

Climate Change: Trends and Farmers Perceptions in Chepang Community of Chitwan District, Nepal

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

To access the trends and farmers perception on temperature and precipitation in Chepang community, a research was conducted in Chitwan district of Nepal in the year 2016. Two VDCs, Shaktikhor and Siddhi were selected purposively and sixty households from each village were selected randomly for the study. Primary information was collected from household using semi-structured interview schedule and secondary data were collected from Department of Hydrology and Meteorology (DHM), Kathmandu. Microsoft Excel and SPSS were used for descriptive and trend analysis. Mann Kendall test is used to determine the trend of climatic variables. 50 percent of the respondents perceived about increase in summer temperature, 37% perceived increase in winter temperature and 58% of respondent's perceived decrease in rainfall amount. Monsoon rainfall was in decreasing (0.541 mm per year) trend and the overall trend of rainfall was also decreasing over the time (1983-2014). Maximum and minimum temperature was increased significantly over the time (1983-2014) by 0.013°C and 0.0075°C per year respectively. The analysis of climatic data strongly supports the farmer's perception. Farmers in rural areas were still unknown about climatic change pattern; they cannot adopt adoption strategies until they will understand the climate change and its adverse impact on farming systems. The findings of this study can be useful for making effective policy and plan.

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1. INTRODUCTION

Climate change refers to the increase of earth temperature due to the release of gases such as CO₂, CH₄, CFCs, N₂O and O₃ into the earth atmosphere [1]. Change in temperature is the major indicator of climate change which rises at the rate of 0.06°C per annum. Such a rise in average temperature is variable across the country [2], higher in the mountain and Himalayan (0.08°C) as compared to low-lying Terai (0.04°C). Rural communities are expected to be affected more due to excessive dependence on climatic variables and limited adaptive capacity to the changes [3]. Nepalese agriculture is highly dependent on the climatic condition; hence even small change in climatic condition could largely affect the food security in the country [4]. Nepalese agriculture is one of the worse hot sectors due to climate change [5]. Extreme weather condition such as irregular rainfall, drought, flood, cold waves, relative humidity, which ultimately decrease the productivity of crops [6]. The Nepalese agriculture production system is highly uncertainty and vulnerable for two reasons. First, the existing system of food production is highly climate sensitive because of its low level of capital investment and non-adoption of modern technological options. Second, agriculture is the main source of livelihoods for a majority of the population i.e. 65% population depends on agriculture [7]. Rising temperature, variation in summer and winter temperature, erratic and higher intensity of rainfall for few periods has increased number of droughts and floods, more often; with landslides, water shortage and increasing land degradation. Similarly, farmers are unable to plant the crops in appropriate time which certainly lowers the production and ultimately affect the food security. Micro scale vulnerability assessment is more important than macro level in our context which has high diversified climatic patterns. Hence, local level study is important [8]. According to 5th assessment report of the [9], compared to the 20th century, the average annual temperature will rise by more than 2°C in most of the South Asia by the mid of 21st century. In addition, it has been suggested that warming of more than 2.5°C could reduce global food supplies and contribute to higher food prices [10]. Study conducted on the annual precipitation data from 1976-2005 from 166 stations across the Nepal revealed the overall an increasing trend of precipitation [11].

Furthermore, the projection also revealed an increasing trend of rainfall intensity during monsoon and post monsoon while this showed a decreasing trend in winter [12]. The objective of this study is to analyze the perception of farmers towards climatic pattern and to know about whether these perceptions match with recorded data or not.

2. MATERIALS AND METHODOLOGY

2.1 Study Area

Saktikhor and Siddhi VDC of Chitwan district were selected purposively for the study (Fig. 1). The study sites were selected purposively because dominance of Chepang population resides in these areas. One cluster was formed in each representative village of the Chitwan district for assessing the trends of climate change. Each cluster consisted of 60 households and there were altogether two clusters i.e. 120 households for the study. The respondents were selected above the age of 40 years, since they could provide the valuable information regarding the past trends of the climatic trends.

2.2 Data Collection and Analysis

The field survey in Siddhi and Saktikhor VDC of Chitwan district was conducted through using semi-structured interview schedule. Each interview schedule was used to collect qualitative information on the community's perception of climate change and experience of weather events, such as rainfall and temperature. The meteorological station records the daily maximum temperature, minimum temperature, and accumulated precipitation. All the climatic data (1983-2014) were collected from the Department of Hydrology and Meteorology (DHM), Kathmandu. Qualitative data about perception were analyzed by using SPSS tools and Microsoft Excel.

2.3 Trend Analysis

The annual trend of climate was analyzed for the following variables: Temperature (annual maximum and minimum at Rampur station) and precipitation (annual accumulated quantities at Rampur station). Mann Kendall test is used to determine the trend of climatic variables. The existence of positive or negative trends among all the considered variables was determined using nonparametric trend test methods.

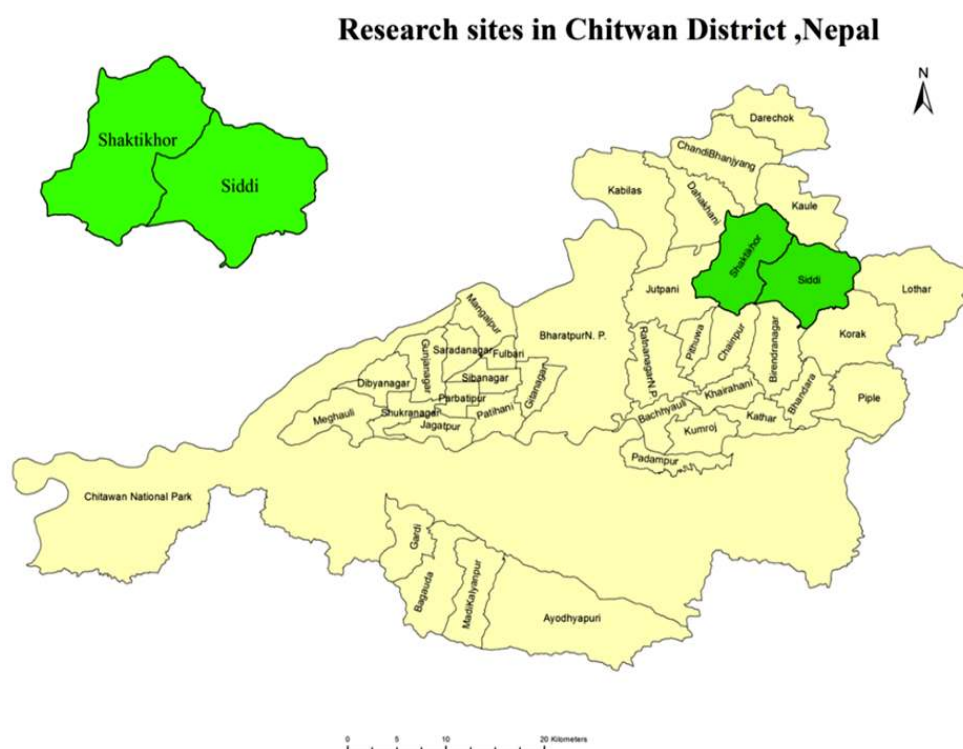


Fig. 1. Map of Chitwan district showing study area

3. RESULTS AND DISCUSSION

3.1 Temperature: Trends and People's Perception

3.1.1 People's perception

The result (Fig. 2) indicate that, 50 percent of the respondents perceived that increase in summer temperature, 20 percent perceived a decrease in summer temperature, 6 percent perceived neither increase nor decrease and 24 percent of respondents were not aware about change in summer temperature pattern. 39 percent of respondents perceived that increasing in winter temperature, 37 percent perceived decrease in winter temperature, 3 percent perceived neither increase nor decrease and 21 percent of respondents were not aware about change in winter temperature pattern. Same perception was found by [13], while conducting household survey in Chepang community of Chitwan district.

3.1.2 Observed trend

Analysis of the maximum and minimum temperature of last 32 years (1983 to 2014) of

Rampur Station (Fig. 3) shows that maximum and minimum temperature increased significantly over the time by 0.013°C and 0.0075°C per year respectively. The average maximum temperature was less than the national average which was 0.06°C per year [14]. The trend analysis support the farmer perception that the summer was hotter and winter was also hot as compared to the past.

3.2 Precipitation: Trends and People's Perception

3.2.1 People's perception

The informants were asked to provide information on changes in precipitation pattern over last 30 years shows that majority of the respondents (58 percent) perceived decrease in rainfall amount as compared to past while 57 percent respondents perceived decrease in duration of rainfall. 49 percent respondents perceived that rainfall time is unpredictable as shown in Table 1.

3.2.2 Observed trend

The rainfall pattern of the last 32 years at the Rampur Station as shown in Fig. 4 indicates that

overall total rainfall, monsoon rainfall and post monsoon rainfall were all varied across the time horizon. Such variations in rainfall pattern increase possibility of climatic extremes like irregular monsoon, droughts and floods which ultimately affecting agriculture production and productivity. Non- monsoon rainfall and

monsoon rainfall was in decreasing trend and total precipitation was decreased with 0.33 mm per year in this station. The analysis of climatic data strongly supports the farmer's perception. These strongly indicate that farmers in such scenario couldn't predict the usual rainfall pattern.

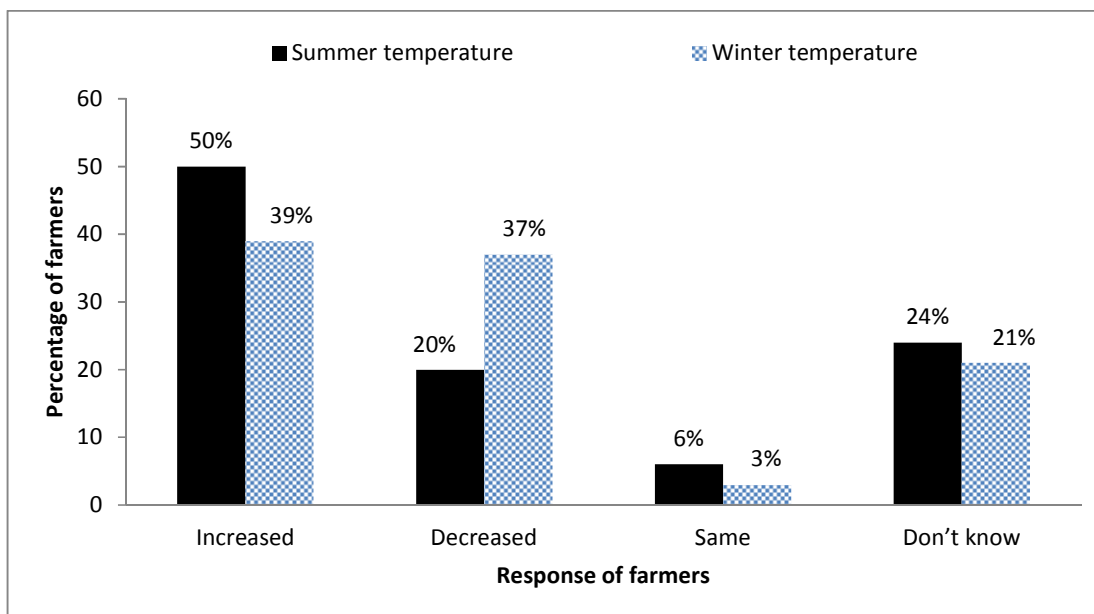


Fig. 2. Perception of farmers towards changing temperature

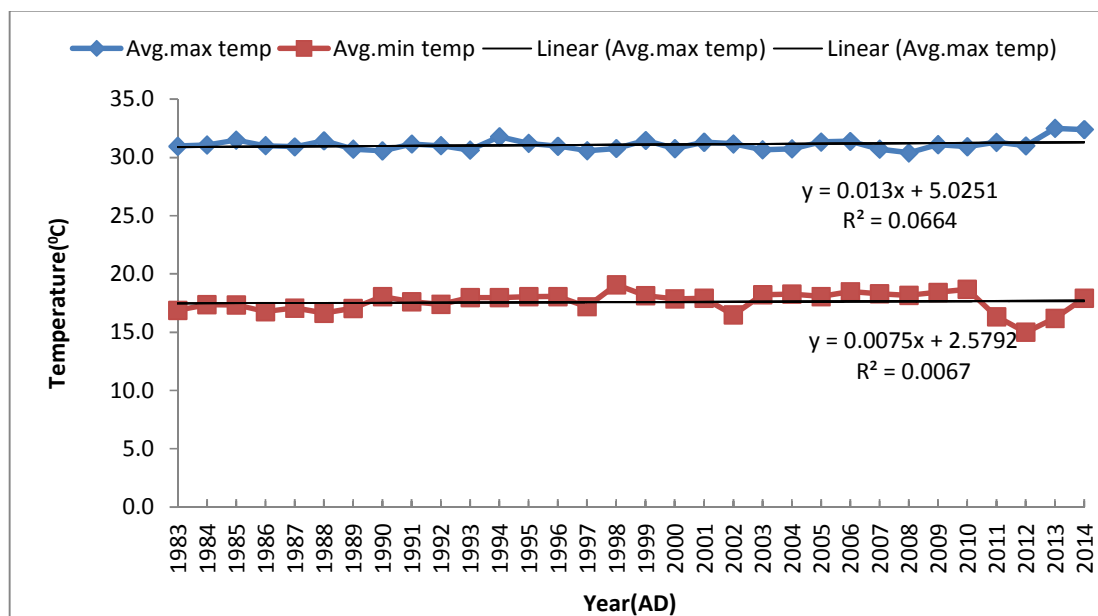


Fig. 3. Trend analysis of maximum and minimum temperature over the last 30 years (1983 – 2014) in Rampur station, Chitwan

Table 1. Perception of farmers towards change in rainfall pattern

Rainfall amount	Village				X ² value
		Siddhi	Saktikhor	Total	
	Increased	9(16.0)	12(19.0)	21(18.0)	1.23
	Decreased	33(58.0)	37(59.0)	70(58.0)	
	Same	11(19.0)	8(13.0)	19(16.0)	
	Don't know	4(7.0)	6(10.0)	10(8.0)	
Rainfall length duration					
	Increased	7(12.0)	8(13.0)	15(13.0)	0.79
	Decreased	32(56.0)	36(57.0)	68(57.0)	
	Same	6(11.0)	9(14.0)	15(13.0)	
	Don't know	12(21.0)	10(16.0)	22(18.0)	
Rainfall time					
	Earlier	5(9.0)	7(11.0)	12(10.0)	1.99
	Later	8(14.0)	7(11.0)	15(13.0)	
	Same	7(12.0)	5(8.0)	12(10.0)	
	Unpredictable	25(44.0)	34(54.0)	59(49.0)	
	Don't know	12(21.0)	10(16.0)	22(18.0)	

Figures in parenthesis indicates percentage

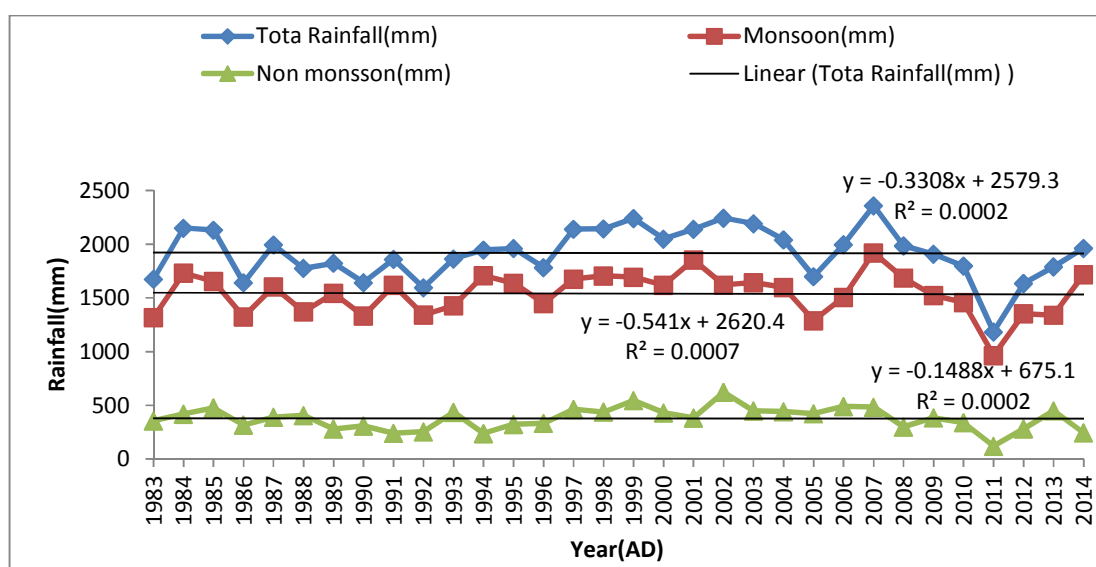


Fig. 4. Trend of rainfall in Rampur station in last 32 years (1983-2014)

4. CONCLUSION

This paper analyzed the trends and farmers perceptions about climate change in Chepang community of Chitwan district. Occurrence of monsoon rainfall varies from year to year and is decreasing in trends in long term basis. Furthermore, the actual trend shown by the recorded data was justified by the perceptions of the local people resembling with the findings of the study, whereas summer and winter temperature increasing over a period of time. This clearly indicates the warming trend in the area. This increasing temperature and

decreasing patterns of rainfall clearly shows that this area is prone to the drought which may cause decrease in agricultural production and productivity. Farmers in rural areas were still unknown about climatic change pattern; they cannot adopt adoption strategies until they will understand the climate change and its adverse impact on farming systems.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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