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Determination of Climate Change Adaptation Behavior of Wheat Producing Farmers; the Case of Çorum Province in Türkiye

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ABSTRACT

Global climate change is a threat to Türkiye, especially in the agricultural sector. In recent years, the impact of climate change has been felt seriously in Çorum Province. The present study was carried out after it was observed that the average temperature in Çorum province, which was 10.8°C in 1929-2019 period, rose up to 13.15°C in 2020. The aim of the present study was to determine the factors that affect the climate change adaptation behavior of the farmers in Çorum, where 37% of the land is devoted to wheat production. A survey was conducted with 385 farmers in January and February, 2021. The effect of factors on adaptation behavior was calculated by means of path analysis. It was revealed that personal experience had a positive effect of 54% on adaptation behavior, 50% on risk perception and 81% on climate change beliefs. In addition, although belief in climate change had a 45% positive effect on risk perception, risk perception and beliefs had no significant effect on the adaptation behavior. As a result, raising the awareness of farmers about adaptation using agricultural extension services and personal experience teaching method before incurring economic loss is critical to reduce climate risks and to better adapt to climate change.

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Introduction

Climate change affects Türkiye as well as many countries on the global scale. Hazards due to climate change (Field, 2014) will cause many social and economic problems in the following years if no precaution is taken (Patz et al., 2005; Stern and Stern, 2007). According to the World Economic Forum's Global Risk Report, 5 of the 10 major risks in the next 10 years are environmental risks (World Economic Forum, 2019). Farmers in developing countries such as Türkiye are expected to be affected more by the environmental risks (Hanjra and Qureshi, 2010) compared to those in developed countries (Tietenberg and Lewis, 2018). The increase in greenhouse gas emissions causes yield and quality problems in crops, causing losses in farmers' incomes (Nelson et al., 2014). For example, it was reported that in 2000-2008 there were significant decreases in barley, oats, corn, tobacco, poppy, chickpea and especially wheat yields due to the global warming in Uşak province of Türkiye, where the yields were about 10-20% higher than the national average (Kara et al., 2010). Since the global climate change impairs the yield and quality of crops (Ainsworth and McGrath, 2010), adapting farmers to climate change and understanding the factors related to the adaptation are important for sustainable agriculture and food supply. Therefore, the aim of the present study was to investigate the farmers' Climate Change Adaptation Behavior (CCAB).

For governments to take measures against climate change and deal with the challenges of the adaptation, farmers' awareness of the effective factors in the CCAB is guiding in terms of policies to follow (Kievik and Gutteling, 2011; Vulturius et al., 2018). In a review investigating the 13 factors motivating the CCAB, over 100 articles from different countries were examined (van Valkengoed and Steg, 2019). Of these factors, norms, negative affect, perceived self-sufficiency and result-effectiveness of adaptation actions were strongly associated with adaptation behavior while lack of knowledge and personal experience were indicated as the main obstacles to adaptation (van Valkengoed and Steg, 2019). Besides, almost 50 studies emphasized the importance of personal experience (Sharma and Patt, 2012; Demuth et al., 2016; van Valkengoed and Steg, 2019).

Although many scientific studies were conducted on climate change (Dogan and Karakas, 2018; Doğan and Kan, 2018; Doğan and Kan, 2019) in the world, there are a limited number of studies (Dang et al., 2019) discussing the psychological dimension of farmers' adaptation behavior (Deressa et al., 2011). In a study on risk perception of farmers in Türkiye about the climate change (Aydogdu and Yenigün, 2016), variables such as age, agricultural income, farm size, experience of the farmer, household size, agricultural credit use, level of education, non-agricultural manpower and water perception were examined. In a logistical regression analysis, the authors used psychological factors of 'water perception' and 'climate change risk perception' as descriptive variables (Aydogdu and Yenigün, 2016). Since the psychological variables are more accurate and stronger than socio-demographic variables in determining the adaptation behavior (Grothmann and Patt, 2005), the present study aimed to determine some psychological factors that have an effect on the CCAB of farmers in Türkiye.

Human behavior is undeniably one of the most important causes of global climate change. In this respect, Stern (2000) provided a conceptual framework to explain environmentally important individual behavior theories. Focusing specifically on value-belief-norm theory, Stern (2000) has made significant contributions to the literature. Arbuckle, Morton and Hobbs (2015) added the perceived factors of climate change for agriculture, climate change belief, climate change risk perception and reliability to this theory in the following years to measure the adaptation of the climate change-sensitive farmers to variable weather conditions. In a study conducted later in Iran, trust, risk specificity, risk perception and beliefs were used to determine psychological factors that are effective in the farmers' the CCAB (Azadi et al., 2019). Since the most prominent factors related to the CCAB in the literature are "personal experience", "risk perception" and "climate change belief", the effects of these factors on CCAB were investigated. Since there has been no research on this issue in Türkiye, it was thought that this research would contribute to the literature.

It was stated in many studies that experiencing a natural disaster due to climate has a positive effect on the CCAB (Demuth et al., 2016; Sharma and Patt, 2012; van Valkengoed and Steg, 2019). As the people who experienced natural disasters (Lawrence et al., 2014) gain a general experience, it is known that they prepare themselves for such future events and seek information to protect themselves (Carrico et al., 2015). The people who experienced disasters such as drought, flood, overflow, sudden rainfall and sea-level rise (Evans et al., 2014) were reported to be more courageous and willing to change their behavior of protection from risk (Akerlof et al., 2013). It was reported that farmers who experienced climate change were beginning to believe in climate change (Spence et al., 2011). It was also reported that after a natural disaster experience, the farmers had higher levels of anxiety (Bickerstaff et al., 2006) and risk perceptions (Le Dang et al., 2014), and become more conscious, understanding and willing to adapt to changing conditions (Zamasiya et al., 2017).

For farmers to adapt to the climate change, the ecological balance must be maintained and water resources should be used consciously, effectively, efficiently and in a planned manner (Karaman and Gokalp, 2019). To achieve these, awareness and beliefs, which are important and strong determinants of adaptation behavior, must be activated (Le Dang et al., 2014). Although beliefs are independent of climate change risk perception (Hyland et al., 2016), because risk perceptions are caused by beliefs (O'Connor et al., 1999), beliefs are important in adaptation processes (Arbuckle Jr. et al., 2013). Personal experiences such as drought and sudden floods affect farmers' beliefs in climate change (Myers et al., 2013). Farmers' climate change risk perception and their beliefs guiding their adaptation actions (Li et al., 2015) are also strong determinants of their behavioral intention in decision-making processes (Truelove et al., 2015). Leiserowitz (2006) stated that climate change causes negative connotations for almost all participants.

Risk perception refers to farmers' subjective interpretations of a particular phenomenon and its effects (Sjöberg et al., 2004). Climate change risk perception may vary according to individuals, level of development and community structures (Smith et al., 2000). With changing climatic conditions, fragile farmers producing on a small scale in the agricultural sector are more affected by climate change than farmers producing on a large scale (Misra, 2017). Extreme climate events, especially drought, flood, temperature and precipitation changes, pose the main risk in agricultural production. For example, increased temperatures adversely affect wheat grain yields due to the shortening of grain filling period (Hatfield et al., 2011). Due to the importance of risk perception in farmer adaptation (Arbuckle et al., 2015), farmers' climate change risk perception was included in the present study (Abid et al., 2016; Arunrat et al., 2017).

The reactions that farmers give individually to climate change may vary depending on many factors such as their crop, region, experience and income. The fact that farmers want to avoid risks and losses motivates their adaptation to climate change (Jin et al., 2020). The farmers who experienced the risks of climate change want to protect themselves by changing the planting and harvesting times (Ofoegbu et al., 2016). Farmers, especially those who personally experienced the negative effects of climate change, were observed to adapt more quickly to climate change (Akerlof et al., 2013). Besides, farmers could change the type and amount of pesticides as an adaptation strategy (Azadi et al., 2019). Another strategy for adapting to changing climate conditions is to change the crop varieties they use and turn to more resistant ones. Crop rotation is also among farmers' adaptation strategies against climatic risks (Talanow et al., 2020). It was reported that the grain producing farmers in Eskisehir province of Türkiye clearly felt the climate change, were aware of it, used different irrigation techniques to achieve higher yields with less water, and changed their fertilizer use (Sevim and Somuncu, 2018).

The statistical hypotheses of the present study aiming to determine the farmers' the CCAB were as follows:

H1: The personal experience of wheat producers on climate change has no effect on the CCAB.

H2: The personal experience of wheat producers on climate change has no effect on the belief in climate change.

H3: The personal experience of wheat producers on climate change has no effect on climate change risk perception.

H4: Climate change belief of wheat producers has no effect on climate change risk perception. H5: Climate change belief of wheat producers has no effect on the CCAB of wheat producers.

H6: Climate change risk perception of wheat producers has no effect on the CCAB of wheat producers.

Material and Method

Türkiye is among the countries most affected by the climate change due to its geographical location (11th Development Plan, 2019). A policy is being followed in Türkiye towards limiting the greenhouse gas emission growth trend and towards the green growth. Thus, the efforts to adapt to climate change are at the forefront (11th Development Plan, 2019). The 11th Development Plan aims at combating the climate change and increasing the resilience of the economy and society against climate risks by providing capacity increases for climate change (11th Development Plan, 2019). Due to increasing sudden rainfall, flood and drought disasters in recent years, the Black Sea Region is among the most sensitive regions of Türkiye to climate change (11th Development Plan, 2019).

With its 530,360 hectares of agricultural land, Çorum province in the Black Sea Region of Türkiye covers 37% of TR83 region and has an important agricultural potential (TURKSTAT, 2020). Since only 15% of these lands is irrigated and 85% is dryland, the province has an agricultural structure sensitive to climate change. Wheat was grown in 36.97% of the total agricultural land of Çorum province in 2019, which was 46.38% in 2004 (TUIK, 2020). The long-term average temperature (1929-2019) in Çorum province was 10.80°C, which was measured to be 13.15°C in 2020 (MGM, 2021). These increasing temperatures have led to significant yield and quality problems in wheat. CCAB of wheat producers in Çorum province is the subject of the present study since the Çorum province has the largest wheat acreage in TR83 region, the province is among the five driest provinces of Türkiye, and the average temperature in 2020 increased by 2.35°C compared to the previous years.

Since pilot survey is very important in designing good research (Van Teijlingen and Hundley, 2002), some adjustments were made to the survey after pilot study was conducted in December 2020. Because the winter months have the least farm work (Pennings et al., 2002), the survey was conducted in January and February 2021. The survey items used in the study were structured based on the previous studies (Akerlof et al., 2013; Arbuckle et al., 2015; Arbuckle Jr. et al., 2013; Azadi et al., 2019; Dang et al., 2019; Grothmann and Patt, 2005; Le Dang et al., 2014; A. A. Leiserowitz, 2005; O'Connor et al., 1999). The dependent variable CCAB was determined using six expressions which were evaluated with a seven-point scale (never, very rare, rare, sometimes, often, mostly, always). A 26-total-point scale consisting of six expressions for the independent variable 'belief factor', nine expressions for the 'risk perception factor' and five expressions for the 'personal experience factor' was used. Independent variables were structured from negative to positive expression (strongly disagree, disagree, neither agree nor disagree, agree, strongly agree) in the form of a Likert scale of 5.

Since the farmer adaptation is a complex process (Bryant et al., 2000), some socio-demographic variables were included in the study (Dang et al., 2019). Although the age of farmers is important in terms of their experience (Hassan and Nhemachena, 2008), very old farmers could be resistant to change and become more conservative (Shiferaw and Holden, 1998). In addition, because the gender (Anyoha et al., 2013), education (Deressa et al., 2011), agricultural and non-agricultural incomes (Franzel, 1999), the amount of land used, agricultural experience and the number of laborers in agriculture (Croppenstedt et al., 2003) were effective in adapting to climate change, they were included in the study (Makuvaro et al., 2018). After the normality of the distribution of the variables were checked using Kolmogorov-Smirnov test, correlation analysis was performed between socio-demographic variables and CCAB.

The study population was 22,722 wheat producing farmers in Çorum province in 2020. Because the whole universe was difficult, impossible and unnecessary to reach, sampling was made. In this study, at least ten times the expressions used in the research were aimed to be included (Büyüköztürk, 2002; Tabachnick et al., 2007), and a total of 385 wheat producing farmers were reached. Kaiser-Meyer-Olkin (KMO) and Barlett test were used to test the adequacy of the sampling. Sampling is generally considered adequate if the KMO and Barlett test result is 0.50 and over ($P < 0.05$) (Hair et al., 2006).

Statistical analyses were performed using IBM Statistics SPSS V22.0 software. The factors influential on the CCAB were determined by explanatory factor analysis. Since structural equation model (SEM) has recently been a popular model (Byrne, 2001), path analysis was used to predict the effects of factors that were effective on CCAB of wheat producing farmers. In addition, Normed Fit Index (NFI) which indicates the fitting index values of factors with confirmatory factor analysis, Incremental Fit Index (IFI), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), $X^{2/}DF$ and Cronbach's alpha (α) confidence coefficients were also calculated (Byrne, 2001; Hu and Bentler, 1999).

Results and Discussion

Of the participating wheat producers in Çorum province, 94.56% were men and 5.44% were women. Age of the farmers ranged from 20 to 83 years, and the average was 47.32 years. Most participants were married (80.6%) and only about one-fifth of them were single. The average number of people engaged in agriculture in the family was 2.5. In terms of education status, 1.3% of respondents were not literate, 3.9% were literate, 38.3% were elementary school, 19.7% were secondary school, 21% were high school and 15.8% were college graduates. It was determined that the wheat producing participants had an average of 25.06 hectares of agricultural land and had an average of 24 years of farming experience. The average agricultural income of farmers, excluding seven farmers with very large lands, was 3958.43 Turkish Liras (₺) per month. All farmers had an average non-agricultural income of ₺2143.35 per month. It was found that 29.61% of farmers did not have any non-agricultural income while 70.39% had an average non-agricultural income of ₺3041.67. In terms of the irrigation status, it was revealed that in 67.80% of the land dryland agriculture was carried out while irrigation using canal water, dam water or groundwater was performed in 32.20% of the land.

Statistical Analysis

To test for any relationship between the variables used in the study, one-sample Kolmogorov-Smirnov normal distribution test was conducted. According to the test results, it was found that the variables were not normally distributed ($P < 0.01$). Spearman's rho correlation analysis, a non-parametric test, was used for variables without normal distribution. The correlations which turned out to be significant based on spearman's rho correlations analysis were discussed.

Spearman's rho correlations showed a negative correlation ($r = -0.533$) between farmers' agricultural experience and educational status ($P < 0.01$). This may be because students who go to school for education stay away from agricultural activities. Similarly, a negative correlation ($r = -0.682$) was found between the age and education level of the farmers ($P < 0.01$). A general problem of individuals living in rural areas and working in agricultural production is that their level of education is low compared to those living in urban areas. A low level of positive correlation ($r = 0.143$) was found between education status of the farmers and size of the land they operated ($P < 0.05$).

The production of farmers with non-agricultural income may be different from those without non-agricultural income. Spearman's rho correlation analysis showed a moderate level positive correlation ($r = 0.350$) between farmers' agricultural and non-agricultural incomes ($P < 0.01$). It can be stated that farmers with non-agricultural income may have less problems with capital investment. In addition, a positive correlation ($r = 0.344$) was found between farmers' agricultural income and size of their farmland ($P < 0.01$). As could be expected, a strong positive relationship ($r = 0.715$) was found between agricultural production experience and the age of farmers ($P < 0.01$). On the other hand, there was a negative correlation between the age of farmers and the agricultural workforce ($r = -0.135$). This may be due to the fact that older and experienced farmers eventually transfer their jobs and land to their heirs. Another finding proving this is the negative correlation ($r = -0.132$) between the age of the farmers and land size ($P < 0.01$).

The SEM was used to determine the factors affecting the farmers' CCAB and its effects. Before starting the SEM analysis, adequacy of the sampling was tested. Based on the KMO and Bartlett's tests (0.965) performed on the data obtained from 385 farmers in Çorum province, the sample was found to be perfectly adequate ($P < 0.001$). The factor loading, mean and standard error of the items used in the scale were calculated using the exploratory factor analysis (Table 2). Results showed that a construct that explained 82.178% of the total variance was obtained. These factors and their Cronbach's alpha (α) reliability coefficients were as follows: risk perception (0.966), belief (0.966) and personal experience (0.946). The dependent variable of the study, CCAB, was found to have a good reliability coefficient (α= 0.891).

Table 1. Statistical findings about the factors

Farmers' Climate Change Risk Perception (α= 0.966, M=3.85, SD=1.28)	Factor loading	Mean	Std. Deviation
Wheat quality in Çorum province is negatively affected.	0.836	3.831	1.276
Agriculture in Çorum province is negatively affected.	0.797	3.948	1.273
Wheat yield in Çorum province is negatively affected.	0.773	3.899	1.288
I believe the number of dairy and beef cattle will decrease.	0.747	3.701	1.283
Diseases and pests increase.	0.700	3.849	1.292
Biodiversity decrease.	0.661	3.644	1.332
Food prices increase.	0.660	3.953	1.288
Soil fertility decreases.	0.660	3.945	1.268
Feed prices rise due to climate change	0.627	3.922	1.290
Farmers' Beliefs About Climate Change (α=0.966, M=4.03, SD=1.27)			
I believe there's more drought.	0.817	4.049	1.266
I believe there's a decrease in snowfall.	0.804	4.132	1.260
I believe there's an increase in temperature.	0.791	4.070	1.240
I believe the winters are warmer.	0.768	3.873	1.281
I believe there's a decrease in rainfall.	0.742	4.127	1.297
I believe the climate is changing where I live.	0.719	3.958	1.294
Farmers' Personal Experiences on Climate Change (α=0.946, M=3.88, SD=1.28)			
I've seen reductions in water levels due to climate change.	0.821	4.062	1.313
I've seen reductions in the quality of crops due to climate change.	0.793	3.810	1.347
I've seen reductions in crop yields due to climate change.	0.760	3.917	1.284
The recent drought in our country has been caused by climate change.	0.748	3.899	1.236
I've personally experienced the effects of global warming.	0.629	3.704	1.194

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Table 2. Climate change adaptation behavior of farmers

Items	Mean	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Using crop rotation on the same land	5.20	1.85	8%	6%	6%	5%	15%	34%	26%
Changing the wheat variety	4.68	1.84	8%	11%	9%	8%	23%	26%	15%
Changing fertilizer use	4.58	1.91	9%	12%	8%	6%	25%	24%	16%
Changing the amount of chemical pesticides and fertilizers	4.45	1.98	12%	11%	9%	8%	23%	22%	15%
Changing the chemical fertilizer and pesticide application times	4.40	1.95	12%	11%	10%	8%	23%	22%	14%
Changing the wheat planting time	4.15	2.02	15%	14%	10%	6%	21%	24%	10%

Note: Never (1), Very rare (2), Rare (3), Sometimes (4), Often (5), Mostly (6), Always (7). α=0.891, Mean=4.58, SD=1.93

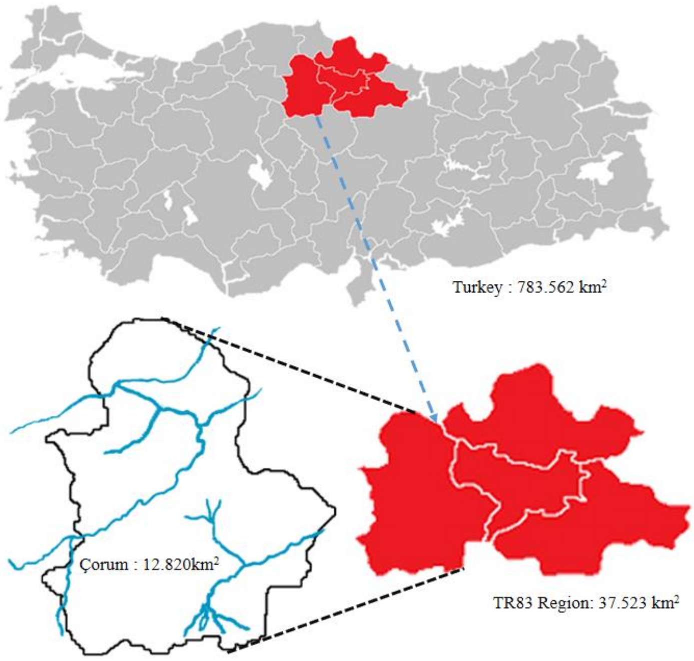

Figure 1. Location of the TR83 region in Türkiye which also includes the Çorum province.
Şekil 1. Çorum ilini de içeren TR83 bölgesinin Türkiye'deki konumu.

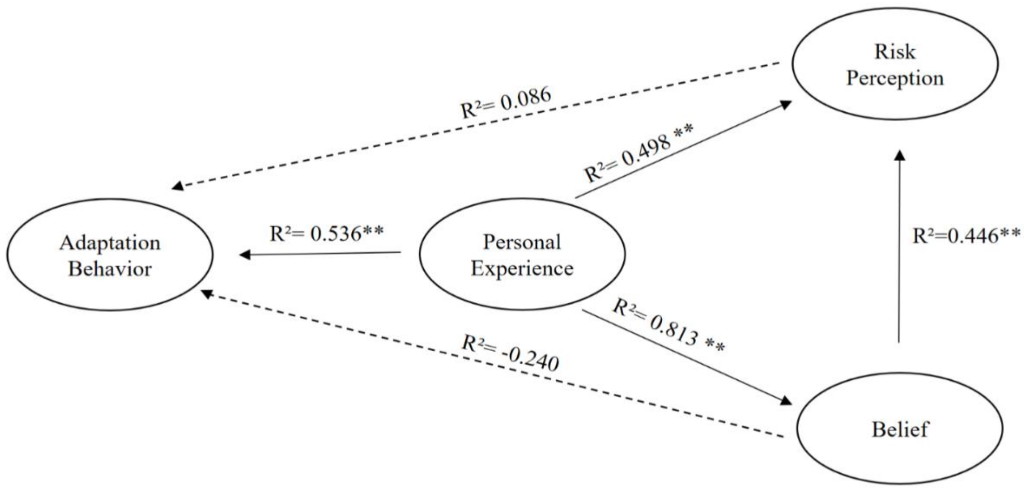

Figure 2. Path Analysis
Şekil 2. Yol Analizi

The effects of farmers' six different adaptation strategies evaluated in the study on the CCAB were examined, and it was revealed that the strategy of 'using crop rotation on the same land' had the highest average score (5.20). This strategy was followed by 'changing the wheat variety' (4.68), 'changing fertilizer use' (4.58), 'changing the amount of chemical fertilizers and pesticides' (4.45), 'changing the chemical fertilizer and pesticide application times' (4.40) and 'changing the wheat planting time' (4.15).

Through the path analysis, hypotheses were tested and the effect of variables on each other was interpreted through the standardized regression (beta) coefficient. The first hypothesis of the study, i.e., The personal experience of wheat producers on climate change has no effect on the CCAB' was rejected and the alternative hypothesis 'The personal experience of wheat producers on climate change has an effect on the CCAB' was accepted. According to the results of the analysis, personally experiencing the climate change had a 54% positive effect on the CCAB (P < 0.01). The second hypothesis of the study, i.e. 'The personal experience of wheat producers on climate change has no effect on the belief in climate change' hypothesis was rejected, and the alternative hypothesis, i.e. ‘The personal experience of wheat producers on climate change has an effect on the belief in climate change’ was accepted. Based on path analyses, it was found that the experiencing the climatic disasters positively affects the belief in climate change by 81% (P < 0.01).

The third hypothesis of the study, i.e., the statistical hypothesis of 'The personal experience of wheat producers on climate change has no effect on climate change risk perception' was rejected and the alternative hypothesis of 'The personal experience of wheat producers on climate change has an effect on climate change risk perception' was accepted. According to path analysis, farmers' experience with climate-related disasters has a 50% direct impact on their risk perception (P < 0.01). The fourth hypothesis of the study, i.e., 'Climate change belief of wheat producers has no effect on climate change risk perception' was also rejected. According to the results of path analysis, climate change belief has a 45% positive effect on climate change risk perception (P < 0.01). Surprisingly, the fifth and sixth hypotheses of the study, i.e., ‘Climate change belief of wheat producers has no effect on the CCAB of wheat producers’ and ‘Climate change risk perception of wheat producers has no effect on the CCAB of wheat producers’ were not significant, and they were accepted (Figure 2).

Spearman's rho correlation analysis was conducted between the CCAB and some variables used in the study. Although there was a significant positive correlation between the CCAB of the farmers and the size of their farmland (r = 0.247, P < 0.01), the correlation between CCAB and non-agricultural income was negative and significant (r = -0.141, P < 0.01). This finding suggested that the farmers with non-agricultural incomes tend to move away from agriculture. It can be concluded that producers who have income other than agriculture will have weaker ties with land, environment and agricultural production over time and turn to different jobs. A low level of positive correlation (r = 0.114) was found between the educational status of farmers and the CCAB (P < 0.05). It can be concluded that farmers with high levels of education understand the climatic risks and are more successful in adaptation compared to those with low levels of education. In addition, farmers' agricultural production experience was found to have weak positive correlations with the risk perception (r = 0.157), with personal experience of climate change (r = 0.161) and with climate change beliefs (r = 0.171) (P < 0.01).

Conclusion and Recommendations

Global grain production decreased by approximately 10% in 1964-2007 period due to drought (Lesk et al., 2016). Although wheat yields decreased by approximately 2.5% in Europe in the years after 1989 (Moore and Lobell, 2015), there were increases in wheat acreage and yield in Russia (Di Paola et al., 2018). There was a 21% decrease in wheat acreage in Çorum province of Türkiye after 2005 (TUIK, 2020). In wheat yield, large variability appeared especially after 2013 (TUIK, 2020). It was reported in the literature that a 1°C temperature increase reduces wheat yields by 5-7% (Aggarwal and Sivakumar, 2010) or by 6% (Asseng et al., 2015; Sultana et al., 2009; Zhao et al., 2017). This decrease was mentioned to be 6-9% in a semi-arid region (Sultana and Ali, 2006). In the light of this information and considering the 2.35°C average temperature increases in Çorum province in 2020, it can be said that if these adverse weather conditions continue, the wheat yield may decrease by approximately 17%.

Although the personal experience is very effective in the climate change adaptation process, it can sometimes harm to farmers economically. In the present study, personal experience was identified as the most important factor affecting all other factors. The reason why people often don't use ready knowledge or the experiences of others may be that they see climate change and similar disasters as psychologically distant to them. These findings on personal experience support the findings of the previous studies (Akerlof et al., 2013; Demuth et al., 2016; Sharma and Patt, 2012; van Valkengoed and Steg, 2019). Lawrence et al. (2014) and Carrico et al. (2015) reported that farmers who experienced climatic disasters personally look for ways to protect against future disasters. Spence et al. (2011) emphasized that the personal experience of farmers has an impact on the belief in climate change, while Le Dang et al. (2014) mentioned that this experience increased perceptions of risk. Similarly, Zamasiya et al. (2017) found that personal experience of farmers about climatic disasters increased their awareness and adaptation. In their study conducted in Iran, Azadi et al. (2019) stated that the most effective factor on the CCAB was the certainty of risk. While they mentioned that farmers’ beliefs had no effect on the CCAB and risk perception, the effect of faith on risk perception was found to be significant in the present study conducted in Çorum province of Türkiye. In addition, Niles et al. (2013) stated that personal experience of climate change has an impact on both faith and risk perception.

Sometimes things that are perceived as threats could in fact be opportunities. Batan and Toprak (2015) explained the negative effects of climate change but also mentioned that it may also have positive effects. Since the transformation of threats into opportunities is not always a job that can be achieved individually, the government has important duties in this regard. For a better adaptation of farmers to the changing climatic conditions, it is necessary for the government to provide farmers with information about the appropriate crop varieties. Providing the farmers with useful information can have an impact on both risk perception and the CCAB. On the other hand, unreliable, inconclusive information can cause farmers to be misled and to react negatively. For example, in their research conducted in Iran, Ghanian et al. (2020) reported that maladaptation had an 18% direct negative effect on adaptation intentions.

According to Holden et al., (2003), climate change could have impact on agricultural production through changing temperature, heating and carbon dioxide concentration. As a result of the increase in temperatures in Çorum province and the decrease in precipitation, the demand for irrigation water has increased. This increase in demand led to the over-use of irrigation water, which is free of charge for farmers, and farmers started using wild flooding irrigation. As the excessive use of water, which causes salinity over time, will reduce soil fertility, a paid water use application was initiated by the official authorities as a solution. Then, it was observed that farmers used water selfishly and excessively on the grounds that they paid for it anyway. They continued irrigation even after the land was saturated with water, causing enormous wasting of water. Thus, it is important to implement programs to increase farmers' awareness of effective water use.

It was found in the present study that although personal experience is a very expensive learning method due to the difficulty with gaining, it is a very important factor in the development of adaptation behaviour in farmers with low level of education living in rural areas. Considering the effectiveness of personal experience on faith, adaptation behaviour and risk perception, providing information and agricultural extension on adaptation to climate change come to the forefront as a proactive solution for the region. As a result, it is critical for farmers to be provided with agricultural extension services using the teaching method through personal experience before experiencing economic loss, to raise awareness of farmers, to reduce climate risks and to adapt to climate change. In addition, new production techniques, new varieties, new tillage methods, using crop rotation on the same land, changing the wheat variety, changing fertilizer use, changing the amount of chemical pesticides and fertilizers, changing the chemical fertilizer and pesticide application times and changing the wheat planting time are important for adaptation to climate change in agricultural production.

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