Determination Of Variables Effective On The Opinion Of Milk Producers About Ensuring Food Security In Milk: A Case Study Of Tr22 South Marmara Region

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Abstract: Milk is a specific product for various fields such as agriculture and industry as well as nutrition of people. According to data of 2013, Turkey is at the 8th rank in production of cow milk and at the 7th rank in production of drinking milk in the world ranking. It was regarded important to mention milk production in the terms of food security which has important contribution to Turkey's economy. Food security is quite a comprehensive term. First of the main dimensions of food security is the aspect of availability. Providing all the other aspects depends on providing the aspect of availability. Sufficient level of production is compulsory to ensure availability. Therefore producers play important role in the terms of ensuring food security.

TR22 South Marmara Region is one of the leading region in the country in the terms of milk production. The study was carried out in TR22 South Marmara Region for this reason. The aim of this study is to determine variables which are effective on the opinion of milk producers whether food security is ensured or not in TR22 South Marmara Region. The study is composed of primary data. A total of 96 milk producers, selected by means of proportional sampling, were interviewed face-to-face. Factor Analysis and Binary Logistic Regression Analysis were used in the analysis of primary data. As a result, positive variables effective on the opinion of milk producers in ensuring food security in milk; factor of conditions for production, factor of sustainable production, factor of availability, experience in dairy farming, the rate of feed crops produced in the enterprise and recordkeeping by the producer. Negative variables are factor of unskilled inspection, factor of costs, variable of province and off-farm income of producer.

Keywords: Milk, Food Security, Factor Analysis, Binary Logistik Regression.

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1. Introduction

Food security exists when all people, at all times, have physical and economic access to suffcient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. This widely accepted defination points to the following dimensions of food security; food availability, food access, utilization and stability (Anonymous, 2015a; Anonymous, 2015b).

Milk occupies an important place in human nutrition. Milk and milk products constitute the main sources of protein in daily diet. Milk is a very important product not only in agricultural sector but also in industry sector. Furthermore, milk producers can generate a cash flow on daily basis in their enterprises by means of milk production. Therefore, it is of importance to ensure food security in milk.

The share of the value of animal production in the value of agricultural production is 32,6 % in Turkey according to the data obtained in 2012-2014. Moreover, the share of the value of milk production in the value of animal production is 40,7 % and in the value of agricultural production is 13,3 % in Turkey between the same years (Anonymous, 2015c).

According to the area classification of NTUS-2 (Nomenclature of Territorial Units for Statistics-2) by TUIK (Turkish Statistical Institute), TR22 South Marmara Region covers the provinces of Balıkesir and Canakkale. The share of the total value of milk produced in the region in the total value of milk in Turkey is 6,04 % given the average value between the years 2011-2013 (Anonymous 2013a; Anonymous 2013b). For that reason, this study was performed in TR22 South Marmara Region, which is a one of leading region in Turkey in terms of milk production. The aim of this study is to determine the variables that have an impact on the opinion of milk producers in TR22 South Marmara Region about ensuring food security in milk.

2. Material And Methods

The main source in the study was primary data. A total of 96 milk producers, selected by means of proportional sampling, were interviewed face-to-face. The analysis of the obtained data was performed by means of Reliability Analysis, Factor Analysis and Binary Logistic Regression Analysis (Tekin, 2000; Tavşancıl, 2005; Cankurt, 2008). The reliability of the estimations on the food security in milk which were addressed to the milk producers was also shown. Factor Analysis was performed in order to reduce a large number of variables to a smaller set of variables (Spearman, 1904; Özdamar 2013). The estimations including the statements on the food security in milk were grouped under certain factors and a smaller set of variables was obtained. Then, Binary Logistic Regression Analysis was carried out in order to determine the variables that have an impact on the opinion of milk producers about ensuring food security in milk. The factors obtained by Factor Analysis in this study were included in Binary Logistic Regression Analysis as an independent variable along with other variables. Thereby, the impact of these factors on the opinion of milk producers on food security was revealed.

3. Findings

Table 1 indicates the descriptive statistics on the characteristics of the milk producers in the study. According to Table 1, the average age of the producers in the research area is 45,65 years; the average of their educational period is 7,44 years; the average of their dairy farming experience is 22,74 years; the average number of the individuals in their household is approximately 5 persons.

Table 1. Descriptive statistics of milk producers' characteristics in the research area

Characteristics of Milk Producers	Mean	Standard Deviation	Minimum	Maximum	Sample Size (N)
Age (Year)	45,65	11,44	18	70	N=96
Education (Year)	7,44	3,26	1	17	N=96
Experience of Milk Producers (Year)	22,74	12,67	2	50	N=96
Number of Person in Household (Person)	4,61	2,25	1	12	N=96

The distribution of the milk producers in terms of income groups indicates that the income of 40 % of the producers is 1.500 TL and below.

The Five-Point Likert Scale consisting of the statements on food security in milk was prepared and the estimations were provided to the milk producers. The consistency of the scale utilized for the estimations was tested by means of Reliability Analysis. In order that the scale is considered reliable, Cronbach's Alpha coefficient should be at least 0,60 (Kalaycı, 2010). In this regard, the Cronbach's Alpha coefficient of 34 estimations in this study was found 0,721; which follows from that the scale is consistent.

Factor Analysis can be performed once the estimations in the study and the scale in relation to these estimations are determined to be reliable. Another indicator that Factor Analysis is practicable is Kaiser-Meyer-Olkin (KMO) value, which is required to be above 0,5 (Field, 2000). The KMO value of the estimations in this study were found 0,621. Therefore, Factor Analysis can be performed in this study.

After the implementation of Reliability Analysis and the determination of KMO values, the first phase of Factor Analysis is the determination of the numbers of factors. There are several methods and this study utilized the method of eigenvalue in the determination of the numbers of factors. Accordingly, it was found that the eigenvalues of 10 variables were above 1, as per the table of total explained variance in

relation to the estimations and that these variables explained 70,306 % of the total variance. In this regard, 34 estimations were grouped under 10 factors.

Table 2. Factor loads and distribution of variables about food security in milk

	1	2	3	4	5	6	7	8	9	10
The cleanliness of containers by which milk is transported	**0.872**	-0.025	0.175	-0.095	0.039	-0.137	0.042	0.083	0.004	0.059
Putting spoiled milk on market	**-0.87**	0.057	-0.042	0.091	-0.088	-0.064	0.072	-0.076	0.194	-0.047
The opinion that milk is of good quality	**0.762**	0.077	0.063	0.142	-0.083	0.153	0.216	-0.121	-0.122	-0.118
The use of yield-enhancing agent for milk	**-0.49**	0.221	-0.165	0.104	0.11	0.242	0.303	0.287	0.059	0.008
Ensuring the hygienic conditions for milking	**0.43**	-0.192	0.361	0.071	0.057	-0.113	-0.11	-0.35	0.295	0.338
The adequacy of state supports	-0.081	**0.789**	0.136	0.09	0.274	0.017	0.062	0.017	-0.079	-0.054
The opinion that the sale price of milk is reasonable	0.087	**0.783**	0.083	-0.002	-0.073	-0.054	0.021	0.343	0.053	-0.077
Obtaining profit in most instances	-0.041	**0.764**	0.032	-0.093	-0.077	0.179	0.033	-0.3	0.169	0.012
Having an adequate income to earn a living and to make production	-0.048	**0.627**	-0.039	-0.024	0.179	0.448	-0.001	-0.188	0.057	0.113
Milk production covering the expenses for milk	-0.131	**0.551**	-0.016	-0.216	0.102	0.405	0.278	-0.044	0.086	0.106
The daily purchase of milk on the market in a regular amount	0.056	-0.012	**0.839**	-0.01	-0.053	-0.09	-0.122	-0.087	-0.167	0.053
The daily supply/sale of milk on the market in a regular amount	-0.039	0.115	**0.783**	0.116	-0.06	0.183	0.143	-0.138	-0.167	-0.038
The opinion of maintaining milk production	0.166	0.217	**0.565**	0.144	0.053	0.096	0.155	0.138	0.11	-0.233
The ability to access a veterinarian at all times	0.342	-0.079	**0.558**	-0.108	-0.129	-0.229	0.151	-0.117	0.304	-0.003
Hygienic conditions for milk storage	0.333	0.06	**0.553**	0.3	0.027	-0.078	0.039	0.036	0.265	-0.149
Hygienic conditions for milk production	-0.031	-0.03	0.13	**0.87**	-0.064	0.042	-0.041	-0.13	0.176	0.013
Adequate inspection for milk production	-0.066	-0.086	0.082	**0.85**	0.235	-0.075	0.121	0.014	0.021	0.087
Regular inspection for animals	0.037	0.09	-0.049	0.057	**0.879**	0.068	0.008	-0.044	0.079	-0.055
Regular inspection for production environment	-0.005	0.126	-0.104	0.165	**0.79**	0.203	0.034	0.122	0.302	0.045
Finding feed prices reasonable	0.043	0.182	-0.001	-0.105	0.093	**0.71**	0.059	0.049	0.098	-0.095
The availability of all the required infrastructure facilities	0.015	0.136	0.123	0.37	0.037	**0.582**	0.243	-0.147	0.195	0.097
The milk production in an amount sufficient for everyone	0.228	-0.002	0.371	0.035	-0.091	**-0.454**	0.296	-0.004	0.262	-0.016
The milk production meeting the target set by the producer	-0.017	0.174	0.086	0.121	0.069	0.302	**0.705**	0.06	0.07	0.002
The ability of the producer to find high quality feeds at all times	0.35	-0.009	0.116	0.104	-0.179	-0.107	**0.559**	-0.362	0.009	-0.1
Using antibiotics only when necessary	0.046	-0.026	-0.086	0.2	-0.473	0.151	**-0.55**	0.179	0.113	-0.195
Acknowledging that feeds contain certain substances threatening human health	-0.006	-0.061	-0.102	-0.093	-0.005	-0.063	-0.103	**0.804**	-0.008	0.125
The availability of storage facilities for free of charge	-0.226	0.083	0.009	0.223	0.228	0.1	-0.114	0.2	**0.684**	0.042
Reasonable veterinary expenses	-0.19	0.152	-0.086	0.085	0.196	0.174	0.183	-0.247	**0.632**	-0.084
Unstable amounts of milk	0.073	0.116	-0.191	0.236	0.031	-0.121	-0.081	0.028	-0.088	**0.773**
Unstable prices of milk	-0.104	-0.16	0.029	-0.206	-0.042	0.236	0.26	0.319	0.1	**0.619**

Kaiser-Meyer-Olkin Measure of Sampling Adequacy=0,621, Bartlett's Test of Sphericity: 1157,45 (p=0,000)

The next phase after the determination of the number of factors in the model should be the determination of the number of variables in each factor and the distribution of variables according to factors. To this end, the factor load of each variable was calculated. Factor loads indicate the load of variables in each factor. The values that constitute factor loads are simply a correlation coefficient and determine the

extent of correlation between variables and factors. A variable belongs to a factor with which the variable has the strongest correlation. Accordingly, the variables that form 10 factors obtained from the estimations provided to the milk producers in regard to food security were determined. Table 2 indicates the factor loads of variables and the distribution of the variables according to their factors.

The last phase of Factor Analysis is the nomenclature of the determined factors. Table 3 demonstrates the phase of the nomenclature of the factors obtained from the estimations in The Five-Point Likert Scale, which was prepared based on the milk producers. The name of the factor with the highest coefficient or the names collectively representing the factors may be taken into consideration in the nomenclature of factors in the factor analysis. In this regard, Table 3 indicates the nomenclature of the factors under the relevant variables in detail.

Table 3. Nomenclature of the factor groups about food security in milk

Variables	Name of Factors
The cleanliness of containers by which milk is transported Putting spoiled milk on market The opinion that milk is of good quality The use of yield-enhancing agent for milk Ensuring the hygienic conditions for milking	Factor of Conditions for Production
The adequacy of state supports The opinion that the sale price of milk is reasonable Obtaining profit in most instances Having an adequate income to earn a living and to make production Milk production covering the expenses for milk	Factor of Sustainable Production
The daily purchase of milk on the market in a regular amount The daily supply/sale of milk on the market in a regular amount The opinion of maintaining milk production The ability to access a veterinarian at all times Hygienic conditions for milk storage	Factor of Sustainable Marketing
Hygienic conditions for milk production Adequate inspection for milk production	Factor of Hygiene
Regular inspection for animals Regular inspection for production environment	Factor of Unskilled Inspection
Finding feed prices reasonable The availability of all the required infrastructure facilities The milk production in an amount sufficient for everyone	Factor of Raw Materials and Infrastructure
The milk production meeting the target set by the producer The ability of the producer to find high quality feeds at all times Using antibiotics only when necessary	Factor of Availability
Acknowledging that feeds contain certain substances threatening human health	Factor of Feed Safety
The availability of storage facilities for free of charge Reasonable veterinary expenses	Factor of Costs
Unstable amounts of milk Unstable prices of milk	Factor of Stability

Logistic Regression Analysis was performed in order to determine the variables that have an impact on ensuring food security in milk in relation to the producers in the research area. The model of Binary Logistic Regression Analysis was deemed appropriate since the outcome for the dependent variable is discrete and can have two options. 10 factors obtained by Factor Analysis were utilized as independent

variables within the Regression Model. Accordingly, Table 4 demonstrates the results of all of the variables in this model and in the Binary Logistic Regression model.

Table 4. Variables effective on the opinion of milk producer about ensuring food security in milk

	B	S.E.	Wald	df	Sig.	Odds Ratio
Coefficient	1,251	6,188	0,042	1	0,838	3,492
Factor of Conditions for Production	3,164	1,440	4,831	1	0,028**	0,042
Factor of Sustainable Production	0,110	0,722	0,023	1	0,879	0,896
Factor of Sustainable Marketing	2,293	1,078	4,524	1	0,033**	0,101
Factor of Hygiene	0,369	0,656	0,316	1	0,574	0,692
Factor of Unskilled Inspection	-1,806	1,031	3,067	1	0,080*	6,087
Factor of Raw Materials and Infrastructure	0,328	0,686	0,229	1	0,632	0,720
Factor of Availability	2,794	1,315	4,514	1	0,034**	0,061
Factor of Feed Safety	0,865	0,868	0,993	1	0,319	0,421
Factor of Costs	-1,722	0,933	3,411	1	0,065*	5,598
Factor of Stability	0,379	0,758	0,250	1	0,617	1,461
Province	-12,226	4,396	7,734	1	0,005***	0,000
Total Milk Production Value	-0,012	0,008	2,545	1	0,111	0,988
Experience in Dairy Farming	0,150	0,080	3,481	1	0,062*	1,161
Cultivation of Feed Crops	4,223	2,933	2,074	1	0,150	68,255
Rate of Feed Crops Production in the Enterprise	0,176	0,071	6,170	1	0,013**	1,192
Recordkeeping	4,134	2,322	3,171	1	0,075*	62,455
Level of the Off-Farm Income	-4,424	2,060	4,610	1	0,032**	0,012

*significant at the level 10 %, ** significant at the level 5 %, *** significant at the level 1 %

Cox&Snell R^2=0,448, Nagelkerke R^2=0,754, X^2=57,021 (p=0,000)

This study utilized Hosmer-Lemeshow test to determine whether the overall model where the relevant variables have an impact on the opinion of ensuring food security in milk by the milk producers is significant or not. The sigma value is required to be above 0,05 so that the model is deemed significant. The sigma value of this model is 0,194. In this regard, the Binary Logistic Regression model, which was based on the opinion of ensuring food security in milk by the milk producers is a significant and valid model.

The independent variables that have an impact on the opinion of ensuring food security in milk by the milk producers in the research area were found as factor of conditions for production, factor of sustainable marketing, factor of unskilled inspection, factor of availability, factor of costs, the variable of province, experience in dairy farming, the rate of feed crops production in the enterprise, recordkeeping by the producer, the off-farm income of the producer.

The potential improvements in the conditions of production and sustainable marketing increase the likelihood that the producers acknowledge that food security in milk is ensured. The increase in the number of unskilled inspections decreases the likelihood that the producers acknowledge that food security in milk is ensured. The increase in the costs decreases the likelihood that the producers acknowledge that food security in milk is ensured.

The significance level of the variable of province was found 5 % and its coefficient sign was negative. As we move from the province of Balıkesir towards the province of Canakkale, which are the provinces covered in this study, the likelihood that the producers acknowledge that food security in milk is ensured decreases compared to the likelihood that they acknowledge that food security in milk is not ensured.

The significance level of the variable of experience in dairy farming was found 10 %, and its coefficient sign was positive. When the experience in dairy farming increases by one year, the likelihood that the producers acknowledge that food security in milk is ensured increases by 1,161 times.

The significance level of the rate of feed crops production in the enterprise was found 5 %, and its coefficient sign was positive. As the rate of feed crops production in the enterprise increases by one unit, the likelihood that the producers acknowledge that food security in milk is ensured increases by 1,192 times.

The significance level of the variable of recordkeeping was found 10 %, and its coefficient sign was positive. As the activity of recordkeeping increases, the likelihood that the producers acknowledge that food security in milk is ensured increases by 62,455 times.

The significance level of the off-farm income was found 5 %, and its coefficient sign was negative. When the off-farm income increases by one Turkish Lira, the likelihood that the producers acknowledge that food security in milk is ensured decreases by 83,3 times. Therefore, engaging in non-agricultural activities weakens the belief that food security in milk is ensured.

4. Results

As a result of the Factor Analysis implemented by means of the data obtained by the face-to-face interviews with the milk producers in the research region, the estimations on food security in milk were grouped under the factor of conditions for production, the factor of sustainable production, the factor of sustainable marketing, the factor of hygiene, the factor of unskilled inspection, the factor of raw materials and infrastructure, the factor of availability, the factor of feed safety, factor of costs, the factor of stability.

Given the milk producers in the research area, the variables with a positive impact on the likelihood that the producers acknowledge that food security in milk is ensured were the factor of conditions for production, the factor of sustainable marketing, the factor of availability, the experience in dairy farming, the rate of feed crops production in the enterprise, and the situation of recordkeeping. Any improvement in these variables would lead to an increase in the likelihood that the producers acknowledge that food security in milk is ensured.

Given the milk producers in the research area, the variables with a negative impact on the likelihood that the producers acknowledge that food security in milk is ensured were the factor of unskilled inspection, the factor of costs, the variable of province and the presence of off-farm income of the producer. Any increase in these variables would lead to a decrease in the likelihood that the producers acknowledge that food security in milk is ensured.

In order that the milk producers in the research area acknowledge that food security in milk is ensured, the variables with a positive coefficient must be increased whereas the variables with a negative coefficient must be decreased.

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