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FOLLOW-UP OF CHANGES IN SOIL PROPERTIES AS A RESULT OF LONG PERIODS OF LAND USE IN EL-FAYOUM GOVERNORATE, EGYPT

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Key Words: Agricultural practices, Chemical properties, Physical properties, Sandy soils, loamy soils and El- Fayoum Governorate.

ABSTRACT

The main objective of this study was concentrated in monitoring the changes in some soils properties as a result of various agricultural practices in the long term of land use (0. virgin soil, 8 and 20 year) on some chemical and physical properties of sandy and loamy soils, at El- Fayoum Governorate, Egypt.

In this study, four locations were chosen from district Yousef Al Seddik. i.,e Sydna ELkhder Village, Sydna Moussa Village and Yousef ELSedeq Village where, these three locations representing sandy soil. The fourth location was chosen at EL-Wlaa Village to represent loamy texture soil. Nine soil profiles at soil depths of 0–30 and 30-60 cm were chosen from each location to representative the three application periods. Samples of irrigation water resources were taken from each region i.e. Bahr Qarun Wadi Al-Rayyan Lake, for the first three locations and (Yousef Al-Siddiq region,) irrigated by the water of Bahr Qaroun.

The obtained data showed that soil salinity (EC) was increased up 4.96-9.1, 5.42-14.8, 14.6-24.2 and 15.0-24.8 dSm^{-1}, soil pH decreased from 7.9 to 7.7, 8.05 to 7.5 , 7.9 to7.51 and 8.1 to 7.2, O.M content (%) increased and reached to 0.34-0.85, 0.74-0.9, 0.68-0.97and 0.67-0.94%, the content of total calcium carbonates tend to decrease to reach 30.2 to 16.4, 20.5 to 14.5, 22.2 to 14.3 and 11.3 to 5.6% for the surface layers after 20 years of agricultural practices compared to virgin soil at Sydna ELkhder Village, Sydna Moussa Village, Yousef ELSedeq Village, and EL-Wlaa Village areas, respectively.

Soil texture changed from sand in the virgin soils to sandy loam at Sydna ELkhder Village, Sydna Moussa Village and Yousef ELSedeq Village. While, it changed from loamy to clay loam in EL-Wlaa Village.

Data showed also, that in all sandy locations area the quickly drainable pores (Q.D.P) and slowly drainable pores (S.D.P)were decreased while, water holding pores (W.H.P), fine capillary pores (F.C.P) and total porosity were increased, the bulk density was decreased from 1.66 to 1.31, 1.62 to 1.38, 0.63 to 1.35 and 1.35 to 1.28 g/cm^3, hydraulic conductivity was decreased from, 15.5 to 10.5, 14.6 to 10.5, 14.5 to 10.5 and 9.7 to 5.02 cm h^-

[1], at so, penetration resistance was decreased from 50.7 to 42.3, 50.5 to 45.2, 50.4 to 44.2, and 44.2 to 38.2 kg cm^2 in the surface layers after 20 years of applying agricultural practices at Sydna ELkhder Village, Sydna Moussa Village, Yousef ELSedeq Village and EL-Wlaa Village locations, respectively.

Soil moisture constituents as field capacity (F.C), wilting point (W. P) and available water (A.W) are high after 20 years of agricultural practices. It can be concluded that, agricultural practices can have many beneficial effects such as decreasing bulk density, hydraulic conductivity, penetration resistance, total calcium carbonate and pH. On Contrary, the total porosity, ECe, O.M and soil moisture constant were increased.

Finally, found from this study that the only negative impact of the exploitation of the soil for long periods is to increase in soil salinity, which results from a decrease in the class of irrigation water used. This effect can be addressed by exploiting those lands by cultivating these lands with salt-tolerant crops.

INTRODUCTION

The dramatic growth of the world's population is increasing the pressure on natural resources, particularly on soil systems. **(Santana *et al*., 2016 and Hana *et al*., 2017)**. At the same time, inappropriate agricultural practices are causing widespread soil degradation. Improved management of soil resources and identification of the potential agricultural capability of soils is therefore needed to prevent further land degradation, particularly in dryland areas such as Egypt.

Egypt has a total land area of approximately one million km^2, most of which is desert and only 5.5% is inhabited. Settlements are concentrated in and around the Nile Delta and the Nile Valley, which narrows considerably in Upper Egypt. The total cultivated land area is about 3.6 million ha (8.6 million fadden) representing 3% of the total land of Egypt and consists mostly of the old agricultural land in addition to newly reclaimed areas) **(ICARDA., 2011).**

Accordingly, there was an urgent need to increase the agricultural production by optimizing the usage of the available land and water resources mainly through horizontal expansion or land reclamation and application of modern agriculture and irrigation systems. In Egypt, **AbdelKawy and Belal (2013)** reported positive changes in cultivated land productivity after 5 decades in El-Fayoum Depression due to the good land management practices. On the other hand, **El- Baroudy (2015)** found that, negative changes were predominant after 4 decades' cultivation in more than 70% of soils in the middle part of the Nile Delta. The cultivated area in the Nile Delta region is 4.4 million feddans (1.8 ha), representing 55% of the cultivated area in Egypt **(Mohamed, 2016)**. This vital portion undergoes factors that prohibit further agricultural development including urban sprawl

(Gouda *et al*., 2016) and different types of degradation, which are related mainly to improper management practices **(El Baroudy, 2011, Mohamed *et al*., 2013 and Arnous *et al*., 2015).**

Land productivity is the overall productivity related to various factors including climate, parent material, topography, and soil physiochemical properties **(Deng *et al*., 2011 and Zhou *et al*., 2012).** Evaluating and monitoring the land productivity help in refining the agricultural practices to preserve soil capacity for producing food, fibers, and essential goods **(Kudrat and Saha, 1993 and Field, 2017).** The depression of El-Fayoum is a unique landform in Egypt based on three accounts. First, it is a semi-closed expansive land carrying similarities to oases of the desert, but not too far away from the Nile Valley. Second, it is connected to the River Nile via Bahr Yousef, which is an old river branch. Third, its geologic features of the area serve to signify regional geologic events. **(Said, 1962 & 1993).** El-Fayoum region represents 0.6% of the total area of Egypt. The province includes most of the major soil types of the delta and Nile Valley. **(Abdelmabod, 2014)** .The climate is arid with very scarce rainfall in a narrow strip along the north coast. The Nile River is the main and almost exclusive source of surface water in Egypt. Agriculture depends on the Nile waters and consumes about 80-85% of the annual water supply **(ICARDA 2011)**. Accordingly, there was an urgent need to increase the agricultural production by optimizing the usage of the available land and water resources mainly through horizontal expansion or land reclamation and application of modern agriculture and irrigation systems. In Egypt, land reclamation projects have been started for over 50 years, and have a significant contribution to food production. Nowadays, a new national project for land reclamation have been planned to make an expansion towards the desert areas along the old agricultural land. Agriculture is the main economic activity in Egypt and supports the livelihoods of approximately 55% of the population, contributing to around 20% of foreign exchange earnings, and approximately 30% of Egypt's commodity exports **(CAPMAS. 2015).**

In the largely fertile Nile Valley, soil productivity is restricted by salinity as result of irrigation and by urban sprawl over productive soils. Such unsustainable management results in land degradation, with implications for soil productivity, food production, and food security **(Gouda, et al., 2016 and Mahmoud and Divigalpitiya, 2017)**. Land evaluation involves determination of the land potential for agricultural purposes **(FAO, 2007 and Anaya-Romero, and et al., 2015)** and its main objective is to manage and improve land in a sustainable way to increase its potential for human uses. Land suitability status is based on intrinsic properties of soils (e.g., parent materials, soil texture and depth) and characteristics that can be altered by human management (e.g., drainage, salinity, nutrient concentration and vegetation cover) **(FAO 1985 and 1993).**

Therefore, the objective of this study was to determine the changes in some physical and chemical properties of sandy and loamy soils at El-Fayoum Governorate , Egypt as a result of agricultural practices for long periods

MATERIALS AND METHODS

Fayoum Governorate, Egypt, is a large depression located about 90 km^2 South-West of Cairo, between latitudes 29° 10 and 29° 30 N and longitudes 30° 20 and31° 10 E; it occupies a portion of Eocene limestone plateau at the northern part of the western desert Figure 1. Fayoum depression differs from all other depressions of Egypt because the main source of potable and irrigation water is from Nile canal (Bahr Yousef canal) which enters Fayoum from the eastern edge at Al Lahoon (+26 m above sea level) and extends through the governorate with a northward slope ending at the coast of Lake Qaroun (42 m below sea level). The total area of Fayoum Governorate is 6,068.7 km^2 including two artificial lakes at Wadi El Rayan, in addition to the natural Lake Qaroun. The governorate includes six administrative districts, namely, Fayoum, Tamia, Etsa, Senoures, Ebshway, and Yousef Al Seddik (Figure 1). The main problems constraining the sustainable agriculture in all districts are the salinization, alkalization, calcicity, low organic matter, closed drainage system, and high-water table **(CAPMAS. Egypt Statistical Yearbook Population 2015).**

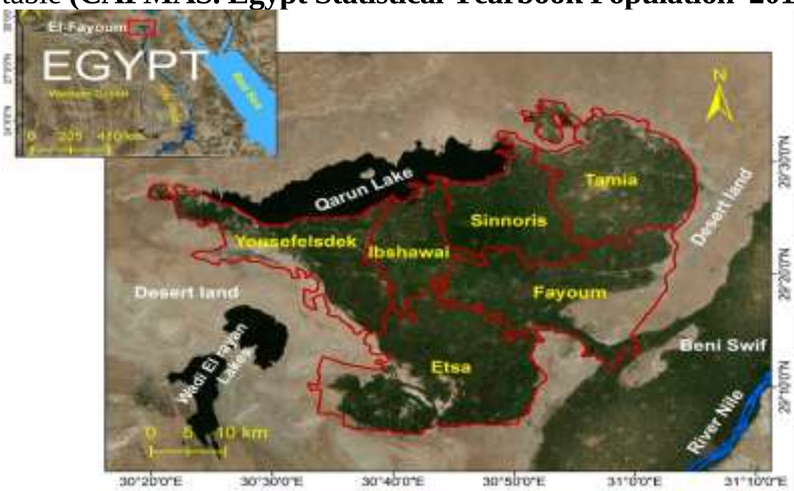

Figure 1. Location of El-Fayoum depression Egypt

Four locations varied in their textural classes were chosen from the study area at district Yousef Al Seddik to represent agricultural practices for long periods, (about 20 years). The first location was Sydna ELchder Village, the second location was Sydna Moussa Village, and the third location was EL-Wlaa Village represent the textural class of the soil is sand, and irrigated with the water of Wadi El Rayan Lake, while the last location was the water of Yousef Al Seddik Village represent the soil textural class of clay loam and irrigated with the water of Bahr Qaroun. Chosen locations to representative the three periods of cultivation as fellows the ; first site had not been agricultural practices and assumed virgin, the second and third sites were selected to represent area, which agricultural practices continuously for 8 and 20 years respectively. Nine soil profiles were chosen from each location to representative the three periods. Disturbed and undisturbed soil samples were taken at soil depth of 0-30 and 30-60 cm. These samples were air dried, crush, sieved through a 2 mm sieve and prepared for the different physical and chemical properties according to the standard methods described by the different publishers, found as in Table (1).

Table (1- A): Some chemical analysis of the virgin soil before cultivation

Location	Period of Agricultural Practices	Soil depth (cm)	EC (dSm^{-1})	pH	Soluble Cations ($mmolcL^{-1}$)				Soluble Anions ($mmolcL^{-1}$)		
					Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$HCO3^{-}$	CL^{-}	$SO4^{--}$
Shydna ELchder Village	Virgin	0 -30	4.96	7.9	15.4	7.60	25.8	0.79	2.04	22.55	25.0
		30 -60	3.7	8.2	8.3	7.4	21.0	0.8	2.04	14.86	20.6
Shydna Moussa Village	Virgin	0 -30	5.42	8.05	20.4	7.20	25.8	0.73	3.03	25.6	25.5
		30 -60	4.2	8.3	11.3	4.4	25.0	0.80	2.04	14.86	24.6
Yousef ELSedeq Village	Virgin	0 -30	14.6	7.6	36.3	22.05	155.0	2.1	2.55	150.4	62.5
		30 -60	5.9	7.9	8.50	11.9	36. 0	2.33	1.53	26.0	31.2
EL-wlaa Village	Virgin	0 -30	15.0	8.2	17.2	10.42	215.0	1.70	4.12	210.1	30.1
		30 -60	7.4	8.4	20.4	13.4	78.75	1.09	2.04	73.0	38.6

Table (1- B): Particle size distribution and the OM and $CaCo_3$ content (%)of the studied soils before cultivation .

Location	Period of Agricultural Practices	Soil depth (cm)	Particle size distribution				Soil texture	O.M (%)	$CaCO_3$ (%)
			Sand (%)		cult (%)	Clay (%)			
			Coarse	Fine					
Sydna ELchder Village	Virgin	0 -30	70.19	20.5	7.3	2.01	Sandy	0.34	30.2
		30 -60	60.2	18.3	14.3	7.2	Loamy sand	0.28	32.6
Sydna Moussa village	Virgin	0 -30	65.2	24.5	8.2	2.1	Sandy	0.47	20.5
		30 -60	64.3	25.8	7.7	2.2	Sandy	0.31	29.2
Yousef ELSedeq Village	Virgin	0 -30	62.2	27.1	8.2	2.5	Sandy	0.68	22.2
		30 -60	60.3	27.8	9.7	2.2	Sandy	0.46	25.2
EL-Wlaa Village	Virgin	0 -30	22.0	19.1	38.6	20.3	Loamy	0.67	11.3
		30 -60	20.0	18.1	40.6	21.3	Loamy	0.41	4.8

Table (1-C): Total porosity and pore size distribution, of the studied soils, before cultivation

Location	Period of Agricultural Practices	Soil depth (cm)	Total porosity (%)	Pore size distribution			
				Q.D.P. (%)	S.D.P. (%)	W.H.P. (%)	F.C.P. (%)
Sydna ELchder Village	Virgin	0 -30	43.3	26.9	10.8	3.21	2.39
		30 -60	37.47	24.6	8.8	2.21	1.86
Sydna Moussa Village	Virgin	0 -30	42.3	26.2	9.8	3.88	2.42
		30 -60	36.88	22.5	8.6	3.76	2.02
Yousef ELSedeq Village	Virgin	0 -30	43.7	26.4	10.2	4.65	2.45
		30 -60	37.6	23.5	7.9	4.16	2.04
EL-Wlaa Village	Virgin	0 -30	42.6	17.1	9.8	7.6	8.4
		30 -60	38.0	14.2	8.5	6.9	8.1

Q.D. P=quickly drainable pores S.D. P=slowly drainable pores
W.H. P=water holding pores F.C. P= fine capillary pores

Table (1-D); Moisture parameters and other some physical properties of the studied soils before cultivation .

Location	Period of Agricultural Practices e	Soil depth (cm)	F.C. (%)	W.P (%)	A.W. (%)	B.D (g\cm3)	P.R (kg cm-2)	KS (cm\h)
Sydna ELchder Village	Virgin	0 -30	6.2	2.39	3.81	1.66	50.7	15.5
		30 -60	5.07	1.86	3.21	1.71	52.5	13.02
Sydna Moussa Village	Virgin	0 -30	8.3	2.42	5.88	1.62	50.5	14.6
		30 -60	6.78	2.02	4.76	1.73	50.8	11.26
Yousef ELSedeq Village	Virgin	0 -30	9.10	2.45	6.65	1.63	50.4	14.5
		30 -60	8.20	2.04	6.16	1,73	53.0	12.88
EL-wlaa Village	Virgin	0 -30	15.7	8.1	7.6	1.35	44.2	9.70
		30 -60	15.3	8.4	6.9	1.42	43.8	6.52

Ks: Hydraulic conductive B.D: soil bulk density
P.R: Penetration resistance

Standard method used for determined of soil analysis

Soil property	References
Particle size distribution (%)	**Gee and Bauder (1986)**
Bulk density (g cm^{-3})	**Vomocil, (1965)**
Penetration resistance	**Davidson (1965)**
Pore size distribution (μ)	**De Leenheer and De-Boodt (1965)**
Saturated hydraulic conductivity (m h^{-1})	**Klute and Dirksen (1986)**
Total calcium carbonate %	
Organic matter content %	
Soil reaction (pH) and electrical conductivity (dS m^{-1})	**Page *et al*. (1982)**
Soluble cations and anions (m moclc L^{-1})	

Water analysis:

Samples of irrigation water were taken from each irrigation water resource i.e. Wadi Al-Rayan Lake and Bahr Qaroun, (which is a mixing water from the agricultural drainages).

Some characteristics of irrigation water carried out , and presented in Table (2)

Table (2). Chemical composition of to the used tow irrigation water resources.

Irrigation	pH	EC (dSm^{-1})	Soluble cations $mmoleL^{-1}$				Soluble anions $mmoleL^{-1}$				SAR	Adj SAR
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	CO_3^{-2}	HCO_3^{-}	Cl^{-}	SO_4^{-2}		
El Rayan Lake	7.3	2.54	3.42	6.08	15.48	0.44	-	2.4	10.9	12.12	7.10	15.1
Bahr Qaroun	7.7	3.08	9	5.02	16.26	0.47	-	2.68	12.54	15.53	6.14	13.6

RESULTS AND DISUCSSION

Chemical characteristics of irrigation water resource

The obtained data in Table 2 clarify that, the electrical conductivity (EC) of Bahr Qaroun, was higher than of El Rayan Lake. A parallel similar trend was found for values pH. While, adj. SAR values of El Rayan Lake was lower than that of Bahr Qaroun. It is noteworthy to mention, that the distribution pattern of soluble cations and anions indicate that, the soluble dominant cations was Na^+ followed by Mg^{2+} and Ca^{2+}, however, the content of soluble Na^+ represent 60.90 and 31.22 % of the total salts in the water of El Rayan and Bahr Qaroun, respectively. Concerning the distribution pattern of soluble anions, it was noticed that, the dominance soluble anions was SO_4 in the water of Bahr Qaroun and was Cl^- in the water of El Rayan Lake.

That was true, since the suitability criteria of irrigation water resources according to **Ayers and Westcot (1985)** limits, show that the used irrigation water resources could be categorized into class C4S1.

Effect of agricultural practices and irrigation water resources on soil properties

Soil chemical properties

It is well known that, the quality of irrigation water is considered one of the main factors that affecting chemical properties of the soil. Soil pH, EC and its content of soluble ions in the soil at depth of 0-30 and 30-60 cm affected by quality of irrigation water sources at long term were presented in Table 3. EC values of the irrigated soils tend to increase with increasing the irrigation period using water of Wadi El Rayan Lake and Bahr Qaroun, while this value was decreased with increasing soil depth, in the virgin soil and no clear trend in the other locations, except EL-Wlaa Village and Sydna ELkhder Village profiles.

Data in Table (3) shown that the soil reaction (pH) was alkaline in virgin soil and changed to slightly alkaline after consecutive agricultural practices (especially irrigations) of soils.

Soil pH was decreased with the increase of cultivation periods in the studied four locations. In addition, soil pH was decreased as affected by soil depth at different cultivation periods in the four locations as compared with virgin location. In this respect, similer results were obtained by **Khafagy, et al., (2015).**

Data in Table 3 also show that, the distribution of soluble cations and anions was differed according to soil texture, soil location as well as the irrigation water source and irrigation period. The distribution of soluble cations in sandy and clay loam soils shows that, the dominant soluble cation is Na^+ followed by Ca^{+2}, Mg^{+2} and K^+ especially after 20 years. Concerning the distribution of soluble anions in sandy and clay loam soils, data show that the dominant soluble anion is Cl^-, followed, SO_4^{-2} and HCO_3^-. except the soil of Yousef ELSedeq Village. In addition, the content of HCO_3^- ions tend to increase as the period of irrigation increased. This trend is holding true for clay loam soil than sandy one. This increase could be attributed to the dissolved effort of products organic matter decomposition on carbonate, compounds especial calcium carbonate. **(Sweed 2012 and EL-Balawy et al,2019).**

Table (3): Chemical analysis of the studied soils at depths as affected by cultivation periods and quality of irrigation water .

Location	Period of Agricultural Practices	Soil depth (cm)	EC (dSm^{-1})	pH	Soluble Cations (meq\L)				Soluble Anions (meq\L)		
					Ca^{++}	Mg^{++}	Na^+	K^+	$HCO3^-$	CL^-	$SO4^{--}$
Shydna ELkhder Village	Virgin	0 -30	4.96	7.9	15.4	7.60	25.8	0.79	2.04	22.55	25.0
		30 -60	3.7	8.2	8.3	7.4	21.0	0.8	2.04	14.86	20.6
	8 – years	0 -30	6.5	7.7	14.8	10.66	38.3	0.43	1.79	34. 8	27.6
		30 -60	8.62	7.9	22.3	14.5	43.02	6.4	1.02	42. 8	42.4
	20 –years	0 -30	9.1	7.6	11.9	10.7	60.0	7.25	2.04	59.01	28.8
		30 -60	14.3	7.8	36.3	22.05	155.0	2.1	2.55	150.4	62.5
Shydna Moussa Village	Virgin	0 -30	5.42	8.05	20.4	7.20	25.8	0.73	3.03	25.6	25.5
		30 -60	4.2	8.3	11.3	4.4	25.0	0.80	2.04	14.86	24.6
	8 – years	0 -30	8.65	7.7	22.3	14.5	43.1	6.32	1.02	42. 8	42.4
		30 -60	13.7	7.9	21.3	22.05	160.0	2.10	2.55	150.4	52.5
	20 –years	0 -30	14.8	7.7	55.30	53.88	110.3	3.65	5.06	109.30	108.7
		30 -60	14.4	7.9	54.36	52.83	111.7	2.25	2.04	109.30	109.8
Yousef ELSedeq Village	Virgin	0 -30	14.6	7.6	36.3	22.05	155.0	2.1	2.55	150.4	62.5
		30 -60	5.9	7.9	8.50	11.9	36. 0	2.33	1.53	26.0	31.2
	8 – years	0 -30	23.6	7.6	55.1	60.1	256.0	1.80	6.6	234.8	131.6
		30 -60	10.7	7.7	28.6	30.43	102.0	8.0	4.53	96.7	67.8
	20 –years	0 -30	24.2	7.51	87.48	76.81	214.5	3.18	3.57	193.7	184.7
		30 -60	24.05	7.6	84.24	74.85	218.2	3.18	6.57	194.9	179.0
EL-wlaa Village	Virgin	0 -30	15.0	8.2	17.2	10.42	215.0	1.70	4.12	210.1	30.1
		30 -60	7.4	8.4	20.4	13.4	78.75	1.09	2.04	73.0	38.6
	8 – years	0 -30	23.2	7.6	50.4	42.5	273.0	1.78	11.68	270.3	85.7
		30 -60	27.5	7.8	57.2	55.9	320.0	3.70	6.10	310.1	120.6
	20 –years	0 -30	24.8	7.2	58.4	49.5	283.0	1.98	15.73	282.45	94.7
		30 -60	26.8	7.5	57.2	39.52	332.0	4.80	6.72	320.1	106.7

Soil physical properties

Soil texture

The particle size distribution in Table 4 showed that, there is a change in soil texture from location and soil layer to another. The soil texture changed from sand in the virgin soils to loamy sand and sandy loam in Sydna ELkhder Village, Sydna Moussa Village and Yousef ELSedeq Village. While, in EL-Wlaa village changed from loam to clay loam. These changes depend on the applying period of agricultural practices. The changes in soil texture are more pronounced in the surface layer were higher than that, found in the subsurface ones.

Table (4): Particle size distribution and the content (%) of OM and $CaCO_3$ of the studied soils, in relation with the periods of land use.

Location	Period of Agricultural Practices	Soil depth (cm)	Particle size distribution				Soil texture	O.M (%)	$CaCO_3$ (%)
			Sand (%)		cult (%)	Clay (%)			
			Coarse	Fine					
Sydna ELkhder Village	Virgin	0 -30	70.19	20.5	7.3	2.01	Sandy	0.34	30.2
		30 -60	60.2	18.3	14.3	7.2	Loamy sand	0.28	32.6
	8 – years	0 -30	49.2	18.3	16.4	16.1	Loamy sand	0.64	18.3
		30 -60	50.2	20.4	15.3	14.1	Sandy loam	0.43	30.36
	20 –years	0 -30	40.4	24.4	16.4	18.8	Sandy loam	0.85	16.4
		30 -60	30.5	21.2	32.2	16.1	Sandy loam	0.65	28.6
Sydna Moussa village	Virgin	0 -30	65.2	24.5	8.2	2.1	Sandy	0.47	20.5
		30 -60	64.3	25.8	7.7	2.2	Sandy	0.31	29.2
	8 – years	0 -30	50.2	28.3	14.3	7.2	Loamy sand	0.88	17.6
		30 -60	57.1	18.3	14.3	10.3	Loamy sand	0.44	27.7
	20 –years	0 -30	43.1	33.3	15.4	8.2	Sandy loam	0.90	14.5
		30 -60	40.1	33.4	17.3	9.2	Sandy loam	0.85	25.4
Yousef ELSedeq Village	Virgin	0 -30	62.2	27.1	8.2	2.5	Sandy	0.68	22.2
		30 -60	60.3	27.8	9.7	2.2	Sandy	0.46	25.2
	8 – years	0 -30	58.2	20.3	14.3	7.2	Loamy sand	0.39	15.2
		30 -60	49.2	18.3	16.4	16.1	Loamy sand	0.74	18.6
	20 –years	0 -30	33.1	33.3	15.4	18.2	Sandy loam	0.97	14.3
		30 -60	30.1	33.4	17.3	19.2	Sandy loam	0.84	16.6
EL-Wlaa Village	Virgin	0 -30	22.0	19.1	38.6	20.3	Loamy	0.67	11.3
		30 -60	20.0	18.1	40.6	21.3	Loamy	0.41	4.8
	8 – years	0 -30	19.5.	18.9	31.2	30.4	Clay loam	0.74	8.4
		30 -60	18.4	18.4	31.8	30.4	Clay loam	0.56	3.3
	20 –years	0 -30	20	15.9	32.4	31.7	Clay loam	0.94	5.6
		30 -60	18.6	15.9	33.8	31.7	Clay loam	0.76	2.7

Soil organic matter content

Data in Table 4 depict the effect of agricultural practices especially irrigation water quality on soil organic matter content (%), which increased by increasing period of applying agricultural practices where the lower content was found in the virgin soil at the two soil depths, as well as this content was increased with increasing the period of irrigation and applying agricultural practices. This due to the effect of plant waste decomposition by appreciable amounts resulting from agricultural practices. These materials are rich in organic matter content. Hence, deposit mainly on the soil surface.

Table (5): Total porosity and pore size distribution, of the studied soils, in relation with the periods of land use.

Location	Period of Agricultural Practices	Soil depth (cm)	Total porosity (%)	Pore size distribution			
				Q.D.P. (%)	S.D.P. (%)	W.H.P. (%)	F.C.P. (%)
Sydna ELkhder Village	Virgin	0 -30	43.3	26.9	10.8	3.21	2.39
		30 -60	37.47	24.6	8.8	2.21	1.86
	8 - years	0 -30	44.6	26.6	8.9	4.72	4.38
		30 -60	37.8	23.6	6.9	3.72	3.58
	20 -years	0 -30	47.6	24.2	9.2	7.39	6.81
		30 -60	37.9	19.4	6.2	6.39	5.91
Sydna Moussa Village	Virgin	0 -30	42.3	26.2	9.8	3.88	2.42
		30 -60	36.88	22.5	8.6	3.76	2.02
	8 - years	0 -30	43.12	25.4	8.02	5.28	4.42
		30 -60	38.2	23.5	6.5	4.09	4.11
	20 -years	0 -30	46.5	22.4	8.0	8.60	7.5
		30 -60	38.5	20.4	6.1	5.8	6.2
Yousef ELSedeq Village	Virgin	0 -30	43.7	26.4	10.2	4.65	2.45
		30 -60	37.6	23.5	7.9	4.16	2.04
	8 - years	0 -30	44.3	25.3	8.8	5.28	4.92
		30 -60	38.39	23.3	6.4	4.4	4.29
	20 -years	0 -30	46.8	23.4	6.8	8.90	7.7
		30 -60	38.9	19.4	5.5	7.7	6.3
EL-Wlaa Village	Virgin	0 -30	42.6	17.1	9.8	7.6	8.4
		30 -60	38.0	14.2	8.5	6.9	8.1
	8 - years	0 -30	53.4	19.8	14.6	9.70	9.3
		30 -60	43.7	15.9	11.8	7.6	8.4
	20 -years	0 -30	59.5	20.4	15.8	12.4	10.9
		30 -60	49.7	16.3	12.7	10.9	9.8

Q.D. P=quickly drainable pores S.D. P=slowly drainable pores
W.H. P=water holding pores F.C. P= fine capillary pores

Total calcium carbonate

Data in Table 4 also show that the soil content of total calcium carbonates was decreased with applying agricultural practices for different periods. This hold true for all studied soils. The relative decrease was 39.4 and 45.7% for surface layers in Sydna ELkhder

Village, 14.1 and 29.3% for surface layers in Sydna Moussa Village, 31.5 and 35.6% for surface layers in Yousef ELSedeq Village and 25.7 and 50.4% for surface layers in EL-Wlaa Village, respectively after 8 and 20 years compared with virgin soil. This trend was found also for the content of subsurface layers.

Pore size distribution

The effect of different periods of agricultural practices on some soil physical properties of the studied areas i.e., pore size distribution, total porosity, soil bulk density and saturated hydraulic conductivity are shown in. Table 5 The data show that increasing periods of land use, associated with an increase in total porosity especially in the surface layers of cultivated soils compared to virgin soils, which ranged from 37.41% in the surface layer (0-30 cm) in the virgin soils to about 42.28% and 43.57% as a resulting from land use practices, for 8 and 20 years respectively. The same trend was found in the subsurface layer (30-60 cm). Generally, the increase in total porosity can be explained by the increase in both fine particles and organic matter contents which helps in forming soil aggregation. The changes in soil total porosity are accompanied by **Mansour, (2002).**

In general, trend quickly drainable pores (Q.D.P) and slowly drainable pores (S.D.P) in irrigated sandy soil were lower than found in virgin soil. Data aslo show, that Q.D.P decreased with increasing the periods of land use in all studied locations. However, water holding pores (W.H.P) and fine capillary (F.C.P) were increased in the irrigated soils than virgin one, where the maximum increase is found often 20 year of land use. Total porosity was increased with the increasing of both fine and water holding pores on the expense of quickly and slowly drainable pores. This means enhancing the ability of sandy soil to retain water and decreasing its ability to conduct water. These results are expected because the coarse sand causes an increasing value of the macro pores and the slipping of fine sand causes decreasing in the macro pores. Furthermore, the presence of clay fraction and organic matter decrease the macro pores. **(El-Amir *et al*., 1997).**

Soil bulk density

Soil bulk density is the main soil character that must be taken into consideration when improving soil physical properties. The obtained results presented in Table (6) showed the effect of land use on soil bulk density. It is obvious that soil bulk density decreased with the increase period of land use in sandy soils region. The magnitude of this decrease depends on the period of land use and applying agricultural practices., where it is values were 1.56, 1.47 and 1.33 (g/cm^3) for virgin, 8 and 20 years of land use respectively. The decrease in soil bulk density is more related with the increase in soil organic matter content. This is may be attributed to the aggregation effect of organic matter exist, producing a more structured soil, consequently decreasing soil bulk density. **(McBride, 1995).** The same trend was found in the subsurface layer (30 - 60 cm).

Table (6); Moisture parameters and other some physical properties of the studied soils in relation with the periods of land use

Location	Period of Agricultural Practices e	Soil depth (cm)	F.C. (%)	W.P (%)	A.W. (%)	B.D (g\cm^3)	P.R (kg cm^{-2})	KS (cm\h^{-1})
Sydna ELchder Village	Virgin	0 -30	6.2	2.39	3.81	1.66	50.7	15.5
		30 -60	5.07	1.86	3.21	1.71	52.5	13.02
	8 - years	0 -30	10.1	4.38	5.72	1.56	48.4	13.4
		30 -60	8.3	3.58	4.72	1.64	50.4	12.7
	20 -years	0 -30	15.2	6.81	8.39	1.31	42.3	10.5
		30 -60	12.3	5.91	6.39	1.58	49.5	9.67
Sydna Moussa Village	Virgin	0 -30	8.3	2.42	5.88	1.62	50.5	14.6
		30 -60	6.78	2.02	4.76	1.73	50.8	11.26
	8 - years	0 -30	10.7	4.42	6.28	1.52	48.4	12.8
		30 -60	10.20	5.11	5.09	1.56	49.5	10.3
	20 -years	0 -30	15.1	6.5	8.60	1.38	45.2	10.5
		30 -60	13.7	6.9	6.8	1.55	48.4	9.98
Yousef ELSedeq Village	Virgin	0 -30	9.10	2.45	6.65	1.63	50.4	14.5
		30 -60	8.20	2.04	6.16	1,73	53.0	12.88
	8 - years	0 -30	14.20	4.92	9.28	1.52	48.1	13.07
		30 -60	12.29	3.89	8.4	1.58	53.4	11.29
	20 -years	0 -30	14.40	5.5	8.90	1.35	44.2	10.5
		30 -60	14.0	6.3	7.7	1.47	46.3	9.81
EL-wlaa Village	Virgin	0 -30	15.7	8.1	7.6	1.35	44.2	9.70
		30 -60	15.3	8.4	6.9	1.42	43.8	6.52
	8 - years	0 -30	19.0	9.3	9.70	1.30	41.7	6.75
		30 -60	16.0	8.4	7.6	1.40	42.3	4.72
	20 -years	0 -30	23.3	10.9	12.4	1.28	38.2	5.02
		30 -60	20.7	9.8	10.9	1.37	40.2	4.44

Ks: Hydraulic conductive **B.D: soil bulk density**
P.R: Penetration resistance

Hydraulic conductivity (Ks)

The hydraulic conductivity values (Ks) of the soils under investigation in relation with their use periods and agricultural practices are presented in Table 6. The obtained data show that Ks values tend to decrease with increasing period of land use in both sandy and loam soils as compared to the virgin one. The data reveal that, the most effective was found after 20 years of land use. This could be attributed to the plant waste decomposition and increasing both soluble and exchangeable calcium which enhanced increasing the micropores and decreasing the macropores **(Mariano et.al 2009)**

Penetration resistance (P.R)

Penetration resistance was measured with a cone number (1) and cross-sectional area of 1 cm^2. Mean values of the penetration resistance in the surface and subsurface layers are presented in Table (6). The data showed that, there is a decrease in P. R with increasing periods of land use (applying agricultural practices) either in the surface or subsurface layers. The data also reveal that, the high effective was found after 20 years of land use. This could be attributed to the plant waste decomposition to soluble and exchangeable calcium which enhanced the soil aggregates which increase both of total porosity and drainable pores. These results were similar to that reported by **Abd El-Hamid, et al ., (2011) and Mansour, (2012).**

Moisture parameters.

The effect of land use and applying different agricultural practices on soil moisture constants i.e. field capacity (F.C), wilting point (W.P) and consequently available water (A.W) presented in Table (6) show that, the moisture constants are have affected by soil texture and organic matter content. The soils high content of clay exhibit high F.C and W. P values. The data also show that, the moisture retained in the soil irrigated long periods is always higher than that in virgin soil. The magnitude of the increase depends on the period of land use and applying different agricultural practices. The values of F.C and W.P tend to increase as the period of applying agricultural practices increased. Data also show that, the values of F.C in the surface layers of the studied soils are higher than that in the subsurface layers for all locations. Moisture constant at F.C in the surface layers (0 – 30 cm) was increased from 6.2 to 15.1% in the sandy soil while increased from 15.7 to 23.3% in the clay loam, after 20 years' land use and applying different agricultural practices, respectively. The limit of available water content was also increased with increasing periods of land use. The maximum increases in wilting point were detected after 20 years of applying agricultural practices. This increase is rendered to the accumulation of organic matter and fine particles presented resulting from applying agricultural practices. The soil content of organic matter have a clear effect on water retention either through the direct effect of organic particles themselves and its ability to absorb and store water or through its indirect effect on other physical properties (such as bulk density, porosity and pore size distribution). Also, the content of (A.W) was decreased by increasing the soil depth. These results could be attributed mainly to the increase in the soil of total soluble salts, (EC, dSm^{-1})causes an increase in osmotic pressure which represent one of the total moisture stresses. This effect may be cleared and explained based on, the effect of different cations such as Na^{+} on soil properties especially their effect as a dispersing agent, particles. **(Balks *et al.*, 1998)**

CONCLUSIONS

Based on the aforementioned data and discussion, it could be concluded that, the applying of agricultural practices for long periods had a clear effect on both chemical and physical soil properties for example, the soil texture changed from sand to sandy loam and from loam to clay loam after 20 years of land use. The soil bulk density, hydraulic conductivity, penetration resistance, total calcium carbonate, and pH were decreased. On contrary, the total porosity, EC, O.M. and soil moisture constant were increased. Although these are obvious benefits, there are also concerns that must be addressed to improper land management practices which cause increased soil salinity and alkalinity and raised water table.

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متابعـــة التغيرات في بعض خصائص التربة نتيجة الفترات الطويلة لاستغلال الارض في محافظة الفيوم، مصر

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الهدف الرئيسى من هذه الدراسة يتركز فى تتبع التأثيرات الناتجة عن استغلال الارض وتطبيق الممارسات الزراعية لفترات طويلة على الاراضى الرملية والطينية الطميية في محافظة الفيوم - مصر ولإنجاز هذه الدراسة، تم اختيار أربعة مواقع في مركز يوسف الصديق (قرية سيدنا الخضر، قرية سيدنا موسى، قرية يوسف الصديق) حيث التربة رملية. بينما تم اختيار الموقع الرابع في قرية الولاء لتمثيل التربة الطينية الطميية . وتم أخذ عدد تسع قطاعات من التربة من كل موقع لتمثيل فترات الممارسة الزراعية الثلاث (8، 20 سنة والتربة البكر). كما تم أخذ عينات من مياه الري التي تروى بها كل منطقة علما بأن مصدر الري المباشر للثلاث مناطق الأولى هو بحيرة وادي الريان بينما منطقة يوسف الصديق مصدر الري لها ممثل في بحر قارون وهي عبارة عن مياه خلط من الصرف الزراعي

أظهرت البيانات التي تم الحصول عليها زيادة ملوحة التربة لتصل إلى حوالي
(قرية سيدنا الخضر 4.96-9.1 dS/m^{-1}) ، (قرية سيدنا موسى5.42-14.8) ، (قرية الولاء 14.6-24.2 dS/m^{-1}) ، (قرية يوسف الصديق 15.0-24.8 dS/m^{-1})

كما تراوحت درجة الحموضة في التربة بين (7.9 إلى 7.7) و (8.05 إلى 7.5)، (7.51-7.9) و(8.1 -7.2) وزاد محتوى التربة من المادة العضوية (٪) حيث تراوحت بين (0.34-0.85) و(0.74-0.9) و(0.68-0.97) و(كما وجد أن كربونات الكالسيوم الكلية انخفضت من (0.67-0.94)، (16.4-30.2٪)، (14.5-20.5٪)، (14.3-22.2٪) و(5.6-11.3٪) وذلك في الطبقات السطحية بعد 20 سنة من الممارسات الزراعية في قرية سيدنا الخضر وقرية سيدنا موسى وقرية يوسف الصديق، وقرية الولاء على التوالي.

كما تغير قوام التربة من الرملية في التربة البكر إلى طمييه رملية في قرية سيدنا الخضر وقرية سيدنا موسى وقرية يوسف الصديق. بينما تغيرت من طمييه إلى طمييه طينية في قرية الولاء.

أظهرت البيانات أيضًا أنه في جميع المناطق، انخفضت مسام الصرف السريع ومسام الصرف البطيء بينما زادت المسام الحافظة للماء والمسام الشعرية الدقيقة وكذا المسامية الكلية.

انخفضت الكثافة الظاهرية من (1.66 - 1.31 جم/سم^3) (1.62 - 1.38 جم/سم^3)، (1.63 - 1.35جم/سم^3) و(1.35 - 1.28جم/سم^3) كما انخفض التوصيل الهيدروليكي من (15.5 - 10.5سم/ساعة) (14.6 - 10.5سم/ساعة)، (14.5 - 10.5سم/ساعة) و(9.7 - 5.02سم/ساعة) وانخفضت مقاومة الاختراق من (50.7 - 42.3كجم سم^2) (50.5 - 45.2 كجم سم^2)، (50.4 - 44.2 كجم سم^2) و(44.2 - 38.2 كجم سم^2) وذلك في الطبقات السطحية بعد 20 عامًا من الممارسات الزراعية في قرية سيدنا الخضر وقرية سيدنا موسى وقرية يوسف الصديق، وقرية الولاء على التوالي. كما وجد ان ثوابت رطوبة التربة مثال ذلك (السعه الحقلية ونقطة الذبول والماء الميسر) قد زادت بعد 20 عامًا من الممارسات الزراعية.

يمكن الاستنتاج أن الممارسات الزراعية يمكن أن يكون لها العديد من الآثار المفيدة مثل تقليل الكثافة الظاهرية والتوصيل الهيدروليكي ومقاومة الاختراق وكربونات الكالسيوم الكلية ودرجة الحموضة وعلى النقيض من ذلك وجدت زيادة في المسامية الكلية ومحتوى التربة من المادة العضوية وملوحة التربة.

واخيرا وجد من هذه الدراسة ان التاثير السلبى الوحيد من استغلال التربه لفترات طويله هو زيادة ملوحة التربه والناتج من انخفاض رتبة مياه الرى المستخدمه ويمكن معالجة هذا التاثير عن طريق استغلال تلك الاراضى بزراعة تلك الاراضى بالمحاصيل المتحمله للملوحه.