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INFLUENCE OF CLIMATE SHIFTING ON AGRICULTURAL AND DAILY LIFE ACTIVITIES IN LOWER SINDH PROVINCE OF PAKISTAN

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ABSTRACT

Climate change not only influences agriculture activities, but also has certain effects on daily human activities, as well as on human health. Keeping in view the concerns of local people over climate shifting and available research gap on the issue, the researchers conducted a study, in which the perceptions of local farmers regarding climate shifting (temperature and precipitation) were gathered in district Hyderabad, Sindh province of Pakistan. The quantified data from 200 respondents were re-collected on a reliable and valid scale and analyzed through SPSS and AMOS software. The results revealed that the significant changes are being occurred in summer (r^2=0.96; M=6.78) and winter seasons (r^2=0.71; M=6.57) leaving bad effects on human health (r^2=0.96) and behavior of the local population (r^2=0.70). In addition, the change in the cropping calendar, i.e., timing of sowing (r^2=0.69; M=8.42) and harvesting (r^2=0.79; M=8.27) of different crops have been altered due to changes in local weather patterns. Since the local farmers are also facing seed germination (r^2=0.57; M=7.98) problems, it is therefore recommended that concerned authorities/ departments should revise the agricultural calendar. Besides this, respondents were in opinion that actual summer starts even before the vacation and cold season starts when winter vacations ended, thus, the government and other concerned departments should reconsider or reschedule the vacation regulation policy (r^2=0.70) at least at the provincial level.

Keywords: agricultural activities**,** calendar, climate change, respondents

INTRODUCTION

Climate is the complex of temperature, humidity, atmosphere, wind, rain, precipitation and other meteorological variables in a region, which includes timing of precipitation, amount of sunshine, average wind speed directions, and weather extremes of local geographical area. However, any noteworthy change in the expected routine patterns of average weather of a region (or the whole earth) over a significant period of time is referred as the climate change. The climate change is also referred as the un-usual variations in the climate (Edwards *et al.,* 2001). This study intends to deal with the climate change in the region that indicates change in average weather conditions, or in the time variation of weather within the context of longer-term average conditions, and also known as the climate change.

Climate is the primary determinant and has immense ability to leave certain effects on agricultural productivity (Adams *et al.,* 2005). It may leave certain influences on livestock production, hydrologic balances, input supplies and other components of agricultural systems (Rosenzweig *et al.,* 2009) that may cause extreme events like droughts, floods, and wind storms (Adams *et al*., 2005). In addition, carbon dioxide is also a vital element for plant production, as rising concentrations have the potential to enhance the productivity of agro-ecosystems. Climate change may potentially change the types, frequencies, and intensities of various crop and livestock pests; the availability and timing of irrigation water supplies; and the severity of soil erosion (Sala and Paruelo, 2010). Jacques *et al.* (2015) investigated the long-term global impacts on crop productivity under different climates. The results of the study indicated that at the global level, the climate change will cause an agricultural production decrease, a food price increase and an expansion of cultivated area by 2050.

As the agricultural ecosystem is managed system, it includes both producers and

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consumers, because they are constantly facing these changes in crop and livestock production, input and output prices, resources management and take up technological changes; hence the human being is the part and parcel of the whole process. Therefore, it is necessary to include local people for in-depth comprehension and perceiving accurate impacts of climate change/shifting on agricultural life/activities (Schimmelpfennig *et al.,* 2014). Similarly, attempting any research on adaptations and adjustments made by people is difficult, because it may consists of short-term changes in utilization and production practices or long-term technical changes. In addition, it is also necessary to be careful while estimating potential damages that it should not be exagerated or potential benefits should not be overlooked. By doing so, one can easily record all actual readings or outcomes as a result of climate change in a particular region (Segerson and Dixon, 2012).

Likewise, Basak *et al.* (2010) had concluded that climate change is likely to have predominately adverse impacts on the yield of Boro rice, due to increased temperatures, because this would lead to grain sterility during the growing season and hence a reduced yield. It was also found that the changes in atmospheric carbon dioxide levels and solar radiation might offset the impact of increased temperatures to certain extent. Early monsoon arrival can also cause flood damage to rice seedlings in early growth stages, whilst late monsoon arrival may potentially lead to water stresses. Therefore, David *et al.* (2014) assumed that the climate change will result in a fertilization effect and a shift of agro-ecological conditions. Hence, the agricultural production is sensitive to weather and agro-ecological shift, which may directly affect the yield because of reduced acreage and the fertilization effect (Gerald *et al.,* 2014). However, Ana *et al.* (2012) optimistically assumed no change in water for irrigation or on the application of agro-chemicals from the production point of view, but somewhat pessimistic from the environmental point of view, as a result of climate change.

Regional and global interest on the issue of climate change motivated the researchers to conduct a research on climate change, in which the concerns of local farmers must be raised and discussed. Therefore, this study was mainly designed to gather data directly from various local farmers in order to determine climate change (mainly climate shifting) in the region (district Hyderabad) including some possible effects on daily life and agricultural activities.

RESEARCH METHODOLOGY

Research methodology elucidates the practices and procedures of the research to conduct a scientific study. In order to meet the research objective, we adopted quantitative research technique to minimize the error rate in analysis. Quantitative research is associated with the paradigm of positivism or the scientific method and provide opportunity to address the study goals, which concerns mainly theoretical ideas and concepts into real numerical measures that signify these ideas. By following the quantitative procedures, social survey technique was adopted and a reliable and valid questionnaire was developed. Survey was carried out in rural areas of district Hyderabad using multi-stage cluster sampling method. This method lies under probability sampling technique and generally known as “area sampling” (Agresti and Finlay, 2008). Moreover, multi-stage cluster sampling method is comparatively economical in terms of money and is normally more accurate than a cluster sampling or a single sampling technique for the same sample size (Agresti and Finlay, 2008). Generally, Hyderabad district is considered as the agricultural vicinity, therefore, 10 rural UCs were randomly selected; however, 20 farmers from each UC were interviewed that finally worked out as 200 respondents/sample size at 6.89% margin of error and 84.4 confidence level, based on unknown population (Raosoft, 2017). Selection of respondents/ farmers was also made randomly, where all the respondents were interviewed personally by the main author. All such necessary information was gathered on a 10 point likert scale. SPSS was used to conduct descriptive analysis and reliability of the constructs and Confirmatory Factors Analysis (CFA) was made by means of AMOS software, to ensure the validity of the questions.

Table 1. Reliability of the constructs

Concept/ Variable	Total Items	Reliable Items	Rank	Cronbach’s Alpha
Climate Change	6	5	Good	0.735
Impact on Daily Life	8	3	Excellent	0.802
Impact on Agricultural Activities	7	3	Excellent	0.719

Reliability can be meditation of a uniformity that is achieved through a pilot study prior to data collection and often measured by

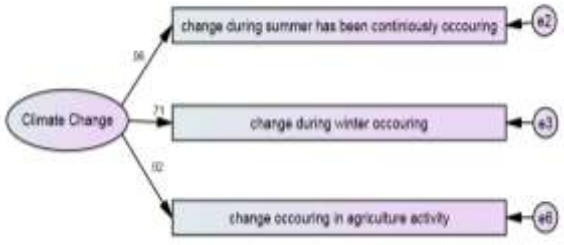
Cronbach's alpha which should not be less than 0.70 (Cresswell, 2009). Therefore, this technique (Cronbach's alpha) was applied to confirm the reliability of the instruments by inserting initially 30 questionnaires into SPSS, and the overall scale as described in Table 1 had considerable results.

With regard to the validity of the data, there are several ways, including statistical tests and techniques, to compute the validity of quantitative instruments, which commonly involves pilot testing (Cresswell, 2009). Confirmatory Factor Analysis (CFA) is a tool to establish the validity and reliability of a scale (Kalk *et al.,* 2014) and a prerequisite for the measurement model in which both the number of factor loadings and their corresponding indicators are clearly defined (Kline, 2011). In selecting scale items, the ultimate objective remains to know the uni-dimensionality rather than internal consistency that focuses on the "validity" of latent constructs. In CFA, a requirement is the prior selections of variables on the basis of establish theory and hypothesize before hand the number of factors in the model.

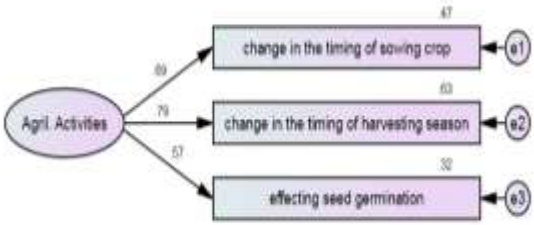
The CFA was applied prior to data analysis, because CFA plays a vital role in ensuring convergent (uni-dimension) and discriminant validity of scales.

Hence, CFA is viewed as a broad-spectrum modeling approach, designed to test hypotheses about a factor structure for a number of interpretations to arrive at a certain future prediction (Hatcher and Rourke, 2014). In this regard, the researchers used advanced tool for analysis (AMOS) through Average Variance Extraction (AVE) for the establishment of validity of the constructs, which should be not less than 0.5 (Trochim, 2006). The results shown in Table 2 suggest that the AVE of items of related constructs were acceptable for further analysis and final results.

CFA of Climate Change



CFA of Agricultural Activities



CFA of Daily Life

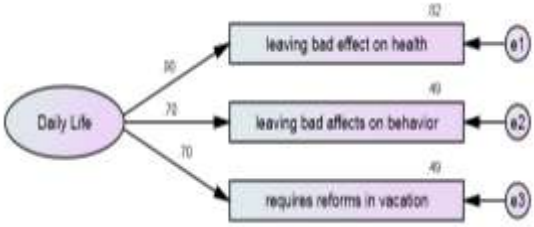


Table 2. Confirmatory factor analysis

Variables	Total Items	Factor Loading	
		Items after CFA	AVE (≥0.5)
Climate change	6	3	0.86
Impact on Daily Life	8	3	0.76
Impact on Agricultural Activities	7	3	0.68

Data analysis

The valid data was finally analyzed by using SPSS software and descriptive statistics were tabulated and interpreted in the following section.

RESULTS AND DISCUSSION

This section of the article is limited to the findings of detailed interviews conducted during 2017, where the results are comprised regarding socioeconomic background of the respondents, their perceptions about climate change as well as the impacts of climate change on their daily personal and professional activities.

Descriptive statistics of the respondents

Table 3. Background of the respondents/farmers

Particulars		Description
Age (years)		M = 39.7
Farming experience		M=12.8
Family size (No)		M = 7.8
Literate (Minimum Primary)		63.9%
Family status (percentage)	Joint	75
	Nuclear	25
House characteristics (percentage)	Pacca	50
	Katcha	20
	Semi Pacca	30

Table 3 shows that on average the respondents were in the age of 39.7 years with reasonable farming experience (M=12.80 years) and almost 64% literacy rate shows certain maturity level and potential human resource connected with agriculture in rural Hyderabad. Normally in Pakistan the average family size is 6.2, but in the study area, the family size was about 8 persons per family, where most of them (75%) were living in joint family system and in Pacca houses (50%). Hence, the overall background of the respondents indicates that the respondents/farmers may share some of the valuable experiences that could be useful to the researchers and policymakers.

Respondents' perception regarding climate change

In this subsection, the findings of the perception of the respondents regarding weather changes and its influence on daily life activities as well as on the shifting of cropping patterns in rural Hyderabad are shared. Table 4 shares the information of climate change in the study area as perceived by the local farmers.

The Table 4 reveals that the local farmers have been observing certain changes both in summer and winter seasons. Therefore, most of the farmers were of the opinion that change of climate in the area brought shift in the agricultural activities to a certain extent. Results show that majority of them were agree about the change of climate which hampering the agriculture of the study area, whether cultivated in winter or summer seasons. The previous literature also endorsed that changes in the climate has affected the agriculture in Pakistan (Basak *et al.,* 2010; David, *et al.,* 2014; Jacques, *et al.,* 2015).

The data in the Table 5 revealed that certain changes are occurring in their daily life or activities mainly due to climate changes. It was shared by the respondents that the unusual climate change has been affecting their health and behavior. Further segregation of the data shows that the climate change has potential to enhance the blood pressure, skin diseases and food poison, where these changes may also produce irritation and inconvenience among the communities. As a result, the people may become violent and also may lead to generate conflict situation and however some people think about the migration. In addition, the local people also demand changes in vacation calendar as their children are suffering from outdated vacation calendar. Results show that the majority of the farmers were strongly agreed about the change of climate to a certain extent and confirmed the bad effects on their daily life. The literature had also supported that change in the climate is affecting the human health in Pakistan (Reuveny, 2007; Alexandratos, 2008).

Table 4. Perception of local farmers regarding climate shifting

Particulars	Range	Minimum	Maximum	Mean	Std. Deviation
Change is occurring in agricultural activities due to climate shifting	8	2	10	6.82	1.348
Change/shifting of climate has been continuously occurring in summer season	6	3	9	6.78	1.297
Change observed during winter occurring	8	2	10	6.57	1.391

Table 5. Impact of climate change on daily life

Particulars		Mean	Std. Deviation
Climate shifting is leaving bad effects on health	Blood pressure	8.61	1.222
	Skin diseases	8.50	1.247
	Food poison	7.98	1.490
Requires reforms in vacation	Summer	8.56	1.391
	Winter	8.42	1.740
It is also affecting the behavior of the local people	Irritation	8.50	1.247
	Violent conflict	8.27	1.529
	Thinking of migration	6.57	1.391

Table 6 shows the results regarding changes occurred in the agricultural activities on account of climate change; where the data was gathered through the statements asked from the respondents. It was shared by the local farmers that the shifting of climate led the change in the sowing timings and harvesting of various crops (rice, wheat and cotton). The literature also collaterals that the shifting/change in climate has been affecting the agricultural activities (David *et al.* 2014; Gerald *et al.,* 2014; Schimmelpfennig *et al.,* 2014). The respondents were also agreed about the effect of weather changes on seed germination in the study area; for example, wheat nowadays is being grown in the period of increased moisture, as shift in its cropping calendar has been recorded. Apart from wheat, the same situation regarding some other crops (vegetables) were also highlighted by the respondents. This situation may badly affect their production and incomes, which may cause to increase poverty level.

Table 6. Effects on agricultural activities due to climate change

Particulars	Range	Minimum	Maximum	Mean	Std. Deviation
Climate change led to the change in the sowing timings of various crops (rice, wheat and cotton)	8	2	10	8.42	1.740
Change in harvesting season of the crops (rice, wheat and cotton)	8	2	10	8.27	1.529
Climate shifting is affecting the seed germination (rice, wheat and cotton)	8	2	10	7.98	1.490

CONCLUSION AND RECOMMENDATION

The researchers conclude that the climate shifting is a validated phenomenon, which may likely to disturb the rural life. Agriculture is the rudimentary livelihood for rural people and mainly depends on climatic conditions including other resources. Therefore, any variation in the weather or climatic conditions may not only disturb the farming communities' income but it may also bring negative impacts on their health and attitude. Since, rural people have already scarce resources to generate income and basic daily life facilities therefore their concerns could be prioritized by the related departments and policymakers. Otherwise, conflict situation in rural areas or significant migration to urban vicinities could be expected in near future. In this regard, a significant majority of the respondents were also queried about the outdated calendar (agricultural and vacation) and emphasized to revise it according to present conditions.

AUTHOR'S CONTRIBUTION

M. J. Sheikh: Floating research idea to the compilation of study.
A. A. Narejo: Data collection and tabulation.
G. M. Khushk: Interpretation and discussion of results.
H. Magsi: Data analysis.

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