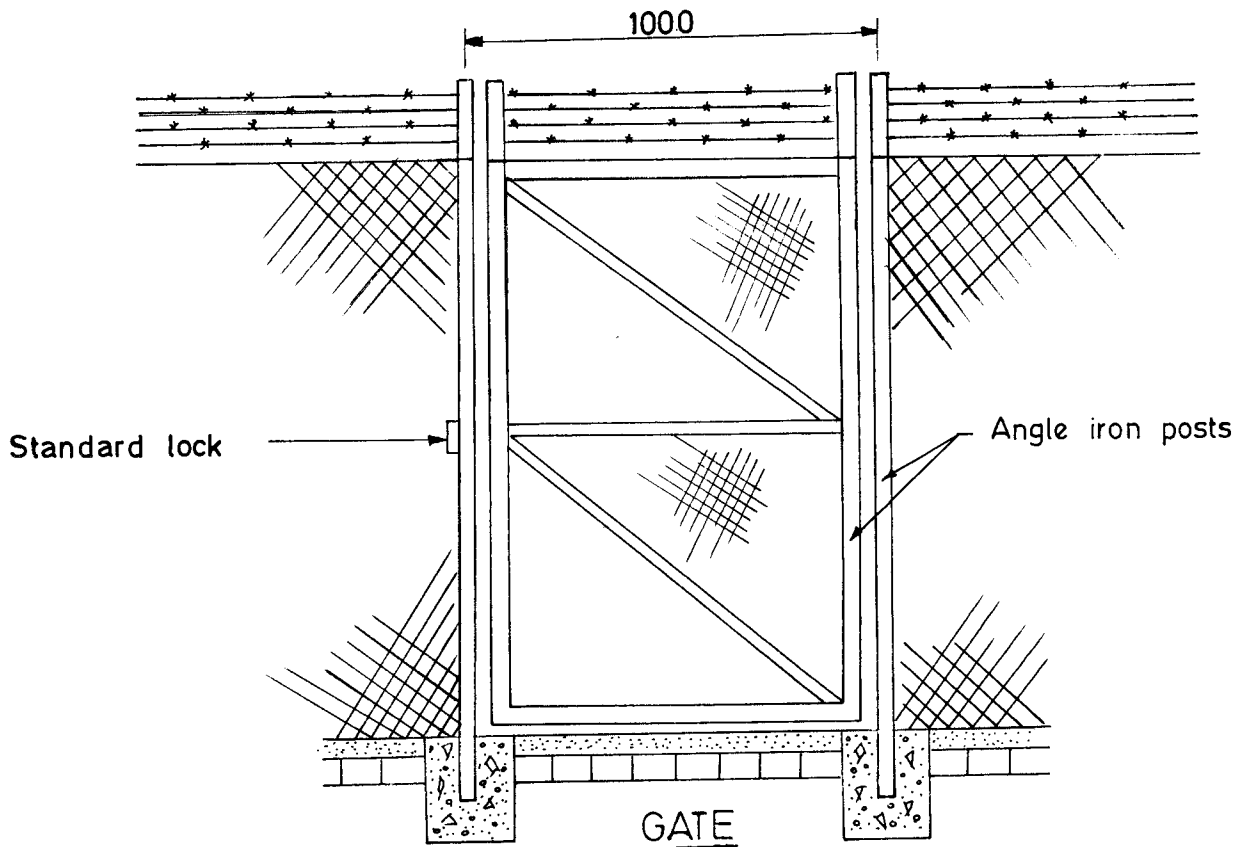
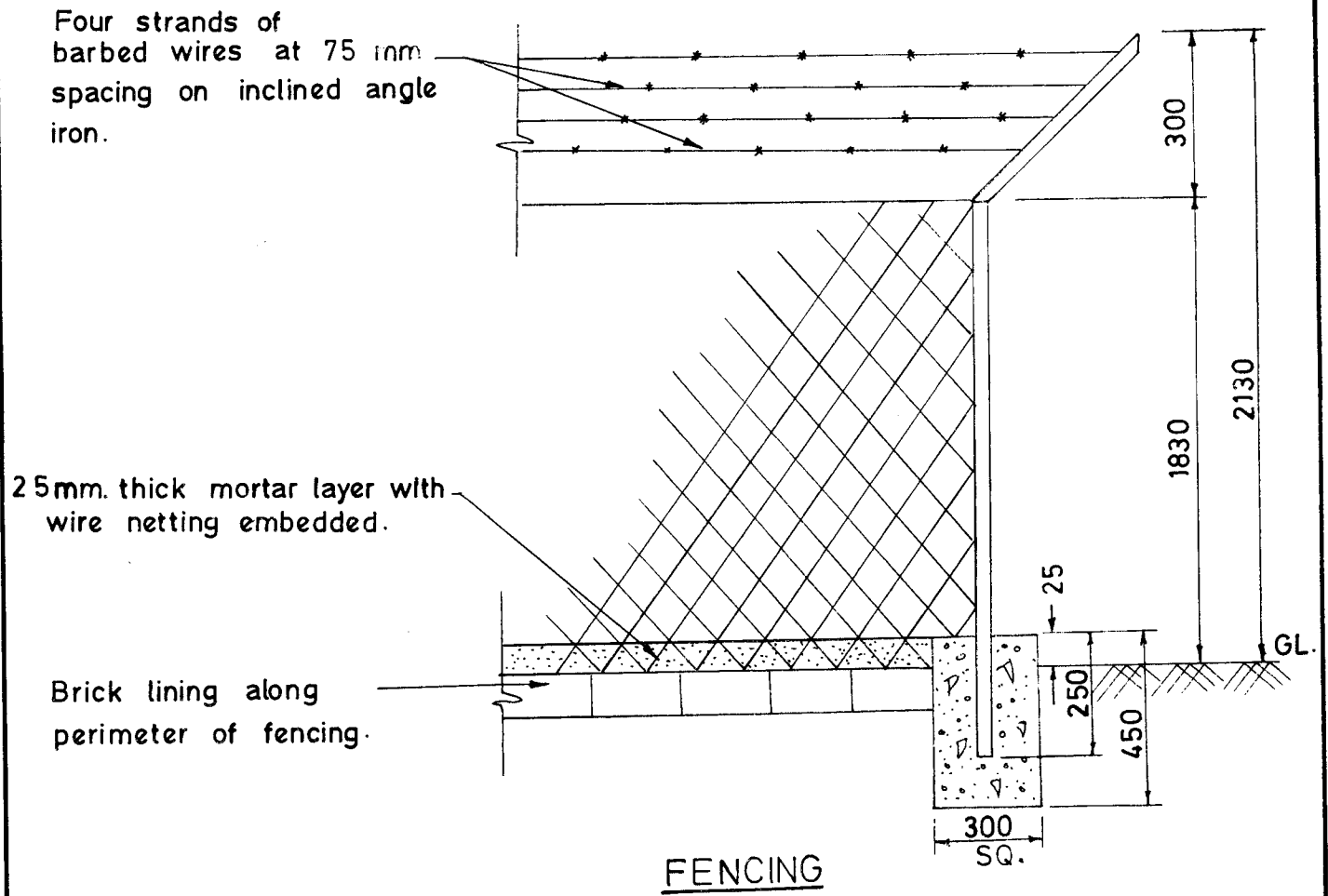


FIG. 2:-DETAILS OF FENCING AND GATE

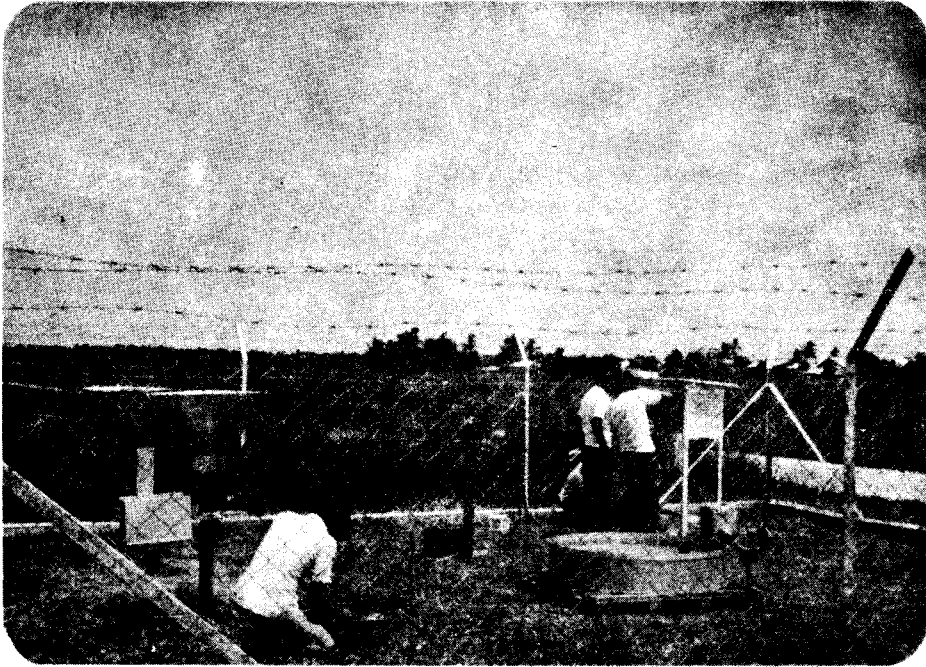


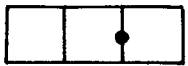
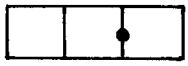
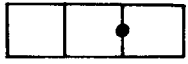

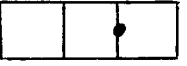
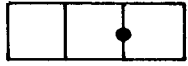
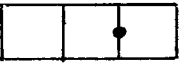
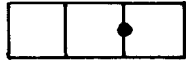
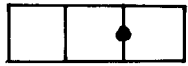

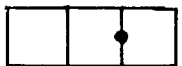
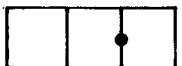




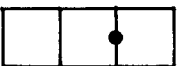
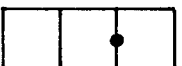
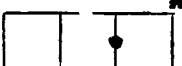
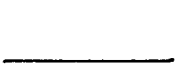






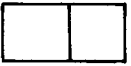

FIG. 3:- AGRO-HYDROLOGICAL STATION INSTALLED
IN TANJONG KARANG IRRIGATION PROJECT
AREA

JABATAN PARIT DAN TALI AIR
BACAAN HARIAN BAGI STESEN AGRO-HIDROLOGI

APPENDIX A

(JPT: 34)

L-J.P.N., K.L.

<p>PERINGATAN: Isikan semua ruangan kecuali ruangan ditanda dengan (*). Ruangan ini adalah untuk kegunaan Ibu Pejabat sahaja.</p>	Nama Stesen:	No. Stesen:							
		Tahun:							
	Nama Pembaca:	Bulan:			Tulis Angka Sahaja				
	Nama Penyemak:	Haribulan:							
Bacaan bagi bahagian ini mestilah diambil sekali tiap-tiap hari pada jam 7.00 pagi.					Bacaan bagi bahagian ini diambil tiga (3) kali tiap-tiap hari, iaitu pada jam 7.00 pagi, 1.00 petang dan 7.00 petang.				
<p>1. Suhu Udara Maksima (°C)</p> <p>2. Suhu Udara Minima (°C)</p> <p>3. Kelembapan Bandingan Maksima (%)</p> <p>4. Kelembapan Bandingan Minima (%)</p> <p>5. Suhu Tanah Maksima (°C)</p> <p style="margin-left: 40px;">5cm dalam 30cm dalam</p> <p>6. Suhu Tanah Minima (°C)</p> <p style="margin-left: 40px;">5cm dalam 30cm dalam</p> <p>7. Tempuh Sinaran Matahari (Jam)</p> <p>8. Putaran Angin pada Takat 2.0m (km.)</p> <p style="margin-top: 20px;">Bacaan Hari ini _____</p> <p style="margin-left: 100px;">Perbezaan Bacaan</p> <p>Bacaan Kelmarin * _____</p>	         	<p>MASA</p> <p>9. Suhu Basah (°C)</p> <p>10. Suhu Kering (°C)</p> <p>11. Suhu Takat Embun (°C)</p> <p>12. Bacaan Tensiometer 15cm dalam (centibars)</p> <p>13. Bacaan Tensiometer 45cm dalam (centibars)</p> <p>14. Kelembapan Tanah 15cm dalam (%)</p> <p>15. Kelembapan Tanah 45cm dalam (%)</p> <p>16. Masa data diambil pada</p>	<p>7.00 pagi</p>     <p>_____</p> <p>_____</p>   <p>0 7 0 0</p>	<p>1.00 Ptg.</p>     <p>_____</p> <p>_____</p>   <p>1 3 0 0</p>	<p>7.00 Ptg.</p>     <p>_____</p> <p>_____</p>   <p>1 9 0 0</p>				
CATITAN:			Untuk kegunaan Ibu Pejabat:						

HYDROLOGICAL PROCEDURES PUBLISHED

	<i>Price</i>
No. 1 — Estimation of the Design Rainstorm (1973)	\$8.00
No. 2 — Water Quality Sampling for Surface Water (1973)	\$3.00
No. 3 — A General Purpose Event Water—Level Recorder Capricorder Model 1598 (1973)	\$5.00
No. 4 — Magnitude and frequency of floods in Peninsular Malaysia (1974)	\$6.00
No. 5 — Rational method of flood estimation for rural catchments in Peninsular Malaysia (1974)	\$3.00
No. 6 — Hydrological station numbering system (1974).. .. .	\$3.00
No. 7 — Hydrological Station Registers (1974)	\$5.00
No. 8 — Field Installation and Maintenance of Capricorder 1599 (1974)	\$5.00
No. 9 — Field Installation and Maintenance of Capricorder Digital Event Water Level Recorder (1974)	\$5.00
No. 10 — Stage-Discharge Curves (1977)	\$5.00
No. 11 — Design Flood Hydrograph Estimation for Rural Catchments in Peninsular Malaysia (1976)	\$5.00
No. 12 — Magnitude and Frequency of Low Flows in Peninsular Malaysia (1976)	\$5.00
No. 13 — The Estimation of Storage-Draft Rate Characteristics for Rivers in Peninsular Malaysia (1976)	\$5.00
No. 14 — Graphical Recorders—Instructions for Chart Changing and Annotation (1976)	\$5.00
No. 15 — River Discharge Measurement by Current Meter (1976) . ..	\$5.00
No. 16 — Flood Estimation for Urban Areas in Peninsular Malaysia (1976)	\$5.00
No. 17 — Estimating Potential Evapotranspiration Using the Penman Procedure (1977)	\$5.00
No. 18 — Hydrological Design of Agriculture Drainage Systems (1977)	\$5.00
No. 19 — The Determination of Suspended Sediment Discharge (1977)	\$5.00

No. 20	— Hydrological Aspects of Agricultural Planning and Irrigation Design (1977)	\$10.00
No. 21	— Evaporation Data Collection Using U.S. Class "A" Aluminium Pan (1981)	\$ 5.00
No. 22	— River Water Quality Sampling (1981).	\$ 5.00
No. 23	— Operation and Maintenance of Cableways Installation (1982)	\$ 5.00