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RESEARCH ARTICLE

Dairy farmers' risk attitudes and their perceptions towards environmental risks in Northwest Turkey

Damla Özsayın[a]*

[a]*Çanakkale Onsekiz Mart University, Gökçeada Applied Sciences School, Department of Organic Farming Business Management, 17760, Gökçeada-Çanakkale, Turkey*

ABSTRACT

This study aims to determine the factors that affect dairy farmers' risk attitudes and their perceptions towards environmental risks in Northwest Turkey. By the proportional sampling method, data were collected from 381 dairy farmers. The survey was performed from September 2020 to June 2021. The study data were evaluated by descriptive statistics, risk matrix method, equally likely certainty equivalent method and probit model. In this study, severe storm, excessive rainfall/flood, livestock diseases, high temperature and drought was posed an important risk for dairy farmers. The majority of them showed risk aversion behaviour. Age, education level, household size, dairy farming experience, the number of dairy cattle, the land ownership status, livestock insurance and access of agricultural credits had a significant effect on risk perceptions and attitudes of dairy farmers. As a result, these findings are expected to ensure contribution to rural development, province and region economy, insurance institutions, agricultural policy makers, and further emphasizing the importance of environmental risks in dairy farming activity.

Keywords: Dairy farmers; Dairy farming; Risk attitude; Risk perception; Turkey

INTRODUCTION

Agricultural activities are confronted with different combination of environmental risks which generally supported with natural environment, market shortcomings and social worries (Ellis, 2000; Ahmad et al., 2019). These risks also negatively affect livestock sector, which is an important branch of agricultural activity, and so farmers have to work under these risks (Hall et al., 2003; Rizwan et al., 2019). Environmental risk is the likelihood and consequence of an undesirable situation. Thus, environmental risk assessment is a process that assessed the probability of negative effects that occur on environment due to human behaviours (ERA, 2000). Livestock and crop yield changes, which are called risks of production, have been defined as the main threats for farmers in agricultural farms (Ahmad et al., 2020). Particularly, disease, excessive rainfall and temperature (high and low) are an important factors of environmental variations in natural ecology which significantly affects dairy farming (Hawkins, 1993). Unanticipated environmental risks negatively affect both animal production and cause significant differences in farmer incomes from year to year. Hence, it is need to detect and to manage of these risks by farmers (Çukur et al., 2008; Ahmad et al., 2019). The perception of risk reveals the impressions people against the dangers that they may be uncovered to and their evaluations regarding this situation. This perception guide decisions on the acceptableness of risks (French et al., 2006). Farmers' behaviour decisions in the risk situations provide feedback about their perceptions (Ullah et al., 2015). Risk attitude refers to the tendency of individuals to identify (for or against) a risk situation and to act accordingly. In this context, thanks to these two different concepts, it can be researched on how farmers' perceive risk in a case unexpectedly and their behaviours and decisions on management the risks (Gattig and Hendrickx, 2007; Ahmad et al., 2019; Ahmad et al., 2020).

The density and frequence of extreme weather conditions such as excessive temperature, droughts and flood/rainfall have increased especially in the recent years. According to Intergovernmental Climate Change Panel (IPCC) report, average temperatures are expected to increase by 2.5-3°C until 2050. In addition, the possible effects (economic,

***Correspondenceauthor:**
Damla Özsayın, Çanakkale Onsekiz Mart University, Gökçeada Applied Sciences School, Department of Organic Farming Business Management, 17760, Gökçeada-Çanakkale, Turkey. **E-mail:** dozsayin@comu.edu.tr

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social, and environmental) of a 6°C increase is considered as one of the greatest risks of the human history. Scientific studies, especially in the 2000s, revealed that the effects of change in climate began to be observed directly on human and natural systems (IPCC, 2017). As a result of this situation, crop and animal production processes are adversely affected and the food supply is also endangered.

In developing countries, climate (environmental risk) and economic changes are factors which have a significant effect on shortage and high inflation related to inputs (Ahmad et al., 2020). Therefore, this situation, which is dependent on climate and economic changes, negatively affects the production process (input and output) of the livestock sector. In developed countries, dairy farming is an important industry and an inseparable part of the economy. The place and importance of dairy farming in Turkey is also very great. Turkey is a country that has favorable potential and conditions for dairy farming activity in terms of its location and geographical features. In dairy farming activity, which provided significant added value to the Turkish economy, milk production value (55.3 billion TL) constitutes 50.9% of total animal production value (108.6 billion TL) in Turkey. In addition, cow milk constitutes 90.4% of the total milk production (24.1 million tons) in Turkey (TURKSTAT, 2020).

According to scenarios of IPCC about change in climate and the results of studies researching climate change effects on the Mediterranean basin (fragility and variability), it has indicated that this basin is one of the areas that will be most affected by climate change in the future (IPCC, 2017; Turp et al., 2015). Accordingly, Turkey, which is placed in this basin and has a long shoreline, is one of the country that will be faced with various climate change (warmer, drier and extreme rain, etc.) (Tayanç et al., 2009; Dellal et al., 2011; Dudu and Çakmak, 2018). In addition, Turkey is among the risk group countries in the environmental change and extreme weather events scenarios of Seventh National Communication of Turkey. In this report, it is stated that the most important effect expected as climate change for Turkey is drought. Also, it is expected that yield losses in natural pasture areas depending on especially drought will adversely affect the lives of livestock in terms of nutrition (GMKA Development Agency, 2014; RTMEU, 2018).

The climate change effects on livestock farming can be expressed directly and indirectly. Some of the direct effects are yield losses, flood, storm, and drought. Some indirect effects arethe increase in input prices, the availableness of drinking water and the increasing of epidemic diseases (Koyuncu, 2017; Thornton and Gerber, 2010). Especially in the last 20 years, some losses such as feed consumption, reproduction, yield and animal deaths have been encountered in dairy farming activities due to climate changes and natural hazards (RTMEU, 2018).

One of tregions of Turkey, which has an important location in terms of dairy farming activity and milk production potential, is Northwest Turkey. This region also known as South Marmara Region (TR22 region) involves Balıkesir province Sub-region placed under West Marmara Region (TR2) that is one of from 12 statistical regions of Turkey according to Turkish Statistical Institute. It is placed between the Marmara and Aegean Regions of Turkey. TR22 region consists of Balıkesir and Çanakkale provinces. Furthermore, this region is also known as Troy in the history, and Kaz Mountains, which are located between these two provinces and called Mount Ida in ancient time, have also witnessed mythological events (GMKA Development Agency, 2014). Therefore, this region has a very strategic importance. In Turkey, TR22 region has a share approximately 5.3% in terms of total bovine animal population. In recent years, there has been an important increases in the number of cultural breeds in the dairy cattle population of this region, and the ratio of culture breed was about 77.2%. In addition, about 6.2% of total milk production in Turkey is produced in TR22 region (TURKSTAT, 2020). In the past decade, it is noteworthy that Balıkesir and Çanakkale provinces, especially are the provinces where the most flood, storm, heavy rain and hail events are observed when the data regarding natural hazards in Turkey are examined. In this context, ensuring the sustainability of agricultural activities in these provinces is getting more difficult day by day, and this situation negatively affects the production process (crop and livestock) of the farmers. Balıkesir and Çanakkale provinces (TR22 region), which have delta areas, are among the most risky provinces according to the results of coastal vulnerability index method applied for all coastal areas to define the risk situation for coastal regions against sea level rise and natural hazards (GMKA Development Agency, 2014; RTMEU, 2018). According to these scenarios related to environmental change, it is expected that dairy farming activity in the study region will be affected more by the negative effects of severe and extreme weather events (temperatures-heat wave, flood and drought, etc.) (Gaughan and Cawsell-Smith, 2015; Koyuncu, 2017). Therefore, it is very important to determine dairy farmers' attitudes towards risks and their perceptions about environmental risks in the TR22 region, which has a high dairy farming potential.

The effects of change in climate, environmental risks and farmers' perceptions and attitudes towards these risks have an important field of study in agricultural economics. However, the majority of the study area on this subject

consists of crop farming. Therefore, there are limited studies conducted on animal husbandry and especially dairy farming in this field. Most of the researches in the literature searched the negative effects of climate change on agricultural production and examined farmers' attitudes and perceptions towards this situation (Adams et al., 1998; Akcaoz and Ozkan, 2005; Flaten et al., 2005; French et al., 2006; Gattig and Hendrickx, 2007; Dellal et al., 2011; Sen et al., 2012; Manandhar et al., 2015; Dumrul and Kilicaslan, 2017; Ahmad et al., 2019). In a study conducted in Scotland, it was evaluated dairy farmers' attitudes and intentions towards change in climate and consequently it was stated that the half of farmers may be affected by negative effects of change in climate in the future (Barnes and Toma, 2012). Some studies revealed that change in climate and variability has an effect on livestock diseases (Gale et al., 2008; Van den Bossche and Coetzer, 2008). Hanslow et al. (2014) and Lakew (2017) indicated that climate change would cause income loss in dairy farms. Several previous studies stated that extreme heat and cold, humidity, wind and radiation were negatively affected dairy cows (Kadzere et al., 2002; Nardone et al., 2010). In this context, considering previous literature studies, it is aimed to define the environmental risks that are important in terms of dairy farmers in the TR22 region of Turkey in this study and to identify the factors that affect dairy farmers' risk attitudes and their perceptions towards environmental risks. For this purpose, the main targets of the current study were set as follows: (i) to investigate environmental risks in dairy farming activity, (ii) to examine dairy farmers' attitude regarding exposing various risks, and (iii) to determine the factors that affect dairy farmers' risk attitudes and their perceptions towards environmental risks. Although the subject of risk assessment has been examined in various dimensions and sectors in the current literature, studies on dairy farming are still very few. To the best of author's knowledge, there has been no previous studies determining environmental risks that is important in terms of dairy farmers, and assessing their risk attitudes and perceptions towards environmental risks. Therefore, it is expected to fill the gap in the literature related to this subject. Also, this dissimilarity of the present study makes it unique, and so it might be contribute for national and international literature. In addition, it is expected that the results of the current study will make significant contributions to the economy of the region, the importance of dairy farming activity, researchers and agricultural policy makers.

MATERIALS AND METHODS

Research methodology

Study area and the size of sample

The current study consisted of the answers provided by the meetings with dairy farmers in Balıkesir and Çanakkale provinces in TR22 region (Fig. 1).

There were some primary features for selection of TR22 region as the study area. Firstly, it has a strategic importance about dairy farming. Secondly, it has approximately 5.3% of total bovine animal population and 6.2% of total milk production of Turkey. Thirdly, environmental hazards of climate change such as specifically flood, storm, heavy rain and hail events affected on this region in the past decade. Lastly, there has no extensive study performed in this region regarding this subject. The survey of this study was conducted from September 2020 to June 2021. The data were gathered with the face to face questionnaire technique. To determine the total number of dairy farms in these two provinces, the data of Directorate of Provincial Agriculture and Forestry for the year 2020 were used. The total number of dairy farms of Balıkesir (28,683 farms) and Çanakkale (14,642 farms) provinces were determined as 43,325 (TURKSTAT, 2020; Anonymous, 2020). Balıkesir province had 66.2% of these farms and Çanakkale province had 33.8% of them. By using the proportional sampling method, the number of dairy farmers to be interviewed was determined (Newbold, 1995). This method is as follows;

$$n = \frac{N * p * q}{(N - 1) * \sigma^2 p + p * q}, \sigma^2 p = r / Z \frac{\alpha}{2} \quad [1]$$

where, n is the sampling size, the size of population (43,325) is N, the variance ratio is $\sigma^2 p$, the probability of the event occurring (0.5) is p, the probability of the examined situation not occurring (1-p) is q, r is the acceptable

Fig 1. Map of study area

margin of error (0.05) and the critical value for the normal distribution at (e.g. for p=0.05, α= 0.05, the critical value is 1.96) is. The sample size was calculated as 381. The available sample size was proportionally distributed. Thus, 252 questionnaires were applied to farmers in Balıkesir province and 129 questionnaires to farmers in Çanakkale province. The survey questions of this study were prepared using some previous studies (Ahmadet al., 2019; Rizwan et al., 2019; Ahmad et al., 2020). In the first part of the survey questions, there was knowledge related to socio-economic and farm-related features (education, age, etc.) of dairy farmers. In the second part, dairy farmers were asked questions to evaluate their risk attitudes (risk aversion, risk preference, etc.) against any risk and their perceptions towards environmental risks (severe storm, drought, etc.).

Analytical framework

Risk attitude

An equally likely certainty equivalent (ELCE) method was applied to estimate the attitude of dairy farmers towards any risks. In the literature, there are various approaches to measure farmers' risk attitudes. However, the most commonly used of these approaches is ELCE method, which is familiar adapted version of Neumann-Morgenstern (N-M) model (Hardaker et al., 2004; Khan et al., 2020). In this method, certainty equivalents were estimated for risky results, and these results were compared with the utility values. Also, household income was taken into account as a utility function in order to represent wealth. Because, there is a direct and close relationship between monetary value and risk. Furthermore, it is accepted that more monetary value equals a higher risk value (Rizwan et al., 2019; Ahmad et al., 2020). Based on this situation, in the study area, dairy farmers were asked to determine their annual household income. Because, these amounts would reveal their attitudes (risk taking or not) against any risk situation. In this study, the monetary values determined for farmers were between 0 to €5,513 ranges (each with equal probability). Based on this income range, it was assumed that it would select an income amount of €2,721 for farmers. Farmers were asked to determine risky outcomes of households income ranging between €2,721 and 0 with equal probability. As a result of this process, different certainty equivalents were determined and these were compared with the utility value. The same procedures were performed to determine the certainty equivalents for the remaining half of the income (ranging from €2,721 to €5,513). This value was indicated 0 for the lowest value of certainty equivalents and 1 for the higher value of certainty equivalents, while 0.5 for each value between €2,721 and €5,513. The amount of the utility values was found €2,721 as follows:

$$u\,(2{,}721) = 0.5u(0) + 0.5u(5{,}513) = 0.5(0) + 0.5(1) = 0.5 \quad [2]$$

where, the utility is u and it used for wealth. In this study, it shows farmers' income function (Ahmad et al., 2019; Khan et al., 2020). After the certainty equivalents comparison with the utility value, a cubic utility function was used to determine farmers' individual utility. This function has equation as follows:

$$u\,(w) = \alpha_1 + \alpha_2 w + \alpha_2 w^2 + \alpha_3 w^3 + \alpha_4 w^4 \quad [3]$$

where, α is parameter and w is dairy farmers' income, and their attitudes towards risks that is hinge on different factors. It is associated with farmers' risk attitudes regarding the preference of risk, the aversion of risk and the indifference towards risk (Pratt, 1964; Rizwan et al., 2019). Thus, risk aversion shows farmers' risk disliking attitudes, risk preference shows farmers' risk liking behaviours in the form of risk-taking under uncertainties, and the indifference towards risk shows neither risk loving nor farmers' risk aversion. In order to calculate the utility, an ordinary scale is used, generally. The form of this function on this scale may be turned into a quantitative degree of risk aversion that is called as the absolute risk aversion (Pratt, 1964; Ahmad et al., 2020). The equation regarding the absolute risk aversion can be expressed as follows:

$$r_a(w) = - u'(w)/u''(w) \quad [4]$$

where, the coefficient of the absolute risk aversion is $r_a(w)$, the derivative of wealth (w) is u that is replaced by the income of dairy farmers in this case. In this study, an alternative of wealth is income (Olarinde et al., 2007). The attitude of individual towards risk is explained the sign of the coefficient values. Hence, $r_a(w)<0$ indicates risk aversion, $r_a(w)=0$ indicates risk indifference, and $r_a(w)>0$ indicates risk preference. The negative sign for the coefficient implies risk preference of individual, zero coefficient value means risk indifference of individual and the positive sign for coefficient indicates risk aversion of individual (Hardaker et al., 2004). In this study, if dairy farmer's attitude shows risk aversion tend, dairy farmer's attitude towards risk was defined as 1, otherwise 0.

Risk perception

In order to understand how risk is perceived by farmers, it is important to measure the probability of a risky event occurring and its consequences. Evaluating risk gives an opinion about how likely something is to go wrong and what its consequences will be (Wang and Roush, 2000). A risk matrix method was used to determine farmers'perception related to environmental effects and

its induced risks (Cooper et al., 2005). In this method, two indicators (frequency and severity) of the risk were assessed using a five-point likert scale, which is one of the methods used to evaluate risk perception. Dairy farmers were asked to ranking the frequency and severity of each risk source (environmental risks) from 1 (very low) to 5 (very high) using by this scale. The grading of risks was obtained by multiplying the numerical values of their likelihood of occurrence and impact. These results gave a risk factor. The risk scores formed for dairy farmers were pooled into a matrix in Fig. 2. They were categorized as low if this score ranged between 2 to 5 and high if it ranged 6 to 10 (Cooper et al., 2005; Khan et al., 2020), and after that the perception of risk was evaluated on a binary scale as 1 for high and 0 for low risk.

Factors affecting risk perception and attitude

In this study, probit model was used to determine the effect of dairy farmers' socio-economic and farm-related characteristics (age, education, etc.) on farmers' risk attitudes and their perceptions towards environmental risks.

Probit model

This model is defined as a statistical probability model whose dependent variable has two categories, and it has zero and one values (Liao, 1994). Since the dependent variable used in the current study had binary outcomes, this model was found appropriate for the study (Ullah et al., 2015; Iqbal et al., 2016). STATA (data analysis and statistical software) program was used in oder to analyze the data of the present study (StataCorp, 2005). Probit model is as follows:

$$Y^* = X_i'\beta + \varepsilon \quad [5]$$

where, Y* is the dependent variable for the risk attitude and the perception towards environmental risks and, X_i' is explanatory variables that are the effect of outcome variables, β is the unknown parameter of estimation and ε is the term of error. It can find as follows:

$$Y_{ij} = \alpha + \sum X_i\ \beta + \varepsilon \quad [6]$$

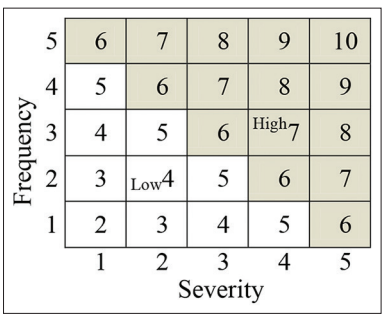

Fig 2. Risk matrix

where, the response variable is Y_{ij}, dairy farmers' risk attitudes and and their perceptions towards environmental risks (j=6) is i_{th}. In the model, if Y_i is greater than 0, it takes a value of 1, and if Y_i is less than zero, it takes a value of 0.

$$Y_{ij} = \begin{cases} 0 & = Y < 0 \\ 1 & = Y > 0 \end{cases} \quad [7]$$

In probit model, parameter estimates are limited to explanation the direction of effect (coefficient β_k) and p value between the dependent and explanatory variables, and these estimates can not predict how much a certain explanatory variables effects a response variable. Marginal effects (y'_{ij}) are calculated in order to precisely measure the magnitude of the effect of a particular independent variable (X_k) on Pr(Y_{ij} = 1). It can be indicated as follows:

$$y'_{ij} = (Pr\ (Y_{ij} = 1).1 - Pr\ (Y_{ij} = 1)).\beta k \quad [8]$$

Description of dependent and independent variables

Some studies in the previous literature was taken into account when determining the independent variables (socio-economic and farm-related characteristics of dairy farmers) for this study (Iqbal et al., 2016; Rizwan et al., 2019; Khan et al., 2020). Accordingly, independent variables of the present study were farmers' age, education level, the size of household, dairy farming experience, the number of dairy cattle, the land ownership status, livestock insurance and access to agricultural credit. Also, dependent variables of this study were dairy farmers' risk attitudes (aversion behaviour from risk) and their perceptions towards environmental risks (severe storm risk, excessive rainfall/flood, livestock diseases risk, high temperature risk and drought risk). In this study, the attitudes and perceptions of dairy farmers were taken into account as two separate dependent variables in order to determine their risk-taking tendencies depending on their socio-economic and farm-related characteristics and to reveal how they perceive the current environmental risks. The mean and standard deviation values of these variables (dependent and independent variables) were calculated using descriptive statistics (Table 1). Some reasons were considered in the selection of environmental risks that is determined as independent variables. Firstly, it is the increases in average temperature values due to climate change, and these increases negatively effect the rainfall distribution and drought in the study area (IPCC, 2017). Secondly, the most important feature of Çanakkale province, which is the study area, is that it is windy for most of the year (163 days) and the annual dominant wind direction is northern winds (GMKA Development Agency, 2014; RTMEU, 2018). However, the increase in the intensity of these winds day by day because of climate change creates negative conditions for dairy farming activity of farmers in the study area.

Table 1: Descriptive statistics for variables

Variables	Identification of variables	Mean	*SD
Characteristics			
Age (year)	Continuous	43.30	9.70
Education level (schooling year)	Continuous	6.29	2.35
Household size (person)	Continuous	3.13	1.05
Dairy farming experience (year)	Continuous	15.03	6.08
The number of dairy cattle (head)	Continuous	21.08	14.31
Land ownership status	Dummy (1 if have own land, otherwise 0)	0.66	0.47
Livestock insurance	Dummy (1 if have off-farm income, otherwise 0)	0.44	0.43
Access to agricultural credits	Dummy (1 if have credit access, otherwise 0)	0.71	0.45
Risk attitude			
Risk aversion behaviour	Dummy (1 if have risk aversion, otherwise 0)	0.75	0.43
Risk perception			
Severe storm risk	Dummy (1 if the value of this risk more than 5, otherwise 0)	0.71	0.45
Excessive rainfall/flood risk	Dummy (1 if the value of this risk more than 5, otherwise 0)	0.68	0.47
Livestock diseases risk	Dummy (1 if the value of this risk more than 5, otherwise 0)	0.63	0.48
High temperature risk	Dummy (1 if the value of this risk more than 5, otherwise 0)	0.61	0.48
Drought risk	Dummy (1 if the value of this risk more than 5, otherwise 0)	0.58	0.49

*SD=Standart deviation

Finally, it is a concern and an expectation of an increase in livestock diseases in dairy farming activities in the study area due to sudden changes in climatic events.

The significance of model (hypothesis testing)

The null hypothesis approach, which is a commonly used the approach, was applied to estimate the goodness of fit for the model and its significance in this study. It is identical to F test that is showed significance values for the model estimation in ordinary least square (OLS). This hypothesis is based on the assumption that all coefficients in the model are equal to zero and that one of the coefficient is not equal to zero (Khan et al., 2020).

$$H_0 = \beta k = 0; H_1 = \text{at least one } \beta k \neq 0 \quad [9]$$

These tests results in Table 2 revealed that LR chi-square values were positive for all the models (ranged from 70.97 to 85.42) and the probability for chi-square was at level of p=0.000. The pseudo R^2 value ranged from 0.14 to 0.17 for all the models. Accordingly, it may be deduced that this model fits for the current study, and thus it can estimate factors that affect dairy farmers' risk attitudes and their perceptions towards environmental risk.

RESULTS AND DISCUSSION

General characteristics of dairy farmers

On average, age of dairy farmers was 43.3 years, the schooling years of them was 6.29 years, their family size was 3.13 persons, dairy farming experience of them was 15.03 years and their number of dairy was 21.08 head. About 66% of dairy farmers had own land, 44% of them had livestock insurance and 71% of them had access to agricultural credits (Table 1). In this study, variation in some environmental risks (severe storm, excessive rainfall/flood, livestock diseases, high temperature and drought) had a significant association with dairy farmers' activity. Dairy farmers in the studyregion indicated that there has increased in summer temperatures and in severe storm and a decrease in overall rainfall during the last years. Also, dairy farmers stated that the drought has become more severe and the excessive rainfall/flood increased relatively. In this context, when the irrigation water availability of dairy farmers decreases due to effects of environmental risks, their opportunities to grow forage crops for their dairy cattle will also decrease. This situation has been a source of anxiety for dairy farmers. Especially in recent years, the increase in livestock diseases has become a concern of dairy farmers in the study area as it harms to productivity of farms and thus farmers' farm income.

Dairy farmers' risk attitudes

The risk-avoidance behaviours of the farmers dealing with dairy farming activity in case of any risk were evaluated by using the ELCE method. The results of this method showed that most farmers (75%) were risk aversion and not willing to take any risk in a crucial status (Table 1). Only 25% of them were willing to take risk in any risk situation. The results of this evaluation, which were made by considering the income status of the farmers, showed that the majority of farmers in the study region changed their risk preferences by taking into accounttheir own income and the financial conditions of their farms. This result revealed that farmersmore careful while making decisions under risks and uncertainties.

Table 2: Factors affecting dairy farmers' risk attitude and perception

Independent variables	Risk attitude			Risk perception													
	Risk aversion			Severe storm risk			Excessive rainfall/flood risk			Livestock diseases risk			High temperature risk			Drought risk		
	Coef.	ME[b]	p level	Coef.	ME[b]	p level	Coef.	ME[b]	p level	Coef.	ME[b]	p level	Coef.	ME[b]	p level	Coef.	ME[b]	p level
Age	-0.0837** (0.0158)[a]	-0.0239	0.000	0.0305* (0.0152)	0.0094	0.044	0.0502** (0.0149)	0.0172	0.001	-0.0005 (0.0137)	-0.0002	0.970	0.0321* (0.0138)	0.0119	0.020	0.0282* (0.0136)	0.0107	0.038
Education level	0.1053* (0.0381)	0.0301	0.006	0.0934* (0.0452)	0.0289	0.039	0.1263** (0.0411)	0.0432	0.002	0.0987** (0.0377)	0.0362	0.009	0.0905* (0.0379)	0.0337	0.017	0.0889* (0.0386)	0.0338	0.021
Household size	-0.1606* (0.0730)	-0.0458	0.028	0.0731 (0.0733)	0.0226	0.318	0.2705** (0.1222)	0.0925	0.000	0.2042** (0.0709)	0.0748	0.004	0.0133 (0.0679)	0.0050	0.844	-0.0594 (0.0678)	-0.0226	0.381
Dairy farming experience	0.0633* (0.0234)	0.0181	0.007	0.0495* (0.0244)	0.0153	0.043	-0.0770** (0.0232)	-0.0263	0.001	0.0212 (0.0213)	0.0076	0.321	-0.0256 (0.0212)	-0.0095	0.227	0.0443* (0.0219)	0.0168	0.044
The number of dairy cattle	0.0135* (0.0057)	0.0039	0.018	-0.0038 (0.0051)	-0.0012	0.458	0.0132* (0.0052)	0.0045	0.011	0.0263** (0.0055)	0.0096	0.000	0.0296** (0.0055)	0.0110	0.000	0.0010 (0.0049)	0.0004	0.845
Land ownership status	0.4644** (0.1577)	0.1401	0.003	-0.0602 (0.1595)	-0.0185	0.706	-0.0314 (0.1529)	-0.0107	0.837	0.2213 (0.1506)	0.0821	0.142	0.0768 (0.1482)	0.0287	0.604	-0.3942* (0.1521)	-0.1459	0.010
Livestock insurance	0.4831* (0.1707)	0.1503	0.005	-0.0291 (0.1779)	-0.0089	0.870	-0.3931* (0.1724)	-0.1262	0.023	-0.4875** (0.1722)	-0.1674	0.005	-0.4734* (0.1704)	-0.1662	0.005	-0.3442 (0.1701)	-0.1266	0.043
Access to agricultural credits	-0.3697* (0.1807)	-0.0986	0.041	-0.1220 (0.1634)	-0.0371	0.455	0.4277* (0.1549)	0.1522	0.006	-0.4779** (0.1615)	-0.1665	0.003	-0.5704** (0.1629)	-0.1993	0.000	-0.1769 (0.1562)	-0.0664	0.257
Log likelihood	-176.01496			-192.04856			-204.16171			-214.33456			-217.79253			-215.45955		
LR chi^2 (9)	75.92			72.05			70.97			72.41			71.61			85.42		
McFadden's Pseudo R^2	0.1774			0.1579			0.1481			0.1445			0.1412			0.1654		
Prob >chi^2	0.0004			0.0002			0.0001			0.0002			0.0003			0.0000		

The significance level: *p<0.05; **p<0.01; [a]Values in parenthesis are the standart errors; [b]ME: Marginal effectsof the probit model

Dairy farmers' risk perceptions

In the research region, dairy farmers were asked to point out the frequency of occurrence of environmental risks and their the severity (Table 1). These results indicated that dairy farmers conceived severe storm and excessive rainfall/flood as high risks. These risks were followed by livestock diseases, high temperature and drought risks. According to the results of the risk matrix score, the majority of dairy farmers (71%) perceived severe storm as the highest risk among the all risks. Also, the excessive rainfall/flood risk was perceived by 68% of dairy farmers as a high risk in terms of negative effects on their financial status. The ratio of other risks (livestock diseases, high temperature and drought) was also over 50%, and these risks were also perceived as high risk by dairy farmers. However, the scores of these risks were found to be lower than the other risks. These results showed that dairy farmers are more likely to encounter severe storm and excessive rainfall/flood risks compared to other environmental risks.

Factors that affect dairy farmers' attitudes and perceptions

The results regarding the effect of dairy farmers' socio-economic and farm-related characteristics on dairy farmers' risk attitudes and their perceptions towards environmental risks are given in Table 2.

Dairy farmers' age

The majority of dairy farmers were middle-aged (43.3 years). Dairy farmers' age had a negative and statistically significant ($P<0.05$) effect on their risk aversion behaviours. While this result is in line with those of Ullah et al. (2015) and Iqbal et al. (2016), it is inconsistent with those of Ahmad et al. (2019) and Khan et al. (2020), which stated that age of farmers has a positive effect on their risk aversion behaviours. In the research region, old dairy farmers were more likely to take risk compared to young dairy farmers. This result revealed that they would be less likely to avoid risk as dairy farmers' age increased. In this context, the increase in dairy farmers' age by one year would decrease the likelihood of their risk aversion by 2.39%. The majority of old dairy farmers had more capital accumulation compared to young dairy farmers. Considering this situation, it can be said that older dairy farmers are less likely to avoid taking risk. Because, the existence of the current capital of these farmers in protecting their farms and dairy cattle in the face of any risk is an element of trust for them. Dairy farmers' age had a positive and statistically significant effect on their perception of severe storm, excessive rainfall/flood, high temperature and droughtas important environmental risks. Old dairy farmers were more likely to perceive these environmental risks as high risk factors compared to young dairy farmers. The increase in dairy farmers' age by one year would increase the likelihood of perception by them as a high risk of severe storm by 0.94%, excessive rainfall/flood by 1.72%, high temperature by 1.19% and drought by 1.07%. These findingsare in line with those of Ahmad et al. (2020), which stated that old farmers perceive the storm rainfall and hail as the major risk compared to young farmers. Also, Rizwan et al. (2019) indicated that older farmers have more risk perceptions towards increasing temperature risk. However, the results of the present study aren't consistent with those of Ullah et al. (2015), Iqbal et al. (2016) and Ahmad et al. (2020), which explained that the relationship between farmers' age and their risk perception related to excessive rainfall/flood and drought is insignificant. Also, Shakoor et al. (2015) stated that the increase in temperature is an important challenge in terms of farmers. Although older dairy farmers in the research region are more likely to take risk depending on their capital accumulation and age-related experience, they are concerned that their production and farm income may be adversely affected when they are faced with these environmental risks. For this reason, the perceptions of older dairy farmers towards these risks were higher. Furthermore, dairy farmers are concerned for their farms and dairy cattle due to the increase of wind intensity in the study area day by day depending on climate change. Hence, severe storm risk was of great importance for dairy farmers. Accordingly, these results showed that older dairy farmers were more aware of the negative effects of environmental risks, they were more concerned about these risks for their farms and dairy cattle, and they had a higher risk perception compared to younger dairy farmers. Drought risk has negative effects on livestock activities such as decreasing of grass amount and roughage production in meadows and pastures, water scarcity and animal losses (Koyuncu, 2017). Older dairy farmers, who perceived drought as a high risk in the study area, were aware of the negative effects of this risk on their farms and dairy cattle depending on their experience with age increases. These results showed that there is a need to emphasize the negative effects of environmental risks, especially for young dairy farmers, and to organize information and training meetings for farmers about ways to cope with these risks. In addition, the importance of agricultural credits and livestock insurance should be emphasized in reducing the negative effects of environmental risks for younger dairy farmers that can adapt to agricultural innovations and changes in a shorter time than older dairy farmers, and they should be encouraged to turn to these practices. Also, transferring the experiences of older dairy farmers about these risks to other farmers by agricultural extension staff may

contribute to the perception of these risks and coping of these risks by them.

Dairy farmers' education level

Most dairy farmers attended primary education (6.29 years). Dairy farmers' education level had a positive and statistically significant ($P<0.05$) effect on their risk aversion behaviours. This result is consistent with those of Akhtar et al. (2018) and Rizwan et al. (2019). However, it is not congruent with those of Aye and Oji (2009), which showed that farmers' schooling years have a adverse effect on their risk aversion behaviours. In the study area, educated dairy farmers were more likely to show risk aversion behaviour compared to less educated dairy farmers. This result revealed that dairy farmers would be more likely to avoid risk depending upon the increase in their education level. In this context, the increase in the education level of dairy farmers by one year would increase the likelihood of their risk aversion by 3.01%. Considering these results, it can be said that the knowledge of the farmers and therefore their education level is an important at the stage of taking the necessary measures to protect their farms and income against various risks. In the study region, educated dairy farmers have ready access to information more quickly and easily about the negative impacts of environmental risks by using existing technology compared to less educated dairy farmers. Therefore, these farmers have more up-to-date and detailed information about current risks. Hence, they had become much more cautious about taking risks. Dairy farmers' education level had a a positive and statistically significant effect on their perception of severe storm, excessive rainfall/flood, livestock diseases, high temperature and drought as important environmental risks. Educated dairy farmers were more likely to perceive these environmental risks as high risk factors compared to less educated dairy farmers. The increase in schooling years of dairy farmers by one year would increase the probability of perception by them as a high risk of severe storm by 2.89%, excessive rainfall/flood by 4.32%, livestock diseases by 3.62%, high temperature by 3.37% and drought by 3.38%. These findings are in line with those of Rizwan et al. (2019), which indicated that literate farmers compared to other farmers have more risk perception regarding high temperature. Also, Ahmad et al. (2019) stated that educated farmers pay regard to storm rainfall and hail as a the major risk rather than less educated and illiterate farmers. However, theresults of the current study are inconsistent with those of Iqbal et al. (2016), which showed that educated farmers compared to less educated detect less the excessive rainfall as a major risk. Also, Iqbal et al. (2016) and Rizwan et al. (2019) stated that more educated farmers' perception is less towards disease risk. Educated dairy farmers in the research region were more willing to access information about the weather forecast than less educated dairy farmers. These farmers have easy access to telecommunication resources where they can get information about the changes in weather events with their skills, but the information available to them through these sources was limited. Since they were not have access to complete information with these resources, they were concerned about the harm that environmental risks could cause to their farms and dairy cattle. In the study area, educated dairy farmers knew ways to overcome some livestock diseases compared to less educated dairy farmers. However, in addition to their knowledge on this subject, they were also aware of the economic losses (livestock deaths, decline in milk yield, compulsory slaughtering etc.) that may occur in their farms due to these diseases. Educated dairy farmers had higher perceptions of livestock diseases risk than less educated dairy farmers because of farmers' concerns about this issue. This result also means that more educated dairy farmers have difficulty in protecting their dairy cattle from various diseases. Therefore, especially more educated dairy farmers considered livestock diseases risk as a major threat to their dairy cattle. In many studies, it is stated that warm and humid environments will cause behavioural and metabolic differences such as in many physiological functions (decrease in feed consumption, and decrease in reproductive efficiency and productivity etc.) and the susceptibility to diseases in livestock (Parsons et al., 2001; Akyuz et al., 2010). In the current study, more educated farmers were more aware of the fact that there would be significant decreases in feed consumption, reproduction, and yield level of their dairy cattle depending on the increase in temperature. Furthermore, educated dairy farmers were more aware of the negative effects of drought risk on farmers who make forage plant breeding for their dairy cattle compared to less educated dairy farmers. For this reason, these farmers are concerned about the negative consequences of this risk in dairy farming activities. Accordingly, in the study area, increasing of training studies towards the awareness of dairy farmers about environmental risks can lead them to seek solutions that can minimize or eliminate the damage of environmental risks. This situation may contribute to the emergence of measures on a regional basis that may need to be included in the scope of agricultural policies.

Dairy farmers' household size

The average household size of dairy farmers was 3.13 persons. Dairy farmers' household size had a negative and statistically significant ($P<0.05$) effect on their risk aversion behaviours. While this result is congruent with those of Aye and Oji (2009), it is inconsistent with those of Akhtar et al. (2018) and Ullah et al. (2015), which indicated that the household size of farmers has a positive effect on their risk aversion behaviours. In the study area, dairy farmers with large family size were more likely to

take risk rather than dairy farmers with small family size. This result revealed that dairy farmers would be less likely to avoid risk depending upon the increase in the number of individuals in their household. In this context, the rise in the number of family members in dairy farmers' household by one person would diminish the probability of their risk aversion by 4.58%. Considering these findings, it can be said that dairy farmers with large family size increases the total labour supply in their household. This situation also augments their income generating potentials (on farm and off-farm). Thus, the majority of household can contribute to income in household by supporting the demand for labour at peak times of the labour necessity in dairy farming activity. Dairy farmers' household size had a positive and statistically significant effect on their perception of excessive rainfall/flood and livestock diseases as important environmental risks. Dairy farmers with large family size were more likely to perceive these environmental risks as high risk factors compared to dairy farmers with small family size. The rise in the number of family members in the dairy farmers' household by one person would increase the probability of perception by them as a high risk of excessive rainfall/flood by 9.25% and livestock diseases by 7.48%. These findings are congruent with results of Iqbal et al. (2016), which indicated that farmers who have large family size perceive excessive rainfall as major threat. Also, Ahmad et al. (2020) explained that there is significant and positive relationship between farmers' family size and their risk perception related to livestock diseases. However, these findings of the present study are not consistent with results of Ullah et al. (2015) and Rizwan et al. (2019), which showed that the relationship between farmers' household size and their risk perception related to heavy rains/flood and livestock diseases is insignificant. The rise in the number of individuals in the household size of dairy farmers also increases their responsibilities to meet the basic needs of the family members. Due to these responsibilities, dairy farmers in the study regionare concerned about the financial harm (in livestock barn, etc.) and economic losses (livestock deaths, decline in milk yield, compulsory slaughtering etc.) that may occur in their farms in case of excessive rainfall/flood and livestock diseases. Because, they were aware that farm and family income of them may decrease significantly and see economic damages when these farmers face with serious economic losses. For this reason, in the study area, dairy farmers with large family size aimed to both meet the basic needs of their families and reduce the negative effects of environmental risks on their farms. Therefore, these farmers need more financial support. These financial supports to farmers can be provided with incentives applied within the scope of agricultural policies.

Dairy farmers' dairy farming experience

Farming experience of dairy farmers was 15.03 years, on average. Farmers' dairy farming experience had a positive and statistically significant ($P<0.05$) effect on their risk aversion behaviours. This result is consistent with those of Ahmad et al. (2020) while different from those of Ahmad et al. (2019), which indicated that the dairy farming experience of farmers has a adverse effect on their risk aversion behaviours. In the study area, farmers who have more dairy farming experience had more likely to risk aversion compared to farmers who have less dairy farming experience. This result revealed that dairy farmers would be more likely to avoid risk depending on the increase in their farming experience. In this context, the increase in dairy farming experience of farmers by one year would increase the probability of their risk aversion by 1.81%. Since experienced dairy farmers have much more exposed to various risks compared to less experienced dairy farmers in the past years, these farmers have more cautious about various risks. In addition, especially experienced dairy farmers who have large-scale farms have reluctant to take risk as much as possible as they are aware that various risks were causing considerable economic losses to their farms. Farmers' dairy farming experience had a positive and statistically significant effect on their perception of severe storm and drought as important environmental risks, while this variable had a negative and statistically significant effect on their perception about excessive rainfall/flood. Farmers with more dairy farming experience had more likely to perceive severe storm and drought as high risk factors and less likely to perceive excessive rainfall/flood as a high risk factor compared to farmers with less dairy farming experience. The rise in dairy farming experience of farmersby one year would increase the probability of perception by them as a high risk of severe storm by 1.53% and drought by 1.68%, while this increase would decrease the probability of perception by them as a high risk of excessive rainfall/flood by 2.63%. These results are inconsistent with those of Rizwan et al. (2016), which explained that farmers with experience were able to perceive flood as major risk, but are congruent with those of Ahmad et al. (2020), which indicated that farmers who have experience are able to perceive drought as major risk to their crop. The results of the present study showed that farmers had taken serious precautions by making certain investments to protect their farms against the risk of excessive rainfall/flood that they have faced so far. Also, they stated that they were partially ready for natural events related to severe storm and drought risks, also.

Dairy farmers' the number of dairy cattle

The average number of farmers dairy cattle was 21.08 head. The number of farmers' dairy cattle had a positive and statistically significant ($P<0.05$) effect on their risk

aversion behaviours. This result is consistent with those of Ahmad et al. (2020). However, it is inconsistent with those of Ahmad et al. (2019), which indicated that the number of farmers' dairy cattle has a negative effect on their risk aversion behaviours. In the research region, farmers who have more number of dairy cattle were more likely to show risk aversion behaviour compared to farmers who have less number of dairy cattle. This result revealed that dairy farmers would be more likely to avoid risk depending upon the increase in the number of their dairy cattle. In this context, therise in the number of farmers' dairy cattle by one unit would increase the probability of their risk aversion by 0.39%. In the study area, farmers who have more number of dairy cattle were more probability to avoid risk as they are more likely to be harm from various risks compared to farmers with less number of dairy cattle. Farmers' the number of dairy cattle had a positive and statistically significant effect on their perception of excessive rainfall/flood, livestock diseases and high temperature as important environmental risks. Farmers who have more numbers of dairy cattle were more likely to perceive these environmental risks as high risk factors compared to farmers who have less numbers of dairy cattle. The increase in the dairy cattle number of farmers by one unit would increase the probability of perception by them as a high risk of excessive rainfall/flood by 0.45%, livestock diseases by 0.96% and high temperature by 1.10%. These results are consistent with those of Iqbal et al. (2016) and Ahmad et al. (2019), which indicated that farmers having more dairy cattle consider excessive rainfall/flood/storm rainfall as major menace to their crop. In the research region, farmers who have more numbers of dairy cattle have difficulty in protecting their dairy cattle from these risks depending on the increase in the size of farm and in the number of dairy cattle. Because, farmers who have more numbers of dairy cattle have faced with more dairy cattle losses and harm compared to farmers who have less numbers of dairy cattle in case of these risks. Livestock diseases are not a naturally occurring process under the control of dairy farmers. Hence, it is important to take measures to reduce or eliminate the risks of livestock diseases so that farmers do not meet with dairy cattle losses due to livestock diseases, especially in farms with a large number of dairy cattle. With the body temperature of animals at high temperature, their stress phenomenon also increases. The feed consumption, milk yield and reproductive efficiency and productivity performances of dairy cattle also decrease under these stress conditions (Koyuncu, 2017). Accordingly, this situation has a negative impact on farmers' income. Therefore, high temperature was perceived as an important risk factor by dairy farmers in the study area. Considering that dairy farmers with a large number of dairy cattle are more likely to be affected by environmental risks, it is seen that these farmers need more financial support to protect their dairy cattle against current risks. Hence, livestock insurance and low-interest agricultural credit applications can be preferred as practices that can minimize or eliminate the losses of dairy farmers against environmental risks. These practices should be carried out by taking into account the deficiencies on a regional basis regarding animal husbandry. According to these deficiencies, the scope of these practices should be expanded. Thus, these practices can make a positive contribution to the risk management of dairy farms and cause them to become financially stronger.

Dairy farmers' land ownership status

About 66% of dairy farmers had own land. The land ownership status of farmers had a positive and statistically significant ($P<0.05$) effect on their risk aversion behaviours. This result is not congruent with those of Ullah et al. (2015). The result of the present study showed that dairy farmers who have own the land were less likely to take risk rather than those who lease land (not own the land). In this context, the increase in the land ownership status of dairy farmers by one unit would increase the probability of their risk aversion by 14.01%. Ullah et al. (2015) stated that tenant farmers was determined to be more risk averse in nature compared to land owners. However, in this study, it was determined that farmers who have own the land were more risk aversion compared to those who lease land. Accordingly, it is possible to attribute this result to two reasons. Firstly, most farmers (66%) in the study area had their own land, and thus the number of farmers renting land was low (34%). Secondly, young farmers, especially in the study area, tend to earn more economic income, and so they want to preserve their current assets (land etc.). Therefore, they do not want to suffer economic loss due to various risks that they may encounter during their dairy farming activities. Dairy farmers' land ownership status had a negative and statistically significant effect on their perception of drought as an important environmental risk. Dairy farmers who have own the land were less likely to perceive drought as a high risk factor compared to dairy farmers who lease land (not own the land). The increase in the land ownership status of dairy farmers by one unit would decrease the probability of perception by them as a high risk of drought by 14.59%. Dairy farmers, who make crop production for themselves and their dairy cattle on their own land, think that they will be less affected by product losses that may occur as a result of drought risk compared to farmers who lease land. Because, the probability of these farmers to compensate for the economic losses on their lands was higher than farmers who lease land. The majority of dairy farmers in the study region have grow forage plants to meet the feed needs of their dairy cattle. Therefore, drought risk, which will occur

as a result of extreme temperature and water insufficiency problems caused by climate change, is one of the important environmental risks that will adversely affected the feed needs of their dairy cattle. Depending on this risk, dairy farmers' opportunities to grow forage plants will decrease. Therefore, this situation will cause the majority of the feed needs of dairy cattle to be met from outside the farm. As a result of this, it will be negatively affect the farm income of the farmers. In addition, the decrease in the feed efficiency of farms due to drought risk will increase dairy farmers' feed costs. In this context, their production costs will also increase. This situation will lead to an increase in feed prices at the national and regional level.

Dairy farmers' livestock insurance

About 44% of dairy farmers had livestock insurance. The livestock insurance of dairy farmers had a positive and statistically significant ($P<0.05$) effect on their risk aversion behaviours. In this study, dairy farmers who have livestock insurance were more likely to show risk aversion behaviour compared to dairy farmers who have not livestock insurance. This result revealed that dairy farmers would be more likely to avoid risk depending upon the rise in the number of insured dairy cattle. In this context, the increase in livestock insurance of dairy farmers by one unit would increase the probability of their risk aversion by 15.03%. The majority of farmers who have livestock insurance (61.4%) consisted of young farmers (45 years old and under). Because, young dairy farmers did not want to take too many risks so as not to be affected too much by various risks. For this reason, they have prefered to tend towards increasing their current income and farm capital by insuring their dairy cattle. Meuwissen et al. (2001) explained that one of the most important as risk management strategies were insurance. Since young dairy farmers in the study area aim to expand their farms by protecting from various risks (natural disaster, disease, death etc.) their savings and income obtained from dairy farming activity, their risk aversion behaviours were higher than that of older dairy farmers. In the Turkey, livestock (cattle) insurance practices are involved death, obligatory slaughter, abortion and calf losses (death) caused by risks such as any kind of natural disaster and animal diseases, sunstroke, poisonous meadow grasses and poisoning caused by fodder (TARSIM, 2020). Considering this practices, it can be said that livestock insurance isan important in decreasing the effect of various risks in terms of farms lossesand financial management. Because, it can decrease the degree of risks by compensatingfor economic losses (death, disease, injury etc.) occurred depending on various risks. Accordingly, dairy farmers who have livestock insurance may both protect against to various risks (disease, other risks etc.) their own dairy cattle and prevent to economic damages. Dairy farmers' livestock insurance had a negative and statistically significant effect on their perception of excessive rainfall/flood, livestock diseases and high temperature as important environmental risks. Dairy farmers who have livestock insurance were less likely to perceive these environmental risks as high risk factors compared to dairy farmers who have not livestock insurance. The increase in involvement dairy farmers' livestock insurance by one unit would decrease the probability of perception by them as a high risk of excessive rainfall/flood 12.62%, livestock diseases by 16.74%, high temperature 16.62% and by drought 12.66%. In this context, dairy farmers who have livestock insurance are not concerned about the economic losses that can result from the risk of excessive rainfall/flood. Furthermore, these dairy farmers had a low risk perception about animal diseases because they think that insurance can prevent or reduce the economic losses that may occur due to livestock diseases. In addition, they had also the financial power and support (farm income and insurance) to cover the physiological changes and economic losses that may occur in their dairy cattle due to the high temperature risk. According to these results, it is of great importance to extend livestock insurance practices and to provide more support to farmers regarding this issue with regards to the sustainability of dairy farming activities in the study area against environmental risks.

Dairy farmers' access to agricultural credit

About 71% of dairy farmers had agricultural credits access. The agricultural credits access of farmers had a negative and statistically significant ($P<0.05$) effect on their risk aversion behaviours. This result is consistent with those of Khan et al. (2020), but is inconsistent with those of Ahmad et al. (2020), which determined that the agricultural credits access of farmers have a positive effect on their risk aversion behaviours. In this study, dairy farmers who have access to agricultural credits were less likely to show risk aversion behaviour compared to dairy farmers who have not access to agricultural credit. This result revealed that dairy farmers would be less likely to avoid risk depending on the increase in agricultural credits access of them. In this context, the increase in agricultural credits access of dairy farmers by one unit would decrease the probability of their risk aversion by 9.86%. Since agricultural credits helps farmers to use in a timely manner to their capital in managing their agricultural production, it plays an important role in terms of the effective risk management at the farm level (Ullah et al., 2015). Accordingly, in this study, dairy farmers who have access to agricultural credits had the opportunity to effectively manage various risks and exhibited risk-taking behavior thanks to these credits. However, the use of agricultural credit or access to agricultural credits provides financial relief for farmers on the one hand, and on the other causes them to become indebted. Because, farmers have an obligation to repay the

loan amounts that they have taken (Pakdemirli, 2019). This situation cause them to be concerned about how they will pay this debt if they can't make a profit from their dairy farming activities. Dairy farmers' access to agricultural credits had a positive and statistically significant effect on their perception of excessive rainfall/flood as important environmental risks, while this variable had a negative and statistically significant effect on their perception about livestock diseases and high temperature. Dairy farmers who have agricultural credits access were more likely to perceive excessive rainfall/flood as a high risk factor and less likely to perceive livestock diseases and high temperature as high risk factors compared to farmers who have not access to agricultural credit. The increase in access to agricultural credits of dairy farmers by one unit would increase the probability of perception by them as a high risk of excessive rainfall/flood by 15.22%. However, this increase would decrease the probability of perception by them as a high risk of livestock diseases by 16.65% and high temperature by 19.93%. These findings are consistent with resultsof Ahmad et al. (2019), which indicated that farmers with access to credit regard not to be important the risk of disease for production,but are not consistent with findings of Rizwan et al. (2019), which determined that the relationship between farmers' loan access and their risk perception related to livestock diseases is insignificant. Also, Iqbal et al. (2016) stated that the relationship between dairy farmers' credit access and their risk perception related to excessive rainfall/flood is insignificant. In the study area, dairy farmers are concerned that their debt burden will increase further due to their obligations to repay these loan, although they have access to agricultural credits to cover the harms to their farms and dairy cattle of the excessive rainfall/flood risk. For this reason, the perception of dairy farmers who have access to agricultural credits towards this risk was higher than that of dairy farmers without access to agricultural credit. Dairy farmers who have agricultural credits access were less likely to perceive livestock diseases and high temperature as important risks. Because, they had a low risk perception about livestock diseases and high temperature since they had seen agricultural credits as a financial support against these risks. Abid et al. (2016) stated that farmers had a request to take more adaptation precautions to reduce climate change effects as their agricultural income of farmers increased. Accordingly, agricultural credits can increase dairy farmers' likelihood of taking adaptation precautions and mitigation strategies towards environmental risks (diversifying their livestock categories). In addition, agricultural creditsare also important in terms of providing agricultural income to dairy farmers in order to support them to develop or reinvest their farms.

CONCLUSION

The present study was focused on defining the environmental risks that are important for dairy farmers in the TR22 region of Turkey and determining the factors that affect farmers' risk attitudes and their perceptions towards environmental risks. Dairy farmers were aware of the negative effects of various risks, and the majority of them were not willing to take risks to protect their available capital and savings. Dairy farmers' age, education level, the size of household, dairy farming experience, the number of dairy cattle, land ownership status, livestock insurance and agricultural credits access were an important factors that affect farmers' risk attitudes and their perceptions towards environmental risks. In line with this study goals and results, it is an important for dairy farmers to receive financial support or thematic training towards reducing the negative effects of environmental risks depending on climate change. To make easier decrease their farms risks of dairy farmers, there is a need to encourage farmers for off-farm activities and training projects. In other words, taking of private and regional policy measures to decrease the negative effects of environmental risks on farmers' dairy farming activities and to adap of them towards these risks may decrease the adverse effects of environmental risks on farmers' dairy farming activities. Accordingly, practices such as adaptation to temperature changes in feeding of dairy cattle, developing new breeds of dairy cattle that are resistant to stress, and improving pastures can be included among these measures.

RECOMMENDATIONS AND POLICY IMPLICATIONS

The current study contributes to the literature by uncovering socio-economic and farm-related characteristics regarding environmental risks. These results have provided some policy suggestions.

- In Turkey, eliminating problems of dairy farming and improving the economic conditions of farmers play avery important role in reducing or eliminating the negative effects of environmental risks. In this study, the obstacles in decreasing or eliminating the adverse impacts of environmental risks on dairy farming activities are mainly the problems arising from the financial inadequacies of dairy farmers. Dairy farmers need financial support in order to protect themselves from these risks or to adapt to these changes due to climate change.
- Policies regarding region-specific environmental risks will be more effective as Turkey has different agricultural and climatic regions. Also, region-oriented policies may aim to encourage farmers to alter their production practices to climate-smart by agricultural supports.

- The awareness of dairy farmers in the study area related to environmental risks should be increased. Dairy farmers with increasing awareness will be aware of the economic losses that these risks will cause to dairy farming activities.Thus, their tendencies towards agricultural practices to reduce these risks can increase.
- Increasing the agricultural credit applications for dairy farmers in the study area will contribute positively to their taking precautions against environmental risks. In addition, agricultural training programs, especially for small-scale dairy farmers, can help decrease the negative effects of environmental risks on their farms.
- The ratio of dairy farmers who have livestock insurance for their dairy cattle in the study area is quite low. Therefore, there is a need to improve the deficiencies in this practice. In this context, it is important to include losses arising from environmental risks in livestock insurance coverage.
- Considering the lack of knowledge of dairy farmers in the study region about the occurrence and consequences of environmental risks, training activities and agricultural extension services should be provided them to decrease the negative effects of these risks. It should be aimed to raise awareness of dairy farmers about the benefits of taking precautions against environmental risks and to inform them about the application of risk methods suitable for regional conditions. Considering that high temperature and drought risks will adversely affect forage plants cultivation, technical assistance in taking decisions regarding feed management is one of the important supports, also.

CONFLICTS OF INTEREST

The authors declared no confict of interest.

DATA AVAILABILITY STATEMENT

The data used during the present study are available from the author on reasonable demand. All data used is present in the article.

ETHICS APPROVAL

Not applicable. In the present study, survey respondents were notified that the questionnaire data will be used for scientific purposes.The questionnaire was performed with the required permissions from the respondents. Also, other ethical rules were taken into account in the current study.

AUTHOR CONTRIBUTIONS

The main idea of study, conceptual framework, data gathering, analysis of findings, interpretation and preparation of manuscript.

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