ARAŞTIRMA MAKALESİ   RESEARCH ARTICLE

Examination of Soil Analysis Applications and Soil Analysis Subsidies in terms of Producers in Edirne and Tekirdağ Provinces

Edirne ve Tekirdağ İllerinde Toprak Analizi Uygulamaları ve Toprak Analiz Desteğinin Üreticiler Yönünden İncelenmesi

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Abstract

The aim of this study was to determine the differences and the importance of the differences in terms of some socio-economic factors and agricultural practices of the producers who had soil analysis in Edirne and Tekirdağ provinces and to evaluate the opinions of the producers about soil analysis and soil analysis subsidies. Three laboratories were selected among the laboratories with the highest number of sample acceptances for soil analysis in the provinces determined in the study. For each province, total of 60 producers who applied to the laboratories in 2015 and who utilized from soil analysis subsidies, and consequently, total of 120 producers were interviewed. The analysis of the differences of the producers who had soil analysis in Edirne and Tekirdağ provinces was determined by the regression tree model (CHAID analysis). According to the CHAID analysis, in which the provinces were taken as the dependent variable, it was seen that the first most distinctive feature was the state-supported agricultural insurance. Of the producers who stated that they did not have agricultural insurance, 31% were located in Edirne and 69% were located in Tekirdağ. It was seen that 56% of the producers in Edirne and 44% of the producers in Tekirdağ had agricultural insurance. The most important feature of the second node was the education level of the producers, the third sub-node decision point was whether the producers had training on fertilization, and the fourth decision point was whether the producers faced risks in agriculture in the last three years. The four most important reasons for the producers to have soil analysis in Edirne province were to increase the product yield, to reduce the cost, to increase product quality and protect the environment, respectively. In the province of Tekirdağ, the criteria of increasing the product yield was on the first rank, increasing the product quality in the second rank, reducing the cost in the third rank and protecting the environment in the fourth rank. It is expected that it will be beneficial to introduce soil analysis conditions to the producers at the stage of purchasing fertilizers, and thus to ensure that the producer purchases fertilizer by determining the type and amount of fertilizer to be disposed of according to the analysis results.

Keywords: Regression tree, Soil analysis, Soil analysis subsidy, Producer opinion

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Öz

Bu çalışmanın amacı Edirne ve Tekirdağ illerinde toprak analizi yaptıran üreticilerin bazı sosyo ekonomik faktörler ve tarımsal uygulamalar yönünden farklılıklarının ve farklılıkların önem düzeylerinin belirlenmesi ve üreticilerin toprak analizi ve toprak analizi destekleri ile ilgili görüşlerinin değerlendirilmesidir. Araştırmada belirlenen illerde toprak analizi için numune kabul sayısı en fazla olan laboratuvarlar arasından 3 adet laboratuvar seçilmiştir. Her il için 2015 yılında laboratuvarlara başvuran ve toprak analiz desteğinden yararlanan üreticilerden toplamda 60 üretici olmak üzere, toplamda 120 üretici ile görüşülmüştür. Edirne ve Tekirdağ illerinde toprak analizi yaptıran üreticilerin farklılıklarının analizi regresyon ağacı modeli (CHAID analizi) ile belirlenmiştir. İllerin bağımlı değişken olarak alındığı CHAID analizine göre, birinci en belirgin özelliğin devlet destekli tarım sigortası yaptırma olduğu görülmüştür. Tarım sigortası yaptırmadığını ifade eden üreticilerin %31'i Edirne ilinde, %69'u Tekirdağ ilinde yer almaktadır. Edirne ilinde üreticilerin %56'sının, Tekirdağ ilinde üreticilerin %44'ünün tarım sigortası yaptırdıkları görülmektedir. İkinci düğüm noktasının en önemli özelliği, üreticilerin eğitim düzeyleri, üçüncü alt düğüm karar noktasında üreticilerin gübreleme ile ilgili eğitim alıp almama durumları, dördüncü karar noktasında ise üreticilerin son üç yıl içinde tarımda riskle karşılaşıp karşılaşmama durumları yer almaktadır. Edirne ilinde üreticilerin toprak analizi yaptırmalarındaki en önemli dört nedenin sırasıyla ürün verimini arttırmak, maliyeti düşürmek, ürün kalitesini arttırmak ve çevreyi korumak olduğu belirlenmiştir. Tekirdağ ilinde de ilk sırayı ürün verimini arttırmak kriteri almakta olup, ikinci sırayı ürün kalitesini arttırmak, üçüncü sırayı maliyeti düşürmek ve dördüncü sırayı çevreyi korumak kriterleri almaktadır. Üreticilere gübre satın alma aşamasında toprak analizi şartının getirilmesinin, dolayısıyla analiz sonuçlarına göre atılması gereken gübre cinsi ve miktarının belirlenerek üreticinin gübre satın almasının sağlanmasının faydalı olacağı beklenmektedir.

Anahtar Kelimeler: Regresyon ağacı, Toprak analizi, Toprak analiz desteği, Üretici görüşü

1. Introduction

The main factor of agricultural production is soil. As long as the fertility of the soil is at an appropriate level, the amount and quality of the product to be taken from the unit area will be high. Therefore, it is extremely important to increase and protect the productivity levels of soils. It is obligatory to restore the plant nutrients that are depleted from the soil in various ways (Özyazıcı et al., 2013). Soil pollution usually occurs as a result of activities (fertilization, spraying, irrigation, etc.) performed by people unconsciously, reducing the sustainable yield capacity of the soil and causing soil fatigue. Although soil fatigue is not as well known as environmental pollution, it is one of the most important issues in terms of the economic life of soils (Bellitürk, 2011).

The main aim in agriculture is to obtain the highest possible yield and quality product from the cultural lands. Achieving this aim is possible, first of all, by taking a series of cultural measures that will increase the productivity of the soils. Among these cultural measures, fertilization takes the first place. However, fertilizing does not indicate that high quality and high yield power can be achieved. As a matter of fact, unconsciously, excessive fertilization of the soil not only disrupts the structure of the soil, but also disrupts the ecological balance (Güçdemir and Kalınbacak, 2009).

Soil analysis should be taken as a basis for effective and correct fertilization. Farmers, who apply the fertilizer recommendations made according to the results of the samples which are duly taken and analyzed, will make a significant contribution to both their own budgets and the country's economy by making a balanced and conscious fertilization. Before fertilizing, it is extremely important technically and economically to learn the amount and application manner of the fertilizer. Profitable fertilization can only be done by using the most appropriate methods to supply the plant nutrients needed by the plant as much as necessary. At this point, the importance of soil analysis emerges. The purpose of soil analysis is to determine the soil structure and the amount of nutrients available to the plants in its content, and to complete the missing part of the nutrients needed by the plants to be grown in that soil with fertilization.

In order to protect the agricultural sector, encourage agricultural activities and promote its sustainability, support payments are made by the state in different subjects (Sayın et al., 2021). In order to ensure adequate and economical fertilization with the fertilization programs created in accordance with the analysis results by encouraging the producers to have soil analysis, it was decided to give soil analysis subsidies with the decree dated 28.03.2005 and numbered 2005/8629 in addition to the direct income support by the Ministry of Agriculture and Forestry.

In this context, the principles regarding soil analysis subsidies are explained in subparagraph b of article 11 of the Communiqué numbered 2005/21 published in the Official Gazette dated 30.04.2005. Soil samples declared by the farmers to the laboratory were analyzed and reported by the laboratories authorized by the Ministry of Agriculture and Forestry, and their support began to be given as of 2006 and the payment was made at a maximum of 60 da. Communiqué dated 31.12.2008 and numbered 27097 published in the Official Gazette and 2008/70 communique dated 18.03.2010 were revised as a maximum of 50 support payments for each soil analysis. According to the communiqué numbered 29019 dated 03.06.2014 and the communiqué numbered 29368 dated 27.05.2015, soil analysis support payments were given to the farmers with diesel and fertilizer support. In accordance with the decision on agricultural supports to be made in 2016 No. 2016/8791, soil analysis support payments were abolished. In accordance with the communiqué numbered 30183 published in the Official Gazette dated 17.09.2017, it was stated that the soil samples will be taken by the technical staff of the authorized soil analysis laboratories using a coordinate determining device. Finally, in the 10th article of the Communiqué on the Payment of Support to Plant Production, published with the communiqué number 2019/46 dated 9.11.2019, the application principles for soil analysis support payments and the issues related to soil analysis laboratories that want to benefit from these payments are included.

In this study, the differences and importance levels of the differences in terms of some socio-economic factors and agricultural practices of the producers who had soil analysis in Edirne and Tekirdağ provinces were determined, and the opinions of the producers on soil analysis and soil analysis subsidies were given. Evaluations were made separately for the producers in Tekirdağ and Edirne provinces, and the provinces were compared.

2. Materials and Methods

2.1. Materials

The material of the research consisted of data obtained from primary and secondary sources. The primary data of the research consisted of the data obtained from the survey studies conducted with the producers who had soil analysis in 2015 in the laboratories that accepted the most sampling for soil analysis and gave fertilizer advice in the provinces of Edirne and Tekirdağ, which had the largest number of laboratories in the Thrace Region. Secondary data in the research was obtained from Turkish Statistical Institute, TR Ministry of Agriculture and Forestry, FAO, domestic and foreign universities and publication services' reports and previous studies and websites. The selected laboratories in the research area are given in *Table 1*.

Table 1. Laboratories in the research area

Provinces	Districts	Laboratories
Tekirdağ	Çorlu	Tua Agriculture Industry and Trade Limited Company
	Çorlu	Tekirdağ Thrace Oilseeds Agricultural Soil Analysis Laboratory
	Hayrabolu	Tekirdag Hayrabolu Commodity Exchange Soil Analysis Laboratory
	Central District	Namık Kemal University, Faculty of Agriculture, Soil Plant Analysis Laboratory
	Central District	Tekirdag Commodity Exchange Soil Analysis Laboratory
	Malkara	Tekirdağ Malkara Soil Plant and Irrigation Water Analysis Laboratory
Edirne	Keşan	Simcan Laboratory Services Industry and Trade Limited Company
	Keşan	Edirne Keşan Commodity Exchange Soil-Plant Analysis Laboratory
	Uzunköprü	Edirne Uzunköprü Commodity Exchange Soil Plant Analysis Laboratory
	Central District	Edirne Commodity Exchange Agricultural Analysis Laboratory

2.2. Methods

In the provinces determined in the research, 3 laboratories were selected among the laboratories with the highest number of sample acceptances for soil analysis. For each province, total of 60 producers who applied to the laboratories in 2015 and who utilized from soil analysis subsidies, and consequently, total of 120 producers were interviewed.

The compiled data were coded, loaded into the computer and evaluated with the widely used SPSS program. Descriptive statistics and cross tables were used in the analysis of the data obtained. The chi-square test in cross-sectional data was used to determine whether there was a difference between the groups in terms of the variables examined. The analysis of the differences of the producers who had soil analysis in Edirne and Tekirdağ provinces was determined by the regression tree model (CHAID analysis), one of the data mining methods.

Data mining is a method that can make predictions using meaningful information from complex data sets (Küçükönder et al., 2014). The most widely used method in data mining is classification and regression tree algorithms based on tree structure. The structure formed by the continuous dependent variable is called the "Regression Tree" (Koç, 2016). The structure formed by the categorical dependent variable is defined as the "Classification Tree" (Oruçoğlu, 2011).

It is a very useful technique with its tree structure and easy rule extraction. In this context, it is known that decision trees are widely used in medicine, industry, agriculture and engineering sciences (Kayri and Boysan, 2008, Sugumaran et al., 2007).

The regression tree method is a method that does not require assumptions that are important for parametric tests (such as normality, homogeneity), and has a visual superiority that is not affected by multiple correlations, missing observations and extreme values (Mendeş and Akkartal, 2009). With the diagram created by the regression tree method, the interaction between the independent variables and which independent variables affect the dependent variables can be easily seen. At the same time, the regression tree method allows the decision rules used in the creation of tree structures to be easily understood (Akşahan and Keskin, 2015).

The most frequently used decision tree models are called CART (Classification and Regression Trees) analysis and CHAID (Chi-Square Automatic Interaction Detector). Both are used for the same purposes, but there are differences in the decision tree creation stage. However, the CHAID method is preferred over the other

method. CHAID analysis is a sub-analysis within the classification and regression tree method (Albayrak and Kotlan-Yılmaz, 2009). The most important difference between CHAID analysis and other decision tree methods is due to tree formation. While the other method generates binary trees, CHAID analysis generates multiple trees (Türe et al., 2009). A regression equation to be obtained by CHAID analysis is kept independent of known classical assumptions (normality, linearity, homogeneity, etc.). Because with a strong translation algorithm, the whole universe can be divided into stable sub-nodes. This process can also ensure normality and homogeneity in the distribution of the data. In addition, continuous and categorical data can be included in the model at the same time with CHAID analysis (Doğan, 2003). For this reason, CHAID analysis removes the distinction between parametric and non-parametric and has a statistically semi-parametric feature in the method algorithm (Kayri and Boysan, 2008). In CHAID analysis, especially the relationships and interactions of independent variables with each other are examined. For this reason, it also tests the relationships between variables. If the dependent variable is categorical, the relationship between the variables is tested with chi-square analysis, and if the dependent variable is continuous, it is tested with the F test. (Kayri and Boysan, 2008).

3. Results and Discussion

3.1. Anaylsis of the differences of the producers

In this part of the study, the differences and the importance of the differences in terms of some socio-economic factors and agricultural practices of the producers who had soil analysis in Edirne and Tekirdağ provinces were examined with the help of CHAID analysis. The distribution of the variables used in the analysis in the provinces is given in *Table 2*.

Producers who had analysis in Edirne and Tekirdağ provinces were predominantly in the middle-aged group (41-60 years old). While it was seen that the ratio of the producers who were primary school graduates in Edirne province was higher than Tekirdağ province, the ratio of producers who were secondary school, high school and university graduates was higher in Tekirdağ province. While it was determined that 45% of the producers in Tekirdağ province had less than 25 years of agricultural experience, this ratio was lower in Edirne province as 33.33%.

The ratio of obtaining agricultural insurance was 85% in Edirne and 66.67% in Tekirdağ. It was seen that the ratio of the producers who stated that they had non-agricultural income in Edirne (66.67%) was higher than those in Tekirdağ (48.33%). It was seen that the ratio of the producers who stated that they faced risks in agriculture in the last three years was quite close to each other in Edirne and Tekirdağ provinces.

It was determined that the ratio of the producers (23.33%) who were engaged in animal husbandry as well as plant production in Edirne province was slightly higher than the producers in Tekirdağ (15%). The ratio of the producers who stated that they cultivated more than 250 decares of land in Edirne and Tekirdağ provinces were found to be quite close to each other in both provinces. 68.33% of the producers in Edirne and 55% of the producers in Tekirdağ stated that they used fertilizer support to buy fertilizer.

While the rate of producers who stated that they received training on fertilization in Edirne was 33.33%, this ratio was found to be 50% for producers operating in Tekirdağ. 46.67% of the producers in Edirne and 51.67% of the producers in Tekirdağ stated that they had separate analyzes for each parcel. While 58.33% of the producers operating in both provinces stated that they complied with the recommended fertilization program, 10% of the producers in Edirne and 28.33% of the producers in Tekirdağ stated that they always complied with the fertilization program (*Table 2*).

The regression tree created with the CHAID algorithm to determine the differences of the producers who had soil analysis in Edirne and Tekirdağ provinces is given in *Figure 1*. According to the CHAID analysis, in which the provinces were taken as the dependent variable, it was seen that the first most distinctive feature was the state-supported agricultural insurance. Of the producers who stated that they did not have agricultural insurance, 31% were located in Edirne and 69% were located in Tekirdağ. It was seen that 56% of the producers in Edirne and 44% of the producers in Tekirdağ had agricultural insurance. The most important feature of the second node was the education level of the producers, the third sub-node decision point was whether the producers had received training on fertilization, and the fourth decision point was whether the producers faced risks in agriculture in the last three years.

Table 2. Descriptive statistics of the variables used in the analysis

Variables	Edirne		Tekirdağ	
	Number	%	Number	%
Age				
Young (20-40 years old)	4	6.67	10	16.67
Middle-aged (41-60 years old)	36	60.00	37	61.67
Elderly (61 years and older)	20	33.33	13	21.67
Young (20-40 years old)	4	6.67	10	16.67
Education level				
Primary school	29	48.33	16	26.67
Middle school	5	8.33	11	18.33
High school	16	26.67	21	35.00
College/University	10	16.67	12	20.00
Agricultural experience				
Less than 25 years	20	33.33	27	45.00
25 years and above	40	66.67	33	55.00
Agricultural insurance				
Yes	51	85.00	40	66.67
No	9	15.00	20	33.33
Non-agricultural income				
Yes	40	66.67	29	48.33
No	20	33.33	31	51.67
Encountering risks in agriculture				
Yes	24	40.00	22	36.67
No	36	60.00	38	63.33
Type of activity				
Vegetative	46	76.67	51	85.00
Vegetative + animal	14	23.33	9	15.00
Total land size				
0-250 da	16	26.67	15	25.00
251 da and above	44	73.33	45	75.00
Purpose of use of fertilizer support				
To get fertilizer	41	68.33	33	55.00
Out of agriculture	0	0.00	2	3.33
Apart from fertilizer but still in agricultural production	19	31.67	25	41.67
Getting training on fertilization				
Yes	20	33.33	30	50.00
No	40	66.67	30	50.00
Performing analysis for each parcel				
Yes	28	46.67	31	51.67
No	32	53.33	29	48.33
Comply with the fertilization recommendation program				
Always	6	10.00	17	28.33
Generally	35	58.33	35	58.33
Rarely	11	18.33	4	6.67
Very rare	6	10.00	1	1.67
No	2	3.33	3	5.00

The situation of not having agricultural insurance was affected by the education level variable and divided into two juvenile nodes. 61.5% of the producers who did not have agricultural insurance in Edirne and 38.5% of those who did not have agricultural insurance in Tekirdağ were primary school graduates. While the ratio of the producers who were above primary school graduates in the producer group who did not have agricultural insurance in Edirne province was determined as 6.2%, this ratio was found as 93.8% in Tekirdağ province.

Agricultural insurance was affected by the total land size variable and divided into two juvenile nodes. The total land size of 51.4% of the producers who had agricultural insurance in Edirne and 48.6% of those who had agricultural insurance in Tekirdağ province was over 250 decares.
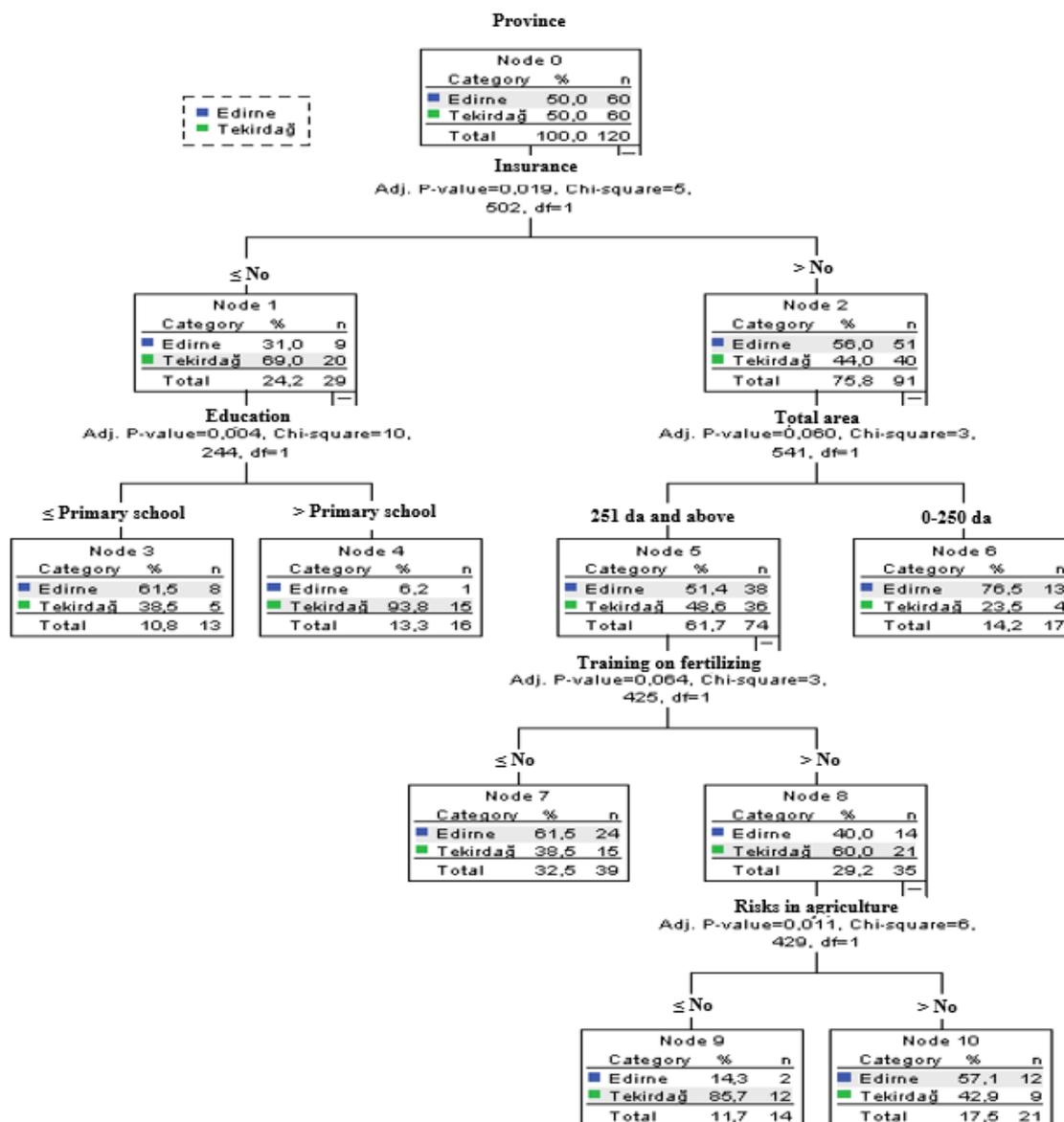
Figure 1. Regression tree for provinces using CHAID algorithm

The variable of land size over 250 decares was divided into two juvenile nodes by being affected by the variable of training on fertilization. While it was determined that 61.5% of the producers working on 250 decares of land in Edirne province did not receive training on fertilization, this ratio was found as 38.5% in Tekirdağ province. The rate of training with fertilization by the producers who cultivated a land of more than 250 decares was found to be 40% for Edirne province and 60% for Tekirdağ province. The variable of receiving education about fertilization was affected by the risk exposure variable in agriculture in the last three years and divided into two juvenile nodes. 14.3% of the producers who received fertilization training in Edirne and 85.7% of the producers who received fertilization training in Tekirdağ stated that they did not encounter any risk in agriculture in the last three years. In the provinces of Edirne and Tekirdağ, the ratio of encountering any risk in agriculture in the last three years was found to be 57.1% and 42.9%, respectively (*Figure 1*).

3.2. Opinions of the producers on soil analysis and analysis subsidies

In this part of the research, the opinions of the producers about soil analysis and soil analysis subsidies are given. Evaluations were made separately for the producers in Tekirdağ and Edirne provinces, and the provinces were compared. The reasons for the soil analysis of the producers were determined (*Table 3*). Producers were asked to rank the reasons for having soil analysis in order of importance (1 = lowest; 5 = highest). The total scores of the criteria were obtained by multiplying the degree of importance given to the reasons for the soil analysis by the producers and the number of producers responding, and adding the obtained values.

In Edirne province, 91.67% of the producers stated that they had soil analysis done to increase product yield, 71.67% to increase product quality, 78.33% to reduce costs, and 61.67% to protect the environment. In Tekirdağ, 88.33% of the producers stated that they had soil analysis done to increase product yield, 60% to increase product quality, 43.33% to reduce costs, and 36.67% to protect the environment. Producers listed the reasons for having soil analysis according to the degree of importance, and it was determined that the four most important reasons for producers to have soil analysis in Edirne province were to increase the product yield, reduce the cost, increase the product quality and protect the environment, respectively. In the province of Tekirdağ, the criteria of increasing the product yield was the first rank, increasing the product quality in the second rank, reducing the cost in the third rank and protecting the environment in the fourth rank. It was determined that the last three criteria that were effective in soil analysis by producers in both provinces were getting subsidies, learning about the condition of the soil and protecting the soil.

In the study conducted by Küçükkaya and Özçelik (2014), it was determined that wheat producers had soil analysis done in order to use less fertilizer, increase product yield, benefit from support and learn the condition of the soil, respectively. In the study of Çönoğlu et al. (2016), producers who benefited from soil analysis subsidies and those who did not, stated that the most important purpose of soil analysis was to use the right fertilizer and increase product yield. In the study conducted by Tanrıverdi (2017), the majority of the producers stated that they had soil analysis done to benefit from the supports. The result of this research was similar to the results of Küçükkaya and Özçelik (2014) and Çönoğlu et al. (2016) literature.

Table 3. Reasons for producers to have soil analysis

Reasons for soil analysis*	Edirne				Tekirdağ			
	Number	%	Total Points	Order of importance	Number	%	Total Points	Order of importance
To increase product yield	55	91.67	245	1	53	88.33	249	1
To improve product quality	43	71.67	158	3	36	60.00	139	2
To reduce the cost	47	78.33	182	2	26	43.33	94	3
To protect the environment	37	61.67	86	4	22	36.67	64	4
For supporting	8	13.33	20	5	14	23.33	45	5
To know the condition of the soil	5	8.33	16	6	7	11.67	30	6
To protect the soil	4	6.67	10	7	7	11.67	28	7

* More than one option marked

The sources of information about the soil analysis of the producers were also determined (*Table 4*). Producers were asked to rank their sources of information on soil analysis in order of importance (1 = lowest; 5 = highest).

In the province of Edirne, 81.67% of the producers stated that their information sources about soil analysis were employees of the provincial/district directorate, 83.33% were laboratory workers, 31.67% were research institutes, 30% were friends-neighbours, 25% were fertilizer dealers, 21.67% were cooperatives, 15% were newspapers/TV and brochures, and 13.33% were social media sites. In Tekirdağ, 66.67% of the producers stated that their information sources about soil analysis were employees of the provincial/district directorate of the information sources on soil analysis, 38.3% were laboratory workers, 30% were friends-neighbours, 26.67%

were cooperatives, 25% were newspaper/TV and brochures, 20% were fertilizer dealers, %16.67 were social media sites and 11.67% were research institutes.

When the producers ranked the soil analysis information sources according to their importance, it was determined that the two most important sources of information about soil analysis of the producers in Edirne and Tekirdağ provinces were the employees of the provincial/district directorate and laboratory workers. While the research institute option was in the third place in Edirne province, it was in the last place in Tekirdağ province.

In the studies conducted by Gülaç (2011), Küçükkaya and Özçelik (2014), and Tanrıverdi (2017), it was determined that the majority of the producers who had soil analysis received information from the district agriculture directorate about soil analysis, which showed similarities with the research result.

Table 4. Information resources of the producers on soil analysis

Soil analysis information resources*	Edirne				Tekirdağ			
	Number	%	Total Points	Order of importance	Number	%	Total Points	Order of importance
Provincial/District directorate of agriculture employees	49	81.67	228	1	40	66.67	178	1
Laboratory	50	83.33	211	2	23	38.33	100	2
Friend-neighbor	18	30.00	38	5	18	30.00	60	3
Research institute	19	31.67	67	3	7	11.67	27	8
Fertilizer dealer	15	25.00	48	4	12	20.00	42	6
Cooperative	13	21.67	26	6	16	26.67	59	4
Newspaper/TV and brochures	9	15.00	15	8	15	25.00	54	5
Social media sites	8	13.33	16	7	10	16.67	29	7

* More than one option marked

Information sources on soil analysis subsidies of producers were also determined (*Table 5*). Producers were asked to rank their sources of information on soil analysis subsidies in order of importance (1 = lowest; 5 = highest).

Almost all of the producers in Edirne and Tekirdağ provinces stated that the information sources on soil analysis subsidies were the publication and training activities of the provincial/district directorate of agriculture. While 45% of the producers in Edirne stated that the information sources about soil analysis subsidies were friends-neighbours, 41.67% of them were newspapers/TV, these ratios were found to be 25% and 23.33% in Tekirdağ. The ratio of producers who stated that their source of information about soil analysis subsidies was the village headman was very close to each other in Edirne and Tekirdağ provinces. While 33.33% of the producers in Edirne stated that they learned about the supports through cooperatives, this ratio was determined as 16.67% for Tekirdağ province. While the ratio of producers who stated that they received information about soil analysis subsidies from the research institute in Edirne province was 33.33%, this ratio was determined as 1.67% in Tekirdağ province. While 6.67% of the producers in Tekirdağ stated that they obtained information about the support from the internet, no producers were found in Edirne who stated that they obtained information via the internet.

When the producers ranked the soil analysis subsidies information sources according to the degree of importance, it was determined that the most important source of information on soil analysis of the producers in Edirne and Tekirdağ provinces was the publication and training activities of the provincial/district directorate of agriculture, and the second and the third information sources were friend-neighbor and newspaper/TV options.

In the studies conducted by Gülaç (2011), Küçükkaya and Özçelik (2014), Güldal (2016) and Tanrıverdi (2017), it was determined that the most important information sources about the soil analysis subsidies of the producers who had soil analysis were the education and publication activities of the provincial-district directorate which showed similarities with the research result.

The distribution of the producers according to the years (2010-2015) in which they benefited from the soil analysis subsidies is given in *Table 6*. It was seen that the ratio of the producers receiving support in 2010 was quite close to each other in both provinces. The ratio of the producers benefiting from soil analysis support in the province of Edirne in 2011, 2012 and 2013, and the ratio of the producers benefiting from soil analysis support in Tekirdağ in 2014 and 2015 was higher. It was seen that the year that benefited the most from soil analysis support between 2010 and 2015 was 2015, according to the provincial average.

Table 5. Information resources on soil analysis support

Soil analysis support information resources*	Edirne				Tekirdağ			
	Number	%	Total Points	Order of importance	Number	%	Total Points	Order of importance
Provincial/District directorate of agriculture extension and training activities	59	98.33	290	1	57	95.00	276	1
Friend-neighbor	27	45.00	84	2	15	25.00	57	2
Newspaper/TV	25	41.67	75	3	14	23.33	48	3
Headman	11	18.33	41	6	13	21.67	43	4
Cooperative	20	33.33	57	4	10	16.67	24	5
Research institute	20	33.33	55	5	1	1.67	2	8
Internet	0	0.00	0	9	4	6.67	14	6
Faculty of agriculture	4	6.67	6	8	2	3.33	5	7
Laboratory	2	3.33	9	7	1	1.67	2	9

* More than one option marked

Table 6. Years of producers benefiting from soil analysis subsidies

Years*	Edirne		Tekirdağ		Total	
	Number	%	Number	%	Number	%
2010	42	70.00	43	71.67	85	70.83
2011	53	88.33	45	75.00	98	81.67
2012	54	90.00	48	80.00	102	85.00
2013	57	95.00	51	85.00	108	90.00
2014	55	91.67	56	93.33	111	92.50
2015	56	93.33	60	100.00	116	96.67

* More than one option marked

It was also asked whether the producers had separate analyzes for each parcel (*Table 7*). 46.67% of the producers in Edirne and 51.67% of the producers in Tekirdağ stated that they had soil analysis done for each parcel. As a result of the chi square test, it was determined that the status of the producers to have soil analysis for each parcel did not change according to the provinces.

Table 7. Status of manufacturers to have separate analysis for each parcel

Making analysis for each parcel	Edirne		Tekirdag		Total	
	Number	%	Number	%	Number	%
Yes	28	46.67	31	51.67	59	49.17
No	32	53.33	29	48.33	61	50.83
Total	60	100.00	60	100.00	120	100.00
Chi-square: 0.300	p: 0.584					

It was also determined whether the producers complied with the recommended fertilization program according to the soil analysis results (*Table 8*). 58.33% of the producers operating in both provinces stated that they complied with the recommended fertilization program. While 10% of the producers in Edirne stated that they always complied with the fertilization program, this ratio was found as 28.33% for Tekirdağ province. The ratio of compliance with the fertilization program of the producers in Tekirdağ province was higher than the producers in Edirne province. As a result of the chi square test, it was determined that the producers' compliance with the recommended fertilization program according to the soil analysis results varied according to the provinces.

In the study conducted by Ataseven et al. (2014) in the province of Ankara, 39.3% of the producers, in the study conducted by Ceyhan (2010) in Samsun, 7% of the producers, in the study conducted by Olhan et al. (2010), 25.9% of the producers, in the study conducted by Küçükkaya and Özçelik (2014), 43.33% of the producers, in the study conducted by Çarkacı et al. (2016) in Konya province, 16.66% of the producers, in the study conducted by Güldal (2016), 33.33% of the producers and 30.19% of the producers in the study conducted by Tanrıverdi (2017) stated that they applied fertilizers according to the results of soil analysis. According to the results of the research, the ratio of producers who stated that they applied fertilizers according to the results of soil analysis was quite high when compared to the literature.

Table 8. Compliance with the recommended fertilization program according to the soil analysis results of the producers

Compliance with fertilization program	Edirne		Tekirdağ		Total	
	Number	%	Number	%	Number	%
Always	6	10.00	17	28.33	23	19.17
Generally	35	58.33	35	58.33	70	58.33
Rarely	11	18.33	4	6.67	15	12.50
Very rare	6	10.00	1	1.67	7	5.83
No	2	3.33	3	5.00	5	4.17
Total	60	100.00	60	100.00	120	100.00
Chi-square: 10.097		p: 0.039				

The producers who stated that they seldom or did not comply with the fertilization program were asked about the reasons for not complying with the program (*Table 9*). 52.63% of the producers operating in Edirne province and 37.50% of the producers operating in Tekirdağ province stated that they did not consider the recommended amount of fertilizer sufficient. While 31.58% of the producers in Edirne stated that they had soil analysis done only to benefit from the support, this ratio was lower for Tekirdağ province and was found as 12.50%. While 75% of the producers in Tekirdağ stated that they did not trust the results, this ratio was lower for Edirne and was determined as 31.58%.

Table 9. Reasons for non-compliance with the recommended fertilization program according to the soil analysis results of the producers

Reasons for non-compliance with the fertilization program*	Edirne		Tekirdağ		Total	
	Number	%	Number	%	Number	%
The amount of fertilizer was insufficient	10	52.63	3	37.50	13	48.15
I'm getting analysis to take advantage of support	6	31.58	1	12.50	7	25.93
I don't trust the result	6	31.58	6	75.00	6	22.22
Due to financial difficulties	1	5.26	1	12.50	2	7.41

* More than one option marked

In the study conducted by Gülaç (2011), financial impossibilities took the first rank among the reasons for not using fertilizers according to the results of soil analysis, and the second rank was the insufficient amount of fertilizer written in the analysis. In the study conducted by Küçükkaya and Özçelik (2014), it was determined that the producers did not comply with the fertilization program primarily due to financial impossibilities and they had an analysis done only to benefit from the subsidies. Çönoğlu et al. (2016) stated that the biggest factor

in not using fertilizers according to soil analysis was the low amount of fertilizer obtained as a result of the analysis. In the study conducted by Güldal (2016), the reasons for not using fertilizers according to the soil analysis results of the producers in the enterprises that had soil analysis were determined as performing analysis to benefit from fertilizer support, not relying on the analysis results, and insufficient amount of fertilizer in the analysis. In the study conducted by Şahinli et al. (2016), the first three reasons for not using fertilizers according to the analysis results of the producers who had soil analysis were to benefit only from the subsidies, not to trust the analysis results, and to have insufficient amount of fertilizer. In the study conducted by Tanrıverdi (2017), the vast majority of producers stated that they had soil analysis done only to benefit from support. The result of this research was similar to the results of Çönoğlu et al. (2016) literature.

The reasons for choosing the laboratory where the producers had soil analysis were also determined (*Table 10*). 68.33% of the producers operating in Edirne and 58.33% of the producers operating in Tekirdağ stated that they preferred the laboratory because it wasclose. While the ratio of the producers who stated that they preferred the laboratory because they found the laboratory reliable in Tekirdağ province was 38.33%, this ratio was determined as 26.67% for Edirne province. As a result of the chi square test, it was determined that the reasons for choosing the laboratory where the producers had soil analysis did not differ according to the provinces.

Table 10. Reasons for the producers to choose the soil analysis laboratory

Reasons for choosing a laboratory	Edirne		Tekirdağ		Total	
	Number	%	Number	%	Number	%
Near	41	68.33	35	58.33	76	63.33
Trustworthy	16	26.67	23	38.33	39	32.50
Fast	3	5.00	2	3.33	5	4.17
Total	60	100.00	60	100.00	120	100.00
Chi-square: 1.930 p: 0.379						

The producers were asked who took the soil sample for soil analysis, and their distribution according to the answers they gave is given in *Table 11*. While almost all of the producers in Tekirdağ (98.33%) stated that they took the soil sample themselves, only one producer stated that their relatives took it. In Edirne province, the ratio of producers who stated that they took the soil sample was lower than Tekirdağ province and was found to be 86.67%. Four producers operating in the province of Edirne stated that the laboratory staff took the soil samples, and two producers each stated that their relatives or the workers they employed. As a result of the chi square test, it was determined that the people who took soil samples for soil analysis varied according to the provinces. In the study conducted by Özçelik and Güldal (2014) in the province of Ankara, it was determined that 91.32% of the producers took the soil sample themselves, which was similar to the research result.

The information on how the producers took soil samples for soil analysis and from which depth they took the soil sample is given in *Table 12*. It was determined that the ratio of the producers who stated that they took the soil samples by drawing zigzags according to the shape of the land in both provinces was the same (95%).

All of the producers operating in Edirne stated that they took the soil sample from 0-30 cm depth. For Tekirdağ province, this ratio was found to be 98.33%. Only one producer operating in Tekirdağ stated that he took the soil sample from a depth of 30-60 cm.

It was also determined whether the producers had regularly soil analysis done every year (*Table 13*). It was determined that 48.33% of the producers operating in the province of Edirne and 26.67% of the producers operating in the province of Tekirdağ stated that they had a soil analysis done every year. As a result of the chi square test, it was determined that the status of the producers to make soil analysis every year varied according to the provinces. In the study conducted by Gülaç (2011), 34% of the producers, in the study conducted by Ataseven et al. (2014), 59% of the producers in Ankara, and 56.1% of the hazelnut producers in the study conducted by Aydoğan and Demiryürek (2012) in Samsun stated that they had soil analysis done regularly.

Table 11. Soil sampling for soil analysis

Who takes soil sample?	Edirne		Tekirdağ		Total	
	Number	%	Number	%	Number	%
Myself	52	86.67	59	98.33	111	92.50
laboratory staff	4	6.67	0	0.00	4	3.33
Relatives	2	3.33	1	1.67	3	2.50
Workers	2	3.33	0	0.00	2	1.67
Total	60	100.00	60	100.00	120	100.00

Chi-square: 9.099   p: 0.039

Table 12. How and depth of soil sampling by producers for soil analysis

Soil sampling method	Edirne		Tekirdağ		Total	
	Number	%	Number	%	Number	%
By drawing zigzags according to the shape of the land	57	95.00	57	95.00	114	95.00
Straight from one end of the field to the other	3	5.00	3	5.00	6	5.00
Total	60	100.00	60	100.00	120	100.00
Soil sampling depth						
0-30cm	60	100.00	59	98.33	119	99.17
30-60cm	0	0.00	1	1.67	1	0.83
Total	60	100.00	60	100.00	120	100.00

Table 13. Status of producers to have soil analysis performed every year

Status of soil analysis every year	Edirne		Tekirdağ		Total	
	Number	%	Number	%	Number	%
Yes	29	48.33	16	26.67	45	37.50
No	31	51.67	44	73.33	75	62.50
Total	60	100.00	60	100.00	120	100.00

Chi-square: 5.120   p: 0.024

Table 14. Soil analysis criteria of the producers

Soil analysis criteria	Edirne		Tekirdağ		Total	
	Number	%	Number	%	Number	%
For soil control	34	56.67	30	50.00	64	53.33
If the yield decreases	9	15.00	15	25.00	24	20.00
To get support	9	15.00	8	13.33	17	14.17
As far as I can think of	5	8.33	6	10.00	11	9.17
When i change the product	2	3.33	1	1.67	3	2.50
If necessary	1	1.67	0	0.00	1	0.83
Total	60	100.00	60	100.00	120	100.00

Chi-square: 3.284   p: 0.701

The criteria for soil analysis were also asked to the producers (*Table 14*). Majority of the producers in both provinces stated that they had soil analysis done for soil control. In Edirne province, the ratio of producers who stated that they had soil analysis done in case of decrease in yield or to get support was found to be 15%, while in Tekirdağ province, 25% of the producers stated that they had it done in case of decrease in yield, and 13.33% to get support. While 8.33% of the producers in Edirne and 10% of the producers in Tekirdağ answered this question whenever they came to my mind, two producers operating in Edirne and one producer operating in Tekirdağ stated that they had a soil analysis done when they were going to change the product they were planting. A producer operating in Edirne stated that he had soil analysis done if necessary while it was determined that there was no producer who preferred this criterion in Tekirdağ province. In the study conducted

by Gülaç (2011), it was concluded that the majority of the producers had soil analysis done in case the yield decreased.

4. Conclusions

It was seen that some of the producers who had soil analysis did not comply with the recommended fertilization program according to the soil analysis results. In order to increase the fertilizing status according to the results of the analysis report, it is thought that it would be appropriate to introduce the soil analysis condition in fertilizer sales in order to increase the use of fertilizers, or the soil analysis condition in fertilizer support for lands of 50 decares or more, as well as the requirement to purchase fertilizer according to the analysis results.

In terms of the reliability of the soil analysis, it is very important to take the soil sample to be analyzed correctly. The majority of the producers in the research area stated that they took the soil sample as a result of their own knowledge. It would be more appropriate for the privately authorized soil analysis laboratories, together with the laboratories belonging to the Ministry of Agriculture and Forestry in the region, to inform the producers more about the soil sampling, and if possible, the soil samples should be taken by the personnel in the laboratory where the analyzes were made, not the producers.

It is important to give practical training to the producers on sampling, not to take fertilizer without soil analysis results, to make supports mandatory and to remove the area limitation. In addition to these, it is thought that it would be beneficial to implement fertilizer sales according to the analysis reports of the laboratories, to expand the training and extension studies, and to explain the necessity of having analysis done by the producers who make a living from the fields. It is expected that it will be beneficial to introduce soil analysis conditions to the producers at the stage of purchasing fertilizers, and thus to ensure that the producer purchases fertilizer by determining the type and amount of fertilizer to be disposed of according to the analysis results.

Acknowledgment

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