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AUTHORS: Osman Sedat Subasi, Osman Uysal

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Producer Perceptions Regarding Policies Implemented for Sustainable Lemon Production and Trade During the Covid-19 Pandemic: The Case of Mersin

COVID-19 Salgınında Sürdürülebilir Limon Üretimi ve Ticaretine Yönelik Uygulanan Politikalara İlişkin Üretici Algıları: Mersin Örneği

Osman Sedat SUBAŞI

Corresponding Author / *Sorumlu Yazar*
Assoc. Prof., Alata Bahçe Kültürleri Araştırma Enstitüsü, Tarım Ekonomisi Bölümü
osmansedat.subasi@tarimorman.gov.tr
ORCID: 0000-0002-6507-1980

Osman UYSAL

Assoc. Prof.., Malatya Turgut Özal Üniversitesi, Ziraat Fakültesi, Tarım Ekonomisi Bölümü
osman.uysal@ozal.edu.tr
ORCID: 0000-0002-9010-2988

Producer Perceptions Regarding Policies Implemented for Sustainable Lemon Production and Trade During the COVID-19 Pandemic: The Case of Mersin

Abstract

This study examined producer approaches against the precautions and measures applied during the Covid-19 pandemic in Mersin province, the center of lemon production and export in Türkiye. It is aimed to determine the effects and reflections of the measures and precautions implemented to lemon production during the Covid-19 pandemic. The data were collected by proportional sampling technique between April and June 2021 from 95 producers. The opinions of lemon producers on the precautions and measures applied during the pandemic were determined by cluster analysis. Ward technique and K-mean technique were used. In the first cluster, the most important criteria are "Leave flexibility for seasonal workers," "Curfew exemption for farmers," and "Facilitate access to the market" while in the second cluster, "Defferal of cooperative debts" and "Curfew exemption for producers" was determined as the most important criteria. The most effective precautions and measures were determined by multidimensional scaling. According to the results of non-metric multidimensional scaling analysis results, similar precautions and measures applied during the pandemic were grouped around the origin. On the other hand, the measure of "obtaining a pre-export permit" took place away from the group and differed from others. The exemption of the labor force from the lockdown restrictions in lemon farming, a labor-intensive mode of production, enabled the use of labor. This measure, taken to prevent production interruptions during the pandemic period, prevented possible problems in lemon production. However, applying preliminary permits and restrictions for lemon exports adversely affected exports. It also caused domestic prices to fall. Today, when possible pandemic conditions are discussed, it is crucial to determine the measures to be applied for food safety and sustainability by considering domestic and foreign market conditions.

Keywords: Covid 19, Lemon, Precautions, Cluster analysis, Multidimensional scaling,

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Öz

Bu çalışmada, Türkiye'nin limon üretim ve ihracatının merkezi olan Mersin ilinde, Covid-19 salgını sürecinde uygulanan tedbir ve önlemlere karşı üreticilerin yaklaşımları incelenmiştir. Covid-19 salgını sürecinde limon üretimine uygulanan tedbir ve önlemlerin etki ve yansımalarının belirlenmesi amaçlanmıştır. Veriler Nisan-Haziran 2021 tarihleri arasında 95 üreticiden oransal örnekleme yöntemiyle toplanmıştır. Limon üreticilerinin pandemi döneminde uygulanan tedbir ve önlemlere ilişkin görüşleri kümeleme analiziyle belirlenmiştir. Ward tekniği ve K-mean tekniği kullanılmıştır. Birinci kümede en önemli kriterler "Mevsimlik işçilere izin esnekliği", "Çiftçilere sokağa çıkma yasağı muafiyeti" ve "Piyasaya erişimin kolaylaştırılması" iken, ikinci kümede "Kooperatif borçlarının ertelenmesi" ve "Çiftçilere sokağa çıkma yasağı muafiyeti" yer almıştır. En önemli kriter olarak "üreticiler" belirlendi. Çok boyutlu ölçeklendirme ile en etkili önlem ve tedbirler belirlendi. Metrik olmayan çok boyutlu ölçeklendirme analizi sonuçlarına göre, pandemi sırasında uygulanan benzer tedbir ve önlemler orjiin etrafında gruplandırılmıştır. Öte yandan "ihracat öncesi izin alınması" ölçüsü gruptan uzakta gerçekleşti ve diğerlerinden farklı konumlanmıştır. Emek yoğun bir üretim biçimi olan limon yetiştiriciliğinde işgücünün karantina kısıtlamalarından muaf tutulması, emeğin kullanımını mümkün kılmıştır. Pandemi döneminde üretimin kesintiye uğramaması için alınan bu önlem, limon üretiminde yaşanabilecek sorunların da önüne geçmiştir. Ancak limon ihracatına yönelik ön izin ve kısıtlamaların uygulanması ihracatı olumsuz etkilemiştir. Bu da yurt içi fiyatların düşmesine neden olmuştur. Olası pandemi koşullarının tartışıldığı günümüzde, gıda güvenliği ve sürdürülebilirliğine yönelik uygulanacak tedbirlerin iç ve dış pazar koşulları dikkate alınarak belirlenmesi büyük önem taşımaktadır.

Keywords: Covid-19, Limon, Önlemler, Kümeleme analizi, Çok boyutlu ölçekleme.

1. INTRODUCTION

Agriculture will continue to be a primary sector in food security, balanced nutrition, and providing livelihoods for rural communities, especially in developing countries. In particular, the Covid-19 pandemic has demonstrated the importance of food accessibility worldwide. Citrus cultivation is limited to areas between 40° north and 40° south latitudes. Although the homeland of citrus fruits is in tropical and subtropical regions, subtropical areas are more suitable for lemons. In terms of temperature conditions, the ideal growth temperature for citrus fruits is 12.8 °C and above, and the development of the plant starts when this temperature is reached. The citrus that is most sensitive to high temperatures is lemon; therefore, low temperatures are one of the most important issues limiting the production of lemons. Considering the climatic characteristics required for lemon cultivation, the southern coasts of Türkiye, Antalya, Finike, Serik and Mersin Erdemli, Akdeniz, Tarsus and Mezitli districts stand out. (Şahin, 2022). Lemon, which is a product that is grown in limited areas in the world and Türkiye, is one of the products that may be adversely affected by possible climate changes. World lemon production is about 20 million tons. Türkiye ranks 6th in production with 1.2 million tons, and 5th in exports in the world with 242.7 million USD. Türkiye exports 39.43% of the total lemon produced (FAOSTAT, 2022). Production in Mersin province constitutes 52.68% of Türkiye's lemon production and is in the first rank in Türkiye regarding lemon export (TURKSTAT, 2022)

Many studies have been published examining the impact of the Covid-19 pandemic, and these studies are generally evaluated on a macro scale or focused on important product and production regions. However, few studies evaluated the measures applied during the Covid 19 pandemic with field studies. It is crucial to examine the effects of the measures applied to ensure the sustainability of agricultural production during the pandemic period. In some studies, conducted in Türkiye, Uysal and Veziroğlu (2020) examined how the measures taken during the Covid-19 pandemic affected the agricultural sector and offered suggestions. However, some predictions remained limited. Ceylan and Özkan (2020) evaluated the impact of Covid-19 on agriculture and food systems for both the world and Türkiye. They emphasized that the problems faced by agriculture are the same almost everywhere in the world. They revealed that these problems are in the form of supply contraction due to seasonality of production and temporary labor supply shortage, price increases due to foreign trade, contraction in demand due to lockdown restrictions, and changes in consumer preferences. Richards and Rickard (2020) noted that the market for fruits and vegetables in Canada has been weakened by the COVID-19 pandemic. Restaurants, bars, and schools have closed, and produce growers and distributors have had to shift their supply almost entirely from the food service to the retail channel. However, labor and logistics constraints have not negatively affected the supply chain as a result of the demand for e-commerce channels. Karaman and Kutlar (2021) found that brokers sold fresh fruits and vegetables to hotels, restaurants, school canteens, and cafeterias before COVID-19, while during the COVID-19 pandemic, they mainly sold to stall owners and e-commerce supermarkets. They stated that the amount of peppers and tomatoes supplied during the COVID-19 outbreak increased, while the amount of zucchini was lower compared to the same period of the previous year. In the study, they observed a high increase in domestic and international demand for lemons with the rise in demand for disinfection products. Uğur and Buruklar (2022) examined the effects of the Covid-19 pandemic on agricultural food production and found increased production costs, price instability, difficulties in finding workers, and shrinkage in the markets in Konya city. It was observed that the level of those concerned about harvesting and sales, who have difficulties accessing food, and who have problems in the supply of production materials has increased.

Other studies in many countries, such as Ridley and Devadoss (2020), examined the effects of Covid-19 on US fruit and vegetable production

using econometric methods. They emphasized that the pandemic was a significant threat to the production of labor-intensive products such as fruits and vegetables and the need for labor for production practices, harvesting, and packaging. It was revealed that the US agricultural labor supply was adversely affected by the Covid-19 epidemic, which caused product losses. Siche (2020) analyzed the effects of the pandemic on agriculture using data from the World Health Organization (WHO). He stated that the pandemic had affected the agriculture and food supply chain, food demand, and food security. Laborde et al. (2020) suggested that the effects of the Covid-19 pandemic on agricultural production may have less direct effects than pandemics of animal origin, and the impact on food safety will differ by product and region. It was determined that changes in production practices would be required to reduce the risk of disease transmission in the labor-intensive sub-sectors of agriculture, and agricultural production with a high level of mechanization could be less affected. It was also found that there could be negative impacts on supply chain disruptions and trade restrictions in agricultural products markets.

Similarly, Espitia et al. (2020) examined the impact of trade policies on world food markets. They quantified the initial shock from the pandemic, assuming that products that were more labor-intensive in production were more affected by worker sickness and containment policies. They suggested how increased export restrictions to protect local food markets could amplify the initial shock, the global food export supply could fall, and global prices could rise. Kerr (2020) emphasized that the measures taken to the Covid-19 epidemic can cause disruptions in economic activity worldwide and that such shocks could lead the economy to periods of instability. He predicted a change in food purchases in the shrinking budgets of consumers. On the other hand, labor could be affected by the spread of the virus, and supply chains may have restrictions. Kumar and Kumar (2022) emphasized how agriculture became the Shining Beacon of Hope for the Indian economy and proposed a 10-point strategy to strengthen the agricultural sector after Covid-19.

In some studies, the effects of the pandemic were examined in terms of country groups, such as Gruere and Brooks (2020) categorized the early policy responses to the Covid-19 pandemic based on a dataset of 496 measures taken by 54 countries and collected by the OECD from government officials and additional sources. It was seen that these policies were a wide variety of measures, some of which were urgent and necessary, some that might be beneficial after the pandemic, and others that could potentially disrupt the functioning of markets or damage the environment. Erokhin and Gao (2020) examined the dynamics of Covid-19 cases, the interactions between food trade, food inflation, and exchange rate fluctuations in 45 emerging economies divided into three groups according to income level. They noted that the food insecurity effects of Covid-19 were more pronounced in upper-middle-income economies than in the least developed countries.

Field-based studies were conducted to evaluate the effects of the Covid 19 pandemic and the policies implemented. Adjognon et al. (2020) examined the impact of the coronavirus pandemic on food safety in Mali. They stated that the pandemic's problems were caused by government policies aimed at slowing the spread of the virus and by individual behavior motivated by fear of contracting the virus. Shahzad et al. (2021) determined that food insecurity increased significantly during the Covid-19 pandemic in Pakistan's Punjab province, and the demographics of households and socioeconomic factors impacted food insecurity. Large family-sized households and people living in lockdown have been found to experience more food insecurity during the pandemic. Takawira (2022) bibliometrically examined the relationship between COVID-19 and food systems, taking 84 publications from Scopus and 259 articles from the Web of Science. It was revealed that Covid-19 affected food systems, such as food distribution, as food transport became more difficult due to lockdown measures. There have been many

studies examining the effects of the pandemic on food systems. These studies generally focused on the predictions of the effects of the pandemic on production and the measures to be implemented. These studies have often shown a macro perspective. Possible trade restrictions have been emphasized in many studies. Disruptions in supply chains due to the Covid-19 pandemic have also caused global trade to be negatively affected (Locke et al., 2022); the changing habits of consumers during the COVID-19 process have once again changed due to reasons such as ship accidents in the Suez Canal, the trade war between the USA and China, and the food supply in Eastern Europe due to Russia's invasion of Ukraine (Hernández-Leal et al., 2023). No comprehensive study has been found that examines the effects of pandemic measures only on lemon production and foreign trade. Different measures have led to different results in products that are strategic for some countries. Despite the measures taken during the pandemic period, the determination of the causes of the negativities experienced in lemon production and trade has led to the necessity of this study. In many studies, the predicted negative effects of export restrictions have been experienced in Türkiye and these predictions have been confirmed. This study was carried out to reveal these effects and determine their causes. There have been many political, social and economic problems in the world recently. Therefore, it is essential to determine the policies to be implemented and to implement them meticulously. Demonstrating the policy tools that can be applied in cases where a similar pandemic or trade restriction is required and the effects of these practices will significantly contribute to both the producer and the country's economy.

2. MATERIAL and METHODS

2.1. Sampling Method

Primary data obtained by questionnaire method from 95 producers in Erdemli, Tarsus, and Silifke districts, which provide 89.72% of lemon production in Mersin, constituted the material of the study. According to the data from the farmer registration system, the total number of lemon producers in Mersin is 11.300. A proportional sampling technique was employed to decide the number of lemon producers to be surveyed. Sample volume was calculated as a 95% confidence interval and 10% margin of error. The number of questionnaires was distributed proportionally to the three largest producing districts. 95 questionnaires, 64, 19, and 12 were conducted in Erdemli, Silifke, and Tarsus districts, respectively. The data were collected between April – June 2021.

The suitability of the survey form applied in the study was approved by the Malatya Turgut Özal University Social and Human Sciences Research Ethics Committee (Meeting No: 2024-29).

2.2. Data Analysis

There are many methods to measure individuals' and groups' attitudes, behaviors, and tendencies about a subject. The Likert scale is one of the most common measurement methods for measuring individual and group attitudes and behaviors and consumer tendencies. The Likert scale, developed by Rensis Likert (1932) as a simplified version of the Thurstone scale, is one of the most commonly used methods. Likert-type questions include a judgment statement containing an attitude or opinion on the subject under study and options showing the level of agreement with this statement. Multiple options have presented that downfall between the two extremes to determine the respondent's level of agreement with the judgment statement. These options are ranked in order of "highest to lowest" or "best to worst" (Turan and Şimşek, 2015). Opinions of lemon producers on the measures and precautions taken under 13 main headings in the Covid-19 pandemic were taken. These measures and precautions were;

X_1: Enablement seasonal workers

X_2: Defferal of cooperative debts

X_3: Curfew exemption for producers

X_4: Ease of access to the market

X_5: Improving access to agricultural land

X_6: Postponement of state-owned land leases

X_7: Supporting exporters

X_8: The flexibility of agricultural credits payment

X_9: Low-interest loans

X_{10}: Measures taken for the sale of products

X_{11}: The flexibility of agricultural irrigation legislation

X_{12}: Price increase and strict follow-up to stocking

X_{13}: Pre-permit applications in lemon export

The Likert-type scale is used to obtain information about the extent to which respondents agree with the determined pandemic measures and precautions. The codes for the level of participation of the producers in these judgment statements are*; (1) Strongly disagree, (2) Partly disagree, (3) Undecided, (4) Partly agree (5) Strongly agree.*

The opinions of the producers on the measures, precautions, and policies applied during the pandemic were evaluated by cluster analysis. The distance or similarity of units in a p-dimensional space to one other in terms of the p variable is handled in cluster analysis. While close/similar phenomena are combined and put into a cluster, other units that differ/distance from the units of this cluster can be divided into clusters that are homogeneous within themselves and heterogeneous among themselves (Özdamar, 2018; Zarghami, 2021).

Cluster analysis has four stages. These include obtaining the data matrix, calculating the distance/similarity/difference matrix, identifying the clusters, and examining and testing the clusters. Ward method, one of the hierarchical clustering methods, and the k-means method, one of the non-hierarchical clustering methods, were used in clustering the judgments of the producers regarding the measures taken during the pandemic (Beşen et al., 2020; Wulandari et al. 2022).

The k-means method divides the data sets with many continuous p variables into k clusters to minimize the sum of squares within the cluster. Intra-cluster homogeneity is aimed to have the highest inter-cluster heterogeneity (Özdamar, 2018). The number of clusters determined by the Ward technique is important regarding how many clusters we will evaluate in the non-hierarchical K-means method. As a result, it was divided into two groups based on the producers' responses to the judgment statements. In addition, the importance levels of the variables in the determined cluster numbers were evaluated by analysis of variance (Aydın et al., 2019; Raptou et al. 2022).

It was examined which measures and precautions applied with multidimensional scaling analysis (non-metric) were more effective/different. Multidimensional Scaling (MDS) Analysis is a graphic-based method that helps obtain a representation/graph/map of objects in a desired dimensional space by using the distances determined depending on the object's variables or units. Thus, it helps determine the relationships between units and variables (Alpar, 2011). MDS is implemented in metric and non-metric multidimensional scaling depending on the data type. Metric MDS should be applied for matrices based on quantitative and metric distances, and non-metric MDS should be applied for the score, ordinal and categorical data. The difference between the analysis's apparent and predicted forms in k-dimensional space constitutes the stress value. This value indicates the suitability of the models created for various dimensions. For non-metric scaling, the stress value must be close to zero (Johnson and Wichern, 2007). The low-stress ratio explains the suitability of the obtained solution. A high value indicates a poor fit. The fitness values corresponding to the stress value were categorized by Kruskal (1964) as "= 0.20 /poor", "0.10 < 0.20 / moderate", "0.05 < 0.10 / good" and "0.025 < 0.05 / very good," (Kruskal 1964). The closer the stress statistic to zero, the greater the fit. In MDS analysis, the extent to which the data fits the model is determined by R^2 called the 'Fitness Index. For R^2, values greater than 0.60 are considered appropriate (Hair et al. 1998). This study used the PROXSCAL algorithm as a multidimensional scaling analysis.

3. RESULTS AND and DISCUSSION

3.1. Socio-Economic Characteristics

Some socioeconomic characteristics of the producers were determined, and demographic data

were obtained. The first feature determined for the producers is age, and the average age of the producers is 47.75. The age distribution of the producers revealed that the share of producers who can be defined as young between the ages of 20-30 is relatively low (11.58%). Producers in the 46+ age group constituted the majority, with a rate of 53.68%.

All lemon producers in the research area are male. When the results of the education levels of the producers participating in the research are examined, it is discovered that 31.58% are high school graduates and 28.42% are university graduates. Although the education level is generally low in rural areas of Türkiye, it has been determined that lemon producers have a higher education level. The average work experience of lemon producers is 20.57 years. The average lemon orchard size is 28.72 decares, the average lemon orchard age is 20.83, and the average lemon production amount per enterprise is 94.93 tons.

3.2. Use of subsidies during the Covid-19 pandemic

Policies to support the agricultural sector continue to be effective despite the liberalization trend worldwide. Especially in many developed countries, agriculture remains the most protected sector (Civan, 2010). Due to its disadvantageous characteristics, agriculture is one of the sectors where supportive policies are implemented, especially in developed countries. As with other countries, agricultural policies implemented in Türkiye have various purposes, such as increasing producer income and welfare, price stability, consumer welfare, self-sufficiency, rural development, and foreign exchange savings (Tan et al. 2015). Lemon production subsidies are generally applied on a field basis in Türkiye. Table 1 shows the subsidies for the year 2020 year and the use of subsidies by the producers in the pandemic period for the development of lemon production. Compared to other agricultural producers, the rate of using status from the subsidies of lemon producers is lower. Due to the small scale of the enterprises and field-based subsidy applications, the producers do not benefit enough from agricultural subsidies. They benefited the most from fuel subsidies (34.74%) and fertilizer subsidies (33.68%).

3.3. Level of participation in measures and precautions implemented during the Covid-19

During the Covid-19 pandemic, many measures and precautions have been implemented to ensure the sustainability of agricultural production, food supply, and safety. First, it was predicted that the restrictions on the use of labor in labor-intensive agricultural production would adversely affect production since the beginning of the pandemic.

Table 1. Using status from agricultural subsidies of lemon producers.

Agricultural subsidies	I don't know		I used subsidies		I didn'use support		Total
	n	%	n	%	n	%	
Small enterprise subsidies	36	37,89	4	4,21	55	57,89	95
Good agricultural practices subsidies	17	17,89	12	12,63	66	69,47	95
Fuel subsidies	19	20,00	33	34,74	43	45,26	95
Fertilizer subsidies	21	22,11	32	33,68	42	44,21	95
Organic agriculture subsidies	17	17,89	13	13,68	65	68,42	95
Soil analysis subsidies	16	16,84	21	22,11	58	61,05	95
Biological pest management subsidies	15	15,79	7	7,37	73	76,84	95
Biotechnical pest management subsidies	15	15,79	8	8,42	72	75,79	95
Certified sapling use subsidies	15	15,79	8	8,42	72	75,79	95
Standard sapling usage subsidies	18	18,95	3	3,16	74	77,89	95

The measures and precautions taken in lemon cultivation, which is a labor-intensive production, and the level of participation of the producers in these measures are given in Table 2.

Table 2. Level of participation in measures and precautions for the agricultural sector during the pandemic period

Measures and Precautions	N	Mean	Std. Deviation
X1: Enablement of seasonal workers	95	3,663	1,527
X2: Defferal of cooperative debts	95	3,495	1,656
X3: Curfew exemption for producers	95	3,495	1,623
X4: Ease of access to the market	95	3,432	1,680
X5: Improving access to agricultural land	95	3,390	1,620
X6: Postponement of state-owned land leases	95	3,211	1,643
X7: Supporting exporters	95	3,168	1,736
X8: The flexibility of agricultural credits payment	95	3,095	1,664
X9: Low-interest loans	95	3,042	1,637
X10: Measures taken for the sale of products	95	2,979	1,707
X11:The flexibility of agricultural irrigation legislation	95	2,874	1,703
X12: Price increase and strict follow-up to stocking	95	2,505	1,630
X13: Pre-permit applications in lemon export	95	2,126	1,468

(1) Strongly disagree (2) Partly disagree (3) Undecided (4) Partly agree (5) Strongly agree.

Regarding the level of producer participation in the measures implemented, the highest scores were "Enablement of seasonal workers.", "Defferal of cooperative debts" and "curfew exemption for producers,". The measure with the lowest score given by the producers was "Pre-permit applications in lemon export." The province of Mersin, where the research was carried out, is Türkiye's most crucial lemon export center, and lemons are mainly export-oriented products. With the coronavirus turning into a global pandemic, there has been a high demand for products containing vitamin C, especially lemon, in many countries. This situation has increased the foreign demand for lemon. However, considering the country's needs, Türkiye has introduced pre-permit applications and restrictions on lemon exports because the inability to send the lemons in stocks to foreign markets led to loss of markets, decrease in lemon exports and domestic lemon prices.

3.4. Cluster analysis results

Ward's minimum variance criterion minimizes the total within-cluster variance. To use this strategy, select the pair of clusters that results in the smallest increase in total within-cluster variance after merging at each phase. At first, all clusters are singletons (clusters with a single point). The initial distance between individual objects must be (proportional to) squared Euclidean distance to execute a recursive algorithm under this goal function.

Ward's minimal variance approach defines the initial cluster distances as the squared Euclidean distance between points (Szekely et al., 2005). According to the results of Ward clustering analysis using the distances determined by the square Euclidean distance method, the most similar producers were determined. 57-95, 56-94, 55-93, 9-92, 42-91, 41-90, 40-89, 77-88, 76-87, 75-86, 74-85, 24-83, 68- 69, 4-63, 8-58, 47-49, 43-47, 29-37, 33-34, 14-29, 18-23, 19-20, 2-18 and 1-2 (0.000) producers appears to be similar. In the tree graph, it was determined that the producers were clustered into two groups.

Table 3 shows the results of the non-hierarchical clustering method of producer judgments about the measures used during the pandemic. In the cluster analysis applied, it has been revealed that

the intensity of labor use is similar between clusters in order to ensure sustainability in production, but there is a difference between clusters for financial sustainability. In the first cluster, " Enablement of seasonal workers," "Curfew exemption for producers," "Ease of

access to the market," and in the second cluster, "Defferal of cooperative debts," "To enable seasonal workers," "Curfew exemption for producers" were determined as the most important criteria.

Table 3. Final Cluster Centers

Measures and Precautions	Cluster	
	1	2
X_1: Enablement of seasonal workers	2,65	4,50
X_2: Defferal of cooperative debts	2,14	4,62
X_3: Curfew exemption for producers	2,51	4,31
X_4: Ease of access to the market	2,44	4,25
X_5: Improving access to agricultural land	2,35	4,25
X_6: Postponement of state-owned land leases	1,93	4,27
X_7: Supporting exporters	2,00	4,13
X_8: The flexibility of agricultural credits payment	2,05	3,96
X_9: Low-interest loans	2,09	3,83
X_{10}: Measures taken for the sale of products	2,14	3,67
X_{11}: The flexibility of agricultural irrigation legislation	1,63	3,90
X_{12}: Price increase and strict follow-up to stocking	1,58	3,27
X_{13}: Pre-permit applications in lemon export	1,63	2,54

ANOVA analysis was used to examine the differences between the clusters formed within the framework of the measures and thoughts on the measures used. According to the analysis results, all applications differ between the groups at the

99% confidence level (Table 4). Table 4 contains the ANOVA results. Accordingly, it is seen that all variables considered are statistically significant.

Table 4. ANOVA Results

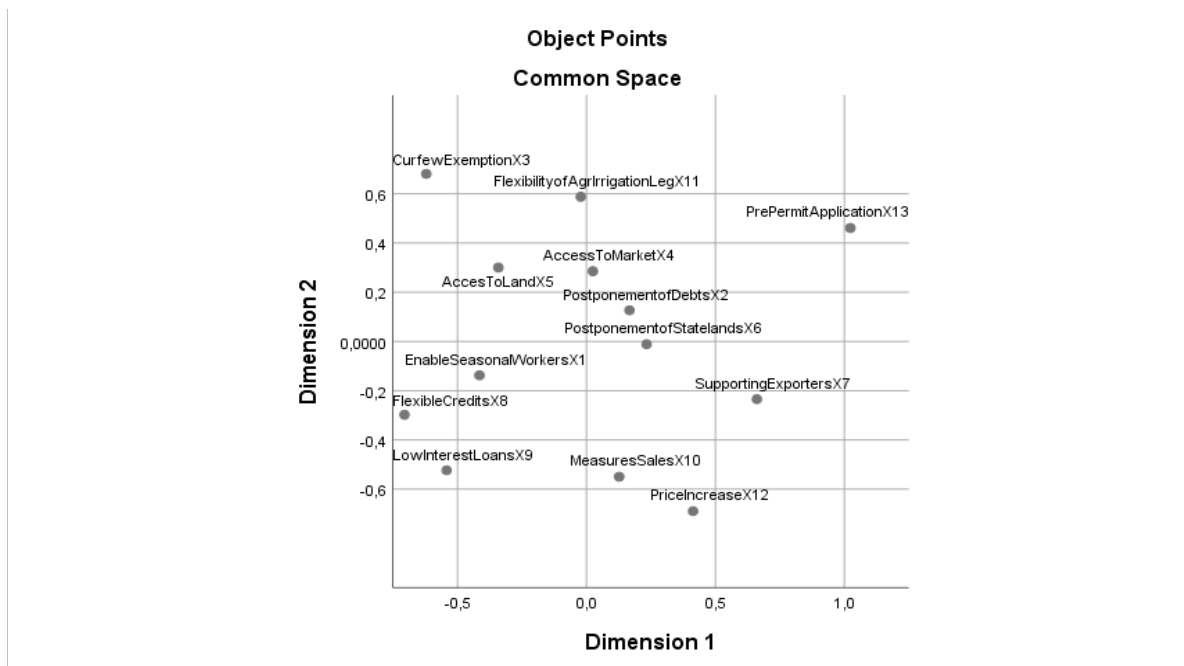| Measures and Precautions	Cluster		Error			
	Mean Square	df	Mean Square	df	F	Sig.
X_1: Enablement of seasonal workers	80,454	1	1,492	93	53,919	,000
X_2: Defferal of cooperative debts	144,277	1	1,220	93	118,249	,000
X_3: Curfew exemption for producers	75,926	1	1,848	93	41,096	,000
X_4: Ease of access to the market	76,951	1	2,025	93	37,994	,000
X_5: Improving access to agricultural land	85,072	1	1,737	93	48,984	,000
X_6: Postponement of state-owned land leases	128,768	1	1,344	93	95,787	,000
X_7: Supporting exporters	107,248	1	1,893	93	56,652	,000
X_8: The flexibility of agricultural credits payment	86,317	1	1,869	93	46,180	,000
X_9: Low-interest loans	70,761	1	1,947	93	36,344	,000
X_{10}: Measures taken for the sale of products	55,353	1	2,351	93	23,548	,000
X_{11}: The flexibility of agricultural irrigation	121,918	1	1,619	93	75,305	,000
X_{12}: Price increase and strict follow-up to stocking	67,051	1	1,964	93	34,132	,000
X_{13}: Pre-permit applications in lemon export	19,515	1	1,967	93	9,919	,002

3.5. Multidimensional scaling analysis results

At this stage, effective practices were determined by examining the opinions of the producers regarding the measures and precautions taken during the pandemic period with non-metric multidimensional scaling analysis. According to Kruskal (1964), the stress value was calculated as 0.04393. This value represents "good fit" according to the stress value and the fitness schedule. R^2, the explanatory coefficient in the analysis, was calculated as 0.96548. If this value is high (it is expected to be above 60%), the stress value for k=2 dimensions explains the data approximately 97%.

As seen here, the measures and similar measures applied during the pandemic are grouped around the origin. On the other hand, those with differences were far from the group. According to the results of the MDS analysis, "X_{13}: Pre-permit applications in lemon export" differs from the others. In Figure 1, which was created according to the calculated coordinates in Table 5, it is seen that pre-permit applications in lemon export are different from the others, and other measures are similar among themselves. Hepburn et al. (2022) stated in their study that 22 countries had declared food export restrictions according to the Covid-19 Food Trade Policy Tracker of the International Food Policy Research Institute (IFPRI). They emphasized that mainly products such as wheat and rice are on the list of export restrictions, but lemons, eggs, turnips, beer, and alcoholic beverages stand out as the most affected products. Sangeeta et al. (2021) analyzed the restrictions during the pandemic faced by citrus growers in India. It has been determined that during the lockdown, the biggest problems of Indian farmers producing India's most popular tangerine variety were the severe restrictions regarding logistics and marketing. Kutlar (2021) analyzed the volatility caused by the pandemic process in macroeconomic indicators and whether it showed similar trends in terms of OECD countries. The macroeconomic indicators of countries with similar characteristics were grouped using cluster analysis and multidimensional scaling analysis, and it was investigated whether this grouping changed during the pandemic process. According to the results obtained, the most affected economic variable was determined as the foreign trade volume. In the measures and precautions implemented during the pandemic, the most adversely affected issue in the lemon sector was exporting, similar to those experienced in other countries.

Figure 1. Representation in Two-Dimensional Space According to the Euclidean Distance Model

Tablo 4. ANOVA results

Measures and Precautions	Cluster Mean Square	df	Error Mean Square	df	F	Sig.
X_1: Enablement of seasonal workers	80,454	1	1,492	93	53,919	,000
X_2: Defferal of cooperative debts	144,277	1	1,220	93	118,249	,000
X_3: Curfew exemption for producers	75,926	1	1,848	93	41,096	,000
X_4: Ease of access to the market	76,951	1	2,025	93	37,994	,000
X_5: Improving access to agricultural land	85,072	1	1,737	93	48,984	,000
X_6: Postponement of state-owned land leases	128,768	1	1,344	93	95,787	,000
X_7: Supporting exporters	107,248	1	1,893	93	56,652	,000
X_8: The flexibility of agricultural credits payment	86,317	1	1,869	93	46,180	,000
X_9: Low-interest loans	70,761	1	1,947	93	36,344	,000
X_{10}: Measures taken for the sale of products	55,353	1	2,351	93	23,548	,000
X_{11}: The flexibility of agricultural irrigation legislation	121,918	1	1,619	93	75,305	,000
X_{12}: Price increase and strict follow-up to stocking	67,051	1	1,964	93	34,132	,000
X_{13}: Pre-permit applications in lemon export	19,515	1	1,967	93	9,919	,002

4. CONCLUSIONS

Many precautions and measures have been implemented worldwide to ensure agricultural production's sustainability during the pandemic. While some measures made significant contributions during the pandemic, others could not provide the desired contribution. It was necessary to determine whether the measures and precautions taken during the pandemic in Mersin, the center of lemon production and export in Türkiye, achieved their purpose and which measures affected the production and export of lemons. In today's world, when possible pandemic conditions are discussed, deciding what measures and practices will not disrupt sustainable lemon production and marketing are crucial for policy-makers. Therefore, the effects of the measures and restrictions taken under pandemic conditions will guide future decisions for the sector. It is anticipated that there may be disruptions in the functioning of the global supply chain due to various global health factors and wars. However, reasons such as sanctions and trade embargoes also negatively affect the supply of raw materials and threaten the security of the food supply.

In the cluster analysis, exemptions for the use of labor in both groups were determined as important criteria. The exemption from lockdown restrictions in lemon farming, a labor-intensive mode of production, enabled the use of labor. According to the non-metric multidimensional scaling analysis results, the applied measures and their similarities are generally gathered around the origin. However, the "pre-permit applications in lemon export" measures took place far from the group and presented a different situation from others. The use of the labor force worldwide was emphasized, and it was stated that it is crucial for the sustainability of agricultural production. This measure, which was taken in order not to disrupt production in agriculture during the pandemic period, prevented possible problems in lemon production. However, pre-permit applications in lemon export and the restrictions placed during the export process harmed exports. At the same time, it caused a decrease in domestic prices and adversely affected domestic sales. Today, when possible pandemic conditions are discussed, the number of lemons in warehouses should be known in terms of the country's needs and exports, and planning should be done accordingly in determining the measures and precautions to be applied for food safety and sustainability.

The reflection of the measures and precautions applied to all producers has been different. However, as a result of the measures and measures

implemented on a macro scale, it was concluded that it did not affect the production very much, and that only the production and trade of lemons were adversely affected due to export restrictions.

The measures and precautions must be meticulously determined to maintain profitability and competitiveness in the region, where the small-scale business structure dominates. In order to ensure food safety, to meet domestic and foreign market demands, planned production, traceability of storage processes and improvement of stock management have been determined as prominent factors in crisis situations.

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Appendix 1. Dendogram using Ward Linkages, rescaled distance cluster combine