Effect of time sequence on the size distribution of soil particles in soils located within Babylon province

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Abstract

This study was conducted in the Al-Mahawil district of Babylon province, located in the central region of Iraq and extending between longitudes 44°33'13" to 45°01'51" east and latitudes 32°25'26" to 32°49'54" north. 22 auger hole locations were identified with an auger hole to a depth of 0 - 30 cm. After that, eight pedons were detected and their coordinates were determined using a GPS device. Two pedons were detected in each cultivated soil for 5 years, with one cultivated pedon and the other left for control, with two pedons in soil. Cultivated for 10 years, one cultivated , the other left for comparison, and two pedons in soil cultivated for 15 years, one cultivated , the other left for comparison, and two pedones in a period of time of 20 years, one cultivated , and the other left for comparison. The horizons of the pedons were described morphologically, and samples were obtained from each location to conduct the necessary laboratory analyzes on them

The results of the morphological description of the soils of the study area indicated that they are soils with a recently formed sedimentary parent material, with an almost flat topography, with a hot, dry continental climate in the summer and a cold, little rain in the winter. The prevailing type of structure is the blocky, non-acute-angled type in the abandoned soils, and the semi-angular blocky structure in the cultivated soils. The time period had no effect on the morphological characteristics of the soil.

Key word: time sequence, pedons, morphological description, cultivated soils

introduction

The concept of soil in its general form is the basic foundation on which agricultural development depends, one of the most important natural resources, the main natural resource in the ecosystem, the source of life and its continuity on this planet, and it is the basic basis for agriculture, and the progress of civilizations takes place in areas rich in soil [6[

Soil is a dynamic body that cannot maintain the same characteristics on time in light of the continuous transformations, including negative and positive ones, and environmental changes. Preserving it from negative changes is one of the natural resources that cannot be equaled by any other natural resource, where it occupies an important position due to the riches it contains. Agricultural production depends mainly on the soil, and good and permanent exploitation of agricultural soil means making full use of it, which means raising its fertility and increasing the availability of nutrients in it. This is done by applying modern young methods in agriculture, and its prominent role in agricultural development, as the development process requires In general, including sustainable agricultural development to successful management methods that help increase productivity and preserve this important economic resource, especially in light of civilizational development and the rapid increase in human growth, which has led to greater use of quantity and intensive

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expansion of the exploitation of agricultural land, as soil systems and their variations are linked The duration of exploitation affects its characteristics, especially its important fertility characteristics, which are required in management and land use planning [4[

Understanding and studying the characteristics of the soil, the extent of its fertility, and the availability of ready-made nutrients in it is important for the purpose of determining agricultural land management practices, not only to improve the productive condition of the land, but also to reduce potential environmental damage on the other hand, and to preserve the main or non-key soil characteristics over time, especially since Soil characteristics are in a state of continuous change, but the rate of change varies over time. In some soils, the change is slow, as is the case with old soils, and in others, the change is relatively rapid, as is the case with young soils [3]Given the importance of time succession in influencing soil properties in general and its effect on soil fertility and available of nutrients in it in particular, scientific study always reveals what is present and explains the variation in soil properties and types and explains their existence because they result from factors and soil formation processes that overlap spatially and temporally and which reflect the influence of these factors and the processes and changes occurring on time, it was necessary to study the factor of time as a succession and its effect on soil fertility, especially since the study of this important factor of soil formation is very, very limited, so the research was directed to achieve the following goals- :

-1Assessing available of some nutrients in the soil

-2Knowing the effect of time on soil fertility and available of nutrients

Materials and methods

-1-3Preliminary procedures

Information was collected about the study area, which is located in the Al-Mahawil district of Babylon province . Given that most of the lands of this district are agricultural and are characterized by the cultivation of various crops, field information from farmers was used, in addition to a visit to the Directorate of Agriculture in Al-Mahawil.

-2-3Field procedures

Based on the information obtained in the preliminary stage, a field visit was conducted to the Al-Mahawil district, which is located in the area that is confined between longitudes ¯13 ¯ 33 ̊44 ◌ ̊ to ¯51 ¯ 01 ̊◌ ̊ east and between two latitudes ¯26 ¯ 25 32̊ to ¯54 ¯. 49 32° N. The total area of the study. The location of the pedons and drill holes were determined according to the time period for cultivating the land. 8 pedons and 22 drill hole location were discovered, and the coordinates of each of the pedons and drill holes were determined. Drilling using a global positioning device (GPS). After that, the horizons of the pedons were described in a fundamental morphological manner according to the principles mentioned in (2017, Soil Science Division Staff). Samples were obtained from each horizon and from every drilling hole. The drilling samples were obtained using a drilling machine (the drill) and preserved. The samples were coded and brought to the laboratory to conduct the necessary laboratory analyzes on them.

The following are the pedons that were identified for the purpose of study according to the time period of cultivation as follows- :

-1pedon 1 on cultivated land for five years and Pedon 2 on uncultivated (abandoned) land for the same period of time for the purpose of comparison.

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-2Pedon 3 on cultivated land for 10 years and Pedon 4 on uncultivated (abandoned) land for the same period of time for the purpose of control.

-3Pedon 5 on cultivated land for 15 years and Pedon 6 on uncultivated (abandoned) land for the same period of time for the purpose of control.

-4A pedon of 7 on cultivated land for 20 years and a pedon of 8 on uncultivated (abandoned) land for the same period of time for the purpose of control.

-3-3Location

The study area is located in the Al-Mahawil District of Babylon province, as the district is one of the agricultural areas in the central region of Iraq., as the Al-Mahawil District is defined by spatial boundaries as it occupies the eastern and northeastern part of Babylon province. It is shaped like a rectangle, as shown in Figure 1. It extends in a northwest-southeast direction, and has a longitudinal extension from north to south of 46 km, while its extension from east to west is 62 km. It is bordered by a group of districts and districts, from the north to Alexandria and the modern village (Al-Haswa) within Al-Musayyab District, to the east and north-east, Al-Suwayra District, affiliated with Wasit Governorate, to the south, Al-Madhatiya District, within Al-Hashimiya District, to the southwest, the center of Al-Hilla District, and to the west and northwest, Sadda Al-Hindiyya District, affiliated to Al-Musayyab District.

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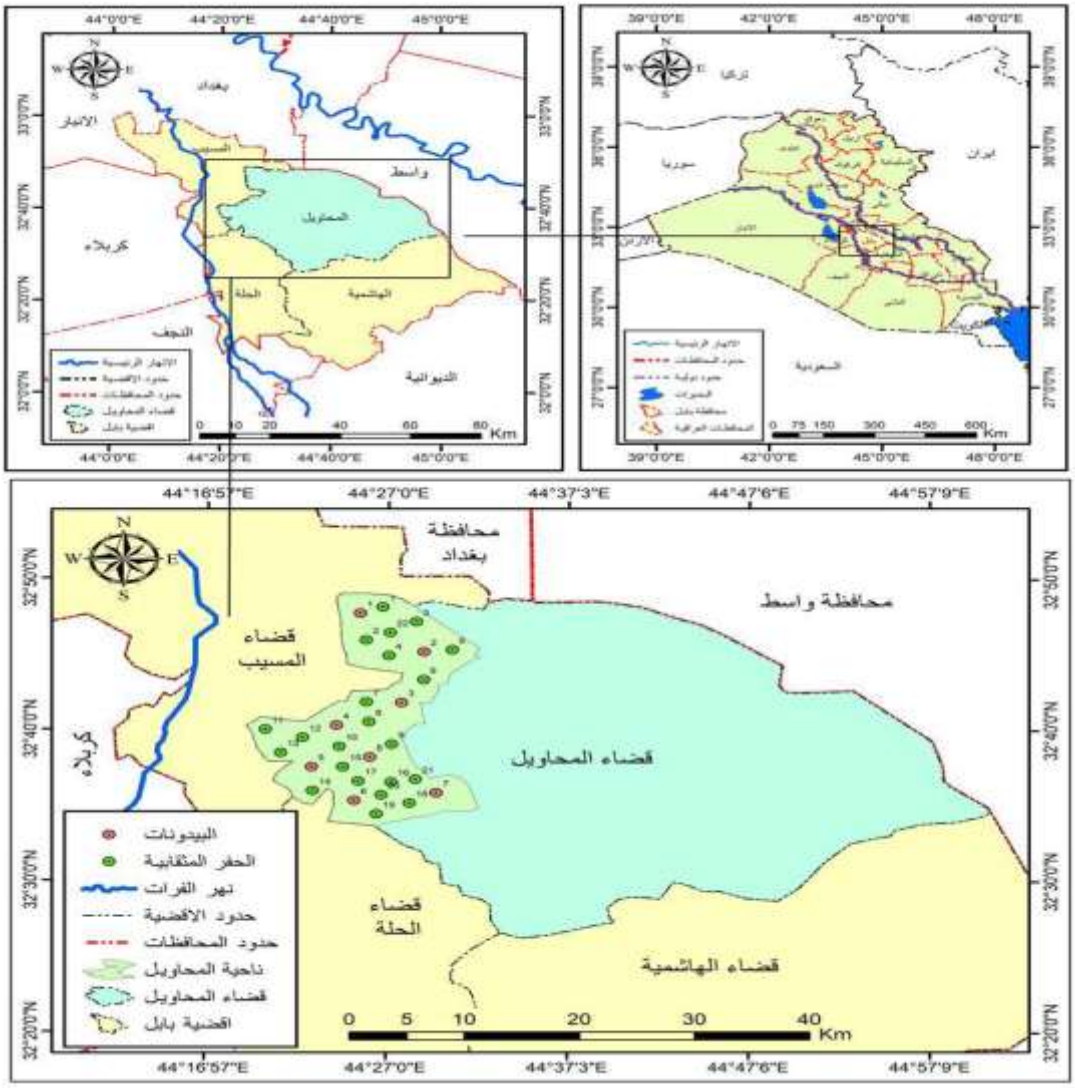

Figure 1: Location of the study area in Al-Mahawil District, Babylon province

-4-3Geology of the study area

The study area is considered part of the alluvial plain from a geological point of view. It is located in an unstable shelf area similar to the diagenetic division of Iraq. Its geological formation is related in some methods to the geological developments that took place in Iraq and the region. Quaternary sediments give most of its areas, which are represented by river deposits, aeolian deposits, and sediments. Due to human activities, the age of the geological formations on the surface of the region extends from the Late Lower Eocene (Dammam) to the Upper Miocene-Pliocene (Formation of the Euphrates and Venus) until the present (modern sediments). (Al-Ani and Al-Barazi, 1979.(

-5-3Natural vegetation and land use

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Natural plants differ in their distribution and spread depending on the exploitation and cultivation of the soil. Imperata cylindrical, Malva parvifloa, Alhagi mavrorum, Lagonychivm farctvm, Cynodon dactylon, and Sorghum halepense prevail in the study area. The agricultural exploitation of land and the use of the land has varied, but most of the crops grown are grains, palm trees, and some vegetables. There are lands left without cultivation due to the lack of rain and the scarcity of water used for irrigation. As for the cultivated lands, irrigation is used, and one of the fertilizers is left uncultivated, which contains... Nitrogen, phosphorus and potassium elements, only once during the cultivation period for any crop.

-6-3Climate

Climate is the most important natural factor influencing agricultural production. It is one of the effective soil formation factors and is important in the emergence, development and classification of soil as a result of its direct influence through its various elements and the changes it causes in the soil body. The climate of the study area is characterized by being hot and dry in the summer and cold with little rain in the winter. Therefore, it is classified as a desert climate, as the daily and monthly temperatures are characterized by extreme extremes between night and day, summer and winter. The results of Table (1) showed that the climate information for the period from 1991-2023 that was Obtained from the General Authority for Meteorology and Seismic Monitoring - Baghdad, the average temperature in the study area was highest in the summer months of June, July, and August, when temperatures reached respectively, while the lowest temperature was reached in The winter months.

As for the amount of rain, as rain is one of the most important climatic elements that has an effective influence on soil formation, its processes, and soil development. It is noted that the scarcity or absence of rain falls in the summer months of June, July, and August, as the average amount of The monthly rainfall is 5 mm, and the rise in temperature and lack of precipitation is reflected in the amount of evaporation, as the amount of evaporation increases in the summer months, as the total amount of annual evaporation reached -------- mm. It is noted from Table 1 that the amount of evaporation increases starting from the month of May. June, July, and August, then it begins to decrease in the winter months, coinciding with the rate of relative humidity in the winter months, as the maximum rate of annual relative humidity reached %, as relative humidity is inversely related to temperature and evaporation.

As for wind speed, it is noted that the average wind speed increases in the study area in the summer months, as the average wind speed reached ---------- m s-1

Laboratory procedures

After bringing the soil samples to the laboratory, they are prepared through the process of air drying, then grinding and sifting them with a 2 mm sieve, and then storing them in special bags to conduct the necessary laboratory analyzes on them, including:

Size distribution of soil particles

The percentage of sand, silt and clay was estimated using a hydrometer according to the method mentioned in (Black, 1965). After that, the texture type was determined on the texture triangle.

Results and discussion

Morphological description of pedons soil of the study area

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The study of morphological traits is of great importance because they express the external morphological features that a person can observe in the soil body initially, and for the purpose of obtaining a clear picture about the effect of time and agricultural exploitation on the morphological traits of the soil. The results of the morphological description in all pedons indicated that the morphological traits of the soil are different from pedon. To another, this is a result of the influence of a number of factors, including the method of soil management followed, the duration of soil cultivation, and the nature of sedimentation in the region, in addition to environmental conditions, the influence of the region's climate, and the source material, as in all pedons there was a newly formed sedimentary source material, with a surface that is predominantly flat, because it has a topographic nature. It is almost flat, and the following is the morphological description of the soil of pedons of the study area:

The results of the morphological description showed that the thickness of the horizon Ap in the agriculturally exploited pedons, according to the time period, ranged between 30-32 cm. The smallest thickness in this horizon was in pedon 1, planted for 5 years, and pedon 3, grown for 10 years. The largest thickness was in pedon 5, cultivated. For 15 years and the planted Pedon 7 for 20 years.

Table 1 Morphological description of pedon 1

Pedon No.	**1**
Soil Series	MM11
Soil classification	**Typic Torrifluvent**
Location	44° 25' 26.807" E , 32° 47' 43.547" N
Elevation	22 m a.s.l
Topography	Nearly level
Climate	Sime arid
Parent Material	Alluvium
Drainage	Moderate drained
Natural vegetation	*Malva parvifloa*
Land use	Wheat
Date of description	30/11/2023
Described By	Dr.Amal Radhi and Hadeer Mouhsen

Table 2: Morphological description of Pedon 2

Horizon	**Depth (cm)**	**Descriptions**
Ap	0 – 30	Grayish Brown (10YR5/2)d, Dark Grayish Brown (10YR4/2)m ; Silt Clay Loam ; moderate ,fine , subangular blocky ; Slightly hard, friable , Slightly sticky and Slightly plastic ; common , fine porse ; plentiful , fine roots ; abrupt smooth boundary
C1	30 – 62	Dark Brown (10YR3/3)m; Silt Clay; moderate , medium , subangular blocky ; Slightly hard, friable , Slightly sticky and Slightly plastic ; common , fine porse ; many , fine roots ; clear smooth boundary

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C2	62 – 95	Dark Brown (10YR3/3)m; common, fine distinct pale brown (10YR 6/3) mottles; Silt Clay ; moderate , fine , subangular blocky , hard, friable, sticky and Slightly plastic ; many fine porse; few , coarse roots ; gradual smooth boundary , spot of lim
C3	95 – 135	Dark Brown (10YR3/3)m; common, fine distinct pale brown (10YR 6/3) mottles ;Silt Clay; moderate , medium, subangular blocky ;Slightly hard , friable , Slightly sticky and Slightly plastic ; many fine porse; , few coarse roots , spot of lim

Pedon No.	**2**
Soil Series	DW55
Soil classification	**TypicTorrifluvent**
Location	44° 28' 59.886" E , 32° 45' 11.386" N
Elevation	21 m a.s.l
Topography	Nearly level
Climate	Sime arid
Parent Material	Alluvium
Drainage	Well drained
Natural vegetation	*Alhaji maurorum ،Malva parvifloa*
Land use	Abandoned
Date of description	30/11/2023
Described By	Dr.Amal Radhi and Hadeer Mouhsen

Horizon	**Depth (cm)**	**Descriptions**
A	0 - 28	Yellowish brown (10YR5/6)d; Brown (10YR3/4)m; Loam ; moderate ,medium , subangular blocky ; Slightly hard, fraible , Slightly sticky and Slightly plastic ; common fine porse ; many , fine roots ; clear smooth boundary
C1	28 - 58	Brown (10YR3/4)m; Silt Loam; moderate , fine , angular blocky ; Slightly hard, friable , Slightly sticky and Slightly plastic ; many , fine porse ; few , fine roots ; clear smooth boundary , spot of lim
C2	58 - 90	Yellowish Brown (10YR5/6)m; Loam ; weak , fine , angular blocky ,Slightly hard , fraible ,Slightly sticky and Slightly plastic ; many fine porse; few , coarse roots ; clear smooth boundary , spot of lim
C3	90 - 130	Yellowish Brown (10YR5/6)m; Loam; weak , medium, angular blocky ;slightly hard , friable , Slightly sticky and non plastic ; many fine porse ; very few coarse roots . spot of lim

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Table 3: Morphological description of Pedon 3

Pedon No.	**3**
Soil Series	DM116
Soil classification	**TypicTorrifluvent**
Location	44° 27' 45.979" E , 32° 41' 49.443" N
Elevation	24 m a.s.l
Topography	Nearly level
Climate	Sime arid
Parent Material	Alluvium
Drainage	Moderate drained
Natural vegetation	*Lagonychium farctum , Convolvulus arvensis*
Land use	Wheat
Date of description	30/11/2023
Described By	Dr.Amal Radhi and Hadeer Mouhsen

Horizon	**Depth (cm)**	**Descriptions**
Ap	**0 - 30**	Brown (10YR4/3)d; Dark Brown (10YR3/3)m; ; Silt Loam ; weak ,medium , subangular blocky ; Slightly hard, friable , Slightly sticky and Slightly plastic ; common fine porse ; plentiful , fine roots ; abrupt smooth boundary
C1	**30 - 68**	Brown (10YR4/3)m; Silt Clay; moderate , medium , subangular blocky ; hard, friable , Slightly sticky and Slightly plastic ; common , fine porse ; many , fine roots ; gradual smooth boundary
C2	**68 -95**	Brown (10YR4/3)m; common, fine distinct pale brown (10YR 6/3) mottles; Silt Clay ; moderate , fine , subangular blocky , hard , friable , sticky and plastic ; common fine porse; few , fine roots ; gradual smooth boundary .
C3	**95 - 140**	Dark Brown (10YR3/3)m; common, fine distinct pale brown (10YR 6/3) mottles ; Silt Clay Loam; moderate , medium, subangular blocky ; slightly hard , friable , Slightly sticky and Slightly plastic ; many fine porse; few coarse roots .

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Table 4: Morphological description of Pedon 4

Pedon No.	**4**
Soil Series	MW4
Soil classification	**TypicTorrifluvent**
Location	44° 24' 10.200" E , 32° 40' 18.853" N
Elevation	23 m a.s.l
Topography	Nearly level
Climate	Sime arid
Parent Material	Alluvium
Drainage	Well drained
Natural vegetation	*Alhaji maurorum , , Imperata cylindrical*
Land use	Abandoned
Date of description	6/12/2023
Described By	Dr.Amal Radhi and Hadeer Mouhsen

Horizon	**Depth (cm)**	**Descriptions**
A	**0 - 25**	Pale brown (10YR6/4)d; Dark Yellowish Brown (10YR4/4)m; ; Loam ; moderate ,medium , Subangular blocky ; Slightly hard, friable , Silghtly sticky and Slghtly plastic ; common fine porse ; many , fine roots ; clear smooth boundary.
C1	**25 - 53**	Dark Yellowish Brown (10YR4/4)m; Loam; moderate , medium , subangular blocky ; Slightly , friable , Slightly sticky and non plastic ; common , fine porse ; few , fine roots ; clear smooth boundary
C2	**53 - 85**	Brownish Yellow (10YR6/8)m; Loam ; moderate , fine , angular blocky , Slightly hard , friable , Slightly sticky and Slightly plastic ; many fine porse; very few , fine roots ; clear smooth boundary . spot of lim
C3	**85 - 130**	Brownish Yellow (10YR6/8)m; Loam; weak , medium, angular blocky ; slightly hard , friable , non sticky and non plastic ; many medium porse; very few coarse roots . spot of lim

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Table 5. Morphological description of Pedon 5

Pedon No.	**5**
Soil Series	MM11
Soil classification	**TypicTorrifluvent**
Location	44° 22' 47.457" E , 32° 37' 34.157" N
Elevation	22 m a.s.l
Topography	Nearly level
Climate	Sime arid
Parent Material	Alluvium
Drainage	Moderate drained
Natural vegetation	*Alfalfa ,Medicago sativa , Imperata cylindrical*
Land use	Wheat , Alfalfa
Date of description	6/12/2023
Described By	Dr.Amal Radhi and Hadeer Mouhsen

Horizon	**Depth (cm)**	**Descriptions**
Ap	**0 - 32**	Yellowish brown (10YR5/8) d, Dark yellowish brown (10YR3/4)m; Clay Loam ; moderate , medium ,subangular blocky ; Slightly hard , Fraible ,Slightly sticky and Slightly plastic ; common fine pores , many , fine roots , abrupt smooth boundary
C1	**32 - 65**	Dark brown (10YR3/3)m; Silt Clay ; moderate ,fine , subangular blocky ; hard , friable , Slightly sticky and Slightly plastic ; common fine, porse ; many , fine and coarse roots ; gradual smooth boundary .
C2	**65 - 100**	Dark yellowish Brown (10YR3/4)m; common, fine distinct Dark brown (7.5YR 3/2) mottles; Silt Clay ; moderate , fine , subangular blocky ; hard, friable , sticky and Slightly plastic ; common , fine porse ; many , fine roots ; gradual smooth boundary.
C3	**100 - 135**	Dark yellowish Brown (10YR3/4)m ,common, fine distinct Dark brown (7.5YR 3/2) mottles ; Silt Clay ; moderate , fine , subangular blocky , Slightly hard , friable ,slightly sticky and Slightly plastic ; many fine porse ; few , coarse roots .

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Table 6: Morphological description of pedon 6

Pedon No.	**6**
Soil Series	DM96
Soil classification	**TypicTorrifluvent**
Location	44° 25' 9.519" E , 32° 35' 20.413" N
Elevation	22 m a.s.l
Topography	Nearly level
Climate	Sime arid
Parent Material	Alluvium
Drainage	Moderate drained
Natural vegetation	*Alhaji maurorum , Malva parvifloa*
Land use	abandoned
Date of description	6/12/2023
Described By	Dr.Amal Radhi and Hadeer Mouhsen

Horizon	**Depth (cm)**	**Drsecription**
A	0 - 27	Dark brown (10 YR 3/3) m; brown (10YR 4/3) d ; Clay Loam ,moderate ,medium subangular blocky; hard,friable , Slightly sticky and slightly plastic ; medium ; many ,fine pores; many ,fine roots clear sooth boundary
C1	27 - 60	Dark brown (10 YR 3/3) m; Silt Clay Loam ; moderate, medium , angular blocky ; Slightly hard , friable; Slightly sticky and Slightly plastic, many, medium pores ,few coarse roots; many smooth boundary . spot of lim
C2	60 -98	Dark brown (10 YR 3/3) m; common , fine dark brown (7.5YR3/2) mottles; Silt Clay Loam ; fine , medium ,subangular blocky ; slightly hard, friable, Slightly Sticky and Slightly plastic ;common fine porse; very few fine roots ;clear smooth boundary . spot of lim
C3	98 - 135	Dark Brown (10YR 4/3) m ; common, fine distinct Dark brown (7.5YR 3/2) mottles; Clay Loam ; moderate , medium ,subangular blocky; hard, friable, Slightly sticky and Slightly plastic; many ,coarse porse; very few coarse roots . spot of lim

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Table 7: Morphological description of pedon 7

Pedon No.	**7**
Soil Series	DM116
Soil classification	**Typic Haplocalcids**
Location	44° 29' 42.807" E , 32° 35' 51.465" N
Elevation	23 m a.s.l
Topography	Nearly level
Climate	Sime arid
Parent Material	Alluvium
Drainage	Moderate drained
Natural vegetation	*Cynodon dactylon*
Land use	Palm , Alfafa
Date of description	6/12/2023
Described By	Dr.Amal Radhi and Hadeer Mouhsen

Horizon	Depth (cm)	Drsecription
Ap	0 -32	Brown to dark Brown (10YR4/3)d; Dark Brown (10YR3/3)m; ; Silt Clay Loam ; moderate ,medium , subangular blocky ; hard, friable , sticky and Slightly plastic ; common fine porse ; plentiful , fine roots ; clear smooth boundary
C1	32 - 70	Dark Brown (10YR3/3)m; Silt Clay ; moderate , medium , subangular blocky ; Slightly hard, friable , Slightly sticky and Slightly plastic ; common , fine porse ; many , fine roots ;accumulation of lime ; gradual smooth boundary
C2	70 - 110	Dark Brown (10YR3/3)m ; few, fine faint gray (10YR 5/1) mottles ; Silt Clay ; moderate , fine , subangular blocky , hard , friable , sticky and Slightly plastic ; many fine porse; few , fine and coarse roots ; gradual smooth boundary
C3	110 - 150	Brown (10YR4/3)m; few, fine faint gray (10YR 5/1) mottles ; ; Silt Clay Loam; moderate , medium, subangular blocky ;slightly hard , friable , Slightly sticky and Slightly plastic ; many fine porse; , few coarse roots

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Table 8 Morphological description of pedon 8

Pedon No.	**8**
Soil Series	DM86
Soil classification	**TypicTorrifluvent**
Location	44° 26' 1.365" E , 32° 38' 12.413" N
Elevation	20 m a.s.l
Topography	Nearly level
Climate	Sime arid
Parent Material	Alluvium
Drainage	Moderate drained
Natural vegetation	*Schanginia arbuscula , Alhaji maurorum , Imperata sylinderica*
Land use	abandoned
Date of description	6/12/2023
Described By	Dr.Amal Radhi and Hadeer Mouhsen

Horizon	**Depth (cm)**	**Descriptions**
A	0 - 30	Very pale brown (10YR7/4)d; Dark Yellowish Brown (10YR4/4)m; ; Clay Loam ; Weak ,medium , angular blocky ; Slightly hard, friable , Silghtly sticky and non plastic ; common fine porse ; many , fine roots ; clear smooth boundary
C1	30 - 65	Very pale Brown (10YR7/4)m; Clay Loam; moderate , medium , angular blocky ; Slightly , friable , Slightly sticky and non plastic ; common , fine porse ; few , fine roots ; clear smooth boundary, spot of lim
C2	65 - 105	Light yellowish brown (10YR6/4)m ; common, fine distinct pale brown (10YR 6/3) mottles ; Silt Clay Loam ; moderate , fine , angular blocky , hard , firm , sticky and Slightly plastic ; many fine porse; very few , coarse roots ; clear smooth boundary , spot of lim
C3	105 - 135	Light yellowish brown (10YR6/4)m; common, fine distinct pale brown (10YR 6/3) mottles ; Silt Clay Loam; moderate , medium, angular blocky ;slightly hard , friable , Slightly sticky and Slightly plastic ; many fine porse; ,very few coarse roots , spot of lim

It is noted that the thickness of the Ap horizon was greater in the soil pedons planted for a long period, while the thickness of the rest of the subsurface horizons of the planted pedons ranged between 27-45 cm, as it was the smallest thickness in the C1 horizon of pedon 3 grown for 10 years, and the largest thickness was also in pedon 3. The thickness of horizon A in the uncultivated (abandoned) pedons ranges between 25-30 cm, as the smallest thickness was in pedon 4, which was left for 10 years without cultivation, and the largest

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thickness was in pedon 8, left for 20 years without cultivation. As for the rest of the subsurface horizons The thickness of these uncultivated pedons ranges between 28-45 cm. The smallest thickness was in horizon C1 of pedon 4, which was left for 10 years, and the greatest thickness was in horizon C3 of pedon 4 as well, as it is noted that the surface horizon A was affected by agricultural exploitation and its duration, so its thickness was large. In cultivated pedons, as the duration of exploitation increased, the thickness of the surface horizon Ap increased. As for the subsurface horizons, their thickness was not affected by the duration of agricultural exploitation or soil cultivation. The reason for this is attributed to the amount of sedimented materials and agricultural processes that occur in the soil, and this is consistent with what he found [1. [

The results of the morphological description of pedon showed that the color of the soil did not differ in all pedon planted according to the period of time and those left without cultivation in terms of their similarity in the wavelength Hve in Mansal color page, as it was YR10 in all horizons, and that the difference was in the values of color intensity (valve) and the degree of color purity (Chroma). The dominant color in cultivated soil pedons is Dark brown and Brown.

The values of Valve in the horizons of the planted pedons ranged between 3-4, while its values in the horizons of the abandoned pedons ranged between 3-7, while the values of Chroma in the horizons of the planted pedons ranged between 2-4, or its values in the horizons of the abandoned pedons ranged between 3-8, which indicates the effect of... Agricultural exploitation in the values of color intensity and color purity compared to their values in soils not exploited agriculturally, as light colors, including Yallo wish brown, were dominant.

The reason for this is that the color of the soil is determined by a number of morphological characteristics that reflect the general state of the nature of the soil components, the state of soil exploitation, and the type of exploitation. It has great importance for the farmer and the soil scientist, where it reveals the important characteristics and conditions that affect the soil and thus plant growth from these components. The content of organic matter. In the soil, the nature of the mineral composition, moisture content, drainage and aeration conditions (Soil survey staff, 1993.(

As the results of the morphological description showed the presence of color spotting in the horizons of some cultivated and uncultivated pedons, or the lack of influence of the duration of agricultural exploitation on the appearance of the spotting that appeared at a depth of 60 cm, the light color in the horizons of uncultivated soil is due to not cultivating it and leaving it, which led to an increase in salts. There is the spread of natural plants such as Akoul, Tarteh and Halfa.

The results of the morphological description indicate that the soil texture was not affected by agricultural exploitation, but the time period of exploitation slightly affected the variation of the dominant textures, as the Sic clay alluvial and the clayey clay alluvial were dominant in the cultivated soils, while in the abandoned soils the L and alluvial mixed texture types were dominant, and perhaps it is due to The reason is the movement of soil particles through the roots of cultivated plants or their descent and mechanical movement with irrigation water, which is why the distribution of these particles in pedons varies.

As for the type of soil structure prevailing in the horizons of the cultivated beds, it was in

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all beds with differences in agricultural exploitation of the Subangvlar blocky type. The difference was in the degree of construction, which ranged between weak and moderate, and the size of the construction ranged between fine and mediocre. As for the type of construction In non-abandoned soil horizons, it is the angular blocky structure, the degree of structure between weak and moderate, and the size of the structure between fine and medium.

The reason for this is that agricultural exploitation has an impact on the type of soil structure, as the effect of the agricultural process had a clear impact on the development of soil structure from angular blocks to non-angular blocks. The results of the morphological description showed that agricultural exploitation of the soil did not affect the texture of the soil in its three states: dry, wet and wet. The results indicated that the texture of the soil in all horizons of cultivated and abandoned soil ranged between little hardness and hardness in the dry state and between little brittleness and fragileness in the wet state, while in the wet state it ranged in terms of viscosity and non-sticky, low viscosity, sticky and non-plastic, low plasticity and plastic, as this indicates. Agricultural exploitation does not affect soil texture because the factors that affect it are soil texture and moisture content.

As for the porosity of the soil, it is abundant, fine, medium, and coarse in size in all horizons of the cultivated soil, where the distribution of roots in horizon Ap was widespread and of fine sizes due to agricultural operations, crop roots, and natural growth. As for the rest of the horizons, the roots were abundant, smooth, rough, and few, and of fine and coarse sizes in These horizons are for cultivated soils, but in non-cultivated soils, the roots were distributed gradually decreasing with depth. This is because the roots are spread on the surface due to the roots of natural plants, but in the subsurface horizons, they were very few, rough and smooth, and also limited to the roots of natural plants.

The results of the morphological description of pedon soil horizons showed that the nature of the horizon boundaries of the cultivated soils was abrupt, sharp, clear, gradual, and had an almost flat topography in most of the horizons, as agricultural exploitation had a clear impact on the boundaries of the surface horizons, while the boundaries of the horizons in the uncultivated (abandoned) soils were all clear and level. This is due to its lack of cultivation and the nature of the sedimentation process in the region, and this is what I obtained [2[

As for the calcification condition, it is noted that small white dots of lime appear in the subsurface horizons of the cultivated and uncultivated soils for a period of 5 years. Likewise, white spots appear in the abandoned (uncultivated) soils for a period of 10 years, 15 years, and 20 years. The reason is attributed to the overlapping effect of agricultural exploitation and the time period. For exploitation in the accumulation of calcium carbonate, which showed this accumulation morphology in the subsurface horizons as well as the surface horizons of the abandoned soil.

The following is the morphological description of pedons according to the time period of agricultural exploitation:

Effect of agricultural exploitation and time period on the size distribution of soil particles in the study area

Sand

The results of Tables (9) and (10) and Figure (2) indicate that the sand in the soil of pedon

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horizons or the location cultivated for 5 years ranged between 85.62 - 210.19 g kg-1, as the lowest content was in Location 22 and the highest content was in Location 3. As for its content in The soil of pedon 3 horizons and the locations cultivated for 10 years ranged between 88.95 - 210.72 g kg-1, as the lowest Ap content was in pedon 3 horizon and the highest content was in location 12, and the sand content in the soils cultivated for 15 years ranged between 88.16 - 200.12 g kg-1. -1 The lowest content was in location 17 and the highest content was in the Ap horizon of Pedon 5. As for the soils cultivated for 20 years, the sand content in Pedon 7 and these cultivated locations ranged between 88.96 - 160.43 g kg-1, as the lowest content was in the horizon C1. From pedon 7 and the highest content on the horizon is Ap for the same pedon

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Table 9: Size distribution of soil particles for soils of the study area

texture	clay	silt	sand	Horizon	pedon
	gKg^{-1}	gKg^{-1}	gKg^{-1}		
SiCL	358.04	528.20	113.76	Ap	P1
SiC	409.55	470.31	120.14	C1	
SiC	437.72	462.18	100.10	C2	
SiC	430.62	458.84	110.54	C3	
L	197.79	482.67	319.54	Ap	P2
SiL	214.35	500.12	285.53	C1	
L	220.06	489.53	290.41	C2	
L	215.5	474.29	310.21	C3	
SiL	490.87	420.18	88.95	Ap	P3
SiC	455.54	448.26	96.20	C1	
SiC	467.13	429.72	103.15	C2	
SiCL	389.23	490.32	120.45	C3	
L	209.07	470.39	320.54	Ap	P4
L	221.28	490.77	287.95	C1	
L	232.05	430.89	337.06	C2	
L	189.77	480.11	330.12	C3	
CL	379.7	420.18	200.12	Ap	P5
SiC	409.23	490.57	100.20	C1	
SiC	488.47	413.04	98.49	C2	
SiC	464.19	430.68	105.13	C3	
CL	310.94	448.19	240.87	Ap	P6
SiCL	345.97	402.37	151.66	C1	
SiCL	391.06	430.55	178.39	C2	
CL	307.67	482.96	209.37	C3	
SiCL	369.18	470.39	160.43	Ap	P7
SiC	408.93	502.11	88.96	C1	
SiC	404.39	495.48	100.13	C2	
SiCL	368.79	510.11	121.10	C3	
CL	302.32	487.18	210.50	Ap	P8
CL	388.76	400.82	210.42	C1	

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SiCL	352.59	506.87	140.54	C2	
SiCL	325.82	550.20	123.98	C3	

Table 10: Size distribution of soil separators at surface depth of auger drill samples

texture	clay gKg^{-1}	silt gKg^{-1}	sand gKg^{-1}	location
SiCL	393.94	508.67	97.39	1
SiCL	379.62	520.26	100.12	2
CL	312.01	477.80	210.19	3
SiL	258.5	501.38	240.12	4
CL	277.37	483.96	238.67	5
L	238.07	461.70	300.23	6
SiCL	395.23	504.11	100.66	7
SiCL	398.62	494.20	107.18	8
SiC	401.22	500.13	98.65	9
CL	276.2	493.61	230.19	10
SiC	404.41	495.08	100.51	11
CL	313.37	475.91	210.72	12
C	449.45	370.19	180.36	13
SiCL	330.16	565.81	104.03	14
SiC	416.43	489.25	94.32	15
SiC	416.2	453.61	130.19	16
SiC	409.65	502.19	88.16	17
SiCL	388.03	494.72	117.25	18
L	243.76	450.14	306.10	19
SiL	213.36	510.43	276.21	20
SiCL	374.96	500.33	124.71	21
SiCL	396.12	518.26	85.62	22

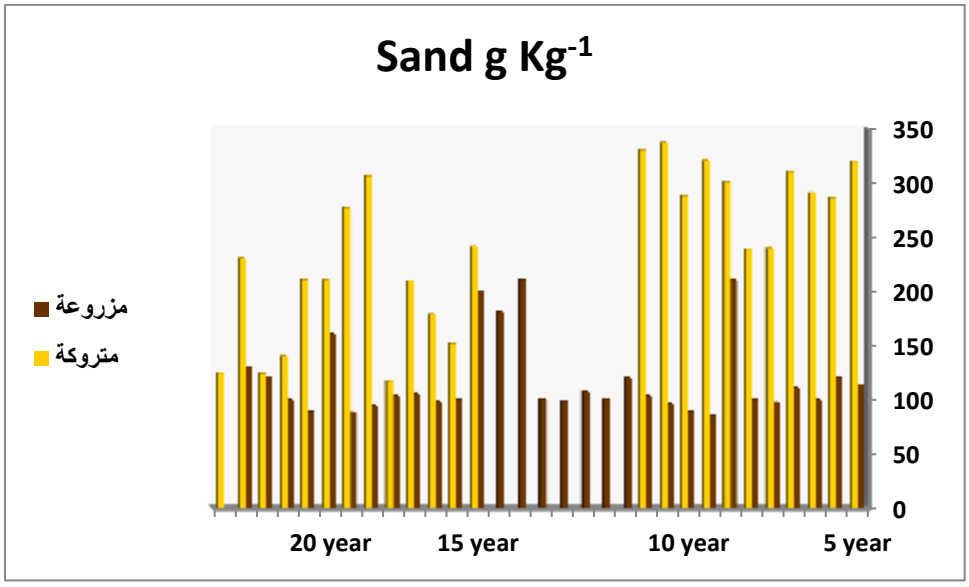

Figure 2: Distribution of separated sand in the soil of the study area

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The results of Tables (9) and (10) and Figure (2) showed that the sand content in the soil of pedon Horizons 2 and the location left without cultivation for 5 years ranged between 238.67 - 319.54 g kg-1, as the lowest content was in Location 5 and the highest content was in Horizon A. From Pedon 2, its content in the soil left for 10 years ranged between 287.95 - 337.06 g kg-1, as the lowest content was in the C1 horizon of Pedon 4 and the highest content in the C2 horizon of Pedon 4 as well, and the sand content ranged between 117.25 - 306.10 g kg-1. 1 in soils left for 5 years, as the lowest content was in location 18 and the highest content in location 19 of these soils.

As for the soils left abandoned for 10 years, the sand content ranged between 123.98 - 230.19 g kg-1, as the lowest content was in Horizon C3 of Pedon 8 and the highest content was in Location 10 of these soils left without cultivation for 20 years.

It is noted from the results of Figure (2) that the pattern and distribution of sand is not homogeneous, and that the short period of agricultural exploitation of 5 years, which was left without cultivation, had a high content of sand. The reason is due to the sedimentary condition and the influence of the study area by the sedimentation process. As the time period for cultivating the lands increases, the sand content decreases and may return. The reason is the effect of the process of irrigation and agriculture on its movement and its transfer to the bottom over time. On the contrary, leaving the lands without cultivation exposes them to the process of deterioration and wind erosion, which transports the fine particles and the coarse particles of sand remain from the soil, losing with them the ready-made nutrients and organic matter and the lack of activity of living things. Microstructure and these results are consistent with what was found by (Jubeir and Mahmoud, 2015.(

silt

The results of Tables (9) and (10) and Figure (3) indicate that the silt content in the cultivated soil for 5 years ranged between 458.84 - 528.20 g kg-1, as the lowest content was in the C3 horizon of Pedon 1 and the highest content was in the Ap horizon of Pedon 1. As for the silt content in the soils of Pedon 3 and 11, cultivated and locationd for 10 years, it ranged between 370.19 - 504.11 g kg-1, as the lowest content was in location 13 and the highest content was in location 7. As for its content in the soils cultivated for 15 years, it ranged between 413.04 - 565.81 g. Kg-1, as the lowest content was in the C2 horizon of Pedon 5, and the highest content was in location 14. The silt content in the soil of Pedon 7, cultivated for 20 years, ranged between 453.61 - 510.11 g.kg-1, as the content was the lowest in Location 16 and the highest content in the horizon. C3 of pedon 7.

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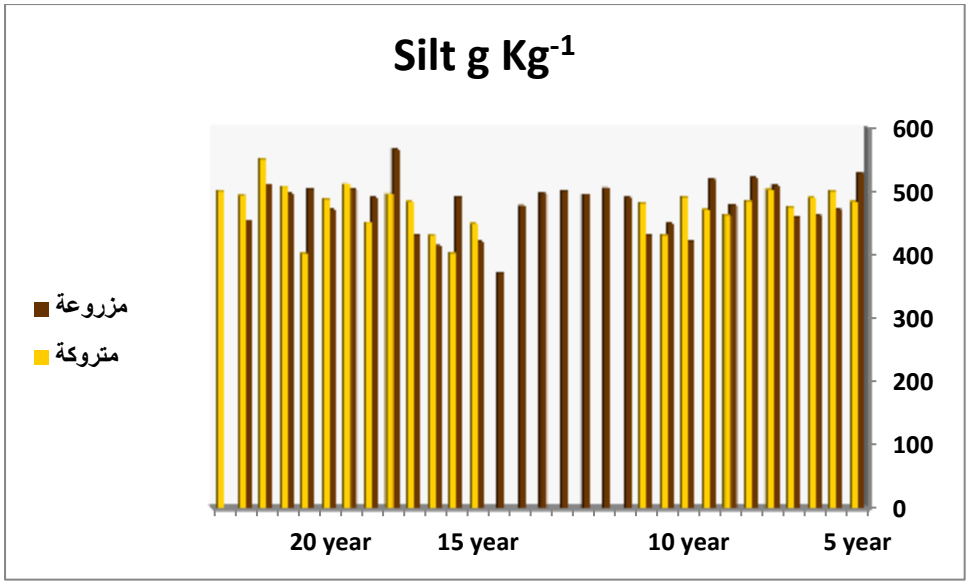

Figure 3: Distribution of silty separators in the soil of the study area

The results of Tables (9) and (10) and Figure (3) showed that the silt content in the soils left without cultivation for 5 years ranged between 461.70 - 501.38 g kg-1, as the lowest content was in location 6 and the highest content was in location 4. As for its content in the soil Left without cultivation for 10 years, it ranged between 430.89 - 490.77 g kg-1, as the lowest content was in the C2 horizon of Pedon 4, while the highest content was in the C1 horizon of Pedon 4 as well, and its content ranged between 402.37 - 510.43 g kg-1 in Pedon 6. In the locations left without cultivation for 15 years, the lowest content was in horizon C1 of Pedon 6, and the highest content was in location 20 in these soils that were left without cultivation for 15 years. As for the soils left without cultivation for 20 years, the silt content ranged between 400.82 - 550.20 g kg- 1, since the lowest content in the C1 horizon was that of pedon 8, and the highest content in the C3 horizon was also that of pedon 8.

From the results in the table and figure, it was noted that there was an increase in the content of separated silt in the horizons of all pedons for cultivated and abandoned soils and at all time periods, but in a varying manner, as a slight increase was observed in cultivated soils for a long period of 20 years. The reason for the variation in the distribution of silt content is attributed to the conditions of the deposition process, as When the water current is strong, it brings with it large quantities of coarse silt to be depolocationd on long distances with the clay [2] The increase in silt content in the soil of the study area may be attributed to the conditions of the deposition process, the nature of soil use, and the time of deposition. These results are consistent with what He obtained it (Sayud, 2024).7

Clay

The results of Table (9) and (10) and Figure (4) indicate that the clay content in the cultivated soil for 5 years ranged between 312.01 - 437.72 g kg-1, as the lowest content was in location 3 and the highest content was in the C2 horizon of Pedon 1. As for the clay content The clay content in soils cultivated for

10 years ranged between 313.37 - 490.87 g kg-1, as the lowest content was in location 12 and the highest content was in Ap horizon of Pedon 3. As for soils cultivated for 15 years, the clay content in it ranged between 330.16 - 488.47 g kg-1. The lowest content was in location 14 and the highest content was in C2 of pedon 5. As for the clay content in the cultivated soil for 20 years, it ranged between 368.79 - 416.20 g kg-1, as the lowest content was in horizon C3 of pedon 7 and the highest content was in location 16 of these. Soils cultivated for 20 years

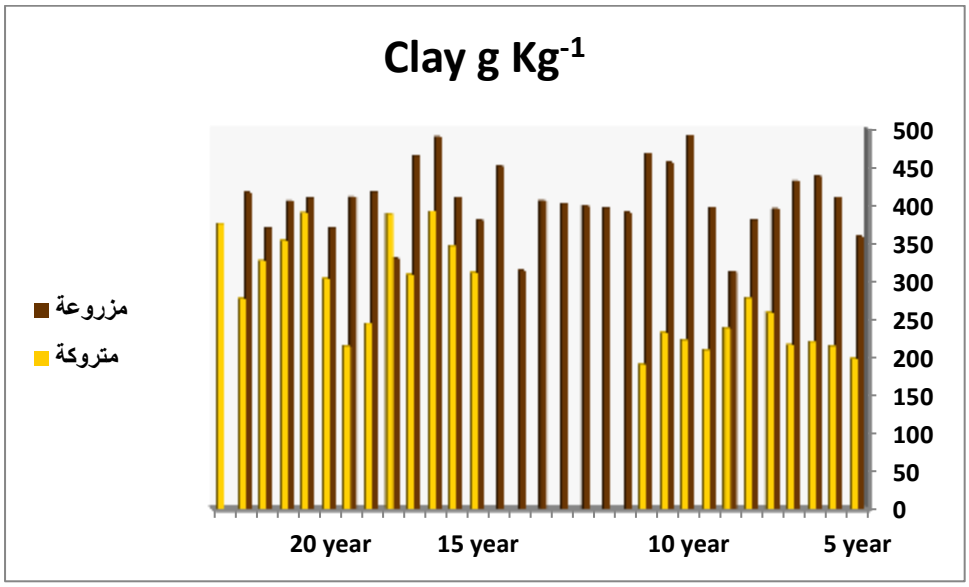

Figure 4: Distribution of clay separators in the soil of the study area

The results of Table (9) and (10) and Figure (4) showed that the clay content in soils left without cultivation for 5 years ranged between 197.79 - 277.37 g kg-1, as the lowest content was in Horizon A of Pedon 2 and the highest content was in Location 5. As for its content in the soil left behind for 10 years, it ranged between 189.77 - 232.05 g kg-1, as it was the lowest content in the C3 horizon of Pedon 4 and the highest content in the C2 horizon of Pedon 4. The clay content in the soil left without cultivation for 20 years ranged between 276.20 - 388.76 g kg-1, as the lowest content was at location 10 and the highest content was at horizon C1 of Pedon 8.

The reason for the varying distribution of clay and its high content in cultivated soils for a long period of time, 15 and 20 years, compared to uncultivated soils. The reason is due to the nature of sedimentation, agricultural operations, and the type of agricultural use of the soil, in addition to the proximity and distance from the source of sedimentation, the effect of dust storms in the region, and the process of sedimentation. Through irrigation water and these results are consistent with what was found [5[

Conclusions

The time duration of agricultural exploitation did not have an effect on the morphological characteristics, but soil cultivation had an

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effect on these characteristics, especially soil color, soil structure, porosity, and root distribution

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