Automatic Soil Analyser and Controller

Niraimathi.K.S[1] Nithyanoopra.P.K.A[2] Pavithradevi.S[3] Rubba sri.M[4] Dr.Gnanasundari.P[5]
[1,2,3,4]UG Scholars [5]HOD
[5]Department of Electronics and Communication Engineering
[1,2,3,4,5]SNS College of Engineering, Coimbatore, Tamil Nadu, India

Abstract— Agriculture is the backbone of Indian economy and it is the primary sector occupation of our country. Soil standard and water is the prime source of agriculture. The amount of water supplied to the field and the enrichment of soil enhances the quality of agriculture. The proposed system is to detect the amount of soil parameters like pH, moisture, humidity and temperature using the respective sensors. The values are measured using sensors and sent to the actuators motor modifier and pH modifier for the control of moisture level and pH level respectively. Then, the status of the system is sent to the user using RF technology. There will be many environmental changes as the idea deals with nature. The pH regulator and motor will regulate pH level and moisture level according to the predefined analysis of various types of soil parameters.

Key words: Sensors, PIC, RF technology, pH modifier, moisture modifier

I. INTRODUCTION

As per the economic status of India, major contribution of GDP to the country is agriculture which in turn makes our nation to be a fast growing economy. It is very important to enhance agriculture in all aspects of improvising soil standard and effective utilization of resources especially water. The traditional methods include the collection of soil parameters and control of the contents manually. it leads to the wastage of resources, infertility of the soil, poor nutrients in the crops and time consumption. Thus it is essential to measure the soil parameters and to control the contents that contributes highly to the fertility of soil. The proposed system measure the soil parameters such as pH, Temperature, Soil moisture and humidity. It controls the pH and moisture content by using sprayers and moisture respectively.

II. LITERATURE SURVEY

An automatic **s**oil quality management is designed in which the soil parameters like soil Electrical conductivity, soil pH, soil moisture and atmospheric humidity is measured. Automated regulation of water supply is done based on the soil condition. the status of the information is sent to farmer at the base station on labview. In this project, the soil parameters are measured and the soil moisture level is controlled.[1].

A system has been developed in which the sensors are scattered over the field for the collection of data. WSAN (wireless sensor and actuators network) is used to provide farmland supervising, human intervention is less, low cost.[2].

WSN is used to design irrigation controller system and is efficient during both heavy rainfall and dry conditions. UART is used for the serial port communication and GSM for transferring the status of the system to the user.[3].

A remote monitoring system using wireless protocols is developed for measuring soil temperature, moisture and relative humidity using Xbee module, FPGA element and UART [4].

At different positions in field, wireless moisture sensors are fixed to check the moisture level of using Zigbee WSN [5].

The proposed system is used to analyse various soil nutrients with the help of pH value to recommend the type of cop to be cultivated and the fertilizers will also be given [6].

Irrigation schedule of different plants is according to their requirement which is based on the data obtained from sensor nodes deployed at various locations. the irrigation management system investigates data to idea to water deficient location and informs the farmers about it via alarming unit or a text or a message sent over LAN [7].

The result in automations of different agriculture activities called precision farming or precision agriculture. It argues the crops quality and production rate is improved by providing right resources at right time in presence of suitable environment conditions. Different methods are adopted for collecting environment a soil related information such as temperature, air humidity, wind direction, soil moisture, soil temperature etc,[8].

A system is proposed for sensing different parameters such as temperature, air humidity, soil moisture, wind directions, leaf wetness etc,[9].

Several sensors is used in measuring physical and chemical parameters of the water. The parameters such as temperature, pH, Turbidity, conductivity, dissolved oxygen of water can be measured. From the sensors can be processed by the core controller. The sensor values are made to display using cloud computing [10].

III. PROPOSED SYSTEM

In the previous works, the soil parameters are analysed and the values are displayed on the screen or transmitted to the user otherwise the system controls the value of soil moisture by turning ON and OFF the motor and the status has been sent to the user. In the proposed system, the device measures the soil contents of pH, temperature, moisture and humidity. Then, the system controls the value of pH and Moisture level using pH modifier and moisture modifier. the status of the system will be sent to the user . Here, the system uses RF transmitter and receiver for transmission of status.

IV. SYSTEM ARCHITECTURE

The block diagram B-1 explains about the architecture of the system. here, the three sensors act as the input to the controller. The outputs are the values of the sensors. Based

on the output values, pH modifier and moisture modifier acts.

The Block diagram B-2 explains about the transfer of pH value to the receiver to demonstrate that the measured values and status of the system can be transmitted to the user.

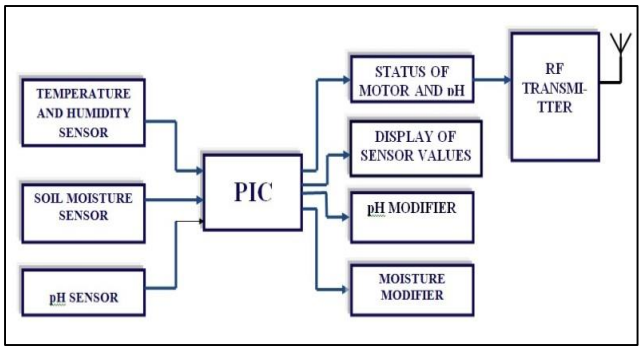

Fig. 1: Transmitter block diagram

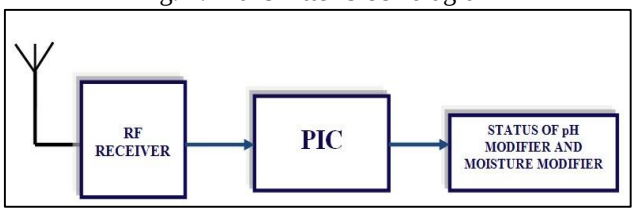

Fig. 2: Receiver block diagram

A. Moisture:

Moisture is the presence of liquid, often in trace amounts. It is a key variable in the exchange of water and heat energy between the land surface and the atmosphere through evaporation and plant transpiration. It plays an important role in the development of weather pattern and the production of precipitation. It is the indicator of drought in the soil.

YL 69 is the moisture sensor used to detect the soil moisture level. It is an electrical sensor. It does not measure the moisture but measures electrical conductivity or resistivity of the soil. The sensor has two probes which reads the current that pass through the soil which makes the measure of resistance to the current in the soil. this measure gives the value of moisture present in the soil.

- Higher the resistance, lesser the soil moisture or dry soil
- Lower the resistance, higher the soil moisture.

B. Relative humidity and temperature:

Relative humidity is the amount of water in air that it can hold before condensation occurs.. It is expressed in percentage. 100% of relative humidity leads to the state of rain occurrence and 0% of Relative humidity will lead to the state of no rainfall. Temperature is the degree or intensity of heat present in a substance or object especially as expressed according to the comparative scale.

C. pH:

The soil pH is a measure of the acidity or basicity in soils. It is the negative algorithm of activity of hydronium ions in a solution. A soil pH sensor is used to measure the soil ph value.

V. HARDWARE OPERATIONS

When the power supply is given to the system, sensors(pH, moisture, temperature and humidity) start collecting the values of the soil content. a delay is given for analog sensor values to get converted to digital values. pH and moisture value is controlled using the sprayers and motor respectively. The threshold values are listed in the table T-1.

Soil parameter	Excess range and operation done	Deficiency range and operation done
Soil moisture	>80 , Motor ON	< 80, Motor OFF
Soil pH	>7, modifier sprays sulphate liquid	<7, modifier sprays lime liquid

Table 1: Threshold values of Soil pH and Moisture

If the moisture level is low, motor is ON and if the moisture level is high, motor is OFF. If pH is low, lime water is sprayed to increase the pH value. If pH value is high, sulphur water is sprayed to lower the pH value. Practically, pH value is always lesser and the increasing system is important. The status of the system is sent to the receiver via RF transmitter.

VI. RESULTS AND CONCLUSIONS

Thus, the automatic soil analyser and controller provides the following results. It controls the moisture level by turning ON and OFF the motor automatically. It controls the ph level by turning ON the sprayers that consist the liquid for increasing and decreasing the level of pH. Transmission of status of the system through
RFID.

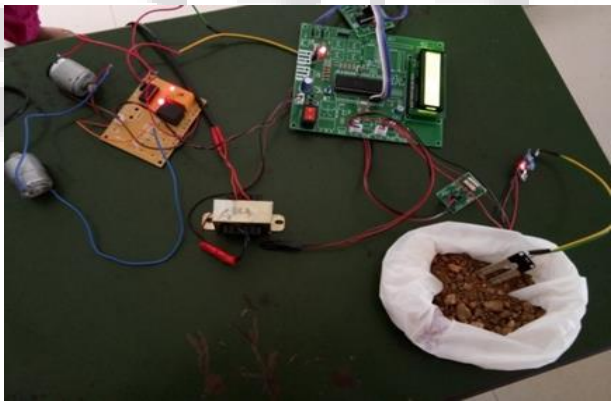

Fig. 1: Output

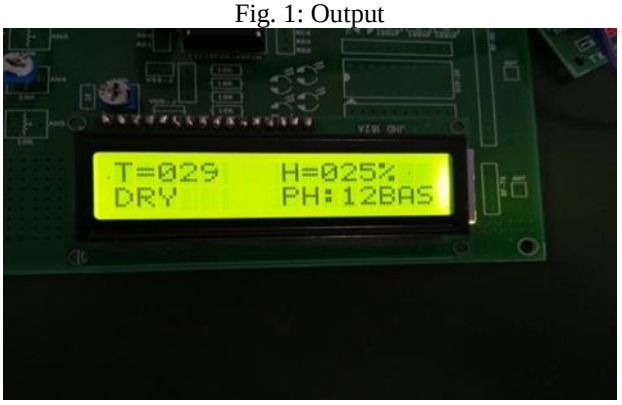

Fig. 2: output with wet condition and pH is basic

Fig. 3: Output with dry condition and pH is basic.

pH range	Moisture range	Type of soil	Type of crops
6.5-7.5	50-80%	Black soil	Chillies, nuts, sugarcanes, maize, cotton.
6.5-8.4		Alluvial soil	Rice, wheat, Jute
Below 5.5		Laterite soil	Tea, coconut, rubber
5.5-7.5		Red soil	Pulses, potato, millets and fruits

Table 2: Crops table

The suggestions for types of crops to be sown can be given by analyzing the range of pH and moisture content. The major types of soil cultivated in India are black soil, alluvial soil, laterite soil and red soil. The table T-2 depicts about the pH and moisture range of the soil types and the types of crops that can be grown.

VII. FUTURE WORKS

The other soil parameters can be controlled. Detection of earthworm rates can be done to increase the fertility of the soil. The system can be furthermore increased by making it wireless and adding other sensors like atmospheric pressure sensor and leaf wetness sensor.

REFERENCES

[1] Sridevi.P.C, khajamoinuddin,"Design and development of auotmated soil quality management system using labview", IJIREC volume 2 Issue 4,june 2015,PP 8-15.
[2] Ghulam Ali, Abdul Wahid Shaikh, aqeel-Ur-Rehman zubair A Shaik,"A framework for development of cost effective irrigation control system based on wireless sensor and actuator network(WSAN) for efficient water management",Proc of IEEE, Vol 2, 2010,pp 377-381.
[3] PrakashgoudPatil, Vidya H, Shreedevipatil, Umakantkulkarni,"Wireless Sensor network for Precision agriculture" Proc of IEEE,2011,pp 736=766.
[4] Swarup S Mathurkar, D S Chaudari, "A Review on Smart Sensors based Monitoring System for Agriculture", IJITEE, Vol 2(4), March 2013, pp 76-78.
[5] Anjum Awasthi, S R N Reddy, "Monitoring for Precision Agriculture using Wireless Sensor Network – A Review", Global Journal of Computer Science and Technology Network, Web & Security, Vol 13(7), 2013, pp 23-28.
[6] J.Jayaprahas,S.Sivachandran,K.Navin,K.balakrishnan," Real time Embedded based soil analyser",International journal of advanced research in computer and communication engineering, Vol 3, Issue 3, March 2014.
[7] Rahim Khan,ihsan ali,M.Asif suryani, Mushtaq Ahmad and Muhammed zakarya,"Wireless sensor network based irrigation management system for container grown crops in pakistan", World applied sciences journal 24(8),september 2009.
[8] Jeonghwan H, S. Changsun and Y.Hyun, "A Wireless sensor network based ubiquitos Paprika Growth System, Sensors 10(12):11566-11589.
[9] Noor.A, N.Srivastava, R. Singh and K. Shinghal, "Wireless sensor networks in agriculture for potato forming", International journal of Engineering Science and technology.
[10] N.Vijayakumar, R.Ramya," The real time Monitoring of water quality in IOT environment",IJSR, Vol 4,Issue 3, March 2015.

