

# The Length of Growing Period in Dryland Farming – A Review

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**Abstract:** Dryland farming accounts for major part of food production worldwide. There are various factors to be considered in this farming to increase the crop production. Among those is the length of growing period, the soil type, cropping pattern used and the amount of water retaining capacity of soil. A wide knowledge of these factors will help to increase the crop productivity in dryland farming.

**Keywords:** Long LGP, Start of Growing Period and semi arid land

## I. INTRODUCTION

Dryland farming is generally defined as agriculture in regions where lack of moisture limits crop production to part of the year. The insufficient soil water limits crop production in approximately  $\frac{3}{4}$  of world's arable soils, which accounts for low yields in the seasonally dry and semiarid areas (Peterson, *et al.* 2006). The Length of Growing Period (LGP) is a measure of time available for crop growth in a given region. It is determined by the combination of temperature and moisture conditions. The LGP is typically measured in days and it can vary greatly from region to region. The Length of Growing Period is a complex phenomenon. It is affected by variety of factors like *climate, soil quality, water availability*. The LGP is also changing in response to climate change, these changes are having a significant impact on agriculture and they are likely to continue to do so in the future. So, In this article let us discuss about the length of growing period of crops in dryland which will in turn help us to increase the crop production in dryland by this knowledge.

### Extent and location of dryland area:

About 38 % of world's land is classified as semiarid (or) dry sub humid region and that an additional 7% is located in arid regions where some form of dryland agriculture occurs (Peterson, *et al.* 2006.).

Table 1–1. Percent of world land area (134 900 000 km<sup>2</sup>) in various regions, percent of land in regions for different dryland areas, percent of world population (6 000 000 000) in various regions, percent of population in regions living in dryland areas, and percent of population in regions engaged in agriculture. (Data constructed from values obtained from FAO, 2000b.)

Regions	World land area				Total world population	Population in drylands	Agricultural population
	Arid	Semiarid	Dry subhumid	%			
Asia and Pacific	21.5	6	15	17	56	44	59.5
Europe	5.4	12	28	23	12	18	13.5
North Africa and Near East	9.5	4	11	5	5	44	44.3
North America	14.8	12	28	23	5	19	3.0
North Asia and East of Urals	15.6	11	51	33	4	89	17.4
South and Central America	15.4	11	6	10	8	24	23.0
Sub-Saharan Africa	17.7	6	13	19	10	36	65.0
World (Total)	100	7	20	18	100	38	45.8

**Definition of LGP:**

The Length of Growing Period is defined as a period in which the available soil moisture is enough to meet the evapotranspiration requirement of the dryland crop and hence the dryland productivity is assured.

**Dryland Farming- Definition:**

According to Hedge (1995), Widstoe defined dry farming as “*the profitable production of useful crops without irrigation on lands that receive annually Rainfall of less than 500 mm.*” Widstoe said the definition could be extended to include areas receiving up to 750 mm annual rainfall if distribution of rainfall was unfavorable.

- It is important to note that this definition is limited to land where Crops are grown and does not include the management of other lands in dryland region.

**Important aspects of consideration in dryland agriculture:**

- In dryland agriculture, the important issue that must be addressed is *soil degradation*.
- Soil organic matter ~ soil productivity
- The warm condition, accelerate the decomposition of native soil organic matter during favorable soil water conditions
- Tillage – Increases rate of decomposition of organic matter
- So, less tillage should be used and more cover maintained on the soil surface in the dryland cropping system
- Livestock plays important role in dryland farming through the production of manure.
- The manure increases yield, improves soil organic matter content, enhance soil structure, increases biological activity and overall quality of soil

The LGP is given as 'G' with starting and ending of length of growing period in terms of methodological standard weeks.

**Crop status based on LGP**

LENGTH OF GROWING PERIOD	CROP STATUS
< 5 weeks	Crop failure will occur
Minimum of 14 weeks ( 98 days)	Permit the dryland crop to attain its potential productivity
14 weeks	A single dryland crop can be cultivated
14 to 20 weeks	Suitable intercropping system can be cultivated
>20 weeks	Long duration crop/ double crop can be cultivated

**Factors affecting the LGP**

**Temperature**

The LGP is generally longer in warmer regions, as crops can grow and mature more quickly.

**Precipitation**

- The LGP is also affected by precipitation, as crops need water to grow. However, too much precipitation can be a problem, as it can lead to *flooding* and *soil erosion*.
- In 1972 ICRISAT at Hyderabad, suggested recommended practice for water conservation in INDIA, is the use of dust mulch. where, most of the dryland areas in INDIA have more than 7 months of the year when there is essentially zero precipitation, and then a monsoon season of varying length when the precipitation greatly exceeds the potential evapotranspiration for at least a portion of the growing season.

**Attitude**

The LGP is shorter at high altitudes, as the temperature are cooler.

### Soil type

- Clayey soils have a longer LGP than sandy soils (Inthavong, *et al.* 2011).
- Fine textured soils have relatively longer LGP compared with coarse soil
- The positive effect of soil clay content on LGP was expected, given that soils with high clay content generally have higher water holding capacity and slower downward water movement, relative to low clay content soil
- Some soil types are better suited for crop growth than others. Foreg: sandy soils tend to warm up more quickly in the spring, which can extend the LGP.

### End Growing Period( EGP)is more affected by soil type than Start Growing Period (SGP)

- Increase clay content
- Decreases downward water flow
- Able to retain more water at the end of growing period.

### Crop type

The LGP also varies depending on the crop type. eg: corn require longer LGP than others such as wheat.

### CLIMATE CHANGE

Climate change is affecting LGP .In some regions LGP is also increasing ,while in others it is decreasing. This is due to combination of factors including rising temperature and changes in precipitation patterns

### DOWNWARD WATER LOSS (D)

- Reduction in Downward water loss
- Lengthens duration of water availability and also improves nutrient use efficiency in rice fields
- Increase LGP
- Methods to decrease (D) is soil compaction and puddling especially in sandy, coarse textured soils.

## II. TAMILNADU AND ITS CROPPING SYSTEMS

**Cuddalore and Vellore** stations comes under northeastern zone of Tamil Nadu.

Parts of Cuddalore receive some rainfall during southwest monsoon also. Hence continuous cropping is feasible during northeast monsoon which is the main source of rainfall. Average rainfall during Northeast monsoon is 880 mm and 350 mm, respectively, in Cuddalore and Vellore. Major soil type is clay loam / sandy clay loam with moderate water holding capacity of

160-200 mm in Cuddalore (IMD, 2009). During kharif season, groundnut is the major crop in the region and black gram and maize are the major crops during rabi season . High probability of wet weeks with 30 mm rainfall starts from 29<sup>th</sup> standard week and fluctuates thereafter. However, there is a well distribution of wet weeks with 30 mm rainfall after 42<sup>nd</sup> standard week. As groundnut is relatively drought tolerant during early stages of growth, erratic distribution of wet weeks as observed, does not affect much on the crop (R. P. Samui, et al.).

**Ramanathapuram comes under southern zone of Tamilnadu** ,with vertisols as major soil type .The water holding capacity is 280mm.This region receives 565 mm rainfall during northeast monsoon season only( IMD 2009). Pulses like black gram and green gram are the major crops in the region due to receipt of low rainfall. Millets like jowar are also selected when there is delay in arrival of monsoon. Probability analysis indicates that there is well distribution of wet weeks with 30 mm of rainfall from 37<sup>th</sup> standard week onwards upto 48<sup>th</sup> standard week. This ensures successful cropping though with intermittent fluctuations. However, good chance for wet weeks with 10 mm of rainfall during the period (R. P. Samui, et al.).

**Coimbatore** is the region under northwestern zone of Tamilnadu .Vertisols and aflisols are major type of soilwith water holding capacity of 300 to 250 mm ( IMD 2009).Thisregion receives rainfall during northeast monsoon only and

rabi crops like groundnut are grown. Maize is also grown after the harvest of rabi crops with residual soil moisture when good monsoon rainfall is received. When monsoon is delayed, pulse crops are selected in lieu of groundnut. Probability analysis for the wet weeks with 30 mm of rainfall indicates that cropping period commences during 40<sup>th</sup> standard week. Rainfall is received upto 48<sup>th</sup> standard week only. However probability of wet weeks with 10 mm rainfall assures sustained crop growth when chances for getting 30 mm

### Calculation of LGP

$$LGP = (P - PET) / 0.5 + 100$$

P- The total precipitation during the growing season

PET- Potential evapotranspiration during season.

100 - correction factor to account for the fact that crops do not need water all day long.

$$LGP - (T_{mean} \geq 5^{\circ}C) \times (P > 0.5 PET) + 100.$$

T<sub>mean</sub>  $\geq 5^{\circ}C$  is the number of days where the average temperature is greater than or equal to 5° C.

P > 0.5PET is the number of days, when precipitation exceeds half the potential evapotranspiration.

The best way to calculate LGP will depend on the specific data that you have available and level of accuracy that you need.

Determining LGP is a difficult process that requires extensive calculations based on precipitation, evapotranspiration and soil moisture holding capacity .It also requires understanding of moisture requirements of specific crops, since the growing period for many extends beyond the rainy season .

### III. TECHNIQUES TO INCREASE THE LGP

- Plant cold tolerant crops
- Use row covers or cloches
- Build a cold fence
- Use mulch
- Choose a right location
- Water regularly

### IV. CONCLUSION

The LGP is valuable tool for agricultural planning .By understanding the LGP farmers can choose the right crops for this regions and develop management practices that will maximize yields .

The analysis of the effect of Soil texture and rainfall on LGP showed that monthly rainfall and the clay content of soils are crucial factors in affecting year-to-year variation in the SGP and EGP. The variation in yearly SGP largely reflects the quantity of rainfall received in the early part of the wet season , while the EGP strongly reflects the soil clay content. The results also clearly indicate that soils with a higher clay content had slower downward water movement, thereby increasing the probability of there being standing water above the soil surface that can, in turn, lengthen the LGP at the end of the growing season.

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