

Examination of Numerical Changes in Goat and Buffalo Population in TRB1 Region with Cluster Analysis

Murat ÇİMEN¹, Alper GÜVEN^{2*}

Öne Çıkanlar:

- Hayvancılık
- Keçi

M

Anahtar Kelimeler:

- Keçi
- Manda
- TRB1 bölgesi
- anda
- Bölge
- Kümeleme analizi
- Kümelemeanalizi

ÖZET:

Bu çalışmada TRB1 bölgesinde keçi ve manda yetiştiriciliği alanında hayvan sayısı değişimlerinin belirlenmesinde kümeleme analizi kullanımının etkinliği test edilmiştir. Araştırmada kullanılan keçi ve manda sayıları TÜİK'in 2004-2023 yılları arasında tuttuğu kayıtlardan elde edilmiştir. Kümeleme analizi sonuçlarına göre 2004-2023 yılları arasında Elazığ ve Bingöl illerindeki manda sayılarının Malatya ve Tunceli illerine göre daha yüksek olduğu tespit edilmiştir. Belirtilen yıllara göre keçi sayısı bakımından Bingöl ili diğer illere göre yüksek bulunurken, en düşük değerlerin Malatya ilinde olduğu tespit edilmiştir. Yıllara göre analiz yapıldığında TRB1 bölgesi illerinin 2004-2006 yıllarına ait manda sayıları sonraki yıllardan daha yüksek bulunmuştur. Diğer ifadeyle manda sayılarının 2007 yılından itibaren TRB1 bölgesinde azalmakta olduğu anlaşılmaktadır. TRB1 bölgesinde 2012-2023 yılları arası keçi sayıları 2004-2011 yıllarından yüksek bulunmuştur. Buna göre 2012 yılından sonra günümüze kadar geçen dönemde TRB1 bölgesinde keçi sayılarında artış olduğu söylenebilir. TRB1 bölgesinde manda ve keçi sayıları bakımından illere ve yıllara göre görülen farklılıklar dikkate alınarak uygun düzenlemelerin yapılması gerekmektedir. Bu çalışmada iller ve yıllara göre hayvan sayılarındaki farklılıkların belirlenmesinde kümeleme analizinin başarılı bir şekilde kullanılabildiği görülmüştür.

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Highlights:

- AnimalHusbandry
- Goat
- Buffalo
- Region
- Clustering analysis

Keywords:

- Goat
- Buffalo
- TRB1 region
- Clustering analysis

ABSTRACT:

In this study, the effectiveness of using cluster analysis in determining the changes in the number of animals in the field of goat and buffalo breeding in the TRB1 region was tested. The numbers of goats and buffalos used in the research were obtained from the records kept by TÜİK between 2004 and 2023. According to the cluster analysis results, the numbers of buffalos in Elazığ and Bingöl provinces was found to be higher than Malatya and Tunceli provinces between 2004 and 2023. According to the specified years, while Bingöl province was found to be higher than other provinces in terms of the numbers of goats, it was determined that Malatya province had the lowest values. When analyzed by year, the numbers of buffalos in the provinces of the TRB1 region for the years 2004-2006 was found to be higher than the following years. In other words, it is understood that the numbers of buffalos has been decreasing in the TRB1 region since 2007. In the TRB1 region, goat numbers between 2012-2023 were found to be higher than those between 2004-2011. Accordingly, it can be said that there has been an increase in the number of goats in the TRB1 region since 2012. In the TRB1 region, appropriate regulations need to be made, taking into account the differences between provinces and years in terms of the numbers of buffalos and goats. In this study, it was seen that cluster analysis could be used successfully in determining the differences in animal numbers according to provinces and years.

¹ Murat ÇİMEN (Orcid ID: 0000-0003-4290-2718), CMN Center for Statistics and Scientific Research, Çorum, Türkiye

² Alper GÜVEN (Orcid ID: 0009-0007-6698-9754), Munzur University, GSTM Faculty, Department of Gastronomy and Culinary Arts, Tunceli, Türkiye

*Corresponding Author: Alper GÜVEN, e-mail: agueven@munzur.edu.tr

INTRODUCTION

Turkey has a great potential in terms of product diversity and quantity in agricultural production. Rational and planned use of existing resources will make the country stronger in the international competitive environment. Achieving this will be possible by determining and implementing policies appropriate to current conditions (Kaymakçı and Taşkın, 2008).. Examining the current situation at the regional and provincial level and carrying out the necessary studies will ensure that resources are used more efficiently in terms of national and international competition. In order to increase productivity by region in the country, appropriate agricultural policies must be determined and implemented as soon as possible (Anonymous, 2007). According to 2023 data, there are 10.3 million goats and 162 thousand head of buffalo in Turkey (TUIK, 2024). It is necessary to increase the number of existing animals by encouraging animal husbandry (Keskin, 2022). Determining the current situation of our country's animal husbandry by analyzing it with current research is of great importance in terms of the direction to be given to animal husbandry (Semerci and Çelik, 2016). It is noteworthy that descriptive statistical methods have been used predominantly in the studies carried out so far in the field of animal husbandry in our country (Vural and Fidan, 2007; Ergün and Bayram, 2021). However, it is possible to gain different perspectives on the relevant data by using different statistical methods. Cluster analysis, one of the non-parametric methods, is an effective method for analyzing existing data according to research groups (Hinton et al., 2004). In this research, the effectiveness of using cluster analysis on data related to goat and buffalo numbers will be tested. A detailed explanation of the statistical method used in this study based on the data will make a great contribution to future research on animal production in our country.

MATERIALS AND METHODS

Data expressing the amounts of buffalo and goats raised in the provinces of the TRB1 region (Bingöl, Elazığ, Malatya, Tunceli) were obtained from the records kept by TUIK between 2004 and 2023 (TUIK, 2024). In TUIK data, data on the quantities of buffalos and goats before 2004 could not be found. Years before these years could not be included in the research due to lack of data. The number of buffalos for the TRB1 region and the provinces of this region are given in Table 1.

Table 1. Number of buffalos in TRB1 region provinces by year

Years	Bingöl	Elazığ	Malatya	Tunceli	TRB1 (Provinces Total)
2004	457	698	0	0	1155
2005	476	713	0	115	1304
2006	130	627	0	0	757
2007	90	130	0	0	220
2008	50	149	0	0	199
2009	65	156	0	0	221
2010	78	147	0	0	225
2011	101	40	0	0	141
2012	166	38	0	0	204
2013	192	32	0	0	224
2014	168	41	0	0	209
2015	122	45	0	0	167
2016	115	85	0	0	200
2017	241	53	10	0	294
2018	190	58	13	0	248
2019	160	67	13	0	227
2020	166	68	21	0	255
2021	124	68	16	9	217
2022	74	84	10	11	179
2023	78	93	9	7	187
Total	3243	3392	92	142	

The data of goats for the TRB1 region and the provinces of this region are shown in Table 2.

Table 2. Number of goats in TRB1 region provinces by year

Years	Bingöl	Elazığ	Malatya	Tunceli	TRB1 (Provinces Total)
2004	175.911	69.597	39.382	60.398	345.288
2005	151.197	71.541	37.653	66.573	326.964
2006	181.608	70.118	38.360	66.974	357.060
2007	134.066	69.322	40.272	63.041	306.701
2008	124.033	61.599	31.786	52.079	269.497
2009	74.740	48.020	31.115	46.446	200.321
2010	80.453	28.022	38.417	46.047	192.939
2011	122.519	50.532	37.986	59.576	270.613
2012	140.800	74.480	50.793	98.434	364.507
2013	154.879	59.690	54.795	127.155	396.519
2014	166.772	70.513	58.671	117.462	413.418
2015	169.157	81.943	65.771	120.889	437.760
2016	173.805	82.982	60.347	99.057	416.191
2017	156.181	94.152	70.669	75.530	396.532
2018	147.682	113.899	69.211	86.918	417.710
2019	168.486	119.375	71.904	100.887	460.652
2020	191.553	141.778	64.564	106.336	504.231
2021	174.619	181.123	65.002	118.954	539.698
2022	170.043	156.425	61.525	121.808	509.801
2023	163.059	109.239	56.346	103.700	432.344
Total	3.021.563	1.754.350	1.044.569	1.738.264	

Cluster analysis method was used to determine the distribution of the data obtained in the study by provinces and years. In cases where the number of N is insufficient ($n < 30$), non-parametric tests are preferred (Ntoumanis, 2005). In cases where the number N is less than 30, cluster analysis is a non-parametric test method that can be used effectively in comparisons between treatment groups. This analysis method is an effective technique that allows seeing in detail how the treatment groups are distributed according to their numerical differences. When determining these differences, comments are made on the basis of the distribution of main clusters and sub-clusters of main clusters (Box et al., 2005; Kaps and Lamberson, 2004). SPSS 18 package program was used to analyze the data obtained from the research (Field, 2017).

RESULTS AND DISCUSSION

When Figure 1 is examined, the highest number of buffaloes in 2004 was seen in Elazığ province. In 2023, the highest number of buffaloes was determined in Elazığ province, and the lowest number was determined in Tunceli province.

It is seen that the total number of buffaloes in TRB1 region, which was over 1000 in 2004 and 2005, dropped well below this number in the following years. It is noteworthy that this figure has fallen below 200 by 2023. It is seen that the number of buffaloes in Malatya and Tunceli provinces is almost negligible over the years. It is noteworthy that the interest in buffalo breeding has gradually decreased over the years for all provinces. This is an important issue that should be emphasized for the future of animal husbandry in the region.

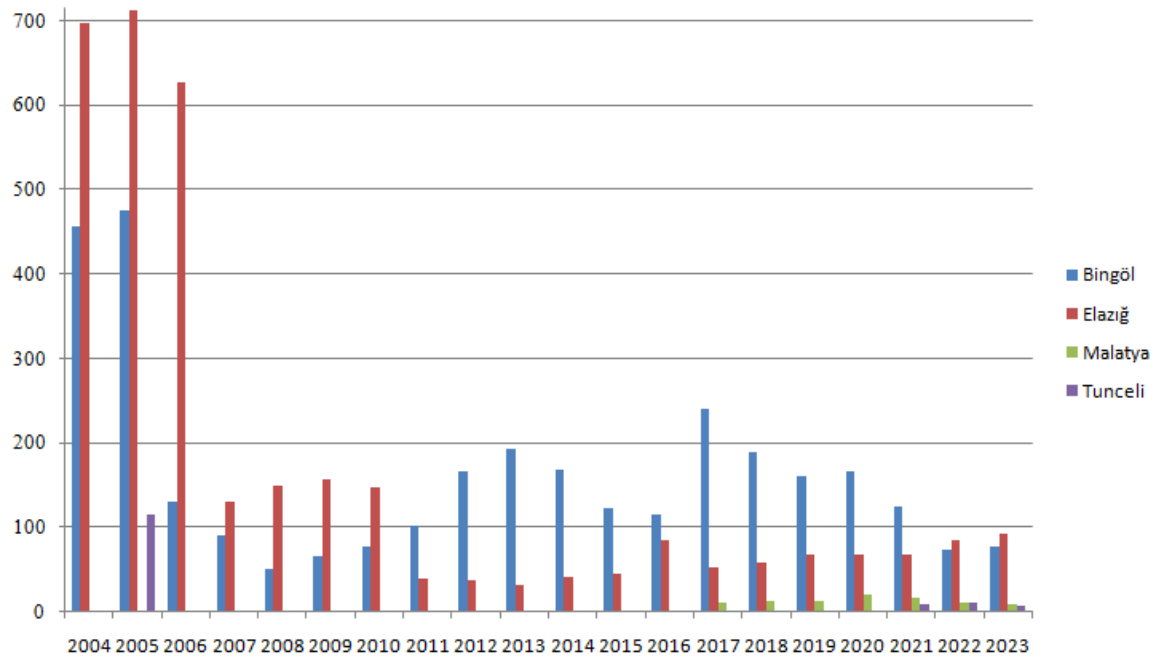


Figure 1. Column chart of buffaloes in TRB1 region provinces by year

When the research data is examined, the numbers of goats by province are presented in Figure 2. In 2004, the highest number of goats was seen in Bingöl province and the lowest in Malatya province. In 2023, the highest number of goats was determined in Bingöl province, while the lowest amount was again obtained in Malatya province.

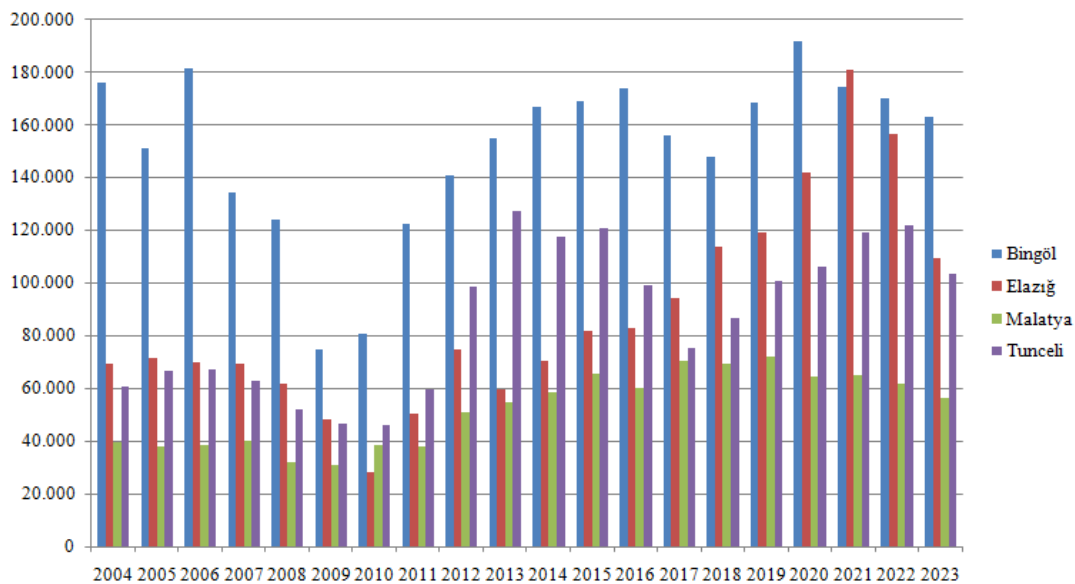


Figure 2. Column chart of goats in TRB1 region provinces by year

When Figure 3 is examined, in terms of buffalo numbers, Elazığ and Bingöl provinces are in the 1st main cluster, and Malatya and Tunceli provinces are in the 2nd main cluster. The number of buffaloes in the provinces of Elazığ and Bingöl in the 1st main cluster is higher than in the provinces in the other cluster.

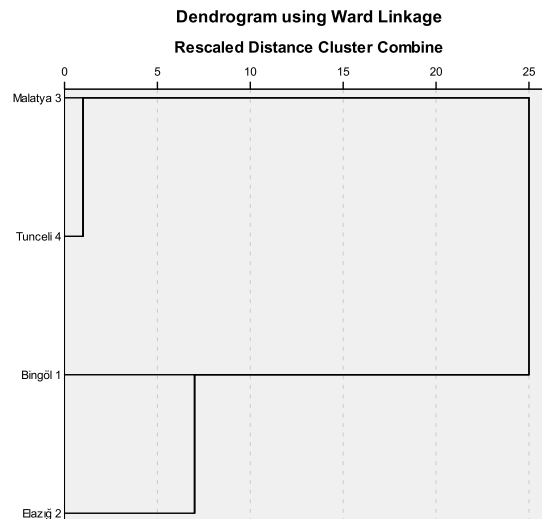


Figure 3. Cluster analysis by province in terms of buffalo numbers

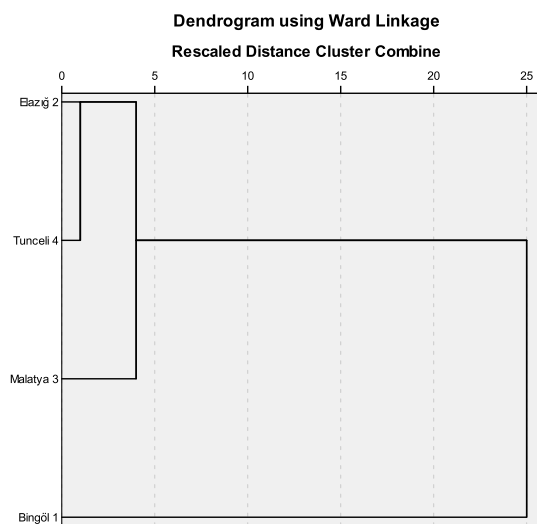


Figure 4. Cluster analysis by province in terms of goat numbers

Looking at Figure 4, two main clusters can be seen by province in terms of goat numbers. The first main cluster consists of Bingöl province, and the number of goats in this province was found to be higher than the other provinces in the second main cluster. The second main cluster consists of two sub-clusters. Elazığ and Tunceli provinces are located in the first sub-cluster of the second main cluster, and the numbers of goats in these provinces were found to be similar. Malatya province constitutes the second sub-cluster of the first main cluster and is the province with the lowest number of goats.

When the years in Figure 5 are examined in terms of buffalo numbers, two main clusters stand out. The first main cluster covers the years 2004-2006. The second main cluster consists of other years. When Figure 5 is examined, it is seen that the years 2004-2005, which is the second sub-cluster of the first main cluster, are statistically similar to each other in terms of buffalo numbers. However, it is seen that these two years have lower values than 2006, which constitutes the first sub-cluster of the first main cluster. In this case, while the highest value in the first main cluster was seen in 2006, all years forming the first main cluster (2004-2006) showed statistically higher values than all other years forming the second main cluster.

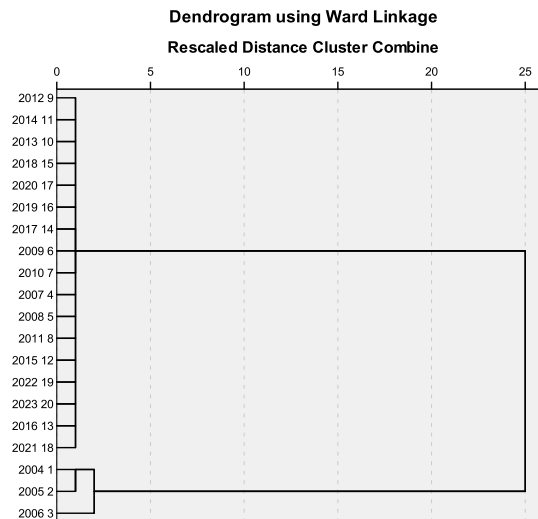


Figure 5. Cluster analysis for buffalo numbers by year

According to Figure 6, two main clusters stand out in terms of goat numbers. The first main cluster covers the years 2012-2023. The second main cluster includes the years 2004-2011. When the evaluations are made on the main clusters, it is understood that the years 2012-2023, which constitute the first main cluster, have higher values than the years 2004-2011, which constitute the second main cluster. When evaluated within the cluster, it was seen that the highest values were in the years 2020-2022, which is the first sub-cluster of the first main cluster. Within the second main cluster, the lowest values belong to the years 2009-2010, which constitute the second sub-cluster. The years 2020-2022, which is the first sub-cluster of the first main cluster, have similar values among themselves and contain the highest values compared to other years. The second subset, 2017-2019 and 2023 years, also has similar figures among themselves. It can be seen from the figure that the third subset, 2012-2016 years, also has similar values among themselves.

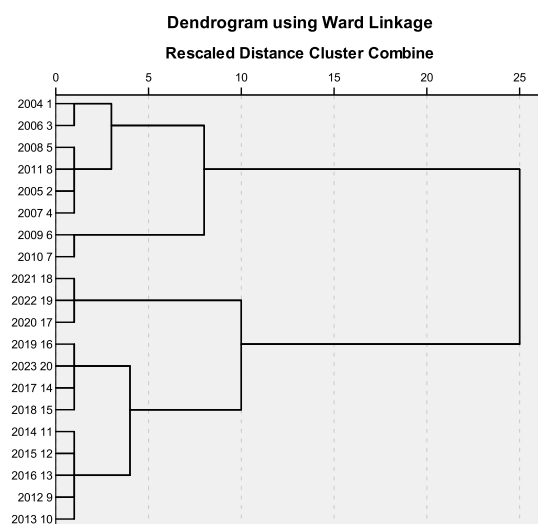


Figure 6. Cluster analysis for goat numbers by year

In general, when we look at the analysis results, it is seen that efficient results are obtained from the cluster analysis method used if the number n is less than 30 (Box et al., 2005; Kaps and Lamberson, 2004). In cases where the number of N is insufficient ($n < 30$), non-parametric tests are preferred (Ntoumanis, 2005). According to the cluster analysis results, the number of buffalos in Elazığ and Bingöl provinces was found to be higher than Malatya and Tunceli provinces between 2004-2023. According to the specified years, while Bingöl province was found to be higher than other

provinces in terms of the number of goats, it was determined that Malatya province had the lowest values. When analyzed by year, the number of buffalos in the TRB1 region provinces for the years 2004-2006 was found to be higher than the following years. In other words, it is understood that the number of buffalos has been decreasing in the TRB1 region since 2007. In the TRB1 region, goat numbers between 2012-2023 were found to be higher than 2004-2011. Accordingly, it can be said that there has been an increase in the number of goats in the TRB1 region since 2012. This increase in goat numbers is important. Because, it is reported that by the end of the 2020s, the demand for milk and especially sheep milk in the world will increase excessively (Hocquette and Gigli, 2005). At this point, it is important to further increase goat production in the TRB1 region. When looking at the results of this research, the efficiency of cluster analysis is clearly seen. Cluster analysis is a useful method that brings different perspectives to the research by distributing groups into main clusters and sub-clusters (Leech et al., 2005; Saunders et al., 2009). The purpose of cluster analysis is to create different clusters according to the values of the treatment groups. Different interpretations can be obtained depending on the distribution of treatment groups into main clusters and sub-clusters and the examined characteristics of these treatment groups (Christian et al., 2016). When previous studies are examined, it is noted that when interpreting animal production data in terms of features such as year, province and region, the numerical changes of the numerical values in the data set are mainly considered (Kandemir and Taşkın, 2022; Şahin et al., 2011). However, in cluster analysis, main clusters and sub-clusters are created by considering the values that make up these data sets, thus providing the opportunity to make statistical interpretations between the treatment groups distributed in the clusters (Romesburg, 1984). In the TRB1 region, appropriate regulations need to be made, taking into account the differences between provinces and years in terms of the number of buffalos and goats. In this study, the effectiveness of using cluster analysis on data obtained from small ruminants was tested. The current study was conducted for the TRB1 region. However, it is of great importance to conduct similar research in all other regions of Turkey and add it to the literature. These studies, which will be handled by region, should be handled not only in the field of animal husbandry but also in many scientific fields such as plant production, engineering, health and social sciences. Cluster analysis is a very useful method in obtaining differences that can be seen on the basis of years and regions (Can, 2023).

CONCLUSION

When the research results were examined, it was seen that cluster analysis provided effective results. The statistical method (Cluster analysis) used in this research and the results obtained by applying this method will contribute to future studies on animal production. Using new statistical methods that will provide different perspectives instead of known statistical methods is of great importance in obtaining useful information. The cluster analysis used in this study provided results that support this explanation. Although cluster analysis is a frequently used method in the field of social sciences, it is rarely used in the field of science. With this research, we tried to show that cluster analysis can be used efficiently in the field of science. Studies similar to this study, which was conducted using cluster analysis in the TRB1 region, need to be examined in other regions of our country and other animal species. Thus, it will be possible to access information that is missing in the literature.

Conflict of Interest

The article authors declare that there is no conflict of interest between them.

Author's Contributions

The authors declare that they have contributed equally to the article

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