

The Social-Psychological Components Of Farmers' Adaptive Behavior In Dealing With Drought (The Case Of Kermanshah County)

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Abstract: When a natural disaster hits, the affected households try to cope with its impacts. A variety of coping strategies, from reducing current consumption to disposing of productive assets, may be employed. Given the negative impacts of climate change the development of the rural community in Iran, it is of crucial importance to understand the solutions adopted by local communities, as the primary target group, to deal with these effects. Considering the importance of the issue, the present study aims to analyze the social-psychological determinants of farmers' adaptive behavior in dealing with drought among 335 farmers in Kermanshah County selected according to Krejcie and Morgan's table by two-stage cluster sampling method. The present work is a descriptive-correlational study in which data were gathered with a questionnaire whose validity was confirmed by experienced experts and whose reliability was estimated by Cronbach's alpha test ($72 \geq \alpha \geq 85$). The results showed that five variables, i.e. environmental attitudes, strategy, subjective norm, perceived behavioral control, and agricultural work experience, could account for 51.9 percent of the total variance of farmer behavior. Also, the results of path analysis revealed that three variables, i.e. environmental attitudes, subjective norm, and strategy had total impacts of 0.400, 0.344, and 0.292, respectively and they were the most important factors in determining farmer behavior. Also, three variables of perceived behavioral control, age, and agricultural work experience had total impacts of 0.169, 0.051 and -0.172, respectively and had a minimal effect on farmers' behavior.

Keywords: Climate Change, Drought, Farmers' Adoptive Behavior, Environmental Attitudes, Kermanshah County.

INTRODUCTION

Climate change has drawn full attention in recent decades, not only because of the continuous decline in rainfall but also because of the low capacity of the community and economic systems to deal with the dangers of these changes. Today, the consequences of climate change, such as drought, are becoming a force for challenging the livelihood of many farmers (Dejene, 2011). Drought is a natural phenomenon that occurs when rainfall is significantly reduced to below normal levels, resulting in a hydrological imbalance with negative impacts on land production systems (Campbell et al., 2011).

The non-structural nature of drought and the complexity of observed patterns have made droughts a unique risk, a risk that is difficult to deal with (Campbell et al., 2011). Therefore, it is impossible to prevent the occurrence of drought, but it should be managed for probable damages, especially in the agricultural sector. The most effective people in the fight against drought are local people, and it is a huge challenge in the management of this crisis to understand their response as the primary target group (Saffari, 2011).

In some societies, social tendency is towards adaptation to environmental hazards. In societies that people find it impossible to adapt to climate change, they will limit their adaptive actions, even if they have the necessary capacity and resources (Becerra et al., 2012). Farmers and villagers have put in a great deal of effort to adapt to climate change and manage it with unique strategies over the centuries. Undoubtedly, it is imperative for future decision-making to explore, discover and expand these strategies due to the frequent occurrence of these changes so that it may help reduce the vulnerability of farmers (Shirazi Tehrani et al., 2009). On the other hand, inefficient management of the technology and the use of inappropriate strategies would cause waste of resources and lay the ground for future droughts (Yazdan-Panah and Monfared, 2011).

Since farmers have used different drought adaptation strategies in different regions and for different crops, it is necessary to increase our knowledge of these strategies in order to better manage the drought phenomenon and reduce the vulnerability of farmers. So, there are two questions to answer:

1. What are the behaviors and strategies of farmers in the studied area to deal with drought?
- 2- Do environmental attitudes, perceived behavioral control, and mental norms can affect farmers' behavior?

The present research seeks to answer these questions. In addition to studying farmers' behaviors in dealing with drought, it is tried to identify the factors and conditions underpinning these behaviors, predict farmers' behavior in critical situations, and provide more suitable solutions for managing drought and reducing the vulnerability of farmers.

According to the reports, Kermanshah province is the sixth

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top drought-suffering province in Iran. Kermanshah province is located in western Iran. The area of the province is 24,549 km² and it has 820,000 ha of arable land. Due to the prevalence of rain-fed cultivation in the province, drought has inflicted substantial damage to farmers over the past few years. Therefore, the geographic area of the research is confined to Kermanshah, which is in critical conditions in terms of severity of drought (Sharafi and Zarafshani, 2010).

The behavior of the people of the community is rooted in their attitudes and beliefs, and as long as these beliefs do not change and are not replaced with appropriate behaviors, there is no guarantee for reducing individual risk factors in society. There are many patterns of behavior change. An example is the theory of planned behavior (Fig. 1).

According to the theory of planned behavior, behavioral intention is predicted by three factors:

1. A person has a positive attitude towards behavior (attitude).
2. A person feels that he/she is under social pressure to behave (mental norms).
3. A person feels that he/she is capable of behaving (perceived behavioral control), (Mazloomi Mahmood Abad *et al.*, 2006; Wolf and Higgins, 2008).

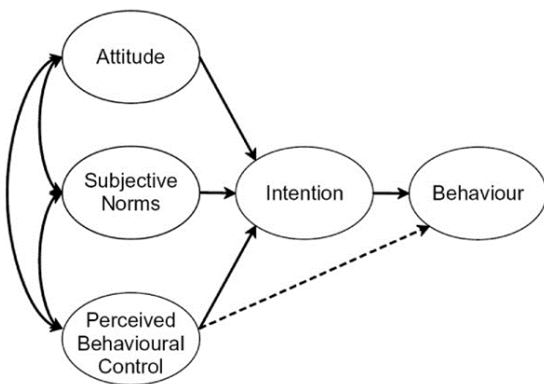


Figure 1. The theory of planned behavior (Ajzen, 1991)

Another factor that influences farmers' behavior is their coping strategy. Strategy is a behavioral pattern, perspective, policy or decision that shows farmers' viewpoints. In other words, a strategy is a set of general and consistent policies that determine the methods to accomplish the ultimate goal. In a field study, Putnam and Wilson categorize the various coping strategies that individuals use when confronted with conflict in three broad strategies, including the strategy of solutionism, non-response, and control (Moghimi, 2011; Karami, 2002).

Although behaviors are influenced by a complex set of factors, most of behaviors are dictated by the environmental attitude of farmers, which is in turn influenced by individual knowledge and information. Value orientation towards nature has a determinant effect on environmental attitudes and behaviors. In one category, these orientations include socio-altruistic values, biospheric values, and egoistic values (Abedi Sarvestani, 2011, 78; Stern *et al.*, 1993: 322-348).

In other words, the response of drought-affected individuals relies on their attitude to droughts, their knowledge of the drought consequences, whether they have experienced

droughts, and the resources available to deal with drought. For this reason, Slegers believes that the attitude towards drought is one of the most effective vulnerability structures (Yazdan-Panah, 2012).

Human societies with different social activities and cultural traits have diverse values and attitudes towards nature and environment. Many philosophers believe that environmental problems emanate from community values and beliefs, and for that reason, we need to know how community members think about ecology, what they know about it, and how they feel emotionally (Abedi Sarvestani, 2011: 78; Deng *et al.*, 2006). Ultimately, the question arises as to whether farmers who have a favorable attitude towards the environment behave in practice appropriately too.

Many studies by scholars and researchers have shown that people's response and strategies are based on factors such as age, gender, socioeconomic status, available facilities, and adoption of strategies to their livelihood systems. As a result, people's strategies depend on local ecological-social systems. Also, the households select certain mediators with respect to the dimensions and consequences of a crisis (Mckenzie, 2003; Keshavarz and Karami, 2008; Wilhite, 1997; Smucker and Wisner, 2007).

Some studies have identified coping strategies such as livestock sales, borrowing from relatives, receiving loans, immigration, searching for non-farm work, and reducing food intake among farmer's households (Shewmake, 2008).

Campbell *et al.* (2011) focused on the behavior of small farmers in Jamaica and concluded that farmers' ability to cope with or adapt to drought depends on their assets. Generally, farmers with more stable assets and more diversified sources of income would be more prepared to respond to unusual climate changes. They report that coping strategies had been developed by farmers to counter the negative effects of short-run stresses in the agricultural systems, while adaptation strategies would be better and more appropriate to deal with long-term changes.

The results of Tologbonse *et al.* (2010) found a positive and significant relationship between farmers' perception of climate change and agronomy ecology with communities, education level, age, and coping strategies.

Also, Abedi Sarvestani (2011) addressed the attitude and environmental behavior of the students in Agricultural Sciences and Natural Resources of Gorgan and showed that there was no significant relationship between attitudes and environmental behaviors. In other words, attitude alone cannot predict behavior, so it cannot be safely claimed that a favorable attitude towards the environment can alone lead to appropriate environmental behaviors. He pointed out that along with attitude, other situational variables –such as mental norms, personality, and individual's control over protective behaviors) might influence the participants' behavior.

Conceptual framework of research

Finally, the conceptual framework of the research was established with respect to the literature review and research objectives (Fig. 2).

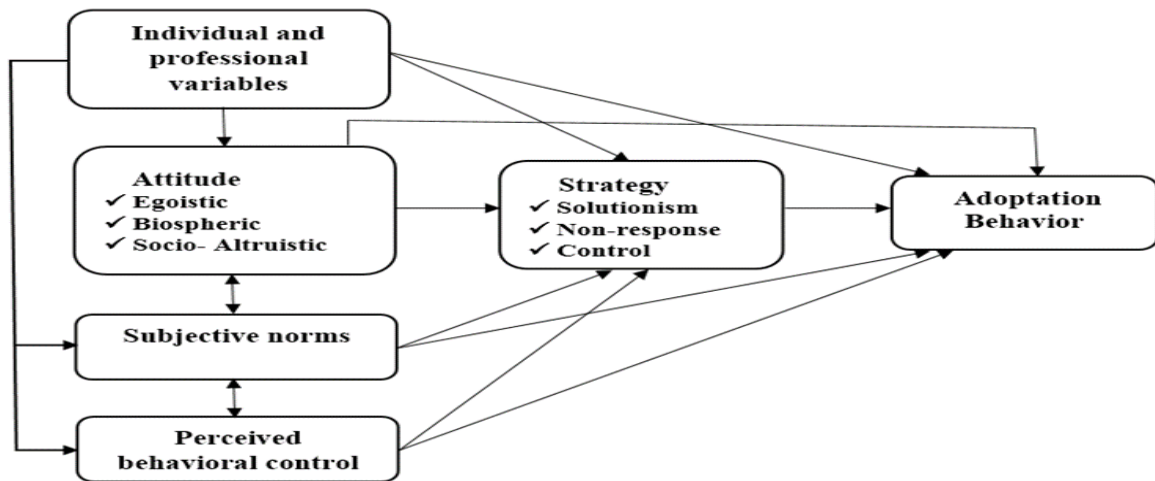


Figure 2. The conceptual framework of research in order to analyze farmers' behavior

METHODOLOGY

This research is a quantitative study in nature and an applied study in objective. Also, according to data collect methods, it descriptive-correlational. Also, a cross-sectional design was used given the research sites. The statistical population consisted of farmers who have been exposed to drought in recent years. In this research, a self-designed questionnaire was used to collect data.

In order to determine the validity of the questionnaire, a number of questionnaires were submitted to the professors and their corrective comments were applied. Finally, the validity of the questionnaire was confirmed. In order to confirm the reliability of the questionnaire, a pre-test study was conducted before initiating large-scale data collection stage. A total of 35 questionnaires were used among farmers living in Kermanshah (Daramrud-olya, Halashi, and Dourborji villages) and outside the main sample distribution area. The results of Cronbach's alpha coefficient ($72 \geq \alpha \geq 85$) indicated that the reliability of the questionnaire was satisfactory for the research.

In this research, independent variables included individual and professional variables, farmers' subjective norms against drought, farmers' perceived behavioral control, coping strategy in dealing with drought, and farmers' attitudes towards drought. Also, the dependent variable of this research was farmers' behaviors in Kermanshah County in dealing with drought.

The study used two-stage cluster sampling method for sample taking. First, one rural district was randomly selected from four regions of Kermanshah County and then, two villages from each rural district were selected to sample farmers out of them randomly.

The sample size was estimated on the basis of the latest census carried out in 2011 (Statistical Yearbook of Kermanshah

Province, 2011). The census showed that a total of 26,121 farmers in four parts of Kermanshah, i.e. central, Firoozabad, Mahidshita and Kozaran, were engaged in farming then. Using Krejci and Morgan (1970)'s table, the sample size was estimated at 379. Of all collected questionnaires, 335 ones were found to be proper for analysis. Data collected in this research were analyzed by descriptive and inferential statistics using the SPSSwin21 software package.

RESULTS

In this section, the collected data is analyzed. First, a summary of the descriptive statistics of the respondents is presented for the analysis of variance and means comparison were performed. The relationships between variables were investigated by Pearson's coefficient of correlation. Also, stepwise multiple regression analysis was applied to determine the predictive power of independent variables in order to explain the variance of dependent variable (farmers' behavior). Finally, path analysis was used to investigate the causal relationship between variables and the indirect effects of independent variables on the dependent variable.

The results showed that the mean age of the participants was 46.44 years with a standard deviation of 11.63. The mean land area of respondents was 6.61 hectares. It was also found that 39.7 percent of the farmers had a cropping area of less than 4 hectares and 10.1 percent had more than 10 hectares.

The survey of frequency distribution of agricultural work experience of respondents showed that on average, they had 25.60 years of experience in farming with the highest and lowest frequencies being 30.1 and 10.2 percent (101 and 34 individuals) in agricultural work experience groups of 20-30 and >40 years, respectively.

The frequency distribution of respondents based on annual income shows that the average annual income of farmers in Kermanshah is 292.3 million IRR with a standard deviation of

10.93. It was also found that 39.7 percent (133 individuals) had an income of less than 80 million IRR per year and 15.8 percent had an annual income of 200-260 and >260 million IRR.

Table 1. A summary of descriptive statistics of respondents (n = 335)

characteristic	mean	standard deviation
Age (year)	46.44	11.73
Agricultural experience (year)	25.60	11.67
land under cultivation (ha)	6.61	4.25

Source: Research Findings.

An important point to note is the frequency of respondents in the categorization of environmental attitudes and strategies, as well as their prioritization. According to Table 2, 14.6 percent of respondents had an egoistic attitude, 53.4 percent had a

biospheric attitude, and 31.9 percent had a socio-altruistic attitude. Therefore, the dominant attitude was for farmers to have a biosphere attitude.

Table 2. Frequency distribution of respondents attitude (n = 335)

Variable	Variable levels	Frequency	Valid percent	cumulative percent
Environmental Attitude	Egoistic attitude	49	14.6	14.6
	Biospheric attitude	179	53.4	68.1
	Socio- altruistic attitude	107	31.9	100

Source: Research Findings.

Based on the results (Table 3), 25.4 percent of the respondents adopted a solving strategy to deal with drought, 55.2 percent adopted a non-response strategy and 19.4 percent adopted a

control strategy. Therefore, more than half of the farmers (55.2 percent) adopted a non-response strategy when faced with drought.

Table 3. Frequency distribution of respondents strategy (n = 335)

Variable	Variable levels	Frequency	Valid percent	Cumulative percent
Strategy	Solving strategy	85	25.4	25.4
	Non-response strategy	185	55.2	80.6
	Control strategy	65	31.9	100

Source: Research Findings.

Table 4 shows the results of the qualitative assessment of farmers' attitudes towards drought coping behavior in Kermanshah province. For this purpose, the ISDM (Interval of Standard Deviation from the Mean) approach divided the levels of attitude into four classes. More than half of the farmers in Kermanshah (59.4 percent) had a positive and relatively positive attitude and less than half (40.6 percent) had a negative and relatively negative attitude towards drought coping behavior.

Therefore, the results in Tables 2-4 indicate that the favorable environmental approach alone cannot lead to a proper strategy because despite the fact that 53.5 percent of the farmers had biospheric environmental attitudes, 31.9 percent had an socio- altruistic attitude, and 59.5 percent of the farmers had a positive and relatively positive attitude towards coping with drought, 55.2 percent adopted a non-response strategy when dealing with drought. Therefore, even a favorable attitude may not guarantee cooperation of farmers.

Table 4. Frequency distribution of attitudes of farmers with respect to coping with drought

Attitude levels	Frequency	Valid percent	cumulative percent
Negative attitude	49	14.6	14.6
Relatively negative attitude	87	26	40.6
Relatively positive attitude	180	53.7	94.3
Positive attitude	19	5.7	100
Total	335	100	

Source: Research Findings.

The research hypothesis as to whether there is a significant difference between the three groups of farmers with three environmental attitudes (egoistic, biosphere and socio-altruistic) in terms of the type of behavior was tested by means

average comparison. The results of variance analysis showed a significant difference in response to drought among farmers in Kermanshah with different environmental attitudes. Also, the LSD post hoc test showed a difference in drought-coping

behavior among three groups of farmers with egoistic, biospheric and socio-altruistic attitudes.

Table 5. Means comparison for environmental attitudes regarding to drought-coping behavior

Variable	Variable levels	Frequency	Mean	Standard deviation	F	df	Sig
Type of environmental attitude	Egoistic	49	2.27 ^a	0.41	55.59	334	0.001**
	Biospheric	179	3.29 ^b	0.58			
	Socio-altruistic	107	3.11 ^c	0.68			

**Significant at the $p < 0.001$ level

a. The same symbol indicates an insignificant difference between the groups

Source: Research Findings.

Relationship between independent variables of research with farmers' behavior:

The results of Pearson's correlation test showed that there was a positive and significant ($p < 0.001$) correlation between type of strategy, attitude, subjective norms, perceived behavioral control, and farmers' behavior in Kermanshah when dealing with drought (Table 6).

Table 6. The results of Pearson's coefficient of correlation between independent variables and drought-coping behavior

Independent variable	Sig	Correlation (r)
Coping Strategy	0.001**	0.489
Environmental Attitudes	0.001**	0.388
Subjective Norm	0.001**	0.465
Perceived Behavioral Control	0.001**	0.376

Significant at the $p < 0.001$ level.

Source: Research Findings.

In order to determine the ability of independent variables in predicting the dependent variable of the research (farmers' behavior), multivariate linear regression test was used by step-by-step method. Among the variables included in the

regression equation, the variables of drought-coping strategy, environmental value attitudes, subjective norms, agricultural experience, and perceived behavioral control could account for 0.51 percent of variance in the drought-exposed farmers in Kermanshah county.

Table 7. The results of regression analysis of drought exposure in farmers in Kermanshah

Independent variables	Sig	t	Beta	B	Adjusted R2	R2	R
Constant coefficient (b)	0.001	-7.16	-	-32.756	-	-	-
Drought-coping strategy	0.001	6.99	0.292	0.269	0.236	0.239	0.489
Environmental value attitudes	0.001	10.45	0.400	0.392	0.366	0.370	0.608
Subjective norms	0.001	5.92	0.288	3.088	0.484	0.489	0.699
Agricultural experience	0.001	-4.38	-0.172	-0.112	0.512	0.518	0.720
Perceived behavioral control	0.01	2.37	0.116	1.127	0.519	0.526	0.726

Durbin Watson= 1.62 F= 73.14 Sig= 0.001 df= 329

Source: Research Findings.

Experimental Research Framework

Based on the results of path analysis and calculation of beta value, the experimental framework of the study was found to be like what depicted in Fig. 3.

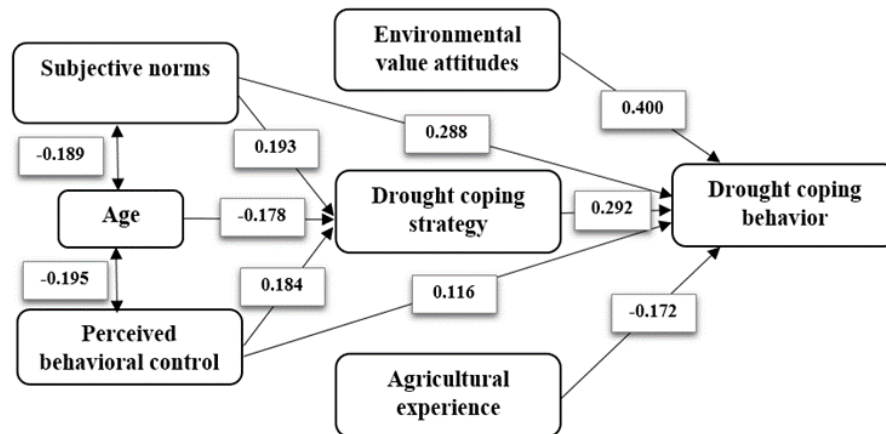


Figure 3. Experimental research framework

In order to determine the direct and indirect effects of independent variables on the dependent variable, we first specified the direct paths that fall into the dependent variable. As Figure 8 shows, coping strategy, environmental value attitudes, farmers' subjective norms about drought, perceived behavioral control, and agricultural experience had a direct

effect on the drought-coping behavior of farmers in the Kermanshah, and the direct effects will be the sum of these paths. Similarly, we calculated the indirect effects. The coefficient efficacy of each path is the product of the effects of the components of the path, and the indirect effects will be the sum of these path effects.

Table 8. Direct and indirect effects on drought-coping behavior

Direct effects		Numerical value
Drought-coping strategy	→ Farmer behavior	0.292
Environmental value attitudes	→ Farmer behavior	0.400
Agricultural experience	→ Farmer behavior	-0.172
Subjective norms	→ Farmer behavior	0.288
Perceived behavioral control	→ Farmer behavior	0.116
Total		0.924
Indirect effects		Numerical value
Subjective norms	→ Drought-coping strategy → Farmer behavior	(0.193) (0.292)=0.056
Age	→ Drought-coping strategy → Farmer behavior	(-0.178) (0.292)= -0.051
Perceived behavioral control	→ Drought-coping strategy → Farmer behavior	(0.184) (0.292)=0.053
Total		0.058
Total of direct and indirect effects		0.982

Source: Research Findings.

As shown in Table 8, the sum of direct effects was 92.4 percent and that of indirect effects was 5.8 percent. Therefore, the total direct and indirect effects were 98.2 percent on farmers' behavior.

Total impact

The direct and indirect effects of independent variables on farmers' behavior were calculated by multiple regression

analysis (Table 9). According to the results, five variables of drought-coping strategy, environmental value attitude, subjective norms about drought, perceived behavioral control and agricultural experience had a direct effect of 0.292, 0.400, 0.288, 0.116 and -0.172 on the dependent variable, respectively. Also, three variables of subjective norms about drought, perceived behavioral control and age have indirect effects of 0.056, 0.053 and -0.051 on farmers' behavior, respectively.

Table 9. Direct and indirect effects of independent variables on drought exposure behavior

Variables	Total	Dependent	Independent
Drought-coping strategy	0.292	⊕	0.292
Environmental value attitude	0.400	⊕	0.400

Agricultural experience	-0.172	⊖	-0.172
Subjective norms	0.344	0.056	0.288
Perceived behavioral control	0.169	0.053	0.116
Age	-0.051	-0.051	⊖

⊖: Having an effect ⊕: Having no effect.

Source: Research Findings.

According to the results, environmental, attitude, subjective norms, and coping strategies had the highest effect on the dependent variable with a total effect of, 0.400, 0.0344 and 0.292, respectively. Also, three variables of perceived behavioral control, age and agricultural work experience had the least effect on farmers' behavior with a total effect of 0.169, -0.051 and -0.172, respectively.

DISCUSSION

According to the results of the research, the dominant attitude for farmers is bio-ecological attitude. On the other hand, most farmers adopt a non-conflict strategy against drought. For this reason, it cannot be reliably asserted that an environmentally friendly attitude can alone lead to appropriate environmental behaviors. However, in addition to the attitude, other variables (such as subjective norms, perceived behavioral control, strategy) might have an effect on participants' behavior.

Also, the research findings showed a positive and significant correlation between farmers' behavioral control and drought-coping strategy, which is consistent with the results of Sharafi and Zarafshani (2010).

Farmers who seem to be able to cope with drought look more courageous and more reliable, so they can reduce drought damage. It should be noted that increasing the ability to manage and confront with drought depends on financial resources, so it is recommended that farmers increase their skills and ability of drought management by diversifying their income and training.

Other findings indicate a positive and significant correlation between environmental value attitudes and drought-coping behavior, which is inconsistent with Abedi Sarvestani (2011). According to this finding, it is necessary to improve the environmental attitudes of farmers by appropriate educational programs in order to improve their view of the environment and motivate them to adopt more appropriate behaviors. In other words, proper education can lead to positive changes in the norms and attitudes of individuals, and this itself requires further research to determine how and with what content.

Pearson's correlation test also showed the lack of a significant relationship between the environmental value attitude of farmers in Kermanshah and their strategy. Therefore, it cannot be asserted that a favorable environmental attitude can lead to a proper strategy because although 53.4 percent of the farmers had biospheric attitudes and 31.9 percent had a social-altruistic attitude, 55.2% of farmers adopted a non-response strategy when dealing with drought. So, even with a biospheric or social-altruistic attitude, one cannot expect the

cooperation of the farmers. This result is not in agreement with Tologbonse et al. (2010).

The results of the research also showed that there was a positive and significant correlation between the farmers' subjective norms and their behavior against drought, which is consistent with several studies (Adger et al., 2009; Becerra et al., 2012; Mortimore, 1989; Tologbonse et al., 2010). For example, as long as farmers believe that drought is divine dispensation and it is impossible to cope with it, they cannot be expected to behave appropriately in the face of drought.

In a society where people find it impossible to adapt to climate change, they will restrict their adaptive actions, even if they have the necessary resources and capacity. By educating leading farmers on how to deal with the drought phenomenon, we can expect other farmers to be influenced.

Also, the results of correlation test revealed a negative and significant relationship between age and farmers' behavior in dealing with drought. Also, there was a negative and significant relationship between farmers' behavior and agricultural work experience. These results indicate that young farmers adopt more appropriate behaviors when dealing with drought than older farmers. Therefore, to enhance the effectiveness of drought-coping programs, they should target changing the attitude of younger farmers because it is easier to change the attitudes of younger farmers than older farmers. Then, younger farmers can be motivated to cooperate in efforts to change the attitude and behavior of other farmers.

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