



## Evaluation of Food Security in Dairy Products in Terms of Manufacturers in Turkey<sup>#</sup>

Özge Can Niyaz<sup>1\*</sup>, İsmail Hakkı İnan<sup>2,1</sup>, Duygu Aktürk<sup>1</sup>

<sup>1</sup>Department of Agricultural Economics, Faculty of Agriculture, Çanakkale Onsekiz Mart University, 17100 Çanakkale, Turkey

<sup>2</sup>Department of Agricultural Economics, Faculty of Agriculture, Namık Kemal University, 59100 Tekirdağ, Turkey

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\*Corresponding Author:

E-mail: ozgecanniyaz@comu.edu.tr

### ABSTRACT

The aim of this study is to evaluate the thought of food security provided in dairy products and the determinants in terms of manufacturers in South Marmara Region in Turkey. The primary data obtained from 70 dairy manufacturers were analysed by Factor Analysis and Logistic Regression Analysis. According to this, price fluctuation and increase in the distance from the place where the milk is provided, reasons such as corporatization are factors that cause the lack of food security in dairy products. On the contrary, the likelihood of providing food security in dairy products increases with the increase in financial sustainability, food safety, quantity of milk and dairy products, the ability to produce and store, the number of employees, the degree of milk use.

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### Introduction

Nutrition is one of the most basic needs of people. Food consumption is a necessity that is essential for every living being and is not elastic. Food security means that all people must have access to adequate, healthy, reliable and nutritious food both physically and economically in order to meet the nutritional needs and food priorities that are necessary for an active and healthy life at all times (Anonymous, 2017a; Anonymous, 2017b). Today, four dimensions of food security are defined and it is stated that these four dimensions must be realized at the same time in order to ensure food security; these are the availability of food, the accessibility of food, the quality and safety of food, and the maintenance of the first three dimensions in a stable manner (Anonymous 2001; Anonymous, 2003; Anonymous, 2017a; Anonymous, 2017b; Anonymous, 2017c; Anonymous, 2017d).

Animal protein sources (milk, eggs and meat) are very important for ensuring food security (Smith et al., 2014). Especially milk has an important place in human nutrition (Haug et al., 2007). Milk and dairy products are the main

source of protein in the daily diet (Lönnerdal, 2003). Milk is a very important product in terms of industrial sector as well as the agricultural sector (Anonymous, 2013a; Anonymous, 2017c). Milk producers are able to provide daily cash flow to their enterprises through milk production (Keown and Dhakal, 2010). In this context availability, accessibility, availability and stability of milk seems important.

According to data from the year 2013, Turkey ranked 8th in cow milk production, 7th in drinking milk production and 5th in fermented dairy products the world (Anonymous, 2013b). In Turkey, the share of animal production value in the agricultural production value with the data of year 2012-2014 is 32.6%. In the same years, the share of milk production value in Turkey in animal production value is 40.7% and the share in agricultural production is 13.3% in Turkey (Anonymous, 2017e).

When the distribution of milk production in Turkey according to regions is examined, the western regions are seen in the front plan (Anonymous 2013b). TR22 South

Marmara Region covers Balıkesir Sub-Region, which is located under TR2 West Marmara region according to the regional classification of SRUC-2 (Statistical Region Units Classification-2) of TSI (Turkish Statistical Institute). TR22 South Marmara Region (Balıkesir Sub-Region) consists of Balıkesir and Çanakkale. According to TSI data, it is stated that TR22 South Marmara Region is one of the leading regions in the country in terms of animal existence and also animal production value. TR22 South Marmara Region, with the year 2013 data, realized 6.1% of Turkey cow milk production amount. Nearly 70% of this production is made in Balıkesir province and 30% in Çanakkale province. In addition, there are 242 dairy products processing enterprises in TR22 South Marmara Region as of 2013.

Drinking milk is not so common habit in Turkey. Consumers usually meets the need of milk from dairy products (Anonymous, 2013b). Manufacturers of dairy products has a direct impact on the availability, quality and safety, the amount of production and price stability of dairy products (Anonymous, 2013c). Besides, manufacturers have also significant effects on consumers' access to dairy products in physical and economic terms (Farina, 2002). The availability dimension means production in sufficient quantity (Anonymous, 2017a). Failure to produce sufficient quantities means that the availability dimension has not been achieved. The inability to produce milk products in sufficient quantities means that the first dimension of food security can not be ensured. According to this situation also the other dimensions can not be provided. On the other hand, providing the quality of dairy products is a process which starts from the production of milk and continues until dairy products reach the final consumer (Spreer, 1995; Walstra et al., 2005). For these reasons, manufacturers of dairy products play an important role in providing these dimensions.

The fact that the quantity of dairy products and accordingly the price varies are directly related to dairy producers and dairy manufacturers (Anonymous, 2008). Consumers' access to dairy products depends on the availability of sufficient dairy products on the market and the prices of dairy products at prices that consumers can reach. In this context, the aim of this study is to evaluate that the thought of food security is provided with all the dimensions in dairy sector in terms of dairy manufacturers.

## Material and Methods

It is benefited from primary data in this study. The primary data were obtained from face-to-face surveys with dairy manufacturers in Çanakkale and Balıkesir provinces. The proportional approach has been used to determine the number of samples to be represented at the best level of the master unit. According to data obtained from Balıkesir and Çanakkale Province Food, Agriculture and Animal Husbandry Departments in 2013, there are 242 dairy manufacturers in TR22 South Marmara Sub-Region. For this reason, since the number N is certain, the proportional sample volume formula is applied over the final mass. According to this, in the 95% confidence

interval determined by the number of enterprises,  $d = 0.10$  error and sample volume;

$$n = \frac{N p (1 - p)}{(N - 1)6^2 p x + p(1 - p)}$$

n =Sample volume

N =Population size

$6^2 p x$  =Variance of the ratio of the population

p =Population ratio

$$n = \frac{242(0.5)(0.5)}{241(0.0026) + (0.5)(0.5)} = 70$$

It was decided to be done a survey with totally 70 dairy manufacturer in TR22 South Marmara Region. Survey of distribution of total enterprises according to the province through the numbers is given in Table 1.

In the analysis of the data, Kolmogorov-Smirnov Test, Chi-Square Independence Test, Reliability Analysis, Factor Analysis and Binary Logistic Regression Analysis methods were used. The Kolmogorov-Smirnov test was used to determine if the data are normally distributed. It was tested with Chi-Square Independent Test whether there are differences between provinces with the idea of providing dairy products in terms of food security.

Reliability Analysis is used to control the consistency of data within itself. Factor Analysis; to define data sets that contain interrelated p variant sets of data that are independent of each other and fewer new variables, to identify common factors that are supposed to describe a formation or event by grouping the variables in the generated data set, to define major and minor factors from the variable groups (factors) (Özdamar, 2013).

In this study, Factor Analysis was applied and analysed with a planned 5-Point Likert-Scale considering the dimensions of food security. Variables obtained as a result of Factor Analysis are collected and named in fewer groups of variables (factors). Factors derived from Factor Analysis are included in the model as independent variables in the next analysis, Binary Logistic Regression Analysis. Logistic Regression, where the dependent variable is qualitative and the independent variables are quantitative or qualitative (Berkson 1944; Menard 2002; Tranmer and Elliot 2005). Binary Logistic Regression Analysis is a Logistic Regression Analysis made on dependent variables containing only two answer options (yes / no). Binary Logistics Model was used in this study. The question is "do you think food security is provided in dairy products?" asked to the dairy manufacturers and two answer options were given as "yes" or "no". The dependent variable of the model encoded as manufacturers of dairy products have the thought of food security provided in dairy products = 1, the thought of food security cannot be provided in dairy products = 2. In addition to factors which were derived from Factor Analysis, some other variables like "type of enterprises, distance from the milk is provided, milk powder usage, get education about dairy production and production level change status" added to Binary Model as independent variables.

Table 1 Distribution of surveyed dairy manufacturers in the research area\*

Provinces	Number of Enterprises Manufacturing Milk and Dairy Products	Ratio (%)	Distribution of Survey Numbers by Provinces
Çanakkale	89	36.78	25
Balıkesir	153	63.22	45
Total	242	100.00	70

\*Anonymous 2014a, Anonymous 2014b.

## Results

### *Demographic Characteristics and General Information*

The average age of the manufacturers in the research area was 41.87 years, the average education period was 10.67 years, and the average working time for milk product manufacturing was 18.73 years.

The general characteristics of the production in the study area; the average activity year of the enterprises in the research area is 27.41 years, the average annual operating income is 2.208.618,97 Euro and the average number of personnel is 18 person.

The daily average amount of cow milk is 12.230 lt (67 enterprises), the daily average amount of sheep milk is 2.067 lt (16 enterprises), the daily average amount of goat milk is 4.443 lt (14 enterprises) that are used for manufacturing dairy products. Manufacturers stated that sheep and goat milk received milk for at least 3 months at most 6 months and cows at least for 10 months and at most 12 months during the lactation period. Total value of daily processed total milk is 6.052 Euro for all enterprises. Annual dairy products average quantities of the enterprises are; 559.897 kg cheese (36 enterprises), 378.853 kg yogurt (15 enterprises), 369.822 lt yogurt drink (9 enterprises), 204.580 kg buttermilk (12 enterprises), 151.267 kg cheese desert (17 enterprises), 52.750 kg curd (6 enterprises), 9.616 kg icecream (6 enterprises), 6.033 kg cream (3 enterprises), 3.360 kg kefir (1 enterprises). Capacity utilization rate of the all enterprises are nearly %57.

Distribution of the dairy manufacturers within the scope of the survey according to scales based on the operating scales based on the definition, qualifications and classification of small and medium sized enterprises published in the Official Gazette of 25997 with the decision of the Council of Ministers dated 18.11.2005 with no. 9617 (Anonymous 2005). According to this classification, 46% of enterprises included in the survey are micro scale, 40% are small scale, 10% are medium scale and only 4% are large scale enterprises in the research area.

Half of enterprises are person based enterprises, half of them are the company. It has been determined that about 97% of businesses have ownership, only 3% are tenants. There are more than 85% of the manufacturing facilities have cold storage.

There are also laboratories, milk collection centres and quality certificates in about 55 % of the production. Half of the dairy manufacturers said that they did not need the other half while they were running a food or agriculture engineer. Milk is transported by manufacturers generally. Milk transport tanks and churns are widely used for transport. Manufacturers have stated that the reasons for widespread use of churns as the distance is not far for transportation and the cost of transporting milk by churns is low. According to the distribution of manufacturers

according to the distance of the place where the milk is provided, 32.9% is less than 10 km, 55.7% is 11 to 50 km, 7.1% is 51 to 100 km, 4.3% and that they supplied raw materials from a distance of more than 100 km.

Dairy manufacturers have stated that they are doing more than 90% of basic control and analysis of the milk. 13% of dairy manufacturers have stated that they use milk powder, which is why they have not found enough milk to be found. Of the dairy manufacturers in the study area, 47% stated that in recent years there has been an increase in production level, 36% said that the production level has not changed, and 17% said that the production level has decreased. Sales prices determined by dairy manufacturers meet their large cost. According to about one quarter of the manufacturers there are problems waiting to be solved in their productions and the most important ones are the lack of infrastructure and the problem of qualified personnel.

### *The Level of Knowledge about the Food Security of Dairy Manufacturers*

In this part of the study, the level of knowledge about the food security of dairy manufacturer in the research area and the points of view on food security have been evaluated in detail. In this context, firstly, it was questioned whether manufacturers had heard the concept of food security. According to this, 45.7% of the dairy manufacturers stated that they had heard this concept before, while 54.3% stated that they did not hear this concept before.

After asking dairy manufacturers in the study area to hear the concept of food security, they were also questioned whether they knew enough to make the definition of this concept. According to this, 10% of the manufacturers declare that they know the definition and 90% of them do not know the definition. 7 dairy manufacturers, who stated that they knew the definition of the concept of food security, were asked to describe the food security in a short and concise way. According to this, 28.6% of the manufacturers who stated that they knew the definition of the concept of food security could partially make the definition and 71.4% could not define it. It has been determined that all manufacturers are not fully aware of the concept of food security.

### *Evaluation of Factors Affecting Food Security in Dairy Sector*

In this part of the study, the factors affecting food security in the dairy sector in terms of dairy manufacturers in the research area were assessed. In this context, Kolmogorov-Smirnov Test, Chi-Square Independence Test, Reliability Analysis, Factor Analysis and Binary Logistic Regression Analysis were used.

A comprehensive description of food security was given to all stakeholders once the knowledge level of food security of all stakeholders in the study area was measured. Accordingly, stakeholders were asked whether food security was provided in the dairy sector. Table 2 presents the opinions of manufacturers in the research area on the provision of food security in dairy products, in cross-tabular format. According to this, the ratio of the manufacturers who think that food security providing about milk products is about 74% while the rate of those who think that food security about milk products are not provided is about 26%.

First, all the variables covered in the surveys for dairy manufacturers were subjected to normal distribution tests. It has been found that all of the variables have Kolmogorov-Smirnov test statistic  $P < 0.05$ , that is, no

normal distribution. For this reason, nonparametric methods were considered suitable for analysis.

The first analysis made after controlling the normal distribution was the Chi-square Independence Test. It was tested whether there was a difference between the idea of providing food security in dairy products and the facts by using the Chi-square Independence Test to decide whether the research would be based on provinces or regional basis. The obtained Chi-square value was found as  $P = 0.166 > P = 0.05$ . Accordingly, it is observed that there is no significant difference between the two variables. In summary, the provision of food security in dairy products for manufacturers does not vary by provinces. For this reason, and because the topic needs to be examined locally, the analyses have been discussed and interpreted on the basis of the research area.

Table 2 The opinions of dairy manufacturers in the research area on the providing of food security in dairy products

Provinces	Provided	Not provided	Total
Balıkesir	31	14	45
Çanakkale	21	4	25
Total	52	18	70

Table 3 Factor Analysis results for dairy manufacturers in the research area

Items	1	2	3	4	5	6	7	8	9
Ability to maintain and stay in the production of income	0.93	-0.08	0.00	-0.05	0.10	-0.01	-0.04	0.10	0.02
Generally profit from production	0.90	-0.09	0.08	-0.01	0.03	-0.01	-0.06	0.21	0.00
Income to cover all costs	0.85	-0.10	0.09	-0.03	0.08	-0.05	0.05	-0.09	0.14
Finding milk at the demanded price	0.56	0.12	0.14	-0.11	-0.05	-0.39	0.38	0.09	-0.16
Thinking that the selling price of the products are normal	0.53	-0.07	-0.11	0.05	-0.04	-0.09	0.32	0.05	0.24
Having the necessary infrastructure facilities	0.49	-0.13	0.24	-0.11	0.49	-0.21	0.16	-0.11	0.19
Sale of milk product at the targeted amount	0.47	0.15	0.24	0.12	0.43	-0.39	0.08	0.24	-0.17
Supervision of manufacturing places	0.45	0.06	0.39	-0.07	0.04	0.00	0.26	-0.21	0.40
Variability of milk quantity (in crisis time)	0.00	0.92	0.10	-0.02	0.01	0.09	0.02	-0.09	-0.16
Varying the amount of dairy products (in crisis time)	-0.01	0.92	0.10	-0.03	0.00	0.12	0.01	-0.10	-0.15
Fluctuations in milk prices (in crisis time)	-0.11	0.89	-0.02	0.20	0.03	-0.04	0.01	-0.07	0.16
Fluctuations in dairy prices (in crisis time)	-0.14	0.87	0.00	0.17	0.02	0.00	0.01	-0.09	0.18
The products contain ingredients that will affect human health	0.01	-0.03	-0.91	0.03	-0.06	0.12	-0.02	0.04	0.07
Thinking the quality of the product produced	0.14	0.03	0.88	-0.04	0.02	-0.06	0.06	-0.09	0.25
Using chemicals in dairy products	-0.03	-0.02	-0.81	0.06	-0.14	-0.03	0.02	-0.18	0.27
Being careful in hygienic conditions of production	0.16	0.05	0.67	0.08	0.43	-0.02	0.19	-0.16	0.11
Being careful in hygienic conditions of storage	-0.02	0.18	0.59	0.16	0.36	0.10	-0.01	0.04	0.38
Consumers think milk prices change frequently	-0.05	0.01	-0.05	0.93	0.09	0.08	-0.06	-0.13	0.05
Consumers think dairy prices change frequently	0.06	0.07	-0.02	0.93	-0.11	0.04	-0.14	-0.11	-0.03
Volatility in prices of dairy products (UNC)	-0.11	0.23	0.07	0.61	0.06	0.27	0.18	0.15	0.05
The idea that audits should be increased	-0.04	0.17	0.04	0.45	-0.12	-0.32	-0.30	0.25	-0.03
The thought of maintaining production	-0.09	-0.03	0.14	0.06	0.83	-0.15	0.07	-0.08	0.16
Availability of producing products on a regular basis	0.34	0.07	0.21	0.04	0.67	-0.33	0.25	0.19	0.01
Production of dairy products enough for everybody	0.07	0.05	0.24	-0.23	0.55	0.16	0.19	-0.16	-0.40
Fluctuation in the amount of dairy products (UNC)	-0.10	0.12	-0.04	0.13	-0.06	0.87	-0.15	0.13	-0.08
Fluctuation of milk quantity (UNC)	-0.11	0.11	-0.02	0.12	-0.23	0.83	-0.15	0.21	-0.13
Finding high quality milk	0.06	0.04	0.10	-0.08	0.13	-0.05	0.89	0.08	-0.05
Finding enough amount of milk for manufacturing	0.14	0.02	0.06	-0.07	0.21	-0.34	0.74	0.09	0.19
Reliability of the enterprises which have quality certificates	0.05	-0.15	-0.13	-0.11	-0.05	0.03	0.08	0.79	0.12
Confidence to enterprises with quality certificates	0.16	-0.18	0.08	0.03	0.00	0.21	0.07	0.75	0.00
MP/PP at the targeted amount per term	0.21	-0.11	0.05	0.09	0.04	-0.27	0.22	0.10	0.58
Possibility to store products	0.22	0.26	0.13	-0.17	0.44	0.12	-0.23	0.15	0.58

UNC: under normal conditions, MP/PP: Milk processing/product production, Kaiser-Meyer-Olkin Measure of Sampling Adequacy=0.554, Bartlett's Test of Sphericity: 2041,869 (P=0.000)

Table 4 Nomenclature of factor groups for dairy manufacturers in research area

Variables	Factor Names
Ability to maintain and stay in the production of income Generally profit from production Income to cover all costs Finding milk at the demanded price Thinking that the selling price of the products are normal Having the necessary infrastructure facilities Sale of milk product at the targeted amount Supervision of manufacturing places	Financial Sustainability Factor
Variability of milk quantity (in crisis time) Varying the amount of dairy products (in crisis time) Fluctuations in milk prices (in crisis time) Fluctuations in dairy prices (in crisis time)	Stability at the Time of Crisis Factor
The products contain ingredients that will affect human health Thinking the quality of the product produced Using chemicals in dairy products Being careful in hygienic conditions of production Being careful in hygienic conditions of storage	Food Safety Factor
Consumers think milk prices change frequently Consumers think dairy prices change frequently Volatility in prices of dairy products (under normal conditions) The idea that audits should be increased The thought of maintaining production	Price Volatility Factor
Availability of producing products on a regular basis Production of dairy products enough for everybody	Sustainability in Production Factor
Fluctuation in the amount of dairy products (under normal conditions) Fluctuation of milk quantity (under normal conditions)	Amount Change Factor
Finding high quality milk Finding enough amount of milk for manufacturing	Raw Materials Factor
Reliability of the enterprices which have quality certificates Confidence to enterprices with quality certificates	Quality Certificates Factor
Milk processing / product production at the targeted amount per term Possibility to store products	Manufacture and Storage Factor

Reliability Analysis was used to determine if there is internal consistency within the data. According to this, Reliability Analysis of 5-Point-Likert-Scale based on the dimensions of food security prepared based on dairy manufacturers in the research area were performed. Within the dimensions of food security, it was determined that the scale consisting of 32 questions prepared to determine the effective variables on the opinion of providing food security of milk in dairy products is very reliable (0.715) and the answers given to the variables are different from each other. The differences between the question averages according to the Hottelling T<sup>2</sup> test were statistically significant.

In this research, the unit matrix of the correlation matrix obtained from the factors evaluated is rejected (2041.869 > 0.000). Also, the value of Kaiser-Meyer-Olkin (KMO) is bigger than 0.5 (0.554). According to the results obtained here, it is appropriate to perform Factor Analysis for the 32 variables considered.

It was determined that there are 9 factors which eigenvalues are over 1. As can be seen from the total explanatory variance table, it is possible to conclude that the factor number is 9. In addition, 9 factors obtained from a total of 32 variables' variance explanation stated as 76.379 %.

Factor loads shows the weight of variables at each factor. The values forming the factor loads consist of a

correlation coefficient and determine the degree of the relationship between the variables and the factors. Which variable has the strongest correlation with which factor that variable belongs to that factor group. According to this, 9 factors are considered which affect the idea of providing food security of manufactures of dairy products and that are taken into consideration in the dimension of food security. The distribution of variables by factor loads and factors is given in Table 3.

After the factor numbers have been determined, the factor nomenclature is reached. The stage of naming factors from 5-point Likert-Scale prepared on the basis of dairy manufacturers and planned according to the dimensions of food security is shown in Table 6. Factor nomenclature in Factor Analysis; the highest coefficient factor can be described by name or by the names that commonly represent the factors. Accordingly, the naming of the factors gathered under the relevant variables is given in Table 4 in detail.

The factors obtained and named as the result of Factor Analysis for dairy manufacturers are grouped according to the dimensions of food security in terms of the scope of the study. According to this, it is possible to see in Table 5 which factor of which factor of food security is covered. Production factors will affect the amount of production, therefore the sustainability factor in production, manufacture and storage factor and raw materials factors

collected under availability size. Ensuring financial sustainability of industrial product prices will be effective on accessibility, this case is provided under the size of accessibility.

Again, the conditions of dairy production are in line with world standards and the importance of food safety is under the utilization dimension. Finally, since factors related to quantity and price changes at regular and unusual (crisis) times affect the dimensionality of constancy, these factors are also aggregated under the dimension of stability.

*Binary Logistic Regression Analysis*

Within the scope of the research, a logistic regression model was established in response to the responses from dairy manufacturers. In this model, the dependent variable has been determined by the manufacturers as to whether the idea of food safety is ensured in dairy products. Due to the fact that the answer given to the dependent variable is cut-off and it is two-folded, the Binary Logistic Regression model was chosen. The purpose of establishing the model is to determine the variables that influence the idea of ensuring food safety in dairy products in terms of the manufacturer in the dairy sector. Nine factors, which were obtained as a result of Factor Analysis and which included the dimensions of food security, were used as independent variables in the regression model. Accordingly, all the variables in the model and their characteristics are given in Table 6.

The Hosmer and Lemeshow (2000), test was used to determine if all of the tested models of the variables influencing the thought of providing dairy products' food security in dairy products were significant. In order to make the model significant, it is expected that the sigma value will be greater than 0.05, which is normal. The chi-square value was calculated as 4.060 (free grade 8). Accordingly, the Binary Logistic Regression model, which is related to the idea of ensuring food safety in milk for manufacturers, is a totally significant and valid model.

Table 7 gives the results of the Binary Logistic Regression model which includes the variables that affect the idea of providing food security in dairy products for manufacturers. According to the Cox and Snell (1989), R<sup>2</sup> coefficient, 43.2% of the variables in the model and 63.5% of the variables in the model according to Nagalkerke (1991), R<sup>2</sup> coefficient are explained. The R<sup>2</sup> values given are quite sufficient for this type of model with horizontal section data.

The variables in the model are determined as independent variables that are not effective on the idea of providing food security in dairy products in terms of the manufacturer's stability at the crisis time factor, sustainability in production factor, raw materials factor, quality certificates factor, amount change factor.

The independent variables that are effective on the idea of providing of food security in dairy products in terms of manufacturers in the study area are the financial sustainability factor, food safety factor, price volatility factor, amount change factor, manufacture and storage factor, the number of personnel, the type of business, and the status of get education on dairy products.

Increased food safety has increased the likelihood that dairy manufacturers will be assured of food security in dairy products. Food safety factor consists of the following variables; the products contain ingredients that will affect human health, thinking the quality of the product produced, using chemicals in dairy products, being careful in hygienic conditions of production and storage. As the subjects of the variables that constitute the food safety factor are improved in the positive direction, the possibility of ensuring food security in the milk is increasing.

The increase in price volatility reduces the likelihood that dairy manufacturers think that food security will be ensured in dairy products. Price volatility factor consists of the following variables; consumers think milk prices change frequently, volatility in prices of dairy products (under normal conditions), the idea that audits should be increased. Efforts to lift price volatility will cause positive effects on food security in dairy products.

The increase in milk and dairy quantity increases the likelihood that dairy manufacturers think that food security will be ensured in dairy products. The quantity change factor is due to fluctuations in the amount of dairy products under normal circumstances and fluctuations in the amount of milk under normal circumstances. It is thought that the amount change in this area is perceived as increasing.

Increased manufacture and storage possibilities increase the likelihood of dairy manufacturers thinking of providing food security in dairy products. Manufacture and storage factor consist of the following variables; milk processing/product production at the targeted amount per term, possibility to store products. The improvement of production and storage facilities increases the provision of food security in dairy products.

Table 5 The food security dimensions included in the groups of dairy manufacturers in the research area

Factor names	Dimension of food security
Sustainability in Production Factor Manufacture and Storage Factor Raw Materials Factor	Availability Dimesion
Financial Sustainability Factor	Accesibility Dimension
Food Safety Factor Quality Certificates Factor	Utilization Dimension
Stability at the Time of Crisis Factor Amount Change Factor Price Volatility Factor	Stability Dimension

Table 6 Variables and characteristics used in Binary Logistic Regression Analysis made on the idea of providing food security in dairy sector in terms of dairy manufacturers in research area

Names of variables	Groups and Properties of Variables
Dependent variable The Idea of Food Security Provided in Dairy Products	Nominal Scale :1=Yes, 2=No
Independent Variables	
Financial Sustainability Factor	Interval Scale
Stability at the Time of Crisis Factor	Interval Scale
Food Safety Factor	Interval Scale
Price Volatility Factor	Interval Scale
Sustainability in Production Factor	Interval Scale
Amount Change Factor	Interval Scale
Raw Materials Factor	Interval Scale
Quality Certificates Factor	Interval Scale
Manufacture and Storage Factor	Interval Scale
Number of employee	Interval Scale
Type of enterprises	Nominal Scale: 1=Person, 2=Company
Distance from the place where the milk is provided	Ordinal Scale 1= $\leq$ 10, 2=11-50, 3=51-100, 4=101 $\geq$
Milk powder usage	Nominal Scale: 1=Yes, 2=No
Get education about dairy production	Nominal Scale: 1=Yes, 2=No
Production level change status	Nominal Scale: 1=Increase, 2=Fixed, 3=Decrease

Table 7 Factors affecting the thought of providing food security in dairy products in terms of manufacturers in the research area\*

Variables	B	S.E.	Wald	df	Sig.	Odds Ratio
Financial Sustainability Factor	1.900	0.785	5.859	1	0.015**	0.149
Stability at the Time of Crisis Factor	-0.976	0.644	2.292	1	0.130	2.653
Food Safety Factor	1.370	0.643	4.542	1	0.033**	0.254
Price Volatility Factor	-1.011	0.610	2.750	1	0.097*	2.758
Sustainability in Production Factor	-0.303	0.427	0.504	1	0.478	1.354
Amount Change Factor	1.413	0.731	3.736	1	0.053*	0.243
Raw Material Factor	-0.267	0.486	0.302	1	0.582	1.307
Quality Certificates Factor	0.219	0.435	0.253	1	0.615	0.804
Manufacture and Storage Factor	1.027	0.614	2.800	1	0.094*	0.358
Number of employee	0.144	0.037	9.189	1	0.002***	1.120
Type of enterprises	-2.945	1.360	4.692	1	0.030**	0.053
Distance from the place where the milk is provided	-1.661	0.827	4.032	1	0.045**	0.190
Milk powder usage	6.324	2.067	9.363	1	0.002***	557.864
Get education about dairy production	2.088	1.228	2.888	1	0.089*	8.065
Production level change status	-0.543	0.677	0.643	1	0.423	0.581

\*Significant at level \*\*% 10, \*\*\*% 5, \*\*\*\* %1 Cox&Snell (1989) R<sup>2</sup>=0.432, Nagelkerke (1991) R<sup>2</sup>=0.635, X<sup>2</sup>=39.589 (P=0.001)

The number of staff variables was found to be significant at 1% level and the coefficient mark was positive. The Wald value for the variable is 9.189>2. When the number of employees is increased by one person, the probability of a manufacturer's assuming food security in dairy products tends to increase 1.120 times. The increase in the number of staff in the enterprises will be an improvement in supporting the provision of food security in dairy products.

The variable of enterprises type was found to be significant at the 5% level, but the coefficient sign was negative. The Wald value of the variable is 4.692>2. As the type of enterprise goes from person to company, the likelihood of manufacturers' assuming food security in dairy products tends to decrease by 18.76 times. It is possible to reach the conclusion that the majority of the enterprises in the research area are against the company.

The distance from the place where the milk is provided is significant at the 5% level, but the coefficient sign is negative. The Wald value of the variable is 4.032>2. As a result of an increase in the distance from where the milk is supplied to the enterprises, the likelihood of manufacturers' assuming food security in dairy products tends to decrease by 5.26 times. Being able to get as close as possible to the milk is thought to positively affect the provision of food security in dairy products.

Milk powder usage status was found to be significant at 1% level and coefficient mark was positive. The Wald value of the variable is 9.363>2. As the use of milk powder increases, the likelihood of manufacturers' assuming food security in dairy products is as high as 557,864 times. In addition to being storable and durable, milk powder is sold at more affordable prices than milk, which is thought to be the result of the manufacturer.

## Conclusions

Manufacturers of dairy products in the research area; have an average of forty years of age, ten years of education and more than ten years of experience in the dairy industry. The average capacity utilization rate of the manufacturing facilities in the research area was determined to be more than 50%. Approximately 85% of the manufacturing sites in the research area fall into the micro and small scale enterprises class. Yoghurt, cheese, butter, curd, cream, kefir, yoğurt drink, cheese deserts, cheese curd, ice cream are produced in the research area.

The level of awareness of the dairy product manufacturers' concept of food security has been measured in the study area. According to this, about 45% of the manufacturers have heard the concept of food security, while others have never heard of this concept before. Approximately 10% of the manufacturers declared that they knew the concept of food security, none of them could make the definition of food security. The concept of food safety was also asked for the manufacturers, and about 80% of them heard this concept.

Four out of the dairy manufacturers in the research area think that milk security is not ensured in dairy products, while the rest of dairy manufacturers think that dairy manufacturers provide security in dairy products. Variables influencing on the idea of providing food security in terms of dairy manufacturers have also been identified. According to this, dairy products in research area are influential variables on food security in dairy products according to manufacturers; financial sustainability factor, food safety factor, price volatility factor, amount change factor, manufacture and storage factor, number of personnel, type of enterprises, distance to where milk is provided, milk powder usage status and education status of manufacturers about dairy products. The coefficient of price volatility, the type of enterprises and the distance from where milk is provided variables are negative. The coefficients of the variables other than these variables are positive. The increase in the price volatility and the distance to where the milk is provided increases will decrease the probability of food security in the dairy products. On the other hand, the increase in all other variables will increase in the sense that food security is provided in dairy products.

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