



Research Article

INFLUENCE OF INTER SEASONAL RAINFALL VARIABILITY ON CHILLI YIELD OVER THOOTHUKUDI DISTRICT IN TAMIL NADU

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Abstract: Dryland horticulture is completely dependent on the monsoonal rainfall for its crop success. Chilli crop cultivation proves to be remunerative in a rainfed region like Thoothukudi district of South Tamil Nadu where the major rainfall contribution is from North-East monsoon. The influence of seasonal rainfall variability on chilli was explored through correlating the inter-seasonal rainfall deviation with chilli productivity using the 30 years (1983-2012) rainfall and chilli productivity data. Results indicated that chilli productivity had the relationship with seasonal rainfall by 45 percent. The study further revealed that chilli crop yield dropped in five out of 10 dry rainfall years and excess rainfall years also reduced the yield of chilli crop. It could be understood from the results that low and high rainfall years adversely affect the yield of chilli crop.

Keywords: Rainfall Variability, Chilli, Crop Simulation Model

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Introduction

Weather takes almost 60 percent share over the vulnerable Indian agriculture, predominantly rainfall during South-West monsoon being a game changer in India [1] and North-east monsoon for Tamil Nadu. The near century is likely to create a vulnerable monsoon behaviour that negatively impact crop productivity [2]. Drylands of Asian countries are in the verge to face the challenge of drought to a greater extent [3]. Drought can directly affect crop production and indirectly influence the salinity stress on chilli crop. Chilli crop is sensitive on soil salinity imparting its effect on growth parameters and eventually fruit yield [4]. Farmers in southern zone of Tamil Nadu tend to choose crop based on seasonal temperature and precipitation. Thoothukudi is one such district in the Southern Agro Climate Zone of Tamil Nadu with maximum temperature of 42°C, minimum temperature of 23°C and 666 mm rainfall [6]. Chilli is a predominant spice crop of Thoothukudi district covering 11402 ha area which is 5.77 percent of the crop sown area in 2016-2017, producing 6930 tonnes and attaining the productivity of 608 kg/ha. This research article presents the impact of seasonal rainfall variability on chilli productivity over Thoothukudi.

Materials and Methods

Weather data

The district level daily weather data obtained from IMD was been used through Weatherman tool in DSSAT for the crop simulation. The seasonal rainfall was calculated for the major chilli growing season in the Thoothukudi district (September to April)

Crop Yield simulations

The experimental data was collected from field trial conducted in Agricultural

Research Station, Kovilpatti, Thoothukudi district. The calibrated genetic coefficient for K1 chillies was used in DSSAT model simulation for 30 years (1983-2012) to simulate the yield and assessed the impact of climate variability on chilli productivity.

Rainfall deviation

Deviation percentage of actual rainfall from the long term mean rainfall was computed using 30 years (1983-2012) weather data. The years were classified as Excess (above 19% value), Normal (+19% to -19% range) and Deficit (below -19% value) based on IMD classification and correlated with the chilli productivity for understanding the influence of varied weather conditions on chilli productivity.

Results and discussion

The results on crop simulation and rainfall deviation are presented in Table 1. It could be found that out of 10 dry years 1984, 1986, 1988, 2001, 2003 have resulted in yield drop which is evident from Fig 1. It could be noted that 50 percent of the dry years have affected the yield negatively. Rainfall deviations of -11.9, -7.6 and 19.9 percent in 1990, 1994 and 2009 respectively had also reduced the yield in spite of being the normal rainfall years. The distribution of rainfall could be emphasised to take into consideration when normal rainfall years had behaved in the negative terms. It is interesting to observe that excess rainfall by 72.1 percent in 1997 resulted in second lowest yield next to 2009 during which the least was observed among the 30 years. The trend line equation $y = 0.9139x + 1030.6$ indicated that rainfall had a positive effect on yield to a certain extent. The present study clearly indicates that rainfall deviation towards the negative side effects the yield and positive rainfall deviation would be beneficial to yield of chilli unless there is excess rainfall that could completely damage the crop.

Influence of Inter Seasonal Rainfall Variability on Chilli Yield over Thoothukudi District in Tamil Nadu

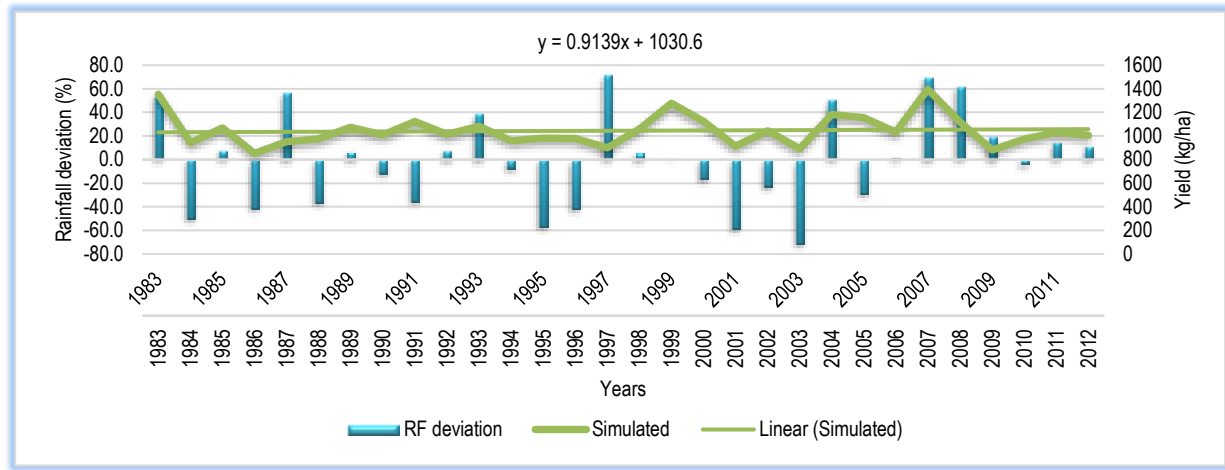


Fig-1 Influence of rainfall variability on chilli yield in Thoothukudi district

Table-1 Simulated chilli yield and seasonal rainfall deviation for Thoothukudi district (1983-2012)

Year	Simulated yield (kg/ha)	Seasonal Rainfall deviation (%)	Rainfall classification
1983	1352	54.6	Excess
1984	943	-50.2	Dry
1985	1067	8.3	Normal
1986	852	-41.6	Dry
1987	952	56.7	Excess
1988	975	-36.3	Dry
1989	1073	6.6	Normal
1990	1009	-11.9	Normal
1991	1123	-35.8	Dry
1992	1015	7.9	Normal
1993	1081	39.3	Excess
1994	959	-7.6	Normal
1995	981	-57.4	Dry
1996	980	-41.9	Dry
1997	901	72.1	Excess
1998	1058	5.7	Normal
1999	1276	1.4	Normal
2000	1124	-16.8	Normal
2001	914	-59.0	Dry
2002	1043	-22.8	Dry
2003	892	-71.8	Dry
2004	1182	51.2	Excess
2005	1154	-29.2	Dry
2006	1033	2.6	Normal
2007	1396	70.0	Excess
2008	1117	62.2	Excess
2009	881	19.9	Normal
2010	973	-4.0	Normal
2011	1030	15.1	Normal
2012	1006	11.6	Normal

The r square value of 0.45 between yield and seasonal rainfall revealed that rainfall influenced the yield by 45.5 percent and certain other factors are deciding chilli productivity in Thoothukudi district.

Conclusion

It could be concluded from the above study that the inter-seasonal rainfall variability proves to be an influential factor in the yield component of chilli crop over Thoothukudi district of Tamil Nadu. Moreover the yield drop during normal years and good yield in Dry years indicate that further exploration is necessary in the rainfall distribution pattern and several other factors to be included in yield estimation in future.

Application of research: The research tends to analyse the influence of rainfall variability on chilli yield over Thoothukudi district which can further be extended to other chilli growing areas.

Research category: Agricultural Meteorology

Abbreviations:

IMD- India Meteorological Department

DSSAT- Decision Support System for Agro Technology Transfer

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Study area: Agro Climate Research Centre, Tamil Nadu Agricultural University, Coimbatore, 641 003

Cultivar/Variety name: K1 chillies

Conflict of interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

Ethical Committee Approval Number: Nil

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