



Research Article

Volume 2 - Issue 2: 39-41 / April 2019

# EVALUATION OF DAIRY CATTLE MILK PRODUCTION IN BLACK SEA REGION BY CLUSTER ANALYSIS

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**Received:** February 07, 2019; **Accepted:** March 05, 2019; **Published:** April 01, 2019


## Abstract


The aim of the study evaluates to the situation of milk production in dairy cattle for 18 cities in Black Sea Region. For this aim, 18 cities have been compared and classified about milk production. Data is including numbers of dairy cattle, milking dairy cattle and dairy cattle milk production for Black Sea Region. The data were obtained from Turkish Statistical Institute between 2013 and 2017 years. As a result of cluster analyzes for milk production in Black Sea Region shows that two groups such as Artvin, Rize, Giresun, Sinop, Gumushane, Zonguldak, Bartın, Düzce, Karabük, Trabzon, Tokat, Bayburt, Bolu, Samsun and Çorum, Ordu, Kastamonu, Amasya.


**Keywords:** Cluster analysis, Dairy cattle, Milk production, Black Sea Region


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**Cite as:** Tirink C, Bayyurt L, Abaci SH, Onder H. 2019. Evaluation of dairy cattle milk production in Black Sea region by cluster analysis. *BSJ Eng Sci*, 2(2): 39-41.

## 1. Introduction

According to the TUIK data in 2017, there are 15.943.586 head of dairy cattle and 18.762.319 tons of milk is produced in Turkey (TUIK, 2017). The Black Sea Region, which constitutes the data of the study, has significant potential for country animal husbandry. The Black Sea Region has 2.416.955 dairy cattle and has about 14% of

total milk production. The city with the highest milk production in the Black Sea is Kastamonu with 370.034 tons and the lowest milk production is in Rize (23,879 tons). The research data were consisted from total cattle presence in the East, Central and Western Black Sea Region. The total numbers of cattle in the regions are 466.593, 1.230.904 and 719.458 million, respectively, and milk production quantities of these regions are 524.423,

1.287.416 and 844.439 tons. This information is crucial to the livestock potential of the Black Sea Region.

For this reason, differences and similarities in dairy cattle in regional cities can be demonstrated by comparison with multivariate statistical methods.

Multivariate statistical analysis refers to multiple advanced techniques for examining and interpretation of relationships among multiple variables at the same time (URL-1). There are many multivariate statistic methods for multivariate statistical analysis like discriminant analysis, cluster analysis, principal component analysis, canonic correlation analysis and multi-dimensional scaling analysis etc. (Gevrekci et al., 2011).

Cluster analysis are one of the multivariate statistical analysis methods that are not known precisely, which contribute to grouping variables into similar group or classes. Cluster analysis can be used in a large area. Celik (2013) were used cluster analysis according to health structures of 81 provinces of Turkey. Kilic and Ozbeyaz (2010) were used fuzzy clustering analysis in sheep breeding.

In this study we used cluster analysis that is used for classifying obscure and ungrouped data by group similarity or distances (Gevrekci et al., 2011).

## 2. Material and Method

Data were obtain from Turkish Statistical Institute between 2013 and 2017 years for milk production, number of milking dairy cattle and number of dairy cattle to 18 cities (Bolu, Bartın, Düzce, Karabük, Kastamonu, Sinop, Zonguldak, Amasya, Çorum, Ordu, Samsun, Tokat, Artvin, Bayburt, Giresun, Gümüşhane, Rize, Trabzon) in Black Sea Region.

Cluster analysis aims to group the n items of the p variables according to their similarities. In the clustering process, two observations are examined according to similarity and distance measurements. Cluster analysis is similar to discriminant analysis because it aims to aggregate similar objects in the same groups. However, cluster analysis is different from discriminant analysis because it performs clustering during analysis. In addition, cluster analysis is similar to factor analysis because of its classification of variables (Cakmak, 1999).

The cluster analysis consists of two algorithms (Isildar, 2017). First algorithm is a hierarchical set of operations that makes it easier to explain clusters created using graphics called dendrograms. The second algorithm is the k-means cluster in which the number of clusters is determined before analysis.

There are two hierarchical cluster methods as agglomerative and divisive (Ceylan et al., 2017; Dogan et al., 2018). In agglomerative hierarchical cluster method: Firstly, each observation is considered as a cluster. After that two closest observations are combined in the new cluster but sometimes there are three observations are closest, so three observations are in the same cluster. The

number of clusters decreases at each step where observations are combined. Consequently, all observations are grouped in a cluster.

## 3. Results and Discussion

When the cluster analysis results are examined (Figure 1.), 99% similarity was detected in the three groups. First group is including Artvin, Rize, Giresun, Sinop, Gumushane and Zonguldak cities; second group is including Bartın, Duzce and Karabuk cities and the third group is including Tokat and Bayburt cities and also there was %99 similarity between three groups. Nevertheless, there are two groups with % 98 similarities, first group is including Artvin, Rize, Giresun, Sinop, Gumushane, Zonguldak, Gumushane and Trabzon cities and second group is including Tokat and Bolu cities. Finally, Çorum and Ordu have a %97 similarity.

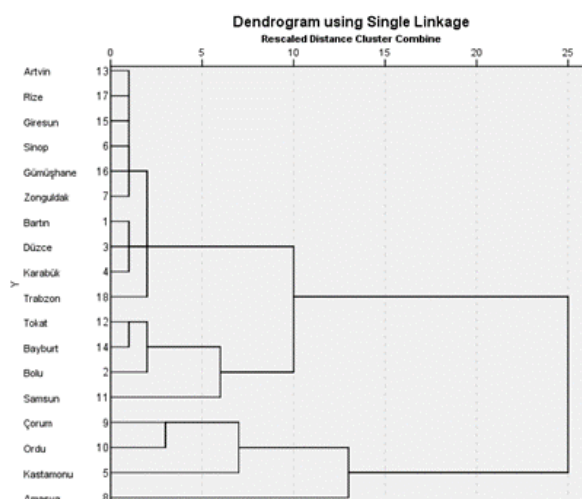


Figure 1. Dendrogram for 18 cities in Black Sea Region

## 4. Conclusion

Cluster analysis was used for evaluation of milk production potential in the Black Sea Region and dairy cattle breeding based on provinces in this region has been evaluated for the future.

According to the study, it is attention that the geographical structure of cities showing similarity in terms of production is similar. In addition, policies should be established in the Black Sea Region in order to promote dairy farming because of the similarity of less population cities.

### Conflict of interest

The authors declare that there is no conflict of interest.

### Acknowledgements

This research was presented as an oral presentation at the International Congress on Domestic Animal Breeding

Genetics and Husbandry (ICABGEH-2018) held on 26-28 September 2018 in Antalya.

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