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PROGRESS REPORT NO. 1

HYDROLOGY OF RAINFED PADDY LAND

C9-187

A RESEARCH PROJECT

Grant No. 936-5544-G-00-7017-00

Submitted by

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PROJECT PROFILE

Country	:	Thailand
Grant No.	:	936-5544-G-00-7017-00
Program	:	U.S.-Israel CDR Program
Project Title	:	Hydrology of Rainfed Paddy Land
Project Leader	:	Sacha Sethaputra
Organization	:	Water Resources and Environment Institute Faculty of Engineering Khon Kaen University
Co-investigators	:	Isaac Shainberg Rami Keren
Project Consultants	:	Charat Mongkolsawat Yongyuth Sukwanachaikul
Authorized Officer	:	Sastri Saowakon Vice Rector for Research, Khon Kaen University
Total Project Budget	:	US $ 150,000
Project Duration	:	May 1987 to April 1990
Reporting Period	:	May to October 1987
Budget Allocation for This Period	:	US $ 52,760 (B 1,345,380)

1. Introduction

Paddy cultivation is common in Southeast and South Asia. It provides most of the carbohydrate nutritional supply in rural areas. Most of the paddy land is rainfed and only a small percentage is under full irrigation. For example, in Northeast Thailand, approximately 80% of paddy land is rainfed. The rainfed farmers are totally subsistent, relying on rainfall for all their agricultural activities. Paddy cultivation occupies most of the farmers' time and effort because rice is the staple food that can be used for barter under economically difficult situation.

Farmers manipulate land and water to suit paddy cultivation without any scientific knowledge of the natural hydrological process. At present hydrology of rainfed paddy land is not well understood to benefit the majority of farmers in Southeast and South Asia. The understanding of the hydrology, coupled with some ability to mainipulate natural streamflow, will enable more efficient use of water.

2. Objectives

2.1 Overall Project Objectives

This study will develop a mathematical model for watersheds containing predominantly paddy land. Such a model will be useful for analysis, planning and management of water utilization in such watersheds in Northeast Thailand and elsewhere. Related components in the process of model development to be studied are: infiltration characteristics of paddy land, erosion and sedimentation processes of the rainfed agricultural land.

The research study is an attempt to understand the interaction of natural processes and human intervention. The results of the research should help answer questions such as: How much water is available in a stream as a result of a certain land use pattern? How much of this water can be used for supplementary irrigation of paddy land? How many diversion weirs should be built for such irrigation? How to minimize erosion? This research is a component in an overall research framework aiming at large scale implementation of small diversion weirs for supplementary irrigation of rainfed paddy land.

2.2 Objectives for this Period (May-October 1987)

1) Detailed formulation of project plan
2) Detail of model compoments
3) Watershed instrumentation
4) Plan of field activities

3. Materials and Methods

1) Meeting of researchers and other hydrologists

A meeting of all the project researchers and a number of hydrologists in the Khon Kaen area was held in May 1987. Past experiences and major issues in research in hydrology were discussed and summarized.

2) Hiring of staff and procurement of equipments

An engineer (Mr. Supachate Thinchana, B.E.) and a secretary (Miss Vipapron Intaratirach, Higher Cert. in Business) were hired beginning May and June 1987, respectively. A vehicle was rented, on a monthly basis, from the Water Resources and Environment Institute. Equipments available on hand at the Faculty of Engineering were 4 automatic rain gages, 2 water level recorders, one current meter, one rain simulator, and one infiltrometer. In addition, the project has purchased 15 standard rain gages, 100 1-m staff gages and one infiltrometer. Other equipments listed in the proposal (ref.2) are being ordered.

3) Field survey, site selection and instrumentation

The 8 watersheds (ref.3) were surveyed in May 1987. Locations for installing equipments were selected and villagers were contacted to tend the equipments. After that the available equipments were installed.

4) Cooperation with the Royal Irrigation Department (RID)

The project has established contact with the RID, especially the RID Regional Office in the area. The project now has access to the rainfall and streamflow data in two small watersheds monitored by RID.

5) Plan for data acquisition

The engineer visits each site regularly, 2-3 times a month to collect the recorded data and pay the equipment attendant. In case of equipment malfunction the attendant is to contact the Water Resources and Environment Institute immediately by telephone or telegraph. So far there has been no malfunction.

6) Formulation of mathematical model

While data collection activities were being carried out the project researchers were busy reviewing documents, formulating mathematical model and its components, and designing field experiments. All the six researchers at the Water Resources and Environment Institute have been participating in this activity.

4. Results

Rainfall and streamflow data have been collected beginning July 1987. Each watershed has 4 or 5 rain stations (one equipped with automatic rain gage, 2 or 3 with standard rain gage) and 4 or 5 stream-gaging stations. Example of rainfall and streamflow data are shown in Table 1. In addition, groundwater observation wells will be installed to monitor groundwater flow.

Equipments procured to date are those mentioned in 3 above and a microcomputer (IBM PC/AT) with 20-megabyte hard disk and a printer (EPSON LQ 2500). The project also has direct access to the computer (VAX 11/780) at the Khon Kaen University Computer Center.

The overall mathematical model of the rainfed agricultural watershed is now clearly defined. Two oversions of such model have been formulated in detail computer programs are being developed using both microcomputer and the VAX 11/780.

5. Remarks

The project will select five more watersheds for verification of the mathematical model that has been calibrated using data from these instrumented watersheds. These additional watersheds will be selected from RID projects in the region. RID can provide most of the basic data. Additional data may need to be collected by the project.

Regarding the rainfall pattern, there have been prolonged drought periods during the rainy season for the past 3 years. Most areas of the Northeast are affected by this drought.

6. Workplan for the Next Period (November 1987-April 1988)

Beginning late October 1987, field experiments will be carried out using infiltrometer and rain simulator to collect infiltration and erosion data. Soil samples will be collected and soil moisture determined in the laboratory (using the service of the Department of Soil Science, Faculty of Agriculture). The rain-gaging and stream-gaging stations will continue to operate.

The researchers will continue to work on the mathematical model and its components. Master program student assistants will be involved in model development, calibration and data collection.

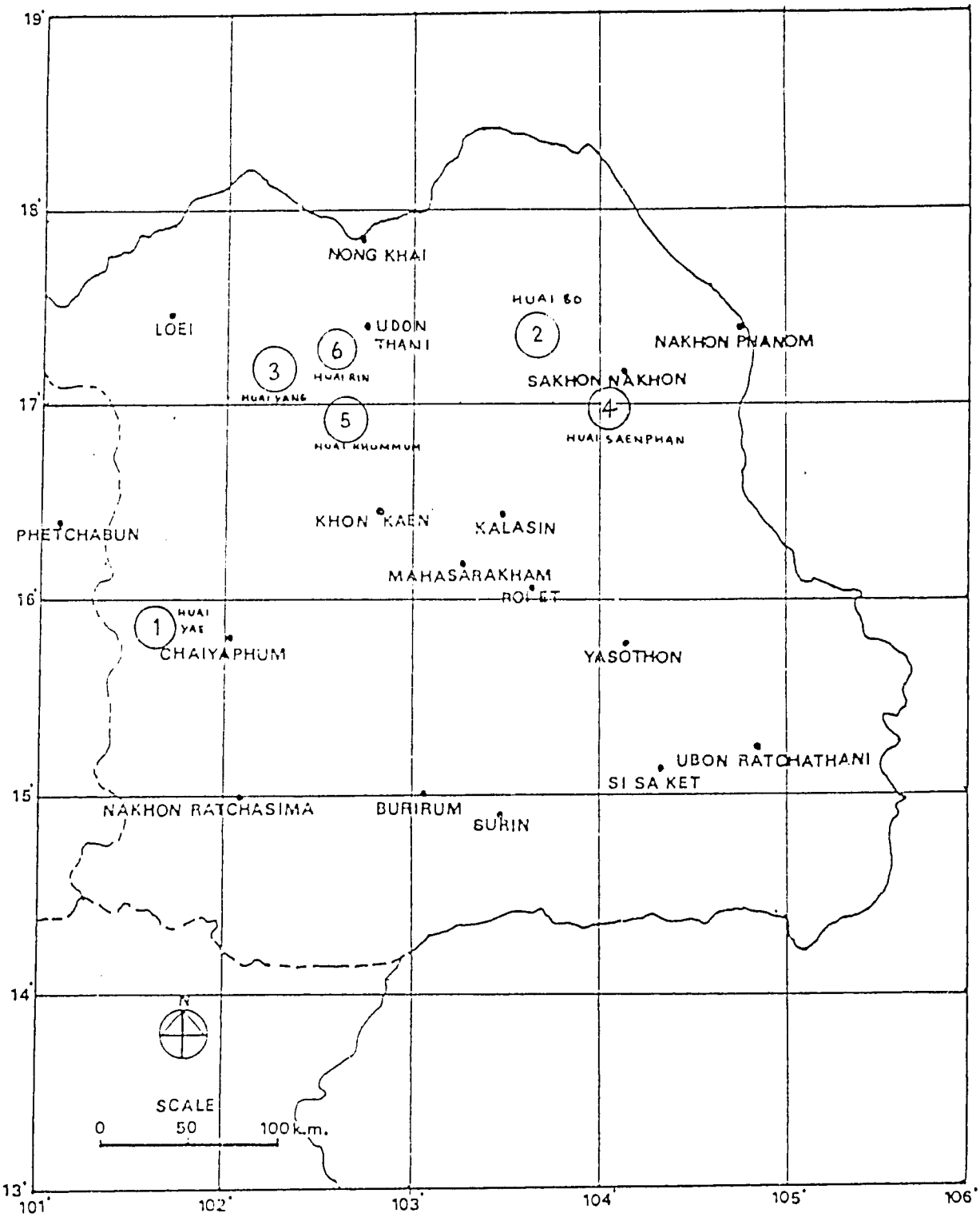

FIGURE 1 LOCATION OF SELECTED WATERSHEDS

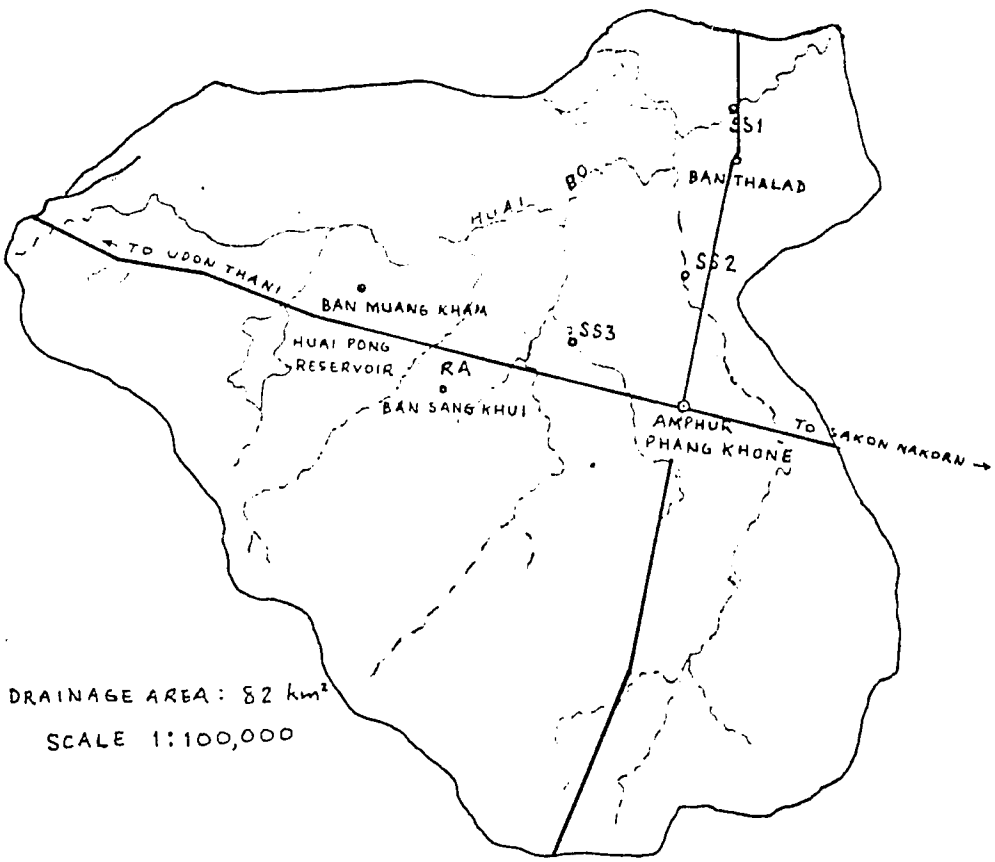

FIGURE 2 HUAI BO WATERSHED

Table 1 Rainfall and Stream Gage Data, Huai Bo Watershed, Amphur Pang Khone, Sakon Nakorn

Date	Rainfall(mm) Station RA	Stream Gage (m above datum) Station SS1	Station SS2	Station SS3
Sep'87				
1	7.0	3.69	0.825	0.89
2	0	3.59	0.75	0.76
3	0	3.525	0.725	0.705
4	10.5	3.425	0.65	0.495
5	0	3.32	0.525	0.38
6	0	3.23	0.455	0.315
7	36.5	3.125	0.365	0.265
8	0	3.1	0.365	0.575
9	3.5	3.3	0.675	0.875
10	0	3.425	0.545	0.905
11	0	3.545	0.46	0.84
12	0	3.59	0.395	0.725
13	0	3.635	0.34	0.635
14	0	3.68	0.445	0.75
15	0	3.635	0.425	0.65
16	2.0	3.57	0.405	0.525
17	0	3.37	0.465	0.36
18	1.5	3.19	0.445	0.28
19	14.0	2.805	0.41	0.295
20	0	2.64	0.465	0.345
21	1.5	2.48	0.39	0.35
22	0	2.285	0.365	0.275
23	0.5	2.135	0.395	0.355
24	0	1.825	0.395	0.535
25	0	1.725	0.385	0.6
26	0	1.62	0.39	0.575
27	0	1.5	0.34	0.615
28	0	1.39	0.285	0.585
29	0	1.29	0.245	0.605
30	0	1.225	0.265	0.595

In December 1987 Dr. Rami Keren, the Israeli co-investigator will visit the project. Detailed workplan of Israeli research activities will be formulated and discussed with other project researchers.

7. References

1) Hydrology of Rainfed Paddy Land, document presented at His Majesty Fifth Cycle Commemorative Conference of USAID Science Award Grantees, 24-26 July 1987, Nakorn Pathom, Thailand.

2) Hydrology of Rainfed Paddy Land, proposal submitted to USAID: U.S.-Israel CDR Program, Water Resources and Environment Institute, Faculty of Engineering, Khon Kaen University, 1986.

3) Responses to Provisos and Comments on the Proposal: Hydrology of Rainfed Paddy Land, document submitted to the Review Panel, U.S.-Israel CDR Program, Water Resources and Environment Institute, Faculty of Engineering, Khon Kaen University, 1986.

8. Annex

Picture 1 Paddy Land Watershed Overview

Picture 2 Automatic Rain Gage at Huai Yae Watershed,

Picture 3 Concrete Culvert for Water Level Recorder at Huai Khummum, Amphur Ubolrat, Khon Kaen

Picture 4 Installing Staff Gage at Hual Khummum