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A research of determinants of structural transformation in agriculture in Turkey

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Problems of Turkish agriculture need a "structural transformation" and what to do for this purpose are frequently mentioned by the bureaucrats and scientists studying in the field of economy. However, the studies on this issue have been mainly theoretical and focused on a single subject. In this study, the issue was discussed with a holistic perspective, 92 public servants were interviewed and their opinions and assessments on the agricultural problems and need for "structural transformation" in agriculture were examined. In conclusion, the failure of ensuring income increase, ineffectiveness of agricultural cooperatives and rural education were identified to be the factors affecting the transformation.
Keywords: Agriculture, structural transformation, agricultural problems.

INTRODUCTION

Until the 1980s, Turkey was one of the few countries in the world which was self-sufficient. However, under the influence of the movement to liberalize the world economy, it saw an acceleration of opening up to the outside and privatization. The sector most affected by these developments was agriculture. Government institutions which had long performed important service in the agricultural sector began to be privatized from 1992, and this process continues, with the example of the sugar factories. The year 2000 was a turning point for "agricultural support": basic support policies were abandoned and a support model known as "Direct Income Support" was adopted, which was independent of production. This system continued until 2008, after which it was replaced by area-based support. In this process, the number of general support units increased, and it became more and more difficult to measure the effects of support. The most radical change in support carried out most recently was Turkey's evaluation in 941 catchments and a change to a system of basin-based support (TOB, 2019).

Relations and harmonization with the European Union have also necessitated changes and transformations in the economy and the agricultural sector as well as in social structure in Turkey. In this process, the strategically important agriculture law, seed law and bio-security law were passed. In addition, as a result of work to prevent the division of agricultural land and its further reduction, which are the main structural problems in agriculture and are seen as a significant hindrance to competitive strength, the Law on Making Changes in the Law on Soil Protection and Agricultural Land Use No. 6537 was passed in 2014. Other important areas of work were the strengthening of cooperatives and the foundation of the Farm Accounting Data Network, which analyzes policies by collecting micro-data to improve agricultural statistics and agricultural policies.

The first intervention for radical change in the structure of agriculture after the foundation of the republic and a general evaluation in Turkey began in 1945 with land reform. Later, it continued with revisions to land and agriculture reform, but these ended in failure. Finally in 2000, radical changes were made in the support system with the "Agricultural Reform Implementation Project" (ARIP), which was started as a result of an agreement made with the World Bank (Oyan, 2009). This project began with great expectations as an agricultural reform, but in fact it was only the beginning of a solution for agriculture in Turkey. One of the aims of the project, the restructuring of the Agricultural Sales Cooperative, did not bring about a positive change. ARIP solved no problems in agriculture and structural problems continued to mount up.

This process of solving problems in the agricultural sector came on the one hand from globalization and on the other from the particular characteristics of the sector in Turkey. Comparing the agriculture sector in Turkey with that of advanced countries such as the EU and the USA, it is seen that there are significant structural differences. The most important of these are that the average size of a farm is very small compared to the EU (14 ha) and the USA (178 ha), and that agricultural activities are performed by unpaid family labor (Eurostat, 2019; USDA, 2019). Aside from this,

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population pressure in agriculture, and particularly deficiencies or weaknesses in economic organization, have emerged as other important structural differences. In addition, the use of technology has remained at a low level because of an inadequacy in the accumulation of capital in agriculture (Demir and Kuş, 2016).

In Turkey, agricultural production activity provides employment for approximately 5.3 million people on three million farms, forming approximately 9% of GDP (gross domestic product) and 18.4% of employment. According to data from 2018, 55.6%of those employed in agriculture were men, and 44.4% were women, and approximately 46% of those employed were unpaid family labor, of which 35.5% were women (TÜİK, 2019).

Farm numbers and employment are important variables in structural transformation in agriculture, and the natural conditions of Turkey increase the variety of crops, while technological conditions and the structural condition of farms affect the demand for labor. The average size of a farm in Turkey is 6 hectares: 65% of farms are under 5ha in size, and 84% have an area of less than 10 ha. (TÜİK, 2019). Insufficient capital causes the use of input and use of technology to be at a low level, the size of farms to remain small, and a labor-intensive production system to remain widespread (Keskin and Dellal, 2010). As well as a diversification in the use of mechanization in terms of production systems and diversity of products, the number of tractors per 1000 hectares has risen by 2.5 times in the last 30 years (Keskin and Dellal, 2010; TUİK, 2019). However, it is debatable how much this increase has been positively reflected in production. Another important variable in structural transformation in agriculture has been shown to be a reduction in population in the sector. With the metropolitan law which came into force in Turkey in 2014, the administrative structure changed, and as a result, the status of most villages was reduced to that of neighborhood. This change reduced the number of villages from 34 247 in 2010 to 18 335 in 2015. In this way, because units of settlement conducting agricultural production were now counted as neighborhoods, the village population after these recent changes showed a rapid decrease from 22% to 7.7% (TÜİK, 2019). However, this is not so much a true reduction as a change in administrative structure.

Changes in agricultural policies and agricultural structure cause changes in production and trade: between 2001 and 2018, the agricultural area shrank by 7.7%, with only land producing fruit, drinks or spices increasing by 32.6%. In the same years, the number of cattle increased, but there was a decline in sheep and goat keeping, for which Turkey is especially suited, of 9.9%. Also, there was discussion of the import of agricultural products and especially between animal rearing and meat imports. In this time, the population of Turkey, which must be fed reliably and healthily, rose by 23.3% to 81 million (TÜİK, 2019). Along with this increase, Turkey found itself under a wave of immigration because of various crises and wars in the Middle East, and was obliged to take care of refugees whose numbers have been stated to be 3-5 million.

Despite many advantages, Turkey's agricultural sector has significant problems. Many of these are structural problems: the small size of farms, population pressure in agriculture, producers not playing an active role in the market, and in particular, weakness or ineffectiveness of economic organization TOBB, 2013). Although the cooperative movement has a long history in Turkey, it has not shown the desired development and effect in agricultural markets. The share of cooperatives in the agricultural market has remained at 2%, and that of farms producing agricultural crops at between 1% and 10% (Özdemir *et al.*, 2011; Böge, 2018).

Descriptive and empirical studies have shown that agriculture has deep and multi-dimensional problems. For this reason, it is necessary to make radical changes in agriculture in order to find a solution. However, how and in what areas these changes and transformations need to be carried out must be determined by the particular dynamics of the country concerned. Because "agricultural structure problems" are made up of many different economic, social and institutional elements (Orman *et al.*, 2010), it is necessary to make an in-depth examination of the topic with stakeholders in the sector in order to be able to look at these complex problems as a whole, since statistical data is inadequate. This study focuses on how technical personnel serving the public area of the agriculture sector assess the problems in agriculture and a structural transformation in agriculture. An examination is made in this context of whether they see a structural transformation in agriculture as necessary and how it will be carried out.

MATERIALS AND METHODS

The main material for this study consists of data gathered in a questionnaire from technical personnel working in the public area of the agriculture sector. The questionnaires were given by face-to-face interview in January and February 2019. A total of 98 questionnaires were given, but six were not included in the assessment. The questionnaires were applied to persons working in various units in the public sector. In this way, it was possible to evaluate the views of educated people in different areas of agriculture. Also, national and international studies or research relating to the topic were examined in the study. Use was made of publications, reports and statistics from relevant institutions and universities. In the analysis of the data obtained in the questionnaire, descriptive statistics, frequency distribution and percentage distributions were given in the first stage. Views, attitudes and behaviors on problems and solutions were evaluated in the study by means of a five-way Likert attitude scale. Factors affecting

structural transformation were determined by logistic regression analysis.

***Structural Transformation In Agriculture*:** With the conditions of increasing liberalization and competition in the world, economic, political and financial crises have caused many problems in all sectors, including that of agriculture. Securing a sustainable agriculture sector with strong competitive capability is the objective of all countries. However, the way to achieve this must be different from one country to another because of the different conditions in each country. In the world in general, changes are being experienced because of the aging of the rural population, migration to the cities, political constraints, conditions imposed by world policies, the characteristics of the agricultural market, the necessity for economic thinking and consumer behavior (Kaiser, 2007).

The concept of "structural transformation in agriculture", which appeared with the beginning of the industrial revolution, has been discussed for many years, and it has been generally stated that as farms sizes have increased, their numbers have fallen (FAT, 2006; PECO, 2010; Gindele *et al.*, 2015; Gindele, 2016; Odening and Hinrichs, 2019). Although the concept of structural transformation in agriculture seems similar to the concepts of structural accommodation, structural breakdown and structural crisis, it is assessed differently from these, and many definitions were found in the literature (Lauber, 2006; Hofer, 2010; PECO, 2010). According to some definitions, it is understood as the relationships which can be statistically determined by technical, economic and social structural elements in a particular time and a particular region, and according to others, it is stated to be change in the intensity of production structure and production factors, and changes in the composition of land, workforce and real capital (Lauber, 2006). From the point of view of the workforce, the steady decline in the numbers of those working in agriculture and the importance of professional and geographical mobility for the creation of new employment opportunities for them has been emphasized (PECO, 2010). The most general indicators of "structural transformation" are an increase in productivity as a result of the use of advanced mechanization by farms, increased size of farms or an increase in the productivity of the workforce, a move from agriculture to industry and a limited increase in demand for foodstuffs, and strong price pressure arising from declining trade (Hofer, 2010; Gindele, 2016; Odening and Heinrichs, 2019). Yakışık and Fikirli (2015), stating that the most important problems appeared in the process of structural transformation, reported that the transformation sectors' share of employment and GDP were a direct inversion from agriculture to industry and services.

Economic and political conditions will not reduce pressure on producers in the future any more than in the present, but rather will increase it. This shows that "structural transformation" in agriculture is still incomplete (Hofer, 2010). However, the question which must be asked here should be how big farms will get, how much their numbers should fall, and by how much the agricultural workforce is going to be reduced. Acar (2008) has stated that the relative importance of the agricultural sector in Turkey has declined, the same situation is seen in employment, and when it is thought that the increase in per person added value in the agriculture sector is approximately 1/4, the move of sources from agriculture to other sectors is positive in terms of productivity. Another important topic is only comparing sectors in terms of productivity and how a balance should be achieved between sectors going from low-productivity sectors to sectors with high productivity. This is because in the agriculture sector, even if productivity is low, what distinguishes it from other sectors is that it must remain in production in order for a country to ensure its independence and food security. One of the important principles of countries' agricultural support programs is the maintenance of food security at a level which will provide independence with regard to agricultural production and in order not to suffer difficulties in emergency situations (Acar, 2006; Yıldız *et al.* 2017). Also, the constant reduction in the share of the sector in macroeconomic indicators and the wealth of the sector must be investigated.

***The problems of agriculture*:** The average size of a farm in Turkey is 6 ha; 67% of them both grow crops and keep animals, and only 3% specialize in keeping animals (Doğan *et al.*, 2015; TUİK, 2019). The small size and lack of specialization of these farms results in their having a lower income than other sectors. This leads to many questions, such as how small farms can acquire a development perspective, how they can achieve growth over time and become successful and stronger, and how they can improve their income prospects. These questions have long been the subject of scientific and political discussion (Petrick, 2007). In studies on the topic, opposing and supporting views of the positive and negative aspects of small farms are put forward, and it is stated that the main reason for the continued existence of these farms is the shortage of suitable employment possibilities outside agriculture (Petrick, 2007; Keskin and Dellal, 2010; Szumelda, 2011; Keskin *et al.*, 2017).

The most important characteristic of farms in Turkey is that in small family farms the size of the farms and the accumulation of capital are directly related, and that factors such as land division, too many people employed in agriculture, an inadequacy of employment opportunities outside agriculture, a low education level and rural population pressure are the most important hindrances to agricultural transformation. In addition to this, small farms continue to be weak in the market and have difficulty competing due to inadequacies in organization. In developed countries one or two intermediaries are involved in the marketing of agricultural products, whereas in Turkey the lack of producers' organizations and in particular cooperatives in the sector means that the number of intermediaries for

agricultural crops is four or five, and six or seven for animal products (Kıymaz and Saçlı, 2008; Orman *et al.*, 2010; Özdemir *et al.*, 2011).

To make a general assessment, in Turkey, where family farming is predominant, "difficulties with sourcing and obtaining raw materials, an aging population with children leaving the land, deficiencies in education and financing services and access difficulties, and little or no participation in the process of setting prices are among the basic problems" (tarimorman.gov.tr, 2014 in Keskin *et al.* 2017). "In addition to these, restrictions due to dependence on banks, political decisions and other sectors, global competition pressure and the opening of borders, the effects of climate change, migration to the cities, changing value judgments in society, inadequacy in defining the role of women, and pressure on the upcoming generation because of parental expectations can be mentioned as limiting factors" (ec.europa.eu, 2014 in Keskin *et al.* 2017). Turkey in general suffers from such factors as high production costs, inadequate education, inadequate organization and ineffectiveness of existing organizations on the market, inadequate cooperative awareness and sense of belonging, indecision in agricultural policies, and the excessive effect on producers of price fluctuations in the market (Orman *et al.* 2010; Özdemir *et al.* 2011). These "structural problems in agriculture" form from the interaction of many different economic, social and institutional elements (Osman *et al.* 2010). For this reason, statistical data alone is not enough to examine these complex problems as a whole.

RESULTS

Table 1 shows the characteristics of individuals participating in this study, which evaluated the problems of agriculture, solutions and the need for structural transformation from the point of view of the public sector. According to Table 1, 47.80% of the subjects were in the 36-45-year age group, 51.09% were male, 58.70% had 6-20 years of experience in the sector, 60.90% were agricultural engineers and 73.90% worked in central organization. The level of professional experience of those whose views were sought in the study was high, and this is important in that it shows their grasp of the subject. Also, not only agricultural engineers and veterinarians but also food engineers and other technical professional groups were included in the study. In this way, the views on the topic of different professional groups working in the agriculture sector contributed to the study.

Table 1. Questionnaire participants' characteristics.

Indicators		Frequency	%
Age	24-35	23	25.00
	36-45	44	47.80
	46-55	22	23.90
	56+	3	3.30
Gender	Female	45	48.91
	Male	47	51.09
Time working in the sector (years)	Less than 2	4	4.30
	2-5	10	10.90
	6-10	21	22.80
	11-15	14	15.20
	16-20	19	20.70
	More than 20	24	26.10
Place of employment	Urban	68	73.90
	Rural	24	26.10
Profession	Agri. engineer	56	60.90
	Food engineer	10	10.90
	Veterinarian	12	13.00
	Other	14	15.20
Postgraduate education	Yes	33	35.90
	No	40	43.60
	Ongoing	18	19.60
Desire for in-service training	Yes	71	77.20
	No	20	21.70

Table 2 and 3 show an assessment of agricultural problems and interventions which would achieve positive developments in agriculture. According to this, the most important problem is that inputs are expensive and there is no

Table 2. Evaluation of agricultural problems.

	Land area very small and divided	Reduction in animal numbers	Migration of young population from rural areas	Inadequate financing	Expensive inputs	Low agricultural product prices	Ineffective support	Losses in agricultural production	Ineffective-ness of cooperatives	Inconsis-tency in agricultural policies
Very important	49	30	51	30	59	33	40	20	44	63
Important	37	41	35	46	26	40	36	51	38	24
Undecided	3	10	3	8	2	8	8	12	8	2
Not important	1	7	3	4	1	5	6	6	2	2
Of no importance	1	3	0	2	0	1	2	0	0	0
Mean	1.53	2.01	1.54	1.87	1.32	1.76	1.85	1.98	1.65	1.36
Standard deviation	0.73	1.04	0.72	0.93	0.65	0.96	0.98	0.86	0.73	0.66

* 1. Very important, 5 of no importance; **Factors with a mean of more than 2 are not included in the table.

Table 3. Activities securing improvement in agriculture

	Production planning	Reducing costs	Increasing animal production	Economic organization of producers	Prevention of migration of young population to cities	Improving social security conditions	Effectiveness of cooperatives	Consistency in agricultural policies	Increased productivity
Very important	57	52	42	39	46	44	51	64	44
Important	33	33	43	43	35	4	31	22	39
Undecided	0	5	4	6	9	6	7	5	6
Unimportant	0	0	1	1	0	0	1	0	0
Of no importance	0	0	0	0	0	0	0	0	0
Mean	1.34	1.45	1.57	1.60	1.55	1.54	1.50	1.34	1.52
Standard deviation	0.519	0.635	0.668	0.712	0.701	0.653	0.719	0.598	0.671

*1. Very important, 5 Of no importance; **Factors with a mean of more than 1.6 are not included in the table

Table 4. Structural transformation in agriculture.

Is structural transformation in agriculture necessary?	**Frequency**	**%**
Yes	84	91.30
No	4	4.30
Other	4	4.40
How should transformation be carried out?		
By legal reforms	46	50.00
By education	51	55.43
By the wishes of the farmers themselves	21	22.83
By creating employment opportunities outside agriculture	12	13.04
Other	14	15.22
How should the unemployed workforce in agriculture be made use of?		
By directing them to other sectors like industry and construction	14	15.22
By creating job opportunities in the rural areas where they are	84	91.30
By directing labor to intensive agricultural activities	22	23.91
It cannot be made use of	1	1.09
By creating new opportunities for women	31	33.70
Other	3	3.26
What should be done first in the agriculture sector?		
Producer organization structure should be changed	11	12.00
Farm structure should be changed	8	8.70
Policies implemented in agriculture should be changed	54	58.70
Rural social structure should be changed	7	7.60
The structure of agricultural markets should be changed	9	9.80
Agricultural labor structure should be changed	1	1.10
Other	3	3.26
How can existing problems be minimized?		
By joining farms together	2	2.20
By shared use of farm assets	6	6.50
By developing research cooperation between the public and private sectors	3	3.30
By forming cooperatives	26	28.30
By reducing production losses	30	32.60
With well-informed producers	1	1.10
By removing excess labor from agriculture	13	14.10
By the use of technology	1	1.10
Other	9	9.78

* More than one choice was selected.

consistency in agricultural policies. This is followed by the small size and fragmented nature of farms and the fact that the young population is leaving the countryside. Activities to make improvements in agriculture, in parallel with the problems, were first to have consistency in agricultural policies, and followed by planning production and reducing costs.

In Table 2, the choices of soil fertility, an inadequate number of tractors, insufficient irrigated areas, lack of agricultural counselling, lack of machine parks, ineffectiveness of

chambers of agriculture and agricultural activities not being a prestige occupation were found not to be important and were therefore removed. In Table 3, some of the variables not given because they turned out to be less important were crops not being recorded (1.61), prevention by law of land division (1.67), increase in the price of crops (1.99), work to consolidate land (1.82), land improvement (1.76), irrigation work (1.84), digitalization in agriculture (2.03), an increase in women entrepreneurs in rural areas (1.97), a reduction in animal diseases (1.75), a reduction in the import of agricultural products (1.77), development of communication with rural areas (1.85), support for traditional products (1.93), increase in supports (2.27), the spread of the shared use of machinery (2.13), and an increase in entrepreneur producers (1.61).

According to these results, an increase in supports was found to be the least important factor among those reducing problems and securing positive development in agriculture. Along with this, support for traditional products was found to be more important than increasing supports.

The results obtained from this study also support other studies previously conducted on this topic. Sav and Sayın (2018) stated that long-term policies were needed for agriculture; agriculture in Turkey was steadily aging, and some of its important problems were its structure of small and fragmented land areas, inadequacy of producer organization, increase in input prices and a low education level. Doğan *et al.* (2015) and Yıldız *et al.* (2017) drew attention to a similar situation and it was reported in the study by Yıldız *et al.* (2017) that 93% of the farmers participating in the study saw increase in the cost of inputs as the most important problem. In an agriculture sector report prepared by TOBB (2010), it was stated that the most significant threat faced by agriculture was the inconsistency in agricultural policies. Aktaş and Tuncer (2010) stated that agriculture had problems with responding to the lack of consistency in policies, and that policies needed to be followed up in the long term.

The proportion of those who said that structural transformation was necessary in agriculture, 91.30%, was seen to be very high. Further, 55.43% of participants in the study stated that this should be done by education, and 50.00% by legal reforms. It was also stated that the unemployed workforce should be made use of by creating new work opportunities in the places where they were (91.30%). Things which were mentioned as necessary to change first in agriculture were the policies implemented (58.70%), the organization structure of producers (12.00%), the structure of agricultural markets (9.80%), and farm structure (8.70%). According to these results, farm structure, which is an important indicator of structural transformation,

Table 5. Reasons why structural transformation is needed in agriculture.

Reasons	Frequency	%
No progress in education of rural population (p<0.10)	***69***	***75.00***
Technology use at low level	54	58.70
No success in reducing population pressure in agriculture	27	29.35
No women entrepreneurs in agriculture	39	42.39
No success in adequately increasing income in agriculture (p<0.05)	***72***	***78.26***
No success in reducing farm numbers	34	36.96
Cooperatives not effective on the market (p<0.10)	***68***	***73.91***
Inadequate entrepreneurship in agriculture	59	64.13
Other	15	16.30

* More than one choice was selected.

Table 6. Logistic regression model results.

Variables in the Equation

								95.0% C.I. for EXP(B)	
		B	S.E	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1a	No progress in education of rural population	-2.745	1.626	2.850	1	0.091	0.064	0.003	1.556
	Technology use at low level	0.645	1.044	0.382	1	0.536	1.906	0.247	14.739
	No success in reducing population pressure in agriculture	0.342	0.923	0.137	1	0.711	1.407	0.230	8.599
	No women entrepreneurs in agriculture	0.670	0.990	0.458	1	0.499	1.954	0.281	13.605
	No success in adequately increasing income in agriculture	-4.182	1.459	8.213	1	0.004	0.015	0.001	.267
	No success in reducing farm numbers	0.966	1.181	.669	1	0.413	2.628	0.260	26.609
	Cooperatives not effective on the market	-3.239	1.841	3.095	1	0.079	0.039	0.001	1.447
	Inadequate entrepreneurship in agriculture	-0.919	1.216	0.571	1	0.450	0.399	0.037	4.324
	Constant	1.610	0.686	5.511	1	0.019	5.002		

a. Variable(s) entered on step 1

came low on the list of priorities (Table 4). It was stated that problems in agriculture could be solved with cooperatives (28.30%), by reducing production losses (32.60%), and by removing excess labor from agriculture (14.10%) (Table 4).
At the same time as saying that excess labor leaving agriculture was a positive development, people also said that this workforce should be employed by creating new work opportunities in situ. Also, another element which would create positive developments in the sector was shown to be cooperatives and the number of farms was not found to be important among the reasons why structural transformation was necessary (Tables 5 and 6).
Logistic regression was used to assess the relationship between structural transformation and the reasons why it was necessary. The model was significant at a level of 5%, and the variables in Table 5 explained 78.7% of the variance in structural transformation. It was concluded that 98.4% of the classification of data had been carried out correctly. According to the results of the Logistic Regression Model, inability to secure progress in the education of the rural population and the inability of cooperatives to be effective on the market were significant at a level of 10%, and the inability to secure an income increase in agriculture was significant at a level of 5% (Tables 5 and 6).

Conclusion: Turkey's shortcomings in the agricultural markets, its deficiency in organization, its deficiency in long term agricultural policies, its dependence on the outside and high costs in income and technology, the small and fragmented nature of its agricultural land, and rural migration and a fall in the young population are important strategic areas (TOB, 2019). In this study also, similar results were obtained on the topic of the problems of agriculture in Turkey and their solutions. Among the elements affecting structural reform in Turkey which were found to be statistically significant are an income increase not being achieved ($p<0.05$), cooperatives not being effective in the market ($p<0.10$), and education of the rural population ($p<0.10$). In contrast to the established opinion in agriculture, farm structure was found not to be statistically significant, and was low on the list of problems. From this, it appears that the main problems of agriculture which need transformation are that income increase has not been achieved, and an organization level has not been reached which would remove the disadvantages of small farms. The reason why income has not been sufficiently increased in the agriculture sector must not be seen as scale economy, because the inconsistency of agricultural policies (1.36) and expensive inputs (1.32) were found to be the most important problems. Other significant problems were the small size and fragmented nature of fields (1.53), the migration of the young population from the countryside (1.54), and the ineffectiveness of cooperatives (1.65).

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