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KALİTE GÜVENCE SİSTEMLERİNE SAHİP OLMADA ETKEN FAKTÖRLER*

Kasım KAYA**

Öz

Bu çalışmanın amacı Gıda Sanayi İşletmelerinin Kalite Güvence Sistemlerine(KGS) sahip olmasında etkili olan faktörleri tespit etmektir. Bu amaçla işletme yetkilileri ile yapılan anket sonuçlarının frekans dağılım sonuçları aktarılarak kurulan hipotezler Lojistik Regresyon yöntemi ile test edilmiştir. Şanlıurfa'daki 118gıda sanayi işletmesinin sadece 67'sinde Kalite Güvence Sistemi (KGS) belgesi bulunmaktadır. KGS belgelerine sahip olmada kuruluş yeri, eğitim düzeyi, kuruluş tarihi ve personel sayısı gibi faktörlerin etkisi vardır. Bunun yanında tecrübe, ciro ve işletme yöneticiliğini kimin yaptığı faktörlerinin etkisinin olmadığı tespit edilmiştir.
Anahtar Kelimeler: Kalite, Gıda Güvenliği, Gıda İşletmeleri, Kalite Güvence Sistemleri, Lojistik Regresyon

CONTRIBUTING FACTORS HAVING QUALITY ASSURANCE SYSTEMS

Abstract

The purpose of this study is to determine the factors contributing to Food Industry Enterprises' getting Quality Assurance Systems (QAS). Logistic Regression test was used to test the hypotheses set by transferring the frequency distribution results of the questionnaires conducted with enterprise authorities. Out of 118 food industry enterprises located in Sanlıurfa, only 67 of them have a Quality Assurance System (QAS) certificate. Factors like location of the establishment, level of education, establishment date and number of the staff have an effect on getting a QAS certificate. It was also determined that factors like experience, turnover and who manages the establishment do not have an effect on getting the certificate.

Keywords: Quality, Food Safety, Food Enterprises, Quality Assurance Systems, Logistic Regression

1. INTRODUCTION

Food industry is a branch of industry that uses agricultural raw materials and applies various techniques of preparation, processing, storing and packing on the material thus making them more durable and ready for consumption. Food industry provides an assurance for an increase in the agricultural production and forms a basis for a balanced nutrition, which are two significant functions of it (Yulafçı and Cinemre, 2005). In food industry, pathogenic microorganisms contaminate the food due to unhygienic practices in the stages of harvest, preparation, processing and packing, which then leads to diseases caused by food (Ertürk, 2009). Food borne diseases are often caused by organisms invisible to the naked eye such as bacteria, yeast, mould and viruses. Research shows that food borne diseases are more widespread in developing countries when compared to developed countries (Demirci, 2002).

Damages caused by food result largely from insanitary food production. The food which goes through such a production harms people's health by chemical materials such as

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pathogenic microorganisms, excessive pesticide residue or hormone as a result of contaminating physical materials like glass, bone and stone (Tamer et. al., 2004).

There are two issues discussed in the world related to nutrition, which are food security and food safety. Food security, defined as people's accessing enough and healthy food to maintain a healthy life and continue their activities at all times, includes concepts of supplying, accessing and consuming the food. Food safety, on the other hand, is defined as raw material procurement and taking necessary precautions in the stages of production, processing, storing, transportation, distribution and presentation of the food in order to ensure secure food production. Starting point of food safety is the farm and final point is the consumer. Food safety therefore includes all the stages from field to fork, which are healthy raw material supply and production, processing, storage, transportation, distribution and storage of food (Giray and Soysal, 2007).

Food safety can be ensured by managing rings of a chain that links the raw material supplier to the customer in a way that it does not pose any physical, chemical and microbiological risks to human life (Veral, 2004).

Food safety is considered as an obligation and an international standard not only in developed countries but in the whole world and regarded as a priority in many countries in order to achieve goals like decrease in product cost, increase in productivity and enhancing export and import (Türksoy and Altıniğne, 2008). Firms in the food sector must make enough production and provide marketing and sale to serve this purpose as a part of their moral and legal responsibilities (Özçırpıcı et. al., 2009).

Food safety, regarding food that has become a thread to human health in today's global food market, is an issue to be dealt with internationally accepted food security systems. General responsibility for food safety should be shared by all components of food-drink system including various industry sectors, state regulatory authorities and consumers. Contamination risk in food supply could be a thread to human health, cause high cost for suppliers and affect food trade as well (Badrie et. al., 2007).

Agreements of Sanitary and Phytosanitary Measures (SPS) and Technical Barriers to Trade (TBT), carried out by Word Trade Organization (WTO), of which Turkey is a member, have obliged member countries to develop special control systems and tried to clarify the rules for the trade of quality, safe and environment-friendly products (Karaali, 2003).

Under present conditions, it is a must to involve quality management system in food establishments. ISO 9000 series of standards have been developed in order to establish quality management. In this way, a series of measures and suggestions related to cold-chain and storage have been developed under the title of HACCP in the stages of production and distribution. Introduction of quality assurance system concept has therefore been ensured in international food trade and market in terms of certification of food establishments and their compliance with the terms (Erkan et. al., 2008).

Codex Alimentarius Commission (CAC), Food and Agriculture Organization (FAO) and World Health Organization (WHO) approved food control systems that have been developed based on HACCP in terms of technique, regulations and science, with the purpose

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of eliminating several food safety practices that could impede international food trade. Use of HACCP (ISO 22000) and ISO 9000 series of quality management system standards complementary to each other stands out as the core strategy (Topoyan, 2003).

ISO 22000 is the first series of international standards prepared by ISO and published under the title of "Food Safety Management System" in September, 2015.Internationally recognized TS EN ISO 22000 Standard of Food Safety Management was published in Turkey instead of Standard of TS 13001 HACCP (Asoğlu et al., 2014). TS EN ISO 22000 Standard of Food Safety Management Systems was recognized by CEN and prepared in the light of EN ISO 22000-2005 series of standards and then was made available to those concerned following its publication as Turkish Standard on April 24, 2006 (Büyükhelvacıgil, 2009).

When TS EN ISO 22000 conditions have been fulfilled, the terms of HACCP and thus regulatory requirements will also be met (Kahvecioğlu and Özen, 2008).

2. MATERIAL AND METHOD

2.1. Material

The research area is composed of food industry enterprises located in Sanlıurfa. Research material was obtained through primary and secondary data sources. It was determined that there were a total of 184 food industry enterprises which received a capacity report from Chambers of Industry and Commerce located in Sanlıurfa. Primary data of the research consists of the information obtained through a face-to-face survey with managers and/or owners of 118 enterprises (complete count) out of all. Secondary data was obtained through the records of Turkish Standards Institute and other institutions and organizations and related publications.

2.2. Method

A certain database was created for the information obtained depending on primary and secondary data and a general coding scheme was prepared and then transferred to Excel environment. The results were interpreted through Logistic Regression test.

The hypotheses developed through the research are as follows:

Hypothesis 1 on enterprises' getting QAS certificate
Hypothesis 1a location has an effect.
Hypothesis 1b education has an effect.
Hypothesis 1c experience has an effect.
Hypothesis1d establishment date has an effect.
Hypothesis 1e number of the staff has an effect.
Hypothesis 1f who manages the enterprise has an effect.
Hypothesis 1g turnover has an effect.
Hypothesis 2 Agreement on the factor that QAS reduces costumer complaints while increasing productivity
Hypothesis 2a varies depending on the age of the respondents.
Hypothesis 2b varies depending on the duty positions of the respondents.
Hypothesis 2c varies depending on the education level of the respondents.
Hypothesis 2d varies depending on the experience of the respondents.

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Hypothesis 3 Agreement on the factor that QAS builds trust with customers and the company gains an advantage in competition and sales
Hypothesis 3a varies depending on the age of the respondents.
Hypothesis 3b varies depending on the duty positions of the respondents.
Hypothesis 3c varies depending on the education level of the respondents.
Hypothesis 3d varies depending on the experience of the respondents.
Hypothesis 4 Agreement on the factor that I follow publications related to QAS
Hypothesis 4a varies depending on the age of the respondents.
Hypothesis4b varies depending on the duty positions of the respondents.
Hypothesis 4c varies depending on the education level of the respondents.
Hypothesis 4d varies depending on the experience of the respondents.
Hypothesis 5 Agreement on the factor that enterprises care about food safety and inform their customers
Hypothesis 5a varies depending on the age of the respondents.
Hypothesis 5b varies depending on the duty positions of the respondents.
Hypothesis 5c varies depending on the education level of the respondents.
Hypothesis 5d varies depending on the experience of the respondents.
Hypothesis 6 Agreement on the factor that ISO 22000(HACCP) is efficient in ensuring food safety
Hypothesis 6a varies depending on the age of the respondents.
Hypothesis 6b varies depending on the duty positions of the respondents.
Hypothesis 6c varies depending on the education level of the respondents.
Hypothesis 6d varies depending on the experience of the respondents.
Hypothesis 7 Agreement on the factor that economical potential of the food enterprises is enough to get quality certificates
Hypothesis 7a varies depending on the age of the respondents.
Hypothesis 7b varies depending on the duty positions of the respondents.
Hypothesis7c varies depending on the education level of the respondents.
Hypothesis 7d varies depending on the experience of the respondents.

3. FINDINGS

Chart 1. Omnibus Tests of Model Coefficients

		Chi- Square	df	P
Step 1	**Step**	37.927	12	0.000
	Block	37.927	12	0.000
	Model	37.927	12	0.000

It can be seen in Chart 1 that chi-square test gives significant results (0.000<0.05). The fact that the test gives significant results shows there is a relationship between combinations of dependent and independent variables.

Chart 2. Model Table

Step	-2 log LL	Cox&Snell	Nagelkerke
1	151.564	0.209	0.303

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Cox&Snell and Nagelkerke values show quantity of the variant given by the model. It can be seen that Cox&Snell value is 20.9%, which explains 20.9% of the variant in QAS possession. It can also be concluded that Nagelkerke value explains 30.3% of the value in QAS possession variable.

Chart 3. Hosmer-Lemeshow Test

Step	Chi-square	df	P
1	12.199	8	0.143

Chart 3 shows the results of Hosmer-Lemeshow test. Hosmer-Lemeshow test evaluates goodness of fit for logistic regression models. The result of the test is not significant regarding the level of significance (p>0.05). This insignificant result shows that model and data do not have enough level of compliance.

Chart 4. Variables in the Model

		β	S.E.	Wald	df	p	Exp(β)
Step 1	**Location (ois)**			14.446	3	**0.002**	
	Location (center)	2.657	0.718	13.674	1	**0,000**	14.251
	Location (fms)	0.933	0.727	1.644	1	**0.200**	2.542
	Location (district)	1.762	0,650	7.342	1	**0.007**	5.823
	Education (primary school)			5.962	3	**0.113**	
	Education (secondary school)	0.643	0.697	0.852	1	0.356	1.902
	Education (high school)	0.685	0.606	1.279	1	0.258	1.985
	Education (university)	1.641	0.681	5.802	1	**0.016**	5.162
	Experience	-0.320	0.294	1.181	1	0.277	0.726
	Establishment date	0.557	0.339	2.704	1	**0.100**	1.745
	Number of staff	0.837	0.545	2.357	1	**0.125**	2.310
	Who the manager is (owner)			2.349	2	0.309	
	Who the manager is (relative)	-1.416	1.379	1.055	1	0.304	0.243
	Who the manager is (profes.)	-1.069	0.831	1.658	1	**0.198**	0.343
	Turnover	0.131	0.230	0.323	1	0.570	1.140
	Constant	-4.367	2.102	4.317	1	0.038	0.013

Variables of experience, establishment date and turnover in Chart 4 are quantitative values. These values are continuous variables that can take on any value at a certain interval. Number of staff is also a quantitative value, which is a discrete variable. These variables were not involved in the analysis as categorical variables. If the probability value of Wald statistics, used in logistic regression analysis for the selection of important variables through univariate models, is below level of significance determined (p <0.25), it is suitable to involve related variables as candidate variables for multivariate model (Cengiz, 2009).

According to Chart , variables of location (Organized Industry Site OIS), location (center), location (Food Manufactures Sıte FMS), location (district), education (primary school), education (university), establishment date and number of staff provided significant results. Other variables did not provide significant results. Therefore, they were excluded from the model. The information related to the most appropriate regression model created with candidate variables is shown below.

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Chart 5. Classification of the Most Appropriate Multivariate Logistic Regression Model

Observed			Expected		
			QAS		Percentage of Correct Classification
Step 1	QAS		No	Yes	
		No	15	34	30.6
		Yes	8	126	94.0
Total Percentage of Correct Classification					**77.0**

Chart 5 shows the classification obtained as a result of the most appropriate multivariate logistic regression. It can be seen that the percentage of correct classification is 77. This value shows us that dependent variables have made a significant contribution to the model.

Chart 6. The Most Appropriate Multivariate Logistic Regression Model

		β	S.E.	Wald	df	p	Exp(β)
Step 1	**Location (OIS)**			16.824	3	**0.001***	
	Location (Center)	2.443	0.602	16.463	1	**0.000***	11.510
	Location (District)	1.334	0.528	6.384	1	**0.012***	3.796
	Education (Prim. School)			7.135	3	**0.063****	
	Education (Seco. School)	1.336	0.646	4.283	1	**0.039***	3.805
	Education (University)	1.512	0.603	6.275	1	**0.012***	4.534
	Establishment Date	0.463	0.233	3.955	1	**0.047***	1.589
	Number of Staff	0.797	0.450	3.136	1	**0.077****	2.219
	Constant	-4.220	1.250	11.396	1	**0.001***	0.015

* p values are significant at 0.05 level of significance.
** p values are significant at 0.10 levels of significance.
Model -2 Log likelihood = 177.057

The constant term in Chart 6 is -4.220. This value gives us log-likelihood rate of enterprises' possessing QAS certificates in the case of independent variables in the model with a value of 0.

Location (center) variable is 11,510 times more likely to possess QAS when compared to location (OIS). Regarding the variable of location (district), the rate is 3,796 times more.

When it comes to the values related to level of education, variable of education (university) is 4.534 times more likely to possess a QAS when compared to the variable of education (primary school). This rate is 3.805 times more regarding education (secondary school) variable.

Considering establishment date variable, one-unit increase in this variable leads to an increase by 1.589 times in possessing QAS.

Regarding number of staff variable, one-unit increase in this variable leads to an increase by 2.219 times in possessing QAS.

In the light of this information, logistic regression equation related to the likelihood of an enterprise to possess a QAS with a center location and with an owner or manager who has a university level of education can be written as below.

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$$\ln\frac{P}{1-P} = -4{,}220 + 2{,}443*\text{location(center)} + 1{,}512*\text{education(university)} + 0{,}463*\text{establishment date} + 0{,}797*\text{number of staff}$$

establis date

If the equation above is rewritten with odds;

$$\frac{P}{1-P} e^{(-4{,}220+2{,}443*(\text{center})+1{,}512*(\text{university})+0{,}463*\text{establ. date}+0{,}797*\text{number of per.})}$$

The hypotheses formed as follows must be confirmed. **Hypothesis 1a** location has an effect, **Hypothesis 1b** education has an effect, **Hypothesis 1d** establishment date has an effect and **Hypothesis 1e** number of staff has an effect. It is possible to conclude that factors of location, education, establishment date and number of staff have an effect on possessing QAS. However, the following hypotheses must be rejected: **Hypothesis 1c** experience has also an effect, **Hypothesis 1g** turnover has an effect and **Hypothesis 1f** who manages the enterprise has an effect.

4. RESULTS

According to the result of logistic regression test, factors like establishment date, level of education, location of the establishment and number of staff have an effect on possessing QAS certificates. However, it was determined that factors of experience, who manages the enterprise and turnover do not have an effect. It was also determined that an enterprise with an Organized Industry Site (OIS) location is 11,5 times more likely to possess a QAS when compared to one in the center; education-university variable is 4.5 times more likely to possess a QAS when compared to education-primary school variable. Moreover, it can be stated that one-unit increase in the variable of establishment date leads to an increase by 1.589 times for possessing a QAS and that one-unit increase in number of staff variable leads to an increase by 2.219 times for possessing a QAS.

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