CHAPTER - IX

SUMMARY AND CONCLUSIONS

C H A P T E R : IX

SUMMARY AND CONCLUSIONS

9.1. SUMMARY OF FINDINGS :

In the district of Cooch Behar,about 10 percent of the total crop area has enjoyed the facility of irrigation. In the remaining area,crops are grown under unirrigated conditions and as such depend on rainfall. For Scientific crop planning and operation adjustment,it is necessary to have a complete knowledge of the various aspects of precipitation. In order to get a complete information on this aspect,suitable statistical methodology is required. At a particular time and space,the occurrence of a given amount of rainfall is beset with uncertainty. So,the statement about it,can only be made in terms of probabilities. Some efforts are already under way in our country. This study is a step in that direction. The present study has provided some quantitative estimates of parameters and tested the relevant hypotheses.

To develop statistical methodology for studying the behaviour of rainfall in this region,the annual rainfall for Cooch Behar and Dinhata stations spreading over 88 years and daily rainfall data for 18 years for Cooch Behar station only have been utilized in this study. The yield data of winter rice for Cooch Behar district are also used in the present study.

The important results from this investigation have been presented here one by one.

The years of large scale deficient and excess rainfall have been identified in this study. The year 1920 was the worst flood year and 1930 appeared to bethe most drought year,in meteorology, in the district of Cooch Behar. The occurrence of droughts and floods, in meteorology,has appeared to be a random phenomenon.

However, the probability distribution of interarrival times between the successive years of drought and the probability distribution of interarrival times between the successive years of flood are considered to follow negative binomial distribution. It is also indicated that the probability distribution of interarrival times for drought and flood years at the two places can be considered as drawn from the same negative binomial population. Droughts and floods may be expected to occur once in 6 years and 8 years respectively and droughts may appear more frequently than floods in this region.

An attempt has been made to study the repetitive behaviour of the weather of rainy months by using the Markov-dependent geometric model. Two-State Markov chain model is fitted to the daily rainfall data for Cooch Behar. The present study has investigated the empirical validity of Markov-dependent geometrical models for wet spells, dry spells and weather cycles of Cooch Behar. The average expected lengths of dry spell and wet spell are 2.5 days and 3 days respectively and they constitute the 5.5 days of weather cycle which is, as such, the average length of observed weather cycle.

The present study has also provided the daily weather pattern of Cooch Behar during the monsoon months. One-step (5×5) Markov chain model is fitted to the daily rainfall data at Cooch Behar. The degree of uncertainty has been measured with the help of information theory. It is also revealed that the test based on entropy is most appropriate rather than the redundancy test which is also based on entropy,against the hypothesis of Marknovian dependence.

The present study has also investigated the spectrum of annual precipitation of two stations in Cooch Behar district and it is found that there are evidences of various band-limited signals. The first signal is quasi-biennial (2.0 to 2.6 years) signal. The second signal has a period near quasi-triennial (3.1 to 3.5 years). The third signal has a period near quasi-five year oscillations. The fourth signal has a period of 9 years. The fifth signal has a period of 17.5 years which is nearly in phase with lunisolar cycle. So,it is not surprising that the time series of meteorological data displays a great deal of variability from year to year. In order to detect the presence of hidden periodicities in the annual precipitations we have found by power spectral analysis,the evidence of highly statistically significant values of the five signals.

Since a regional approach has been considered, a linear multiple regression equation has been developed to predict the yield of winter rice in Cooch Behar district. The regression equation is appropriate if different physical mechanisms are

involved in the nature of daily precipitation. The yield of winter rice in Cooch Behar district has been considered as the dependent variable and the derived categories of daily rainfall have been considered as explanatory variables. The multiple regression equation has been fitted to establish the crop-weather relationship. The yield regressed equation is verified in all intermediate states from fourteen explanatory variables to the final twelve-term equation. The combination of twelve explanatory variables has been selected for which these variables are appeared physically and statistically realistic. The coefficient of determination indicates that more than 93 percent of the total variation in yield is explained by the explanatory variables. It is,also noted that the values of the yield of winter rice are independent of the earlier values.

9.2. FUTURE SCOPE OF RESEARCH WORK.

There are several bottlenecks in the extension of this study, the first and foremost is advanced mathematical and statistical techniques.

Though the scope of the study is restricted to Cooch Behar district,the results are valid for many areas having similar agroclimatic condition as well as meteorological sub-division. Moreover,meteorological behaviour has limits of accuracy defined by physical nature of the region and also the rainfall amount can exhibit substantial variability over very small distance. A more sophisticated approach such as the probability of precipitation

due to ariel variability needs to be examined towards facilitating the principal types of local adjustment. This apparent incoherent spatial and temporal behaviour of precipitation in the region of study may have complicated the theoretical development of its causal mechanisms. However,it is a matter of investigation. The study needs to be replicated under different climatic conditions. And the appropriate statistical techniques would be an important field of research work.

Higher order entropy may be introduced to test the stochastic dependence by the theoretical development and this is one of the fields of absolutely new informational measure on the probabilistic system.

The knowledge of amount of rainfall and its behaviour is not necessarily sufficient for crop planning and operational adjustment. For some region, measures of other climatic variables like soil moisture,temperature,humidity,sunshine,evaporation and average wind speed etc. are also essential to consider for better establishment of crop-weather relationship. Moreover,considering their interactions, a multiplicative model is to be needed for the better understanding of crop-weather relationship and it would be one important field of future research work for various agroclimatic regions.
