

CHAPTER -I

INTRODUCTION

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I N T R O D U C T I O N

1.1. Introduction

The population of our country is estimated to reach thousand million mark in 2000 A.D. It is implied that to meet the basic necessities, for the existence of mankind, the agricultural production should have increased rapidly enough to keep pace with the population growth. But our estimates show that the irrigated area is not expected to be more than forty two percent of the total cropped area in the ensuing time. Therefore, judicious utilization of the direct precipitation would have to be thought of for increasing agricultural production.

The Director General of Food & Agriculture Organization (FAO) said in a statement to the press on February 1st, 1973, "It is intolerable that this world of the 1970's with all its scientific progress and its slowly growing sense of common purpose, should go on enduring a situation in which the changes of enough decent food for millions of human beings may simply depend on the whim of one year's weather". The statement would be contemplated in the sense ofournation. Consideringthe economic importance of agriculture, the important role of weather and climate is patent.

Earlier Ramdas (1967) had pointed out "Weather exercises a profound influence on farm work as well as crop growth. Success or failure of farming is very intimately linked up with the prevailing weather conditions. Farming in India is largely

gamble in weather conditions.....A sound knowledge of climatic factors and the effects of weather on crop growth and yield is , therefore, essential for every farmer..... " Doubtless,thepractical difficulties of specifying the rainfall variables more precisely account forthis gap in the literature. And rainfall totals are important in defining the climate of a region.

Rainfall is chosen as a climatic variable in this thesis because it is the climatic element of maximum significance specially in this region where the inter-annual variations of other other climatic elements are not so large.

The report of the National Commission on Agriculture (1976) made recommendations for future research thrust in these aspects,some of them are as follows :

- i) The method of working district normals should be reviewed.
- ii) Work in the field of Mathematical modeling should be reviewed.
- iii) Crop-weather studies should be intensified and formulae should be developed on a district wise basis.

Thus, a detailed examination of the systematic study of precipitation,particularly of a relatively small region may however, be suggested for regional peculiarities of the climatic system. The present investigation concentrates on the district of Cooch Behar, formerly an important region of the independent Kingdom of Coach , in the state of West Bengal . We admit that our geographical coverage is limited, but the studies of smaller region make it possible to investigate in greater details over the Terai agroclimatic zone of West Bengal.

Agricultural systems in this region i.e. the district of Cooch Behar, are susceptible to vagaries of rainfall received to a very large degree. The precipitation brings both benefits and problems to the ecosystem of this district.

The rainfall, with extremes bring drought, in meteorology, on the one hand and flood i.e. excess of this phenomenal rate on the other hand. A surfeit of water may be a problem, if it causes flooding but it is not always experienced, drought however, is invariably a problem in agriculture. So, the occurrence of droughts and floods, in meteorology in this district may have a systematic pattern which together with the interplay between these two factors could therefore be analyzed.

During the peak monsoon season, the rain does not occur on all days at a station. Rain occurs in spells. The prior knowledge of dry spells, wet spells and weather cycles, is very useful for crop planning. Investigation of the probability of occurrence of these spells and cycles has been undertaken in this study.

The present study is intended to seek empirical evidence to determine the suitability of probability distribution model for representing the character of the daily rainfall occurrence.

The nature of the daily precipitation has a complete lack of confidence in their occurrence which creates the well known uncertainty of the nature of the daily rainfall. In this study attention has been paid to the measure of this uncertainty.

The dominant characteristic of the climate is the marked rhythmic recurrence of precipitations, and the droughts or floods naturally found, its echo in a marked rhythm of their occurrence in this region. Such a study of rainfall variability in this region has attracted a good deal of attention in this study.

Agriculture and meteorology remain self contained disciplines since very ancient time. But the research in this subject requires a thorough knowledge of both the meteorology and its influence on crop production. For estimating the impact of weather on crop production, the use of total rainfall within a week or a month is not significant to predict the yield of a crop.

The relation between the yield of winter rice and the nature of daily rainfall during the sensitive months in this district has been of great interest to study .

All these apprehensions need to be analyzed through empirical investigations of the actual behaviour of precipitation in the district of Cooch Behar.

It is surprising to find that a detailed study of the behaviour of annual and daily anomalies of the atmospheric circulation pattern in this region has not been previously undertaken.

The studies examining the behaviour of nature of daily rainfall and the possible periodicities in the rainfall record as well as the relationship between yield of winter rice and the nature of daily rainfall during the crop sensitive months are for many years quite rare in the literature and most of the works

published are studies on the variability of climatological nature in this meteorological sub-division.

This thesis is essentially oriented by applied mathematics which depends on the understanding of theoretical principles of empirical statistical techniques.

12. OBJECTIVES

The specific objectives set forth in this present study are as follows :

a) To determine the distribution function of inter arrival time of drought years and flood years.

b) To derive the one day dependent weather model and to estimate average length of dry spells and wet spells and weather cycles and to determine the probability distribution of spells as well as weather cycles.

c) To derive the stochastic dependence model on the nature of the weather of a day and to assess the measure of uncertainty.

d) To detect the hidden periodicities in the recorded time series of annual rainfall.

e) To develop the relation between the winter rice yield and the nature of daily rainfall during the sensitive months on the life time of that crop.

13 : PLAN OF THE STUDY

This study is organized into nine chapters including this chapter which states the problem and the scope of the study.

Chapter-II reviews past studies on relative objectives.

Chapter-III discusses the materials and methods used in this study. It also presents the short profile of the district of Cooch Behar, West Bengal.

Chapter-IV deals with probability distribution of inter arrival time of drought years and flood years for two identical rain gauge stations in Cooch Behar district.

Chapter-V provides the preliminary analysis of spell distribution as well as the weather cycles of Cooch Behar station.

Chapter-VI also provides the measure of uncertainty of daily rainfall with the help of information theory. It also deals with the stochastic dependence of daily rainfall and it is tested by entropy.

Chapter-VII investigates to detect the hidden periodicities in the annual rainfall at two stations of Cooch Behar district.

Chapter-VIII is designed to establish the relationship between the yield of winter rice and the derived categories of daily rainfall at Cooch Behar.

The summary and conclusions drawn from the present study are recorded in Chapter-IX. Based on these conclusions certain suggestions also have been proposed to identify the scope of future research to strengthen the present study.

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