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# Evaluation of Agricultural Mechanization Level of Karaman Province

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| ARTICLE INFO | ABSTRACT |
|---|---|
| *Research Article* <br><br> Received : 15/09/2019 <br> Accepted : 02/12/2019 <br><br><br> *Keywords:* <br> Agricultural structure <br> Combine harvester <br> Mechanization level <br> Tractor <br> Karaman | The main purpose of this study is to determination of agricultural structure and mechanization features of agricultural enterprises in Karaman province. The main material of the study is statistical data of Turkish Statistical Institute (TSI) of 2009 – 2018 years for Karaman province. According to the data of Karaman province in 2009 and 2018, the average tractor power is 34.92 kW and 35.33 kW; the average tractor power per cultivated areas 2.45 kWha⁻¹ and 1.93 kWha⁻¹; the number of tractors per 1,000 ha is 52.27 and 40.76; the cultivated area per tractor is 19.13 ha and 24.54 ha, respectively. The number of equipment per tractor is 10.66 and 9.86, and the number of combine harvester per 1,000 ha is 0.47 and 0.55. |

# Karaman İlinin Tarımsal Mekanizasyon Düzeyinin Değerlendirilmesi

| MAKALE BİLGİSİ | ÖZ |
|---|---|
| *Araştırma Makalesi* <br><br> Geliş : 15/09/2019 <br> Kabul : 02/12/2019 <br><br><br> *Anahtar Kelimeler:* <br> Tarımsal mekanizasyon <br> Biçerdöver <br> Mekanizasyon düzeyi <br> Traktör <br> Karaman | Bu çalışmanın amacı; Karaman ilindeki tarım işletmelerinin tarımsal yapı ve mekanizasyon özelliklerinin belirlenmesidir. Çalışmanın materyalini Karaman iline ait Türkiye İstatistik Kurumu'nun (TUİK) 2009-2018 yıllarındaki istatistiksel verileri oluşturmuştur. Karaman ilinin 2009 ve 2018 yılları verileri sırasıyla ortalama traktör gücü 34,92 kW ve 35,33 kW işlenen alana düşen traktör gücü 2,45 kWha⁻¹ ve 1,93 kWha⁻¹, 1,000 ha alana düşen traktör sayısı 52,27 adet ve 40,76 adettir. Bir traktöre düşen işlenen alan 19,13 ha ve 24,54 ha, bir traktöre düşen ekipman sayısı 10,66 adet ve 9,86 adet, 1.000 ha alana düşen biçerdöver sayısı 0,47 adet ve 0,55 adet olarak belirlenmiştir. |

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## Introduction

The use of machinery in agriculture increases the effectiveness and economic efficiency of technological applications and improves working conditions (Baran et al., 2014).

The machine selection and planning is becoming more and more important because of diversification of the mechanization applications in agricultural enterprises. The profitable production of agricultural enterprises depends on the suitability and economic use of these machines consisting of tractors and agricultural machines. Therefore, the right choice and use of mechanization investments, which have a large share in the production expenses, is an important factor for the enterprises (Işık, 1988).

The development of agriculture is directly related to the use of production technologies in agriculture. Increasing agricultural productivity, income and reducing production costs are possible by increasing the use of new and modern technologies in agriculture. A country's level of agricultural development is directly related to the use of production technologies used in agriculture. Increasing product yield is possible by increasing producer income, reducing production costs and increasing the use of new and modern technologies in agriculture (Sessiz et al., 2012).

To increase the product yield by the machines used in agriculture, optimization of features like land size, product design, production techniques, capacity of the machines used, power of tractors, tractor-machine compatibility, trained personnel and etc. is required (Yavuzcan et al., 1986).

The level of agricultural mechanization may vary depending on the region's technical equipment and economic structure. The main power source is the tractor in agricultural production. Therefore, the tractor power per unit area is the most widely used criterion to determine the mechanization level. Careful determination of these criteria will allow the realization of the mechanization level dimension (Sabancı and Akıncı, 1994).

## Materials and Method

### Material

Karaman province is in the south of the Central Anatolia Region between 37.11 northern latitudes and 33.15 eastern longitudes. Konya is located to the north, Mersin to the south, Ereğli to the east, Silifke to the southeast, and Antalya to the west. It is 1,033 meters above sea level. The overall surface area of the province is 8,869 km². Karaman has 6 districts including the central district. The districts of the Karaman province areAyrancı, Başyayla, Ermenek, Kazımkarabekir and Sarıveliler (Anonymous, 2019a).

The main material of the study is statistical data of Turkish Statistical Institute (TSI) of 2009–2018 years for Karaman province. Dataused in the study are agricultural fields, number of tractors, number of harvesters, number of agricultural machinery and equipment drawn by tractor or animal.

### Method

Many criteria are used to determine the level of mechanization of agricultural enterprises. The use of these criteria alone is inadequate in determining the degree of mechanization of enterprises (Kadayıfçılar et al., 1990).

The source of power used in Turkey is tractors. The most accurate criterion in determining the mechanization level is the tractor power of $kWha^{-1}$. In addition, the other criteria used to determine the level of mechanization are tractor $1,000ha^{-1}$, ha $tractor^{-1}$, equipment-$tractor^{-1}$ and the number of combine harvester $1,000$ $ha^{-1}$(Sabancı and Akıncı, 1994; Işık et al., 2003; Koçak, 2006; Koçtürk and Onurbaş Avcıoğlu, 2007; Altıkat and Çelik, 2011; Eryılmaz et al., 2014).

In the study, by using TSI data for 2009-2018, tractor power per unit area ($kWha^{-1}$), agricultural area per tractor (ha $tractor^{-1}$), number of tractors per unit agricultural area (tractor $1,000ha^{-1}$), the number of equipment per tractor (equipment- $tractor^{-1}$) and the number of combine harvesters per unit agricultural area (combine harvester $1,000ha^{-1}$) values were calculated for Karaman province Excel program and evaluated numerically.

## Results and Discussion

Tractor is important in terms of increasing utilization of modern agricultural technology, spreading usage in production, providing economy and improving working conditions (Yalçın, 1990).

The number of tractors of Karaman province between 2009 and 2018 in the last decade is given in Table 1 according to power groups. The number of tractors is 12,437 according to 2009 data and 12,176 according to 2018 data. While the number of tractors decreased from 2009 to 2012, it entered an upward trend after 2013.When the range of 1-5 HP in single axle tractors is examined by years, it has continuously increased from 2009 to 2018.Single-axle tractors with more than 5 HP also increased continuously in 2009-2018 and reached 1,116 by 2018.The number of tractors in the 1-10 HP group with double axles is very low. While it was 7 in 2009, it increased to 9 in 2018.When the tractors between 11-24 HP were examined, the number decreased from 1,082 in 2009 to 260 in 2018.The number of tractors in the 25-34 HP range was 1,606 in 2009 and 888 in 2018.The number of tractors in the 35-50 HP range decreased from 3,636 in 2009 to 3,441 in 2018.The tractor group in the range of 51-70 HP, which was 4,322 in 2009, dropped to 3,627 in 2012 and by increasing in the following years it reaches to 4,653 in 2018.

When the number of single axle tractors of Karaman province is compared for 2009 and 2018; 538.71% increase in 1-5 HP group and 227.27% increase in tractors with more than 5 HP is observed. For double axle tractors; 28.57% increase in 1-10 HP group, 75.97% decrease in 11-24 HP group, 44.71% decrease in 25-34 HP group, 5.36% decrease in 35-50 HP group, 7.66% increase in 51-70 HP group and 14.09% increase in the group over 70 HP is observed.

The number of combine harvesters of Karaman province is given in Table 2. When we examine Table 2, it is seen that the number of combine harvester, which was 112 in 2009, increased to 164 in 2018. In combine harvesters;183.33%, 50.00%, 16.67% increase is observed for 0-5, 6-10, 11-20 age groups respectively and 16.67% decrease for over the age of 21 group.

Table 1. Number of tractors in Karaman for last decade

| Years | Total | Single Axle (HP) | | Double Axle (HP) | | | | | | Tracked (HP) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1-5 | 5+ | 1-10 | 11-24 | 25-34 | 35-50 | 51-70 | 70+ | |
| 2009 | 12,437 | 31 | 341 | 7 | 1,082 | 1,606 | 3,636 | 4,322 | 1,412 | - |
| 2010 | 11,983 | 33 | 381 | 7 | 993 | 1,468 | 3,341 | 4,333 | 1,427 | - |
| 2011 | 11,926 | 29 | 437 | 9 | 950 | 1,430 | 3,278 | 4,345 | 1,448 | - |
| 2012 | 9,520 | 43 | 645 | 10 | 325 | 1,032 | 3,245 | 3,627 | 593 | - |
| 2013 | 10,369 | 168 | 1,005 | 10 | 310 | 927 | 3,370 | 3,824 | 755 | - |
| 2014 | 11,376 | 184 | 1,094 | 10 | 282 | 889 | 3,320 | 4,242 | 1,355 | - |
| 2015 | 11,600 | 192 | 1,091 | 11 | 283 | 891 | 3,358 | 4,364 | 1,410 | - |
| 2016 | 11,776 | 192 | 1,112 | 11 | 274 | 892 | 3,376 | 4,469 | 1,450 | - |
| 2017 | 12,096 | 196 | 1,119 | 10 | 268 | 891 | 3,413 | 4,629 | 1,570 | - |
| 2018 | 12,176 | 198 | 1,116 | 9 | 260 | 888 | 3,441 | 4,653 | 1,611 | - |
| Change*(%) | -2,10 | 538,71 | 227,27 | 28,57 | -75,97 | -44,71 | -5,36 | 7,66 | 14,09 | - |

Source: Anonymous (2019b); *Calculated values

Table 2. Number of combine harvesters in Karaman for last decade

| Years | Total | Age groups of combine harvester | | | |
|---|---|---|---|---|---|
| | | 0-5 | 6-10 | 11-20 | 21< |
| 2009 | 112 | 18 | 34 | 36 | 24 |
| 2010 | 112 | 18 | 34 | 36 | 24 |
| 2011 | 116 | 21 | 35 | 36 | 24 |
| 2012 | 125 | 26 | 38 | 38 | 23 |
| 2013 | 135 | 28 | 39 | 43 | 25 |
| 2014 | 142 | 32 | 41 | 44 | 25 |
| 2015 | 145 | 36 | 43 | 42 | 24 |
| 2016 | 150 | 41 | 44 | 42 | 23 |
| 2017 | 163 | 48 | 50 | 44 | 21 |
| 2018 | 164 | 51 | 51 | 42 | 20 |
| Change*(%) | 46.43 | 183.33 | 50.00 | 16.67 | -16.67 |

Source: Anonymous (2019b); *Calculated values

Agricultural machinery and equipment of Karaman province between 2009 and 2018 are given in Table 3.Machines with an increase in decade change are tractor plow with disc, cultivator, roller, disc harrow, toothed harrow, combicure (mixed harrow), weed harrow, farm manure spreading machine, binder, baling machine, haymaker, potato lifter, combined sugar beet harvester, tractor drawn mower, weed silage machine, corn silage machine, corn harvesting machine, feed grinder, mulcher, engine pulverizator, pollinator, atomizer, electrical pump, deep-well pump, milking plant, milking machine (portable), trailer (agricultural truck), water tanker (used in agriculture), subsoiler, rotary tiller, stone picker, levee making machine, earth auger, animal or tractor drawn hoeing machine, pneumatic seeder, universal drill (mechanical) (including beet seeder), stubble drill, straw baler and hay making machine, straw conveyor and unloader, motor scythe, product classification machine (except selector), feed spreading trailer, drip irrigation system, bucket (used in agriculture).Machines with a decrease in 10-year change are primitive plow, animal plow, reversible plow, furrow opener plough, plow for stubble with disc (oneway), reversible plow for stubble, rotary cultivator, tractor drawn seed drill, combined seed drill, chemical fertilizer spreading machine, mowing machine, flail, beet lifter, selector (fixed or portable), pulverizator carried on shoulder, self-propelled engine pulverizator with stretcher and duster, tail shaft movable pulverizator, centrifugal pump, motor-pump (thermal), sprinkler system, cream separator, grader, straw threshing machine (thrasher) and churn. The most significant decrease is in animal plow and primitive plow

and it is related to increase of the use of mechanization in agriculture.

Tractor power groups and average tractor power of Karaman province are given in Table 4. When the Table 4 is examined, the total tractor power in 2009 was 582,984.00HP and in 2018 it was 577,389.50 HP. The average tractor power was calculated as 46.87 HP in 2008 and 47.42 HP in 2018.

When Table 5 is examined, the district which has the highest number of tractors in 2009 is the Central district with 9,920 units, while Sarıveliler district with 190 units has the least tractor presence. In 2018, while the number of tractors in the central district decreased to 8,980, the minimum number of tractors was again in the Sarıveliler district and fell to 167. It was determined that the number of tractors in the Karaman province decreased by 2.10%.

Many criteria are used to determine the level of agricultural mechanization. The most commonly used ones are: Tractor engine power per total agricultural area, agricultural area per tractor, number of tractors per 1,000 ha agricultural area, amount of equipment per tractor (Kadayıfçılar et. al., 1990; Yavuzcan, 1994). When the Table 6 is examined, the number of tractors per 1,000 hectares area decreased from 52.27 in 2009 to 40.76 in 2018.The unit area processed by a tractor increased from 19.13 ha in 2009 to 24.54 ha in 2018.The power value per unit area decreased from 2.45 kW in 2009 to 1.93 kW in 2018.The number of equipment per unit tractor decreased from 10.66 in 2009 to 9.86 in 2018. The number of combine harvesters per 1,000 hectares increased from 0.47 in 2009 to 0.55 in 2018.

Table 3. Change in the number of agricultural machinery and equipment of Karaman province for last decade

| Agricultural Machinery And Equipment | 2009 | 2018 | Decade Change*(%) |
|---|---|---|---|
| Primitive plow | 1,685 | 1,181 | -29.91 |
| Animal plow | 1,179 | 389 | -67.01 |
| Reversible plow | 10,902 | 9,686 | -11.15 |
| Furrow opener plough | 1,971 | 1,706 | -13.44 |
| Tractor plow with disc | 874 | 901 | 3.09 |
| Plow for stubble with disc (oneway) | 2,093 | 1,781 | -14.91 |
| Reversible plow for stubble | 2,042 | 1,277 | -37.46 |
| Rotary cultivator | 2,395 | 2,209 | -7.77 |
| Cultivator | 7,515 | 8,406 | 11.86 |
| Roller | 1,446 | 1,771 | 22.48 |
| Disc harrow | 1,280 | 1,699 | 32.73 |
| Toothed harrow | 679 | 778 | 14.58 |
| Combicure (Mixed harrow) | 105 | 189 | 80.00 |
| Weed harrow | 229 | 345 | 50.66 |
| Animal drawn seed drill | 90 | - | -100.00 |
| Tractor drawn seed drill | 4,495 | 4,145 | -7.79 |
| Combined seed drill | 5,667 | 5,636 | -0.55 |
| Farm manure spreading machine | 2 | 41 | 1,950.00 |
| Chemical fertilizer spreading machine | 8,396 | 7,663 | -8.73 |
| Mowing machine | 3,039 | 1,288 | -57.62 |
| Binder | 9 | 37 | 311.11 |
| Baling machine | 46 | 149 | 223.91 |
| Haymaker | 48 | 62 | 29.17 |
| Flail | 200 | 117 | -41.50 |
| Potato lifter | 1 | 6 | 500.00 |
| Sugar beet lifter | 1,128 | 1,042 | -7.62 |
| Combined sugar beet harvester | 213 | 355 | 66.67 |
| Tractor drawn mower | 224 | 310 | 38.39 |
| Weed silage machine | 59 | 182 | 208.47 |
| Corn silage machine | 151 | 341 | 125.83 |
| Corn harvesting machine | 20 | 23 | 15.00 |
| Selector (fixed or portable) | 27 | 23 | -14.81 |
| Feed grinder | 115 | 245 | 113.04 |
| Mulcher | 11 | 60 | 445.45 |
| Pulverizator carried on shoulder | 5,347 | 4,876 | -8.81 |
| Self-propelled engine pulverizators with stretcher and duster | 210 | 199 | -5.24 |
| Tail shaft movable pulverizator | 6,900 | 6,616 | -4.12 |
| Engine pulverizator | 774 | 813 | 5.04 |
| Pollinator | 14 | 21 | 50.00 |
| Atomizer | 118 | 187 | 58.47 |
| Centrifugal pump | 1,972 | 1,930 | -2.13 |
| Electrical pump | 1,339 | 1,707 | 27.48 |
| Motor-pump (Thermal) | 2,541 | 1,654 | -34.91 |
| Deep-well pump | 1,923 | 3,453 | 79.56 |
| Sprinkler system | 11,589 | 4,772 | -58.82 |
| Cream separator | 5,814 | 1,143 | -80.34 |
| Milking plant | 8 | 92 | 1,050.00 |
| Milking machine (portable) | 965 | 2271 | 135.34 |
| Trailer (agricultural truck) | 13,435 | 13,988 | 4.12 |
| Water tanker (used in agriculture) | 1,254 | 1,469 | 17.15 |
| Subsoiler | 99 | 197 | 98.99 |
| Rotary tiller | 2,239 | 2,268 | 1.30 |
| Stone picker | 5 | 20 | 300.00 |
| Grader | 579 | 467 | -19.34 |
| Ditchingmachine | 6 | 20 | 233.33 |
| Earth auger | 95 | 167 | 75.79 |
| Animal or tractor drawn hoeing machine | 3,251 | 3,710 | 14.12 |
| Pneumatic seeder | 186 | 1,109 | 496.24 |
| Universal drill (mechanical) (ıncluding beet seeder) | 82 | 140 | 70.73 |
| Stubble drill | 2 | 19 | 850.00 |
| Straw threshing machine (thrasher) | 7,432 | 2,114 | -71.56 |
| Straw baler  and hay making Machine | 254 | 325 | 27.95 |
| Straw conveyor and unloader | 45 | 361 | 702.22 |
| Motor scythe | 145 | 811 | 459.31 |
| Product dryer | 2 | 2 | - |
| Fruit harvesting machines | - | 7 | - |
| Product classification machine (except selector) | 8 | 10 | 25.00 |
| Feed spreading trailer | 8 | 107 | 1,237.50 |
| Drip irrigation system | 3,952 | 7,270 | 83.96 |
| Churn | 1,568 | 1,389 | -11.42 |
| Bucket (used in agriculture) | 105 | 308 | 193.33 |

Source: Anonymous (2019b), *Calculated values

Table 4. Tractor power groups and average tractor power of Karaman province

| | Power Groups (HP) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| TP | 1-5 | 5< | 1-10 | 11-24 | 25-34 | 35-50 | 51-70 | 70< |
| ATP | 2.5 | 5 | 5.5 | 17.5 | 29.5 | 42.5 | 60.5 | 70 |
| Years | Tractor Numbers by Power Groups (HP) | | | | | | | |
| 2009 | 31 | 341 | 7 | 1,082 | 1,606 | 3,636 | 4,322 | 1,412 |
| 2010 | 33 | 381 | 7 | 993 | 1,468 | 3,341 | 4,333 | 1,427 |
| 2011 | 29 | 437 | 9 | 950 | 1,430 | 3,278 | 4,345 | 1,448 |
| 2012 | 43 | 645 | 10 | 325 | 1,032 | 3,245 | 3,627 | 593 |
| 2013 | 168 | 1,005 | 10 | 310 | 927 | 3,370 | 3,824 | 755 |
| 2014 | 184 | 1,094 | 10 | 282 | 889 | 3,320 | 4,242 | 1,355 |
| 2015 | 192 | 1,091 | 11 | 283 | 891 | 3,358 | 4,364 | 1,410 |
| 2016 | 192 | 1,112 | 11 | 274 | 892 | 3,376 | 4,469 | 1,450 |
| 2017 | 196 | 1,119 | 10 | 268 | 891 | 3,413 | 4,629 | 1,570 |
| 2018 | 198 | 1,116 | 9 | 260 | 888 | 3,441 | 4,653 | 1,611 |
| Years | Total Tractor Powers * (HP) | | | | | | | |
| 2009 | 77.50 | 1,705 | 38.50 | 18,935.00 | 47,377.00 | 154,530.00 | 261,481.00 | 98,840.00 |
| 2010 | 82.50 | 1,905 | 38.50 | 17,377.5 | 43,306.00 | 141,992.50 | 262,146.50 | 99,890.00 |
| 2011 | 72.50 | 2,185 | 49.50 | 16,625.00 | 42,185.00 | 139,315.00 | 262,872.50 | 101,360.00 |
| 2012 | 107.50 | 3,225 | 55.00 | 5,687.50 | 30,444.00 | 137,912.50 | 219,433.50 | 41,510.00 |
| 2013 | 420.00 | 5,025 | 55.00 | 5,425.00 | 27,346.50 | 143,225.00 | 231,352.00 | 52,850.00 |
| 2014 | 460.00 | 5,470 | 55.00 | 4,935.00 | 26,225.50 | 141,100.00 | 256,641.00 | 94,850.00 |
| 2015 | 480.00 | 5,455 | 60.50 | 4,952.50 | 26,284.50 | 142,715.00 | 264,022.00 | 98,700.00 |
| 2016 | 480.00 | 5,560 | 60.50 | 4,795.00 | 26,314.00 | 143,480.00 | 270,374.50 | 101,500.00 |
| 2017 | 490.00 | 5,595 | 55.00 | 4,690.00 | 26,284.50 | 145,052.50 | 280,054.50 | 109,900.00 |
| 2018 | 495.00 | 5,580 | 49.50 | 4,550.00 | 26,196.00 | 146,242.50 | 281,506.50 | 112,770.00 |
| Years | Total Tractor Powers*(HP) | | | The Average Tractor Power* (HP) | | | The Average Tractor Power* (kW) | |
| 2009 | 582,984.00 | | | 46.87 | | | 34.92 | |
| 2010 | 566,738.50 | | | 47.30 | | | 35.23 | |
| 2011 | 564,664.50 | | | 47.35 | | | 35.27 | |
| 2012 | 438,375.00 | | | 46.05 | | | 34.31 | |
| 2013 | 465,698.50 | | | 44.91 | | | 33.46 | |
| 2014 | 529,736.50 | | | 46.57 | | | 34.69 | |
| 2015 | 542,669.50 | | | 46.78 | | | 34.85 | |
| 2016 | 552,564.00 | | | 46.92 | | | 34.96 | |
| 2017 | 572,121.50 | | | 47.30 | | | 35.24 | |
| 2018 | 577,389.50 | | | 47.42 | | | 35.33 | |

TP: Tractor Power, ATP: The Average Tractor Power, Source: Anonymous (2019b), * Calculated values

Table 5. Tractor and combine harvester numbers of Karaman province

| Districts | Tractor | | Combine harvester | |
|---|---|---|---|---|
| | 2009 | 2018 | 2009 | 2018 |
| Center | 9,920 | 8,980 | 75 | 109 |
| Ayrancı | 691 | 937 | 2 | 9 |
| Başyayla | 270 | 402 | 0 | 2 |
| Ermenek | 653 | 1,004 | 0 | 0 |
| Kazımkarabekir | 713 | 686 | 35 | 44 |
| Sarıveliler | 190 | 167 | 0 | 0 |
| Total | 12,437 | 12,176 | 112 | 164 |

Source: Anonymous (2019b.)

Table 6. Calculated agricultural mechanization level indicators of Karaman province

| | Level of Mechanization* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Years | NT | NCH | AA | ATP | T | H | K | E | CH |
| 2009 | 12,437 | 112 | 237,957 | 46.87 | 52.27 | 19,13 | 2.45 | 10.66 | 0.47 |
| 2010 | 11,983 | 112 | 233,527 | 47.30 | 51.31 | 19,49 | 2.43 | 11.26 | 0.48 |
| 2011 | 11,926 | 116 | 234,752 | 47.35 | 50.80 | 19,68 | 2.41 | 11.39 | 0.49 |
| 2012 | 9,520 | 125 | 281,307 | 46.05 | 33.84 | 29,55 | 1.56 | 14.25 | 0.44 |
| 2013 | 10,369 | 135 | 305,185 | 44.91 | 33.98 | 29,43 | 1.53 | 13.34 | 0.44 |
| 2014 | 11,376 | 142 | 309,247 | 46.57 | 36.79 | 27,18 | 1.71 | 10.72 | 0.46 |
| 2015 | 11,600 | 145 | 306,412 | 46.78 | 37.86 | 26,41 | 1.77 | 10.28 | 0.47 |
| 2016 | 11,776 | 150 | 301,749 | 46.92 | 39.03 | 25,62 | 1.83 | 10.18 | 0.50 |
| 2017 | 12,096 | 163 | 298,500 | 47.30 | 40.52 | 24,68 | 1.92 | 9.89 | 0.55 |
| 2018 | 12,176 | 164 | 298,756 | 47.42 | 40.76 | 24,54 | 1.93 | 9.86 | 0.55 |

NT: Number of Tractors, NCH: Number of Combine Harvester, AA: Agricultural Area (ha), ATP: Average Tractor Power (kW), T: Tractor / 1,000 ha, H: ha/ Tractor, K: kW/ ha, E: Equipment / Tractor, CH: Combine Harvester / 1,000 ha, Source: Anonymous (2019b), * Calculated values

**Conclusions**

Almost all of the 12,176 tractors in Karaman province consist of two axle tractors. Tractors with 26-50 kW and over 50 kW power are preferred for tractor power size. In the distribution of tractors by district, it was observed that the most tractors were located in Center and Ermenek districts.

In a survey conducted in Karaman province, tractor engine power was 54.90 kW, power per unit area was 3.39 kWha$^{-1}$ and the number of tractors per 1,000 hectares was found to be 61.75 (Yıldız et al., 2007).

When 2018 data in Table 6 and the results of the study of Yıldız et al. (2007) compared, it is seen that 13.62% decrease in tractor power by 47.42 kW in 2018; 43.07% decrease in power per unit area by 1.93 kWha$^{-1}$ in 2018; 33.99% decrease in the number of tractors per 1,000 hectares by 40.76% in 2018.

When the number of machinery and equipment in Karaman province was examined, it was concluded that the tillage machines and equipment were widely used.

When the data of 2018 drill machines are examined, an increase of 496.24% is observed in pneumatic drills, 70.73% in universal drills (mechanical) and 850.00% in stubble drills. The reason why stubble drill has increased by 850.00% is that the Ministry of Agriculture and Forestry has supports as a grant to increase the use of stubble drill. Its use is expected to increase further in the coming years.

In particular, tail shaft movable pulverizators are used in Karaman province. The numbers are 6,616. There was also an increase of 4.12% in engine pulverizators. Pulverizators carried on shoulder can be used both in vineyards and gardens easily. These pulverizators are 4,876 in number.

74.58% of the sugar beet harvest in the province is made with sugar beet lifter. The remaining 25.42% is harvested with combined beet harvester. When the 2018 data is considered, it is seen that the combined beet harvester has increased by 66.67%.

When the number of machinery and equipment for animal husbandry mechanization in 2018 is analyzed; there is an increase in farm manure spreading machine 1,950.00%, binder 311.11%, baling machine 223.91%, weed silage machine 208.47%, corn silage machine 125.83% and feed grinder 113.04%.The reason for the increase of these numbers is; as the feed is among the most important expense items in animal husbandry, it is due to the willingness of the producers to produce their own feeds and the purchase of these machines through governmental supported grants.

Agricultural mechanization is expensive and long-term investments for enterprises. Especially for subsistence family enterprises, the use of agricultural mechanization is low. For this purpose, agricultural mechanization usage levels of both enterprises and regional areas should be determined (Oğuz et al., 2017). The average age of the agricultural machinery park should be studied and their economic life should be questioned (Keleş and Hacıseferoğulları, 2016).

In Karaman province, common machinery usage systems should be established for agricultural machinery.

For joint machinery use, neighbor assistance should be used from models in developed countries such as contracting, machine associations, cooperatives, companies, producer associations, and state-owned joint use. Establishing machinery parks support in the IPARD program which is given by the Agriculture and Rural Development Support Institution within this scope should be focused on.

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