



Risk management and sustainability in banana production: A case study from Turkey

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Abstract

The aim of this paper was to show some empirical evidence of sustainability and risk management in banana production in Turkey. The study also included socio-economic characteristics, decision making, financial characteristics, sustainability issues, risk sources and risk management strategies related with banana farms. The main material of the study was obtained from the data collected by survey conducted in three villages in Anamur county of Mersin province. Within the context of the research 89 farmers were interviewed in the 2008 production season. Farmers' perceptions were studied using descriptive statistical analysis. Mean values were obtained in banana farming, and factor analysis was conducted on the data obtained in the questionnaires. In the research it was found that the decision of the farmer overweighs in decision making process for banana production, there is no regular record keeping in almost 90% of the farms and around 70% of the farmers will continue banana production. According to the research findings, the most important risk sources in banana production are the variation of banana prices and input prices and the most important risk management strategy is to spray and drench for diseases and pests.

Key words: Banana, sustainability, decision making, financial characteristics, risk, Turkey.

Introduction

Banana fruit, the production of which is restricted in some regions in both the world and in Turkey, is a rather demanded product as it is delicious, exotic and nutritious. The production, consumption and trade of banana is in high volumes in the world, it is being exported from tropical and subtropical regions to the developed countries and it can easily find market for sale in these countries. Banana is the fourth most important staple crop in the world and is critical for food security in many tropical countries. World banana production amounts to some 71 million tons in 2006¹, concentrated in Africa, Asia, Latin America and The Caribbean. More than 85 countries produce bananas and plantains².

Zereyesus reported that in Eritrea, production problems experienced by farmers include shortage of capital and a scarcity of land, shortage of farming materials limiting production levels, high level of spoilage during harvesting basically due to inappropriate harvesting techniques and lack of technical know-how and facilities, shortage of pesticides, adverse climatic conditions and lack of selected seeds². Mbogoh *et al.*³ attempt to demonstrate that a prudent introduction and promotion of a new biotechnological innovation in banana farming can make a positive contribution to the socio-economic status of resource poor farmers in a developing country such as Kenya. In Cape Verde, problem of declining banana exports was investigated with the set of specific objectives like to analyze factors affecting the supply of bananas in Cape Verde, to review trends in the total demand for Cape Verde bananas as an attempt to discover the decline in bananas exported, to suggest additional research and policy recommendations which could improve the production and sales of bananas⁴.

Turkey is residing in the north end of the countries producing banana⁵. The share of Turkey in banana plantation lands is 0.20%, in production 0.84% and in imports 0.25%. Yet, in 2002 Turkey exported banana for the first time. All banana production of Turkey is met by Antalya and Mersin provinces in Mediterranean Region, and banana is produced in Anamur, Bozyazi, Alanya and Gazipaşa counties and their periphery that provide protected microclimates by Toros Mountains. Banana production in Turkey has gained importance in recent years with the impact of developing covered production⁶. However, the local production has still not met the domestic demand and the discrepancy could not be met by imports⁵.

There are various problems encountered in banana production and marketing. Some of the problems are disability of current production to meet domestic demand, existing property right disputes of banana production fields, limited opportunities for irrigation, limited amount of production lands, farmers having implementing fertilization and pest control unconsciously, banana imports affecting farmer prices negatively, incompatibility with covered production techniques, amount of production lands diminishing due to territorial interconnection with tourism^{6,7}.

Farmers with more access to financial liquidity are able to purchase cash inputs, finance land improvements, hire labor and smooth household consumption throughout the agricultural production cycle. In the absence of insurance markets, reliable access to credit allows farmers to invest in more risky but higher yielding crop management practices. However, because of risk and asymmetrical information inherent in agriculture, formal

financial institutions ration the amount of credit supplied to the farm sector, leading to a cash constraint, in particular among the smallholder farmers. The response from farmers is to allocate their family labor to non-farm income generating activities (including wage employment) or to farms whose production characteristics enable farmers to relax the liquidity constraint (e.g. livestock and bananas). Bananas are harvested throughout the year and monthly sales can enable farmers buy the required inputs. Monthly production also enables the farmers have some food throughout the year, which is not the case with annual food crops such as maize and millet that are only produced once or twice a year with the probability of crop failure. Thus while farmers might mark negatively output prices for annual food crops (e.g. maize and millet) because of the risk involved, output prices for bananas are marked positively because of the relaxation in the liquidity constraint. Access to off-farm activities and farm assets (livestock) also enables farmers get regular income enabling them to take risky decisions with respect to resource allocation ⁸.

There are various researches in the literature regarding subjects related with banana production, demand, marketing and trade, etc.⁸⁻²⁸. Yet there is no acknowledged research in our country on the subject of sustainability in banana production and risk management. Subsequently, the objectives of this study are: i) to study the current general socio-economical situation of farmer in the banana farm, ii) to investigate risk sources and risk management strategies in banana production, iii) to evaluate farming reasons of farmers and iv) to determine sustainability conditions in banana production.

Research Area

Mersin province has been an important settlement area since the ancient ages due to its geographical situation, high yield agricultural lands, natural harbor characteristics and natural beauty. Mersin province takes place in Mediterranean Region and its western neighbor is Antalya, eastern neighbor is Adana, northern neighbors are Nigde-Konya and Karaman and it is surrounded with Mediterranean Sea on the south. The north-south borders of the province are between 36-37° Northern latitudes and the east-west borders are between 33-35° Eastern longitudes.

The territorial border of the province is 608 and coastal border is 321 km, respectively, and the area it covers is 15.953 km². Mersin province counts for 2% of the surface area of Turkey. Mersin has 10 counties, including the central county, 57 county towns and 510 villages, and poly-cultural agricultural practices are widespread across the province. There are significant differences among counties in terms of development level of agriculture, industry and tourism sectors. The climatic conditions are under the impact of the Mediterranean. More than half of the annual precipitation takes place in autumn and winter months. Snow fall does not take

place in the low altitude regions, yet it approaches in plateaus and high altitude regions. The annual amount of precipitation is 450-736 mm, and there are significant differences in low altitude regions. The average temperature of the province is 7.5°C in February and 26°C in July. The relative humidity is around 63% ⁷. Mersin province is subdivided into four agro-ecological sub regions due to biophysical significance and socio-economical level of development (Table 1).

Anamur and Bozyazi towns constitute a region, situated towards South around 30 km more than the North end of Africa (Fig. 1), where mostly banana farming takes place and at least 90% of the economy is dependent on agriculture. The region has a subtropical climatic situation and a specific microclimate. Anamur has a considerable agricultural efficiency and potential, and it is a region where most typical subtropical plants (banana - *Musa sapientum*, orange - *Citrus aurantium*, lemon - *Citrus limonum*, pomegranate - *Punica granatum*, avocado - *Persea americana*, kiwi - *Actinidia deliciosa*) and undercover products (tomato - *Solanum lycopersicum*, pepper - *Capsicum annuum*, egg plant - *Solanum melongena*, cucumber - *Cucumis sativus*, strawberry - *Fragaria vesca*) are planted. Anamur also gave its name to some typical agricultural product (Anamur banana, Kukur Pomegranate, Bozyazi Golevazi, Ovabasi Orange, etc.)²⁹.



Figure 1. Research area.

Material and Methods

The Anamur region of Turkey was selected for this study in order to determine sustainability, risk sources and strategies in banana farming. Anamur county is located in Turkey's main banana production area. The major share of banana production in the Mersin region is concentrated in this area. Of total agricultural lands in Anamur county of Mersin province 3.2% is composed of open banana fields and 31.7% are covered banana fields ²⁹. Around 99.8% of banana production in Mersin takes place in the second sub-region, Anamur being a part of it ⁷.

Table 1. Sub-regions and characteristics in Mersin.

Sub-region	County	Location	Annual mean rain (mm)	Annual mean temperature (°C)	Climate
I	Centre, Tarsus, Erdemli, Silifke	In the coastline	590	19.6	Mediterranean climate
II	Anamur, Aydıncık, Bozyazi	In the coastline	926	19.0	Mediterranean climate
III	Gulnar, Camliyayla	In the coastline with an altitude 1000-1500 m.	912	8.9-19.4	Plateau and gateway climate
IV	Mut	Far from the coast line, in territorial region.	411	11.4-24.0	Gateway climate

A face-to-face questionnaire was conducted in order to determine sustainability, risk sources and strategies of banana production. Farmers rated the importance of sources of risk with regards to their farm decision making process on Likert type scales ranging from one (much more important) to five (much less important). There were 26 sources of risk included in questionnaires. Farmers also rated the importance of their risk management responses on similar Likert type scales, and there were 17 management responses to risk included in these questionnaires. In addition, in determination of the indicators of banana farming sustainability also Likert type scales were used. For sampling, stratified random sampling method was used. The sample size was calculated using the Neyman method ³⁰:

$$n = \frac{\left(\sum N_h S_h\right)^2}{N^2 D^2 + \sum N_h S_h^2} \quad (1)$$

n required sample size, N number of farmers in population, N_h number of farmers in the hth stratification, S_h² variance of the hth stratification, d permitted error ratio deviated from average of population, z reliability coefficient, D² (d/z)². The permissible error in the sample size was defined to be 5% within 95% confidence interval.

Farmers were categorized with respect to their land size as small (<0.2 ha), medium (0.2-1 ha) and large (1 ha ≤). The questionnaire was implemented in January 2008 with 89 randomly selected banana farmers in Anamur county of Mersin province. The sample was selected randomly from three different villages in Anamur. The three villages were selected with respect to the recommendations of The Anamur Town Directorate of Agricultural and banana production statistics.

Farmers' perceptions were studied using descriptive statistical analysis. Mean values obtained in banana farming and factor analysis was conducted on the data obtained in the questionnaires. The general purpose of factor analytic techniques is to find a way of condensing the information contained in a number of original variables into a smaller set of new composite dimensions (factors) with a minimum loss of information. For interpretation of the factor analysis, it is a rule of thumb that has been used frequently by factor analysts as a means of making a preliminary examination of the factor matrix. In short, factor loadings greater than +0.30 are considered significant; loadings of +0.40 are considered more important and if the loadings are +0.50 or greater, they are considered very significant. These guidelines are considered useful when the sample size is 50 or larger.

In our study, the factors were interpreted according to factor loadings greater than +0.40 ³¹. All computations were made using the SPSS statistical package for Windows.

Results and Discussion

Of 89 farms that the surveys were implemented 40.45% took place in small (<0.2 ha), 46.07% in medium (0.2 - 1 ha) and 13.48% large (1 ha <) farm groups. The socio-economic characteristics of farmers due to the farm size are provided in Table 2. In the analyzed farms, the average age of farmers is 45.33 years and the average duration of experience is 21.22 years. These values are found higher in the large farm group with respect to the small farms. Almost 50% of farmers in all farm groups indicated that they started agricultural activities with their own capital and the capital inherited to them. Among the surveyed farms, it is seen that more than half of the farmers are elementary school graduates. The rate of elementary school graduation is 55.6% in small farms, 48.8% in medium sized farms and 66.7% in large farms, respectively. These values are in parallel with the values recorded for Turkey in general. The average family size in the farms is 3.38. The share of banana in the production patterns is 81.07%, followed by wheat, apple and peanuts.

Sustainability indicators in banana farming: Sustainability in agriculture is an issue that has been popular since the report of Brundtland Commission ³². Even though many definitions can be found for sustainable agriculture, it remains difficult to link the concept to practical actions and decisions ³³. Development of sustainability indicators can be an effective tool to make agricultural sustainability operational ³⁴ and to implement

Table 2. Socio-economic features in the investigated farms.

	Farm size			Mean
	Small (≤0.2 ha)	Medium (0.2-1 ha)	Large (≥1 ha)	
Farmer's age (year)	42.27	46.07	51.92	45.33
Farmer's experience in agriculture (year)	16.64	23.88	25.92	21.22
Farm numbers according to groups	36	41	12	89
Starting situation to farming				
- With inheritance capital and land	2.8	4.9	8.3	4.5
- With own capital	50.0	46.3	41.7	47.2
- With inheritance capital, land and own capital	47.2	48.8	50.0	48.3
- Total	100.0	100.0	100.0	100.0
Farmers' education level (%)				
- Illiterate	-	2.4	8.3	2.2
- Literate	8.3	2.4	-	4.5
- Primary school	55.6	48.8	66.7	53.9
- Middle school	2.8	14.6	16.7	10.1
- High school	22.2	17.1	8.3	18.0
- University	11.1	14.6	-	11.2
- Total	100.0	100.0	100.0	100.0
Household size	3.33	3.41	3.42	3.38
Farm size (ha)	0.14	0.47	0.31	0.69
Banana yield (kg/ha)	50819.44	52947.56	53645.83	52180.89
Production pattern (%)				
- Banana (<i>Musa sapientum</i>)	97.97	93.82	72.11	81.07
- Wheat (<i>Triticum vulgare</i>)	0.00	0.00	13.0	7.83
- Apple (<i>Malus communis</i> L.)	0.00	5.15	7.58	6.20
- Orange (<i>Citrus aurantium</i>)	0.00	0.51	1.90	1.31
- Groundnut (<i>Arachis hypogaea</i>)	0.00	0.00	4.87	2.94
- Vegetables: pepper (<i>Capsicum annuum</i>) eggplant (<i>Solanum melongena</i>)	2.03	0.51	0.54	0.65
- Total	100.00	100.00	100.00	100.00

sustainability in practical policy decisions^{35,36}. It is important to determine the extent to which certain farming practices and farming systems can be considered sustainable or not^{37,38}. In general, sustainability of agricultural practices and agricultural systems concerns all economic, social and ecological sustainability³⁹⁻⁴¹.

The unpredictability of agricultural product prices and accordingly the agricultural income leads to unwillingness of farmers to make new investments. That's why the new investment finance needs to be made with either by the existing savings or by credit loans. The low level of incomes prohibits meeting the new investment finance by savings. Accordingly, new investments can only be financed by credit loans. The farmers, who receive credit funds, have to consider both receiving profits more than the current interest rate and to pay back the credits on a timely basis. Farmer who does not have ability to pay back the credit on due, prefers not to make new investment⁴².

In our country, the financial structure of the farms is also rather important for the sustainability of the farms. Within this research, some characteristics like record-keeping, indebtedness status, saving and investment situation and land sales kept place under financial situation heading and the declaration of farmers are considered at the first sense. Accordingly, it is found out in a general interpretation that there is no record-keeping in an important share of the farms like 94.4%, there is no utilization of credits in 80.0% of them, while 12.4% is indebted towards public institutes and 51.7% is towards private institutes. It was found that 92.1% of the farms cannot save, 92.1% could not have sold land in the last five years, 49.4% could not invest in the farm and 73.0% could not invest in out of the farm as well. The share of farms that keep regular records was largest with 16.7% among large-scaled farms. The level of credit use in medium-scaled was the largest. Indebtedness ratio was higher in large farms towards public institutes and higher in small farms towards private institutes relevantly with 16.7% and 63.4%. It is understood from the

observed farms that the saving rate, investing in and out of the farms ratios are lower for the last five years (Table 3). Similar findings were retrieved in different studies concerning different regions and provinces of Turkey⁴³⁻⁴⁶.

The employment situations of the farmers and their families in or out of the farm are interpreted within the study (Table 4). The share of farmer working in his farm was 94.4% of the surveyed 89 farms and the rate of employment in off-farm agricultural jobs 18%. It was observed that as the land size gets larger, the rate of getting employed in off-farm agricultural or non-agricultural jobs decline.

Decision making under risk is also important in agricultural production. The steps of decision making under risk in agricultural production are determination of potential risk sources, determination of probable cases and outcomes that can occur like price variations and climatic change, deciding upon implementation of alternative strategies, determination of probable outcomes of each strategy, interpretation of the relationship between risk and income⁴⁷. The farms generally consider solely their own conditions while they are making decisions in our country. The methods of decision making under risk cannot be used in farms due to low level of education of farmers, irregular record keeping, etc. Accordingly, the effective persons rather than methods are surveyed in terms of agricultural decision making⁴⁶.

The effective persons in terms of decision making with regards to investment, saving, enlarging the farm, future, marketing, product patterns and cases related with out of the farm are provided in Table 5. In a general interpretation, it was understood that the farmer himself is the decision maker in more than 50% farms, and the family members of the farmer are effective in decision making in around 40-50% of farms. Similar findings were reached in different farm groups.

The reason of dealing with and sustaining agricultural activities, the factors that can help farmers, youngsters having dealing with agricultural activities and the effective factors behind, were investigated within the research in order to set forward sustainability of banana production. The main reason of agricultural activities was defined as receiving profits in small-scaled farms (1.19), and keeping ownership of land for medium- (1.22) and large-scaled (1.17) farms (Table 6). The reason of maintaining agricultural activities was identified as keeping the ability to find credits when required for all farm groups. It is understood that contributions of publicly employed agricultural engineers and membership to cooperatives perceived as negligible (Table 7).

The factors that can help farmers to maintain agricultural activities are demonstrated in Table 8. It is understood that the most important factor that can help farmers in future is price guarantee for products and the most unimportant factors is provision of household economics services for all farm groups.

It was declared that young farmers will sustain banana production in 69.4% of small-scaled, 68.3% of medium-scaled and 75.0% of large-scaled farms (Table 9). The most important reason declared by young farmers for non-maintenance of agricultural activities in future are better education opportunities and life standards in out of the sector for small-scaled farms, better

Table 3. Financial characteristics of investigated farms (%).

	Farm size			Mean
	Small (≤0.2 ha)	Medium (0.2-1 ha)	Large (≥1 ha)	
Keeping record				
- Keeping record regularly	5.6	2.4	16.7	5.6
- Do not keeping record regularly	94.4	97.6	83.3	94.4
Agricultural credit usage				
- Use credit	2.8	31.7	16.7	18.0
- Do not use credit	97.2	68.3	83.3	80.0
State institutions				
- Debiting to state institutions	8.3	14.6	16.7	12.4
- No debiting to state institutions	91.7	85.4	83.3	87.6
Private institutions				
- Debiting to private institutions	36.1	63.4	58.3	51.7
- No debiting to state institutions	63.9	36.6	41.7	48.3
Saving				
- Make saving	13.9	2.4	8.3	7.9
- No saving	86.1	97.6	91.7	92.1
Land selling in the last 5 years				
- Sold	13.9	2.4	8.3	7.9
- Did not sell	86.1	97.6	91.7	92.1
Agricultural investment in the last 5 years				
- Making investment	33.3	65.9	50.0	50.6
- No investment	66.7	34.1	50.0	49.4
Off-farm investment in the last 5 years				
- Making investment	19.4	31.7	33.3	27.0
- No investment	80.6	68.3	66.7	73.0

Table 4. On farm and off-farm working for farmer and farmer family (%).

	Farm size			Mean
	Small (≤0.2 ha)	Medium (0.2-1 ha)	Large (≥1 ha)	
Farmer				
- working on farm	94.4	92.7	100.0	94.4
- not working on farm	5.6	7.3	-	5.6
Farmer				
- working on other farms	30.6	9.8	8.3	18.0
- not working on other farms	69.4	90.2	91.7	82.0
Farmer				
- off-farm employment	36.1	17.1	-	22.5
- no off-farm employment	63.9	82.9	100.0	77.5
Farmer's wife				
- working on farm	38.9	26.8	50.0	34.8
- not working on farm	61.1	73.2	50.0	65.2
Farmer's wife				
- working on other farms	2.8	-	-	1.1
- not working on other farms	97.2	100.0	100.0	98.9
Farmer's wife				
- off-farm employment	5.6	7.3	8.3	6.7
- no off-farm employment	94.4	92.7	91.7	93.3
Farmer's children				
- working on farm	11.1	29.3	50.0	24.7
- not working on farm	88.9	70.7	50.0	75.3
Farmer's children				
- working on other farms	2.8	4.9	-	3.4
- not working on other farms	97.2	95.1	100.0	96.6
Farmer's children				
- off-farm employment	11.1	2.4	16.7	7.9
- no off-farm employment	88.9	97.6	83.3	92.1

Table 6. The reasons of farmers for farming.

Reason	Farm size			Mean
	Small (≤0.2 ha)	Medium (0.2-1 ha)	Large (≥1 ha)	
Having land for farming	1.47	1.22	1.17	1.31
Enjoying farming	2.56	2.51	2.50	2.53
My family shares the work with me	3.78	3.80	3.25	3.72
Making profit	1.19	1.29	1.25	1.25
Lack of off-farm opportunities	4.58	3.93	3.50	4.13
Difficulties to make a different work for me	3.17	2.32	1.58	2.56
Difficulties to change the job	3.17	2.51	1.58	2.65
Being boss of own business	2.03	1.80	2.00	1.92

Likert Scale: From 1 (Much more important) to 5 (Much less important)

Table 5. Decisions on farms (%).

	Farm size			Mean
	Small (≤0.2 ha)	Medium (0.2-1 ha)	Large (≥1 ha)	
Investment decisions				
- Farmer	50.0	51.2	66.7	52.8
- Farmer's children	2.8	-	-	1.1
- Households	47.2	48.8	33.3	46.1
Saving decisions				
- Farmer	50.0	51.2	58.3	51.7
- Farmer's children	2.8	-	-	1.1
- Households	47.2	48.8	41.7	47.2
Finance decisions				
- Farmer	50.0	51.2	58.3	51.7
- Farmer's children	2.8	-	-	1.1
- Households	47.2	48.8	41.7	47.2
Future decisions				
- Farmer	50.0	51.2	58.3	51.7
- Farmer's children	2.8	-	-	1.1
- Households	47.2	48.8	41.7	47.2
Farm enlargement decisions				
- Farmer	50.0	51.2	58.3	51.7
- Farmer's children	2.8	-	-	1.1
- Households	47.2	48.8	41.7	47.2
Marketing decisions				
- Farmer	52.8	53.7	75.0	56.2
- Farmer's children	2.8	-	-	1.1
- Households	44.4	46.3	25.0	42.7
Production pattern decisions				
- Farmer	52.8	53.7	75.0	56.2
- Farmer's children	2.8	-	-	1.1
- Households	44.4	46.3	25.0	42.7
Off-farm work decisions				
- Farmer	52.8	51.2	66.7	53.9
- Farmer's children	2.8	-	-	1.1
- Households	44.4	48.8	33.3	41.9

Table 7. Factors helping farmers to keep farming.

Factor	Farm size			Mean
	Small (≤0.2 ha)	Medium (0.2-1 ha)	Large (≥1 ha)	
Extension programs	3.53	3.02	3.67	3.31
My debts are not excessive	2.44	2.59	1.92	2.44
I can get a loan when I need one	1.64	1.83	1.67	1.73
Off-farm income keeps the farm going	3.58	3.93	4.50	3.87
Government supports	3.94	4.46	3.50	4.12
My participation in a farmers' cooperative	4.56	4.78	4.58	4.66
Agricultural engineers in input suppliers	2.75	2.44	3.08	2.65
Agricultural engineers in public sector	4.72	4.61	4.33	4.62
Farmer's family shares the work with farmer	4.03	4.09	3.58	4.00

Likert Scale: From 1 (Much more important) to 5 (Much less important)

Table 8. Factors helping to farmers in the future.

Factor	Farm size			Mean
	Small (≤ 0.2 ha)	Medium (0.2-1 ha)	Large (≥ 1 ha)	
To make agricultural education programs for young people	2.22	1.95	2.42	2.12
Availability of home-economics services	4.50	3.78	4.50	4.17
Increasing educational opportunities	1.75	1.66	1.83	1.72
Improve infrastructure (road, telecommunication etc.)	2.33	2.27	3.00	2.39
To increase the availability of off-farm employment	2.06	2.22	2.17	2.15
Provide support to natural disasters (flood, hail, frost, etc.)	1.28	1.61	1.33	1.44
To exist additional employment opportunities for family members	2.36	2.41	2.42	2.39
Providing guarantee for crop prices	1.03	1.09	1.33	1.10
Increasing credit availability	3.28	2.56	2.17	2.79
The increase in income support by government	2.11	2.32	2.17	2.21
To increase number of agricultural cooperatives	3.03	2.90	2.42	2.89

Likert Scale: From 1 (Much more important) to 5 (Much less important)

education opportunities in out of the sector for medium-scaled farms and inadequacy of agricultural income and better education opportunities and life standards in out of the sector for large-scaled farms (Table 10).

Risk sources in banana farming: Agricultural households in developing countries are characterized by high poverty levels, large proportion of their production is kept for subsistence needs and selling surplus to the market to meet households' basic needs. Production, consumption and reproduction decisions are integrated. Not all products and factors of production are tradable because of high transaction costs, shallow markets and risks and uncertainty of weather conditions which drive purchase prices up and selling prices low. Limited access to credit is a frequent cause of market failure, as the household cannot satisfy an annual cash income constraint, with expenditure higher than revenue at certain periods of the year. The household faces a price band, where the purchase price is higher than the selling price⁸.

Farming is a risky occupation. Farmers are confronted with a continuously changing landscape of possible price, yield and other outcomes that affect their financial returns and overall welfare⁴⁸. In mathematical terms, risk is described by the probability distribution function of outcome variability. Agricultural risks include production, price and market, institutional, human or personal, business and financial risks⁴⁹. Risk management involves the selection of methods for with all types of risks in order to meet the decision maker's goal while also taking their-risk attitude into account. This means calculating the risk return trade-off in designing risk management strategies is an important target in agricultural business⁵⁰.

There are various similar studies in the literature aiming to determine risk sources affecting agricultural production and risk management strategies^{46, 51-61}. Yet, a similar study could not be found directly related with risk sources and risk management strategies in banana production.

In the study, the risk sources encountered by farmers are investigated under 26 headings with regards to the regional conditions. The average values referring to risk sources affecting agricultural production are provided with regards to farm groups in Table 11. Accordingly, in an overall interpretation, the most important risk factor for banana farmers is the variation in banana prices (1.59), the least important one is landslide (4.83). With regards to different farm groups, variability in banana prices is the most important risk source for small- and large-scaled farms

(consecutively 1.58 and 1.33), yet variability in input prices is important for medium-scaled farms. The least important factors are thieving for small-scaled (4.78) and landslide for medium- and large- scaled farms (consecutively 4.78 and 4.92).

The outputs of factor analysis regarding risk factors affecting banana production are provided in Table 12. Six different factors were found at the end of the factor analysis for small-scaled farms, conducted considering the requirement of having eigen values larger than 1, and these factors explained 61.67% of the variation. As variables of the changes in the economic situation of the country, the changes in the general and agricultural policy of the government, excessive rainfall, insufficient rainfall and flood have high positive factor loading. The Factor 1 is named as "*policy and production risk*", Factor 2 is "*financial risk*". Factors of debt situation, changes in interest rates, changes in land prices and inadequate ownership of tools and machines have high factor loading. As the factors of changes in input and banana prices changes in banana yields, diseases and lack of contracted farming have high factor loading, Factor 3 is named as "*marketing risk*". Factor 4 is named as "*institutional risk*", considering the loadings of factors taking in this group, the changes in government policies (0.436) and lack of record keeping (0.463) have positive correlation with Factor 4. Factor 5 is positively correlated with problems regarding finding labor force and inadequacy of contracted farming, therefore, Factor 5 is named as "*contracting risk*". Factor 6 is same-directionally related with climatic conditions variable, and the factor loading is found as 0.724. Accordingly, Factor 6 is called as "*climate risk*".

Six factors were found in the factor analysis conducted for banana production risk sources in medium-scaled farms. These factors explained 61.2% of the variation. Factor 1 is named as "*human risk*". Yet, variables of occupational accident, health problems, family relations, difficulties for finding labor and thieving have high factor loadings and directly related with Factor 1. Factor 2 can be named as "*contracting risk*". This factor is related with diseases, pests, lack of contracted farming and inadequacy of tools and machines positively, and factor loadings of these variables change between 0.40 and 0.75. Factor 3 is named as "*institutional risk*" as the factor loadings of changes in interest rates, frost cases, diseases and thieving variables. Factor 4 is "*policy risk*". The variables of government policies and changes in economic situation of the country, difficulties for finding labor and Factor 4 are found to be directly correlated. Factor 5 is "*production risk*" and found to be positively related with

Table 9. Views of youth farmers on farming.

Farm size	Going on farming	%	Giving up farming	%	Total	%
Small (< 0.2 ha)	25	69.4	11	30.6	36	100.0
Medium (0.2-1 ha)	28	68.3	13	31.7	41	100.0
Large (1 + ha)	9	75.0	3	25.0	12	100.0
Total	62	69.7	27	30.3	89	100.0

Table 10. Factors affecting to give up farming by youth farmers.

Factor	Farm size			Mean
	Small (≤ 0.2 ha)	Medium (0.2-1 ha)	Large (≥ 1 ha)	
Lack of institutional support to farming	3.36	3.61	4.00	3.56
Farming doesn't provide adequate income	1.82	2.23	1.00	1.93
Difficulties obtaining credit	4.18	4.08	3.67	4.07
Farming is to risky	2.36	3.00	2.00	2.63
Farming is not attractive	1.82	2.31	1.67	2.04
Better educational opportunities in other sectors	1.36	1.23	1.00	1.26
Better standard of living in other industries	1.36	1.54	1.00	1.41

Likert Scale: From 1 (Much more important) to 5 (Much less important)

Table 11. Risk sources in banana production in the investigated farms.

Source	Farm size			Mean
	Small (≤ 0.2 ha)	Medium (0.2-1 ha)	Large (≥ 1 ha)	
Government policy and agricultural policy	2.72 (1.06)	2.90 (1.26)	2.75 (1.36)	2.81 (1.19)
Economic situation	1.92 (0.84)	1.80 (0.71)	1.67 (0.65)	1.83 (0.76)
Input costs	1.72 (0.45)	1.63 (0.62)	1.50 (0.52)	1.65 (0.55)
Banana prices	1.58 (0.50)	1.68 (0.61)	1.33 (0.49)	1.59 (0.56)
Debt situation	3.44 (1.29)	3.17 (1.05)	3.08 (1.16)	3.27 (1.17)
Banana yields	3.64 (1.19)	3.39 (1.24)	2.92 (1.24)	3.43 (1.23)
Interest rates	3.69 (1.09)	3.29 (1.19)	2.83 (1.40)	3.39 (1.20)
Climate conditions	2.64 (0.72)	2.56 (0.87)	2.00 (0.74)	2.52 (0.81)
Frost	2.33 (0.68)	2.09 (0.80)	1.67 (0.65)	2.13 (0.76)
Excessive rainfall	2.89 (1.09)	3.19 (0.90)	3.00 (0.74)	3.04 (0.96)
Insufficient rainfall	2.56 (0.84)	2.95 (0.89)	2.67 (0.89)	2.75 (0.88)
Diseases	4.25 (1.16)	3.85 (1.19)	3.50 (1.38)	3.97 (1.22)
Pests	4.36 (0.89)	4.12 (1.08)	4.08 (1.08)	4.21 (1.01)
Work accidents	4.75 (0.44)	4.66 (0.62)	4.75 (0.62)	4.71 (0.55)
Health problems	4.56 (0.69)	4.54 (1.07)	4.83 (0.39)	4.58 (0.86)
Family relationships	4.67 (0.48)	4.76 (0.54)	4.83 (0.39)	4.73 (0.49)
Land prices	4.42 (0.77)	4.02 (1.08)	3.67 (1.07)	4.13 (0.99)
Insufficient family labor	3.61 (1.36)	3.46 (1.25)	4.17 (0.72)	3.62 (1.25)
Difficulties for finding labor	4.53 (0.51)	4.66 (0.69)	4.67 (0.49)	4.61 (0.59)
Lack of contract growing	4.33 (1.01)	4.02 (1.15)	4.00 (1.48)	4.15 (1.14)
Insufficient machinery	4.56 (0.50)	4.32 (0.76)	4.58 (0.90)	4.45 (0.69)
Thieving	4.78 (0.42)	4.68 (0.52)	4.67 (0.65)	4.72 (0.49)
Fire	4.64 (0.49)	4.83 (0.38)	4.83 (0.39)	4.75 (0.43)
Floods	2.56 (0.94)	2.76 (0.97)	2.25 (0.75)	2.61 (0.94)
Landslide	4.86 (0.35)	4.78 (0.48)	4.92 (0.29)	4.83 (0.41)
Lack of keeping farm records	4.75 (0.50)	4.76 (0.58)	4.75 (0.45)	4.75 (0.53)

*Likert type scale is used (from 1 (much more important) to 5 (much less important). Values in parenthesis are Standard deviations

insufficient rainfall and negatively with prices of inputs and products. Factor 6 can be explained as "climate risk". Yet, variables such as change in climatic conditions, pests and change in banana yield are positively related with this factor.

In the survey area, the risk sources encountered in banana production in large-scaled farms are analyzed and factor analysis was implemented to the retrieved data. It is considered to be appropriate to take variables with eigen values higher than 2 in determination of number of factors. The determined 5 factors explained 77.24% of the variation. Factor 1 is "financial risk". This factor is found to be positively correlated with variables affecting business finance such as debt situation, change in

banana yields and interest rates, lack of contracted farming and inadequacy of tools and machines. Factor 2 is interpreted as "production risk". Yet, the loadings of variables affecting production like policy changes, banana yield, changes in interest rates, frosts, diseases, difficulties for finding labor, flood, landslide and lack of record keeping are found to be higher than 40%. All these variables can affect production inversely. Changes in input and product prices taking place in marketing risk have high factor loading and found to be positively correlated with Factor 3. Accordingly, Factor 3 is identified as "market risk". Factor 4 can be explained as "human risk". Yet, factor loadings of thieving, problems in family relations and health problems are found higher.

Factor 5 is named as “*climate and contracting risk*”, and found in positive relationship with inadequacy of contracted farming, work accidents and health problems, insufficient and excessive rainfall.

Risk management strategies in banana farming: The most important risk management strategy implemented by farmers towards risk sources affecting banana production in the surveyed farms in the investigated region was found to be spraying and drenching for diseases and pests among all farm groups. The average value changed between 1.02 and 1.08 for all farm sizes. The unimportant risk strategies that banana farmers do not pay attention in the surveyed farms are having consultancy for debt management and reducing the farm land (Table 13).

In order to summarize risk management strategies implemented by farmers in banana production, factor analysis was applied and the findings are demonstrated in Table 14. Six factors were determined in small-scaled farms with eigen values higher than 1. These factors explained 64.65% of total variation. For this group of farms, Factor 1 is determined as “*certain income*”. Record keeping in farms, off-farm employment of family members, off-farm investment and growing more than one crop have high factor loadings and are positively related with Factor 1. Factor 2 is named as “*contracting production*” due to the factor loadings of contracted farming and growing more than one crop. Factor 3 is named as “*insurance and diversification*” and is positively related with producing more than one variety, having insurance, enlarging the farm. Factor 4 is named as “*spreading sales*” due to heavy loadings of spreading the sales over time and arranging resource use. Factor 5 is named as “*marketing management*”. Gathering market information variable has 0.563 factor loading that it is positively related with Factor 5. Factor 6 is named as “*financial management*” due to the heavy factor loading of receiving consultancy for debt management.

For the factor analysis undertaken with medium-scaled banana farms, 6 factors with eigen values higher than 2 were determined and these factors explained 69.21% of the variation. Factor 1 is called as “*security*” due to factor loadings of variables of contract growing, reducing debts, producing more than one variety, keeping regular records and having insurance. Factor 2 is “*off-farm income*”. Variables of off-farm investment and off-farm employment of farmer have higher factor loading than 0.80 and positively related with Factor 2. Factor 3 is named as “*insurance*”. The reasoning is, finding factor loadings of spreading sales over time and arranging resource use. Variables of producing more than one variety, regular record keeping and reducing the farm land are positively related with Factor 4 and they have heavy factor loadings. Accordingly, Factor 4 is named as “*financial management*”. Due to factor loadings of gathering market information and planning expenditures variables, Factor 5 is called as “*marketing management*”. Factor 6 is “*production management*” factor. Variable of spraying and drenching for diseases and pests is correlated with Factor 6 positively and has heavy factor loading.

At the end of the factor analysis implemented with the risk management strategies applied by surveyed large-scaled farms, 5 factors with eigen values higher than 1 were determined. These factors explain 80.86% of total variation. Factor 1 is called as “*marketing management*” as the variable of gathering market

information has factor loading of 0.830. Factor 2 can be explained as “*insurance and security*” due to heavy factor loadings of having crop insurance, regular record keeping, planning expenditures and producing more than one variety variables. Factor 3 is named as “*production management*”. This is because of the direct relationship of this factor with variables of spraying and drenching for diseases and pests, enlarging the farm and off-farm employment of family members. Factor 4 is called as “*income spreading*”. Factor loadings of variables ordering resource utilization, off-farm employment of the farmer, spreading of sales over time and producing more than one variety are found to be higher than 0.40. Factor 5 is “*off-farm investment*” factor and is positively related with reducing farm land and off-farm investment variables.

Conclusions

The objectives of this study were to study the current general socio-economic situation of farmer in the banana farm, to investigate risk sources and risk management strategies in banana production, to evaluate farming reasons of farmers and to determine sustainability conditions in banana production. In the analyzed farms, the average age of farmers is 45.33 years and the average duration of experience is 21.22 years. Almost 50% of farmers in all farm groups indicated that they started agricultural activities with their own capital and the capital inherited to them. Among the surveyed farms, it is seen that more than half of the farmers are elementary school graduates. The most important reason declared by young farmers for non-maintenance of agricultural activities in future are better education opportunities and life standards in out of the sector for small-scaled farms, better education opportunities in out of the sector for medium-scaled farms and inadequacy of agricultural income and better education opportunities and life standards in out of the sector for large-scaled farms.

In addition, farmers all over the world face with several sources of risk, such as production and price risks, which are an inherent part of agriculture. Especially in Turkey, risk management in banana production is, therefore, an important topic at the farm level. The most important risk factor for banana farmers is the variation in banana prices (1.59), the least important one is landslide (4.83). The most important risk management strategy implemented by farmers towards risk sources affecting banana production in the surveyed farms in the investigated region is found to be spraying and drenching for diseases and pests among all farm groups. The average value changes between 1.02 and 1.08 for all farm sizes.

Sustainability of banana production is rather important for banana production in Turkey. It will be possible to enjoy rise in production in the next years if the farmers are guided with regards to technical and financial topics related with covered production. Organization of farmers is required in order to plan banana production according to the demand and in order to increase product quality of Anamur banana, which is the resource of Turkish banana⁶. In accordance, Research & Development aiming to reduce costs and improve quality needs to be considered carefully and research for driving the consumer to consume local products need to be made. In this concern, keeping the competitive power of national production is also important⁶².

Table 12. Factor analysis results for risk sources by farm groups (rotated component matrix).

Risk source	Factors for Small Farm Group ≤ 0.2 ha ¹						Factors for Medium Farm Group 0.2-1 ha ²						Factors for Large Farm Group ≥ 1 ha ³				
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5
Government policy and agricultural policy	0.566			0.436						0.718			0.468	0.583			
Economic situation	0.808									0.586					0.815		
Input costs			0.813								-0.811				0.739	-0.447	
Banana prices			0.850								-0.698						
Debt situation		0.807					0.444						0.880				
Banana yields		0.830							0.797			0.592	0.533	0.526		0.449	
Interest rates						0.724					0.649		0.747	0.589		0.814	
Climate conditions									0.775				0.666	0.476			
Frost	-0.547								-0.461		0.561						0.717
Excessive rainfall	0.552				-0.485							0.646					0.913
Insufficient rainfall	0.668								0.499	0.561			0.562	0.573		0.406	
Insufficient rain	-0.668								0.728			0.462				0.801	
Diseases	-0.647																
Pests																	
Work accidents						-0.488	0.772						0.491				0.621
Health problems							0.599										0.556
Family relationships						0.429	0.678									0.452	
Land prices																0.742	
Insufficient family labor							0.510										
Difficulties for finding labor							0.614										
Lack of contract growing																	
Insufficient machinery																	
Thieving							0.565										
Fire																	
Floods	0.591																
Landslide	-0.583																
Lack of keeping farm records	-0.629																
Percent of total variance explained (%)							61.67						61.20				77.24

¹Name of factors: 1: Policy and production risk, 2: Financial risk, 3: Marketing risk, 4: Institutional risk, 5: Contracting risk, 6: Climate risk

²Name of factors: 1: Human risk, 2: Contracting risk, 3: Institutional risk, 4: Policy risk, 5: Production risk, 6: Climate risk

³Name of factors: 1: Financial risk, 2: Production risk, 3: Market risk, 4: Human risk, 5: Climate and contracting risk. Note: Factor loadings are small from .40 in the blank cells

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