RISK PERCEPTION AND MANAGEMENT STRATEGIES IN AGRICULTURAL PRODUCTION: A CASE OF ADANA PROVINCE OF TURKEY

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ABSTRACT

This study aims to determine and analyze farmers' risk perceptions and risk management strategies in agricultural production. Data were obtained in 2015 production year from face-to-face interviews of 99 farmers in Yüregir and Karaisalı district of Adana province of 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 socioeconomic characteristics on the farmers' risk perceptions and risk management strategies using factor loadings. The results of this study show that the most important risk source that the farmers' perceive is availability of many middlemens in agriculture and food market and risk management strategy that the farmers' perceive is producing at the lowest cost. The result of factor analysis showed that the risk scale consists of 5 factors explaining 60.66% of total variance. The internal consistency coefficient Cronbach Alfa of the scale is 0.918 and KMO is 0.869. The risk management scale consists of 4 factors explaining 64.23% of total variance. The internal consistency coefficient Cronbach Alfa of the scale is 0.944 and KMO is 0.910. According to the results, perceptions are farmer-specific, a number of socio-economic variables are found to be related to risk and risk management. Improving of risk management strategies is useful for farmers as well and might help them to avoid many risks and reduce losses.

Keywords: Risk, Risk Perception, Agriculture, Turkey

INTRODUCTION

Agricultural activities are carried out largely under the influence of natural conditions. Farmers don't estimate their yield and income due to fluctuations in the factors that they can not control such as rains, temperature, disease, frost, wind, flood and so on. As a result of input-output price change, there are income fluctuation and important differences in agriculture year after year. As a result of this, farmers are forced to take risky decisions. Farmers show different reactions and attitudes to changes, depending on the objectives and capital structure. It will be useful that analysis of the risk faced by farmers and their weight and determining of farmers' attitudes toward to risk. Therefore when planning in crop and livestock production, it is quite necessary that analysis of risks involved in agricultural production and understanding farmers' risk behaviors (Ceyhan, 2003; Ceyhan et al., 2003; Hardaker et al., 2004). There are quite a large literature about farmers' risk perception and understanding risk behavior in the World (Bergfjord, 2009; Dewan, 2011; Flaten et al., 2005; Gebreegziabher and Tadesse, 2014; Hanson et al., 2004; Lien et al., 2006; Meuwissen et al., 2001; Stordal et al., 2007; Toma and Mathijs, 2007; Zhou et al., 2012) but limited in Turkey (Agır et al., 2015; Akcaoz et al., 2009a; Kızılay, 2006). In study has attempted to fill this gap a little bit in Turkey.

This study aims to determine and analyze farmers' risk perceptions and risk management strategies in agricultural production and examine relationship between farmers' risk perception and socioeconomic variables.

MATERIALS AND METHODS

Data were obtained in 2015 production year from face-to-face interviews of 99 farmers in Yüregir and Karaisalı district of Adana province in Turkey. In determining of the farmers which were included in survey, the following formula was used (Kaya et al., 2014).

$$n = \left(\frac{(\frac{Z}{2})}{d} \right)^2 .p.q$$

As determining sample volume, calculations were made by including values for 10% error margin (d = 0.10) and 95% confidential intervals (Z = 1.96), q = p = 0.50 into the formula. According to these calculations, it was found that total 96 farmers should be interviewed.

In order to determine farmers' risk perception, they were presented and asked to rating according to their own perception risk and risk strategies statements which prepared in accordance with the five-point Likert scale (Akcaoz et al., 2010; Akcaoz et al., 2009b; Akçaöz et al., 2006; Bergfjord, 2009; Cukur et al., 2011; Dewan, 2011; Lien et al., 2006). Farmers' risk perception was analyzed using descriptive statistics and factor analysis. The large number of variables were reduced into smaller. This was done through factor analyses for sources of risk and risk management strategies. Factor analysis is a popular multivariate technique used to assess the variability of variables of a data-set (in our case, risk sources and risk management strategies variables) through linear combination of smaller number of latent variables, called factors. The extent of variation between variables in each factor is expressed by eigenvalues. If there is a strong relationship between variables, the first few factors explain a high proportion of the total variance and the last factors contain very little additional information. In our analysis, factors which eigenvalues are greater than one were retained. Varimax rotation was used to maximize the variance of the squared loadings for each factor, and thus polarizes loadings (either high or low) on factors for easy interpretation. To check the internal reliabilities, we calculated Cronbach's alpha. Kaiser–Meyer–Olkin (KMO) measures of sampling adequacy for sources of risk and risk management strategies scale was calculated to check scales were adequate for factor analysis due to large portion of communality (Alpar, 2011; Hair et al., 1994; Kalaycı, 2008).

Multiple regression analysis was used to study in order to examine relationship between farmers' risk perception and socioeconomic variables (Alpar, 2011; Hair et al., 1994; Kalaycı, 2008). Regression model was established accordance with the following general form.

$$Y = \alpha_0 + \beta X_i \ \dots \ X_n + e_i$$

In equality;

Y: Perception of risk and risk amnagement strategies (as the factor scores)

X_{i-n}: Socioeconomic variables.

RESULTS AND DISCUSSION

Farmers' socioeconomic characteristics

Farmers' socioeconomic characteristics examined by descriptive statistics like as frequency, percentage, mean, standart deviation and are presented in table 1. According to the result, farmers are average 51.52 years old and their agricultural experience is 24.97 years. Farmers' family size is 4.12 persons average. Average farm size is 158.97 and annual income is 66,691.92 TL. 30% of farmers have off-farm work and their education levels are shown in the table 1.

Table 1. Farmers' soscioeconomic characteristics in Adana

Socioeconomic Variables			
Age (years) (mean - standard deviation)		51.52	12.25
Household size (person) (mean - standard deviation)		4.12	1.43
Number of employees (person) (mean - standard deviation)		2.52	2.44
Agricultural experience (years) (mean - standard deviation)		24.97	12.49
Land size (da) (mean - standard deviation)		158.97	152.18
Annual income (TL) (mean - standard deviation)		66.691.92	56.663.33
Education	Uneducated (frequency - percentage)	11	11.11
	Reader / Writer (Frequency - Percentage)	3	3.03
	Primary / Secondary School (frequency - percentage)	27	27.27
	High School (Frequency - Percentage)	46	46.46
	University (frequency - percentage)	12	12.12
Off-farm work (frequency - percentage) *		30	30.30

* The number of farmers have a off-farm works

RİSK SOURCES

Farmers' perception of risk sources was examined using a scale contain of 22 items. The risk scale was pepared based on five-point Likert scale. In total, 22 sources of risk were presented to the respondents. Farmers were asked to score each source of risk on a Likert-scale from 1 (not important) to 5 (very important) to express how significant they considered each source of risk to be in terms of its potential impact on the economic performance of their farm. The first column of table 2 shows average scores and third, fourth, fifth, sixth and

seventh columns of table 2 shows factor analysis results for all farmers. The most important risk sources that the farmers' perceive are the availability of many middlemens in agriculture and food market (4.16), fire (4.10), drought (4.09), changes in agricultural policy (4.03) and variability in input prices (4.03) in Adana.

Farmers' perceptions of the risks was evaluated by factor analysis. KMO measure of sampling adequacy was found to be 0.732 and the Bartlett sphericity test result was $p<0.001$, the internal consistency coefficient Cronbach Alfa of the scale was 0.919. These values showed that scale was suitable for factor analysis. As a result of factor analysis, the risk scale consists of 5 factors explaining 60.92 % of total variance. These factors according to the factor loading are named "finance and technology", "insurance and human resources", "market and meteorology", "ecomony and dıseases" and "veterinary or engineering services and drought", respectively.

Factor 1, finance and technology, loads significantly from technologic and financal variables like changes in agricultural policy, variability in input prices, relationship between family members, variability in product price, indebtedness and unable to repay debts, inability to use modern technologies due to low capacity, lack of technical knowledge and changes in interest rate. Risk arising from activities as theft, labor costs, the lack of agricultural insurance and difficulty in finding labor variables indicates insurance and human resources risk in factor 2. Significant loading of the availability of many middlemens in agriculture and food market, fire, variability in land value, meteorological events such as floods ect. reflects role of marketing and meteorological conditions in agriculture because that factor 3 is called market and meteorology. Factor 4 is called ecomony and diseases because of the extremely high loadings of possibility of not marketing the products, animal/plant diseases and pests, and credit availability changes in the economic situation of Turkey. Factor 5 is labeled as veterinary or engineering services and drought because of the loadings drought and misuse of veterinary or engineering services variables (Table 2).

Risk management strategies

Farmers' perception of risk management strategies was examined using a scale contain of 22 items. The risk management scale was pepared based on five-point Likert scale. In total, 22 risk management strategies were presented to the respondents. Farmers were asked to score each source of risk on a Likert-scale from 1 (not important) to 5 (very important) to express how significant they considered each risk management strategies to be in terms of its potential impact on the economic performance of their farm. The first column of table 3 shows average scores and third, fourth, fifth and sixth columns of table 3 shows factor analysis results for all farmers. The most important risk management strategies that the farmers' perceive are producing the lowest possible cost (ceteris paribus) (4.01), collecting market information (3.94), working with appropriate to climate conditions and highly efficient animal breeds / plant varieties (3.94), working with modern equipment (such as cold air tank) (3.93), taking precautions to prevent animal / plant disease (3.92) in Adana (Table 3).

Farmers' perceptions of the risk management strategies was evaluated by factor analysis. KMO measure of sampling adequacy was found to be 0.944 and the Bartlett sphericity test result was $p<0.001$, the internal consistency coefficient Cronbach Alfa of the scale was 0.910. These values showed that scale was suitable for factor analysis. As a result of factor analysis, the risk management strategies scale consists of 4 factors explaining 64.23 % of total variance. These factors, according to the factor loading, are maned "planning and insurance", "financial and market-based instruments", "cost reduction" and "producing the lowest cost", respectively (Table 3).

Table 2. Risk Sources and Factor Analysis Results

Risk Sources	Mean	SD	Factors				
			Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Availability of many middlemens in agriculture and food market	4.16	0.77	0.182	0.210	**0.555**	0.234	0.248
Fire	4.10	0.76	-0.068	0.363	**0.486**	0.208	0.286
Drought	4.09	0.76	0.136	0.145	0.319	0.328	**0.699**
Changes in agricultural policy	4.03	0.87	**0.598**	-0.183	0.327	0.455	0.064
Variability in input prices	4.03	0.83	**0.731**	0.099	0.097	0.248	0.131
Variability in land value	4.02	0.78	0.089	0.116	**0.827**	0.062	-0.005
Possibility of not marketing the products	3.99	0.75	0.132	0.060	0.269	**0.744**	0.153
Relationship between family members	3.98	0.81	**0.615**	0.249	0.150	0.231	0.313
Meteorological events such as floods ect.	3.98	0.77	0.280	0.064	**0.690**	0.170	0.117
Animal / plant diseases and pests	3.98	0.82	0.365	0.182	0.026	**0.623**	0.268
Theft	3.97	0.78	0.158	**0.771**	0.029	0.088	0.179
Variability in product price	3.97	0.83	**0.638**	0.102	0.054	0.311	0.065
Indebtedness and unable to repay debts	3.95	0.80	**0.483**	0.366	0.039	0.278	0.287
Misuse of veterinary or engineering services	3.95	0.88	0.466	0.179	0.136	0.000	**0.651**
Credit availability	3.94	0.73	0.358	0.446	0.039	**0.571**	-0.012
Inability to use modern technologies due to low capacity	3.92	0.89	**0.521**	0.247	0.409	-0.082	0.093
Changes in the economic situation of Turkey	3.89	0.73	0.334	0.343	0.280	**0.496**	-0.100
Lack of technical knowledge	3.87	0.79	**0.734**	0.188	0.068	0.184	0.086
Labor costs	3.86	0.76	0.363	**0.543**	0.282	-0.048	0.160
Changes in interest rates	3.83	0.94	**0.633**	0.304	0.254	0.031	-0.007
The lack of agricultural insurance	3.82	0.86	0.107	**0.641**	0.196	0.179	0.173
Difficulty in finding labor	3.82	0.90	0.291	**0.633**	0.261	0.243	-0.344
Explained variance (%)			18.74	12.45	11.57	10.87	7.29

Factor 1, planing and insurance, loads significantly from variables like planning expenditure, making production in multiple fields, farmers union membership - cooperative partnership, working with future markets, making agricultural insurance, debt management with the help of expert, making personel insurance. Significant loading of collecting market information, working with modern equipment (such as cold air tank), obtaining non-farm income, keeping cash, benefit from agricultural extansion services, family members working off-farm, division of labor among family members, benefit technical consultancy services, appling strict hygiene rules reflects role of financial and market-based instruments in agriculture because that factor 2 is called financial and market-based instruments. Factor 3 is called cost reduction because of the high loading of take precautions to prevent animal / plant disease, off-farm investment, reducing of farm capacity, reducing fixed costs such as rent machinery ect. Factor 4 is labeled as producing the lowest cost because of the loading to produce the lowest possible cost (ceteris paribus) and work with appropriate to climate conditions and highly efficient animal breeds / plant varieties variables (Table 3).

Relationship between risk perception and socioeconomic variables

In order to examine relationship between farmers' risk perception and socioeconomic variables, multiple regression models carried out in this study. The regression coefficients and significant variables and models are presented in Table 4. In regrestion analysis, we used farmers' perception of risk sources and management strategies as dependent variables and socioeconomic characteristic as independent variables.

According to the result of regression analysis, only one model which establish for veterinary or engineering services and drought risk, is significant. Land size is negatively related to "veterinary or engineering services and drought" risk. This implies that farmers who have higher area of land allocated to agricultural production are likely to perceive this risk sources as significantly more less than farmers who have smaller agricultural land. Annual income is positively related to "veterinary or engineering services and drought" risk perception but coeffient is higly low. This result shows that have the more annual income perceive risk related to "veterinary or engineering services and drought" as important.

Table 4. Relationship between risk perception and socioeconomic variables

Independent Variables	**Risk Sources**					**Risk Management Strategies**			
	Factors					**Factors**			
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**
	coef.	**coef.**	**coef.**	**coef.**	**coef.**	**coef.**	**coef.**	**coef.**	**coef.**
(Constant)	-0.001	-1.052	0.167	-0.674	0.851	1.018	-1.046	0.276	0.550
Age (years)	0.001	0.014	0.007	-0.006	-0.010	-0.003	0.034	-0.004	-0.003
Education[a]	-0.038	0.130	0.114	0.030	-0.049	-0.013	0.195	0.044	-0.017
Household size (person)	0.041	0.091	-0.033	0.091	-0.100	-0.009	-0.018	-0.095	-0.079
Number of employees (person)	-0.010	-0.023	0.008	0.005	0.063	-0.072	-0.042	0.036	0.018
Agricultural experience (years)	0.004	-0.004	-0.010	-0.010	0.009	-0.001	-0.031	0.020	-0.001
Off-farm work[b]	-0.087	-0.006	-0.407	0.421	0.006	-0.439	-0.281	-0.130	0.063
Land size (da)	-0.001	0.002	0.000	0.000	**-0.004***	0.002	0.000	0.000	-0.003
Annual income (TL)	0.000	0.000	0.000	0.000	**0.000***	0.000	0.000	0.000	0.000
R2	0.023	0.102	0.064	0.080	0.145	0.072	0.100	0.087	0.023
p-value	0.976	0.262	0.629	0.456	**0.069***	0.547	0.279	0.390	0.258

a reader / writer is not:
1 Reader / Writer: 2, Elementary / secondary: 3, High School: 4, University (Undergraduate-Graduate): 5

b 1 if the farmer has off-farm work, 0 if no off-farm work

* Variables and models significant at $p < 0.10$

Table 3. Risk Management Strategies and Factor Analysis Results

Risk Management Strategies	Mean	SD	Factors			
			Factor 1	Factor 2	Factor 3	Factor 4
Pproducing the lowest possible cost (ceteris paribus)	4.01	0.74	-0.165	0.307	0.020	**0.783**
Collecting market information	3.94	0.92	0.267	**0.609**	0.275	0.352
Working with appropriate to climate conditions and highly efficient animal breeds / plant varieties	3.94	0.74	0.274	-0.195	-0.037	**0.801**
Working with modern equipment (such as cold air tank)	3.93	0.91	0.290	**0.805**	0.127	0.010
Taking precautions to prevent animal / plant disease	3.92	0.88	-0.039	0.374	**0.772**	0.210
Obtaining non-farm income	3.89	0.83	0.208	**0.609**	0.257	-0.068
Keeping cash	3.88	0.88	0.405	**0.464**	0.140	0.132
Planning expenditure	3.87	0.91	**0.466**	0.292	0.386	0.355
Make production in multiple fields	3.83	1.02	**0.551**	0.507	0.305	-0.053
To benefit from agricultural extansion services	3.82	0.91	0.328	**0.470**	0.407	0.200
Family members working off-farm	3.82	1.09	0.467	**0.473**	0.443	-0.115
Division of labor among family members	3.80	0.95	0.403	**0.489**	0.264	0.194
To benefit technical consultancy services	3.79	0.94	0.323	**0.519**	0.479	0.077
Farmers union membership - Cooperative partnership	3.79	0.96	**0.481**	0.416	0.455	0.252
Working with future markets	3.76	1.01	**0.751**	0.302	0.162	0.012
Off-farm investment	3.74	1.07	0.346	0.198	**0.745**	-0.055
Making personel insurance	3.74	1.07	**0.691**	0.272	0.342	-0.029
Debt management with the help of expert	3.74	0.99	**0.672**	0.300	0.378	0.088
Reducing of farm capacity	3.73	1.04	0.363	0.186	**0.697**	-0.114
Appling strict hygiene rules	3.72	1.04	0.537	**0.558**	0.248	0.092
Reducing fixed costs such as rent machinery ect.	3.71	0.97	0.472	0.107	**0.652**	0.036
Making agricultural insurance	3.65	1.03	**0.678**	0.330	0.219	0.228
Explained variance (%)			20.56	18.66	17.03	8.28

CONCLUSIONS

In order to examined farmers' perception of risk sources, a scale used consists of 22 items in its Cronbach' Alpha 0.918. The most important risk source that the farmers' perceive is the availability of many middlemens in agriculture and food market. In order to examined dairy farmers' perception of risk management strategies, a scale used consists of 22 items and its Cronbach's Alpha was 0.944. The most important risk management strategies that the farmers' perceive producing the lowest possible cost (ceteris paribus). It is suggested that the most effective measures that can be taken farmers organization and contract farming against fluctuations in the input and output price. Through farmer organization, farmers could control supply amount and they can be reach production level for establish an effective marketing network. And also, through the veterinarian, agriculture or food engineers will be employed within farmer organization, can be enable a better production quality and taken measures against the disease. Via contract farming, farmers could be guaranteed a certain price level and they could applying strict hygiene rules in order to fulfill the contract terms and they could reduce the number of middlemens in the sector. Also included in the contract as buyer industrial enterprises could also provide technical support to producers.

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