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Farmers' Risk Perception towards Climate Change: A Case of the GAP-Şanlıurfa Region, Turkey

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Abstract: The purpose of this research is to evaluate farmers' risk perception towards climate change in dry farming areas of the Şanlıurfa province in Southeastern Anatolia Project (GAP) Region, Turkey, and their willingness to pay for adaptation practices and explore the potential factors that contribute to the understanding of climate change. The main material of this research comes from a sample of 466 farmers among 32,809 in Şanlıurfa who were chosen via a simple random sampling method. Sampling was conducted in 2014 and participants were interviewed face to face by questionnaires and local interviewers were used in order to maximize the reliability of the results. The logistic regression and fit tests were used for analysis. The results indicate that 53% of farmers have a risk perception about climate change and 62% of farmers accept paying for adaptation practices to reduce its potential effects. Explanatory affecting factors, such as age, agricultural income, amount of land owned, farming experience, agricultural credit usage, household numbers, non-agricultural manpower, education level and water perception, significantly explained the risk perceptions. This study is one of the first of its type in GAP-Şanlıurfa, Turkey. Therefore, the results could be helpful for decision- and policy-makers to develop adaptive strategies.

Keywords: climate change; risk perception; willingness to pay; GAP-Şanlıurfa; Turkey

1. Introduction

The interaction and exchange between the natural environment and human activities affect each other [1] and outcomes from this interaction are important for both sides in terms of sustainability. Global warming and climate change are occupying the world's agenda as important problems. Many areas of the world experience variability as a part of their normal climate over both short and long periods [2]. One of the biggest challenges is dealing with uncertainties in the future climate and it is critical for nations, economies, and societies. This situation requires a new way of planning [3] and new approaches. Climate change is predicted to make the existing problems worse in many regions [4], and it will change features of the environment and ecology [5]. This results in the deterioration of resources, which negatively affects the welfare of societies. Current management practices are increasingly being assessed in terms of the ability to overcome climate change and uncertainty [6]. Agriculture plays a substantial role in food security. It is known that climate change and water-based problems will negatively affect agricultural production, which leads to significant yield losses [7], especially in dry farming areas [8,9] and semi-arid and arid areas, with significant impacts on the livelihood of rural communities, especially smallholder farmers [10]. This will be more important for societies where agriculture is predominant in the economy and provides the most employment [11]. Are the farmers aware of climate change and the associated risks? What are the factors that influence this awareness and farmers' perceptions? How will they adopt? What will be the adaptive practices?

Are they willing to pay for adaptation? As adaptation becomes more tightly integrated into the range of responses due to climate change, understanding how knowledge of climate change impacts on farmers and how vulnerabilities can effectively be used is necessary both to direct research and to support action [12]. It may also have long-term impacts on the adaptation capacity of a society in terms of livelihood development and by resulting in a reversed development [13]. Information needs of policy-makers for adaptation evaluations are being reversed in beginning with the adaptation problem in its decision context rather than with climate projections [14].

Attitudes and expectations play a noteworthy role in society, development, environment, and resource economics. Risk is an unlikeable and subjective concept that may potentially result in individuals' loss of values, and risk perception differs based on many factors. These factors contribute to an understanding of the overall risk perception, although they do not explain it all [15]. Human risk perception varies across individuals, households, and societies [16]. Preferences with respect to risk, time, and the environment shape the decision-making processes of individuals and can be used as an important source of information for policy design development [17]. When risk perception increases, it may result in increasing the conservative attitudes of individuals due to livelihood considerations.

Numerous recent studies indicate that there is an increasing tendency of climate instability in Turkey [18,19]. A precipitation feature of Turkey is represented by a complex pattern of spatial, seasonal and inter-annual variability that is subject to extreme climatic variations, resulting in recurrent droughts and floods that negatively affect resources [20] and the degradation of water-related ecosystems, causing serious problems for agriculture. These lead to loss of crop yield, shorter growing seasons and salinity. Turkey will be at a higher risk of experiencing meteorological droughts as well as these droughts turning into agricultural and hydrological droughts in the near future [21,22]. Seasonal variability of precipitation characteristics in Turkey is relatively higher than the annual average, which is around 5%–65% in the southern part of the country [23]. Şanlıurfa is a city where agriculture is extensively carried out and it is located in the southeastern part of Turkey. Agriculture is the main base of the economy of Şanlıurfa [24]. The number of abnormal to exceptionally dry years was 17 in Şanlıurfa, and that is based on 64 years of data from 1951 to 2015. Five of the last 10 years saw drought [25]. These figures indicate that there is a causal relationship between climate change and dry farming, and thus precipitation, in another word, water.

Beliefs, attitudes and cultural influences affect farmers' behaviors [26,27], and an understanding of farmers' beliefs, concerns and willingness to adapt is necessary for political, economic and social action towards risks arising from climate change [28]. Most of the literature on climate change in Turkey deals with impact studies [18–23,25] and none of the studies focused on the risk perceptions from the farmers' perspective in the GAP (The Southeastern Anatolian Project) Region and Şanlıurfa. This study is aimed at determining farmers' risk perception towards climate change in the dry farming areas of Şanlıurfa and their willingness to pay (WTP) for adaptation practices and factors that contribute to the understanding of them.

2. Materials and Methods

2.1. Study Area

The Southeastern Anatolian Project (GAP, in its Turkish acronym) is a multi-sectoral regional sustainable development project that is mainly based on soil and water resources in the southeastern region, the second poorest region of Turkey. There are 22 dams, 19 hydro-electric power units (energy), and 1.8 million ha of irrigation area within the scope of GAP with a total project budget of $32 billion, which is a flagship project in the country. The 19 dams are completed and physical realization rate was 74% at the energy and 40% at the irrigation sectors [29]. The GAP Region is almost 10% of Turkey in terms of area and population. The GAP Region has 7.5 million ha of land. Agriculture is the leading sector with 3.13 million ha of cultivated land, 1.8 million ha of economically irrigable land and 1.33 million ha of dry farming area [30]. Şanlıurfa is the most important city out of the nine provinces in the region based on agricultural potentials and has 13 administrative districts that cover 22.3% of the population, 37.7% of the agricultural area, and 24.1% of the livestock potential of GAP [24]. Şanlıurfa has 1.18 million ha of agricultural land and 42% of its arable land is irrigated [31]. The added value obtained per unit area is increased by 2.7 times with irrigation, that is, three- to seven-fold of dry farming area depends on seasonal change due to climate [24]. In this sense, dry farming area farmers are disadvantaged in terms of getting benefit from the GAP Project and climate change will worsen the situation. Rural development support programs are being implemented in dry farming areas for improvement of income distribution within the GAP Region by the state. On the other hand, it cannot be said that these supports are adequate as expected by the farmers.

Şanlıurfa has a continental climate in which summers are dry and very hot; the winters are rainy and moderate. Average annual precipitation and evaporation are 438.3 mms and 1375.5 mms, respectively. Annual average number of rainy days was 77.9 and average temperature was 18.3 °C from 1950 to 2014 [32]. The total amount of cultivated land was 7974 ha in the surveyed area, 48.7% of the farms are 10 ha or smaller. The main crop was wheat, followed by barley and red lentil. The average income from agricultural activities was calculated as 17,778 TL/year and 1039 TL/ha. Thirty-seven percent of farmers have non-agricultural income with an average value of 3582 TL/year. (TL = Turkish Lira, 1$ = 2.19 TL, and 1€ = 2.91 TL at surveyed time, [33]).

2.2. Materials

According to the farmer registration system, in 2014, there were 54,976 farmers in Şanlıurfa and 32,809 of them were located in dry farmland. The data source was used to draw the random sample of 466 farmers among the 32,809 in Şanlıurfa. Sample volume was determined by Taro Yamane's probability distributions formula [34] with 95% confidence level that conducting 380 questionnaires would be appropriate, but to be on the safe side 466 were used. Sampling was conducted in 2014 and participants were interviewed face to face and by questionnaires. Within this scope, all the administrative districts were visited in Şanlıurfa and local interviewers were used in order to maximize the reliability of the results.

2.3. Methods

Logistic regression analysis was used together with Odds, Omnibus, Cox and Snell R^2, Nagelkerke R^2, Wald and Hosmer-Lemeshow fit tests in SPSS. Logistic regression uses maximum likelihood estimation in multiple regressions, which try to find estimates of parameters that make the data actually most likely observed. Odds ratio is defined as the ratio of the probability of an event taking place and the probability of the event not taking place [35]. The exp (beta) for the dummy variable estimated by the logistic model can be interpreted as the odds ratio of the corresponding category with respect to the reference category when the other variables are held constant. Also, in the case of a continuous variable, the exp (beta) or odds ratio indicates the change in odds with respect to one unit change in the variable. A Wald test can be used in different models, including models for dichotomous variables and models for continuous variables [36] and used to determine whether a certain predictor variable is significant or not. Omnibus test refers to an overall test. It is implemented on an overall hypothesis that serves to find general significance between parameters' variance while examining parameters of the same type. It tests whether the explained variance in a set of data is significantly greater than the unexplained variance, overall [37].

R^2 statistics do not exist in logistic regressions that are similar to the regression analysis. There are two modified R^2 values; one is developed by Cox and Snell and never reaches to 1 and the other is developed by Nagelkerke in SPSS. The correction increases the Cox and Snell version to make 1.0 a possible value for R^2 by modified Nagelkerke. These values indicate the amount of variance explained by the model. The Hosmer-Lemeshow fit test is designed to correct and use when there are discontinuous and continuous predictors available at the same time and is not recommend for use when sampling size is less than 400 [38]. In this research sample size was 466. It is computing a Pearson chi-square that compares the predicted frequencies to the observed frequencies. Lower values and insignificances indicate a good fit to the data and, therefore, good overall model fit [39].

2.4. The Variables and the Hypotheses

The variables have been selected depending on the socio-cultural and economic structure of the sampling area. Economic and social values play an important role in risk perception and the behavior of individuals [40]. The selected variables were assumed to be effective on the behaviors and perceptions of the farmers, either in a positive or negative way. It is also aimed to determine the differences between groups if the effects of these variables are significant. Education level, marital status, number of household, number of family members in agricultural jobs, farming experience, amount of land owned, income derived from farming, agricultural credit usage and water perception by the farmers are thought to be effective in a positive way. When the values of these variables increase, it is expected to increase in the risk perception by farmers. On the other hand, age, the number of family members working in non-agriculture jobs and who have income besides farming are considered to be effective in a negative way. In other words, when the values of these variables increase, it is expected to decrease in the risk perception by farmers. There are many researches indicating that the selected variables of this research have an effect on attitudes, perceptions and behaviors of individuals [40–48] either in a positive or negative way. These are described in more detail in the following sections. Therefore, the hypotheses have not been established and not tested in order to save the volume of this research.

3. Results and Discussions

All questionnaires were conducted with male farmers due to the rural family structure. The average age of the farmers was calculated as 43.45 years, and the average amount of land owned was 17.11 ha together with 22.11 years of farming experience. The descriptive statistics of the model are given in Table 1.

Table 1. Descriptive statistics of the research.

Variables	Definition	Mean	Std. Deviation
Age	If age of the farmer is between: 18–29 years 1 (12.7%), 30–44 years 2 (39.2%), 45–59 years 3 (38.4%), 60 years and more 4 (9.7%)	2.45	0.834
Education	If the farmer: literate 1 (18.2%), primary school graduate 2 (47.6%), secondary school graduate 3 (14.4%), high school graduate 4 (11.6%), university graduate 5 (8.2%)	2.44	1.155
Marital	If the farmer: married 1, if not 0	0.90	0.374
Household	The number of dependent persons	7.44	4.067
Agr. man power	The number of family members working in agricultural sectors	3.51	2.236
Non-agr. power	The number of family members working in non-agriculture sectors	0.69	1.093
Experience	If farming experience is between (years): 1–10 years 1 (21.2%), 11–20 years 2 (34.2%), 21 years and more 3 (44.6%)	2.23	0.778
Land Amount	The amount of cultivated land size of farmer (hectare) is between: 10.1–19.9 ha 1 (25.1%), 20 ha and more land 2 (26.2%), 10 ha and less land 3 (48.7%)	1.77	0.836
Income	If income of the farmer from farming is between: $4001–$9000 is 1 (39.7%), $9001 and more is 2 (24.7%), $4000 and less is 3 (35.6%)	1.80	0.770
Add. Income	If the farmer has non-farm income 1, if not 0	0.37	0.484
Credit	If the farmer uses agricultural credit 1, if not 0	0.23	0.422
Risk	If the farmer has risk perception for climate change 1, if not 0	0.53	0.500
Water perception	The farmers' understanding of "both absence and abundance of water is harmful in the field" fair 1 (23.4%), agree 2 (30%), strongly agree 3 (46.6%)	2.23	0.805
WTP	If the farmer accepts payment for adaptation practices 1, if not 0	0.62	0.241

The farmers who have a risk perception towards climate change, a dependent variable, accounted for 53%, and those WTP for adaptation practices to reduce the effects of climate change numbered 61.6%. Then it was asked how much they want to pay per hectare. The initial value was selected as 120 TL/ha which was the minimum fee for cereals in the irrigation area of Şanlıurfa at the survey time. Then, starting from 10% and increasing with multiples of 10%, up to 100% of the increased current price was randomly drawn for each farmer and he was asked to accept to pay or not this amount for adaptation practices. The cross-tabulation table of risk perception and WTP is given in Table 2.

Table 2. The cross-tabulation table of risk perception and WTP.

Risk Perception		WTP (Increased Rate of Initial Value by 10% and the Multiples) 10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	Total
No	Count	3	5	5	4	13	15	35	43	49	47	219
	Expected Count	3.3	5.2	9.4	12.2	16.9	20.7	36.7	37.1	39.9	37.6	219.0
Yes	Count	4	6	15	22	23	29	43	36	36	33	247
	Expected Count	3.7	5.8	10.6	13.8	19.1	23.3	41.3	41.9	45.1	42.4	247.0
	Count	7	11	20	26	36	44	78	79	85	80	466
	Expected Count	7.0	11.0	20.0	26.0	36.0	44.0	78.0	79.0	85.0	80.0	466.0

The Chi-square test statistics of the cross-tabulation are given in Table 3. The results indicated that a significant relationship exists between risk perception and WTP by $p < 1\%$.

Table 3. The Chi-square test statistics.

	Value	df	Asymptotic Significance (2-Sided)
Pearson Chi-Square	29,230	9	0.001 *
Likelihood Ratio	30,752	9	0.000 *
Linear-by-Linear Association	20,585	1	0.000 *
Number of Valid Cases	466		

* Indicates the degree of statistical significance of 1%.

There are 8.6% (40 people) of the farmers who do not have a risk perception but tend to have WTP for adaptation practices. The average WTP of 61.6% of the farmers was calculated as 164.4 TL/ha, that was 15.8% of their income derived from agriculture. These results indicate that more than half of the farmers have a risk perception and 8.6% more of the farmers tended to pay without having a risk perception. This outcome could be used by policy-makers for adaptation practices. All the respondents were classified as "yes" by the model and the percentage of verification was 53% in the classification. Then the next step was run and the model coefficients of the Omnibus tests are given in Table 4. The results indicate that the independent variables were making meaningful contributions to the model.

Table 4. Omnibus tests of model coefficients.

		Chi-Square	df	Significance
Step 1	Step	316,952	12	0.000 *
	Block	316,952	12	0.000 *
	Model	316,952	12	0.000 *

* Indicates the degree of statistical significance of 1%.

The Omnibus test showed the existence of statistical significance between dependent variables and independent variables at the level of $p < 1\%$ in the model. The model summary is given in Table 5.

Table 5. Model summary.

Step	-2 Log Likelihood	Cox and Snell R^2	Nagelkerke R^2
1	327,378	0.493	0.659

The Cox and Snell and Nagelkerke R^2 values indicate the amount of variance explained by the model. The variance of risk perception towards climate change was explained to be 49.3% by Cox and Snell and 65.9% by Nagelkerke R^2. The test result of Hosmer and Lemeshow is presented in Table 6.

Table 6. Hosmer and Lemeshow test results.

Step	Chi-Square	df	Significance
1	8318	8	0.403

The test assessed the compliance of the logistic regression model as a whole and the result indicated that it was insignificant ($p > 0.10$); it means that a sufficient level of model-data fit existed. The classification table that was obtained from the logistic regression is given in Table 7.

Table 7. Classification table at step 1.

Observed			Predicted		
			Risk Perception		Percentage Correct
			No	Yes	
Step 1	Risk Perception	No	182	37	83.1
		Yes	31	216	87.4
	Overall Percentage				85.4

The percentage of verification was increased from 53% to 85.4%, which indicates that variables were making significant contributions to the model. Initially, more variables were used in the model these were given in the descriptive statistics, and significant ones were selected after the first run in terms of contribution to the model. This is because of the increased demand on the robustness and the reliability of the estimates [49]. The marital status and additional income besides farming variables were found as insignificant and omitted from the model. In fact, 90% of the respondents were married and 37% have an additional income that was up to 20% of their farming revenue. The most appropriate multivariable, which are age, education, farming experience, agricultural income, land amount, agricultural credit usage, household, non-agricultural manpower and water perception, were selected as variables in the model. The model was run for the second time and results are given in Table 8.

The results are obtained by a logistic regression analysis that is based on odds ratios which, presented for dummy variables, are interpretable in relation to their respective reference group where less than one unit change indicates the existence of a negative relationship, which means having less risk perception towards climate change. A more than one unit change shows the existence of a positive relationship, which means having greater risk perception than their respective reference group. Interpretations can be done according to the coefficient of the exponential logistic regression as well. In this case, the formula $(\exp^{b} - 1) \times 100$ could be used in order to understand how an increase or decrease will happen based on the superiority rate of a dependent variable based on a unit change in the independent variables [50–52]. The interpretation of this research is done according to the general literature surveys. There is a relationship between age and risk perception ($p < 1\%$). There are many studies showing that age is one of the important indicators and influencers of risk perception by individuals [10]. The youngest ones (Gr.1) have 28.5 times greater risk perception regarding climate change as compared to the reference group. The middle-aged (Gr.2) have seven times and the upper-middle-aged (Gr.3) have 3.1 times greater perception in a positive way. Age has an effect on the attitude of individuals. The preferences and behaviors are related to expectations and experiences that influence the formation of different value priorities. Environmental concerns and value priorities tend to become increasingly important as the younger generation replaces the older generation [42] and this can be explained by the level of education and awareness.

Table 8. Logistic regression model's variables in the equation.

		B	S.E.	Wald	df	Sig.	exp(b) Odd Ratios
Step 2	**Age (years)**						
	60 and more (Ref. group)			16,489	3	0.001 [c]	
	Between 18 and 29 years (Gr.1)	3.350	0.955	12,289	1	0.000 [c]	28.489
	Between 30 and 44 years (Gr.2)	1.943	0.595	10,672	1	0.001 [c]	6.977
	Between 45 and 59 years (Gr.3)	1.125	0.564	3982	1	0.046 [b]	3.080
	Agricultural Income ($/year)						
	$4000 and less (Ref. group)			25,184	2	0.000 [c]	
	Between $4001 and 9000 (Gr.1)	2.092	0.483	18,806	1	0.000 [c]	8.105
	$9000 and more (Gr.2)	2.102	0.425	24,443	1	0.000 [c]	8.182
	Land (Hectares)						
	10 ha and less land (Ref. group)			24,856	2	0.000 [c]	
	Between 10.1 and 19.9 ha land (Gr.1)	1.687	0.410	16,903	1	0.000 [c]	5.406
	20 ha and more land (Gr.2)	2.038	0.422	23,320	1	0.000 [c]	7.677
	Farming experience (year)						
	21 years and more (Ref. group)			25,277	2	0.000 [c]	
	Between 1 and 10 years (Gr.1)	3.066	0.627	23,877	1	0.000 [c]	21.450
	Between 11 and 20 years (Gr.2)	1.032	0.318	10,540	1	0.001 [c]	2.808
	Agricultural credit usage						
	Agricultural credit usage (Yes)	0.625	0.341	3351	1	0.067 [a]	1.868
	Household numbers	0.086	0.045	3743	1	0.053 [a]	1.090
	Non-agricultural manpower	−0.924	0.312	8792	1	0.003 [c]	0.397
	Education (Levels)						
	University graduated (Ref. group)			13,540	4	0.009 [c]	
	Literacy (Gr.1)	−3.977	1.157	11,815	1	0.001 [c]	0.019
	Primary school graduated (Gr.2)	−3.938	1.136	12,025	1	0.001 [c]	0.019
	Secondary school graduated (Gr.3)	−3.588	1.127	10,139	1	0.001 [c]	0.028
	High school graduated (Gr.4)	−4.077	1.134	12,936	1	0.000 [c]	0.017
	Water perception						
	Strongly agree (Ref. group)			54,494	2	0.000 [c]	
	Fair (Gr.1)	−3.045	0.462	43,471	1	0.000 [c]	0.048
	Agree (Gr.2)	−2.676	0.397	45,381	1	0.000 [c]	0.069
	Constant	10.622	1.568	45,880	1	0.000 [c]	41,030.84

[a,b,c] Orderly indicates the degree of statistical significance of 10%, 5% and 1%.

There is a relationship between the income level derived from farming and risk perception ($p < 1\%$). Risk perception is increasing with the increasing income level of the farmers from agriculture, and vice versa. The Gr.1 and Gr.2 have an 8.1 and 8.2 times greater risk perception as compared to the reference group (lowest income derived from farming), respectively, in a positive way. Higher income groups are more sensitive to climate change due to their income, which is mainly based on climate in the dry farming areas. It is statistically significant ($p < 1\%$). There is a relationship between the amount of land owned and risk perception ($p < 1\%$). Farmers' incomes are dependent on the amount of land owned. A bigger amount of land means more revenue for the farmer. The Gr.1 and Gr.2 have greater risk perception as compared to the reference group by 5.4 and 7.7 times, respectively, in a positive way. The result is significant ($p < 1\%$).

There is a relationship between farming experience and risk perception (p < 1%). Groups with less farming experience which are the youngest ones (Gr.1) have greater risk perception as compared to the reference group by 21.5 times in a positive way. It was unexpectedly high. Gr.2 has a 2.8 times greater perception in a positive way as well. The outcomes are consistent with age-related results and it is statistically significant (p < 1%). The younger ones have less experience about how to deal with and overcome the effects of climate change. The older farmers are more experienced about agriculture, farming and the potential effect of climate change and know how to overcome this situation. They are also more conservative as opposed to younger farmers and may consider climate change religiously rather than by evidence. The level of suspicion is dependent on demographics, personal experience and values, among other factors [41].

There is a positive relationship between agricultural credit usage and risk perception (p < 10%). Agricultural credit users have 1.9 times greater perception as compared to the non-credit users. Generally, farmers pay their debts at harvest time. Thus, climate change directly affects the income of these farmers. Therefore, they have more concerns about risk. The result is statistically significant. There is a positive relationship between household numbers and risk perception (p < 10%). When the number of households is increasing, the perception of risk increases by 1.1 times. This result arises mainly from livelihood and household members are considered as manpower in agriculture. Crowded families will be more affected. There is a negative relationship between non-agriculture manpower and risk perception (p < 5%). It means that a one-unit increase of non-agricultural power decreases the odds of having risk perception by 60.3%. It is hypothesized that people's perception of risk is directly dependent on environmental conditions and the employment status of the household [43]. These farmers have income besides agricultural activities, so they will be less affected by the loss of prosperity due to climate change as opposed to loss of manpower in agriculture.

There is a relationship between education levels and risk perception (p < 1%). When the education level decreases, there is a decrease in risk perception. The opposite is true, too. Education is an important indicator of life quality and attitudes. There are some studies showing that different cultural groups based on different socioeconomic and education levels differ in their risk perception considerably [44–47]. Gr.1, Gr.2 and Gr.4 have 2% odds of having risk perception as compared to the reference group, in a negative way. Gr.3 has 3% odds of having risk perception as compared to the reference group, in a negative way, as well. The results of Gr.1 and Gr.2 were understandable. These farmers were conservative, the least educated and older as compared to the other groups. This point can be explained with beliefs. The results of Gr.3 and Gr.4 were unexpectedly lower. This can be explained by the rural culture and poor quality of education in the rural areas.

Water perception is defined as the availability of more or less water than is needed in the field by the farmers because the farmers are adversely affected in both cases. The flood, drought, and other measures of climate variability are perceived as influential, typically negatively, to livelihood strategies [40]. There is a relationship between the understanding of water and risk perception at the significance level of p < 1%. This is a predictable result but the values are lower than expected because risk is a function of water availability for the farmers in the dry farming areas. The strongly agree group selected as the reference group is mainly composed of the young and those less experienced in farming, with greater income and education levels. Gr.1 and Gr.2 have 5% and 7% odds of having risk perception as compared to the reference group in a negative way, respectively. The results were significant. Water is one of the most important inputs of agriculture, not only for dry farming but also in irrigated areas. Water-related issues always receive high priority among the farmers in the GAP Region. The studies conducted in GAP-Harran Plain have shown that age, land, farming experience, income and education levels are significant in water management [48]; WTP for safe irrigation water is found as 71.69% more than the existing price [53], 2.23-fold greater than current price under shortages [54], and they believe in the necessity of irrigation training for sustainable usage and accept payment by 59% [9] in GAP, the Harran Plain, and Şanlıurfa.

4. Conclusions

Climate change has already started to be experienced in the GAP Region and the number of drought years has increased [25]. There is a need for adaptation of practices and policies for the farmers to reduce the potential effect of climate change, at least for food security and employment in the near future. It is important to know the risk perception regarding climate change and the WTP of farmers for adaptation practices in the formation of these policies. The statistically significant results were obtained based on the variables and the reference groups found in this research. This study showed the existence of risk perception in 53% of farmers in the dry farming areas of Şanlıurfa regarding climate change, and 62% of them have WTP for adaptation practices in order to be less affected. The average WTP was calculated as 164.4 TL/ha, that was 15.8% of their income derived from agriculture. Age, income, farming experience, education, the amount of land owned, agricultural credit use, the number of households and the number of non-agricultural employees have been identified as important factors in the formation of this perception. When the income, land amount and agricultural credit usage increase, the WTP amount increases as well, and vice versa. Furthermore, the perception of water has been identified as an important factor among the farmers. These outcomes can be used as a tool for the implementation of policies to give priority among those variables and groups for applications.

Public risk perceptions are critical components of the socio-political context within which policy-makers operate [40]. It is crucial to identify the necessary adaptive actions to be taken in order to avoid the unwanted consequences of climate change [55], and decision-support tools are needed to assist decision-making under uncertainty [56]. The crop pattern may have to switch to drought-resistant plant production. These areas are generally located at high altitudes, far away from main roads, urbanization and industrialization. Organic farming can be encouraged in these areas. More effective rural development programs, such as local and traditional foods and handicrafts for the farmers with lower incomes, may be considered by policy-makers. Şanlıurfa is located at the upper Mesopotamian region and has very rich cultural values. Therefore, rural tourism may also be used as a tool. Regarding these issues, target groups can be selected according to the outcome of this research. For instance, younger farmers can be encouraged to new crop patterns and develop rural tourism while the older ones can take part in organic farming, handicrafts and traditional foods. The WTP and the calculated amounts can be considered as additional financial resources for the implementation of these policies. This research is one of the first of its kind in the GAP Region of Turkey. The results are important for decision-makers and policy-makers; they provide functional information about risk perceptions of the farmers and their WTP for adaptation practices. The outcomes of this study can be used for capacity building of farmers regarding climate change practices.

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Abbreviations

The following abbreviations are used in this manuscript:

GAP	South East Anatolia Project
WTP	Willingness to pay

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