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Long-term trend in rainfall identify priority zones for targeting climate smart agricultural technologies in East and Southern Africa

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Climate change and variability has increased frequency and intensity of agricultural drought with consequent impacts on global agricultural production. These impacts are significantly higher in rain-fed agriculture in Africa. Adoption of climate smart agricultural (CSA) practices is one of viable option to mitigate impacts of climate change and variability. Specific CSA technologies are suited for particular biophysical context. Spatial targeting is required to guide their dissemination in suitable context and support site specific agro-advisory. Information on spatial-temporal trends of rainfall that could support spatial targeting of CSA technologies in Africa is limited by sparsely distributed and poorly monitored meteorological stations. Satellite derived products offer a logical alternative for discerning long-term spatio-temporal trends in rainfall. Remote sensing derived monthly and annually aggregated time series rainfall data spanning 34 years was obtained for Tanzania, Malawi and Zambia. Mann-Kendall test was used to identify zones with significant monotonic changes. The magnitude of change was determined using Theil-Sen's slope estimator. Zones with significant long-term trends were identified for targeting appropriate CSA technologies depending on direction and magnitude of observed trend. Maps revealing zones experiencing significant increasing and decreasing trends in rainfall over space and time were generated. The corresponding rate of change (Theil-Sen's slope) was mapped and matched with changes. For monthly time series, May to September recorded the highest area with significant decreasing trend but of low magnitude. Rainfall in Zambia revealed a significant decreasing trend in October but increase in November and December. Results in this paper identify spatial and temporal trends in rain-fed agricultural potential. Maps on long-term spatial-temporal trends in rainfall have great potential to guide development partners and extension agents on spatial targeting CSA technologies to appropriate zones to reduce their risk of failure. Results further demonstrate the potential of time series satellite derived rainfall data in guiding spatial targeting of CSA technologies and agro-advisory services.

Key words: climate change, drought, monotonic trends, spatial-temporal analysis, spatial targeting, Satellite rainfall estimates