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The Recent Status of Turkish Mechanized Farming Towards the Integration Process of the European Union

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Abstract: This study was carried out in order to reveal the agricultural mechanization potential of Turkey, who has been trying to integrate with the EU to establish the current problems in agricultural mechanization and to find permanent solutions to those problems. In this study, the recent agricultural mechanization data and the values regarding the mechanization index are compared to the ones of the member states and candidate states of the European Union. A significant structural variation has been observed in Turkey's agriculture however the current agriculture and mechanization potential is much better than many candidate states to be integrated with the EU Generally, the data regarding the western regions of Turkey are higher than the ones belonging to the member states of the EU and the candidate states if you consider the situation in the mechanization process.

Key words: Turkey, Turkish mechanized farming, EU integration, mechanization, agriculture

INTRODUCTION

The most important resources for agriculture are labor, land and water. With worldwide population increases and industrialization, land and water have become constraints for further agricultural development. Some developing countries started to use new methods to quantitatively integrate agricultural, environmental and socio-economic aspects of agricultural land based on explicit design objectives (Dogliotti *et al*., 2004). In the past 40 years starting from the first development plan, the indexes have also rapidly changed in Turkey, who has been continuing to apply the development plan systematically and the member countries have been in great interest towards those indexes. Since the establishment of the Turkish Republic, one of the most rapidly changing indexes has been agriculture in this reformist country (Evcim, 2000; Saglam and Akdemir, 2002). In spite of the fact that the Turkish agriculture differs from the one in the member countries of the EU, some improvements conforming to the European standards have recently been observed in the Turkish agriculture with the new laws, regulations and their applications.

After the negotiations on the structure and the regulations of the integration of Turkey with the EU, it was noted that the Turkish agriculture is far more different from the ones of the member states. Despite this fact, some improvements conforming to the EU standards have been observed with the decisions taken and the laws put into effect. Even though the agricultural production and the workforce potential are higher in Turkey than any of the member states, she has confronted with some agricultural problems (Kasnakoglu *et al*., 2000; Zeren, 1996; FAO, 1995). The basic reasons for that are the weak planning policies and the growing population forcing the current equilibrium. When the republic was first established Turkey was a real agriculture country. But in time due to the population growth and

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the missing parts of the Law of Ownership, the production fields were reduced. So this caused immigration to big cities and the agricultural fields were not used gradually. Thus while the area of the lands used for the agricultural activities were increased by some measures in the member countries, the situation in Turkey is vice versa. Due to the immigration from rural areas to cities, the uncontrolled and unplanned urbanization process has become rapid and due to the destruction of the sources which the rural economy is based on, the agriculture sector has faced the danger of losing its power.

When the republic was established the rural population was 10.3 million and that was 75% of the nation's population (SPO, 2000). However the rural population has become 24 million and it is now 32% of the nation's population. During the years between 1990 and 2004 millions of people emigrated from rural areas to immediate cities, so the urban population increased by 65%. So this percentage hindered the planned foundation services and increased education and health problems. Today 44% of 68 million Turkish people live in the cities and 24 million people live in rural areas. The statistical data received through the years have proved that the national population growth rate is 1.8%; the urban population growth rate is 2.7% and the rural population growth rate is 0.4%; the employment rate of the agricultural sector has been 34% for quite a long time, however despite the high percentage of this rate the Gross National Product rate is 11.2% (calculated by current prices in 2004).

The term mechanization has previously been understood to be the application of mechanical engineering to agricultural production. This definition is too limited, a fact which may explain many of the failures of the past. Agricultural mechanization has the principal aim of increasing land productivity by increasing labor productivity and decreasing other production costs (Twomlow *et al*., 2002). Mechanization planning requires the quantitative assessment of a mechanization index and its impact on agricultural production and economic factors (Gyanendra, 2006). In this study the business and mechanization data concerning the rural areas in Turkey, who has been in the integration process with the EU were controlled and those data were compared to the data of the member states. This comparison enables the discussion of the mechanization problems of the country's agriculture. In this way the proposals made to solve those problems would bring the basic data concerning the modernization of the country's agriculture into action.

The Structures of The EU and Turkish Agriculture and the Mechanization Process

For the past 30 years there have been no significant changes in the size of the total agricultural lands. However the number of fallow lands has decreased whereas the number of orchards and vegetable gardens has increased. So this situation shows that fallow lands have been transformed partly into orchards and vegetable gardens. In general, the use of tractor farm technology is increasingly becoming important among smallholder farmers mechanizing smallholder crop production systems in most developing countries (Panin, 1995). One of the main problems of the agricultural mechanization is investing wisely in farm equipment and making good use of them. Indeed, in any country, suitable machinery management is a very common problem and there have been a number of research studies to optimize those factors involved in the selection of agricultural machinery (Henning *et al*., 2004). If you consider this subject relating to mechanization, one of the most important factors affecting the mechanization planning are the number and size of the agricultural businesses in Turkey and the number of the pieces of plots belonging to those businesses.

It can be seen some striking results when we compare our data concerning the agricultural mechanization standards to the similar standards of the member states in the global world. The most striking one is the active population rate of the agricultural lands in the member states is 10% of the total active population, whereas it goes up to 32% in our country. For that reason Turkey has to decrease the active population of the agricultural lands to a rate of 10% despite its population growth rate: 1.8%. When we consider this in aspect of agricultural workforce, we can see a more significant

decline than it is expected. And this figure obliges a more balanced plan to meet the mechanization requirements in the agricultural sector. A decline in the agricultural workforce is balanced by an incline in the workforce of industrial and service sectors. Today when we rate the workforce among the country, agriculture takes a 35% share, industry 24% and the service sector takes a 41% share. When the data of the 15 EU member states are compared, the employment rate in the agriculture sector is 6%, in the industrial sector is 32% and it is 62% in the service sector.

The surface area of Turkey is 780,000 km^2 and she has significant acreage of rural areas. If we consider this acreage the rates are as follows: the rate of the arable cultivated lands is 22.8%, meadow and pasture lands is 21.8%, woodland and public gardens is 28.9%, fruit and vegetable growing lands is 4.9% and fallow and uncultivated lands is 23%. When we consider the number of the agriculture businesses, we can see the distribution of these businesses on 9 agricultural areas according to the size of the businesses and land assets and the mechanization data are summarized in Table 1.

According to Table 1 on which the distribution among the agricultural areas was done by considering the climatic differences, agricultural businesses who have a smaller acreage than 100 one-tenth hectares cover the rate of 84% of the whole country's agricultural businesses. Businesses having bigger acreage than 100 one-tenth hectares cover the rate of 16% of the whole country's agriculture businesses. If you consider businesses having the acreage from 50 up to 200 one-tenth hectares according to the farmlands and hobby sites, they can be considered as family businesses. These businesses are so common throughout Turkey and take the rate of 45% among others. Businesses having the acreage of 20 one-tenth hectares give priority to fruit and vegetable growing and those businesses are not considered to lead a long business life. So to wind up businesses in Turkey are usually categorized as small businesses and when considered regionally they are usually gathered in the western regions.

Some interesting results can be seen in the distribution of regions where agricultural production is carried out intensively by the above-mentioned businesses. When you take the whole country into consideration nearly 90% of the fields (totally 185 thousand square-kilometers) used for the agricultural production by agricultural businesses are used by the small businesses having less than

Table 1: Mechanization data for Turkey

Farm	Provinces									
size (ha)	1	2	3	4	5	6	7	8	9	Nation
	The No. of farms according to the agricultural provinces in Turkey Farm size									
No land	4080	4329	4556	7260	3677	19034	700	6378	4307	54321
<0.5	9475	30807	8944	31606	4929	20442	50960	9116	11612	177891
0.5-0.9	19062	65497	12197	45980	9890	23321	84253	17467	12661	290328
1-1.9	45428	111075	34690	69345	23133	44904	141094	44966	24873	539508
2-4.9	96331	190301	84138	111050	49375	69965	178132	107604	63646	950542
5-9.9	80878	92362	56040	53744	48148	53820	62743	57780	54490	560005
10-19.9	63030	31644	26629	27367	35136	39964	20710	30055	52792	327327
20-49.9	32530	7599	9493	12862	14652	27723	2758	13031	33040	153688
50-99.9	3461	408	1541	1617	1222	5121	230	446	3382	17428
100-249.9	624	112	208	477	53	2026	18	368	313	4199
250-499.9	34	3	4	77	0	104	0	0	0	222
>500	23	5	2	9-	2	5	2	4	4	56
Total	354956	534142	238442	361394	190217	306429	541600	287215	261120	3075515
	The No. of tractors									
No. of tractors	165398	219101	130963	102528	25700	40496	73220	80198	132429	970033
Used land (1000 ha)	4913.7	1905.0	1438.8	2110.1	1459.7	3253.7	1103.2	1985.1	4998.1	23163.4
Tractors/1000 ha	33.7	115.0	91.0	48.6	17.6	12.4	66.4	40.4	26.5	41.91

1: Midnorth, 2: Egean province, 3: Marmara region, 4: Mediterreanen, 5: North East, 6: South east 7: Black Sea Region 8: Mideast, 9: Midsouth

50 ha. In many regions, especially in the south-east Anatolia, agricultural processing is done in lands having the land of 50 hectares or more and the rate of the businesses having the land of 500 ha and is 2% in the whole country. In Table 1, businesses that process intensive agriculture and the distribution of lands are shown.

One of the indicators of the development stage of a country's rural areas is simply the mechanization standards. There are basically three criteria to establish the mechanization standards:

- Production standards of tractors and other farming equipment which are the power of the agriculture in a country,
- International market share of this production and power or energy spent per unit,
- Number of the tractors per 1000 hectares.

The mechanized farming in Turkey started fifty years ago and if we have a look at the data in recent years, we can see that the number of the tractors is almost 1 million, the power rate is 1.5 kW ha^{-1}, the number of the tractors per ha is 42 and the number of the tractors for an average of 1000 businesses is 315. The number of the pieces of the equipment per tractor is 1 heavy plough and 1 trailer. The number of the other pieces are lower than 1.

The age, maximum usage life and power are also the important parameters as well as the number of tractors. The tractors used in our country are 16 years old on average and 34% of the tractors in the tractor park covers 20 years old or above ones. The percentage of younger tractors having an age up to 10 is 36%. The mechanical life of tractors, when we talk technically, is 12000 h and if we think that the average usage of them is 600 h $year^{-1}$, the mechanical usage life of the 34% of the tractors in the machinery park is over.

The power of the tractor per 1000 hectares with which the mechanization standards are also established and the values of the farmlands where mechanized farming per tractor is done can be seen in all the regions in Table 1. The average power of tractors used in farming is about 40 kW although it has made small differences in years. So as you can see on Table 1, the mechanical power or power rate spent for the agricultural production per hectare in Turkey is 1.5 kW and the number of the tractors per hectare is 42. When 9 agricultural regions are compared to each other on Table 1, the mechanization standards are higher in the Aegean region.

When the data of the 15 EU states are studied on Table 1, we can see that Germany, Spain, France and Italy have great potential for agriculture in aspect of the acreage of their rural areas. Generally speaking, 140383 hectares of the lands of total 70 million hectares are used for agriculture. So this is only 2% of the total acreage of the lands. So when we consider the candidate states in the Union as well 12% of the lands will be used for agriculture. Among the candidate states of the Union, Turkey has got the largest farmlands so she will make great contribution to the Union in this aspect. In other words without Turkey the rate of the farmlands of the Union with its 31 members and candidate states is 14%, however when Turkey is included the percentage rises to 16.

First of all when we consider the data of the farmlands and the mechanization in farming of the Union states, the data of Spain is similar to of Turkey. The acreage of the lands per tractor in the Union states is 20 ha on average, whereas this is almost the double value for Turkey. As you can see on Table 1, the farmlands of 8 candidate states of the Union has much smaller values than of Turkey, however their ha/tractors rate is higher than Turkey's ha/tractors rate average and kW/ha^{-1} rates of those states are much lower than the Union's average (Table 1).

When we consider the candidate states of the Union, the mechanization index values per hectare in Turkey are similar to the data of the member states; Spain and Greece (Table 2). On the other hand, her kW ha^{-1} rate is higher than the 8 candidate states and lower than 6 candidate states. So when we categorize generally Turkey is on the 22nd line; when the acreage of farmlands is considered, she comes first; and when we consider ha/tractors rate she is on the 23rd line.

Table 2: Mechanization data for EU and Candidates countries (FAO, 2000)

Country	1	2	3	4	Country	1	2	3	4
Austria	330	3397	10.3	3.9	Cyprus	17	136	8.0	5.1
Belgium	96	1394	14.5	2.8	Norway	130	1036	7.9	5.1
Denmark	123	2658	21.6	1.9	Iceland	11	2281	207.0	0.2
Finland	194	2246	11.6	3.5	Latvia	55	2471	45.0	0.9
France	1264	29690	23.5	1.7	Lithuania	102	3484	34.2	1.2
Germany	944	17008	18.0	2.3	Poland	1371	16169	11.8	3.4
Greece	255	8431	33.0	1.2	Check Republic	91	4270	47.0	0.9
Ireland	155	4370	28.1	1.4	Slovakia	23	2438	106.0	0.4
Italy	1680	15074	9.0	4.5	Hungary	113	5866	51.9	0.8
Luxembourg	-	128	-	-	Romania	169	14717	87.1	0.5
Netherlands	149	1930	12.9	3.1	Switzerland	107	1525	14.2	2.8
Portugal	169	3748	22.2	1.8	Serbia	324	5595	17.3	2.3
Spain	944	30185	32.0	1.3	Herzegovina	29	2148	74.1	0.5
Sweden	165	3166	19.2	2.1	Bulgaria	31	5326	171.8	0.2
Britain	500	16956	33.9	1.2	Turkey	970	39180	41.9	1.5
EU (15)	6968	140383	20.1	2.0					

1: Number of tractors (thousands), 2: Farm land (thousand ha), 3: 1000 ha/tractors (thousands), 4: Power (kW) per ha

RESULTS AND DISCUSSION

The agricultural lands are becoming smaller because of the division of properties and lands with which the Inheritance Law agrees and the dense population working in the agriculture sector. Those lands have been ruined in time so that has affected our mechanized farming in a negative way. One of the most significant problems in Turkish agriculture is this problem. Making reasonable regulations in the Inheritance Law, expanding the studies on the gathering of lands will solve the problems to be encountered in the use of lands in mechanized farming and mechanization economy.

Two of the mechanization problems in the country are firstly the decrease in the number of agricultural businesses and secondly insufficient studies to be done about the modernization of those businesses. Most of the agricultural businesses are small-scaled ones and the machines in their machinery places are economically overworked and worn out. So the use of those machines in farming lowers the production quality and the production quantity per unit and besides it increases the cost of the production. Therefore the choice of the mechanization tools which include the technical, economical and social aspects of agricultural businesses in different types and sizes and developing new models and benefiting (Glancey *et al*., 2005) from them in real life should be fulfilled in a very short time. The legal regulations to be made to motivate the modern production techniques in the agricultural activities and long-lasting agricultural practices will decrease the energy and workforce costs in agriculture and will spur environment-friendly activities.

Using new and repaired farming machines needs high investment amounts. One of the most significant regulations is the adoption of the machinery ring and common machine designs used in the developed countries. When we consider the subject in this aspect, the establishment of the legal mechanization organizations which will enable the common usage of machinery regarding the agricultural production programs the record of the machinery parks in businesses after the regulations are made and the statistical studies about the tractors in traffic are some of the several studies that should be carried out by authoritative associations. The cumulated data should be transferred to the data base.

Reaching high standards in mechanization in agriculture starts with the increase of the capacity usage rates in tractors which are considered as power sources (Gifford, 1980; Clarke, 1997). Though the mechanization data are more than any candidate EU state, the mechanization is not at a desired level because of the inappropriate farmlands and the high average of the tractors when compared to the developed countries. Any kind of support should be given to produce tractors having a power rate smaller than 36 kW and bigger than 75 kW in Turkey (FAO, 2000) and any kind of study about

agricultural activities should also be supported. The use of low-capacity tractors in agricultural production affects mechanized farming in a negative way and brings forth some other problems like the quality in farming, the cost of this and using work and workforce in a wrong way. Research and development studies that make variation in farming machines, especially in animal-breeding mechanization must be done and the projects and designs of the machines to be used in farming should be fulfilled.

The production number of farming machines in mechanization is a favorable criterion. However for various business fields, farming machines with different functions are desired to be used. For that reason, it is an important criterion for a tractor to have ten different pieces of equipment and machines having various specifications in multicultural farming in the international concept. When the subject is taken into consideration in this aspect, international goals are not achieved in regions even where the multicultural farming is carried out. In order to reach the desired standards in mechanization in the country, investments should be incited, cooperation in international projects and production technologies should be done, improvement in competition circumstances should be reached by healing standardization and quality problems and last but not least, problems in marketing should partly or completely be abolished.

One of the significant problems of the production industry of farming machines is the marketing problem. The demand for tractors and farming machines and equipment by the internal market differs greatly in short terms. Demand variations that will affect our farming machines' production industry are the results of the rapid and unexpected changes in agricultural policy. The impacts caused by those negative results would partly be abolished if the medium-termed production plans and appropriate pricing policies were applied decisively.

So the protection of consumers on the national market is provided by the incitement of investments in the farming machines production whereas competition power on the international market is gained with the provision of quality guarantee in production. One of the positive factors that affect the quality is the standard and performance testing of the locally-produced farming machines. Research and development results can be observed with the help of those tests, so problems caused by quality and standards could be solved by establishing fully-equipped testing centers conforming to the EU standards.

As a result the integration of Turkey with the EU has increased our agricultural mechanization standards and has spurred those standards to reach the European ones. To attain the aimed quality and productivity in agricultural production and to catch the same standards as EU states in the mechanization index which is an indication in agricultural mechanization should be considered as soon as possible. Problems at every stage of mechanized farming in the forthcoming years could only be solved by fulfilling the above-mentioned suggestions and by applying conscious, decisive and long-lasting agricultural policies systematically.

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