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Almanac study on forecasting annual rainfall

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Abstract: An analysis was taken up to find out the validity of forecasting annual rainfall by using Tamil almanac information and 90 years (1909-1999) historical rainfall data of Coimbatore. The results revealed that the annual rainfall of a particular Tamil year in a cycle was not the same for the corresponding Tamil year in the fourth-coming cycle and one can expect an opposite event. There was no correlation between occurrence of rainfall at specific dates and total annual rainfall. Between dates of rainfall within a Tamil year had correlation.

Key words : Rainfall forecasting, Tamil almanac.

Introduction

Rainfall is the end product of many complex atmospheric processes. Attempt to predict rainfall scientifically on temporal and spatial basis is going on from the time immemorial. During the early history of India, based on astronomical observations almanac was prepared and used for rainfall prediction. Tamil almanacs were also prepared based on 60 Tamil years and used to understand the future occurrence of rainfall events. There are 60 Tamil years, which follow a definite cyclic pattern, which has both head and tail ends. In this cycle, the Tamil year *Prabava* comes as the first year and the Tamil year *Akhsaya* terminates as the 60th year in that 60 year cycle. Each Tamil year consists of 12 months *viz. Chithirai, Vaikasi, Aani, Aadi, Aavani, Puratasi, Iyppasi, Karthigai, Markhazhi, Thai, Masi* and *Panguni*. Such one 60 years cycle was started during 1927-'28 in this generation and terminated during 1986-'87 and a fresh cycle has commenced from 1987-'88 with the year name *Prabava* and this cycle would be completed at 2047-'48.

According to Almanac information, the quantum of annual rainfall of a particular Tamil year in a cycle will be repeated for the corresponding Tamil year in the forth-coming cycles. Similarly, occurrence of rainfall at specific dates in a month of a Tamil year would bring copious annual rainfall during that particular Tamil year. Based on these hypothesizes, a scientific study was taken up to find out the validity of the hypothesizes through simple correlation (Kawanchai *et al.* 1984).

Materials and Methods

The analysis was carried out in two pha as directed below.

Phase I: Repeatability of tamil year rainf

Daily rainfall data for the period of 19 to 1999 were collected for the study purpo from the Department of Agricultural Meteorolo Tamil Nadu Agricultural University, Coimbato The Tamil years normally start by April 1 and end by April 13th of the next year. Henc rainfal from April 14 to next year April were added to get the annual rainfall of th particular Tamil year. Accordingly the rainf data collected from 1908 to 1999 were cumulate into annual rainfall for the concerned Tam year. For computation of the quantum of th annual rainfall, the Tamil year cycle startin from 1927-'28 to 1986-'87 was taken as th base cycle and the annual rainfall quantity c these years was categorised into different categorie based on India Meteorological Department (IMD standard classification. The IMD standar classification is as follows:

Normal	:	± 19% of the mean annual rainfal
Wet	:	+ 19 to + 59 of the mean annua rainfall
Excess	:	> + 59% of the mean annual rainfal
Deficit	:	-19% to -59% of the mean annua rainfall
Dry	:	-59% to -99% of the mean annual rainfall

For vertification purpose, the subsequen cycle, which has started from 1987-'88, was

able 1. Total rainfall (mm) for corresponding Tamil year

mil year	English year	Rainfall (April 14 – April 13)	Predicted
rabava	1927-28	576	Normal
bava	1928-29	435	Deficit
ikkla	1929-30	619	Normal
ramothutha	1930-31	939	Wet
rajothpathi	1931-32	529	Normal
ngirasa	1932-33	705	Normal
jmuga	1933-34	707	Normal
ava	1934-35	560	Normal
va	1935-36	493	Deficit
athu	1936-37	492	Deficit
svara	1937-38	502	Deficit
haghuthanya	1938-39	378	Deficit
ramathi	1939-40	621	Normal
krama	1940-41	927	Wet
shu	1941-42	684	Normal
hithirabanu	1942-43	664	Normal
vabanu	1943-44	574	Normal
harana	1944-45	843	Wet
rthiva	1945-46	695	Normal
vaya	1946-47	975	Wet
rvajith	1947-48	242	Dry
rvathari	1948-49	520	Deficit
rothi	1949-50	469	Deficit
krutha	1950-51	522	Normal
gra	1951-52	505	Deficit
anthana	1952-53	392	Deficit
jaya	1953-54	817	Wet
ya	1954-55	620	Normal
anmatha	1955-56	447	Deficit
hurmugi	1956-57	645	Normal
eyvilambi	1957-58	902	Wet
lambi	1857-59	572	Normal
kari	1959-60	878	Wet
rvari	1960-61	645	Normal
lava	1961-62	772	Wet
bhakiruth	1962-63	775	Wet
bhakiruth	1963-64	406	Deficit
rothi	1964-65	741	Normal
chvavasu	1965-66	552	Normal
rabava	1966-67	753	Normal
lavanga	1967-68	413	Deficit
elaga	1968-69	355	Deficit
owmya	1969-70	688	Normal
tharana	1970-71	371	Deficit
rothikiruth	1971-72	751	Normal
rithabi	1972-73	1073	Excess
ramathesa	1973-74	720	Normal
antha	1974-75	365	Deficit
kshasa	1975-76	632	Normal
la	1976-77	519	Deficit
ngala	1977-78	995	Wet

contd...

Tamil year	English year	Rainfall (April 14 – April 13)	Predicted
Kalayukthi	1978-79	741	Normal
Chiththarthi	1979-80	1188	Excess
Routhri	1980-81	716	Normal
Thuirmathi	1981-82	751	Normal
Thunthubi	1982-83	622	Normal
Ruthirouthkari	1983-84	865.5	Wet
Rakthakshi	1984-85	790	Wet
Kurothana	1985-86	525	Normal
Akshaya	1986-87	473	Deficit

Table 2. Prediction of annual rainfall trend for 1987-'88 to 2047-'48 cycle by using base Tamil year cycle (60 years)

Tamil year	English year	Rainfall (April 14 – April 13)	Predicted	Observed
Prabava	1987-88	687	Normal	Normal
Vibava	1988-89	558	Deficit	Normal
Sukkla	1989-90	623	Normal	Normal
Pramothutha	1990-91	568	Wet	Normal
Prajothpathi	1991-92	446	Normal	Deficit
Angirasa	1992-93	801	Normal	Wet
Srimuga	1993-94	839	Normal	Wet
Bava	1994-95	680	Normal	Normal
Yuva	1995-96	643	Deficit	Normal
Thathu	1996-97	704.9	Deficit	Normal
Eswara	1997-98	899.4	Deficit	Wet
Bhaghuthanya	1998-99	906	Deficit	Wet

Table 3. Prediction of annual rainfall trend for 1967-'68 to 1926-'27 cycle by using base Tamil year cycle (60 years)

Tamil year	English year	Rainfall (April 14 – April 13)	Predicted	Observed
Keelaga	1908-99	512	Deficit	Deficit
Showmya	1909-10	532	Normal	Normal
Satharana	1910-11	690	Deficit	Normal
Virothikiruth	1911-12	750	Normal	Normal
Parithabi	1912-13	794	Excess	Wet
Pramathesa	1913-14	418	Normal	Deficit
Anantha	1914-15	558	Deficit	Normal
Rakshasa	1915-16	568	Normal	Normal
Nala	1916-17	634	Deficit	Normal
Pingala	1917-18	574	Wet	Normal
Kalayukthi	1918-19	672	Normal	Normal
Chiththarthi	1919-20	783	Excess	Wet
Routhri	1920-21	558	Normal	Normal
Thuirmathi	1921-22	630	Normal	Normal
Thunthubi	1922-23	772	Normal	Wet
Ruthirouthkari	1923-24	511	Wet	Deficit
Rakthakshi	1924-25	1068	Wet	Excess
Kurothana	1925-26	737	Normal	Normal
Akshaya	1926-27	583	Deficit	Normal

Table 4. Particulars on the occurrence of rainfall (mm) at specific dates of a Tamil year

Tamil year	English year	Aani 10	Aadi 8	Aavani 6	Puratasi 4	Iyppasi 2	Karthigai 1	No. of occurrence	Total RF (mm)	Rainfall category
Routhri	1980-81	0	0	0.6	1.4	0	17.4	3	750.4	Normal
Thuirmathi	1981-82	5.4	0	0	0	2.0	0	2	771.4	Wet
Thunthubi	1982-83	2.6	0	0	11.0	0	0.5	3	637.9	Normal
Ruthirouthkari	1983-84	7.5	5.0	2.4	0	11.4	0	4	666.2	Normal
Rakthakshi	1984-85	0	0	1.5	0	0	0	1	884.5	Wet
Kurothana	1985-86	1.5	0	26.0	0	0	0	2	586.3	Normal
Akshaya	1986-87	2.0	0	0	0	0	0	1	507.3	Deficit
Prabava	1987-88	0	0	0	2.0	0	0	1	666.6	Normal
Vibava	1988-89	0	0.8	0	0	0	0	1	521.3	Normal
Sukkla	1989-90	0	12.4	0	17.8	0	0	2	582.1	Normal
Pramothutha	1990-91	0	0	0	0	1	0	1	568.3	Normal
Prajothpathi	1991-92	0	0	0	0	0	2.0	1	488.3	Deficit
Angirasa	1992-93	0	0	0	27.5	0	12.0	2	748.0	Normal
Srimuga	1993-94	0	0	0	0	0	0	0	663.0	Normal
Bava	1994-95	0	0	0.8	0	0	0	1	911.7	Wet
Yuva	1995-96	0	2.0	1.4	0	0	0	2	572.3	Normal
Thathu	1996-97	0	13.8	26.0	0	18.6	0	3	753.7	Normal
Eswara	1997-98	0	1.5	7.5	0	0	0	2	869.9	Wet
Bhaghuthanya	1998-99	0	0	1.0	0	0	0	1	949.0	Wet
Pramathi	1999-2000	0	1.8	0	0	1.6	0	2	598.2	Normal

Table 5. Correlation between occurrence of rainfall at specific dates and total annual rainfall

Particulars	Aani 10	Aadi 8	Aavani 6	Puratasi 4	Iyppasi 2	Karthigai 1	Total Rainfall
Aani 10	1						
Aadi 8	0.0131 NS	1					
Aavani 6	-0.0221 NS	0.4267 NS	1				
Puratasi 4	-0.0981 NS	0.1944 NS	-0.1808 NS	1			
Iyppasi 2	0.3438 NS	0.6957*	0.5549*	-0.1570 NS	1		
Karthigai 1	-0.1507 NS	-0.1580 NS	-0.1299 NS	0.4221 NS	-0.1253 NS		
Total rainfall	-0.0544 NS	-0.0607 NS	0.0571 NS	-0.0284 NS	0.0788 NS	0.1537 NS	

* Significant at 5% probability level

taken into account (12 years) and the rainfall quantity was classified into various categories as that of base cycle. Similarly, the preceding cycle, which was having 19 years, which ended during 1926-'27 was also taken for vertification purposes. The annual rainfall of the part of the preceding cycle also was categorized as per IMD classification.

Phase II: Relationship between occurrence of rainfall on specific dates and annual rainfall

The occurrence of rainfall during specific *viz. Aanni 10, Aadi 8, Aavani 6, Puratasi 4, Iyppasi 2* and *Karthigai 1* as given in the almanac was recorded for 20 years from 1980-'81 to 1999-2000. The concerned Tamil years annual rainfall was taken for correlation with the rainfall events occurred on specific dates with in the Tamil year.

Results and Discussion

Phase I : Repeatability of tamil year rainfall

The mean annual rainfall of Coimbatore is 644.04 mm and from this Normal (521-766mm), Wet (767-1024mm), Excess (>1024mm), Deficit (520-264mm) and Dry (263mm-6.44mm) categoies were worked out as per IMD classification. The total annual rainfall was of highly varying in nature between Tamil years in a cycle studied (Table 1).

The category of annual rainfall for the base Tamil year cycle (1927-'28 to 1986-'87) is given in Table 1. Based on the results furnished in Table 1, occurred rainfall in the subsequent and preceding Tamil year cycle were verified (Table 2 and 3).

The data revealed that in 75 per cent of the years of verification in the subsequent cycle and 58 per cent of the years of verificaton in the preceding cycle, there was an opposite event with respect to the rainfall category that occurred in the 60 year base cycle (Table 2 & 3). It can be further explained that if a particular Tamil year (*Vibhava*) in a 60-year base cycle had deficit rainfall, in the subsequent cycle that concerned Tamil year had exhibited opposite trend either with high rainfall or with normal rainfall. Similarly, the preceding cycle to the base cycle of the 60 years, there was opposite rainfall category event. The information are interesting and it needs further probing.

Phase II: Relationship between occurrence of rainfall on specific dates and annual rainfall

The details on the occurrence of rainfall at specific dates of a Tamil year are given in Table 4. The total annual rainfall and the category of rainfall of particular Tamil year are also furnished (Table 4).

From the results, it is observed that there was no relationship between the occurrence of rainfall at a specific dates and annual rainfall. This is because, during 1983-'84 (*Ruthiroutkari*) rainfall occurred in four specific dates out of six specific dates and annual rainfall was grouped into normal and during 1993-'94 (*Srimuga*) there was no rainfall occurrence on specific dates but the annual rainfall was Normal. Similarly during 1986-'87 (*Akshaya*) and 1991-'92 (*Prajothpathi*), the occurrence of rainfall during specific dates was one out of six, even though the category was under deficit.

Even though there was no correlation between rainfall at specific dates and annual rainfall, there was a significant correlation between rainfall occurrence between dates especially between *Aadi 8* and *Iyppasi 2* and between *Aavani 6* and *Iyppasi 2* (Table 5).

Conclusions

The phase I analysis revealed that the annual rainfall of a particular Tamil year in a cycle was not the same for the corresponding Tamil year in the forth-coming cycle. One can expect an opposite event. The phase II analysis revealed that there was no correlation between occurrence of rainfall at specific dates and total annual rainfall. But between dates of rainfall within a Tamil year had correlation

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