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An Intelligence Based Alert System for Farmers

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ABSTRACT: In India, Agriculture is considered to be a primary occupation for a most segment of population. E-Agriculture is a rising field focusing on the improvement of rural and agricultural development through advanced information and communication processes. E-Agriculture entails the conceptualization, design, development, assessment and appliance of innovative ways to use information and communication technologies (ICT) in the rural field, with a principal focus on agriculture. In this work, the data mining concept has been proposed for sending information to farmers. The details based on agriculture parameter are sent to farmers on daily and seasonal basis. In seasonal basis the information can be sent to farmers only on selected basis. This can be done by using data mining technique of Birch clustering, one of the Hierarchical clustering. The other information such as information from agriculture board or any board meeting messages can be conveyed to farmer's .These messages has been conveyed to farmers through SMS via SMS gateway. Comparative result provides the proposed result estimation when compared with the existing works

KEYWORDS: E-agriculture, birch clustering, SMS gateway

I. INTRODUCTION

In India, Agriculture is believed is believed as a major occupation for a most part of population. Most rural population depends upon agriculture as their important occupation. Yet, agriculture in India is in stagnation and in turns needs renewal, the leading cyber security ,Techno legal ICT and cyber law specialist of India and the managing member of 'Association for people of India' (AFPOI), the agriculture development characteristics are analyzed keeping in mind the advent of e-agriculture in India .

1.1 The current scenario of agriculture sector in India

The agriculture sector in India is currently facing a difficult phase. India is moving towards an agriculture emergency due to inadequate investment in irrigational and agriculture infrastructure, lack of attention, ineffective land management, non-given of fair prices to farmers for their crops and insufficient land reform in India, etc. Food production and productivity in India is declining while its food consumption is increasing. The situation has further been worsening due to use of food grains because of demand of bio fuels. As India does not have ports and logistical systems for large - scale food imports, the solution of import of food grains would be difficult.

1.2 Problem Definition:

By the use of ICT, India's food production and productivity has been increased for agricultural purposes. The developed nations are using technology of laser in place of tractors to plough lands. This helps in optimizing the use of a range of inputs parameter such as water, seeds, fertilizers, etc. The problem occurs here is that Indian farmers cannot pay for this technology. In addition, power and electricity also cause a major problem for Indian farmers and choice of power like solar energy panels, regulated and optimized by ICT.

1.3 E-Agriculture

"E-Agriculture" is an emerging field in the connection of agricultural informatics, development and entrepreneurship which is focussing to agricultural services, technology distribution and information delivered or developed through the

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Internet and associated technologies. Specifically, it engages the conceptualization, design, development, assessment and application of innovative ways to use active or emerging information and communication technologies (ICTs).

E-agriculture is a rising field for enhancing existing agriculture and food security through enhanced processes for knowledge access and switch using information and communication technologies. The World Summit on the Information Society (WSIS) Plan of Action comprises e-Agriculture as a region of function of information and communication technologies (ICTs). In short e-Agriculture will connect all concerned persons starting from farmers to researchers together. Farmers can get the desired information at any instant of time from any part of world and they can also get the help from experts viewing their problem immediately by without moving anywhere.

1.4 Mobile Phones on Indian Agriculture

The Indian agricultural sector has been characterised by low productivity growth despite periods of strong growth in the past. Serious challenges must be addressed in order to achieve faster productivity growth. These include infrastructure constraints, supply chain inefficiencies and significant problems in the diffusion of and access to information. The challenge for the government and policy makers is to regain agricultural dynamism. To achieve a higher agricultural growth rate, the next generation green revolution in India must be preceded by the next generation of technology and infrastructure development. Small and marginal farmers, who are the vast majority of Indian farmers, are often unable to access information that could increase yields and lead to better prices for their crops. The sector also faces problems arising from a shortage of investments in rural infrastructure, which adversely affects farm productivity growth.

An improvement and strengthening of agricultural infrastructure is needed at all levels of the supply chain – input delivery, credit, minimising post-harvest losses, cold storage chains, marketing etc. Shrinking extension is another component of infrastructure that needs attention. The government has a huge research and development infrastructure in the form of institutions such as the Indian Council of Agricultural Research (ICAR), state agricultural universities (SAUs) and krishi vigyan kendras (KVKs). The role of this set-up in research and extension activity is of great importance. However, crumbling public extension services are a cause for concern.

After the green revolution in the mid-sixties, there has been no major technological innovation, which could give a fresh impetus to agricultural productivity. Insufficient extension services and poor access to information further widen the gap in the adoption of technology and lead to poor productivity levels.

A push towards higher agricultural productivity will require an information-based, decision-making agricultural system (precision agriculture). This is often described as the next great evolutionary step in agriculture. Precision agriculture, in turn, is heavily dependent on an efficient information dissemination system – GPS and mobile mapping technologies offer the means to set up such a system. The increasing penetration of mobile phones and mobile-enabled information services in rural India can reduce information asymmetry and complement the role of extension services. In the context of India, the impact of mobiles as a mode of providing information for farming purposes would depend on how effectively the mobile network links farmers to market information. The impact on productivity can be measured in terms of increased returns –through changes in cropping pattern, yield increases and better price realisation (inputs and output) – to farmers. Non-price factors like information on the availability of inputs, seed quality, and adoption of modern techniques are also critical to raising productivity.

II. RELATED WORK

In [1] Pretty, Ball, Xiaoyun, & Ravindranath information presented the Communication Technology refers to a set of tools that can be used to collect, distribute, store and disseminate information for decision making. As ICT in terms of information collection, storage, dissemination and processing, it does not indicate the ICT tools. A more profound definition can be obtained from [2] who presented by Dewan & Kraemer, 2000 defines ICT as a group of hardware, software, telecommunication networks, and people that can assist in data collection, processing, storage of information. In [3] (Unwin, 2009) argues that due to enormous change in ICT technology, ICT based developments offers new opportunities to improve the usage and performance of livelihood technologies such as agriculture, education and

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artesian technologies. The main challenge in this is to recognize the areas where growth in ICT could be used to improve the performance of these technologies, and construct cost effective ICT based systems improving the living principles of rural people. In this [3] an effort is utilized to improve the utilization and performance of agriculture technology by make use of recent progress in ICT.

E-agriculture is now be familiar with globally as means of allowing farmers make informed decisions on construction and marketing of agricultural produce. According to [4] Meera & Jhamtani, 2004) presented e-agriculture which illustrates a rising field to be focused on the enhancement of agricultural and rural development through better information and communication processes.

In [5] (Adhau, 2010) argues that e-agriculture in affecting all parts of human life. We can exploit these advances to design a cost effective system to provide expert advice to the farmers.

In [6] (Inklaar, O'Mahony, & Timmer, 2005), presented an advent of modern information technology revolution possible provides latest proficient advice in a timely manner to the farmer and so reduce the effect of the factors that disturb the crop. By exploiting the advances in information technology especially e-agriculture, we can enable the agriculture assistance to get the status of the crop in a cost effective manner.
In [7] Sami Ayramo presented Cluster analysis for organize a collection of data items into clusters, in which items inside a cluster are more "similar" to each other than they are to items in the other clusters. Those similarity characteristic can be expressed in different ways, along with the reason of the study, to domain-specific assumptions and to previous knowledge of the problem.

In[8] Mittal, S., Gandhi, presented the information service, called Reuters Market Light or RML, sends SMS to farmers with information on prices, weather forecasts, crop advice, and general news items. The price information is expected to improve farmers ability to negotiate with buyers and to enable them to arbitrage better across space (e.g., di¤erent sales outlet). Weather information is expected to help farmers reduce crop losses due to extreme weather events such as storms. Crop advisory information is expected to induce farmers to adopt new crop varieties and improve their cultivation practices.

In [9] Latika Sharma presented a growing number of applications of data mining techniques in agriculture and a growing amount of data that are currently available from many resources. This is relatively a novel research field and it is expected to grow in the future. There is a lot of work to be done on this emerging and interesting research field. The multidisciplinary approach of integrating computer science with agriculture will help in forecasting or managing purpose.

In [10] Cunningham presented a process model for analyzing data, and describes the support that WEKA provides for this model. The domain model 'learned' by the data mining algorithm can then be readily incorporated into a software application. This WEKA-based analysis and application construction process is illustrated through a case study in the agricultural domain-mushroom grading.

III.**PREVIOUS WORK**

In existing more paper work have done for providing information to farmers. Farmers don't have sufficient knowledge to make land highly cultivable.
Farmers don't have sufficient knowledge to make land highly cultivable.

- They are not getting high yielding seeds and the seeds which can resist to common illnesses & which can give good crop in less water
- Farmers are not getting soil friendly fertilizers & pesticides.
- Farmers are not getting weather information or timely weather information.
- They don't have 'agricultural experts' for help, experts consultation or guidance is needed regarding:

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IV. PROPOSED SYSTEM

In proposed system, information from agriculture board can be sent to farmers on a routine basis,. The proposed system uses information and communication technologies (ICT) which uses mobile phones and e-mails .The information is divided into three phases, namely daily basis, seasonal basis, and other information. In daily basis the information regarding agriculture parameter can be send to farmers as daily alert. In seasonal basis. The information regarding weather, crop details etc can be sent to only particular farmers based on their respective agriculture type. This can be done by using clustering mechanism namely birch cluster to group the farmers. In other details phase the general information can be sent to farmers whenever the board of agriculture announces messages.
The overall Architecture of the proposed system is as follows:

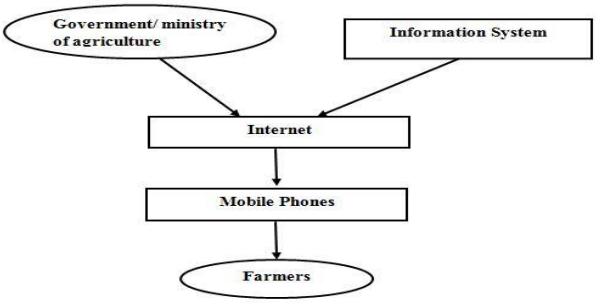

Figure 1: Overall architecture

The news releases from the government does not reach the farmers in time, therefore an alert system is being built for daily releases and for seasonal releases.
The Information System is classified as follows:

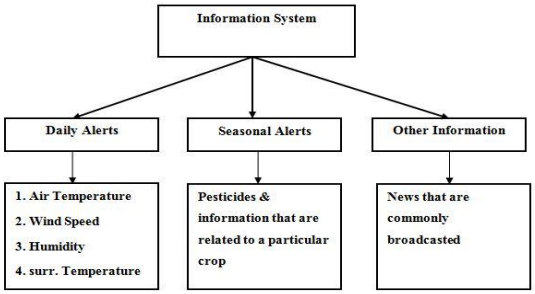

Figure 2 : Information System

The daily alert system, is being built using JAVA environment.

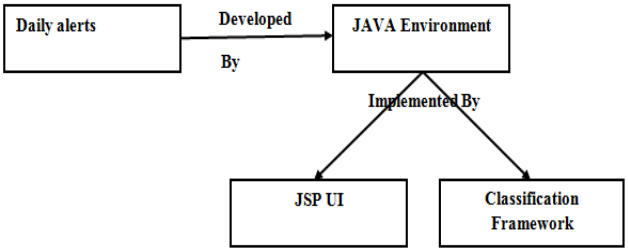

Figure 3: Daily Alert System

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For a seasonal alert system WEKA environment is being used.

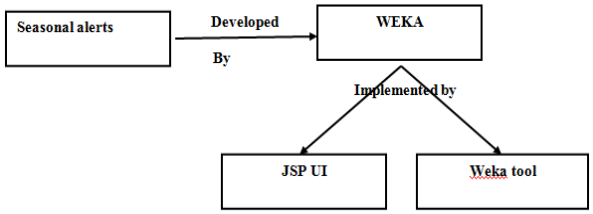

Figure 4: Seasonal Alert System

The process view for a daily alert system is as follows:

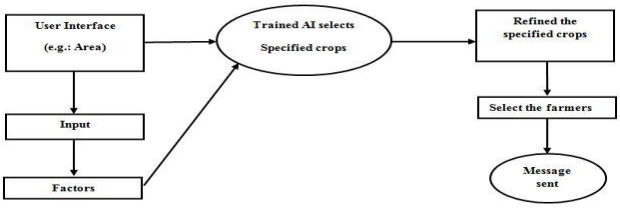

Figure 5: Process view for daily alert system

The process view for a seasonal alert system is as follows:

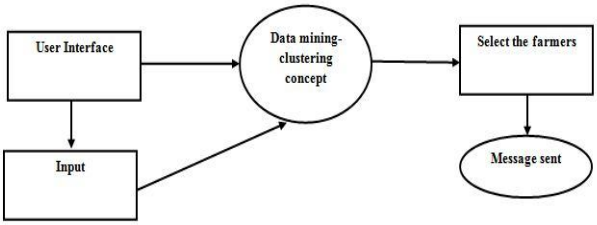

Figure 5: Process view for daily alert system

The following diagram shows the system architecture of the proposed system.

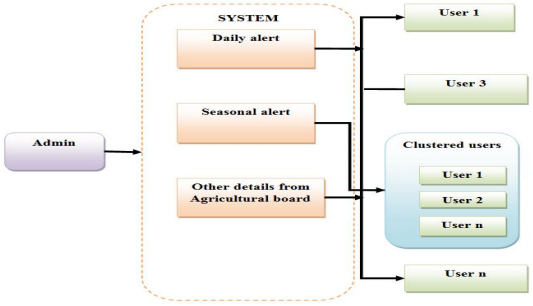

Figure 6: System architecture of proposed system

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The step by step process of proposed framework is as follows:

1. Information passed on daily basis
2. Information passed on seasonal basis
3. Other details Information regarding agriculture.

4.1 Information passed on daily basis

Initially, the Administrator has to be registered and logged into their organization. The database can be maintained consists of Farmers details and Crops details. Farmer's details such as Username, password and mobile number. Crop details such as Wind, Humidity, Air temperature, surrounding temperature and Crop.

In this phase, farmers receive the information regarding agriculture parameters such as Prices of Crop details, Prices of fertilizers, Weather conditions etc. This information can be sent to farmers through SMS via SMS Gateway.

4.2 Information passed on seasonal basis

In this phase, particular farmers receive the information on seasonal basis. To do this the farmer's details in the database has been clustered. The clustering of farmer's details can be done by using data mining technique called birch clustering which is one of the Hierarchical clustering method.

4.2.1 Birch Clustering

The initial step of the Birch Algorithm is to search data from database file which is from 1 to n. During searching the database the Birch algorithm data points which are near to each other are considered. Points in sparse region are treated as outlier and it must be removed. To consider clustering feature , it is defined as triple (N, LS, SS) where N is any number of data point in the cluster, LS is a Linear sum of N data point and SS is a Square Sum of N data points. Next stage is to form a hierarchical tree which is same like B+ Tree. If the tree is sufficient to fit in memory, it will be spitted in two. The leaf contains the original data points of the database.

The clustering of database can be done from this tree based on some threshold value and distant measurement. As the parameters of this algorithm include centroid, average distance of all member point, the spherical form of clustering can be obtained. The next step of the algorithm is to take two random points and estimate the portion of the clusters cover by the area. Major task of this algorithm is performance analysis with respect to time and memory space.

The algorithm flow of Birch clustering is as follows:

Step1: Consider the input data in the dataset
Step2: Load the memory by building CF tree
Step3: Decompose into desirable range by building a smaller CF tree
Step 4: Global clustering can be done with the obtained smaller CF tree
Step 5: Finally, the obtained cluster can be refined which results out best cluster

4.3 Other details Information regarding agriculture

The other detail information included in this phase is as follows:

1. Announcement form agriculture board
2. Board members update of agriculture
3. Additional Crops and fertilizes details. Etc

Besides from details of daily and seasonal basis, the above additional or other details can be sent to farmers whenever the additional information provided by the agricultural board or from agricultural members.

V. EXPERIMENTAL RESULTS

The proposed system can be experimentally verified in terms of clustering efficiency. Comparison can be made based on parameters such as Time and Accuracy. A previous method of E-agriculture does not use any data mining algorithms. The proposed system uses data mining method of clustering technique to group the datas of farmers. The clustering performance can be measured in following terms namely precision, recall, f-measure

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Precision

Precision value is calculated is based on the retrieval of information at true positive prediction, false positive. In E-agriculture data precision is calculated the percentage of positive results returned that are relevant.

Precision =TP/ (TP+FP)

TP-True positive

FP-true negative

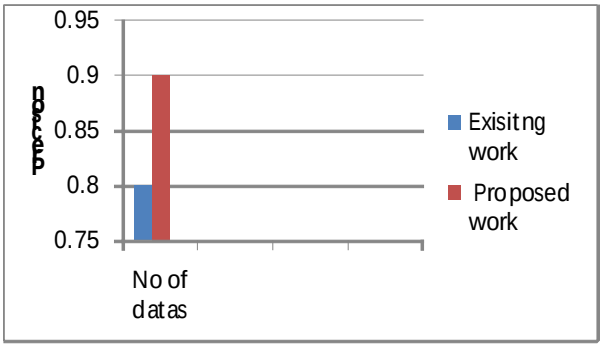

Figure 7 : Precision comparison

Recall

Recall value is calculated is based on the retrieval of information at true positive prediction, false negative. In E-agriculture data precision is calculated the percentage of positive results returned that are Recall in this context is also referred to as the True Positive Rate. Recall is the fraction of relevant instances that are retrieved,

Recall =TP/(TP+FN)

FN – false negative

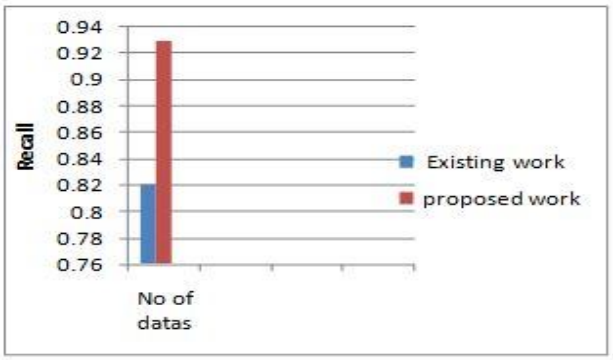

Figure 8: Recall Comparison

F-measure

The F-Measure computes some average of the information retrieval precision and recall metrics.

F-Measure= $\frac{2*Recall*Precision}{Precision+Recall}$

The following graph shows the obtained results for existing and proposed system.

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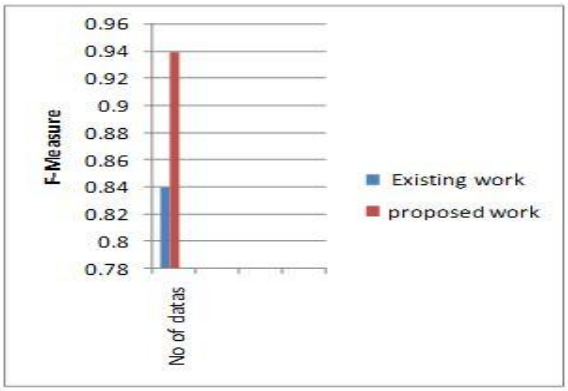

Figure 9: F-Measure comparison

Thus the above graph in fig 2-4 shows that the proposed system provides higher clustering result interms of precision, recall, f-measure than with existing work.

VI. CONCLUSION

In the present work, E-agriculture scheme using the data mining technique namely birch clustering has been used for clustering the large datasets of farmers details .The present work on E-agriculture conveys the information regarding agricultural details to farmers in SMS via SMS gateway. The details such as daily alert, seasonal alert and other additional details can be sent to farmers. The daily alert can be sent to all farmers in the database. Seasonal alert can be sent to farmers only for selected farmers based on clustering result. Finally the other or additional detail which is announced by agriculture can be sent to all farmers. Experimental result shows better result when compare with the existing work.

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