Original Research Article

Analysis on length of growing period use NDVI value in Coimbatore region

ABSTRACT

Study has been conducted to analyses length of growing period use NDVI value. The LGP is normally analyses weather station data. In this study LGP analyses using NDVI data (1992-2015) from public domain AVHRR (Advanced Very High Resolution Radiometer) 1km resolution for Coimbatore regions. Length of growing period extracted for using NDVI threshold value and correlated with Normal length of growing period NBSS&LUP (1999). Using ground station data such as rainfall and PET analyzing LGP for J. Reddy method validation purpose. Study indicated that Coimbatore different regions LGP analyses among the region highest LGP was karamadai, pollachi north and pollachi south, lowest LGP was sulur region and also recommended short duration crops.

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2. remove the citation in the abstract
3.your method was not clearly stated
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Keywords: LGP, NDVI, NDVI Threshold value, Start of season, End of season

1. INTRODUCTION

The length of growing period refers to number of days in a year during which rainfall and moisture stored in the soil exceeds half of potential evapotranspiration. The National Bureau of Soil Survey and Land Use Planning estimated LGP using the PET and rainfall [1],[2]. An alternative method to analyses to LGP is the direct use of multi-temporal remote sensing data. Time series of vegetation indices, derived from optical sensors on board satellites, provide information about the green-up and senescence of vegetation during the year. These include the Advanced Very High-Resolution Radiometer (AVHRR) and the Moderate Resolution Imaging Spectroradiometer (MODIS). Many authors have performed phenological analysis on vegetation index time series from these sensors [3],[4]. The most commonly used vegetation index is the normalized difference vegetation index (NDVI), which is calculated as the near infrared minus red reflection, divided by the sum of the two [5],[11]. Normalized difference vegetation index (NDVI) reflects growing status of green vegetation, so crop monitoring could be realized by using LGP [6]. The LGP can be estimate from NDVI Threshold value, including start- and end-of-season [7],[10]. LGP analyses at the multiple years of AVHRR NDVI data [8],[9].

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2. MATERIAL AND METHODS

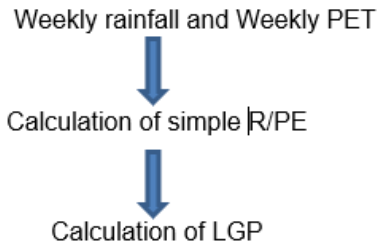
2.1 Study area:

Coimbatore district is situated in North Western part of the Tamil Nadu, the district covering an area of 4889 sq.km falls between 10°13'4" North to 11° 24'5" North latitude and 76° 39' 25" East to 77° 18' 26" East longitude with elevation 426.72 m above mean sea level. The mean annual rainfall is 657mm distributed in 47 rainy days. The mean maximum temperature is 31.5°C and minimum temperature is 21.4°C.

2.2 LGP using ground station data:

Ground station data for 24 years (1992-2015) (TNAU, ACRC, Coimbatore) such as weekly rainfall and weekly PET using analyses Length of growing period (Jeevananda Reddy method).

Image 1 : LGP using ground station data



LGP by Jeevananda Reddy method, 1983 [12]		
Climate Variable	**14 weeks moving average R/PE**	**Simple weekly R/PE**
G-Growing period.	≥ 0.75	≥ 0.50
S-Sowing Rain	-	≥ 0.50
Ps-Presowing	≥ 0.50	≥ 0.25
W-Wet spell	-	≥ 1.50
D-Dry spell	-	≤ 0.50

Chart 1 : LGP by Jeevananda Reddy method, 1983 [12]

SGS: Simple R/PE value more than 0.75

EGS: The simple R/PE value less than 0.75 (after start of growing season)

LGP using temporal NOAA-AVHRR (7-day, 1km) NDVI data composite. AVHRR-NDVI composite data were downloaded from respective website (http://maps.elie.ucl.ac.be/CCI/viewer/profiles.php) for 1992-2015. Crop information was extracted from NDVI composite using NDVI threshold values, identified for Coimbatore region. The NDVI value of the 7-day composite of the corresponding season was taken as Threshold NDVI Value for each Coimbatore regions.

2.3 Methodology for analyzing LGP using NDVI

To identify crop phenology stage, i.e., Start of Season, NDVI threshold value was identified Start / Onset of season (SOS) were considered when NDVI crosses the threshold value (TV) and continues in an upward trend. End of Season (EOS) is identified as the period when NDVI falls below the threshold value and continues a downward trend.

3. RESULTS AND DISCUSSION

Determination of LGP using NDVI value:

Different region of Coimbatore NDVI composite data indicates the trend in extent under various crop phenology. NDVI Threshold value analysis was performed to assess variability in various LGP classes. LGP 90-120 days, 120-150 days,150-180 days and 180-210 days comparison between the LGP derived from NDVI and reported by NBSSS & LUP (1999) in different regions of Coimbatore. Satellite data is able to sense crop germination only after a sufficient time-lag of 2-3 weeks after date of sowing (DOS).

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Comment [W14]: 1. which formua did you use in extracting crop information from NDVI. Show the equation and the method of extraction. Working process please
2.what is NDVI value that was taken as the threshold NDVI value
3.how did you process the AVHRR-NDVI DATA

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2.all the model used should be outline
3.the NDVI threshold value should be stated and the process of getting it should be explained
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2.the LGP should be put in table and the implications of each interval should be stated

3.1 Determination of the length of growing period using weather station data for analyse J. Reddy method – Karamadai.

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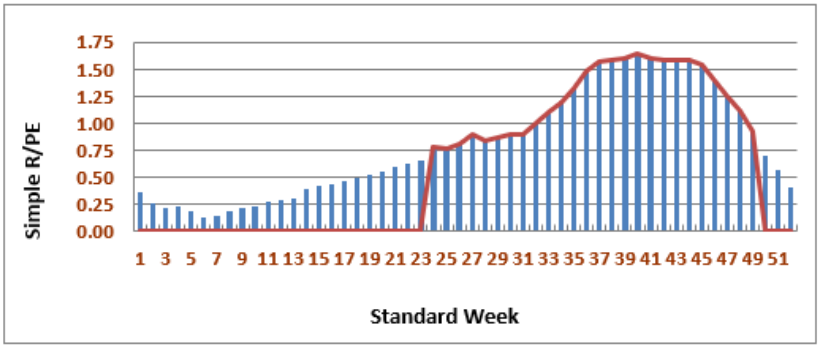

Fig 1: Karamadai region R/PE 14 week moving average 24 years (1992-2015)

The Fig.1 showed Karamadai region 24 years (1992-2015) length of growing period 175 days and the start of season was 23 standard week and end of season 51 th standard week.

3.1.1 Determination of LGP using NDVI value- Karamadai

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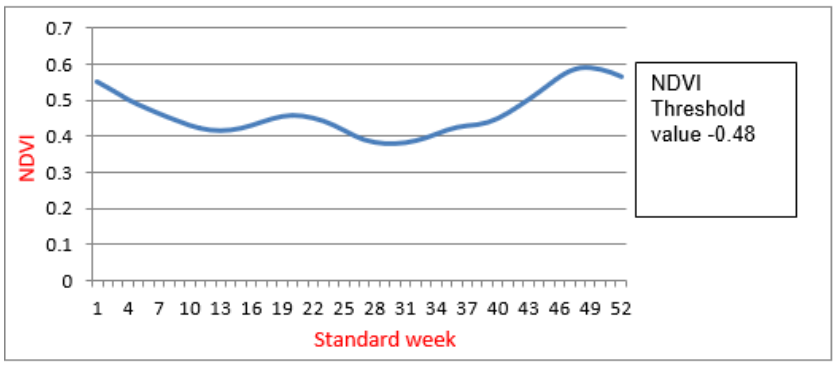

Fig 2: Karamadai region NDVI for AVHRR (1992-2015) composite data

Satellite data is able to sense crop germination only after a sufficient time-lag of 2-3 weeks after date of sowing (DOS). The NDVI value is more than NDVI threshold value stat the season and less means end of season. Fig showed start of season 25 standard week and end of season 5 th satandard week.

3.2 Determination of the length of growing period using weather station data for analyse J. Reddy method – Sulur

The Fig.3 showed Sulur region 24 years (1992-2015) length of growing period 84 days and the start of season was 36 th standard week and end of season 48 th standard week.

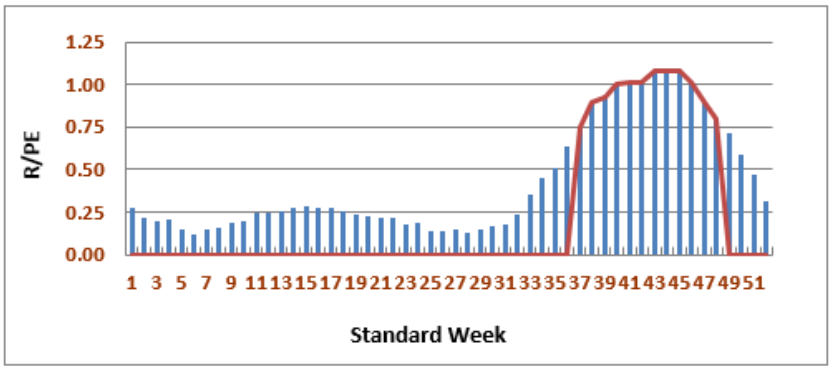

Fig 3: Sulur region R/PE 14 week moving average 24 years (1992-2015)

3.2.1Determination of LGP using NDVI value – Sulur

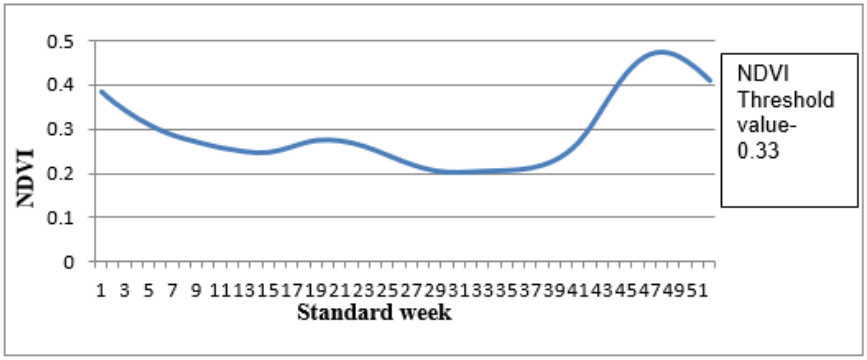

Fig 4: sulur region NDVI for AVHRR (1992-2015) composite data

The NDVI value is more than NDVI threshold value stat the season and less means end of season. Fig .4showed sulur region start of season 38 standard week and end of season 5 th satandard week.

3.3 Determination of the length of growing period using weather station data for analyse J. Reddy method – Sulthanpet

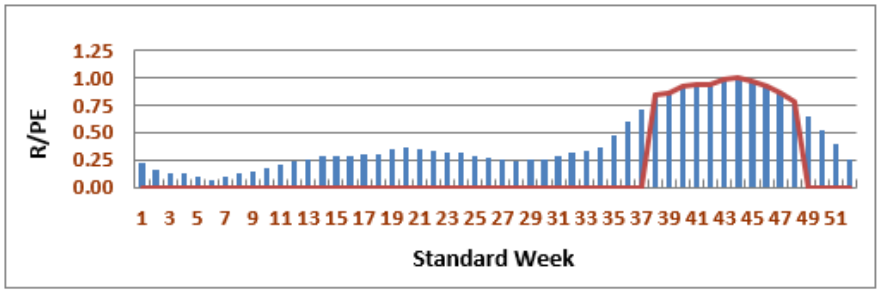

Fig 5: Sulthanpet region R/PE 14 week moving average 24 years (1992-2015)

The Fig.5 showed Sulthanpet region 24 years (1992-2015) length of growing period 91 days and the start of season was37 th standard week and end of season 48 th satandard week.

3.3.1Determination of LGP using NDVI value- Sulthanpet

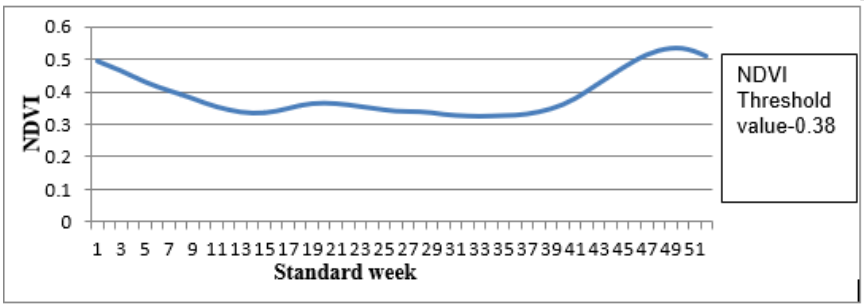

Fig 6: Sulthanpet region NDVI for AVHRR (1992-2015) composite data

The NDVI value is more than NDVI threshold value stat the season and less means end of season. Fig .6 showed Sulthanpet start of season 25 standard week and end of season 5 th standard week.

3.4 Determination of the length of growing period using weather station data for analyse J. Reddy method - Pollachi north

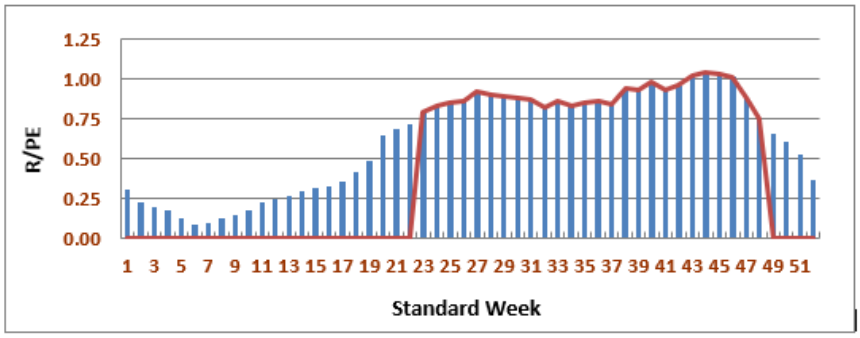

Fig 7: Pollachi north region R/PE 14 week moving average 24 years (1992-2015)

The Fig.7 Showed Pollachi north region 24 years (1992-2015) length of growing period 182 days and the start of season was 22nd standard week and end of season48 th standard week.

3.4.1 Determination of LGP using NDVI value- Pollachi north\

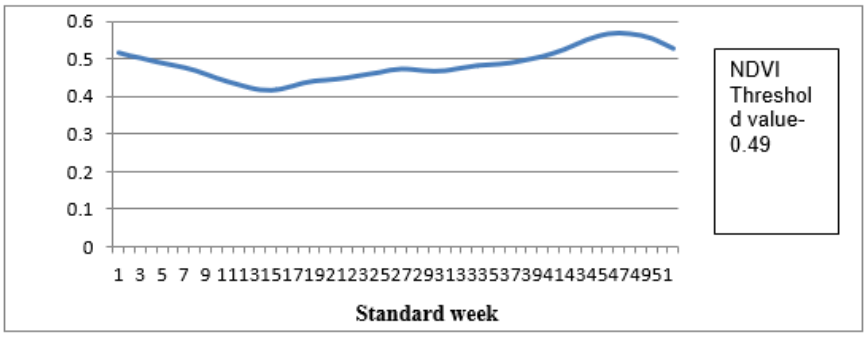

Fig 8: Pollachi north region NDVI for AVHRR (1992-2015) composite data

The NDVI value is more than NDVI threshold value stat the season and less means end of season. Fig.8 showed pollachi north start of season 26 standard week and end of season standard week 3.

3.5 Determination of the length of growing period using weather station data for analyse J. Reddy method - Pollachi south

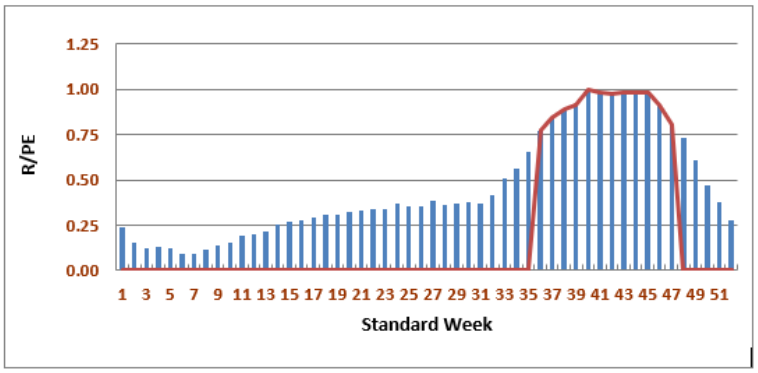

Fig 9: Pollachi south region R/PE 14 week moving average 24 years (1992-2015)

The Fig.9 Showed Pollachi south region 24 years (1992-2015) length of growing period 175 days and the start of season was 34 th standard week and end of season 48 th standard week.

3.5.1 Determination of LGP using NDVI value- Pollachi south

The NDVI value is more than NDVI threshold value stat the season and less means end of season. Fig.10 showed pollachi south start of season 38 th standard week and end of season 6 th standard week.

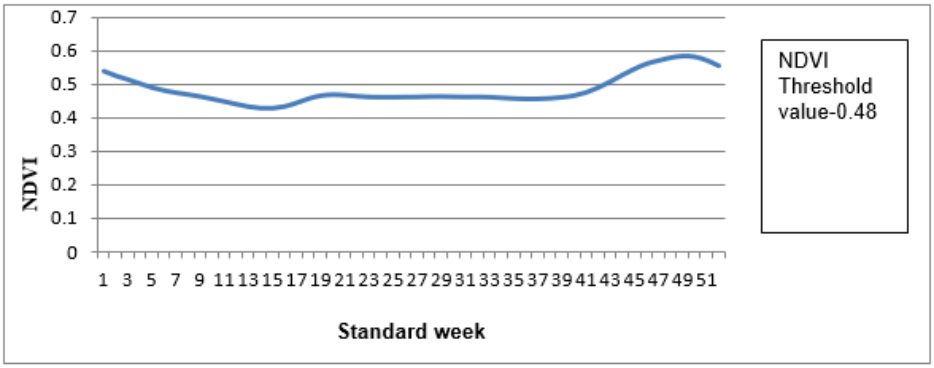

Fig 10: Pollachi south region NDVI for AVHRR (1992-2015) composite data

3.6 Determination of the length of growing period using weather station data for analyse J. Reddy method - Periyanaicken palayam

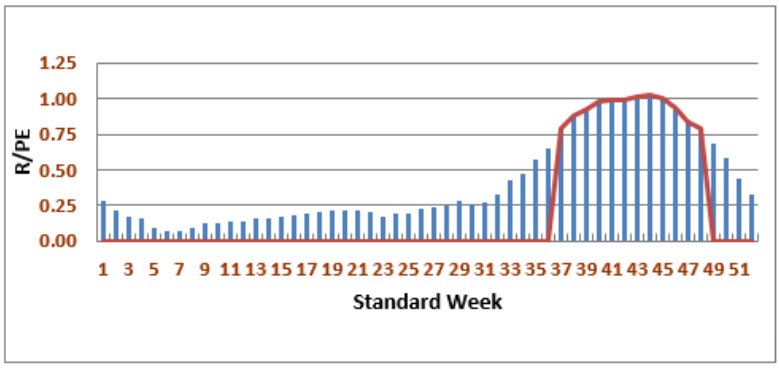

Fig 11: Periyanaicken palayam region R/PE 14 week moving average 24 years (1992-2015)

The Fig.11 showed Periyanaicken palayam region 24 years (1992-2015) length of growing period 98 days and the start of season was 36 th standard week and end of season 50 th standard week.

3.6.1 Determination of LGP using NDVI value- Periyanaicken palayam

The NDVI value is more than NDVI threshold value stat the season and less means end of season. Fig.12 showed Periyanaicken palayam start of season 39 th standard week and end of season standard week 3.

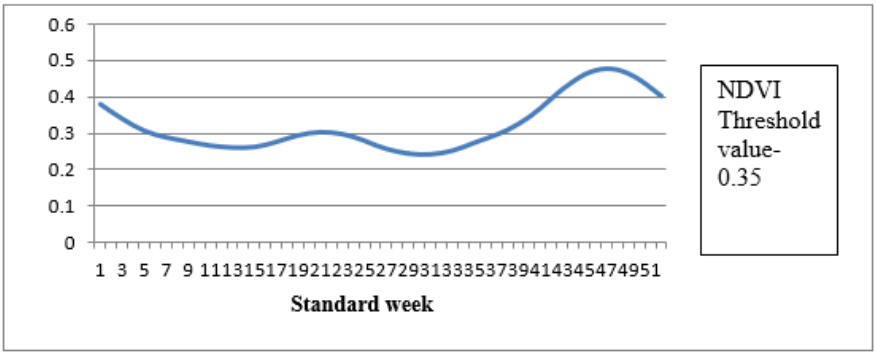

Fig 12: Periyanaicken palayam region NDVI for AVHRR (1992-2015) composite data

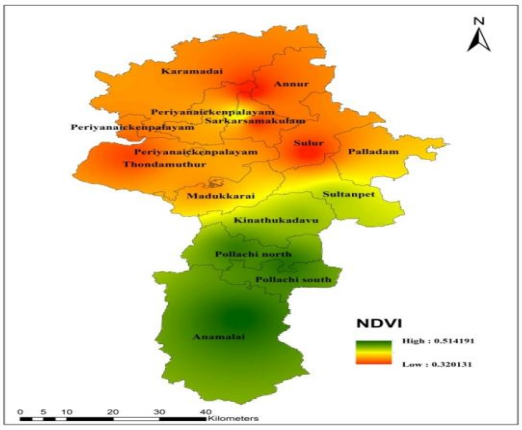

Fig 13: NDVI for AVHRR (1992-2015) composite data

Table1: Comparison of LGP for J. Reeddy method and NDVI value

S.NO	Name of the Coimbatore regions	NDVI Threshold value	Normal LGP (NBSS&LUP 1999) days	Simple R/PE using LGP days
1	Karamada	0.48	150-180	175
2	Sulur	0.33	60-90	84
3	Sulthanpet	0.38	90-120	91
4	Pollachi North	0.49	150-180	182
5	Pollachi South	0.48	150-180	175

6	Periyanaicken palayam	0.35	90-120	98

The simple linear regression NDVI threshold value and simple R/PE LGP was correlated different regions of Coimbatore. Fig .14, showed number of days length of growing period Coimbatore regions.

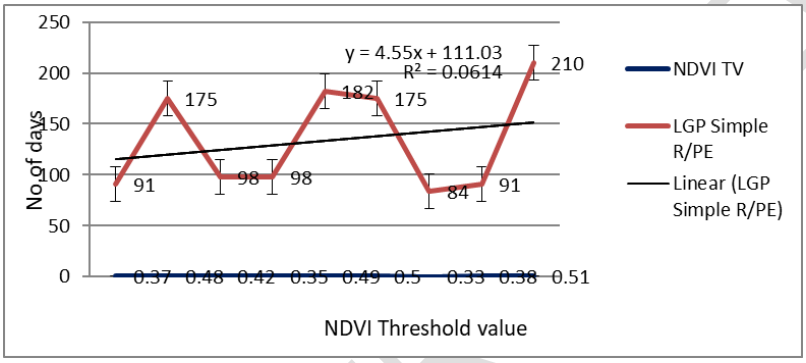

Fig 14: LGP Variations in Coimbatore different regions

4. CONCLUSION

Start and end of the rainfed crop growing periods were delineated for all the Coimbatore region from which, the length of the growing periods was estimated. The LGP is using selection of crop and variety for particular regions for crop planning. Results of this study may suggest the possibility of remote sensing in determining the length of growing period and mapping of suitable crops. Future comparison of our results with station-based LGP estimates can assist in optimal utilization of the complementarity between climate- and NDVI-based LGP estimates.

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