RAITHA MITRA-DIGITAL MAPPING OF SOIL FERTILITY

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Abstract

Agriculture is the backbone of a country's economy. Success of Agriculture has a direct impact on development of country which depends on the yield of crops .The yield of any crop depends on climatic conditions and soil fertility. At present, the parameters pertaining to climatic conditions and soil fertility are described to the farmers. The decision has to be made by the farmer on the type of crop to be grown based on the parameters. This has human interference and the result may have imperfections which does not fetch desired yield. The project proposed aims at increasing the yield of crops by digital analysis of climatic conditions and soil fertility. This is done by using suitable components and the parameters are used to suggest the crop to be grown for a particular soil.

I. INTRODUCTION

Agriculture plays an important role in the development of a country. High population may result in scarcity of food. The fulfillment of food depends on the yield of crops.

The factors affecting the yield of crops are of two categories, Genetic factors and Environmental factors.

Genetic factors: Yield of crops depends on the genes of the plant. Hence the yield can be increased by using hybrids.

Environmental factors: These are the external factors that affect the growth of a plant. The important environmental factors are

a. Temperature: The germination of seeds depends on atmospheric temperature. So the crop suitable for a specific temperature has to be grown to get maximum yield.

b. Soil Moisture: Soil moisture is the measure of exchange of water and heat energy between land and atmosphere through evaporation. The soil moisture content for the optimal growth varies from crop to crop. In order to obtain maximum yield for any crop, required soil moisture content has to be maintained.

c. Radiation Energy: Soil absorbs radiant energy in the form of heat and light. The heat energy promotes plant growth. Photosynthesis of crops depends on intensity of light.

d. Nutrients: These are the elements present in the soil which are required for the effective growth of the crops. Roots absorb mineral nutrients as ions from soil.

In traditional cultivation, the precise analysis of these parameters are not carried out and even if the analysis is done by the experts, it leads to human errors which reduces the yield.

Our project aims at providing a compact system which evaluates the parameters and suggest the crop applicable for the required soil. The amount of water that has to be present in the soil plays an important role in the effective growth of crop. Hence, we have implemented an additional attribute, automatic irrigation. Since, the system is independent of human interference, maximum yield can be expected.

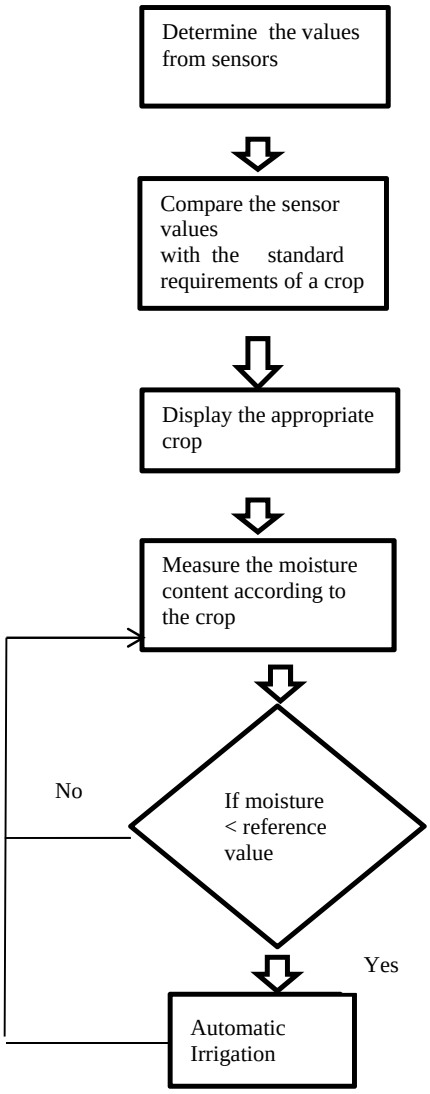
II. METHODOLOGY

The main purpose of our project is to accelerate the pre-stages of sowing seeds such as

determining the parameters of soil like moisture, atmospheric temperature etc. It suggests the farmers on the crop to be grown. Initially, we collected information on the factors of soil that affects the plant growth. Appropriate sensors have been incorporated to measure the moisture, temperature and intensity of light. Arduino UNO controller has been employed for the analysis of these parameters and display the suitable crop accordingly. An automatic irrigation system has also been implemented which pumps water depending on the moisture content of the soil. This enables conservation of water.

III. WORKING

The flow diagram is shown below:



Analysis of parameters through sensor values:
The parameters considered for this project are soil moisture, atmospheric temperature and intensity of sunlight. These values are determined using suitable sensors. LM35 is a precision integrated-circuit temperature device with an output voltage linearly proportional to the temperature. The soil moisture content is measured using YL69 sensor. This sensor provides an output voltage depending on the moisture content of the soil and this value is compared with the threshold value by LM293 comparator. The output of comparator ranges from 0-1023 and this output is used in determining the moisture percentage. Light dependent resistor (LDR) is used to determine the intensity of sunlight which provides an output in the range 0-1023.

Mapping the sensor values with the standard values:

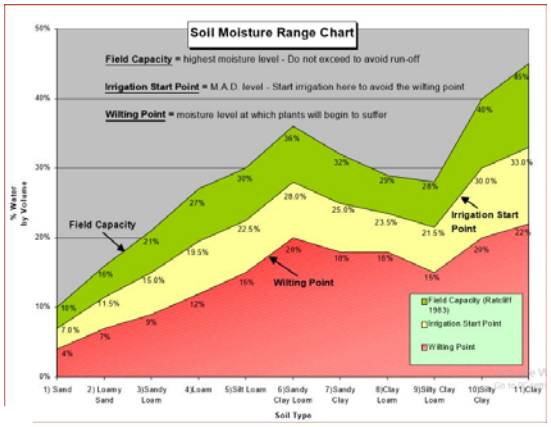


Fig (a)

CROP	X	Y	Z
Carrot	25-45	15-35	>150
Beans	30-55	40-55	>150
Onion	25-55	10-15	>150
Spinach	20-50	35-40	>150
Tomato	30-60	42-48	>150
Rice	35-50	24-28	>150
Tea	30-55	30-35	>150
Coffee	27-44	50-55	>150
Pepper	28-60	35-45	>150

Fig (b)

X-Temperature
Y-Soil Moisture
Z-Sunlight Intensity

The statistical data of temperature, soil moisture and intensity of sunlight required for the optimal growth of various crops is collected from relevant resources. Fig (a) describes the moisture content of various kinds of soil. The statistical data is systematically compared with the sensor values and the appropriate crop is displayed. Fig (b) represents the temperature, moisture and sunlight intensity for the effective growth of various crops.

Fig (c) Suitable crops

Automatic Irrigation:

This is an additional attribute used in the project in order to control the water level present in the soil for a given crop. The reference value depends on the water requirement of the crop. If the moisture sensor value is less than the reference value, water is automatically pumped on to the field through various irrigational techniques.

Fig (d) Working Mode

IV. CONCLUSION

This project provides a compact system that suggests the typical crop for a soil to obtain maximum yield considering few of the vital factors. Methods used in traditional irrigation leads to soil erosion reducing the minerals in the soil. Hence, automatic irrigation has been implemented in which water is supplied based on the moisture content of the soil.

V. FUTURE SCOPE

The model presented in this paper represents a node. Similar nodes can be implemented throughout the entire area of the field and are communicated through antennas. This forms a network which analyzes the information from all the nodes and gives the result. The network is known as wireless sensor network. This increases the accuracy of the result as the entire field is considered.

GSM module can also be interfaced to vary the reference value for automatic irrigation and also relevant messages can be sent to the farmer based on the performance of the system.

VI. REFERENCES

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