REPORT OF RECONNAISSANCE OF

HAURSEAH LANDSLIDE IN CIMANUK RIVER

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1. SURVEY SCHEDULE

1ST	DATE	:OCT. 26-27 1991
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	COUNTERPART	:Ir. Hadi Sudarsono Ir. Suradji
2ND	DATE	:DEC. 30-31 1991
	RESERCHER	:Ir. Agus Sumaryono Ir. Djamal Y. SAKATANI
	COUNTERPART	:Drs. Soepomo Ir. Suradji
3RD	DATE	:FEB. 9-13 1992
	RESERCHER	:Ir. Djamal Y. SAKATANI
	COUNTERPART	:Ir. Sutanto Wardjono Drs. soepomo Ir. Suradji

2. PURPOSE OF SURVEY

Countermeasure against landslide is one of the subject of STC project, and Cimanuk river basin was selected by the preliminary survey team and directorate of rivers as the case study site where the technical development and the training activity of the project will be carryed out. Landslides mainly occerred in the west of Jawa island. especialy more in Cimanuk upstream basin. From within a lot of landslides, Haurseah landslide is proposed as a model which is dealed with in detail by both activities. The purpose of this survey is a introduction of Haurseah landslide and a proposal of the research programme of this.

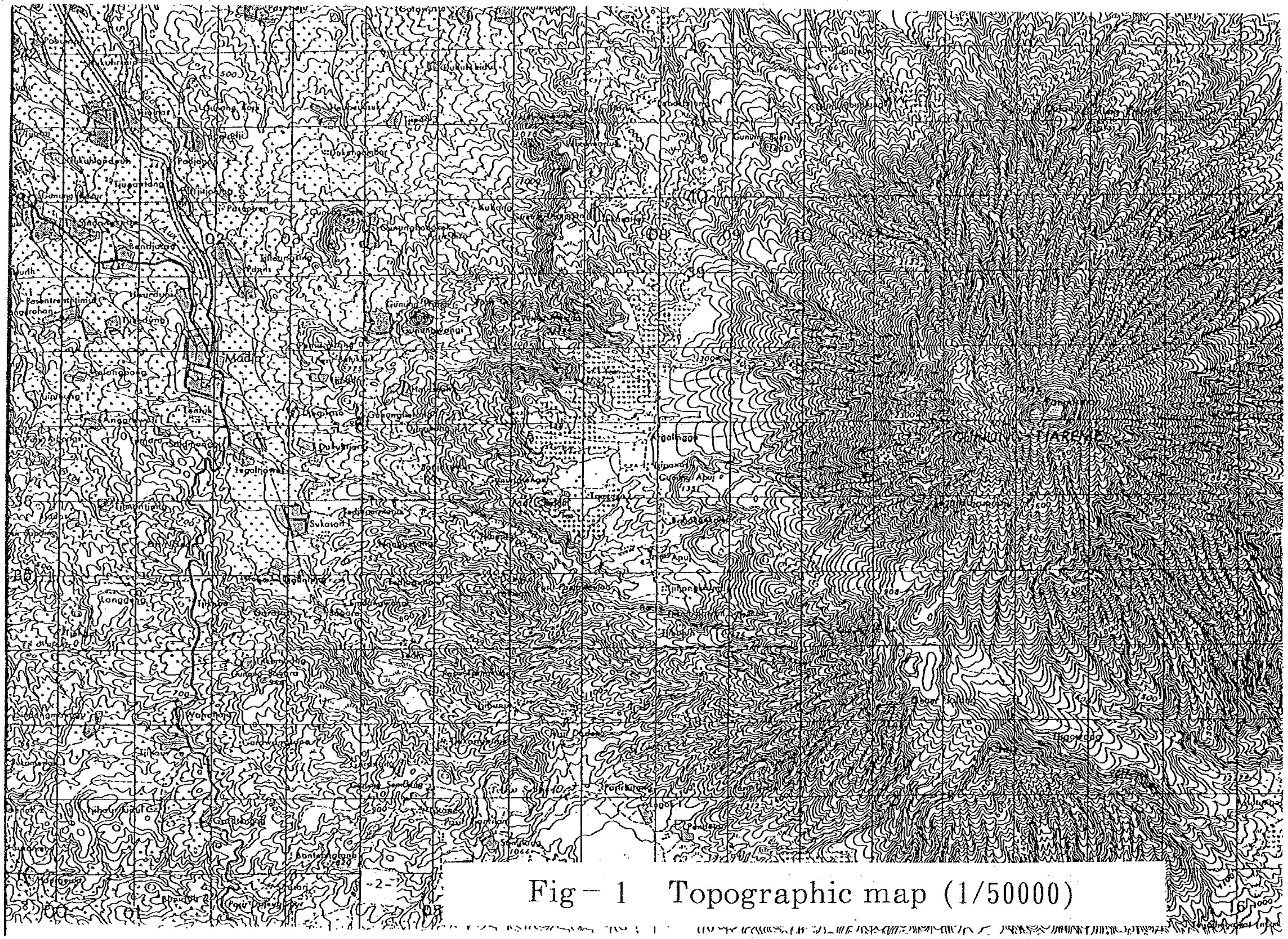
3. RESULT OF SURVEY

3-1 INFERENCE OF SCOPE OF LANDSLIDE

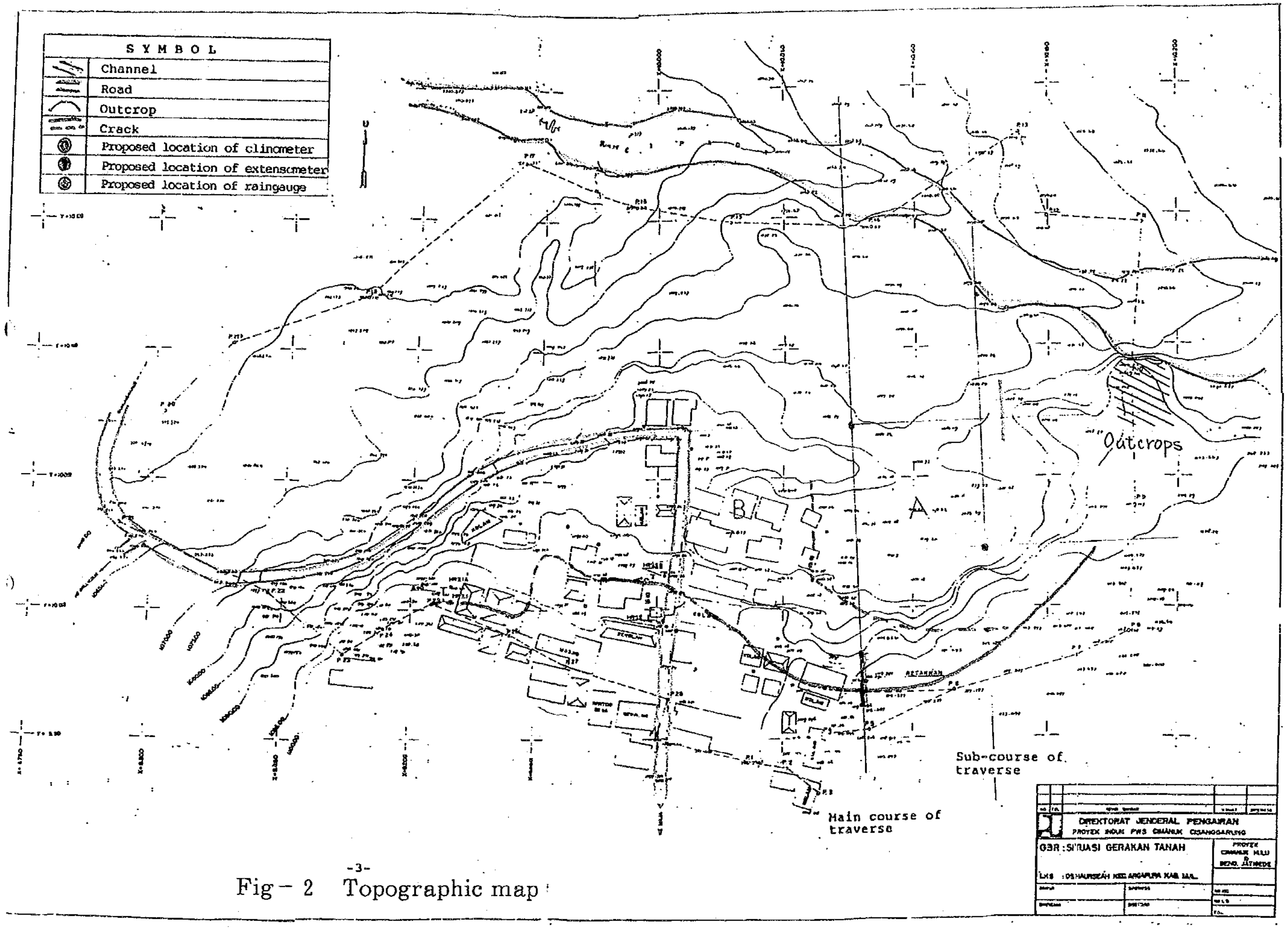
Haurseah village with an altitude of 1100 m locates on the west foot of Volcanic mountain, Ciremai (alt. 3078 m). Cipada river which is on the nouth side of Haurseah village, flows from the middle of slope (alt. 2000 m), down the slope, through the gentle slope, and down the steep slope at just upstream of Haurseah village. Near here it is violent to deposit and scour. Along Cipada river there are three outcrops, and landslides topograp hy can be seen between and besides outcrops. (Fig-1, -2)

Landslide occurred in the village which is on the talus. The report which was written by Gadjah Mada University in 1983, mentions Haurseah landslide as follows.

Then landslide of slump type which has measurement about 350 m x 200 m x 25 m occurred on Cipada river bank, the tributary of Cikeruh river. Slide plane forms very steep bank which will be upright. This landslide occerred on claystone which is laid by andesite lava. Landslide material



Fig－1 Topographic map (1/50000)



Fig−2 Topographic map

is block clay mixed by rock-blocks enter to Cipada river. The ground area around its clay, sand, clay to gravel which according to soil classification is andosol type with solum thickness about 30 cm consistingof horizon B and C.

3-2 INFERENCE OF PRIMARY CAUSE

Lithology that is in the basic area of Cimanuk river's upstream is a large part of volcanic material sediment and igneous rock. In the same form of lava and the others are sea sedimentary rock and alluvial sediment. Based on it's age, the lithology can be classified into 2 groups which consist of Quarter aged rock group and Tertiary aged rock group.

Bedrock at Haurseah area is Unit of old volcano that can't be loosened (Quarter aged rock group)-VTKT- and Oligocene claystone(Tertiary aged rock group)-BLO-. VTKT cosists of volcanic rock namely volcanic mudflow, volcanic bullast of andesite lava, basalt lava and volcanic clay. In Majalengka area this Unit can be found on the west slope way of Mt. Ciremai.

Besides on the lava, rock of this Unit is easily eroded and on the steep slope way often slides down especially volcanic clay which is very decayed and forms yellow until reddish brown clay. The thickness of decayed soil is about 2 until 3 m.

BLO composed by claystone with parting in coal seams of sandstone, limestone, limestone sand and volcanic sand. This Unit spreads in the south area of Majalengka comes along from the west to the east. This Unit easily slides down, eroded and broken if it is disclosed on surface. The decayed soil is brownish grey sand clay and its thickness is about 1.5 m.

3-3 INFERENCE OF PROXIMATE CAUSE AND PROGRESS

According to a chief of village, the landslide moved largely in 1981, 1982, and still now it has moved bit by bit in the end of wet season and in the start of dry season. Therefore about ten houses were broken. During this survey, we can see other houses which have cracks, masonry retaining walls which are pushed out.

Manager of Cimanuk upstream sub-office said that the landslide had started to move from 1981-82, after Cipada river changed the water-route, and scoured the left bank, which is a tail of the landslide. It is one point. And another point is suggested as follows that the groundwater has an influence for movement of landslide becouse the landslide moves in the end of wet season and in the start of dry season.

People use land as puddyfields on the landslide area, and next to their house they make fish ponds.

3-4 DIVISION OF LANDSLIDE MOTION BLOCKS

Aerial photograph (1/30000) was taken in Cimanuk upstream basin at August 1981. Surveying this photograph and the topographic map (1/500), Haurseah landslide located on the talus. The block that looks like active on this survey is discriminated as alandslide clearly. The area of the whole landslide looks like that area and the around of that along the Cipada river.

Haurseah landslide can be divided to 2 blocks, one (Block-A) is the area which moved largely in 1981 and 1982, another (Block-B) is the area which moved bit by bit, so that houses have cracks. It is considered that Block-B have been more active than before Block-A moved, because Block-A came off from the slope.

3-5 PREPARATION OF TOPOGRAPHICAL MAP

Cimanuk project office has done the topographical survey on the all of Haurseah landslide of 1/500 with 5 m counter interval. But for the landslide survey, the topographical map of 1/500 with 1-2 m counter interval is necessary.

3-6 GROUNDWATER AND SURFACEWATER SURVEY

There are 2 spring wells in the direction of Cipada river's upstream. 1798 inhabitants in Haurseah and other 2 villages make use of these wells by a small channel from these wells to villages. The channel passes through on the upside of Haurseah village along the steep slope. The water though this channel flows down into the landslide area.

3-7 COLLECTION OF EXISTING DATA

List of existing data is shown in Table-1.

As for rainfall data, Argalingga station is the nearest one from Haurseah, at adistance of about 3 km from there. This station was started from 1977, and has 6 years data (at least). Location of it is shown in Fig-3.

4. FORMATION OF SURVEY PLAN

4-1 BLOCK DIVISION AND SETTING OF SURVEY COUSES OF TRAVERSE

Generally, the procedure taken to plan landslide countermeasres is to conduct stability analysis and decide the amount of countermeasure work necessary to obtain the cross section along the course of traverse that is set and countermeasure work is planned for each landslide block. Therefore, block division and the setting of courses of traverse are basic

Table－1

DATA CHECKLIST OF CIMANUK FOR S. T. C. PROJECT

No.	KINDS OF DATA	YES	NO	REMARK
1.	Topographical map (1 : 50.000)	Yes	-	
2.	Geological map (1 : 100.000)	Yes	-	
3.	Land use map (1 : –)	–	No	
4.	Surveying map			
	- Cross section (1 : 100)	Yes	–	
	- Long profile (1 : –)	–	No	
	- Situation (1 : 500)	Yes	–	
5.	Rainfall record			
	- Raw data	Yes		
	- Max. daily rainfall	Yes		
	- Hourly rainfall	Yes		
6.	Discharge record			
	- Flood marked/Flood discharge	Yes		
	- rating Curve	Yes		
7.	Water level record			
	- Daily record	Yes		
	- Hourly record	Yes		
8.	Soil mechanical data			
	- Bor Log	Yes		} not all at the sliding location
	- Sondir	Yes		
9.	Sediment transport data			
	- Volume	-	No	
	- Grain size analysis	-	No	
10.	Reports			
	- Overall plan study	Yes		
	- Feasibility study	–	No	
	- Detail design study	–	No	
	- Natural disaster reports	Yes	-	
	- Pers. rellese (Newspaper) about natural disaster	Yes	-	
11.	Statistical data			
	- Population	Yes		
	- Socio-economic	Yes		
	- Agriculture production	Yes		
12.	Equipment			
	- Automatic rainfall recorder	Yes		} at the field
	- Manual rainfall recorder	Yes		
	- Automatic water level recorder	Yes		
	- Manual water level recorder	Yes		
	- Compas & Abney level	Yes		
13.	Others data			
	- Isobyat map (annually)	Yes		
	- Erodibility map	-	No	
	- Photoes of debris-flow	-	No	
	- Aerial photograph <1:30.000>	Yes.		
14.	Name of engineers attended			
	· Sabo Eng. Course in VSTC			

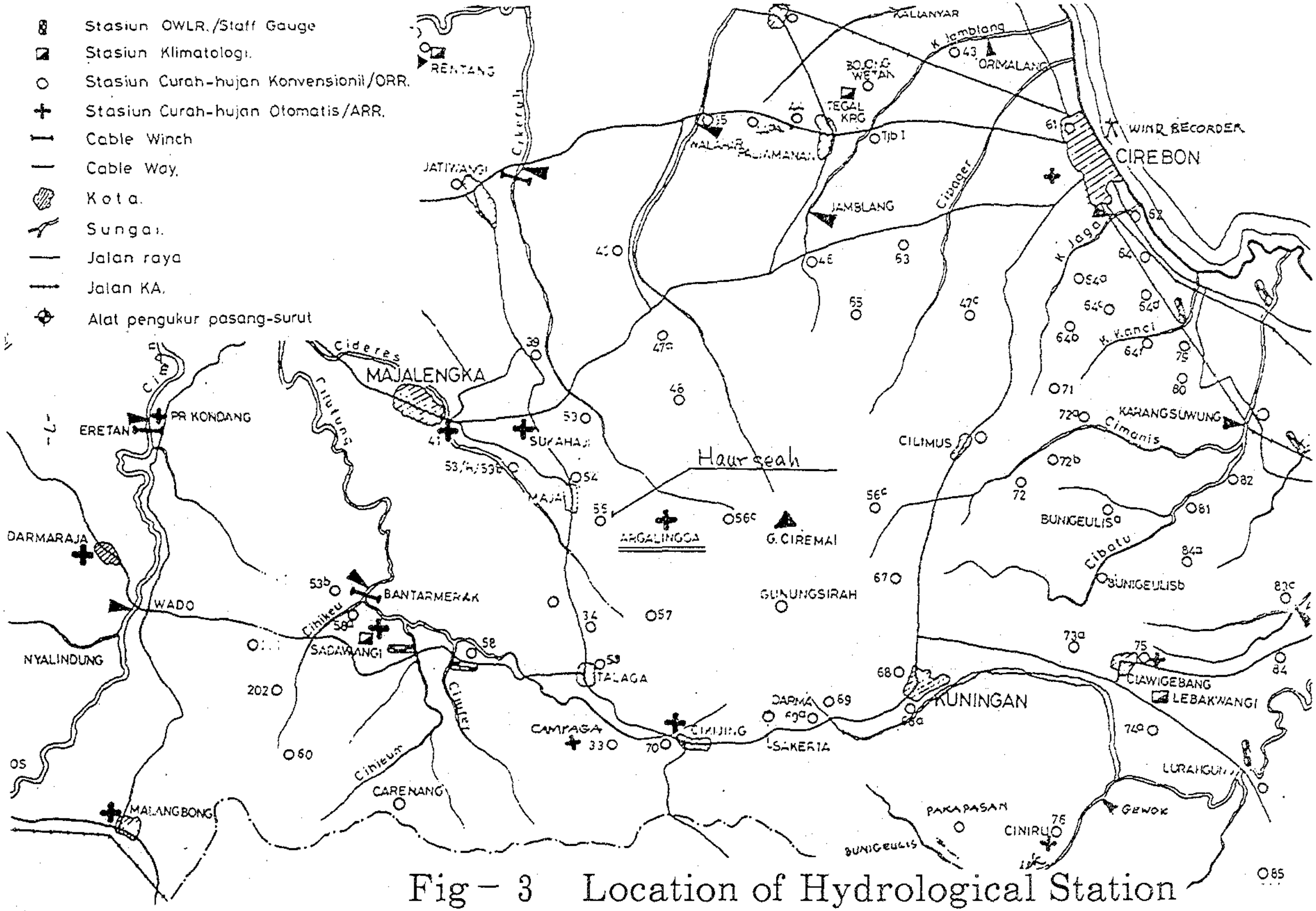


Fig − 3 Location of Hydrological Station

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to landslide countermasures. Fig-4 is a schematic diagram for motion block division. And Fig-5 is a schematic diagram for setting courses of traverse.

Now due to reconnaissance and other survey, tentative motion block division and setting courses traverse in Haurseah landslide are shown in Fig-2. The main course of traverse is set in the centerof the block approximately parallel to the direction of motion. As the width of the landslide is more than 100 m, a subsidiary couse of traverse is set 50 m from the maincourse of traverse and in pallael to it.

4-2 SURVEY OF MOVEMENT

(1) Extensometer

The extensometer is an instrument to measure the amount of expansion / shrinkage of ground between two points, using an invar-wire with only small temperture expansion, and accuracy of 0.2 mm or higher. (Fig-6) It is often installed mainly astride a tensile crack or side crack to measure landslide displacement or installed to confirm the tail end. Also, extensometer are sometimes serially installed along the main course of traverse to grasp the overall motion of alandslide.

On Haurseah landslide, two extensometers are tentatively installed astride two tensile cracks. (Fig-2)

(2) Tiltmeter

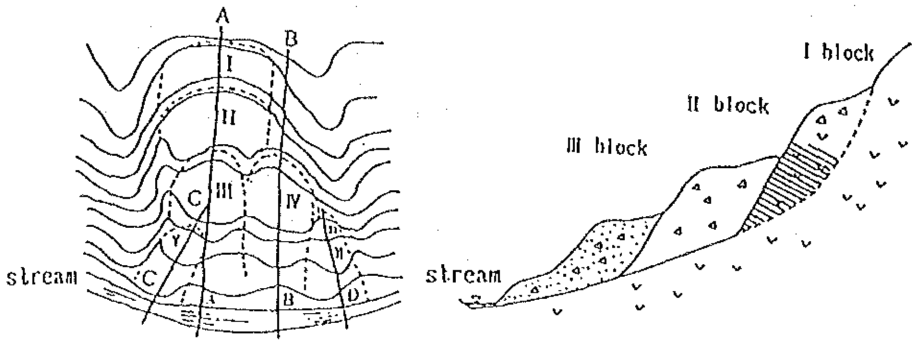
Generally the tiltmeter consists of bubble levels placed in N-S and E-W directions on a concrete foundation of 50 cm x 50 cm x 30 cm, as indicated in Fig-7. The base must be covered with a wooden box designed to hold instruments. The accuracy of this instrument should be 1 to 2 seconds.

This instrument, with its high accuracy, is often used to infer stability in an area where landslide motion is unclear. Especially it is absolutely necessary to install a tiltmeter on the slope above the motion block along the course of traverse and check for the danger of expansion of the landslide.

On Haurseah landslide three tiltmeters are tentatively installed along the main course of traverse (2) and on the subsidiary course (1). (Fig-2)

(3) Location Survey

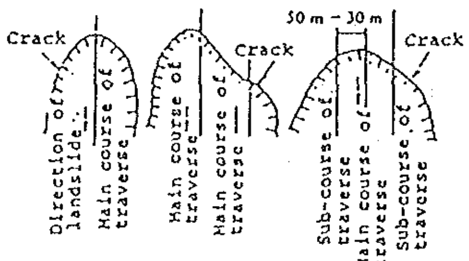
Survey on the amount of migration by location survey is used mainly for cases where the motion direction of a landslide is unclear or cases where the amount of motion is large. Hence, cross-sectional unobstructed surveying according to fixed points outside the landslide motion area, triangulation and surveying by aerial photographs are used of these, unobstructed surveying according to fixed points outsidethe landslide area is most commonly used.



(a) Division into blocks and courses of traverse

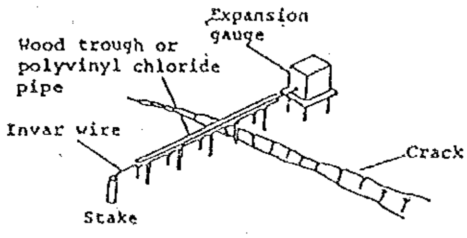
(b) Section of A-A

Fig-4 Division into blocks and courses of traverse

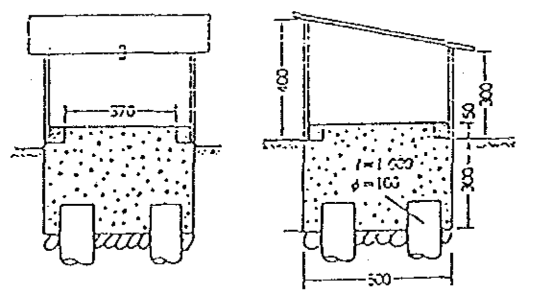


Note:
Sub-courses of traverse are to be located at 30 to 50 m (50 m at the maximum).

Fig-5 Selection of Courses of Traverse



Fig－6 Schematic Diagram of Installation of Expansion Gauges



Fig－7 Installation of Ground Dip Meter (example)

On Haurseah landslide, useing the main course traverse and the subsidiary course, 50 m x 50 m meshes are tentatively made by two cross sections.

4-3 SLIDING SURFACE SURVEY

Determining the depth of the sliding surface is most important in designing landslide countermeasure work, particularly restraint work. Erroneous determination of the sliding surface may easily cause destruction of structures or overly complicated and, therefore, uneconomical design. So, it is, indeed, important to determine sliding surface depth accurately by combining the following sliding surface survey methods or comparing inferred sliding surface depth in the longitudinal and transverse directions.

(1) Determination during boring
(2) Determination by boring core
(3) determination by surveying rod
(4) Determination by strain gauge pipe
(5) Determination by boring hole clinometer
(6) Determination by logitudinal extensometer

After the drawing of topographical map, location of boring holes will be investigated on the map and proposed. Fig-8 is a schematic diagram for location of boring.

4-4 GROUNDWATER SURVEY

The commonest of all proximate causes of landslide is groundwater. Therefore, removing groundwater from the landslide area is an effective countermeasure and higher precision is required of the groundwater survey necessary to plan and design the countermeasure. Groundwater survey is also indispensable to the stability analysis of groundwater. It usually conducted in landslide areas can be classified as in Fig-9.

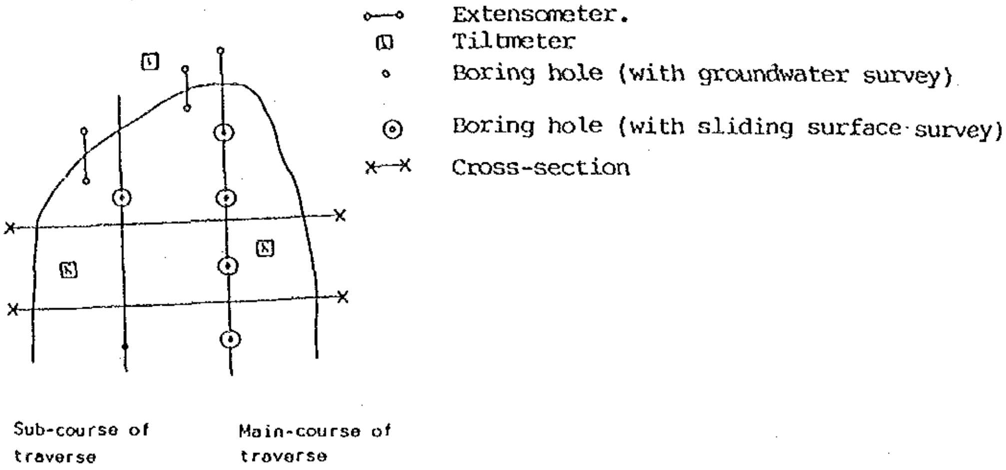
(1) Groundwater level measurement

In conducting the stability analysis of a landslide, it is necessary to learn pore water presure on the sliding surface. But for reasons including the ease of measurement, it is now common practice to use the groundwater level in the boring hole as the value of pore water pressure on the sliding surface.

Groundwater level measurement at least in the boring hole along a main course of traverse must always be conducted during certain periods including wet season.

(2) Groundwater tracing

Groundwater tracing is the survey that consists of depositing a water-



Fig－8 Location of Boring hole etc.

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solubie pigment, inorganic chemical or some other tracer into the groundwater, taking advantage of, say, a survey boring hole, detecting it at another boring hole, a springwater point or elsewhere and thereby inferring the course of the groudwater. The site of tracer deposition must be above the slope and it is necessary to infuse large quantities of water and facilitate percolation at the water head to ensure the outflow of the tracer. For a tracer, salt, fluorescent soda or some other poisonless substance must be used.

(3)Groundwater logging

Groundwater logging is a test to be conducted in the boring hole to clarify vertically the position of the flowing layer of groundwater and its state of flow.

(4)Other groundwater surveys

Besides the abovementioned survey items, the simple pumping test conducted in the boring hole to obtain the groundwater velocity and the coefficient of permeability for each stratum, the water analysis to infer the course of groundwater by classifying groundwater distributed in the landslide area according to water properties and the earth temperrature probing to infer the distribution of groundwater, particularly in the shallow strata by measuring earth temperatures near the ground surface, are also practised.

4-5 OTHER TESTS AND SURVEYS

If the landslide area is large, the basement is relatively strong (Mesopaleozoic or Paleogene stratum) and distribution of the basement is extremely uneven, the distribution of the basement is sometimes inferred by seismic exploration. Though this survey does not always clarify the position of the sliding surface, the general geological structure can be made clear by the distribution of seismic wave velocities in the stratum. So, it is often used at the stage of the general suevey, too. But to make the results of this survey more accurate, checking by a boring survey is necessary to an extent.

If the outcrop of a sliding surface appears in a shaft or tunnel excavation, an in-situ shearing test is sometimes conducted. However, it often cannot be practised because of the large equipment that must be used for the reaction of a jack. In which event, it can substituted with laboratory test by taking an undistubed sample that includes a sliding surface.

Laboratory soil tests include the triaxial compression test and the single shear test. But now the ring shear test using doughnut-shaped sample is often practised. In this test method, unlike in the common single shear test, the shearing area can be kept constant during the test and a

Fig－9 Items of Groundwater Survey

- Groundwater survey
  - Groundwater pressure survey
    - Groundwater level measurement
    - Pore water pressure measurement
  - Groundwater distribution survey
    - Rough survey
      - Water quality analysis survey
      - Water temperature survey
    - Detailed survey
      - Plane survey
        - Groundwater tracing test
      - Vertical survey
        - Groundwater logging test
        - Pumping test

long shearing stroke can be obtained. For these advantaes, it is considered most suitable for learning the strength characteristic of a sliding surface.

5. SCHEDULE OF SURVEY

The schedule of survey in Haurseah landslide is shown in Fig-10.

Fig－10

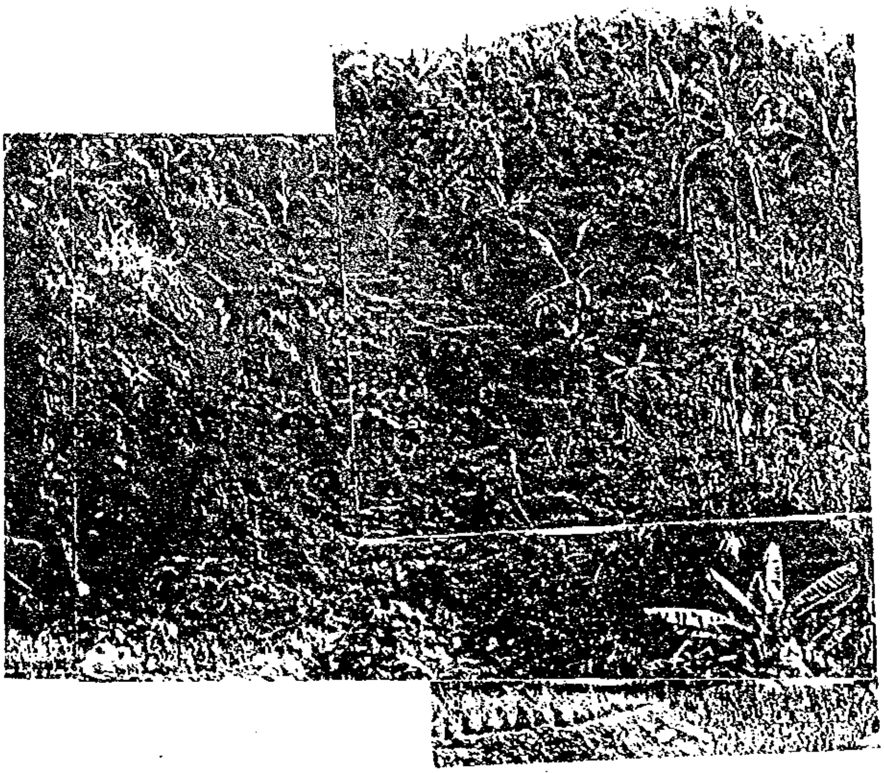
SCHEDULE OF 1992's ACTIVITIES
AT HAURSEAH

ACTIVITY	1992 JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	1993 JAN	FEB	MAR
Collection of Existing Data	——	——													
Topographical map (1/500, 1m counter interval)	——	——													
Setting of Survey Courses of Traverse	——	——				——									
Survey on the amount of migration by location survey	——	——				——									
Extensometer (2)		——	—— Observation	Observation											
Tiltmeter (3)		——	—— Observation	Observation											
Raingauge (1)		——	—— Observation	Observation											
Distribution of groundwater survey		Surface water	—— Surface water								—— Track of groundwater	—— Track of groundwater			
Boring (sampling boring core)											—— Preparation	—— Boring			
Groundwater level observation during boring												——			
Dynamic Penetration Test												——			
Strain gauge pipe												—— Installation	—— Observation		
Inclinometer												—— Installation	—— Observation		
Groundwater level observation in boring holes													—— Observation		
Seismic prospecting						——									
Electric prospecting											——				
Soil experiment												——	——		
Trainning Activity										——	——	——	——	——	——

Haurseah landslide

- Between outcrops

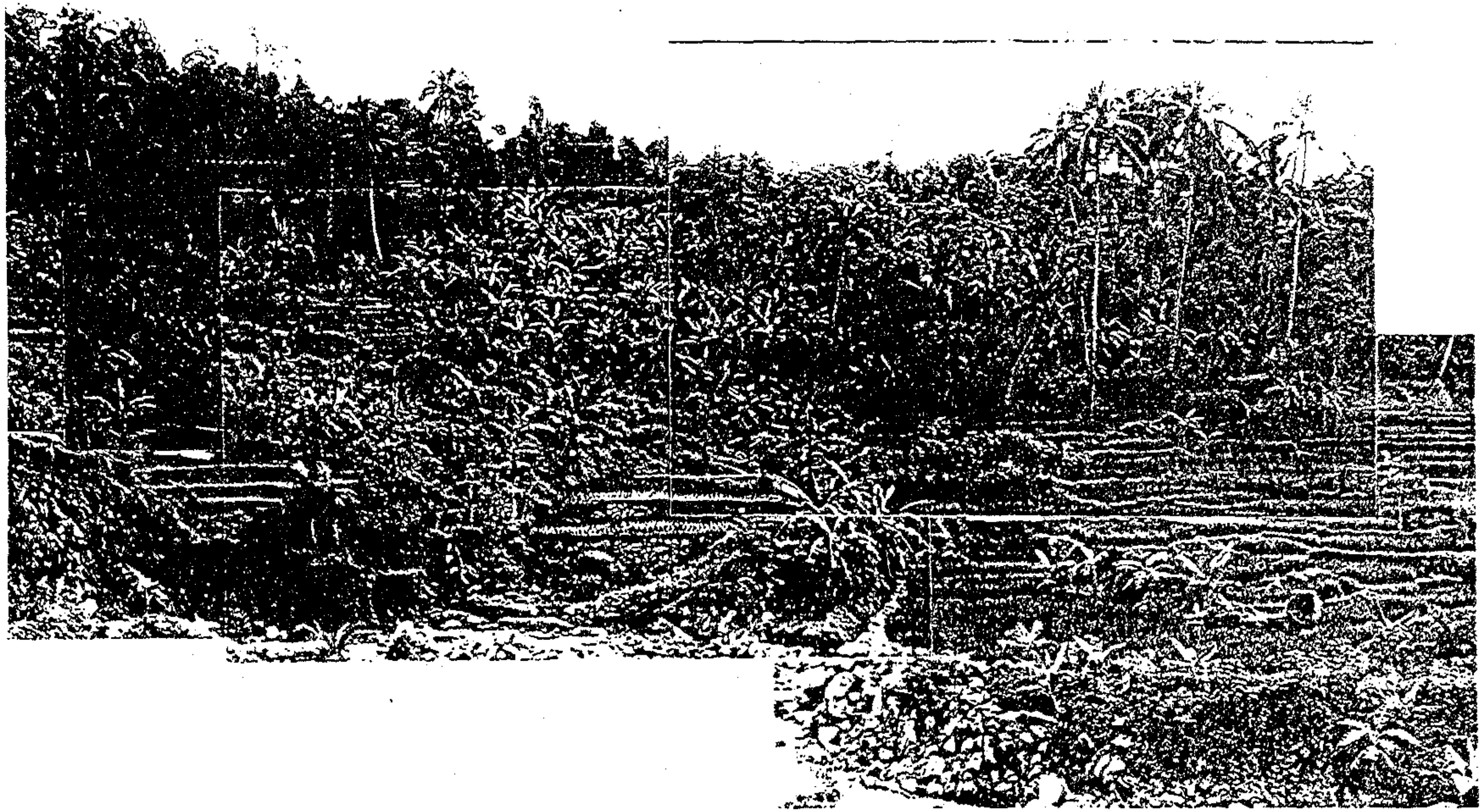
(2)



Haurseah landslide

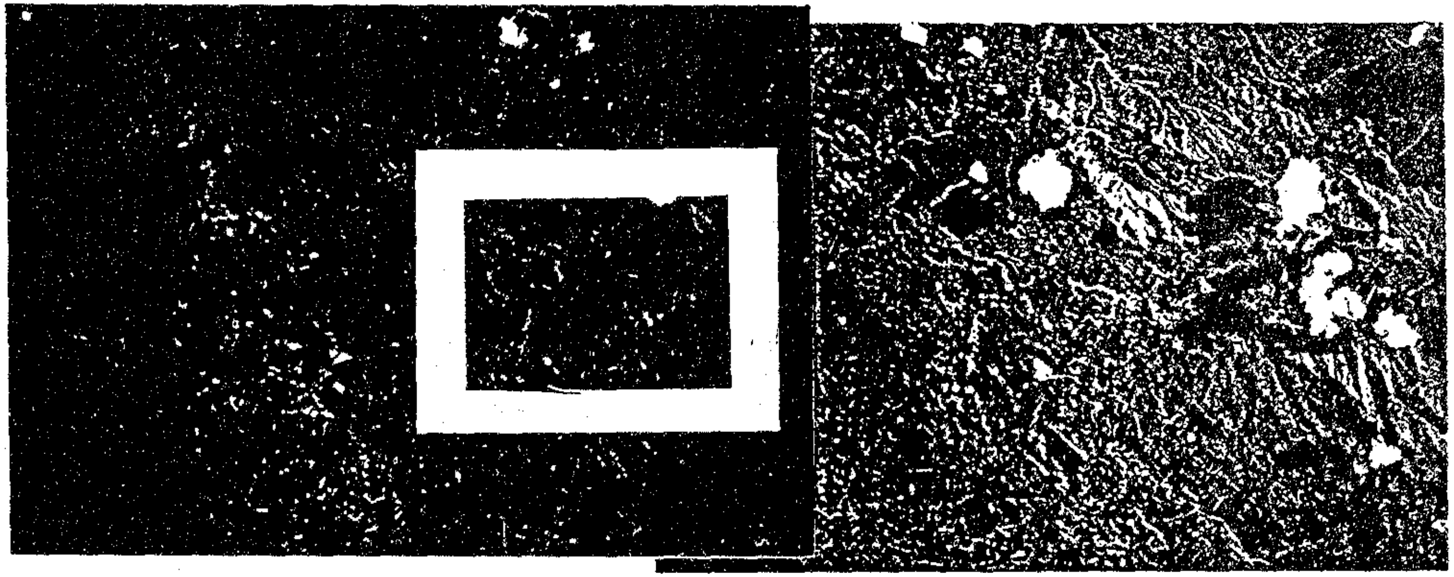
- Between outcrops

3

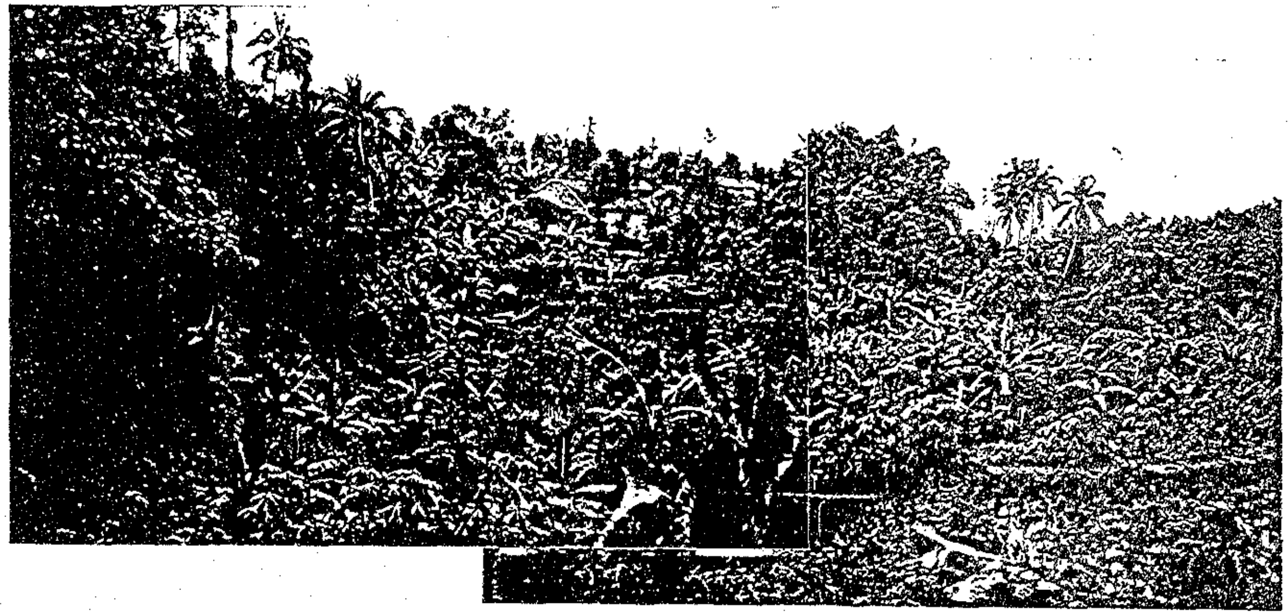


Haurseah landslide (job site)

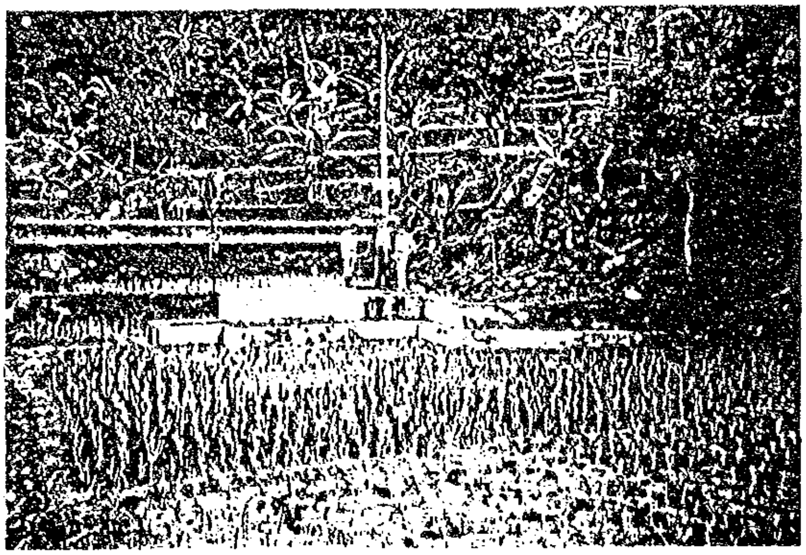
- Besides outcrops



Aerial Photograph

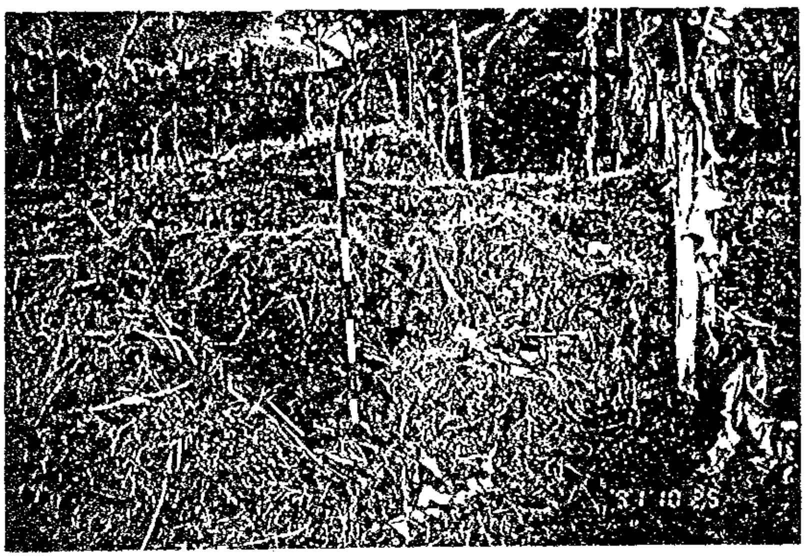


- Block A infront of the photo.
- Block B behind the photo.

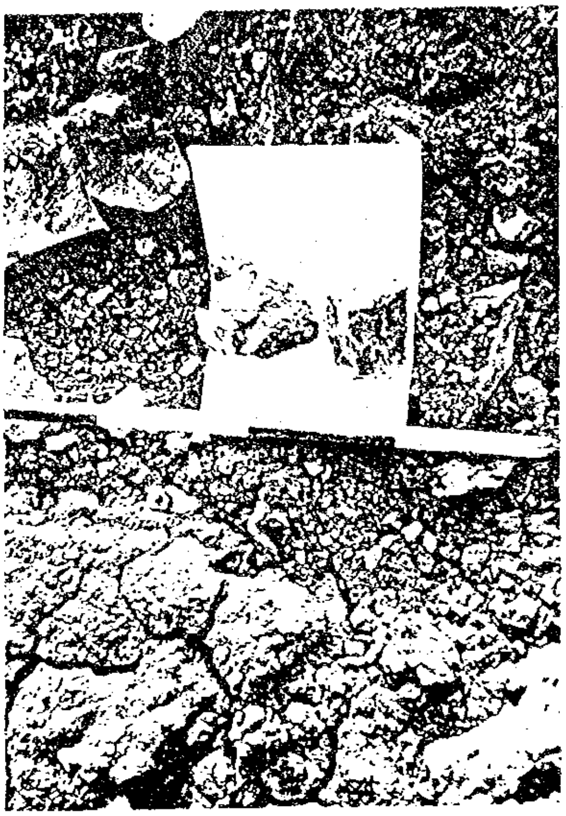


Spring well

Scarp



Radical cracks



Clay rock

Looking at the upstream (change of channels)

Crack in houses

Masonry retaining walls which are pushed out

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