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DETERMINING THE LENGTH OF GROWING PERIOD (LGP) FOR EFFICIENT CROP PLANNING AND SUSTAINING FARM PRODUCTIVITY IN THE RAINFED SLS OF KARNATAKA

M.MAHADEVASWAMY, S.RAMESH AND S.S.SREENIVAS

ICAR-Central Tobacco Resarch Institute, Rajahmundry 533 105

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The Southern Transitional Zone (STZ) of Karnataka with 70% of the area under rainfed farming is characterized by dry-sub humid to semi-arid climate. Even though the zone comes under the transitional belt, productivity levels in most of the rainfed crops is either low or uncertain due to uncertain rainfall, high rainfall variability and poor crop planning. Based on the weekly rainfall or precipitation (RF) and potential evapotranspiration (PET) data of 52 standard weeks for 20 years period (1996-2015) the length of the growing period (LGP) was worked out for the zone. Successful crop production activities were possible for a period of 210 days starting from April 2nd fortnight to November 1st week in this zone during which the precipitation is sufficient enough to satisfy the minimum potential evapotranspiration (PET) demand (RF/PET ratio of >0.50). However, the 26th standard week (RF/PET ratio of <0.50) in the growing season (May 4th week and partly July 1st week) was found critical for moisture for the kharif sown crops during which precipitation is not sufficient enough to meet the minimum PET demand of the crops/vegetation in the region. On the other hand, 41st - 42nd standard weeks (RF/PET ratio of >1.50) from middle September to 1st week of October could create water logged /saturated conditions in the field for the rabi crop. Based on the LGP and the occurrence of dry or wet spells in the growing season, planting /sowing time and mid season correction measures can be planned for a particular zone/ region for optimizing and sustaining the farm productivity.

Keywords: Southern transitional zone, Length of growing period, Crop planning.

INTRODUCTION

The southern transitional zone situated in the southern part of Karnataka coming under Agro-ecological sub zone. No.7 has a geographical area of 12.2 lakh ha of which the gross cropped area is 7.3 lakh ha. Nearly 70% of the total cultivated area is mainly under rainfed farming and typically characterized by dry-sub humid to semi-arid climate (Mahadevaswamy and Giridhar, 2003). Being a transitional zone with bimodal rainfall pattern, different crops such as cereals (finger millet, maize, fodder jowar etc.,), pulses (red gram, cowpea, horse gram, field bean), commercial crops (cotton, FCV Tobacco) and horticultural crops (mango, jack, tamarind) are being cultivated in the rainfed farming areas of this zone. However, the productivity levels in most of the crops are either low or uncertain due to uncertain rainfall, high rainfall variability and poor crop planning. Dry land agriculture in arid and semi arid regions where 40% of the world's population live is more vulnerable to risks of climate change and rainfall variability, drought in particular (Sivakumar, 2012). Any strategy to increase agriculture production on a sustained basis should take explicit account of the complementarity of the agro-meteorology and development (Biswas,1994)

Productivity of rainfed farming is always uncertain due to long temporal and spatial variation in the rainfall. The crop growing period should necessarily coincide with the availability of moisture to meet the evaporative demand of the crop for successful crop production. If the proper growing season is fixed based on the length of the growing period, it is always possible to select a suitable crops/varieties and adopt productive cropping systems to minimize the risks and maximize the productivity. Considering this an attempt was made to identify the length of the growing period for efficient crop planning and productivity enhancement in rainfed environments of the STZ of Karnataka.

Weekly rainfall or precipitation (RF) and the potential evopotranspiration (PET) data for 52 Standard weeks of 20 years (1996-2015 period) were collected from the Agro meteorological

observatory situated at ICAR-Central Tobacco Research Institute Research farm, Hunsur, Mysore district, Karnataka. The agro weather station is situated at an altitude of 826 MSL with a latitude of 12^0 to18^0 N and Longitude of 76^0 to 81^0E with a long term average rainfall of 825-850 mm. Weekly rainfall (RF) and the weekly potential evopotranspiration (PET) were determined for 20 years period and the average ratio of RF/ PET was computed for each of the meteorological standard week (Table 1). The ratio of RF/ PET was plotted against the standard weeks in the graph to work out the length of the growing period (Fig.1). The length of the growing period was computed based on the number of consecutive standard weeks in the graph in which the RF/ PET ratio exceeded 0.50 and above (Jeevananda Reddy, 1983). The dry spells were also worked out based on the standard weeks having RF/ PET ratio of <0.50 while wet spells based on the standard weeks having RF/ PET of >1.50 were identified within the growing season.

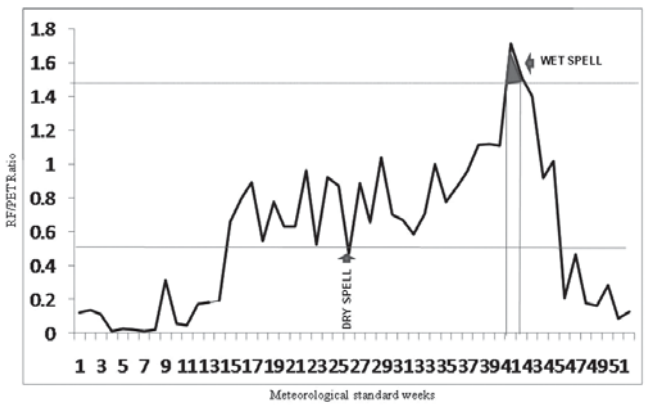

Fig. 1: Length of Growing Period (LGP) based on RF/PET ratio for each Meteorological standard week (1996-2015)

It is observed from the figure that the weeks having RF/PET ratio of 0.50 and above (which is considered as growing period) starts from 15th standard week (0.659) and continues consecutively up to 26th standard week (from April 2nd fortnight to June last week) and ratio just falls below 0.50 at 26th standard week. Once again the growing season standard week (0.50 and above) starts from the 27th standard week and continues consecutively up to 45th week standard week. Hence, the standard weeks from 15th to 25th (11 weeks) and from 27th to 45th standard week (19 weeks) are considered as growing periods which totally amounts to 30 weeks or 210 days. Thus the length of the growing season starts from 15th standard week (from April 2nd fortnight) and ends up in 45th standard week (November 1st week), with only 26th standard week with 0.466 falling below 0.50. Hence, the length of the growing season for this region can be considered from 15th to 26th (77 days) and from 27th to 45th week (133 days) amounting to 210 days. Therefore, successful crop production for about 210 days in the normal rainfall years is quite possible in the rainfed zone of STZ of Karnataka. In other words the crop production activities can be taken up from April 2nd fortnight to November 1st week in this zone during which the rainfall is sufficient enough to satisfy the minimum potential evapotranspiration demand indicating the availability of moisture for successful crop production.

However, during the growing season that extends from 15th week to 45th standard week, there are certain periods which are called as dry spells (RF/PET ratio below 0.50) and certain periods called as wet spells (RF/PET ratio more than 1.50). While 26th standard week coming under the dry spell, the standard weeks 41st and 42nd are coming under wet spells. The 26th standard week in the growing season may be critical for moisture which means that May 4th week and partly July 1st week could be meteorologically drought period, during which precipitation is not sufficient enough to meet the minimum PET demand of the crops/ vegetation in the region. Fortunately these dry spells/weeks are not found continuous and growth of crops may not be markedly affected if the recommended drought management practices for a given crop/crops are adopted.

The analysis indicates that farming activities can be commenced from 15th standard week onwards (i.e., from April 2nd fortnight). However, considering 1-2 weeks period for land preparation and other cultural operations, the sowing/planting operations can be commenced from the beginning of May month. FCV Tobacco, one of the important commercial crop being grown as a rainfed crop in this zone, can be planted during May as it has been observed that early planting always results in better productivity and quality. Similarly the crops like hybrid cotton (the other potential

commercial crop), sesame, jowar, cowpea etc. can be sown during beginning of May where these crops respond to early sowing as the delayed sowing leads to pest and disease incidence and poor crop productivity. However, as per the standard week analysis, May last week to July 1st week (with RF/PET ratio falling below 0.50) may become crucial for moisture availability (coinciding with high evaporation demand and temperature regimes) affecting the establishment of the early sown/planted crops. In case of tobacco which is planted very early in the season, adopting tray nursery seedlings for planting has been recommended for better establishment and uniform growth under these dry periods (Mahadevaswamy *et al.,* 2007). Similarly thinning out excess population in sorghum, DAP spray in cotton , use of anti-tranpirants, repeated harrowing to provide soil dust mulch for conserving available moisture, organic mulching (especially in horticulture crops) etc., could be successfully practiced during this dry spell period for mitigating the short duration drought effectively. One protective or life saving irrigation based on the critical stage of the crop would be of great advantage.

As the double cropping system practice is in vogue in this area, early planting also facilitates for sowing of second crops in the same field in quick succession taking advantage of late kharif rains and north east monsoon rains, which are more or less assured in this area as RF/PET ratio during this growing period is sufficiently higher than 0.50. Crops like horse gram, field bean,

Table 1: Average weekly rainfall (RF), weekly Potential Evapotranspiration (PET) and RF/PET ratio of 20 years (1996-2015) at CTRI Research Station farm, Hunsur

Standard week.	Weekly RF	Weekly PET	RF/PET Ratio	Standard week.	Weekly RF	Weekly PET	RF/PET Ratio
1	3.0	25.0	0.170	27	23.7	26.7	0.887
2	3.3	24.7	0.133	28	16.5	25.2	0.657
3	2.8	25.0	0.112	29	26.4	26.1	1.040
4	0.3	26.6	0.011	30	17.9	25.6	0.699
5	0.7	27.3	0.025	31	16.6	24.7	0.672
6	0.6	28.5	0.021	32	14.9	25.6	0.582
7	0.3	29.2	0.009	33	17.3	24.6	0.703
8	0.6	31.3	0.020	34	26.4	26.5	0.996
9	2.9	25.7	0.111	35	20.3	26.1	0.777
10	1.7	31.2	0.054	36	22.0	25.3	0.869
11	1.5	32.5	0.045	37	28.5	29.8	0.956
12	5.4	32.5	0.168	38	30.0	26.9	1.115
13	5.8	31.9	0.183	39	35.0	31.3	1.118
14	6.4	33.4	0.192	40	28.6	25.8	1.108
15	20.9	31.7	0.659	41	46.3	27.0	1.714
16	23.9	30.1	0.794	42	37.0	24.5	1.510
17	27.2	30.5	0.891	43	37.5	26.9	1.400
18	16.1	29.6	0.544	44	24.7	26.9	0.918
19	23.5	30.2	0.774	45	30.0	29.4	1.020
20	18.4	29.3	0.627	46	5.2	25.3	0.205
21	18.9	30.0	0.630	47	11.9	25.8	0.461
22	27.5	28.6	0.961	48	4.6	26.2	0.175
23	15.7	29.8	0.526	49	4.0	25.2	0.158
24	24.0	26.0	0.923	50	6.5	23.1	0.281
25	21.6	24.8	0.870	51	2.0	22.9	0.087
26	13.0	27.9	0.466	52	3.4	27.5	0.123

cowpea, short duration sunflower, transplanted finger millet, rabi maize, short duration castor etc., can be successfully taken up after the harvest of early planted kharif crops particularly in FCV tobacco felids. Other profitable double copping systems like Finger millet - Field bean, or Cowpea –Finger millet can be successfully raised especially in low to marginal lands. A long duration crop like Hybrid Cotton as sole or Red gram + Finger millet (2:8) intercropping based on the soil type can be a better option for effectively utilizing length of the growing season. Sometimes, wet spell (during 41-42 standard weeks) from middle September to 1st week of October could create water logged conditions in the field for the second crop. Hence growing of second crop should be preferably done well before the wet spell commences so that early period can escape excess moisture/water logged situations. In such situations draining away excess moisture and safe disposal of water during this period becomes absolutely necessary.

In this way, working out the length of growing period based on the ratio of RF and PET of a particular region or the zone and also identifying the critical dry spells or the wet spells in the growing period, serves as a useful guide for efficient natural resource management, proper crop management and productive crop planning to optimize the farm productivity in a given agro-ecological region.

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