ASSOCIATION BETWEEN THE ONSET OF RAINS AND THE VARIATION OF THE *MAHA* AND *YALA* SEASONS IN BATTICALOA DISTRICT

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INTRODUCTION

Previous agronomic studies relating to cropping- decision making conducted in Batticaloa for decades have taken little account of variations in the climatic potential in the region. This has led to slow progress in fully exploiting the agricultural potential of the said region. There is no doubt that cropping/production efficiency would increase if the climatic variations in Batticaloa are accounted for and incorporated in agricultural decision-making. In this respect, even under highly erratic rainfall regimes, years with favorable rainfall distribution could occur and it is necessary to strive for paddy product maximizing strategies in such times (Punyawardena, 2002). **Hence, the early identification of the potential of a season's variability is important in designing appropriate strategies for increased paddy production in the Batticaloa region.**

Traditionally, the time of planting has been taken as the dry and wet seasons for *Maha* and *Yala* cultivations respectively. Agrarian committees, which comprise of the Meteorological Officer, Irrigation Engineer, Assistant Director of the Department of Agriculture and the farmers' representatives *etc*. are responsible for deciding the time of planting in Batticaloa based on these traditional concepts. The time of planting may be adjusted due to the poor modification of land use in accordance with available water resources (i.e. from rainfall and irrigation tanks) to a certain extent. However, due to the **general unpredictability** of rainfall variations, agricultural planners in Batticaloa also tend to rely on simple probability levels (Panabokke and Walgama, 1979). These elementary statistical methodologies are not comprehensive enough, when considering the highly dynamic and stochastic nature of rainfall in Batticaloa.

A study which to evaluate the dynamics of such situation(s) is presented in this paper. The principal aim is to provide suggestions to farmers for adjusting the time of planting in accordance to the changing weather pattern using a much comprehensive and refined mathematical approach[1].

METHODOLOGY

The unique aspect of this paper is that it deals with the development of a cost effective statistical (quantitative) methodology for estimating future seasonal rainfall period length in order to aid in paddy production management using archived/historical data sets. However, a common problem is that the relevant governmental departments (Department of Agriculture, Department. of Meteorology.) do not hold sufficient/comprehensive long-term records on climatic data in their offices in Batticaloa (Parthеѐpan, 2004). Therefore, to overcome this shortfall, long-term rainfall data of the Batticaloa Meteorological Station was collected from the manuscripts of the Department of Meteorology, Colombo. Time series data sets such as monthly rainfall, number of rainy days from 1900 to 2003 were used in this study. In this respect, a sustained rain spell, which more or less represents the transition from dry season to wet season, should be identified from the time series. Secondly the spell so chosed, the rain that fall should percolate into the soil up to a reasonable depth and also build a moisture profile therein after loss through evaporation. Keeping in view the above requirements in association with physical properties such as water holding capacity, expected evaporative conditions in the atmosphere and normal depth of seed placement of the major soil group of the Batticaloa region, (sandy rego sols) the following criteria was chosen to define the onset of the seasons in terms of rainfall:

A spell of at least 30mm of rain per week in three consecutive weeks after a pre-specified week for the *Maha* (standard week 40) and *Yala* (Standard week 5) seasons.

If three weeks criterion was not satisfied, the condition was relaxed up to two consecutive weeks with rainfall equal to or greater than 30mm. this relaxation was particularly important for *Yala* season where the continuity of the rains is always uncertain. **Length of season was taken as the number of weeks between the end of the season and the onset of the season.** Using criteria, onset and withdrawal of the rainy season and the amount of the rainfall within each season were determined from the simulated data. Such a large number of simulation data ensured the inclusion of all possible extreme values of the rainfall process. Once these attributes are determined for each simulated year, a linear regression analysis was performed between onset and withdrawal, length of the season and amount of seasonal rainfall.

Those data were then analysed by using MS Excel and MINITAB software programmes, to visually infer the temporal patterns (figures 1, 1.1&2).

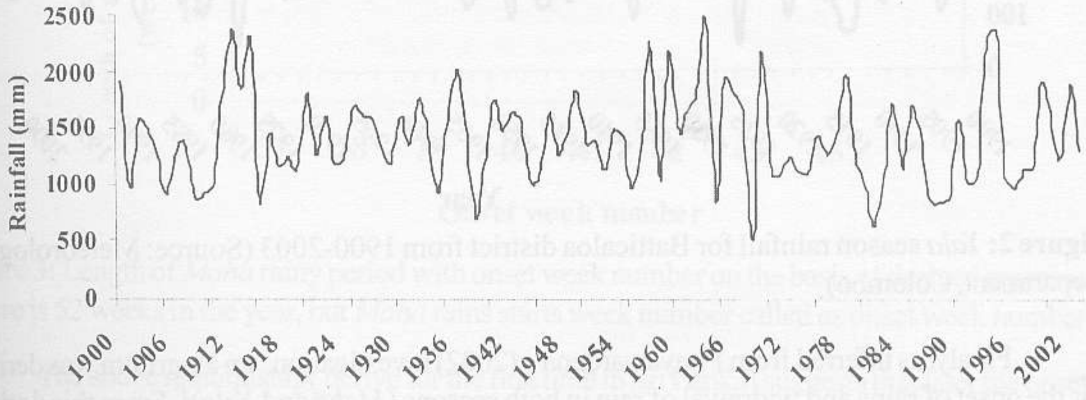

Figure 1: *Maha* season rainfall for Batticaloa district from 1900-2003 (Source: Meteorological Department, Colombo)

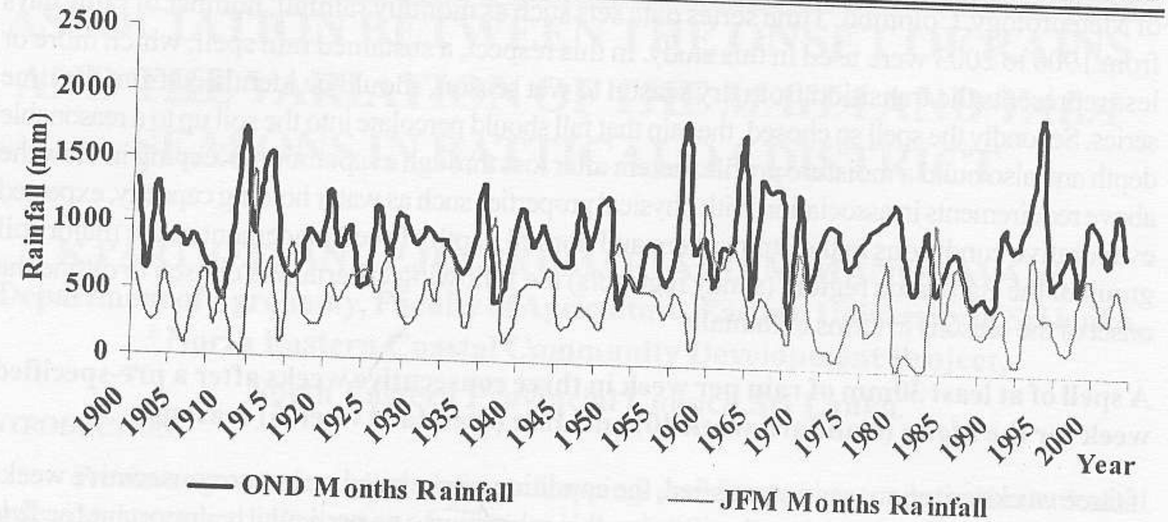

Figure 1.1: *OND, JFM, Rainfall for batticaloa district from 1990-2003 (Source : Partheepan, 2004) (OND means October, November, December, JFM Means January, February, March)*

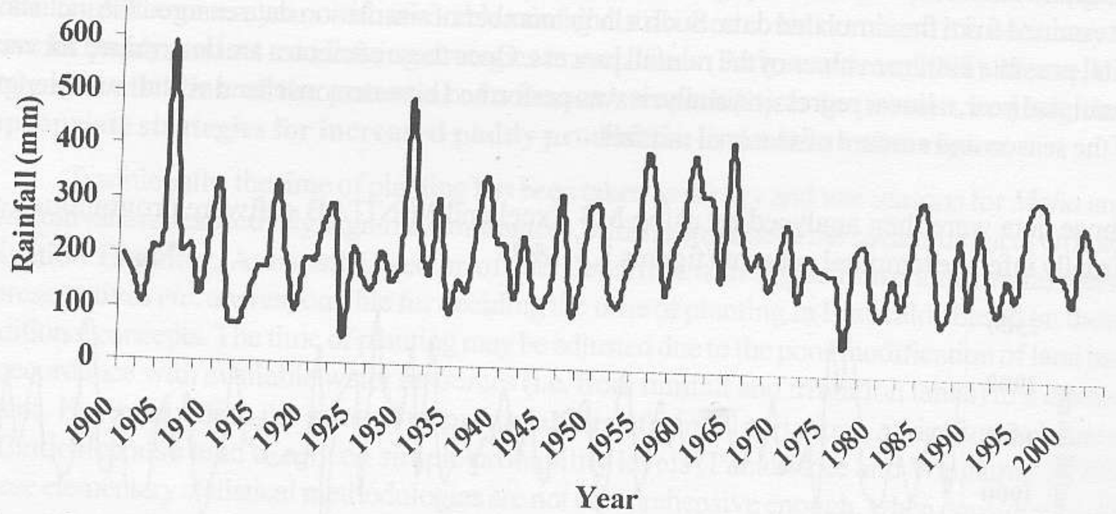

Figure 2: *Yala* season rainfall for Batticaloa district from 1900-2003 (Source: Meteorological Department, Colombo)

Finaly, as inferred from Punyawardena's (2002) investigation, an alogrithm was derived for the onset of rains and widrawal of rain in both seasons (*Maha* and *Yala*)[2]. From this derived alogrithm, the farmer can calculate the length of the *Maha* rain period and the widrawal week for the *Yala* season rain on a weekly basis.

ANALYSIS AND RESULTS

The computed average onset of rains during the *Maha* season was around mid October, the standard week number 40 to 41, and these rains remain effective until late January of the following year, (till the standard week 4 or 5 week). The average time of the onset of the *Yala* season was in late April (between standard weeks numbers is 13 to16). The average length of the season was around 5 weeks. Coefficient of variation (CV) of the start and end of the season is

0.29 and 0.27 respectively. Thus, the variability of the start and end of the *Yala* season is almost similar.

MAHA SEASON

The coefficient of variation of the onset of the *Maha* rains (CV = 0.054) was relatively lower than that of the onset of the *Yala* rains (CV= 0.29). The relationship was opposite for the end of rains where the withdrawal of the *Maha* rains (CV= 0.49) and was much higher than for the *Yala* rains (CV = 0.27). Thus, unlike the *Yala* season, it is likely that the *Maha* season should start within the first couple of weeks of October. The average length of *Maha* season was around 14 weeks, being longer than the rainfall in the *Yala* season. These comparative statistics between *Yala* and *Maha* seasons confirm the general rule: **variability is the highest and its reliability the least where the total rainfall is lowest.** The relationships between the lengths of the *Maha* rainy period with the onset week number can be stated as:

$$L_W = 17.222 - [0989(W - 39.5)] \quad \text{.................................} (1)$$

Where,

= Length of season in weeks

W = Starting standard week

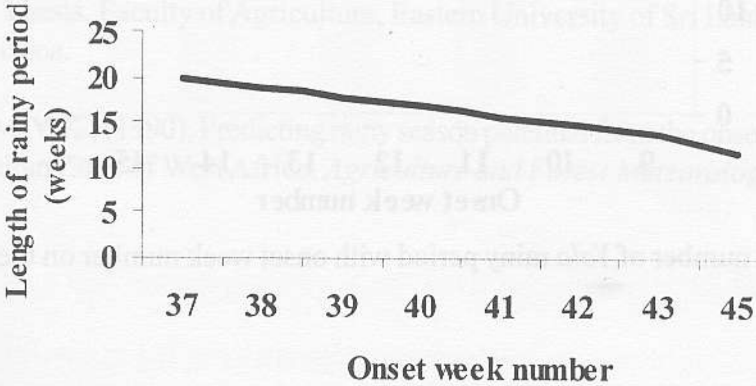

Figure 3: Length of *Maha* rainy period with onset week number on the basis of derived equation. (There is 52 weeks in the year, but *Maha* rains starts week number called as onset week number)

The above relationship(derive for the first time in Sri Lanka) suggests that later the onset, the shorter the season's length because the end of the season is almost constant in any year(figure 3). But, the correlation of determination (r^{2--}) of the relationship was only 0.35, which implies that the strength of the relationship having a correlation coefficient value greater than 0.70 alone is worthwhile to be considered for any predictive purposes because it can explain at least 50% of the total variation. Hence, as the correlation is weak, the onset time of the *Maha* rains can not be used for predicting the duration of the *Maha* season without wide margins of error. There was no evidence to suggest that the season has significant impact on the amount of rainfall received during the *Maha* season.

YALA SEASON

The correlation between the start of the season and the length of the season was very poor ($r^2 = 0.029$). This relationship confirms the underlying trend that would account for an average five week period for end of the season from the start of the season. Which indicates that irrespective of the start of the season, the *Yala* rains pause around 5 to 6 weeks fro the onset. The relationship between the seasonal rainfall during *Yala* season and the onset of the rains was also very week (Punyawardena, 2002). It implies that the onset time cannot be used for predicting the seasonal rainfall as inferred from Punyawardena (2002). Hence, it can be stated as:

$$E_W = 17.3 + [1.01(W - 12)] \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where,

E_w = Standard week number of the end of the season

W = Standard week number of the start of the season

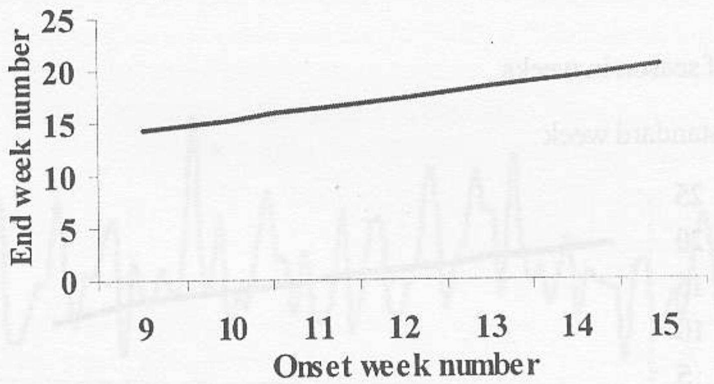

Figure 4: End week number of *Yala* rainy period with onset week number on the basis of the derived equation.

CONCLUSION

The above analysis and results confirms that agricultural planning in the Batticaloa during the *Yala* season can not be formulated from the alternatives based on the onset time of *Yala* rains. At last it provides a meaningful explanation for this unusual behaviour of Batticaloa district's rainfall compared to other dry zone districts in Sri Lanka.

An algorithm/equation, for *Maha* and *Yala* seasonal rain withdrawal and length developed from Punyawardane (2002) is also introduced in this paper. Further more, this paper presents a graphical visualization of the relationship between onset rains and length of the rainy period (for *Maha* and *Yala*) for the first time in research in agroclimatology in Sri Lanka. This explains the relationships between *Yala* and *Maha* seasonal rains, their withdrawal and length, and emphasises on the need of the awareness of the onset of rains in forecasting studies such as this.

FOOTNOTES

[1] It should be noted that this paper solely focuses on rainfed paddy cultivation Batticaloa

[2] Time of onset, withdrawal of rains and length of the rainy season: the three key parameters, which characterize the rainfall season for paddy production, have been identified as time of the onset, withdrawal of rains and the length of the rainy seaso

n (Sivakumar, 1990).

REFERENCES

Punyawardena, B.V. R., (2002) Identification of the potential of growing seasons by the onset of seasonal rains: A study in the DL_1 region of the north central zone. *Journal of. Naiotnal Science. Foundation Sri Lanka*. 30. (1&2): 13-21

Panabokke, C. R., and Walgama, A., (1974) The application of rainfall confidence limits to crop water requirements in dry zone agriculture in Sri Lanka. *Journal of the National Science Council*, Sri Lanka. Vol. 2. pp. 95-113.

Partheepan, K., (2005) *Development of a time-series modeling methodology to forecast cropping times of paddy in the Batticaloa district using climatic data.* Unpublished BSc Thesis. Faculty of Agriculture, Eastern University of Sri Lanka, Vantharumoolai. Batticaloa.

Sivakumar, M. V. K., (1990). Predicting rainy season potential from the onset of rains in Southern Sahelian Zone of West Africa. *Agriculture and Forest Meteorology* 42: 295-305.