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Risk Sources Encountered by Farmers in the Open Field Production of Strawberry and Risk Management Strategies: A Case of Menemen-Emiralem District of Izmir

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ABSTRACT

This study aims to determine and analyze farmers' risk perceptions, risk management strategies in strawberry production under open field. Data were obtained in 2010 production year from face-to-face interviews of 52 open-field strawberry farmers in Menemen-Emiralem district of Izmir province in Turkey. Factor analysis was used in data reduction to identify a small number of factors related to risk sources and risk strategies in this study. Then, multiple regression model was used to evaluate the influence of socio-economic characteristics on the strawberry farmers' risk perceptions and risk management strategies using factor loadings. The results of this study show that the most important risk resource that the strawberry farmers' perceive is arise from the lack of production capacity. "Sustainable income" was the most important risk management strategy factor that was significantly perceived by strawberry farmers. As a solution to lack of capacity, strawberry farmers should be specialized on strawberry growing to increase the capacity providing soil fertility, improve the product quality and application of new agricultural technologies, instead of product diversification. In terms of sustainable income, strawberry farmers should focus more on the application of alternative marketing methods, such as direct marketing from field to consumers. By forming their own cooperatives, strawberry farmers should furthermore, access to alternative market channels.

Keywords: Strawberry; Risk; Risk sources; Risk strategies; Izmir

Açıkta Çilek Üretiminde Çiftçilerin Karşılaştığı Riskler ve Risk Yönetim Stratejileri: İzmir İli Menemen İlçesi Emiralem Beldesi Örneği

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ÖZET

Bu çalışma İzmir ilinde açıkta çilek yetiştiriciliği yapan üreticilerin karşılaştıkları riskler ile tercih ettikleri risk yönetim stratejilerini incelemek amacıyla yapılmıştır. Veriler İzmir ili Menemen ilçesi Emiralem beldesinde açıkta çilek yetiştiriciliği yapan seçilmiş 52 üreticiden yüz yüze görüşme yoluyla 2010 üretim yılı için elde edilmiştir. Çalışmada belirlenen risk kaynakları ve risk stratejileri faktörlerinin sayısını azaltmak amacıyla faktör analizi yöntemi kullanılmıştır. Daha sonra, faktör analizinden elde edilen faktör yükleri kullanılarak çoklu regresyon yöntemi ile çilek üretimi yapan üreticilerin sosyo-ekonomik özelliklerinin risk kaynakları ve risk stratejileri üzerindeki etkisi analiz edilmiştir. Çalışmada, en önemli risk kaynağının kapasite yetersizliği olduğu belirlenirken, buna karşılık en önemli risk yönetim stratejisinin sürdürülebilir gelir olduğu ortaya çıkmıştır. Çalışmada çilek üreticilerinin kapasite yetersizliği riskine çözüm olarak çilek üretiminde ihtisaslaşmaya gitmeleri, sürdürülebilir gelir stratejisi için dealternatif pazarlama yöntemlerine (tarladan sofraya doğrudan pazarlama vb.) yönelmeleri gerektiği sonucuna varılmıştır. Ayrıca çilek üreticilerinin kendi kooperatiflerini kurarak alternatif pazarlama kanallarını oluşturmalarının çözüm olacağı ifade edilmiştir.

Anahtar Kelimeler: Çilek; Risk; Risk kaynakları; Risk stratejileri; İzmir

1. Introduction

Risk is uncertainity that affects an individual's welfare, and is often associated with adversity and loss. Farming is characterized by uncertainity. Farm operators are faced with variable weather conditions, fluctuating input and product prices, rapidly advancing technology, changing environmental regulations and changing government policies, both domestically and internationally (Stockil & Ortmann 1997). The risk is so high in open field strawberry production. Strawberries are susceptible to many insects, pests, and diseases; weeds can easily overrun strawberry fields, choking off production. Severe winter temperatures or late spring frosts can destroy crops. Excessive rain increases diseases and can interfere with pollination, fruit set, and harvest. Labour, marketing, and transportation represent risks as well. Strawberry production is complex, and intensive management is needed to produce a successful commercial crop.

Modern strawberry production in Turkey started in 1970s (Keçecioğlu 2009). According to the data of 2010, 299.940 tons of strawberry produced in 116.792 decare area in Turkey. 40% of this production (122.316 tons) belongs to greenhouse production (TurkStat 2010). According to the data of 2010, the USA ranks first with 1.292.780 tons and it belongs with 29.6% of world strawberry production. This figure was followed by Turkey with 299.940 tons, Spain with 275.300 tons, Egypt with 238.432 tons, Republic of Korea with 231.803 tons (FAOSTAT 2012).

There is much literature about risk sources and risk management strategies. Some of these are: Ceyhan et al 1996; Patrick & Musser 1997; Coble et al 1999; Babcock et al 2000; Bard & Barry, 2000; Mickelsen & Trede, 2001; Akcaoz et al 2006; Gunduz & Esengun, 2006; Sahin et al 2008; Tumer et al 2012. Recent research similar to this research was conducted in the US, South Africa, Antalya and Erzurum(Patrick & Musser 1997; Ortman et al 1995; Nicol et al 2008; Akcaoz et al 2006; Tumer et al. 2012). Patrick & Musser (1997), using factor analysis and determining risk sources costs, family, livestock gross income, crop gross income, credit and policy in their studies. Ortmann et al (1995), conducted a study among 199 commercial farmers in the province of Kwazulu-Natal, South Africa and they determined risk sources and risk strategies. Factor analysis suggests that crop gross income, government policy, livestock gross income, credit access, government regulation and cost were described as risk sources. Risk strategies were marketing, insurance, production, financial, cost reduction and assurance. Nicol et al 2008 did the same in Kwazulu-Natal in South Africa. Akcaoz et al (2006) determined risk sources and risk

management strategies by using factor analysis in Antalya and Tumer et al (2012) searched risk sources and risk management strategies in Erzurum.

Despite the fact that the evaluation of farmers risk perceptions and risk management strategies are essential to better understand their risk behaviour and managerial decisions, no studies have explicitly investigated awareness of risk among strawberry farmers. The purpose of this paper is to determine the risk sources that the farmers face in strawberry production and the risk management strategies that can be used for dealing with these risk sources in Izmir Emiralem District. There are several reasons for selecting this district as a research area. The research district has very favourable climatic conditions for strawberry production. On the other hand strawberry production in Emiralem district has 98.1% of production quantity in Izmir.

2. Material and Methods

Data were collected in 2010 via personal interviews of a random sample of 52 open-field strawberry farmers in Izmir Province of Turkey. The survey was implemented in the district of Menemen-Emiralem in Izmir province (Agir 2012). The sample size is determined by using proportional sampling method (Newbold 1995).

$$n = \frac{Np(1-p)}{(N-1)\sigma_{p_x}^2 + p(1-p)} \quad (1)$$

Where; n, sample size; N, number of farms (280 farmers); p, the percentage of farmers who grow strawberries in open fields (taken as 0.50 to reach maximum sample size); variance.

According to the proportional sampling method, with a 95% confidence interval and 10% error margin, the required sample size was found as 72. Randomly selected 52 open-field strawberry farmers and 20 greenhouse farmers were interviewed. But, this article contains only the information collected from farmers growing strawberry under open field.

To carry out the survey to determine the risks encountered by farmers growing strawberry under open field and the strategies to counter the risks observed, a questionnaire form was prepared. Two sections of risk perceptions and strategies questions were included in the questionnaire. Survey respondents were requested to rank the importance of each risk or strategy response using a Likert-type scale with a range from one (not relevant) to five (very relevant). Many of these past studies have used multivariate analysis (specifically factor analysis) to identify the main sources of risk and management responses to risk that are prevalent in their respective study samples (Nicol et al 2008). It was also used factor analysis to determine strawberry farmers' risk sources and strategies to manage risk.

Factor analysis is the name given to a group of statistical techniques that can be used to analyze interrelationships among a large number of variables and to explain these variables in terms of their common underlying dimensions (factors). The factors are simply a weighted sum of the observed variables, where the weights associated with the variables usually differ from each other. Thus, each subject in the sample obtains a score on each defined factor that is computed by summing the weighted scores on the observed variables of this subject. The weights for the various variables used to define the factors are equal for all subjects. The factors are usually not computed from the raw observed scores on the variables, but from the standardized versions of the variables. Hence, it is customary to use standard scores, also called z-scores, instead of the raw scores on the variables. By definition, the mean score of a standardized variable over all subjects in the sample is zero, and the standard deviation is one. In the factor analysis, the factor score for the i^{th} subject on the q^{th} factor was calculated according to the formula given below (Timmerman 2005).

$$f_{iq} = b_{1q}z_{i1} + b_{2q}z_{i2} + b_{3q}z_{i3} + \ldots + b_{Jq}z_{iJ} \quad (2)$$

Where; b_{jq} denotes the weighting of the j^{th} variable (j=1,…,J) used in the determination of the q^{th} factor, and z_{ij} denotes the score of subject i (i=1,…,n) on the j^{th} standardized variable. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (MSA) was

used to determine whether individual variables are suitable for inclusion in the factor analysis. The MSA lies between 0 and 1 and is described by Kaiser as a measure of the extent to which a variable "belongs to the family" of the larger group of variables. Berghaus et al (2005) states that a value which is lower than 0.5 may be considered "unacceptable" (Jordaan & Grové 2007).

A first quick estimate of the number of factors is obtained from the sizes of the eigenvalues reported as part of an initial run with principal factor extraction. Eigenvalues represent variance. Because the variance that each standardized variable contributes to a principal factor extraction is 1, a factor with an eigenvalues less than 1 is not as important, from a variance perspective, as an observed variable. Once we have determined the number of factors by these criteria, it is important to look at the rotated loading matrix to determine the number of variables that load on each factor. Factors are interpreted through their factor loadings. The greater the loading, the more the variable is a pure measure of the factor (Huber 2012). Factor loadings greater than ±0.30 are considered to meet the minimal level; loadings of ±0.40 are considered more important; and if the loadings are ±0.50 or greater, they are considered practically significant. Thus the larger the absolute size of the factor loading, the more important the loading in interpreting the factor matrix. Because factor loading is the correlation of the variable and the factor, the squared loading is the amount of the variable's total variance accounted for by the factor. Thus, a 0.30 loading translates to approximately 10 percent explanation, and a 0.50 loading denotes that 25 percent of the variance is accounted for by the factor. The loading must exceed 0.70 for the factor to account for 50 percent of the variance (Hair et al 1998). Choice of the cut off for size of loading to be interpreted is a matter of researcher preference (Tabachnick & Fidell 2007). In this study, the factors were interpreted according to factor loadings greater then ±0.40.

Multiple regression model was used to analyse the relationships between the socio-economic characteristics and the perception of risk sources and risk management strategies of the strawberry farmers (Aditto et al 2012; Flaten et al 2005). This method was employed to evaluate the influence of socio-economic characteristics on the strawberry farmers risk perceptions and risk management strategies. The regression equations for the strawberry farmer's perceptions of risk source and risk strategies with socio-economic variables are presented as follows:

$$RS_i = b_0 + b_1FSIZ + b_2SSIZ + b_3GM + b_4INCM + b_5OFFW + b_6GPVSP + b_7EDU + b_8FEXP + b_9SEXP + e \quad (3)$$

$$RMS_i = b_0 + b_1FSIZ + b_2SSIZ + b_3GM + b_4INCM + b_5OFFW + b_6GPVSP + b_7EDU + b_8FEXP + b_9SEXP + e \quad (4)$$

Where; RS_i is the source of risk i (the factor loadings for the three risk source factors that resulted from the factor analysis); RMS_i is the risk strategy i (the factor loadings for the two risk strategy factors that resulted from the factor analysis); b_0 is the regression constant; 'b_1', 'b_2', 'b_3', 'b_4', 'b_5', 'b_6', 'b_7', 'b_8' and 'b_9' are the regression coefficients of socio-economic variables; e is the error term of the regression model. FSIZ (farm size), SSIZ (area of land allocated to growing strawberries, GM (brut margin of strawberry per decare), INCM (annual household income), OFFW (off-farm work), GPVSP (percentage of the strawberry production value in the farm's total gross production value), EDU (farmer education), FEXP (farming experience, SEXP (farmers' experience in strawberry production) were considered as independent variables.

3. Results and Discussion

3.1. Socio-economic characteristics of strawberry growing farms

Socio-economic characteristics in open field strawberry farms are given Table 1. Average age of farm owner is 48.29 and education level is 5.71 years. 80.76% of producers in strawberry farms are graduated from primary schools. Average family size is 3.48 people. Experimental period of producer is 21.04 years in open field strawberry production. 90.3% of farmers are member of an agricultural cooperative in research area. The average farm size of investigated farms is 20.27 decares. The average number of parcels per farm is 3.71 and the average strawberry land size is 5.10 decares. In the strawberry farms the seasonal labour usage (59.01%) are higher than family labour usage (40.99%). The species of Camarosa, Sweet Charlie and Festival are mostly preferred by strawberry farmers in research area. Strawberry production has very labour- intensive. In this research seasonal labour usage is found higher than family labour usage.

Total strawberry production is 16.88 tonnes per farm. The strawberry yield is 3.34 tonnes per decare. According to an another research including Izmir-Emiralem District, average strawberry yield per decare was found 1.15 tonnes (Konak 1997). When this situation is compared with the current one, the yield increases by the presentation of the new kinds to the region. The yield amount of Izmir-Emiralem District is higher than in most of provinces in Turkey and also Turkey's average strawberry yield. For example, yield per decare is 0.94 tons in Bursa, 1.92 tons in Elazığ, 1.11 tons in Konya, 3.26 tonnes in Sakarya, 0.50 tons in Erzurum (Karadas 2007) and 2.2 tons in Samsun (Balcı 2005) and average strawberry yield is 2.31 tons in Turkey (Turkstat 2010).

In this research it was observed that the strawberry yield per plant is 556.33 grams. A research that conducted in Van province strawberry yield was obtained 352.05 grams per plant (Gecer & Yılmaz 2011). The average strawberry yield per plant was found 224.4 grams in Samsun (Balcı 2005) and it was found 648.1 grams Amik plain in Antakya-Turkey for open-field conditions (Gunduz 2003).The yield quantity of Izmir- Emiralem District compared with other regions of Turkey, it might be said that Izmir-Emiralem District climate conditions is highly available for strawberry production. A research that carried out by Adak & Pekmezci (2011) the highest fruit yield was obtained in March and April months. The highest amount of first fruit quality was at the beginning of harvest time (in a period from December to February)

Table 1-Socio-economic characteristics of open-field strawberry farms

Çizelge 1- Açık alanda çilek yetiştiriciliği yapan tarımsal işletmelerin sosyo-ekonomik özellikleri

Characteristics	*Mean*
Age of farmer (year)	48.29
Education level of farmer (year)	5.71
Experience of farmer in strawberry production	21.04
Household size (person)	3.48
Farm size (da)	20.27
Number of parcels per farm (item)	3.71
Open-field strawberry land per farm (da)	5.10
Seasonal labour usage (%)	59.01
Family labour usage (%)	40.99
Total labour usage (MLU* da^{-1})	0.45
Strawberry yield per decare (in open-field) (ton da^{-1})	3.34
Strawberry yield per plant(g)	556.33
Gross production Value($ da^{-1})	4296.32
Variable costs ($ da^{-1})	2762.46
Gross margin ($ da^{-1})	1533.86
Production cost($ da^{-1})**	4293.86
Production cost($ kg^{-1})	1.29

*, MLU, male labour unit: Manpower used in different stages of the production was calculated in male labor unit (MLU) considering the sex, age and working hours of the farm household members (Erkus & Demirci 1996). Labour use in production activities was given in hours. Number of working days for family labor was accepted 300 for adults and 100 for children of 7-14 age group in calculation of potential labor force in male working day unit (Karagolge 1996). (1 MLU= total 300 man-days $year^{-1}$); **, production cost includes facility cost, fixed cost and variable cost (1 $ is equal to 1,5473 Turkish Liras in 2010)

Table 2- Gross production value, variable costs, gross margin in strawberry production by some selected countries

Çizelge 2- Seçilmiş bazı ülkelerde çilek üretiminde brüt üretim değerleri, değişken masraflar, brüt karlar

Countries	*Gross production value ($ da^{-1})*	*Total variable costs ($ da^{-1})*	*Gross margin ($ da^{-1})*
Mid-Atlantic Region (Demchak 2012)	4840	2439.26	2401
Eastern United States (Lantz et al 2010)	7797.02	3244	4553
Iran (Salami et al 2010)	1101.3	918.8*	182.5**
Iraq (USAID 2009)	10991	5241	5750
Ireland (O'Brien 2006)	13626	11332	2294

*, total production costs; ** , net margin

Gross production value of strawberry is 4296.32 $ per decare, gross margin is 1533.86 $ per decare and production cost is 4293.86 $ per decare and 1.29 $ per kg in Menemen -Izmir District (Table 1). But, the levels of gross margin, gross production value, and variable costs can vary drastically from one country to another (according to the farming systems, geographic location, weather and market conditions, supporting goverment policies and farm types).

While price received by farmers for fresh strawberry in Izmır-Turkey is 1.286 $ kg^{-1} for 2010, the average price in U.S as 2.0 $/kg is found 55% greater than Turkey's strawberry price at the same year (USDA 2010). The reason of that is have to direct marketing conditions for strawberry in U.S. In research area, the marketing methods of strawberry were determined as selling to local wholesaler (75%), retail selling in local market (11.0%), and selling to wholesaler and retail selling in local market (14%) (Agir 2012).

3.2. Perceived sources of risk by farmers in strawberry growing farms

Mean ratings of various sources of risk, measured on a five-point Likert-type scale (where five indicated 'very relevant'), are presented in Table 3. This table shows that, on average, the highest score was given to risk related to poor farm maintenance practices (4.83). This was followed by changes in costs of farm inputs (4.81), producing low quality products (4.77), improper harvesting techniques and harvesting time (4.69), marketing inefficiency (4.60), the management of weather-related risks (4.46), and issues related to small-scale farms in strawberry production (3.90). Sources of risk that received average scores below 2 (indicating that they were generally not perceived as relevant) related to usage of certified seedlings (1.79) and selection of suitable varieties (1.75). Factor analysis was conducted to reduce the dimensionality of the personal reasons which restricted farmers to grow strawberry, with the results being presented in Table 3. Nine sources of risk given in Table 3 were included in a factor analysis to determine various dimensions to the sources of risk. Three factors, having Eigenvalues greater than one and accounting for 64% of the variation in the data, were included in the analysis. With regard to the goodness of fit measures, the communalities of the variables, except for the management of weather-related risks, are more than 0.5 which indicates that the factors explain more than 50% of the variation in the variables. These variables also contribute significantly to the interpretation of the respective factors and therefore, the results were judged to be acceptable. In the first factor, usage of certified seedlings, selection of suitable varieties, producing low-quality product, improper harvesting techniques and harvesting time, and poor farm maintenance practices, scored high factor loadings and thus were grouped into Factor 1.

Table 3- Likert scale scores, standard deviation and varimax rotated factor loadings for sources of risk

Çizelge 3- Risk kaynakları için likert ölçek skorları, standart sapma ve varimaks rotasyon yöntemi ile elde edilen dönüştürülmüş faktör yük değerleri

	Average		Factors[2]			
Source of risk	*scores* [1]	*sd*	*1*	*2*	*3*	*Communalities*
Usage of certified seedlings	1.79	1.486	-0.906	0.112	0.032	0.834
Selection of suitable varieties	1.75	1.356	-0.834	0.070	-0.079	0.706
Producing low-quality product	4.77	0.581	0.770	0.176	-0.194	0.662
Improper harvesting techniques and harvesting time	4.69	0.579	0.768	-0.184	-0.050	0.626
Poor farm maintenance practices	4.83	0.474	0.542	0.341	0.385	0.558
Changes in prices of farm inputs	4.81	0.398	0.091	0.730	0.002	0.541
The management of weather-related risks	4.46	0.917	0.146	-0.634	0.019	0.423
Marketing inefficiency	4.60	1.107	0.125	-0.338	0.778	0.735
Issues related to small-scale farms in strawberry production	3.90	1.404	0.264	-0.267	-0.706	0.639

[1], (1, not relevant; 5,very relevant); [2], factors 1 to 3 are lack of capacity, variability *in* costs, and market risk respectively; Kaiser-Meyer-Olkin, 0.643; Barlett's Test of Sphericity, 140.466. sig.0.000. correlations between the variables is significant at the 0.01 level

When the variables of F1 factor are analyzed, it is seen that these variables are related with lack of capacity. Factor 1 was therefore labelled "lack of capacity". The usage of certified seedling and selection of suitable varieties within factor 1 have negative values. This points out that risk value arising from lack of capacity will decreases depending on the usage of suitable seedlings and certified farmers. On the other hand, the other variables of factor 1 have positive values. Producing low quality strawberry, improper harvesting techniques and harvesting timing; poor farm maintenance practices (soil cultivation, disease control, irrigation etc.) increase the risk arising from lack of capacity. Therefore, farmers should enhance their capacity in order to reduce the value of factor 1. In this way, strawberry farmers should be directed to sustainable production which considers the demand of the market.

Factor 2 can best be described as the 'variability in costs' factor because of the high loadings associated with the changes in prices of farm inputs and the management of weather-related risks. The loadings show a positive value of 0.730 for changes in prices of farm inputs and a negative value -0.634 for the management of weather-related risks.

Changeable prices of the inputs (especially soil and fuel oil) for strawberry production considerably affect the production cost. This change is generally negative, so the increase of the input prices affects the increase of the production cost. Another variable that increases value of the variable is the lack of weather related risk management. In open field farming, protection precautions against environmental conditions are taking place at the lowest level. Plants stay unprotected against wind, rain, snow, cold and hot weather and other negative environmental factors. This causes harmful effects on plants in growing period and a degression in unit area efficiency. Consequently, weather condition related sudden efficiency degression results with the negative effect on costs, in other words results with the increase of production cost.

Factor 3 can be referred to as a 'market risk' factor due to high loadings of variables related to marketing inefficiency and issues related to small-scale farms in strawberry production. The loadings show a positive value of 0.778 for marketing

inefficiency and a negative value -0.706 for issues related to small-scale farms in strawberry production.

As strawberry farmers have low marketing efficiency, the value of price risk increases. Even though product quality in Emiralem is better than the other regions, the product price is low. Strawberry farmers who don't work with any cooperatives don't have their own freezing and packaging facilities. For that reason they sell their products to commissioner or dealer. Moreover, it is determined that farmers having poor marketing experiences do not have any alternative marketing approach. These problems affect marketing inefficiency and increase of the market risk.

Generally, being small-scaled enterprises, strawberry farmers are implicitly affected from price risk. The strawberry enterprises located in investigated regions are small-scaled, limited and distributed enterprises. Therefore, they are not able to reach the profits or standards of large-scaled enterprises. Small-scaled enterprises' higher unit production costs than large-scaled enterprises, supplying low quantity to the market, lack of opportunity to process and power to finance the expenditure have a negative effect on bargaining power. Thus, this means that the small-scaled enterprises have more price risk.

3.3. Risk management strategies by farmers in strawberry growing farms

Strawberry Farmers' perceptions of strategies to manage risk were also assessed using scales from 1 (not relevant) to 5 (very relevant). Table 4 shows that, on average, the highest scores were given to risk strategies related to the establishment of cooperative associations among the farmers (4.92), production of new varieties (4.90), and marketing differentiation (4.88). These were followed by farm crop production planning (4.35), implementation of processing techniques for strawberry (4.15), and agricultural insurance (4.00).

Factor analysis of responses to risk management approaches resulted in two factors with eigenvalues greater than 1 and a total variance explained of 62.75%. Factor analysis obtained under varimax rotation of the strawberry farmers' responses is presented in Table 4. Based on the concentration of factor loadings, the two factors can be described as 'reducing market risk' and 'sustainable income'. With regard to the goodness of fit measures, the

Table 4- Likert scale scores, standard deviation and varimax rotated factor loadings for risk management strategies

Çizelge 4- Risk yönetimi stratejileri için likert ölçek skorları, standart sapma ve varimaks rotasyon yöntemi ile elde edilen dönüştürülmüş faktör yük değerleri

Risk management strategy	*Average scores*[1]	*sd*	*Factors*[2]		*Communalities*
			1	2	
Marketing differentiation	4.88	0.379	0.900	0.112	0.823
The establishment of cooperative associations among the farmers	4.92	0.334	0.839	0.084	0.711
Production of new varieties	4.90	0.409	0.809	-0.049	0.657
Implementation of processing techniques for strawberry production	4.15	1.420	0.505	0.497	0.501
Farm crops production planning and control	4.35	1.251	-0.270	0.861	0.813
Agricultural insurance	4.00	1.386	0.306	0.407	0.259

[1], (1,not relevant; 5, very relevant); [2], factors 1 to 2 are reducing market risk and sustainable income respectively; Kaiser-Meyer-Olkin, 0.704; Barlett's Test of Sphericity: 84.601. sig.0.000. correlations between the variables is significant at the 0.01 level

communalities of the variables, except for the agricultural insurance, are more than 0.5 which indicates that the factors explain more than 50% of the variation in the variables. These variables also contribute significantly to the interpretation of the respective factors and therefore, the results were judged to be acceptable. In the first factor, marketing differentiation, the establishment of cooperative associations between the farmers, production of new varieties, and implementation of processing techniques for strawberry, scored high factor loadings and thus were grouped into Factor 1. The loadings show positive values ranging from 0.900 to 0.505 and explain the largest percentage (about 44%) of the total variance.

When the variables of the F1 factor take into account, it is seen that these variables are the approaches in order to reduce the market risk. Factor 1 was therefore labeled "reducing market risk". With the market differentiation approach within factor 1, farmers aim to reduce the market risk. Risk management approaches of the other farmers in factor 1 support that notion. These approaches can be listed as; founding a cooperative among strawberry farmers, producing new kinds demanded by market, enabling product differentiation applying processing techniques. Strawberry farmers have lack of capacity in market differentiation. Thus they must provide the differentiation by founding a cooperative. By this means, farmers are able to sell their products to consumer groups, retailers and the other purchaser groups at better prices.

Factor 2 is formed mainly from the two components of farm crop production planning and control and agricultural insurance. The factor loadings show positive values ranging from 0.861 to 0.407 and explain 19.58% of the total variance. When the variables that compose the F2 factor take into account, it is observed that these variables are the approaches in order to maintain the sustainability of income. Factor 2 was therefore labelled "sustainable income". The most important risk strategy in factor 2 is the production planning and control. With this strategy it is identified that strawberry farmers aim to accomplish production planning and control for the other products that are grow besides strawberries in the establishment. Within this scope; the increase of product variety, allocation of the resources for more profitable production activities, choice of the appropriate cultures, attending the education and publication in order to decrease the efficiency loss caused by improper cultural applications (fertilization, irrigation, disinfection, harvest, etc.). Hereby, the prevention of the possible income loss caused by both strawberry and other crop production is aimed.

The second risk strategy variable in the factor 2 is an agricultural insurance. This variables factor load is considerably low when it is compared with the other variable. It shows that agricultural insurance variable is insufficient to explain factor 2. Agricultural insurance attracts attention for being the least important risk strategy in the eyes of strawberry farmers. It is also not seen effective for the sustainability of income. Newly getting known agricultural insurance, insufficient knowledge of farmers about the insurance, views about how high the insurance premium is show that agricultural insurance is not an effective risk strategy in Turkey.

3.4. The relationship between the farmers' characteristics with perceptions of risk sources and risk management strategies

Multiple regression analysis used to examine the relationship between the strawberry farmers' socio-economic characteristics and perception of sources of risk and risk management strategy components obtained from the factor analysis. Table 5 shows the relationship between strawberry farmers' socio-economic characteristics and perceptions of risk sources. "Lack of capacity" is the only risk source that is statistically significant at the 10% significance level, compared to the other risk sources. The model related to the "lack of capacity" risk explains around 30% of the variation of the dependent variable. This result shows that risk related to the "lack of capacity" was only perceived as highly important by strawberry farmers. Of the socio-economic characteristics, only strawberry land size, farm experience and strawberry experience have significant effects on the perception of this risk

Table 5- Results of multiple regression analysis in relation to the source of risk components and socio-economic characteristics of strawberry farms

Çizelge 5-Çilek üretimi yapan işletmelerin risk kaynakları unsurları ile sosyo-ekonomik özelliklerine ilişkin çoklu regresyon analizi sonuçları

Independent variables	*Source of risk*					
	Lack of capacity (1)		*Variability in costs (2)*		*Market risk (3)*	
	Coefficient	*p-value*	*Coefficient*	*p-value*	*Coefficient*	*p-value*
Constant	0.756	0.317	-0.180	0.837	0.068	0.932
Farm size	0.023	0.181	-0.010	0.607	-0.027	0.141
Strawberry land size	-0.111	0.008***	0.021	0.648	-0.036	0.394
Gross magrin	0.000	0.475	0.000	0.886	0.000	0.258
Household income	-0.008	0.969	0.099	0.667	0.092	0.659
Off-farm work[b]	0.281	0.428	-0.074	0.856	-0.068	0.856
GPV strawberry (%)[c]	0.307	0.405	-0.273	0.524	-0.711	0.073
Education[d]	0.247	0.489	0.344	0.408	0.383	0.312
Farm experience (yrs)[e]	0.873	0.028**	0.141	0.753	-0.145	0.723
Strawberry experience (yrs)	-0.054	0.024**	-0.009	0.730	0.008	0.752
R^2	0.294		0.043		0.211	
P-value(F)	0.071*		0.991		0.294	

[a], variables and model significant at *, P<0.1; **P<0.05; ***P<0.01; [b], 1, if the farmer has off-farm work, 0 if no off-farm work; [c], percent of the strawberry production value in the farm's total gross production value (GPV), 1, if it is greater than 50% , 0 otherwise; [d], 1, if the education of the farmer is secondary school and higher, 0 if primary school education or less; [e], 1, if the farming experience over 30 years, 0 otherwise

source. Strawberry land size is negatively related to the "lack of capacity" risk. This implies that farmers who have higher the area of land allocated to growing strawberries are likely to perceive this risk source as significantly more less than farmers who have smaller strawberry land size. Farming experience of strawberry farmers is positively related to the "lack of capacity" risk perception. This result shows that the more experienced farmers perceive risk related to "lack of capacity" as highly important. However, experience or the number of years in strawberry farming is negatively related to the "lack of capacity" risk perception. This result suggests that less experienced farmers in strawberry farming tended to perceive risk related to the "lack of capacity" as highly important. This finding suggests that the specialization in agricultural production is more important than the years of farming experience.

The multiple regression models of the risk management strategy components and the socio-economic variables for strawberry farmers are presented in Table 6. The "sustainable income" risk strategy, except that for "reducing price risk", was statistically significant. This implies that the strawberry farmers found "sustainable income" risk strategy more important than the other risk strategy. Education, farming experience and strawberry growing experience variables, except the other socio-economic variables, have at least 5% significant relationship with the "sustainable income" risk management strategy. These variables were positively related to "sustainable income" risk strategy. This shows that the more educated and more experienced farmers believe that this risk strategy can help to maintain their farm income.

Table 6- Results of multiple regression analysis in relation to the risk strategy components and socio-economic characteristics of strawberry farms

Çizelge 6- Çilek üretimi yapan işletmelerin risk stratejileri unsurları ile sosyo-ekonomik özelliklerine ilişkin çoklu regresyon analizi sonuçları

Independent variables	*Risk management strategies*			
	Reducing market risk (1)		*Sustainable income (2)*	
	Coefficient	*p-value*	*Coefficient*	*p-value*
Constant	-0.437	0.599	-1.690	0.028**
Farm size	-0.021	0.258	0.004	0.792
Strawberry land size	-0.048	0.286	0.003	0.941
Gross magrin	0.000	0.545	0.000	0.164
Household income	0.222	0.312	0.037	0.849
Off-farm work	-0.083	0.832	-0.225	0.524
GPV strawberry (%)	-0.101	0.804	0.211	0.565
Education	0.214	0.586	0.910	0.014**
Farm experience (yrs)	0.288	0.499	-0.889	0.025**
Strawberry experience (yrs)	0.001	0.979	0.067	0.006***
R^2	0.138		0.297	
P-value(F)	0.663		0.067*	

[a], Variables and model significant at *, P<0.1; **P<0.05; ***P<0.01; [b], 1, if the farmer has off-farm work, 0 if no off-farm work; [c], percent of the strawberry production value in the farm's total gross production value (GPV), 1, if it is greater than 50% , 0 otherwise; [d], 1, if the education of the farmer is secondary school and higher, 0 if primary school education or less; [e], 1, if the farming experience over 30 years, 0 otherwise

4. Conclusions

The results of this study shows that the most important risk resource that the strawberry farmers perceive is arise from the lack of production capacity. As a solution to lack of capacity, strawberry farmers should be specialized on strawbery growing to increase the capacity providing soil fertility, improve the product quality and application of new agricultural technologies, instead of product diversification. "Sustainable income" was the most important risk management strategy factor that was significantly perceived by strawberry farmers. One of the alternative solutions is the application of this strategy by means of establishing a cooperative. Another alternative solution is that the strawberry farmers apply the direct marketing methods. Within these methods, there exists options such as, direct sales from field to consumer in the harvest season, the application of community supported agricultural models and establishment of connections and sales contracts with institutions such as retailers, restaurants, schools, hotels, hospitals, dormitories, etc. Also, in order to use the direct marketing options, strawberry farmers have to make differentiation in the presentation of the products to the market. Some of this diversifications are; choice of the varieties which are oriented to the consumer preferences, producing strawberries as organic or good agricultural practices, packaging in different sizes, with the bounds of possibility processing the strawberry (organic strawberry jam, organic dried strawberry etc.).

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