The Role of Agricultural Mechanization in Farming System in a Continental Climate

Sakine ÖZPINAR[1*] Anıl ÇAY[1]

[1]Department of Agricultural Machinery and Technologies Engineering, Faculty of Agriculture, Çanakkale Onsekiz Mart University, 17020 Çanakkale, Turkey,

*Corresponding author e mail**:** sozpinar@comu.edu.tr

As is known, the use of mechanization for agriculture production have crucial importance for crop quality and yield in unit area. The mechanization of agricultural production is constantly renewing itself, depending on the time with the development of technology. For this reason, it is necessary to make determinations periodically for the current situation of the mechanization development in an agricultural area. Therefore, a study was conducted for a local area named Elbistan district, to put out agricultural potential and mechanization facilities used. For this purpose, a questionnaire was applied to this area including 5-village of 70 farms which were decided according to farmers recording system. Results indicated that 81% of the farms had only one-tractor while the rest of them had two-tractor which represent medium-sized tractors with average 60 kW of power. Massey Ferguson was most used tractor followed by Tümosan which were under economic life limit. It was also concluded that tractors mainly used for soil tillage practices with 45% followed by sowing (16%), transporters (14%), hoeing (9%), irrigation (8%), fertilizing (4%), spraying (2%), and other operations (2%). The machinery per tractor was found 7 which were completely performed in conventional farming system, especially in sugar beet, maize and wheat growing under dry farming. On the other hand, farm size was found very small mainly 5 decare by the rate of 44% which has similar to the type of parcels in our country while followed by 5-10 hectare with 25%. Additionally, sugar beet was major popular crop and grown by 53% farmers because of available processing unit in the region. Maize was second crop grown by 27% while wheat was third one in this study area.

Keywords; Agricultural mechanization, tractor, farming system.

Karasal İklim Koşullarında Mekanizasyonun Tarımsal Üretimdeki Rolü

Bilindiği üzere tarımsal üretimde mekanizasyonun gerek ürün kalitesi ve gerekse ürün verimi üzerine önemli bir etkisi bulunmaktadır. Mekanizasyon, tarımsal üretim teknolojisindeki gelişmeye bağlı olarak sürekli kendini yenileme özelliğindedir. Bu sebeple herhangi bir tarımsal alanda tarımsal mekanizasyonun durumu periyodik olarak belirlenmesinde yarar vardır. Bu amaçla Elbistan ilçesindeki bazı köylerin tarımsal üretim ve mekanizasyon potansiyelini belirlemek için bir çalışma yürütülmüştür. Bunun için ilçenin 5 köyünde yer alan 70 tarım işlemesinde bir anket çalışması yapılmıştır. İşletmelerin seçimi çiftçi kayıt sistemi kayıtlarına göre işletmelerin %81'nin tek, geri kalanında ise iki traktöre sahip olduğu ve mevcut traktörlerin orta büyüklükte olduğu saptanmıştır. En çok bulunan traktörün Massey Ferguson marka ve model olduğu ve bunu Tümosan markasının izlediği görülmüştür. Bu traktörlerin işletmelerin %45'inde toprak işlemede kullanıldıkları ve bunu sırasıyla ekim (%16), taşıma (%14), çapalama (%9), sulama (%8), ilaçlama (%2) ve diğer (%2) işlemlerin izlediği saptanmıştır. Traktör başına düşen tarım makinası sayısı ise 7 olup, genel olarak sulu tarımda şeker pancarı ve kuru tarımda buğday gibi ürünlerin geleneksel üretim sistemine uygun oldukları belirlenmiştir. Diğer taraftan 5 dekar ve altı olan işletmelerin oranı %44 ve 5-10 dekar arasında olanların ise %25 ve ülkemizdeki genel durumu yansıttığı görülmüştür. Ayrıca başlıca ürünün şeker pancarı olduğu ve işletmelerin %53'nün bu ürünü yetiştirdikleri ve bununda özellikle bölgede bu ürünü işleyen fabrikaların varlığının etkili olduğu saptanmıştır. İkinci ürün ise mısır olup, işletmelerin %27'sinde üretildiği ve bunu ise kuru tarım alanlarında yaygın üretimi yapılan buğdayın izlediği belirlenmiştir.

Anahtar kelimeler tarımsal mekanizasyon, traktör, üretim sistemleri.

Introduction

Agricultural mechanization is a central indispensable support to do farm operations efficient and productive. It determines much of the efficiency and productivity of all inputs used such as direct and indirect in crop production. Ou et al. (2002). reported that mechanisation in agriculture requires not only advances in machinery development but also the close cooperation of many issues such as environmental, agricultural, social and economic conditions. Mechanization also benefits from technologic innovations and it is site-specific and dynamic (Sing, 2006). According to FAO (2014), agricultural mechanization generally involves inputs such as manufacture, selection, distribution, using, repairing, maintenance of mechanical devices (powered machinery, implements, tools) and systems in agricultural operations and their management in crop production with seeds, fertilizer, water, labour, and time (Zeren, 1991; Fadavi et al., 2010), but it is often associated solely with tractors and agricultural machinery. In other words, mechanization in agriculture is a necessary input and it has also capacity for improving rural

families' economies by minimizing work with human powered in agricultural production (Adekunle, 2015). Tools, implements and powered machinery that are used in agricultural mechanization are necessary for minimizing main inputs in agriculture (Clarke, 2000). In addition, it is recognized as one of the greatest engineering achievements of the 20th century that is still differs hugely across the globe. Clarke (2000) also defined that the adoption of machine in farming operation is increasing time by time in worldwide as it resulted in saving of cost of production and increasing net income of the farmers. Therefore, one of the most important criteria for any area development of agriculture is the levels of agricultural mechanization. It was argued that the agricultural mechanization level of an area in terms of kW per hectare, hectare per tractor, number of tractors for 1000 hectare, and hectare per tractor (Özpınar, 2001; Sessiz et al., 2014). Adequately choice and certain preparation of mechanized inputs in agriculture has a direct effect on land and labour productivity, farming profitability, the sustainability and on the quality of life of people who are engaged in agriculture. The highest levels of mechanization can typically be found in most developed counties such as the United State and Western European countries human beings are used less and less as a source of power and more for machine operation and control. In contrast, the lowest levels of mechanization are addressed many of the most fundamental farming systems in many developing countries in a profound and comprehensive manner. In many developing countries up to 80% of farm power (manual by human and animal draft and powered machinery and equipment) is provided by human beings (Clarke, 2000; Adekunle, 2015). In these countries, the most problem are high population and low land productivity which is based on insufficient power availability on the agricultural production and low level of agricultural mechanization when compared with developed counties. In Turkey, such as developed in terms of agriculture production, there is an increasing development in the use of mechanization facilities in agriculture as it contributed to the increase in output due to timeliness of operation performing and increasing precision in input application in many agricultural regions. The success of farm machinery use in Turkish agriculture depends more on some variables such as climate characteristics and the existence of agricultural areas. Also, the use of farm machinery in agriculture is different for each region where is generally divided into seven geographical regions (Black Sea, Marmara, Aegean, Mediterranean, Central Anatolia, East Anatolia, Southeast Anatolia). Considerable climate and agricultural areas as variables, agricultural mechanization also has been helpful to bring about a significant improvement in agricultural productivity. Among these regions, the Mediterranean region has an important value which contributes agriculture output in terms of variable crop production due to its climate condition. Agriculture branch plays an extremely important role the economy of this region with regard to many variable crops such as vegetables, field and orchids crop production, and also greenhouse systems during whole year. It includes about 10% of total arable area of 2386 million decar which is under cultivation in Turkey. The type of product and crop production system will be increasing, depend on increasing agricultural mechanization technologies which is performed for all mechanization practices. As a result, in the region, demand for agricultural machinery will increase due to different agricultural production systems. However, this increase in the demand for agricultural machinery in the region are favourable for provinces that are closer to Mediterranean coast, but the use of the machinery is much lower in other province far from coast area, for example, Kahramanmaraş has 14 525 km^2 surface area. The surface area of the Mediterranean region is 89493 km^2 which are approximately 2322 thousand hectares of total agricultural land in the region (TUIK, 2015a). Approximately 2321 thousand hectares of the areas constitute agricultural arable land which represents 10% of fallow areas. When considered the agricultural areas, the province with the largest agricultural area is Adana, covering 21.1% of total arable area in the region followed by Mersin, Antalya, Kahramanmaraş, Hatay, Isparta, Burdur, Osmaniye with 16.3%, 15.8%, 15.6, 10.4%, 9.0%, 6.7%, 5.1%, respectively (Table 1). Kahramanmaraş province and its districts within the region are mostly under the influence of continental climate and the use of machinery in agricultural production is lower when compared to other coastal provinces. The other reason for the low use of machinery in agriculture in these areas is that the existence of the land is very fragmented and the parcel sizes are very small inappropriate to agriculture machinery using. In addition, in the province, especially in the districts such as Elbistan, the arable land is basically uneven the fact that is also limiting the effective use of machinery in agriculture (Table 2).

Table 1. Distribution of agricultural land in provinces of the Mediterranean region (TUIK, 2015a)*

Province	Arable area (decar) x10^3	Rate (%)
Antalya	3671	15.81
Isparta	2086	8.98
Burdur	1565	6.74
Adana	4887	21.05
Mersin	3794	16.34
Hatay	2419	10.42
Osmaniye	1174	5.05
Kahramanmaraş	3623	15.60
Tot. (Med. Region)	23219	100,00

*: Fallow fields are included. It also includes field and permanent (horticulture) crops.

Table 2. Distribution of arable area in districts of Kahramanmaraş

Districts	Arable area (decar) x10^3	Rate(%)
Afşin	628	17.33
Andırın	166	4.58
Çağlayancerit	43	1.19
Ekinözü	65	1.79
Elbistan	1015	28.02
Göksun	447	12.34
Nurhak	30	0.83
Pazarcık	485	13.39
Türkoğlu	173	4.78
Merkez	571	15.76
Tot.	3623	100.00

According to TUIK (2015a) data, approximately 362 thousand hectares constitute the agricultural land, while 10% of this amount constitutes the fallow field. When the agricultural regions of the province are considered, the district with the most agricultural area is Elbistan and covers about 28% of total arable area that followed by Afşin, Pazarcık, Göksun, Dulkadiroğlu, Turkoglu, Ekinözü, Çağlayancerit, Nurhak with 17%, 13%, 12%, 8%, 5%, 2%, 2%, 0.8%, respectively (Table 2).

When considering current agricultural area in the province and its districts, it is necessary to increase the crop productivity in unit area in order to obtain more agricultural products. In order to increase the productivity factor in agriculture, it is necessary to give farmers knowledge information such as using and protecting agricultural machinery in efficient, to carry out agricultural breeding works, to apply plant protection techniques correctly to protect plants against diseases, harmful and weed, to improve irrigation techniques and quality and to implement agricultural mechanization successfully.

On the other hand, the success of a mechanization application is directly proportional to the presence of tractors and agricultural machinery in the region. Tractors are the most important indicator which has effect on determining the mechanization level is defined with the units such as the number of tractors per 1000 hectare or arable land as hectare per tractor. Tractors are not only used for field works but also for transportation and additional power applications such as drainage, irrigation, road works and canal making etc. In addition, farm size, the power of tractor and the number of farm machinery or implement are important in a region or in a country. Depending on the intensive use of the machine in agriculture, the number of agricultural machines per tractor in our country is also increasing in few last decades. However, the agricultural machinery per tractor depends on the diversity of agriculture production systems and also crop under these systems. It is observed that the mouldboard plough per tractor was the highest when followed by the cultivator and disc harrow while similar results were found for all regions (TUIK, 2015b). Similarly, in Mediterranean region, mouldboard plough is the most common agriculture implement when followed by field cultivator and trailer. Most common usage of agriculture machinery and the like means that agriculture is still conducted in the region according to traditional production systems.

As can be seen, the use of machinery in agriculture depends on factors such as climate, agricultural area, crop variety, etc. Therefore, these factors are varying for each geographical region which have different climate effects. These changing factors are affecting to agricultural structure and also the mechanization level. For this purpose, a study was carried out to determine the existing agricultural structure and the use of machinery in agriculture in Elbistan located in Kahramanmaraş province which is affected by both the Mediterranean and the continental climate. A questionnaire has been done for this study to collect data. The questionnaire was interviewed face to face with farmers in 5-village located in Elbistan district. The questionnaire included main questions such as the agricultural structure, the social structure of the farmers and the existence and use of the machines or implements, and also future mechanization estimates.

Materials and Method

The study conducted in Elbistan district is located in the southeaster of Turkey with 38°12'23.5260'' north latitude and 37°11'35.0772'' eastern longitude at 1136 metre sea level. It has also with 2201 km^2 area and 74 kilometres far from Kahramanmaraş province. This study involved two parts that one part includes statistics and data sources recorded from the Turkey Statistical Institute (TUIK 2015a,b). Throughout this part, it was collected data from TUIK web page. In second part, it was conducted a questionnaire in agricultural farms to take information about agricultural practices with farmers. Questionnaire was applied Elbistan district which takes place in Kahramanmaraş province, 70 farmers in five villages, were selected while agriculture is the main occupation of the people in these villages. Questioned farmers are registered to farmer registration system which is branch of Directorate of Provincial Food Agriculture and Livestock (Anonymous, 2015), and the farmer identity of record is kept confidential. Selected farmers under registration system were randomly selected on proportionate sampling basis. A well-structured questionnaire was prepared for the collection of data. Throughout questionnaire, all the necessary information was collected on family activities, farm composition, age groups, participation of men and women in agriculture, properties of agriculture land, etc. Questionnaire was also included to determine the agricultural structure and properties of labours. In all farms, farmers were interviewed face to face to conduct personal interviews with a sample of usually 70 farmers or workers known to use mechanization equipment intensively.

The questionnaires included the general information of the farms which were selected randomly, soil tillage operations, types of machinery used in the farms, seeding or planting, weeding and fertilizing applications, harvesting operations, post-harvest processes and storage, transportation. The questionnaire also surveyed information on the social and economic characteristics of people who are working in selected farms such as age and sex, educational levels, labour collaboration of the family in the farm. Data analysis was conducted to find out the required results of the study. All data obtained from the questionnaire were evaluated in Excel programme, and Minitab v17 package programme for statistical analyses.

Results and Discussion

The study was conducted two parts that one of them is based on the data taken from TUIK (2015) and presented in Table 3 and 4. Under Table 3, tractor numbers according to their axle and some agriculture machineries which are used mainly in agriculture activities were given. Tractor numbers according to motor power was also presented while one-axle power tractor ranges less than 25 horse-power and two-axle power tractor was more than 25 horse-power (Sessiz et al., 2014). Two-axle tractor is commonly using in agriculture activities in both Turkey and Kahrmanamaraş province while there is no any record one-axle tractor, especially in district that two-axle tractors were the most supported in this study area (Table 3). The unavailable of one-axis tractor in the study attributed to the widespread production of field crops such as wheat, sugar beet and maize because this type of tractors are generally using in orchard branches which were no record in the area (Table 9). On the contrary, it was concluded that one-axle tractors were the most supported machines in our country agriculture (TUIK, 2015b).

Table 3. Tractors and agricultural machineries according to engine power source (TUIK, 2015b).

Tractor	Turkey	Mediterranean		Kahramanmaraş		Elbistan	
	(number)	(number)	Rate (%)*	(number)	Rate (%)**	(number)	Rate (%)***
One-axle	67114	9190	11.7	438	5.3	-	-
Two-axle	1154175	150268	19.7	13217	8.9	3016	22.7
Total (one-and two-axle)	1221289	159458	13.1	13281	8.3	3016	22.7
Mouldboard plough	1016658	119328	14.3	9859	8.3	2700	27.4
Furrow opener plough	65388	12853	14.6	2083	16.2	1610	77.3
Disc plough	71170	10161	13.2	460	4.5	41	8.9
Stable-disc plough	44402	6482	8.1	178	2.8	90	50.6
Cultivator	499334	65978	13.9	7956	12.1	2200	27.7
Soil levelling	83314	6751	3.9	1449	21.5	200	13.8
Disk harrow	233195	32396	4.7	3355	10.4	250	7.5
Hay rake machine	111129	4369	8.3	486	11.2	50	10.3
Binder binding machine	8735	414	6.1	70	16.9	12	17.1
Baler	19590	1635	31.7	67	4.1	8	11.9
Maize silage machine	24662	1500	14.9	153	10.2	45	29.4
Maize harvest machine	1036	328	25.3	42	12.8	40	95.2
PT-driven sprayer	319074	47411	19.7	2789	5.9	1850	66.3
Motorized knapsack sprayer	84627	21380	14.1	660	3.1	120	18.18
Centrifugal pomp	109784	21617	12.7	1036	4.8	100	9.65
Milking machine	282707	39851	17.9	991	2.5	250	25.2
Trailer	1091973	138233	15.9	11576	8.4	3000	25.9
Water tank	206979	37084	17.92	2598	7.0	350	13.5
Subsoiler	33309	5281	15.85	125	2.4	21	16.8

*: Rate in country.**:Rate in Mediterranean Region.***: Rate in Kahramanmaraş province.

In Turkey or agriculture regions, there are many companies the produce in different types and power sizes of tractors and nearly 1.3 million tractors (Table 4), except, are being used in Turkish agriculture while total tractor with tracked-tractor are 1.6 million (TUIK, 2015b). In considering axle number of tractors, two-axle tractor has 17.2, 16,2 and 30.2 times bigger than one-axle in Turkey, Mediterranean Region and Kahramanmaraş province while all tractors in Elbistan district are two-axle (Table 4). From these results, it is understood that one-axle tractors are being not used in Elbistan because of common field agriculture activities such as tilling, seeding, fertilizing, hoeing, etc. On the other hand, field farming system is common agriculture activities in this area with field crops such as sugar beet, wheat and maize under both irrigated and rainfeed-dry farming conditions and most agricultural activities are conducted using machinery (Table 9). Mechanization is also one factor that has had a significant effect on total factor productivity. In the future, mechanization will also have to contribute to better management of inputs that vary widely among crop types and regional economic status.

In Table 4, the relationship between the tractor and main agricultural machineries were shown. The number of machinery per tractor, which is prevalence of the machinery and it also, gives an idea of how it is used in the area as well. In considering all machineries, mouldboard plough is very common implement which used for tillage operations in both region and province and also in district which is under questionnaire. This is followed by cultivator and disk harrow in range of tillage implement. Özpınar (2001) concluded that approximately one-decade ago the same common implements used in the agriculture activities were found. This shows that mechanization level is still very inadequate due to using the conventional agriculture machineries for agriculture activities because of current agriculture system are conducted according to traditional systems inputs. The available of agriculture machinery in this area are varied according to some farm properties such as number, sizes and geometrical structure (Table 5). In Table 5, the farms which are under the study have the smallest farm structure when they comparing to literature considering mechanization using (Aybek and Senel, 2009) who found farm sizes were mostly between 0-50 decar for eastern Mediterranean provinces

(Adana, Kahramanmaraş, Osmaniye, Hatay). Some of these areas are also including of this study area. They are concluded very similar farm sizes to this study results which has approximately 67 decar in average. They were also reported that farm size ranged as 51-100 decar with the rate of 22.4% followed by 101-150, 51-200, and 201≥ decar with 7.8%, 3.9% and 8.8%, respectively. It was known that the best performance of mechanization is depending on the geometric of the farm structure or size. So, the current farm structure in this study area were very limited farm size to working the implements or machinery in performable in cultural activities (Table 5). Therefore, sometimes labour power by manpower were used to performed the agricultural activities, for example, such as hand-hoeing, harvesting, etc. (Table 6), but the intensity of human labour using varies according to the person working in agriculture activities in each family, and also depending their education level. In Table 6, the majority of the farmers are above 40 years of age while person per family ranged from 4.67 to 6.50 persons that male and female person in each family are almost equal (Table 6).

Table 4. Rate of majority agriculture machinery per tractor under study area (%) (TUIK, 2015b)

Machinery	Turkey	Mediterranean	Kahramanmaraş province	Elbistan district
Mouldboard plough	0.83	0.75	0.74	0.90
Furrow opener plough	0.05	0.08	0.16	0.53
Disc plough	0.06	0.06	0.03	0.01
Stable disc plough	0.04	0.04	0.01	0.03
Cultivator	0.41	0.41	0.60	0.73
Soil levelling	0.07	0.04	0.11	0.07
Disk harrow	0.19	0.20	0.25	0.08
Hay rake machine	0.09	0.03	0.04	0.02
Binder binding machine	0.01	0.00	0.01	0.00
Baler	0.02	0.01	0.01	0.00
Maize silage machine	0.02	0.01	0.01	0.01
Maize harvest machine	0.00	0.00	0.00	0.01
PT-driven sprayer	0.26	0.30	0.21	0.61
Motorized knapsack sprayer	0.07	0.13	0.05	0.04
Centrifugal pomp	0.09	0.14	0.08	0.03
Milking machine (Mobile)	0.23	0.25	0.07	0.08
Trailer	0.89	0.87	0.87	0.99
Water tank	0.17	0.23	0.20	0.12
Subsoiler	0.03	0.03	0.01	0.01

Table 5. The properties of the farms in villages questioned

Village	Total number of farms	Farm area (decar)	Smallest farm size (decar)	Biggest farm size (decar)	Ave. farm size (decar)
Ağ	6	72	5	26	11.92
Al	40	321	1	35	8.03
B	6	161	3	80	26.83
D	10	93	5	25	13.29
H	8	26	4	10	6.50
Tot./Ave.	70	672.5	3.6	35.2	66.56

*Ağ, Ağlıca; Al, Alembey; B, Balıkçıl; D, Doğan; H, Hasankendi. These abbreviations present the same meaning in the following text.

About 36% of the farmers are primary school followed by high school and middle and with 32.86 and 31.43%, respectively (Table 6) while there is no any person graduated from university. This situation may effects negatively their adopting capacity about innovations in agricultural mechanization. According to the questionnaire results, very few of the family persons are involved in agricultural activities because of availability of mechanical operations for agricultural activities. Therefore, manual operations were limited only to hoeing and harvesting operations in crops such as sugar beet and maize are used for mechanically controlling weeds instead of using herbicides during later growth their periods. Additionally, in this study area, sugar beet was harvest by manpower in many farms because of unsuitable farm size in terms of both parcel size and geometric structure (Table 7) that the 42.9% of current farms were under 5-decar following by 25.7% with 5-10 decar while the rate of the remaining farms ranges from 20 decar to above were very low with lower than 15%. This is attributed to a result of dividing the parcels by way of inheritance that there is the same situation in the area where the study is carried out, and also in the region or in whole country. Other operations like tillage ploughing, sowing, harrowing, weeding, fertilizer application and harvesting are mechanically done. Despite all the use of mechanical energy in agricultural activities, the use of mechanical energy is still not commonly used in farms where the questionnaire is conducted. This is attributed to non-standardization and non-availability of mechanization inputs to serve all of the production activities. This is an indicator for the agricultural practices, which are not visible application of modern techniques. The results showed low production efficiency (Table 8) because of using of mechanical power due to using of old tractors (Table 9) with attendant conventional applications.

Table 6. Average age, population of farmers in study area and workable statue in agriculture according to male and female

Village	Education level (person in farm)				Family population (person)			Age
	Primary	Middle	High	Total	Male	Female	Total	(year)
Ağ	4(66.67)*	1(16.67)	1(16.67)	6(100.00)	2.50±0.55	1.17±0.41	5.67±0.82	46.33±4.93
Al	14(5.00)	18(45.00)	8(20.00)	40(100.00)	1.85±0.92	1.13±1.22	4.88±1.38	42.53±8.83
B	0(0.00)	1(16.67)	5(83.33)	6(100.00)	1.83±0.98	0.50±0.55	4.67±1.03	39.33±7.03
D	3(30.00)	2(20.00)	5(50.00)	10(100.00)	1.86±0.90	1.00±1.83	5.14±0.90	48.14±2.61
H	4(50.00)	0(0.00)	4(50.00)	8(100.00)	3.00±1.41	0.75±1.50	6.50±0.58	52.00±11.92
Total	25(35.71)	22(31.43)	23(32.86)	70(100.00)	2.21(0.53)	0.91(0.28)	5.37(0.73)	45.67(4.92

*: Values in parentheses represent percentages of education level.

In agriculture, the parcel sizes are important for more efficient of using of the machines. The use of machines in very small parcels is not very efficient, and so is the case with very large parcels. The size of the parcel in our country is divided over time by inheritance and because of this; the general parcel structure is small parcel property. However, 5% of the total agricultural land is in large parcel. This is the same for every agricultural region in the country. Therefore, the region, province and even the district where the study was conducted reflected the same situation (Table 7 and 8). In the province of Elbistan where the study is conducted, approximately 68.6% of the farms are under 10 decar or less. Approximately 42.9% of these farms are smaller and have a size of 5 decar or less. The rest of farms were included farms sizes ranged from 10 to 30 decar with rate of 19% which were approximately included 10-20 decar farms sizes by 12.9% and 14.3% was 20-30 decar (Table 7).

The number of parcels in each farm has also increased due to the number of the small parcel existing in the farms (Table 8). Most of the farms, the 55 out of 70 farms, had at least farm number, ranges 1 to 3 farms, with the rate of 78.5%. The 10% of the remaining farms had 11 and more and followed by 7-10 parcel numbers with 8 farms. It is show that about 20% of the farms had three or more parcels (Table 8) that it corresponds to 45 farms. In considering Table 7 and 8, it has generally been found that most of the farms are in the form of small parcels and that the majority of the farms with small parcels structure are not appropriate to use mechanization in performance or to apply machinery with full working capacity.

It is reported that increasing of farm size requires the using mechanization that is leads considerable increase in production and income (Van Den Berg et al., 2007) and decreasing energy inputs compared

with manual activities (Nkakini et al., 2006) while some others revealed that the using mechanization has caused to productivity growth in agriculture (Chen et al., 2008).

Table 7. Distribution farms according to the parcel size

Parcel size (decar)	Farm (number)	Rate (%)
≤5	30	42.9
5.1-10	18	25.7
10.1-20	9	12.9
20.1-30	10	14.3
30.1-40	2	2.9
≥40.1	1	1.4
Total	70	100.0

Table 8. Farm number and distribution according to parcel number

Parcel number	Farm number	Rate (%)
1-3	55	78.5
4-6	5	7.1
7-10	3	4.3
≥11	7	10.0
Total	70	100.0

However, as the application of mechanization in agriculture depends on the size and the structure of the parcel, but it is also depending on variety of crops or their production systems. When considering Table 9, sugar beet was commonly grown crop in the study area due to climate conditions which are cold and snowy in winters, but the short summer months are hot. Maize is second common crop in the area because of the high animal production, especially cattle breeding for milk and meat demand. It has been determined that the most commonly grown crop in the questioned farms is sugar beet. These two crops were followed by wheat which is grown especially in dry farming areas under rainfeed conditions with 386.7 mm annual rainfall (Anonymous, 2016) in district which is under data collection area. Wheat was produced in 24 farms with the rate of 34.29% (Table 9). In addition, the other production branch is greenhouse which is recorded in two farms, particularly Mediterranean climate effect is more pronounced in the villages where located in side of south. The estimate of crop yields was recorded 8402 kg per decare for sugar beet and ranged from 750 to 1200 kg per decare area. Maize was yielded 960 kg per decare in average over all farms and varied from 700 to 1300 kg per decare (Table 9) while average wheat yields was 479 kg per decare and the lowest recorded in 250 kg and the highest yield was700 kg per decare (Table 9). These yield values for each crop which were under study area found to be within normal limits (TUIK, 2015a) but, three crops yield were found lower than average Mediterranean region and Turkey. The reason for the lower yield is to show that the crop production is still done with conventional agricultural techniques such as conventional machinery or manually. For wheat, however, lower yield is attributed to lower rainfall through year or during growing season in the district where questionnaire was conducted for the study.

It has been observed that a crop is grown every year in the questioned farms and the application of crop rotation is commonly done. In general, crop rotation which is application of different crops in seeding sequence was similar in all questioned farms. It was determined that crop rotation was found as maize-sugar beet, especially in irrigable fields with the rate of 24,29% in 17 farms (Table 9). However, the many of the farms were grown only one crop such as wheat, sugar beet and maize under irrigable conditions, by 34.29%, 60.00% and 44.29%, respectively, while others concluded similar results for this area in an early study (Aybek and Senel, 2009) who found most grown crops were wheat, maize and cotton for eastern Mediterranean provinces by 29.5%, 27.8% and 12.8%, respectively. In similar to annual crop rotation, two-crop rotation, in other words, one crop in current year and another crop in next year was found at the same rate by 17.14% of farms with wheat-maize rotation while the rotation of wheat+sugar beet and maize+sugar beet was 12.86% and 24.29%. In general, these two-

crop rotation were recorded in cereal-industry crop sequence such as sugar beet-wheat, maize-wheat, but it was found in the farms which are conducted agricultural activities in rotation with sugar beet-maize sequence. It has been stated that one of the reasons to produce sugar beet commonly in this questionnaire area or the commonest sugar beet-maize crop rotation was higher yield from unit area. The other reason is the presence of sugar beet processing facilities units established to close the area where the questionnaire was conducted.

For the next or following year, 60% of farmers did not have an idea about crop production in their farms because of depending on yield output of current year (Table 9). The 22 of farms were inform that they will produce only one crop in next year such as sugar beet, maize, wheat and sunflower which is recorded by 7, 6, 8 and 1 farms, respectively. Among these farms which were foresee about one crop production for the coming year, while 11.43 of the farms said that they decided to produce only wheat. Sugar beet, maize and sunflower will be able to foresee as the rate of 10.00%, 8.57%, and 1.43%, respectively, while it was concluded the most preferred product in the region for the coming projection. The first reason for popularizing sugar beet in the region is the presence of climate demand and the other was processing facilities such as sugar beet factories.

Table 9. Crop variety and average crop yield in all farms for current year and projection for next year

Crop	Farm number	Rate (%)	Ave. yield (kg/decar)
		2016	
Sugar beet	42	60.00	8402±2055
Maize	31	44.29	960±215
Wheat	24	34.29	479±134
Wheat+maize	12	17.14	-
Wheat+sugar beet	9	12.86	-
Maize+sugar beet	17	24.29	-
		Plan for 2017	
Sugar beet	7	10.00	
Maize	6	8.57	
Wheat	8	11.43	
Sunflower	1	1.43	
Maize+sugar beet+wheat	1	1.43	
Maize+sugar beet	5	7.14	
No idea	42	60.00	
Total	70	100.00	

Tractors and its attached implements or machineries have crucial important to conducted agricultural activities at the right time and rate of yield (Table 10, 11, 12, 13, 14, 15). When observed in Table 10, the age of the tractor was found to be quite variable in the villages where the questionnaire was conducted, but the ages of the tractors varied according to the brands. In general, tractors such as Valtraa were younger while the Ford tractor was older, but the Massey Ferguson has been involved in both the young and the old group. It is observed that about 52% of the tractors are quite young ranged from 1-year old to 5-year old while others found in an early study as 30% (Aybek and Senel, 2009). This age range was followed by the over middle age tractors aged from 16 to 25-year-old with the rate of 23.68%. It observed that middle age tractors, ranged from 6 to 15 year, were found to be low with the rate of 11.84% while Aybek and Senel (2009) recorded 36.3% for 6-10 age old tractor in the same region for ten years ago. The older tractors over 25-year-old are including proportionately 13.16% and are generally composed of Massey Ferguson and Ford, but others found this rate as 20.8% for at the age of 16 or more irrespective of brands (Aybek and Senel, 2009) who also concluded that nearly 65% of tractors were under the age of 10 years while 35% were over the age of 10 years. It was stated that the tractors were older in the early study when compared with our study. For example, in Ağlıca village, the youngest tractor was Valtraa when the oldest was MF, Tümosan and Stery. In Alembey, Ford was the oldest one which was bought in 1978 year followed by Massey and Stery that those were bought in 1995 and 1999, respectively, while the youngest was John Deer and New Holland. In Balıkçıl, Valtraa was the

youngest and 2-year old, 2014, but the Massey was the oldest. Erkunt and John Deer by 4-year old bought in 2012 by farmers was the youngest in Doğan. As it is in Doğan, it was observed that tractors were recorded in Hasankendi was the youngest. In contrast, some researchers found that 45% of total tractors' economic life over our country is over than 25-year old (Civelek, 2016). When economic life of a tractor is considered to be 15 years (Tezer and Sabancı, 1997) it can be said that 52% of tractors in this study area have already completed their economic life which have over 16-year old (Table 10) 9% of tractors have to be complete their economic life in 8-year later ranged from 6-year to 15-year old (Table 10). It has been determined that all of these tractors recorded during the questionnaire have been buying from both the seller and the gallery (Table 10). When all questionnaire villages are considered, it was determined that the farmers generally prefer to buy more galleries at a rate of 50% or more by 61.84% while 38.16% of the remaining farmers preferred from the sellers. When they bought these tractors owned by the farmers, they mostly preferred the second-hand ones by 57.89%, and the main reason was that they did not have enough economic and purchasing budgets (Table 10). Moreover, it is observed that tractors brands used in agricultural production in our country are found similar to villages where has to be studied by questionnaire sheets, such as New Holland, Massey Ferguson, Tümosan, Valtraa, Steyr, Erkunt, etc. (Table 11).

Table 10. Tractor age, purchasing and purchasing statue in questioned farms*

Age (year)	Ağ	Al	B	D	H	Total
1-5	3 (37.5)	23 (52.27)	6 (54.55)	5 (62.50)	2 (40.00)	39(51.32)
6-15	1 (12.5)	3 (6.82)	4 (36.36)		1 (20.00)	9(11.84)
16-25	2 (25.00)	12 (27.27)	1 (9.09)	2 (25.00)	1 (20.00)	18(23.68)
25≥	2 (25.00)	6 (13.64)		1 (12.50)	1 (20.00)	10(13.16)
Total	8 (100.00)	44 (100.00)	11 (100.00)	8 (100.00)	5 (100.00)	76(100.00)
Buy from						
Gallery	6 (75.00)	28 (63.64)	5 (45.45)	4 (50.00)	4 (80.00)	47(61.84)
Seller	2 (25.00)	16 (36.36)	6 (54.55)	4 (50.00)	1 (20.00)	29(38.16)
Total	8 (100.00)	44 (100.00)	11 (100.00)	8 (100.00)	5 (100.00)	76(100.00)
Statue						
First-hand (new)	2 (25.00)	19 (43.18)	5 (45.45)	5 (62.50)	1 (20.00)	32(42.11)
Second-hand (old)	6 (75.00)	25 (56.82)	6 (54.55)	3 (37.50)	4 (80.00)	44(57.89)
Total	8 (100.00)	44 (100.00)	11 (100.00)	8 (100.00)	5 (100.00)	76(100.00)

*: Value in the parentheses presents rate as percentage in all questioned farms.

There were recorded 311 tractors in 5-village which are under questionnaire according to farmer registration system which is brands of Directorate of Provincial Food Agrıculture and Livestock (TUIK, 2015b), but it is only consider 76 tractors which correspond to 24.44% of total tractors in 5-village (Table 12). 76 tractors were determined in 70 farms that some of farms had more than one tractor (Table 11). The study questionnaire was conducted in 70 of 216 farms, corresponds to 32.41%, which were under 5 villages according to farmer registration system. The 11.43% of farms had two-tractor, but the 88.57% of the farms had only one tractor. Similarly, it was reported that by Aybek and Senel (2009) in an early study which conducted in the same region, but in more extensively villages, 89.3% of farmers have one-tractor and the rate of those who own one-tractor was 7.8% while the remaining 2.9% only have three or four-tractor. In other earliest study in very close and similar area of this study, it was found that owing one-tractor rate was determined to be 72% (Isık, 1996). When it is taken into consideration the reasons of the farms with two tractors, it can be said that the main reason is the tractor ages which one of tractors is old and other is new. Other reason is sometimes tractor size for field or orchard branch agriculture activities, for example in Ağlıca, one of farms has 28-year old Steyr and also 4-year old Valtraa. It was recorded similar situation in Alembey which has 28-year old named Massey Ferguson, despite that is 4-year old, Tümosan. In addition, it has been determined that having more than one tractor is not a consequence of large land assets or variety of crops. It was concluded that some farms with lower arable land have also more than one tractor. In considering all farms in located 5-village, the study was carried out in farms which had the highest rate by 80% of tractor in Ağlıca where

had 10 tractors in total according to the records of the village management unit. These corresponding values are 51.76% in Alembey followed by 40.00%, 30.56% and 7.69% in Doğan, Balıkçıl and Hasankendi villages, respectively. When the tractor brands are considered, it is observed that farms had both old and new brand tractors. This shows that especially the farmers in the study area are open to acquiring new tractors in addition to existing tractors, which are not far from the mechanization. Massey Ferguson had highest rate with 38.16% followed by Tümosan, Steyr, John Deer, Valtraa with 17.11%, 14.47%, 9.21%, 5.26%, respectively. The lowest rate was found for Fiat brand by 1.32% because of the earliest tractor and it is not produced yet. The brand of Case, Erkunt and Ford were the second lowest tractors which were used in the region for many agriculture activities (Table 11). In similar, Aybek and Sener (2009), they concluded that mostly used tractor type on farms were Massey Ferguson with the rate of about 36.3% regardless of model type, for example, MF 240 DF (18.9%), MF 266 G (8.8%) and MF 285 (7.5%). In contrast, others were found that the most popular tractor brands were Fiat, New Holland and Massey Ferguson which were sold by Turk Tractor Company (Civelek, 2016) and consisted of more than 70% of all tractors recorded in our country. Tractors recorded for this study constitute approximately 25% of the total tractors in the villages where the questionnaire is conducted and this corresponds to a quarter of the total tractors (Table 12). In addition, it was recorded 216 farmers in total according to the registration system of Directorate of Provincial Food Agriculture and Livestock in 5-village where the questionnaires were conducted, but approximately 35.19% of them were questioned for this study (Table 12). When factors are taken into account for purchasing tractors, power has been identified as an important factor in all villages and followed by the availability of service facility, spare parts and PTO properties such as dual-pull wheel (Table 13). In addition to these factors, the bank loan, fuel saving, wheel and gear characteristics proportionally represented about 60% of the farmers. However, factors such as colour and availability in neighbour which are more important in our country in last decades (Özpınar, 2002) were remained relatively low with about 50%. When considering the tractor purchase preferences, especially factors such as power, service facility and spare parts were recorded as main predilection.

Table 11. Tractor numbers according to their brands in each farm under study area

Tractor	Ağ		Al		B		D		H		Total		Brand	
brand	One-trac.	Two-trac.	One-trac.	Two-trac.	One-trac.	Two-trac.	One-trac.	One-trac.	Two-trac.	One-trac.	One-trac.	Two-trac.	(num.)	Rate (%)
Case	0	0	2	0			0	0			2	0	2	2.63
Erkunt				0			2	0			2	0	2	2.63
Fiat	0	0	1	0			0	0			1	0	1	1.32
Ford	0	0	1	0			0	0		1	1	1	1	2.63
Goldin	0	1	0	0			0	0			0	1	1	1.32
JD	0	0	5	1			1	0			6	1	7	9.21
MF	2	0	15	0	9		2	0	1		29	0	29	38.16
NH	0	0	2	1			1	0			3	1	33	5.26
Steyr	1	1	7	0			0	1	1		9	2	11	14.47
Tüm	2	0	7	2			1	0	1		11	2	13	17.11
Valtraa														
a	1	0	0	0	2		0	0	1		4	0	4	5.26
Total	6(75.0)	2(25.0)	40(90.9)	4(9.1)	10(90.9)	1(9.1)	7(87.5)	1(12.5)	4(80.0)	1(20.0)	67(88,2)	9(11.8)	76	100.0
Total *	22 (36.36)		81 (54.32)		62 (17.74)		120 (6.67)		26 (19.23)		311 (24.44)			

JD, John Deere; MF, Massey Ferguson; Tüm, Tümosan; NH, New Holland. *:The total number of tractors in the village according to farmer registration system under Directorate of Provincial Food Agriculture and Livestock (Anonymous, 2015). The parentheses indicate the percentage of tractors questioned.

Table 12. Total and questioned farms and tractors in villages and their rate

Village	Number of total farms in village*	Number of questioned farms in village	Rate in total farms (%)	Number of total tractors in village*	Number of questioned tractors in village	Rate in total tractors (%)
Ağ	10	6	60.00	22	8	36.36
Al	85	40	47.06	81	44	54.32
B	36	6	16.67	62	11	17.74
D	20	10	50.00	120	8	6.67
H	65	8	12.31	26	5	19.23
Total	216	70	32.41	311	76	24.44

*: According to farmer registration system of Directorate of Provincial Food Agriculture and Livestock (DPFAL, Anonymous, 2015)

Table 13. Considering factors for purchasing tractors according to farm numbers and their rate*

Factors	Ağ	Al	B	D	H	Total
Power	6(100.00)	4(100.00)	6(100.00)	10(100.00)	8(100.00)	70(100.00)
Colour	4(66.67)	25(62.50)	4(66.67)	5(50.00)	2(25.00)	40(57.14)
Bank loan	6(100.00)	25(62.50)	1(16.67)	10(100.00)	3(37.50)	45(64.29)
Fuel saving	4(66.67)	29(72.50)	2(33.33)	5(50.00)	4(50.00)	44(62.86)
Wheel	4(66.67)	28(70.00)	2(33.33)	10(100.00)	3(37.50)	47(67.14)
Gear	4(66.67)	28(70.00)	3(50.00)	6(60.00)	3(37.50)	44(62.86)
PTO-dual	5(83.33)	27(67.50)	2(33.33)	10(100.00)	5(62.50)	49(70.00)
Service facility	6(100.00)	26(65.00)	4(66.67)	10(100.00)	9(112.50)	55(78.57)
Spare part	6(100.00)	29(72.50)	6(100.00)	10(100.00)	9(112.50)	60(85.71)
Similarity(neighbours)	0(0.00)	28(70.00)	6(100.00)	0(0.00)	0(0.00)	34(48.57)
Others	0(0.00)	23(57.50)	0(0.00)	0(0.00)	0(0.00)	23(32.86)
Total	6(100.00)	40(100.00)	6(100.00)	10(100.00)	8(100.00)	70(100.00)

*: The parentheses indicate the percentage of questioned farms.

Considering tractor usage time in annual according to cultural practices in Table 14, it was used mainly for tillage operation in average with rate of 36.90% over 5-village (Table 14). It was followed by sowing-planting, transportation, hoeing, irrigation and others such as fertilizing and spraying with rate of 19.82%, 13.44%, 10.72%, 4.05%, 2.32%, respectively. It was also found similar relationship for each village due to operation time required by tractor. For example, the most time required of tractor usage for operation throughout growing season was occurred in Ağlıca where showed similar to average over all villages. It had the highest time consumption for tillage in rate of 40.14% and followed by transportation with 17.24%. In contrast, Hasankendi village has annually the least time consumption for tractor in cultural operations that it was recorded most time consumption for tillage with 36.57% folowed by both irrigation and transportation by 16.09%. As expected and as is seen over all our country, tractor is still used for tillage operation and also transportation in annual. These results show that conventional or traditional agricultural systems were conducted commonly in this study region as in our country. In particular, the traditional tillage requires more than one field traffic in traditional agricultural systems which indicate that the tractor is being used more time for this operation.

It was concluded machineries per farm for 5-village and their rate in percentage according to all villages (Table 15). As expected, mouldboard plough which is used commonly in traditional agriculture was recorded most used equipment in all villages while it was followed by dish-harrow because of crusting soil following to plough for preparation seedbed, especially in cereals production systems. The other most recorded machine was the cultivator which used the same purpose as disc harrow, and universal seeding machine, especially mechanical type with 22 (Table 15). In addition, bailer was most used machine because of the reason from cereals being the main product produced (Table 9) and the extensive breeding of livestock. In contrast, maize silage machine was found very low with 2 over all villages (Table 15) despite the fact that maize is one of the main crops (Table 9). Considering all machineries and equipment in Table 15, it has found that traditional agriculture is still commonly performed in this region where the study is conducted.

Table 14. Time of annual tractor usable due to cultural operations in questioned farms for each village (hour)*

Village	Tillage	Planting	Fertilizing	Hoeing	Spraying	Irrigation	Transportation	Others operations	Work out of farm	Total
Ağ	283.33±125.17 (40.14)	91.00±9.27 (12.89)	36.33±11.69 (5.15)	103.33±71.18 (14.64)	12.67±6.68 (1.79)	34.17±27.64 (4.84)	121.67±93.26 (17.24)	0.00±00.00 (00.00)	23.33±27.33 (3.31)	705.80 (100.00)
Al	76.13±74.18 (23.03)	44.88±41.50 (13.57)	19.00±16.82 (5.75)	32.63±34.35 (9.87)	9.33±7.16 (2.82)	52.95±98.32 (16.02)	69.20±110.52 (20.93)	5.50±19.61 (1.66)	21.0±37.47 (6.35)	330.60 (100.00)
B	207.83±305.66 (31.82)	68.17±115.02 (10.44)	16.50±26.60 (2.53)	91.50±116.45 (14.01)	13.67±11.24 (2.09)	150.17±229.89 (22.99)	77.00±96.57 (11.79)	28.33±44.91 (4.34)	0.0±0.00 (0.00)	653.17 (100.00)
D	551.43±288.70 (41.19)	427.14±314.47 (31.91)	49.29±18.35 (3.68)	77.86±46.36 (5.68)	35.14±20.58 (2.63)	7.86±13.50 (0.59)	127.86±29.42 (9.55)	57.86±54.15 (4.32)	4.29±11.34 (0.32)	1338.71 (100.00)
H	156.25±151.40 (36.57)	53.75±36.37 (12.58)	18.75±15.48 (4.39)	65.00±77.67 (15.21)	9.50±7.72 (2.22)	12.75±14.73 (16.09)	68.75±34.25 (16.09)	0.00±0.00 (0.00)	42.5±50.58 (9.95)	427.25 (100.000)
Ave.	254.99±7.42 (36.90)	136.99±8,82 (19.82)	27.97±1,26 (4.05)	74,06±4,00 (10.72)	16.06±0,41 (2.32)	51,58±9.59 (7.46)	92,89±4,51 (13.44)	18,34±2,18 (2,65)	18,22±4,21 (2,64)	691,00±0,00 (100.00)

*: Value in parentheses includes rate of total time for each operation.

Table 15. Agriculture machinery per farms for each village, machine rate according to total machine of 5-village *

Machine	Ağ	Al	B	D	H	Total
Subsoiler	3±0.55(15.79)	7±0.33(36.84)	3±0.55(15.79)	5±0.49(26.32)	1±0.50(5.26)	19±2.28(100.00)
Chisel	6±0.00(21.43)	11±0.38(39.29)	4±0.52(14.29)	6±0.38(21.43)	1±0.50(3.57)	28±3.65(100.00)
Rotovator	5±0.41(10.00)	39±0.45(78.00)	2±0.52(4.00)	2±0.49(4.00)	2±0.58(4.00)	50±16.26(100.00)
Mould. plough	6±0.00(12.00)	29±0.16(58.00)	4±0.52(8.00)	7±0.00(14.00)	4±0.00(8.00)	50±10.70(100.00)
GDH	5±0.41(15.15)	16±0.45(48.48)	4±0.52(12.12)	5±0.49(15.15)	3±0.50(9.09)	33±5.32(100.00)
DH	0±0.00(00.00)	34±0.50(97.14)	0±0.00(0.00)	0±0.00(0.00)	1±0.50(2.86)	35±15.10(100.00)
Cultivator	6±0.00(13.64)	22±0.36(50.00)	6±0.00(13.64)	6±0.38(13.64)	4±0.00(9.09)	44±7.43(100.00)
Roller	2±0.52(6.45)	24±0.50(77.42)	1±0.41(3.23)	1±0.38(3.23)	3±0.50(9.68)	31±9.98(100.00)
Cer.seed.mac.	6±0.00(30.00)	2±0.50(10.00)	2±0.52(10.00)	7±0.00(35.00)	3±0.50(15.00)	20±2.35(100.00)
USMP	0±0.00(0.00)	1±0.22(0.00)	0±0.00(0.00)	0±0.00(0.00)	1±0.50(0.00)	1±0.45(100.00)
USMM	0±0.00(0.00)	20±0.00(90.91)	0±0.00(0.00)	2±0.49(9.09)	0±0.00(0.00)	22±8.76(100.00)
Cen. fert. sp.	0±0.00(0.00)	29±0.51(93.55)	0±0.00(0.00)	0±0.00(0.00)	2±0.58(6.45)	31±12.77(100.00)
RH with FU	1±0.41(5.88)	8±0.45(47.06)	2±0.52(11.76)	5±0.49(29.41)	1±50(5.88)	17±3.05(100.00)
RH with DO	5±0.41(20.83)	7±0.41(29.17)	4±0.52(16.67)	6±0.38(25.00)	2±0.58(8.33)	24±1.92(100.00)
Sprayer(field)	2±0.52(18.18)	1±0.38(0.00)	2±0.52(18.18)	6±0.38(54.55)	1±0.50(9.09)	11±1.92(100.00)
Sprayer(orch.)	0±0.00(0.00)	0±0.00(0.00)	0±0.00(0.00)	0±0.00(0.00)	0±0.00(0.00)	0±0.00(0.00)
Sickle mac.	0±0.00(0.00)	0±0.00(0.00)	0±0.00(0.00)	0±0.00(0.00)	0±0.00(0.00)	0±0.00(0.00)
Mover	0±0.00(0.00)	2±0.00(0.50)	2±0.52(0.50)	0±0.00(0.00)	0±0.00(0.00)	4±1.10(100.00)
Maize SM	0±0.00(0.00)	0±0.00(0.00)	0±0.00(0.00)	2±0.49(100.00)	0±0.00(0.00)	2±0.89(100.00)
Bailer	0±0.00(0.00)	39±0.00(100.00)	0±0.00(0.00)	0±0.00(0.00)	0±0.00(0.00)	39±17.44(100.00)
Trailer	6±0.00(29.09)	0±0.16(0.00)	6±0.00(26.09)	7±0.00(30.43)	4±0.00(17.39)	23±2.79(100.00)
Thresher	0±0.00(0.00)	0±0.00(0.00)	0±0.00(0.00)	0±0.00(0.00)	0±0.00(0.00)	0±0.00(0.00)
Harvester	0±0.00(0.00)	1±0.00(50.00)	1±0.41(50.00)	0±0.00(0.00)	0±0.00(0.00)	2±0.55(100.00)
Stem mover	3±0.55(42.86)	0±0.16(0.00)	1±0.41(14.29)	3±0.53(42.86)	0±0.00(0.00)	7±1.52(100.00)
Others	0±0.00(0.00)	28±0.00(100.00)	0±0.00(0.00)	0±0.00(0.00)	0±0.00(0.00)	28±12.52(100.00)

*: Value in parentheses includes rate of total machine for each farm. GDH, goble disc harrow; DH, disc harrow; Cer. seed mac., cereals seeding machine; USMP, universal seeding machine (pneumatic); USMM, universal seeding machine (mechanic); Cen. fert. sp., Centrifugal fertilizer spraying; RH with FU, row hoeing with fertilizer unit; RH with DO, row hoeing with disc opener; Maize SM, maize silage machine.

Conclusions

The existence of the possibilities for the sustainability of agricultural production have crucial importance. Sometimes the existence of these possibilities is not enough for sustainable agriculture, but also they have to be used correctly. Therefore, it is necessary to know agricultural possibilities in an agricultural area and to determine them for to be planned for next projections. In general, for this purpose, a questionnaire is conducted to make the necessary determinations about agriculture activities which were performed by mechanization possibilities and human source. For this purpose, a questionnaire was done to determine, in general, agriculture structure and mechanization for some villages in Elbistan district. Results from the study were found to similar our country or early studies results conducted about 10-year ago in terms of both agricultural structure and mechanization characteristics. Education level is found low and farmers are generally graduated from high school or primary school while university degree is very low. Families generally have 4-5 person on average, and the 2-3 person per family are working and occupying in the agriculture activities. On the other words, agricultural activities are conducted according to traditional production systems despite having enough tractor and agricultural machinery or implement in studied farms. In particular, it is confirming that mouldboard plough, cultivator, disk harrow, mechanical seeding machine are used common machineries which were used in the farm production and also farms had high number of these machinery. Additionally, many tractor brands have also been recorded in the studied farms that all tractors were including new brands such as New Holland, Valtraa, Tümosan, Massey Ferguson. However, it was recorded a few main crops which were grown in

the study area such as maize, wheat, sugar beet, mostly in rotation because of dairy farm for maize, sugar beet processing unit in the region and dry farming system for wheat. In general, machinery using in agriculture was found very low because the parcel of the study area is not fully compatible with mechanization. On the other hand, using machinery in agriculture by farmer was found low due to traditional farming systems and also having low education level to use or follow agriculture technology for their agricultural activities.

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