ABSTRACT

Estimation of rainfall for a desired return period is one of the pre-requisites for any design purpose at a particular site, which can be achieved by probabilistic approach. This study is aimed at using the statistical parameters of long-term observed rainfall data to generate monthly rainfall depth and estimate rainfall values at different return periods for hydrological and agricultural planning purposes. The daily rainfall data of 60 years from 1953 to 2012 were collected from the meteorological station situated at the Institute for Agricultural Research (IAR), Ahmadu Bello University (ABU) Zaria. In this work, the expected number of observations was 720.However, a sample size of 431 being the months with rainfall amounts was used for the study. Three probability distributions functions viz: normal, log normal and exponential distribution were used for rainfall generation. The data was processed to estimate the statistical parameters of the distributions for Probability Density Functions (PDFs) selected. The two types of parameters estimated using the methods of maximum likelihood via the statistical package called EasyFitXL5.6 are the scale and location parameters. The parameters estimates were further used in various PDFs equations to generate new sets of rainfall amounts. Five statistical goodness of fit test were used in order to select the best fit probability distribution and are; Anderson-Darling, Chi-square and Kolmogorov-Smirnov, ANOVA and Student t test. From the analysis of the data, it was discovered that the normal PDF predicts correctly the monthly amount of rainfall and specific return periods rainfall values followed by the log-normal and exponential PDF, the least predictor. After carefully observing and testing the three PDFs, it was discovered that the normal PDF estimated closely the monthly amounts of rainfall compared with the log-normal and exponential PDFs when considered generally for monthly and return periods rainfall values estimation. Nevertheless, the normal PDFs have been found to predict well the daily rainfall amounts in Samaru. This work should be made available to local and immediate environments to Samaru through local and regional experts on climatic information dissemination for use in planning and management of specific rainfed crop(s) production.

CHAPTER ONE
INTRODUCTION
1.1.Background of the Study
Synthetically generated daily or monthly rainfall data are frequently necessary in data scarce environments as input into the planning and design of water resources and soil conservation projects; simulation studies of crop growth and yield; farming systems and field farm operations scheduling (Jamaludin and Jemain 2007). Rainfall is the principal phenomenon driving many hydrological extremes such as floods, droughts, landslides, debris and mud-flows; its analysis and modelling are typical problems in applied hydrometeorology. Rainfall

exhibits a strong variability in time and space. Hence, its stochastic modeling is not an easy task (De Michele and Bernardara, 2005).

A good understanding of the pattern and distribution of rainfall is important for water resource management of an area. Knowledge of rainfall characteristics, its temporal and spatial distribution play a major role in the design and operation of agricultural systems, telecommunications, runoff control, erosion control, as well as water quality systems. Generated weather is needed to supplement existing weather data, provide alternative weather realizations for a particular historical record, or identify possible weather sequences for a seasonal climate forecast (Walpole and Mayers, 1989)

RAINFALL DATA GENERATION FOR SAMARU, ZARIA USING STATISTICAL PARAMETERS