The study investigated potential of enhancing precipitation through cloud seeding during October-November-December (OND) season. Rainfall, cloud top temperature (CTT), aerosol optical depth (AOD) and wind data were used. Short-Cut Bartlett correlation, composite wind and time series analysis, and HYSPLIT backward trajectory analysis were used to achieve the objectives of study. Precipitation showed decreasing patterns with peaks between pentad 65 and 68. Delineated dry years (18) exceeded wet years (9). Low level winds were predominantly north-easterly during dry years characterized by continental trajectory. AOD values increased in all stations during dry year with aerosol load being higher in areas characterized by depressed rainfall. Pollutants suspended 1000 above mean sea level (AMSL) originated from Arabian and India subcontinent and pollutants suspended below 1000 AMSL were predominantly south easterly during wet years originated from Western Indian Ocean and characterized by maritime trajectory. Mean CTT during dry/wet years were positve over coastal areas while central, Rift-valley and Lake Victoria basin showed negative values, indicating presence of seedable conditions and thus potential cloud seeding to enhance rainfall and alleviate existing water stress.