

بسم الله الرحمن الرحيم



Sudan University of Science and Technology



College of Agricultural Studies

**Study of some physical properties in Salha Farm Department of Soil and
Water Sciences**

A research Submitted in partial fulfillment for the award of Bachelor degree

By:

Sayed Mohammed Osman Abkar

Supervisor:

Dr. El Abbas Doka Mohammed Ali

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الآية

بسم الله الرحمن الرحيم

قال تعالى:-

أَفَرَأَيْتُمْ مَا تَحْرُثُونَ ﴿٦٣﴾ أَأَنْتُمْ تَزْرَعُونَهُ أَمْ نَحْنُ الزَّارِعُونَ ﴿٦٤﴾

صدق الله العظيم

سورة الواقعة الآيات 63-64

Dedication

This work is dedicated to:-

To the soul of my

Father, mother

Brothers and sisters

Teachers and colleges

To my Friends

And ALL THE PEOPLE I KNOW.

AKNOWLEDGMENT

PRaise IS TO ALLAH WHO GAVE ME THE HEALTH STRENGTH AND PATIENCE TO COMPLETE THIS STUDY.

FIRST AND FOR MOST, MY DEEPEST GRATITUDE AND APPRECIATION DUE TO MY SUPERVISOR,Dr. EL Abbas Doka Mohammed Ali.

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FINALY, MY DEEPEST GRATITUDE GOES TO MY FAMILY FOR THEIR UNCONDITIONAL SUPPORT THROUGHOUT MY LIFE AND MY STUDIES.

List of Content

No	Content	Page
	الآية	I
	Dedication	II
	Acknowledgement	III
	List of content	IV
	List of tables	V
	Chapter one	
1-1	Introduction	2
1-2	Objectives of study	2
1-3	Problem of study	2
	Chapter two	
	Literature Review	
2-1	Soil Texture	3
2-2	Bulk density	4
2-3	Hydraulic conductivity	4
2-4	Saturation percentage	5
2-5	Moisture content	5
2-6	Porosity	5
	Chapter Three	
	Materials and Methods	
3-1	Study area	7
3-2	Soil Sampling Methods	8
3-3	Laboratory analysis	8
3-4	Physical analysis	9
	Chapter four	
4-1	Results and discussion	11
	Chapter five	
	Conclusion and Recommendations	
5-1	Conclusion	14
5-2	Recommendations	15
5-3	References	16

List of tables

No	Content	Page
1	The moisture contents %	11
2	The moisture contents %	11
3	The moisture contents %	11
4	Saturation percentage %	12
4	Saturation percentage %	13
6	Saturation percentage %	13
7	Bulk Density (g/cm)	13
8	Bulk Density (g/cm)	14
9	Bulk Density (g/cm)	14
10	Hydraulic conductivity (cm ³ /H)	14
11	Texture determination %	15

ABSTRACT

The study Farm is located on the west of White Nile in Omdurman district of Salha with a total area of the Farm is about 30 Feddans. The area is characterized by semi-desert, climate with dry winters, seasonal variations in precipitation, temperature and evaporation. The geological formations in the area is Nubian Sandstone. The objectives of study is to characterized physical of the soil farm, Soil texture, Bulk density ,Hydraulic conductivity, porosity and Moisture content, determine its suitability for irrigated farming. The soils of the farm were described and sampled in the field by auger and profile site. The physical analysis were carried at the laboratory of the college of Agricultural studies (CAS).

CHAPTER ONE

1-1 INTRODUCTION

To know the land production capacity and to allocate the land to the best and to the most profitable use should be considered , Global concerns about food security , the quality of life for future generations and the awareness about environment degradation are posing penetrating questions to the world of sciences (De Bie, Van Lanen , and Zuidema, 1996)

The land is evaluated and their suitability for the possible uses will be specified. Hence, the land base on their characteristics will be determined to the most profitable use. Sustainable agriculture comes true, provided that the land based on their suitability will be classified and utilized for different uses types (FAO, 1983)

1-2 Objectives of Study:

To know the physical of the soil

To identification of land uses

To improve the soil and increase production

To knowledge of the soil validity to agriculture

1-3 Problem of study:

Lack of information on the area

Lack of agricultural uses in the area

CHAPTER TWO

LITERATURE REVIEW

2-1 Soil Texture:

Soil texture is a phrase that has no universally accepted definition, because two different concepts of how soil texture is defined are current. Soil texture was concerned originally with a property which referred to how open a soil was. or how it worked in the field, and a farmer might refer to the texture of his soil as being light or heavy or sometimes he should describe it by the of horses needed to plough the land. Thus he should talk of two-horse or four-horse land . But he should also describe the texture of his soil by referring to it as a Sandy, Silty, Loamy or Clay texture, and a soil with a coarse sandy texture , for example , would have many of the properties of a coarse sand, a clay soil of a clay and a loam soil would be one in which the properties due to these three components were fairly evenly balanced (B. A. Keen, 1931). The term soil texture is used to describe the proportions of its constituents such as sand , gravel, silt (HuguesDupriez 2000)

Sand:

Sand has the largest particles in soil. Sand cannot hold nutrients because it does not have any organic material.

Silt:

Silt particles are smaller than sand. Silt is smooth and powdery.

Clay:

Clay particles are the smallest .soils with a lot of clay have more nutrients, but do not allow much air and water to pass through (Beth Gurney 2005).

2-2 Bulk Density :-

The bulk density of soil depends greatly on the mineral make up of soil and the degree of compaction. The density of quartz is around $2.65 \text{ g}\text{cm}^3$ but the (dry) bulk density of a mineral soil is normally about half that density , between 1.0 and $1.6 \text{ g}\text{cm}^3$. (Webber, J. 2008).

Particle Density :-

The weight per unit volume of the solid portion of soil is called particle density. Generally particle density of normal soils is 2.65 grams per cubic centimeter. (AgrilInfo. In 2015).

2-3 Hydraulic conductivity :-

Hydraulic conductivity is the ratio of velocity to hydraulic gradient indicating permeability of porous media. (Wosten, J.H.M., and Rawls, 2001).

2-4 Saturation Percentage :-

Saturation percentage is the ration of water to soil in a saturated paste, multiplied by 100 (USDA, 1954).

The volume of water required to create a saturated paste varies with soil properties, including texture (Stiven& Khan 1966).

2-5 Moisture content :

Soil moisture is the water that is held in the spaces between soil particles.

(James E. 1999).

2-6 Porosity :-

Porosity is a measure of the void spaces in a material, and is a fraction of the volume of voids over the total volume, between 0 and 1, or as a percentage between 0 and 100% (Nelson, J. Roy 2000).

الباب الثالث

مواد وطرق البحث

Material and methods

3-1 Study Area

Location:-

The Farm in Khartoum State is Located on the west of the White Nile in Omdurman District of Salha which is characterized by semi-desert climate , dry winters , seasonal variations in precipitation , temperature and evaporation rate.

Climate :-

The climate is semi-desert and the temperature ranges from 24 to 43 degree.

Summer in the period between the beginning of April to June and between 20 to 30 degree.

The winter from November to March.

Topography :-

The surface of the land is semi flat and the land is covered with gravel and coarse sand and sand is estimated at 10%

Land Use :-

The land is not used in the area but there are trees , shrubs and some weeds , and there is a farm about 500 Meters away.

Equipments and Tools for profile description:-

Profile description sheets

- 1- Hcl (Hydrochloric acid)
- 2- Water bottle
- 3- Mater
- 4- GPS
- 5- Color Book
- 6- Hammer
- 7- Markers
- 8-

3-2 Soil Sampling Methods :-

Soil samplings may be taken by two methods which either digging profiles or augering method at the different site in the field.

3-3 Laboratory analysis :-

It is away to obtain soil samples from different depths (0 – 30 , 30 – 60 , 60 – 90)

By drilling (auger) without having to dig a pit .the augering method is cheap and fast , you can quickly check the soil at the several places of your site .

Laboratory analysis :-

All the samples taken at the Sudan University of Science and Technology Laboratory (SUST) were studied by the College of Agricultural Studies, Soil and Water Department .

3-4 Physical analysis :-

- 1- Bulk density was tested by paraffine Wax
- 2- Real density cylinder
- 3- Texture by hydrometer
- 4- Hydraulic conductivity by (Richard) method
- 5- The porosity by measuring the real and bulk density
- 6- Primary moisture by oven temperature 105 c^o

الباب الخامس

النتائج والمناقشة

Results and Discussions

Table No 2 .the moisture contents: (%)

Auger	0-30	30-60
A1	0.01	0.1
A2	0.33	0.02
A3	0.06	0.02
A4	0.01	0.05
A5	0.01	0.01
A6	0.01	0.03

Table No 3: Moisture contents (%)

Depth	Horizons	M.C
0-15	A	0.01
15-45	B	0.02
45-120	C	0.08

Profile No 2: Moisture contents (%)

Horizon	0-30	30-55	55-70	70-120
	0.1	0.02	0.1	0.03

The results on the above table show the amount of which is moisture content range from 0.1 to 0.8. that means all of the studied soils are moderate, despite a lower moisture content.

Table No. saturation percentage: (%)

30-60	0-30	Auger NO
28.1%	28.4%	A1
31.6%	36.8%	A2
30.2%	33.1%	A3
28.6%	30.1%	A4
30.6%	32.2%	A5
29.2%	30.9%	A6

Depth (cm)	Horizon	S. P (%)
0-15	A	28.9%
15-45	B	31.8%
45-120	C	62%

Depth (cm)	Horizon	S.P (%)
0-30	A	30.9%
30-55	B	33.6%
55-70	C	68%
70-120		69%

The results on the table above the saturation percentage is range from 28 to 36%. It is observable the lower of saturation percentage, which means the soil is coarse sand. As it is known, the saturation percentage is affected by; texture, bulk density and porosity.

The saturation percentage increases with increasing depth. This due the increase in proportion of clay and silt and effects the physical properties of the soil.

Table No Bulk density: (gcm^3)

Auger	0-30	30-60
A1	1.3	1.1
A2	1.8	1.5
A3	1.5	1.2
A4	1.5	1.1
A5	1.6	1
A6	1.8	1

Depth	Horizon	B.D (%)	
0-15	A	1.9	
15-45	B	1.9	
45-120	C	1.45	

Depth	Horizon	B.D g/cm ³
0-30	A	1.6
30-55	B	1.8
55-70	C	1.48
70-120		1.76

The laboratory results show that the bulk density ranged between 1.1 to 1.76 g/cm³.

We note that the bulk density decreases with increasing the organic content. And increasing the depth, which means the bottom of the soil layers are compacted. And effects the plants roots and porosity.

Table No. texture determination (%):

Auger	0-30			30-60		
	Clay	Silt	Sand	Clay	Silt	Sand
A1	12	13	75	26	10	64
A2	11	10	79	18	16	66
A3	16	14	70	17	14	69
A4	14	13	73	20	16	64
A5	16	14	70	18	16	66
A6	16	13	70	21	19	60

The soil texture is coarse sand because of increasing the sand.

The soil is well drained and that effects the availability of water and plants nutrients.

There is an increase of silt and clay content in the subsoil and the is good for water availability and nutrient. But it effects on the water infiltration and that leads to poor drainage and aeration.

