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COMPUTERIZED EXPERT SYSTEMS FOR CROP PROTECTION WITH SUSTAINABLE CROPS BEING USED IN INDIA: SURVEY REPORT

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ABSTRACT:

In the current years, a plenty of modernized expert systems has been produced for different divisions of horticulture in India. The accessibility of minimal effort PCs, agricultural learning and information innovation experts are the important explanations behind the development of such a variety of agricultural expert systems. Among all agricultural expert systems, the expert systems for yield protection require uncommon specify. These expert systems are intended to be utilized by agriculturists and different people without much involvement of utilizing PCs. Subsequently, uncommon care must be taken while creating them. Indian economy is an agro based economy. In any case, Indian horticulture relies upon storm which is continually fluctuating. Henceforth viable water system administration is required if there should arise an occurrence of water serious products. The proposed examine work manages the analysis of water system issues in division. The exploration will be led for assessment of good water system techniques. Through this examination work, Analyst needs to plan and execute learning based expert system for productive water system of yields and using computerized dribble water system.

KEYWORDS: Expert System, Indian Economy, Dribble Water System

1. INTRODUCTION:

Around 66% of all Indians rely upon agriculture for their livelihood either straightforwardly or in a roundabout way. The area cultivated is impressively more than the half of the aggregate area of the nation. In the more fertile areas, similar to the northern fields and the deltas on the eastern coast, the extent of cultivated area to the aggregate area for the most part surpasses 90%. Since the late 1960s, horticultural innovation in India is experiencing fast changes. Expansion of irrigation tasks, expanded utilization of concoction manures and pesticides, and presentation of high-yielding assortment seeds area few changes to name.

The start of the across the board utilization of PCs and data technology in India in the 1990s turned out to be helpful to the Indian agriculture. Aside from different utilities, the help likewise came as horticultural expert systems. An expert system can be characterized as a bit of PC programming that utilize encoded learning to tackle issues in a particular space that ordinarily requires human expertise [1]. Not long after from that point forward, there was a blast in the quantity of farming expert systems for a huge area of exercises in agriculture including crop assurance, irrigation, soil management and nutrient management. The present paper intends to give an overview of the present pattern as opposed to performing complete audit and investigation of the technology. Here we are talking about the execution issues of agrarian expert systems when all is said in done and expert systems for crop insurance specifically. The paper likewise gives brief outlines of four expert systems for crop insurance that are in effect effectively utilized as a part of India.

1.1 ***The agricultural expert system explosion in India***

In the last decade, expert systems have been developed for almost all sectors of agriculture in India. They include expert systems for pest management, crop selection, soil preparation, animal husbandry, fisheries and food processing. Though this paper focuses on expert systems for crop protection, there are four common reasons for the outburst in the number of agricultural expert systems in India.

The principal critical explanation behind the sudden increment in the quantity of agrarian expert systems in India is the availability of minimal effort computers. The appearance of economic computer systems that are moderate to enormous and even medium-sized farm proprietors has been a driving element for the improvement of a substantial number of horticultural expert systems. The second essential reason is the accessibility of information and learning from long haul explore in agriculture. The greater part of this information has been produced from systematic research in both lab and field conditions supported by different government and non-government organizations. Thirdly, a respectable number of information technology experts are presently accessible to plan and actualize the horticultural expert systems. Last however not the slightest bit the minimum, is the lift in computer education and enthusiasm among the rural and agrarian social orders that has essentially helped in the expansion of the horticultural expert systems.

1.2 ***Design and implementation issues of expert systems for crop protection***

Developing an expert system for crop protection is not a trivial task. Several issues are required to be considered during the design and implementation stages. Some of these issues are quite different from the issues in evolving expert systems in other domains [1].

The expert systems for crop protection are intended to be used directly by the farmers and the extension workers. Although a formidable part of this clientele group may be computer literate, none of them are proficient computer users. The expert systems for crop protection should be such that farmers finds them easy to use. Another profound issue is the use of the local languages that will help the expert systems for crop protection to extent to farmers who are not very confident in English. The key issues for success of expert systems for crop protection have been identified and listed next.

(a) **User benevolence**. The expert systems ought to be anything but not difficult to utilize. They ought not to ask an excessive number of inquiries as that may overpower generally clients. The inquiries ought to be straight forward and their answers must be very much characterized.

(b) **Use of neighborhood dialects**. Since all farmers are not knowledgeable in English, the expert systems ought to bolster nearby dialects to contact a bigger group of onlookers.

(c) **Simple UIs**. The UIs of the expert systems must be kept as straightforward as could be expected under the circumstances. The inquiries ought to be asked one by one and the expert systems ought not to show excessively information at once.

(d) **Use of photos**. The expert systems ought to utilize photos of pests and disease plants to help the clients to accurately distinguish the manifestations.

(e) **Use of intuitive controls to abstain from writing**. Since most clients are not habituated to utilize computers, the expert systems must utilize intuitive controls like radio catch, check box, and drop down rundown and rundown box to limit the need of writing.

(f) **Option for printout**s. Alternative to print a duplicate of the analysis and the proposed treatment must be accessible.

(g) **Standalone systems.** Since the farmers from time to time have any capability in utilizing computers, the expert systems ought to be independent systems and the clients must not have to utilize whatever other programming.

(h) **Setup program**. The expert systems must accompany basic setup programs so that the clients can themselves introduce the expert systems on their computers. The development of an expert system for crop protection is a active process rather than a one-time activity. The occurrences of most crop diseases are greatly influenced by the changes in the environmental and edaphic conditions of the region. The disease scenario is also affected by the introduction of new crop varieties. Therefore, an expert system for crop protection should be modernized regularly using the comments obtained from the fields. To develop a reliable expert system for crop protection, the

various factors that may influence the occurrences of the diseases in the crops must be tracked continuously for at least 10 years.

The working of most expert systems for crop protection can be broadly divided into two mutually limited and in-depth phases. A typical first phase deals with the diagnosis of the pest or the disease from the available symptoms. Alternatively, a typical second phase deals with the prescription of proper preventive or curative measures. Most expert systems for crop protection use some form of backward chaining of logic to implement the first phase and some form of forward chaining of logic to implement the second.

1.3 ***Examples of expert systems for crop protection****.*

At this point of the paper, taxonomy of expert systems for crop protection should be formalized. Two parameters that can be used for the classification of these expert systems for crop protection are crop specificity and disease specificity. An expert system for crop protection can be developed either for a specific crop or a number of crops. A crop specific expert system for crop protection, in turn, may be developed either for a specific disease or a number of diseases of the specific crop. Accordingly, there are three types of expert systems for crop protection, viz., crop nonspecific, crop specific and disease nonspecific, and crop specific and disease specific.

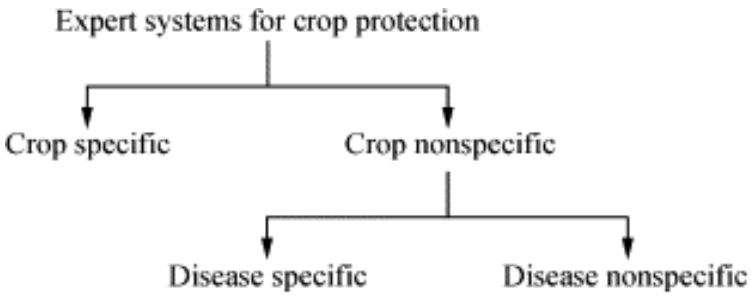


Fig. no. 1 **Classification of expert systems for crop protection**.

2. Literature review:

Agriculture is as yet a part where the level of unsaid learning stays high [2]. The agrarian expert systems join the trial and experiential learning with the instinctive thinking aptitudes of a large number of authorities to help farmers and augmentation specialists in settling on the best choices for their crops [3]. The horticultural expert systems help in getting moment answer for the issues confronted by the farmers. They help the farmers where administrations of the agrarian experts are not generally accessible and therefore take care of the issues confronted by farmers at remote spots. Thusly, the rural expert systems lessen the heap from the experts. The agrarian expert systems support spread of research discoveries and encourage subjective research on crop assurance.

Consequently, expert systems can be utilized as a viable instrument for horticultural research and arranging.

It has been observed that a computerized expert system is most effective augmentation device to take the technology from research facilities to farms.[3]. This is a striking element of every single expert system and it to a great extent credits to the ubiquity of expert systems in various spaces. Another key favorable position of crop security utilizing computerized expert systems over traditional crop insurance procedures is the prudent utilization of less unsafe concoction pesticides which can help in lessening their evil impacts to a huge degree [2]. This wonder turns out to be more noticeable if a legitimate scope investigation of the accessible pesticides is performed before planning the expert systems

G.N.R. Prasad and Dr. A. Vinaya Babu in the paper entitled "PANI *[5]: An Expert System for Irrigation Management" manages the reasonableness of utilization of expert system technology in agriculture and proposes the advancement of administer - based expert system name PANI, for the compelling irrigation management of the crop. The proposed system utilizes the learning of just a single parameter i.e. dampness levels in the dirt to get the knowledge of season of irrigation. The system has been produced in the Visual Essential 6.0 condition.

S. Sivakami and C.Karthikeyan in their paper entitled "Assessing the Adequacy of Expert System for Performing Agrarian Augmentation Benefits in India" introduced investigate concentrate that was done to evaluate the impact of utilizing expert system on the execution and basic leadership expertise of the expansion faculty in the wake of utilizing the expert system on maize. The Paper discusses possibility of utilizing an expert system as a choice bolster instrument for exchange of agrarian advancements to the farming group.

3. STATEMENT OF PROBLEM:

An agricultural generation has developed into a perplexing business which requires the gathering and mix of learning and information from numerous different sources. Expert systems have been connected progressively for agrarian fields as of late to solve the vast majority of the issues. The significant expectation of the scientist is to recognize irrigation issues confronted by the farmers while developing the Sugarcane. Analyst needs to configuration, create and execute an expert system in light of learning base which will be planned utilizing trial and experiential information in agriculture field. Expert System is referred as knowledge based systems, is one of the important application branches of Artificial Intelligence. This is a computer application that performs a task that would otherwise be performed by a human expert. Expert systems of today support many problem solving activities such as decision making, knowledge fusing, designing, and planning, forecasting, regulating, controlling, monitoring, identifying, diagnosing, prescribing, interpreting, explaining, training etc. using different techniques and it is expected that future expert systems will

support even more activities. Expert System Technology comprises of Learning base (dialect for encoding information) and Surmising motor (calculations for thinking). In control based expert System. Apparatuses for Building up an Expert System comprises of Programming dialects, Shells for run set director (programming for building, keeping up, and gathering principle sets) and derivation engine(algorithms for thinking) and Coordinated environments(shells abilities incorporated with other processing capacities into a solitary instrument). A govern comprises of two sections: condition (forerunner) part and conclusion (activity, subsequent) part, i.e.: IF (conditions) THEN (activities). Forerunner some portion of the govern portrays the realities or conditions that must exist for the administer to flame.

4. OBJECTIVES OF THE STUDY:

Following objectives has been formulated for the proposed study,

1. To identify the irrigation problems of sustainable crops.
2. To study various Irrigation methods.
3. To design knowledge base for Expert System
4. To develop and implement Expert System
5. To analyze post implementation applications, problems and prospects of Expert System
6. To study comparative analysis of applications of Expert System in irrigation and conventional irrigation.

5. HYPOTHESES

Following hypotheses has been formulated for the proposed study,

1. Irrigation problems faced by farmers vary from one district to another district.
2. The irrigation problems faced due to conventional irrigational methods can be minimized using Expert System irrigation method.

6. RESEARCH DESIGN:

The proposed study is an exploratory study to identify irrigation problems of Sugarcane faced by the farmers while cultivating the crops and suggest application of Expert System in order to provide solution to these problems.

a**. Data Collection:** It is of two types, Primary data and Secondary data

i) Primary Data: The primary data related to the proposed study will be collected using questionnaire from farmers, Officials in irrigation departments and experts in related field. The data will be presented in tabular and graphical form. Appropriate statistical techniques will be applied to process data and conclusion and suggestions will be drawn.

ii) Secondary Data: The secondary data - Published Reports, Periodicals, News papers and Internet etc, - will also be used for the proposed research work.

Researcher has study various ongoing and completed researches work on national and international level.

b) **Selection of crop for research**. -Irrigated or rain fed crop. -Cash crop. -Productivity of crop.

c) **Weather** - Rainfall - Data available of actual rainfall.

d) **Requirement of rainfall- [**stages] -Before sowing - After sowing - At cultivation.

There are particular strides taken after to do for the information examination.

i. Gather the information.
ii. Orchestrate the information as per subject.
iii. Channel the information.

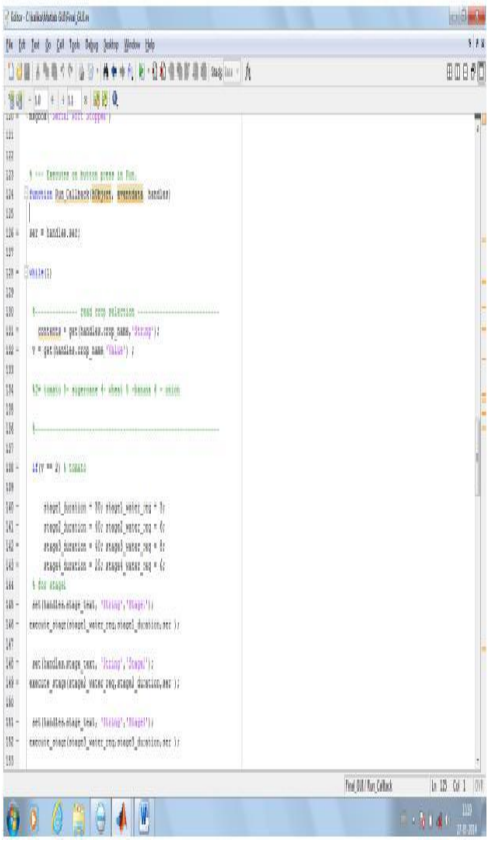
So that superfluous information ought to take out from the examination. 4. Apply reasonable procedure. 5. Adjust and settle the model as per the outcome. At first above errands were done utilizing Exceed expectations. Be that as it may, for the colossal information, it is exceptionally hard to investigate it utilizing same technique. It is hard to organize the information and retain the different strides. So to conquer this trouble scientist checked different choices. What's more, he went to a last approach which is depicting beneath: 1. Consider the information as database. 2. Select the appropriate RDBMS for the information. 3. Finish the table outline for database. 4. Get to the information in database utilizing information mining device [MATLAB].

Subsequent to finishing these stages scientist handle the information in information mining model which he built utilizing MATLAB. MATLAB is essentially a framework programming dialect. A grid is a two dimensional cluster of genuine or complex numbers. Straight variable based math characterizes numerous lattice operations that are straightforwardly upheld by MATLAB. Straight polynomial math incorporates network number juggling, direct conditions, eigen values, particular qualities, and framework factorizations. MATLAB gives many capacities to performing numerical operations and breaking down information. Creation and alteration of frameworks and vectors are direct assignments. MATLAB has a few helper libraries called Tool compartment, which are accumulations of m-records. That has been created for specific applications. These incorporate the Insights tool kit, the Improvement tool stash, and the money related tool kit among others. In our specific case, we will do a short depiction of the Measurements an Advancement tool stash and we will utilize same summons of the budgetary tool compartment. Insights tool compartment (Applications). The Measurements tool kit, made in the variant 5.3 and persistently refreshed in more up to date forms, is an accumulation of factual instruments based on the MATLAB numeric processing condition. The tool kit underpins an extensive variety of regular factual errands, from irregular number era. The Measurements tool kit gives capacities to depicting the elements of an

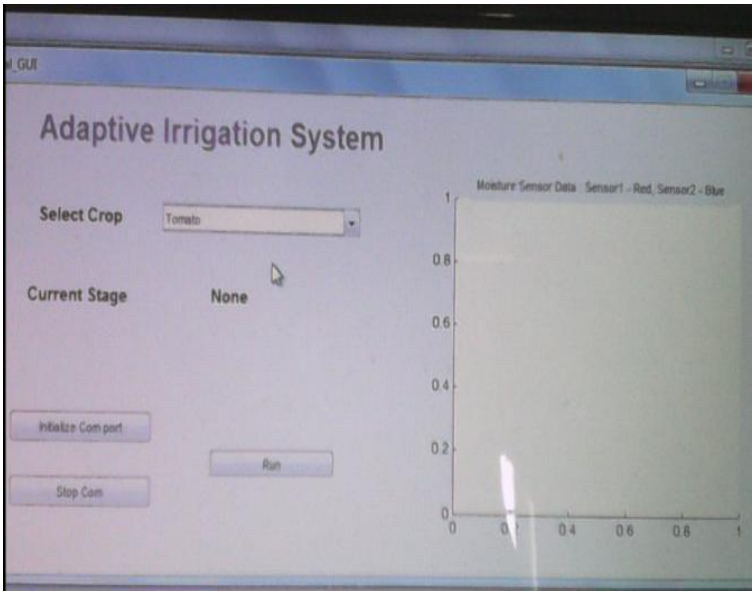
information test. These clear insights incorporate measures of area and spread, percentile gauges and capacities for managing information having missing qualities. The accompanying table demonstrates the most critical ones with a short portrayal of their utilization. MATLAB is an abnormal state dialect that incorporates framework based information structures, its own inside information sorts, a broad inventory of capacities, a situation in which to build up our own particular capacities and scripts.

7. SOFTWARE IMPLEMENTATION:

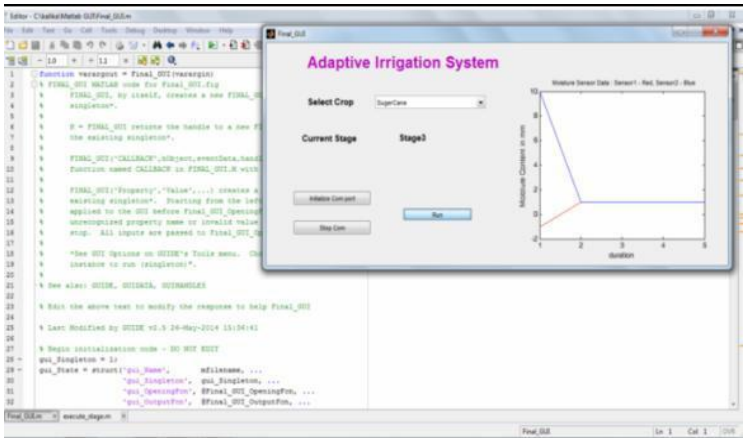
The field station sends the signal to the simulation model viz. At the base station using MATLAB we can write a code for a particular crop and observe the result. Figure shows a MATLAB code for a selected crop. Figure 1shows the result for the same code. Figure 2 shows the result window at crops.



1 Snapshot of MATLAB code to observe the crops.



2Snapshot of MATLAB code to observe the result



3 Snapshot of output of soil irrigation crops

RESULTS

- By using PIC microcontroller we can automatically run the system
- At field station the soil crops sensor can sense the soil moisture and send to the microcontroller
- At base station MATLAB code defines different crops water requirement depending upon their growing stages required for proper irrigation.
- At the same time temperature and humidity are observed
- The insect avoidance circuit is used to avoid insect attack.
- Figure shows the output of soil crops sensor.

Conclusion:

This system is generally minimal effort and easy to understand because of a system utilized. This system gives mechanized irrigation to various crops alongside water necessity for those crops at various developing stages utilizing MATLAB. Likewise, the system is fused with creepy crawly repulsed to keep away from bugs for better yield.

Concluding Remark:

Despite the fact that the writing presents the exploration as of now led in assortment of areas of uses of Expert System in Agriculture, the proposed research will essentially concentrate on investigation of irrigation issues for crops in all division especially. This area has remained horribly untouched from the examination point of view. In this way the analyst is endeavoring to direct the examination in this specific area. Expert system arrangements can be accommodated viable irrigation management. The proposed inquire about work will break down irrigation issues of crops. The examination will be directed for assessment of conceivable irrigation strategies. Through this examination work, an information based expert system will be planned and created for robotization of dribble irrigation for effective irrigation of crops supportability.

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