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IOT based Green House Farming

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Abstract: India is an agricultural country as nearly 65% of its population depends on agriculture for its livelihood. It accounts for about 25% of the gross domestic product. Environmental factors that influence the extent of crop agriculture are terrain, climate, soil properties, soil moisture etc. It is the combination of these four factors that allow specific crops to be grown in certain areas. Farmers are engaged in agriculture by taking financial support from banks, moneylender's etc. If they fail in producing the necessary food products within the period, they are forcefully withdrawn from this field and move to other sectors. According to the survey of FAO in 2019, about 25% of the people leave the agricultural sectors due to the climatic hazards and other natural calamities that affect the agriculture. We propose the system of greenhouse farming by using IOT. Here we supply all the climatic conditions required to flourish the growth of plants by artificially inside the greenhouse. In this system we use soil moisture sensor, light sensor, temperature sensor, pH sensor, humidity sensor etc. to monitor the conditions inside the greenhouse. Then by using controlling mechanism, we are able to maintain all the climatic conditions to threshold level. To make system more user-friendly, we use LCD display to monitor the conditions inside the greenhouse and GSM module to send SMS to the user whenever it is needed.
Keywords: Green house, IOT, sensor, LCD display, GSM module

I. INTRODUCTION

In India there exists different climate in different places. Not every plant will grow in all climatic conditions. Also there are problems caused by Global warming. Each plant requires the specific climatic conditions to flourish their growth. When we provide the unique climatic conditions for each plant, we can cultivate all crops in every places and thereby decrease the agricultural scarcity. we propose a system to supply all conditions requires for the proper growth of plants artificially inside the greenhouse and monitor the proper growth of plants. Here we use different sensors to sense the corresponding values and if it is above the threshold level, we are able to maintain in the threshold level by using controlling mechanism. The parameters favourable for the plant (which is grown) will be set in advance, in cases of variations from this optimum condition, the system would take measures as per the algorithms to re-establish the optimum condition. Along with the green house a rainwater harvesting system and a solar power plant will also be established which will make it more eco-friendly and also it will address many other issues too.

A. Environmental Factors for Plant Growth

During the growth phase of plants, it undergoes many changes like tissue formation, growth of roots, stem, leaves, flowers etc. The condition of environment plays a crucial role in the growth of plants. The environmental factors are light, temperature, humidity, soil moisture, acidity of soil etc. Poor climatic conditions will affect the growth of plants either directly or indirectly.

B. Temperature Effects

Temperature plays major role in photosynthesis, transpiration, absorption, respiration and flowering. Each species of plants has different temperature range for the proper growth. Below this range ice forms within the tissue, growth process stops etc. Above this range, enzymes become inactive and again stop the growth process. So, it is necessary to maintain the level of temperature to optimum level.

C. Light Effects

Plants get energy from sun light through a process called photosynthesis. Through this way light affects the growth of a plant. Plants will not have the ability to produce the energy without using light. Same species of plant exhibit different responses in normal light and in darkness. The range of light that is used by the plants for photosynthesis is 400 to 700 nano-meters.

D. Soil Moisture Effects

By using roots, plants intake the water and eliminates it by using small openings in the leaf called stomata. When absorption of water by root hinders, loss of turgor occurs and the stomata will close. If the loss of turgor extends to the rest of the leaf and stem,

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the plant will eventually wilt. If the water content in soil increases water content in pores increases and the roots will become damage. It is necessary to keep the optimal rate of transpiration for the proper growth of plants.

E. Humidity Effects

Humidity is important to plants because it partly controls the moisture loss from the plant. The small openings present in the leaves called stomata, through which gas exchange occurs and water leaves. Transpiration rates decrease proportionally to the amount of humidity in the air.

The damage to the plants is more severe when the difference in humidity is large. Under very humid environments, fungal diseases most likely to spread. Plants are exposed to high humid environment for a long period of time and may suffer deficiencies.

F. Soil Acidity Effect

The pH of the soil is also an important factor affecting the growth of plants. For certain plant acidic soil is more favourable and for another group of plants soil having basic nature is favourable..

II. PROPOSED SYSTEM

We are proposing the system to grow the plants inside greenhouse, which is fully isolate from the natural environment and provide the environmental conditions that are required to flourish their growth inside it.

Rainwater gutters made up of glass will be equipped on the green house to collect rainwater, which will be transported and stored in an underground water tank.

Solar power plant will be established nearby, to meet the electrical energy requirements. Green houses are made up of glass plates which are covered by polyethylene coating to trap the maximum amount of light.

Here we employ light sensors, soil moisture sensors, temperature sensors, pH sensor, humidity sensors, CO2 sensors to monitor the climatic conditions inside it.

The system is first initialized by the threshold value of climatic conditions required for the growth of plants. If the temperature is above the threshold level, we enable the exhaust fans to reduce the temperature inside the system. If the temperature is below the threshold level, we activate heaters to increase the temperature.

When the soil moisture reduces within the threshold level, we enable water pump to supply water to soil, the water will be supplied through drip irrigation method so that minimum amount of water will be consumed and it also helps to provide plant nutrients. There will be a specially arranged tank with a mixer and a dispenser, to mix the nutrients with water in required quantities.

The plant nutrients and other elements will be stored in the dispenser.

Whenever required the dispenser will dispense the required substances in the required amount into the tank which will be diluted with the water using a mixer wheel, this solution will be supplied to the plants through drip irrigation system ensuring uniform supply.

Soil moisture will not increase above the threshold because due to the absorption of water by plants and the temperature maintained inside the system.

In case if the humidity inside the greenhouse is to be increased, water will be sprayed by pumping water into the water spraying system suspended from the roof.

Due to the presence of polyethylene coating in the glass, they trap the light. So, there should be the particular amount of light exist within the system.
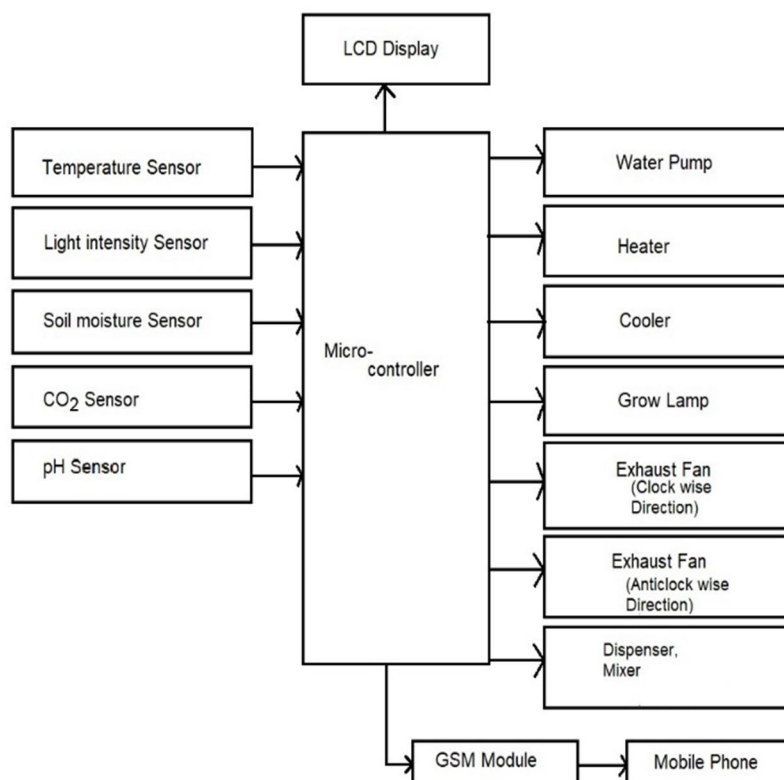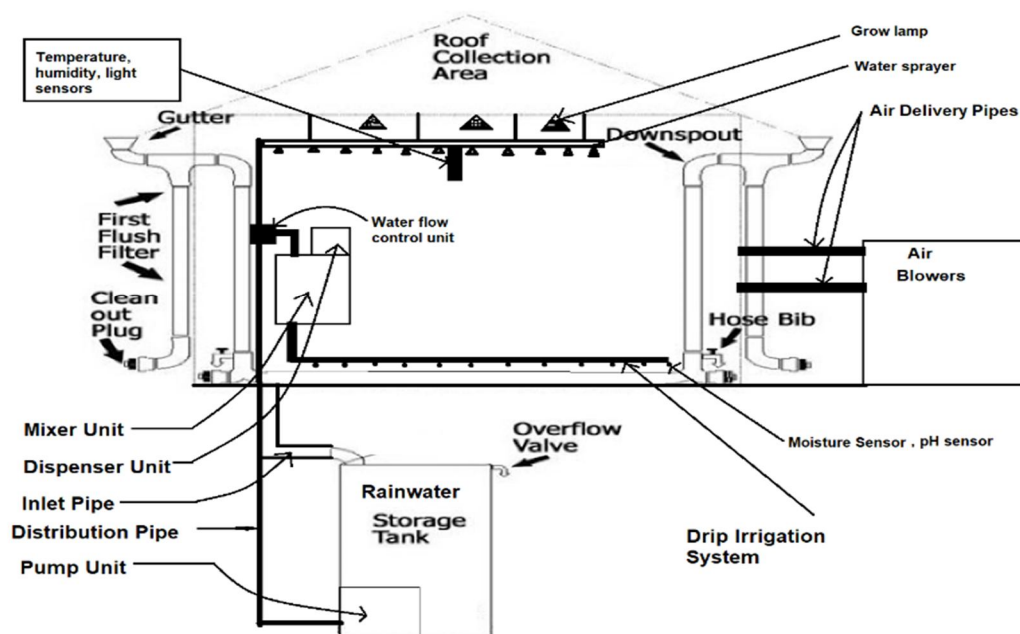
The range of light that requires the plants for photosynthesis is 400 to700 nm. Depending on the type of plant being cultivated, the stage of cultivation and the photo period required by the plants, specific ranges of spectrum, luminous intensity is required.so we employs grow lamp to provide light in different intensities. Grow lights attempt to provide a light spectrum similar to sun in every growth phases of plants.

In order to maintain the threshold level of gas, we employ two exhaust fans where one will rotate in clockwise direction and the other will rotate in anticlockwise direction to control the gas flow. The pH of soil will be measured using pH sensor (periodically). In case the pH value is to be raised, limestone(powdered) will be added to the water which is supplied to the plants through drip irrigation system.
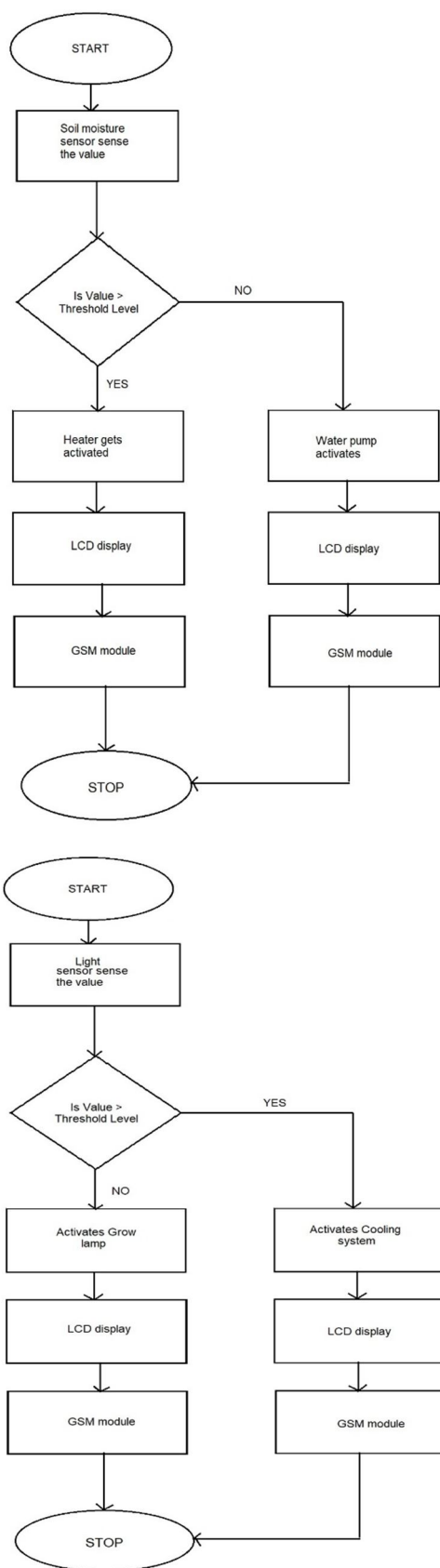
In case the pH is to be lowered, Sulphur will be mixed to the water being supplied through drip irrigation system.
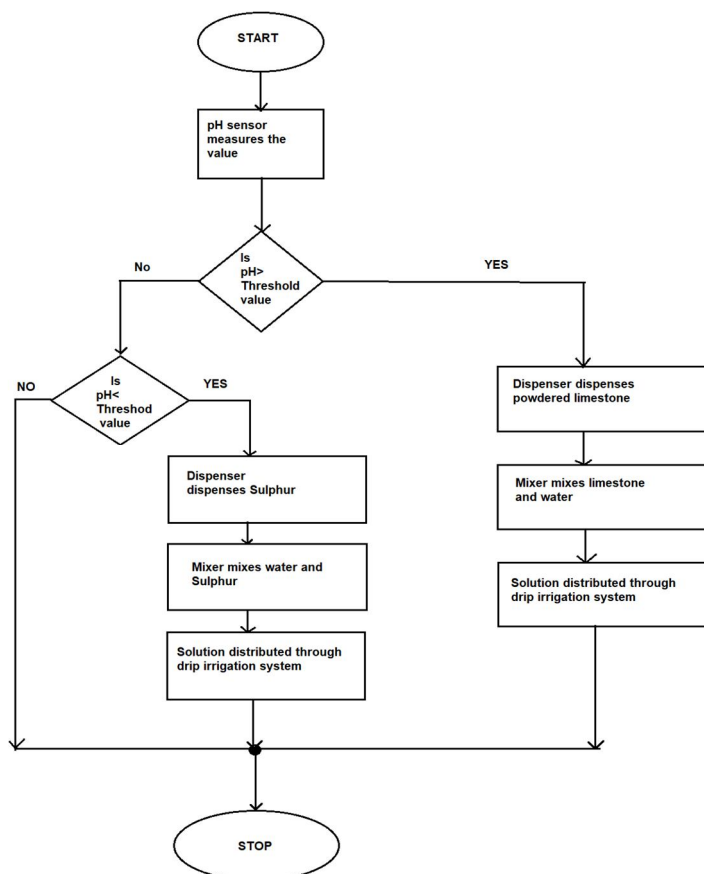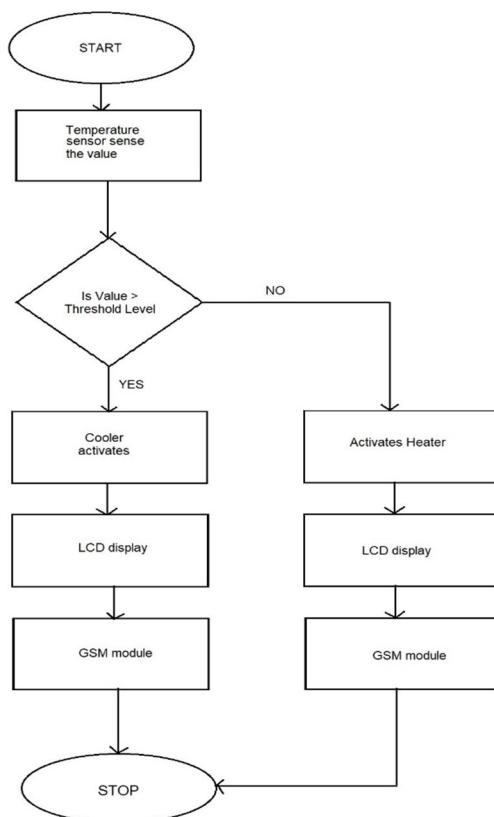
For making the system more user friendly, we use LCD display and GSM module to monitor the conditions inside the system. By using GSM module, user can monitor the conditions inside the system in any place and this system will also send the messages to the user if any adverse conditions are occurring and it cannot be controlled automatically.

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A. Block Diagram

B. Flowchart

III. CONCLUSION

In many developing countries including India we are using the outdated cultivating techniques. By using modern agricultural technique, we can cultivate all the crops in everywhere and can overcome the scarcity of food. Even though there are many modern agricultural techniques are introduced, farmers are unaware of these technologies. So, they are forceful to use these conventional agricultural methods. This system is more user-friendly and eco-friendlier and can be implemented in cheaper way. When farmers become aware about these technologies, this will help to improve significantly both by socially, economically and financially. It will also make them able to overcome the challenges like scarcity of water, scarcity of human resource, climate change etc.

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