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A RESEARCH ON AGRICULTURAL MECHANIZATION LEVEL OF TURKEY

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Introduction

For the first time in Turkey the data about the legal status of the agricultural holdings was collected by the 1991 General Agricultural Census. When the total number of holdings is considered, 99.45 percent of that is the household holdings, of the 0.54 percent is the two or more households holdings, and of the 0.001 percent is the corporation, cooperative and agricultural state holdings.

While the number of holdings operating less than 5 decar area constituted 7.23 percent of the total number of holdings in the 1980, this ratio decreased to 6.34 percent in the 1991. On the other hand, the ratio of the area operated by these holdings within the total area is found as 0.20 percent and 0.28 percent in 1980 and 1991. While the ratio of the number of holdings operating area among 10–99 decar is 67.76 percent in 1980, this ratio increases to 69.07 percent in 1991. The ratio of the area operated by these holdings is 40.07 percent and 40.71 percent in 1980 and 1991 respectively. It shows that even though there is not much expansion in the amount of area, the number of holdings increased.. In other words, the average area per holding decreased or the holding areas were split. The ratio of the holdings operating the area among 100–999 decar size decreased from 18.22 percent to 14.65 percent in between 1980 and 1991. The ratio of the area operated by these holdings was found as 54.75 percent in 1980. This ratio was found as 47.20 percent in all 1991. In all Turkey, the average cultivated area per holding in 1980 was 65.8 decar, and this was found to be 59.1 decar in the 1991. This means that on average 6.7 decar decrease occurred in the amount of the average cultivated area per holding in the last eleven years [ANONYMOUS 1994a].

The small size holdings in Turkey, cause considerable problems that affect the profitability and productivity in mechanization in a negative way. In small size holdings, the capital that can be paid for the equipment and machines is insufficient; and generally, low power machines were used in such holdings.

In this paper our intention is to examine the situation of mechanization in crop production and animal husbandry, and to determine the level of mechanization in Turkey, as well as to reconstruct the data that may be helpful for planning the mechanization.

Material and methods

In this work; the data about the agricultural characteristics and mechanization, and the situation of the mechanization in production of crop and animal husbandry were examined. In the selection and the determination of the indicators that reflect the mechanization level in Turkey [ANONYMOUS 1982], we made use of the data achieved from the State Institute of Statistics. We examined the criteria mentioned below, for the determination of the mechanization level in Turkey:

- The number of tractors and the distribution of tractors for the power groups,
- Tractor motor power per cultivated area,
- Number of tractors per 1000 hectares,
- The cultivated area per tractor,
- The number of equipment per cultivated area and tractor, and
- For the animal husbandry, the number of equipment per 1000 animal.

Results and Discussion

The criteria values showing the cultivated field area and tractor numbers in Turkey and the agricultural mechanization level which was determined according to these values are given Table 1. While the cultivated field area was about 24 million hectares between the years 1980–1999, the tractor number increased twice during the same years. On the other hand, the tractor motor power per cultivated areas was 0.75 kW/ha in the year 1980, and it reached 1,66 kW/ha in the year 1999. Although, the tractor number per 1000 hectares was calculated as 17.8 in the year 1980, it was calculated as 39.4 in 1999. During the same years, the cultivated area per tractor fell from 56.28 ha to 25.41 ha in term.

Table 1; Tabela 1

The values showing the agricultural mechanization level of Turkey by years
Dane charakteryzujące poziom mechanizacji rolnictwa w Turcji w kolejnych latach

Years; Lata	1980	1985	1990	1995	1999
Cultivated area (1000 ha) Pow. gruntów ornych (w tys. ha)	24560	23933	24192	23558	23489
Tractor number; Liczba ciągników	436369	583974	692454	776863	924471
kW/ha; Liczba kW/ha	0.75	1.03	1.21	1.39	1.66
Tractor/1000 ha; Liczba ciągników na 1000 ha	17.80	24.40	28.60	32.90	39.40
ha/tractor; Liczba ha na ciągnik	56.28	40.98	34.94	30.36	25.41

In Table 2, the proportional distribution of the tractors according the power groups are given. Between the years 1991 – 1999, about 3.5% of the total tractor number in Turkey were in the power group below 18.4 kW. The tractor number, in the power group between 18.4 kW – 36.8 kW were 61.4% in 1991, and this amount fell to 55.8% in the year 1999. The number of tractors were higher than 36.8 kW increased to 40.7% from 34.8% between the years 1991 and

1999. During the recent years, a decrease in the usage of low power tractors, and an increase in the usage of high power tractors was observed.

Table 2; Tabela 2

The proportional distribution of the tractors according the power groups by years in Turkey

Struktura liczebności ciągników w Turcji wg mocy w poszczególnych latach

Years; Lata		1991	1995	1997	1999
Tractor number; Liczba ciągników		704373	776863	874995	924471
< 25 KM (18.4 kW)	number; liczba	26696	27268	29469	31856
	%	3.8	3.6	3.4	3.5
25–50 KM (18.4–36.8 kW)	number; liczba	432447	461558	502368	516022
	%	61.4	59.4	57.4	55.8
50 KM< (36.8 kW)	number; liczba	244910	287616	342709	376092
	%	34.8	37.0	39.2	40.7

Table 3; Tabela 3

The number of the equipment in Turkey according to cultivated area of 100 ha and one tractor

Liczba maszyn w Turcji w przeliczeniu na 1 ciągnik i 1000 hektarów

Years; Lata		1991	1993	1995	1997	1999
Cultivated area (1000 ha) Pow. gruntów ornych (w tys. ha)		23979	23827	23558	23522	23489
Tractor number; Liczba ciągników		704373	746283	776863	874995	924471
Plough Pługi	Number; Ogółem	657690	708455	744986	819362	866322
	Number/tractor Na 1 ciągnik	0.93	0.95	0.96	0.94	0.94
	Number/1000 ha Na 1000 ha	27.43	29.73	31.58	34.83	36.88
Cultivator Kultywatory	Number; Ogółem	283996	307511	329422	369040	395547
	Number/tractor Na 1 ciągnik	0.40	0.41	0.42	0.42	0.43
	Number/1000 ha Na 1000 ha	11.83	12.91	13.97	15.69	16.84
Seed drill Siewniki	Number; Ogółem	96098	111161	121423	130606	146715
	Number/tractor Na 1 ciągnik	0.14	0.15	0.16	0.15	0.16
	Number/1000 ha Na 1000 ha	4.01	4.67	5.15	5.55	6.25
Sprayer Opryskiwacze	Number; Ogółem	129682	145303	154680	187426	210300
	Number/tractor Na 1 ciągnik	0.18	0.19	0.20	0.21	0.23
	Number/1000 ha Na 1000 ha	5.41	6.10	6.56	7.97	8.95
Trailer Przyczepy	Number; Ogółem	661618	707024	742959	854171	908047
	Number/tractor Na 1 ciągnik	0.94	0.95	0.96	0.98	0.98
	Number/1000 ha Na 1000 ha	27.59	29.67	31.50	36.31	38.66

The values for the equipment pr in Turkey are given in Table 3. addition to that information about the values for plough, cultivator, seed drill, sprayer, and trailer are given in Table 3 as on example. According to the data for the period between the years 1991–1999 there was an average of 0.95 mould board type ploughs, 0.42 cultivators, 0.15 seed drills, 0.20 sprayers, and 0.97 trailers per tractor in Turkey. Since the increase in the number of tractors and the equipment are parallel to each other, no extra change was observed in the number of the equipment per tractor. On the other hand, between the years 1991 and 1999, the number of equipment per 1000 hectares had reached to 36.88 from 27.43 for mould board type ploughs; to 16.84 from 11.83 for cultivators; to 6.25 from 4.01 for seed drills, to 8.95 from 5.41 for sprayers, and to 38.66 from 27.59 for trailers.

In animal husbandry, the values related to the balers, drawn movers, and forage harvesters were calculated as the criteria of the mechanization level. The values for these machines, and the numbers for the livestock are given in Table 4. As seen in the Table, the number of the livestock was 70 866 000 in the year 1985, and this number decreased to 56 268 000 in the year 1995. The most important characteristic of animal husbandry in Turkey is its being executed with crop production in the holdings. In these holdings that are getting smaller with the continuously increase in the number of the holdings, animal husbandry began to be made as a subsidiary for crop production; and it decreased as the years passed.

Table 4; Table 4

Mechanization level according to livestock animals and equipment
Poziom mechanizacji produkcji zwierzęcej w poszczególnych latach

Years; Lata		1985	1990	1995
Tractor number; Liczba ciągników		583974	692454	776863
Livestock number; Liczba zwierząt		70866000	64992000	56268000
Baler Prasy	Number; Ogółem	6845	7170	7909
	Number/tractor Na 1 ciągnik	0.012	0.010	0.010
	Number/ 1000 animals Na 1000 zwierząt	0.097	0.110	0.141
Drawn mower Kosiarki	Number; Ogółem	11894	17698	24853
	Number/tractor Na 1 ciągnik	0.020	0.026	0.032
	Number/ 1000 animals Na 1000 zwierząt	0.168	0.272	0.442
Forage harvester Sieczkarnie polowe	Number; Ogółem	376	423	1534
	Number/tractor Na 1 ciągnik	0.0006	0.0006	0.0020
	Number/ 1000 animals Na 1000 zwierząt	0.0050	0.0070	0.0270

The number of the equipment per 1000 animals between the years 1985 and 1995 changed from 0.097 to 0.141 for balers, from 0.168 to 0.442 for drawn movers, and from 0.005 to 0.027 for forage harvesters. In Table 5, the number of the milked animals, and milking machines had is given for the years respectively.

As seen in the Table, between the years 1987 and 1997 the number of the milked animals decreased. The number of the milking machine per 1000 animals was 0.23 in the year 1987, and this number the increased to 0.27 in the year 1990, to 1.18 in the year 1995, and to 2.76 in the year 1997. Because of the reason that the machines like balers and forage harvesters are too expensive and too big, it is impossible for the small size holdings to own these machines.

Table 5; Tabela 5

Number of the milked animals and milking machines by years
Pogłowie zwierząt poddawanych udojowi i liczba dojarek mechanicznych

Years; Lata	1987	1990	1995	1997
The number of milked animal Liczba zwierząt	36261837	35791950	30055680	27170170
The number of milking machines Liczba dojarek	4382	9636	35593	75095
Milking mach./1000 animals Liczba dojarek/1000 zwierząt	0.23	0.27	1.18	2.76

As a result; it is so necessary to plan the mechanization level for the potential production branches, and to determine the optimum amount of tractor - equipment. On the other hand, in order to determine policies to solve the problems in the agricultural sector which accounts for a considerable part of our national income, and to evaluate progress in the sector, it is necessary to compile reliable and detailed data related to the sector.

References

ANONYMOUS 1982. *V. Beş Yýllýk Kalkýnma Planý – Tarým Alet ve Makinalarý Özel Ýhtisas Komisyonu Raporu*, I. Tasarý, Ankara.

ANONYMOUS 1993. *1991 General Agricultural Census. Results of Village Information Survey.* State Institute of Statistics Prime Ministry Republic of Turkey, Ankara.

ANONYMOUS 1994a. *1991 General Agricultural Census. Results of the Agricultural Holdings (Households).* State Institute of Statistics Prime Ministry Republic of Turkey, Ankara.

ANONYMOUS 1994b. *The Summary of Agricultural Statistics 1992.* State Institute of Statistics Prime Ministry Republic of Turkey, Ankara.

ANONYMOUS 1997. *The Summary of Agricultural Statistics 1996.* State Institute of Statistics Prime Ministry Republic of Turkey, Ankara.

ANONYMOUS 1998. *The Summary of Agricultural Statistics 1997.* State Institute of Statistics Prime Ministry Republic of Turkey, Ankara.

ANONYMOUS 1999. *Agricultural Structure 1997.* T.C. State Institute of Statistics Prime Ministry Republic of Turkey, Ankara.

Key words: mechanization level, mechanization of crop production and animal husbandry

Summary

The aim of this research is to determine some data which is necessary for mechanization planning, and mechanization level. Change of tractor motor power per cultivated field area, number of tractor per 1000 ha, and cultivated field area per tractor by years were calculated the determination the mechanization level. Moreover, the number of agricultural equipment per tractor was given related to different kinds of equipment. On the other hand, the number of agricultural equipment and machinery used in animal husbandry were presented to determine mechanization level from different points of view.

The results indicated that values of mechanization level indicators increased according to years (Table 3) in general. In 1999, tractor power per cultivated area was 1.66 (kW/ha), number of tractor per 1000 ha was 39.40 (tractor/1000 ha) and cultivated field area per tractor was 25.41 (ha/tractor) in Turkey. In addition to, number of some equipments per tractor for ploughs, for seed drills, for tractor drawn mowers, and for trailers are given in Table. Since the increase in the number of tractors and the equipment are parallel to each other, no extra change was observed in the number of the equipment per tractor. On the other hand, between the years 1991 and 1999, the number of equipment per 1000 hectares reached to 36.88 from 27.43 for mould board type ploughs; to 16.84 from 11.83 for cultivators; to 6.25 from 4.01 for seed drills, to 8.95 from 5.41 for sprayers, and to 38.66 from 27.59 for trailers.

BADANIA POZIOMU MECHANIZACJI ROLNICTWA W TURCJI

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Słowa kluczowe: poziom mechanizacji, mechanizacja produkcji roślinnej i zwierzęcej

Streszczenie

Celem badań było określenie danych potrzebnych dla planowania mechanizacji i jej poziomu. Dla wyznaczenia poziomu mechanizacji obliczono zmiany w mocy ciągników odniesione do powierzchni gruntów ornych, liczbę ciągników na 1000 hektarów i powierzchnię gruntów ornych przypadającą na jeden ciągnik w poszczególnych latach. Wyznaczono również liczbę różnych maszyn rolniczych przypadających na jeden ciągnik. W celu określenia poziomu mechanizacji z różnych punktów widzenia, przedstawiono również liczbę maszyn i urządzeń rolniczych stosowanych w produkcji zwierzęcej.

Wyniki wskazują, że wartości wskaźników poziomu mechanizacji w zasadzie rosną w poszczególnych latach (tab. 3). W 1999 roku w Turcji moc ciągników odniesiona do powierzchni gruntów ornych wynosiła 1,66 kW/ha, liczba ciągników wynosiła 39,40/1000 ha, a powierzchnia gruntów ornych na jeden ciągnik 25,4

ha/ciągnik. Obliczone liczby poszczególnych maszyn: pługów, siewników, kosiarek i przyczep, przeliczone na jeden ciągnik przedstawiono w tabeli. Ponieważ wzrost liczby ciągników i maszyn jest wzajemnie proporcjonalny, nie zaobserwowano dodatkowych zmian w liczbie maszyn w przeliczeniu na jeden ciągnik. Natomiast w okresie od 1991 do 1999, liczba maszyn na 1000 hektarów zmieniała się następująco: pługów odkładnicowych od 27,43 do 36,88, kultywatorów od 11,83 do 16,84, siewników od 4,01 do 6,25, opryskiwaczy od 5,41 do 8,95 i przyczep od 27,59 do 38,66.

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