

Preface

Since the start of the present century, climate change has been the topic of discussion in varied fields. In the same line, the topic gained its importance in the areas of water resources and agriculture. The climate with its various important variables, i.e., climatological variables, has a direct or indirect impact on agricultural production. There is a need to study the effect of climatological variables and their dominance in crop yield estimation. Downscaling techniques in general and statistical downscaling method in particular and principal component analysis in detail are discussed. This book will be helpful to the students and researchers, who are starting their works on climate and agriculture with a special focus on estimation models. The flow of chapters takes the readers in a smooth path, starts in understanding climate and weather and impact of climate change, and gradually proceeds towards downscaling techniques and then finally towards development of principal component regression models, and applies the same for the crop yield estimation.

Chapter 1 starts with differentiation of climate and weather and then discussions on climate change and its impact on global context, and mainly on agriculture, are highlighted. The various climatological parameters affecting crop yield are then discussed. This is followed by a brief description of downscaling techniques and their application. This chapter concludes with the brief introduction to multiple linear regression and principal component analysis, followed by the objectives of study.

Chapter 2 explores the transfer function in detail, with multiple linear regressions, and principal component analysis. Furthermore, it contains a brief description of various types of regression and emphasizes on the principal component analysis and the calculations of principal components (PCs) in detail.

Chapter 3 covers the various research works carried out in the field of analyzing climatic variability induced due to climate change scenarios and its impact on agriculture. The reviews of works are classified into four domains, viz., climate change, downscaling techniques, multiple linear regression, and principal component analysis and principal component regression.

Chapter 4 contains a brief overview of agroclimatic zones of India followed by the sub agroclimatic zones of Gujarat. Thereafter, a brief description of the study area and the data required for the study are provided.

Chapter 5 gives an overview on the methodology to predict the yield of cotton using multiple linear regression and principal component regression, which is followed by the description of the performance indices to estimate the best model. The methodology of MLR and PCR models to predict the crop yield for the study area, considering the climatological parameters as input and yield as output, is discussed.

Chapter 6 illustrates the results and analysis of the study. The MLR models are developed and the performance indices for the MLR model are analyzed. This is followed by the development and evaluation of PCR model using the performance indices. The outcomes are statistically analyzed and their accuracy is assessed and discussed during training and validation.

Chapter 7 summarizes the results obtained during the study, the comparisons of the results by MLR and PCR are focused, and the conclusions of the study are drawn.

Principal Component Regression for Crop Yield
Estimation

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