

Auto-Smart Fertilizer

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Abstract- The country like India, the economy is heavily dependent on agriculture. Still, we are not able to make optimal, profitable and sustainable use of our agricultural land. Crop production is strongly influenced by soil properties, rooting depth, nutrition and their interaction with climate. For the new agricultural area, without knowing or monitoring the important parameters of soil, cultivation will be difficult and so the farmers suffer financial losses. Soil testing is the basis for the nutrient recommendation and formulated fertilization. The soil test will help to ensure the application of enough fertilizer to meet the requirements of the crop. The farmers find it difficult to know the proper amount of fertilizer which is required for the particular type of crop which yields better productivity. Development of agriculture using technology will be very much useful in cultivation. The main target of our work is to develop a device which continuously monitors soil fertility and provides sufficient fertilizer required.

Keywords- Rapitest device, Microcontroller, LCD display ,Relay.

I. INTRODUCTION

Auto-smart fertilizer uses an electronic device which monitors the soil fertility and provide sufficient fertilizer required for a particular type of crop to yield a better productivity. The electronic device which is used is a "RAPITEST" device is an automated soil testing device. It is a portable device which is simple and user friendly so that any person can test the soil without the presence of an operator. The Microcontroller is used to compare the measured value with the threshold value and display the measured value in the LCD. According to the displayed value we use the relay board to send the fertilizer and water through pump to the crop. Rapitest device can be used on-spot field to check fertility so that the farmer need not take the pain of visiting the soil testing laboratories.

II. REQUIREMENTS

- A. Rapitest digital 3-way analyzer
- B. PIC18F4520 Microcontroller
- C. 16X2 Liquid crystal display
- D. Relay
- E. Submersible water pump
- F. GSM Modem

A. Rapitest digital 3 way analyzer

This digital three-way soil test device will help to get the proper readings for fertility, PH and temperature. It is easy to read digital results .The 3-Way Analyzer combines the most important functions necessary for testing soil. The fertility function reads the combined levels of nitrogen, phosphorus, and potash to determine the nutrient health of the soil. pH and fertility readings are auto-adjusted based on soil temperature.

B. Microcontroller

The microcontroller used is PIC18F4520 operates at 40MHZ at 5V DC. The microcontroller plays a key role in processing data received from the device, where it compares the measured value with the threshold value.

C. 16x2 Liquid Crystal Display

A Liquid Crystal Display is a low cost , low power device capable of displaying text. The LCD controller receives control words from the microcontroller and performs the corresponding actions on . Once the initialization sequence is done ,it displays the soil fertility value on LCD.

E. Submersible water pump

Submersible pump operates at 230-240V DC Voltage .The two submersible pumps are used to pump the water and to pump the liquid fertilizer. Depending on the fertility value fertilizer and water pump will ON/OFF.

F. GSM modem

The land lord send a command to the controller via GSM Modem to test the soil fertility .After the testing process is done the land lord receives the message about the supply of fertilizer .

G. ADC

Microcontroller requires input in digital form for this Purpose analog to digital converter is used to convert the

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output of signal conditioning, which is in analog ,to digital signal.

H. Signal Conditioning

Signal conditioning converts output signal from the device , which is a weak signal , in to a strong signal.

D. Relay

Relays are the switches that open and close circuit electromechanically or electronically. It operates at 5V 2-channel relay interface board, which can be able to control various appliances, and other equipments with large current.

I. I/O Interface

A switch is interfaced to controller. Whenever this switch is interrupted it sends signal to the controller to generate address. If GSM is not used switch is considered, otherwise there will be automatic switching is done through the commend send by the land lord.

III. WORKING PRINCIPLE

Whenever a farmer wants to analyze the soil fertility, he has to send the command to the controller to check the soil fertility. The rapitest device which is placed in the field will be automatically test the soil fertility and the value will be sent to the microcontroller. The microcontroller plays a key role in processing data received from the device, where it compares the obtained value is compared with the threshold value. The microcontroller after comparison gives the output and the values

lesser then the threshold value then the valve of both water and fertilizer will be opened. If it is more than the threshold value only the water valve is opened or if it is equal to the threshold value then the valves will be closed. The message will be sent to the landlord about the supply of fertilizer and water.

Fertility Value	Nitrogen in PPM	Phosphorous in PPM	Potash in PPM
0	0	0	0
1	25	2	25
2	50	4	50
3	50	4	50
4	87.5	6.5	87.5
5	120	9	120
6	162.5	11.5	162.5
7	200	14	200
8	200	14	200
9	200	14	200

Table.1 Soil Fertility Values

The standards by which the instrument is calibrated are as follows in Table.1

If the fertility value is between 0-2 then the fertility of the soil is “Too Little”. If it is in the range 3-7 then the fertility of the soil is “Ideal”, between the range 8-9 soil fertility is “Too Much”. Since the NPK values are in ppm , to convert ppm of the nutrient (mass/mass as in mg/kg) to an actual amount in kilograms or pounds, we must have three other parameters known. The area for which we want to calculate the nutrient amount, volume of soil , and the soil density (Most soil have a bulk density of 1.1-1.6 ton/m³). Hence this helps to know the required quantity of fertilizer to supply to field.

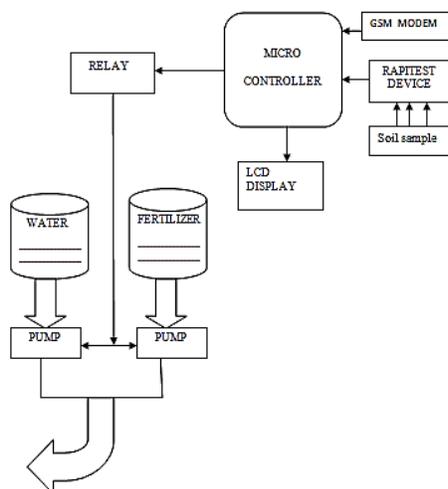


Figure.1 Block Diagram

are displayed on the LCD display, also the landlord receives the message of the fertility value. If the obtained value is

III.APPLICATIONSOFTWARE

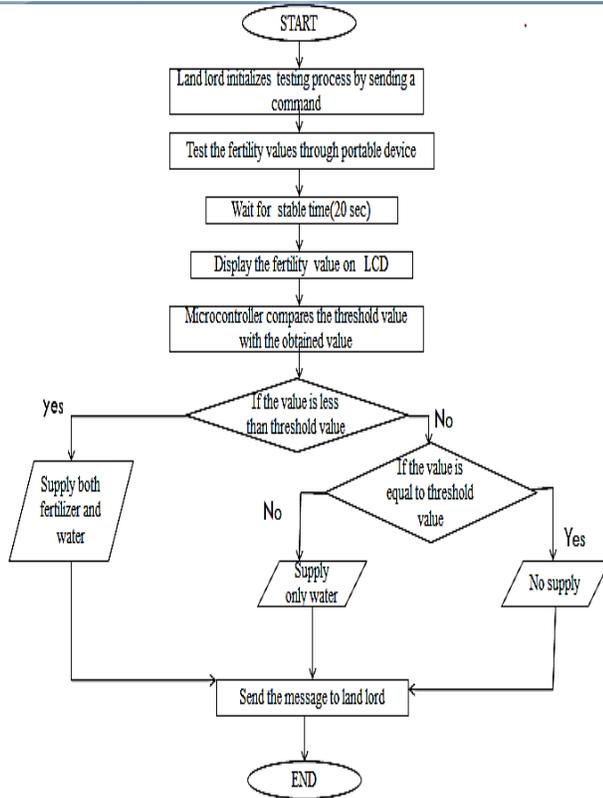


Fig.2:Flow Chart for the basic operation of the system

IV. USER INTERFACE



Figure.3: Microcontroller system

The application software was developed in c language using KEIL software of version 8.08.The basic operation of the system is shown as flow chart in fig.2.

The system setup using the Microcontroller is shown fig.3.

A Initial Display

Auto-Smart Fertilizer.

B. Input

The command given by the land lord to the controller is the input given to the Soil testing device and then tested output value is given to the Microcontroller.

C. Output

The supply of water and fertilizer through water pump and the fertilizer pump.

D. LCD

Displays the Fertility value of the soil after the testing process.

V. CONCLUSION

“Auto Smart Fertilizer” is the automated process has been developed for soil testing of the agriculture farm and automatic supply of fertilizer to the farm. The fertility values vary from one type of soil to others. The fertility value of the soil are measured in real time and compared with the threshold value. This system provides a required quantity of fertilizer to a particular crop. Hence there is no necessity of taking a soil sample to the laboratory and waiting for the result. And there is a even supply of fertilizer through drip irrigation.

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