Implementation of System for Detecting Unwanted Gases and Monitoring the Agricultural Parameters using IOT

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Abstract*: *Agriculture is the most significant economic activity in the developing countries like India. Agriculture monitoring systems are vital to monitor and improve the production abilities of crops; it is also important to detect other parameters like soil moisture and other dangerous gases effecting the crop production. Automation is one way in which we can precisely control the energy, water flow, etc; this can be achieved by means of the embedded devices, these results in reduction of energy conservation and labor intensive work for crop monitoring. In this paper, the Arduino UNO , soil moisture sensor, rain drop sensor, methane gas detector, and humidity control sensor along with an LCD display system are employed to develop agriculture monitoring system; with the help of these hardware's we can program them and create a device which can monitor the field, the farmer or the user of these equipment can also keep a check on the water content in the soil and the level of dangerous gases like methane in the field through cloud using Internet of things (IOT) platform.

Index Terms*: *Internet of things, Arduino, Agricultural Parameters monitoring.

I. INTRODUCTION

In this automated world we need to help the farmers that provide the basic need and source of life on this earth in such a way that provide efficient results in the field of agriculture. The dangerous effects that make the crop production to be reduced are the content of atmosphere that pollutes the environment in which plants grow. So in order to reduce such effects we need to monitor the amount of such compounds in the soil and in the area of plants grows. Therefore, methane can be considered as the major contributor of temperature increase and the source to result in adverse reduce in the crop production. So at least if we succeed in intimating the presence of such harmful gases we can alert the farmer to get rid of the adverse effects of such gases. Before IOT we used the RFID tags and readers in order to pass the information from one place to other place. After the advancement in sciences they used the IOT technology to monitor the simple things like just to check whether the level of drink in the refrigerator is up to the level or not so that the users in that area could access the information updated. Later on they used to connect the sensors and integrate different operations using open sources; now we can connect this to various embedded systems so that we can monitor them and control them from the place where we are.

II. LITERATURE REVIEW

In [1], the system designed uses PIC for the automation purpose so that to check the moisture content in the soil. Finally the status of motor is sent to user through GSM. This system uses PIC which is not as accurate as that when compared to Arduino and does not have any source to update in the website. In [2], the system designed next to this have an automatic irrigation system but does not have the sensing device that can detect the presence of unknown compounds in the field area. In [3-8], these explain about the model that can automatically monitor the amount of moisture level and then according to the requirement the motor is turned on/off until the level reaches the optimum level. The present model will be an extension provided to this. Different papers discussed above use different technologies like microcontroller that are having specific instruction set, PIC that makes the circuit more complex. Finally we can understand to what extent the field production is effected due to presence of unwanted dangerous compounds like methane, carbon monoxide and other dangerous gases in the soil and in the area of the field and the need to design a cost effective and user friendly system that can easily programmed and modified for any further extensions if needed. So after conducting this survey we can conclude that we need a system to detect the dangerous compounds that effect the field production so that we can use some other pesticides in the very early stages so that to avoid the adverse conditions. The proposed design includes the sensing action and update the information in the website through IOT an open source that can be easily accessed by the user. The objectives of the proposed work are as follows:

- The main aim of the project is to detect the field ability so that efficient crop production can be achieved from the field.
- To monitor the temperature from time to time and update in website through IOT.
- To design an embedded system used to monitor the agricultural fields.

Revised Manuscript Received on June 05, 2019

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III. SYSTEM ARCHITECTURE

The agriculture monitoring system is illustrated in Fig.1, The technology used in this model is Arduino Uno as basic device used to integrate various sensors and update the entire information into the website through an open source cloud using Node MCU (i.e., MICRO CONTROLLER UNIT). The ESP8266 is traditionally used in IOT implementations. This is a low cost Wi-Fi that can connect the things easily. Here we used this component to integrate various sensors namely soil moisture sensor that can sense the information and converts that into digital form that is read by the arduino at the pin which is allotted for soil moisture sensor. Here the values are scaled to a factor and more the value less the soil is wet.

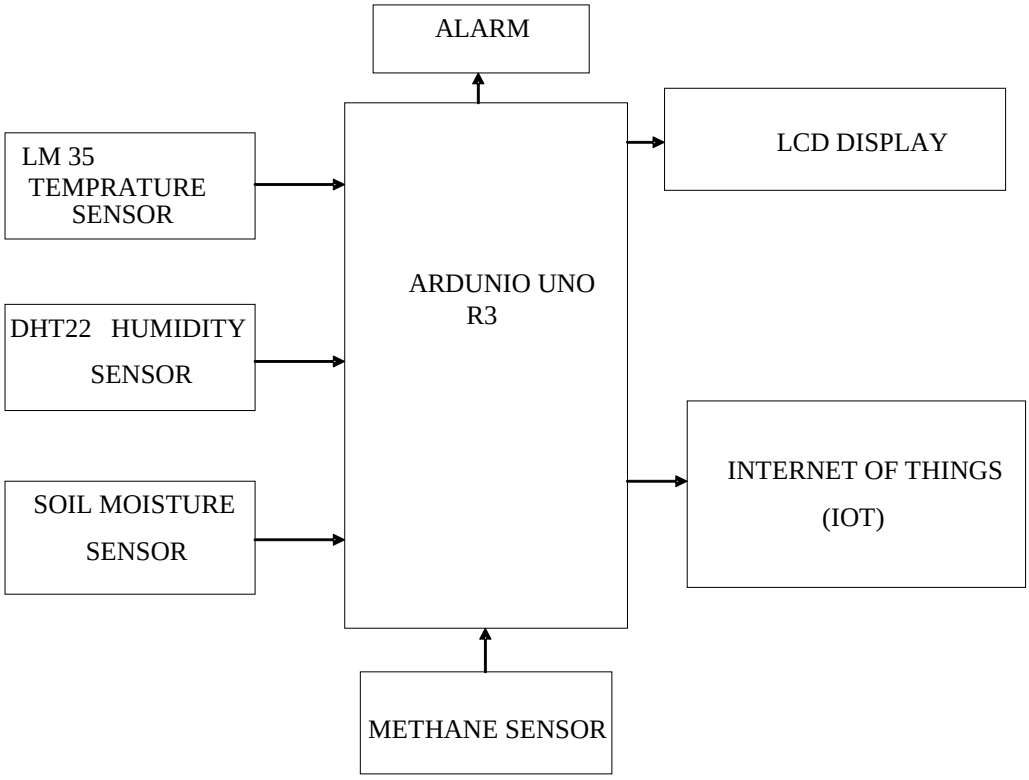


Fig.1 .Block diagram of agriculture monitoring system

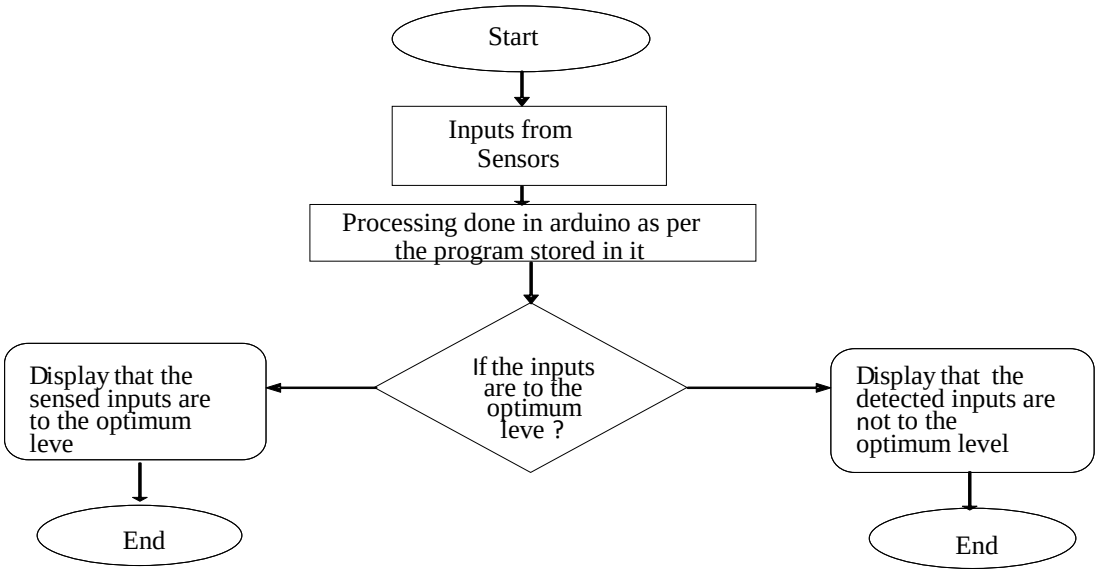


Fig.2 . **Working principle of agriculture monitoring system**

The other sensor we used is rain drop sensor which informs the information related to occurrence of rain to the user ,the mechanism involved is that when it is raining the drops connect the printed wiring on the sensor panel that create a short path in the circuit and through this the resultant voltage is sent to the digital converter and corresponding values are drawn at the arduino pin connected to this sensor.

Next comes the gas sensor the major part of the model which detects the presence of unwanted compounds either in the soil or in the environment of crop production in terms of ppm and the detected amount is sent to the appropriate arduino pin in the desired format. When the amount detected is in the scale that effect the crop then we have the buzzer that alerts the user to take certain measures such as to use some pesticides in the field in adequate amount that can not affect the final crop production.

This is the basic open source that everyone can access in which we will be given a channel on to which the entire information will be updated for every particular period of time as per the scheduled session in the program. The output of the moisture sensor will be scaled into further values and the soil with more moisture content will have less scaled value and vice versa. The optimum temperature required for a crop to get the best production is up to 27o C ,this is measured in the RH percentage 60-70% is optimum range and accordingly the output voltage will be noted and compared with that to optimum temperature fixed. The gas detection system will be measured in parts per million and the range of operation is about 200-10000ppm the threshold value will be around 2000ppm. The system is to be placed in the area to be under inspection.

The algorithm for proposed system is presented in Fig.2. The sensors places will collect the information, converted to the required type and then sent to the Arduino. With the program written already in the controller verifies whether the values are up to the threshold value or not. Displays the status on the LCD display and if any unwanted gases detected will intimate through buzzer.

All the sensed information will be updated on the screen for every particular period of time. Finally all the data sensed will be updated to the website through open source node MCU unit in which the code is written that relates this device to the website so that all the data will be displayed in the website. This data can also be accessed through the open source application named All Things talk Maker which is background connected to the node MCU. The experimental setup is shown in Fig.3.

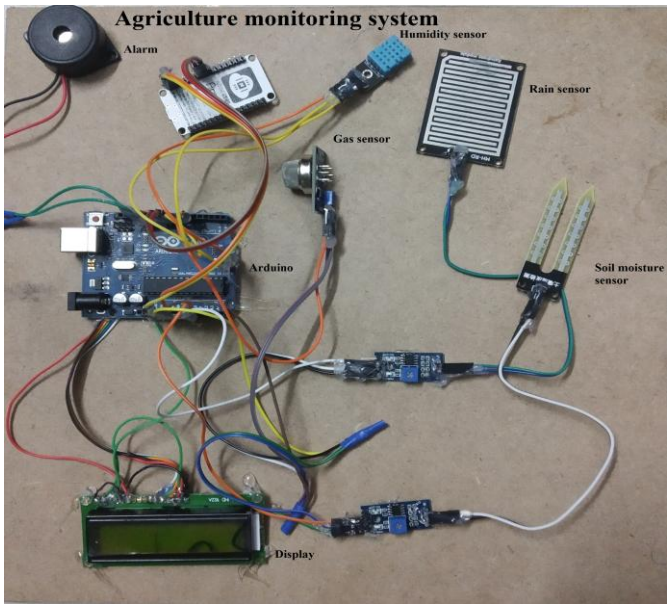
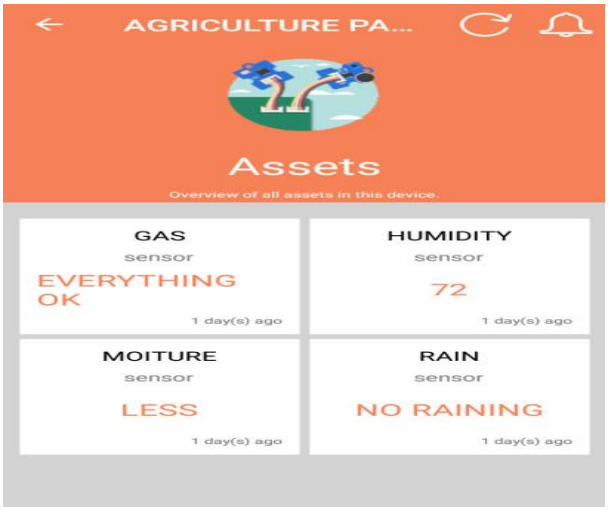


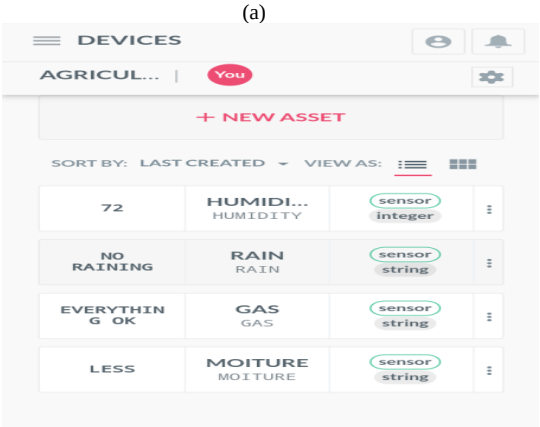
Fig.3 Experimental Setup For Agriculture Monitoring System

IV. RESULTS

The exploratory setup is tested in different atmospheric conditions like variations in temperature, humidity, natural gases and moisture changes. The results are as shown in Fig.4, all the sensed information is sent into the website through node MCU and then after that in the wake of signing all things talk maker website as shown in Fig.4 (b); we can access the data through the dispensed channel to the user. The same can also be accessed through the mobile application as shown in Fig.4 (a).



(a)



(b)

Fig.4 (a) Applications monitoring via phone, (b) appliation monitoring using website

Here the results detected are, there is no presence of gas in the area tested that is shown in the first section. We can observe the humidity of the area of testing environment is around 72 which is the scaled factor in terms of RH. The moisture in the area is less that is to be considered and the plants are to be watered for effective results and the output of rain drop sensor is it is not raining and hence NO RAIN indication is shown below. Further clarifications are given in the below figure.4

V. CONCLUSION

It is observed that this system can provide assistance to the farmers technically in simple and effective manner. This can help the users who cannot continuously monitor the field and also provide information so that to protect the field from various unwanted effects. This also provides the information about the rain status trough rain drop sensor and the temperature at which the crop is growing and the moisture level in the soil. We also succeeded in providing the appropriate information about any gas leakages in the area of farm so that the user can be alerted with buzzer if any such gases are detected and thereby protecting the farming fields. Thus the device collects the entire information and updates that in the website and mobile application.

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