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Intelligent Smart Farming Technique Embedded with Weather Tracking and Manure Notification for Turmeric in Red Soil

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Abstract: ***Agricultural growth is very important in our day to day life. As per today's population the existing technologies are insufficient for good yield. It is important to implement the enhanced technologies for the wealth of agriculture. The active technologies are not focused on specific soil and crop. The quality and quantity of the cropyielded are based upon the soil it has been cultivated.***
Monitoring of moisture, Prediction of weather and analyzing nutrient level in soil has been separately executed. The proposed system incorporates all three concepts for the good yield of Turmeric in Red Soil and provides a sufficient usage of H_2O, Weather and Manure for the agricultural development. This system is completely focused on the drip irrigation method in order to restrict the excess usage of water.
As drip method pours the water directly to the root of the crop, the irrigation system to the field can beon a precised manner. Moisture level of the soil is regularly monitored through sensors with thethreshold value that has been encoded into it. When the level of moisture in soil gets decreasedto the threshold value provided, the system notifiesabout the constraint. Weather monitoring system monitors the environmental condition in which thissystem has been implemented. Additional to it the system notifies about the application of fertilizer tobe sowed into the field during an interval of time.
Keywords: Internet of Things (IoT), Moisture, Weather Monitoring, Fertilizer, Sensors, Threshold Value.

I. INTRODUCTION

Agriculture is the backbone of India. Cultivation is the major source of food. Two-third of the world's population is depending on agriculture directly or indirectly. For cultivation of crops water is the essential phenomenon. Waterconsumed for agriculture is more than an annual rainfall, 71% of the earth's surface is covered with water. Rain is the only source for the natural fresh water. There exists a decrease in agricultural land with increase in population due to industrialization.
In medical field many leaves, roots, barks, spices, etc., are used for manufacturing of medicines. In that Turmeric is the most valuable medicinal product which has been used from ancient days due to its extraordinary antibiotic properties. Turmeric is widely used in all extents like foodstuff, cosmetics, medicinal purposes, etc….

There exist six types of soil deposits in India namely;

A. Alluvial Soil.
B. Black Soil.
C. Red / Red Loamy Soil.
D. Desert Soil.
E. Mountainous Soil.
F. Laterite Soil.

From the details gathered about the soil andits nutrient contents, Red soil is more suitable for agriculture when compared to other varieties. Approximately 10.6% of the geographical area of India is covered by red soil. A red soil can yield a massive quantity of product due to its high nutrition level.
Producing a good agricultural product is a very difficult task. By using the modern technologies, the quality of the crop increases resulting in good yield.

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Irrigation plays a vital role in agriculture. Combination of irrigation technique with sensors helps in achieving smart agriculture. To enhance productivity some factors which should be kept in mind while harvesting is the amount of water the crop needs, nutrient content in soil and the climate in upcoming days. Various irrigation techniquesare followed in current scenario such as;

1) Surface Irrigation.
2) Drip Irrigation.
3) Sprinkler Irrigation.
4) Manual Irrigation.
5) Artificial Raining method.

From that drip irrigation is more efficient in today'sagriculture.
Drip irrigation is the most potential technique to save more amount of water to drip slowly to the roots of plants, either from above the soil surface or buried below the surface. This proposed system not only focus on irrigation manner also used to detect the moisture content of the soil, weather prediction and notify about the fertilizing period throughout the cultivation.

II. LITERATURE REVIEW

A. An IOT Based Smart Irrigation System Using Soil Moisture and Weather Prediction.
Author name: Dr. S. Velmurugan and et al.
A system consists of distributed wireless network of soil-moisture and weather prediction sensor placed in the agriculture field. Threshold value is scheduled into the sensor in order to monitor the flow of work of the system. The mobile application can be designed to analyze the data received and check the threshold values of moisture, humidity and temperature. The decision can be made either by the system automatically without user interruption or the user can manually operate the system through application provided.

B. Smart Irrigation System With Solar Power and GSM Technology.
Author name: Abu Shufian, Md. MominurRahman, and et al.
Smart irrigation system uses solar power and GSM technology. Sensors which are used in this system get power supply from the solar energythe water is dripped to the agriculture field basedon the value provided for the soil moisture and temperature. The GSM module used in the system communicate with the farmers to control the water flow in the field.

C. Automation of Irrigation System Using IoT.
Author name: Pavankumar Naik, Arun Kumbiand et al.
The important role in the agriculture field isirrigation process. Now a days the irrigation process is also got automated. The system uses ESP-8266 WIFI module chip is connect the system to the internet. The system uses various sensors to monitor the field moisture and the water is supplied to the field through motor pump. Using an android application, the farmers can get the information about the water supply.

D. Smart Irrigation System Based on Soil Moisture Using IOT.
Author name: S Nalini Durga and M Ramakrishna.
Moisture content of the agricultural soil was continuously monitored by soil moisturesensor. The control unit was achieved using microcontroller based on the Arduino platform. The output of the irrigation system is controlled bythe soil moisture and controller with the help of value provided. All these functions are tested automatically and the water flow is automated or commanded by the farmer from their reserved location.

E. Smart Irrigation Using Internet of Things.
Author name: Anubhav Gulati and SanjeevThakur.
Water is the most essential resource used in Agriculture. Irrigation is one of the most important methods to supply water for the growth of the crop. The automatic irrigation system using IoT will pulldown the wastage of time and water consumption for the soil. In this system they using various sensors like temperature, humidity, soil moisture sensors which sense the various parameters of the soil. The sensed parameters and the actions to be performed are displayed on user application.

III. PROPOSED SYSTEM

In the field of agriculture the yield of the product is mainly based on the soil in which the crop has been cultivated and also by the way of irrigating it. Hence, the precised moisture level andnutrient content present in the soil and correct irrigation method can improve the growth of the crop and can maximize the yield in better quantity.

A. Soil Moisture Sensor

It helps to monitor the moisture level of the soil to maintain the wetness level in a stable state.

B. Weather Prediction Sensor

It helps in predicting the environmental weather conditions at the area where the system is installed.

C. Arduino UNO

Used for system control and data processing depend on the sensed parameters and

D. GSM Technology

Used to fetch the data from the system and loads the processed data into the application in order to update the current scenario to the cultivator.

E. Photovoltaic Panel

Provides sufficient energy source to the system by absorbing the sun light, thereby reducing the electricity cost.

IV. WORKING

The proposed system for cultivation of turmeric goes on the basis of monitoring the soil moisture along with the environmental condition that includes temperature and humidity [1]. Additional to it, this system provide details about application of fertilizer in between the harvesting period. The details about the manure are updated tothe cultivator through a personalized notification totheir peripheral devices, in order to maintain the nutrient (NPK) content of the soil for turmeric in a proper way.

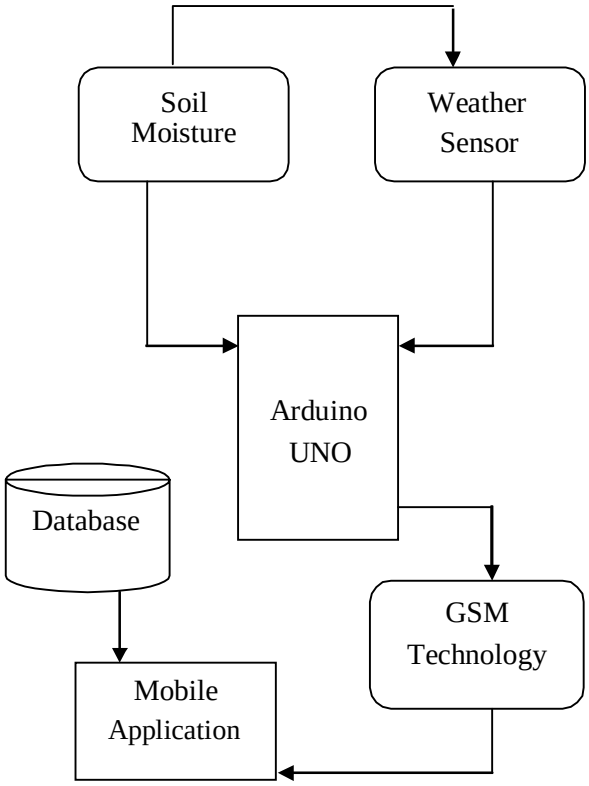

Figure 1. Block diagram for proposal system

The system incorporates the placement of availability constraints. 'n' number of sensors in the field at an average distance to monitor the moisture level in order to predict the moisture content in a precised manner [1]. The moisture level of the soil is continuously monitored to the threshold value provided with the help of Soil Moisture Sensor placed at the field at different regions [2].

When the threshold value of the moisture level gets decreased, the system gains the average value from the sensors placed at different locations in order to take decision regarding irrigation [3] to the field. Here, a relationship (or) connectivity is made between the moisture sensor and the weather sensor [1]. When the moisture level gets decreased to the threshold value provided the system will not immediately irrigate the field [1], apart from it the system checks the environmental condition.

The next process of the proposed system will be held upon two constraints [1] [2].

1) The first constraint is, if the environmental condition is cloudy with humidity (or) thereexists a chance of rainfall, the irrigation process is stopped for quite time.
2) The next constraint is that, if there is no chance rainfall (or) the weather is dry; the irrigation process is started immediately.

The irrigation process is carried out until the moisture level of the soil is back to its threshold sate [2]. As above mentioned the irrigation processis carried out in a drip manner [5]. As the drip irrigation manner pours the water directly into the root of the crop it restricts the excess usage of the water [4].

Time of application	N	P	K
	(kg/ha)		
Basal dressing	25	60	18
Top dressing			
At 30 Days after planting	25	25	18
At 60 Days after planting	25	25	18
At 90 Days after planting	25	25	18
At 120 Days after planting	25	25	18

Figure 2. NPK values in kg/ha

The Crop can give yield only if the crop is enriched by its nutrient level [3]. Therefore, manure to be sowed to the field is provided to the farmers through notifications. The amount of manure, the duration in which the manure should be sowed and the land preparing manure notifications are sent to the cultivators at a regular interval of time using GSM technology [2].
As this proposed system focuses on a particular crop (turmeric) and particular irrigation method (drip) the details provided and the progresscarried out are in a precised manner.

V. CONCLUSION

Adopting the agriculture to the modern age makes it more efficient than olden days. Electricityand water are the main challenges in agricultural line of work. The improvement or breakage of agriculture field depends upon the usage of main challenges. These issues has been get ridden by using the water and electricity in a precised and renewed manner throughout the harvesting period. As a result, agricultural line gets evoked in a fine manner. This paper plainly describes the smart farming techniques for a particular crop (turmeric) that includes monitoring the soil moisture, prediction of environmental conditions and manure notifications. A finest IoT structural design for agriculture, to enhance its quality and quantity of yield, efficient usage of its source and to reveal its importance is achieved. As of wastage of sourcesis controlled, it make more profit as in country likeIndia with raise in GDP (gross domestic product) of the country.

VI. FUTURE WORK

Implementation of Machine Learning (ML) concepts can reduce the hardware requirements for the system. Machine learning concepts need a hugedataset to predict the accurate results. Our surviveddata on various regions will help in improving the concept and its performance in the area of soil, weather and water. This paper can further be customized with the concept of leaf disease detection and yield monitoring concepts for particular crop. Providence of various concepts on different crop and method is awaited.

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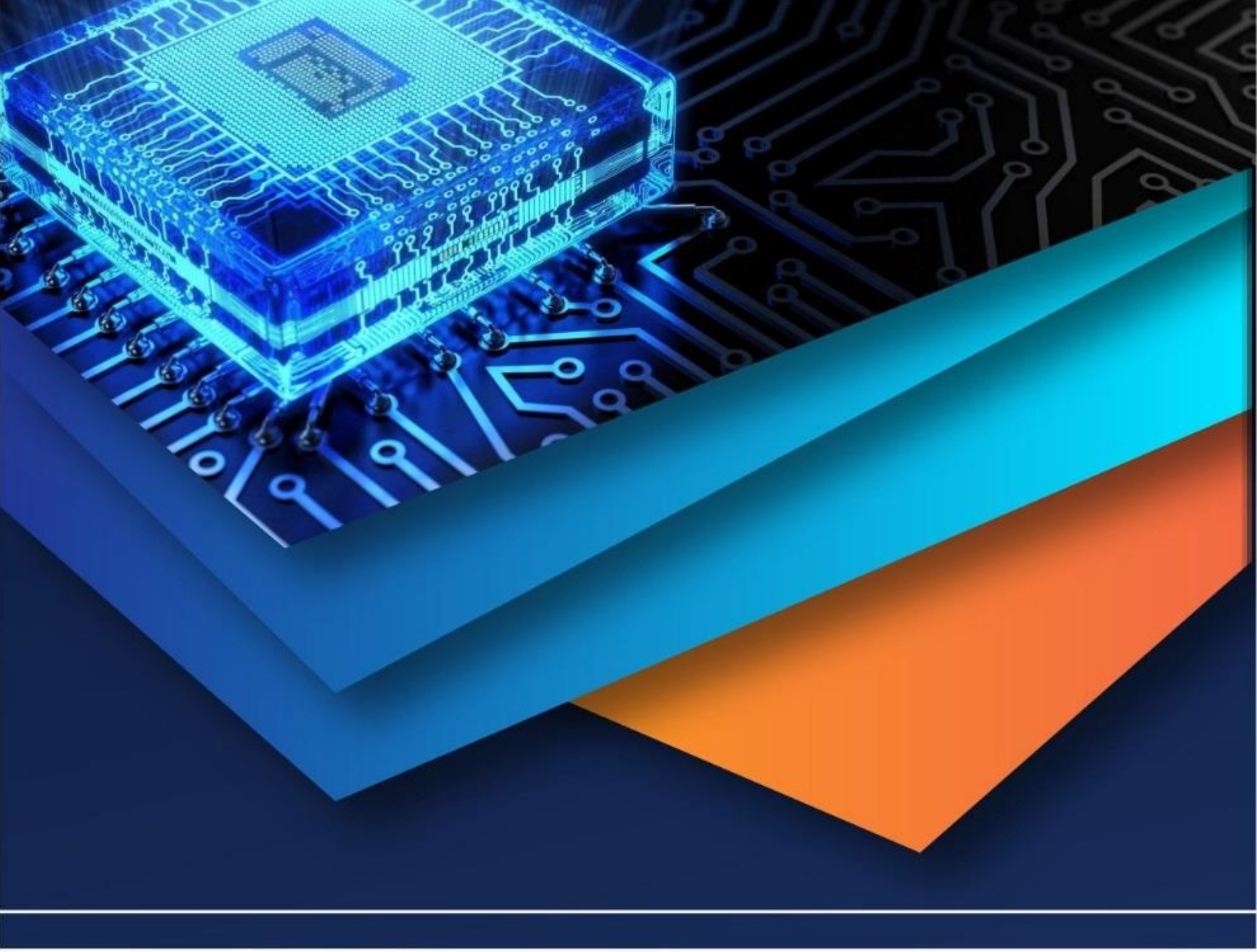

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