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**C Nivetha**

Krishna College of Agriculture & Technology, (Affiliated to Tamil Nadu Agricultural University, Coimbatore, Srirengapuram, Madurai, Tamil Nadu, India)

**V Janahiraman**

Krishna College of Agriculture & Technology, (Affiliated to Tamil Nadu Agricultural University, Coimbatore, Srirengapuram, Madurai, Tamil Nadu, India)

## Rainfall analysis and suggested cropping system for Usilampatti Taluk of Madurai district, Tamil Nadu

C Nivetha and V Janahiraman

**Abstract**

The rainfall data for the years (2013-2017) pertaining to Usilampatti Taluk of Madurai District were analysed for annual, seasonal, monthly and weekly (696.5mm) periods. The existing cropping system and water requirement is also analyzed and discussed. Based on the rainfall pattern (annual, seasonal, monthly and weekly), to suggest the modified cropping system and to instruct the effective utilization of land, moisture and nutrients and also to raise the income of dry land farmers and save water scarcity.

**Keywords:** rainfall analysis, cropping system

**Introduction**

Water is vital for all life process and there can be no substitute for it and also used for transportation, is a source of power and serves many other useful purposes for domestic consumption, Agriculture and Industry. The main important source of water is rain and it has a dramatic effect on Agriculture. Plants get their water supply from natural sources and through irrigation. The yield of crops particularly in rain-fed areas depends on the rainfall pattern, which makes it important to predict the probability of occurrence of rainfall from the past records of hydrological data using statistical analysis (Arvind *et al.*, 2017) <sup>[1]</sup>. Rainfall is the primary source of soil moisture and this decides crop production particularly under semi-arid tropics. Many workers have reported suitable cropping pattern based on rainfall analysis of that particular area (Kulandaivelu *et al.*, (1980) <sup>[3]</sup>, Balasubramanian *et al.*, (1984) <sup>[2]</sup> and Panchanathan *et al.*, (1987) <sup>[4]</sup>. Such type of rainfall analysis was not done in the Usilampatti taluks, Madurai districts. So far analyze the cropping pattern and rainfall data in Usilampatti taluks. Hence, based on the rainfall analysis to suggest a suitable improved cropping pattern to Usilampatti Taluk.

This taluk is positioned at 9°97' North latitude and 77°8' East longitude with a mean elevation of 201 M. The climate of this place is semi arid tropics with a mean rainfall of 696.5 mm. The maximum temperature ranges from 28°C to 39°C (maximum during May). The minimum temperature fluctuates between 16°C to 28°C (lowest during December and January). This taluk has got a total cultivable area of 13,762.3 ha against its geographical area of 37,417.3 ha.

**Materials and Methods**

Primary data of rainfalls collected from the weather station Usilampatti blocks (2013-2017). The data was analysed and correlated by Kulandaivelu *et al.*, (1980) <sup>[3]</sup>. The 75 percent of probability rainfall was also worked out for annual, seasonal and monthly rainfall data.

**Results and Discussion****Annual Rainfall**

The mean annual rainfall of Usilampatti works to 696 mm received in 36 rainy days (Table 1). The maximum rainfall of 840 mm was recorded during the year of 2015 while the minimum 354 mm of rainfall was obtained during the year of 2016. The annual coefficient of variation recorded 43.9 percent. It indicates and assured that receipt of rainfall in every year of this taluk is recorded of 75% portion of rainfall.

**Correspondence****C Nivetha**

Krishna College of Agriculture & Technology, (Affiliated to Tamil Nadu Agricultural University, Coimbatore, Srirengapuram, Madurai, Tamil Nadu, India)

**Table 1:** Mean annual rainfall of Usilampatty (2013-2017)

Year	Rainfall (mm)	Rainy days
2013	691.5	28
2014	818.5	49
2015	840.7	42
2016	354.9	16
2017	776.7	44

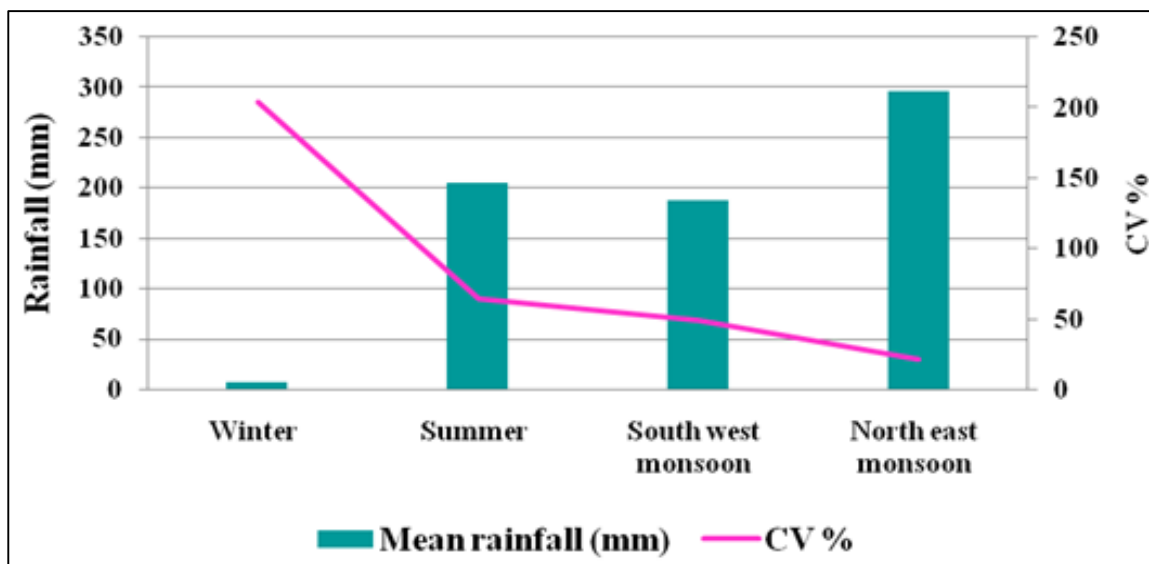
Average mean rainfall (mm)	:	696.5
Rainy days	:	35.8
Coefficient of variation (%)	:	43.9
75% Probable rainfall	:	840.7 mm

**Seasonal rainfall**

The data on the distribution of rainfall for the four standard seasons and indicate that contribution from North East Monsoon the total rainfall was recorded in 43 percent (296.7 mm), followed by Summer season (29 percent) (205.24 mm) and South West Monsoon recorded in (27 percent) (187.21 mm) and the rest by winter season (1 percent) (7.34 mm) (Table.2). Considering the CV for the four seasons, North East Monsoon stood first in respect of assured rainfall followed by Summer and South West Monsoon (Fig.1). There is possibility of receiving assured rainfall at this tract during Summer, North East Monsoon and South West Monsoon on every year. This summer rainfall is effectively used for (Summer ploughing) and followed rainfall received from South West Monsoon and North East Monsoon (Rainy crops).

**Table 2:** Mean seasonal rainfall of Usilampatty (2013 - 2017)

Season	Percentage	Mean rainfall (mm)	Percentage of Rainfall	CV %
Winter (Jan - Feb)	1	7.34	1	204.38
Summer (Mar-May)	29	205.24	29	65.08
South west monsoon (Jun - Sep)	27	187.21	37	49.59
North east monsoon (Oct - Dec)	43	296.70	43	21.84
Total		696.5 mm		



**Fig 1:** Mean Seasonal rainfall (mm) Usilampatty (2013-2017)

**Monthly rainfall**

Among the twelve months the monthly rainfall recorded in the month of October (202.3 mm) and May (95.06 mm). The period of March to May and April to November during this period recorded high amount of rainfall. In these period

received the amount of rains around 50mm/month. The rainfall data presented in the (Table.3).This could be substantiated from the data on CV and 75 percent probable rainfall for these months.

**Table 3:** Mean annual and Monthly Rainfall of Usilampatty (2013 – 2017)

Month	Mean rainfall (mm)	Percentage of Rainfall	CV %
January	0.52	0	223.61
February	6.82	1	223.61
March	66.08	9	75.10
April	44.10	6	158.14
May	95.06	14	83.55
June	19.96	3	128.05
July	10.02	1	164.24
August	67.50	10	79.83
September	89.72	13	69.58
October	202.33	29	55.14
November	62.56	9	117.03
December	31.82	5	68.55
Total	696.5 mm		

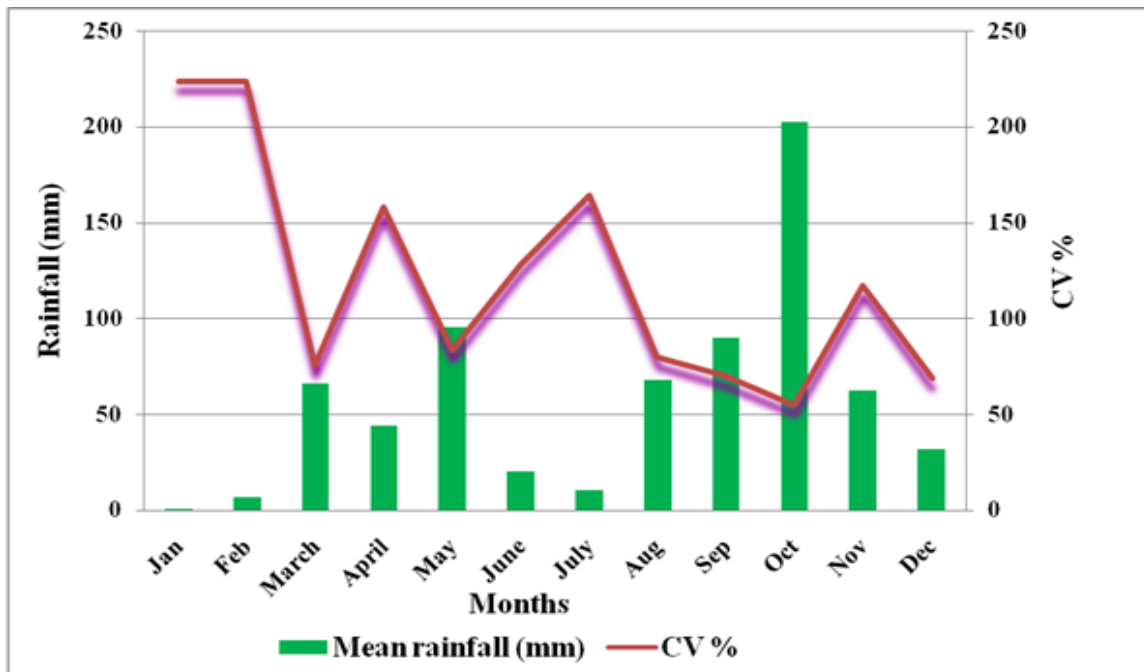


Fig 2: Mean Annual and Monthly rainfall (mm) and CV% Usilampatty (2013-2017) Weekly Rainfall

The weekly rainfall is more than 10 mm per week during the standard week 13, 14, 16, 17, 34, 35, 45, 46 and 47. The rainfall is more than 20 mm per week during 10, 11, 19, 20, 22, 31, 33, 36, 38, 39, 40, 41, 44 and 48. The rainfall more

than 50 mm/week during 42 and 43 Standard weeks. Highest rainfall of 62.42 mm was recorded by 42<sup>nd</sup> week (15-21 Oct). (Table 4).

Table 4: Mean weekly rainfall of Usilampatty (2013-2017)

Standard week No.	Date	Rainfall (mm)	Percentage of rainfall	Rainy days	CV %
1	01 Jan – 07 Jan	0.00	0	0.00	0.00
2	08 Jan – 14 Jan	0.52	0	0.00	223.60
3	15 Jan – 21 Jan	0.00	0	0.00	0.00
4	22 Jan – 28 Jan	0.00	0	0.00	0.00
5	29 Jan – 04 Feb	0.00	0	0.00	0.00
6	05 Feb – 11 Feb	1.66	0	0.20	223.60
7	12 Feb – 18 Feb	5.16	1	0.20	223.60
8	19 Feb – 25 Feb	0.00	0	0.00	0.00
9	26 Feb – 04 Mar	4.46	1	0.20	223.60
10	05 Mar – 11 Mar	25.94	4	1.20	148.78
11	12 Mar – 18 Mar	21.42	3	0.40	182.72
12	19 Mar – 25 Mar	0.86	0	0.20	223.60
13	26 Mar – 01 Apr	13.40	2	0.20	223.60
14	02 Apr – 08 Apr	10.88	2	0.20	212.98
15	09 Apr – 15 Apr	3.78	1	0.40	165.30
16	16 Apr – 22 Apr	13.75	2	0.60	223.60
17	23 Apr – 29 Apr	15.69	2	1.40	79.20
18	30 Apr – 06 May	8.22	1	0.80	179.20
19	07 May – 13 May	27.89	4	1.80	122.73
20	14 May – 20 May	38.69	6	2.40	135.22
21	21 May – 27 May	2.34	0	0.40	158.62
22	28 May – 03 Jun	20.18	3	0.60	163.89
23	04 Jun – 10 Jun	8.44	1	0.40	180.79
24	11 Jun – 17 Jun	0.00	0	0.00	0.00
25	18 Jun – 24 Jun	0.00	0	0.00	0.00
26	25 Jun – 01 Jul	9.26	1	0.20	223.60
27	02 Jul – 08 Jul	0.00	0	0.00	0.00
28	09 Jul – 15 Jul	0.00	0	0.00	0.00
29	16 Jul – 22 Jul	0.00	0	0.00	0.00
30	23 Jul – 29 Jul	7.58	1	0.60	223.60
31	30 Jul – 05 Aug	24.34	3	0.80	138.32
32	06 Aug – 12 Aug	8.00	1	0.60	165.91
33	13 Aug – 19 Aug	25.36	4	1.20	94.63
34	20 Aug – 26 Aug	10.14	1	0.40	134.88
35	27 Aug – 02 Sep	14.94	2	0.40	186.81

36	03 Sep – 09 Sep	26.82	4	1.40	110.65
37	10 Sep – 16 Sep	3.50	1	0.20	189.02
38	17 Sep – 23 Sep	25.32	4	0.40	210.18
39	24 Sep – 30 Sep	21.24	3	1.60	130.05
40	01 Oct – 07 Oct	26.93	4	1.20	118.44
41	08 Oct – 14 Oct	36.79	5	2.00	63.13
42	15 Oct – 21 Oct	62.42	9	1.80	169.68
43	22 Oct – 28 Oct	53.95	8	2.00	101.92
44	29 Oct – 04 Nov	32.36	5	1.40	103.53
45	05 Nov -11 Nov	12.25	2	1.00	76.09
46	12 Nov – 18 Nov	11.84	2	1.40	119.03
47	19 Nov – 25 Nov	19.48	3	1.20	178.39
48	26 Nov – 02 Dec	28.15	4	1.40	127.59
49	03 Dec – 09 Dec	5.98	1	0.40	120.95
50	10 Dec – 16 Dec	3.66	1	0.40	130.51
51	17 Dec – 23 Dec	2.50	0	0.40	148.70
52	24 Dec – 31 Dec	0.40	0	0.00	223.60
Total			696.5 mm		

An attempt was made to evolve a changed the cropping pattern based on the rainfall analysis for this taluk so as effective utilize the rainfall and to avoid the risk of cropping systems.

Presently, cropping pattern followed in this taluk is as follows.

#### Rainfed (Double cropping)

1.	Rice – Pulses (June-July) – (September – October) (100-150 days) – (80-85 days)	2.	Small millets – Pulses (June-July) – (September – October) (90-95days) – (80-85 days)
3.	Bhendi – Pulses (June - Sep) (Oct – Nov) (100-125 days) (80-85days)		

Farmers normally followed the some cropping system like, Rice and pulses are the major crops sown under both pure and intercrop in the month of June –July and September – October. Suppose the South West Monsoon is delay, farmers go for small millets and pulses. In the normal years, farmers cultivate the pulses, vegetables and Jasmine next to rice as a second crop.

#### Proposed Cropping System

Based on the analysis of rainfall, the existing cropping pattern is suitably modified. The modified / proposed cropping system in accordance with early, normal and late onset of South West Monsoon rains for Usilampatty taluk of Madurai district, Tamil Nadu is given below.

#### Early rains

1.	Cumbu – Ragi + Black gram – Gingelly (June) (Sep – Oct) (Dec-Jan) (95 days) (105-110 days) (85 days)	2.	Groundnut – Gingelly / Black gram (June - Sep) (Oct – Nov) (100-125 days) (80-85days)
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#### Normal rains

1.	Gingelly - Black gram (June - Jul) (Sep – Oct) (80-85 days) (65-70 days)	2.	Groundnut + Red gram – Ragi + Black gram (June - Sep) (Oct – Nov) (100-125 days) (105-110days)
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#### Late rains

1.	Varagu - Gingelly (July - Aug) (Oct - Nov) (100-120 days) (80-90 days)	2.	Cumbu – Gingelly (Sep - Oct) (Dec - Jan) (95 days) (80 - 85days)
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