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Determination of greenhouses and its insurance conditions damaging from natural disasters occurred in districts of eastern Antalya region

Doğu Antalya bölgesinde bulunan ilçelerde meydana gelen doğal afetlerden zarar gören seralarin ve sigorta durumlarinin belirlenmesi

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Ö Z E T / A B S T R A C T

Aims: Antalya has a very suitable potential for greenhouse production due to its climatic structure and geographical location. However, the vast majority of this greenhouses have not statically projected. These greenhouses were installed by untrained people who are not qualified about the greenhouse more than the competent firms. In addition, these unqualified people used structurally insufficient constructions in the installation stage in the vast majority of these greenhouses. At the same time, Antalya is a region that can be seriously damaged climatically due to the fact that its geographical location. Therefore, the damage potential of those greenhouses can be is high in any natural disaster. In this study, it was aimed at the determination of greenhouses and its insurance conditions damaging from natural disasters occurred in districts of the eastern Antalya region.

Methods and Results: In this study, it was determined how the plant production structures in the districts of East Antalya are affected by the natural disasters such as hail, showers, storms, hurricanes, hoses and fire, and how they were able to withstand or affected these climatic disasters. In addition, it was determined whether the greenhouses damaged were covered by agricultural or private insurance and if they were insured, how much they benefited from this insurance. For this purpose, surveys were carried out with the greenhouse owners in the districts located in the East Antalya region. The results of the survey were evaluated with SPSS software.

Conclusions: It has been determined how the disasters occurred in which part of Antalya and how they affect the greenhouses in the area. At the end of the study, the suitable greenhouse type (size, roof type, cover type etc.) and construction sections for those regions were proposed.

Significance and Impact of the Study: It was determined that education level, foundation, and basement status, profile type used in the greenhouse were related to damage situations of greenhouses caused by natural disasters.

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INTRODUCTION

The agricultural sector is of vital importance for people living in a country to sustain their vital activities. Adequate and balanced nutrition of the population of the country will only be ensured by regular agricultural production. In our country, a significant part of the population lives in rural areas and provides with agricultural production their livelihood. Therefore in our country, for reducing all risk factors affecting agricultural production, ensuring a regular agricultural production and for the prevention of fluctuations in the income of people living in rural areas Agricultural Insurance is a very important need.

The agricultural sector is one of the sectors most affected by natural and economic risks. Besides, the agricultural sector is a sector needs to be supported both economically and strategically throughout the world. Therefore, this sector should be protected against all risks to occur. Minimizing the effects of natural risks such as heavy rainfall, hail, hurricane, hose, frost, drought in the agricultural sector can only be achieved by applying effective risk management in the agricultural sector. Today, the most important and effective risk management tool used for the agricultural sector in the world is “Agricultural Insurance”. Agricultural Insurance is a security system that compensates the losses occurred due to risks and uncertainties in agriculture (Kırkbeşoğlu, 2015). In Turkey, In order to be guaranteed the risks threatening the agricultural sector in 2005 within the scope of Law No. 5363 dated 14.06.2005 "Agricultural Insurance Act" has been enacted. Within the scope of this law, an insurance pool was established for the purpose of compensating damages in agricultural production from a single center and developing and extending agricultural insurances. In order to carry out all the works and transactions related to this pool by a company in which the insurance companies participating in this pool have equal shares, the Agricultural Insurance Pool Management Inc. (TARSİM) was created (Çipil, 2008; Sümer and Polat, 2016). Mostly, agricultural structures are considered as buildings cheap and uncomfortable only with sufficient width. However, when planning agricultural structures, first of all, it should be remembered that the material to be sheltered is living material and the building should be planned according to the living species. For this reason, agricultural production structures should be designed in accordance with the purpose of construction like other structures and should be built to long last and durable in accordance with the standards (Büyüktaş et al., 2016).

For plant production, greenhouses are used which are defined as structural elements capable of providing the necessary development factors throughout the year and capable of the workable inside (Üstün and Baytorun, 2003). Greenhouses should be constructed in accordance with the climatic conditions of the region and provide the necessary environmental conditions for plant development (Baudion and Zabeltitz, 2002). In Turkey, greenhouses are often built without taking into account local conditions and without static and strength calculations. Therefore either more or fewer construction materials than necessary are used. If more materials are used than necessary the shading rate in the greenhouse increases and if less material is used the collapse occurs in bad weather conditions (Üstün and Baytorun, 2003).

Antalya is a vulnerable region to serious damage because of the surrounded by the Mediterranean Sea in the south and the Taurus Mountains extending parallel in the north. In addition, it is a place where greenhouse cultivation is intense due to the favorable climatic conditions. In this study, it was determined that the number of plant production structures damaged by the natural disasters in Eastern Antalya in recent years. In addition, it was found out that whether these structures are covered by agriculture and/or private insurance, if they are covered by insurance, how much they benefit from this insurance. In addition, the technical and structural features of the plant production structures damaged due to natural disasters and the causes of damage were determined.

MATERIALS and METHODS

The study was conducted in Antalya and its some districts. High tunnels and greenhouses damaged by natural disasters in Central and Eastern Antalya where the plant production is intense were used as material. For this purpose, the enterprises which were damaged according to data obtained from Antalya Directorate of Provincial Agriculture and Foresty and District Directorate of Agriculture and Foresty were determined. The climatic events data that caused the damage were taken from Antalya Meteorology Regional Directorate. Data on whether damaged greenhouses are agricultural or private insured were obtained from Antalya Provincial Directorate of Agriculture and Forestry, TARSİM Antalya Regional Directorate and other insurance companies that work with TARSİM (Agricultural Insurance Pool).

In this study, a survey was conducted with the damaged greenhouse owners in order to determine the damages of the disasters caused by climatic events in the agricultural sector. In the selection of the surveyed

enterprises, Stratified Sampling (Neyman) Method" was used in order to increase the accuracy of the findings to be obtained with the information collected from the enterprises. Stratified sampling is a classical survey sampling technique, which is used to estimate population parameters efficiently when there is substantial variability between subpopulations (Cochran 1977; Neyman 1934). The number of sample enterprises to be surveyed with Stratified Sampling Method was calculated with the help of Eq. 1 and Eq. 2 (Çiçek and Erkan 1996; Karagölge and Peker 2002).

$$n = \frac{N.\sum(Nh.Sh^2)}{N^2.D^2 + \sum(Nh.Sh^2)} \quad \text{(Eq. 1)}$$

$$D^2 = \frac{d^2}{z^2} \quad \text{(Eq. 2)}$$

Where the n is sample volume/size, N is number of units in the population, Nh is number of units in h layer, Sh is standart deviation in h layer, Sh^2 is variance in h layer, d is the allowed error amount in the population mean or difference between the sample mean and the population mean, which is taken as 5%, z is the z value in the standard normal distribution table (95% distribution table) according to this margin of error.

At the end of the study, statistical analysis of the data obtained from the measurements, observations, and surveys were evaluated with SPSS software. The results of the survey were statistically analyzed in SPSS package program according to Pearson Chi-Square test method. The number of disasters such as hail, storms, hose and flood causing damage to the greenhouse structures in the research area are given in Fig. 1-4.

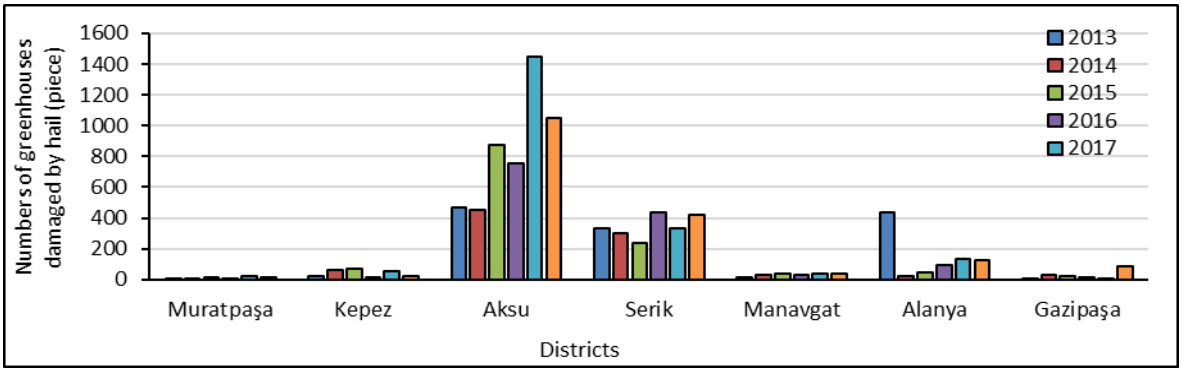

Figure 1. Amount of greenhouse damaged by hail according to years

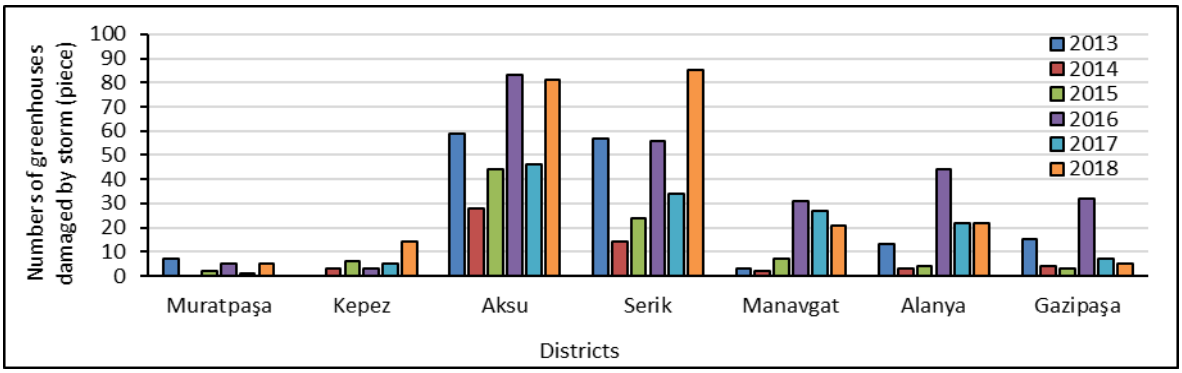

Figure 2. Amount of greenhouse damaged by storm according to years

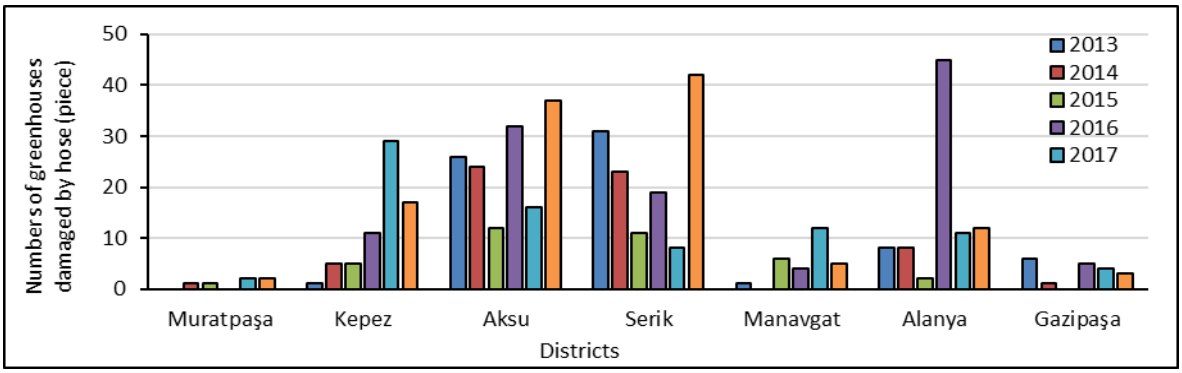

Figure 3. Amount of greenhouse damaged by hose according to years

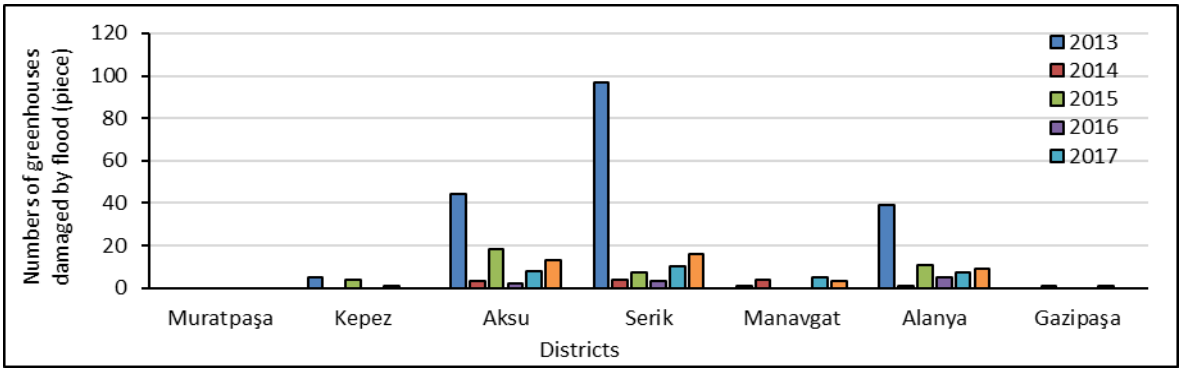

Figure 4. Amount of greenhouse damaged by flood according to years

RESULTS and DISCUSSION

The results obtained in this study are given as graphs. The educational status of the owners is given in the Figure 5. As can be seen in the figure, 80% of greenhouse owners of the respondents in the sample are primary school graduates, 8% are secondary school graduates, 5% are high school graduates, 7% are bachelor degree.

In the study, 98% of the surveyed owners are farmers and 2% are agricultural engineers. In most of the enterprises, while the greenhouse cultivation is carried out by people who do not have any knowledge and training about plant cultivation and only 1 of them is carried out by experts. When the ownership status of the greenhouses is examined, it is determined that 95% is owned by the owner and 5% is a shareholder by the owner and someone else. According to the results of the survey, almost all greenhouses are owned by the owners.

The building years of the greenhouses damaged by disasters are given in the Figure 6. As can be seen in Figure 6, 40% of greenhouses were made before 2010 and 60% were made during and after 2010, the years covered by the survey. It was determined that 2% of the greenhouses damaged by disasters were damaged between 1990 and 2000, 10% were damaged between 2001 and 2010 and 88% were damaged in 2011 and after.

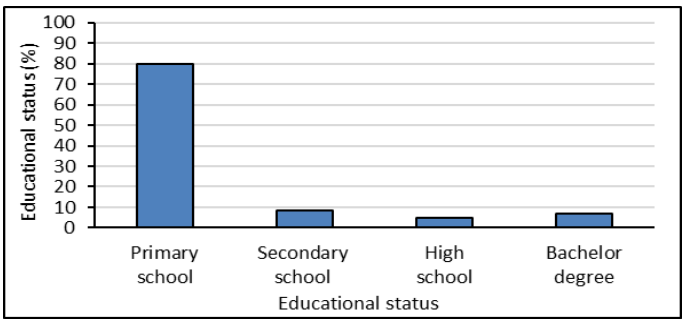

Figure 5. Educational status of greenhouse owners

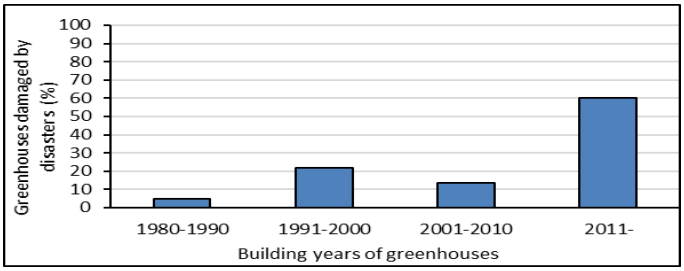

Figure 6. Building years of the damaged greenhouses

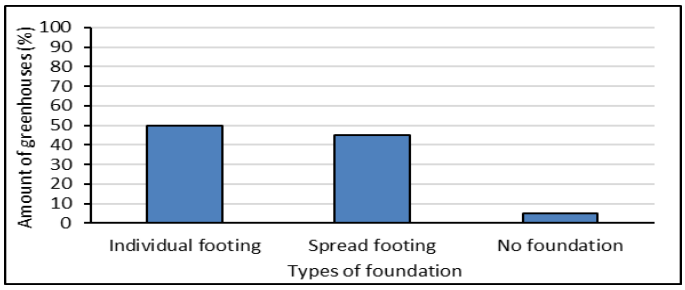

Figure 7. Foundation status of the greenhouses

The foundation types used in greenhouses are given in the Figure 7. It has been determined that 50% of the greenhouses damaged by disasters have a individual footing and 45% have spread footing. Owners has been stated that in the remaining 5% has no foundation. In addition, it was determined that while 68% of the surveyed greenhouses had a basement, 32% had not got. Heavy rainfall and storm are common in the research area. Besides, there is no basement one of in every three greenhouses examined. This may cause greenhouses to be damaged more easily than natural disasters.

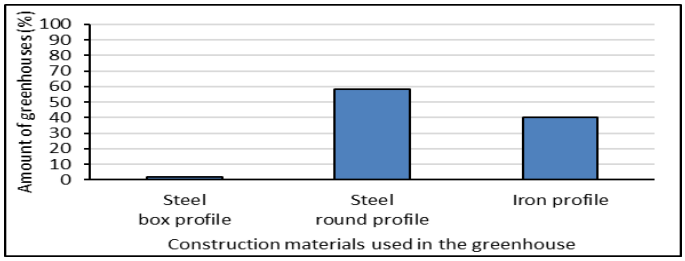

Figure 8. Distribution of construction materials used in the greenhouse

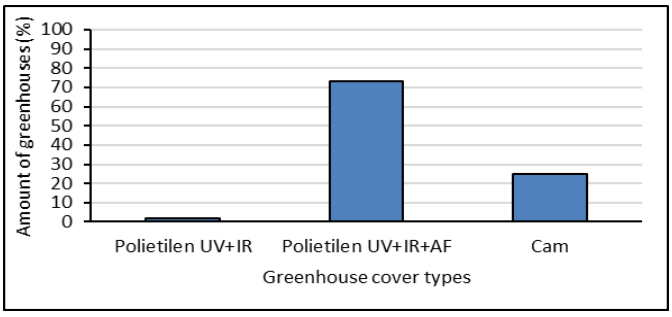

Figure 9. Types of damaged greenhouse cover material

In the study, it was determined that 2% of the construction materials used in the greenhouses were steel (box profile), 58% were steel (round profile) and 40% were iron profile (Figure 8). When the elements that joining construction elements used in greenhouses are examined, it was determined that 5% of the metal elements used in the greenhouse were combined with rivets, 18% with bolts, 65% with welding, 10% with bolts and welds, and 2% with both rivets, bolts and welds. Almost half of the damaged greenhouses have been observed to be welded greenhouses.

Greenhouse cover material types examined in the study are given in Figure 9. 2% of the cover materials of damaged greenhouses are PE UV, 73% are PE UV + IR + AF and 25% are glass. In addition, the service life of the cover material of the greenhouses examined was determined to be 24 months in 7% of the greenhouses, 36 months in 70% and 60 months in 23%. It was also determined that 10% of the greenhouses are in the east-west direction and 90% in the north-south direction. Besides, 32% of the greenhouse roof types are gable roofs, 3% are venlo roofs, 62% are arc roofs and 3% are gothic roofs. It was determined that the majority (65%) of the greenhouses damaged by disasters were plastic covered greenhouses. Glass-covered greenhouses are more resistant to disasters.

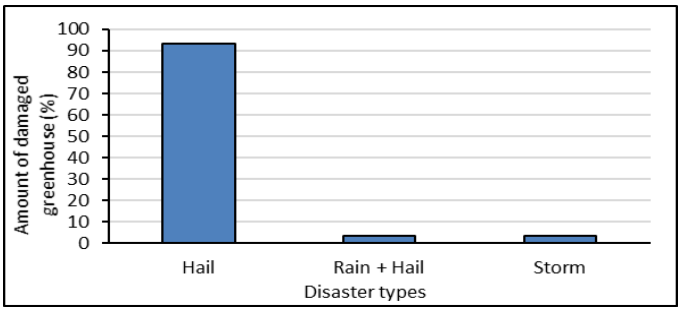

Figure 10. Disaster types that damage the greenhouses

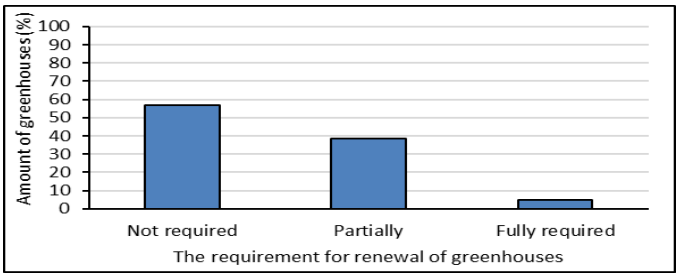

Figure 11. The renewal requirements of greenhouses

It was determined that 2% of the greenhouse building elements of the greenhouses damaged by disasters had no corrosion, 92% had less, and the remaining 7% had too much corrosion. Corrosion in the carrier construction of 99% of the greenhouses caused a cross-section shrinkage. This may have caused to decrease in resistance of the greenhouse skeleton system to the storm and the destruction of greenhouses more quickly. According to the greenhouse owners, the renewal requirements of the greenhouses are given in Figure 11. Accordingly, it was stated that 57% of the greenhouses did not need to be renewed, 38% needed partial renewal and 5% needed complete renewal.

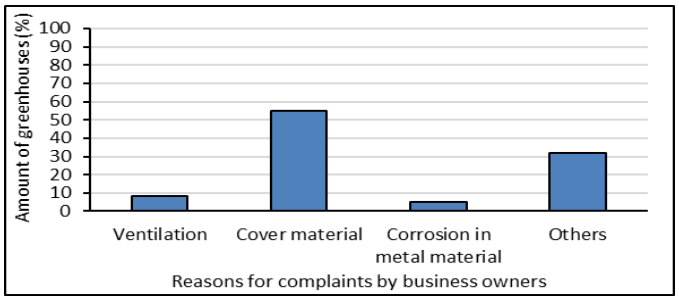

Figure 12. Cases where business owners complain in greenhouses

In the study, 8% of the surveyed owners reported that they have complaints from ventilation, 55% from cover material, and 3% from metal corrosion. The remaining 32% reported that they have complaints from other reasons (Figure 12).

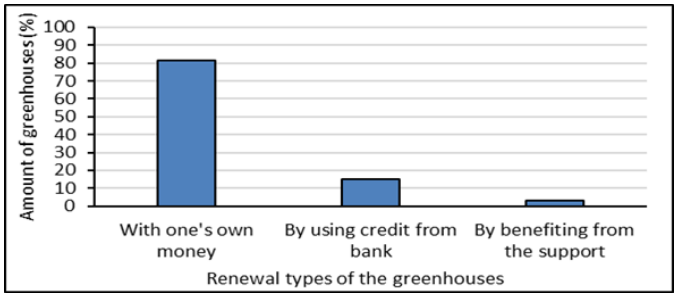

Figure 13. Support, grant and credit usage status of the greenhouses

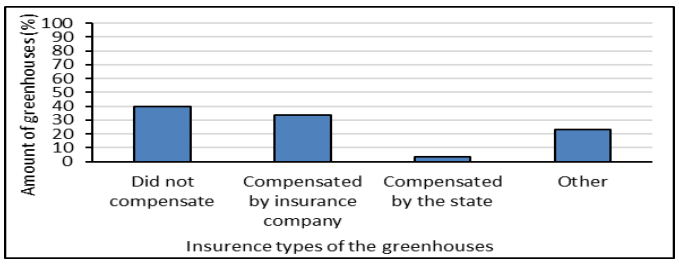

Figure 14. Compensating situation formed in greenhouses as a result of natural disasters

The status of enterprises to receive loans, support or grants is shown in Figure 13. It is determined that 82% of enterprise owners have built their greenhouses with their own money, 15% by taking loans from the bank and 3% by benefiting from the grant. The majority of greenhouses damaged by disasters are greenhouses built by the owner's sources. It was observed that the greenhouses receiving grants and support from the state suffered less damage. Besides, while 43% of the greenhouses damaged by the disaster had no agricultural insurance and 57% of greenhouses had agricultural insurance. Figure 14 shows the ways in which greenhouse owners can compensate for damages in greenhouses surveyed as a result of natural disasters. According to the survey results, 40% of greenhouse owners did not receive any support to repair their greenhouses. Moreover, 33% of greenhouse owners received support from the insurance company to repair their damaged greenhouses and 4% from the state. The remaining 23% stated that they had been compensated their damage by other means.

CONCLUSION

According to the results of the survey, it was found out that the damage situation of greenhouses from natural disasters depends on the criteria such as education level, foundation, and basement status, profile type used in the greenhouse. Greenhouses build by blacksmiths who are not experts in their work have no static plan and project and they are more likely to be damaged in natural disasters. In addition, the severity and types of natural disaster have been significantly effective of damage to greenhouses. It was understood that as the education level increased, the insured status of the greenhouses increased. Therefore, insurance the greenhouses in the regions where natural disasters occur frequently minimizes the damage to the farmer families. This situation is an obligation that will not be put at risk for the farmers whose only source of income is agriculture.

ÖZET

Amaç: Antalya ili gerek iklimsel yapısı gerekse coğrafi konumu gereği sera üretimi için oldukça uygun bir potansiyele sahiptir. Ancak, bu seraların büyük çoğunluğu statik açıdan projelendirilmemiş, yapısal yönden yetersiz konstrüksiyon kullanılarak, yetkili firmalardan daha çok gelişi güzel eğitimsiz ve işinin uzmanı olmayan kişilere yaptırılmış seralardır. Bununla birlikte, Antalya coğrafi konumundan dolayı ciddi anlamda iklimsel hasara açık bir bölgedir. Dolayısı ile oluşabilecek herhangi bir doğal afette zarar görme potansiyelleri yüksektir. Bu çalışamada Doğu Antalya bölgesinde bulunan ilçelerde meydana gelen doğal afetlerden zarar gören seralarin ve sigorta durumlarinin belirlenmesi amaçlanmıştır.

Yöntemler ve Bulgular: Bu çalışmada, Doğu Antalya bölgesindeki ilçelerde bitkisel üretim yapılarının ilde oluşan dolu, sağanak yağış, fırtına, kasırga, hortum ve yangın gibi doğal afetlerden nasıl etkilendikleri, oluşan bu iklimsel afetlere karşı hangi oranda dayanabildikleri ya da bu olaylardan nasıl zarar gördükleri belirlenmiştir.

Bunun yanında, zarar gören seraların tarım veya özel sigorta kapsamında olup olmadıkları, eğer sigortalıysa bu sigortadan ne kadar yararlandıkları belirlenmiştir. Bunun için Doğu Antalya bölgesinde bulunan ilçelerdeki sera sahipleri ile anketler yapılmıştır. Anket sonuçları SPSS paket programı ile değerlendirilmiştir.

Genel Yorum: Oluşan afetlerin Antalya'nın hangi bölgesinde hangi oranda etkili olduğu, o bölgedeki örtüaltı yapılarını nasıl etkilediği belirlenmiş ve o bölgeler için uygun sera yapı tipi (boyutları, çatı tipi, örtü tipi vs.) ve konstrüksiyon kesitleri önerilmiştir.

Çalışmanın Önemi ve Etkisi: Eğitim düzeyi, kuruluş, su basmanı ve serada kullanılan profil tipinin seraların doğal afetlerden kaynaklanan hasar durumuyla ilişkili olduğu belirlenmiştir.

Anahtar kelimeler: Bitkisel üretim yapıları, dolu zararı, konstrüksiyon, küresel ısınma, tarım sigortası

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DECLARATION OF CONFLICTING INTERESTS

The authors declared no potential conflicts of interest for this study.

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