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A Smart Agricultural System For Effective Yeild Of Tropical Plants Based On Modern Technology

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Abstract— Agriculture is a very important thing for everyone. The numbers of farmers are reduced day by day. So that automation is implemented for fertilizer mixing. In this project fertilizer and water are mixed in the ratio by the commands given by the users. This project is mainly used to mix different fertilizers to obtain the required NPK ratio and give it to plants along with irrigation systems. This work is carried out by three modes. In manual mode the ratio of the water and fertilizer are given manually. In auto mode the ratio of water and fertilizer are mixed automatically by knowing the name of the plant. In smart mode the name of the plant, fertilizer ratio is automatically updated by the value of soil moisture, atmosphere temperature and NPK value. The modes can be selected by the users using the mobile system.

Keywords— fertilizer, water, Moisture control, mixing and distribution modes.

I. INTRODUCTION

Agriculture plays a major role in our day to day life. In India climatic conditions change randomly. NPK fertilizer plays a major role in agriculture. Fertigation is the process of providing essential nutrients to plants by delivering fertilizer mixture along with the irrigation water. Now the farmers do not know the ratio of fertilizer and water are mixed. It may lead to spoil the soil, ground water pollution and raise the temperature of the soil also.

Farmers need to meet the rising demand of more food without any trimming the quality of food. To meet this rising demand, many young farmers are involved in this agricultural business. As we all know farming is the toughest job, the young and new farmers do not get hands-on training of handling the fertilizer.

Though fertilizer increase the crop production. The young and new farmers are own using this harsh chemicals will harden the soil. There are three major fertilizers plays a major role in agriculture they are,

1) Nitrogen (N)
2) Phosphorus (P)
3) Potassium (K)

The plants could not survive without any of these three nutrients. The plants without these nutrients will have stunted growth, weak stems and yellowing or discolored leaves from the tip inwards.

The role of Nitrogen (N) in agriculture is used to significant components in amino acid and used to building the protein block, and it allows the energy for storage and use. It is also used for greatest yield response in crop plants. Some Nitrogen fertilizers are Urea, Anhydrous Ammonia, Manure, compost, Blood meal.

The role of phosphorus (P) in agriculture is to increase the structural strength, seed production, crop quality and more. It transformation of solar energy into usable compounds. It is responsible for energy transfer, transformation of starch and sugar. The some phosphorus fertilizers are compast, biosolids, blood meal, bone meale.

The role of Potassium (K) in plants to associate with movement of water, carbohydrates in plant tissue. It has an abundant mineral macronutrient. It is used to constituent for the correct development of plants. Likewise, it is also important for biochemical reaction for plants. The some fertilizers of potassium are langbeinite, biosolids, granite dust.

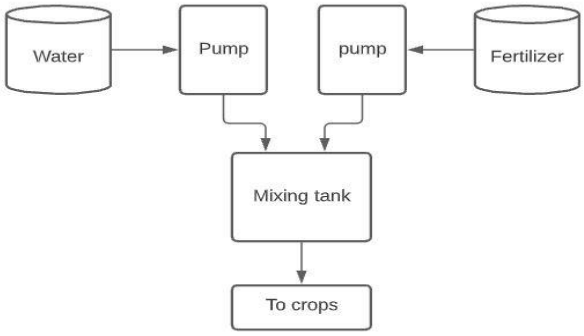

Fig 1.1 Fertigation system

Agriculture is very essential for every one's life in the world. Now a day the count of farmers are reduced because of his revenue. To render these problems we have to initialize automation in agriculture. In this project we calibrate the condition of the soil corresponding to crop cultivating and suggest the amount of fertilizer either through manual or automatic mode.

Here there is a two segment with water and fertilizer. The user can enter the type of plant, and we can choose the type of mode we want using a mobile system. The fertilizer is mixed with water and delivered along with drip irrigation.

It monitors the NPK (nitrogen, phosphorus potassium) quantity in soil. By this project the farmers are mixing the fertilizer correctly, and it reduces the wastage of the fertilizer. We also monitor the atmosphere temperature, humidity, soil moisture and amount of fertilizer and water in the tank.

This project gives a particular and correct in predicted crop yield and supply the right fertilizer to the users to control the fertilizers. It given an approximate ratio of the fertilizer by using temperature, moisture and humidity. The NPK ratio varies with different region and different soil type. The moisture sensor is used to detect the water content in the soil.

Drip irrigation method permits the application of nutrient directly to the high concentration of active roots as they needed. For crop yield the fertilizer and water must be balanced. For an fertigation process the calculating of actual water and nutrient requirement for the crops, to the uniform distribution to the plats are very important parameters.

II. LITERATURE SURVEY

A. Deteection of fertilizer quantity in soil using hyperspectral data

This paper is published by Jay Prakash Kumar and Arun Inamdar. In this project the soil and fertilizer mixture samples are shown in a spectrometer to measure the spectral signature of the sample. Next it finds the diagnostic depth calculation and it is performed by three stages. In the first stage, it finds the minimum reflectance from 1450 nm- 1780nm. In the second stage, it takes the starting and ending wavelength as input and calculates diagnostic depth. In the third stage, it takes input as from the second stage with target wavelength and calculates diagnostic depth. For the quantification process, the data are analyzed by SVM with multiple regression techniques for the reactance value. It shows a fertilizer consumption of the plants and tabulates for the fertilizer concentration of the soil samples.

B. ICT based fertilizer distribution system

This paper was published by Priyanka Roy and Anugrah Pandya. In this paper they discuss the fertilizer consumed by the farmers and the fertilizer need to be delivered for the farmers. By using Information and communication technology, we know the kind of fertilizer used by the farmer and area they purchase the fertilizer, the amount of fertilizer consumed per day. These details are monitored and store the data in ICT. From the survey the fertilizer is delivered to the farmers by the aadhar enabled system. We also find the availability of fertilizer according to the farmers requirement and also a chart shows the NPK ratio. By this system we purchase fertilizer directly from the government using aadhar enabled system and biometric system also. It is very useful to control the wastage and over usage of fertilizer.

C. Prediction of crop fertilizer consumption

This paper was published by Vijay Bhajantri in 2018. In this we discuss the various approaches to identify the nitrogen deficiency and amount of fertilizer consumed by plants. First we capture a photo to notice healthy and unhealthy plants. The images are resized to the dimension 300*400 for easy to process the image. Next to convert the images into grayscale. For plotting the histogram analysis, initially scan the image and then the pixel values are measured and finally histogram is constructed. Then they analyze the image into a symmetric or asymmetric image. If it is symmetric it is a healthy plant. If it is an Asymmetric image, it finds the nitrogen deficient plant and they find the area of affected Plants and to find the fertilizer needed to be consumed by the plants.

D. Prediction of crop yeild and the efficient use of fertilizers

This paper was published by Chaithra M Rao in 2020. This project works based on the K-nearest neighbor (KNN) algorithm. For implementing an algorithm we need a database. First we upload a database with training and testing data. Next we want to give crop information to find the usage of the fertilizer and we give the pH value, location, rainfall. The algorithm checks the database and calculates the fertilizer which used among the nearest distance. Based on the distance, sort the value in ascending order and get the K value. By KNN algorithm, we find the NPK fertilizers are used in the nearest distance the farmers are fertigate the fertilizer in the field. It may lead the wrong prediction also.

TITLE	AUTHOR	ALGORITM	MERITS
Detection of fertilizer quantity in soil using hyper spectral data.	Jay Prakash Kumar	Multiple regression	It shows the ratio of mixing with fertilizer to the soil.
ICT based fertilizer distribution system.	Priyanka Roy	ICT deployment	It shows the quantity of the fertilizer is had by the farmers.
Prediction of crop fertilizer consumption.	Vijay Bhajantri	Grey scale imaging	It shows the amount of fertilizer is consumed.
Prediction of crop yeild and the efficient use of fertilizers	Chaithra M Rao	KNN algorithm	We find the NPK value by the nearest farmer used and suggest it.

Table 2.1 Literature survey

III. PROPLEM INDENTIFICATION

Agriculture is an important one in our healthy life. The main problem for the newcomers is they do not know the correct ratio of fertilizers that want to be given to the crops. They didn't know the role of NPK fertilizers in agriculture. Many of the farmers are leaving the farming because it is his revenue. Some farmers are not mixing the fertilizer in correct ratio it leads to affect the plants, groundwater pollution and also spoil the soil. For that we come out with an idea which improves the interest of youngsters to come into agriculture.

It also reduces the usage of fertilizer. The farmers can save some money by this. The idea is to give a suggestion to the farmers according to their field and crops, which gives the ratio of fertilizer to be used in that situation.

IV. EXISTING SYSTEM

For an effective yielding the fertilizer is a major role. In the existing system, there is a segment with water and fertilizer. There is a mixing tank contains the mixture of fertilizer and water. Only PH data is monitored the soil quantity and the fertilizer are mixing. The soil characteristics are monitored through PH sensor and EC sensor. The pH values are used to control the availability of nutrient. The EC values are used to give the information about the quantity of fertilizer is distributed for the plants. There is an acid solution is mixed with the nutrients' fertilizer. When the EC reading is higher than the required amount means it consumes a high amount of fertilizer. In this method the fertilizer are mixed are not accurately. This system is works only in manual mode. The major disadvantage is the farmers did not the fertilizer ratio they may give a wrong ratio. It may lead major affects to the plants and soil. For a new farmer it is very difficult to use.

V. PROPOSED SYSTEM

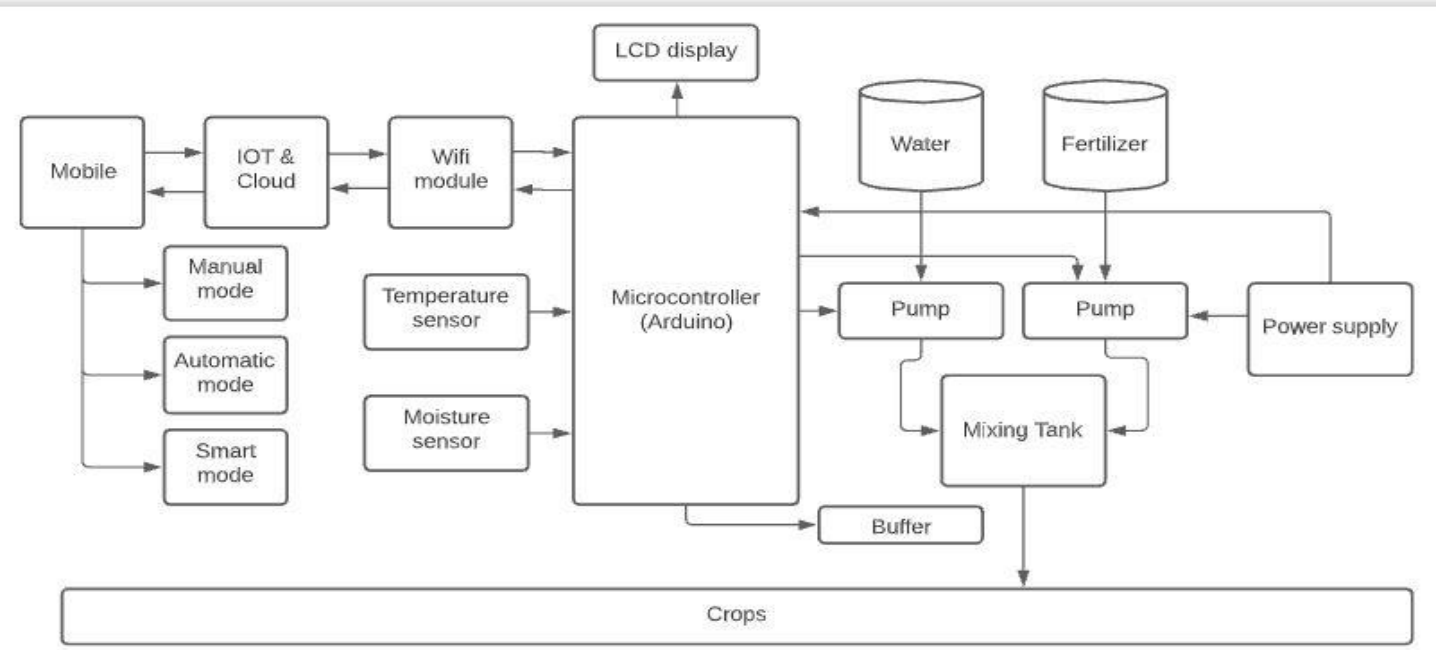

Fig 5.1 Proposed block diagram

The figure 5.1 represents the block diagram of the fertilizer mixture. There is a two segment with water and fertilizer. The users can choose the mode using a mobile system. There is a mixing tank, which contains fertilizer and water. They are distributed to the plants through the drip irrigation along with water. In this block diagram ATmega328P with Arduino is an open source programmable device which is programmed by Arduino IDE. 5v power supply is needed for the controller for a high voltage there is a step-down transformer to reduce the voltage. It consists of various sensors to monitor temperature, humidity, soil moisture and NPK value.

All the sensors are interfaced with the microcontroller and the values are continuously monitored and collected through the IoT module and the data's are stored in the IoT cloud. If water contend is decreased it will indicate through the mobile or buzzer and the required fertilizer amount is shown in the Liquid Crystal Display (LCD).

All the components are connected to the microcontroller. For a microcontroller we use an ATmega32P. Because it is an open source programmable device. The operating voltage of the controller is

5V. It programmed by Arduino IDE (Integrated Development and Environment). It is inexpensive, simple to use, open source extensive software and hardware.

For an IoT communication we use an ESP8266 Wi-Fi module. It is used to send the data of temperature, humidity, soil moisture to the IoT cloud. It has a 2.4 GHz and supporting of WPA/WPA2. Likewise, it might have a range of 160 feet or fewer. It is easy to use and less in cost.

The LCD is used to show the ratio of the fertilizer and water is mixed, the amount of fertilizer and water are in the tank. It fallows as a blocking light method. We use a 16x2 display to show the value. Because it is very easy to programmable. The buzzer is used to indicate when the water content is decreased in the field and also to indicate whether the fertilizer is mixed or not. It indicates through the beep sound. It is an audio signalling device, which have an electromechanical or piezoelectric. When the certain changes in crystal they give electricity to them. By applying signal ate the right frequency, the crystal gives an sound.

The temperature sensor and moisture sensor is used to monitor the crop data. By these we monitor temperature; humidity and soil moisture value through IoT and it store the data in cloud. The moisture sensor is used to get the volumetric water content in soil. The output value ranges from 0 to 1023mv. It is used in climate research also. By using this sensor we known water content of the soil, if it less it indicates through the buzzer. According to the moisture value the ratio was varied.

Output condition	**Output value**
In dry condition	0-300mV
In humid soil	300-700mV
In water	700-950mV

Table 5.1 Moisture sensor configuration

The table 5.1 shows the output range of the moisture sensor. The temperature sensor is used to collect the data of temperature and humidity. These values are calculated by measuring the electrical resistance between two electrodes. The changes in resistance value are proportional to the relative humidity.

Here there is a two pump for mixing a fertilizer and water. A pump is a device that used to movement of fluids. Pumps can be categorised into 3 types; direct carry, gravity pumps and displacement. The pump plays a major role in pumping water from the well, pond filtering and aeration. These pumps are controlled by the microcontroller.

In agriculture NPK fertilizers are used for the growth of plants, increase the crop production. The soluble fertilizer is stored in tanks with high concentration. The concentration of the fertilizer are mixed with water and distributed along with drip irrigation. The NPK fertilizers are present in right amount in the soil. The NPK ratio in soil is different for a region and soil type.

Nutrient name	**Fertilizer name**	**Ratio**
Nitrogen	Blood meal	20-0-0
Phosphorous	Biosolids	0-20-0
Potassium	Granite dust	0-0-25

Table 5.2 NPK ratio

VI. CONCLUSION

The backbone of India's economy is agriculture; more than 60% of lands in India are agricultural lands. In the existing system the fertilizer and water are mixed in manually. The system has only pump ON/OFF system only. The developed system for an effective yield of tropical plants based on modern technology, it will help farmers to increase the agricultural output. The aim of this project is fertilizer and water is mixed in the ratio by the commands given by the users. This project is mainly used to mix different

fertilizer to obtain the required NPK ratio and given it to plants along with irrigation system. The distribution is done by three different modes. In manual mode, the ratio of NPK and water are given manually by the users through the IoT. In automatic mode, if the farmers didn't know the ratio has given to a plant type and the fertilizer are mixed automatically. The user can choose his mode through the IoT platform. For a smart mode, the plant type and NPK ratio are automatically taken through the moisture sensor and the fertilizers are mixed in the correct ratio. Hence, this project helps the farmers on a great scale.

VII. RESULT

After the process of microcontroller and selecting the mode in the mobile. The fertilizer and water comes out in the ratio, according to the crop and the situation of the field. Based on drip irrigation system, mixer is supplied to the crops. We can monitor the temperature, humidity, water and fertilizer containers in our mobiles on the IOT platform. This gives higher production of crops than the normal method and increases the interest of youngsters to come into the agriculture sector.

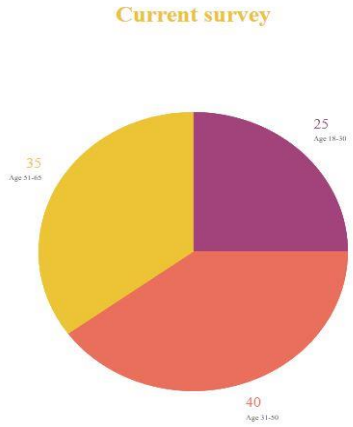

Fig 7.1 a Farmers range before this project

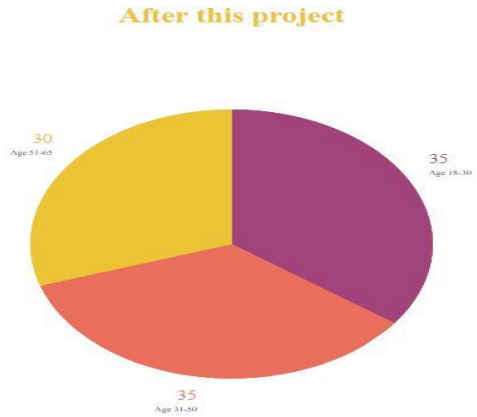

Fig 7.1 b Rise in farmer

VIII. DATA ANALYSIS

Data analysis for several has done for example for one plant corn amount of nitrogen is 6%, amount of phosphorous is 5%, amount of potassium is 5%, amount of water level is 15ml, amount of fertilizer in tank is 250gm, range of temperature is 32 and range of humidity is 43%. This data are monitored through IoT platform.

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