



Annual temperature profile of Thrissur: a climate change perspective*

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Abstract

Climate change is one of the most serious issues faced by the global community of the present era. Hence, maximum, minimum and average temperatures for the period 1986 to 2016 collected from the Department of Agricultural Meteorology, Kerala Agricultural University (KAU), Vellanikkara were analysed to study the change in climate over years of Thrissur district. The present study showed no significant trend with respect to the annual mean maximum temperature from 1986 to 2016 as the temperature was not continuously progressive. But during 2011- 2016, for the annual mean maximum temperature, increasing trend was found and it was significantly increasing by 0.1495°C per year. The annual mean minimum and average temperatures also showed no significant trend from 1986-2016.

Keywords: Maximum temperature, Minimum temperature, Average temperature, Temperature trend

Global warming is one of the major factors that cause climate change (Webster *et al.*, 2008). Temperature and humidity changes have a profound impact on agricultural and animal husbandry systems when compared to other climatic variables. As climate is the long-term average of the meteorological variables, data for 30 years were collected and analysed. This study investigated the trends in annual mean maximum, minimum and average temperatures of Thrissur district over a year, each year from 1986 to 2016.

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Materials and Methods

Meteorological data of 30 years from 1986 to 2016 regarding maximum, minimum and average temperatures were collected for the present study from the Department of Agricultural Meteorology, Kerala Agricultural University (KAU), Vellanikkara, to analyse the trends in annual mean maximum, mean minimum and average temperatures of Thrissur. The total period was also classified decennially. The annual and decadal trends were found using regression methods. Statistical analysis was done by using the software Statistical Products and Service Solutions (SPSS), Version 24.0

Results and discussion

Trends in annual mean maximum temperature from 1986 to 2016

During the period from 1986 to 1990, the highest mean maximum temperature was recorded in 1987 (32.86°C) while the lowest was in 1986 (31.72°C). An increase of 0.11°C over a period of five years was observed (Fig.1a) but the trend was not significant ($P>0.05$). During the period from 1991-2000, the highest mean maximum temperature was recorded in 1995 (33.00°C) while the lowest was recorded in 1999 (31.57°C). A decrease of 0.64°C was observed during these ten years (Fig.1b) but the trend was not significant ($P>0.05$). During the period from 2001-2010, the highest mean maximum temperature was recorded in 2003 (32.22°C) while lowest in 2006 (31.62°C). There was a decrease of 0.16°C during these ten years (Fig.1c) but there was no significant trend ($P>0.05$) was observed. During the period from 2011-2016, the highest mean maximum temperature was recorded in 2016 (32.64°C) while the lowest was recorded in 2011 (31.78°C). There was an increase of 0.89°C in the above six years in mean maximum temperature (Fig.1d). A significant increase of 0.1495°C per year ($P<0.05$) was observed over a period of six years (2011-2016). When the temperature trend of 30 years (1986-2016) was analysed, the highest mean maximum temperature was recorded in 1995 (33°C) while the lowest was recorded in 1999 (31.57°C). A decrease of 0.16°C was recorded

during these 30 years (Fig.1e) but the trend was not significant ($P>0.05$). The present study showed no significant trend for the annual mean maximum temperature from 1986 – 2016 as the temperature was not continuously progressive.

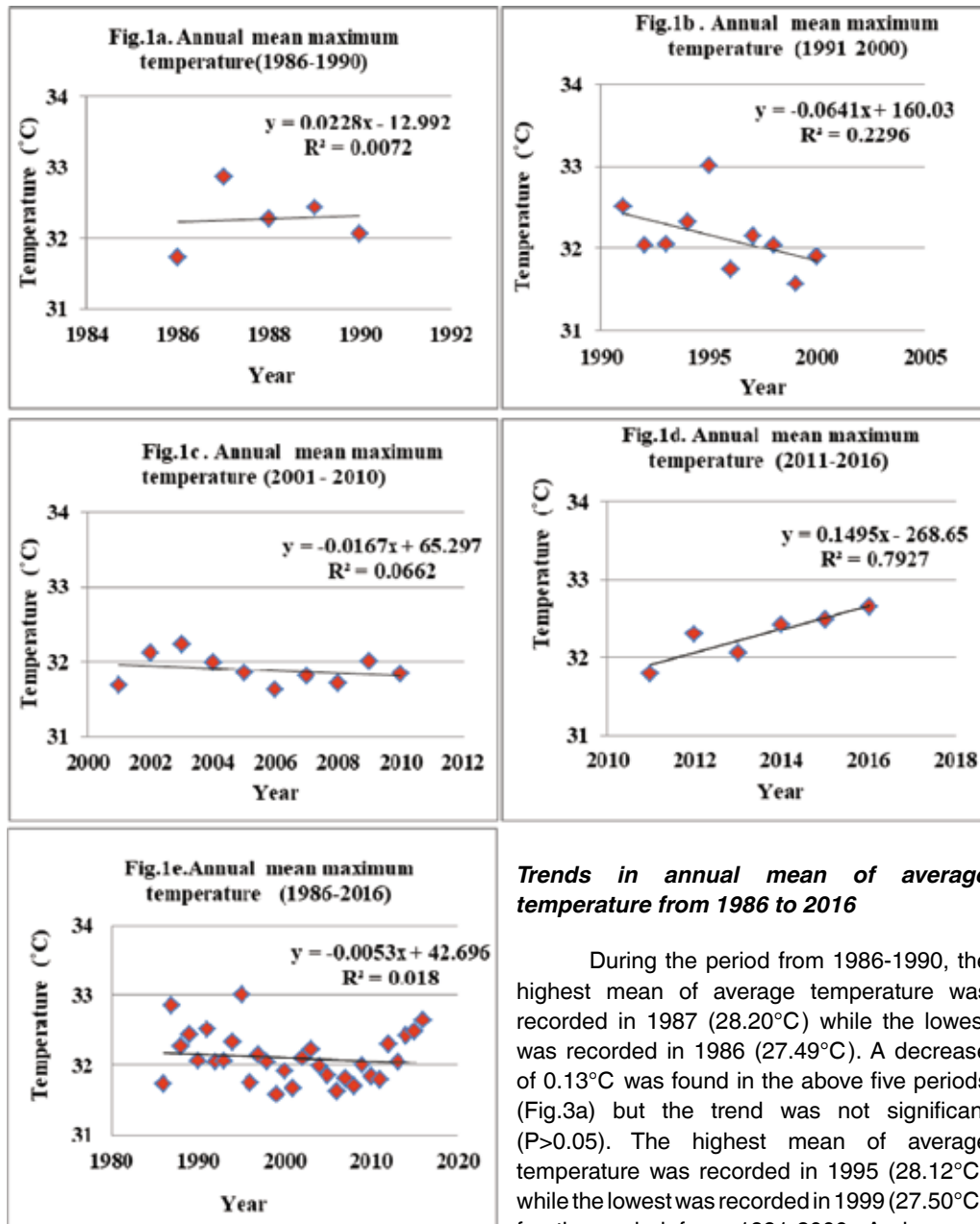
According to Rao (2016), the temperature in Kerala has shown a significantly increasing trend since 1980. The annual mean maximum temperature across the state of Kerala, varied from 30.4°C to 32.4°C with an average of 30.5°C.

Trends in annual mean minimum temperature from 1986 to 2016.

During the period from 1986 to 1990, the highest mean minimum temperature was recorded in 1987 (23.54°C) while the lowest in 1990 (23.10°C). A decrease of 0.36°C was observed during these five years (Fig.2a) but the trend was not significant ($P>0.05$). During 1991-2000, the highest mean minimum temperature was recorded in 1998 (23.70°C) and lowest in 1992 (22.99°C). An increase of 0.5°C was also observed in the same period but it was not a significant trend ($P>0.05$). (Fig.2b). During the period from 2001-2010, the highest mean minimum temperature was recorded in 2003 (23.56°C) and lowest in 2007 (23.10°C). An increase of 0.07°C was noticed during these ten years (Fig.2c) but it was not a significant trend ($P>0.05$).

During the period from 2011-2016, the highest mean minimum temperature was recorded in 2015 (23.79°C) and lowest in 2011 (23.24°C). An increase of 0.32°C was observed in this six-year period (Fig.2d) but no significant trend ($P>0.05$) was observed. While analysing the data of the 30-year period under consideration, from 1986 to 2016, the highest mean minimum temperature was recorded in 2015 (23.75°C) while the lowest was recorded in 1992 (22.99°C). An increase of 0.22°C was recorded in this period (Fig.2e) but it was not a significant trend ($P>0.05$).

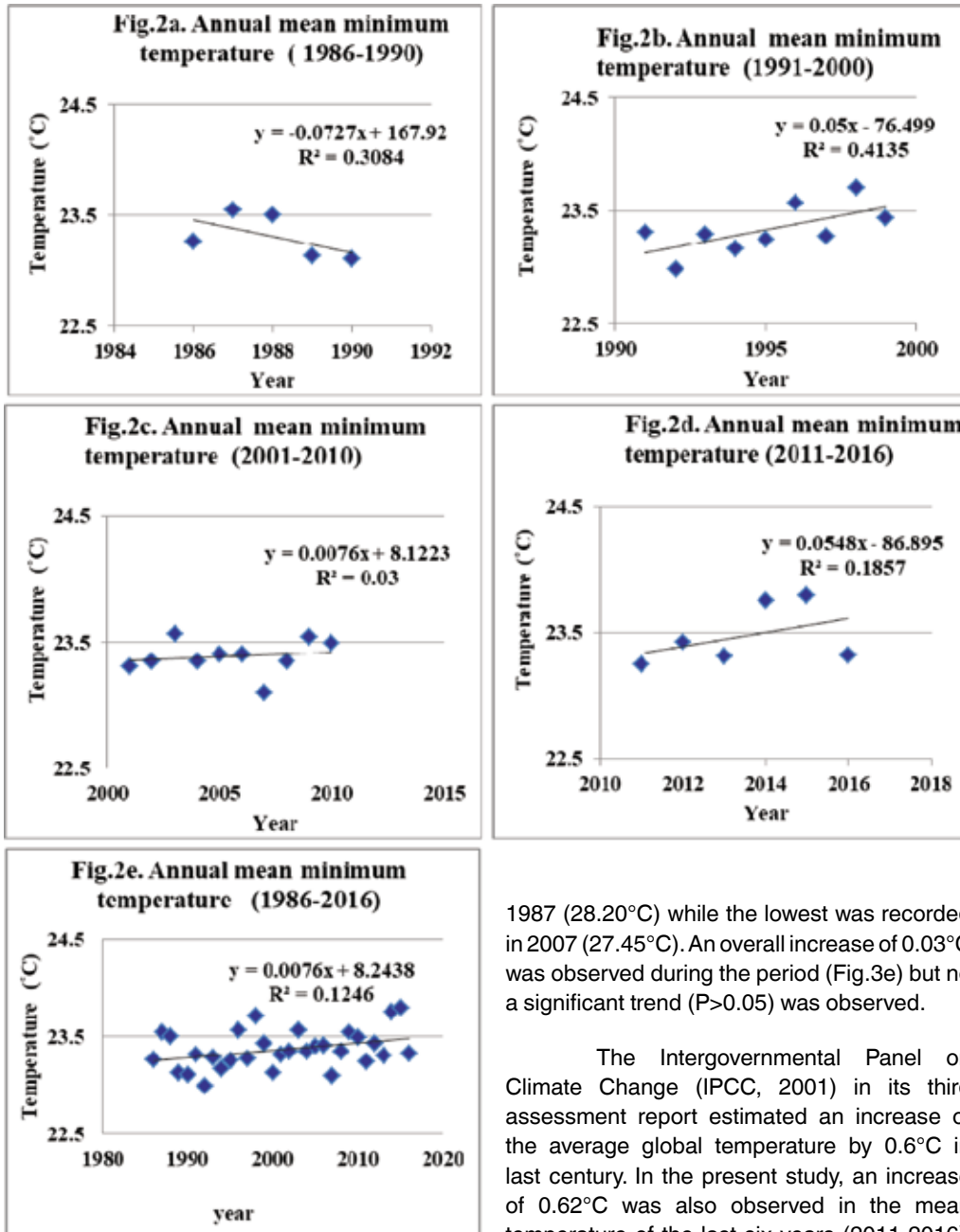
Sahai (1998) observed an increasing tendency in the mean temperature in some cities of India. Rao (2016) reported that the annual minimum temperature varied from 22.3°C to 24.1°C across the state with an average of

Fig1. Trends in annual mean maximum temperature from 1986 to 2016

Trends in annual mean of average temperature from 1986 to 2016

During the period from 1986-1990, the highest mean of average temperature was recorded in 1987 (28.20°C) while the lowest was recorded in 1986 (27.49°C). A decrease of 0.13°C was found in the above five periods (Fig.3a) but the trend was not significant ($P > 0.05$). The highest mean of average temperature was recorded in 1995 (28.12°C) while the lowest was recorded in 1999 (27.50°C) for the period from 1991-2000. A decrease of 0.2°C over ten years was noticed (Fig.3b) but it was not a significant trend ($P > 0.05$). The highest mean average temperature was recorded in 2003 (27.89°C) while the lowest was recorded in 2006 (27.45°C) in the ten-year period from 2001-2010. A decrease of 0.04°C was observed during this period (Fig.3c) but no significant trend ($P > 0.05$) was observed. The highest mean average temperature was

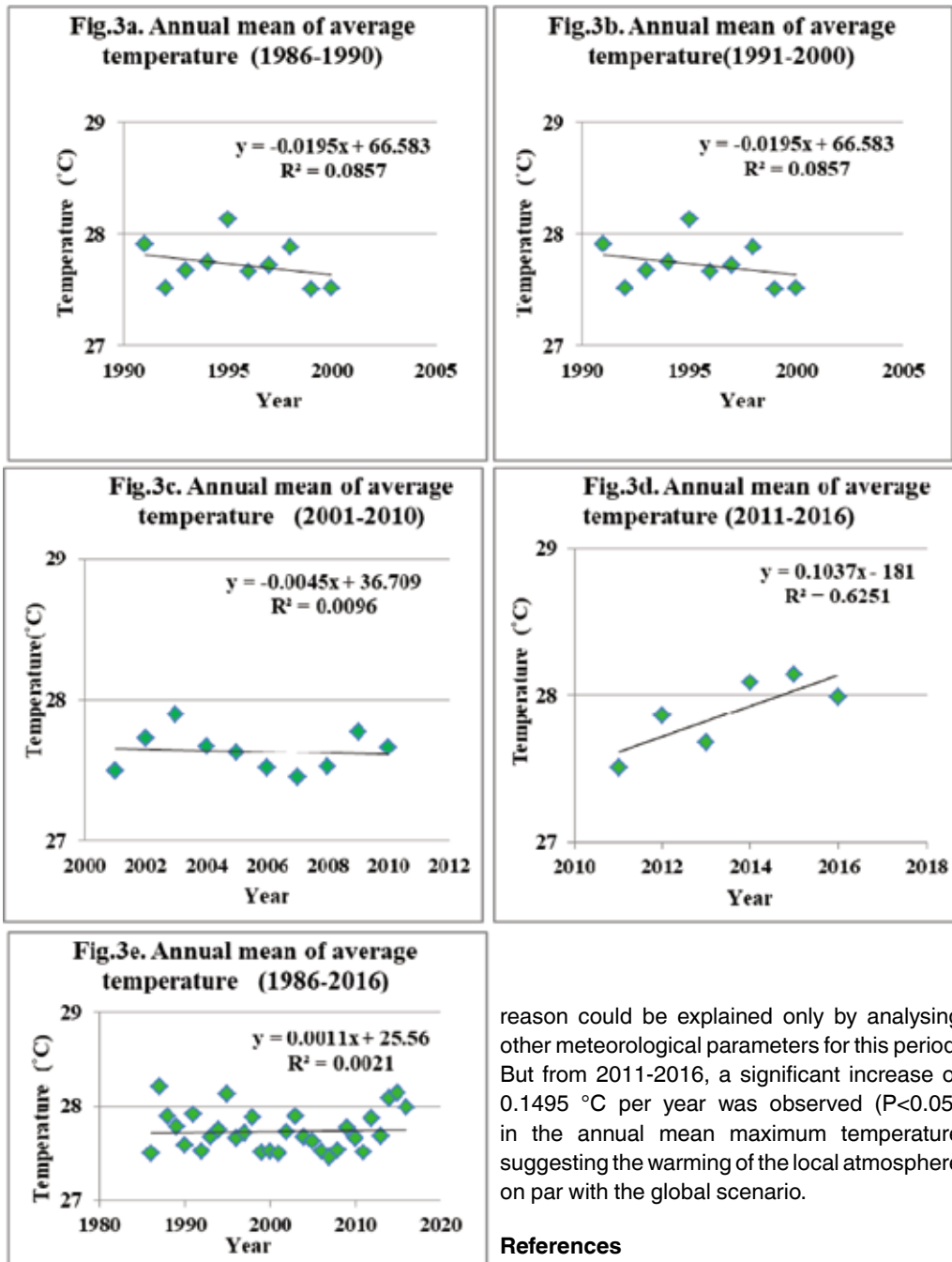
22.1°C. Anie (2018) reported that an increasing trend was shown in the minimum temperature, monthly average temperature and annual average temperature of Thiruvananthapuram, Ernakulam and Kannur districts of Kerala and observed these changes as the signs of climate change and warming nature of Kerala.

Fig.2. Trends in annual mean minimum temperature from 1986 to 2016

recorded in 2015 (28.14°C) while the lowest was recorded in 2011 (27.50°C) in a period of recent 6 years from 2011-2016. There was an increase of 0.62°C over the period of six years (Fig.3d) but it was not a significant trend ($P > 0.05$). When the data of the 30-year period under consideration were analysed, the highest mean average temperature was recorded in

1987 (28.20°C) while the lowest was recorded in 2007 (27.45°C). An overall increase of 0.03°C was observed during the period (Fig.3e) but no a significant trend ($P > 0.05$) was observed.

The Intergovernmental Panel on Climate Change (IPCC, 2001) in its third assessment report estimated an increase of the average global temperature by 0.6°C in last century. In the present study, an increase of 0.62°C was also observed in the mean temperature of the last six years (2011-2016). However, when the data for the 30-year period under consideration was analysed, no significant increase in temperature could be observed. This difference could be due to the local variability in meteorological parameters. Das (2008) reported that in Pune the incidence of slight decrease of maximum, minimum, and mean annual temperature had occurred in the last decades of the twentieth century.

Fig.3. Trends in annual mean of average temperature from 1986 to 2016

reason could be explained only by analysing other meteorological parameters for this period. But from 2011-2016, a significant increase of 0.1495 °C per year was observed ($P < 0.05$) in the annual mean maximum temperature suggesting the warming of the local atmosphere on par with the global scenario.

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Conclusion

In the present study the annual mean maximum temperature, minimum temperature and average temperature did not show any increase when the data pertaining to the 30-year period under consideration were analysed. The

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