

FEASIBILITY OF USING SOIL SUCTION  
AS MEANS OF SOURCE OF ENERGY  
FOR LIFT IRRIGATION

IN  
SANDY REGOSOLS OF SRI LANKA

By

THIRUNAVUKKARASU KARUNAINATHAN

A Research Report

submitted in Partial Fulfilment for  
the requirments of the advanced course

IN

AGRICULTURAL ENGINEERING

for the Degree of

BACHELOR OF SCIENCE IN AGRICULTURE

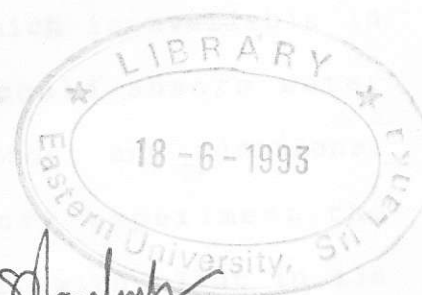
EASTERN UNIVERSITY, SRI LANKA

1992

Approved by



FAG13  
  
Project Report  
Library - EUSL



*Sivapalan*

Supervisor  
Mr. S. Sivapalan  
Dept. of Agronomy  
Faculty of Agriculture  
Eastern University, Sri Lanka  
Chenkalady.

*S. Raveendranath*  
Head, Dept. of Agronomy  
Dr. S. Raveendranath  
Dept. of Agronomy  
Faculty of Agriculture  
Eastern University, Sri  
Chenkalady.

< 2661

PROCESSED  
Main Library, EUSL

## ABSTRACT

The energy for irrigation involves considerable inputs in terms of labour and/or capital. It is therefore, essential to identify any low cost method of irrigation by manipulating available natural resources. In this context an attempt was made to find out whether the suction available or created in unsaturated soil could be used as an alternate energy source for lift irrigation in sandy regosols where shallow water table is present.

The experiment was conducted in the laboratory and in the field. The clay pots which were manufactured locally were used as the main tool to transmit the absorbed water to the soil from lower elevations (heads). The laboratory and field experiments were conducted with two (25 and 50 cm) and three heads (35, 70 and 105 cm) respectively and the performance of this system was tested with the crop blackgram.

It was evident that suction which is available in the soil or created by the soil could absorb water freely from lower water tables without any additional input of energy. In the laboratory experiment, the amount of water absorbed by the soil with plant in 138 hours under the heads of 25 cm and 50 cm were 129 and 114 ml respectively. But the amount of water absorbed under the field condition was quite high, giving the

## TABLE OF CONTENTS.

CHAPTER.	TITLE.	Page.
	Abstract.	i
	Acknowledgment.	iii
	Table of contents.	iv
	List of figures.	vii
	List of tables.	viii
1.	INTRODUCTION.	1
1.1	Objectives of the study.	3
2.	LITERATURE REVIEW.	
2.1	Water.	4
2.2	Soil water.	4
2.2.1	Kinds of soil water.	5
2.2.2	Energy relation of soil water.	9
2.2.3	Measurement of soil water.	13
2.3	Irrigation.	15
2.3.1	Aim of irrigation.	16
2.3.2	Soil moisture and irrigation practices.	17
2.3.3	Limitations of irrigation.	17
2.3.4	Energy utilization and management in irrigation.	17
2.3.5	Future energy sources.	18
2.3.6	Localized irrigation.	19
2.4	Agricultural drainage.	22
2.4.1	Benefits of soil drainage.	23
2.4.2	Drainage of container grown plants.	24
3.	METHODS AND MATERIALS.	
3.1	Site selection.	25

3.2	Description of the soil.	25
3.3	Experimental lay-out.	
3.3.1	Laboratory experiment.	26
3.3.2	Field experiment.	26
3.4	Experimental procedure.	
3.4.1	Clay pots.	28
3.4.2	Laboratory experiment.	28
3.4.3	Field experiment.	30
3.4.4	Laboratory and field experiments with black gram.	30
3.4.5	Determination of moisture content	31
3.4.6	Determination of soil temperature.	31
3.4.7	Determination of volume of water absorbed by the soil.	31
3.4.8	Cultivation practices for blackgram.	32
3.4.9	Response of blackgram.	33
3.4.10	Weed growth.	33
4.	RESULT AND DISCUSSION.	
4.1	Laboratory experiment.	
4.1.1	Moisture content of the soil.	34
4.1.2	Volume of water absorbed by the soil.	37
4.2	Response of blackgram planted in pots.	37
4.2.1	volume of water absorbed by the soil with plant.	37
4.2.2	Number of plants.	41
4.2.3	Dry matter production of plants.	42
4.3	Field experiment.	43
4.3.1	Volume of water absorbed by the soil.	43