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ORIGINAL ARTICLE

Comparing of Drought Economic Impacts in Rural areas (Case Study: Sirvan and Chardavol townships in Ilam province – Iran)

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ABSTRACT
The paper explores drought in 2006 t0 2012 and the aim of the study was comparing of drought economic impacts in rural areas in Sirvan and Chardavol townships. The population of the research were all heads of household in villages of Sirvan and Chardavol townships (N=15087). The Cochran formula was used for determining of sample research and were selected 375 heads of household (Of which selected 287 and 88 people from chardavol and sirvan township respectively) using the multi–stage stratified random sampling. To collect data, we used from questionnaire in this paper. Some experts including Isfahan University professors and the agricultural specialists of the agricultural organization of Ilam province tested the validity of questionnaire and the reliability of the economic impacts was obtained by performing a pre-test and calculating Cronbach's alpha (α= 0.862). In order to analysis of comparing the economic impacts of drought in rural area of tow townships, the Mann-Whitney Test was introduced as the most appropriate test. Results showd that in general, recent droughts have the same economic effects in both townships Sirvan and Chrdavl. Thus tow townships were similar to in case of negative changes in economic structure.
Key Words: *Drought, Economic Index, Economic Impacts, Sirvan and Chardavol Townships, Mann-Whitney Test.*

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INTRODUCTION

Definition of drought is not so simple due to its frequent occurrence. On the other hand researchers' from their professional perspective look to it. Meteorologists generally consider drought as a period which during it the rainfall is considerably less than the amount that would ordinarily fall. It is also function of the location and season. Agricultural scientists are considered that droughts mainly from the standpoint of plant life and the monitoring of soil moisture content appropriate. From the perspective of hydrologists, droughts solely reduced flow of the rivers and falling groundwater level present [1]. In general droughts can be defined such that: Conditions of low in precipitation and rise in temperature that may occur in any climate conditions [2]. This phenomenon is provided a lot of risks for the region due to the disruption of vital water system [3]. As well as drought is one of the most persistent and economically the most damaging natural disaster that have a complex mechanism according to the opinion of many people and its nature is less known than all natural disasters [4].

Drought is one of the main features of the climate of Iran that is visible in both wet and dry climate area. In general Iran droughts characteristics show that any region of the country is not immune to this event and is located under its damaging effects according to the natural position, [1]. No doubt, for most people, drought is including an image of barren lands, destruction of crops and organisms strive to survive. So, when it occurs, not only had the expected weather anomaly, but also other routines had to wait for serious abnormality. Drought impacts can be divided into economic, social and environmental impacts [5]. In this regard, it can be stated that droughts have been caused negative economic and social effects in human society, especially in the village that is center of agricultural production in recent years. One of the most important works of droughts, was creating adverse effects on the agricultural sector in villages that the most significant adverse impact on the sector are reducing crop yields and consequently reducing production. Therefore, drought not only effects on the economy of rural households, but also is associated with some effects such as migration and create serious social marginalization phenomenon, increase in

local disputes and etc. In the context of the social and economic impacts of drought, several studies have been conducted within and outside the country, some of them are mentioned here.
Karbassi [6] showed that drought reduced rainfall and increased heat thus, because of drought the recoverable amount of water for agriculture was reduced and the area under crops, crop yield and income of farmers in the province have decreased. Mohammadi Yegane [7] Concluded that successive droughts has arrived irreparable economic damage on villages configuration of Abarkuh township. Rezai and et al [8]showed that the impacts of drought was appeared in three factors: economic, environmental and Social – psychological in the village of Haji Arash in Zanjan province. Velayati [9], showed that rural to urban migration, rising costs of drilling and pumping of underground water, the progressive salinization of aquifers and earth Summit is considered as the effects drought. Khosh Akhlagh et al [10], introduced that reducing the amount of harvest per unit area as the most important and most obvious effects of droughts. Holden and Shiferaw [11], Showed that indirect effect of drought on household welfare through its effect on prices of livestock and crops, has been most of the direct impact of droughts Sivakumar et al [12], Believe that agricultural productivity is sensitive in the tropics of Asia not only with increasing the temperature, but also to changes in the nature and characteristics of the monsoon rains. Simulated climate change by them showed that climate change leading to increase repeatability of droughts that is the greatest threat to agriculture and ultimately has been reduced crop yield and have serious effects on food security in tropical Asia. Kenny [13], considers that Physical and mental stress, anxiety, depression, family conflicts, reduced quality of life, increased immigration and the increasing poverty are the social consequences of droughts. Mongi et al [14], Indicated that climate change is caused vulnerability of dryland agriculture in Tabvray of Tanzania. Schilling et al [15], Showed that the economy and the poor people in Morocco is heavily dependent on the agricultural sector and Climate change and drought is likely to have the strongest effect on the sector.
The township's economy is based on agriculture, in recent years due to climate change and the incidence of drought, the agricultural sector heavily damaged and the farmers have encountered with widespread social and economic constraints. On the effects of the recent drought, two townships have confronted with the change in agricultural water sources, so that in recent years, the drought continuing effected on many permanent and seasonal rivers (such Zanjire river that was a branch of the Chardavol river dried and Chardavol river has very low water, etc.), and the rivers dried or has encountered with low in water and irrigated agriculture has heavily damaged. In addition, farmers in these areas no hope for rainfed agriculture due to dependence on this type of agriculture to precipitation, and due to sharp decline in rainfall in tow townships.
The aim of this study is to investigate the effects of drought (especially droughts in 2006 to 2012) based on the Standardized Precipitation Index (SPI), and examines a comparative study of the economic impacts of the drought in rural areas in Chrdavl and Sirvan townships. In this regard, the present study looking for answering the main research question (What are the economic impacts of droughts in both Sirvan and Chardavl townships?)

MATERIALS AND METHOD

This study was done by method of survey research in the Sirvan and Chardavol townships in the Ilam province in western Iran. The townships provided rice produce in the years before the drought in Ilam province. After the onset to drought, some rivers in tow townships has encountered with water scarcity and farmers don't have any ability for cultivatig the corps.
All heads of household in Sirvan and Chardavol townships were selected as the population of research (N=15087). The Cochran formula was used for determining of sample research and were selected 375 heads of household (Of which selected 287 and 88 people from chardavol and sirvan township respectively) using the multi –stage stratified random sampling. To collect data, we used from questionnaire in this paper. Some experts including Isfahan University professors and the agricultural specialists of the agricultural organization of Ilam province tested the validity of questionnaire and the reliability of the economic impacts was obtained by performing a pre-test and calculating Cronbach's alpha (α= 0.862). In order to analysis of comparing the economic impacts of drought in rural area of tow townships, the Mann-Whitney Test was introduced as the most appropriate test.
Precipitation data for calculating the SPI index were provided by agricultural organization of Ilam province for 1971 to 2012. Table 1 shows the classification of drought conditions based on the SPI values.

Drought Category	SPI Values
Mild drought	0 to -0.99
Moderate drought	-1.00 to -1.49
Severe drought	-1.50 to -1.99
Extreme drought	≤ -2.00

Table1. The drought classification based on the SPI values

To calculate the standardized precipitation index following equation was used:

$$SPI = \frac{(pi - pmean)}{(SD)}$$

In which:
p_i = amount of precipitation per month
p_{mean}= average of precipitation during the long period
SD = standard deviation of precipitation during the long period.

RESULTS AND DISCUSSION

The Personal, socio-economic and agricultural characteristics of farmers in the Sirvan and Chardavol townships

In this paper the characteristics of farmers show that the mean of respondent's age was 48.53 and 46.01 in Sirvan and Chardavol townships respectively. Results show that 48.6 % of respondents in Sirvan, and 51.7% of respondents in Chardavol were farmer. About 34.1 percent of farmers believe that the water sources of irrigated agriculture were spring before the onset of drought in the sirvan township and 70.5 percent of farmers said that the main source of water sources for irrigation during the drought is the rainfall. 39.7 percent of farmers indicated that the spring was as the water sources for irrigating agriculture before the drought in the Chardavol and 65.5 percent of respondents selected rainfall as the most important source for irrigation water at the time of drought.

The drought detection in Sirvan and Chardavol townships

The results of the Standardized Precipitation Index (SPI) Indicated that drought has proven in the Sirvan and Chardavol townships during the long time period and mostly in the period 2006-2012. This results showed that drought is most unprecedented droughts in both the townships in 2007-2008. Based on the obtained results, Chardavol township was faced with most severe drought in this year. and Sirvan township was faced with severe drought. The overall results indicate that drought was occurred during 2006-2012 in the Sirvan and Chrdavl townships. Table 2 shows SPI index, Drought Category in Sirvan and Chardavol.

Table2. SPI index, Drought Category in Sirvan and Chardavol townships

Chardavol		Year	Sirvan	
Drought Category	SPI index		SPI index	Drought Category
Normal	0/32	2006-2007	0/30	Normal
Extreme drought	-2/20	2007-2008	-1/67	Severe drought
Moderate drought	-1/30	2008-2009	-1/59	Severe drought
Normal	-0/53	2009-2010	-0/14	Normal
Moderate drought	-1/11	2010-2011	-0/33	Normal
Severe drought	-1/79	2011-2012	-1/58	Severe drought

The ranking of indexes of drought economic impact on rural areas in Sirvan and Chardavol townships

The indexes of drought economic impact on rural areas was ranked by the respondents of the study.

Table 3. The ranking of indexes of drought economic impact on rural areas in Sirvan and Chardavol townships by respondent

Chardavol Township				Indexes	Sirvan Township			
Ranking	C.V	Standard Deviation	Mean		Mean	Standard Deviation	C.V	Ranking
1	0/068	0/312	4/54	Increasing tendency to employment in non-agricultural jobs (labor, guarding various companies and ...)	3/99	0/811	0/203	12
2	0/070	0/288	4/11	Decline in agricultural production	4/52	0/729	0/161	7
3	0/077	0/309	3/97	Reduced area under cultivation of crops	4/05	0/967	0/239	17
4	0/098	0/462	4/69	Increases in agricultural debt	4/37	0/858	0/196	11
5	0/099	0/399	4/01	Increasing tendency for farmers to obtain loans from banks and local	3/87	0/722	0/186	10
6	0/107	0/491	4/59	Reduction of employment in	4/43	0/753	0/170	8

				agriculture				
7	0/126	0/581	4/62	Reduce the amount of derived income from farming	4/57	0/653	0/143	4
8	0/134	0/620	4/63	Reduce the level of household savings	4/58	0/433	0/094	2
9	0/135	0/541	3/98	Inability of farmers to insure crops	4/09	0/444	0/109	3
10	0/137	0/616	4/50	Increases in Unemployment generation of Agriculture	4/27	0/884	0/207	14
11	0/147	0/466	3/15	Rising input prices	3/11	0/289	0/092	1
12	0/149	0/672	4/50	Increases in production costs	4/28	0/909	0/212	16
13	0/169	0/751	4/45	Delays in repayment of loans	4/48	0/715	0/160	6
14	0/182	0/860	4/72	Reduce incentives for investment in agriculture	4/28	0/898	0/210	15
15	0/184	0/788	4/28	Destruction of agricultural lands	4/28	0/779	0/182	9
16	0/192	0/838	4/35	Reduce the value of agricultural land	4/10	0/999	0/243	18
17	0/204	0/721	3/54	Increasing the number of years of fallow land (not cultivated)	4/55	0/654	0/143	5
18	0/207	0/871	4/20	The Emergence and rise of poverty in rural	4/18	0/856	0/205	13
19	0/238	0/998	4/19	Change in patterns of agricultural crops	3/50	1/11	0/317	19
20	0/283	0/994	3/51	Change in agricultural land use	3/25	1/28	0/394	20
21	0/425	1/59	3/74	Crop calendar changes	3/07	1/32	0/430	21

Results in Table 3 showed that in the Chardavol township most important effect of drought was increasing tendency to employment in non-agricultural jobs (workers, guarding various companies, colportage). Villages in this township are dependent to agricultural income and villagers have fed over the years through the farm production. In the recent years due to lack of rainfall and drought the ability of the farmers economy are facing serious risks. So farmers have faced with a lack of production and have reduced the level of income that sometimes the heads of households have to work in jobs with daily income such as workers, colportage and etc for durability and survival of their lives and families This result is consistent with Ghanbarzadeh and Behnyafar [16] study. The results showed that farmers in Sirvan township have introduced with increases in the input prices. In previous years of drought, farmers kept some of their products as seed for next year in his barn and at the beginning of the growing season did not need to buy seed for replanting the same crop in new growing season. After reducing the rainfall and onset of drought, Seeds of products that were used in the past, don't have any ability to cope with drought and water scarcity, and often survive until the early vegetative period and then are dried, But in the years of drought, resistant to drought seeds were enterd to the market and every year at the beginning of the growing season farmers are purchased with the higher prices than the former seeds. In addition to Purchase of resistant to drought seeds, farmers have encountered with raising in input prices such as water wells, fertilizers, pesticides and etc in the recent years. Nasaji Zavareh [1] has introduced that increases in input prices is one of the economic consequences of droughts.

The result of Mann-Whitney test in Sirvan and Chardavol townships

The Comparing of drought economic impact in both townships showed a significant difference between two township Sirvan and Chrdavl in terms of economic indexes Such reducing area under cultivation of crops, increasing in agricultural debt, devaluation of agricultural land, reducing the incentive to invest in agricultural, shifting patterns of agricultural crops, changing in crop calendar, increasing in trends of employment in non-agricultural jobs (workers, security companies different colportage) and increasing the number of years of fallow land (not cultivated). Table 4 shows Mann-Whitney Test for comparing the economic impacts of the drought on rural areas in Chrdavl and Sirvan townships.

Table 4. Mann-Whitney Test for comparing the economic impacts of the drought in rural areas in Chrdavl and Sirvan townships

Indexes	Ratings average		Mann-Whitney test	sig
	Chardavol	sirvan		
Reduce the amount of derived income from farming	193/22	184/84	13517/500	0/424
Decline in agricultural production	194/18	182/20	1/32	0/257
Reduced area under cultivation of crops	213/05	183/04	1/19	0/000
Increases in production costs	196/17	176/67	1/26	0/084
Increases in agricultural debt	199/64	167/05	1/17	0/002
Increases in Unemployment generation of	194/54	181/18	1/31	0/224

Agriculture				
Reduction of employment in agriculture	196/57	175/57	1/25	0/063
Reduce the value of agricultural land	197/61	172/68	1/22	0/030
Reduce incentives for investment in agriculture	209/56	193/54	8/94	0/000
Agricultural land use change	195/76	177/80	1/28	0/144
Changing patterns of agricultural crops	209/89	138/63	8/85	0/000
Crop calendar changes	240/72	152/98	1/03	0/000
Delays in repayment of loans	190/19	193/25	1/39	0/784
The Emergence and rise of poverty in rural	192/01	188/21	1/38	0/744
Destruction of agricultural lands	191/10	190/72	1/41	0/974
increasing tendency to employment in non-agricultural jobs (labor, guarding various companies and ...)	206/01	180/00	1/11	0/000
Increasing tendency for farmers to obtain loans from banks and local	190/18	191/11	1/36	0/432
Rising input prices	194/18	196/43	1/57	0/755
Inability of farmers to insure crops	198/99	199/10	1/55	0/943
Reduce the level of household savings	181/66	183/18	1/78	0/811
Increase the number of years of fallow land (not cultivated)	233/23	180/11	1/43	0/000

Ratings average of the indexes indicated that the Chardavol township has greater impact of droughts between to townships. This result can be rationalized so that the Chardavol in the whole Ilam province provided a wide range of rice in the past that was faced with the problem due to the recent drought and water scarcity.In this case due to the luck of agricultural water resource, the areas under irrigated crops were much lower because of reducing production and farmers often faced with increasing in debt. Additionally, in during the drought, farmers have been facing with some problems, that effects on the incentive to invest in agriculture. At this time, the employment in non-agricultural occupations are chosen as a last resort for survival. In general, we can say that recent droughts have similar economic effects in both townships Sirvan and Chrdavl. thus negative changes in economic structure are similar in tow townships. Mongi et al [14], Schilling et al [15], Barrios et al [17], Mohammadi Yeganeh and Hakim Doust [18] , Nasaji Zavareh [1] and Ghanbarzadeh and Behniafar [16], Also believe that drought has been caused negative effects on the agricultural sector and ultimately economic structure of villages.

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