

## **Evaluation of Attitudes and Behaviors on Food Safety and Quality Management Systems of Firm Owners in Olive Oil Enterprises: The Case Study of Mugla Province-Turkey**

F. Cukur<sup>1\*</sup>, N. Demirbas<sup>2</sup>, T. Cukur<sup>3</sup>, V. Dayan<sup>4</sup>, and A. C. Uzun<sup>3</sup>

### **ABSTRACT**

Olive oil is one of the foods that are preferred by consumers seeking healthy nutrition. Healthy, safety and high quality olive oil production can only be achieved in olive oil enterprises that follow these criteria. Therefore, food safety and quality management systems should be placed in these olive oil enterprises. The aim of this study was to determine behaviors and attitudes of firm owners towards the application of food safety and quality management systems in olive oil enterprises in the Milas district of Mugla province. The material used in this study was collected by face-to-face surveying of the 60 firm owners of the olive oil enterprises in Milas. Sample size was determined by using proportional sampling. In this study, five-point likert scale was used in terms of attitudes and behaviors on food safety and quality management systems of firm owners in olive oil enterprises. In this research, the knowledge level of olive oil enterprise owners on food safety and quality management systems was determined to be inadequate. In addition, logistic regression analysis was made with the aim of determining the factors that are effective on the tendencies of firm owners to utilize food safety and quality management systems in their olive oil enterprises. At the end of the analysis, it was determined that knowledge status of production capacity, capacity usage ratios and food safety are effective in utilizing food safety and quality management systems in the facilities.

**Keywords:** Food industry, Healthy, Milas Olive oil, Nutrition, Quality management system.

### **INTRODUCTION**

It is a fact that rising awareness of food safety and changing food habits have pushed the food industry into taking numerous safety measures in the production process. Turkey has also begun to apply production techniques to provide food safety in agriculture and the food industry. Conducting alternative methods

such as Good Agricultural Practices (GAP) and organic agriculture accelerates the process. Eco-friendly agricultural techniques in animal and crop production, and production within the principles of food safety have gained importance in the food industry recently. Especially due to the increasing food related diseases in the world, there is a tendency for consumers to seek health, food security, and quality criteria in the products they purchase.

<sup>1</sup> Department of Management and Organization, Milas Sitki Kocman Vocational School, Mugla Sikti Kocman University, 48200 Milas/Mugla, Turkey.

\* Corresponding author; e-mail: figenc@mu.edu.tr

<sup>2</sup> Department of Agricultural Economics, Faculty of Agriculture, Ege University, 35040 Bornova/Izmir, Turkey.

<sup>3</sup> Department of Marketing and Advertising, Milas Sitki Kocman Vocational School, Mugla Sitki Kocman University, 48200, Milas/Mugla, Turkey.

<sup>4</sup> Department of Computer Technology and Information Systems, Uzunköprü School of Applied Sciences, Trakya University, 22300 Uzunkopru/Edirne, Turkey.



Today, nutrition style is one of the basic elements of a healthy life. In the Mediterranean nutrition pyramid, which is considered to be the healthiest nutrition style, olive oil is one of the food products that should be consumed every day. Considering that the numbers of conscious consumers increase day by day, it can be said that olive oil will continue to be increasingly important for human nutrition. Turkey has 8.06% of the world total olive production area, 8.24% of the world olive production and 6.21% of the world olive oil production (FAO, 2014). At the same time, Turkey is one of the five arbiter countries regarding olive oil production. Increasing current market share in global trade and its continuation can only be achieved by production of the healthy and high quality olive oil that is required by consumers. At this stage, the necessity of secure and high quality production appears in olive oil producing facilities. In Turkey, there are many legal regulations related to food safety and quality management systems for olive oil enterprises from the past to today. Legal regulations started with decree No. 560 dated 1995. In this decree, working permit, food registry document, working permit for the food processing facility, workplace establishment and operating license, brand registry document and other necessary documents ensuring that the facility will process olive oil in compliance with food security were established. Edible olive oil standard No. TS 341 is a quality standard that has been in effect since 1967. In addition, the food security and quality of olive oil in the Turkish local market is established by the Turkish food codex, olive oil and olive pomace oil statement No. 2007/36 and edible olive oil standard document No. TS 341. Turkish food codex, olive oil and olive pomace oil statement No. 2007/36 is continuously renewed according to EU (European Union) regulations. Regarding the export of olive oil from Turkey, food security and quality is determined by TS 341, and IOC and EU olive oil standards. The Undersecretariat of Foreign Trade mandatorily requires conformity with TS 341 in exports. (Tunalioglu, 2010). As is the case

with all food products, efforts in order to provide food safety and quality criteria in olive oil have become prominent in terms of human health and international competitiveness. Within this context, various studies have been made about the importance of food safety and product quality in olive oil. The contribution of HACCP (Hazard Analysis and Critical Control Analysis) and ISO 22000 to businesses has been examined in international studies on olive oil food safety (Martinez *et al.*, 2003; Pardo *et al.*, 2003; Zorpas and Tzia, 2008). Subjects such as quality at the harvesting and storage stage, effects of processing technology, and some chemical, physical, and sensory features of olive oil have been discussed in the studies of quality management systems (Tzia *et al.*, 1999; Giovacchino *et al.*, 2002; Aly and Ravid, 2008; Vossen, 2009).

Chosen as the research area, the Milas district of Mugla Province, located in the Aegean Region, has great potential in terms of olive and olive oil production. By the year 2010, the Milas district of Mugla Province had nearly 9% of all olive trees in Turkey (TUIK, 2012). Milas district is also important in Mugla Province due to its 91 olive oil enterprises. Milas district has a wide consumer group in its domestic market with its olive oil enterprises and the olive oil sent to the neighboring districts and provinces. When the value-added benefit of the olive oil enterprises in the province on both the provincial and district economies is considered, the importance of efforts to meet food safety and quality criteria for the olive oil produced in the region becomes clear. The aim of this study was to determine the opinions of facility owners in Milas district related to food security and quality management systems from different aspects as well as their knowledge levels regarding this issue. There are quite a few studies completed in the context of this research in Turkey. Food safety in olive oil marketing and practices on quality assurance systems and the relevant innovations are discussed in these studies (Bozdogan *et al.*, 2003; Tunalioglu, 2010; Tunalioglu, 2012a; Tunalioglu, 2012b). The relevant literature in

the world is also very scarce. While studies around the world focus on technical aspects, studies in Turkey remain insufficient to discuss the subject economically and/or technically. This research aimed to contribute much to the literature in order to have common understanding of matters related to food safety and quality management systems in Turkish olive oil enterprises.

## MATERIALS AND METHODS

### Materials

Primary data of the study was composed of face to face questionnaires undertaken with the owners of olive oil enterprises in the Milas district of Mugla Province. In addition, we researched previously published relevant studies and explored internet resources. Relevant statistical data were obtained through Turkish Statistical Institute (TUIK, 2010) and Directorate of Food Agriculture and Livestock of Milas District (GTHB, 2010).

### Method of Data Gathering

The study was conducted in 29 villages of the Milas district. First of all, the number of olive oil enterprises in the Milas district was designated in order to gather the primary data of the study. According to the collected data, it was decided that 91 olive oil enterprises registered in Milas would form the basis for interviews. However, in the preliminary survey it was found that 31 olive oil enterprises had terminated their operations. As a result of some olive oil firm owners declining to participate, 60 olive oil firm owners, from whom reliable data could be collected, were interviewed face to face and the questionnaire completed. The olive oil enterprises included in this survey represent 65.93% of the total number of olive oil firm owners in Milas District. In the study, firm owners' attitudes and behaviors in terms of food safety and quality management systems

of olive oil enterprises were measured using five-point Likert scale. In order to measure the reliability of the Likert scaled dataset, Cronbach's-Alpha coefficient was calculated (Santos and Reynaldo, 1999; Alpar, 2011). Cronbach's-Alpha coefficient is often used in studies where Likert type scales are included (Gliem and Gliem, 2003; Kennedy *et al.*, 2008; Kvakkestad *et al.*, 2011; Cobanoglu, 2012; Tunalioglu, 2012b; Kaya *et al.*, 2012). The test is regarded as highly reliable if Cronbach's-Alpha coefficient is between 0.60-0.79 (Alpar, 2011). The Likert scaled questions related Cronbach's-Alpha coefficient for this study was calculated as 0.63. Thus, it can be said that the developed test was highly reliable according to this value. Kolmogorov-Smirnov tests were made about whether the study showed a normal distribution of variables (age, education, experience) (Albayrak, 2006; Alpar, 2011). After that, Analysis Of Variance (One-way ANOVA) was conducted for the ones that showed normal dispersion. Kruskal-Wallis test was applied to the variables that did not show normal dispersion (Kruskal and Wallis, 1952). The olive oil enterprises included in the scope of this study were grouped homogeneously with respect to their real capacity. For this purpose, the frequency distribution of olive oil enterprises was first determined. Thus, according to real processing capacity grouping, olive oil enterprises were divided into three groups as eight or fewer, 9-25, and 26 tons day<sup>-1</sup> or above. Accordingly, the first group had 23, the second had 18, and the third group had 19 olive oil enterprises (Table 1).

Whether there were differences between groups in terms of the characteristics of the firm owners such as age, educational level, experience, etc. and their practices was determined by using *Chi-square* (independency) analysis for intermittent variables (Gujarati, 2005). Variables and variable groups analyzed by *Chi-square* are indicated in Table 2.

For the purpose of determining the factors that affect olive oil firm owners in terms of finding a place for food safety and quality management systems in their plants in the

**Table 1.** Distribution of the studied olive oil enterprises according to real processing capacity.

Olive oil enterprises (Real capacity, ton day <sup>-1</sup> )	Number of olive oil enterprises	%
Group 1 ( $\leq 8$ )	23	38.33
Group 2 (9-25)	18	30.00
Group 3 ( $26 \geq$ )	19	31.67
Total	60	100.00

**Table 2.** Analyzed variables and variable groups using *Chi-square* analysis.

Variables	Groups
Firm owners' age (Year)	Group 1: $\leq 49$ Group 2: 50-61 Group 3: $62 \geq$
Firm owners' education (Year)	Group 1: $\leq 5$ Group 2: 6-8 Group 3: $9 \geq$
Firm owners' experience in olive oil sector (Year)	Group 1: $\leq 25$ Group 2: 26-40 Group 3: $41 \geq$
Real capacity (ton day <sup>-1</sup> ) <sup>a</sup>	Group 1: $\leq 8$ Group 2: 9-25 Group 3: $26 \geq$

<sup>a</sup> Based on daily olive processing capacity.

future, binary logistic regression analysis was conducted. Binary logistic regression analysis analyzes the effect of multiple independent variables on dependent variables. (Griffiths *et al.*, 1993; Liao, 1994; Guris and Caglayan, 2000; Pampel, 2000; Alpar, 2011). As for

having food safety and quality management systems being below expectations, it is based on the answers of the olive oil firm owners to the question: "Would you like to have food safety and quality management systems in the future?", as dependent variable (Y). The answers of the olive oil firm owners were evaluated with Yes= 1 and No= 0. The independent variable related to the model is shown in Table 3.

First, Hosmer and Lemeshow test statistics were applied to the model. Hosmer and Lemeshow test is a test statistic that measures the model compatibility (Sumbuloglu and Akdag, 2009; Alpar, 2011). Hosmer and Lemeshow test statistic was found as 10.653 and due to the fact that this result was smaller than *Chi-square* table values and bigger than 5% of the 0.300 meaningfulness level, it was determined that the model compatibility was good. In the literature, it is possible to see other studies that utilize this method (Northen, 2001; Zhang, 2005; Rodríguez *et al.*, 2006; Hasdemir and Talug, 2012; Rezai *et al.*, 2012; Cobanoglu *et al.*, 2013). In order to

**Table 3.** The independent variables related to the logistic regression analysis.

Some Features of Variables	Variable name
Features of firm owners	Age (Year)
	Education (Year)
	Experience in olive oil sector (Year)
Firm owners' features related to food safety and quality management	Knowledge of food safety issues (Known=1, Not known= 0)
	Education on food safety issues (Yes= 1, No= 0)
	Attending any food safety related meeting (Yes= 1, No= 0)
Structural features of the olive oil plants	Theoretical capacity (ton/day)
	Real capacity (Production capacity) (ton/day)
	Capacity utilization ratio (%)

identify whether the variables included in the logistic regression model were meaningful or not, Wald statistics value for each variable in the model was calculated (Table 11). Wald value is one of the commonly used tests for identifying if the variables that are included in the model are meaningful or not in logistic regression analysis (Sumbuloglu and Akdag, 2009; Alpar, 2011).

## RESULTS AND DISCUSSION

### General Characteristics of Olive Oil Firm Owners

Within the scope of the olive oil firm owners' general features, firm owners' age (year), education period (year) and experience in olive oil production (year) were taken into consideration. The average age of olive oil firm owners was 51. The average education period was eight years and the average experience in olive oil production was 29 years. Statistically, there was no significant difference between the groups in terms of age, education period, and experience. In a study made in the Aegean region, the average age of olive oil facility owners was determined to be 56 and their agricultural experience was determined to be 40 years (Artukoglu, 2002). In another study, again in the Aegean region, the average age of olive pressing facility owners was determined to be 50, period of

education was determined to be 8.67 and olive pressing experience was determined to be 26 years. (Olgun *et al.*, 2011). On the other hand, the theoretical capacity of the olive oil enterprises was 42.30, 54.72 and 68.94 tons day<sup>-1</sup> for the first, second, and third groups of olive oil enterprises, respectively (Table 4). On the other hand, real capacity of olive oil enterprises was low. All of the olive oil enterprises worked below the theoretical capacity. Capacity utilization rate of olive oil enterprises was determined to be 10.26% for the first group, 29.24% for the second group, and 53.06% for the third group. Average capacity utilization rate of olive oil enterprises was defined as 33.13%. Statistically, there were significant differences between the groups in terms of theoretical capacity. In a study made it was determined that olive pressing facilities used 53.73% of their capacities. (Olgun *et al.*, 2011). In another study, the capacity usage ratio was determined to be 69.14% for continuous systems. (Isin and Kocak, 2003).

### Structural Features of the Olive Oil Enterprises

The olive oil enterprises comprising 60% of the survey were established between 1981 and 2011. In another study, it was determined that 58.33% of olive pressing facilities were established before 1975 and 41.67% were established in and after 1995 (Olgun *et al.*,

**Table 4.** General characteristics of olive oil firm owners and enterprises.

The groups of olive oil enterprises	Firm owners' age (Year)	Education period (year)	Experience in olive oil production (Year)	Theoretical capacity (ton day <sup>-1</sup> )
Group 1 (n= 23)	52.26	7.48	30.52	42.30
Group 2 (n= 18)	51.83	8.89	29.67	54.72
Group 3 (n= 19)	49.26	8.05	25.73	68.94
General total (n= 60)	51.18	8.08	28.75	54.46
<i>P</i> value <sup>a</sup>	0.707	-	0.584	-
<i>F</i> value	0.348	-	0.543	-
<i>P</i> value <sup>b</sup>	-	0.454	-	0.049
<i>Chi-square</i> value	-	1.577	-	6.019

<sup>a</sup> One-way ANOVA test, <sup>b</sup> Kruskal-Wallis test. Significant for  $P < 0.05$ .



2011). Cooperatives represented only 3% of the total enterprises. As in other subsectors of the food industry, the share of the cooperatives was fairly small. Accordingly, during the years between 1997 and 2007, the average of the agriculture cooperatives' market share in the field of olive oil production was calculated as 11% throughout the country (Inan *et al.*, 2010). Another study notes that the agriculture sales of cooperatives have a share of 12-20% in olive oil production, while agricultural development cooperatives have a share of 6-8% (Yercan, 2011). In this research area, 91.67% of the olive oil enterprises studied were involved only in olive oil extraction and 8.33% of them were involved both in extraction and bottling. Also, 85% of the olive oil enterprises produced natural olive oil while 8.33% produced both refined and natural olive oil. The rate of extra virgin olive oil producers, refined and extra virgin olive oil producers, and natural and extra virgin olive oil producers were calculated as 1.67, 1.67, and 3.33%, respectively. In addition, 91.67% of the olive oil enterprises followed the continuous system, while 8.33% followed the conventional system. Notably, 93.33% of the olive oil enterprises hired seasonal workers and only 13.33% hired food engineers. Also, 8.33% of the olive oil production plants held certificates of food safety and/or quality management systems.

### **Definitions of Food Safety and Quality According to Firm Owners**

Food safety is defined as following the rules and taking the necessary precautions during the production, processing, preservation, and distribution process of food in order to provide healthy and infectible food safety according to the Federation of Food and Drink Industry Associations of Turkey (TGDF, 2011). Food safety is an absolute consumer demand. For this reason, food safety is regarded as an absolute and unconditional quality parameter by the Turkish Standards Institution (TSI, 2012). Firm owners' opinions regarding the concepts of food safety and quality are of vital

importance in implementing the food safety and quality management systems in the businesses. To this end, firm owners were questioned on the definitions of food safety and quality concepts. In terms of olive oil production, 40% of the firm owners defined food safety concept as a feature of a product produced considering human health and hygienic measures. Also, 21.67% of the firm owners noted that food safety is a concept requiring the olives to be extracted at once, and the olive oil to be stored in proper storage places following hygienic measures, while 11.66% of the business firm owners defined food safety as the safety precautions taken until the products were packed and reached consumers. Considerable numbers of the firm owners defined it in a manner similar to the general definition of food safety (Table 5).

Quality is defined as all the features determining a product's suitability for use (Anonymous, 2012). According to the standards of TSI (Turkish Standards Institution), quality is the total of features that are related to a product or service's ability to meet current and possible needs (TSI, 2013). Quality in olive oil production is determined by a successful processing method including transportation, processing, and storing of olive oil in addition to good product management and activities during and after harvesting peculiar to the product itself (IOC, 2012). On the other hand, 33.33% of the questioned firm owners defined quality in olive oil as low value of appearance, taste, odor, and acid in olive oil, while 21.80% defined this concept as hygienic production and 16.67% defined it as the feature of the product to be extracted without losing time after harvesting season (Table 6). It has been observed that a limited number of the firm owners made similar definitions to those of related institutions.

### **The Firm Owners' Opinions on the Benefits of Food Safety and Quality Management Systems**

In order to find out the opinions of the firm owners on food safety and quality

**Table 5.** Definitions of firm owners about food safety in olive oil production.

Definitions	Number	%
Feature of a product produced considering human health and hygienic measures	24	40.00
A concept requiring the olives to be extracted at once, the olive oil to be stored in proper places following hygienic measures	13	21.67
The safety precautions taken until the products are packed and reach consumers	7	11.66
A concept regarding a product being chemical and residue-free	6	10.00
A concept guaranteeing the product's standards for appearance, taste and odor	2	3.33
Supervision and controlling activities during the production process	2	3.33
No opinion	2	3.33
A concept regarding oil production in accordance with the quality standards	1	1.67
A production related concept determined by international standards	1	1.67
A concept regarding a product certified to be conforming to the existing standards	1	1.67
Producing non-adulterated food	1	1.67
Total	60	100.00

management systems in olive oil production, 5 point Likert scale was used. In this study, attitude scale was used as: (1) Disagree, (2) Partially agree, (3) Moderately agree, (4) Agree, and (5) Strongly agree. According to this scale, the contribution of food safety and quality management systems to branding the product has turned out to be the primary benefit (4.22). This was followed by enhancing the company's presence and importance in the market (3.93) and increasing productivity and providing quality product (3.85) (Table 7).

### Why Firm Owners Fail to Follow the Food Safety and Quality Systems

According to the firm owners, the primary reason why they are not able to follow the food safety and quality systems is that information meetings regarding food safety and quality management systems held by relevant institutions and organizations are

insufficient (4.17). This is followed by the necessity of additional allocation (4.03) and lack of staff to follow food safety and quality systems in the olive oil enterprises (2.50) (Table 8). Firm Owners' Problems in Food Safety and Quality in Olive Oil Production

The leading problem of the firm owners was insufficient information and training activities regarding food safety and quality conducted by public institutes and organizations (4.45). This was followed by the fact that the firm owners did not have enough knowledge of food safety and quality systems (4.17) and that high temperature water (higher than 36°C) was used in pressing in order to extract oil easily (3.92) (Table 9).

### Firm Owners' Suggestions Regarding Food Safety and Quality Problems

Firm owners expressed that olive oil should

**Table 6.** Definitions of firm owners about quality in olive oil production.

Definitions	Number	%
A feature of the product suitable for appearance, taste, odor and acid	26	33.33
A feature of the product produced under hygienic conditions	17	21.80
A feature of the product to be extracted without losing time after harvesting in season	13	16.67
A feature of the product which is stored and transported with a suitable material	9	11.53
A feature of the product produced using suitable olive types and cultivation activities	7	8.97
Remediation activities to be carried out on a product to preserve its features	3	3.84
A concept related to the production considering technical criteria	2	2.56
A feature of a safe product	1	1.30
Total	78 <sup>a</sup>	100.00

<sup>a</sup> Firm owners of olive oil enterprises have given multiple answers.

**Table 7.** Firm owners' opinions on the benefits of food safety and quality management systems to the olive oil enterprises.

Opinions	1 <sup>a</sup>	2 <sup>b</sup>	3 <sup>c</sup>	4 <sup>d</sup>	5 <sup>e</sup>	Scale average	Standard deviation
It contributes to the product's branding (n= 60).	2 (%3.33)	2 (%3.33)	5 (%8.33)	24 (%40.00)	27 (%45.00)	4.22	0.97
It may enhance the company's presence and importance in the market (n= 60).	7 (%11.66)	2 (%3.33)	6 (%10.00)	18 (%30.00)	27 (%45.00)	3.93	1.32
It may provide productivity and quality production in the olive oil enterprises (n= 60).	6 (%10.00)	4 (%6.70)	5 (%8.33)	13 (%21.67)	32 (%53.33)	3.85	1.34
It may increase customer demand (n= 60).	9 (%15.00)	6 (%10.00)	8 (%13.34)	17 (%28.33)	20 (%33.33)	3.55	1.43
It may increase exportation opportunities (n= 60).	15 (%25.00)	5 (%8.33)	5 (%8.33)	17 (%28.33)	18 (%30.00)	3.30	1.58
It may remedy the management system (n= 60).	15 (%25.00)	2 (%3.33)	9 (%15.00)	23 (%38.33)	11 (%18.33)	3.22	1.46
It may affect staff relations positively (n= 60).	21 (%35.00)	4 (%6.66)	8 (%8.33)	17 (%28.33)	10 (%16.66)	2.85	1.56

<sup>a</sup> Disagree; <sup>b</sup> Partially agree; <sup>c</sup> Moderately agree; <sup>d</sup> Agree, <sup>e</sup> Strongly agree.

**Table 8.** The reasons why firm owners fail to follow the food safety and quality systems.

Opinions	1 <sup>a</sup>	2 <sup>b</sup>	3 <sup>c</sup>	4 <sup>d</sup>	5 <sup>e</sup>	Scale average	Standard deviation
Information meetings regarding food safety and quality management systems held by relevant institutions and organizations are insufficient (n= 60).	5 (%8.33)	2 (%3.33)	4 (%6.67)	16 (%26.67)	33 (%55.55)	4.17	1.22
Additional allocation is needed to follow food safety and quality systems in the olive oil enterprises (n= 60).	5 (%8.33)	4 (%6.67)	4 (%6.67)	18 (%30.00)	29 (%48.33)	4.03	1.26
There is lack of staff to follow food safety and quality systems in the olive oil enterprises (n= 60).	31 (%51.67)	-	5 (%8.33)	16 (%26.67)	8 (%13.33)	2.50	1.63
Work load density does not give opportunity to launch food safety and quality systems in the olive oil enterprises (n= 60).	33 (%55.55)	6 (%10.00)	6 (%10.00)	10 (%16.67)	5 (%8.33)	2.13	1.43
Structural possibilities of the olive oil enterprises are not sufficient to follow food safety and quality systems (n= 60).	34 (%56.67)	6 (%10.00)	4 (%6.67)	13 (%21.67)	3 (%5.00)	1.92	1.40

<sup>a</sup> Disagree; <sup>b</sup> Partially agree; <sup>c</sup> Moderately agree; <sup>d</sup> Agree, <sup>e</sup> Strongly agree.



**Table 9.** The problems of the firm owners in food safety and quality of olive oil.

Opinions	1 <sup>a</sup>	2 <sup>b</sup>	3 <sup>c</sup>	4 <sup>d</sup>	5 <sup>e</sup>	Scale average	Standard deviation
Seminars and training activities regarding food safety and quality held by relevant institutes and organizations are very insufficient (n= 60).	2 (%3.33)	1 (%1.67)	4 (%6.67)	14 (%23.33)	39 (%65.00)	4.45	0.94
We do not have enough knowledge of food safety and quality (n= 60).	1 (%1.67)	5 (%8.33)	8 (%13.33)	15 (%25.00)	31 (%51.67)	4.17	1.06
High temperature water is used in pressing in order to extract oil easily (n= 60).	11 (%18.33)	3 (%5.00)	3 (%5.00)	6 (%10.00)	37 (%61.67)	3.92	1.59
Table olives are kept in sacks for very long periods (n= 60).	12 (%20.00)	3 (%5.00)	3 (%5.00)	6 (%10.00)	36 (%60.00)	3.85	1.63
There is no legalized tasting panel in public or private sector (n= 60).	7 (%11.67)	5 (%8.33)	10 (%16.67)	11 (%18.33)	27 (%45.00)	3.77	1.40
Olive oil is not stored in suitable and hygienic places (n= 60).	13 (%21.67)	4 (%6.67)	7 (%11.67)	11 (%18.33)	25 (%41.67)	3.52	1.59
Table olives used in the olive oil enterprises are not sorted and cleaned (n= 60).	17 (%28.33)	4 (%6.67)	6 (%10.00)	9 (%15.00)	24 (%40.00)	3.32	1.70
Tools and equipment used are not suitable (n= 60).	35 (%58.33)	4 (%6.67)	12 (%20.00)	3 (%5.00)	6 (%10.00)	2.02	1.38
Too many table olives are used for stone crushers (n= 60).	54 (%90.00)	2 (%3.33)	1 (%1.67)	1 (%1.67)	2 (%3.33)	1.25	0.85

<sup>a</sup> Disagree; <sup>b</sup> Partially agree; <sup>c</sup> Moderately agree; <sup>d</sup> Agree, <sup>e</sup> Strongly agree.

be stored in stainless steel tanks depending on its acidity, peroxide and sensory value, and under suitable storage conditions, as their primary resolution for food safety and quality problems in olive oil production (4.73). A study regarding the effect of olive processing on the quality of extra virgin olive oil mentions that the quality of extra virgin olive oil depends on the way the olives are collected, stored and processed (Giovacchino *et al.*, 2002). As shown in Table 10, this suggestion is followed by subsidy with scale average of 4.65 and using boxes instead of sacks with scale average of 4.52. Another study puts forward that quality of olive oil is affected by

several factors, one of which is storage conditions. This study mentions that storage boxes, an important factor considering the storage conditions, could cause several chemical reactions affecting human health negatively. This is the case once olive oil is preserved and stored in boxes with plastic material and the like (Aly and Ravid, 2008). According to the results, firm owners had enough knowledge of food storing conditions and preservation methods, which is vitally important in terms of food safety and quality in olive oil production. Yet, it was observed that some of the businesses still used boxes with plastic and similar materials for storage.

**Table 10.** Firm owners' suggestions regarding food safety and quality problems in olive oil production.

Suggestions	1 <sup>a</sup>	2 <sup>b</sup>	3 <sup>c</sup>	4 <sup>d</sup>	5 <sup>e</sup>	Scale average	Standard deviation
Olive oil should be stored in stainless steel tanks depending on its acidity, peroxide and sensory value, and under suitable storage conditions (n= 60).	-	-	2 (%3.33)	12 (%20.00)	46 (%76.67)	4.73	0.51
Government should provide subsidies (n= 60).	2 (%3.33)	1 (%1.67)	1 (%1.67)	8 (%13.33)	48 (%80.00)	4.65	0.87
Number of information meetings should be increased (n= 60).	3 (%5.00)	-	2 (%3.33)	14 (%23.33)	41 (%68.33)	4.50	0.96
Boxes should be used instead of sacks to carry the olives (n= 60).	4 (%6.67)	1 (%1.67)	2 (%3.33)	6 (%10.00)	47 (%78.33)	4.52	1.11
Table olives should be harvested earlier (n= 60).	30 (%50.00)	1 (%1.67)	9 (%15.00)	3 (%5.00)	17 (%28.33)	2.60	1.65

<sup>a</sup> Disagree; <sup>b</sup> Partially agree; <sup>c</sup> Moderately agree; <sup>d</sup> Agree, <sup>e</sup> Strongly agree.

**Table 11.** Results of logistic regression analysis.

Name of variable	Coefficient (B)	Standard error	Wald's equation	P
Age (Year)	-0.0361	0.0443	0.6650	0.4148
Education (Year)	0.1131	0.0878	1.6610	0.1975
Firm owners' experience in olive oil production (Year)	0.0172	0.0346	0.2473	0.6190
Theoretical capacity (Ton)	0.0215	0.0233	0.8472	0.3573
Production (Real) capacity (Ton)	-0.1099	0.0648	2.8815	0.0896**
Capacity utilization rate (%)	0.0753	0.0380	3.9287	0.0475*
Knowledge of food safety (Knows= 1, Does Not Know= 0)	1.5447	0.7473	4.2722	0.0387*
Educational background of food safety (Yes= 1, No= 0)	1.2388	0.8621	2.0649	0.1507
Participation in meetings regarding food safety (Yes= 1, No= 0)	-0.1915	0.7216	0.0704	0.7908
Constant	-2.0719	2.3377	0.7856	0.3754

\*  $P < 0.05$  level, \*\*  $P < 0.10$  level.

Thus, there was no parallel between the firm owners' theoretical knowledge and their practices.

#### Factors Affecting Firm Owners' Future Utilization of Food Safety and Quality Systems

A logistic regression analysis was conducted in order to determine the factors

affecting firm owners' future utilization of food safety and quality systems (Table 11).

According to the results of binary logistic regression analysis, production capacity, capacity utilization rate, and knowledge of food safety influence whether firm owners will launch food safety and quality systems in their businesses in the future. Firm owners of the businesses with high production capacity and high capacity

utilization rates considered starting food safety and quality systems more seriously than the other firm owners. Likewise, as expected, firm owners having knowledge of food safety and quality systems tended to utilize food safety and quality systems in the future.

## CONCLUSIONS

In recent years, food related diseases have increased and are now found in more than 30% of the population in industrialized countries. These problems may also cause important economic losses (WHO, 2012). The increase in food related diseases necessitates that food products be produced in compliant with health, hygiene, and quality standards in a chain reaching from farm to table. The fact that consumer consciousness related to products produced according to health and hygiene standards increases day by day has increased the demand for food products fulfilling food security and quality conditions. This necessitates the awareness of food facility directors related to food safety and quality applications in food facilities. In recent years, legal regulation of applications of food safety and quality have increased in Turkey in parallel with developments in the world related to food safety and quality. At present, legal regulations for this purpose are being prepared for application. On the other hand, in global competition, marketing the product and ensuring its sustainability replaces production at the forefront of considerations. Today, the preferences of consumers to buy products that meet food safety and quality criteria force the production facilities to fulfill these conditions. In a study, it was determined that food safety and quality is important for the olive oil industry and that quality guarantee at the production stage is essential for ensuring the acceptability of the product by consumers. In the same study, the necessity of quality management systems such as ISO 9001 and ISO 22000 for placement of

quality in the production facilities was emphasized (Zorpas and Tzia, 2008). In Turkey, the related regulations and laws and studies enforcing food safety and quality management systems in production facilities in the agricultural sector continue with increasing speed. Although there was previously slow development in the technical infrastructure of olive oil production and industry, in the last decade, Turkey has made many efforts for its development (Tunalıoglu and Ozdogan, 2012). In Turkey, olive production has an important place in the plant production sub sector, which is a part of the agricultural sector. Olive, with the grain and oil produced from its fruit, is an important part of the agricultural products exports of Turkey. For this reason, it is essential that Turkey implement food safety and quality standards in production plants in order to increase its export share within the world's olive oil production sector and maintain its sustainability. It is crucial that the olive farms that provide raw material to the olive oil plants meet the food safety and quality standards as well as the olive oil processing plants. For this reason, quality standards should be applied throughout the supply chain from olive farms to consumers. Research results show that the firm owners in the olive oil plants in Milas district of Mugla, which holds a very important position in olive and olive oil production within the Aegean Region, do not have enough knowledge of food safety and quality. This will inevitably affect consumer demand in a negative way. As a consequence of the increase in the level of education and income, the food safety and quality awareness of consumers has increased. For this reason, firm owners have to enhance their knowledge and meet the food safety and quality criteria in order to ensure reliance. It was observed that the researched businesses had difficulty with branding. As a matter of fact, the contribution of food safety and quality systems to the product's branding is regarded as the primary advantage of these



systems by the firm owners. Branding is a must in order to increase export levels as well as quality (Anonymous, 2013b). Trade awareness related to branding and branded products has increased in Turkey in recent years. In particular, applications by food companies to register their brands have increased by five times in the last 10 years (Anonymous, 2013a). Branding needs to be promoted within the olive oil production sector. According to the results of a study in Greece, brand is one of the most important characteristics of olive oil for consumers. (Fotopoulos and Krystallis, 2001). More research conducted in Spain showed that branding is one of the most important features of olive oil in the international market (Mili and Zúñiga, 2001). The firm owners' views on the problems involved in implementing food safety and quality systems in olive oil production have also been mentioned. The leading problem among these is lack of seminar and training activities held by relevant institutions and organizations regarding food safety and quality. Increasing the frequency of these information meetings is highly important in order to eliminate the lack of knowledge. Another problem is that initiating food safety and quality systems is costly. The fact that the businesses are primarily small-scaled with limited income prevents them from implementing these systems. To this end, holding meetings on the starting processes of these systems in the businesses and budget-planning is quite important for the sector. Establishment of food safety and quality management systems will be ensured in production facilities if they are provided with government support.

The primary resolution by the firm owners to the problems of food safety and quality systems is that olive oil should be preserved in stainless steel tanks depending on its acidity, peroxide, and sensory value. However, it has been observed that firm owners having certain knowledge of storing and preserving olive oil are not able to utilize their knowledge in practice. The primary reason for this is insufficient

economic resources. Consequently, considerable numbers of the businesses have not been able to implement food safety and quality systems in their plants and, therefore, they have not been able to get certified. In addition, it was found that firm owners lacked knowledge of the content and the processes of food safety and quality systems. Yet, some businesses were planning to launch food safety and quality systems in their plants in the future. These businesses had relatively high production and capacity utilization rates. Efficient training and extension activities need to be conducted in olive oil production plants as soon as possible in order to eliminate the firm owners' lack of knowledge of food safety and quality systems. In a study made, it was emphasized that education is important for ensuring the economic and technical efficiency of the olive pressing industry in Turkey. (Olgun *et al.*, 2011). Education should be provided not only for company owners but also for employees. For this purpose, the number of current education and publication studies organized by related establishments should be increased. The placement of food security and quality management systems in production facilities will be achieved by monitoring the application of existing regulations and legislation in facilities and the establishment of an effective supervision system by the government. In particular, paying visits to the firms currently implementing food safety and quality systems and exchanging views on how these systems contribute to the olive oil enterprises would be very beneficial. Moreover, subsidies to reduce the cost of setting up food safety and quality systems might increase the number of olive oil enterprises launching these systems.

## ACKNOWLEDGEMENTS

This study was supported by Scientific Research Project Unit of Mugla Sitki Kocman University (SRP) with the project number 10/23.

## REFERENCES

1. Albayrak, A. S. 2006. Practical Multivariable Statistic Techniques. *Asil Publishing*, Ankara, PP.1-499 (In Turkish).
2. Alpar, R. 2011. Practical Multivariable Statistical Methods. *Detay Publishing: 429*, Ankara, PP.1-853 (In Turkish).
3. Aly, R. and Ravid, U. 2008. Effect of Storage Conditions on Virgin Olive Oil Quality. *Israel J. Plant. Sci.*, **56**: 273-278.
4. Anonymous. 2012. *Total Quality Management*. Innovation Committee, Dokuz Eylul University, <http://web.deu.edu.tr/inoviz/index.php/kalite>, (Accessed: 24.04.2013, in Turkish).
5. Anonymous. 2013a. *Branding Gains Importance Day by Day*. World Food Magazine, <http://www.dunyagida.com.tr/haber.php?nid=2098>, (Accessed: 07.10.2013, in Turkish).
6. Anonymous. 2013b. *Quality in Olive Oil, Brand in Marketing*. <http://mitso.org.tr/zeytinyaginda-kalite-pazarlamada-marka/>, (Accessed: 07.10.2013, in Turkish).
7. Artukoglu, M. M. 2002. A Research on The Socio-economic Features of the Olive Oil Producers in Western Part of Turkey, Production, Organization, Marketing Problems and Solutions. *Pak. J. Biol. Sci.*, **5**: 371-374.
8. Bozdogan, D, Didin, M. and Keceli, T. 2003. A Study on Determining Natural Olive Oil Quality in Hatay Province, Turkey. 1. *Olive Oil and Table Olive Symposium Notifications*. Taris Olive Oil Production Plant, 02-03 October, Cigli, İzmir. (in Turkish)
9. Cobanoglu, F. 2012. Determination of Stimulants to Place Food Safety Practices in Dried Fig Companies. *Anadolu J. Agr. Sci.*, **27**: 6-16. (in Turkish)
10. Cobanoglu, F., Karaman, A. D. and Tunalioglu, R. 2013. Critical Evaluation for Adoption of Food Safety Systems in the Turkish Dairy and Meat Processing Businesses. *J. Agr. Sci. Tech.*, **15**: 101-114.
11. FAO (Food Agriculture and Organization). 2014. *Statistics*. [www.fao.org](http://www.fao.org), (Accessed: 27.11.2014).
12. Fotopoulos, C. and Krystallis, A. 2001. Are Quality Labels a Real Marketing Advantage? *J. Int. Food Agr. Mark.*, **12**:1-22.
13. Giovacchino, L. D., Sestili, S. and Vincenzo, D. D. 2002. Influence of Olive Processing on Virgin Olive Oil Quality. *Euro. J. Lipid. Sci. Technol.*, **104**: 587-601.
14. Gliem, J. A. and Gliem, R. R. 2003. Calculating, Interpreting, and Reporting Cronbach's Alpha Reliability Coefficient for Likert-type Scales. *2003 Midwest Research to Practice Conference in Adult, Continuing, and Community Education*, The Ohio State University, Columbus, OH, PP. 82-88.
15. Griffiths, W., Hill, E. R. C. and Judge, G. G. 1993. *Learning and Practicing Econometrics*. John Wiley and Sons, Inc., Canada.
16. GTHB (Directorate of Food, Agriculture and Livestock of Milas District). 2010. *Numerous Statistics*. Milas, Mugla.
17. Gujarati D. N. 2005. *Basic Econometrics (International Edition)*. 3<sup>rd</sup> Edition, Mc Graw Hill, Boston, USA.
18. Guris, S. and Çağlayan, E. 2000. *Econometrics Basic Concepts*. Der Publishing: 282, Istanbul. (in Turkish)
19. Hasdemir, M. and Talug, C. 2012. Analysis of Factors Affecting Good Agricultural Practices in Cherry Cultivation. Western Mediterranean Agricultural Research Institute, Journal of Derim, **29 (1)**:23-36 (In Turkish).
20. IOC (International Olive Oil Council). 2012. *Spotlight on Cultivation Systems and Olive Oil Quality at International Seminar*. IOC Headquarters, 12-16 December, 2011, Madrid.
21. Inan, I. H., Basaran, B., Saner, G., Yercan, M., Inan, C. and Ozdogan, O. 2010. Cohesion between Turkish Agriculture Cooperatives and EU Agriculture Cooperatives and Effects to Agricultural Industry. *Turkey Agricultural Engineering VII Technical Congress*, Book of Notifications -1, 11-15 January, Ankara, PP. 1321-1341. (in Turkish)
22. Isin, S. and Kocak, E. 2003. Economic Analysis of Olive Oil Plants Applying Different Production Techniques in İzmir. *J. Ege Uni. Fac. Agri.*, **40(1)**:127-134. (in Turkish)
23. Kaya, E., Gurbuz, H. and Derman, M. 2012. University Student Approach to Genetically Modified Products. *Iğdır Uni. J. Inst. Sci. Tech.*, **2**: 55-60. (in Turkish)



24. Kennedy, C., Worosz, M., Todd, E. C. and Lapinski, M. K. 2008. Segmentation of US Consumers Based on Food Safety Attitudes. *Brit. Food J.*, **110**: 691-705. (Accessed: 16.04.2013)
25. Kruskal W. H. and Wallis W. A. 1952. Use of Ranks in One-criterion Variance Analysis. *J. Amer. Stat. Assoc.*, **47**: 583-621.
26. Kvakkestad, V., Refsgaard, K. and Berglann, H. 2011. *Citizen and Consumer Attitudes to Food and Food Production in Norway*. Discussion Paper No. 2011-2, Norwegian Agricultural Economics Research Institute, 18 PP.
27. Liao, T. F. 1994. *Interpreting Probability Models, Logit, Probit and Other Generalized Linear Models*. International Educational and Professional Publisher, Series/Number 07/101, Sage Publications, London.
28. Martinez, M. G., Gharbi, M. and Laajimi, A. 2003. Food Safety and Quality Systems in the Tunisian Olive Oil and Dates Sector: An Exporter View. Book Quality Assurance, Risk Management and Environmental Control in Agriculture and Food Supply Networks. *Proceedings of the 82<sup>nd</sup> Seminar of the European Association of Agricultural Economists (EAAE)*, Bonn, Germany, A and B: 325-333.
29. Mili, S. and Zúñiga, M. R. 2001. Exploring Future Developments in International Olive Oil Trade and Marketing: A Spanish Perspective. *Agri. An Int. J.*, **17**: 397-415.
30. Northen, J. R. 2001. Using Farm Assurance Schemes to Signal Food Safety to Multiple Food Retailers in the UK. *Int. Food. Agri. Man. Rev.*, **4**: 37-50.
31. Olgun, A., Artukoglu, M. M. and Adanacioglu, H. 2011. Profitability and Efficiency Olive Oil Mills in Turkey: The Case of Ege Region. *J. Ege Uni. Fac. Agri.*, **48(3)**:217-227. (in Turkish)
32. Pampel, F. 2000. *Logistic Regression: A Primer*. International Educational and Professional Publisher, Series/Number 07/132, Sage Publications, London.
33. Pardo, J. E., Perez, J. I., Andres, M. and Alvarruiz, A. 2003. Application of the Hazard Analysis and Critical Control Point (HACCP) System in the Processing Line of Virgin Olive Oil. *Grasas y Aceites*, **53**: 309-318.
34. Rezai, G., Teng, P. K., Mohamed, Z. and Shamsudin, M. N. 2012. Functional Food Knowledge and Perceptions among Young Consumers in Malaysia. *World Acad. Sci. Int. J. Bio. Vet. Agri. Food Eng.*, **6**: 207-312.
35. Rodríguez, E., Lupín, B. and Lacaze, M. V. 2006. Consumers' Perceptions about Food Quality Attributes and Their Incidence in Argentinean Organic Choices. *International Association of Agricultural Economist Conference*, August 12-18, Gold Coast, Australia, 12 PP.
36. Santos, J. and Reynaldo, A. 1999. Cronbach's Alpha: A Tool for Assessing the Reliability of Scales. *J. Extension*, **37(2)**: <http://www.joe.org/joe/1999april/tt3.php/>.
37. Sumbuloglu, K. and Akdag, B. 2009. *Advanced Biostatistical Methods*. ISBN 978-975- 8322 -29-9, Hatiboglu Publishing: 147, Ankara. (in Turkish)
38. TGDF (Federation of Food and Drink Industry Associations of Turkey). 2011. *A General View on Food Safety, TGDF Food Safety Report*. Apple Technique Issue, October, Ankara. [http://www.tgdf.org.tr/turkce/resimler/yayinlar2011/guvenlik\\_raporu2011.pdf](http://www.tgdf.org.tr/turkce/resimler/yayinlar2011/guvenlik_raporu2011.pdf), (Accessed: 24.04.2013, in Turkish).
39. TSI (Turkish Standards Institution). 2012. *TS EN ISO 22000 Food Safety Management System*. <http://www.tse.org.tr/>, (Accessed: 24.04.2013, in Turkish).
40. TSI (Turkish Standards Institution). 2013. *Directorate of Quality, Documentation of Quality Systems Quality with Questions, What is Quality?* TSE Izmir Regional Directorate, <http://tseizmir.8m.com/sorukal.htm#nedir>, (Accessed: 06.05.2013, in Turkish).
41. Tunahoglu, R. 2010. Implementation of the Olive Oil Food Safety and Quality Assurance in the Marketing System in Turkey and Evaluation of Developments. *Turkish J. Agri. Eco.*, **16**: 59-66. (in Turkish)
42. Tunahoglu, R. 2012a. Differences within Some Marketing Preferences of the Table Olive Firms Implementing and Non-Implementing Food Safety Systems. *J. Ege Uni. Fac. Agri.*, **49**: 1-6. (in Turkish)
43. Tunahoglu, R. 2012b. Differences in Perceptions and Practices of the Managers of Table Olive Firms Implementing and Not Implementing Food Safety Systems, *J. Food, Agri Env.*, **10**: 104-111.
44. Tunahoglu, R. and Ozdogan, Y. G. 2012. New Approaches and Changes in Olive Oil

- Marketing in Turkey, 6th International Symposium on Olive Growing Book Series. *Acta Horti.*, **949**: 579-585.
45. TUIK (Turkish Statistical Institute) (TurkStat). 2012. *Agriculture Statistics Summary*. [www.tuik.gov.tr/IcerikGetir.do?istab\\_id=53](http://www.tuik.gov.tr/IcerikGetir.do?istab_id=53), (Accessed: 29.06.2012, in Turkish).
46. Tzia, C., Oreopoulou, V., Kallisperi, M., Liadakis, G. N. and Melanitis, A. 1999. Quality Assurance and HACCP of Olive Oil. *III International Symposium on Olive Growing, ISHS Acta Horti.*, **474**. [http://www.actahort.org/books/474/474\\_138.htm](http://www.actahort.org/books/474/474_138.htm), (Accessed: 06.05.2013).
47. Vossen, P. 2009. *Olive Oil Processing Technology Influences on Quality*. <http://ucce.ucdavis.edu/files/filelibrary/2161/17353.pdf>, (Accessed: 29.04.2013).
48. Yercan, M. 2011. *Evaluation of Cooperative Movement in EU*. [tarimekonomisi.files.wordpress.com/2011/12/abde-kooperatifler.ppt](http://tarimekonomisi.files.wordpress.com/2011/12/abde-kooperatifler.ppt), (Accessed: 17.04.2013, in Turkish).
49. WHO. 2012. *Food Healthy Organization*. <http://www.who.int/mediacentre/factsheets/fs237/en>, (Accessed: 11.05.2012).
50. Zhang, X. 2005. Chinese Consumers' Concerns about Food Safety. *J. Int. Food Agri. Mark.*, **17**: 57-69.
51. Zorpas, A. A. and Tzia, N. 2008. The Implementation of a New ISO 22000 in the Cyprus Olive Oil Industry, Risk Analysis. *VI. Simulation and Hazard Mitigation*. PP. 261-274, <http://library.witpress.com/pages/PaperInfo.asp?PaperID=18775>, (Accessed: 29.04.2013).

## ارزیابی نگرش و رفتار صاحبان شرکت های روغن زیتون در باره سلامت و کیفیت غذا: مطالعه موردی در استان موگلا در ترکیه

ف. شوکور، ن. دمیرباس، ت. شوکور، و. دایان، و. ا. س. اوزون

### چکیده

در سال های اخیر، مدیریت سلامت و کیفیت غذا برای دنیا و ترکیه بسیار مهم شده است که علت آن هم افزایش آگاهی مصرف کنندگان از مسایل سلامتی و بهداشت محصولات غذایی است. در این رابطه، سیستم مدیریت سلامت و کیفیت روغن زیتون، همانند سایر محصولات غذایی، از اهمیت بر خوردار است. روغن زیتون از شمار مواد غذایی است که مصرف کنندگانی که به سلامتی خود توجه دارند مصرف آن را ترجیح می دهند. تولید روغن زیتون سالم با کیفیت بالا فقط در تاسیساتی مقدور است که از ضوابط مربوطه پیروی می کنند. از این رو، سیستم مدیریت سلامت و کیفیت محصول می بایست در چنین تاسیساتی اجرا شود. در پژوهش حاضر، تاسیسات فرآوری روغن زیتون در منطقه میلاس در شهر موگلا که منطقه ای مهم از نظر تولید زیتون در ترکیه و منطقه اژه است، بررسی شد. هدف پژوهش تعیین رفتار و نگرش صاحبان کارخانه ها و شرکت های روغن کشی زیتون در باره کاربرد سیستم مدیریت سلامت و کیفیت محصول در منطقه میلاس در استان موگلا بود. داده های استفاده شده در این مطالعه از نظر سنجی رو در روی ۶۰ نفر صاحبان شرکت ها و کارخانه های روغن زیتون در میلاس گردآوری شد. اندازه نمونه با روش نمونه برداری متناسب (proportional sampling) تعیین شد. در این



بررسی، از مقیاس پنج رتبه ای لایکرت در مورد نگرش و رفتار صاحبان شرکت های روغن زیتون در زمینه سیستم مدیریت سلامت غذا و کیفیت آن استفاده شد. نتایج پژوهش حاکی از آن بود که سطح دانش صاحبان این شرکت های روغن زیتون در مورد سیستم مدیریت سلامت و کیفیت محصول کافی نبود. همچنین، این بررسی نشان داد که به منظور تثبیت سیستم مدیریت سلامت و کیفیت روغن زیتون، لازم است صاحبان شرکت های مزبور را در زمینه این مدیریت ها آگاه کرد. همچنین، به منظور تعیین عوامل موثر بر تمایل صاحبان شرکت ها برای اعمال سیستم مدیریت سلامت غذا و کیفیت آن در تاسیسات خودشان، از تجزیه رگرسیونی منطقی (logistic regression analysis) استفاده شد. با انجام تجزیه مزبور معلوم شد که عواملی شامل سطح دانش در مورد ظرفیت تولید، نسبت کاربرد ظرفیت تولید، و سلامت غذا، در کاربرد سیستم مدیریت سلامت غذا و کیفیت آن در تاسیسات مزبور موثراند.