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## RAINFALL PATTERN AND CROPPING SYSTEM IN DENKANIKOTTA TALUK OF TAMIL NADU

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Denkanikotta Taluk is a part of Northwestern agroclimatic zone of Tamil Nadu and 80 per cent area is under rainfed farming. The daily rainfall data for 44 years (1940-83) were analysed. Winter, summer, southwest monsoon and Northeast monsoon periods on an average receive 13, 195, 426 and 332 mm respectively. Rains during May in summer, July and September during Southwest and October in Northeast monsoon periods are more dependable. It brought out the feasibility of introducing a second crop in traditionally single cropped drylands. The crop substitution of cowpea in the place of horsegram is also proposed to increase the net income. Suggestions are also made to have double cropping systems with existing cultivars.

In the seasonally rainfed tracts, crop yields are low and highly variable from year to year. The instability in production is caused primarily by un dependable and erratic rainfall. The farmers have to cope with the vagaries of a rainy season which is short and

highly unpredictable. Agriculturists require a knowledge on rainfall intensity, distribution, variability and dependability for various agricultural operations. In this paper, the rainfall pattern of Denkanikotta Taluk of Dharmapuri district of Tamil Nadu

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which forms a distinct ecological zone has been taken up for analysis and critical study.

### MATERIALS AND METHODS :

The daily rainfall data for 44 years (1940-83) collected from the revenue records were analysed statistically for annual, seasonal, monthly and weekly periods as reported by Kulandaivelu *et. al.*, (1979 and 80). The geographic location of this taluk is 12° - 31' North latitude and 77° - 47' East longitude with an altitude of 750 metres. It forms a continuous stretch of Karnataka State from west. The soils are red-calcareous with less undulating topography.

## RESULTS AND DISCUSSION

### ANNUAL AND SEASONAL RAINFALL :

The annual and seasonal rainfall, rainy days, mean rainfall, coefficient of variation and percentage contribution to the annual rainfall are given in Table 1. The mean annual rainfall is 966 mm received in 58 rainy days. The coefficient of variation for annual rainfall in different years is 25 per cent. In most of the years the annual rainfall is normal (+ or — 20 per cent). It is in excess in the years 1946, 58, 62, 66, 71, 72, 73, 75 and 77. In 1966, 72 and 77 the excess was due to increased amounts of rainfall received during

Table : 1 Annual and Seasonal Rainfall, C. V. %, and Mean Rainfall

Year	Winter		Sumer		Southwest monsoon		Northeast monsoon		Annual Total	
	Rain-fall (mm)	Rainy days	Rain-fall (mm)	Rainy days	Rain-fall (mm)	Rainy days	Rain-fall (mm)	Rainy days	Rain fall (mm)	Rainy days
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1940	—	—	319.3	13	253.4	26	383.8	23	965.5	62
1941	16.3	2	92.5	6	499.6	25	246.4	17	854.8	50
1942	—	—	186.0	12	344.7	25	362.6	15	893.3	52
1943	40.8	4	296.0	9	298.9	23	354.1	18	989.8	54
1944	130.5	3	138.6	11	498.3	20	199.5	20	956.9	54
1945	—	—	163.8	12	367.4	30	119.7	10	650.9	52
1946	5.3	1	202.2	14	365.1	30	612.5	30	1185.1	75
1947	13.2	2	82.8	8	569.4	39	268.5	13	933.9	62
1948	21.9	2	267.5	13	319.5	28	168.2	19	777.2	62
1949	2.3	—	104.6	10	389.2	27	251.9	15	748.0	52
1950	24.9	2	115.8	7	468.3	35	326.0	26	935.0	70
1951	—	—	372.3	22	443.4	30	298.9	19	1114.6	71
1952	5.1	1	231.4	14	366.3	26	379.8	16	982.6	57

1953	19.6	2	180.9	11	374.6	34	445.4	21	1020.5	67
1954	28.2	3	304.0	14	366.4	21	357.9	19	1056.5	57
1955	—	—	201.9	20	300.8	26	205.9	14	708.6	60
1956	—	—	105.1	7	377.7	28	676.7	31	1159.5	66
1957	—	—	171.5	8	269.4	21	421.0	23	861.9	52
1958	12.0	1	307.1	18	600.8	34	293.9	12	1214.4	55
1959	27.5	2	165.5	13	445.1	33	260.4	15	898.5	63
1960	—	—	148.0	7	476.3	23	272.7	21	897.0	51
1961	70.3	6	91.1	12	397.7	31	238.1	16	797.2	65
1962	15.0	1	331.8	18	511.8	30	354.1	21	1212.7	70
1963	17.1	2	121.3	7	419.0	32	416.8	19	974.2	60
1964	—	—	62.2	7	678.2	34	395.0	17	1135.4	58
1965	—	—	124.6	5	282.3	24	155.1	14	562.0	43
1966	1.2	—	235.6	11	550.4	33	528.4	27	1315.6	71
1967	23.2	2	219.4	12	252.2	24	340.6	15	835.4	53
1968	—	—	162.8	11	528.2	26	229.4	13	920.4	50
1969	—	—	278.0	15	266.2	16	387.8	27	920.3	58
1970	1.8	—	290.8	10	323.4	17	373.2	18	989.2	45
1971	—	—	302.9	16	615.9	35	338.6	17	1257.7	68
1972	—	—	446.6	12	611.9	29	695.1	26	1751.6	67
1973	—	—	151.6	11	813.7	37	480.0	20	1445.3	68
1974	—	—	121.0	12	630.5	28	142.5	11	894.0	51
1975	—	—	300.7	16	661.4	41	308.4	22	1270.5	79
1976	—	—	129.7	10	211.8	21	331.1	13	672.6	44
1977	34.4	2	304.8	18	497.6	34	423.3	24	1260.1	78
1978	—	—	213.9	11	377.4	21	297.2	22	888.5	54
1979	64.0	3	160.1	8	256.6	27	311.2	21	891.9	59
1980	—	—	163.4	14	294.5	19	158.2	12	616.1	45
1981	—	—	154.0	12	465.3	23	393.8	17	1013.1	54
1982	—	—	—	—	167.2	7	215.2	13	382.4	20
1983	—	—	80.5	6	491.2	33	192.4	13	734.1	52
Mean	13.06	0.91	195.48	11.43	426.34	27.23	332.08	18.52	966.96	58.09
CV %	183.91		101.93		65.78		77.65		25.56	
% contribution to the Annual Rainfall		1.36	20.22		44.08		34.34			

summer, southwest and northeast monsoon seasons. The increase in 1958, 62, 71 and 75 was due to excess summer and southwest monsoon rain, southwest and northeast monsoon rain in 1973 and northeast monsoon rain in 1946. In the years 1945, 49, 55, 65, 76, 80, 82 and 83 the rainfall was deficit (—20 per cent to —60 per cent). The deficit in 1945, 49, 65, 80 and 82 was caused by below normal quantum received during summer, southwest and northeast monsoon seasons. The summer and southwest monsoon seasons contributed less in 1976, while the summer and northeast monsoon rains were low in 1983. In 1955 the southwest and northeast monsoon seasons were below normal.

Among the seasons, the southwest monsoon contributes the maximum quantity of 426 mm while in the northeast monsoon the rainfall is 332 mm both accounting to 44 and 34 per cent respectively. The rest of the rainfall is received in summer (20 per cent) and winter season (1 per cent). The number of rainy days in winter, summer, southwest and northeast monsoon seasons is 0.91, 11.43, 27.23 and 18.52 respectively. The dependability of rainfall is the highest in southwest monsoon and least in winter season. In summer, the rainfall is well assured and gives scope for sowing the first rainfed crop in April itself. Fairly well distributed rainfall in summer, southwest and northeast monsoon seasons facilitates the farmers to raise two or more crops under rainfed condition.

#### MONTHLY RAINFALL :

The mean monthly rainfall, coefficient of variation, per cent over annual rainfall and rainy days are given in Table 2. The highest (199.5 mm) and lowest (5.45 mm) quantities of rainfall are received in the months of October and January respectively. Following October, the rainfall is high in the months of September, May, August and November. Comparatively the rainfall is lower in the months of February, March and December. Thus, the distribution is essentially a bimodal type. The rainy days follow the same trend as that of rainfall.

The range of variation as evidenced by coefficient of variation is the least in October followed by May, July and September. The dependability of rainfall is the most uncertain in January, February, March and December.

The rainfall received during March is meagre for taking up sowing and this can be effectively utilized for preparing the lands. The month May is more dependable for taking up summer sowing in rainfed lands as the coefficient of variation is comparatively low.

#### WEEKLY RAINFALL :

The mean weekly rainfall, coefficient of variation and rainy days are given in Table 3. The rainfall is the highest peak in 38th standard week (Sep 17-23) followed by 39th to 44th (Sep 24 to Oct 4), 37th (Sep 10-16)

Table: 2 Mean Monthly Rainfall, Coefficient of Variation and Rainydays

Month	Rainfall (mm)	Coefficient of variation %	Percent over annual Rainfall	Rainy days
January	5.45	182.47	0.56	0.52
February	7.61	180.37	0.79	0.39
March	10.37	110.71	1.07	0.75
April	49.74	83.03	5.14	3.20
May	15.37	42.30	4.00	7.48
June	30.86	72.01	6.29	4.23
July	79.57	43.66	8.23	6.98
August	13.52	52.55	1.73	7.52
September	172.49	47.76	17.84	8.50
October	199.50	37.09	0.63	10.00
November	93.22	55.60	9.64	5.98
December	39.36	89.02	4.07	2.55

and 20th to 22nd week (May 14 - June 3). The rainfall is low in 1st to 15th standard week (Jan 1 - Apr 15), 25th, 26th week (Jun 18 - Jul 1) and 50th to 52nd week (Dec 10 - 31). The rainfall in 16th to 24th standard week (Apr 16 - Jun 17) and 27th to 49th standard week (Jul 2 - Dec 9) ranges from 13.74 to 58.73 mm which would be sufficient to support the crop. Number of rainy days also follow the same trend as that of rainfall.

The range of variation in rainfall is the least during 20th to 22nd standard week (May 14 - June 3) in summer, 23rd to 25th (Jun 4 - 24), 27th (Jul 2 - 8), 29th (Jul 16 - 22), 38th and 39th standard weeks (Sep 17 - 30) in southwest monsoon season and 40th (Oct 1 - 7), 42nd (Oct 15 - 21) and 44th (Oct 29 - Nov 4) standard week in northeast monsoon season.

#### EXISTING CROP PATTERN :

Ragi (*Elusine coracana*) forms the predominant crop in dryland cropping system. It is sown by broadcast during the month of July, Lablab (*Dolichos lablab*), Sorghum (*Sorghum Vulgare*) and castor (*Ricinus communis*) are sown as intercrops, mustard as mixed crop, while niger grown as border crop. Long duration traditional ragi cultivars namely "Sannakeddaragulu, Nallakeddaragulu, Posurukeddaragulu" are mostly grown as single crop with a field duration of 150 - 160 days.

In summer, on receipt of first shower the farmers prepare the field and keep it ready for sowing. After the receipt of the second shower in the month of April the gingelly (*Sesamum indicum*) sowing is taken up and harvest

Table : 3 Mean Weekly Rainfall, Coefficient of Variation and Rainy days

Std. week	Month & date	Rainfall (mm)	Co-efficient of Variation (%)	Rainy days	Std. week	Month & Date	Rainfall (mm)	Co-efficient of variation %	Rainy days
(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
1.	Jan 1-7	3.40	102.42	0.27	27.	Jul. 2-8	14.26	18.85	1.45
2.	8-14	1.26	128.67	0.16	28.	9-15	16.28	64.38	1.29
3.	15-21	0.66	163.67	0.06	29.	16-22	21.32	31.19	1.75
4.	22-28	0.01	380.00	—	30.	23-29	21.89	39.75	1.93
5.	Feb. 29-4	0.77	144.82	0.06	31.	30-5	21.22	40.01	1.43
6.	5-11	0.01	252.22	—	32.	Aug. 6-12	26.84	71.30	1.68
7.	12-18	0.36	145.80	0.06	33.	13-19	30.24	64.54	1.64
8.	19-25	6.38	73.33	0.27	34.	20-26	26.75	37.57	1.93
9.	26-4	1.11	121.71	0.11	35.	27-2	22.28	32.99	1.50
10.	Mar. 5-11	3.55	101.68	0.20	36.	Sep. 3-9	25.04	38.65	1.41
11.	12-18	0.41	251.00	0.04	37.	10-16	38.73	56.21	1.86
12.	19-25	2.54	55.61	0.18	38.	17-23	58.73	13.43	2.68
13.	26-1	3.42	86.67	0.34	39.	24-30	45.54	29.31	2.27
14.	Apr. 2-8	4.14	59.15	0.34	40.	Oct. 1-7	51.56	18.06	2.34
15.	9-15	10.04	52.81	0.68	41.	8-14	57.20	38.89	2.64
16.	16-22	15.99	77.22	0.95	42.	15-21	40.88	18.16	2.20
17.	23-29	17.73	66.14	1.13	43.	22-28	35.92	50.56	2.16
18.	May. 30-6	19.44	71.77	1.15	44.	29-4	36.88	23.79	1.81
19.	7-13	22.76	48.92	1.52	45.	Nov. 5-11	23.02	39.44	1.56
20.	14-20	43.03	15.54	2.25	46.	12-18	21.37	68.07	1.45
21.	21-27	34.05	21.29	1.91	47.	19-25	18.07	41.10	1.27
22.	28-3	34.79	31.27	1.41	48.	26-2	14.68	49.91	0.86
23.	Jun. 4-10	14.76	33.84	1.09	49.	Dec. 3-9	18.27	36.52	0.98
24.	11-17	13.74	35.94	1.04	50.	10-16	9.32	56.28	0.77
25.	18-24	8.72	33.19	0.79	51.	17-23	4.06	60.17	0.32
26.	25-1	7.44	51.56	0.75	52.	24-31	2.52	92.90	0.27

spreads from the last week of July to second week of August. Following gingelly, horsegram (*Macrotyloma uniflorum*) is sown in the first week of September and harvested in the last week of December.

The second important crop is groundnut (*Arachis hypogaea*) grown in fields of less undulating, moderately fertile soils. The crop is usually sown during mid July and harvested in the month of November. The cultivar is a local spreading type 'Perunadam' with a duration of more than 120 days. The local bunch cultivars are also grown and after the harvest, horsegram will be sown.

#### PROPOSED CROP PATTERN:

The analysis of rainfall showed that there is continuous and dependable precipitation from the 16th standard week (April 16th) to 49th standard week (Dec 9th). To utilize this rainfall more effectively, the present crop pattern can be modified by increasing the cropping intensity, by adjusting the sowing dates and also by crop substitution. The following are the proposed crop patterns to increase the net income per unit area of rainfed land.

For summer sowing of gingelly, rains during the month of May are dependable as compared to other months of summer period. The summer season gingelly comes to harvest during the first week of August. After the harvest of gingelly the horsegram sowing is usually done from middle of September to end of October. Instead of this practice immediately after the harvest of gingelly, cowpea or cowpea + horsegram could be sown so as to increase the net income per unit of

land. The research evidences have shown that sowing of cowpea during the month of September was more remunerative. Under late sown condition horsegram is more suitable (Gopalaswamy and Narayanan (1985)

In places where ragi is raised as single crop the medium duration varieties like Indaf - 5 / Paiyur. 1 could be sown followed by a second crop of horsegram. There is also a possibility of advancing the sowing date of the spreading type of groundnut to the middle of May so that a second crop of horsegram can be cultivated. By adopting the above cropping systems the net income could be augmented with the increased cropping intensity.

In areas where groundnut spreading type is grown, semi-spreading groundnut varieties could be sown which could be followed by the horsegram during northeast monsoon season. The sowing dates of the existing spreading cultivars can be advanced to the end of May or first week of June and the harvest will be completed in the month of October. A second crop of horsegram can be sown as done in bunch groundnut areas.

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