Use of Parametric and Non-parametric approaches to identify Rainfall Patterns in Batticaloa district in Sri Lanka over last three decades

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Introduction

Batticaloa district (latitude7.72°,longitude81.7°) is situated in the central part of the Eastern province in Sri Lanka. District is in the flat coastal plain and boarded by the Indian Ocean in the east. Its average elevation is around 5 meters. Mean annual temperature of the district is around 28℃ ranging from 25 ℃ to 35 ℃. Batticaloa has a tropical wet and dry climate.

Because of climate conditions and low elevation, district is affected by both flood and drynessin almost every year.The consumption of water has gone up due to the development in irrigation and agriculture with the increase in population. Therefore, a proper water management system is essential.

Only a few comprehensive studies have been conducted in Sri Lanka on the trends of rainfall depth over long periods (Jayewardene et al., 2005). Domroes and Schaefer (2000) have carried out a study for annual rainfall over two time periods (1895 – 1996 and 1960 – 1996) for 13 stations.

The aim of this analysis was to gain the knowledge of variation in rainfall, both spatially and temporally, which is essential for proper water management practices, designing water storages, planning drainage channels for flood mitigation and controlling damages.

Methodology

Batticaloa district monthly rainfall data, from 1978 to 2010, were collected from meteorological department. The linear trend and seasonal pattern were analyzed separately by using annual and monthly rainfall data.

Annual rainfall was used for the analysis of trend. The Mann-Kendall rank test was used to test the existence of a linear trend of the rainfall during this period. The result obtained from this test was confirmed by the use of Spearman's rank test. Pilon and Cavadias (2002) have shown that nonparametric tests, Mann-Kendall rank test and Spearman's rank test which indicate only the direction have the same power of detecting linear trend. Further, obtained results were confirmed by using a parametric approach, the least-square regression method.

Then monthly rainfall data were analyzed to identifythe seasonal patterns. The decomposition method was used for analyzing seasonal pattern. All decisions were drawn at 5% significance level and the software R(version 2.15.2) was used for the analysis.

Results and discussion

During this period, the minimum rainfall, 920 mm, had been recorded in 1983 and the maximum rainfall, 3080.7 mm, was recorded in 1994. Annual average rainfall, during this period, was 1609 mm. Average monthly rainfall during *Yala* and *Maha* seasons were 48mm and 225 mm respectively.

It was not able to reveal either an increasing or a decreasing trend in the rainfall during the period from 1978 to 2010. This confirms the result that there was nota long range trend in rainfall in Batticaloa district (Jayewardene et al., 2005).

Rainfall is not equally distributed throughout the year and exhibited a seasonal pattern (three different patterns) within the year. In most of the years, rainfall decreases, on average, from 240 mm to 36 mm within the period January to May. From June to August, neither increment of decrement in rainfall could be observed. But an increasing trend could be observed from September to December. That was, on average, from 82 mm to 409 mm. Past studies have identified four seasons in a year (Domroes and Ranatunge, 1993) in some other areas.

Conclusions

There was not either an increasing or a decreasing trend in the rainfall during the period from 1978 to 2010. But rainfall change seasonallywith three different patterns within the year.There is a decreasing pattern in rainfall from January to May, while there is a steady pattern from June to August. Rainfall increase from September to December.

References

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