האוניברסיטה העברית בירושלים
THE HEBREW UNIVERSITY OF JERUSALEM
THE SEAGRAM CENTRE FOR
SOIL AND WATER SCIENCES
מרכז סיגרם למדעי
הקרקע והמים

RAIN WATER HARVESTING SYSTEM FOR LIVESTOCK IN SANDY SEMI-ARID REGIONS

CDR Research project: PDE-5544-0-SS-6019 Second Progress Report

January 11,1987 - July 10,1987

Principal Investigator: Y. Mualem

Cooperative Scientist: M. Cohen

The Seagram Center for Soil and Water Sciences

The Faculty of Agriculture

The Hebrew University of Jerusalem

Rehovot, Israel

July, 1987

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Study of the technical and the theoretical aspects of the research project has begun in the University of Nairobi-Kenya and in the Hebrew University of Jerusalem-Israel. This report briefly summarizes these activities as well as the main points of concern.

Work done in Israel

I. Some progress has been made with regard to the construction of the experimental systems required for the laboratory investigations.

1. A plan for modification of the experimental set-up used for measurment of the soil hydraulic properties including repair of the gamma attenuation system and its control unit, has been drawn up. An agreement is reached with "CONTROL-BIT" company for the execution of this plan. Upon completion, the experimental observation and the readout storage will be done automatically.

2. Flow columns with flow chambers, for control of the flow boundary conditions, were constructed for measurements of the soil-water retention curves and the unsaturated hydraulic conductivity. They might later be used for laboratory test of the numerical simulation of the soil-water flow regime under sequential wetting and drying processes following rainfall.

II. A numerical solution of two-dimensional unsaturated flow is now modified to investigate the effect of evaporation on the outflow from the rain harvesting unit. We hope to be able to report results in the next progress report.

III. A new numerical program is now under development which will allow simulation of sequence of wetting and drying processes, taking into account the hysteretic nature of the soil properties.

IV. Literature review of experimental and field studies has shown that a seal is developed over bare soil surface exposed to rainfall. As a result, the soil infiltrability changes considerably during rainfall, depending on the rainfall characteristics as well as on the soil chemical and physical properties . Except for pure sand, the phenomena may have a significant effect on the efficiency of the rain water harvesting system. The effect of the phenomenon on rainfall- infiltration- runoff relationships is now under study. The objective is to draw conclusions about the applicability of this method of rain water harvesting with regard to soil properties and rainfall characteristics. Current results of theoretical study of this phenomenon were presented by Mualem and Assouline in two scientific meetings : The Annual Meeting of the Spanish Association of Irrigation and Drainage , held in Malaga in December, 1986, and the International Workshop on the Deterioration of Arid Zones in the Mediterranean Areas, held in Madrid in May 1987.

Progress in Kenya

Mr. R.K. Muni, our collaborating scientist in Kenya, reported that all construction materials required for the project are locally available. My suggestions about the use of the Kenyan budget and technical alternatives for expensive equipment are now studied.

We are sorry that no Kenyan student was chosen yet to be sent to Israel to work with my group in the soil physics laboratory and be trained in the various aspects of the project. However, we are taking care of this point and we hope that it will be settled this year. Mr. Muni also announced to me that he is considering the possibility of doing his Ph.D on this research project but the question of his supervisor has yet to be solved.

The subcontract to bind the University of Nairobi for this project , was sent by Ms. E. Slater from the Hebrew University of Jerusalem on February 11, 1987. We have not received yet an endorsed copy.

Mr. D.B. Thomas, Chairman of the Dept. of Agric. Engineering at the University of Kenya, suggested that he will replace Mr. G. Muchiri as a cooperative scientist (Ref. letter 4.24.87). I approve this change on June 3,1987 , expressing my hope that communication between our research groups will take a faster course.

Y. Mualem

July , 1987.