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Probability studies of rainfall and crop production in coastal Tamil Nadu

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सार — तटीय तमिलनाडु के विभिन्न केन्द्रों में, वर्ष के दौरान नम व शुष्क अवधियों के लिए मासिक आधार पर एवं उत्तर-पूर्वी मानसून ऋतु के दौरान साप्ताहिक आधार पर वार्षिक और मौसमी वर्षा की संभाव्यता ज्ञात करने के लिए अध्ययन किए गए हैं। संभाव्यता के समस्त स्तरों के अध्ययन से पता चला कि अलनगुडी और टोंडी के उत्तरी केन्द्रों में क्रमशः उत्तर-पूर्वी तथा दक्षिण-पश्चिम मानसून ऋतु के दौरान अधिक वर्षा होती है। तथापि ग्रीष्म ऋतु के दौरान अदिरामपटिनम के दक्षिण में स्थित केन्द्रों में अधिक वर्षा होती है। तटीय तमिलनाडु के उत्तरी केन्द्रों में जुलाई से सितम्बर तक नम अवधियों की संख्या अधिक होती है। उत्तर-पूर्वी मानसून ऋतु के दौरान भी नम साप्ताहिक अवधियां मुख्यतः तटीय तमिलनाडु के उत्तरी केन्द्रों तक ही सीमित रहती है। वर्षा-सिंचित कुछ फसलों के उत्पादन के आंकड़ों के विश्लेषण से यह ज्ञात हुआ कि तटीय तमिलनाडु के दक्षिणी केन्द्रों की तुलना में उत्तरी क्षेत्रों में अधिक उत्पादकता किलोग्राम/प्रति हैक्टर दृष्टिगोचर होती है।

ABSTRACT. Studies are made of the probability of occurrence of annual and seasonal rainfall, wet and dry spells on monthly basis throughout the year and on weekly basis during the northeast monsoon season for various stations in coastal Tamil Nadu. It has been observed that amount of rainfall received is more in the stations north of Alangudi and north of Tondi in the northeast and southwest monsoon seasons respectively at all the probability levels. However, the quantum of rainfall is more in stations south of Adiramapattinam during the hot weather period. Number of wet spells are more from July to September in the stations of north coastal Tamil Nadu. During the northeast monsoon season also wet weeks are mainly confined to the stations of north coastal Tamil Nadu. Analysis of production figures of some rainfed crops shows more productivity (kg/ha) in north than in south coastal Tamil Nadu.

Key words — Probability, Rainfall, Dry and wet weeks, Rainfed crops, Southwest monsoon, Pre-monsoon.

1. Introduction

The agricultural scenario of India is closely linked with the spatial and temporal distribution of rainfall throughout the year, particularly, in rainfed areas. A comprehensive knowledge of the probability of rainfall for a particular area is of great importance because of economic implications of rain-sensitive operations (Virmani *et al.* 1982). Studies of variability of annual and seasonal rainfall, frequency of dry and wet spells on monthly and weekly basis will provide useful information for determining the climatic potential for agricultural development and for evolving suitable cropping pattern (Sarker *et al.* 1982).

Basu (1971) and Medhi (1976) applied Markov chain model to Calcutta and Guwahati respectively for determining dry and wet days during the southwest monsoon. Victor and Sastry (1979) determined the dry spell probabilities during the monsoon season in Delhi by applying Markov chain model. Sarker *et al.* (1982) studied the probability analysis of short period rainfall in dry farming tract of India. Chowdhury and Abhayankar (1984) & Khambete and Biswas (1984) applied Markov chain model for drought studies. Besides, Subramaniam and Rao (1986, 1989) studied the probability of rainfall and estimated the occurrence of dry spells in Andhra Pradesh.

In Tamil Nadu, both irrigated and rainfed agriculture are practised throughout the year (Agrostat 1991). The overall production of pulses, millets, cotton and oilseeds depends on rainfall in different seasons/months/weeks of the year. The literature in respect of the above aspect for Tamil Nadu is meagre. In this paper an attempt has been made to study the variability of annual and seasonal rainfall pattern in coastal Tamil Nadu and Markov chain model has been applied to estimate the probability of occurrence of dry and wet months as well as dry and wet weeks during the northeast monsoon season, *i.e.*, October to December. Productivity of some unirrigated crops grown in the coastal districts of Tamil Nadu are also presented to observe the relation between the probability of rainfall and productivity of crops.

2. Data and methodology

Annual, seasonal, monthly and daily rainfall data for the northeast monsoon season for twelve

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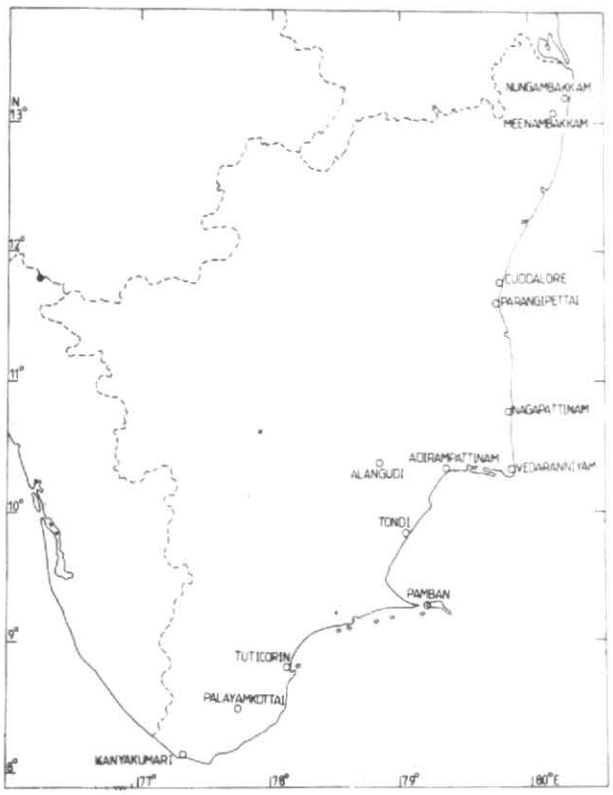

Fig. 1. Station location map of coastal Tamil Nadu

stations of coastal Tamil Nadu for 30 years, from 1955 to 1984, have been utilised in the present study. The stations selected (Fig. 1) are Nungambakkam (13° 04′N, 80° 15′E), Meenambakkam (13°N, 80° 11′E), Cuddalore (11° 46′N, 79° 23′E), Parangipettai (11° 30′N, 79° 23′E), Nagapattinam (10° 46′N, 79° 51′E), Adirampattinam (10° 20′N, 79° 23′E), Alangudi (10°N, 78° 30′E), Tondi (09° 44′N, 79° 02′E), Pamban (09° 16′N, 77° 45′E), Tuticorin (08° 45′E, 78° 09′E), Palyamkottai (08° 44′N, 77° 45′E), and Kanyakumari (08° 05′N, 77° 30′E). All the stations selected are departmental observatory stations which have long data sets and these stations are well distributed along the coastal districts of Tamil Nadu.

Nungambakkam, Meenambakkam, Cuddalore, Parangipettai, Nagapattinam, Adirampattinam and Alangudi are in the north coastal Tamil Nadu, whereas, Tondi, Pamban, Tuticorin, Palyamkottai and Kanyakumari lie in the south coastal Tamil Nadu.

The variability studies of seasonal rainfall, *i.e.*, northeast monsoon, southwest monsoon, hot weather period, winter period rainfall and annual rainfall are carried out according to the methods enunciated by Oldeman and Frere (1982). The method followed is the ranking order method described by Frere *et al.* (1975) and Doorenbos and Pruitt (1977). The seasonal and annual rainfall data are arranged in descending order and each year is assigned a ranking number m, the ranking numbers are then given probability levels $F_a(m)$ and calculated as follows:

$$F_a(m) = \frac{100\,m}{n+1} \qquad (1)$$

in which n is the number of years and m the ranking number.

The probability of occurrence of dry and wet months/weeks are calculated according to the Markov chain model described by Robertson (1976). Standard weeks from 40 to 52, during northeast monsoon season, are considered here.

As the average weekly potential evapotranspiration of stations under study ranges from 21 to 38 mm, it will be realistic to take 21 mm as threshold value for determining the occurrence of dry and wet weeks. Because it is the minimum of the potential evapotranspiration observed in the stations. Secondly, it is 51.5 per cent of the maximum potential evapotranspiration, *i.e.*, 38 mm. It may be mentioned here that crop yields especially in dry land areas will not affect adversely if plants get about 30 to 70 per cent of potential evapotranspiration depending on the growth stage of crop (Khambete and Biswas 1984). Besides, Subramaniam and Rao (1989) have seen that rainfall amount 20 mm per week is adequate in all the growth stages of all crops grown in south coastal Andhra Pradesh.

Thus, if rainfall for a particular week is below 21 mm, the week is considered as a dry week. Similarly, a month receiving 90 mm and more rainfall is taken as a wet month.

The probabilities that are calculated by this model are mentioned below:

$$P(D) = F(D)/n \qquad (2)$$

$$P(DD) = F(DD)/F(D) \qquad (3)$$

$$P(W) = F(W)/n \qquad (4)$$

$$P(WW) = F(WW)/F(W) \qquad (5)$$

$P(D)$ — Probability of occurrence of dry spell,

$F(D)$ — Frequency of dry spell,

$P(DD)$ — Probability of occurrence of dry spell preceded by a dry spell,

TABLE 1

Rainfall amount at different probability levels

Rank No	$F_a(m)$ (%)	Period					Period					Period				
		WP	HP	SW	NE	GT	WP	HP	SW	NE	GT	WP	HP	SW	NE	GT
		Nungambakkam					**Meenambakkam**					**Cuddalore**				
1.	3.2	199	137	759	1227	1993	322	136	723	1213	1866	396	350	691	1370	2195
2.	6.4	114	115	654	1191	1810	127	124	714	1162	1835	262	170	672	1341	1918
3.	9.7	97	113	625	1156	1749	126	90	698	1131	1823	241	125	594	1259	1901
4.	12.9	87	84	609	1094	1620	108	89	658	1115	1726	211	121	559	1206	1759
5.	16.1	62	82	582	1037	1599	55	88	630	1079	1700	119	78	549	1159	1652
6.	19.3	24	76	579	1009	1591	52	77	608	1014	1600	66	61	541	1113	1600
7.	22.5	22	72	548	972	1542	38	70	604	929	1542	62	49	511	1104	1557
8.	25.8	17	66	513	965	1495	33	44	596	922	1526	56	41	471	1079	1539
9.	29.0	11	62	501	964	1401	24	43	531	902	1454	54	37	468	1077	1474
10.	32.2	10	47	499	906	1363	23	41	505	895	1442	43	33	452	1057	1418
11.	35.5	6	43	465	900	1347	14	40	493	885	1441	31	32	426	925	1388
12.	38.7	5	42	454	857	1344	13	31	485	875	1439	24	26	399	891	1363
13.	41.9	4	34	443	831	1301	10	28	466	808	1370	23	21	392	870	1362
14.	45.2	3	32	438	828	1273	7	24	415	798	1306	21	20	382	867	1268
15.	48.4	2	31	428	778	1238	6	23	395	772	1254	20	19	376	859	1263
16.	51.6	1	22	416	777	1219	5	20	383	709	1223	17	9	351	853	1260
17.	54.8	0	10	393	702	1190	3	14	350	694	1220	13	7	346	805	1236
18.	58.0	—	8	383	664	1175	2	13	345	645	1219	6	2	334	765	1216
19.	61.3	—	7	374	644	1162	1	11	335	603	1214	4	1	318	714	1168
20.	64.5	—	6	371	627	1150	0	10	331	602	1204	3	0	315	691	1157
21.	67.7	—	5	345	504	1131	—	8	323	590	1194	2	—	308	667	1042
22.	71.0	—	4	336	550	1105	—	6	317	566	1135	1	—	306	647	1001
23.	74.2	—	2	325	518	1104	—	4	285	558	1094	0	—	303	541	985
24.	77.4	—	1	319	484	1056	—	2	245	539	1089	—	—	300	499	894
25.	80.6	—	0	301	450	1044	—	1	210	526	1080	—	—	274	447	857
26.	83.9	—	—	230	429	877	—	0	171	475	1063	—	—	238	438	784
27.	87.1	—	—	197	419	876	—	—	167	456	880	—	—	183	364	694
28.	90.3	—	—	170	412	858	—	—	53	400	730	—	—	173	353	194
29.	93.5	—	—	—	393	821	—	—	—	363	—	—	—	137	303	—
30.	76.8	—	—	—	383	664	—	—	—	—	—	—	—	—	91	—
		Parangipettai					**Nagapattinam**					**Adiramapattinam**				
1.	3.2	523	289	829	1601	2186	442	207	460	1912	2626	175	292	636	1743	2353
2.	6.4	193	151	742	1600	1992	236	146	445	1703	2296	144	257	624	1194	1919
3.	9.7	188	102	585	1466	1858	235	133	397	1535	2139	96	249	564	981	1784
4.	12.9	177	96	520	1296	1819	186	107	368	1420	2068	86	244	489	923	1570
5.	16.1	90	87	459	1288	1797	173	103	361	1331	1811	84	242	476	853	1538
6.	19.3	71	74	452	1240	1776	97	97	351	1321	1801	79	226	432	845	1533
7.	22.5	62	69	419	1045	1687	94	95	344	1268	1778	77	225	428	834	1500
8.	25.8	51	68	392	950	1527	91	94	329	1226	1763	68	195	418	822	1435
9.	29.0	43	65	369	926	1441	89	80	326	1206	1707	64	177	417	794	1395
10.	32.2	39	57	359	918	1341	68	62	319	1181	1562	62	147	404	785	1358
11.	35.6	32	53	345	812	1305	67	60	303	1175	1484	49	144	383	754	1357
12.	38.7	26	50	377	807	1271	60	55	284	1143	1423	41	141	382	745	1354
13.	41.9	15	47	328	800	1185	59	48	272	1036	1312	39	140	378	741	1341
14.	45.2	14	46	327	789	1175	49	47	263	1014	1359	37	131	359	735	1300

TABLE 1 (*Contd.*)

Rank No	$F_a(m)$ (%)	Period					Period					Period				
		WP	HP	SW	NE	GT	WP	HP	SW	NE	GT	WP	HP	SW	NE	GT
		Parangipettai					**Nagapattinam**					**Adiramapattinam**				
15.	48.4	10	44	326	780	1167	43	45	246	1002	1302	30	115	343	730	1295
16.	51.6	7	32	313	752	1108	21	42	243	861	1217	24	99	312	721	1265
17.	54.8	6	30	293	694	1091	14	33	240	849	1190	22	97	291	716	1218
18.	58.0	5	25	268	662	1077	10	32	233	848	1186	19	93	287	646	1176
19.	61.3	4	23	252	648	1050	9	28	232	843	1131	15	90	261	570	1163
20.	64.5	0	21	250	608	1041	8	25	216	831	1129	8	73	254	529	1145
21.	67.7	—	20	248	588	1026	7	18	210	752	1099	6	59	252	525	1140
22.	71.0	—	18	242	556	1015	5	15	180	726	887	1	57	250	495	1112
23.	74.2	—	16	234	540	1003	1	8	162	718	827	0	55	241	476	1105
24.	77.4	—	12	198	530	961	0	1	158	677	810	—	43	219	463	919
25.	80.6	—	4	195	529	917	—	0	119	662	800	—	32	199	452	887
26.	83.9	—	3	187	520	880	—	—	113	638	796	—	21	176	355	868
27.	87.1	—	0	167	470	834	—	—	64	532	—	—	14	167	343	857
28.	90.3	—	—	162	454	737	—	—	47	385	—	—	10	133	268	797
29.	93.5	—	—	131	420	717	—	—	—	260	—	—	—	—	—	793
30.	96.8	—	—	—	297	—	—	—	—	—	—	—	—	—	—	713
		Alangudi					**Tondi**					**Pamban**				
1.	3.2	176	266	608	796	1386	228	469	343	1052	1580	210	249	331	1265	1687
2.	6.4	146	240	544	672	1343	174	377	232	747	1234	202	225	153	1080	1484
3.	9.7	110	228	528	663	1330	152	299	216	743	1118	201	210	122	956	1386
4.	12.9	95	184	496	644	1234	133	217	193	737	1104	141	209	87	940	1201
5.	16.1	85	177	494	613	1216	84	186	174	719	1024	93	206	86	908	1144
6.	19.3	81	175	489	608	1176	61	180	173	712	1009	81	201	81	880	1135
7.	22.5	68	155	486	596	1148	56	171	170	681	1006	76	172	67	864	1122
8.	25.8	58	142	465	562	1146	55	154	162	584	985	48	170	57	798	1060
9.	29.0	54	141	461	542	1113	52	152	156	581	924	40	128	45	785	1044
10.	32.2	46	133	459	535	1111	31	134	152	578	908	39	123	43	777	1023
11.	35.5	40	130	443	526	1073	30	128	150	571	898	38	120	26	767	1005
12.	38.7	29	107	428	499	1054	17	118	146	553	897	37	115	22	740	965
13.	41.9	19	104	420	483	1044	11	112	138	552	873	31	95	21	646	890
14.	45.2	17	99	390	443	1024	10	106	127	534	786	25	80	19	631	887
15.	48.4	15	93	375	442	1012	9	97	121	511	784	23	77	17	612	875
16.	51.6	11	90	372	432	1004	4	96	109	467	770	19	71	15	600	810
17.	54.8	10	86	364	424	981	0	72	107	452	731	15	70	9	594	759
18.	58.0	8	82	345	414	939	—	59	105	450	692	10	69	7	575	714
19.	61.3	2	79	338	369	929	—	47	96	426	672	8	53	5	539	713
20.	64.5	0	69	316	362	912	—	45	94	409	665	5	53	4	450	699
21.	67.7	—	64	294	351	803	—	43	91	363	648	0	50	0	417	625
22.	71.0	—	52	283	349	780	—	39	77	358	593	—	46	—	389	608
23.	74.2	—	31	273	320	761	—	15	59	346	584	—	37	—	242	589
24.	77.4	—	24	268	286	739	—	—	56	341	564	—	26	—	322	531
25.	80.6	—	23	262	224	727	—	—	45	333	564	—	23	—	200	442
26.	83.9	—	22	258	214	659	—	—	37	295	455	—	20	—	163	406
27.	87.1	—	0	250	186	654	—	—	6	293	425	—	2	—	157	309
28.	90.3	—	—	220	163	592	—	—	0	213	418	—	0	—	116	277
29.	93.5	—	—	208	162	546	—	—	—	157	382	—	—	—	1	228
30.	96.8	—	—	206	—	452	—	—	—	—	—	—	—	—	0	—

TABLE 1 (*Contd.*)

Rank No	$F_a(m)$ (%)	Period					Period					Period				
		WP	HP	SW	NE	GT	WP	HP	SW	NE	GT	WP	HP	SW	NE	GT
		Tuticorin					Palyamkottai					Kanyakumari				
1.	3.2	288	266	142	848	1060	373	319	229	877	1663	151	630	724	777	1699
2.	6.4	156	238	128	650	994	337	250	167	819	1033	100	473	700	687	1504
3.	9.7	122	211	86	650	958	211	215	159	737	966	92	446	556	608	1472
4.	12.9	103	197	56	637	815	166	185	151	705	942	75	439	544	592	1408
5.	16.1	80	211	52	605	795	127	179	134	591	938	68	406	540	588	1406
6.	19.3	52	168	42	601	760	124	174	126	582	931	59	395	529	534	1311
7.	22.5	51	166	41	576	758	105	168	125	580	925	55	391	495	517	1252
8.	25.8	43	164	38	546	752	83	157	123	566	904	54	368	396	516	1241
9.	29.0	38	146	35	540	745	82	153	117	559	892	48	332	391	492	1193
10.	32.2	37	142	30	524	716	76	140	97	525	882	43	291	366	450	1186
11.	35.5	36	115	27	503	695	75	138	85	495	836	42	218	356	430	954
12.	38.7	35	109	25	499	667	56	119	81	478	809	41	205	344	386	945
13.	41.9	32	98	23	456	653	49	115	76	469	774	35	188	324	384	863
14.	45.2	31	95	21	446	621	41	114	72	452	724	29	167	274	362	850
15.	48.4	21	86	18	445	612	33	106	70	435	667	26	152	272	350	849
16.	51.6	19	81	12	437	564	31	102	65	402	660	25	141	270	335	840
17.	54.8	14	79	11	389	554	20	98	61	389	653	20	126	246	327	789
18.	58.0	9	64	9	365	538	15	92	59	387	617	19	124	208	313	787
19.	61.3	6	63	6	356	470	14	90	57	343	595	15	123	201	307	775
20.	64.5	5	56	4	350	465	13	89	38	338	554	12	122	193	281	758
21.	67.7	0	55	0	338	405	11	83	33	319	528	11	106	183	270	730
22.	71.0	—	51	—	282	399	5	65	30	309	522	10	94	180	242	685
23.	74.2	—	44	—	151	355	0	52	29	288	512	6	85	166	238	627
24.	77.4	—	39	—	136	353	—	45	28	238	510	0	72	154	207	590
25.	80.6	—	37	—	110	304	—	35	25	222	491	—	60	145	204	556
26.	83.9	—	35	—	91	193	—	34	20	216	481	—	52	124	179	539
27.	87.1	—	29	—	79	—	—	21	14	208	406	—	43	81	165	517
28.	90.3	—	9	—	75	—	—	20	10	185	363	—	16	74	163	495
29.	93.5	—	3	—	—	—	—	—	—	119	223	—	11	46	130	479
30.	96.8	—	—	—	—	—	—	—	—	107	58	—	—	42	106	414

WP — Winter Period, HP — Hot weather Period, SW — Southwest monsoon season, NE — Northeast monsoon season, GT — Annual.

$F(DD)$ — Frequency of dry spell preceded by a dry spell,

n — Number of years,

$PD2$ — Probability of occurrence of two consecutive dry spells one following another.

Two consecutive dry spells are expressed in percentage. Similarly, for wet spell (W), these probabilites are calculated. Here spells indicate months and weeks.

In order to observe the effect of the probability of rainfall mentioned above on the production of some unirrigated crops, production figures (kg/ha) of cholam, cambu, groundnut and gingelly for the districts of coastal Tamil Nadu for 15 years (1970-1984) are collected from the Department of Statistics, Madras. Average production of crop of the regions of north and south coastal Tamil Nadu are worked out by averaging the production of crop of the respective districts within the region.

3. Results and discussion

3.1. *Probability of occurrence of annual and seasonal rainfall*

The probabilities of occurrence of annual and seasonal rainfall, *i.e.*, northeast monsoon, southwest

monsoon, hot weather period and winter period rainfall of the stations under study are presented in Table 1. The occurrence of rainfall at various probability levels from 3.2 to 96.6 per cent, as determined by the ranking number method descibed earlier, are presented. In the following discussion, the amount of rainfall at two representative probability levels, namely, 51.6 and 83.9 per cent levels have been taken to inter-compare and discuss quantum of rainfall which occurs in the selected stations of coastal Tamil Nadu.

The amount of annual rainfall ranges from 1108 to 1265 mm and 784 to 1063 mm at 51.6 and 83.9 per cent probability levels respectively in all the stations north of Alangudi which lies extreme south of north coastal Tamil Nadu. In all the stations in south coastal Tamil Nadu, annual rainfall amount ranges from 564 to 840 mm at 51.6 per cent probability level and 193 to 539 mm at 83.9 per cent probability level. During the northeast monsoon season, the pattern of distribution of rainfall is almost same as that of annual rainfall at all the probability levels. At 51.6 per cent probability level, the ranges of rainfall received by the stations north of Alangudi and the remaining stations are 709 to 861 mm and 355 to 638 mm respectively. Same trend of rainfall is also observed at 83.9 per cent probability level. Thus, a sharp variation in the amount of rainfall received at these probability levels is observed between the stations north of Alangudi and the remaining stations of coastal Tamil Nadu.

In the southwest monsoon season except Kanyakumari, all the stations of south coastal Tamil Nadu receive low rainfall ranging from 12 to 109 mm at 51.6 per cent probability level and 0 to 37 mm at 83.9 per cent probability level, whereas, in all the stations of north coastal Tamil Nadu, the rainfall amounts are more than 243 and 113 mm at 51.6 and 83.9 per cent probability levels. As can be seen from the table, where the stations have been arranged according to their latitude, in the order of descending values, it would appear that there is a sharp demarcation in terms of expected rainfall at Alangudi in respect of entire year and the northeast monsoon. But in respect of the southwest monsoon period, the demarcation obtains not at Alangudi but at Tondi, slightly south of Alangudi. In the hot weather period the stations which lie north of Adirampattinam receive low amounts of rainfall both at 51.6 (range : 29 to 42 mm) and 83.9 per cent probability levels (0 to 3 mm) compared to the remaining stations under study (71 to 141 mm and 20 to 52 mm at 51.6 and 83.9 percent probability levels respectively). In the winter period, the rainfall received at all the probability levels in all the coastal stations is comparatively low than at other seasons. The ranges of rainfall are 1 to 31 mm at 51.6 probability level.

Thus, from the above discussion it is observed that the quantum of rainfall at a particular probability level, in general, is comparatively higher in the stations of north than in the south coastal Tamil Nadu during the northeast as well as southwest monsoon season. The agricultural operations, which are sensitive to the rainfall amounts, can be carried out with great ease in the northern parts of coastal Tamil Nadu than is possible in the southern parts of coastal Tamil Nadu during the northeast and southwest monsoon seasons. During the hot weather period, however, greater advantage can be taken of pre-monsoon showers in southern parts of Tamil Nadu coast than in northern parts though the quantum of rainfall available through pre-monsoon showers can hardly meet the actual water requirement.

3.2. *Probability of occurrence of dry and wet spell on monthly basis*

Probability of occurrence of a month being dry is 0.77 and above from January to September in all the stations of south coastal Tamil Nadu except Kanyakumari where it is between 0.53 & 1.00 during the same period (Table 2). It is 0.77 and above from January to June in Nungambakkam, Meenambakkam and Cuddalore and from January to July in the rest of the stations of north coastal Tamil Nadu. In Nungambakkam, Meenambakkam and Cuddalore, $P(D)$ ranges from 0.17 to 0.53 and it ranges from 0.23 to 0.68 from August to September in other stations of north coastal Tamil Nadu. From October to November $P(D)$ values lie between 0 to 0.23 and 0.73 to 0.17 in the stations of north coastal and south coastal Tamil Nadu respectively except Kanyakumari where it is from 0.33 to 0.43. As $P(D)$ is equal to $1-P(W)$, the probability of occurrence of wet month in the stations under study show same variation as that of $P(D)$ but in reverse order of values.

Sharp variation in the probability of occurrence of wet month preceded by wet month are observed from July to August in Nungambakkam, Meenambakkam and Cuddalore and from August to September in the remaining stations of coastal Tamil Nadu. In the stations of south coastal Tamil Nadu, the marked variation in $P(WW)$ values are seen from October to November. In the stations of south coastal Tamil Nadu, the high value of $P(WW)$

TABLE 2

Probability of occurrence of dry and wet spells over coastal Tamil Nadu on monthly basis

Months	F(D)	F(DD)	P(D)	P(DD)	PD2%	F(W)	F(WW)	P(W)	P(WW)	PW2%	F(D)	F(DD)	P(D)	P(DD)	PD2%	F(W)	F(WW)	P(W)	P(WW)	PW2%
					Nungambakkam										**Meenambakkam**					
Jan	28	11	.93	.39	90	2	1	.07	.5	0	27	12	.90	.44	90	3	3	.10	1.00	0
Feb	29	28	.97	.96	97	1	0	.03	0	0	29	26	.97	.89	97	1	0	.03	0	0
Mar	30	30	1.00	1.00	100	0	0	0	0	0	30	29	1.00	.97	100	0	0	0	0	0
Apr	30	30	1.00	1.00	90	0	0	0	0	0	30	30	1.00	1.00	97	0	0	0	0	0
May	27	27	.90	1.00	77	3	0	.10	0	3	29	29	.97	1.00	73	1	0	.03	0	0
Jun	24	23	.80	.95	33	6	1	.20	.11	10	23	22	.77	.96	80	7	0	.23	0	17
Jul	14	12	.47	.86	23	16	3	.53	.18	50	9	6	.30	.67	6	21	5	.70	.24	60
Aug	9	18	.30	.88	10	21	16	.70	.76	33	5	2	.17	.40	3	25	18	.83	.72	50
Sep	14	4	.47	.28	0	16	15	.52	.93	57	9	1	.30	.11	0	21	14	.70	.67	60
Oct	1	0	.03	0	0	29	17	.97	.58	90	2	0	.07	0	0	28	18	.93	.64	87
Nov	1	0	.03	0	0	29	29	.97	1.00	46	2	0	.07	0	0	28	26	.93	.93	57
Dec	12	0	.40	0	37	18	18	.60	1.00	6	13	1	.43	.07	53	17	16	.57	.94	6
					Cuddalore										**Parangipettai**					
Jan	26	6	.87	.23	83	4	1	.13	.25	0	27	7	.90	.26	87	3	3	.10	1.00	0
Feb	29	23	.97	.86	93	1	0	.03	0	0	29	26	.97	.90	97	1	0	.03	0	0
Mar	29	28	.97	.96	97	1	0	.03	0	0	29	28	.97	.96	97	1	0	.03	0	0
Apr	30	29	1.00	.97	93	0	0	0	0	0	30	29	1.00	.97	97	0	0	0	0	0
May	29	28	.97	.96	87	1	0	.03	0	0	29	28	.97	.96	90	1	0	.03	0	0
Jun	28	26	.93	.93	50	2	0	.07	0	0	28	27	.93	.96	70	2	0	.07	0	0
Jul	16	15	.53	.94	10	14	0	.47	0	33	23	22	.77	.96	27	7	0	.23	0	10
Aug	11	7	.37	.64	6	19	9	.63	1.00	43	14	4	.47	.28	10	16	3	.53	.19	47
Sep	9	1	.27	.12	3	22	14	.73	.64	63	10	3	.33	.30	0	20	11	.67	.55	77
Oct	4	1	.13	.25	0	26	19	.87	.73	87	4	0	.13	0	0	26	18	.87	.69	83
Nov	0	0	.01	0	0	30	26	1.00	.87	66	2	0	.07	0	0	28	20	.93	.71	70
Dec	9	0	.30	0	13	21	21	.70	1.00	6	7	0	.23	0	16	23	20	.77	.87	10
					Nagapattinam										**Adiramapattinam**					
Jan	24	6	.80	.25	77	6	6	.20	1.00	3	26	7	.87	.27	87	4	0	.13	.01	3
Feb	28	23	.93	.82	93	2	0	.07	0	0	29	26	.97	.90	87	1	1	.03	1.00	3
Mar	30	28	1.00	.93	97	0	0	0	0	0	26	26	.87	1.00	77	4	1	.13	.25	0
Apr	29	29	.97	1.00	90	1	0	.03	0	0	27	25	.90	.92	70	3	0	.10	0	3
May	28	27	.93	.96	83	2	0	.07	0	0	27	21	.90	.78	70	3	0	.10	0	0
Jun	27	25	.90	.92	70	3	0	.10	0	0	28	21	.93	.75	67	2	0	.07	0	0
Jul	23	21	.77	.91	43	7	1	.23	.14	0	22	21	.72	.95	27	8	0	.27	0	6
Aug	20	13	.67	.65	40	10	0	.33	0	10	14	8	.47	.57	26	16	2	.53	.12	30
Sep	18	12	.68	.66	6	12	4	.40	.33	27	14	6	.47	.43	0	16	10	.53	.62	37
Oct	4	2	.13	.50	0	26	10	.87	.38	87	3	1	.10	.33	0	27	14	.90	.52	80
Nov	0	0	0	0	0	30	27	1.00	.90	83	2	0	.07	0	0	28	24	.93	.86	47
Dec	6	0	.2	0	16	24	24	.80	1.00	10	10	0	.33	0	20	20	15	.67	.75	3
					Alangudi										**Tondi**					
Jan	28	16	.93	.57	93	2	1	.07	.50	0	27	13	.90	.48	87	3	2	.10	.07	0
Feb	30	28	1.00	.93	100	0	0	0	0	0	29	26	.97	.90	87	1	0	.03	0	3
Mar	30	30	1.00	1.00	90	0	0	0	0	0	27	27	.90	1.00	83	3	1	.10	.33	3
Apr	7	27	.90	1.00	73	3	0	.10	0	0	26	25	.87	.96	73	4	2	.13	.50	0
May	23	21	.77	.91	73	7	1	.23	.14	6	25	22	.83	.88	83	5	1	.17	.20	0
Jun	27	22	.90	.81	57	3	2	.10	.66	3	30	25	1.00	.83	97	0	0	0	0	0
Jul	23	21	.72	.94	10	7	1	.23	.50	20	28	28	.93	1.00	87	2	0	.07	0	0
Aug	7	3	.23	.43	13	23	7	.77	.30	43	28	26	.93	.93	70	2	0	.07	0	0
Sep	13	4	.43	.31	10	17	16	.57	.94	50	23	21	.77	.91	20	7	0	.23	0	20
Oct	2	2	.07	1.00	3	28	17	.93	.61	66	6	6	.20	1.00	6	24	6	.80	.25	67
Nov	7	2	.23	.28	13	23	20	.77	.87	30	6	6	.20	1.00	6	24	17	.80	.71	40
Dec	17	4	.57	.23	50	13	10	.43	.77	3	13	8	.43	.61	50	17	12	.57	.70	10

TABLE 2 (*Contd.*)

Months	F(D)	F(DD)	P(D)	P(DD)	PD2%	F(W)	F(WW)	P(W)	P(WW)	PW2%	F(D)	F(DD)	P(D)	P(DD)	PD2%	F(W)	F(WW)	P(W)	P(WW)	PW2%
					Pamban										Tuticorin					
Jan	26	7	.87	.26	83	4	4	.13	1.00	3	28	14	.93	.50	90	2	1	.07	.50	3
Feb	28	26	.93	.93	93	2	1	.07	.50	3	28	26	.93	.93	87	2	11	.07	.50	0
Mar	29	29	.97	1.00	83	1	1	.03	1.00	3	28	26	.93	.93	80	2	0	.07	0	0
Apr	26	26	.87	1.00	70	4	1	.13	.25	0	26	24	.87	.92	80	4	0	.13	0	0
May	25	24	.83	.96	83	5	0	.17	0	0	28	24	.93	.86	93	2	0	.07	0	0
Jun	30	25	1.00	.83	100	0	0	0	0	0	30	28	1.00	.93	97	0	0	0	0	0
Jul	30	30	1.00	1.00	97	0	0	0	0	0	29	29	.97	1.00	97	1	0	.03	0	0
Aug	29	29	.97	1.00	93	1	0	.03	0	0	30	29	1.00	.97	97	0	0	0	0	0
Sep	29	28	.97	.96	33	1	0	.03	0	0	29	29	.97	1.00	43	1	0	.03	0	3
Oct	11	11	.37	1.00	6	19	1	.63	.05	50	11	10	.37	.91	23	19	1	.63	.05	50
Nov	2	1	.07	.50	3	28	18	.93	.64	43	9	5	.30	.55	23	21	15	.70	.71	37
Dec	7	1	.23	.14	20	23	17	.77	.74	3	16	7	.53	.44	53	14	11	.47	.78	3
					Palyamkottai										Kanyakumari					
Jan	26	15	.87	.58	80	4	0	.13	0	3	30	22	1.00	.73	97	0	0	0	0	0
Feb	27	24	.90	.89	90	3	1	.10	.33	3	29	29	.97	1.00	97	1	0	.03	0	3
Mar	29	27	.97	.93	80	1	0	.03	0	0	29	29	.97	1.00	63	1	1	.03	1.00	3
Apr	25	24	.83	.96	73	5	0	.17	0	3	20	20	.67	1.00	47	110	1	.33	.10	20
May	26	22	.87	.84	83	4	1	.13	.25	0	19	16	.63	.84	33	11	6	.37	.54	17
Jun	29	25	.97	.86	97	1	0	.03	0	0	16	11	53	.68	40	14	5	.47	.36	10
Jul	30	29	1.00	1.97	97	0	0	0	0	0	23	14	.77	.61	77	7	3	.23	.43	13
Aug	29	29	.97	1.00	77	1	0	.03	0	0	26	23	.87	.88	67	4	4	.13	1.00	3
Sep	24	23	.80	.96	17	6	0	.20	0	20	23	20	.77	.87	30	7	1	.23	.14	20
Oct	5	5	.17	1.06	3	25	6	.83	.24	57	10	8	.33	.80	17	20	6	.67	.30	17
Nov	9	1	.30	.11	3	21	17	.70	.80	33	13	4	.43	.31	17	12	12	.57	.70	17
Dec	18	7	.60	.39	46	12	10	.40	.83	0	22	9	.73	.41	73	8	5	.27	.62	0

extends up to April or May, whereas, the *P(WW)* values are not observed after January in stations of north coastal Tamil Nadu till May except Adirampattinam.

Sharp variation in the probability of occurrence of two consecutive dry weeks are observed from August to September in the stations of south coastal Tamil Nadu, whereas, in north coastal Tamil Nadu it is observed from May to June or June to July. It ranges from 0 to 43 per cent from July to November and 3 to 43 per cent from September to November in the stations of north coastal and south coastal Tamil Nadu respectively.

The probability of occurrence of two consecutive wet weeks is above 30 from July to November in Nungambakkam, Meenambakkam, Cuddalore and from August to November in the remaining stations of north Tamil Nadu. In the stations of south coastal Tamil Nadu *PW2* values above 30 per cent are seen from October to December.

From the above study, it is revealed that the probability of occurrence of dry month, dry month preceded by dry month, two consecutive dry months are less in the stations of north coastal Tamil Nadu form July to September compared to the stations of south coastal Tamil Nadu. In other words the probability of occurrence of wet month, wet month preceded by wet month, two consecutive wet months are comparatively high in the stations of north coastal Tamil Nadu than in south coastal Tamil Nadu from July to September. During northeast monsoon season, *i.e.,* from October to December, the probability of getting wet month preceded by wet month, two consecutive months is much higher in the stations of north coastal than south coastal Tamil Nadu. Thus, it, can be inferred that cultivation of crops can be made possible from July to December in north coastal Tamil Nadu, whereas, agricultural operation can be made with great ease from October to December only in south coastal Tamil Nadu and during the other months, massive inputs of irrigation water would be required.

TABLE 3

Probability of occurrence of dry and wet spells over coastal Tamil Nadu on weekly basis

Weeks	F(D)	F(DD)	P(D)	P(DD)	PD2%	F(W)	F(WW)	P(W)	P(WW)	PW2%	F(D)	F(DD)	P(D)	P(DD)	PD2%	F(W)	F(WW)	P(W)	P(WW)	PW2%
					Nungambakkam										**Meenambakkam**					
40	30	30	1.00	1.00	1.00	0	0	0	0	0	30	30	1.00	1.00	100	0	0	0	0	0
41	30	30	1.00	1.00	73	0	0	0	0	0	29	29	.97	1.00	70	1	0	.03	0	0
42	26	22	.73	.86	53	8	0	.27	0	7	25	23	.83	.92	48	5	0	.17	0	7
43	22	16	.73	.73	46	8	3	.27	.37	0	19	15	.63	.79	48	11	3	.37	.27	3
44	25	16	.83	.64	73	5	0	.16	.20	7	25	14	.83	.56	77	5	1	.17	.20	3
45	26	23	.87	.88	70	4	3	.13	.75	0	27	24	.90	.89	73	4	1	.10	.33	0
46	25	21	.83	.84	56	5	0	.17	0	3	27	26	.90	.96	54	4	0	.10	0	3
47	23	20	.77	.86	70	7	1	.23	.14	3	22	20	.73	.91	68	8	1	.20	.12	3
48	28	22	.93	.78	83	2	1	.07	.05	0	29	20	.97	.69	73	1	0	.03	0	0
49	27	25	.90	.92	86	3	0	.10	0	0	26	24	.87	.92	80	4	0	.13	0	0
50	29	28	.97	.93	96	1	0	.03	0	0	30	25	1.00	.83	100	0	0	0	0	0
51	30	28	1.00	.93	96	0	0	0	0	0	30	30	1.00	1.00	93	0	0	0	0	0
52	29	29	.97	1.00	100	1	0	.03	0	0	29	29	.96	1.00	93	1	0	.03	0	0
					Cuddalore										**Parangipettai**					
40	27	26	.90	.96	90	3	2	.10	.67	0	30	30	1.00	1.00	90	0	0	0	0	0
41	29	26	.97	.90	76	1	1	.03	1.00	3	29	29	.97	1.00	80	1	0	.03	0	0
42	23	22	.77	.96	60	7	1	.23	.14	3	26	25	.87	.96	62	4	0	.13	0	3
43	21	17	.70	.81	50	9	2	.30	.22	10	24	20	.80	.83	60	6	1	.20	.16	0
44	22	15	.73	.68	63	8	2	.27	.25	6	26	20	.87	.77	60	4	0	.13	0	0
45	26	19	.87	.73	66	4	0	.13	0	0	24	20	.80	.83	60	6	0	.20	0	72
46	23	20	.77	.87	57	7	1	.23	.14	3	24	20	.80	.83	63	6	2	.20	.33	3
47	24	17	.80	.71	57	6	0	.20	0	0	26	23	.87	.88	73	4	1	.13	.25	72
48	23	12	.77	.74	86	7	0	.20	0	0	26	24	.87	.92	70	4	1	.13	.25	3
49	23	19	.77	.83	77	7	4	.57	.13	0	26	24	.87	.92	76	4	1	.13	.25	3
50	27	23	.90	.85	83	3	3	.10	1.00	10	29	27	.97	.93	87	1	0	.03	0	0
51	28	25	.93	.89	83	2	0	.07	0	0	29	28	.97	.96	87	1	0	.03	0	0
52	27	25	.90	.92	90	3	0	.10	0	0	29	28	.97	.96	90	1	0	.03	0	0
					Nagapattinam										**Adiramapattinam**					
40	30	30	1.00	1.00	100	0	0	0	0	0	28	28	.93	1.00	67	2	0	.07	0	3
41	30	30	1.00	1.00	77	0	0	0	0	0	29	28	.97	.96	61	1	1	.03	1.00	3
42	23	23	.77	1.00	56	7	0	.23	0	0	26	26	.87	1.00	58	4	1	.13	.25	3
43	24	17	.80	.71	67	6	0	.20	0	6	28	25	.93	.89	58	2	1	.07	.50	0
44	24	20	.80	.83	67	6	2	.20	.33	6	27	25	.90	.92	58	3	0	.10	0	3
45	24	20	.80	.83	67	6	2	.20	.33	10	27	25	.90	.92	64	3	1	.10	0	3
46	23	21	.77	.91	60	7	3	.23	.43	3	29	27	.97	.93	61	1	0	.03	0	0
47	24	18	.80	.75	67	6	1	.20	.16	6	27	26	.90	.96	61	3	0	.10	0	0
48	24	20	.86	.83	63	6	2	.20	.33	3	28	26	.93	.93	61	2	0	.07	0	0
49	24	18	.80	.75	77	6	1	.20	.16	0	28	26	.93	.93	64	2	0	.07	0	0
50	29	23	.97	.79	93	1	0	.03	0	3	29	27	.91	.93	67	1	0	.03	0	0
51	28	28	.93	1.00	87	2	1	.07	.50	0	28	27	.93	.96	61	2	0	.07	0	0
52	28	26	.80	.93	93	2	0	0	0	0	28	26	.93	.93	67	2	0	.07	0	0

TABLE 3 (*Contd.*)

Weeks	*F(D)*	*F(DD)*	*P(D)*	*P(DD)*	*PD2%*	*F(W)*	*F(WW)*	*P(W)*	*P(WW)*	*PW2%*	*F(D)*	*F(DD)*	*P(D)*	*P(DD)*	*PD2%*	*F(W)*	*F(WW)*	*P(W)*	*P(WW)*	*PW2%*
					Alangudi										**Tondi**					
40	30	30	1.00	1.00	100	0	0	0	0	0	29	29	.97	1.00	100	0	0	.03	0	0
41	30	30	1.00	1.00	81	0	0	0	0	0	29	28	.97	.96	100	1	0	.03	0	0
42	28	28	.93	1.00	83	2	0	.07	0	0	28	27	.93	.96	100	2	0	.07	0	0
43	29	27	.97	.93	90	1	0	.03	0	0	28	26	.93	.93	100	2	0	.07	0	0
44	30	29	1.00	.97	100	0	0	0	0	0	29	27	.97	.93	100	1	0	.03	0	0
45	30	30	1.00	1.00	100	0	0	0	0	0	29	28	.97	.96	100	1	0	.03	0	0
46	30	30	1.00	1.00	90	0	0	0	0	0	30	29	1.00	.97	100	0	0	0	0	0
47	29	29	.97	1.00	87	1	0	.03	0	0	30	30	1.00	1.00	100	0	0	0	0	0
48	29	28	.97	.96	80	1	0	.03	0	0	29	29	.97	1.00	100	1	0	.03	0	0
49	27	27	.90	1.00	83	3	0	.10	0	0	28	27	.93	.96	100	2	0	.07	0	0
50	29	27	.97	.93	90	1	1	.03	1	0	29	27	.97	.93	100	1	0	.03	0	0
51	30	29	1.00	.97	100	0	0	0	0	0	28	27	.93	.96	100	2	0	.07	0	0
52	30	30	1.00	1.00	100	0	0	0	0	0	30	28	1.00	.93	100	0	0	0	0	0
					Pamban										**Tuticorin**					
40	30	30	1.00	1.00	93	0	0	0	0	0	30	30	1.00	1.00	97	0	0	0	0	0
41	28	28	.93	1.00	79	2	0	.07	0	3	29	29	.97	1.00	96	1	0	.03	0	3
42	27	25	.90	.92	67	3	1	.10	.33	0	27	27	.90	1.00	80	3	1	.10	.33	0
43	23	21	.77	.91	60	7	1	.23	.14	3	27	24	.90	.89	83	3	0	.10	0	0
44	25	19	.83	.76	76	5	1	.17	.20	0	28	25	.93	.89	77	2	0	.07	0	0
45	29	21	.97	.83	83	1	0	.03	0	0	26	24	.87	.92	86	4	0	.13	0	0
46	27	26	.90	.96	75	3	0	.10	0	0	29	24	.97	.83	93	1	0	.03	0	0
47	26	23	.87	.88	69	4	0	.13	0	3	29	28	.97	.96	97	1	0	.03	0	0
48	25	22	.83	.88	75	5	1	.17	.20	3	30	29	1.00	.97	100	0	0	0	0	0
49	26	23	.87	.88	83	4	2	.13	.50	0	30	30	1.00	1.00	100	0	0	0	0	0
50	29	25	.97	.86	93	1	0	.03	0	3	30	30	1.00	1.00	100	0	0	0	0	0
51	27	25	.90	.92	83	3	1	.10	.33	0	30	30	1.00	1.00	100	0	0	0	0	0
52	28	25	.93	.89	90	2	0	.07	0	0	30	30	1.00	1.00	100	0	0	0	0	0
					Paiyamkottai										**Kanyakumari**					
40	30	30	1.00	1.00	96	0	0	0	0	0	30	30	1.00	1.00	77	0	0	0	0	0
41	29	29	.97	1.00	93	1	0	.03	0	0	29	29	.97	1.00	74	1	1	.03	0	0
42	29	28	.97	.96	80	1	0	.03	0	0	29	28	.97	.96	70	1	0	.03	0	0
43	29	28	.97	.96	80	1	0	.03	0	0	28	27	.90	.96	70	2	0	.07	0	0
44	28	23	.93	.82	76	2	0	.07	0	0	29	27	.97	.93	77	1	0	.03	0	0
45	26	24	.87	.92	87	4	3	.13	.75	0	30	29	1.00	.97	74	0	0	0	0	0
46	30	26	1.00	.87	100	0	0	0	0	0	28	28	.93	1.00	74	2	1	.07	0	0
47	30	30	1.00	1.00	100	0	0	0	0	0	30	28	1.00	1.93	80	0	0	0	0	0
48	30	30	1.00	1.00	97	0	0	0	0	0	30	30	1.00	1.00	80	0	0	0	0	0
49	30	30	1.00	1.00	97	1	0	.03	0	0	30	30	1.00	1.00	77	0	0	0	0	0
50	29	2	.97	1.00	93	1	0	.03	0	0	29	29	.97	1.00	77	1	0	.03	0	0
51	29	28	.97	.96	87	1	0	.03	0	0	30	29	1.00	.97	80	0	0	0	0	0
52	30	29	1.00	.97	100	0	0	0	0	0	30	30	1.00	1.00	80	0	0	0	0	0

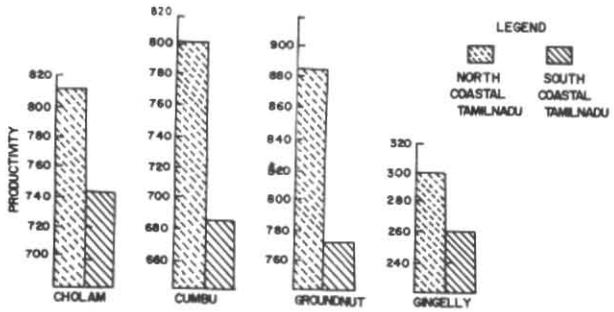

Fig. 2. Average productivity (kg/ha) of some rainfed crops in north coastal and south coastal Tamil Nadu

Besides, long duration crop varieties can be cultivated in north coastal Tamil Nadu.

3.3. *Probability of occurrence of dry spell and wet spell on weekly basis during the northeast monsoon season*

Northeast monsoon season is the main rainy season in state of Tamil Nadu (Raj *et al.* 1993). As most of the rainfed crops are in active growing stage in this season, probability studies of rainfall on weekly basis for this season has been undertaken. The probability of occurrence of dry week, wet week preceded by wet weeks, two consecutive dry and wet weeks are presented in Table 3.

Except Alangudi the values of probability of occurrence of dry week fall in the range of 0.63 to 0.83 in certain weeks between 42nd and 49th week in all the stations of north coastal Tamil Nadu. *P(D)* values are more than 0.83 in all the weeks in the stations of south coastal Tamil Nadu. Except Adirampattinam and Alangudi, the probability of occurrence of dry week preceded by dry week lies between 0.56 & 0.83 in all the stations of north coastal Tamil Nadu in a number of weeks from 43rd to 50th week in this season. Similar to *P(D)*, *P(DD)* values lie above 0.83 in all the weeks in the stations of south coastal Tamil Nadu. The probability of occurrence of wet week preceded by wet week is less in the stations of south than north coastal Tamil Nadu in all the weeks in this season. In some of the weeks from 40th to 51st, the stations of north coastal Tamil Nadu have *P(WW)* values in the range of 0.14 to 1.00. The probability of occurrence of two consecutive dry weeks falls in the range of 46 to 67 per cent in a number of weeks in this season in all the stations of north coastal Tamil Nadu and Pamban. *PD*2 values are comparatively high in the stations south of Pamban in all the weeks in this season. *PW*2 ranges from 6 to 10 per cent in Cuddalore and Nagapattinam in between 43-45, 47, 49 and 50th week, whereas, *PW*2 is 72 per cent in 45th and 47th week in Parangipettai.

Thus, from the above discussion it is observed that the probability of occurrence of dry week, dry weeks preceded by dry week and two consecutive dry weeks are, in general, comparatively low in all the weeks under study in all the stations north of Alangudi except Pamban. In other words, the probability of occurrence of wet week, wet week preceded by wet week and two consecutive wet weeks are comparatively higher in stations north of Alangudi in all the weeks in the northeast monsoon season. Among the stations in north coastal Tamil Nadu, Nungambakkam and Meenambakkam which lie south of it, the probability of wet week, wet week preceded by wet week and two consecutive wet weeks are more in 42nd to 45th and 47th week, *i.e.,* 15 October to 11 November and from 19 to 25 November while *P(W)*, *P(WW)*, *PW*2 in other coastal stations of north Tamil Nadu are less between 42nd and 50th week, *i.e.,* 15 October to 16 December. The finding so far obtained gives an idea of the percentage chances of dryness and wetness in a particular week. The knowledge could be utilised in supplementing water source by recourse to irrigation or conservation of excess rainfall in the crop growing period. Besides, the sowing dates can be adjusted so that grand growth and development phases of crop can fall in the weeks having the maximum probability of rainfall 21 mm or more in the coastal districts of Tamil Nadu and also in the choices of crops to be grown in this region.

In Tamil Nadu, rainfed crops like cumbu, cholam, groundnut and gingelly are generally cultivated from June to December (Crop Production Guide 1991). Analysis of production figures (Fig.2) shows that the production (kg/ha) of rainfed cumbu, cholam, groundnut and gingelly is higher in north than south coastal Tamil Nadu in the order of 9.0, 17.1, 14.6 and 12.9 per cent of the production of south coastal Tamil Nadu respectively. Among the other factors which play important role in crop production, it appears that the quantum of rainfall and occurrence of more wet spells from July to December and in the weeks of the northeast monsoon season helps produce more cholam, cumbu, groundnut and gingelly in the coastal districts of north Tamil Nadu though the water requirement of the crops mentioned is comparatively low than that for other cereal crops.

4. Conclusions

Annual and northeast monsoon rainfall amounts are found to be higher in stations north of

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Alangudi whereas rainfall during the southwest monsoon is high north of Tondi among the coastal stations of Tamil Nadu. During the hot weather period rainfall mainly occurs in the stations south of Adiramapattinam. The occurrence of wet spell, *i.e.*, rainfall 90 mm or more per month starts from July and continues up to December in the stations of north coastal Tamil Nadu. As the chance of getting rainfall 90 mm or more per month is high from July to December, agricultural operations can be started from the month of July in the north coastal Tamil Nadu and long duration variety of crops can be cultivated in this region, whereas, all the agricultural operations dependent mainly upon rainfall have to be necessarily limited to the northeast monsoon season in south coastal Tamil Nadu as the wet spells are observed only in the months of October to December. During the northeast monsoon seasons the wet weeks are mainly confined to the stations of north coastal Tamil Nadu. As most of the crops are in active growing stage in this season, these findings could be utilised in a quantitative fashion in supplementing water sources through recourse to the irrigation or conservation of excess rainfall in the crop growing periods. Sowing dates can be adjusted so that the grand growth and development phases can occur in the weeks having the maximum probability of rainfall 21 mm or more in coastal Tamil Nadu. Analysis of production figures of rainfed cumbu, cholam, groundnut and gingelly shows that the average production of these crops is higher in north than in south coastal Tamil Nadu. The obvious inference is that the production of those crops — even though this requires marginal amounts of water only — is very sensitive to the actual amounts of rainfall, a fact that should be incorporated in any agricultural strategy related to these crops.

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