A Computer Based DSS (Decision Support System) for Rainfall Analysis

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Abstract

Identification of onset of wet and dry periods and their maximum length within seasons has paramount importance in agriculture. The knowledge on these wet and dry periods helps farmer to adjust the cropping calendar to obtain maximum yield while managing available water efficiently for the crop cultivation.

As there is no special software package available to identify above mentioned valuable parameters, a Decision Support System (DSS) has been developed using MS Access and VBA (Visual Basic for Application) software packages. The system is user friendly and the input of the DSS system is weekly rainfall data.

The system helps to calculate onset of wet and dry periods and their maximum length at 75% expectancy level using rainfall data in a particular region. Apart from that the DSS provides details such as length of wet periods, dry periods, number of dry weeks on the cropping seasons and records on past rainfall events.

In the system, the user has a facility to input his own criteria to demarcate wetness and dryness. The developed DSS will help to researchers, students, farmers and others who need the knowledge on agro-climatology for their work for decision-making.

Introduction

There is a gap between potential centers for innovations such as universities, research institutions and users such as farmers in the agricultural sector. The significance of this physical distance has dramatically decreased with the advent of the computer, and more recently the Internet, which has become effective and efficient tool for delivering information both locally and globally.

However, in agricultural sector, the availability accessibility and application of contemporary expert agricultural information has high priority for researchers, farmers, and students. Therefore the most current information, numerous scientific data and other required information have turned to computerized DSS (Decision Support System) as a means of packaging to make information more easily accessible and useful for various beneficiaries in the rapidly transforming and competitive world.

Although many environmental factors determine the density and distribution of vegetation in agriculture, one of the most important factors is the amount of precipitation. Even agriculture can flourish in some deserts but only with water either pumped from ground water or imported from other areas. Therefore, that maintaining the available water for crops is most important factor and it could be easily done when crop is established with the rain. So that it is very important to have the knowledge of onset of rain as well as water deficit periods. Therefore the present research aims to develop a DSS (Decision Support System) to determine onset of rain, number of water deficit weeks, length of maximum wet run and maximum dry run, onset of maximum wet run and maximum dry run of any given location during Yala and Maha seasons.

Materials and Methods

Rainfall data collected from Mapalana and Ambalantota rain gauge stations were used for the analysis. The DSS was developed for Pentium or AMD personal computers running on windows platform. The package was developed using two tools, Microsoft Access to store data and an OOP (Object Oriented Programming) language, VBA (Visual Basic for Application) for User Interface development. This combination proved usefulness of utilizing available resources as well as having the flexibility in designing the users interface. These packages help to setup necessary tables and relationships, produce customized input screens, design report as needed and, make and save queries to select certain records for reports.
Important aspects of the program are determining of onset and maximum length of wet and dry periods using 75%expectancy value. These values are processed using 75% probability level of more than 25 years previous continuous rainfall data. "**Help**" topic describes how to bring these values. When the user enters the limit to demarcate wetness and dryness, the program compares the entered value with stored 75% expectancy rainfall value and decides the wetness or dryness of weeks. The results print as reports and graphs.

The menu design is explained in the figure 1.

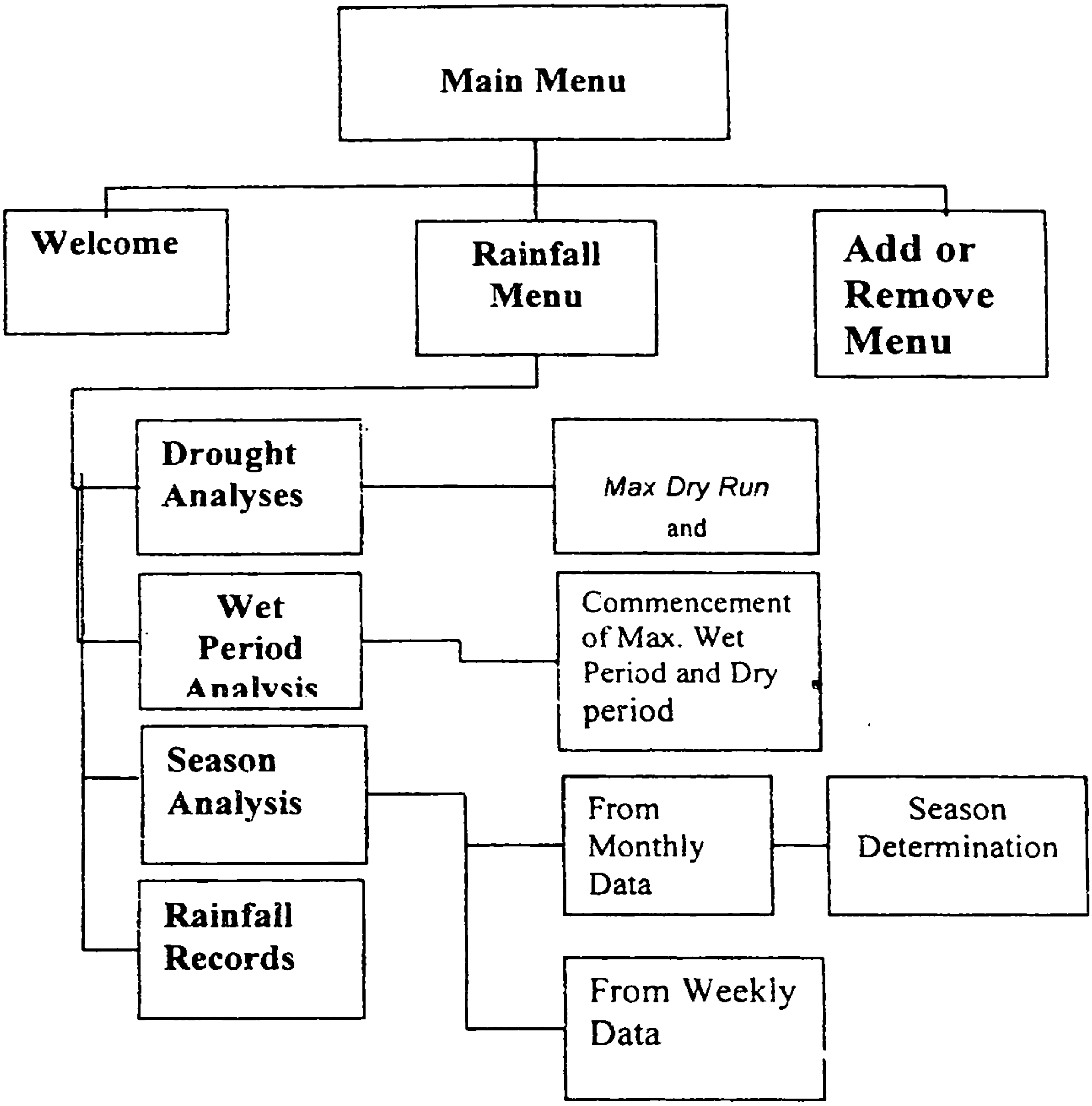

Fig. 1: Menu structure of "DSS"

The program was logically, functionally and systematically tested in order to ensure that no errors have been occurred.

Results and Discussion

When the user enters the limit to demarcate wetness and dryness, the graphical overview with the total number of dry weeks is shown in Fig.2 for Ambalantota station from 1960 to 1995. The same procedure is adopted to identify number of wet weeks as well. The onset of cropping seasons and the distribution of dry and wet weeks within the seasons are easily observed through these graphs. In the season determination, the program provides 75% probability level rainfall in graphical view (Fig.3).

Conclusion

A DSS (Decision Support System) for rainfall analysis has been developed. The developed DSS identifies the onset of maximum dry run and its maximum length, the onset of maximum wet run and its maximum length, seasonal changes and past rainfall records. The developed DSS is properly in working order and it helps to make decisions in designing cropping seasons.