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Research Paper

Effect of Climate Change Dimensions on Agricultural Entrepreneurial Opportunities Recognition

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Abstract

Climate change is one of the most important challenges of the current century, affecting agriculture more than other ones, an entrepreneur farmer perceives environmental challenges and changes as an opportunity. In this regard, this study aims to analyze the effects of climate change dimensions on Entrepreneurial Opportunities Recognition (EOR) in the agricultural sector of Kermanshah Province, Iran. The statistical population of the study included all entrepreneurs of the agricultural sector in Kermanshah Province, with 102 of them being selected through a simple randomization method. A researcher-made questionnaire was used as the main tool of data collection whose validity and reliability were confirmed by a panel of experts and Cronbach's alpha coefficient and Kuder and Richardson formulas. The findings indicated that respondents had correctly and successfully identified existing entrepreneurial opportunities in the agricultural sector since they examined the proportion and desirability of these opportunities at a high level of possibility. Results also showed that more than half of the respondents perceived climate changes at a high level and took them into account for initiating their business. According to the results of regression analysis, climate changes dimensions (drought, dust, and temperature rise) account for 41% of variance changes in EOR in the agricultural sector of Kermanshah Province. Our findings have implications to help policymakers, planners, and managers in improving entrepreneurial opportunities and recognizing farmers' capability.

Keywords:
Climate changes, drought, dust, entrepreneurial opportunities

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INTRODUCTION

The climate or weather of a region refers to the medium state of determinant quantities of weather status in that region (Moghadam & Rezaei, 2009). Once these quantities divert away from medium state continuously through time, climate change occurs. Climate change is considered one of the most important challenges of the current century. Scientific evidence shows that the climate of the earth is changing due to humans' economic activities, especially greenhouse gases emission due to the increasing use of fossil fuels, which disturbs the balance of these gases in the atmosphere and contributes to climate change (Eslami, 2011). The implications of this event can be mentioned as global warming, changing rainfall patterns and periods, increasing the frequency of the so-called extreme climatic events and unexpected events such as floods, droughts, and vast dust which exert most detriment effects on agricultural activities, natural resources, and the environment (Khaleghi et al., 2015) because there is a close connection between agriculture and climate change. Therefore, this could bring about unpleasant consequences for rural societies whose economy is dependent on agriculture and natural resources (Nelson, 2009). In this regard, despite some uncertainties, climate change is accepted by many scholars and researchers as a certain fact (Stott et al., 2010; Fussel, 2009). Nevertheless, various scenarios as to predicting climate change in future emphasize the continuity and expedition of this trend of climate change (Ford & Berrang-Ford, 2011). Therefore, it appears that climate change is an inevitable reality, with no way to elude but to accept, and adopt and make capacities in order to minimize its adverse effects. In doing so, farmers and rural residents, as those affected by these conditions more than others, with their livelihood exposed to vulnerability inasmuch as climate change (Keshavarz et al., 2013), are required to own proper capability and capacity to confront risks caused by climate change (IPCC, 2007). Although the costs of the adaptation of the agricultural sector to climate change tend to be high with non-confirmed efficacy of some adaptation approaches (Singh & Grover, 2013), it appears that farmers need to adopt some practices to maintain their economic and social life as well as improve their livelihood. Hence, farmers must evince entrepreneurial behaviors to adapt to climate change (Ntalen & Litondo, 2013). In this regard, researchers introduce entrepreneurial behavior as an adaptation strategy to climate change (Momodu et al., 2011).

Entrepreneurship is one of the most important factors contributing to economic and social development; that is, it is a driver for employment creation (Shiri et al., 2017). For this purpose, an entrepreneur farmer with a particular futuristic method, considering resources and environmental limitations, taking lessons out of the past, depending on local and recent knowledge, equipped with a transformable personality along with risk-taking attitude as well as high creativity and innovation takes action to identify, evaluate and discover the best and recent market and economic situations and to exploit potential and actual agriculture opportunities based on personal talent and external guidance with location, space, and human rights taken into consideration (Kayne, 2002). In contrast to other society individuals who possess a common view, agriculture entrepreneurs see issues from a different angle. In fact, agriculture entrepreneur refers to someone interpreting environmental challenges and changes as an opportunity and exploits manufacturing factors in product processing or new services (Aliabadi et al., 2016).

In this regard, some experts contend that there are generally two inventories of opportunities: innovative opportunities and arbitrage opportunities (Schumpeter, 1934; Kirzner, 1997; Eckhardt & Shane, 2003). Innovative opportunities emerge from discovering new technologies between the tool and the goal; in other words, these kinds of opportunities include conditions in which product, services, raw material, market, and new

organizing methods are introduced (Eckhardt & Shane, 2003). These kinds of opportunities have also been a spotlight for entrepreneurship researchers for many years. In addition to innovative opportunities, researchers posit that individuals are capable of taking advantage of another inventory of opportunities called arbitrage ones. These opportunities are created along with failed market mechanisms in fast-identifying changes in resources (or manufacturing factor) demand and supply and relevant product or services (Kirzner, 1997). There are two types of arbitrage opportunities: technical arbitrage and market arbitrage. As for technical arbitrage, those innovations introduced by others are imitated (Lane et al., 2002). Technical arbitrage opportunities are, thus, some kind of imitation activity contributing to disseminating new technology and advancement (Anokhin et al., 2009). On the other hand, with regard to market arbitrage opportunities, any kind of changes in spatial distribution of demanding services and products may eventuate in changes in customers' preferences, discovering new material resources, political chaos and exogenous impulses such as natural catastrophes, thereby changes in distribution of manufacturing factors, products and services. Information dissemination as to balance change between supply and demand causes less efficacious pricing mechanisms, and consequently, temporary emergence of market arbitrage opportunities (Kirzner, 1997). According to previous statements, it could be concluded that arbitrage opportunities form an important facet of entrepreneurial facet so that they outnumber innovative opportunities (Anokhin et al., 2009). Since individuals quickly follow innovations (Rivkin, 2001), arbitrage opportunities constitute a considerable part of newly developed businesses (Aldrich, 1999).

Based on what was described above, it could be said that climate change has provided some kind of market arbitrage opportunities for entrepreneurs and individuals who view their surroundings from a different angle. As a matter of fact, not only are they not vulnerable to environmental challenges and climate changes but they also interpret each threat as an opportunity and look for profitability in all conditions (Khoshmaram, 2017a). Regarding this, Albert Einstein also asserted that opportunities and odds are hiding behind difficulties and obstacles (Yaghubi, 2006). Despite the continuing debate over climate change on the one hand and the necessity to attend entrepreneurship and distinguishing opportunity (as the key of entrepreneurship process), on the other hand, there is no research in the literature as to specifically and practically analyzing the effect of climate change on EOR in the agricultural sector. This ambiguity clearly exists in the literature of this domain if potential entrepreneurs see climate changes as an opportunity (not a threat). It is clear that making efforts to elevate farmers' capabilities to convert this threat into an opportunity would be improbable unless this relationship is examined at first. Thus, the current research aims to analyze the effect of climate change dimensions on EOR in the agricultural sector of Kermanshah as a province struggling with the challenge of climate change. It is hoped that the study results will create a point of departure for studies with similar trend.

Entrepreneurship is characterized as a term with no singular definition so that different definitions have been presented for it in scientific community since it was first introduced (Ahamdpour Dariani, 2007). Although the concept and main essence of entrepreneurship is not yet well identified and no standard comprehensive definition have been presented (Samadaghaei, 2003), opportunity is considered as the heart of entrepreneurship in most presented definitions (Yeganegi, 2004), and opportunities recognition is the main element of entrepreneurship process. Gregoire et al. (2009) recognized a set of practices to entrepreneurial opportunities recognition which either eventuates in introducing methods, products or services, or brings about improving methods, products or

services. They posited that aforementioned practices must cover existing definitions or other people's failure. In addition, they believed that a true opportunity is identified by the entrepreneur only when the desirability, feasibility and proportion between supply and target market are examined. While entrepreneurial opportunities recognition is counted as entrepreneurship's center of gravity without which no entrepreneurship exists, most studies on this research subject have examined the effect of climate change on entrepreneurial behavior, ignoring the effect of these changes on entrepreneurial opportunities recognition as the first step in entrepreneurship process (Shane, 2003; Baron, 2007; Khoshmaram et al., 2017b). Thus, some studies on the effect of climate change on entrepreneurial behaviors are reviewed below. Many studies have focused on farmers' adaption to climate change in which models, strategies and principles of farmers' adaptation are presented. In some studies, entrepreneurial behavior which brings about diversity in livelihood is recognized as an approach for farmer's adaptation to climate change (Paavola, 2008). In the study of Momodu et al. (2011), developing entrepreneurial behavior is considered as one of the adaptation strategies. Nyanga et al. (2011) conducted a study on small farmers' understanding of climate change and conservation practices in Zambia and found that entrepreneurial behavior was considered one of the adaptation behaviors to climate change and farmers' vulnerability to climate change was an effective variable in evincing adaptation behaviors. Akbari et al. (2016), also, did a research work to analyze farmer's entrepreneurial behavior in dealing with climate change and concluded that only about 30 percent of farmers confronted with climate change opted for entrepreneurial behavior.

METHODOLOGY

The research statistical population included all entrepreneurs in the agricultural sector of Kermanshah Province (N=136), out of which 102 farmers were selected by a simple randomized method. The main instrument of data collection was a researcher-made questionnaire consisted of three sections, *i.e.,* demographic features, climate changes, and EOR. Climate change was evaluated by three items on a 5-point Likert scale. In doing so, agricultural entrepreneurs were required to respond to the question as to how much they have paid attention to the consequences of climate change like drought, dust, and temperature rise in initiation of their business. To evaluate EOR in this study, three dimensions of opportunity desirability (OD), opportunity feasibility (OF) and the proportion between supply and target market (PSTM) were examined. These dimensions were adopted from Gregoire et al. (2009). Subsequently, to evaluate the dimensions of distinguishing opportunity, ten researcher-made items were applied with nominal scale (0=no; 1=yes). Four items were devoted to evaluating the dimension of opportunity desirability; three items for OV and also three items for the PSTM. As for our study, those entrepreneurs succeeded in distinguishing opportunities whom had examined the desirability, feasibility and PSTM, thus, respondents were asked to select via options "yes" or "no" if they had examined each dimension stated above prior to initiate their business. Content validity of the measurement tool was evaluated by in-person and electronic interviews with eight faculty members in agriculture extension and education at Razi University, during which some questions of the questionnaire were modified and corrected based on their opinions, and then, it was approved. In addition, Cronbach's alpha was used to assess construct reliability with an evaluation range of 5-point, and Kuder and Richardson formulas were applied to investigate construct reliability with a bi-facet (yes and no) evaluation range of (Table 1).

As shown in Table 1, the coefficients of Cronbach's alpha and Kuder and Richardson formulas were above 0.70 for all research constructs, confirming the appropriate relia-

bility of the instrument for the study. SPSS software was adopted for analysis in descriptive and inferential statistics.

Table 1
The Reliability of Constructs

Construct	Item	Kuder-Richardson	Cronbach's alpha
OD	4	0.74	
OF	3	0.71	
PSTM	3	0.73	
Climate Change	4	-	0.74

RESULTS

According to results, the average age of the studied agriculture entrepreneurs (AE) was 32.44 with an SD of 7.60 years, ranging from 23 to 65 years. The results indicated that 85 people (83.3 %) of the studied agriculture entrepreneurs were male and the remaining were females. More than half (57.8%) of them were married as well. The findings also demonstrated that more than half of the studied agriculture entrepreneurs were B.Sc. graduates, with only 15 percent owning a diploma degree or lower. In addition, 85.3 percent were urban residents and most of studied agriculture entrepreneurs (85.4%) had not participated in general courses of entrepreneurship training. Furthermore, based on the results, most participants (67.6 %) had attended training courses related to the kind of their entrepreneurship activity.

In this study, entrepreneurial opportunities recognition was examined using 10 questions (four for OF, three for OD, and three for PSTM), with two-option responses (0-1). Thus, agriculture entrepreneurs could score 0-3 for feasibility and PSTM, and 0-4 for desirability, and totally receive a score ranging from zero to ten for EOR. Consequently, the total score for feasibility and PSTM were categorized as low (<1), medium (1-2) and high (>2). As for desirability, scores were categorized into low (<0.33), medium (0.33 -2.66) and high (>2.66). Finally, the total score for EOR among respondents was categorized into low (<3.33), medium (3.33-6.66) and high (>6.66).

Table 2 shows that the mean scores for OF, PSTM and OD are 2.09 (SD=0.90), 2.72 (SD= 0.65), and 3.36 (SD= 1.11), respectively. The findings also demonstrate that most respondents had examined OF, PSTM, and OD up to a high point prior to exploiting the identified opportunity. Moreover, according to the results, the mean score of EOR among the respondents was 8.18 (SD= 1.33). Thus, it can be asserted that most entrepreneurs had successfully and correctly identified existing entrepreneurial opportunities in the agricultural sector since they managed to examine OF, PSTM and OD at a high level.

Given that entrepreneurs are characterized as those who are able to create an opportunity out of any threat, so, in our study noticing climate change and taking it into consideration for initiating agriculture entrepreneurial business were examined by three questions 5-point Likert scale (1=very low to 5= very high). Consequently, the respondents were categorized as low (<2.35), medium (2.35 to 3.70) and high (>3.70) (Table 3).

According to Table 3, the mean score of considering and comprehending climate change among agricultural entrepreneurs was 3.53 (SD=0.82). Moreover, according to Table 3, more than half of the agriculture entrepreneurs of Kermanshah Province comprehend climate change at a high level and take it into consideration when initiating their business.

Table 2

Frequency Distribution of Respondents Based on the Dimensions of EOR

Constructs	Low level		Moderate Level		High level		mean	mod
	F	%	F	%	F	%		
OF	35	34.4	22	21.6	45	44.1	2.09	High
PSTM	5	4.9	15	7.14	82	80.4	2.72	High
OF	12	11.8	5	4.9	85	83.3	3.36	High
EOR	4	3.9	9	8.8	89	87.3	8.18	High

Table 3

Frequency Distribution of Respondents Based on Attention to Climate Change in Business Start-Ups

Level	F	%	mod
Low	35	34.4	Low
Moderate	5	4.9	
High	12	11.8	
Total	4	3.9	

In other words, 51 percent of respondents asserted that they have paid close attention to environmental challenges such as drought and dust when initiating their venture.

Multiple linear regression is a proper method to examine linear relationships between dependent and independent variables. Multiple linear regression as enter form is one of multiple linear regression methods in which all independent variables are analyzed simultaneously and then, the effects of all independent variables on dependent variable are examined. In other words, a linear combination of some independent variables is applied in this analysis to predict the dependent variable (Hasheminasab et al., 2014). In this part, enter multiple regression analysis method is used to examine the effect of climate change (drought, dust, temperature rise) on EOR.

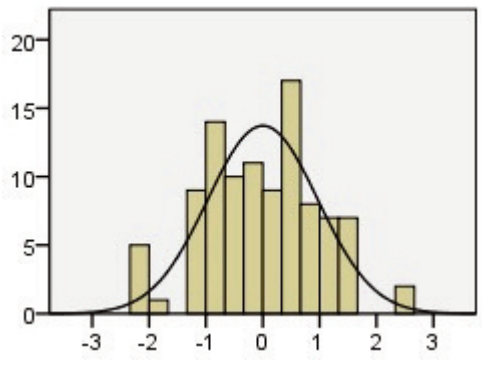

Figure 1. Normal distribution histogram

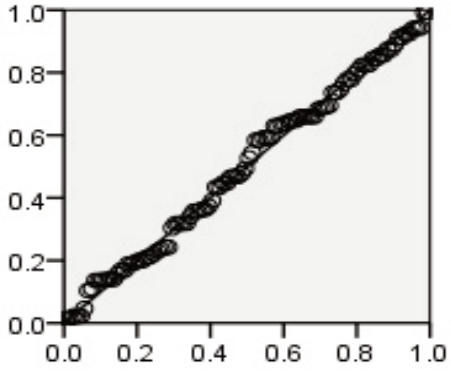

Figure 2. Standardized Residuals

To perform multiple regression analysis ideally, no colinearity must exist among the independent variables; in other words, the research independent variables need not to be intercorrelated. To address this obstacle, Variance Inflation Factor (VIF) and tolerance index should be calculated to assess colinearity relationship among independent variables. If VIF is above 10 with tolerance index close to 0, there is colinearity among independent variables and regression model is useless. The closer these two statistics are to one, the lower the colinearity would be among independent variables and the more appropriate the model would be (Belsley et al., 1980). Moreover, analysis of variance (F) could be used to assess goodness-of-fit of the regression equation. If analysis of variance statistic is significant, the goodness-of-fit of the regression equation can be supported.

The results in Table 5 demonstrate that VIF and tolerance index support appropriate values. Also, the ANOVA (F) value is significant at 0.01 levels, so it can be said that no colinearity relationship exists among independent variables and the regression model possesses a good fitness for the effect of climate change (drought, dusts, and temperature rise) on EOR. In addition, the residuals of regression model are drowning in the normality draft of the data (Hasheminasab et al., 2014). Normal diagram and normal distribution histogram of standardized residuals are shown in Figures 1 and 2. Based on Figure 2, the standardized residuals appear as a direct line. According to the normal distribution histogram, the measurement errors of the independent variables (EOR) are normally distributed in the regression analysis (Figure 1). Therefore, these results support the goodness-offit of the regression model to forecast EOR using climate change such as drought, dust and temperature rise.

Table 4 shows that climate change (drought, dust, and temperature rise) construct good predictors EOR so that the value of multiple correlation coefficient (R) and determinant coefficient (R^2) in this regression model equals to 0.64 and 0.41, respectively. In other words, climate change accounts for 41 percent of variance of the dependent variable (EOE) among entrepreneurs of the agricultural sector in Kermanshah Province.

Table 4
The Summary of the Model and ANOVA

Predictors	R	R^2	R^2_{ad}	F	p-value
Climate change	0.64	0.41	0.40	23.10**	0.000

** $P< 0.01$

Table 5
Coefficients of Regression Analysis

Predictors	β	βeta	t	p-value	Tolerance	VIF
Constant	2.98	-	2.04*	0.044	-	-
Temperature (X_1)	1.39	0.23	2.80**	0.006	0.88	1.13
Drought (X_2)	1.37	0.41	4.86**	0.000	0.85	1.17
Dust (X_3)	1.14	0.24	2.97**	0.004	0.90	1.11

** $P< 0.01$ and * $P< 0.05$

According to what was described above and the results presented in Table 5, the linear regression equation obtained is as below:

$$Y= 2.98+1.39_{X1}+1.37_{X2}+1.14_{X3}$$

While the significance of F and t-test is indicative of the significance of the regression model, it does not imply anything about the independent variables. To determine relative importance of the independent variables, one must consider the βeta value. This statistic shows the effect of each independent variable separately from the effect of other independent variables on the dependent variable. Thereby, it could be asserted that drought (βeta=0.41) forecasts the dependent variable (EOR). This means that a unit change in its standard deviation brings about a 0.41-unit change in the standard deviation of EOR in the agricultural sector of Kermanshah Province. Accordingly, the other parameters of climate change with respect to the importance of influence on EOR in the agricultural sector of Kermanshah Province included dust (βeta=0.24) and temperature rise (βeta=0.23), respectively.

DISCUSSION AND CONCLUSION

The results indicated that most respondents had deeply examined feasibility, desirability and proportion between supply and target market (PSTM) prior to exploiting the identified entrepreneurial opportunity in the agricultural sector. To justify this finding, we refer to the assessments performed by experts of Kermanshah Province Science and Technology Park (who include a considerable number of agriculture entrepreneurs of Kermanshah Province). They declare that most entrepreneurial businesses in Kermanshah Province are in a growth phase. According to them, in a growth phase, entrepreneurial businesses have reached a point at which agricultural entrepreneur takes steps to develop a production line for the intended product. At this stage, it could, thus, be said that identified entrepreneurial opportunity has proven successful. Hence, it could be inferred that if the entrepreneurial opportunity is not either correctly identified or the intended dimensions are not well analyzed by the entrepreneur, one must expect shut down, bankruptcy, or lack of prosperity. Indeed, the results show that an unrealistic evaluation of business design is one of the main reasons of bankruptcy and recession of Iranian entrepreneurial businesses (Omidvar et al., 2014; Arasti & Gholami, 2010). Needless to say, a business unrealistic evaluation originates from invalid detection of the opportunity since, as it was mentioned earlier, the entrepreneur must notice feasibility, desirability and proportion in suggested business plan to the customer and market requirements. Aliabadi et al. (2016) conducted a research on rural youths and found that the rate of EOR was low for most of them. They mentioned unemployment status of most of their samples as the main reason for this. Therefore, given that the sample of our study is composed of agricultural entrepreneurs and that of Aliabadi et al. (2016) was rural youth (with a high rate of unemployment), their results could be justified.

The results indicated that disturbing events, changes and sudden challenges in the environment bring about new issues to be addressed by entrepreneurs and other individuals of society (Shapero & Sokol, 1982), which may change some individuals' path of life (Tang, 2010). Many may leave themselves to the fate in confronting with the faintest obstacles and acknowledge their destiny. Unfortunately, some people refuse to take any action believing that patience over difficulties is compensated by spiritual rewards. On the other hand, potential entrepreneurs interpret each threat as an opportunity, looking for profitability in any conditions. In this regard, Albert Einstein states that opportunities and odds are hiding behind difficulties and obstacles (Yaghubi, 2006). In the case of drought as an environmental challenge, potential agriculture entrepreneurs not only do not expose themselves to the fate but also

begin searching for profitable opportunities. For example, designing irrigation systems adapted to drought or performing research as to planting profitable crops with least water requirements are among practices adopted by these individuals in Kermanshah Province.

According to the findings, more than half of the respondents had acknowledged climate change and considered it in initiation of their business. However, despite expensive climate changes in the agricultural sector, 49 percent of the respondents had moderately to lowly noticed entrepreneurial challenges and problems when initiating their entrepreneurial ventures. Given high dependency of the agricultural sector to the environmental conditions, it appears that making efforts to elevate agricultural entrepreneurs' awareness of environmental challenges and proceeding towards environmental challenges not only facilitates identification of existing entrepreneurial opportunities but also guarantees the success of agricultural entrepreneurial businesses. With respect to this, our findings demonstrate that drought, dust, and temperature rise were most influential on EOR in the agricultural sector, respectively. To explain this finding, we can utter high dependence of agriculture on water in the first place which motivates agriculture entrepreneurs to develop an innovative solution to deal with this challenge, followed by dust and temperature rise which attract entrepreneurs' attention. In consistence with our results, Tang (2016) showed that turbulence occurrence in life and surrounding environment of individuals instigate them to intensively collect information in order to overcome challenges ahead, thereby increasing creativity among them. Moreover, Tang (2010) pointed out in another research that different individuals have achieved a variety of knowledge and experience which affect their perception of new events. Actually, this extensive repertoire of experience and knowledge structure causes different individuals to respond differently to the same stimuli. This, in turn, leads to different actions among entrepreneurs in dealing with analogous disturbances. In other words, when various individuals are faced with environmental challenges and climate changes, based on their rate of knowledge, experience, communications. and social skills, they evince different reactions (Tang, 2010). Hence, while climate change occurrence in some agriculture entrepreneurs' lives has affected their creativity, depending on individuals' perception of resources and their diverse experiences, this may not necessarily draw similar responses among them.

Finally, we can come to the conclusion that although different economic sectors including agriculture, forestry, water, industry, tourism, energy, and financial markets are affected by climate change, the agricultural sector is the most affected so that the climate is the main determinant factor of location, production resources, and productivity in the agricultural sector. The important point is that acknowledging obstacles and passively reacting do not provide a solution to environmental problems. Accordingly, encouraging people to think and be creative in this condition can be an appropriate solution to overcome existing obstacles. Thereby, the efforts made by authorities, policymakers, and planners to enhance creativity and innovation among society individuals can be highly effective.

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