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Short Communication

Temperature Variability Trends in Dhubri District of Assam

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The Dhubri district is situated in the extreme western end of Assam, covering a total geographical area of 2746 sq. km. The district is under the agro-climate zone "Lower Brahmaputra Valley zone" of Assam. About 90% of the populations are member of farm-families depending mainly on agriculture for their livelihood. The district experiences a warm humid climate. The district also experiences substantial amount of pre-monsoon rainfall event starting from the month of April. The average annual rainfall is about 2244 mm. Paddy, wheat, other cereals, jute, mustard, pulses, vegetables etc. are the main crops of the district. Arecanut, coconut, citrus, betle-vine, cashew nut, spices etc. are the major horticulture crops of the district. During the last century, the temperature increase was noticed around 0.7^0C which has been surpassed by the first decade of 21st century scoring about 1^0C average global rise (Rasul *et al*., 2011). Productivity of wheat and other crop species falls markedly at high temperatures. Wheat in India is invariably exposed to extreme temperatures during some stages of development (Abrol *et al*., 1991). Acute effects of high temperature are most striking when heat stress occurs during anthesis. In rice, heat stress at anthesis prevents anther dehiscence and pollen shed, to reduce pollination and grain numbers (Mackill *et al*., 1982; Zheng and Mackill, 1982). As 90% of population of Dhubri district is dependent on agriculture based livelihood and recent trend about the global warming it is hypothesized that long-term temperature deviations may harm the crops physiologically, and ultimately crop yields are most likely to drop over the present level. Keeping this in mind, a study on trend analysis of temperature was done for the district.

The daily maximum and minimum temperature data recorded at the meteorological obsevatory of Rupsi airport (Latitude 26.8, longitude 89.5 and altitude 131ft) for a period of 24 years (1988-2012) have been used for the present study. The moving averages both for maximum and minimum temperatures for 5 years and 10 years and annual temperature anomaly, maximum and minimum temperature anomalies were calculated for both maximum and minimum temperatures. The trend analysis was done to observe if there was any significant change in temperature (Parmer and Shrivastava, 2009).

Trend analysis of maximum and minimum temperature (monthly mean) for 24 years (1988-2012) is presented in Fig.1. Maximum temperature trend for the study period (1988-2012) was in decreasing trend while minimum temperature trend was in increasing trend. Moving averages for 5 and 10 years interval for maximum temperature was decreasing and minimum temperature was increasing. The 10 years moving average was found to be very close with trend line compared to 5 years moving average.

Trend analysis of seasonal variation of maximum and minimum temperature is presented in the Fig. 2. The seasonal variation revealed that maximum temperature trend was in decreasing

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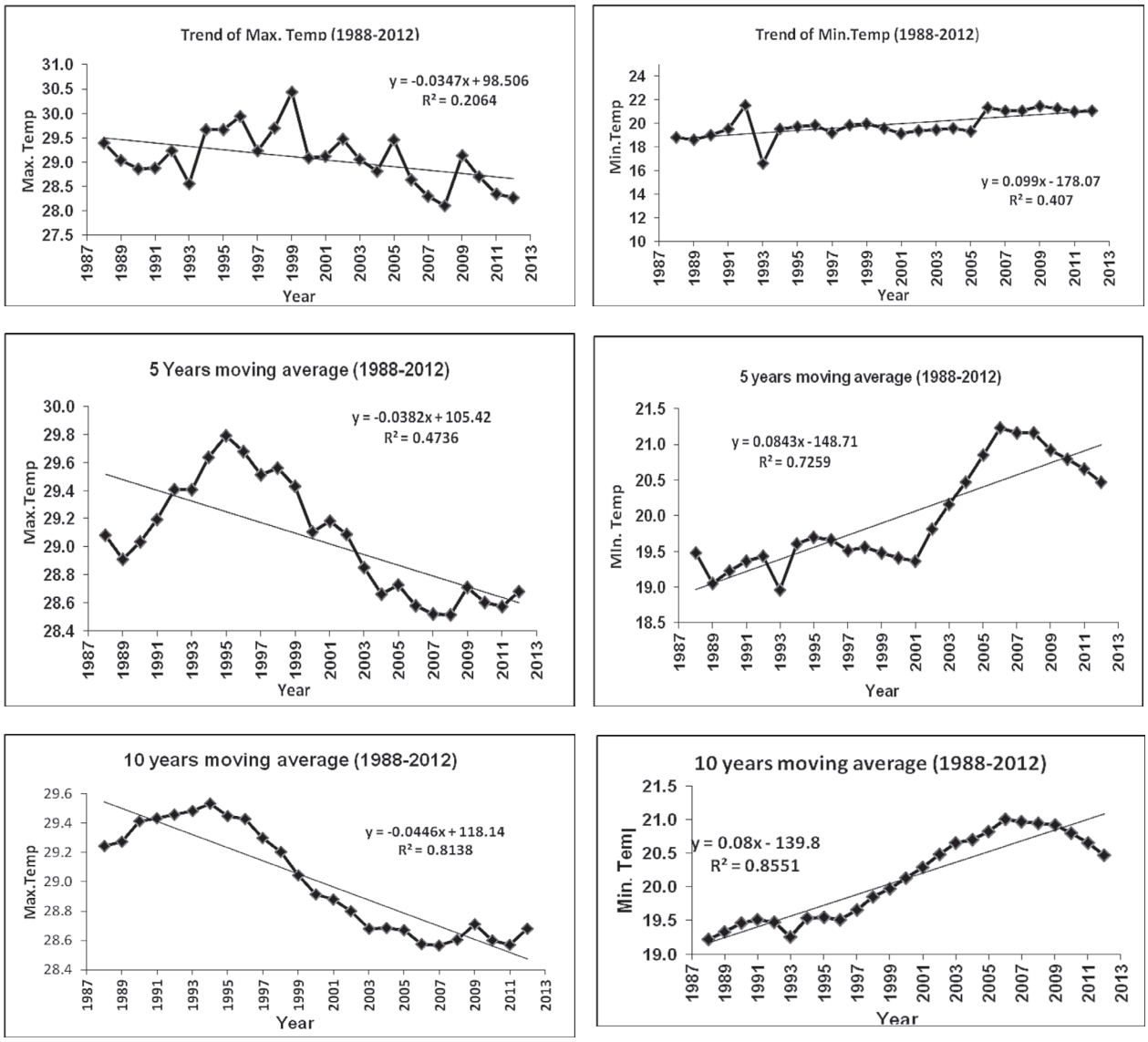

Fig. 1. Trend analysis of 24 years (1988-2012) maximum and minimum temperature (monthly mean) data

trend while minimum temperature trend was increasing for all the three seasons viz. *summer*, *kharif* (rainy season) and *rabi* (winter) season. Minimum temperature trend for *rabi* season was found to be close to the trend line.

Figure 3 illustrates the temperature anomalies of annual, maximum and minimum temperatures. In case of annual temperature anomalies, in 60% of the years positive anomaly was able to observed. Highest positive anomaly was observed in the year 1992 which was +1.0 and highest negative anomaly was seen in the year 1993 (-1.9). In case of anomaly of maximum temperatures, in 58% of the years positive anomaly was seen, as compared to 40% in case of negative anomalies. Highest positive anomaly was in 2009 which was +1.0 and the highest negative anomaly was in 1999 *i.e* -1.3. Similarly in case of minimum temperature anomalies, in 67% of the years positive anomaly was seen as compared to 33% in case of negative anomalies. From the year 2006 onwards upto 2012 negative anomaly was observed. Highest positive anomaly of 3.3 was observed in 1993 and highest negative anomaly was observed in 1992 (-1.6).

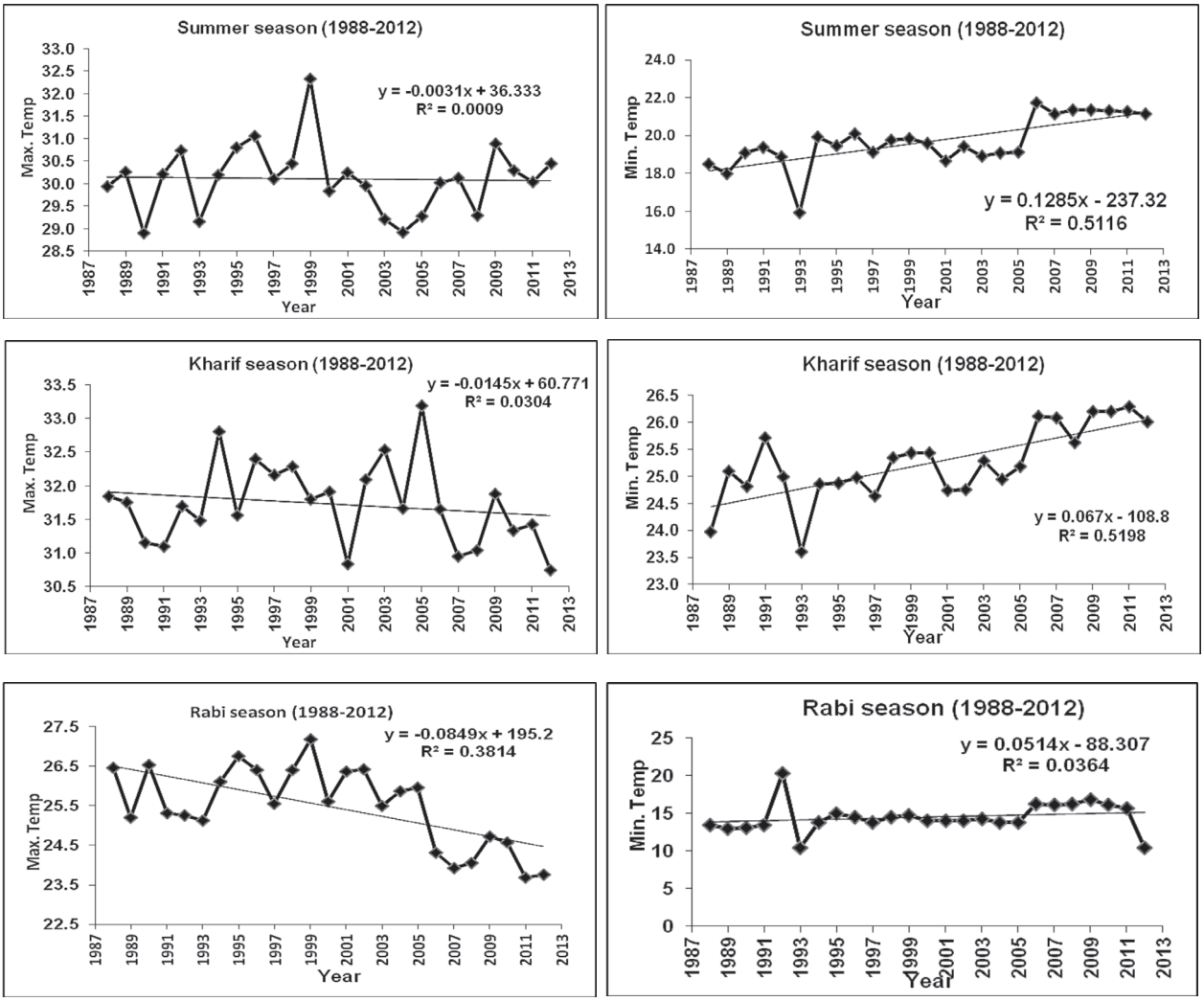

Fig. 2. Trend analysis of 24 years (1988-2012) of maximum and minimum temperature (seasonal variation)

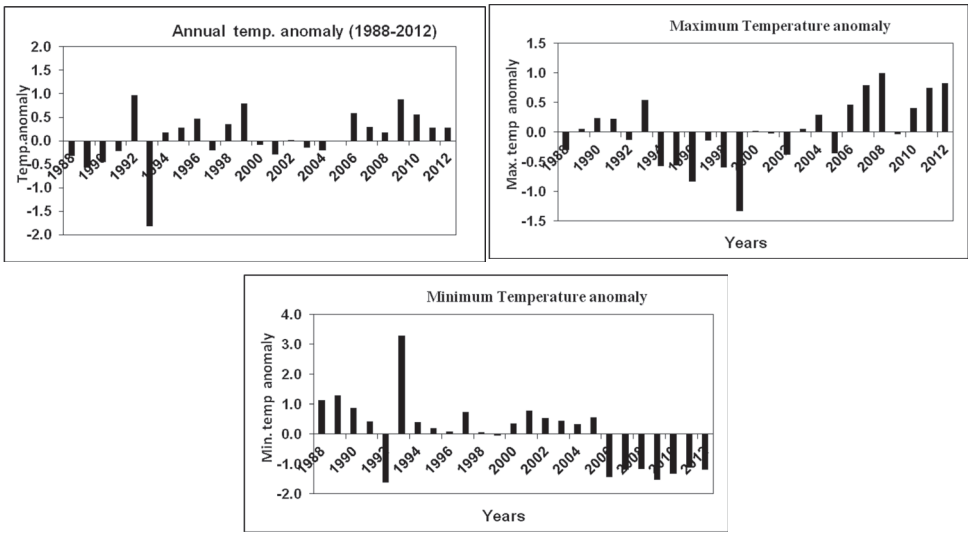

Fig. 3. Temperature anomalies of annual, maximum and minimum temperature

From the observations it could be concluded that maximum temperature range showed a decreasing trend while the minimum temperature had an increasing trend during the 24 years (1988-2012) study period. The seasonal variation trend was decreasing for all the three seasons in case of maximum temperature and increasing trend was observed in case of minimum temperature. Similar findings were reported by Murty *et al.* (2008). The trend for *rabi* season was close to the trend line in case of minimum temperature. It could be concluded that changes the weather patterns in summer and winter are resulting adverse effect on crop yield. Significant temperature increase for years enhances heat stress on plant growth and development. Higher night temperatures may reduce the net gain in the form of grain yield. Sudden shoot up of air temperatures at reproductive stage of the crop may cause significant reductions in the grain yield despite affecting the apparent health of the crops.

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