Harran Tarım ve Gıda Bilimleri Dergisi 19 (4), 209-222, 2015
ISSN 2148 - 5003, **Research Article**

Determination of Types of Tractor Failures, Failure Density and Solutions for Economic Stability of Agriculture in Şanlıurfa District

Bülent PİŞKİN[1], Ramazan SAĞLAM[1], Hasan ÇOBAN[1]

Department of Agricultural Machinery, Faculty of Agriculture, University of Harran, Şanlıurfa/Turkey [1]
For correspondence: bpiskin@harran.edu.tr

Abstract
In this study a questionnaire form and a tractor failure service registration form used for determine the failure density. Survey is applied in the South Eastern Anatolia Project (GAP) provinces with 68 farmers, 22 service stations and 18 spare parts dealers. Target audiences within the scope o f the survey were asked 20 questions. They have chosen the failures that were occurred on their tractors. Obtained results are compared with the tractor failures registered in services. Based on the results of the questionnaire: Engine component failure % 26.1 , Electrical system failure %22.8, steering failure % 11.2, hydraulic system failure %10.7, transmission failure % 6.6, clutch failure % 6.4, front axle failure % 5.5, brake system failure % 3.9, bonnet failure % 3.5 and rear axle failure % 3.3. The service tractor failure registration results : Engine component failure % 28.6, Hydraulic system failure % 24.9, steering failure 11.1, transmission failure % 8.3, % 6.3 electrical system failure, % 6.2 front axle failure, % 5.6 brake system failure, % 4.4 rear axle failure, % 3.9 clutch failure and % 0.7 bonnet failure to became fact. Ratios of a lot of failures which have been repaired excluding itself ateliers of services (Electric, bonnet, pump etc.) had been come lower than expected. In this study, the variations of tractor failures are determined and the related solutions are provided to end user of tractors for prevent any possible failures.

Keywords: Tractor failures, failure density, tractor,

GAP Bölgesinde Traktörde Arıza Sıklıklarının Saptanması Üzerine Bir Araştırma

Özet
Bu çalışmada, bir anket formu ve traktör servislerindeki hasar kayıtları hasar yoğunluklarının belirlenmesi için kullanılmıştır. Anket, Güneydoğu Anadolu Projesi (GAP) kapsamındaki illerde, 68 çiftçi, 22 yetkili servis ve 18 yedek parça sağlayıcı firma ile yapılmıştır. Hedef kitleye 20 soru sorulmuştur. Ankete katılanlar kendi traktörlerinde oluşan hasarları seçmişlerdir. Elde edilen sonuçlar yetkili servis kayıtlarıyla karşılaştırılmıştır. Anket sonuçlarına göre; Motor bileşenleri arızası %26.1, Elektrik sistemi arızası %22.8, direksiyon sistemi arızası %11.2, hidrolik sistem arızası %10.7, şanzıman arızası %6.6, debriyaj arızası %6.4, ön düzen arızası %5.5, fren sistemi arızası %3.9, kaporta arızası %3.5, arka dingil arızası %3.3 bulunmuştur. Yetkili servisten alınan arıza kayıt sonuçları; Motor bileşenleri arızası %28.6, Elektrik sistemi arızası %6.3, direksiyon sistemi arızası %11.1, hidrolik sistem arızası %24.9, şanzıman arızası %8.3, debriyaj arızası %3.9, ön düzen arızası %6.2, fren sistemi arızası %5.6, kaporta arızası %0.7, arka dingil arızası %4.4 olarak elde edilmiştir. Ankete katılan çiftçilerin verdiği değerlerin düşük olmasının sebebi, arızaların bir kısmının (kaporta, elektrik aksamı, pompa vs) Yetkili servis dışında tamirhanelerde giderilmiş olmasındandır. Bu çalışmada, traktör arızalarının çeşitleri belirlenmiş ve arızalara sebep olan durumlar ortaya konarak olası arızaların önlenmesi için çözüm yolları sunulmuştur.

Anahtar Kelimeler: Traktör arızaları, arıza yoğunluğu, traktör

Introduction

With the GAP Project, the significant increase in the irrigated agricultural areas is manipulate the more powerful tractor need of the farmers in the region in the positive way. Especially in Harran, which is the GAP Project first application area, the farmers have changed their old tractors to larger and more powerful tractors. These tractors have air-conditioning, cabinet, powerful music system, automatic transmission, GPS Positioning, automatic pilot and hydraulic control units. Although that tractors have been developing with modern technology, but they still require the more conscious driver. Therefore, the firms generally give short training programs for their customers on their own tractors. The failures arising from improper usage of tractors have gained great importance in terms of the national economy and the product cost. In order to determine the machine value constituting an important input in the agricultural activities made in the farm area accurately, it is required to calculate the frequencies of the failures and the total cost of them.

In terms of determination of the reasons of failures and the failures arising from usage, informing the tractor drivers will also be enabled with supports such as training and courses. From this perspective, it has been aimed to make a cost analysis in the tractors for repair and maintenance. In the conditions of Şanlıurfa-Harran plain, it has been determined that the requirement of tractor power and agricultural work machines varies depending on the operating characteristics, and the tractor tail axle power level required by the product model is proposed for a 35-ha average institution magnitude and for the 2000s is approximately 31 kw (0.88 kw/ha) for the field works and 42 kw (1.2 kw/ha) for all the farm processes. It has been determined that for the 141.538-ha Şanlıurfa-Harran plain, the total tractor tail axle power required in the 2000s will be about 163.000 kW (Sabancı et. al., 1996). According to a survey study made in 56 institutions in Harran Plain, it was determined that a vast majority of the population consists of the young people who can work in the agricultural works, that the rate of literacy is bigger in men compared to women, that the agricultural enterprises perform the irrigated agriculture in big land groups, and that weight is given rather to cotton farming, medium-power tractors are preferred in the agricultural enterprises that have been examined, and the medium tractor power in the survey field has been found to be 74.93 BG, and in the agricultural enterprises found in the research area, the agricultural mechanization level is 1.69 kW/ha, and an agricultural area allotted per tractor is 32.57 ha, and the number of the equipment and machinery is 5.17 (Yaylagül, 1994). By means of a survey applied right before the start of the irrigation, the current agricultural structure and mechanization characteristics of the agricultural enterprises before the irrigation have been determined. Accordingly, in the agricultural enterprises, the magnitude of an average agricultural enterprises area is 35.5 ha, the magnitude of an average parcel is 11.7 ha, the number of the tractors per agricultural enterprises is approximately 1.7, the average tractor power is 46.8 kW/tractor, the number of the agricultural machines per tractor is 3.8 machine/ tractor, the annual fuel consumption per tractor is 2244 l/tractor, the annual tractor working period is 290 h/year (Işık and Atun, 1988). According to the results of the survey made in 62 villages in GAP (Central, Akçakale, Harran towns), it

has been detected that there has been important increases especially in the number of the tractors, however, the increase in the agricultural equipment and machinery did not realize in the expected level, and quite a few number of agricultural equipment and machinery were included in the agricultural enterprise's park. One of the most important reasons leading the producer of the region is that they do not possess sufficient knowledge and skill in terms of agricultural equipment and machinery, and secondly, the tractor is seen as a means of investment rather than a means of production. Therefore, it has also been declared as a fact that the tractors will not be able to be used economically throughout the year (Özgüven and Karşıgil., 1997). It was seen that the renewing time of an agricultural tractor chosen depending on the economic conditions of our company changes between 12 - 16 years, and the renewing time of a rotary cultivator changes between 12 - 15 years (Şahin and Işık, 1997).

In this study, especially the failures were examined and the issues that our farmers ought to take heed of in the tractor usage were handled. Hence, solution suggestions have been offered for the failures arising from the user errors.

Material and Method

Material

The farmers, services and the spare part dealers in the provinces within the scope of the GAP Project were encountered face to face. The discussions with the farmers were generally made in the coffee house, in the field or in the repair workshops in the village. Interviews one to one were made with the other participants in their working environments. The distribution of the participants filling in the questionnaire form has been demonstrated in Table 1.

Table 1. Distribution of the participants filling in the questionnaire form

GAP	Farmer		Service		Spare Part Dealer		TOTAL	
Provinces	Number	(%)	Number	(%)	Number	(%)	Number	(%)
Şanlıurfa	18	26	1	5	4	22	23	21
Diyarbakır	12	18	2	9	5	28	19	18
Gaziantep	9	14	2	9	3	17	14	13
Mardin	4	6	5	23	2	11	11	10
Siirt	3	4	2	9	-	-	5	5
Kilis	7	10	1	5	-	-	8	7
Batman	6	9	2	9	2	11	10	9
Şırnak	2	3	4	18	-	-	6	6
Adıyaman	7	10	3	13	2	11	12	11
TOTAL	**68**	100	**22**	100	**18**	100	**108**	100
Ratio (%)	63		20		17		100	

108 persons in total have participated in the questionnaire. 63% of the participants consisted of the farmers, 20% of the services, and 17% of the spare part dealers.

Educational status

When the educational status of the survey participants was examined, it was seen that the only group that was illiterate was the farmers (%10), and the elementary school graduates were generally in the majority as the farmers 75%, services 85%

and spare part dealers 94%. The ratio of the secondary school graduates was 12% in the farmers and they were followed by the services with 10%. The ratio of the high school graduate farmers was found to be % 3 and the ratio of the services as 5 %. The only university graduate among the spare part dealers got a share of 6 %. The educational status of the survey participants have been given in Table 2.

Table 2. Educational status of all the survey participants (%)

	Farmer	Service	Spare Part
Illiterate	10	-	-
Elementary	75	85	94
Secondary School	12	10	-
High School	3	5	-
University	-	-	6

Age Status of the Survey Participants

In order to be able to evaluate the age status of the farmers who participated in the survey, age grouping has been made to the survey participants. According to this grouping, the results that have been obtained have been given in Table 3. When it is examined in terms of the age status of the farmers who participated in the survey, it is seen that there are farmers from all age groups.

Table 3. Distribution ratios according to the age groups of the farmers, services and spare part dealers who participated in the survey (%)

	Farmer	Service	Spare Part
Younger than 20	8	30	10
20 – 30	30	35	35
30 – 40	28	26	45
40 – 50	16	5	6
Older than 50	18	4	4

The ratios of the ages of the survey participants were seen to be as 8 % in the farmers under 20 years of age, 20 – 30 age group as 30%, 30 – 40 age group as 28%, 40-50 age group as16% and over 50 years old as 18%. In the services, this situation was 30% for under 20 years of age, 20 –30 age group as 35%, 30 – 40 age group as 26%, 40 – 50 age group as 5% and in the group over 50 years old as 4%. In the spare part dealers, it was seen to be 10% for those under 20 years old, 20 –30 age group as 35%, 30 – 40 age group as 45%, 40 – 50 age group as 6%, and over 50 years old as 4%.

Method

The tractor breakdown ratios in the provinces of Şanlıurfa, Gaziantep, Adıyaman, Diyarbakır, Mardin, Siirt, Batman, Şırnak and Kilis which are included in the scope of GAP Project and the breakdown types encountered have been determined with the surveys made with the farmers, services and spare part dealers. Moreover, the tractor results with breakdowns on the monthly basis were taken from the service workshops. The surveys and the workshop records were evaluated separately and they were researched into by comparing their compatibilities with one another.

Giving points to the questions from 1 to 20, the least frequently seen breakdown was graded with 1 point, and the most frequently seen breakdown was graded with 20. While choosing the breakdowns, and the views of the producer firms and services were taken and several breakdowns whose density was expected to be high (i.e. motor, hydraulic and the electrical system) were examined in detail, and some of them (i.e. body shell and cabin) were united and tried to be simplified. Moreover, the writing order of the questions related to the breakdowns was written randomly so that the poll takers would not be affected.

The results of the evaluation were obtained by adding the points taken by each breakdown. Afterwards, these points were proportioned to the total point of each questionnaire group, and the percentage of the breakdown frequencies was calculated.

Results and Discussion

The Breakdown Frequencies in the Tractors According to the Farmers with whom the Survey was Carried Out.

By making interviews face to face with 68 farmers in the GAP provinces, the survey questions were asked. According to the survey results obtained from the farmers, the points taken by each breakdown were demonstrated in figure 1 as a graphic.

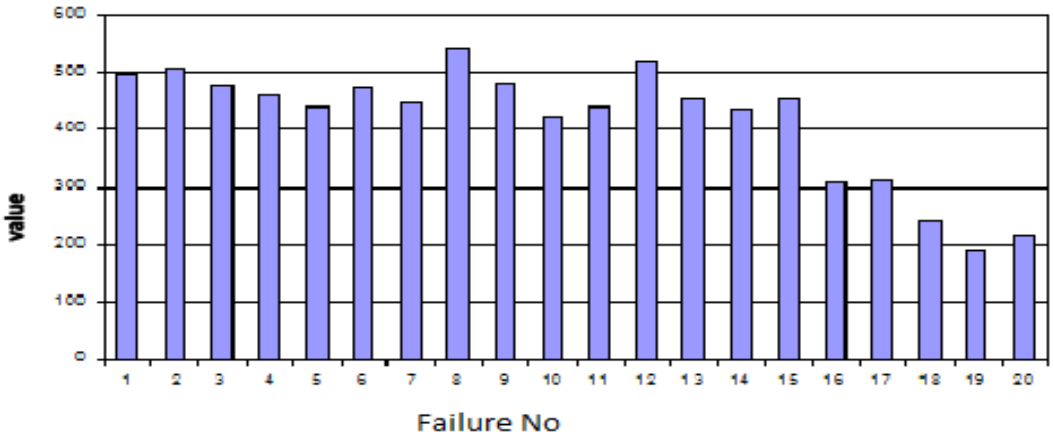

Figure 1. Status of the Breakdown Frequencies according to the Farmers

According to the survey results, it was seen that priority was given to the complete indication table (542 points) among the breakdowns for the farmers and the motor breakdowns (518 points). When these breakdowns were examined, it was seen that breakdowns occurred in the course of time because of deviating of the indicator and the jerks and shakings during the operating time, the motor breakdowns, however, resulted rather from not complying with oil, filter change, clean oil usage and antifreeze mixture usage in the radiator supposed to be performed during the general maintenances. The least frequently seen breakdowns were detected to be hydraulic trailer outlet (190 points) and driver's seat (218 points). In spite of the fact that the driver's seat breaks down little is accepted by all the participants, the hydraulic trailer outlets received somewhat

more points in the other participants. Some farmers said that they did not drive the tractor themselves, but had the drivers they hired seasonally do this work. This naturally causes the breakdown ratios to increase.

Breakdown Frequencies in the Tractors According to the Services with whom the Survey was made

A survey study was made with 22 services in total that make tractor maintenance – repair in the GAP provinces. According to the information given by the Services, when the breakdown situations were examined, it is seen that there are distinctive differences among the breakdown frequencies. When the situation is examined, it is seen that this situation is caused by the fact that the services know about the breakdowns better than the farmers or spare part dealers, and that they transmit this to the survey results. Especially, as a result of increasing record taking and archive works in the service in the recent years, it was seen that they make a retrospective informing in many issues, and that they give information to the farmers and tractor drivers with respect to all the processes and spare part changes made within that year.

The survey results taken from the services have been given in Figure 2. When the breakdown estimations of the services were examined, it was seen that the operating hour cycle indicator shown with the numbers 2, 9 and 11, the clutch group and the fuel tank float valve took the first three rows. One of the reasons why the breakdowns of the braking system shown with the number 13 appeared to be in the least rate was shown as the fact that the farmers had this breakdown mended in other places.

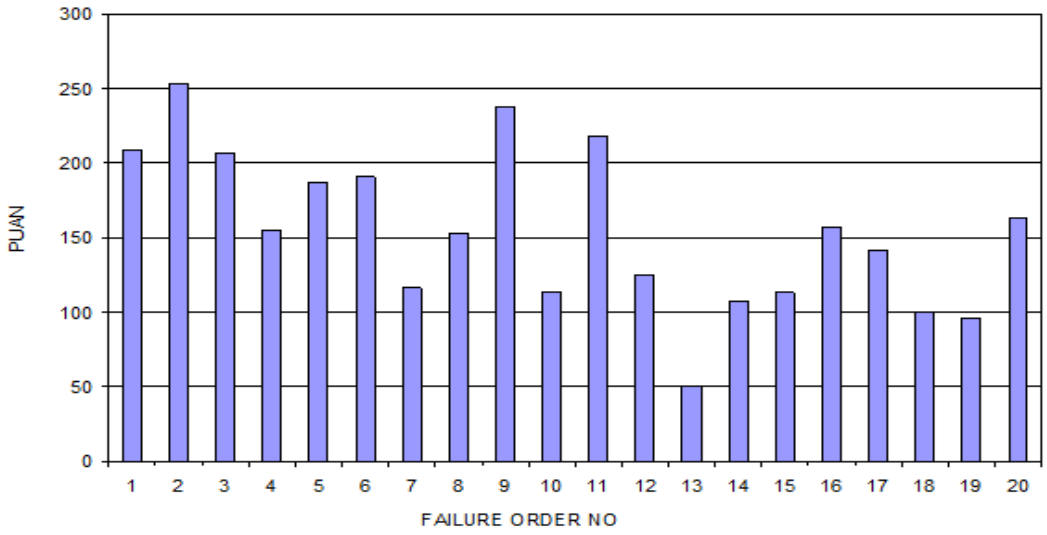

Figure 2. The Status of the breakdown frequencies encountered in the tractors according to the services.

The Breakdowns According to the Spare Part Dealers with whom the Survey was made

The survey was applied to 18 people who dealt in spare part sales and dealership. According to the survey results taken from the Spare part dealers, the breakdowns have been given in Figure 3.

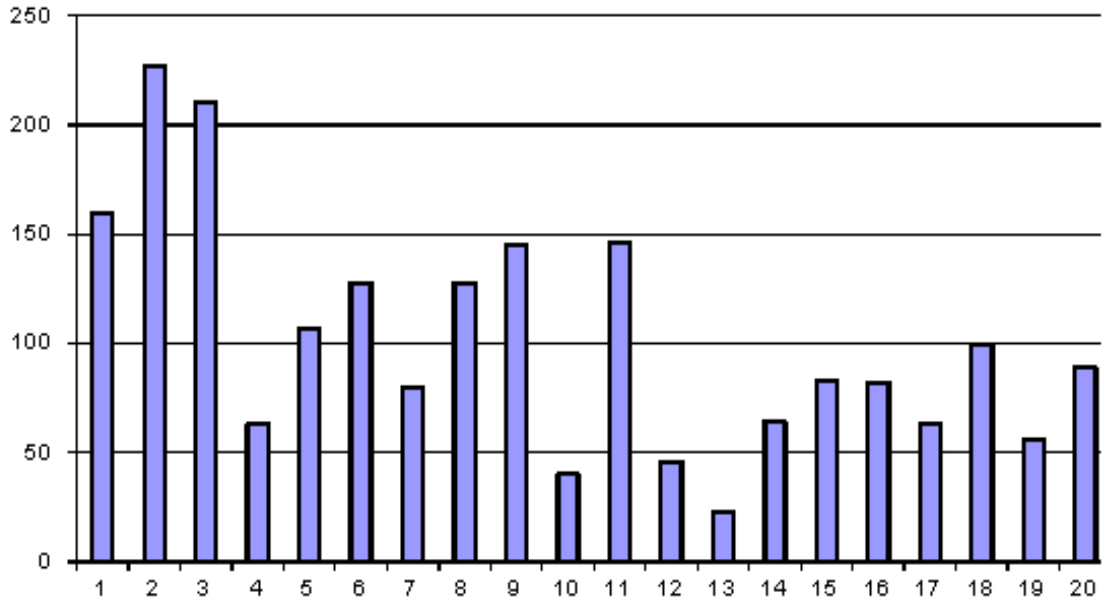

Figure 3. The status of the breakdown frequencies encountered in the tractors according to the spare part dealers.

It was seen that the spare part dealers were generally people who knew about the tractor, who had worked in repair-maintenance jobs before. When the survey results were examined, it is seen that especially the operating hour and the cycle indicator shown with the number 2 encounters us as the part that breaks down most. The part that least breaks down is the braking system shown with the number 13 as in the service evaluations.

The points given to the breakdowns by all the groups that participated in the survey have been given in figure 4. According to this, the breakdowns that received the most points were, respectively; the operating time and cycle indicator 988 points, the transmission and gear group 893 points and steering system 865 points appear.

According to the responses given by all the survey participants with respect to the tractor breakdowns, the total points they gave to the breakdowns and the percentage distributions were given in Table 4. Accordingly, the operating time and the cycle indicator ratio was 7.3%, the transmission and gear group was 6.6% and the steering system 6.4% happened to be the first three breakdowns, the hydraulic trailer outlets 2.5% and differential as 3.3% remained in the least ratio.

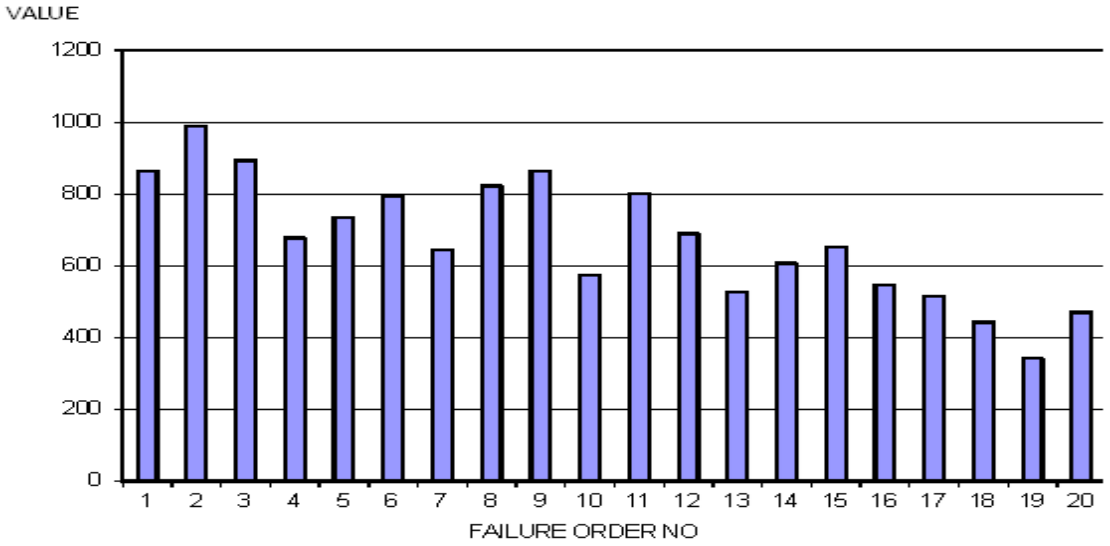

Figure 4. The status of the breakdown frequencies encountered in the tractors according to all the survey participants

Table 4. The total points given to the breakdowns by all the survey participants and the change of the ratios

No	Breakdown Explanation	Farmer Point	Service Point	Dealer Point	Total Point	(%)
1	Steering system breakdowns	496	209	160	865	6.4
2	Operating time and cycle indicator	508	253	227	988	7.3
3	the transmission and gear group	476	207	210	893	6.6
4	Fuel system breakdowns	460	155	63	678	5.0
5	Front assembly and the wheels	440	187	107	734	5.5
6	Fuel level and heat indicators	474	191	128	793	5.9
7	Hydraulic (power) steering distributor	448	116	80	644	4.8
8	Complete indicator table	542	153	128	823	6.2
9	Clutch group complete	480	238	145	863	6.4
10	Hydraulic distributor	422	113	40	575	4.3
11	Fuel Tank and float valve	438	218	146	802	6.1
12	Motor breakdowns (crankcase, crank shaft piston, valve, etc.)	518	125	46	689	5.1
13	Braking system	454	50	23	527	3.9
14	Electrical system and the Battery	436	107	64	607	4.5
15	Starter motor and charging generator	456	113	83	652	4.8
16	Radiator and water pump	308	157	82	547	4.1
17	Hydraulic lifting system	312	141	63	516	3.8
18	Differential gear	244	100	99	443	3.3
19	Hydraulic trailer outlets	190	96	56	342	2.5
20	Driver's seat, body shell and cabin	218	163	89	470	3.5
	TOTAL	8.320	3.092	2.039	13.451	100

The weighted means of the points given for the breakdowns by all of the survey participants have been given in table 4. When the Table is examined, it was found that the breakdowns which the weighted mean appeared most are, respectively;

Operating time and cycle indicator (7,3), the transmission and gear group (6,6), clutch group complete (6,4) and steering system breakdowns (6,4). The breakdowns which the weighted mean appeared least were found to be, respectively, the braking system (3,9), Hydraulic trailer outlets (2,5), Hydraulic distributor (4,3) and ve differential breakdowns (3,3). This situation has been shown graphically for each three group surveys in Figure 5.

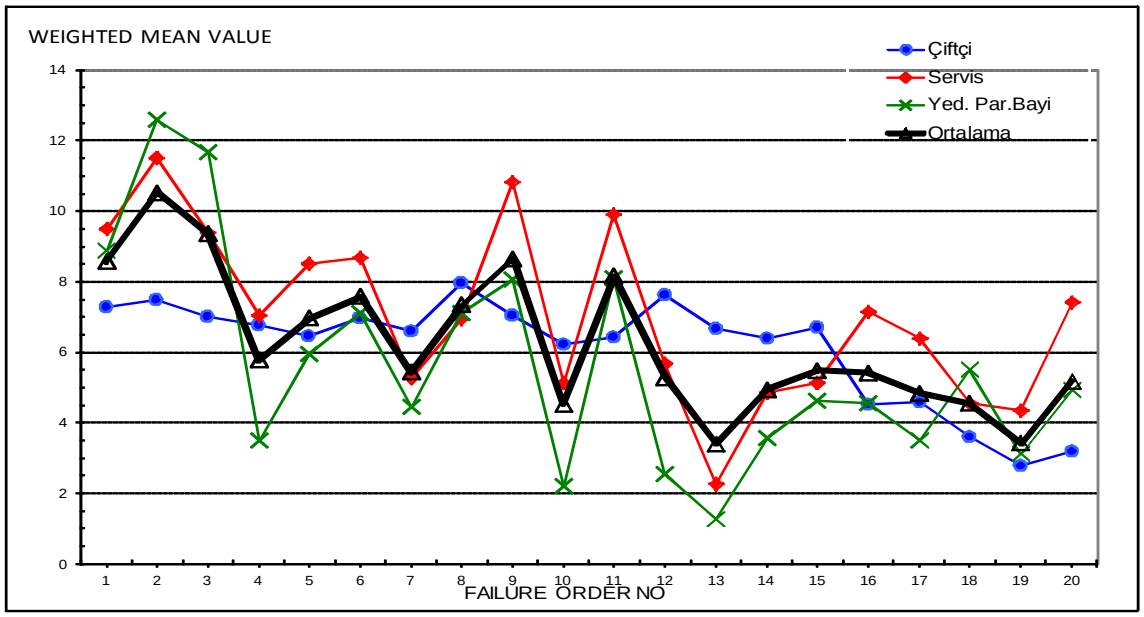

Figure 5. The distribution diagram of the weighted means of the points given by the survey participants to the breakdowns

Breakdowns according to the service workshop records

The breakdown records of the 1.469 tractors in total that came to 17 service workshops between July – December 2012 were examined. The breakdown sequencing seen in the Service workshops has been given in Figure 6. According to these, the motor breakdowns come to the forefront with a ratio of 19.0%, and they were followed by Hydraulic breakdowns with 18%, and transmission breakdowns with 8.3%. The cabin breakdowns come to the fore front as the least frequently seen breakdowns.

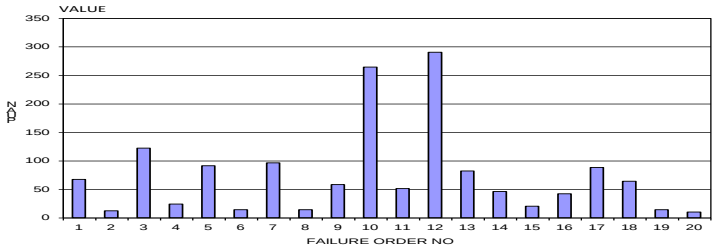

Figure 6. The distribution of status of the breakdowns according to the tractor service records.

Distribution according to the main organs of the breakdowns

The distribution of the breakdown ratios according to the farmer, service ve spare part dealer surveys of the tractor main organs has been given Table 5 and figure 7. If we classify the points received by the 5.5%, brakes 3.9%, body shell 3.5% ve back axle 3.3%.

breakdowns in the survey results according to the tractor main organs, the breakdown ratios; they were seen to be as motor 26.1%, electrical system 22.8%, steering system 11.2%, Hydraulic lifting system 10.7%, transmission 6.6%, clutch 6.4%, front alignment

Table 5. Breakdown ratios of the tractor main organs according to the farmer, service and spare part dealer surveys

	TOTAL POINT	BREAKDOWN RATIO (%)
MOTOR	3.509	26.1
CLUTCH	863	6.4
TRANSMISSION	893	6.6
BACK AXLE	443	3.3
BRAKE	527	3.9
STEERİNG	1.509	11.2
HYDRAULIC	1.433	10.7
ELECTRICAL	3.070	22.8
BODY SHELL	470	3.5
FRONT ALIGNMENT	734	5.5
TOTAL	13.451	100.00

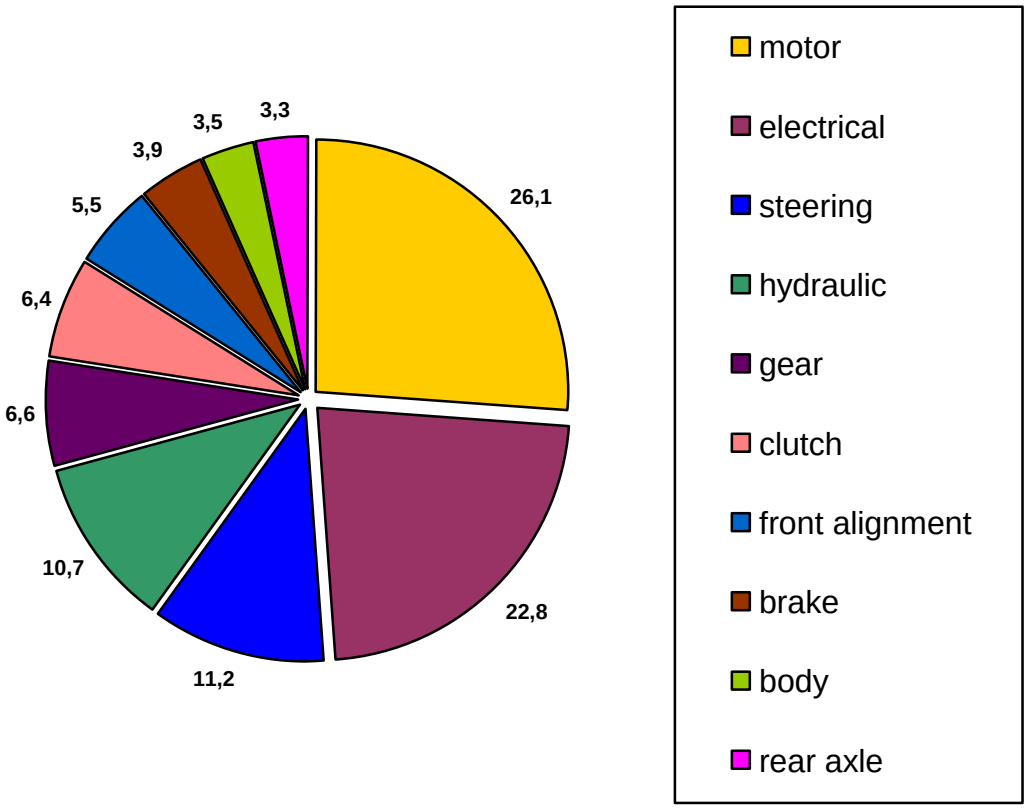

Figure 7. The distribution of the breakdowns according to the tractor main organs pursuant to the survey results (%)

The breakdown ratios according to the tractor records coming to the service workshops have been given in Table 6. When the records of the breakdown results were examined for the tractors coming to the service for maintenance and repair, the ratios were 28.6% motor, 24.9% hydraulic, 11.1% steering, 8.3% transmission, 6.3% electricity, 6.2% front alignment, 5.6% brake, 4.4% back axle, 3.9% clutch and 0.7% body shell.

Table 6. The breakdown ratios according to the tractor service workshops records.

	Breakdown Number	Breakdown Ratio (%)
MOTOR (4,6,11,12,16)	421	28.6
CLUTCH (9)	58	3.9
TRANSMISSION (3)	122	8.3
BACK AXLE(18)	64	4.4
BRAKE(13)	82	5.6
STEERING (1,7)	163	11.1
HYDRAULIK (10,17,19)	366	24.9
ELECTRICAL (2,8,14,15)	92	6.3
BODY SHELL (20)	10	0.7
FRONT ALIGNMENT (5)	91	6.2
TOTAL	1.469	100.00

At the end of the Survey and Service studies; in total, it is seen that the following breakdowns have the greatest share with 70.8% ratio Motor, electricity, steering and Hydraulic breakdowns.

According to the information obtained from the producer firms, especially the breakdown ratios in the tractors within the guarantee change according to the years. The producer firms perform works directed towards customer satisfaction by making rehabilitations in the parts in which breakdown density is high. Hence, it is seen that the density of the breakdowns seen in the early years decrease in the recent years.

Tractor operation cost

In a study made in the United Sates, in order to calculate the cost of a tractor to a farmer, it is assumed that the tractor operates 500 hours annually and that its economic usage life is 10 years. The annual inputs of the tractors according to their Powers have been calculated. Moreover, 75-87 BG (horse power) dual thrust tractor and 100-125 BG (horse power) track type tractor have been chosen (FARMWEEK). If we analysis the tractor operation costs given in Table 7, it is seen that the repair and maintenance constitutes a serious input in a ratio of 22.7%.

Table 7. Tractor cost analysis

	57-66 BG	**75-87 BG**	**100-125 BG**	**RATIO (%)**
Purchasing Value	15.000	22.500	47.500	-
Capital Gain / Interest	730	1.080	2.285	22.7
Wear and Tear / Loss in Value	1.200	1.800	3.800	37.7
Taxes and Insurance	175	220	335	3.3
Repair - Maintenance	750	1.125	2.375	23.6
Fuel and Oil	530	925	1.280	12.7
Annual Cost	3.375	5.150	10.075	100

NOTE: the numbers have been chosen as the US dollar

According to the data taken from the services in which the survey study was made, the annual repair, maintenance and spare part costs for an average tractor were determined to be between 500 - 2500 US dollars. When the weighted average mean values are taken into consideration, it has been determined as 1500 dollar/tractor. According to the figures of 2002, the purchase price for a new tractor is between 12.000 and 30.000 $. From this point of view, when we compare the tractor purchase values and the repair and maintenance costs are compared, the annual repair, maintenance and spare part costs for the tractors which are sold in the Turkish market are between the ratios of 4-9%. The fact that, in the conditions in Turkey, the tractor life is 20 years which can be considered to be a very long period has been taken into consideration in the calculation. However, the negative effects of an old tractor park on the Turkish economy will be inevitable in the following years.

Discussion

According to the results of the survey made; the ratios happen as the motor breakdowns 26.1%, the electricity system breakdowns 22.8%, steering system breakdowns 11.2%, Hydraulic lifting system breakdowns 10.7%, transmission breakdowns 6.6%, clutch breakdowns 6.4%,

front alignment breakdowns 5.5%, brake system 3.9%, body shell 3.5% and back axle 3.3%. According to the tractor records that come to the service: breakdowns are in the ratio of 28.6% motor, 24.9% hydraulic, 11.1% steering, 8.3% transmission, 6.3% electricity, 6.2% front alignment, 5.6% brake, 4.4% back axle, 3.9% clutch and 0.7% body shell.

When these breakdowns are examined; Motor breakdowns mostly because of improper oil usage during the periodical maintenances, (some farmers were used same oil in motor and transmission), filter change (especially, cheap and improper filter usage), cheap fuel (especially fuel oil found in diesel fuel widespread manner in our region and it has been brought from Iraq) and antifreeze in the radiator (especially many farmers said that they were preferred to put antifreeze and then add pure water in coolant of radiator, because antifreeze increases temperature of radiator coolant in the summer).

Some of the hydraulic breakdowns are caused by using wrong or improper equipment for required pressure level so they can cause oil leakages in the system.

Most of the electricity breakdowns are caused by the battery faults from the leakage current, the sources of leakage current are ; oxidation of battery lead terminals, improper assembly of cables, displacement of indicators and devices due to vibration shocks because of field roughness.

Among the reasons of the brake system breakdowns, shifting the gear to neutral frequently down the slopes, poor connection or lose connection between the trailer and tractor during working on glacis.

Clutch breakdowns are also shifting the gear to neutral frequently down the slopes like the brake breakdowns, and pressing on the clutch pedal continuously in a way that is called half clutch.

It is a known that most of farmers do not give attention to obey the rules about tractor usage. Therefore, some of farmers are paid value varying between 15 – 30 thousand dollars for their tractor's heavy repairs and maintenance costs.

Mostly seen situations on improper usage of tractor are; Age of the drivers (most of them are in childhood age who are not qualified), ignoring cleaning of parts in contact with the soil, insufficient maintenance because of the fact that they are used in the fields, greater amount of wheel wear due to sliding of tires on stony areas on the field, increased motor revolution per minute requirement due to excess sliding of worn wheels into field area therefore more fuel consumption and decreased motor life, choosing improper power capacity of tractor for agricultural applications on field area (generally four wheel drive tractors are preferred in last years), choosing tillage equipment which is smaller or larger in scale for agricultural operations, mostly regret the usage rules suggested by the producer firm, using improper consumption materials (oil, filter) instead of materials recommended by the producer, mostly preferring unauthorized services for less amount of bill, mostly preferring OEM parts instead of original spare parts in the repairs and maintenances, insufficient tire pressures and overloading, preferring the trailers which has no trailer brakes, use of tractors for every purpose.

References

Yaylagül, H.H., 1994. Harran ovası işletmelerinde makina kullanma durumu ve geliştirme olanakları üzerine bir araştırma. Atatürk

Üniversitesi, Fen Bilimleri Enstitüsü, Erzurum.

Sabanci, A., A. Başçetinçelik, I. Akinci, and A. Işik, 1996. GAP bölgesinde tarımsal mekanizasyon planlaması (entegre proje), T.C. Başbakanlık, Güneydoğu Anadolu Projesi, Bölge Kalkınma İdaresi Başkanlığı, Ankara. Çukurova Üniversitesi, Ziraat Fakültesi, Güneydoğu Anadolu Projesi (GAP) Tarımsal Araştırma ve İnceleme Paketi, Proje Bileşeni No:5.7.2, GAP Yayınları No: 98, Genel Yayın No: 157, Adana.

Işik, A. and İ. Atun, 1988. agricultural structure and mechanization characteristics in şanlıurfa-harran plain. Turkish Agriculture and Forrestry Bulletin, TÜBİTAK, 22(2), s: 151 – 160.

Özgüven, F. and Y. Karşigil, 1997. Şanlıurfa-Harran ovasında tarımsal yapı ve mekanizasyon özellikleri. Türk Tarım ve Ormancılık Dergisi, Tübitak, 22(2), s: 151 – 160.

Şahin, S. and A. Işik, 1997. Tarım makinalarında yenileme zamanının belirlenmesine yönelik bilgisayar programının geliştirilmesi. Tarımsal Mekanizasyon 17. Ulusal Kongresi. Tokat, s: 830 - 838.

Farmweek, 2000. Monthly agricultural bulletin, Number : 28, London.