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"Development of Data Management and Crop Growth Application Setup"

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Abstract: *The farmers have the difficult task of managing their crops on poor soils in harsh and risky climates. Crop is defined as an "Aggregation of individual plant species grown in a unit area for economic purpose". Growth is defined as an "Irreversible increase in size and volume and is the consequence of differentiation and distribution occurring in the plant". Simulation is defined as "Reproducing the essence of a system without reproducing the system itself". In simulation the essential characteristics of the system are reproduced in a model, which is then studied in an abbreviated time scale.*

I. Introduction

A model is a schematic representation of the conception of a system or an act of mimicry or a set of equations, which represents the behavior of a system. Also, a model is "A representation of an object, system or idea in some form other than that of the entity itself'. Its purpose is usually to aid in explaining, understanding or improving performance of a system.

The national meteorological organizations provided weather data for crop modeling purposes through observatories across the globe (Sivakumar et al., 2000). In many European countries weather records are available for over 50 years. In crop modeling the use of meteorological data has assumed a paramount importance. There is a need for high precision and accuracy of the data. The data obtained from surface observatories has proved to be excellent. It gained the confidence of the people across the globe for decades. These data are being used daily by people from all walks of life.

Weather and climatic information plays an important role before and during the cropping season and if provided in advance can be helpful in inspiring the farmer to organize and activate their own resources in order to heap benefits.

Fuzzy logic is a powerful concept for handling non-linear, time-varying, adaptive systems. It permits the use of linguistic values of variables and imprecise relationships for modeling system behavior. The paper presents an overview of fuzzy logic modeling techniques, its applications to biological and agricultural systems and an example showing the steps of constructing a fuzzy logic model.

The principal effects of weather on crop growth and development are well understood and are predictable. Crop simulation models can predict responses to large variations in weather. At every point of application weather data are the most important input.

1. Related Works

In a "Crop Growth Modeling & Its Applications In Agricultural Meteorogy"[2] discusses various crop growth modeling approaches viz. Statistical, Mechanistic, Deterministic, Stochastic, Dynamic, Static and Simulation etc. Role of climate change in crop modeling and applications of crop growth models in agricultural meteorology are also discussed. A few successfully used crop growth models in meteorology are discussed.

In a "Management and Cultural Practices for Peanuts"[10] Peanuts were traditionally planted in April before TSWV. This disease has pushed the planting window later. However, recent information with newer varieties show that optimum yields may be obtained from plantings made around April 25. Peanuts can do well planted through the first week of June and will suffer yield loss planted later than this. Early planted peanuts (any time in early April) could suffer a yield loss from cool soils.

An "Effect of Vermicompost on Growth and Yield of Groundnut" [6], Through Efficient Irrigation Solutions Water Requirements during the Peanut Life cycle. The growing season for peanuts can be divided into three distinct phases: per-bloom/bloom, pegging/ pod set and pod fill/maturity. Prior to bloom, peanuts are in a vegetative growth stage; the reproductive stage begins at bloom and continues through pod-fill and maturity. Although the need for water varies during each growth period, irrigation may mean the difference between economic success and economic failure.

"Crop Growth Simulation Models"[1] Crop growth is a very complex phenomenon and a product of a series of complicated interactions of soil, plant and weather. Dynamic crop growth simulation is a relatively recent technique that facilitates quantitative understanding of the effects of these factors, and agronomic management factors on crop growth and productivity. These models are quantitative description of the mechanisms and processes that result in growth of the crop. The processes could be crop physiological, meteorological, physical and chemical processes.

Crop models can be used to understand the effects of climate change such as :a) Consequences of elevated carbon-dioxide, and b) Changes in temperature and rainfall on crop development, growth and yield. In crop modeling the use of meteorological data has assumed a paramount importance. There is a need for high precision and accuracy of the data. The data obtained from surface observatories has proved to be excellent. It gained the confidence of the people across the globe for decades. These data are being used daily by people from all walks of life.

Super-Optimal Temperatures are Deter-mental to Peanut[10] The principal effects of weather on crop growth and development are well understood and are predictable. Crop simulation models can predict responses to large variations in weather. At every point of application weather data are the most important input. The main goal of most applications of crop models is to predict commercial out-put (Grain yield, fruits, root, biomass for fodder etc.).

Now, crop growth modeling and simulation [1] have become accepted tools for agricultural research. A few models used in agrometeorological studies are:

1. **The De Wit School Of Models:** In the sixties, the first attempt to model photosynthetic rates of crop canopies was made (de Wit, 1965). The results obtained from this model were used among others, to estimate potential food production for some areas of the world and to provide indications for crop management and breeding (de Wit, 1967; Lineman et al., 1979). This was followed by the construction of an Elementary CROP growth Simulator (ELCROS) by de Wit et al. (1970). This model included the static photosynthesis model and crop respiration was taken as a fixed fraction per day of the biomass, plus an amount proportional to the growth rate. In addition, a functional equilibrium between root and shoot growth was added (Penning de Vries et al., 1974). The introduction of micro meteorology in the models (Goudriaan, 1977) and quantification of canopy resistance to gas exchanges allowed the models to improve the simulation of transpiration and evolve into the Basic Crop growth Simulator (BACROS) (de Wit and Goudriaan, 1978).

2. **Ibsnat and Dssat Models:** In many countries of the world, agriculture is the primary economic activity. Great numbers of the people depend on agriculture for their livelihood or to meet their daily needs, such as food. There is a continuous pressure to improve agricultural production due to staggering increase in human population. Agriculture is very much influenced by the prevailing weather and climate. The population increase is 2.1 per cent in India. This demands a systematic appraisal of climatic and soil resources to recast an effective land use plan. More than ever farmers across the globe want access to options such as the management options or new commercial crops. Often, the goal is to obtain higher yields from the crops that they have been growing for a long time.

"Fuzzy Logic for Biological and Agricultural Systems"[11] Fuzzy logic is a powerful concept for handling non-linear, time-varying, adaptive systems. It permits the use of linguistic values of variables and imprecise relationships for modeling system behavior. The paper presents an overview of fuzzy logic modeling techniques, its applications to biological and agricultural systems and an example showing the steps of constructing a fuzzy logic model.

1. Program Structure

The key objectives of current work are as given below:

1. To formulate fuzzy logic based on crop advisory,
2. To formulate setup for crop growth application,
3. To develop crop growth system for groundnut(crop),
4. To develop crop growth management system.

Methodology with respect to each objective is briefly given below:

1. To formulate fuzzy logic based on crop advisory:

Crop advisory plays an important role in a agriculture. Timely crop advisory enables the farmers to plan their farm operations in a way that not only minimizes the costs and crop loss but also helps in maximizes the yield gains. Advisory is very useful to decisions regarding crop as well as in farm inputs such as an irrigation, fertilization, spreading pesticides, fungicides, etc. Hence improved advisory will helps farmers for deciding what will improve their agricultural production.

1. To formulate setup for crop growth application:

Crop growth application set will be helpful for the farmers who have completed their registration process. They will get all the crop related information for their farm.

2. To develop crop growth system for Ground-Nut(Crop):

As per above mentioned advisory system,it will be replicated for one crop to prove its organization and systematic steps for users to develop new crop advisory based on their methodology given below.

3. To develop Crop Growth Management System:

In the crop growth management system, database will be created and it will get modify according to the feedback of farmers. Also information dissemination and deliver to the farmer as well as feedback from farmers will take care for the future study of evolution of effectiveness of the crop growth anagement system.

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