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Analysis of pesticide by Smart Farming System using machine learning algorithm over AWS Cloud

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Abstract: -Smart Farm is a crop management system that allocates crops to the farmers by the highest requirement, which predicts through their machine learning the appropriate crops for their area according to soil, type, mean rainfall, and pesticides, etc. That crop is not wasted and, accordingly, is not produced subsequently. There are two applications for a mobile app for end users, such as a web application for farmers and administrators. We are planning to create a hybrid mobile application 'Smart Farm' which will allocate crop to every farmer who registers this applicant. If the farmer agrees with it, then the amount of money that will be paid to them will be corrected. This will encourage their allotted crops to grow. Statistical information is available in a particular crop quantity per year, and with the help of those figures, it is possible to determine the amount required in next year, but with little precision (this will enable us to maximize the amount of each crop needed for the future). Also, if all crops are available in abundance, then the prices will be low, and this will benefit the poor sections of the society who cannot afford to buy such expensive food grains.

Introduction:-

Technology, however, helps these farmers reduce costs. Your farms are connected wirelessly. Moisture detectors around each of the plants monitor what happens in the soil. They send their observations to a computer in the cloud to be analysed and, depending on the needs of the plant, the irrigation system of the farm solves these deficiencies. This irrigation system resembles the hydroponic culture used in greenhouses. Every half hour, a quantity of calibrated water, based on the calculations made by the server in the cloud, and mixed with the appropriate amount of fertilizer falls on each plant. This drip is deposited in the two parts of the trunk of the plant, since experience has shown that absorption is better. Before this system was available, it would have been watered at least once a week. With this new technique, 20% less water is used than used to be used. This means saving money and water. This type of farms and some similar ones that grow other fruits such as pistachios, nuts and grapes are known as "smart farms". But not only nut farmers are those who take advantage of these benefits. Row plantations, such as corn and soybeans, which cover a large amount of Central West America, are also using this type of technique. Planting, irrigation, fertilization and harvest are automatically controlled. Even the soil on which they grow is monitored. Farms are becoming more and more like factories: highly controlled operations to get reliable products, immune as much as possible to the vagaries of nature. The times have gone by when we had to rush out in the middle of the night to a farm field to monitor the temperature and humidity of the crops. Nowadays, a farmer only has to take his Smartphone, press some keys and go back to sleep in his bed. And that, thanks to a technology known as "smart farm" ("smart farm"). The applications of this technology work with the Internet of Things (IoT), and through them are measured and analysed temperature, humidity and intensity of sunlight in a greenhouse. The data thus obtained is sent to a smartphone, or a desktop computer, for farmers to review and control the conditions of the greenhouse in real time.
As soon as they began to be used, these new systems have made it possible to increase the productivity and quality of crops, while reducing the use of labour and energy consumption.

We plan to make a hybrid mobile application 'SMART FARM' that will **assign crops to every farmer** who registers on that application. If the farmer agrees upon it, then the amount that will be paid to them will be fixed. This will encourage them to grow the allotted crops. The statistical data on the amount of a particular crop consumed every year is available and with the help of those stats, it is possible to determine the amount that will be required in the next year, not exactly but with a precision to some extent (it will give us the upper bound on the amount of each crop needed in future). Also, if all the vegetables are

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available in ample amount, then the prices will remain low, and this will **benefit the poor sections of the society** who were not able to afford to buy such costly food grains.

Registrations of Farmer

Phase 1: -Registration of Farmer

The Farmer registers himself on the application by entering the following details:-

Name of the farmer, Age, Aadhar Number, Contact Number, Land Area (Hectare), Village, District , State

Phase 2: Detail Updation in the database

After submitting all the information relevant to the farmer, the registration will be done by the application. Then the farmer will save his data database.

Phase 3: Crop Selection

Farmers with a list of suitable crops will be shown based on the following factors:

1. Land area - Each crop yield is different, and so it is essential to decide which type of crop is most suitable.
2. Types of soil - Weather, black, iron, clay, etc. based on soil. The best suitable crop will be selected for the soil that is given.
3. Rainfall - Rainfall in the region is affected by crop yield. Depending on the land geographical location, the crop will be selected.
4. Crop requirement - Real-time crop will be given priority with higher cost rates.

Phase 4: Crop Allotment

Based on crop cultivation, he wants to cultivate, he will be asked for confirmation, and if he ensures the same increase, he will be given an allotment ID. This allocation ID will be sent via SMS.

Phase 5: Updating Crop Requirements

After informing the farmers about the crop, he has agreed to cultivate, the details of the crop allocation will be updated in the database. Also, the new crop requirements will be updated by increasing crop yield in the farmers' land area at the first stage of the old need.

Phase 6: Verification of farmer and crop

After allocation of 15-20 days of the crop, one representative officer will visit the peasant and verify the details of the farmer. If all the features provided by the farmers are correct and the farmers cultivate agreed crops, then the advance amount will be presented to facilitate the further requirements of the farmers.

Phase 7: Collection of crop and paying off the remaining amount

Once the crop is fully grown, the farmer will get the remaining amount, and the crop will be collected from him, and the market will be outsourced.

Technical Details of the Project

1. **Mobile Application -** Ionic Framework and AngularJS
2. **Web Application -** HTML/CSS, AngularJS
3. **Database -** Firebase real-time database
4. **Machine Learning** - python, pandas, scikit-learn (Linear Regression), matplotlib and mpl3d
5. **SMS API -** Textlocal
6. **Server -** Host web app
7. **Training data -** https://data.gov.in/node/87630

Features of the project : -

1. **Easy Navigation**: This application doesn't require any purchases means it is **free of cost**.
2. **No Ads**: This application does not contain any advertisements.
3. **Multi-Platform**: This application can quickly run across **multiple platforms** and provide easy and **convenient** access to the user, who has little or no knowledge of how to use an app.
4. **Notification**: Whenever a farmer registers himself on the mobile application, and agree to cultivate the crop allotted to him, then after successful submission, the farmer will be notified about his successful presentation through a text message.
5. **24X7 Access**: By using the **real-time database** (Firebase), we provide the farmers the flexibility to register themselves on the application whenever they want themselves to express.
6. **Admin**: The **admin dashboard** details of the farmers, will be built in such a way, that as soon as a new user registers themselves on the application, the admin will be able to see all the details of the farmers including their district, village, land area and allowed crops in real time.
7. **Predictive Crop Allotment**: The farmers will be allotted crops **according to their soil type, average rainfall, soil texture and soil color** in their district and most importantly the crop with the maximum requirement that can be grown in that area.
8. **Real-Time Crop Requirement Updation**: As soon a crop is allotted to a farmer the **requirement of that will be updated accordingly** by subtracting the amount that can be grown in the land they have from the original specification.
9. **Interactive Plots**: The admin will be able to interact with the **plots of the requirements of the crops** over the years and the predicted requirement of the crop.

Closed loop irrigation solution for farmers:

Fossil field plays an essential role in crop production. However, how much and when it can be sprinkled is still restricted by the traditional knowledge of the peasants. For a given soil type, for a given crop it is necessary to know precisely how much water is required to keep the humidity depend mainly on the power of the soil. We need an IOT,

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AI-based solution that can irrigate the fields of crops based on soil moisture content automatically

Seventy percent of the water has been consumed and most of the wasteful use of farmer's account. Farmers are central to the whole picture, where they are the world's most miserable place of poverty.

Agriculture cannot be ignored in the water equation, and it is the essential part of the developing world.

A country like India, with a tropical climate, disagrees with its diversified region, today experiences a flawed pattern which depends on farmers to be a significant source of irrigation.

The state's estimated irrigation potential is 5.1 million hectares, which is 3.1 million hectares already achieved. The gap of 2 million hectares cannot be fully solved by fully absorbed land water.

Proposed Solution

1. Our model is responsible for obtaining information related to location, time and weather conditions (mostly on rainfall) and during one interval, the irrigation system will be automated according to soil moisture required.

2. When working with varieties of weather types, different weather and season variation, the model facilitate movement.

3. It is all done while reminiscing the possibilities in the remote areas even to the farmers.

4. It is designed to take advantage of the soil humidity sensor, humanity, temperature, and rain sensors to provide a smart watering system for users with existing soil systems. All climate activities will be managed by an intelligent controller that will be able to collect information and allow users to adjust the quantity and timing of the water supply based on those readings.

5. Our Smart Controller integrates users into existing Sprinkler systems so that users can remotely control their home irrigation through a web interface or an Android interface.

6. The data collected by the sensor is sent to the cloud-generated database for further processing and predicting future weather conditions.

Methodology:

Stage 1: Creating an admin application (web application).

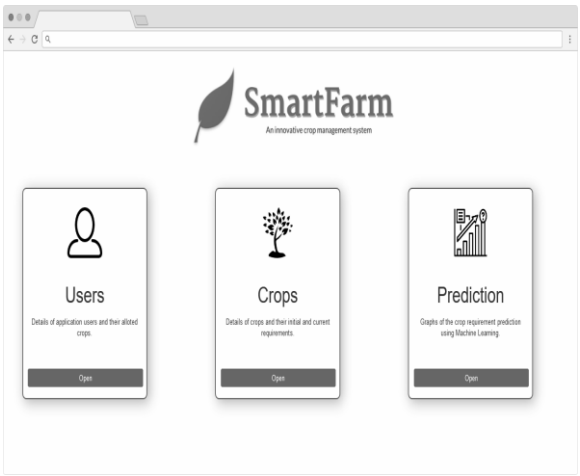

Image1: Prototype of Smart Farm Admin Web App Interface

Stage 2: Gathering the essential data like soil fertility, feasible crops, atmospheric conditions, annual rainfall of every region in the state.

Stage 3: Design a hybrid mobile application that will gather farmer details.

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Image2: Prototype of Registration Form

Image: Prototype of Soil and Weather Attributes

Image2: Prototype of suggested crops

Stage 4: Register the application on the Play Store and Apple App Store.

Stage 5: Update the details of the farmer in the database and reflect the changes on the web app.

Stage 6: Creating banners and campaigns for creating an awareness among the farmers.

Methodology

The farmer will register himself on the application and after we have all the relevant details, which we will use for crop allotment based on geographic conditions and previous year consumption statistics.

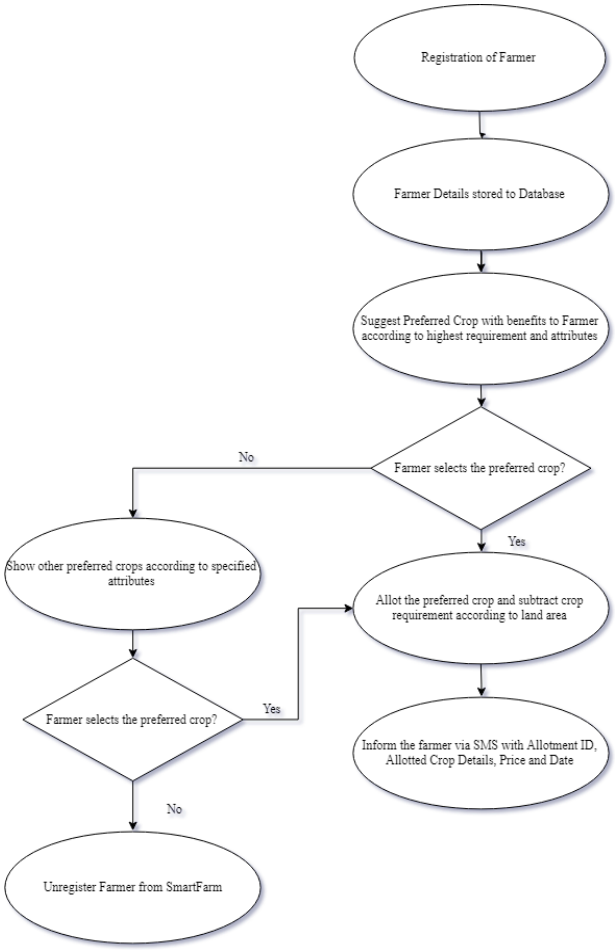

Fig: Flowchart for the Process of Crop Allotment

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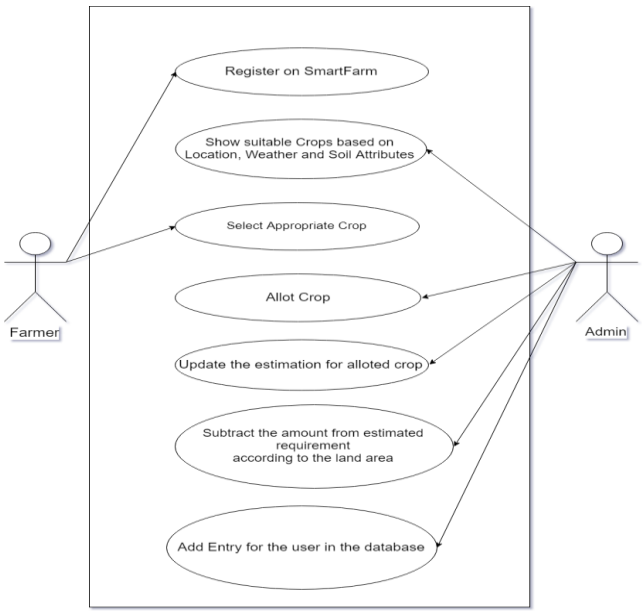

Image3: Use case diagram for Smart Farm

Conclusion:-

Our solution to this problem will be an innovative crop management system for farmers and the government. In 'this tool, we **predict the average (upper bound) consumption of several types of crops by Machine Learning** using the open source data of crop production and consumption of previous years. Through this precisely accurate prediction we will assign a crop and amount of it to be grown to each farmer, following the following factors -

1. Soil type of area
2. Average rainfall in the area
3. Soil texture

If the farmers linked to the tool grow the assigned crop, they will be provided with the designated price for it, and the crops will be raised in the desired amount.

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