



Soil pH Level For Agriculture Land

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Abstract : This paper proposes an automatic system that makes the farm soil pH fertilized and suitable for crops. As the farming lands are getting infertile or barren due to many reasons, so this paper includes the solution for this problem. The main objective of the project is to develop an automatic system that maintain the soil pH of agricultural land. Plants plays a crucial role in everyone's life so to get a better crop, the most important things that should be there in the land that has accurate fertilizer, better irrigation facilities and best methods for cultivation. For this soil pH plays an important role. Our system uses Arduino and Soil PH sensors to monitor the different stages of plant cropping like, pH value and Nutrients of the soil. In this the Arduino board is used which is programmed to detect the pH of soil and take necessary actions to balance it. The main purpose of this project is to balance the soil pH until harvesting and also save electricity, reduce the wastage of water and increase the productivity of crop.

Keywords- Acidity of soil, Alkalinity of soil, Dosing , pH Sensor, soil ph.

I. INTRODUCTION

Due to the fact that soil pH regulates plant nutrient availability by controlling the chemical forms of the different nutrients and also influences their chemical reactions. As a result, soil and crop productivities are linked to soil pH value. Though soil pH generally ranges from 1 to 14, the optimum range for most agricultural crops is between 5.5 and 7.5. However, some crops have adapted to thrive at soil pH values outside this Soil pH is a master variable in soils because it controls many chemical and biochemical processes operating within the soil. It is a measure of the acidity or alkalinity of a soil. The study of soil pH is very important in agriculture optimum range. The United States Department of Agricultural National Resources Conservation Service groups soil pH values as follows: Ultra acidic : <3.5, Extremely acidic : 3.3-4.4, Very strongly acid : 4.5-5, Strongly acidic : 5.1-5.5, Moderately acidic : 5.6-6, Slightly acidic : 6.1-6.5, Neutral : 6.6-7.3, Slightly alkaline : 7.4-7.8, Moderately alkaline : 7.9-8.4, Strongly alkaline : 8.5-9. An adequate amount of fertilizer can help plants to produce better yield and quantity to meet the needs of world economy that is increasing the raise in need of food and its production. Over 58% of the rural population depends on agriculture for their livelihood and its export constitutes 10% of the country's exports, so the farmers and even the nation's economy will be reduced if there are no proper yields due to lack of knowledge of the soil nature and unavailability of water. Our system using Arduino and Soil PH sensors to monitor the different stages of plant cropping like, pH value and Nutrients of the soil. In this, we are using the Arduino module . It helps the processing, transmission, and reception of data between sensors and the Microcontroller. Arduino board is used which is programmed to detect the pH content in the soil and take necessary actions to balance it. The system collects the readings of pH of soil using a pH sensor and sends it to the Arduino microcontroller. The microcontroller is coded to water the plants whenever the PH reading of the soil goes below the standard value and spray Stabilizer solution to make the soil neutral. Along with , DC dosing pump, Online pH meter , Dosing solutions are used.

1.1 Aim of the Project

The aim of this project is to designed a low cost soil pH maintaining System and ultimately soil fertilizing system for agriculture land to increase the productivity, to increase land life. The Aim is to make the

agriculture smart. Here are some examples of various types of crops with their ph values:

II. TABLE

Table. 1: Types of crop with their pH level

Sr. No	Crop Name	PH Level	Other Information
1	Radishes	4.5 - 5.5	Plant them in early spring or fall and give them full sun, consistent water, and well- draining soil. Harvest them when they're young, because larger radishes become woody and hot.
2	Sweet potatoes	4.5 - 5.5	These are loaded with vitamin A. Sweet potatoes need a long growing season and are difficult to grow in the north. If you live in a mild climate.
3	Parsley	5.5 - 6.5	Parsley is a fast-growing annual herb . Plant it after the last frost in full sun and cover it with a light dusting of soil. you can grow parsley almost year-round.
4	Potatoes	4.8 - 5.5	Potatoes adapt to more alkaline soils. After all they're one of the main crops grown in southern Idaho.
5	Beans	6.0 - 8.0	Beans are a warm-season crop so wait to plant them until after the last frost.
6	Beet	6.0 - 7.5	Beets grow best in loamy soil. If your soil is heavy clay, rocky, hard, or alkaline, mix in an inch or so of compost.
7	Tomato	5.5 - 7.5	Tomatoes can be grown on soils from light, sandy soils to heavy, clay soils.
8	Spinach	6.0 - 7.5	For spinach germination Temperature - 10°C - 22°C. Sunlight - Sun to partial shade. Water - Since spinach grows best in cold weather, avoid over-watering
9	Garlic	up to 8.0	Garlic requires well drained loamy soils, rich in humus, with fairly good content of potash.

III. BLOCK DIAGRAM

Fig. 1 shows block diagram of automatic pH maintaining system for agricultural . In which the blue block indicates the power supply component. The solar panel capture the sun rays and then the energy passes through the charge controller which modules at the energy and then in battery the energy gets stored and the block voltage regulator will condition the energy. The block coloured with yellow indicates the storage components . The reservoir contains water from lake , river etc. And pH stabilizer solution contains acid and alkaline dosing .the controlling devices are represented by green coloured boxes . The Arduino is automated device which serves the main purpose on this project which is to charge and maintain the ph. The dosing pump supplies chemicals to farm land in controlled manner . The pH sensor is to measure pH of water. The purple colour is used for farm land. The black colour box used for pH phase changer.

IV. METHODOLOGY

Optimal pH range for a specific crop. By adding acid to the water the pH is lowered. To ensure that the final pH is within the optimal range for a specific crop the dosage rate must be carefully controlled. This is done with a pH controller that controls the rate of acid dosage and a pH probe that measures the pH of the water at a point downstream of the acid dosage point. A mixer is installed between the acid dosage point and the mixer to ensure that the pH is controlled to the correct pH. The dosage rate is dependent on The proposed system consist

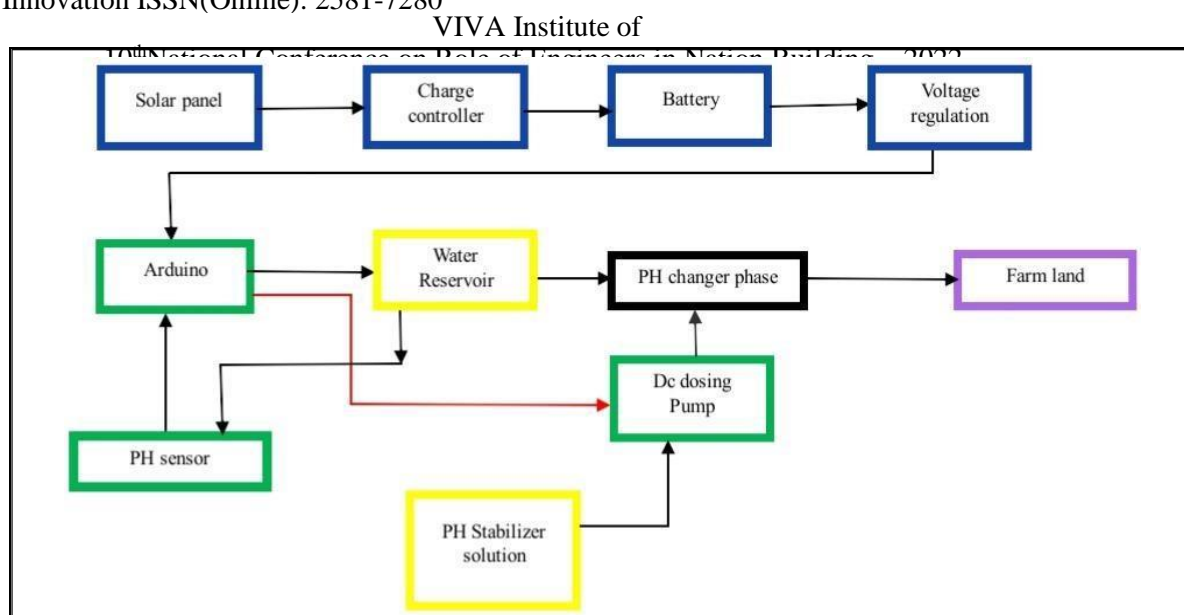


Fig. 1: Block Diagram of Soil PH Level for Agricultural Land

mainly Five major components namely soil pH sensor, Arduino, water pH sensor, dosing chemicals and pump. The main focus is on to change soil pH and maintain till the harvesting. To make the soil pH suitable for crops dosing plays an important role. In dosing process a required amount of chemical is added to water which is going to mix or resolve in farm Soil. If the soil is acidic in nature, then it will require alkaline chemical dosing.

And if the soil is alkaline then acid chemical dosing will be done. pH lowering with acid dosage: The correct pH is very important for the optimal absorption of nutrients. Some nutrients will precipitate out when the pH is too high, making it impossible for the plants to absorb it. Again when the pH is too low the absorption of some nutrients are restricted. It is recommended that the pH of soil-less production systems be set at 5.3 to 6.3. Some crops may need their solutions to have slightly lower or higher pH levels, but most crops should grow well at pH 5.8 pH lowering with acid dosage is done when the pH of the water is higher than the two factors; the flow of the irrigation water and the alkalinity of the water. In most cases, the alkalinity is equal to the sum of the carbonate and bicarbonate concentrations. The pH can then be controlled with sulfuric acid to obtain the optimal pH. The Background Study on Plant pH Requirement and Water pH Values: The soil pH scale vary between 0 and 14, where the soil having pH value below 7 are acidic in nature which is termed as sour soil and soils having pH levels above 7 are termed as sweet soil which are alkaline in nature. India houses different types of soil types with varying amounts of nutrient contents. The nutrient contents are categorized into macronutrients viz. Nitrogen, Phos-phorus and Potassium and micronutrients viz. Manganese, zinc, copper, cobalt, chlorine, molybdenum and others. The capacity of the soil to absorb these macro and micro nutrients greatly depend on the pH environment in which they grow along with other factors like crop type, growth stage and soil texture.

V. CONCLUSION

A new automatic method is proposed to detect the pH levels of soil and accordingly spray water and fertilizers to control pH of soil respectively. The soil pH sensors detect the pH parameters respectively, and send the detected data to the Arduino microcontroller. The Arduino microcontroller after receiving these parameter values takes the decision which is to water in the case of spray fertilizer in order to control the pH of the soil. The future enhancement of this method is to send an SMS to the user's mobile number using an Ethernet/Wi-Fi connection through Internet with the help of third party online messaging clients. If any activity is being carried out in this automatic system say regulating the pH, then an SMS stating the same is delivered to the user. The user thus can keep track of the process that is taking place in the automatic system.

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