J. Agric. Sci. Mansoura Univ., 25 (2): *1127 - 1137*, *2000.*

EFFECT OF TILLAGE TREATMENTS AND FARMYARD MANURE APPLICATION ON SOME PHYSICAL PROPERTIES OF THE SOIL AND MAIZE PRODUCTION

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ABSTRACT

This study was conducted during 1998 and 1999 seasons at El-Gemmeiza Agricultural Research Station, to study the effect of tillage treatments and farmyard manure (FYM) application on some physical properties of the soil and maize variety single cross 10 production.

Bulk density and penetration resistance tended to decrease with tillage treatments, while hydraulic conductivity and infiltration rate were increased compared with no-tillage treatment. The values of bulk density and resistance of penetration of surface layer (0-15 cm) were always less than of subsurface layer under different tillage treatments. The best tillage treatment was chisel two ways and rotary tiller (C_2 + R.T.), which caused a good physical properties and gave high yield of grain and straw.

Farmyard manure (20 m^3/fed) reduced the bulk density and penetration resistance, while increased hydraulic conductivity, infiltration rate, grain and straw yields.

The improving effect of ploughing and F.Y.M. on bulk density and hydraulic conductivity values had continued till the harvest as compared with the initial state specially for C_2 + R.T. and C_1 + R.T. treatments at the tilled layer of 0-30 cm depth.

INTRODUCTION

The main objective of tillage operations is mainly to prepare the more convenient seed bed for better germination and root distribution, which eventually could be reflected on greater yield of crops. This can be achieved through improving the soil structure and fertility status.

The effect of tillage on physical properties of a soil mainly depends on the type of the used instrument as well as on the rate of this process and the initial soil properties. Tillage manipulations have a considerable effect on the physical properties of the soil. In general. the aeration, bulk density, porosity, pore size distribution, water holding capacity, infiltration rate, hydraulic conductivity and soil penetration resistance get advantages from specific limits of tillage processes.

Pidgeon and Soane (1977) showed that under zero tillage compared to mouldboard plough, bulk density was higher. Tillage with chisel plough tended to have intermediate bulk density value at 0-50 cm depth. A low bulk density was obtained under deep ploughing with mouldborad plough than under other tillage treatments. Korayem *et al*. (1985) found that soil bulk density generally decreased in all tillage treatment (Chisel, mouldboard + disk and rotary ploughs). After tillage, the bulk density of the surface layer was always less than lower layers and it increased with increasing soil depth. Zein Al-Din (1985), El-Gayar *et al*. (1986) and Roseberg and McCoy (1992) showed that soil bulk density and the resistance of penetration generally decreased with most tillage treatment. The reduction in bulk density increased by increasing ploughing depth. El-Said *et al*. (1988) and El-Kholi (1992) reported that the bulk density and the resistance of penetration of surface layer (0-15 cm) was always less than that of the subsurface under different tillage practices.

Mayrya (1986) found that tillage increased the infiltration rate in comparison to untilled plots in a clayey soil. Also, Cunha Medeiros *et al*. (1992) pointed out that tillage treatment increased infiltration rate value. Othman (1995) illustrated that tillage treatments reduced bulk density and penetrometer resistance, while increased hydraulic conductivity and infiltration rate compared with no tillage.

Maize is considered as one of the five most important field crops in Egypt with respect to value and area. Tillage and farmyard manure application play a significant role in the production of this crop.

Zein El-Abedine *et al*. (1970) showed that the maximum yield of maize was produced in clay loam soil ploughed by the rotary plough followed by the descending order of the mouldboard, the chisel two ways and baladi, with the lowest yield from the unploughed land. Hakimi and Chokrobarti (1976) found that yield of maize is strongly favoured with the chisel plough and one disking treatment over any other treatments. The no-tillage treatment resulted in the lowest yield.

Maurya (1986) illustrated that maize yield was significantly lower under no-tillage treatment compared with tillage treatments. Herbek *et al*. (1986) reported that no-tillage on poorly drained soil results in more uneven stands and slower early growth of corn compared to conventional tillage methods. El-Awag *et al*. (1992) showed that maize yield was higher in deep ploughing than normal plowing.

Farmyard manure (FYM) is one of the natural amendments which corrects and improve physical properties of the soil, especially the heavy texture one. Sarkar *et al*. (1973); Kurual and Tripathi (1990); El-Awag *et al*. (1992) and Kaoud (1994) stated that bulk density and penetration resistance decreased, while hydraulic conductivity and infiltration rate increased in plots receiving F.Y.M. Othman (1995) and El-Naggar *et al*. (1996) pointed out that addition of 30 m^3 FYM/fed reduced the bulk density and increased the hydraulic conductivity, total porosity and infiltration rate in clay soil.

El-Attar *et al*. (1982) found that application of 10 tons/acre of FYM increased maize yield by 13% in the clay loam soil of Abis and by 19% in the calcareous sandy loam of Nubaria over the control. El-Awag *et al*. (1992) showed that addition of 25 m^3 FYM/fed increased grain and straw yield of maize under tillage treatments. El-Naggar *et al*. (1995) observed that fertilized maize with FYM increased grain and straw yields.

This work aimed to study the effect of tillage treatments and application of FYM on some physical properties of the soil and maize production.

MATERIALS AND METHODS

Two field experiments were carried out at El-Gemmeiza Agriculture Research Station (El-Gharbia Governrate) in 1998/99 seasons, to study the effect of tillage treatments and FYM application on some physical properties of the soil and maize production. Soil properties of the experimental soil in the initial state is presented in Table (1).

Table 1. Some physical properties of the experimental soil.

Depth (cm)	Particle size distribution (%)				$CaCO_3$ (%)	O.M (%)	Text-ural class	Bulk dens-ity (g/cm^3)	Hyd-raulic cond. (Cm/hr)	Infiltr-ation rate (cm/hr)
	Clay	Silt	F. sand	C. sand						
0-15	48.3	36.0	14.2	1.3	3.6	1.59	Clay	1.25	1.84	2.10
15-30	48.7	38.3	10.4	1.2	3.4	1.41	Clay	1.34	1.34	
30-60	49.4	39.4	8.4	1.5	3.3	1.20	Clay	1.35	1.35	

The split plot design with four replicates was adopted . Experimental field was divided into four main plots to represent the treatments of the tillage as follows:-

1. Chisel two ways and rotary tiller (C_2 + R.T.)
2. Chisel one way and rotary tiller (C_1 + R.T.)
3. Rotary tiller (R.T.)
4. No tillage (N.T.).

Two levels of farmyard manure (0 and 20 m^3/fed) were distributed on soil surface of the abovementioned treatments before plowing.

The experimental plots were planted with *Zea maize* (single cross 10 variety) at the 15th of June for the two seasons. The size of each plot was 30 m^2. The basal doses of N, P and K fertilizers were applied according to the recommendations by Ministry of Agriculture.

Representative soil profiles were taken at the tree periods:

1. After ploughing and preparing a seed bed completely.
2. After the 1st irrigation.
3. At the harvest time.

Soil samples were collected from each profile to represent three successive layers of 0-15, 15-30 and 30-60 cm.

Some physical properties such as bulk density, total porosity, hydraulic conductivity and infiltration rate were studied during the three abovementioned periods. The soil penetration resistance was measured during the 1st and 2nd irrigation cycles.

Soil bulk density was determined by using the core method (Vomocil and Floker (1965). Hydraulic conductivity was determined using undisturbed soil cores according to the falling head method (Black, 1965). The infiltration rate was determined by the double rings infiltrometer as described by

Michael (1987). Penetration resistance was measured by the cone penetrometer (Davidson and Roy, 1980).

At harvesting grain and straw yields (ton/fed) were recorded for each plot. Data were statistically analyzed according to the procedure described by Snedecor and Cochran (1969).

RESULTS AND DISCUSSION

Physical properties of the soil:

a. Soil bulk density:

Data presented in Table (2) reveal that the values of bulk density tend to decrease for the soil surface layer (0-30 cm) under the used tillage treatments compared with no-tillage treatment. The decrement of bulk density become more clear with the addition of FYM. The data reveal also that the values of bulk density increased with increasing the soil depth for all the treatments.

After ploughing, the lowest values of bulk density recorded at C_2 + R.T. followed by C_1 + R.T. and R.T. treatments compared with no-tillage. Bulk density decreased at 15-30 cm depth under C_2 + R.T. and C_1 + RT treatments, while it increased under R.T. treatment. This increase is due to the shallower tilth layer of the rotary tiller, which can not be reached deeper than 10 cm depth. The values of bulk density under C_2 + R.T. and C_1 + R.T. treatments increased at 30-60 cm depth. This increments attributed to the high axle load and the tractor wheel traik as pointed out by Mielke *et al*. (1984).

After the first irrigation, data in Table (2) show that bulk density for 0-15 cm and 15-30 cm depth increased slightly under C_2 + R.T. and C_1 + R.T. treatments as compared with values after ploughing. The improving effect of ploughing on bulk density values has continued till the harvest as compared with the initial state especially for C_2 + R.T. and C_1 + R.T. at the tilled layer 0-30 cm. This finding coincides with the results of Korayem *et al*. (1985); Zein Al-Din (1985); El-Gayar *et al*. (1986); Roseberg and McCoy (1992); El-Awag *et al*. (1992) and Othman (1995).

The addition of FYM caused a reduction in bulk density values at 0-30 cm layer under all tillage treatments compared with its values without FYM addition. The improving effect of FYM in reducing bulk density value extended up to the end of the growing season to the depth of 0-30 cm under C_2 + R.T., and C_1 + R.T. treatments and to 0-15 cm depth for R.T. treatment. Kahle *et al*. (1992) found that the soils fertilized with organic materials (FYM) characterized by the lower values of bulk density. This results are in harmony with the findings of Sarkar *et al*. (1973), Kurual and Tripathi (1990) and El-Awag *et al*. (1992), Othman (1995) and El-Naggar *et al*. (1996).

Table 2. Soil bulk density, hydraulic conductivity and infiltration rate as affected by different tillage treatments and FYM application (average of two seasons).

Time of determination	FYM application	Tillage treatment	Bulk density ($g\ cm^{-3}$) Soil depth (cm) 0-15	15-30	30-60	Hydraulic conductivity (cm/hr) Soil depth (cm) 0-15	15-30	30-60	Infiltration rate Ib(cm/hr)
After ploughing	0	C_2+RT	1.05	1.05	1.38	3.44	2.52	0.51	7.75
		C_1+RT	1.10	1.13	1.36	3.17	2.16	0.53	6.42
		RT	1.16	1.36	1.35	2.78	0.82	0.63	4.35
		NT	1.24	1.34	1.35	2.00	1.54	0.63	2.15
	20 m^3/fed	C_2+RT	1.03	1.06	1.38	4.83	3.52	0.82	8.00
		C_1+RT	1.09	1.12	1.36	4.70	3.10	0.76	6.95
		RT	1.14	1.36	1.36	4.00	1.90	0.70	6.00
		NT	1.20	1.34	1.36	3.30	2.10	0.66	3.50
After 1st irrigation	0	C_2+RT	1.11	1.14	1.37	2.75	2.00	0.64	4.10
		C_1+RT	1.13	1.17	1.36	2.00	1.60	0.63	3.70
		RT	1.15	1.34	1.36	1.74	1.14	0.63	3.60
		NT	1.20	1.33	1.36	1.32	0.84	0.63	3.60
	20 m^3/fed	C_2+RT	1.08	1.11	1.36	3.22	2.42	0.67	4.95
		C_1+RT	1.10	1.15	1.36	3.04	2.22	0.66	4.30
		RT	1.17	1.33	1.36	2.15	2.00	0.64	4.00
		NT	1.18	1.34	1.36	2.00	0.86	0.64	3.65
At Harvest	0	C_2+RT	1.16	1.21	1.36	1.99	1.62	0.68	3.50
		C_1+RT	1.18	1.25	1.35	1.75	1.48	0.64	3.25
		RT	1.20	1.32	1.36	1.40	1.00	0.63	2.30
		NT	1.23	1.34	1.36	1.32	0.84	0.63	2.30
	20 m^3/fed	C_2+RT	1.14	1.19	1.36	2.33	1.84	0.72	3.80
		C_1+RT	1.17	1.24	1.36	2.10	1.63	0.70	3.60
		RT	1.18	1.32	1.36	1.86	1.20	0.63	2.55
		NT	1.20	1.34	1.36	1.48	0.90	0.63	2.50

C_2 + RT : Chisel two ways + Rotary tiller. **C_1 + RT : Chisel one way + Rotary tiller.**
RT : Rotary tiller **NT : No-tillage.**

b. Hydraulic conductivity:

Data in Table (2) show that hydraulic conductivity values tended to decrease with increasing soil depth as well as the time after ploughing. The values of hydraulic conductivity were higher under tillage treatments than that of the untilled one especially at the 0-15 and 15-30 cm depths at ploughing time and also at the two following times of sampling.

After ploughing, the data revealed that there is a great differences in hydraulic conductivity values between tillage treatments in the surface layer. These differences could be attributed to the differential effects of tillage treatments on the degree of disturbance of soil after ploughing. The hydraulic conductivity values at 15-30 cm depth were still greater for C_2 + R.T. and C_1 + R.T. treatments than those for no-tillage, while the lowest value was at RT treatment. This decrement may be attributed to soil compactness, which possibly resulted from the effect of plough shear plane and tractor wheel track. The depressing effects of the plough chear plane on hydraulic conductivity were also noticed at 30-60 cm layer under both C_2 + R.T. and C_1 + R.T. tillage treatments.

After the first irrigation, data in Table (2) show that tillage treatment increased hydraulic conductivity at 0-15 and 15-30 cm depth compared with no-tillage treatment. Data reveal that the values of hydraulic conductivity after the first irrigation were reduced as compared to its values after ploughing at any tillage treatment. This reduction may be due to settlement of the fine soil particles as a result of irrigation which could reduce the percentages of drainable pores and consequently reduce the hydraulic conductivity as indicated by El-Khoti (1992) and Othman (1995).

Data recorded in Table (2) reveal that at harvesting time, the differences in hydraulic conductivity values between tillage treatments is still pronounced at surface and sub-surface layers. The hydraulic conductivity values reduced at harvesting time when compared with those at first irrigation under all treatments. Similar results had been obtained by El-Gayer *et al*. (1986), Mayrya (1986), Kurual and Tripathi (1990), Cunha Medeiros *et al*. (1992), Kaoud (1994) and Othman (1995).

Data in Table (2) reveal also that addition of FYM increased hydraulic conductivity at the three time of determination. This increment could be attributed to the increase of the soil total porosity, which was magnified by the application of FYM. The addition of FYM resulted in remarkable increase of hydraulic conductivity values under different tillage treatments when compared with their values under non-FYM treated plots. This concept is supported by data of El-Awag *et al*. (1992) and Othman (1995).

c. Infiltration rate:

Data in Table (2) show a remarkable increase in infiltration rate after ploughing particularly under C_2 + R.T. treatment followed by C_1 + R.T. and R.T. as compared to that of the no-tillage. This result is in accordance with that of El-Awag *et al*. (1992) and Kaoud (1994), who found that the infiltration rate increased under deep ploughing more than that under shallow ploughing.

Comparing the values of infiltration rate at the first irrigation with its values at ploughing time under different tillage treatments, a remarkable decrease can be observed in values of infiltration rate with increasing the time after ploughing. The data in Table (2) reveal another decrease in the infiltration rate at harvesting time under the different tillage treatments when compared with their values at the first irrigation. This reduction in the values of infiltration rate with time may be ascribed to slipping reorientation and close packing of soil particles after irrigation. The obtained results are in agreement with those obtained by Mayrya (1986), Cunha *et al*. (1992) and Othman (1995).

The addition of FYM prior to ploughing resulted in increasing values of infiltration rate under different tillage treatments compared with its values under plots without FYM. The results in Table (2) reveal also that the effect of ploughing on infiltration rate values are still acting until the harvest time in the presence of FYM. Similar results had been obtained by El-Awag *et al*. (1992) and Othman (1995).

d. Soil penetration resistance:

The penetration resistance for different tillage treatments throughout the two irrigation cycles are shown in Table (3). The results reveal that the penetration resistance reading increased with the depth and with the time after irrigation at the two irrigation cycles. The data also show that the tillage treatments gave the lowest values of penetration resistance compared with the no-tillage treatment at 0-30 cm depth through the two irrigation cycles. Throughout the two irrigation cycle, the C_2 + R.T. treatment gave the lowest readings of the penetrometer at different depths and through the irrigation cycle compared with values of no-tillage treatment. The penetration resistance increased at 15-30 cm depth for rotary tiller treatment and at 30-45 cm depths under the chisel tillage treatments through the two irrigation cycle compared with untillage treatment. This increase may be attributed to the effect of frequent implement traffic on the sub surface depths. These results are in accordance with findings of El-Said *et al*. (1988) and El-Kholi (1992) and Othman (1995).

Table 3. Soil penetration resistance as affected by different tillage treatments and FYM application throughout the first and second irrigation cycles of maize (average of two seasons).

FYM application	Tillage treatments	Times after irrigation (day)	Soil penetration resistance ($N\ cm^{-2}$)					
			First irrigation			Second irrigation		
			Soil depth (cm)			Soil depth (cm)		
			0-15	15-30	30-60	0-15	15-30	30-60
Without FYM	C_2+RT	5	9.92	16.20	32.18	12.82	20.30	35.80
		10	11.85	20.30	39.25	17.34	28.20	41.82
		15	20.20	27.42	43.13	26.62	32.32	48.32
	C_1+RT	5	11.42	17.93	32.18	15.30	23.46	35.80
		10	15.30	23.42	39.25	19.23	30.22	39.50
		15	20.92	31.64	43.13	25.74	36.42	45.20
	RT	5	10.82	26.19	33.00	15.82	29.34	33.18
		10	13.40	29.40	40.20	21.76	33.68	35.10
		15	21.43	33.15	44.35	28.42	40.17	43.18
	NT	5	12.18	24.20	30.17	17.20	27.34	33.00
		10	16.45	24.28	36.42	22.13	32.12	38.12
		15	24.13	34.22	41.40	31.25	38.31	40.22
With FYM	C_2+RT	5	7.82	9.08	29.25	9.62	15.33	32.62
		10	10.10	18.12	36.75	12.37	21.19	37.75
		15	18.30	24.20	41.12	21.23	27.24	43.18
	C_1+RT	5	9.12	11.22	30.00	12.42	19.55	31.85
		10	11.35	20.15	35.12	14.33	25.14	36.60
		15	19.65	26.22	40.25	22.12	29.25	42.13
	RT	5	7.82	19.25	31.20	12.50	20.95	32.80
		10	10.20	23.12	37.25	16.33	27.13	34.80
		15	20.10	29.14	41.32	24.20	33.19	41.25
	NT	5	10.32	16.23	28.18	14.62	20.00	31.28
		10	13.42	20.12	34.12	18.13	26.25	37.70

		15	22.30	30.18	39.62	25.18	32.22	40.00

C_2 + RT : Chisel two ways + Rotary tiller. **C_1 + RT : Chisel one way + Rotary tiller.**
RT : Rotary tiller **NT : No-tillage.**

Data in Table (3) demonstrated that the addition of FYM caused decreases in soil penetration resistance throughout the two irrigation cycles. The decreasing effect of FYM on the penetration resistance reading was clear under rotary tiller treatment especially at the surface layer and gave the similar reading to that obtained under C_2 + R.T. treatment. It can be observed that the addition of FYM can decrease the harmful effect of rotary tiller by decreasing soil compaction at 15-30 cm depth as indicated from data in Table (3). The obtained results are in agreement with those obtained by El-Awag *et al*. (1992), Kaoud (1994) and Othman (1995).

Grain and straw yield:

The data in Table (4) reveal that significant differences were found between all tillage treatments in grain and straw yields when compared with no tillage treatment in the two seasons. The highest yield of grain and straw were produced under C_2 + R.T. and C_1 + R.T. treatments in 1998 and 1999 seasons. The increase of grain and straw yields under tillage treatments was attributed to their role on optimizing the soil physical properties as well as their influence on minimizing weed competition with maize plants.

The relationship between tillage treatments and the increase in maize yield was also found by Zein El-Abedine *et al*. (1970), Hakimi and Chokrobarti (1976), Mayrya (1986), Herbek *et al*. (1986) and El-Awag *et al*. (1992).

Table 4. Grain and straw yields of maize as affected by different tillage treatments and FYM application in 1998 and 1999 seasons.

FYM Application	Tillage treatments	Yield (ton/fed.)			
		1998 season		1999 season	
		Grain	Straw	Grain	Straw
Without FYM	C_2 + RT	3.48	4.38	3.75	4.62
	C_1 + RT	3.42	4.33	3.56	4.45
	RT	3.59	4.33	3.40	4.30
	NT	3.16	4.09	3.00	4.00
	Mean	3.41	4.28	3.42	4.34
With FYM	C_2 + RT	3.94	4.82	4.15	4.96
	C_1 + RT	3.80	4.74	3.95	4.82
	RT	3.72	4.42	3.64	4.63
	NT	3.50	4.30	3.45	4.40
	Mean	3.74	4.57	3.80	4.70
	L.S.D. 5%	0.014	0.095	0.046	0.303
Average of tillage treatments	C_2 + RT	3.71	4.60	3.95	4.79
	C_1 + RT	3.61	4.53	3.75	4.63
	RT	3.65	4.37	3.52	4.46
	NT	3.33	4.19	3.22	4.20
	L.S.D. 5%	0.145	0.184	0.502	0.209

C_2 + RT : Chisel two ways + Rotary tiller. **C_1 + RT : Chisel one way + Rotary tiller.**
RT : Rotary tiller **NT : No-tillage.**

The data reveal also that significant differences were achieved on grain and straw yields between treatments received 20 m^3 FYM/fed and that which not received any FYM addition in 1998 and 1999 seasons. The increment of grain and straw yields may be attributed to the improvement action of FYM on the soil physical properties as well as nutrients status in the soil.

These results are in harmony with the finding of El-Attar *et al*. (1982), El-Awag *et al*. (1992) and El-Nagger *et al*. (1995).

REFERENCES

Black, C.A. (1965). "Methods of Soil Analysis". Part 1. Amer. Soc. of Agron. Inc. Modison, Wisconsin, USA.

Cunha Medeiros, J.D.A.; R. Espejo Serrano; J.L. Hernonz; V. Sanchez Giron and L.A. Daniel (1992). An evaluation of the effect of different cultivation systems on the infiltration of water into the soil. Zaragoza, Spain, FIMA, 221-226 (C.F. Soil & Fert., 56(3):2840, 1993).

Davidson, D.T. and C.J. Roy (1980). The geology and engineering characteristics of some Alaskan soils. Iowa Eng. Exp. Sta. Bull. 186.

El-Attar, H.; M. El-Halfawi and E. El-Haddad (1982). Response of maize to farmyard manure and zinc. FAO, Soil, Bull. 45:221-224.

El-Awag, T.I.; A.M. Hanna and I.M. El-Naggar (1992). Effect of added amendments and plowing types on *Zea maize*, root growth, sub soil mechanical impedance, chemical and physical properties of soil and ion uptake. J. Agric. Sci. Mansoura Univ., 17(7):2510-2520.

El-Gayar, A.A.; R.M. El-Awady and A.A. Abd El-Razek (1986). The effect of different types of ploughs on some physical properties of clay soil under growth of maize plants. Annals Agric. Sci Moshtohor, 24(4):2287-2302.

El-Kholi, H.E.A. (1992). Effect of some tillage systems on some soil physical properties and yield. Ph.D. Thesis, Fac. Agric., Cairo Univ.

El-Naggar, I.M.; A.M. Hanna; E.A.Y. El-Kabbany and A. Y. El-Tawil (1995). Effect of soil moisture levels and different sources of nitrogen on physical and chemical properties of nitrogen on physical and chemical properties of soil and maize production. Menofiya J. Agric. Res., 20(3):1237-1263.

El-Naggar, I.M.; A.A. Darwish and A.M. Hanna (1996). Response of cotton plant to application of some soil amendments and phosphorus fertilization. Menofiya J. Agric. Res., 21(3):715-731.

El-Said, A.S.; A.A. Abd El-Razek and M.M. El-Monoufi (1988). Effect of different tillage practices upon soil properties and wheat yield. Misr J. Agric. Eng., 5(3):282-296.

Hakimi, A.H. and S.M. Chakrabarti (1976). The profitability of selected cultivation and their influence on growth and yield of silage corn. J. Agric. Eng. Res., 21:15-19.

Herbek, J.H.; L.W. Murdock and R.L. Blevins (1986). Tillage system and data of planting effects on yield of corn on soil with restricted drainage. Agron. J., 78(5):824-826.

Kahle, P.; P. Leinweber and P. Menning (1992). On the influence of soil organic matter on physical properties of soils. Agribiological Res., 45(1):18-27. (C.F. Soil & Fert., 50(1):251, 1993).

Kaoud, E.E. (1994). Influence of tillage and amendment practices on some soil physical properties and crop production in compacted clayey soils. J. Agric. Mansoura Univ., 19(6):2077-2088.

Korayem, A.Y.; M.A. Shaibon and E.R. Al-Ashry (1985). Development of the locally chisel plough. Misr. J. Agric. Eng., 2(4):33-50.

Kurual, A. and R.P. Tripathi (1990). Effect of continuous use of manure and fertilizers on physical properties of soil under paddy-wheat-cowpea cropping system. Crop Res., 3(1):7-12.

Maurya, P.R. (1986). Effect of tillage and residue management on maize and wheat yield and on physical properties of an irrigated sandy loam soil in northern Nigeria. Soil and Tillage Res., 8:161-170.

Michael, A.M. (1987). “Irrigation and Practice”. Soil Plant Water Relationship. PP. 448-584, 1987. Ed. Vikas Publ. House PVT Ltd, 576 Jid Road, New Delhi.

Mielke, L.N.; W.W. Wihelm; K.A. Richards and C.R. Ferster (1984). Soil physical characteristics of reduced tillage in wheat fallow system. Transactions. ASAE, 27(6):1724-1738.

Othman, S.A.E. (1995). Effect of minimum tillage and fertility management on some crops in alluvial soils. Ph.D. Thesis, Fac. Agric., Zagazig Univ.

Pidgeon, J.D. and B.D. Soane (1977). Effect of tillage and direct drilling on soil properties during the growing season in a long term barley mono-culture system. J. Agric. Eng., 88(2):341-342.

Roseberg, R.J. and E.L. McCoy (1992). Tillage and traffic induced changes in macroporosity and macropore continuity: Air permeability assessment. Soil Sci. Soc. Amer. J., 56(4):1261-1267.

Sarkar, M.C.; M. Singh and J. Nath (1973). Influency of farmyard manure on soil structure and some related soil properties. J. Indian Soc. Soil Sci., 21(2):227-230.

Snedecor, G.W. and G.W. Cochran (1969). “Statistical Methods”. 6th Edition Iowa State Col. Press, Iowa, USA, P. 343.

Vomocil, J.A. and W.J. Flocker (1965). Degradation of structure of Volo loam by compaction. Soil Sci. Soc. Amer. Proc., 29:7.

Zein Al-Din, A.M.A. (1985). Comparative study between different tillage methods. M.Sc. Thesis (Agric. Eng.), Fac. Agric., Alex. Univ.

Zein El-Abdeine, I.A.; G.B. Hanna; M.M. Abdalla and M.S. Seoudy (1970). The effect of different types of ploughs on germination, plant growth and yield. J. Soil Sci., A.R.E., 10:7-21.

J. Agric. Sci. Mansoura Univ., 25 (2), February, 2000.

تــأثير معــاملات الحــرث وإضــافة الســماد العضــوى علــى بعـض الخـواص الطبيعية للتربة وإنتاجية محصول الأذرة الشامية0

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فـى تجربــة منشـقة عشـوائياً أجـرى هـذا البحـث خـلال موسـمين متتـاليين (1998 ، 1999) بمحطــة البحـوث الزراعيـة بـالجميزة وذلـك لدراسـة تـأثير معـاملات الحـرث وإضـافة السـماد العضـوى علـى بعـض الخواص الطبيعية للتربة وإنتاجية محصول الأذرة الشامية صنف هجين فردى 10 0

أظهـرت النتـائج المتحصـل عليهـا أن قيم الكثافـة الظاهريـة للتربـة ومقاومـة التربـة للإختراق تقل بينمـا تزداد قيم كل من درجـة التوصـيل الهيدروليكى ومعدل رشـح الميـاه فـى التربـة وذلـك تحت معـاملات الحـرث المختلفة وذلك عند مقارنتها بالمعاملة بدون حرث0 وأوضـحت النتائج أيضـاً أن قيم كـل مـن الكثافـة الظاهريـة ومقاومـة التربة للإختراق فى الطبقة السطحية أقل منها فى الطبقات السفلية0

وكانت أحسن معاملة حرث وخدمـة لـلأرض بإستخدام المحـراث الحفـار مـرتين مـع إستخدام المحـراث الدورانى حيث أعطت أقل قيم لكثافـة التربـة ومقاومـة التربـة للإختـراق وزيـادة فـى معدل رشـح المـاء ودرجـة التوصيل الهيدروليكى وأعطت أيضا أعلى قيم فى محصول الحبوب والقش0

أوضـح البحـث أيضـاً أن إضـافة السـماد العضـوى بمعـدل 20 م^3/فـدان يقلـل مـن قيم كـل مـن الكثافـة الظاهرية للإرض ومقاومة التربة للإختراق بينما يزداد قيم كل من درجة التوصيل الهيدروليكى ومعدل رشـح المياه وكذلك محصول الحبوب والقش0

أوضـحت النتـائج أيضـاً أن تـأثير كـل مـن معـاملات الحـرث وإضـافة المـادة العضـوية علـى الخـواص الطبيعية للأرض تحت الدراسة يمتد حتى الحصاد وخصوصـاً عند معـاملتى الحرث بإستخدام (الحفـار مـرتين + المحراث الدورانى) ، (الحفار مرة + المحراث الدورانى) وذلك بعمق طبقة الحرث من صفر - 30 سم0