Fast Food Consumption Behavior of Consumers in The Northern Region of Iraq[1] / Sulama Organizasyonlarında Yönetim Şekillerine Göre Fiyatlandırma Yaklaşımlarının İşletme Başarısına Etkisinin Belirlenmesi[2] / Farm Safety Behaviors of Farmers in Izmir and Manisa Provinces in Turkey[3] / Türkiye Şeker Dış Ticaretinin Yapısı ve Rekabet Gücü[4] / Turkey's Competitive Power in the International Wheat Market[5] / Factors Affecting The Most Preferred Local Tomato Variety "Akikon" Purchasing Prices in Benin[6] / Evaluation of Wheat Producers' Adoption for Protective Agriculture Techniques[7]

1. Zozik Sabah RASOOL, Cuma AKBAY,

2. Zeki BAYRAMOĞLU, Süheyla AĞIZAN, Kemalattin AĞIZAN, Merve BOZDEMİR,

3. Murat BOYACI, Özlem YILDIZ,

4. Sinan DURU, Seyit HAYRAN, Aykut GÜL,

5. Ozan KILIÇ, Fatma Handan GİRAY,

6. Rahmiye Figen CEYLAN, Mouinatou ALIDOU,

7. Fatma Dilek METİN, Makbule Nisa MENCET YELBOĞA

ATED | AVRASYA TARIM EKONOMİSTLERİ DERNEĞİ

EJEA

Eurasian Journal of Agricultural Economics

EJEA

Eurasian Journal of Agricultural Economics

ATED | AVRASYA TARIM EKONOMİSTLERİ DERNEĞİ

Fast Food Consumption Behavior of Consumers in the Northern Region of Iraq

Zozik Sabah RASOOL[1]   Cuma AKBAY[1*]

[1]*Kahramanmaraş Sütçü İmam University Department of Agriculture Economics, Kahramanmaraş / Turkey*

ARTICLE INFO

*Corresponding author:
cakbay@ksu.edu.tr

ABSTRACT

Fast food is a food that can be cooked and prepared in a short time; some people enjoy (relish) fast food instead of popular food. The purpose of this research is to investigate the fast food consumption behavior of consumers in the Northern Region of Iraq. The sample size was 380 and questionnaires were distributed among the families in three main areas includes Erbil, Sulaimaniya, and Duhok. Multiple linear regressions models and ANOVA were used to analyze the fast food consumption behavior of consumers. The result shows that the share of total food expenditures spent on fast food consumption increased with incomes. Results from this research suggest that increasing household income increased household fast food consumption share, but decreased food expenditure. In addition, household size has a statistically significant and positive effect on fast food consumption expenditure. The result of statistically significant coefficient showed that household income has a positive effect on fast food consumption expenditure. The income elasticity of fast food consumption is equal to 0.56, that's mean when the income increasing by 1%, the amount of fast food consumption expenditure will increase by only 0.56%.

1. Introduction

Fast food is a mass-produced food that is prepared and served very quickly. It was first introduced in the early 1900s with automatic vending machines for simple foods and drinks could be bought by inserting coins into the machine. The first food chain, White Castle in the United States, started with producing hamburgers in 1921 (Chavadi and Kokatnur, 2008). Fast food started with the main fish and chip shops in Britain in the 1860s. Drive-through eateries were first promoted in the 1950s in the United States. The expression "fast food" was perceived in a lexicon by Merriam-Webster in 1951. As indicated by the National Institutes of Health (NIH), quick sustenance is speedy other options to home-cooked suppers (Schlosser, 2012).

The conventional family supper is progressively being supplanted by the utilization of takeaway, or eating "on the run". The idea of prepared cooked nourishment available to be purchased is firmly associated with urban advancements (Block et al., 2013). Along these lines, urbanites were urged to buy pre-arranged meats or starches, for example, bread or noodles, at whatever point conceivable. This need is the thing that drove the marvelous achievement of the early fast food monsters, which obliged the family in a hurry (Franklin A. Jacobs). Fast nourishment turned into a simple alternative for a bustling family, just like the case for some families today (Andreyeva et al., 2010).

Eating is an everyday activity and needs of every single individual. Contingent upon person's explanation behind eating at eateries, person's aim or intuition surveys a diverse arrangement of characteristics in front of picking an eatery (Warraich et al., 2013). The significance of these eatery characteristics is eventually assessed in the client's psyche and prompts by choice. A few components like age, organization, and even social divisions enhance these properties as the client settles on eating choice (Powell et al., 2007). The investigation of buyer conduct possibly manages the majority of the ways individuals may act on their part as buyers (Schiffman and Kanuk, 1997).

Without pre-existing knowledge of these behaviors, it's difficult to ascertain what influences are important for determining the amount of fast food consumed. Menu availability suggests that traditional fast food items are more popular than healthier alternatives. In contrast, MacDonalds have cited sales from their healthy choice menu as a reason for sales growth (Green et al., 2003).

The main aim of this research is to know the costumers behaving and reactions towards fast food as well as its level. Furthermore, to clarify the budget of the families that they spend on fast food, the effect of income and other socio-demographic factors on fast food consumption of families. Eating fast food has increased in the north of Iraq due to its large number of citizens who are employees. In addition, a large number of women/girls working outside has a positive effect on increasing fast food eating. On the other hand, increasing the number of tourists coming from the middle and south of Iraq to the north has made a great change in opening more fast food restaurants. There are around 1800 restaurants in northern Iraq, 776 of them are international restaurants, and others are national or local restaurants.

The fundamental target of this research is to distinguish the determinants that impact purchase fulfillment in fast food showcasing in northern Iraq. Information was gathered from the general population in the private industry in northern Iraq. The fast food eatery industry has been growing up; the primary element which remains the achievement in the north of Iraq, buyer decision is identified with the statistic elements and the showcasing elements. One of the main thrusts behind the development of the fast administration eatery in the north of Iraq is the adjustment in the purchaser's inclination.

The purpose of the research was to investigate sociodemographic factors on consumers' fast food consumption behavior in Northern Iraq. Hence, the research depends on the plausibility of helping merchants to make reasonable systems and grow new fast food items and additionally holding clients to make a supportable upper hand. The research can help fast food industries to create suitable strategies and develop new fast food products as well as retaining customers to create a sustainable competitive advantage. The research attempts to recognize the consumers' buying behavior of fast food problem and to obtain a sale performance model of fast food restaurants in the north of Iraq.

2. Material and methods

The study was conducted in the Northern region of Iraq (Erbil, Duhok, and Sulaymaniyah), which is located north of Baghdad. Erbil city is located between Sulaymaniyah, Duhok, Mosul, and Kirkuk; it is within the borders of Turkey and Iran. Duhok is near to Mosul and Erbil. Duhok is also located on the borders of Turkey and Syria. Sulaymaniyah is near to Erbil and Kirkuk, it is the border of Iran.

The sample size was determined by utilizing the ungrouped one stage random likelihood sampling method based on families (Aydin and Kilic, 2013):

$$n = \left(\frac{z_{a/2}}{d}\right)^2 * p * q$$

Where, n is the sample size; $Z\alpha/_2$ is the significant level (assumed to be 95%); P is the probability of examining the state occurring (p= 0.5 is used to the absence of preliminary information concerning consumers' fast food demand awareness levels); d is the margin of error (assumed to be 95%); q is the probability of the situation not occurring (q=1-p). According to the method utilized, the sample size was found to be 380. All questionnaires were distributed randomly and all families respond to questionnaires.

To obtain the necessary data for the study, a questionnaire has been designed particularly for this purpose collected through the family in the province (north Iraq) during 2016. Data collected by the research instrument were analyzed in line with each research question and hypothesis. Descriptive statistics (such as percentages and frequencies) were used to answer the research questions. In addition, the F-test was carried out to compute the variance within each group for the factors of more than two groups. ANOVA is a statistical technique that assesses potential differences in a scale-level dependent variable by a nominal-level variable having three or more categories.

The multiple linear regression analysis was used that allows the inclusion of any preferred variable. Moreover, multiple linear regression analysis pursues to launch a relationship between a dependent variable (in this case fast food consumption) and independent variables (the predictors). The regression model was used to analyze fast food consumption of respondents:

Ln (Fast food consumption expenditure) = $\beta_0 + \beta_1 x_1 + \beta_2 \times_2 + \ldots + \beta_k \times n + \varepsilon_i$

Where β_0 is intercepted; β_k is the regression slope or coefficient for a given independent variable k, and ε_i is the error term for the individual *i* based on the record of observations. The model includes independent variables covering age and education level of respondents, household size, and income. The independent variables should have slight or no correlation with each other to avoid problems initiated by multicollinearity. In order to attain valid results from the overall significance of each regression coefficient (F-test) of the equation, the residual ε_i has to be normally and independently distributed, with a mean of zero and a constant variance.

3. Results and discussion

3.1. Socio-demographic characteristics of

According to survey results, the average age of respondents was around 36.1 and 24.2% were less than 30 years old, and 43.2% were older than 35 years old. The result indicated that 6.3% of participants were non-literate, 31.6% of the respondents had degrees less than a

diploma, while the remained 62.1% of respondents had a degree of a high school diploma, bachelor or masters. The average household size in the research area was about 3.61 and 21.6% of respondents are living in a family with a size of more than 4 individuals. Out of 380 participants, 92.1% of respondents were employed, while 7.9% of them were jobless and unemployed for various reasons.

In terms of income, households have been divided into three groups; 30.3% of participants (lower-income households) have income less than 900000 Iraqi Dinars (IQD). Also, 34.7% of respondents (Middle-income households) earn between 900000-1300000 IQD, and the remained 35% of respondents (Higher-income households) have income more than 1300000 IQD. Moreover, the finding accounted 1225793.42 IQD for the average income.

Food and beverage consumption of households represent 35.0% of their total household expenditure following by transportation (13.7%), clothes (10.0%), health (8,3%) and oil and gas (7.9%), communication (6.3%), rent (5.6%), electricity and water (4.7), education (2.2%), and smoking (1.8). In a similar study in Turkey, Akbay and Boz (2005) reported that share of food expenditure on the total household expenditure was 28.6%, education was 8.4% and clothing was 5.3% (Table 1).

Table 2 shows household total expenditure and food consumption expenditures by income groups for the Northern Region of Iraq. Based on the results, there is a positive relationship between income and total expenditure and food expenditure. Results revealed that lower-income households spent a higher share of their household income (91.5) compare to higher-income households (67.1%). Results showed that the poorest households spent more than their household income.

Nonetheless, there is a strong relationship between food expenditures and income. Therefore, it is suggested that the actual amount spent on food may rise because lower-income households may make a change in the composition of their food bunch as their income increases. The share of food expenditure in total income decreases from 34.86% for lower-income households to 22.72% for higher-income households.

According to the results, there is a positive relationship between household income and fast food consumption (P<0.01). However, the share of fast food expenditure in total food expenditure increase when the income level increase from the lowest (27.2%) to the highest income (32.4%) (P<0.05). According to result by Gül et al. (2007), the share of food away from home expenditure in total expenditure in Turkey is 21.7% for lowest-income households, 20.3% for medium-income households, and 21.7% for higher-income households. On the other hand, by using USA national consumer expenditure 2004-2005 survey data, French et al. (2010) reported that low-income households spend 26% of their food dollars to eating out, compared with 47% among high-income households. According to the results, there is a positive relationship between household income and fast food consumption (P<0.01). However, the share of fast food expenditure in total food expenditure increase when the income level increase from the lowest (27.2%) to the highest income (32.4%) (P<0.05). According to result by Gül et al. (2007), the share of food away from home expenditure in total expenditure in Turkey is 21.7% for lowest-income households, 20.3% for medium-income households, and 21.7% for higher-income households. On the other hand, by using USA national consumer expenditure 2004-2005 survey data, French et al. (2010) reported that low-income households spend 26% of their food dollars to eating out, compared with 47% among high-income households.

Table 1. Household expenditure by income group

Income Groups	Total food	Smoking	Rent	Education	Clothes	Health	Electricity and water	Liquid fuel/oil/gas	Telephone/ internet	Transportation /travel	Other	Total expenditure
Lover-income household	37,89	1,34	3,43	1,18	10,21	9,04	5,17	8,48	6,72	12,19	4,35	100,00
Middle-income household	34,74	2,12	5,23	1,98	10,40	8,38	4,85	8,50	6,53	13,04	4,23	100,00
Higher-income household	33,69	1,90	7,05	2,87	9,68	7,89	4,36	7,18	5,88	14,88	4,62	100,00
Average	34,98	1,85	5,62	2,19	10,04	8,31	4,71	7,92	6,29	13,66	4,43	100,00
F-test (P-value)	41.64 (0.000)	8.52 (0.000)	10.06 (0.000)	16.58 (0.000)	50.67 (0.000)	25.18 (0.000)	42.56 (0.000)	29.13 (0.000)	48.03 (0.000)	71.52 (0.000)	11.35 (0.000)	-

Table 2. Food and Fast food consumption expenditure share by income groups

Income Groups	Total Expenditure (IQD)	Total Food Expenditure (IQD)	Share of food expenditure in total expenditure (%)	Total Fast Food Expenditure (IQD)	Share of fast food in total food expenditure (%)
Lover-income household	685915,22	259897,83	38,19	71906,52	27,16
Middle- income household	905018,94	314412,88	34,65	95473,48	28,91
Higher-income household	116086,47	392146,62	33,73	137695,49	32,38
Average	929384,87	325121,71	35,40	103119,08	29,59
F-test (P-value)	141.070 (0.000)	41.646 (0.000)	15.26 (0.000)	17.914 (0.000)	9.298 (0.000)

3.2. Types of fast food consumption by respondents and household

The empirical findings in Table 3 revealed that there is a significant difference between the household expenditure on the fast food consumer products according to the income group in Northern Iraq. When income increases kebap, pizza and fast food from KFC consumption are increasing significantly (P<0.01). The results represent that a single individual share of each fast food group reports a significant difference based on income strata in Northern Iraq. The share of pizza for lower-income households was 26,28% and rose to 31.36% for higher-income households, while the share of KFC for lower-income was 11.07% and increased to 19.46% for higher-income households. However, an increase in income does not affect of the share of some fast food consumption product, for example, the share of kebab for lower-income is 38.58% but it decreased to 33.43% for higher income, while the share of shawarma for lower-income is 12.19% but it decreased to 7.05% for higher-income, also the share of burger for lower-income was 5.50% but it decreased to 4.12% for higher-income. The reason for this result is that when the income

increased then the household may consume another fast food consumption product such as pizza and KFC. According to the result by Prabhavathi et al. (2014), 45% of the respondents preferred Sandwich followed by Pizzas (30%) and Burgers (23%).

In another study in Kampala district, Sserunkuuma et al. (2012) indicated that deep-fried chicken (14.5%), Pizzas (6.7%), Kebabs (4.4%), and hamburgers (1.1%) were the main fast-food consumed. The outcome of the previous study by Yardimci et al. (2012) is different from this study as it showed that 15.5% of the participant eats pizza, 19.5% of respondent eat meat dough, 21.4% eat the kebab, 35.2% eat burger and 22.2% eat chicken.

Table 4 explains the prevalence of several food types of consumption during defined periods. For instance, in the last one month period, most of the participants eat kebap (96.84%), pizza (83.95%), shawarma (76.84%), falafel (61.15%). Consumers generally go fast food restaurants with their family but they prefer to eat falafel, shawarma, and burger alone. In addition, most consumers (on average 70.1%) prefer to go fast food restaurant weekdays instead of weekends. This result is different from Yardimci et al. (2012). They reported that

43.8% of consumers prefer to go to a fast-food restaurant both on weekdays and weekends, 20.8% on weekdays, and 35.4% on weekends. Further, the finding indicates that most consumers (62.4%) prefer to eat fast food for lunch. According to a study by Prabhavathi et al. (2014),

81% of participants' favorite time to eat fast food is evening. On the other jand, results indicated that 95% of respondents consumed go KFC and burger in the mall. On the other hand, 34.47% of respondents consume falafel outside the mall.

Table 3. Fast food consumption expenditure share (%)

Income Groups	Kebab	Shawarma	Falafel	Meat mixture	Pizza	Burger	KFC	Fast food (%)
Lower-income household	38.58	12.19	4.12	2.26	26.28	5.50	11.07	100.00
Middle income household	34.06	8.26	5.48	2.01	33.62	5.34	11.24	100.00
Higher-income household	33.43	7.05	2.30	2.27	31.36	4.12	19.46	100.00
Average	34.72	8.53	3.71	2.18	31.01	4.80	15.04	100.00
F-test (P-value)	5.92 (0.000)	0.56 (0.57)	1.68 (0.18)	20.83 (0.06)	6.36 (0.000)	1.90 (0.15)	35.35 (0.000)	-

Table 4. Fast food consumption behaviour of household by fast food type

Fast food	Percentage of consumers consume fast food (%)	With family (%)	Single (%)	With wife (%)	With children (%)	Lunch (%)	Dinner (%)	Night (%)	Weekdays (%)	Weekend (%)	The mall (%)	Outside the mall (%)
Kebab	96.84	53.26	8.42	27.17	11.14	51.36	42.66	5.98	47.63	52.37	20.38	79.62
Shawarma	76.84	21.16	49.49	21.50	7.85	85.67	11.26	3.07	78.95	21.05	5.82	94.18
Falafel	36.84	21.58	61.15	11.51	5.76	87.86	10.00	2.14	90.79	9.21	65.53	34.47
Meat dough	20.53	30.77	37.18	29.49	2.56	82.05	17.95	0.00	94.74	5.26	100.00	0.00
Pizza	83.95	44.83	8.46	33.86	12.85	50.78	35.42	13.79	64.21	35.79	37.93	62.07
Burger	43.95	20.24	48.81	22.62	8.33	77.11	16.87	6.02	86.84	13.16	5.39	94.61
KFC	40.53	39.61	14.94	34.42	11.04	24.03	52.60	23.38	76.05	23.95	95.54	4.46
Average	57.068	36.21	27.70	29.39	11.53	62.44	28.99	8.10	70.73	29.26	30.23	64.50

3.3. Fast food consumption behavior of households

According to survey results, 95% of the respondents cooked at home, and only 5% of them don't cook at home. Consuming food type is usually vary between individuals. For instance, in this study, the number of participants who were eating nationals foods, including meat dough, shawarma, kebab was 52.4 % of total participants, while those who were eating international foods like KFC, Burger, Pizza were compromising 47.6 %.

The consumption of fast foods in restaurants differs between the participants as the results of this study showed that a high percentage of consumers (51.1%) are likely to eat fast foods several times in a month. Whereas, those who were eating fast food every day were lowest and compromised 6.3 %, while equal shares responded with eating fast food several times a week or in a year, as they both compromised 21.3 % each. As found in the

outcome by Akbay et al. (2007), approximately 55% of consumers claimed to consume fast food as a way of diversified their diets. According to their study, 45.3% indicated that they never consumed fast food in the last one-month period, 21.4% ate fast food once or twice a month, 20.5% consumed once a week and surprisingly only 12.8% consumed fast food on a daily basis.

Table 5 explains the evaluation of food by participants and when asked about regularity in cooking at home, we found that a high percentage (84.7%) of the participants agree while this percentage decreased to 9.5% and 5.8% responding disagree and somewhat agree respectively. The highest percentage of the participants (73.2%) responded that they pay attention to the food they eat. Furthermore, most people (72.1%) usually get food from where it is the most appropriate price in all kinds of shopping. On the other hand, the highest percentage (67.9%) agreed with consuming foods rich in proteins and vitamins. Eating healthy foods is always in concern of human health cholesterol level in the food is

increased worry in recent years among peoples, so when we asked participants about their view on this matter, 57.9% of them agreed with the statement. Eating white meat and red meat are usually depend on the individuals, thus when the participants asked about their preferable type of meat, this study found that highest percentage of the participant (49.2%) prefer to have white meats (chicken and fish). Eating outside is not always useful. Thus when the participants were asked about wasteful of money and time to eat outside, the highest response (56.3%) disagreed with that statement. A high percentage of the participants (65.5%) responded with disagreement on the eating outside are cheaper than eating at home. Moreover, 71.8% of the participants responded with disagreement on "consumption of fast food does not harm health".

Table 6 explains consuming fast food by customers and their behavior about fast food. The comfort of the environment within the fast food restaurant is very important for most of the consumers. According to this result, showing respect and appreciating fast food consumption is the key to produce a better quality consuming. Most of the consumers go fast food restaurant because they like to eat in different environments. Moreover, participants believed that meat products in local fast-food restaurants are more reliable than international restaurants. It indicates that to some extent, fast food consumers are happier to consume local meats in their fast foods. Furthermore, promotions have a great impact on customer choice for the foods, most of the participants prefer fast food that have been promoted. Addiotanlly, the presence of children playgrounds is convenient for the parents. However, for most consumers, fast food restaurants are not in easily reachable places.

Table 7 outlines the reasons for not eating outside rather than at home. Most of the participants indicated that they do not have enough time to visit restaurants to eat fast food. Eating healthy foods is in concern of so many people, thus most of the participants found it's not healthy to eat outside.

Moreover, most of the consumer believed that the price of foods in restaurants are usually higher than cooking food at home. Other most important reasons not eating fast food are having limited time, discomfort in the self-service facility, having health problems, limited income, and the cost of fast food.

Table 5. General evaluation of the fast food consumption characteristic of the respondents

Variable		Frequency	Percentage	Mean	S. D
The food is cooked at home regularly.	Disagree	36	9.5	2.75	0.614
	Somewhat agree	22	5.8		
	Agree	322	84.7		
I usually get from where it is the most appropriate price in all kinds of shopping.	Disagree	21	5.5	2.67	0.578
	Somewhat agree	85	22.4		
	Agree	274	72.1		
The food I eat should be healthy (I pay attention to it).	Disagree	39	10.3	2.63	0.663
	Somewhat agree	63	16.6		
	Agree	278	73.2		
I choose foods that contain protein, vitamins and, energy values.	Disagree	33	8.7	2.59	0.645
	Somewhat agree	89	23.4		
	Agree	258	67.9		
I drink at least 2.5 liters of water a day.	Disagree	50	13.2	2.49	0.717
	Somewhat agree	92	24.2		
	Agree	238	62.6		
I prefer low-cholesterol foods.	Disagree	62	16.3	2.42	0.755
	Somewhat agree	98	25.8		
	Agree	220	57.9		
I prefer white meat (chicken or fish) when I go outside for eating.	Disagree	65	17.1	2.32	0.749
	Somewhat agree	128	33.7		
	Agree	187	49.2		
I try to do a little provident (austerity) each month.	Disagree	94	24.7	2.13	0.783
	Somewhat agree	141	37.1		
	Agree	145	38.2		
To eat a balanced diet, meaty foods should be eaten.	Disagree	98	25.8	2.08	0.770
	Somewhat agree	153	40.3		
	Agree	129	33.9		
I eat at least 5 servings of fruits and vegetables a day.	Disagree	126	33.2	1.94	0.779
	Somewhat agree	149	39.2		
	Agree	105	27.6		
I think the food made from the healthy ingredients that I eat outside.	Disagree	151	39.7	1.81	0.805
	Somewhat agree	128	33.7		
	Agree	101	26.6		
Expensive foods are healthier.	Disagree	176	46.3	1.79	0.825
	Somewhat agree	106	27.9		
	Agree	98	25.8		
I think it is "wasteful" to eat outside.	Disagree	214	56.3	1.66	0.818
	Somewhat agree	82	21.6		
	Agree	84	22.1		
Eating outside is generally less costly than cooking at home.	Disagree	249	65.5	1.52	0.774
	Somewhat agree	65	17.1		
	Agree	66	17.4		
There is no harm to the health of the constant consumption of fast food.	Disagree	273	71.8	1.43	0.73
	Somewhat agree	50	13.2		
	Agree	57	15.0		

Table 6. Reasons of choosing fast food restaurants

Variable		Frequency	Percentage	Mean	S.D
I like the environment (atmosphere).	Disagree	34	8.9	2.58	0.651
	Somewhat agree	92	24.2		
	Agree	254	66.8		
I find the food in accordance with the type of palate (my own palate)	Disagree	28	7.4	2.54	0.630
	Somewhat agree	120	31.6		
	Agree	232	61.1		
I like to eat in different environments	Disagree	48	12.6	2.53	0.709
	Somewhat agree	84	22.1		
	Agree	248	65.3		
I always find the same quality	Disagree	49	12.9	2.43	0.710
	Somewhat agree	118	31.1		
	Agree	213	56.1		
I am pleased with the easiness of ordering by phone	Disagree	85	22.4	2.28	0.807
	Somewhat agree	103	27.1		
	Agree	192	50.5		
I usually prefer promotional products	Disagree	67	17.7	2.27	0.743
	Somewhat agree	143	37.6		
	Agree	170	44.7		
I think they are not easily reachable places	Disagree	83	21.8	2.19	0.768
	Somewhat agree	143	37.6		
	Agree	154	40.5		
I find it convenient to have play areas for children	Disagree	151	39.7	2.07	0.930
	Somewhat agree	50	13.2		
	Agree	179	47.1		
I am going because children prefer	Disagree	148	38.9	2.06	0.913
	Somewhat agree	63	16.6		
	Agree	169	44.5		
I am going there in order to meet and talk with my friends	Disagree	127	33.4	2.04	0.844
	Somewhat agree	109	28.7		
	Agree	144	37.9		
I think that the meat products in local fast-food restaurants are more reliable	Disagree	104	27.4	2.03	0.763
	Somewhat agree	159	41.8		
	Agree	117	30.8		
I see the service is fast	Disagree	120	31.6	1.98	0.782
	Somewhat agree	148	38.9		
	Agree	112	29.5		
I don't like the quality of service	Disagree	114	30.0	1.97	0.754
	Somewhat agree	164	43.2		
	Agree	102	26.8		
I think the products are not satisfactory according to the fees I paid	Disagree	127	33.4	1.94	0.782
	Somewhat agree	147	38.7		
	Agree	106	27.9		
The waiting time is less at checkout	Disagree	150	39.5	1.91	0.833
	Somewhat agree	114	30		
	Agree	116	30.5		
Prices are more expensive than other restaurants	Disagree	200	52.6	1.72	0.830
	Somewhat agree	88	23.2		
	Agree	92	24.2		
I think it was the high nutritional value of preferred foods	Disagree	199	52.4	1.70	0.814
	Somewhat agree	95	25.0		
	Agree	86	22.6		

Table 7. Reasons for not preferring meals outside of home

Variable		Frequency	Percentage	Mean	S. D
I don't have enough time	Disagree	69	18.2	2.41	0.779
	Somewhat agree	86	22.6		
	Agree	225	59.2		
I have doubts about that healthy	Disagree	70	18.4	2.32	0.767
	Somewhat agree	118	31.1		
	Agree	192	50.5		
Prices are very high compared to food cooked home	Disagree	97	25.5	2.24	0.835
	Somewhat agree	93	24.5		
	Agree	190	50.0		
There is no opportunity to sit for a long time	Disagree	77	20.3	2.24	0.768
	Somewhat agree	134	35.3		
	Agree	169	44.5		
I don't like the environment (atmosphere)	Disagree	105	26.8	2.13	0.809
	Somewhat agree	125	32.9		
	Agree	153	40.3		
I have no habits	Disagree	101	26.6	2.11	0.796
	Somewhat agree	135	35.5		
	Agree	144	37.9		
I see the service is inadequate (disqualify)	Disagree	94	24.7	2.07	0.748
	Somewhat agree	166	43.7		
	Agree	120	31.6		
I don't like their customers	Disagree	113	29.7	2.06	0.810
	Somewhat agree	130	34.2		
	Agree	137	36.1		
I don't like self-service	Disagree	126	33.2	2.05	0.844
	Somewhat agree	109	28.7		
	Agree	145	38.2		
My income is inadequate	Disagree	150	39.5	1.92	
	Somewhat agree	110	28.9		
	Agree	120	31.6		
Having health problems	Disagree	87	22.9	1.92	0.840
	Somewhat agree	86	22.6		
	Agree	207	54.5		

3.4. Results of multiple linear regression

Descriptions of the variables used in the model are given in Table 8. In the Multiple Linear Regression Model, fast food consumption expenditure, age, and income are continuous variables and enter the model as a logarithmic form. According to the correlation analysis, there is no multicollinearity between independent variables. The coefficient of determination, R^2 which does not only indicate the goodness of fit but can also be interpreted as the amount of variation of the dependent variable explained by the regression equation, shows that 0.35 of the variation in the dependent variable was explained by independent variables. For a model estimated with cross-section data, this R^2 values not unusual because of the large degree of stochastic variation in survey data. The F-value of the regression model is 25.20 and the p-value is smaller than 0.01, meaning that regression models can be used to predict the dependent variable (Table 9).

Table 8. Descriptive statistics of variables in the model

Variable	Definition	Mean	Standard devision
LnFfood	Fast food consumption expenditure of respondents		
DEDU2	1: Graduated from primary school or secondary school; 0: other	0.316	0.465
DEDU3	1: Graduated from high school; 0: other	0.221	0.415
DEDU4	1: University graduated respondents; 0: other	0.400	0.490
DHHS2	1: Household size between 3 and 4 individual 0: other	0.516	0.500
DHHS3	1: Household size more than four individual; 0: other	0.216	0.412
LnAge	Age of respondents	3.560	0.225
LnIncome	Household income	13.941	0.380
FF_frequeny	Except the workplace cafeteria how many times did you eat outside the home in the last month	2.130	1.071

According to model results, the first variable in Table 9 represents the constant. This is the predicted value of a degree when all other variables are 0. This estimated value of 2.068 is found to be statistically significant (P<0.05). According to results from the model, as the result of the statistically significant coefficient, "size of the household more than four individual", has a positive effect on the fast food consumption expenditure (P<0.05). This result showed that when the number of household size increases, fast food consumption expenditure of respondents will increase too. According to the finding of Akbay et al. (2007), a decreasing affinity to eat fast food as size household increases, as well as the results, smaller households are more frequently consume fast food products than greater households.

Moreover, the age of respondents has a positive effect on the fast food consumption expenditure (P<0.01). As well as to the results from the model when the age of respondents increases by 1%, the fast food consumption will increase by 0.338%. In a similar study, Uzunoz et al. (2009) found different results and show that as the age of respondents increases, the ratio of consuming food away from home decreases.

Household income statistically affects fast food consumption expenditure positively (P<0.01). The coefficient value of income is equal to 0.557, that's mean when the income increasing by 1%, the value of fast food consumption expenditure will increase by 0.557%. These results were similar to Akbay et al. (2007) and Gül et al (2007) but different than Sserunkuuma et al. (2012). According to the results of Sserunkuuma et al. (2012), disposable monthly income had the negative and significant effects on fast food expenditure. On the other hand, the education level of respondents has positive effects on fast food consumption expenditure but the results were not found to be statistically significant (P>0.05). The output of the statistically significant coefficient represents "Except the workplace cafeteria how many times did you eat outside the home in the last month" shows positive effects on fast food consumption (P<0.01).

Table 9. Regression results for fast food consumption expenditure

Variables	Coefficients	Std. Error	t-values	P-values
Constant	2.068	0.912	2.266	0.024
DEDU2	0.169	0.097	1.750	0.081
DEDU3	0.142	0.103	1.384	0.167
DEDU4	0.141	0.101	1.399	0.163
DHHS2	0.003	0.053	0.059	0.953
DHHS3	0.262	0.074	3.556	0.000
LnAge	0.338	0.121	2.799	0.005
LnIncome	0.557	0.069	8.062	0.000
FF_frequeny	0.067	0.021	3.160	0.002
F-test: 25.203; P value: 0.000; R^2 : 0.352				

4. Conclusion and recommendations

Fast food is a kind of mass-produced food that is prepared and served very quickly. The purpose of the research was to investigate the fast food consumption behavior of consumers in the Northern Region of Iraq. According to the result of the multiple linear regression, there is a statistically important relationship between the size of household, household income, age of consumers and fast food consumption. Firstly, large families in which the families with an extent more than 4 persons were high responded to than small families to consume fast food. Moreover is a positive and statistical relatiınship between the age of consumers and fast food consumption expenditure. Older consumers eat fast food more than others due to their business and working time.

Consumers are price sensitive who purchase low price but they are willing to pay extra for improvement in intrinsic cues such as ingredients and taste, but not for extrinsic cues like the packaging. Can take this as consideration for the strategy of building in the future. Health concerns have been found to be adversely related to fast food consumption. The results of the study also revealed that consumers criticize fast foods primarily for their high content of additives and preservatives. This was a common comment on fast food products from the consumers who participate.

The results of this study will help to fast food manufactures and restaurants to plan their advertising methodologies which are most reasonable to fit with the customers' states of mind and desires and their purchasing conduct of fast food eateries. Consumers demand that fast food points of sale provide additional information about the nutritional value of the products as well as the stipulations of the kitchen. The results will help fast-food managers grasp the key factors that affect consumers' fast food consumption behaviors and likewise make improvements. Food managers can better anticipate successful entry into new markets by understanding the attitudes of fast food consumers. The study is limited to three cities of the Northern region of Iraq and the sample size is small due to time and resource constraints. In subsequent studies, it is useful to examine fast food consumption behaviors across the country.

References

Akbay, C. & Boz, İ. (2005). Kahramanmaraş'ta Ailelerin Ev ve Ev Dışı Gıda Tüketim Talebi ve Tüketici Davranışlarının Ekonomik Analizi. KSÜ Fen ve Mühendislik Dergisi, 8(1): 122-131.

Akbay, C., Boz, I. & Chern, W.S. (2007). Household1 Food Consumption in Turkey. European Review of Agricultural Economics, 34(2): 209-231.

Andreyeva, T., Long, M.W. & Brownell, K.D. (2010). The impact of food prices on consumption: a systematic review of research on the price elasticity of demand for food. American journal of public health, 100(2): 216-222.

Aydin, G. & Kilic, O. (2013). Factors Affecting Consumers Awareness of Food Safety: A Case Study in the Urban Area of Samson Provence In Turkey. Research Journal of Applied Sciences, 8(6): 330-334.

Block, J.P., Condon, S.K., Kleinman, K., Mullen, J., Linakis, S., Rifas-Shiman, S. & Gillman, M.W. (2013). Consumers' estimation of calorie content at fast food restaurants: cross sectional observational study. BMJ, 346: f2907.

Chavadi, C.A. & Kokatnur, S.S. (2008). Consumer Expectation and Perception of Fast Food Outlets: An Empirical Study in Davangere. ICFAI Journal of Service Marketing, 6(2): 6-21.

French, S.A., Wall, M. & Mitchell, N.R. (2010). Household income differences in food sources and food items purchased. International Journal of Behavioral Nutrition and Physical Activity, 7(1): 77.

Gül, A., Akbay, C., Özcicek, C., Özel, R. & Akbay, A.O. (2007). Expenditure Pattern for Food Away From Home Consumption in Turkey. Journal of International Food & Agribusiness Marketing, 19(4): 31-43.

Green, L.A., Chobanian, A.V., Bakris, G.L., Black, H.R., Cushman, W.C., Izzo, J.L., Jones, D.W., Materson, B.J., Oparil, S., Wright, J.T. & Roccella, E.J. (2003). Seventh Report of the Joint National Committee on Prevention, Detection, evaluation, and treatment of high blood pressure. Hypertension, 42 (6): 1206-1252.

Prabhavathi, Y., Kishore, N.K. & Kumar, M.R. (2014). Consumer Preference and Spending Pattern in Indian Fast Food industry. International Journal of Scientific and Research Publications, 4(2).

Powell, L.M., Chaloupka, F.J. & Bao, Y. (2007). The availability of fast-food and full-service restaurants in the United States: associations with neighborhood characteristics. American journal of preventive medicine, 33(4): 240-S245.

Schiffman, L.G. & Kanuk, L.L. (1997). Consumer Behavior. Prentice Hall College Div; 6th edition.

Schlosser, E. (2012). Fast food nation: The dark side of the all-American meal. Houghton Mifflin Harcourt.

Sserunkuuma, D., Bonabana-Wabbi, J. & Ayo, S.A. (2012). Determinants of Fast Food Consumption in Kampala, Uganda. African Journal of Food, Agriculture, Nutrition and Development, 12(5): 6567-6581.

Warraich, U.A., Nawaz, A. & Qureshi, F.K. (2013). Customer Retention in Fast Food Industry. Indus Journal of Management Sciences, 1(1):41-47.

Yardimci, H., Ozdogan, Y., Ozcelik, A.O. & Surucuoglu, M.S. (2012). Fast-food consumption habits of university students: The Sample of Ankara. Pakistan Journal of Nutrition, 11(3): 265.

Sulama Organizasyonlarında Yönetim Şekillerine Göre Fiyatlandırma Yaklaşımlarının İşletme Başarısına Etkisinin Belirlenmesi

Zeki BAYRAMOĞLU[1*]   Süheyla AĞIZAN[1]   Kemalettin AĞIZAN[1]   Merve BOZDEMİR[1]

[1]*Selçuk Üniversitesi, Ziraat Fakültesi, Tarım Ekonomisi Bölümü, Konya / Türkiye*

ÖZET

Tarımsal üretimin gerçekleştirilmesinde temel girdilerden biri olan su, doğada sınırlı olması nedeniyle sürdürülebilir kullanılmalıdır. Sürdürülebilir kullanım için fiyatlandırma önemli bir kriterdir. Bu nedenle çalışmada; su yönetiminde etkin rol oynayan sulama organizasyonlarının uyguladıkları fiyatlandırma yaklaşımlarının işletme başarısına olan etkisini belirlemek amaçlanmıştır. Amaca yönelik olarak Konya Kapalı Havzası'nda faaliyet gösteren sulama birlikleri, belediyeler ve kamu tüzel kişilikleri için tam sayım yöntemi ve sulama kooperatifleri için toplam sulama kooperatifi varlığının %10'u örneğe seçilerek toplamda 67 tane anket yapılarak organizasyonlara göre fiyatlandırma yaklaşımları tespit edilmiştir. Elde edilen veriler doğrultusunda sulama organizasyonlarına göre fiyatlandırma yaklaşımları saat, sulama sistemleri, hacim, ürün çeşidi ve bölgeler esasına göre belirlenmekte olup bu yaklaşımların işletme başarısına olan etkisi yapısal eşitlik modeliyle tespit edilmiştir. Model sonucunda kooperatiflerde ve kamu tüzel kişiliğinde (KTK) saat esasına dayalı, belediyelerde hacime dayalı, sulama birliklerinde ise bölgelere göre fiyatlandırma yaklaşımlarının benimsenmesi durumunda işletme başarısının ve performansının arttığı tespit edilmiştir. Sonuç olarak sulama organizasyonları içerisinde yer alan sulama kooperatiflerinin uyguladıkları fiyatlandırma yaklaşımlarının (saat ve sulama sistemleri) diğer organizasyonlara göre işletme başarısı üzerinde daha fazla avantaj sağladığı belirlenmiştir. Sulama kooperatiflerinde saat esasına göre belirlenen fiyatlarda 1 TL'lik artışın organizasyon kârını 0.125 TL artıracağı, sulama sistemlerine göre belirlenen fiyatlarda 1 TL'lik artışın ise organizasyon kârını -0.007 TL azaltacağı öngörülmüştür. Bu nedenle mevcut şartlarda organizasyonlar arasında ve organizasyonların kendi içlerinde denge fiyatının belirlenmesi gerekmektedir. Dolayısıyla organizasyonlarda bir bütünlük sağlanabilmesi, işletmelerin karşılaştırılması, su tasarruflarının sağlanabilmesi ve su verimliliğinin yükseltilmesi için saat veya hacim esaslı fiyatlandırma yaklaşımları benimsenmelidir.

ABSTRACT

Water, which is one of the basic inputs in the realization of agricultural production, should be used sustainably because it is limited in nature. Pricing is an important criterion for sustainable use. Therefore, in the study; It was aimed to determine the effect of pricing approaches applied by irrigation organizations that play an active role in water management on business success. For the purpose, the full count method for irrigation unions, municipalities and public legal entities operating in the Konya Closed Basin, and 10% of the total irrigation cooperative assets for irrigation cooperatives were selected as the sample, and a total of 67 surveys were conducted and pricing approaches were determined according to the organizations. In line with the data obtained, pricing approaches according to irrigation organizations are determined on the basis of time, irrigation systems, volume, product type and regions, and the effect of these approaches on business success has been determined by the structural equation model. As a result of the model, it has been determined that business success and performance increase in case of adopting pricing approaches by hour in cooperatives and public legal entities, by volume in municipalities, and by region in irrigation unions. As a result, it has been determined that the pricing approaches (hour and irrigation systems) applied by irrigation cooperatives within the irrigation organizations provide more advantages over operation success compared to other organizations. It is predicted that an increase of 1 TL in prices determined on an hourly basis in irrigation cooperatives will increase the organizational profit by 0.125 TL, and an increase of 1 TL in the prices determined according to the irrigation systems will decrease the organization profit by 0.007 TL. For this reason, it is necessary to determine the balance price between organizations and within the organizations in the current conditions. Therefore, hourly or volume-based pricing approaches should be adopted in order to ensure integrity in organizations, to compare businesses, to ensure water savings and to increase water efficiency.

1. Giriş

Sınırlı su kaynaklarının sürdürülebilirliği; suyun etkin kullanımını, tasarrufun dikkate alınmasını, su yönetiminin sağlanmasını ve doğru fiyatlandırmanın yapılmasını gerektirir. Özellikle hem dünyada hem de Türkiye'de sahip olunan su kaynaklarının %70'inin tarım sektöründe kullanılması nedeniyle sektörde uygulanacak fiyatlandırma politikaları, suyun tasarruflu kullanımını teşvik ederek kaynakların sürdürülebilirliğine katkı sağlayacak en önemli faktördür (FAO, 2019).

Mevcut su varlığına, kullanım alanına, muhtemel risklere, işletme-bakım maliyetlerine, ekonomik ile çevresel dışsallıklara vb. kriterlere göre belirlenen su fiyatları, kullanıcılara karar aşamasında fikir vermekte, aşırı su kullanımını sınırlandırmakta ve su yönetimini kolaylaştırmaktadır. Bu nedenle fiyatlandırma yaklaşımları suyun kullanım etkinliğini doğrudan etkilemekte ve ülkeler itibariyle de farklılık arz etmektedir. Nitekim bazı ülkelerde sulama yatırımlarına ayrılan sermayenin kullanıcılardan geri alınması amaçlanırken bazılarında sektörler arasında gelir transferi yapmak, su kaynaklarını korumak, sürdürülebilir kullanılmasını sağlamak gibi amaçlar yer almaktadır (Akçapınar, 2007).

Dünyada birçok ülkede sulama suyu fiyatlandırmasında, sadece işletme-bakım masrafları dikkate alınırken az sayıdaki ülkede bu masraflara ek olarak belirli oranlarda sermaye maliyeti de dikkate alınmaktadır (Özçelik et al., 1999; Tanrıvermiş et al., 2001). Ancak son yıllarda yaşanan iklim değişikliğinin ve nüfus artışının su kaynakları üzerindeki baskıyı artırması sürdürülebilir su kullanımının önemini artırmıştır. Bu nedenle sürdürülebilir su kullanımının sağlanması için fiyatlandırmada sosyal, çevresel ve ekonomik sürdürülebilirliğe dikkat edilmeye başlanmıştır. Sosyal sürdürülebilirlik, talep-arz dengesinin kurulmasıyla; çevresel sürdürülebilirlik, çevre ve su kaynaklarının korunmasıyla; ekonomik sürdürülebilirlik ise maliyet geri dönüşümünün sağlanmasıyla gerçekleştirilebilir. Bu nedenle birçok çalışmada da vurgulandığı gibi su kullanımında sürdürülebilirliğin sağlanması için fiyatlandırmanın tam maliyet yöntemine göre yapılması gerekmektedir (Ağızan, S. & Bayramoğlu, 2019; Muslu, 2015). Dünya Bankası ise suyun yoğun kullanıldığı tarım sektöründe verimli ve sürdürülebilir kullanım için fırsat maliyetlerini dikkate alan hacimsel fiyatlandırma yapılmasını önermektedir (Julius & Alicbusan, 1989).

Su fiyatlandırma yaklaşımları ülkeler itibariyle farklılık göstermekle birlikte bölgeler, kullanım alanları, organizasyonlar vb. açıdan farklılıklar arz etmektedir. Örneğin; Belçika, Macaristan, İrlanda, İtalya, Polonya, Slovenya ve İsrail'de su hacimsel fiyatlandırılırken Avusturya, Estonya, Fransa, Yunanistan ve Portekiz'de tam maliyet yöntemine (yatırım-bakım-onarım maliyetleri, ekonomik-çevresel dışsallıkları, fırsat maliyetini kapsamakta) göre fiyatlandırma yapılmaktadır. Bulgaristan, Çek Cumhuriyeti ve İspanya'da ise tam ekonomik maliyet yöntemine göre fiyatlandırma yapılmakta olup çevresel maliyetler dikkate alınmamaktadır (Anonim, 2010; Anonymous, 2010, 2012, 2013; García-Rubio et al., 2015; Heidler & Prandstetten, 2008; Koundouri et al., 2014; Reynaud, 2016; Worldbank, 2015a, 2015b).

Türkiye'de ise fiyatlandırma yaklaşımları su kullanım alanı ve bölgeler itibariyle değişmekle birlikte sulama organizasyonlarına göre de farklılık arz etmektedir. Bu nedenle çalışma kapsamında Konya Kapalı Havzası'nda faaliyet gösteren sulama organizasyonlarının fiyatlandırma yaklaşımlarının belirlenerek yaklaşımlardaki farklılıkların organizasyon başarısına etkilerinin belirlenmesi amaçlanmıştır.

2. Materyal ve Metot

Çalışma kapsamında araştırma alanı olarak Konya Kapalı Havzası belirlenmiştir. Havzanın seçilmesinde su kullanımının yaklaşık %90'nın tarım sektörüne ait olması, sulanan tarım alanlarının fazla olması, toplam

tarımsal üretim değerinin yüksek olması ve tarımsal alan itibariyle en önemli hidrolojik havzalardan biri olması etkili olmuştur (Berke et al., 2013). Havza dokuz ilden oluşmakta olup çalışma alanının yaklaşık %90'ı Konya, Aksaray, Karaman ve Niğde illerinden oluşmaktadır (SYGM, 2017). Havzayı temsilen bu dört ilde faaliyet gösteren sulama organizasyonlarıyla çalışma gerçekleştirilmiştir.

Türkiye'de sulama organizasyonları; kamu, sulama birlikleri, sulama kooperatifleri, yerel yönetimler ve halk sulamaları işletmeciliğinden oluşmaktadır. Kamu sulamaları içerisinde Devlet Su İşleri Genel Müdürlüğü

(DSİ) tarafından inşa edilmiş ve DSİ tarafından işletilen sulama tesisleri yer almaktadır. 2018 yılında sulama birliklerinin kontrolü DSİ Genel Müdürlüğü'ne devredilmiş ve birliklere DSİ tarafından başkan atanmıştır. Halk sulamaları ise üreticilerin kendi imkânları dâhilinde işletilmekte olup herhangi bir kurum/kuruluşa bağlılıkları olmaması nedeniyle çalışma kapsamında değerlendirilmemiştir. Sulama organizasyonları Şekil 1'de gösterildiği gibi kamu sulama işletmeciliği, yerel yönetimler sulama işletmeciliği, sulama kooperatifleri işletmeciliği ve halk sulamaları işletmeciliği olarak dörde ayrılmıştır.
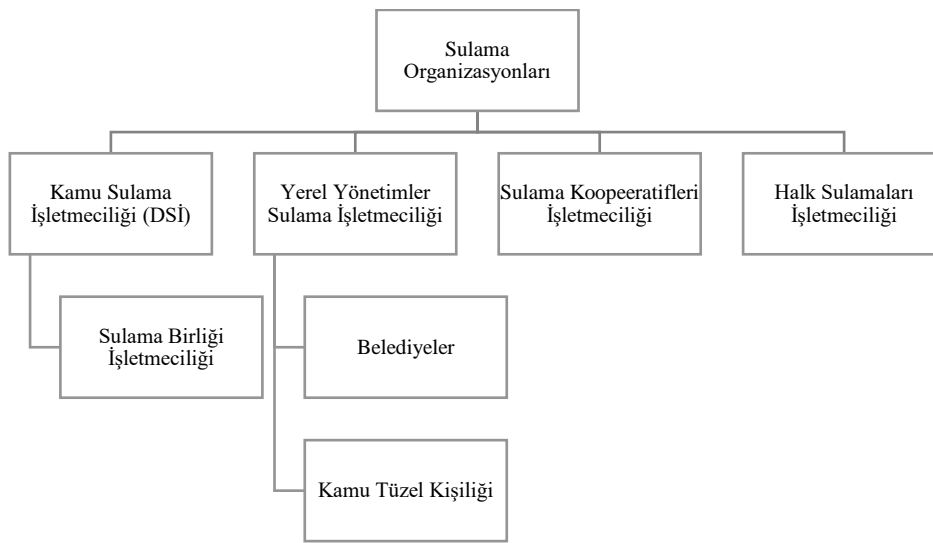
Şekil 1. Sulama Organizasyonlarının Yönetim Şekillerine Göre Sınıflandırılması

Çalışmada ana çerçeve dört ilin havzaya dâhil olan alanlarında DSİ tarafından inşa edilen ve çeşitli sulama organizasyonlarına (sulama birlikleri, sulama kooperatifleri, belediyeler ve KTK'lara) devredilen tesislerden oluşmaktadır. DSİ (2018) verilerine göre havza sınırları içerisinde DSİ tarafından 18 tane sulama birliklerine, 299 tane sulama kooperatiflerine, 14 tane belediyelere ve 11 tane KTK'lara olmak üzere toplam 342 adet tesis devredilmiştir. Bu doğrultuda anket sayısının belirlenmesinde sulama birliği, belediye ve KTK'lar için tam sayım, sulama kooperatifleri için toplam sulama kooperatifi varlığının %10'u örneğe seçilmiştir. Bu oran araştırmacı tarafından sulama kooperatiflerinin ortalamasını yansıtacağı düşünülerek belirlenmiştir. Sonuç olarak toplam 73 adet sulama

organizasyonu ile anket uygulaması gerçekleştirilmesi planlanmış olup çeşitli nedenlerden dolayı (yetkili olmaması, havza dışı kalması, tarımsal amaçlı sulama yapmaması vb.) altı adet organizasyon (dört adet KTK, iki adet belediye) ile görüşülmüş ve 67 adet sulama organizasyonuyla anket uygulaması gerçekleştirilmiştir.

Sulama organizasyonlarında fiyatlandırma yaklaşımları temel olarak; hacim, alan, çıktı ve girdi fiyatlarıyla ilişkili olarak belirlenmektedir. Fakat Türkiye başta olmak üzere gelişmekte olan ülkelerde sulama organizasyonlarında farklı fiyatlandırma yaklaşımlarının olduğu bilinmektedir. Bu kapsamda sulama organizasyonlarının yönetim şekillerine göre fiyatlandırma yaklaşımlarının işletme başarısı üzerindeki etkileri Yapısal Eşitlik Modeli (YEM) ile hesaplanmıştır.

YEM gözlenen değişkenler ve gözlenemeyen (gizil) değişkenler arasındaki nedensel ilişkilerin ve korelasyon ilişkilerinin bir arada bulunduğu modellerin test edilmesi için kullanılan istatistiksel bir teknik olup bağımlılık ilişkilerini tahmin etmek için, varyans, kovaryans analizleri, faktör analizi ve çoklu regresyon gibi analizlerin birleşmesiyle meydana gelen çok değişkenli bir yöntemdir (Tüfekçi & Tüfekçi, 2006).

YEM iki parçadan oluşmakla birlikte bunlardan birincisi, gözlenen değişkenleri gizil değişkenlere doğrulayıcı faktör analiziyle bağlayarak uygulanan ölçüm modelidir. İkincisi ise birbirine eşzamanlı eşitlikle sistemleri bağlayarak uygulanan yapısal modeldir (Çelik & Yılmaz, 2013). YEM'de öncelikle kullanılan tüm gizil değişkenlerin doğrulayıcı faktör analizi yapılarak, istenen yapıyı ölçtüğü doğrulanmalıdır. Daha sonra YEM yapılarak istenen tüm değişkenlerin birbirine etkisi incelenmiştir.

YEM bugüne kadar birçok çalışmada kullanılmış olup başlıca; eğitim (Arı et al., 2015; Özer & Anıl, 2011; Yellice Yüksel et al., 2011), tüketim (Toklu et al., 2016), turizm (Gültekin et al., 2016), sanayi (Karacaoğlu, 2009), hizmet (Yücenur et al., 2011), planlanmış davranış teorisi (Yılmaz & Doğan, 2016), internet (Ustasüleyman & Eyüboglu, 2010), kredi kartı (Girginer et al., 2011), sağlık (Şahin, B. & Taşkaya, 2010), girişimcilik (Ağızan, K. & Bayramoğlu, 2020; Kayalar & Arslan, 2016), çevre (Emel & Uygun, 2012), bankacılık (Bülbül et al., 2012), pazarlama (Ayyıldız & Cengiz, 2006) ve örgütlenme (Çetinkaya & Çimenci, 2014; Çınar & Yeşil, 2016; Emhan et al., 2013; Mete et al., 2015; Şahin, B. & Taşkaya, 2010) alanlarında çalışmalar yapılmıştır. Tarım sektöründe ise son yıllarda kullanılmaya başlayan YEM'e ilk olarak Şahin, A. et al. (2008) tarafından çiftçilerin risk davranışları, üreticileri etkileyen risk faktörleri ve risk stratejileri üzerine gerçekleştirdikleri çalışmalarında yer verilmiştir. Son dönemlerde ise tarımsal kooperatifler (Bilgin & Kuzey, 2013; Şahin, A. et al., 2013; Timurkaynak, 2017), traktör kullanımı (Cankurt et al., 2010), girişimcilik (Ağızan, K. &

Bayramoğlu, 2020; Horasan, 2014), girdi kullanımı (Hurma et al., 2017), bitkisel üretim (Aytop & Akbay, 2018; Bal, 2018), sosyal sermaye (Keleş et al., 2018) ve çevre kirliliği (Özgür Güler & Börüban, 2019) gibi konularda YEM'den yararlanılmıştır.

Bu çalışmada da YEM'le sulama organizasyonlarında oluşan farklı fiyatlandırma yaklaşımlarının organizasyonların performanslarına ve kârlarına olan etkileri belirlenmiştir. Önceki çalışmalarda fiyatlandırma yaklaşımlarıyla organizasyonların performansları arasındaki ilişkinin incelenmemiş olması bu çalışmanın özgün değer kazanmasına katkı sağlamaktadır. Oluşturulan modelde sulama kooperatifleri (KOOP), belediyeler (BLD), KTK'lar (KTK) ve sulama birliklerinde (BRL) oluşan fiyatlar gözlenen değişkenler olup, işletme performansları gizil değişkenler ve organizasyon kârı ise endojen gözlenen değişken olarak ele alınmıştır. Bu kapsamda çalışmanın hipotezleri aşağıda gösterilmiştir:

H_0:Kooperatifler itibariyle fiyatlandırma yaklaşımlarının performans kriterleri üzerinde etkisi yoktur.

H_1:Kooperatifler itibariyle fiyatlandırma yaklaşımlarının performans kriterleri üzerinde etkisi vardır.

H_0:Belediyeler itibariyle fiyatlandırma yaklaşımlarının performans kriterleri üzerinde etkisi yoktur.

H_1: Belediyeler itibariyle fiyatlandırma yaklaşımlarının performans kriterleri üzerinde etkisi vardır.

H_0:KTK'lar itibariyle fiyatlandırma yaklaşımlarının performans kriterleri üzerinde etkisi yoktur.

H_1:KTK'lar itibariyle fiyatlandırma yaklaşımlarının performans kriterleri üzerinde etkisi vardır.

H_0:Birlikler itibariyle fiyatlandırma yaklaşımlarının performans kriterleri üzerinde etkisi yoktur.

H_1:Birlikler itibariyle fiyatlandırma yaklaşımlarının performans kriterleri üzerinde etkisi vardır.

İncelenen organizasyonlarda, organizasyonlar itibariyle fiyatlandırma yaklaşımlarının farklılık arz ettiği ve saat, sulama sistemi, hacim, ürün çeşidi, bölgeler

bazında fiyatlandırmalarında benimsendiği tespit edilmiştir (Tablo 1). Ayrıca performans kriterlerinde 21 adet gösterge modele dâhil edilmiş olup veriler bu çalışmanın da elde edildiği "Konya Kapalı Havzasında Faaliyet Gösteren Sulama Organizasyonlarının Su Arz Maliyetlerinin Belirlenmesi ve Bunu Etkileyen Faktörlerin İncelenmesi" adlı projeden temin edilmiştir (Bayramoğlu et al., 2020).

Tablo 1. Yapısal Eşitlik Modelinde Kullanılan Değişkenler

		Sulama Organizasyonlarına Göre Fiyatlandırma Yaklaşımları		Performans Kriterleri
KOOP	a1	Saat Esasına Göre	a11	Sulama Oranı
	a2	Sulama Sistemleri Esasına Göre	a12	Sulama Alanı Sürdürülebilirlik Oranı
	a3	Hacim Esasına Göre	a13	Sulanan Alandaki Bitki Dağılımı
BLD	a4	Ürün Çeşidi Esasına Göre	a14	Ekilen Alan Oranı
	a5	Sulama Sistemleri Esasına Göre	a15	Altyapının Etkinliği
KTK	a6	Saat Esasına Göre	a16	Tesislerden Üreticilerin Yararlanma Oranı
	a7	Ürün Çeşidi Esasına Göre	a17	Mali Etkinlik
	a8	Ürün Çeşidi Esasına Göre	a18	Mali Yeterlilik
BRL	a9	Sulama Sistemleri Esasına Göre	a19	Birim Alana Düşen Toplam İşletme-Bakım-Yönetim Masrafları
	a10	Bölgeler Esasına Göre	a20	Tahsilat Oranı
			a21	Personel Başına Fiilen Sulanan Alan
			a22	Personel Başına Toplam Sulama Alanı
			a23	1000 ha Alan Düşen Personel Sayısı
			a24	Personel Giderlerinin Toplam İşletme Bakım Giderlerine Oranı
			a25	Sulama İstihdam Oranı
			a26	Yatırımın Brüt Geri Dönüşüm Oranı
			a27	Sulanan Alan Başına Bitkisel Üretim Değeri
			a28	Sulanması Öngörülen Birim Alan Başına Bitkisel Üretim Değeri
			a29	Nisbi Refah
			a30	Fiiline Sulama Yapan İşletme Başına Tarımsal Gelir

3. Tartışma

Suyun sınırlı kaynak olması, kullanım alanının geniş olması ve suya olan talebin çeşitli (özellikle tarımsal üretimde kuraklık) nedenlerle artış göstermesi suyun fiyatlandırılması gerekliliğini ortaya çıkarmıştır. Sulama organizasyonlarında fiyatlandırma yaklaşımları farklılıklar arz etmektedir. Farklılığın temelinde organizasyonların bulundukları bölgelerdeki su varlıkları, su kaynakları, suyun iletimi, dağıtımı ve depolamasında kullandıkları tesis yapıları, iklimsel ve topoğrafik parametreler, yönetim şekilleri, üyelerinin/ortaklarının su talep etme durumları ve ödeme güçleri, üretim deseni gibi unsurlar yer almaktadır. Organizasyonlardaki fiyatlandırma yaklaşımları; hacim, alan, çıktı ve girdi esasına dayalı olmak üzere genellikle dört başlık altında incelenmektedir. Hacim esasına göre fiyatlandırmada, kullanılan su miktarının m^3 veya ton üzerine hesaplamaları yapılırken, alan esasına göre fiyatlandırmada dekar üzerinden, çıktı esasına göre ürünlerin brüt üretim değerlerinin belirli bir oranına göre, girdi esasına göre fiyatlandırmada ise kullanılan üretim maliyetlerine göre bir fiyatlandırma yöntemi belirlenmektedir. Fakat Türkiye'de genel olarak hacim, saat, alan, ürün, bölge ve sulama sistemi esasına dayalı fiyatlandırma yaklaşımları görülmektedir. Çalışma kapsamında incelenen sulama kooperatiflerinde saat esasına ve sulama sistemlerine, belediyelerde hacme, ürün çeşidine ve sulama sistemlerine, KTK'larda saat ve ürün çeşidine, sulama birliklerinde bölgelere, ürün çeşidine ve sulama sistemlerine göre fiyatlandırma yaklaşımlarının uygulandığı tespit edilmiştir.

Sulama organizasyonlarının başarı ölçütü olarak performans kriterleri ele alınmış olup bu performans oranlarıyla organizasyonların fiyatlandırma yaklaşımları arasındaki ilişki YEM yardımıyla ortaya konulmuştur (Şekil 2). Nitekim belirlenen fiyatlandırma yaklaşımlarında meydana gelecek 1 TL'lik artışa karşılık organizasyonun toplam gelirinin artacağı ve dolayısıyla maliyetlerini karşılama oranlarının yükseleceği belirlenmiştir. Bu nedenle sulama fiyatlarının artmasıyla organizasyon performansları arasında doğru yönlü bir ilişki olması beklenmektedir.
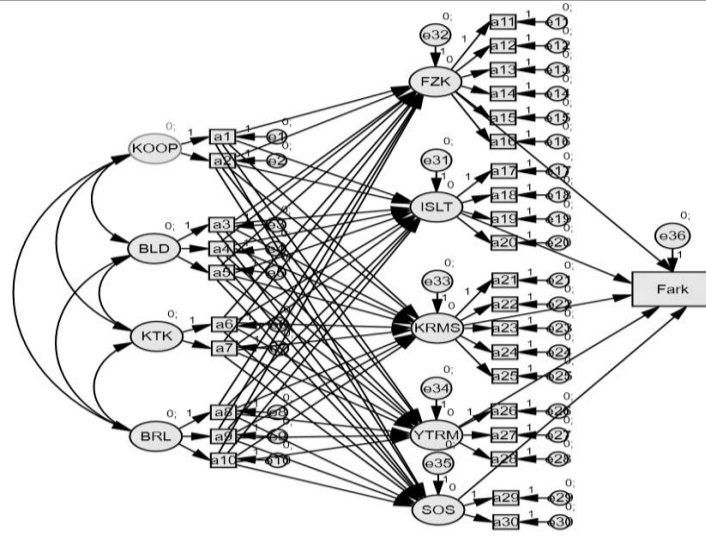
Şekil 2. Sulama Organizasyonlarında Fiyatlandırma Yaklaşımlarının İşletme Performansına ve İşletme Karlılığına Olan Etkisinin Belirlenmesine Yönelik YEM

Verilerin normal dağıldığını belirlemek için mardia istatistiği hesaplanmış ve değer 3.437 olarak belirlenmiştir. Bu değerin 5'ten küçük olması verilerin normal dağıldığını göstermektedir. Bu nedenle çalışmadaki örneklem sayısının yeterli olduğu anlaşılmaktadır. Bugüne kadar 60-100 arası örneklem büyüklüğüne sahip çalışmalarda da YEM kurulduğu ve anlamlı sonuçların bulunduğu tespit edilmiştir (Ağızan, K. & Bayramoğlu, 2020).

Kurulan YEM sonucunda elde edilen değerler arasında en önemlisi serbestlik derecesidir. Çalışma kapsamında serbestlik derecesinin iki olmasından dolayı modelin aşırı doymuş olduğu kabul edilmektedir. Ayrıca modelin önem seviyesi 0.655 olarak belirlenmiş olup bu değerin modelin veriye uyması açısından 0.05'ten büyük olması istenmektedir. Analiz sonucunda elde edilen değerlerin teoriye uygunluğunu belirlemede bazı uyum endeksleri kullanılmaktadır. Bu uyum endekslerine ait normal ve kabul edilebilir değerler ile analiz sonuçları Tablo 2'de gösterilmiştir. Tabloya göre YEM sonucunda elde edilen değerlerin kabul edilebilir değerler sınırında olduğu ve modelin verilere uyduğu belirlenmiştir.

Tablo 2. Yapısal Eşitlik Modeli Uyum Endeksleri

Endeks	Normal Değer	Kabul Edilebilir Değerler	Analiz
χ^2 "p" Değeri	p>0.05	-	0.655
χ^2/sd	<2	<5	3.478
GFI	>0.95	>0.90	0.934
AGFI	>0.95	>0.90	0.916
CFI	>0.95	>0.90	0.924
RMSEA	<0.05	<0.08	0.072
RMR	<0.05	<0.08	0.024
NNFI	0.97-1.00	0.95-1.00	0.978
IFI	0.95-1.00	0.90-1.00	0.932

Kaynak: (Ağızan, K. & Bayramoğlu, 2020; Doğan, 2015; Karagöz, 2016; Karagöz & Ağbektaş, 2016)

Araştırma kapsamında öncelikle sulama kooperatiflerinde saat esasına ve sulama sistemlerine göre fiyatlandırma yaklaşımlarının işletme başarısına olan etkileri incelenmiştir. Bu organizasyonlarda saat esasına göre belirlenen fiyatların fiziksel, işletme, kurumsal, yatırım ve sosyal performansını artıracağı, sulama sistemlerine göre belirlenen fiyatların ise fiziksel ve yatırım performansını artırırken işletme, kurumsal ve sosyal performansı azaltacağı öngörülmektedir. Ayrıca modelde toplam etkiler sonucunda sulama kooperatiflerinde saat esasına göre belirlenen fiyatlarda 1 TL'lik artışın organizasyon kârını 0.125 TL artıracağı, sulama sistemlerine göre belirlenen fiyatlarda 1 TL'lik artışın ise organizasyon kârını -0.007 TL azaltacağı öngörülmektedir (Tablo 3).

Tablo 3. Yapısal Eşitlik Modeli

			Tahmin	Standart Hata	C.R.	P				Tahmin	Standart Hata	C.R.	P
Fark	<---	FZK	20731.6	24762.6	0.433	0.165	KRMS	<---	a4	0,009	0,136	0,065	0,048
Fark	<---	ISLT	36797.4	25339.9	1.452	0.146	KRMS	<---	a5	0,081	0,116	0,692	0,089
Fark	<---	KRMS	18528.8	31446.8	2.497	0.013	KRMS	<---	a6	0,082	0,189	0,434	0,164
Fark	<---	YTRM	16644.4	70654.8	0.236	0.114	KRMS	<---	a7	0,027	0,186	0,145	0,285
Fark	<---	SOS	22224.6	32286.3	-0.688	0.091	KRMS	<---	a8	-0,488	0,188	-2,604	0,009
FZK	<---	a1	0.353	0.078	0.676	0.099	KRMS	<---	a9	-0,096	0,1	-0,965	0,135
FZK	<---	a2	0.174	0.066	2.645	0.008	KRMS	<---	a10	0,085	0,092	0,919	0,158
FZK	<---	a3	0.648	0.079	0.609	0.043	SOS	<---	a10	0,409	0,102	1,069	0,185
FZK	<---	a4	0.085	0.068	1.245	0.113	SOS	<---	a9	0,236	0,117	2,867	0,004
FZK	<---	a5	0.036	0.058	0.62	0.135	SOS	<---	a8	0,172	0,209	1,302	0,193
FZK	<---	a6	0.128	0.095	1.351	0.177	SOS	<---	a7	0,284	0,21	1,35	0,177
FZK	<---	a7	-0.047	0.092	-0.513	0.008	SOS	<---	a6	0,419	0,218	1,923	0,054
FZK	<---	a8	-0.061	0.092	-0.66	0.509	SOS	<---	a5	-0,022	0,131	-0,169	0,866
FZK	<---	a9	0.057	0.049	1.158	0.147	SOS	<---	a4	-0,011	0,153	-0,071	0,943
FZK	<---	a10	0.613	0.054	11.318	***	SOS	<---	a3	0,145	0,178	0,817	0,414
ISLT	<---	a1	0.035	0.087	-0.397	0.041	SOS	<---	a2	-0,319	0,152	-2,107	0,085
ISLT	<---	a2	-0.026	0.073	0.359	0.02	SOS	<---	a1	0,106	0,177	0,602	0,047
ISLT	<---	a3	0.23	0.088	2.609	0.009	YTRM	<---	a10	0,007	0,037	0,184	0,154
ISLT	<---	a4	0.068	0.076	0.894	0.171	YTRM	<---	a9	-0,035	0,041	0,839	0,101
ISLT	<---	a5	-0.061	0.065	-0.94	0.147	YTRM	<---	a8	0,229	0,092	-2,479	0,013
ISLT	<---	a6	0.181	0.106	1.711	0.087	YTRM	<---	a7	0,272	0,099	2,746	0,306
ISLT	<---	a7	0.124	0.103	1.2	0.13	YTRM	<---	a6	0,231	0,078	0,403	0,087
ISLT	<---	a8	-0.104	0.102	-1.012	0.311	YTRM	<---	a5	-0,045	0,049	-0,92	0,357
ISLT	<---	a9	0.121	0.055	2.202	0.028	YTRM	<---	a4	-0,129	0,063	-2,027	0,243
ISLT	<---	a10	0.422	0.05	0.447	0.155	YTRM	<---	a3	0,358	0,066	-0,88	0,079
KRMS	<---	a1	0.06	0.156	0.388	0.068	YTRM	<---	a2	0,103	0,059	1,752	0,18
KRMS	<---	a2	-0.034	0.132	-0.261	0.044	YTRM	<---	a1	0,394	0,068	1,387	0,065
KRMS	<---	a3	0.197	0.158	1.252	0.18							

Belediyelerde kullanılan fiyatlandırma yaklaşımlarının (hacim, ürün çeşidi ve sulama sistemleri) organizasyon performanslarına olan etkileri incelendiğinde hacim esasına göre belirlenen fiyatların fiziksel, işletme, kurumsal ve yatırım performansını, ürün çeşidine göre belirlenen fiyatların fiziksel, işletme, kurumsal performansı, sulama sistemlerine göre belirlenen fiyatların ise fiziksel ve kurumsal performansı artırdığı tahmin edilmektedir. Modelde toplam etkiler sonucunda belediyelerde hacim esasına göre belirlenen fiyatlardaki 1 TL'lik artışın organizasyon kârını 0.182 TL artıracağı, ürün çeşidine göre belirlenen fiyatlardaki 1 TL'lik artışın organizasyon kârını -0.031 TL ve sulama sistemlerine göre belirlenen fiyatlardaki 1 TL'lik artışın -0.017 azaltacağı öngörülmektedir (Tablo 3).

KTK'larda uygulanan fiyatlandırma yaklaşımlarının (saat ve ürün çeşidi) organizasyon performanslarına olan etkileri incelendiğinde saat esasına göre belirlenen fiyatların fiziksel, işletme, kurumsal, yatırım ve sosyal performansı anlamlı bir şekilde artırdığı tahmin edilmektedir. Ayrıca KTK'larda ürün çeşidine göre belirlenen fiyatların fiziksel performansı azaltacağı, işletme ve sosyal performansı anlamlı düzeyde artıracağı tespit edilmiştir. Bu fiyatlandırma yaklaşımının kurumsal performans ve yatırım performansları üzerinde ise anlamlı bir ilişki belirlenememiştir. Modelde toplam etkiler sonucunda KTK'larda saat esasına göre belirlenen fiyatlarda 1 TL'lik artışın organizasyon kârını 0.157 TL artıracağı fakat ürün çeşidine göre belirlenen fiyatlardaki 1 TL'lik artışın organizasyon kârını -0.011 azaltacağı öngörülmektedir (Tablo 3).

Sulama birliklerinde uygulanan fiyatlandırma yaklaşımlarının da (bölgeler, ürün çeşidi ve sulama sistemleri) işletme performansına ve organizasyon kârına nasıl etki yaptığı incelenmiş ve bölgelere göre belirlenen fiyatlarla fiziksel, işletme, kurumsal, yatırım ve sosyal performans arasında anlamlı ve doğrusal bir ilişki belirlenmiştir. Ayrıca ürün çeşidine göre belirlenen fiyatlarla sulama birliklerinin fiziksel ve işletme performansları arasında anlamlı bir ilişki

belirlenmemiştir. Ürün çeşitlerine göre belirlenen fiyatların kurumsal performansı azaltacağı, yatırım ve sosyal performansı artıracağı tespit edilmiştir. Sulama sistemlerine göre belirlenen fiyatların ise fiziksel, işletme ve sosyal performansı artırdığı, kurumsal ve yatırım performanslarını azalttığı belirlenmiştir. Modelde toplam etkiler sonucunda ise bölgeler esasına göre belirlenen fiyatlarda 1 TL'lik artışın organizasyon kârını 0.214 TL artıracağı, ürün çeşidine göre belirlenen fiyatlarda 1 TL'lik artışın kârı -0.093 TL ve sulama sistemlerine göre belirlenen fiyatlarda 1 TL'lik artışın kârı -0.048 azaltacağı görülmektedir (Tablo 3).

Çalışma sonucunda tüm hipotezlerin kabul edildiği bir diğer deyişle fiyatlandırma yaklaşımlarının sulama organizasyonlarının performansı üzerinde etki yaptığı söylenebilmektedir. Ancak bu yaklaşımlardan saat veya hacim esaslı fiyatlandırmanın diğer fiyatlandırma yaklaşımlarına göre işletme başarısı ve performansı üzerinde daha fazla olumlu etki yaptığı belirlenmiştir. Olumlu etkilerin artırılabilmesi için diğer organizasyonlarda da bu fiyatlandırma yaklaşımlarının benimsenmesi gerekmektedir. Nitekim saat veya hacim esaslı fiyatlandırma yaklaşımının benimsenmesi hem organizasyonların da hem de tarımsal işletmelerin ekonomik, sosyal, çevresel olarak sürdürülebilirliğinin sağlaması açısından önemlidir.

4. Sonuç

Sulama organizasyonlarının fiyatlandırma yaklaşımları, sürdürülebilir su kullanımını teşvik edici yönde olmalıdır. Nitekim tarımsal sulamalarda fiyat düzeyinin nasıl belirlenmesi gerektiği ve fiyatlandırmanın serbest piyasaya bırakılma durumu her zaman tartışma konusu olmuştur. Sulama ücretlerinin (fiyatlarının) düşük veya yüksek olması toplumsal refahı ve faydayı doğrudan etkilemektedir. Literatürde birçok çalışmada fiyat düzeyinin düşük olmasının aşırı su kullanımına neden olduğu belirlenmiştir. Aşırı su kullanımı; ürün kayıplarına ve dolayısıyla gelir kayıplarına yol açmakla birlikte su kaynakları üzerindeki baskıyı artırmaktadır. Bu nedenle mevcut şartlarda

organizasyonlar arasında ve organizasyonların kendi içlerinde denge fiyatının belirlenmesi gerekmektedir. Fiyat dengesinin oluşmaması durumunda ise organizasyonların etkinlikleri azalacak, bu oluşumların özelleştirilmesi veya tamamen devletin kontrolü altına girmesi beklenecektir.

İncelenen organizasyonlarda fiyatlandırma yaklaşımları organizasyonlar itibariyle farklılık göstermektedir. Fiyatlandırma; kooperatiflerde saat ve sulama sistemine, belediyelerde hacim, ürün ve sulama sistemine, KTK'larda ürün ve saate, birliklerde ise ürün, sulama sistemi ve bölgeye göre belirlenmektedir. Yapılan analizler sonucunda ise kooperatiflerde ve KTK'larda saat esasına, belediyelerde hacim, sulama birliklerinde ise bölgelere göre fiyatlandırmaya dayalı yaklaşımlarının benimsenmesi durumunda işletme başarısının ve performansının arttığı tespit edilmiştir.

Çalışma kapsamında organizasyonlarda bir bütünlük sağlanabilmesi, işletmelerin karşılaştırılması, su tasarruflarının sağlanabilmesi ve su verimliliğinin yükseltilmesi için saat veya hacim esaslı fiyatlandırma yaklaşımları benimsenmesi gerekliliği vurgulanmaktadır. Dolayısıyla diğer organizasyonlarda da bu fiyatlandırma yaklaşımlarının uygulanması gerekmektedir. Bu fiyatlandırma yaklaşımları hem organizasyonların hem de tarım işletmelerinin ekonomik, sosyal ve çevresel olarak sürdürülebilirliğinin sağlaması açısından önemlidir. Bu nedenle sulama organizasyonlarında,

- Suyun hacimsel fiyatlandırma yaklaşımına göre fiyatlandırılmasını sağlamak,
- Hacimsel fiyatlandırma yaklaşımını uygulayabilmek için şebeke içi ve tarla başında ön ödemeli (kartlı) sayaç sistemlerinin kullanılmasını sağlamak,
- Ön ödemeli sayaç sistemlerini kullanabilmek için üreticilere finansman modeli oluşturmak,
- Tam maliyet prensibinin tüm organizasyonlarda benimsenerek ülke genelinde tam maliyet

yöntemine göre fiyatlandırma yaklaşımını uygulamak gerekmektedir.

Ancak Türkiye'de sulama organizasyonlarında suyun fiyatlandırılmasında çevresel ve ekonomik dışsallıklar ile fırsat maliyetinin dikkate alınmaması (diğer bir ifadeyle tam maliyete göre fiyatlandırma yapılmaması) su kaynaklarının sürdürülebilir kullanımını engellemektedir. Ayrıca genellikle suyun nicel olarak ölçümünün yapılmadan kaynağından alınması ve tarım arazilerine yönlendirilmesi nedeniyle yönetilmesi güçleşmektedir.

Nitekim ölçülmeyen unsurun varlığını (mevcut varlığını, gelecek yıllardaki durumunun tahminin, kullanım miktarını, vb.) yönetmek zordur. Bu nedenle suyun hacimsel olarak ölçülerek tarım sektörüne tahsisi sağlanmalıdır. Hacim üzerinden dağıtılması durumunda kartlı sistemin uygulanması organizasyonların ekonomik sürdürülebilirlikleri açısından önem arz etmektedir. Bu doğrultuda ülke genelinde ve küresel düzeyde suyun ivedikle tam maliyet yöntemine göre fiyatlandırılması, hacimsel ölçümünün yapılarak tahsisinin sağlanması ve organizasyon sürdürülebilirliği açısından ön ödemeli sayaç sisteminin yaygınlaştırılması gerekmektedir.

5. Teşekkür

Kaynaklar

Ağızan, K., & Bayramoğlu, Z. (2020). The Role of Social Capital in the Formation of Entrepreneurship Skills on Agricultural Farms. *Kahramanmaraş Sütçü İmam Üniversitesi Tarım ve Doğa Dergisi, 23*(3), 678-686.

Ağızan, S., & Bayramoğlu, Z. (2019, Nisan 20-22). *Konya Kapalı Havzasında Tam Maliyet Yöntemine Göre Suyun Sürdürülebilir Kullanımı.* Paper presented at the International Science and Academic Congress, Konya, Türkiye.

Akçapınar, M. C. (2007). *Afyon İli Şuhut Ovası Sulama Organizasyonlarında Sulama Suyu Fiyatlandırma Yaklaşımları ve Üretim Maliyeti Üzerine Etkileri* [Yüksek Lisans, Ankara Üniversitesi]. https://dspace.ankara.edu.tr/xmlui/bitstream/handle/20.500.12575/32885/tez.pdf?sequence=1&isAllowed=y

Anonim. (2010). Havza Koruma Eylem Planlarının Hazırlanması – Konya Kapalı Havzası. Retrieved from https://www.tarimorman.gov.tr/SYGM/Belgeler/havza%20koruma%20eylem%20planlar%C4%B1/Konya_Kapali_Havzasi.pdf

Anonymous. (2010). *PRBA, Piano di gestione del distretto idrografico del fiume Po, Sintesi dell'analisi economica sull'utilizzo idrico* (Publication No. Po River Basin Authority:

Anonymous. (2012). *Office International de l'EAU, Etude de calcul de la récupération des cot^s des services liés lutilisation de l'eau pour les bassins hydrographiques franais en application de la directive cadre sur l'eau* (Publication No. Office International de l'Eau, Final Report:

Anonymous. (2013). *ERSAR, Annual Report on Water and Waste Water in Portugal Executive Summary* (Publication No.

Arı, E., Yilmaz, V., & Doğan, M. (2015). Üniversite Öğrencilerinin İnternet Üzerinden Alışverişlerine İlişkin Tutum ve Davranışların Önerilen Bir Yapısal Eşitlik Modeliyle Araştırılması. *Yönetim ve Ekonomi: Celal Bayar Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 22*(2), 385-399.

Aytop, Y., & Akbay, C. (2018). Maraş Biberi Üretim Memnuniyetinin Yapısal Eşitlik Modeli ile Belirlenmesi. *Kahramanmaraş Sütçü İmam Üniversitesi Tarım ve Doğa Dergisi, 21*(5), 725-737.

Ayyıldız, H., & Cengiz, E. (2006). Pazarlama Modellerinin Testinde Kullanılabilecek Yapısal Eşitlik Modeli (YEM) Üzerine Kavramsal Bir İnceleme. *Süleyman Demirel Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 11*(2), 63-84.

Bal, D. Ç. (2018). *Trakya Bölgesinde Bitkisel Üretim Yapan Tarım İşletmelerinin Risk Kaynakları ve Risk Yönetim Stratiejilerinin Değerlendirilmesi* [Doktora, Tekirdağ Namık Kemal Üniversitesi].

Bayramoğlu, Z., Ağızan, S., Ağızan, K., & Bozdemir, M. (2020). *Konya Kapalı Havzasında Faaliyet Gösteren Sulama Organizasyonlarının Su Arz Maliyetlerinin Belirlenmesi ve Bunu Etkileyen Faktörlerin İncelenmesi* (Publication No. 19401016). Selçuk Üniversitesi Bilimsel Araştırmalar Projesi.

Berke, M. Ö., Dıvrak, B. B., & Sarısoy, H. D. (2013). Konya'da Suyun Bugünkü Raporu. *WWF-Türkiye ve Pegasys Strategy and Development*.

Bilgin, N., & Kuzey, C. (2013). Tarımsal Kooperatif Yöneticilerin Karizmatik Liderlik Davranışları İle Ortakların İşbirliği ve Performans-Tatminleri Arasındaki İlişkiye Yönelik Bir Araştırma. *Üçüncü Sektör Sosyal Ekonomi, 48*(1), 49-72.

Bülbül, H., Akın, M., Demirer, Ö., & Doğan, İ. (2012). Türk Bankacılık Sektöründe Hizmet Kalitesinin Müşteri Tatmini ve Tekrar Satın Alma Niyeti Üzerine Etkisi: Yapısal Eşitlik Modeli ile Bir İnceleme. *Doğuş Üniversitesi Dergisi, 13*(1), 28-40.

Cankurt, M., Miran, B., Günden, C., & Şahin, A. (2010, Eylül 22-24). *AB ve Türkiye'nin Tarımsal Üretim Etkinlik ve Verimliliği Üzerine Küresel Krizlerin Etkileri.* Paper presented at the Türkiye IX. Tarım Ekonomisi Kongresi, Şanlıurfa.

Çelik, H. E., & Yılmaz, V. (2013). Yapısal eşitlik modellemesi temel kavramlar uygulamalar programlama. *Ankara: Anı Yayıncılık*.

Çetinkaya, M., & Çimenci, S. (2014). Örgütsel Adalet Algısının Örgütsel Vatandaşlık Davranışı Üzerindeki Etkisi ve Örgütsel Özdeşleşmenin Aracılık Rolü: Yapısal Eşitlik Modeli Çalışması. *Yönetim Bilimleri Dergisi, 12*(23), 237-278.

Çınar, Ö., & Yeşil, S. (2016). Örgütsel Bağlılık ve Örgütsel Desteğin Çalışan Performansı Üzerindeki Etkisini İnceleyen Bir Yapısal Eşitlik Model Önerisi. *International Journal of Social Sciences and Education Research, 2*(1), 349-369.

Doğan, İ. (2015). *Farklı Veri Yapısı ve Örneklem Büyüklüklerinde Yapısal Eşitlik Modellerinin Geçerliği ve Güvenirliğinin Değerlendirilmesi* [Doktora, Eskişehir Osmangazi Üniversitesi Sağlık Bilimleri Enstitüsü].

DSİ. (2018). DSİ'ce İnşa Edilerek İşletmeye Açılan Sulama ve Bataklık Islahı Tesisleri (2017-2018). Retrieved from http://www.dsi.gov.tr/docs/yayinlarimiz/2017-2018-sulama-ve-bataklik-islahi-tesisleri.pdf?sfvrsn=4

Emel, O. B., & Uygun, S. (2012). Çevre Farkındalığı-Çevre Tutumu Arasındaki İlişkinin Yapısal Eşitlik Modeli ile Sınanması. *Uludağ Üniversitesi Eğitim Fakültesi Dergisi, 25*(2), 459-473.

Emhan, A., Kula, S., & Töngür, A. (2013). Yapısal Eşitlik Modeli Kullanılarak Yönetici Desteği, Örgütsel Bağlılık, Örgütsel Performans ve Tükenmişlik Kavramları Arasındaki İlişkilerin Analizi: Kamu Sektöründe Bir Uygulama. *Hacettepe Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 31*(1), 53-69.

FAO. (2019). The State of the World's Land and Water Resources for Food and Agriculture. Retrieved from http://www.fao.org/land-water/en/

García-Rubio, M. A., Ruiz-Villaverde, A., & González-Gómez, F. (2015). Urban water tariffs in Spain: What needs to be done? *Water, 7*(4), 1456-1479.

Girginer, N., Çelik, A. E., & Uçkun, N. (2011). Kredi Kartı Tutum Ölçeği Üzerine Bir Yapısal Eşitlik Modeli Uygulaması. *Eskişehir Osmangazi Üniversitesi Sosyal Bilimler Dergisi, 12*(1), 17-30.

Gültekin, P., Gültekin, Y. S., Uzun, O., & Gök, H. (2016). Katılımcı Ekoturizm Planlamasında Yapısal Eşitlik Modellemesi ile Paydaş Analizi: Batı Karadeniz Bölgesi Örneği. *Düzce Üniversitesi Ormancılık Dergisi, 14*(2), 34-56.

Heidler, S., & Prandstetten, C. (2008). Financing in the Field of Communal Water Supply and Sewage Disposal Services in Austria. *Water Utility Management International, 3*(4), 06-08.

Horasan, B. (2014). *Aydın İli Tarım Sektörünün Girişimcilik Yönüyle Değerlendirilmesi* [Yüksek Lisans, Adnan Menderes Üniversitesi].

Hurma, H., Unakıtan, G., Aydın, B., Azaboğlu, Ö., Demirkol, C., & Yılmaz, F. (2017). Bitkisel Üretimde Çiftçilerin Girdi Kullanım Bilinç Düzeylerinin Analizi: Trakya Bölgesi Örneği *Gaziosmanpaşa Üniversitesi Ziraat Fakültesi Dergisi, 34*(1), 104-117.

Julius, D., & Alicbusan, A. P. (1989). *Public Sector Pricing Policies: A Review Of Bank Policy And Practice* (Publication No. WPS49). Washington, D.C.: World Bank Group: http://documents1.worldbank.org/curated/en/785851468764365407/pdf/multi-page.pdf

Karacaoğlu, K. (2009). Rekabet Üstünlüğünü Etkileyen Unsurların Yapısal Eşitlik Modeli İle Belirlenmesi: İSO 500 Büyük Sanayi İşletmesi Örneği. *Erciyes Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 2009*(34), 165-187.

Karagöz, Y. (2016). SPSS ve AMOS 23 Uygulamalı İstatistiksel Analizler Kitabı. 1. *Nobel Akademik Yayıncılık, Bask 1. Ankara*.

Karagöz, Y., & Ağbektaş, A. (2016). Yapısal Eşitlik Modellemesi ile Yaşam Memnuniyeti Ölçeğinin Geliştirilmesi; Sivas İli Örneği. *Bartın Üniversitesi İİBF Dergisi, 13*(7), 274-290.

Kayalar, M., & Arslan, E. T. (2016). İç Girişimcilik ve İnovasyon İlişkisi: Yapısal Eşitlik Modeli İle Bir İnceleme. *Bartın Üniversitesi İİBF Dergisi, 7*(14), 517-542.

Keleş, Ş., Keskin, A., & Ertek, N. (2018). Kırsal Alanda Sosyal Sermayenin Yaşam Memnuniyeti Üzerine Etkisi. *Kahramanmaraş Sütçü İmam Üniversitesi Tarım ve Doğa Dergisi, 21*(Özel Sayı), 123-132.

Koundouri, P., Papandreou, N., Remoundou, K., & Kountouris, Y. (2014). A Bird's Eye View of the Greek Water Situation: The Potential for the Implementation of the EU WFD. In *Water Resources Management Sustaining Socio-Economic*

Welfare: The Implementation of the European Water Framework Directive in Asopos River Basin in Greece (pp. 1-24). Dordrecht: Springer.

Mete, M., Zincirkıran, M., Yalçınsoy, A., & Pekcan, A. (2015). Personel Güçlendirme, Örgütsel Bağlılık ve İş Memnuniyeti İlişkisinin Yapısal Eşitlik Modeli İle İncelenmesi: Turizm Sektöründe Bir Araştırma. *Bartın Üniversitesi İİBF Dergisi, 6*(12), 137-156.

Muslu, A. V. (2015). *Dünya'da ve Türkiye'de Suyun Fiyatlandırılması* [Uzmanlık Tezi, T.C. Orman ve Su İşleri Bakanlığı].

Özçelik, A., Tanrıvermiş, H., Gündoğmuş, E., & Turan, A. (1999). *Türkiye'de Sulama İsletmeciliğinin Geliştirilmesi Yönünden Şebekelerin Birlik ve Kooperatiflere Devri ile Su Fiyatlandırma Yöntemlerinin İyilestirilmesi Olanakları* (Vol. 32). Ankara, Tarımsal Ekonomi Arastırma Enstitüsü Yayınları.

Özer, Y., & Anıl, D. (2011). Öğrencilerin Fen ve Matematik Başarılarını Etkileyen Faktörlerin Yapısal Eşitlik Modeli İle İncelenmesi. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 41*(2011), 313-324.

Özgür Güler, E., & Börüban, C. (2019). Tarımsal Üretimin ve Ölçek Etkisinin Çevre Kirliliği Üzerindeki Etkisinin İncelenmesi. *Journal of the Cukurova University Institute of Social Sciences, 28*(3), 1-11.

Reynaud, A. (2016). Assessing the İmpact of Full Cost Recovery of Water Services on European Households. *Water Resources and Economics, 14*(2016), 65-78.

SYGM. (2017). T.C. Orman ve Su İşleri Bakanlığı Su Yönetimi Genel Müdürlüğü, Konya Kapalı Havzası Sektörel Su Tahsis Planını Hazırlanmasına Yönelik Teknik Destek Hizmet Alımı İşi, Taslak Su Talepleri Analizi Raporu.

Şahin, A., Cankurt, M., Günden, C., & Miran, B. (2008). Çiftçilerin Risk Davranışları: Bir Yapısal Eşitlik Modeli Uygulaması. *Dokuz Eylül Üniversitesi İktisadi İdari Bilimler Fakültesi Dergisi, 23*(2), 153-172.

Şahin, A., Cankurt, M., Günden, C., Miran, B., & Meral, Y. (2013). Türkiye'de Kooperatiflere Ortak Olmada ve Kooperatif Başarısında Etkili Faktörlerin Analizi. *Akademik Ziraat Dergisi, 2*(1), 23-34.

Şahin, B., & Taşkaya, S. (2010). Sağlık Çalışanlarının Örgütsel Adalet Algılarını Etkileyen Faktörlerin Yapısal Eşitlik Modeli İle İncelenmesi. *Hacettepe Sağlık İdaresi Dergisi, 13*(2), 85-114.

Tanrıvermiş, H., Gündoğmuş, E., Çakmak, B., & Türker, M. (2001, Kasım 08-11). *Sulama Suyu Fiyatlandırma Yaklaşımları ve Bu Yaklaşımların Türkiye'de Kullanılabilme Olanakları.* Paper presented at the Ulusal Sulama Kongresi, Antalya.

Timurkaynak, İ. (2017). *Kayseri pancarı ekicileri kooperatifi ortaklarının memnuniyetlerinin belirlenmesi* [Yüksek Lisans, Adnan Menderes Üniversitesi].

Toklu, I. T., Ustaahmetoğlu, E., & Küçük, H. Ö. (2016). Tüketicilerin Coğrafi İşaretli Ürün Algısı ve Daha Fazla Fiyat Ödeme İsteği: Yapısal Eşitlik Modellemesi Yaklaşımı. *Yönetim ve Ekonomi: Celal Bayar Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 23*(1), 145-161.

Tüfekçi, N., & Tüfekçi, Ö. K. (2006). Bankacılık Sektöründe Farklı Olma Üstünlüğünün ve Müşteri Sadakatinin Yarattığı Değer: Isparta İlinde Bir Uygulama. *Süleyman Demirel Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 2*(4), 170-183.

Ustasüleyman, T., & Eyüboglu, K. (2010). Bireylerin İnternet Bankacılığını Benimsemesini Etkileyen Faktörlerin Yapısal Eşitlik Modeli ile Belirlenmesi. *Journal of BRSA Banking & Financial Markets, 4*(2), 11-38.

Worldbank. (2015a). *Water and Wastewater Services in the Danube Region : Bulgaria Country Note* (Publication No. 97247). Washington, DC., World Bank: https://openknowledge.worldbank.org/handle/10986/22134

Worldbank. (2015b). *Water and Wastewater Services in the Danube Region : Hungary Country Note* (Publication No. 97229). Washington, DC., World Bank: https://openknowledge.worldbank.org/handle/10986/22139

Yellice Yüksel, B., Kaner, S., & Güzeller, C. (2011). Öğretmenlerin Mesleki Yetkinlik, Mesleki Sosyal Destek ve Tükenmişlik İlişkisinin Yapısal Eşitlik Modeli ile İncelenmesi. *Mehmet Akif Ersoy Üniversitesi Eğitim Fakültesi Dergisi, 1*(21), 1-25.

Yılmaz, V., & Doğan, M. (2016). Planlanmış Davranış Teorisi Kullanılarak Önerilen Bir Yapısal Eşitlik Modeli ile Geri Dönüşüm Davranışlarının Araştırılması. *Anadolu Üniversitesi Sosyal Bilimler Dergisi, 16*(5), 191-206.

Yücenur, G. N., Demirel, N. Ç., Ceylan, C., & Demirel, T. (2011). Hizmet Değerinin Müşterilerin Davranışsal Niyetleri Üzerindeki Etkisinin Yapısal Eşitlik Modeli ile Ölçülmesi. *Doğuş Üniversitesi Dergisi, 12*(1), 156-168.

Farm Safety Behaviors of Farmers in Izmir and Manisa Provinces in Turkey

Murat BOYACI[1*]   Özlem YILDIZ[1]

[1]*Aegean University Agricultural Faculty Department of Agricultural Economics, İzmir / Turkey*

ARTICLE INFO

*Corresponding author:
murat.boyaci@ege.edu.tr

ABSTRACT

Due to natural structure, production systems, and farmer behaviors, agriculture is one of the most dangerous sectors. This research has aimed at determining the safety behaviors of farmers in the production process. The research data was collected from 282 farmers in 18 villages of six counties in Izmir and Manisa Provinces via the questionnaire form in 2016. The farmers are averagely 54 years old, 6.8 yearly educated and cultivating 10.3-hectare lands. The farmers have limited knowledge about farm safety applications and the subject has low priority in the region. The common health problems exposed by the farmers are back and muscle pains, and sunstrokes during the production activities. While 10% of the farmers had tractor accidents and poisoning cases, 6.4% of farmers have encountered with injury or disability during agricultural activities. The safety objectives must take place in the extension programs for the adoption of farm safety practices in agriculture. The experts on safety must be employed in extension services for preparing and conducting the programs. The demonstrative farms can be set up in the rural areas for introducing the correct applications to the farmers. At the local level, crop/livestock-oriented courses on farm safety principles can behold and the adopter farms can be declared as "safety" by giving a certificate. It is thought that the adoption of safety practices in agriculture will lead to an increase in awareness in rural areas and will have a positive impact on product quality, consumer health, and environment-friendly sensitivity as well as farmer health in the production process.

1. Introduction

There are 6.143 million farmers in approximately three million farms that create 21.0% of employment, 7.5% of national income, and 4.0% of export value in the Turkish economy (TUIK, 2015). Farm safety in agriculture has a multidimensional aspect for farmers, farmworkers, and consumers, besides economic, sociological, cultural, and environmental. According to the Labor Organization (ILO) agriculture is one of the most dangerous sectors after construction. ILO records show that 1.7 million farmers and farm workers annually die during agricultural production in the world (ILO, 2015). The ILO lists the causes of accidents in agriculture as machinery (cutting, drilling tools, etc.), chemicals (fertilizers, pesticides, antibiotics, etc.), toxic and allergic agents (plants, flowers, animal feces, oils, etc.), carcinogenic agents (arsenic-containing pesticides, herbicides, etc.), animal diseases (Brucella, etc.), parasites (malaria, etc.), indoor/undercover areas (tanks, cellars, greenhouses, etc.), noise and vibration, weather conditions, wild and poisonous animals (attacks, insect/snake bites, etc.) (ILO, 2010; Berk, 2012; Taştekin et al., 2012).

Farmers' attitudes, economic conditions, shortcomings in education and training, age, poor design of farm machinery and equipment, characteristics of the workforce, insufficiency of related institutions are identified as the barrier to farm safety (Day et al., 1999).

The accident numbers have increased from 370 to 1863 in the last decade (SGK, 2018). It is thought that the actual accident numbers are higher than SGK records. Generally, in Turkey, the accidents and poisoning cases accept as the nature of agricultural production by the farmers for that reason they only apply for receiving the medical treatment to the hospitals in serious cases. The inadequacy and deficiency of figures cause the neglect of the farm safety problems in Turkey.

Agricultural extension activities mainly focus on the increases of production, yield, and quality, but farm safety issues are not sufficiently considering in Turkey. The farmers' knowledge and behaviors, applications on safety, and factors affecting adoption were examined by the study. The research findings are also hoped to contribute to the extension services, policymakers, and rural people's health and to international trade via sensitivity to human health.

2. Material and Methods

The data were obtained from 282 farmers by using the questionnaire form in Izmir and Manisa Provinces in 2016. The counties (Bergama, Tire, Bayindir) from Izmir and (Salihli, Saruhanli, Akhisar) Manisa Provinces were selected as a research area. The surveys were conducted in a total of 18 villages by selecting three villages to form each county. These counties and villages represent the Provinces in terms of socio-economic, ecological, and production patterns. The numbers of interviewing were calculated as 282 farmers by using the proportional sampling method with a 90% confidence interval and a 12% error margin (Box 1). The farmers were proportionally distributed according to their numbers in each village (Table 1).

Box 1: Sample Size Formula

$$n = \frac{Np(1-p)}{(N-1)\sigma_{\hat{p}_x}^2 + p(1-p)} \qquad n=Sample$$

size, N=Population, p= Proportion

Sources: Newbold, 1995; Miran, 2003

Five-point Likert Scale used to measure farmer's attitudes and behaviors that should be chanced for safety problems in agricultural production (Malhotra, 2010). Cronbach's Alpha was used for internal consistency reliability (Pallant, 2010). Mann Whitney U Test, Factor Analysis, Logit were employed for data analysis.

Table 1. Distribution of farmers interviewed by provinces, counties and villages

Province	Counties	Villages	Number of Farmers	Percent (%)
IZMIR	Bayindir	Furunlu	21	7.4
		Pinarli	17	6.0
		Balcilar	9	3.2
		Bayindir Total	**47**	
	Bergama	Zeytindag	20	7.1
		Asagikiriklar	14	5.0
		Bolcek	13	4.6
		Bergama Total	**47**	
	Tire	Boynuyogun	8	2.9
		Kireli	21	7.4
		Yeniciftlik	18	6.4
		Tire Total	**47**	
		IZMIR TOTAL	**141**	
MANISA	Salihli	Taytan	20	7.1
		Capakli	15	5.3
		Durasilli	12	4.3
		Salihli Total	**47**	
	Saruhanli	Hacirahmanli	14	5.0
		Koldere	23	8.2
		Mutevelli	10	3.5
		Saruhanli Total	**47**	
	Akhisar	Akcesme	11	3.9
		Sazoba	15	5.3
		Zeytindag	21	7.4
		Akhisar Total	**47**	
		MANISA TOTAL	**141**	
		GENERAL TOTAL	**282**	100.0

3. Findings

3.1. Some characteristics of farmers

Averagely the farmers are 54 years old and 6.8 yearly educated. The education levels are grouped as primary (63.2%); the secondary (18.9%); high school (17.9%) and over (Table 2). The averagely farmers have 29.8 years of farming experience and household numbers are 4.1 persons in the region. The job satisfaction levels of farmers are comparatively good (3.96). About 70% of farmers employ temporary workers and 28.1% of them stated that they employ younger than 16 years old. Workers usually come as families and charge for all family members. People under the age of 16 usually work in light jobs for a fee. Otherwise, workers prefer to go to other farms with their families. In addition, family members under the age of 16 also assist in production activities in 14% of farms.

Table 2. Education levels of farmers

Education Levels	Izmir		Manisa		General	
	N	%	N	%	N	%
Primary	94	67.1	83	59.3	177	63.2
Secondary	24	17.1	29	20.7	53	18.9
High school and more	22	15.7	28	20.0	50	17.9
Total	140	100.0	140	100.0	280	100.0

Almost all farmers (96.8%) have at least one member of the cooperative/union and/or chamber. Because of compulsory membership for providing the government supports, the majority of farmers (94%) are members of agricultural chambers. The other membership levels of farmers differ as Agricultural Credit Cooperatives (59.9%), irrigation cooperatives (33.0%), agricultural sales and rural development cooperatives (31.9%), and cattle breeders association (22.0%). Some farmers have memberships of political parties, associations, and non-governmental organizations, too (Table 3).

Table 3. Memberships of agricultural cooperatives of the farmers

Cooperatives	Izmir		Manisa		General	
	N	%	N	%	N	%
Chamber of Agriculture	130	92.2	135	95.7	265	94.0
Agricultural Credit Cooperative	71	50.4	98	69.5	169	59.9
Irrigation Association / Cooperative	28	19.9	65	46.1	93	33.0
Agriculture Sales, Rural Development Cooperative	59	41.8	31	22.0	90	31.9
Breeding Cattle Breeders Association	50	35.5	12	8.5	62	22.0
Others (NGO, Associations, Political Parties, etc.)	20	14.2	10	7.1	30	10.6

The average farmland is 10.3 hectares and parcel numbers of farms are 5.6 in the region. Fruits (57.1%); grains (41.1%), vegetables (33.7%), forage plans (25.2%), and industrial plants (17.4%) are grown in order by region farmers (Table 4). Animal husbandry for market and/or own family consumptions are engaged by

39.7% of farmers. There are averagely 38.5 cattle, 26.3 sheep/goats, 19.9 poultries in the farms.

Table 4. Grown crops

Grown Crops	Number of Farmers	Percentage	Average (hectare)
Fruit	161	57.1	5.0
Grain	116	41.1	9.4
Vegetable	95	33.7	3.8
Forage plants	71	25.2	5.4
Industrial plants	49	17.4	11.6

Farmers' Behaviors on Farm Safety

The safety behaviors/applications of farmers were evaluated by using a Likert scale in the study, 17 different. The farm safety behaviors were categorized into four groups as pesticides and fertilizers (chemicals) usage information, the weather conditions during the field works, disposal of chemicals' waste (after chemicals' usage), and the precautions (Table 5).

Table 5. Farmers attitudes and behaviors about farm safety

Factor Groups	Statements	Factor loads	Total variance explained (%)	Reliability
Chemicals usage information	I read the prospectuses of chemicals	0.909	31.977	0.929***
	I understand the instructions of pesticides /fertilizers	0.884		
	I know which chemical will apply to why.	0.869		
	I follow the instructions of chemicals during the applications	0.835		
	I pay attention to the expiration date when buying pesticides and fertilizers.	0.750		
	I take into account the mixing instructions	0.657		
	The information on the labels of chemicals are sufficient	0.649		
Attention to weather	I do not apply pesticides If the temperature is above 30 degrees,	0.894	19.806	0.857***
	I do not apply pesticides if the wind speed is 5m / hour	0.836		
	I do not apply pesticides, If the humidity is less than 50%.	0.799		
	I follow the weather reports	0.716		
After chemical usage	I cannot burn, bury or put in the water resources of pesticide cans.	0.837	11.855	.744
	I rinse the pesticide cans 3-4 times with water and pour them in the tank.	0.834		
Chemical precautions	I keep the pesticides locked cabins	0.855	10.850	0.697*
	I take care of the protective clothing instructions	0.829		
Total			74.490	
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.852	Bartlett's Test of Sphericity	Approx. Chi-Square	***2664,113
Degree of freedom	325		Sig.	0,00

The farmers' reactions to weather conditions are statistically different from the provinces. The farmers in Izmir Province are more sensitive to the meteorological events during agricultural applications (Table 6).

Table 6. Farmer's behavior on meteorological events (Mann Whitney U)

Statements; **I do not apply pesticides** "…"	Provinces	Number	Mean Rank	Sum of Ranks	Mann Whitney U Value	Z Value	P Value
if the wind speed is 5m /hour	Izmir	140	160.61	22485.00	6985.000***	-4.622	0.000
	Manisa	140	120.39	16855.00			
If the temperature is above 30 degrees	Izmir	140	156.47	21906.00	7704.000***	-3.512	0.000
	Manisa	141	125.64	17715.00			
If the humidity is less than 50%	Izmir	140	154.34	21608.00	7862.000**	-3.030	0.002
	Manisa	140	126.66	17732.00			

*** α<0.01   ** α<0.05

3.2. Precautions taken by farmers

The majority of the farmer (79.8%) examines the risks in their farms. Separately storing of the fuels and pesticides with flammable items are considered by 69.9% of the farmers. The farmers (68.5%) fence the area around the water wells and pits in the farmyards for preventing the fallings. For fire prevention, 54.3% of farmers store up the straw away from the house and 66.0% of farmers do not keep the flammable items in the barns and houses. The emergency intervention equipment such as the first aid kits (27.0%) and the fire extinguishers (26.6%) are improperly kept at the farms in the region (Table 7). Keeping the emergency intervention equipment, storing the straw away from the barns and houses, and the fencing areas around wells/pits are common behaviors in Manisa Province (Table 8).

Table 7. Farmers' applications for farms safety

Statements	Izmir		Manisa		General	
	N	%	N	%	N	%
I look over what can be dangerous in my farm	113	50.2	112	49.8	225	79.8
I store fuels and pesticides separate from flammable materials	94	47.7	103	52.3	197	69.9
I fence the area around the water wells and pits	78	43.8	100	56.2	178	68.5
I store up all flammable items far from the barns and houses	94	50.5	92	49.5	186	66.0
I store up the straw 20 meters away from the barns and houses	65	43.3	85	56.7	150	54.3
I have a first aid kit in my farm	24	31.6	52	68.4	76	27.0
I have a fire extinguisher in my farm	29	38.7	46	61.3	75	26.6

Cronbach's Alpha: 0.734

Table 8. Precautions taken by farmers on their farms according to the provinces (Mann W. U)

Statements	Provinces	Number	Mean Rank	Sum of Ranks	Mann Whitney U	Z Value	P Value
I have a fire extinguisher in my farm	Izmir	141	133.0	18753.0	8742.0**	-2.29	0.02
	Manisa	141	150.0	21150.0			
I have a first aid kit in my farm	Izmir	141	127.5	17977.5	7966.5***	-3.75	0.00
	Manisa	141	155.5	21925.5			
I store up the straw 20m. away from the barns and houses	Izmir	136	129.5	17606.0	8290.0**	-2.15	0.03
	Manisa	140	147.3	20620.0			
I fence the area around the water/pits	Izmir	125	122.6	15327.5	7452.5**	-2.02	0.04
	Manisa	135	137.8	18602.5			

*** α<0.01   ** α<0.05

3.3. The Poisoning Cases and Accidents

The poisoning cases and accidents have found the dependent on the sizes and parcel numbers of farms, contact frequency with extension workers, and job satisfaction of the farmers. While increasing farmlands and parcel numbers augment the occurrences of poisoning and accident in the farms, but higher job satisfaction and frequent contact with extension workers decrease (Table 9).

Table 9. Occurrences of poisoning and accident by some characteristics (Logit)

Variables	Coefficient	Std Error	Z	P-Value
Const	-0.048271	0.617337	-0.0782	0.93768
Age	-0.001841	0.004648	-0.3960	0.69213
Education	0.001771	0.010547	0.1679	0.86662
Experience	-0.004345	0.007492	-0.5800	0.56193
Farm size (ha)	**0.002225**	**0.001231**	**1.8079**	**0.07061***
Parcel numbers of the farm	**0.001313**	**0.000615**	**2.1347**	**0.03278****
Job satisfaction	**-0.203152**	**0.121633**	**-1.6702**	**0.09488***
Workers younger than 16 years old.	0.000743	0.001258	0.5904	0.55490
Contact with extension workers	**-0.199328**	**0.114013**	**-1.7483**	**0.08041***
Log-likelihood: -131.6869		Akaike Criterion: 283.3738		
Likelihood Ratio Test: Chi-square(9) = 14.9279 [0.0929]		Number of cases 'correctly predicted' = 228 (80.9%)		

*** $\alpha<0.05$ * $\alpha<0.10$*

The poisoning cases and accidents on farms indicate the behaviors and sensitiveness of safety applications in the farms. Considering 26 safety precautions in the farms and understanding the warning pictures on chemical packages affect the poisonings and accidents on the farms. Understanding of warns on the package is decreasing the number of poisonings and accidents. Knowing sustainable practices, applying cultural practices, and controlling farm risks do not have any effect on the poisonings and accidents in the region (Table 10). It is understood that precautions to be taken during agricultural production activities are prioritized for farm safety, picture literacy is important especially for considering the cautions in agricultural chemical packages.

Table 10. Poisonings and accidents by farmer's applications (Logit)

Variables	Coefficient	Std Error	Z	P-Value
Const	-0.875314	0.614942	-1.4234	0.15462
Safety precautions	0.044367	0.065630	0.6760	0.49903
Taking safety precautions during the farm works	**-0.061413**	**0.031295**	**-1.9624**	**0.04972****
Understanding level of pictures	**-0.148705**	**0.064003**	**-2.3234**	**0.02016****
Knowledge on sustainable practices	0.029429	0.020848	1.4116	0.15807
Cultural applications	-0.087148	0.178541	-0.4881	0.62547
Log-likelihood: -133.2914		Akaike Criterion: 278.5827		
Likelihood Ratio Test: Chi-square (5) = 11.7189 [0.0388]		Number of cases 'correctly predicted' = 227 (80.5%)		

*** $\alpha<0.05$*

3.4. Precautions taken for pesticides

During the pesticide applications some behaviors determined are to take into account the wind and its intensity (81.9%), do not eating/drinking something (73.4%) and do not smoke (64.8%); to wear glasses (62.1%) and masks (46.1%) for protecting eyes and skin, and to alert people around (57.0%), (Table 11).

The farmers carry sufficient drinking water with them (91.0%), keep the foods appropriately (81.3%); provide shadow places for resting (67.4%), have the first aid kits (29.4%) during the field works. As an employer, 47.9% of the farmers advise their workers to wear protective materials such as masks, hats, gloves. The presence of a toilet in the field is not common in the region. Limited numbers of farms (18.3%) have a toilet in the field (Table 11).

The farmers know to adjust the equipment for spraying (68.0%) and take frequent breaks during spraying (48.4%). Most farmers wash their hands and face (91.0%), takes shower (82.0%), cleans gloves and boots (77.3%), washes clothes by using soap (76.3%) after spraying. The chemical contaminated clothes are separately washed from the daily ones (75.7%). The farmers also keep spraying clothes in water for about three hours before washing them (44.4%) (Table 11).

Table 11. Precautions taken during spraying

	Statements	Izmir		Manisa		General	
		N	%	N	%	N	%
Before spraying pesticides	I don't use pesticides against the wind	113	49.8	114	50.2	227	81.9
	I don't eat or drink during the spraying	98	48.0	106	52.0	204	73.4
	I don't smoke during the spraying	89	48.9	93	51.1	182	64.8
	I protect my eyes while spreading chemicals	86	50.0	86	50.0	172	62.1
	I warn my surround before the spraying	77	48.7	81	51.3	158	57.0
	I use mask for inhalation during the spraying	58	45.0	71	55.0	129	46.1
During spraying pesticides	I had sufficient drinking water in the field	127	50.2	126	49.8	253	91.0
	I provide a shadow place for the workers in the field	92	48.9	96	51.1	188	67.4
	Workers use masks, hats, gloves.	62	46.3	72	53.7	134	47.9
	I get a first-aid kit when I work in the field	33	40.2	49	59.8	82	29.4
After spraying pesticides	I wash my hands and face after spraying	128	94.1	124	87.9	252	91.0
	I take a shower after spraying	107	78.1	121	85.8	228	82.0
	I wash my gloves and boots after spraying/fertilizing	103	75.7	112	79.4	215	77.3
	I wash my clothes with soap and water	106	77.4	106	75.2	212	76.3
	My clothes used for spraying are washed separately from other laundry	105	77.2	104	74.3	209	75.7
	I adjust the equipment for every application	87	64.0	102	72.3	189	68.0
	I often take a break during spraying	65	47.8	69	48.9	134	48.4
	After spraying I put my clothes used in water for three hours before washing	55	40.1	67	48.6	122	44.4

Cronbach's Alpha: 0.840

3.5. Preferred field clothes by farmers

Although protective equipment (PE) is suggested for preventing farmers' exposure to health hazards in the field, the usage of EP among farmers is inadequate in the developing countries (Kearney et al., 2015; Yuantari et al., 2015; Sharifzadeh et al., 2017, Bondori et al., 2018). During the field works, the farmers wear and use protective items such as the hats or poshu (a kind of local headcover), (83.8%), long-sleeved shirts (%82.7), boots (%73.3), protective clothes (%58.6), mask against to dusts (%46.4), sunglasses (%46.1) in the region (Table 12).

3.6. Measures taken by farmers in machinery use

Because of using a wide variety of hazardous machinery and equipment, farmers and farmworkers face many risks that result in injuries during agricultural production. The tractors as the most common hazardous machinery in agriculture (Jawa et al., 2013; Caffaro et al., 2018) are the reasons behind the mentioned accidents as operator's carelessness, neglected tractor maintenance, inexperienced operators, and non-compliance with the safety rules of people (Yıldırım and Altuntaş, 2015; Baydaş and Altuntaş 2017).

Table 12. Protective clothes and equipment used by farmers

Statements	Izmir		Manisa		General	
	N	%	N	%	N	%
I use a hat protecting my forehead and neck	114	49.1	118	50.9	232	83.8
I wear a long-sleeved shirt	116	50.4	114	49.6	230	82.7
I wear boots	96	47.3	107	52.7	203	73.3
I wear protective, not abundant clothing	76	46.6	87	53.4	163	58.6
I wear a mask to protect from dust and dirt	68	52.3	62	47.7	130	46.4
I wear sunglasses on sunny days	56	43.4	73	56.6	129	46.1

Cronbach's Alpha: 0.732

In general, the farmers believe they follow the safety rules during the machinery usage by not allowing the below 18 years old ones to drive tractors (86.9%), not transporting any passengers (47.9%) and any children (71.8%) by the tractor. They also fasten the seat belt (74.7%) and keep the driver's cabin clean (82.6%). When driving the tractor and trailer 90.7% of the farmers follow the security requirements. Besides, the regular maintenance of tractors (93.8%), the mirrors (88.0%), the signal/headlights (94.0%), air pressure of tires (93.4%) and the braking system (38.6%) are regularly checking by farmers. The first aid kits exist only 38.6% of the tractors in the region. Half of the farmers (49.4%) leave the tractor keys on the starter (Table 13).

Table 13. Measures taken in the use of tractors and tools

Statements	Izmir		Manisa		General	
	N	%	N	%	N	%
Person must be older than 18 years for driving my tractor	100	82.6	125	90.6	225	86.9
I pick up the passengers on my tractor	55	45.5	80	58.0	135	52.1
I carry the children on the tractor	25	20.7	48	34.8	73	28.2
I fasten the seat belt during driving the tractor	15	12.5	50	36.5	65	25.3
The driver's cabin is clean	92	76.0	122	88.4	214	82.6
The security requirements are provided while I drive the tractors, trailer, etc.	109	90.1	126	91.3	235	90.7
I regularly maintain to my tractor	111	91.7	132	95.7	243	93.8
The tractor's mirrors are intact	108	90.0	119	86.2	227	88.0
The signals/head lights of the tractors are in working conditions	112	93.3	132	95.7	244	94.6
I often check the air pressure of the tires	111	92.5	130	94.2	241	93.4
The brake system works well	112	93.3	134	97.1	246	95.3
There is a first aid kit on my tractor	43	35.5	57	41.3	100	38.6
I leave the tractor key on the starter even I do not drive	56	46.3	75	54.3	131	50.6
I regularly check and maintain the tractor and equipment	100	83.3	124	89.9	224	86.8

3.7. Encountered Health Problems in Farming

The wide-ranging production process and ecological conditions have occupational risks to human health in farming. The most common health problems in farming are mentioned as musculoskeletal conditions, skin and respiratory diseases, and loss of hearing (Griffin, 2013; ILO, 2011). According to the different researches, some cancer types such as leukemia, non-Hodgkin's lymphoma, multiple myeloma, soft-tissue sarcoma, skin, lip, stomach, brain, and prostate are seen the elevated rates among farmers (Blair and Zahm, 1995; Alavanja et al., 2005). In the study, approximately 13% of farmers mentioned the existing cancer cases in their families in the last decade. The common cancer types are listed by farmers as lung (47.1%), larynx (23.5%), skin (8.8%), colon (8.8%), and others (11.8%) in the region.

By using the Likert scale that consisting in-between "never (1) and always (5)" the farmers have identified their health issues and frequencies during agricultural production activities. The muscle and back pains (2.4), sunstrokes (2.1), cough (1.7), contact of chemicals to eyes and skin (1.7), allergy (1.5), skin problems (acne, etc.) (1.5), respiratory problems (1.4), chemical inhalation and swallowing (1.4), cramps (1.4), tachycardia (1.3), pyrexia (1.3) are more or less encountered health issues in the region (Table 14).

Table 14. Health problems

Subjects	Izmir		Manisa		General	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Muscle and back pains	2.17	1.652	2.58	1.474	2.37	1.577
Sunstrokes	2.09	1.432	2.20	1.284	2.14	1.359
Cough	1.57	1.151	1.90	1.108	1.74	1.140
Contact of chemicals to eyes and skin	1.34	0.752	1.98	1.142	1.65	1.015
Allergy	1.33	0.816	1.73	1.053	1.53	0.961
Skin problems (acne, etc.)	1.31	0.846	1.71	1.003	1.51	0.946
Respiratory problems	1.16	0.557	1.72	1.007	1.44	0.858
Chemical inhalation and swallowing	1.15	0.547	1.69	0.877	1.42	0.776
Cramps	1.13	0.519	1.67	1.044	1.40	0.863
Tachycardia	1.13	0.546	1.55	0.939	1.33	0.792
Pyrexia	1.06	0.287	1.54	0.939	1.29	0.730

Although the health problems in Table 14 are relatively low, the poisoning cases and accidents rates in agriculture are higher than expected in the region. The farmers perceive injuries as a natural consequence of their works. Nearly 10% of farmers faced poisoning and accident in the last decade. According to the observations, farmers usually prefer traditional treatments at home and are reluctant to go to the hospital for medical treatments after poisoning or (simple) accidents. Although the higher rates on poisoning cases because of spraying chemicals (9.6%) and tractor related accidents (9.9%) the tendency on home treatments decreases the importance of the subject because of

insufficiently recorded in the region. Some farmers (6.4%) experienced injuries, disabilities after agricultural accidents in the last decade (Table 15).

Participating in courses such as first aids (16.7%) and farm safety (3.2%) are not at intended levels in the region. Furthermore, keeping and recording emergency phone numbers are not common habits in the region. Only 3.9% of farmers know The National Poison Center's (UZEM) phone number (114) (Table 16). Poisoning cases are decreasing in who love farming (job satisfaction), while the number of land sizes and parcels increases, the number of poisonings rises in the region (Table 17).

Table 15. Accidents and poisonings faced by farmers

Accidents and poisonings	Izmir		Manisa		General	
	N	%	N	%	N	%
Poisoning cases	16	8.8	11	6.1	27	9.6
Injury / disability / accident	8	4.4	10	5.5	18	6.4
Tractor Accident	13	7.2	15	8.3	28	9.9

Table 16. The precautions for emergency

Training and precautions	Izmir		Manisa		General	
	N	%	N	%	N	%
Attending a first aid course	35	74.5	12	25.5	47	16.7
Attending farm safety training	5	55.6	4	44.4	9	3.2
Writing the emergency phone numbers somewhere at home/barn that everyone able to see it.	30	60.0	20	40.0	50	17.7
Recording the emergency numbers on their phones	21	45.7	25	54.3	46	16.4
Knowing UZEM's phone number	6	54.5	5	45.5	11	3.9

Table 17. Encountering poisoning and some personal characteristics (Logit)

Variables	Coefficient	Std Error	Z	P-Value
Const	0.085946	1.38727	0.0620	0.95060
Age	-0.022224	0.02401	-0.9257	0.35462
Education	-0.092179	0.08369	-1.1015	0.27070
Experience	-0.004425	0.01707	-0.2592	0.79548
Processed area (ha)	**0.004246**	**0.00144**	**2.9446**	**0.00323*** **
Fragmentation of the land	**0.001480**	**0.00073**	**2.0334**	**0.04202** **
Livestock breeding	0.555299	0.42778	1.2981	0.19425
Job satisfaction (loving the farming)	**-0.344295**	**0.15927**	**-2.1616**	**0.03065** **
Log-likelihood: -80.05013		Akaike Criterion: 176.1003		
Likelihood Ratio Test: Chi-squ (7) = 17.92 [0.012]		Number of cases correctly predicted=256 (90.8%)		

*** $\alpha<0.01$ ** $\alpha<0.05$

Furthermore, the farmers' behaviors such as not carrying children on the tractor, cleaning the driver cabin, taking precautions for pulling a trailer, regular maintaining of the machines, and controlling the air pressure of the tires effect the accident numbers. As shown in Table 18 the farmer's sensitiveness to safety decreases the accident numbers.

Table 18. Tractor accidents and some personal characteristics (Logit)

Variables	Coefficient	Std Error	Z	P-Value
Const	-2.225	0.46292	-4.8070	<0.00001
Only 18 years old persons can drive my tractor	-0.2164	0.86597	-0.2499	0.80263
I take passengers on the tractor	-0.0136	0.76505	-0.0177	0.98585
I carry the children on the tractor	**1.2292**	**0.70260**	**1.7495**	***0.08021**
I fasten the seat belt	-0.0033	0.02886	-0.1153	0.90822
The driver's cabin is clean	**-2.6815**	**1.24597**	**-2.1521**	****0.03139**
I take precautions for pulling trailer with tractor	**-1.6502**	**0.82663**	**-1.9962**	****0.04591**
I make regular maintenance my tractor	**-1.9747**	**0.96391**	**-2.0487**	****0.04049**
The tractor's mirrors are intact	0.0321	0.84966	0.0378	0.96987
The signs of the tractor work well	2.6167	3.06549	0.8537	0.39325
I often check the air pressure of the tires	**-2.6738**	**0.98076**	**-2.7262**	****0.00641**
The brake system of the tractor works well	0.0375	2.9591	0.0127	0.98990
There is a first aid kit on my tractor	0.1565	0.62515	0.2503	0.80237
I leave the tractor key on the starter when I don't use	-0.2256	0.59246	-0.3808	0.70336
I regularly make the equipment maintenance	-0.0045	0.02591	-0.1739	0.86193
Log-likelihood: -50.56580		Akaike Criterion: 131.1316		
Likelihood Ratio T., Chi-square (14) = 38.0623 [0.0005]		Number of cases 'correctly predicted' = 267 (94.7%)		

** $\alpha<0.05$ * $\alpha<0.10$

4. Conclusion and Recommendations

Gaining the skills and behaviors about farm safety will contribute to health and happiness in rural communities and the economy. Following the farm safety rules will also provide a prestige in international trade due to decent and humanitarian farming circumstances. Considering the research findings, the below recommendations have developed for the region:

- Most extension activities focus on production, yield, and quality in the region. Farm safety studies and advice should take a room in agricultural extension services.

- The local causes and production branches must be considering for planning farm safety advices.

- The database should be prepared by identifying the reasons, social and economic effects of accidents, poisoning cases in the region. Extension services and health organizations collect and keep records as reliable about accidents and poising cases on the regional bases. A standard form can be developed

- for the reporting process that contains information on who, what, where, when, how, why, effects, and results.

- Local and regional commissions or advisory committees must be built by participating of different actors such as the Ministry of Agriculture and Forestry, the Ministry of Health, universities, Chambers of Agriculture, municipalities, security institutions, trade unions, input producers, and product chain.

- The guide of extension and health services must prepare the strategic plan on regional farm safety.

- The researches should be encouraged to improve agricultural working conditions for developing policies. The safety applications, risks, and risk perceptions of farmers must take place in the research agenda.

- Courses on farm safety principles and practices should be organized by extension services with the coordination of health organizations. The farmers who participate in the courses and adopt the practices should be rewarded with a marketing advantage, premium support, etc. The adopters of safety precautions must have a certificate of "safe farm" and the priority for government support such as subsidies, premiums, etc.

- The model/demonstrative farms should be established about safety practices in the villages.

- The field days about farm safety should be arranged by considering the local priorities.

- The mass media and campaigns should be employed to reach a wide audience and social awareness. Especially, effective information transfer and warning announcements must be organized by utilizing the different extension aids and methods during the periods of intensive usage of chemicals.

- Agricultural accidents and their consequences should be shared with the rural communities via local media for attracting public attention.

- Farmers must be informed about the short and long terms economic and social costs of the accidents.

Understanding these costs can motivate the farmers to take steps on the security precautions. Furthermore, tax deductions and incentives can be useful for the security equipment, renewal of the equipment (such as seat belts or cabins).

- Vehicle/tractor inspections should be seriously considered as in other motor vehicles.

- The courses must be organized on the use and maintenance of tractors and trailers in the region.

- The phone numbers of the centers as poisoning, the emergency response must be more visible and known in rural communities.

- First aid courses should be organized in the villages for increasing the farmers' intervention skills in case of poisonings and accidents.

References

Alavanja MCR, Sandler DP, Lynch CF, Knott C, Lubin JH, Tarone R, Thomas K, Dosemeci M, Barker J, Hoppin JA, Blair A. 2005. Cancer incidence in the agricultural health study. Scand Journal Work Environment & Health. 31 (suppl 1), 39–45.

Baydaş, F., Altuntaş, E., 2017. Türkiye'deki bazı yörelere ait traktör ve tarım makinaları kullanımından kaynaklanan iş kazalarına ait sonuçların değerlendirilmesi, Gaziosmanpaşa Bilimsel Araştırma Dergisi, Cilt:6, Sayı:1, S:33-45.

Berk, M., 2012. Tarımda iş sağlığı ve güvenliği, 1. Tarım Sağlığı ve Güvenliği Sempozyumu, 6-7 Nisan 2012 Şanlıurfa.

Blair, A., Zahm, S. H. 1995. Agricultural exposures and cancer. Environmental Health Perspectives,103(suppl 8), 205-208.

Bondori, A., Bagheri, A., Damalas, C. A., Allahyari, M. S. 2018. Use of personal protective equipment towards pesticide exposure: Farmers' attitudes and determinants of behavior. Science of the Total Environment, 639, 1156-1163.

Caffaro, F., Schmidt, S., Murphy, D. J., Cavallo, E. 2018. Comprehension rates of safety pictorials affixed to agricultural machinery among Pennsylvania rural population. Safety Science, 103, 162-171.

Day, L.M., Cassell, E, Li L., McGrat,h A., 1999. Preventing Farm Injuries Overcoming the Barriers, Monash University Publication No: 99/126 Project No. UMO 15A, p 87.

Griffin, P. J. 2013. Safety and Health in Agriculture. Farming - a hazardous occupation how to improve health & safety. http://www.europarl.europa.eu/document/activities/cont/201303/20130321ATT63633/20130321ATT63633EN.pdf, Accessed: 21.05.2019.

ILO, 2015. Agriculture: A Hazardous Work, https://www.ilo.org/global/topics/safety-and-health-at-work/areasofwork/hazardous-work/WCMS_356550/lang--en/index.htm, Accessed:16.05.2019.

ILO, 2011. Safety and Health in Agriculture. ILO code of practice, Geneva.

ILO, 2010. Code of Practice on Safety and Health in Agriculture, Meeting of Experts to Adopt a Code of Practice on Safety and Health in Agriculture, Geneva.

Jawa, R.S., Young, D.H., Stothert, J.C., Yetter, D., Dumond, R., Shostrom, V.K., Cemaj, R., Rautiainen, R.H., Mercer, D.W., 2013. Farm machinery injuries: the 15-year experience at an urban joint trauma center system in a rural state. J. Agromed. 18 (2), 98–106.

Kearney, G. D., Xu, X., Balanay, J. A. G., Allen, D. L., Rafferty, A. P. (2015). Assessment of personal protective equipment use among farmers in Eastern North Carolina: a cross-sectional study. Journal of Agromedicine, 20(1), 43-54.

Malhotra, N.K., 2010, Marketing Research: An Applied Orientation Global Edition, Prentice-Hall International, New Jersey.

Miran, B., 2003. Temel İstatistik, Ege Üniversitesi Basımevi, Izmir.

Newbold, P., 1995. Statistics for Business and Economics, New Jersey, Prentice-Hall International.

Pallant, J., 2010, SPSS Survival Manual: A Step by Step Guide to Data Analysis Using SPSS, 4th Edition, McGraw-Hill International.

SGK, 2018. SGK İstatistik Yıllıkları, 2007-2016, http://www.sgk.gov.tr/wps/portal/sgk/tr/kurumsal/istatistik/sgk_istatistik_yilliklari, Accessed: 03.07.2018.

Sharifzadeh, M. S., Damalas, C. A., Abdollahzadeh, G. 2017. Perceived usefulness of personal protective equipment in pesticide use predicts farmers' willingness to use it. Science of the Total Environment, 609, 517-523.

Taştekin, H., Tülü, M., Atasoy, E., Özkan, M., 2012. Türkiye'de tarım sektörü için Avrupa Birliği tarım rehberi örneği, 1. Tarım Sağlığı ve Güvenliği Sempozyumu, 6-7 Nisan 2012 Şanlıurfa.

TUIK, 2015, İşgücü ve Tarım İstatistikleri, http://www.tuik.gov.tr, Accessed: 16.9.2016.

Yıldırım, C., Altuntaş, E., 2015. Tokat ilinde traktör ve tarım makinaları kullanımından kaynaklanan iş kazalarının iş güvenliği açısından değerlendirilmesi, Gaziosmanpaşa Üniversitesi Ziraat Fakültesi Dergisi, 32 (1),77-90.

Yuantari, M. G., Van Gestel, C. A., Van Straalen, N. M., Widianarko, B., Sunoko, H. R., Shobib, M. N. 2015. Knowledge, attitude, and practice of Indonesian farmers regarding the use of personal protective equipment against pesticide exposure. Environmental Monitoring and Assessment, 187(3), 142.

Türkiye Şeker Dış Ticaretinin Yapısı ve Rekabet Gücü

Sinan DURU[1]   Seyit HAYRAN[1]   Aykut Gül[1*]

[1] Çukurova Üniversitesi, Ziraat Fakültesi, Tarım Ekonomisi Bölümü, Adana / Turkiye

MAKALE BİLGİSİ

ÖZET

Şeker, dünya tarihi boyunca gıda güvencesi açısından stratejik öneme sahip bir ürün olmuş ve zamanla özel mevzuat düzenlemesi olan ender gıdalardan biri haline gelmiştir. Dünyada şeker üretimin büyük çoğunluğu verimin yüksek ve maliyetinin düşük olması nedeniyle şeker kamışından elde edilmektedir. Dünyada son 20 yıllık dönemde şeker kamışı ve şeker pancarı üretiminde %50 artış gerçekleşirken, şeker üretimi 10 yıllık dönemde %4'lük artış sağlamıştır. Türkiye gibi şeker pancarı üretimi yoğun olan ülkelerde kota uygulaması şeker üretim artışını sınırlandırmıştır. Son 20 yıllık dönemde şeker pancarı ekim alanlarının ¼ oranında azalmasına karşın verimdeki artış toplam üretim miktarının azalmasını önlemiştir. Bununla birlikte ülkemizde şekerli mamul sektörünün gelişmesi ve hammadde ihtiyacının artması ülkemizi son 20 yıllık dönemde şekerde ihracatçı konumdan ithalatçı konuma getirmiştir. Özellikle son beş yıllık dönemde ihracatçıların C şekeri ihtiyacının karşılamasında iç piyasanın yetersiz olması ve bu ihtiyacın DİİB kapsamında karşılanması şeker ithalatının neredeyse tamamının bu amaçla yapılmasına neden olmuştur. Bu çalışmada, 2000-2019 döneminde Türkiye şeker dış ticaretinin rekabet gücü Açıklanmış Karşılaştırmalı Üstünlük (AKÜ) endeksi ile belirlenmiştir. Şeker ihracatının yıllar içinde azalmasıyla şeker sektörünün AKÜ değeri birin altına düşmüş ve rekabet üstünlüğünü kaybetmiştir. Ancak şekerli mamuller sektörünün sağladığı katma değer daha fazla ihracat geliri elde edilmesine olanak sağlamaktadır. Bu mevcut durumun gelecek yıllarda da süreceği öngörülmüştür.

ARTICLE INFO

ABSTRACT

Sugar has been a strategically important product in terms of food security throughout the world history and it has become one of the rare foods with special legislation regulation over time. The vast majority of sugar production in the world is obtained from sugar cane due to its high efficiency and low cost. In the last 20 years, 50% increase in sugar cane and sugar beet production, while sugar production increased 4% in 10 years period. Sugar beet-producing countries such as Turkey quota application limited the increase in sugar production. Although sugar beet cultivation areas decreased by ¼ in the last 20 years, the increase in yield prevented the decrease in total production amount. In addition to this, the development of the sugar products sector in our country and the increase in the need for raw, materials has transformed our country from exporter to importer position in sugar in the last 20 years in the world. Especially in the last five years, exporters insufficient domestic market to meet the sugar needs and meeting this need within the scope of DIB caused almost all of the sugar imports to be made for this purpose. In this study, during 2000-2019 competitiveness of Turkey's foreign trade sugar is determined by the Revealed Comparative Advantage (RCA) index. RCA value of the sugar sector with the decline in sugar exports over the years fell below one and lost its competitive edge. However, the added value provided by the confectionery industry enables more export revenues. This current situation is expected to continue in the coming years.

1. Giriş

Şeker, şeker pancarı (*Beta Vulgaris l.)* veya şeker kamışından *(Saccharum officinarum L.)* üretilen, form olarak sakkaroz ile izglukoz, glukoz, sakkaroz veya invert şekerin ayrı ayrı ya da karışımının suda çözünmesiyle meydana gelen, çözelti olarak bulunan tatlı bir gıda maddesidir. Şeker, beyaz, yarı beyaz, rafine, ham veya kahverengi şeker olarak beş grupta sınıflandırılmaktadır (Anonim, 2011).

Şeker, kelime kökeni Arapça olup, dünyada ilk defa Milattan Önce (M.Ö.) 4. yüzyılda Hindistan'da şeker kamışından elde edilmiştir. Şeker kamışının kökeni tropik ve sub-tropik iklim özelliği olan Güney Asya ve Güney Batı Pasifik adalarıdır. Şeker pancarı üretimi ise ilk olarak M.Ö. dönemlerde Avrupa, Anadolu ve Orta Doğu coğrafyalarında hastalık tedavilerinde kullanılmak amacıyla yapılmıştır. Günümüzde şeker sanayinde kullanılan şeker pancarı ise 18. yüzyılda Avrupa'da ıslah edilmesiyle şeker endüstrisinde kullanılmaya başlanmıştır (Karayaman, 2010).

Şeker pancarından elde edilen şekerin içinde bulunan sakkarozun (glikoz ve fruktoz) kimyasal olarak bağlı olmasından dolayı sağlık açısından tercih edilmektedir. Şeker pancarı dışında mısır kaynaklı Nişasta Bazlı Şeker (NBŞ) yani glikoz şurubunun, yetiştirilmesinin kolay ve maliyetinin düşük olması nedeniyle son yıllarda üretimi artmıştır. Ancak glikoz şurubunun kullanımıyla, diyabet ve obezite gibi şeker kaynaklı hastalıkların artması NBŞ kullanımının kotaya bağlanmasına neden olmuştur (Anonim, 2018a). Bu amaçla özellikle gelişmiş ülkelerde şeker pancarından üretilen şeker için kota uygulanmaktadır. Türkiye'de ise bu durumun yanı sıra, şeker fabrikalarının özelleştirilmelerini cazip kılmak amacıyla da NBŞ kullanımı için kota uygulaması yapılmaktadır (Uztürk, 2019).

Şeker, stratejik bir tarım ürünü olduğundan şekerle ilgili birçok mevzuat düzenlemeleri mevcuttur. Bu düzenlemeler, 4634 sayılı Şeker Kanunu'na dayanak olarak hazırlanmaktadır. Bu kanun çerçevesinde şeker üretimi kota ile sınırlandırılmakta olup, stok birikmesini önlemek, üretimin etkin ve verimli kullanımını sağlamak için A kotası, B kotası ve C şekeri olmak üzere üç farklı şeker kotası belirlenmiştir. A ve B kotası ile iç piyasadaki şeker miktarı düzenlenmekte olup, C şekeri ise ihracat kapsamında olan şeker olarak belirlenmiştir. Her pazarlama yılı için, A ve B kotalarının miktarı 4634 sayılı Şeker Kanunu'nun 3. maddesi gereğince Resmi Gazete'de yayınlanmakta olup, B kotası, A kotasının %5'ini temsil etmektedir. Nişasta Bazlı Şeker (NBŞ) ise A kotasının %2.5'ine denk gelmekte olup, A kotası kapsamında beş fabrikaya verilmektedir (Anonim, 2001).

Son yıllarda ulusal literatürde şeker piyasası ve pazarı konusunda; şeker kanununun sektörde getirdiği değişiklikler (Tosun ve Arslan, 2016), şeker sanayinin gelişimi ve izlenen politikalar (Erdinç, 2017), şeker sektörünün mevcut durumu ve geleceği (Eştürk, 2018), Şeker fabrikalarının, şeker piyasasında yeri ve önemi (Uztürk, 2019) üzerine çalışmalar yapılmıştır. Uluslararası literatürdeki çalışmalar ise Avrupa Birliği (AB) şeker sektörünün dünyadaki konumu (Maitah et al., 2016), Birleşik Krallık'da şeker üretim ve pazarlamasının bazı sürdürülebilirlik faktörlerinin incelenmesi (Lang et al., 2017), Amerika Birleşik Devletleri (ABD) şeker ithalatını etkileyen faktörlerin incelenmesi (Fuller & Kennedy, 2019) ve küreselleşmenin şeker sektörüne etkileri (Patil, 2020) üzerine gerçekleşmiştir.

Bu çalışmada, dünya ve Türkiye şeker üretim ve ihracatına ilişkin verilerle piyasa yapısından bahsedilerek, 2000-2019 yılları arasında şeker dış ticaretinin rekabet yapısı Balassa'nın Açıklanmış Karşılaştırmalı Üstünlük (AKÜ) Endeksi kullanılarak analiz edilmiştir. Ayrıca aynı dönemde şekerli mamuller sektörünün şeker piyasasına etkileri ortaya konmaya çalışılarak, şeker sektörünün gelişimi için çözüm önerileri sunulmaya çalışılmıştır.

2.Materyal ve Yöntem

2.1. Materyal

Araştırmanın ana materyalini 2000-2019 dönemi yıllarına ait dünya ve Türkiye şeker üretimi ve ihracatına ilişkin ikincil veriler oluşturmuştur. Araştırmada kullanılan istatistiki veriler Food and Agricultural Organization of the United Nations statistical data (FAOSTAT), FO Licht Commodity Analysis, Trade Map, Türkiye İstatistik Kurumu (TÜİK) ve Türkiye Şeker Fabrikaları Anonim Şirketi'nin (TŞFAŞ) internet siteleri veya veri tabanlarından alınmıştır.

Şeker dış ticaretine ilişkin veriler, Dünya Gümrük Örgütü (WCO) tarafından geliştirilmiş Uyumlaştırılmış Mal Tanım ve Kod Sistemi (Harmonized Commodity Desctription and Coding System) kullanılarak elde edilmiştir. Araştırmada, HS 17 nolu fasılda bulunan ve 17 Gümrük Tarife İstatistik Pozisyonu (GTİP) kodu ile başlayan şeker (17.01) ve şekerli mamuller (17.02, 17.03 ve 17.04) (ilave aroma/renk verici madde içermeyen) ürünler ele alınmıştır (Anonim,2019b).

2.2. Yöntem

Araştırmada, Türkiye şeker piyasasının uluslararası alanda rekabet gücünü belirlemek amacıyla Balassa'nın AKÜ Endeksi uygulanmıştır. AKÜ Endeksi, sektörel rekabetçiliği ihracat performansına göre ölçmek ve ihracat yapılarındaki farklılıkları karşılaştırmalı üstünlüğe göre belirlemeyi amaçlamıştır (Abbas & Waheed, 2017). Araştırmada kullanılan Balassa'nın AKÜ Endeks denklemi aşağıda verilmiştir:

$$RCA = \frac{X_{ij}/X_{j}}{X_{iw}/X_{w}} \qquad (1)$$

Denklem 1'de AKÜ Endeksi'nde kullanılan semboller;

X_{ij} = j ülkesinin i malı ihracatı (Türkiye şeker ihracatı)

X_{j} = j ülkesinin toplam ihracatı (Türkiye toplam ihracatı)

X_{iw} = i malının toplam dünya ihracatı (Dünya şeker ihracatı)

X_{w} = Dünya toplam ihracatını (Dünya toplam ihracatı) ifade etmektedir.

Açıklanmış Karşılaştırmalı Üstünlük Endeksi 0 ile ∞ arasında değer almakta olup, bu değer 1'den büyükse sektörün ülke ihracatındaki payının, sektörün dünya genelindeki ihracat payından büyük olduğunu ortaya koyar. Kısaca sektörün ihracat açısından dünyaya göre açıklanmış karşılaştırmalı üstünlüğe sahip olduğu ortaya çıkmaktadır (Bashimov, 2017).

Balassa'nın AKÜ Endeksi'nde farklılıkların karşılaştırılmasını kolayca yorumlayabilmek için endeks dört sınıfa ayrılmaktadır (Hinloopen & Marrewijk, 2001):

Sınıf a = 0< AKÜ ≤ 1; Karşılaştırmalı avantaja sahip değil

Sınıf b = 1< AKÜ ≤ 2; Zayıf karşılaştırmalı avantaj

Sınıf c = 2< AKÜ ≤ 4; Orta karşılaştırmalı avantaj

Sınıf d = 4< AKÜ;   Yüksek karşılaştırmalı avantaja sahip olarak değerlendirilmektedir.

3. Bulgular ve Tartışma

3.1. Dünya şeker üretim, ticareti ve politikaları

Şekerin hammaddesi olan şeker kamışı ve pancarı 2000-2019 yılları arasında dünya üretiminde %45'lik bir artış gerçekleştirmiştir. Bu artışın %96'sı şeker kamışı üretiminden kaynaklı olup, şeker kamışı bu dönemde %50'nin üzerinde bir artış gerçekleştirerek yıllık üretimi iki milyar tona yaklaşmıştır. Şeker pancarında ise artış oranı %10 civarında gerçekleşmiştir (Şekil 1). Ayrıca şeker kamışı, iki milyar tonluk üretim ile dünyada en çok üretimi yapılan bitkisel ürün konumundadır (Anonim, 2018b).
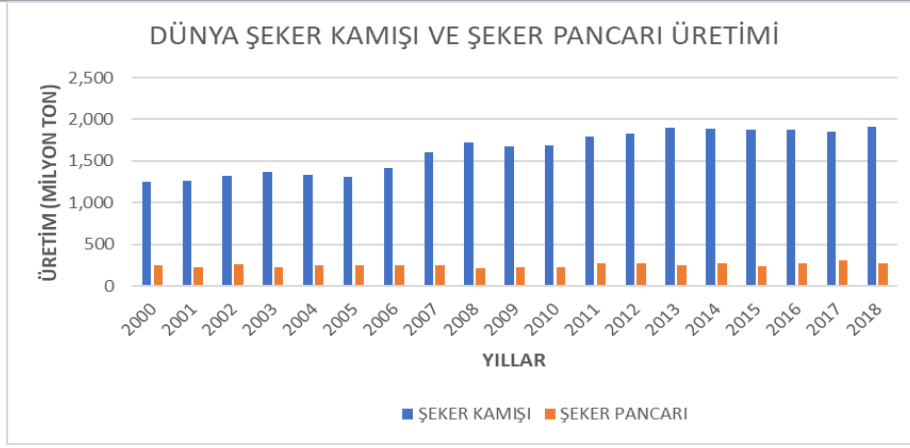
Şekil 1. Dünya Şeker Kamışı ve Pancarı Üretimi (Kaynak: FAOSTAT, 2020)

Şeker pancarı ve kamışından üretilen şekerin sakkaroz saflık oranı %99.95 olup, şeker oranı açısından herhangi bir farklılık bulunmamaktadır. Şeker pancarı üretiminden melas ve yaş küspe yan ürünleri oluşmakta olup, bu ürünlerin gıda sanayinde ve hayvancılıkta kullanılması şeker pancarının ekonomik değerinin yüksek olmasını sağlamıştır (Şimşek, 2018). Ancak bir kilogram şeker kamışı için 1500 litre, şeker pancarı için ise 900 litre gibi aşırı su istekliği göstermeleri su kaynaklarının tükenmesine yol açmaktadır Ayrıca üretimlerinden kaynaklanan toprak kaybı ve özellikle şeker pancarından CO_2 salınımı gibi nedenlerle çevre kirliliğine yol açmaktadırlar (Lang et al., 2017).

Dünya şeker üretiminde son 10 yılda yaşanan dalgalanmalara karşın %4'lük bir artış gerçekleşmiştir. Şeker kamışı; üretiminin şeker pancarına göre daha kolay, maliyetinin ucuz ve yılda birkaç kez hasat edilebilme gibi özelliklere sahip bir bitkidir. Bu durum iklimsel olarak şeker kamışı üretimine uygun olan Brezilya, Hindistan, Tayland ve Çin'in şeker üretimini kolaylaştırmış ve dünyada söz sahibi olmalarına katkı sağlamıştır. Bu özellikler sayesinde bu ülkeler, dünya şeker üretiminin yarısını karşılar duruma gelmiştir (Tablo 1).

Tablo 1. Dünya Şeker Üretiminin Ülke ve Sezonlara Göre Dağılımı (Bin ton)

Ülkeler	Yıl				Payı (%)	Değişim (%)
	2010/11	2015/16	2018/19	2019/20		
Brezilya	39,010	34,650	29,500	29,925	18.00	-23.29
Hindistan	26,446	27,385	34,300	28,900	17.39	9.28
Avrupa Birliği	15,120	14,283	17,982	17,253	10.38	14.11
Tayland	9,978	9,743	14,581	8,250	4.96	-17.32
Çin	10,000	9,050	10,760	10,200	6.14	2.00
Türkiye	2,492	2,000	2,700	2,750	1.65	10.35
Diğerleri	62,458	67,861	69,839	68,900	41.48	10.31
Toplam	165,504	164,972	179,662	166,178	100.00	4.07

Kaynak: F.O. Licht Commodity Analysis - World Sugar Balances, 2020

Dünya şeker ihracatı, 2001-2019 döneminde %50'lik bir artış göstermiş olup, şeker kamışı üretiminin getirdiği avantaj ile Brezilya ve Tayland dünya şeker ihracatının yarısını gerçekleştirmiştir. Türkiye'nin, dünya şeker ihracatındaki payı %1'in altında olup, dünyanın şeker ihracatında önemli bir konumu olan Hindistan, bu dönemde üç kat artış göstererek üçüncü sıraya yerleşmiştir (Tablo 2).

Tablo 2. Dünya Şeker İhracatının Ülke ve Yıllara Göre Dağılımı (Bin ton)

Ülkeler	Yıl					Payı (%)	Değişim (%)
	2001	2005	2010	2015	2019		
Brezilya	11,173	18,147	28,000	24,012	18,049	32.11	61.54
Tayland	3,258	3,041	4,501	7,591	9,539	16.97	192.79
Hindistan	1,299	108	1,764	3,038	5,180	9.21	298.77
Fransa	2,766	2,383	2,339	2,287	2,457	4.37	-11.17
Guatemala	1,130	1,287	1,742	2,138	2,029	3.61	79.56
Türkiye	561	8	77	9	30	0.05	-94.65
Diğerleri	17,072	19,873	17,980	21,201	18,930	33.67	10.88
Toplam	37,259	44,847	56,403	60,276	56,214		50.87

Kaynak: Trademap, 2020

Uluslararası şeker ticaretinin geçmişi 11. yüzyıla dayanmakta olup, şeker pancarından şeker üretimi 19. yüzyılda Avrupa'da başlamıştır (Karayaman, 2010). 1929 yılında yaşanan büyük buhrandan sonra korumacılık önlemleri kapsamında şeker sektöründe kota uygulanmasına başlanılmıştır. İkinci dünya savaşından sonra dünya şeker fiyatları ve üretiminin dengeye oturması için 1953 yılında Şeker Anlaşması yürürlüğe girmiş olup, 1968 yılında Uluslararası Şeker Örgütü (ISO) kurulmuştur. 1994 yılında Dünya Ticaret Örgütü'nün (WTO) kurulmasına kadar geçen sürede birçok şeker anlaşması yapılmış olup, WTO'nun kurulmasından sonra dünya şeker ticaretinin serbestleşmesi için WTO'nun yaptığı çalışmalar yetersiz kalmıştır. Ancak dünyanın önde gelen şeker üretici ülkeleri başta olmak üzere şekerde korumacılık ve kota uygulamalarına devam etmektedir (Kepoğlu, 2008).

Avrupa Birliği, şeker piyasalarında üretim kotası, ticaret mekanizması ve şeker pancarında taban fiyat uygulaması ile dünyadan bağımsız bir sistem oluşturmuştur. Dünya şeker pancarı üretiminin yarısını gerçekleştiren AB'nde üretim; Fransa, Almanya ve Polonya'da yoğunlaşırken, şeker piyasasındaki kotanın %90'ı ise Fransa, Almanya, İngiltere ve Hollanda'da bulunan yedi birlik tarafından kontrol edilmektedir (Maitah et al., 2016; Lang, 2017). Ancak AB 2017 yılında şeker kamışı ve izglukoz üretimini sınırlayan kota uygulamasını kaldırarak 50 yıldır sürdürmüş olduğu pancar üretim sınırı ve asgari fiyat destekleme uygulamasını kaldırmıştır (Anonim, 2019a). Dünyanın

en büyük şeker ithalatçılarından biri olan ABD'de ise üreticilerin siyasi gücünün yüksek olması sebebiyle yurt içi fiyatları desteklemek için uygulanan tarım politikaları şeker ithalatını zorlaşmaktadır. Ancak başta Meksika olmak üzere ABD'nin Serbest Ticaret Anlaşması yaptığı ülkelere kolaylık sağlayarak ihracat imkanı sağlamaktadır (Fuller & Kennedy, 2019).

3.2. *Türkiye'de şeker pancarı üretimi ve izlenen politikalar*

Türkiye'de, uygun iklim özelliklerinden dolayı şekerin %95'i şeker pancarı üretimiyle elde edilmektedir. Türkiye, şeker pancarından şeker üretiminde dünyada dördüncü sırada iken, Avrupa'da ise üçüncü sıradadır (Anonim, 2019a). Şeker pancarı üretimi, aynı zamanda, cumhuriyet döneminde sözleşmeli tarımın uygulandığı ilk tarımsal üretim modelidir.

Türkiye'de şekerde kotalı üretimin yanı sıra şeker üretim maliyetinin diğer ülkelere göre yüksek olması, Türkşeker ve özel fabrikalar için sözleşmeli tarım modeliyle üretim yapan üretici sayısında ciddi bir azalmaya neden olmuştur. 2000 yılında pancar üretici sayısı 411 bin iken, 2010 yılında 196 bine, 2018 yılında ise 106 bine kadar düşmüştür (Anonim, 2019a).

Çalışma kapsamında olan 2000-2019 döneminde şeker pancarı ekim alanı dörtte bir oranında azalmasına rağmen, tarımsal teknolojilerin gelişmesi ile verimde %27'lik artış sağlanarak üretimde düşüşün önüne geçilmiştir (Tablo 3). Böylece şeker pancarı üretim ve ekim alanının azalmasına, kota uygulaması ve alternatif

ürünlerin üretiminin artması yol açmıştır (Anonim, 2019a).

Tablo 3. Yıllara Göre Türkiye Şeker Pancarı Üretimi, Ekim Alanı ve Verim Değerleri

Şeker Pancarı	Yıl						Değişim (%)
	2000	**2005**	**2010**	**2017**	**2018**	**2019**	
Üretim (Ton)	18,821,033	15,181,247	17,463,621	21,149,020	17,436,100	18,085,528	-3.91
Ekim alanı (da)	4,100,230	3,358,120	3,291,669	3,392,742	2,921,044	3,101,000	-24.37
Verim (kg/da)	4,590	4,521	5,451	6,234	5,969	5,832	27.06

da: dekar; kg: kilogram, Kaynak: TÜİK, 2020

Türkiye'de ilk şeker fabrikası 1925 yılında Uşak'da kurulmuş olup, cumhuriyet döneminde tarıma dayalı sanayiye geçişte ilk aşama olmuştur. Daha sonrasında Kırklareli Alpullu, Eskişehir ve Tokat Turhal şeker fabrikaları izlemiş olup, sonrasında bu fabrikalarının ekonomik yapılarının güçlenmesi amacıyla 1935 yılında kurulan Türkiye Şeker Fabrikaları Anonim Şirketi (TŞFAŞ) çatısı altında birleştirilmiştir (Anonim, 2019; Döşer, 2019). Günümüzde TŞFAŞ çatısı altında 15 fabrika olup, ayrıca 12'si özel sektör ve altı tanesi kooperatifler olmak üzere Türkiye 33 adet Şeker Fabrikasına sahiptir (Çalışkan ve ark., 2020).

Türkiye'de şeker üretiminde kota uygulamasına ilk kez 1998 yılında Uluslararası Para Fonu'yla (IMF) yapılan iyi niyet mektubu anlaşması ile geçilmiştir (Eştürk, 2018). Daha sonrasında IMF ile Dünya Bankasına verilen taahhütler kapsamında 2001 yılında yürürlüğe giren 4634 sayılı Şeker Kanunu ile kamu tüzel kişiliğe sahip Şeker Kurumu kurulmuştur. Şeker Kurumu, kanunun verdiği düzenleyici ve denetleyici özelliğiyle şeker piyasalarında üretim ve arz düzenlemelerini sağlama amacını taşımıştır. Bu süreçte, şekerde oluşan stok riskinin azaltılmasına karşın NBŞ ve izglikoz, şekerin yerini almaya başlamıştır (Tosun ve Arslan, 2016). Son olarak 24 Aralık 2017 tarihinde 30280 sayılı Resmi Gazete'de yayınlanan 696 sayılı Kanun Hükmünde Kararname (KHK) kapsamında Şeker Kurumu ve Şeker Kurulu kapatılarak Tarım ve Orman Bakanlığı'na bağlanmış ve sonrasında bakanlık bünyesinde Daire Başkanlığı olarak faaliyetlerini sürdürmektedir (Anonim, 2017a).

Şeker üretimini kısıtlayan en önemli unsurlardan biri artan maliyet olup, köyden kente göç, modernizasyondaki eksiklikler nedeniyle üretim kaybı, toprak analizlerinin yetersiz olması ve şekerin yerini NBŞ'nin alması olarak görülmektedir (Çimenderoğlu, 2020). Şeker fabrikalarındaki şeker satış hacmi ise fiyattan bağımsız olarak ekim alanı, üretim kapasitesi ve üretim miktarı ile doğrudan ilişkilidir (Uztürk, 2019).

3.3. Türkiye şeker üretimi, dış ticareti ve ihracat teşvikleri

Araştırma kapsamında incelenen dönemde Türkiye'nin şeker üretimi aynı seviyede kalmış olup, şeker dış ticaret rakamları çok fazla değişkenlik göstermiştir. Son 20 yıllık dönemde şeker dış ticaretinde roller değişmiş, Türkiye ihracatçı konumdan ithalatçı konumuna dönmüştür. Türkiye, 2001 yılında dünyada en fazla şeker ihraç eden 8. ülke konumunda iken, 2019 yılı sonu itibariyle 72. sıraya gerilemiştir. 2015 yılından itibaren Türkiye'nin şeker ihracatı, şeker ithalatının yanında oldukça düşük seviyelere gerilemiştir (Tablo 4). Bunun en büyük nedeni, 2015 yılında büyük çoğunluğu Dahilde İşleme İzin Belgesi (DİİB) kapsamında mamul madde ihracatçıları için belirlenen C şekerinin ihtiyacı karşılamayıp, ithalat yoluyla temin edilmesidir. 2015 yılında şeker ithalatının %97.82'si bu amaçla gerçekleştirilmiştir. (Anonim, 2017).

Tablo 4. Türkiye Şeker Üretim ve Dış Ticaretinin Yıllara Göre Değişimi

Yıl	Üretim		İhracat		İthalat	
	Ton	İndeks	Ton	USD (Bin)	Ton	USD (Bin)
2000	2,534,623	100	560,668	129,192	2,376	947
2005	2,070,022	82	8,101	4,662	3,926	2,626
2010	2,262,000	89	77,311	45,165	4,213	4,919
2015	1,976,000	78	9,877	6,004	169,693	76,606
2016	2,559,000	101	16,383	10,029	279,910	153,350
2017	2,770,000	109	3,838	3,196	229,863	120,227
2018	2,273,000	90	68,309	24,236	201,192	82,945
2019	2,523,030*	99	30,344	10,334	132,571	65,091
Değişim (%)	-0.46		-94.59	-92.00	5,480	6,773

*Tahminidir, Kaynak: TÜİK ve TŞFAŞ, 2020

Şeker ihracatı, 2 Ekim 2013 tarih ve 28783 sayılı Resmi Gazete'de yayınlanan "Şeker İhracatı ve Ön İzin Belgesi Düzenlenmesine İlişkin Tebliğ" kapsamında yürütülmektedir. Bu tebliğ kapsamında şeker ihracatçıları, Tarım ve Orman Bakanlığı'na bağlı Şeker Dairesi'nden alınan ihracat ön izni kapsamında ihracat yapmaktadırlar (Anonim, 2013).

Türkiye'de şekerli mamuller ihracatına verilen teşvikler ilk kez 1986 yılında, yapımında şeker kullanılan bisküvi, kakao içermeyen şekerli ürünler, çikolata ve kakao içeren ürünlerde dünya ile iç piyasa fiyat farkının ödenmesiyle başlamıştır. Daha sonraki dönemler şeker üretim ve stoğunun fazla olduğu yıllarda uygulanmış olup, 1994 yılında WTO'nun kurulmasıyla verilen destek, ihracatın %20'si ile sınırlandırılmıştır (Kıymaz, 2003).

C şekerinin ihracata konu olması 2001 yılında 4634 sayılı Kanunu'nun yürürlüğe girmesiyle olmuştur. C şekeri, yurt içinde satışa sunulmayan, işlenmek üzere ihracat edilmek şartıyla temin edilen ham veya beyaz şeker olup, ihracatçılara belli ürünlerde mamul ihracatı sonucunda sağlanmaktadır. Bu ihtiyaç, Tarım ve Orman Bakanlığı'nın 2018/34 sayılı "İmalatçı-İhracatçıların, C Şekeri Taleplerinin Yurt İçinden Karşılanması Şartları ve Uygulama Esaslarına Dair Tebliğ" kapsamında temin etmektedirler. Başvurular elektronik ortamda yapılmakta olup, tahsisatlar Ticaret Bakanlığı Bölge Müdürlükleri'nce verilmektedir. Tahsis kapsamında olan mamuller için ihracatçılara sağlanacak şeker miktarları kapasite raporları baz alınarak belirlenmektedir (Anonim, 2018c). İhracatçıların C şekeri talepleri, Şeker Dairesi'nin belirlediği tedarikçiler tarafından yapılmakta olup, C şekeri tahsisatı yapan Şeker Fabrikaları Anonim Şirketleri'nin görev zararı hazineden alacaklar olarak işlenmektedir (Anonim, 2017b).

3.4. Türkiye şeker mamulleri ihracatı ve şeker sektörünün karşılaştırmalı üstünlükleri

Gıda alt sektörü olan şeker imalatı sektörünün yoğunlaşma oranının çok yüksek olması, kakao, çikolata ve şeker imalatı sektörlerinin yoğunlaşma oranının ise orta düzeyde olması şeker hammadde kullanım ihtiyacını artırmaktadır (Anonim, 2018b). Şekerde gümrük vergisi oranı %135 olmasına karşın, DİİB kapsamında firmalara gümrük vergisinden muaf bir şekilde şeker ithalat hakkı tanınmıştır (Anonim, 2019a). Şekerli mamul ihracatçılarının yurt içi alım kapsamında NBŞ fabrikalarından izoglikoz ihtiyaçlarını karşılaması sektörün hammadde olarak şeker ihtiyacının yüksek olduğunun bir göstergesidir.

Tablo 5. Yıllara Göre Türkiye Şekerli Mamuller İhracat Miktarları

Yıl	Kakao İçermeyen Diğer Şeker Mamulleri		Diğer Şekerli Mamuller		Toplam	
	Ton	USD (Bin)	Ton	USD (Bin)	Ton	USD (Bin)
2000	16,334	34,846	112,482	68,452	128,816	103,298
2005	43,536	97,529	78,294	100,116	121,830	197,645
2010	89,003	228,881	108,335	113,375	197,338	342,256
2015	142,243	359,106	216,967	191,812	359,210	550,918
2016	150.228	359,772	215,624	157,655	365,852	517,427
2017	172,813	388,600	258,301	194,154	431,114	582,754
2018	182,515	405,372	254,760	170,333	437,275	575,705
2019	203,597	428,656	297,046	177,982	500,643	606,638
Değişim (%)	1146.61	1130.14	164.08	160.01	288.65	487.27
Payı (%)	40.37	70.66	59.33	29.34		

USD: Amerikan Doları Kaynak: TÜİK, 2020

Son 20 yıllık dönemde şekerli mamuller sektöründe ihracat üç kata yakın artış göstermiş olup, değer bakımından beş katlık bir artış gözlenmiştir. Bunun ana nedeni katma değerli ürün ihracatının sektör içerisindeki oranın artmasıdır. Bu dönemde mamul madde imalatçılarına sağlanan C şekeri desteği sayesinde şekerli mamullerin ihracatında özellikle 2015 yılından sonra ciddi bir artış gerçekleşmiştir (Tablo 5).
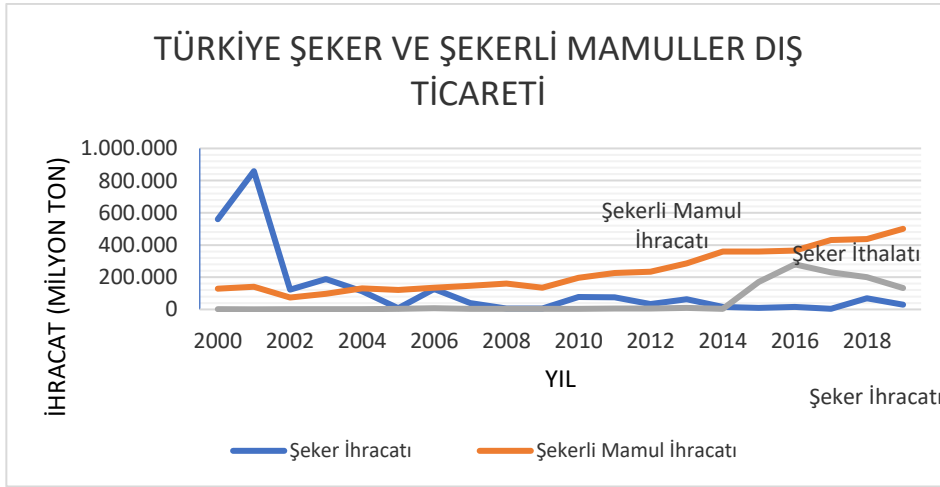
Şekil 2. Yıllara Göre Türkiye Şeker ve Şekerli Mamuller Dış Ticareti (Kaynak: TÜİK, 2020)

Son 20 yıllık dönemde Türkiye şeker sektörünün uluslararası alanda rekabet gücü AKÜ endeksli incelenmiştir. 2000 yılında orta derecede karşılaştırmalı üstünlüğe sahip olan şeker sektörü, ilerleyen yıllarda karşılaştırmalı üstünlüğü AKÜ değeri birin altına düşmesiyle rekabet üstünlüğünü kaybetmiştir. Bunun ana nedeni incelenen dönemde Türkiye'de kota uygulamaları nedeniyle şeker üretiminin artmamasıdır. Şeker üretiminin artmamasıyla beraber iç tüketim ile şekerin gıda sanayinde hammadde olarak kullanımının artması şekerin doğrudan ihracatını azaltarak şeker sektörünün rekabet gücünü oldukça azaltmıştır (Tablo 6).

Tablo 6. Türkiye Şeker Sektörünün Uluslararası Rekabet Gücü (Bin USD)

Yıl	Türkiye		Dünya		AKÜ Değeri	Üstünlük Derecesi
	Şeker İhracat	Toplam İhracat	Şeker İhracat	Toplam İhracat		
2000	129,192	27,774,906	8,861,294	6,277,413,819	3.30	Orta
2005	4,662	73,476,408	13,915,920	10,342,422,169	0.05	Düşük
2010	45,165	113,883,219	29,703,042	15,094,271,000	0.20	Düşük
2015	6,004	143,838,871	23,801,886	16,530,691,171	0.03	Düşük
2019	10,344	171,468,132	19,974,95	18,754,622,224	0.06	Düşük
Değişim (%)	-94.59	517.35	125.42	198.76		

Kaynak: TÜİK, Trademap & Worldbank, 2020

Şekerin gıda sanayinde kullanımının artması, şekerli ve çikolatalı mamul sektörlerinin rekabet gücünü artırmıştır. Uzun (2019) şekerli ve çikolatalı mamuller sektöründeki 42 alt ürün grubunda 34 ürünün rekabet gücünün yüksek olduğunu, beş ürünün sınırda, üç ürünün ise rekabet gücünün düşük olduğunu belirtmiştir. Rekabet gücünün yüksekliği sektörün sahip olduğu bilgi ve birikimin yanı sıra hedef pazarlara yakınlığı, hammadde maliyetinin düşük ve ürünün kaliteli olmasından kaynaklandığını saptamıştır. Bashimov (2017) ise 2002-2015 döneminde şeker ve şeker mamulleri sektörünün rekabet gücü olarak karşılaştırmalı üstünlüğe sahip ve net ihracatçı konumda olduğunu ortaya koymuştur.

4. Sonuç ve Öneriler

Türkiye'de şeker pancarı üretiminde son 20 yıllık dönemde girdi maliyetlerinin yükselmesi, özelleştirmeyle fiyat ile alım garantisinin olmaması ve üretimde kota uygulaması gibi nedenlerle ekim alanlarında azalma ve üretici sayısında %75'lik bir düşüş gerçekleşmiştir. Bu azalma ve düşüşe karşın verimdeki %27'lik artış şeker pancarı üretim miktarındaki azalmanın önüne geçmiştir.

Şeker pancarının destekleme kapsamında olmaması, üretiminin azalmasında önemli faktörlerden birisi olarak görülebilir Ayrıca son yıllarda NBŞ üretiminin artması da şeker pancarı üretim dengelerini bozmaktadır. Şeker pancarı üretiminde destekleme sistemi kurulmasıyla hayvancılık sektöründe yem ve küspe maddesi olarak şeker pancarının daha etkin bir şekilde kullanılması,

katma değerli üretime geçilmesi maliyetleri düşürerek çiftçi sayısının azalmasının önüne geçilecektir.

Türkiye, özellikle son beş yılda şeker dış ticaretinde ihracatçı konumdan ithalatçı konuma düşmüştür. Bunun en büyük nedenleri, ihracatçılar için üretilen C şekerinin talepleri karşılamaması ve 2015 yılında ihracatçıların DİİB kapsamında mamul madde ihraç eden işletmelerin hammadde ihtiyacını ithalat yoluyla karşılamaya gitmesi olmuştur. Önümüzdeki yıllarda şekerli ve çikolatalı mamuller sektöründeki ihracat artışına bağlı olarak şeker ithalatının artacağı öngörülmektedir.

Çalışma dönemini kapsayan son 20 yıllık dönemde şeker sektörünün rekabet düzeyinin azaldığı ve oldukça zayıf düzeye gerilediği gözlenmiştir. Bu dönemde şeker sektöründe üretim artışının sağlanamaması ve şekerli mamul sektörünün hammadde ihtiyacının karşılanması şekerin doğrudan ihracatını azaltmıştır. Ancak şekerli mamullerin katma değerinin yüksek olması şeker sektörünün ürün başına ihracat değerini artırarak genel düzeyde ihracattan sağlanan geliri artırarak ekonomiye katkı sağlamaya devam edecektir.

Kaynaklar

Abbas, S., & Waheed, A. (2017). Trade Competitiveness of Pakistan: Evidence from the Revealed Comparative Advantage Approach. Competitiveness Review: An International Business Journal, 27(5): 462-475. https://doi.org/10.1108/CR-12-2015-0092.

Anonim, (2001). 4634 Sayılı Şeker Kanunu. 19 Nisan 2001 Tarih ve 24378 Sayılı Resmi Gazete. Ankara.

Anonim, (2013). Şeker İhracatı ve Ön İzin Belgesi Düzenlenmesine İlişkin Tebliğ. 2 Ekim 2013 Tarih ve 28783 Sayılı Resmi Gazete. Ankara.

Anonim, (2017a). Olağanüstü Hal Kapsamında Bazı Düzenlemeler Yapılması Hakkında Kanun Hükmünde Kararname Karar Sayısı: KHK/696. 24 Aralık 2017 Tarih ve 30280 Sayılı Resmi Gazete. Ankara.

Anonim, (2017b). 2017 Yılı Faaliyet Raporu. Türkiye Şeker Fabrikaları Anonim Şirketi. 214s. Ankara.

Anonim, (2018a). Nişasta Bazlı Şekerlerin (NBŞ) Sağlığa Etkileri. https://www.saglik.gov.tr/TR,32856/tc-saglik-bakanligi-nisasta-bazli-sekerlerin-nbs-sagliga-etkileri-hakkinda-bilim-kurulu-raporu-basin-duyurusu-12032018.html (Erişim Tarihi: 15.05.2020).

Anonim, (2018b). On Birinci Kalkınma Planı (2019-2023) Tarım ve Gıdada Rekabetçi Üretim Özel İhtisas Komisyon Raporu. T.C. Kalkınma Bakanlığı. Ankara.

Anonim, (2018c). İmalatçı-İhracatçıların, C Şekeri Taleplerinin Yurt İçinden Karşılanması Şartları ve Uygulama Esaslarına Dair Tebliğ. 5 Ekim 2018 Tarih ve 30556 Sayılı Resmi Gazete. Ankara.

Anonim, (2019a). Sektör Raporu 2018. Türkiye Şeker Fabrikaları A.Ş. Ankara.

Anonim, (2019b). İstatistik Pozisyonlarına Bölünmüş Türk Gümrük Tarife Cetveli (Karar Sayısı: 1951). 30 Aralık 2019 Tarih ve 30994 Sayılı Resmi Gazete. Ankara.

Anonymous, (2020a). http://www.fao.org/faostat/en/#data/QC. (Erişim Tarihi: 31.05.2020).

Anonymous,(2020b).https://www.trademap.org/Country_SelProduct_TS.aspx?nvpm=1%7c%7c%7c%7c%7c1701%7c%7c%7c4%7c1%7c1%7c1%7c2%7c1%7c2%7c2%7c1%7c1 (Erişim Tarihi: 06.06.2020).

Anonymous,(2020c). https://www.agra-net.com/agra/international-sugar-and-sweetener-report/ (Erişim Tarihi: 09.06.2020).

Anonymous,(2020d).https://wits.worldbank.org/CountryProfile/en/Country/WLD/Year/2000/Summarytext (Erişim Tarihi: 25.06.2020).

Bashimov, G. (2017). Türkiye'nin Tarım ve Gıda Ürünlerinde Karşılaştırmalı Üstünlüğü. Türk Tarım ve Doğa Bilimleri Dergisi, 4(3), 319-330. https://dergipark.org.tr/tr/download/article-file/328202.

Çalışkan, M.E., Çalışkan, S., Demirel, U., Aksoy, E. ve Arıoğlu, H.H. (2020, 13-17 Ocak). Nişasta ve Şeker Bitkileri Üretiminde Mevcut Durum ve Gelecek [Konferans Sunumu]. Türkiye Ziraat Mühendisliği IX. Teknik Kongresi. Ankara, Türkiye. https://www.zmo.org.tr/resimler/ekler/3e99ecaf98a5e17_ek.pdf

Çimenderoğlu, S. (2020). Şeker Fabrikalarının Sosyoekonomik Etkilerinin Değerlendirilmesine Yönelik Bir Çalışma: Kastamonu Örneği [Yayınlanmamış Yüksek Lisans Tezi]. Çanakkale Onsekiz Mart Üniversitesi.

Döşer, B. (2019). İklim Değişikliğinin İç Anadolu Bölgesi'nde Şeker Pancarının Tarımsal Üretim Ekonomisi Üzerine Olası Etkileri [Yayınlanmamış Yüksek Lisans Tezi]. İstanbul Üniversitesi.

Erdinç, Z. (2017). Türkiye'de Şeker Sanayi'nin Gelişimi ve Şeker Sanayinde İzlenen Politikalar. Anadolu Üniversitesi Sosyal Bilimler Dergisi, 17(3), 9-26. https://doi.org/10.18037/ausbd.417269.

Eştürk, O. (2018). Türkiye'de Şeker Sektörünün Önemi ve Geleceği Üzerine Bir Değerlendirme. Anadolu İktisat ve İşletme Dergisi, 2(1), 67-81. https://dergipark.org.tr/en/download/article-file/462828.

Fuller, K., & Kennedy, P.L. (2019). A Determination of Factors Influencing Sugar Trade. International Journal of Food and Agricultural Economics, 7(1), 19-29. DOI: 10.22004/ag.econ.283880.

Hinloopen, J., & Marrewijk, C. V. (2001). On the Empirical Distribution of the Balassa Index. Review of World Economics, 137(1), 1-35. http://www2.econ.uu.nl/users/marrewijk/eta/pdf%20files/ballassa%20wwa.pdf.

Karayaman, M. (2010). Osmanlı Devleti'nde Şeker Fabrikası Kurma Teşebbüsleri. Tarih İnceleme Dergisi, 25(1), 297-318. https://dergipark.org.tr/tr/download/article-file/58749.

Kepoğlu, A. (2008). Şeker Pancarında Kota Uygulamalarının Şeker Pancarı Üretimine Etkileri ve Üreticilerin Sosyo-Ekonomik Durumlarında Meydana Gelen Değişimler: Eskişehir İli Alpu İlçesi Araştırması [Yayınlanmamış Yüksek Lisans Tezi]. Ankara Üniversitesi.

Kıymaz, T. (2003, 8-9 Ocak). Avrupa Birliği (AB) ve Türkiye'de Şeker Politikaları [Konferans Sunumu]. AB Genişleme Sürecinde Tarımsal ve Kırsal Politikalar Sempozyumu, Ankara. https://www.zmo.org.tr/resimler/ekler/fe77ac7060e716f_ek.pdf?tipi=14&sube=

Lang, T., Schoen, V., Hashem, K., McDonald, L., Parker, J., & Savelyeva, A. (2017). The Environmental, Social, and Market Sustainability of Sugar. Advances in Food Security and Sustainability, Amsterdam: Elsevier, pp. 115–36, chp. 5.

Maitah, M., Rezbova, H., Smutka, L., & Tomsik, K. (2016). European Sugar Production and Its Control in the World Market. Sugar Tech, 18(3), 236-241. https://doi.org/10.1007/s12355-016-0439-9.

Patil, B.V. (2020). Globalization is Changing The Role of Sugar Industry? Studies in Indian Place Names (UGC Care Journal). 40(42), 71-79. https://archives.tpnsindia.org/index.php/sipn/article/view/2236/2159.

Şimşek, G. (2018). Şeker Fabrikalarının Ekonomik ve Sosyal Etkileri: Erzurum Şeker Fabrikası Örneği. Uluslararası Sosyal Araştırmalar Dergisi, 11(60), 1136-1152. http://dx.doi.org/10.17719/jisr.2018.2862.

Tosun, F. & Arslan, S. (2016). 4634 Sayılı Şeker Kanunu Sonrasında Türkiye Şeker Sanayinde Meydana Gelen Gelişmeler. Tarla Bitkileri Merkez Araştırma Enstitüsü Dergisi, 2016(25), 328-333. DOI: 10.21566/tarbitderg.282861.

Uzun, B. (2019). Türkiye Çikolatalı ve Şekerli Mamuller Sektörünün Uluslararası Rekabet Gücünün İncelenmesi [Yayınlanmamış Yüksek Lisans Tezi]. İstanbul Ticaret Üniversitesi.

Uztürk, N.E. (2019). Türkiye'de Özelleştirme Süreci İçerisinde Şeker Fabrikalarının Yeri [Yayınlanmamış Yüksek Lisans Tezi]. Yıldız Teknik Üniversitesi.

Turkey's Competitive Power in the International Wheat Market

Ozan KILIÇ[1]   Fatma Handan GİRAY[2*]

[1]*Isparta University Graduate School of Applied Science, Isparta/ Turkey*
[2]*Eskişehir Osmangazi University, Faculty of Agriculture, Department of Agriculture Economics, Eskişehir/Turkey*

ABSTRACT

The aim of this study is to analyse the competitive power of wheat and wheat originated commodities produced in Turkey in export markets. A well-recognized measure of Revealed Comparative Advantage (RCA), Balassa's Index, was adopted in the study in order to analyse competitiveness. The study covers the period of between 2001 and 2018. The results indicate that Turkey had a comparative advantage for wheat in 2001, but this was later lost, although the RCA was comparatively high in wheat products exports from 2001 to 2018. This shows that Turkey has significant potential for specialization in the production and export of wheat originated commodities to generate more foreign trade revenues for the country.

1. Introduction

Wheat has been considered a blessed product for societies since the beginning of its cultivation, not only for its role in nutrition but also because of its social, cultural and historical value. Currently, it also maintains its importance in human nutrition despite all the negative arguments about it, and the effects of the debates against wheat remain marginal. Wheat is still one of the most produced grains in the world after maize and rice (Özberk et al., 2016) because of its significant contribution to agriculture, animal feeding, human nutrition, and its strategic importance through economic and socio-cultural aspects. Wheat is an important calorie source that can be grown over a wide geographical area. It has high nutritional value and a good amino acid balance, and it can be easily stored, transported and processed.

Wheat is an annual plant of the Gramineae family and belongs to the genus Triticum. Wheat grain consists of three parts, which are the pericarp, the germ (embryo) and the endosperm. Bran is obtained from the pericarp part of the grain and is generally used in the feed industry, while the germ, which is used in nutrition and wheat oil production, remains with the bran or is separated from it. The endosperm constitutes 85% of the grain, and flour is obtained from this part (Geçit, 2011).

Özberk et al. (2016) reports that Turkey is in the first place in terms of the number of wild relatives of wheat. There are 28 taxa of wheat and hundreds of local races. This was the gene pool which formed modern wheat, which currently includes 198 bread wheats and 61 durum wheat varieties.

The aim of this study is to analyse the international competitive power of wheat, which is historically and socio-economically important for Turkey. In order to achieve this, first, the structure of the wheat market in Turkey is discussed in the framework of statistical data and agricultural policies, then Revealed Comparative Advantage (RCA), Balassa's Index, was calculated for the period of 2001-2018. Wheat is the most important agricultural product in Turkey in terms of production area and quantity, and affects many sectors directly or indirectly. It is an income source for the rural population, an input for industry, a food, and an important item for foreign trade. Investigating supply, demand, actors and policies which are drivers for the wheat market, and analysing foreign trade and competitive power are crucial for future forecasts and developing policy recommendations.

2. Material and Methodology

The data used in the research was determined by following the scientific literature compiled from the relevant statistical sources. The main data sources were the Turkish Statistical Institute (TURKSTAT), the United Nations Food and Agriculture Organization (UN FAO) and the International Trade Centre (INTRACEN). The data used covers the years 2001-2018. In accordance with the purpose and the method of analysis, wheat production, consumption and foreign trade data were obtained from the online databases of the sources specified for the period 2001-2018 in order to analyse the current status and calculate the RCA to reveal the international competitiveness of Turkey's wheat sector.

In comparing the countries, labour productivity, capital structure, raw material costs and labour costs are used as criteria (Gündüz et al. 2004). In this study, the well-recognized measure of Revealed Comparative Advantage was selected to analyse

competitiveness in the study. In measuring the competitiveness of countries at the international level, Balassa's RCA index (1965) is conventionally used. The RCA index, which is used to measure the export performance of a product, can be shown as follows (Aktan and Vural, 2004):

$$RCA_{ij} = (X_{ij} / X_{it}) / (X_{wj} / X_{wt})$$

X_{ij}:   Total export value of item j in country i.

X_{it}:   Total export value of country i.

X_{wj}: World export value of item j.

X_{wt}: World export value.

According to Coxhead (2007), if an RCA coefficient for a product of a country is bigger than 1, it indicates that the export share of that product of the country in the year t is greater than its share in total world exports. In other words, the country has specialized in this product and has competitive power in its export. (Erkan et al., 2015)

3. Findings and Discussion

3.1. World Wheat Market

The world cultivation area, production and yield statistics of wheat are presented in Table 1. It can be seen that there was a significant increase in total world wheat production between 2001 and 2018. Production was 588 million tonnes in 2001, and reached 734 million tonnes in 2018. In other words, world wheat production increased by approximately 25% in the last two decades. This increase in production despite the cultivation areas remaining almost the same in that period, indicates a yield increase. Indeed, the data in Table 1 show that wheat yield per hectare increased from 2742 kg in 2001 to 3425 kg in 2018, an increase of 25%, and wheat production has increased significantly over the years even though the cultivation areas have not changed.

Table 1. World wheat cultivation area, production and yield statistics

Years	Cultivation Area		Production		Yield	
	Million ha	Index (2001=100)	Million tonnes	Index (2001=100)	kg/ha	Index (2001=100)
2001	214.6	100.0	588.2	100.0	2742	100.0
2002	214.9	100.1	592	100.6	2755	100.5
2003	207.4	96.6	550.1	93.5	2652	96.7
2004	215.7	100.5	634.9	107.9	2943	107.3
2005	221.6	103.3	626.9	106.6	2829	103.2
2006	212.6	99.1	614.5	104.5	2891	105.4
2007	215.5	100.4	606.7	103.1	2815	102.7
2008	222.4	103.6	681	115.8	3062	111.7
2009	225.3	105.0	684.1	116.3	3037	110.8
2010	215.5	100.4	640.3	108.9	2972	108.4
2011	220.5	102.7	697.6	118.6	3165	115.4
2012	217.8	101.5	672.7	114.4	3089	112.7
2013	218.9	102.0	710.9	120.9	3248	118.5
2014	219.9	102.5	726.3	123.5	3303	120.5
2015	223.9	104.3	751.9	127.8	3358	122.5
2016	220.3	102.7	749	127.3	3401	124.0
2017	218.5	101.8	771.7	131.2	3531	128.8
2018	214.3	99.9	734	124.8	3425	124.9

Source: (FAO, 2020a)

The amounts and shares of production of the countries which are in the top ranks in world wheat production are given in Table 2. The biggest wheat producer in the world is China with 131 million tonnes. This amounts to 17.9% of world wheat production, and is followed by India (13.5%), Russia (9.8%), the USA (6.9%) and France (4.8%). These top five countries together produce more than half of the total wheat traded in world markets. Turkey ranks eleventh in world wheat production, with 20 million tonnes of production and 2.7% of the share.

Table 2. Top wheat producing countries (2018)

Rank	County	Production	
		Tonnes	%
1	China	131 440 500	17.91
2	India	99 700 000	13.58
3	Russia	72 136 149	9.83
4	USA	51 286 540	6.99
5	France	35 798 234	4.88
6	Canada	31 769 200	4.33
7	Pakistan	25 076 149	3.42
8	Ukraine	24 652 840	3.36
9	Australia	20 941 134	2.85
10	Germany	20 263 500	2.76
11	Turkey	20 000 000	2.72
12	Argentina	18 518 045	2.52
	Other countries	182 462 883	24.86
	Total	734 045 174	100

Source: (FAO, 2020b)

3.2. World Wheat Foreign Trade

Changes in the world wheat production are given in Table 3. When the values in the table are analysed, it can be seen that the exports of all countries decreased between 2014 and 2016. In countries other than Russia, Canada and the USA, this decline also continued in 2017. The biggest wheat exporters at the beginning of the period were Canada and the USA, but the situation changed in favour of Russia at the end of the period because of these declines. In 2018, the total value of world wheat exports was $41 billion, and the largest wheat exporting country was Russia, with $8.4 billion in export revenue. Thus, Russia realized one fifth of total world wheat exports. Russia was followed by Canada, the USA and France in that order, and these four countries together realized 58% of world wheat exports in 2018.

Table 3. Wheat exporting countries

Rank	Countries	Expert value (000 $)				
		2014	2015	2016	2017	2018
1	Russia	5 423 131	3 948 719	4 215 803	5 791 013	8 432 493
2	Canada	7 189 829	6 220 979	4 504 561	5 089 422	5 700 484
3	USA	7 780 927	5 632 586	5 382 154	6 096 872	5 436 883
4	France	5 424 535	4 269 282	3 371 809	2 994 202	4 128 547
5	Australia	5 372 388	4 429 945	3 610 022	4 655 434	3 100 410
6	Ukraine	2 290 754	2 238 182	2 717 474	2 759 757	3 004 277
7	Argentina	603 676	1 032 845	1 867 745	2 361 855	2 489 495
8	Romania	1 275 029	769 185	1 265 113	1 122 751	1 226 375
9	Germany	3 074 909	2 427 199	1 933 068	1 614 791	1 162 955
Other countries		9 370 437	7 807 532	7 609 858	6 483 056	6 386 793
World		47 805 615	38 776 454	36 477 607	38 969 153	41 068 712

Source: (INTRACEN, 2019a)

Developments in world wheat import are presented in Table 4. Total world wheat import was approximately $43 billion in 2018. The biggest wheat importer was Egypt with $2.6 billion, followed by Indonesia, Algeria, Italy and the Philippines, in that order. Turkey was the ninth country, with an import value of approximately $1.3 billion in 2018.

Table 4. Wheat exporting countries

Rank	Countries	Import value (000 $)				
		2014	2015	2016	2017	2018
1	Egypt	3 066 217	2 536 044	1 537 611	2 624 361	2 636 468
2	Indonesia	2 387 262	2 082 768	2 408 210	2 647 825	2 570 952
3	Algeria	2 372 542	2 400 320	1 790 473	1 788 702	1 845 238
4	Italy	2 391 664	2 046 597	1 803 299	1 718 699	1 823 890
5	Philippines	922 529	982 107	1 040 762	1 303 522	1 682 640
6	Japan	1 971 103	1 652 510	1 361 701	1 528 644	1 639 761
7	Brazil	1 812 451	1 216 466	1 335 389	1 149 306	1 502 383
8	Spain	1 384 305	1 205 959	1 303 538	1 203 976	1 328 235
9	Turkey	1 545 853	1 103 420	892 409	1 043 327	1 289 386
Other countries		34 521 019	27 174 639	25 729 537	27 139 943	26 826 174
World		52 374 945	42 400 830	39 202 929	42 148 305	43 145 127

Source: (INTRACEN, 2019b)

Cultivation area, production and yield quantities of wheat in Turkey are given in Table 5. During 2001-2018, the cultivation area of wheat in Turkey showed a downward trend. The cultivation area was 9.3 million hectares in 2001, but decreased by 22% to 7.2 million hectares in 2018. No significant change in the amount of production was observed, and it remained around 20 million tonnes, which is the general long-term annual average of wheat production in the country. During this period, increasing yields in world wheat production were also seen in Turkey. The yield per decare was 203 kg in 2001; it increased by 35% by 2018, reaching 274 kg per

decare. The reason why wheat production did not decrease despite the decrease in cultivation area was this significant increase in yield. However, Turkey's wheat yield figure is still below the world average.

Table 5. Wheat cultivation area, production and yield in Turkey

Years	Cultivation area		Production		Yield	
	000 ha	Index (2001=100)	000 tonnes	Index (2001=100)	kg/da	Index (2001=100)
2001	9 350	100	19 000	100	203	100
2002	9 300	99	19 500	103	210	103
2003	9 100	97	19 000	100	209	103
2004	9 300	99	21 000	111	226	111
2005	9 250	99	21 500	113	232	114
2006	8 490	91	20 010	105	236	116
2007	8 098	87	17 234	91	213	105
2008	8 090	87	17 782	94	220	108
2009	8 100	87	20 600	108	254	125
2010	8 103	87	19 674	104	243	120
2011	8 096	87	21 800	115	269	133
2012	7 530	81	20 100	106	267	132
2013	7 773	83	22 050	116	284	140
2014	7 919	85	19 000	100	240	118
2015	7 867	84	22 600	119	287	141
2016	7 672	82	20 600	108	269	133
2017	7 669	82	21 500	113	280	138
2018	7 299	78	20 000	105	274	135

Source: (TUİK, 2019a)

3.3. Wheat Supply, Prices, Consumption and Self-sufficiency In Turkey

The data on wheat supply, consumption per capita, self-sufficiency and prices in Turkey are given in Table 6. During the period discussed in the study, wheat supply in the country increased by 29% from 20 million tonnes 26 million tonnes, while consumption per capita decreased from 225 kg in 2001 to 175 kg in 2018. The data show that wheat prices increased between 2001 and 2008. The highest price, $439/tonnes, occurred in 2008, when the supply was at its lowest level of the period investigated, but declined later. Although the supply, prices and consumption rose and fell, it is seen that the country was either self-sufficient or close to self-sufficiency.

Table 6. Wheat supply, consumption and self-sufficiency in Turkey

Years	Supply		Consumption per capita		Self sufficiency	Price*	
	000 tonnes	Index (2001=100)	kg	Index (2001=100)	%	$/tonne	Index (2001=100)
2001	20 474	100	225	100.0	107	127	100
2002	19 218	94	230	102.2	94	164	129
2003	19 539	95	227	100.9	96	222	175
2004	20 171	99	212	94.2	98	254	200
2005	22 549	110	214	95.1	106	268	211
2006	22 550	110	..	..	121	249	196
2007	21 548	105	..	..	100	322	254
2008	18 798	92	207	92.0	96	439	346
2009	20 432	100	216	96.0	95	328	258
2010	22 418	109	200	88.9	115	351	276
2011	22 766	111	214	95.1	102	351	276
2012	23 826	116	229	101.8	105	336	265
2013	23 024	112	225	100.0	98	348	274
2014	25 022	122	213	94.7	102	338	266
2015	23 736	116	201	89.3	89	285	224
2016	25 467	124	183	81.3	114	266	209
2017	24 053	117	182	80.9	104	242	191
2018	26 427	129	175	77.8	112	228	180

Source: (TEPGE, 2018, TUİK, 2019b); *(FAO, 2020c).

3.4. Turkey's Foreign Trade in Wheat and Wheat Products

Variation by years in the quantity and quality of Turkey's wheat exports and imports is given in Table 7. When the data in the table are analysed, it is seen that wheat exports fell from 1.1 million tonnes in 2001 to about 70 thousand tonnes in 2018, with an enormous decline rate of 94%, while the quantity and values of imports increased by 16 times and 25 times respectively over the same period.

Wheat production changes from one year to another according to the climate conditions. During years when production is low, wheat imports increase in order to maintain the supply, whereas in high production years, the state is involved in the market as a buyer. In fact, Turkey regularly imports wheat in order to provide higher quality raw material and/or maintain a reasonable price to meet the wheat products industries' needs and to be able to compete with other countries. Even in years when the domestic production is adequate, quality wheat imports take place.

Table 7. Turkey's wheat export and import by years

	Export quantity		Export value		Import quantity		Import value	
	tonnes	Index (2001=100)	000 $	Index (2001=100)	tonnes	Index (2001=100)	000 $	Index (2001=100)
2001	1 117 969	100	136 225	100	346 827	100	49 621	100
2002	55 317	4.9	9 780	7.2	1 097 766	317	148 010	298.3
2003	938	0.1	401	0.3	1 846 284	532	277 543	559.3
2004	864	0.1	359	0.3	1 065 389	307	221 868	447.1
2005	327 931	29.3	52 155	38.3	135 596	39	25 031	50.4
2006	685 673	61.3	100 853	74	239 874	69	52 624	106.1
2007	33 921	3.0	9 132	6.7	2 147 107	619	570 390	1 149.50
2008	8 005	0.7	5 569	4.1	3 708 003	1 069	1 483 190	2 989.00
2009	301 457	27	60 692	44.6	3 392 692	978	901 858	1 817.50
2010	1 171 002	104.7	200 848	147.4	2 554 189	736	655 044	1 320.10
2011	5 233	0.5	2 580	1.9	4 754 682	1 371	1 623 089	3 271.00
2012	116 079	10.4	34 248	25.1	3 719 174	1 072	1 125 977	2 269.20
2013	275 132	24.6	79 317	58.2	4 053 001	1 169	1 289 235	2 598.20
2014	68 572	6.1	35 356	26	5 285 243	1 524	1 545 853	3 115.30
2015	68 798	6.2	32 394	23.8	4 349 820	1 254	1 103 420	2 223.70
2016	26 503	2.4	11 439	8.4	4 225 784	1 218	892 409	1 798.50
2017	42 014	3.8	14 828	10.9	4 990 867	1 439	1 043 327	2 102.60
2018	69 989	6.3	24 034	17.6	5 781 704	1 667	1 289 386	2 598.50

Source: (INTRACEN, 2019c)

Turkey imports wheat, but wheat related exports from the country are mostly based on processed products (Mızrak, 2018). In fact, this is the main reason behind Turkey's progressively increasing wheat imports.

Variation in the total export value of wheat products for the period of 2001-2018 is given in Table 8. The data in the table show that the export of wheat products increased by 13 times between 2001 and 2018, rising from $131 million to $1.7 billion. The wheat products exported are mostly wheat flour, pasta, biscuits, semolina and bulgur (TMO, 2017).For example, the composition of total wheat and wheat products exports in 2016/2017 was as follows: wheat flour, 72%; pasta,

18%; biscuits, 9%; bulgur-semolina, 1%; and wheat 1%. The most important importer countries for Turkey's wheat flour are Iraq, Syria, Sudan, Angola, the Philippines, Benin, Madagascar, Israel and Indonesia; the main importers of pasta from Turkey are Benin, Angola, Iraq, Somali, Japan, Djibouti, Syria, Libya, Niger and Cameroon; for biscuits, Iraq, Syria, Yemen, Saudi Arabia, Libya, Germany, Israel and Lebanon are the top importer countries from Turkey; bulgur and semolina are mostly imported by Saudi Arabia, Senegal, the USA, Ghana, Tanzania, Kuwait, Yemen, Jordan, Syria, Ukraine, Cameroon and Iraq (TEPGE, 2018).

Table 8. Turkey's wheat products export values by years

Years	Wheat products exports	
	Total value (000 $)	Index (2001=100)
2001	131 114	100
2002	164 044	125
2003	239 009	182
2004	304 125	232
2005	348 444	266
2006	401 959	307
2007	532 908	406
2008	711 939	543
2009	678 128	517
2010	804 479	614
2011	1 037 190	791
2012	1 234 702	942
2013	1 544 821	1 178
2014	1 656 090	1 263
2015	1 505 591	1 148
2016	1 500 485	1 144
2017	1 618 271	1 234
2018	1 740 502	1 327

Source: (INTRACEN, 2019d)

3.5. Turkey's Competitive Advantage for Wheat and Wheat Products in Export

The concept of competitive advantage was first introduced by the famous economic theorist Adam Smith. At the time, it was considered a very proper tool for increasing the foreign trade, welfare and competitiveness of countries through the studies of classical economists such as David Ricardo, J.S. Mill and A. Marshall (Demir, 2004; Peker, 2014). The first international trade theory, Absolute Advantage, was introduced by Adam Smith (1766). The theory argues that countries should export products that they can produce at a low cost and import products that they produce at a high cost. Later, the Comparative Advantages Theory was proposed by David Ricardo (1817). Unlike Adam Smith, Ricardo emphasizes that a country needs to specialize in the export of a particular product or service, and to import the other goods (Erkan, 2012; Peker, 2014).

The RCA index values of Turkey and the top wheat producing countries were calculated for wheat, and are presented in Table 9. It was found that RCA values were below 1 except in 2001. Although the RCA in 2001 was bigger than 1 (1.83), this was only one year during the period 2001-2018, and it can be concluded that Turkey has no competitive power for wheat in general.

On the other side, Russia, which is one of the most important producers on the world wheat market, is the country with the highest competitive power, with an RCA value of 8.79. It is followed by Canada with an RCA coefficient of 5.93.

Table 9. Wheat RCA Index values by countries and years*

Years	Turkey	Russia	Canada	Australia	France	USA
2001	1.83	0.61	4.05	14.87	2.6	1.95
2002	0.11	2.96	3.16	14.11	2.2	2.14
2003	0.00	2.7	3.44	10.37	2.98	2.52
2004	0.00	1.36	3.89	16.37	2.82	2.91
2005	0.41	2.73	3.61	12.49	3.22	2.85
2006	0.68	2.63	4.8	11.9	3.26	2.36
2007	0.04	4.64	4.73	5.29	2.96	3.25
2008	0.02	2.18	5.17	6.1	3.38	3.1
2009	0.23	3.51	6.46	9.34	3.12	1.96
2010	0.81	2.39	5.39	8.32	4.18	2.43
2011	0.01	2.71	4.86	8.89	4.4	2.87
2012	0.08	3.24	5.1	9.74	3.4	1.99
2013	0.20	2.54	5.46	8.98	4.17	2.56
2014	0.09	4.33	6.01	8.45	3.8	1.91
2015	0.10	4.9	6.5	9.89	3.69	1.6
2016	0.04	6.49	5.08	8.37	3.03	1.63
2017	0.04	7.33	5.5	9.22	2.6	1.79
2018	0.07	8.79	5.93	5.72	3.4	1.53

*Calculated from INTRACEN data

The RCA Index values of wheat products are given in Table 10. According to the finding, the RCA index was always bigger than 1 between 2001 and 2018, increasing from 1.48 in 2001 to 2.64 in 2018. In 2001, Turkey was behind Italy, Belgium, France and Netherlands in this regard until 2018. The country with the highest RCA index value in all years was Italy. However, it is seen from the index values that Turkey underwent the most development, and caught up with Italy over those years.

Table 10. RCA Index values of wheat products by countries and years*

Years	Turkey	Italy	Belgium	France	Canada	Netherlands	Germany	USA
2001	1.48	2.74	2.54	1.7	1.36	1.58	1.13	0.72
2002	1.52	2.73	2.35	1.69	1.53	1.67	1.17	0.7
2003	1.63	2.66	2.34	1.82	1.64	1.64	1.16	0.71
2004	1.6	2.74	2.29	1.97	1.62	1.6	1.19	0.72
2005	1.63	2.86	2.24	2.09	1.63	1.52	1.25	0.75
2006	1.70	2.88	2.18	2.06	1.73	1.57	1.27	0.72
2007	1.77	2.66	2.08	2.18	1.74	1.5	1.21	0.71
2008	1.83	3.04	2.15	2.12	1.62	1.51	1.31	0.73
2009	1.81	2.94	2.05	2.01	1.81	1.69	1.33	0.74
2010	2.22	3.00	2.14	2.17	1.91	1.81	1.37	0.76
2011	2.49	2.99	2.24	2.34	1.82	2.17	1.35	0.77
2012	2.56	3.03	2.34	2.41	1.82	2.16	1.37	0.79
2013	2.95	2.88	2.23	2.37	1.74	2.24	1.33	0.77
2014	2.91	2.80	2.2	2.26	1.67	2.19	1.27	0.73
2015	2.71	2.75	2.14	2.13	1.89	2.06	1.21	0.74
2016	2.54	2.57	2.19	2.08	1.97	2.04	1.18	0.67
2017	2.55	2.57	2.21	2.25	1.96	1.86	1.21	0.65
2018	2.64	2.65	2.29	2.26	2.13	2.01	1.26	0.63

* Calculated from INTRACEN data

4. Results

Between 2001 and 2018, world wheat production significantly increased even though the cultivation areas remained the same, thanks to increases in yield. The wheat yield was 2742 kg / ha in 2001, and reached 3425 kg / ha in 2018. Similar developments were also observed in Turkey.

In the study, the competitiveness of Turkey for wheat and wheat products was analysed by calculation of Balassa's RCA Index values for the period 2001-2018. The results show that Turkey has no competitive power for unprocessed wheat, but has a strong position in wheat products, particularly wheat flour and pasta. That is to say that Turkey has an advantage in wheat flour and pasta export markets and import progressively increasing amount of wheat in order to meet quality wheat deficit in the country. Although it is good to export value added products for the economy of the country, considering the strategic importance of wheat, it is suggested that emphasis be put on increasing quality wheat production domestically and maintaining competitive power in the world market of wheat products.

References

Aktan, C.C., Vural, İ.Y., (2004). Rekabet Gücü ve Rekabet Stratejileri. Türkiye İşveren Sendikaları Konfederasyonu, Rekabet Dizisi:3, 131s.

Balassa, B., (1965). Trade Liberalization and Revealed Comparative Advantage. The Manchester School of Economic and Social Studies, 33 (2), 99-123.

Coxhead, I., (2007). A New Resource Curse? Impacts of China's Boom on Comparative Advantage and Resource Dependence in Southeast Asia. World Development, 35 (7), 1099-1119.

Demir, M., (2004). Dış Ticaret İşlemleri ve Muhasebesi. Ankara, Detay Yayıncılık.

Erkan, B., (2012). Ülkelerin Karşılaştırmalı İhracat Performanslarının Açıklanmış Karşılaştırmalı Üstünlük Katsayılarıyla Belirlenmesi: Türkiye-Suriye Örneği. Uluslararası Yönetim İktisat ve İşletme Dergisi, 8 (15), 195-218. Retrieved from https://dergipark.org.tr/tr/pub/ijmeb/issue/54849/751081

FAO, (2020a). İstatistik Bölümü İnternet Sitesi. Erişim Tarihi: 10.07.2020. http://www.fao.org/faostat/en/#data/QC.

FAO, (2020b). İstatistik Bölümü İnternet Sitesi. Erişim Tarihi: 10.07.2020. http://www.fao.org/faostat/en/#data/QC.

FAO, (2020c). İstatistik Bölümü İnternet Sitesi. Erişim Tarihi 10.07.2020. http://www.fao.org/faostat/en/#data/PP.

Geçit, H.H., Çiftçi, C.Y., Emeklier, H.Y., İkincikarakaya, S., Adak, M.S. (2011). Tarla Bitkileri. Ankara Üniversitesi Ziraat Fakültesi Yayınları, 550s., Ankara.

Gündüz, O., Erdal, G., Esengün, K., 2004. Tarımsal Ürünlerin Dış Ticaretinde Karşılaştırmalı Üstünlükler: Türkiye-AB Kuru Meyve Dış Ticareti Örneği, Türkiye 6. Tarım Ekonomisi Kongresi, 2004, Tokat. 1-6.

INTRACEN. (2019a). International Trade Statistics. Erişim Tarihi: 27.05.2019. https://www.trademap.org/tradestat/Country_SelProduct_TS.aspx?nvpm=1%7c%7c%7c%7c%7c19%7c%7c%7c2%7c1%7c1%7c2%7c2%7c1%7c2%7c1%7c1

INTRACEN. (2019b). International Trade Statistics. Erişim Tarihi: 16.05.2019 https://www.trademap.org/tradestat/Country_SelProduct_TS.aspx?nvpm=1%7c%7c%7c%7c%7cTOTAL%7c%7c%7c2%7c1%7c1%7c2%7c2%7c1%7c2%7c1%7c1

INTRACEN. (2019c). International Trade Statistics. Erişim Tarihi: 16.05.2019 https://www.trademap.org/tradestat/Country_SelProduct_TS.aspx?nvpm=1%7c%7c%7c%7c%7cTOTAL%7c%7c%7c2%7c1%7c1%7c2%7c2%7c1%7c2%7c1%7c1

INTRACEN. (2019d). International Trade Statistics. Erişim Tarihi: 16.05.2019 https://www.trademap.org/tradestat/Country_SelProduct_TS.aspx?nvpm=1%7c%7c%7c%7c%7cTOTAL%7c%7c%7c2%7c1%7c1%7c2%7c2%7c1%7c2%7c1%7c1

Mızrak, G., (2018). Topraktan Softaya Buğday, Ankara, 367s. https://www.gürbüzmızrak.com/Yayinlarim/BUGDAY_TopraktanSofraya_B5_Kitap_10_04_2018.pdf

Özberk, F., Karagöz, A., Özberk, İ , Atlı, A . (2016). Buğday Genetik Kaynaklarından Yerel ve Kültür Çeşitlerine; Türkiye'de Buğday ve Ekmek . Tarla Bitkileri Merkez Araştırma Enstitüsü Dergisi, 25 (2) , 218-233 . Retrieved from https://dergipark.org.tr/tr/pub/tarbitderg/issue/26719/281346

Peker, A., E., (2014). Türkiye Ekonomisi'nde Tarım Sektörünün Üretim Yapısı ve Karşılaştırmalı Rekabet Gücü. Selçuk Üniversitesi Sosyal Bilimler Enstitüsü, Doktora Tezi, 194s., Konya.

TMO, (2017). 2017 Yılı Hububat Raporu. TMO, 202s. http://www.tmo.gov.tr/Upload/Document/hububat/HububatRaporu2017.pdf

TEPGE, (2018). Buğday Durum Tahmin Raporu 2017-2018. TEPGE, Yayın No:299, 61s. Ankara.

TUİK, (2019a). Bitkisel Üretim İstatistikleri. Erişim tarihi: 10.05.2019. http://www.tuik.gov.tr/PreTablo.do?alt_id=1001

TÜİK, (2019b). Bitkisel Ürün Denge Tabloları. Erişim Tarihi: 10.05.2019 http://tuik.gov.tr/OncekiHBArama.do

Factors Affecting The Most Preferred Local Tomato Variety "Akikon" Purchasing Prices in Benin

Mouinatou ALIDOU[1]   Rahmiye Figen CEYLAN[1*]

[1]*Akdeniz University Department of Agriculture Economics, Antalya / Turkey*

ARTICLE INFO

*Sorumlu Yazar :
ceylan.figen@gmail.com

ABSTRACT

Tomato is the most consumed vegetable in Africa. It is consumed by millions of people across the continent's diverse religious, ethnic and social groups. Even though it is not produced everywhere among the continent, there are some countries having endowments and producing local varieties. As an instance, there are many local varieties grown in the Benin Republic. However, within many local varieties of tomato grown in Benin, the mostly preferred variety and consumers' willingness to pay for this variety and its characteristics haven't been searched yet. This paper aimed to evaluate factors influencing consumers' willingness to pay for their most preferred local tomato variety. Through a formal structured questionnaire prepared based on the Hedonic-pricing model, data were collected from 223 consumers in Cotonou district of Benin Republic to identify the key factors that are most likely to affect consumers' accepted premium price for the most preferred tomato variety. 51% of consumers preferred mostly "Akikon" (*L.esculentum var. Pyriforme)* variety. The average accepted premium was 0.28 USD and the price rises to 0.64 USD with addition of 200 FCFA (0.36 USD), the standard market price of 400 grams of tomato. The reasoning behind the excepted premium was analysed and shape, colour, freshness, size, variety preference and income had appeared as the factors that mostly affect Akikon preference.

1. Introduction

Vegetables are important components of the daily diets of African residents and important sources of income, especially in urban and peri-urban areas. They have significant roles in reduction of rural poverty, increasing rural employment and economic development in Benin. For example, 15 % of agricultural GDP in Benin was constituted of only four types of vegetables, namely tomato, pepper, onion and okra with 80 million USD in 2007 due to the data retrieved from the National Institute of Statistics and Economic Analysis of Benin Republic (Anonymous, 2007).

As many as twenty different types of indigenous and exotic vegetables are grown at major vegetable production sites around West Africa. Tomato is one of the most popular and widely grown fruit in sub-Saharan Africa. Tomato ranks first among vegetable crops produced in Benin Republic (Colin & Heyd.1991). According to FAO statistics, 335,412 tonnes of tomato were produced Benin on 40,177 hectares in 2016, in the research year. Yet, the recent data of 2019 signs a declination 274,700 tonnes of production in 37,648 hectares. However, reasoning of this declination should be considered in the scope of another research (Anonymous, 2021). Tomato increases the benefit of gardeners and producers, offers employment to thousands of people without jobs and contributes significantly to poverty reduction in Benin (Ezin et al 2012). Therefore; tomato plays a vital role in social, economic and also nutritional scheme in Benin.

Fresh and processed tomato consumption has much more increased in the world. Tomatoes are Africa's most consumed fruit (or vegetable); eaten by millions of people across the continent's diverse religious, ethnic and social groups (Iwuoha, 2016). Tomato is central to most African diets and remains a regular ingredient in many soups, stews, sauces and dishes across the continent. The average growth rate of Benin's vegetable consumption in 1991-2007 was 22.94 %.

More than 20,000 varieties of tomato are produced in the world and more than fifteen indigenous tomato varieties are produced locally in Benin. Every variety has its own demand various desired characteristics which can be derived from consumer willingness to pay for it. Many research has been made on consumer's willingness to pay (Xu et al., 2015; Grebitus et al., 2013; Anonymous, 2011; Carpio & Isengildina-Massa, 2009; Darby et al., 2016; Giraud et al., 2005; Brown, 2003). However, little is known about the local variety of tomato that Benin consumers preferred most mostly, the premium price level that consumers are willing to pay for these variety characteristics and factors that affect consumer's premium prices in Benin. The main objective of this study is to analyse factors affecting market price including the accepted premium price of Akikon (L.esculentum var. Pyriforme) variety grown in Benin.

2. Material and Methods

2.1. Materials

Primary data was collected from Cotonou province of Littoral region in 2017 through a field survey for a Master thesis. Cotonou was selected as it is the economic and commercial capital of Benin Republic. Also, being a cosmopolitan city, Cotonou hosts various consumption attitudes. Heckman's random sample selection criteria were applied (Heckman, 1979) with reference to 95 % confidence interval (Collins, 1986) in determining the overall sample. Data set in this study is sourced from 223 consumers in 13 districts of Cotonou via simple random sampling with 95 % confidence interval (equation 1). The sample was distributed to the districts of Cotonou on a ratio basis respecting their population.

$$n = \frac{t^2}{E^2} P * Q \qquad (1)$$

There are more than fifteen (15) different tomato varieties produced in Benin. Yet, six (6) local varieties as Tounvi (*L.esculentum var. cerasiforme*), Akikon (*L.esculentum var. pyriforme*), Sonafel, Ouaga (*L.esculentum var. grandifolium*) Mongal and Petromèche were selected for this research. So

consumers were asked to determine which one of these varieties is their first choice and also the reasons of their preference. A standard market price of 200 FCFA (0.36 USD) [1] for 400 grams of any other varieties that the consumer does not prefer was chosen as the reference price. Then, consumers were asked how much they were willing to pay more than this standard price in order to consume regularly their most preferred local tomato variety. Accordingly, Akikon (*L.esculentum var. pyriforme*) was the most selected variety of consumers due to its important various characteristics. The household purchase premium prices for Akikon (*L.esculentum var. pyriforme*) of consumers were collected.

In order to evaluate the impact of consumer's prices on Akikon (*L.esculentum var. pyriforme*) tomato various characteristics, a hedonic price model is next applied to determine the key factors mostly affect consumers' acceptance premiums prices for Akikon (*L.esculentum var. pyriforme*) tomato characteristics attributes.

2.2. Methods

Hedonic pricing was first implemented in agriculture by Waugh (Xu et al,, 2015) who analysed the effects of product characteristics (colour, size, variety) on vegetables and he found that the accepted price changes due to quality features of vegetables. Different applications of hedonic pricing can be noted as the price analysis of wheat (Espinosa & Goodwin,1991), apple (Tronstad et al., 1992), cottonseed (Misra & Bondurant, 2000) and tomato (Carpio & Isengildina-Massa, 2009; Xu et al., 2015).

Although product characteristics are neither produced nor consumed in isolation, hedonic price models assume that the price of a product reflects embodied characteristics valued by some implicit or shadow prices. Under the hedonic hypothesis, individual products themselves do not provide a consumer utility but instead are seen as bundles of individually valued attributes, and the value of a product is based on the utility delivered by these attributes. The hedonic price analysis offers a method to estimate the impact of individual attributes on retail prices. Early adopters such as Becker, Lancaster and Muth (Becker, 1965; Muth, 1966), they attribute these values strictly as consumers' value of these attributes.

Rosen extends this into the more widely accepted view where he demonstrated that the hedonic price functional form is a reduced form equation that reflects mechanisms of both supply and demand (Rosen, 1974). A further important task researchers facing is how to function the relationships of the dependent variable and the explanatory variables naturally, which imposes an incorrect functional form on the regression equation, and that will lead to misspecification bias.

The analytical framework of this article is based on Rosen's hedonic price theory. Products in the market are described by n objectively measured characteristics and, therefore, can be fully represented by the vector $z = (z_1 . . z_n)$, where z_j describes the jth attribute of the product. It is assumed that there exists a sufficiently large variety, but not necessarily every combination, of potential packages of attributes in the marketplace. Prices for products are then interpreted as functions of the bundled characteristics; in particular, the price p_i of product i is p_i $(z_1 . . . z_n)$. Perfect competition is assumed where producers and consumers are price takers with perfect market information. Therefore, prices are revealed in the market through the usual mechanisms of individual consumer utility maximization, producer profit maximization, and market clearing conditions. In this framework, estimated hedonic price effects are not interpreted as identifying the structure of consumer preferences or producer technologies but instead are generated through a joint-envelope function of supply and demand.

---

[1] 24.11.2017: 1 USD = 554,31 FCFA XOF

The recent hedonic pricing methodology incorporates linear and log-linear models that enable valid interpretation of parameter estimates. Accordingly, double log-linear estimation was used in this study to estimate Akikon (*L.esculentum var. pyriforme*) tomato price for Benin following Diewert (Diewert, 2003).

$$\ln(PA_i) = a + b \times Akikon\ var_{.i} + \sum_k \beta_k \times MF_{ki} + \sum_n \gamma_n \times QF_{ni} + \sum_r \theta_r \times S_{ri} \qquad (2)$$

$$+ \sum_s \delta_s \times SD_{si} + e_i$$

In the equation 2 above, the dependent variable is a varying willingness to pay for the Akikon (*L.esculentum var. pyriforme*) tomato variety. Yet, the price was calculated with addition of a premium to the standard market price of 0.36 USD (200 FCFA) of 400 grams packaged of any other tomato variety except the Akikon variety. Therefore, the price referred to the consumer's accepted price for Akikon tomato in exchange to any other tomato variety. The explanatory variables are categorised due to average responses retrieved from survey participants. Table 1 presents the variables.

Table 1. Name and description of variables

Variables	Description	
Dependent: PA$_i$	Accepted market price for **Akikon tomato** by ith consumer, with addition of price premium to standard price of any others variety except Akikon – (400 grams) (USD)	
Independents	**Modality**	
Akikon Preference (PA)$_i$	Akikon tomato variety choice of ith consumer (1-Akikon, 0- another variety)	
MF$_{ki}$	**Market related factors that incorporate four sub-factors.**	
a. Purchasing Places	1: Bazaar & district bazaar	0: Supermarket & peddler
b. Preferred package	1: Basket	0: Plastic bag & cardboard
c. Preferred size	1: Medium	0: Small & big
d. Purchasing frequency	1: More than once per week	0: Once or less than once per week
QF$_{ni}$	**Product quality related factors that incorporate four sub-factors**	
a. Hardness	1: Most preferred quality feature is hardness	0: not
b. Shape	1: Most preferred quality feature is shape	0: not
c. Colour	1: Most preferred quality feature is colour	0: not
d. freshness	1: Most preferred quality feature is freshness	0: not
S$_{ri}$	Dummy variable indicating seasonal fluctuations (1 - more consumption in local supply season, 0 -more consumption in other seasons)	
SD$_{si}$	**Socio-demographic features of the household giving the purchasing decision incorporates five sub-factors**	
a. Employment status	1: Employed	0: Unemployed
b. Age	1: If between 18 and 45	0: other
c. Gender	1: Female	0: Male
d. Education	1: If between 18 and 45	0: Other
e. Income	Household income in USD)	

3. Findings and Results

3.1. Socio-Demographic Outlay and Consumption Preferences

Considering surveyed 223 attendants, major socio demographic findings need to be interpreted. Most of the households surveyed were female with 81 %. The mean age of the sample was 44, while 60 % ranged between 25 and 45. While 17 % of the participants were unemployed, income generating activity of 37 % was small-scale sales businesses as street vending. 25 % of participants were working with payroll in public or private sectors. 51 %

of the respondents had secondary or above degree, with 17 % (37 participants) holding university degrees.

When the income distribution is considered, 210 participants indicated that they have personal income with an average of 152.39 2 USD (84,471.43 FCFA XOF) per month. The average household income was 275.55 USD (152,741.94 FCFA XOF) and 46 % of consumers declared that they have monthly family income below 180.4 USD (100,000 FCFA XOF).

The results show that 72 % of the interviewed consumers care about tomato variety while purchasing. Figure 1 below gives information on consumer's most preferred local tomato varieties .
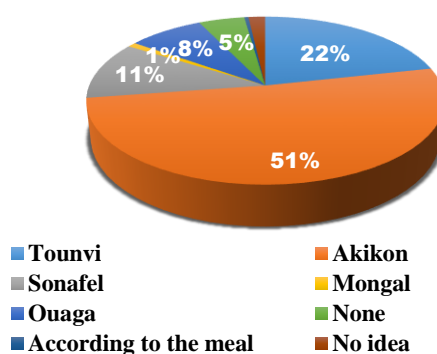
Figure 1: The distribution of the most preferred local tomato varieties

51 % of consumers choose Akikon (*L.esculentum var. pyriforme*) as the most preferred local variety within the pre-selected varieties above. 64 % of consumers explained that the Akikon variety was more expensive than other varieties. Tounvi (*L.esculentum var. cerasiforme*) and Sonafel (*L.esculentum var. grandifolium*) are respectively the second and the third most preferred variety chosen by participants. Consumers mentioned that Akikon (*L.esculentum var. pyriforme*) is the most preferred according to its attributes. Firstly this variety has a good taste (31 %), and possesses important nutritional values (30 %). Other reasons for this preference are the shelf life of Akikon tomato fruit (17 %), its freshness (10 %), its availability (8 %) and its price (4 %). Due to these various attributes

of Akikon (*L.esculentum var. pyriforme*) tomato variety, consumers were asked if they were willing to pay for this variety in order to consume it regularly. 60 % of consumers had willingness to pay for Akikon (*L.esculentum var. pyriforme*) tomato attributes. The average gross premium price was 0.28 USD (153,85 FCFA XOF). Figure 2 shows consumers' willingness to pay a premium for Akikon (*L.esculentum var. pyriforme*) tomato variety.

Consumers were asked the potential premium that they were able to afford on a standard price of 400 grams of any other local tomato variety fixed at 200 FCFA (0.36 USD). Adding the gross average premium price (0.28 USD) to the fixed standard market price (0.36 USD), the final average accepted premium price was 0.64 USD (354.76 FCFA).

---

[2] 24.11.2017: 1 USD = 554,31 FCFA XOF
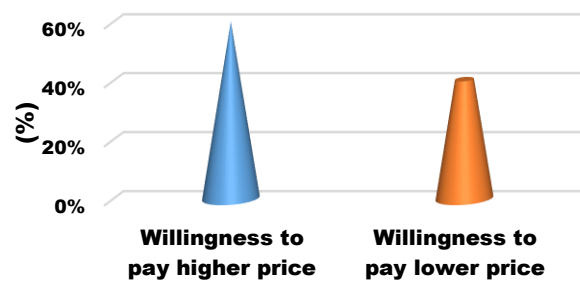
Figure 2: Distribution of consumers' willingness to pay a premium for Akikon tomato variety.

3.2. Hedonic Price Analysis

Since the dependent variable Akikon Price **"PA"** log-linear model estimation is performed, the normality test was first of all performed to check whether the data set of the dependent variable was appropriated for normal distribution. Normally test results for Akikon (*L.esculentum var. pyriforme*) tomato variety price are presented in the below Table 2 under the assumption of normal distribution.

Table 2. Normality Test for Local Variety "Akikon" Price

Kolmogorov-Smirnov		Shapiro-Wilk	
Statistics	**p-value**	**Statistics**	**p-value**
0.23	0.00*	0.751	0.00*

According to the p-values found above (both for Kolmogorov-Smirnov and Shapiro-Wilk), local tomato variety Akikon price doesn't have a normal dıstribution at 5% statistic level. Accordingly it is necessary to continue the analysis with the logarithmic transformation of continuous variables. In this study natural logarithm was applied. Therefore, local tomato variety "Akikon" price including the accepted premium price on the standard market price for 400 grams of any other variety sold in the market was estimated under the explanatory variables. The results of the estimated dependent variable with its explanatory variables are presented in above table 3.

Table 3. Estimation Output for Local Tomato Variety "Akikon" Price

Dependent Variables	**β**	**t**	**p-value**
Constant	2,966	9.776	0.00***
ln Income	0.081	2.722	0.007*
Akikon Preference	0.195	4.448	0.00***
Purchasing Place	0.043	0.546	0.586
Packaging	-0.02	-0.485	0.629
Size	-0.096	-2.002	0.047**
Frequency	-0.004	-0.082	0.935
Seasonal effect	0.05	0.936	0.350
Quality _ hardness	-0.091	-1.647	0.101
Quality _ shape	0.071	0.955	0.341
Quality _ colour	-0.195	-2.117	0.035**
Quality _ freshness	0.137	1.952	0.052*
Age	-0.066	-1.337	0.183
Employment Status	0.082	1.431	0.154
Gender	-0.012	-0.167	0.867
Education	0.016	0.336	0.737

*;**;*** refers to statistical significance of the estimate at 90 %, 95 % and 99 % confidence interval consecutively.

Firstly the variation explained by the dependent variables was found out as 24%. Yet, single significance and inference quality of the parameters need to be emphasized as well. Income, Akikon preference, size,

colour and freshness characteristics referring to quality of the product quality_ colour and quality _ freshness were found as statistically significant factors with 95 %. Even if the joint significance was high due to F-test with 4.395 (p<0.01*), there are non-interpretable factor estimates and a possible problem of overestimation. Accordingly, it was considered essential to check the linear relationship between Akikon price and independent variables. As most of the variables are dummy variables representing categories attached, it is essential to check the correlation between variables to infer on the linear relationship (Gujarati, 2003). Estimates of income, Akikon preference, purchasing place, freshness of the product as a quality characteristic and employment status were found to be positively correlated with "Akikon Price". However, the relationship was negative for colour quality and respondents' ages. These correlations are statistically significant at 95 % confidence interval. Therefore, in order to interpret the parameter estimates efficiently, the possible overestimation problem was overcome with reduction of the inefficient parameters and "Akikon" price was re-estimated with correlated and economically interpretable variables (Gujaratı. 2003). The findings were demonstrated in the Table 4.

Table 4. Estimation Output for Akikon Tomato Variety Price with Selected Variables

Dependent Variables	β	t	p-value
Constant	2.972	10.415	0.00*
ln Income	0.083	3.013	0.003*
Employment Status (ES)	0.086	1.592	0.113
Akikon Preference (AP)	0.192	4.531	0.00***
Seasonal Effect (SE)	0.046	0.881	0.379
Quality _freshness (QF)	0.125	1.846	0.066*
Size	-0.091	-2.085	0.038**
Quality _ hardness (QH)	-0.108	-2.039	0.043**
Quality_ colour (QC)	-0.215	-2.444	0.015**
Age	-0.068	-1.469	0.143

*;**;*** refers to statistical significance of the estimate at 90 %, 95 % and 99 % confidence interval consecutively.

The findings indicated that 24 % variation in "Akikon tomato price" was explained by the selected indicators. Yet, the correlated variables seemed to have statistical significance by 99 %, leaving *freshness quality* aside with a significance of 90 %. However, the high joint significance with F-statistics of 7.334 (0.00*) enabled us to interpret the insignificant *seasonal effect*, *age* and *employment* variables.

Therefore, the final estimation of "Akikon tomato price" equation can be summarized as follows:

$$ln(\widehat{PA_i}) = 2.972 + 0.192 * AP_i - 0.091 * Size + 0.046 * SE - 0.108 * QH - 0.215 * QC + 0.125 * QF + 0.083 * ln(Income) - 0.068 * age + 0.086 * ES \text{ (3)}$$

It's important to emphasize some important details in parameters estimation stage. In order to reach sound interpretations, the dependent and explanatory variables especially the continuous variables were multiplied by 100 before inserting them into the analysis due to their considerably initial low values. The continuous variables such as "Akikon Price" variable and the explanatory variable "income" were used in Dollars after their transformation into natural logarithmic. Accordingly, the proportional change obtained by the logarithmic transformation in the explanatory variables is considered to estimate numerically the dependent variable "Akikon Price" rate (Gujarati, 2003). While the Ordinary Least Squares regression original variable (Y or lnPA in this present case) is used to estimate the expected arithmetic mean, the Ordinary Least Squares regression of the log transformed outcome variable is to estimate the expected geometric mean of the original variable.

Therefore, the value of estimated constant of 2.972 (Table 4) represents the unconditional expected mean. So the geometric mean is the exponentiated value (anti-

logarithm) of the constant that gives $\exp^3$ (2.972) = 15.530. As the level variables were multiplied by 100, the average mean value for "Akikon Price" is 0.15 USD when all the variables were kept constants. In Benin local currency, consumers accepted to pay 83 FCFA XOF for Akikon tomato variety holding other variables constants.

When it comes to categorical variables estimated parameters interpretation, as their haven't been transformed such "Akikon preference (PA)", its exponentiated coefficient is the ratio of the geometric mean for Akikon variety choice to the geometric mean for any other variety choice[4]. Accordingly, we expected that consumers are willing to pay more 21% for Akikon preference than any other local tomato variety as $\exp(0.192)=1.211$. This meant that consumers accepted to pay 0.03 USD or 17 FCFA more than the average price for 400 grams of Akikon tomato variety.

Size, age and tomato quality characteristics such as hardness and colour affect Akikon Price inversely. If the consumer's mostly valued quality preference was hardness, he /she declared that she/he accepted to pay 9 % less than average price $(\exp(-0.091): 0.91)$. It means that while consumers purchasing Akikon tomato variety, if their most preferred size is medium size, they would like to pay 9% less than the average price. The consumers who perceived hardness (QH) and colour (QC) as the most important quality characteristic for Akikon tomato variety were willing to pay respectively 10% (0.01USD or 8 FCFA) and 19% (0.03 USD or 16 FCFA) less than average mean since for QH $\exp(-0.108): 0.90$ and QC $\exp(-0.215): 0.81$.

For Akikon tomato variety, consumers who perceived freshness characteristic as the most important were willing to pay 13% (0,02 USD or 11 FCFA).

The most significant interpretation occurs with the parameter of logged income (ln(Income)). Without any requirement of anti-log transformation, a 100 % rise in consumer's average family income leads to 8 % more payment willingness for Akikon tomato variety. Accordingly, when consumer's family income rise by 100 %, they were willing to pay more than 0.16 USD (76 FCFA) on average price.

Although in this analysis age, employment status and seasonal effect were not statistically significant at the end of results it's necessary to evaluate their effects on Akikon price too. Hence, the consumers whose age range between 18 to 45 years were willing to pay 7% or 0.01 USD (6 FCFA) less than the average price as $\exp(-0.068)= 0.93$; when it comes to interpret employment status and seasonal effect parameters, according to the values getting respectively from the geometrical mean as $\exp(0.086)= 1.09$ and $\exp(0.046) = 1.047$. This mean that the employed consumers (one who work) and those who prefer buying Akikon tomato variety mostly in tomato intense supply period were willing respectively to pay more 9 % (0.01 USD or 4 FCFA) and 5% (0.008 USD or 4 FCFA) on average price.

4. Discussion and Conclusion

In Benin, more than 15 local and improved tomato varieties are produced. But within these varieties locally grown which one is the consumer's favourite? This study informed about the most preferred locally grown tomato variety and examined the factors that likely affect this variety price (market price adding to the accepted premium price) for 400 grams of tomato by using hedonic pricing analysis. So it was checked if consumers had any mostly locally grown tomato variety, secondly if they had a willingness to pay for this variety and finally how much were they willing to pay more than 200 FCFA (0.36 USD), a standard market price fixed for 400 grams tomato weighted just in order to consume "Akikon" variety over the others locally grown tomato varieties.

---

[3] e=2,718

[4] Akikon preference is a categorical variable that is dichotomous (it has two categories such as "0-Akikon choice; 1- another variety) (Table 1)

It was found that 72 % of surveyed consumers cared about tomato variety while purchasing. Daily market and neighbourhood bazaar were the major sources of tomato supply. In this study within six (6) varieties that were chosen, 51 % of consumers had chosen "pears tomato" (*L.esculentum var. pyriforme*) locally called in Benin "Akikon" variety. They specified that despite its high price, due to "Akikon" characteristics attributes such as good taste its nutritional values, long shell life freshness, availability and price, they mostly preferred Akikon over the other varieties. Accordingly, 60 % of surveyed consumers had a willingness to pay for Akikon variety.

When all of the variables were neglected, consumers accepted to pay 0.15 USD for Akikon tomato variety. Those who had a huge preference for Akikon were willing to pay 21% as a premium price regard to the average price. Akikon preference, purchased size, market factors, household income and Akikon tomato fruit quality preferences such as hardness, colour and freshness affected mostly Akikon price. Moreover, there were also the inverse relationship between Akikon price and consumers who perceived tomato fruit's hardness (QH) and colour (QC) as the most important quality characteristics for Akikon tomato and also for age and size. Those consumers were willing to pay less than the average price.

In conclusion, there was a significant positive relationship between local tomato preference and Akikon variety preference as well as local tomato price premium and the Akikon price premium. These results showed that there was an important potential demand for the Akikon tomato variety in Benin Republic. This study has provided some information regarding the development and application of marketing policies for tomato producers in Benin considering Akikon, a local tomato variety, consumers expected quality attributes for this variety, the most preferred package and size preference regard to seasonal preference and tomato consumption frequency. So, it is necessary to encourage production and marketing policies in Benin towards consumer's most preferred tomato varieties.

References

Anonymous (2007). Enquête modulaire intégrée sur les conditions de vie des ménages (EMICoV) Bénin. Rapport de synthèse, Cotonou, Bénin. Institut National de la Statistique et de l'Analyse Economique du Benin (Benin National Institute of Statistics and Economic Analysis); 2006. Available: http://www.insae-bj.org/ Consulté le 8 Octobre 2008. 2007. French

Anonymous (2011). Ulupono Initiative, Report on "Local food market demand study confirms that Hawaii residents want more locally grown products and are willing to pay more for it." December 6; 2011.

Anonymous (2021). Tomato production data for Benin. Food and Agriculture Organisation of the United Nations. Retrieved: http://www.fao.org/faostat/en/#data/QC on 29.01.2021.

Becker, G.S. (1965). A Theory of the Allocation of Time. *Economic Journal,* 75:493–517.

Brown C., (2003). Consumers' Preferences for Locally Produced Food: A Study in Southeast Missouri. American *Journal of Alternative Agriculture,* 18:213–24.

Carpio, C.E. & Isengildina-Massa O., (2009). Consumer Willingness to Pay for Locally Grown Products: The Case of South Carolina. *Agribusiness,* 25:412–26.

Colin, J.E. & Heyd, J.C. (1991). Situation Des Légumes Feuilles Dans La Production Maraîchères au Sud Benin. In *Tropicultura*, 9(3): pp 129-133.

Collins, M. (1986). Sampling In: Worcester RM, Downhom J. editors. *Consumer Market Research Handbook. Elsevier Science Puplishing* Company Inc.

Darby, K., Batte, M.T., Ernst, S. & Roe, B. (2006). Willingness to pay for locally produced foods: A customer intercept study of direct market and grocery store shoppers. Selected Paper prepared for presentation at the American Agricultural Economics Association Annual Meeting, Long Beach, California, July 23-26.

Diewert, E. (2003). Hedonic regressions: a review of some unresolved issues. Paper presented at the 7th Meeting of Ottawa Group, Paris, May 27-29.

Espinosa, J.A. & Goodwin, B.K. (1991). Hedonic price estimation for Kansas wheat characteristics. *Western Journal of Agricultural Economics,* 16(1): 72-85.

Ezin V., Ibouraïma, Y. & Adam, A. (2012). Impact of salinity on the production of tomato along the coastal areas of Benin Republic. *African Journal of Environmental Science and Technology*, Vol. 6(4), pp. 214-223, April 2012. Available online at DOI: 10.5897/AJEST11.369 ISSN 1996-0786 ©2012 Academic Journals. http://www.academicjournals.org/AJEST.

Giraud, K.L., Bond, C.A., & Bond, J.J. (2005). Consumer Preferences for Locally Made Specialty Food Products across Northern New England. *Agricultural and Resource Economics Review*, 34:204–16.

Grebitus, C., Lusk, J.L. & Nayga, R.M. Jr. (2013). Effect of Distance of Transportation on Willingness to Pay for Food. *Ecological Economics,* 88:67–75. Hawaii Department of Agriculture. "Island Fresh Hawaii Seasonality Chart."

Gujarati, D. (2003). *Basic Econometrics*. McGraw Hill, 4th edition. New York. pp: 1002.

Heckman, J.J. (1979). Sample Bias as a Specification Error. *Econometrics*, 47(1), 153-162.

Iwuoha, J.P. (2016). Meet the Smart Entrepreneurs Making Money from Africa's tomato problems retrieved: https://www.linkedin.com/pulse/meet-smart-entrepreneurs-who-making-money-from-africas-iwuoha/. Accessed 19 June 2018.

Lancaster, K.J. (1966). A New Approach to Consumer Theory. *Journal of Political Economy,* 74:132–57.

Misra, S.K. & Bondurant, J. (2000). The role of product and market characteristics in determining cottonseed prices. *Agribusiness*, 16(3):357–366.

Muth, R.F. (1966). Household Production and Consumer Demand Functions. *Econometrica,* 34 :699–708.

Rosen, S. (1974). Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition. *Journal of Political Economy,* 82:34–55.

Tronstad, R., Huthoefer, L.S. & Monke, E. (1992). Market windows and hedonic price analyses: An application to the apple industry. *Journal of Agricultural and Resource Economics*, 17(2):314-322.

Waugh, F.V. (1929). *Quality as a determinant of vegetable prices*. New York Columbia University Press;

Xu, X., Loke, M.K. & Leung, P. (2015). Is there a price premium for local food? The case for the fresh lettuce market in Hawaii. *Agriculture and Resource Economics Review*, 44:110-123.

Eurasian Journal of Agricultural Economics

www.jeae.org

Evaluation of Wheat Producers' Adoption for Protective Agriculture Techniques

Fatma Dilek METİN[1]   Makbule Nisa MENCET YELBOĞA[1*]

[1]*Akdeniz University Department of Agriculture Economics, Antalya / Turkey*

ARTICLE INFO

*Corresponding author:
nmencet@akdeniz.edu.tr

ABSTRACT

In the study, it was aimed to determine the non-price factors affecting the wheat producers in Kadınhanı and Ilgın districts of Konya in Turkey. The main material of the study is the data obtained from the face-to-face survey conducted with the wheat producers in these districts in 2018. In this context, whether the dependent variables affect irrigation, yield, income, area and producer demographic characteristics were analyzed with the help of the bivariate probit model. In the applied model, it is concluded that as the area of operation increases, the producers' levels of applying protective agriculture techniques increase and as their income increases, their awareness of climate change decreases. Additionally, as the wheat yield increases, it is found that the producers' level of application of protective agriculture techniques and the possibility of being aware of the changes in the climate decrease.

1. Introduction

Environmental problems caused by climate change affect the agricultural sector in many ways. While global climate change causes a decrease in agricultural products and loss of products in the short term, it may cause more permanent damages such as drought in the long term. At the same time, the decrease in groundwater resources and the unexpected decrease of precipitation during the season also affect agricultural production. The problem of combating and adapting to climate change, especially improving the sustainability of ecosystems, has no boundaries and has been emphasized in many international agreements. Effective implementation of the adopted strategies and plans relies on multi-level governance, involvement of various stakeholders and expert support. One of the means of adaptation mentioned is protective agriculture, which is named differently but the ultimate goal is common.

Protective agriculture is an agro-ecological based approach based non tillage or minumum/striped tillage, product rotation, different agricultural systems and water saving methodology. This method include direct sowing, phytosanitary, fertilizing, pre-planting cover crops, weed management and plant residue management (FAO, 2018; Corsi, 2018). Protective agriculture provides economic advantage which reduces production costs (Yalcin et al, 2003).

In Turkey, when compared to the previous year, a decrease of 8.86% in the area sown and 9,127% in harvested area was recorded in 2019. The decrease in the cultivated area and the harvested area affected the production amount 10% negatively. Konya has 9.7% of wheat area in Turkey and its wheat production amount corresponds to 10.2% of the country (MIEM, 2019). Wheat yield was 291 (kg/ decare) in 2018 and decreased by 288 (kg/decare) in 2019 (TUIK, 2020). The average yield of wheat in Turkey is 2.629 kg/ha. In terms of added value, the agricultural industry based on wheat and wheat products is said to be one of the main sectors in the food industry and economy (Kan et.al., 2017; FAOSTAT, 2017).

The main objective of the study is to determine the non-price factors affecting the application level of protective agricultural techniques and climate change perception of wheat producers in Kadinhanı and Ilgın districts of Konya province in Turkey.

2. Material and Methods

The research was carried out based on the data obtained from the face-to-face survey conducted with wheat producers in 2018 in Kadınhanı and Ilgın districts in Turkey. The stratified sampling method, was used to determine the number of producers. Homogeneous layers should be obtained in terms of the width of the cultivated area in order to increase the accuracy of the forecast (Yamane, 2001). Thus, it is expected that the sensitivity of the estimation will increase if homogeneity is provided. In determining the sample volume, 5% standard error has been accepted within the 95% confidence intervals. As a result of the sampling method, 100 producers randomly selected in Konya were interviewed.

In the study, to determine the factors affecting the protective agriculture practices and the perception level of climate change, the analysis was made by choosing the bivariate probit model, which is one of the qualitative reactive regression models. These models are also called reactive qualitative preference models (Güris et al., 2017). In qualitative-response regression models, the dependent variable can take two or more values. In the models with two options, the most beneficial one is selected (Greene, 2016). In this model, the independent variable or variables can be of any type (qualitative, quantitative, etc.) (Tari, 2018). The multivariable probit model was proposed by Ashford and Sowden (1970) in order to model the system of binary results that are related to each other within the framework of regression. The bivariate probit model is a special version of the multivariate probit model where it is more than one variable (Giampiero, 2013; Gencer, 2016; Emmanuel, 1992). In Bivariate probit models, unlike independent variables, correlation is sought between dependent

77

variables. Two variables that are thought to be related are analyzed together (Ozer, 2007; Gencer, 2016).

The least squares method is insufficient in the estimation of the econometric model used because the least squares method acts with the assumption that the dependent variable shows normal distribution. While the least squares method is used in regression estimation, this method is not used in regression models with qualitative variables. None of the qualitative responsive models can be predicted consistently with linear regression models and therefore, in most cases, estimation is done by using maximum likelihood method (Greene, 2016). The most likelihood estimation method function is given below.

In the main hypotheses of the study, the absence hypothesis defends that the variables used in the model have no effect, while the alternative hypothesis argues that the variables are effective.

H_0: Independent variables have no effect on the level of protective agriculture practices and climate change.

H_1: Independent variables have no effect on the level of protective agriculture practices and climate change.

For the bivariate probit regression application, the data set consisting of wheat producers in Kadınhanı and Ilgın districts of Konya was used. Y_1 is defined as dependent variable for producers who apply protective agriculture method coded 1 and 0 vice versa. Y_2 is defined for producers who believe that climate change is a fact and threat agriculture as 1 and for 0 who doesn't believe climate change issues (Table 1).

Dependent variables in the model:

Y_1= Protective agriculture techniques

Y_{11} = Applying Y_{12}= Not applying and rejecting

Y_2= Climate change

Y_{21} = Accepting its existence Y_{22}= Denying its existence

Independent variables are chosen as age, enterprise area width, yield, income, experience for quantitative types and education level and irrigation for qualitative types in Table 1.

Table 1. Variables Used in Model

Independent variables		Type	Display form	Reference
X_1	Age	Quantitative	Years	(Bicer & Vaizoglu, 2015)
X_2	Enterprise area width	Quantitative	Decares (ha^{-1})	(Koksal & Cevher, 2015).
X_3	Yield	Quantitative		(Keles 2019)
X_4	Income	Quantitative	TL	(Yayar et al., 2014)
X_5	Experience	Quantitative	Years	(Akyuz & Atis, 2018)
D_{1i}	Education level	Qualitative	D_{11}: Primary and below D_{12}: Secondary and high school D_{13} : High school D_{14} : University and higher	(Yayar et al. 2014)
D_{2i}	Irrigation	Qualitative	D_{21}: Applying irrigation D_{22}: Not applying irrigation	(Yildiz & Topal, 2002)

3. Findings and Discussion

In the study, it was aimed to determine the preferences of producers to apply protective agriculture techniques and the factors affecting their view on climate change. In this context, bivariate probit model was used. Descriptive statistics of the variables used in the model can be seen in Table 2. The scope of protective farming techniques is defined as mainly *"Direct sowing-stubble sowing, stripy processing, using certified seeds etc."*. Used as a dependent variable, producers applying protective agricultural techniques make up 30% of the total producers. As another dependent variable, while those who accept the presence of climate change are 75%, 25% of the producers stated that there is no climate

change. There are two reasons why the bivariate probit model is preferred. The first reason is the attempt to look at the application level of producers of protective agriculture techniques and the factors that affect the level of awareness of climate change awareness at the same time. The second reason is that there is a correlation between climate change awareness and protective agriculture techniques.

Table 2. Descriptive statistics of model variables

	Variables				
Dependent variables	**Qualitative Variables**		**Frequency**	**Percent (%)**	**Cumulative Percent (%)**
	Protective agriculture techniques	Not applying	70	70	70
		Applying	30	30	100
	Climate change	No	25	25	25
		Yes	75	75	100
Independent variables	**Quantitative Variables**		**Average**	**Standard deviation**	**Standard error**
	Age		46.55	11.52	1.15
	Eneterprise field width		117.79	105.35	10.53
	Yield		343.71	199.67	19.96
	Income		182804.1	354082.1	35408.21
	Experience		26.83	13.24	1.32
	Qualitative Variables		**Frequency**	**Percent (%)**	**Cumulative Percent (%)**
	Education	Primary education and below	36	36	36
		Secondary education	14	14	50
		High school	32	32	82
		University and above	18	18	100
	Irrigation	Non irrigatied	10	90	10
		Irrigated	90	90	100

According to the results, the gross income of the producers from agriculture and non-agriculture is an average of 182804.1 TL. The average operational area width of the producers interviewed in Kadınhanı and Ilgın districts is 117.79 and the average yield of this area is 343.71 TL/da. Standard deviation values of operating width, yield and income variables were calculated as 105.35, 119.67 and 354082 respectively. The average age of producers is 46.55. The age range of the producers participating in the research is between 19 and 71. The education level of the producers in the agricultural establishments sampled is classified in 4 categories. According to this classification, 36% of the producers participating in the survey have primary education, 14%

secondary education, 32% high school, 18% university and higher education. According to the research, the average experience of the producers is 26.83 years and the standard deviation is 13.24. Years of experience of producers range from 1 to 60 years. The producers were asked whether they are making irrigation and which irrigation methods they use and 90% of them stated that they are making irrigation. Producers' irrigations systems and water sources are given Table 3. Most of the producers (80%) use water from well and 20% of producers benefits from river. Agricultural irrigation system is preferred as 36.47 % drip irrigation, 35.22 % sprinkler irrigation, 6.91% other system. Producers apply

either sprinkler and drip irrigation systems for only 21.8% of them.

Table 3. Water resources and irrigation systems

Wheat irrigation	%	Water resources	%	Agricultural Irrigation Systems	%
Irrigated	72	Well	80	Drip irrigation	36.48
				Sprinkler	35.22
		River	20	Other	6.91
				Both (drip+sprinkler)	21.38
Non-irrigated	28				
Total	100		100		100

Correlation matrix is given in Table 4 in order to determine the presence of multiple linear correlation between variables. According to the correlation matrix of independent variables, there is a strong (0.74> 0.50) and same relationship between age and experience variables. R values of other variables indicate that there is no

multiple linear connection. However, age variable and experience variable r value was found to be 0.74 and age and education variable r value was found to be -0.53. The existence of multiple linear connections must be tested for age, experience and education variables.

Table 4. Correlation matrix of variables

Correlation matrix	Age	Area Width	Yield	Income	Experience	Education	Irrigation
Age	1.000						
Area Width	-0.1300	1.0000					
Yield	-0.1062	-0.0083	1.0000				
Income	-0.0460	0.2916	0.0421	1.000			
Experience	0.7490	-0.0973	-0.0145	-0.0003	1.0000		
Education	-0.5319	0.2903	0.0075	0.1096	-0.4526	1.0000	
Irrigation	-0.1234	0.0662	0.1660	0.1645	-0.2773	0.0936	1.0000

In order to decide the correlation coefficients obtained from the correlation matrix, variance swelling factor (VIF) values were examined (Table 5). It was found that average VIF 1.62<5, income (1.13 <5), age (2.68<5), area (1.06<5), experience (2.58<5), education (1.52 <5) and VIF value of the irrigation variable (1.18<5). So there is no multiple linear connection problem in the model.

Normality assumption was tested with Shapiro-Wilk W and Kolmogav-Simirnov tests with skewness coefficients showed in Table 5. The Shapiro-Wilk W test absence hypothesis is expressed as "data is suitable for normal distribution" and alternative hypothesis is expresses as "data is not suitable for normal

distribution". Prob>z values are; age (prob>z=0.44), experience (prob>z=0.33), establishment area width (prob>z=0.76) and education (prob>z=0.31). Absence hypothesis was accepted because p values are <0.05. In other words, the data are suitable for normal distribution. Alternative hypothesis was accepted for yield, income and irrigation variables. According to the Kolmogorov-Smirnov test, the ho hypothesis is expressed as "data is suitable for normal distribution" and the h1 hypothesis is expressed as "not suitable". P value is accepted for the ho hypothesis. In this context, h0 hypothesis is accepted for age (0.677), efficiency (0.118), establishment area width (0.364), income (0.056) and experience (0.129) variables, while alternative hypothesis is accepted for

other variables. When looking at the skewness coefficient values in normality test, the data of age (-0.13), yield (0.86), experience (0.03), enterprise area width (-0.20), income (-0.86) and education (0.08)

variables are normally distributed. The logarithm of data related to the enterprise width has been taken and retested.

Table 5. Testing Independent Variables

Variables	Multiple linear linkage testing				Normality test					
	VIF	SQRT VIF	Tolerance	R^2	Shapiro-Wilk W		Kolmogorov-Simirnov		Skewness and Flatness Coefficient	
					Z	Prob>Z	Statistics	P	Skewness	Flatness
Age	2.68	1.64	0.372	0.62	0.12	0.44*	0.72	0.677	-0.13	2.29
LogArea	1.18	1.09	0.846	0.15	-0.72	0.76*	0.92	0.364	-0.20	2.75
Yield	1.06	1.03	0.940	0.05	3.08	0.00	1.19	0.118	0.86	4.07
LogIncome	1.13	1.06	0.883	0.11	3.83	0.00	1.33	0.056	-0.86	7.66
Experience	2.58	1.61	0.387	0.61	0.42	0.33*	1.17	0.129	0.03	2.27
Education	1.52	1.23	0.658	0.34	0.48	0.31*	2.41	0.000***	0.08	1.54
Irrigation	1.18	1.09	0.845	0.15	5.57	0.00	5.29	0.000***	-2.66	8.11
Average VIF = 1.62										

(*<0.05, **<0.01, ***<0.001)

Within the scope of the econometric model application of the study, it is aimed to determine the factors that affect the awareness level of climate change awareness of wheat producers and the application of protective agriculture techniques. The results obtained from the bivariate probit model are given in Table 6. A positive correlation was determined between Y1 and Y2 variables and r = 0.2268 was calculated. The model established was statistically significant as a whole (Prob > chi2 = 0.0112). Rho (ρ) measures the correlation of error terms in two models (Gençer, 2016). The value of ρ between the two models was 0.625 (0.176). The meaning of this figure indicates that there is a moderate relationship between both models. For Rho(ρ)=0 hypothesis testing, it was found that estimated correlation coefficient/ estimated standard error value is 0.626/0.176=2.64. Since the calculated value is greater than the critical value of 1.96, ρ has become significant (Greene, 1996). Significant ρ value indicates that both dependent variables are related and if these dependent variables are analyzed individually, the parameters will

be deviated and this model should be analyzed simultaneously, using a bivariate probit model (Demir, 2009). The magnitude of the estimated ρ value indicates that the independent variables that are important for the two dependent variables are neglected. The fact that ρ value is 0.625 (not close to 1) indicates that it is not a very important variable neglected (Özarıcı, 2002). The estimated models are age (0.29 and 0.12> 0.05), yield (0.34 and 0.24> 0.05), experience (0.30 and 0.118> 0.05) and irrigation (0.63 and 0.189> 0.05) and their coefficients are insignificant. Within the scope of the survey, the producers are asked whether there has been any climate change in the last 10 years. In the model defined as Y2, the p value (0.089 <0.10) of the income variable was significant. 1% increase in income reduces acceptance of climate change by -0.25 units. As income increases, awareness of climate change decreases. In the models, the basic category of the education variable is the producers who are at primary school level and the results are evaluated in this framework. In the predicted models, producers with high school education level (0.51

and 0.45> 0.05) and producers with university or higher education level (0.54 and 0.88> 0.05), their coefficients are insignificant. In other words, the level of education has no effect on the implementation of protective agricultural techniques. The secondary education category in the Y2 model is statistically significant since the p value is 0.08 <0.10. As the education level of the producers changes from primary school to secondary school, the level of climate change awareness is negatively affected (Table 6).

Table 6. Bivariate Probit Regression Model Prediction Results

Variables		Y1 (Protective agriculture techniques)				Y2 (Climate change)			
		Coefficient	St. Error	Z	P	Coefficient	St. Error	Z	P
Age		0.01956	0.01878	1.04	0.298	-0.03446	0.02252	-1.53	0.126
Enterprise area size		1.3759	0.44880	3.07	0.002 **	-0.15686	0.43764	-0.36	0.720
Yield		-0.00070	0.00075	-0.94	0.349	0.00115	0.00079	1.46	0.144
Income		-0.25797	0.26875	-0.96	0.337	-0.54147	0.31856	-1.70	0.089
Experience		-0.01656	0.01616	-1.02	0.305	0.02795	0.01790	1.56	0.118
Education	Secondary school	-0.59656	0.49346	-1.21	0.227	-0.81578	0.47534	-1.72	0.086
	High school	-0.25857	0.39526	-0.65	0.513	-0.31391	0.41875	-0.75	0.453
	University and master degree	0.27873	0.46206	0.60	0.546	0.07202	0.51362	0.14	0.888
Irrigation	No irrigation	0.25853	0.53599	0.48	0.630	0.65700	0.49996	1.31	0.189
_Cons		-2.31772	1.57699	-1.47	0.142	3.81041	1.82370	2.09	0.037
		Coefficient		St. Error		Z		P	
Athrho		0.73418		0.28933		2.54		0.011	
Rho		0.62562		.176092					
Likelihood = -99.173454		chi2(1) = 6.43868		Prob > chi2 = 0.1076		Wald test of rho = 0 : Wald chi2(18) = 25.67		Prob > chi2= 0.0112	

(*<0.05, **<0.01, ***<0.001)

The marginal effects showing the changes in the dependent variable by increasing 1 unit are shown in Table 7. The probability of producers to apply protective agricultural techniques and to be aware of climate change is calculated for the age variable. These probability values were found to be 0.16, 0.22, 0.27 and 0.28 for the producers' age range, respectively. As the age of the producers' increases, they are more likely to be aware of climate change and benefit from protective agriculture techniques (Table 7).

The probability of applying protective agriculture techniques by the establishments having an area width 50 da and the producers' awareness of climate change awareness is calculated as 0.03. Therefore, this value is nor statistically meaningful. The probability of the producers, whose production area is between 50 and 250 da, to apply protective agriculture techniques and to be aware of climate change, is 0.18 and the probability of

producers with 250 da is 0.45. The marginal coefficient results given for the establishments whose production area is more than 50 da are statistically significant (Table 7).

Enterprises over 250 da production area are more likely to apply protective agricultural techniques and to accept climate change, compared to establishments with maximum 250 da production area. For the yield variable, the probability of producers to apply protective agriculture techniques and to be aware of climate change is 0.30 for producers having 430 da production area and below, 0.26 and 0.19 for producers having 430-830 da production area. All the results of the yield variable were statistically significant. In line with these results, it is concluded that as wheat yields increase, the probability of applying protective agriculture techniques and being aware of the change in climate change is decreasing (Table 7). Probability was 0.52 for producers with

income levels below 20000 TL, and 0.15 for producers between 20000 TL-110000 TL. The income variable is meaningful since all p values are smaller than 0.05. As the income of wheat producers increases, they are less likely to apply protective agricultural techniques and to be aware of climate change (Table 7).

Average experience of the producers participating in the research is 26 years. The least experienced wheat producer is making production for 1 year, and the most experienced is making production for 60 years. The possibility of producers to be aware of climate change and apply protective agriculture techniques is related to the producers' experience. The probability values were calculated as 0.28 under 30 years, 0.25 over 30 years and 0.20 over 46 years. Producers with less experience level are more likely to be aware of climate change and apply protective agriculture techniques (Table 7).

The probability of producers to apply protective agriculture techniques and to be aware of climate change is 0.31 for primary school education level and below, 0.31 for secondary school education level, 0.22 for high school education level and 0.39 for university and higher education level. P values are statistically significant for 4 levels in the training variable (Table 7). Most of the producers (90%) are producing wheat in the districts of Kadınhanı and Ilgın and making irrigation.

Table 7. Calculation of marginal coefficients

Variables		Possibility	Delta – Method St. Error	z	P>|z|
Age	19-33	0 1619488	0.1057843	1.53	0.126
	34-48	0.2239547	0.0646547	3.46	0.001**
	49-63	0.2752465	0.0465268	5.92	0.000***
	64 and above	0.2880881	0.1071744	2.69	0.007 **
Enterprise Area (da)	Below 50 da	0.0373974	0.0345546	1.08	0.27
	50 da - 250 da	0.1851556	0.0462475	4.00	0.000***
	250 da and above	0.4525772	0.0820718	5.51	0.000***
Yield	430 and below	0.3060234	0.0801475	3.82	0.000***
	430-830	0.2613153	0.0456233	5.73	0.000***
	830 and above	0.1980223	0.0980371	2.02	0.043*
Income (TL)	Below 20000	0.5247861	0.2433591	2.16	0.031*
	20000 – 110000	0.3353813	0.0701045	4.78	0.000***
	1100000 and above	0.1585842	0.0769234	2.06	0.039*
Experience	1-15 year	0.2867425	0.1248594	2.30	0.022*
	16-30 year	0.2850186	0.066063	4.31	0.000***
	31-45 year	0.2526154	0.0443584	5.69	0.000***
	46 and above	0.2032644	0.0807891	2.52	0.012*
Education	Primary School	0.3109794	0.0830753	3.74	0.000***
	Secondary School	0.1363369	0.0743021	1.83	0.067
	Highschool	0.2284645	0.0674974	3.38	0.000***
	University and master	0.396636	0.111003	3.57	0.000 ***
Irrigation	Non irrigated	0.184495	0.1078605	1.71	0.087
	Making irrigation	0.2803349	0.0445764	6.29	0.000***

(*<0.05, **<0.01, ***<0.001)

The probability of being aware of the change in the climate in the last 10 years and the possibility of applying protective agricultural techniques is 0.28 . Producers who are not making irrigation constitute 10% of the total producers.

The probability value of the producers who are not making irrigation is calculated as 0.18. Producers who are making irrigation are more likely to apply protective agricultural techniques and to be aware of climate change (Table 7).

4. Result

In the study, it has been tried to identify factors that affect the level of implementation of protective agricultural techniques of wheat producers and awareness of climate change. In this context, the bivariate probit model was used. The model includes seven independent variables. These are yield, income, establishment area width, age, agricultural experience, education and age variables. In the normality assumption test for variables, the coefficient of weakness, Komogorov-Simirnov and Shapiro-Wilk tests were used. Logarithms were taken since the establishment area width and the yield variables not conforming to the normal assumption. The existence of multiple linearity concept belonging to Ragnar Frisch was tested for independent variables. Correlation matrix followed by VIF values are examined. It is concluded that there is no multiple linear connection between the variables. Protective farming techniques are described as "direct cultivation, strip-toe processing, using certified seeds". In Celik (2009), it was stated that many factors have an impact on the performance of sowing machines directly to the stubble, and it is of great benefit in conducting research at regional level on these factors. The study is product-based and a regional-level research in Kadınhanı and Ilgın districts. A positive relationship between climate change awareness and the implementation of protective agricultural techniques has been detected. In the study of Yayar et al. (2014), a direct relationship was observed between the increase in the level of education and the awareness of the effects of global warming. According to this statement, as the level of education increases, awareness of the effects of global warming has increased. According to the bivariate model results, there was no significant impact on climate change awareness for all levels of the education variable. However, according to marginal coefficients, probability of education level and applying climate change with protective agricultural management. In that case, university level coefficient the highest one among all education levels. Although the highest probability is seen at university and above, no linear effect of the education variable was found. Not only the level of education, but also the agricultural training of the producers is very important. In Ipekcioglu (2016), the result of certified seed use rate is high for those participating in agricultural training was obtained and the importance of agricultural education was emphasized. Akyüz and Atış (2018) stated that only irrigation methods and changes in product pattern can only suppress the negative effects of climate change in Küçük Menderes Basin to a certain extent. In the survey, producers were asked whether they make irrigation or not and which irrigation methods they use. 90% of the producers stated that they make irrigation. Producers who make irrigation are more likely to apply protective agricultural techniques and be aware of climate change. Yayar et al. (2014) found that young individuals are more aware of the effects of global warming than individuals aged 45 and over. The probability of wheat producers to apply protective agriculture techniques and to be aware of climate change increases with age more than. Average agricultural experience of producers was found 26.83 years. The years of experience of the producers are between 1 and 60 years and the average experience of the producers is 26 years. Producers with less experience are more aware of climate change and are more likely to apply protective agricultural techniques. 1% increase in income reduces acceptance of climate change by 0.25 units. In other words, as income increases, awareness of climate change decreases. At the same time, as the income of wheat producers increases, they are less likely to apply protective agricultural techniques. As a result of the model, it is concluded that as the establishment area increases, producers' level of application of protective agriculture techniques increases and their awareness of climate change decreases as income increases. Providing efficiency by increasing the efficiency of other inputs in agricultural production and resulting in increased

income, water is a limited natural resource and is affected by climate change (Bayramoğlu, 2020). Irrigation in wheat is done to protect crops from water stress, especially in dry agricultural areas where rainfall is inadequate. However, in order to provide maximum benefit from irrigation, cultivation techniques such as soil cultivation and seed bed preparation, variety selection, planting, fertilization, irrigation, disease-pest control and harvesting should be kept at an optimum level according to the regional conditions. In the study conducted by Aykanat and Barut (2018), by using direct sowing method, 326.66 kg/da yield was obtained from the irrigated wheat compared to those not irrigated.

The average yield in Kadınhanı and Ilgın districts was 343.71 kg/da. In the study conducted by Polat (2020), it was stated that the widespread adoption of protective soil cultivation systems can lead to net increases in the accumulation of organic matter in agricultural lands. In this study, it is concluded that as the area of operation increases, the producers' levels of applying protective agriculture techniques increase and as their income increases, their awareness of climate change decreases. Additionally, as the wheat yield increases, it is found that the producers' level of application of protective agriculture techniques and the possibility of being aware of the changes in the climate decrease.

References

Akyüz, Y., & Atıs E. (2018). Possible Effects of Climate Change in Küçük Menderes Basin and Awareness of Producers on the Issue. Kahramanmaras Sütcü Imam University Journal of Agriculture and Nature, 2018, 21: 109-115.

Aykanat, S., & Barut, H., (2018). Comparison of Different Sowing Methods and Irrigation in Technical Aspects in Wheat Farming. Journal of the International Eastern Mediterranean Agricultural Research Institute, 1(1): 131-142, 2018

Bayramoglu, Z. (2020). Determination of Water Supply Costs of Irrigation Organizations Operating in Konya Closed Basin and Investigation of Factors Affecting This. Selcuk University Scientific Research Project, Project number: 19401016. Konya.

Bicer, B. K., & Vaizoglu, S. A. (2015). Determination of Knowledge and Awareness of Nursing Students about Global Warming /Climate Change. Hacettepe University Journal of Nursing Faculty, 2(2), 30-43.

Celik, A. (2009). Factors Affecting Performance of Direct Seeding Machines. Atatürk University Journal of the Faculty of Agriculture, 40(2), 101-108.

Corsi, S., (2018). Provective Agriculture (Training Manual for Extension Specialists and Farmers in Eastern Europe and Central Asia, Fao Documents, ISBN: 978-92-5-130777-9.

Demir, E., Saatcioglu, O., & Imrol, F. (2016). Examination of Educational Research Published in International Journals in Terms of Normality Assumptions. Current Research in Education, 2.3: 130-148.

Gencer, O. (2016). Analysis of Variables Affecting Alcohol-Tobacco Use Using Bivariate Probit Regression, Master's Thesis, Atatürk University Institute of Social Sciences Department of Econometrics, Erzurum.

Greene, H. W. (2016). Econometrics Analysis (7th Edition), Place of Publication: Palme Publishing, Ankara.

Greene, W.H. (1996). Marginal Effects İn the Bivariate Probit Model, Working Paper No. 96-11

Güris, S., Çaglayan, E., & Güris, B. (2017). Basic Econometrics with Eviews (1th Edition), Der Publications, İstanbul.

Kan, M., Kucukcongar, M., Morgounov, A., Keser, M., Ozdemir, F., Muminjanov, H., & Qualset, C. O. (2017). Determination of the Effective Factors in Populations of Local Wheat Producers of the State and Local Wheat Production Production Decision in Turkey. Journal of Agricultural Faculty of Gaziosmanpasa University.

Keles, G. (2019). Analysis of Factors Affecting Seed Preferences of Wheat Producers in Thrace Region. Journal of Tekirdag Agricultural Faculty, 16(3).

Koksal, O., & Cevher, C. (2015). A Research on the Factors Affecting the Preferences for Certified Seed in Wheat Farming. Journal of Agricultural Economics Research, 1(1), 29-39.

Ozer A, (2007). Comparison of Normality Tests. Master Thesis, Ankara University Institute of Science, Department of Animal Science, Ankara.

Polat, H. Effects of Different Tillage Systems on Sustainable Organic Matter Management. Journal of Agricultural Machinery Science, 16 (1), 1-11.

Yamane, T. (2001). Basic Sampling Methods. (1th Edition)). Literatür Publishing. Istanbul.

Yayar, R., Kaplan, C., & Simsek, U. (2014). Global Warming Economic, Social and Environmental Impact Awareness: Turkey (TR 83 Region) Experimental Results. Business and Economics Research Journal, 5(3), 81-95.

Yıldız, C., & Topal, A. (2002). The Effect of Different Nitrogen Doses and Irrigation Levels on Yield, Some Yield Components and Quality Factors in Selçuklu-97 Durum Wheat Variety in winter and Summer Planting. Selcuk Journal of Agriculture and Food Sciences, 16(30), 5-13.