

# Automated Hydroponics System

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## ABSTRACT

Farmers are facing so many problems in agriculture field. We are trying to rectify some of the problems by our automated hydroponics system. The problems faced by farmers are small and fragmented land-holdings, usage of large amount of manures, Fertilizers, Biocides, Irrigation, Lack of labours, Pest control, Seasonal crops. To overcome the above problems we are going to study which medium is suitable for plant growth except soil and which wavelength of light is suitable to give high yield. From the result of this research we are going to implement the effective hydroponics system. Hydroponics is a technology for growing plants in nutrient solutions (water and fertilizers) with or without the use of artificial medium (e.g., sand, gravel, vermiculite, rock wool, peat, coir, sawdust) to provide mechanical support. Different methods are available in hydroponics method. In our project we are using Deep Flow Technique (DFT), which is very easy to implement and produce high yield in small area.

**Keywords :** Temperature Sensor, Moisture Sensor, MSP430, PVC pipe, Motor.

## I. INTRODUCTION

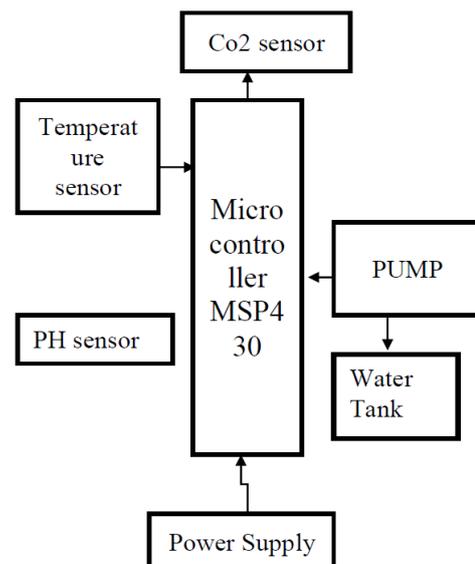
Hydroponics is a subset of hydro culture, the method of growing plants without soil. Using mineral nutrients solution in water solvent. Terrestrial plants may be grown with only their roots exposed to the mineral solution, or the roots may be supported by an inert medium, such as perlite or gravel. The nutrients in hydroponics can be from fish waste, duck manure, or .Deep Flow Technique is used for this project. As the name implies, 2-3 cm deep Nutrient solution flows through 4 inch PVC pipes to which plastic net pots with plants are fitted. The plastic pots contain planting materials and their bottoms touch the nutrient solution that flows in the pipes. The plant will be grown in a coco coir medium. Coco peat or coco coir plays a main role in the plant growth. Coir is a 100% natural grow and flowering medium. Coco coir will absorb the water and maintains its humidity for some time than normal soil plant. So the usage of water will be reduced by this method. The PVC pipes may be arranged in one plane or in zigzag shape depending on the types of crops grown. Many methods are available for hydroponic plant growth but here we are using Deep Flow Technique. In our project we are using many sensors . In this project water will be recycled so this type of plant growth method is very useful in summer times. We grow plant in temperature controlled environment. CO2

sensor is used for monitoring CO2 level. If CO2 level is higher means we can ventilate the surrounding to get required O2. pH sensor is used to measure the nutrient content in water. All the automation part will be done through MSP430.

MSP430 will control all the sensors and water pump. This reduces our time and our effort. This project is mainly helpful for farmers.

## II. METHODS AND MATERIAL

### Experimental Work



## HARDWARE MATERIALS

- MSP430
- Temperature Sensor
- Humidity Sensor
- Co2 Sensor
- pH Sensor
- Motor Driver
- Power Supply

### MSP430

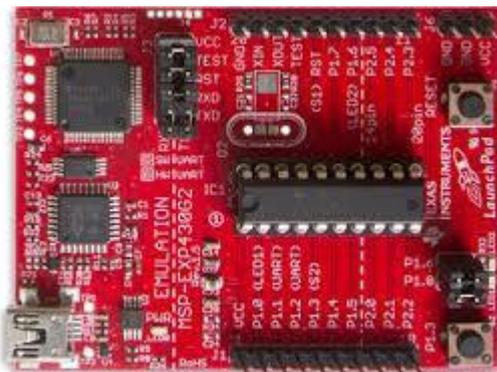


Figure 1. MSP430

MSP430 is used for low power applications because of its compactability. Easy to interface with PC using USB. Humidity and temperature sensor sense the range and provide output to MSP430. It has 16 bit comparator, 16 bit timers, etc.

### TEMPERATURE SENSOR

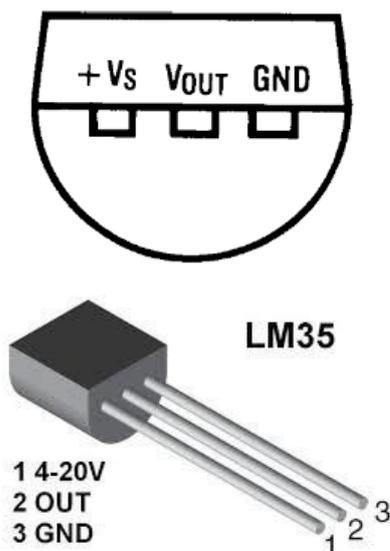


Figure 2. LM35

LM35 is a precision IC temperature sensor with its output proportional to the temperature (in °C). The sensor circuitry is sealed and therefore it is not subjected to oxidation and other processes. With LM35, temperature can be measured more accurately than with a thermistor. It also possess low self-heating and does not cause more than 0.1 °C temperature rise in still air.

### HUMIDITY SENSOR



Figure 3. Humidity Sensor

Humidity is the presence of water in air. The amount of water vapour in air can affect human comfort as well as many manufacturing processes in industries. Hence, humidity sensing is very important, especially in the control systems for industrial processes and human comfort. Humidity control is also necessary in chemical gas purification.

### MOTOR

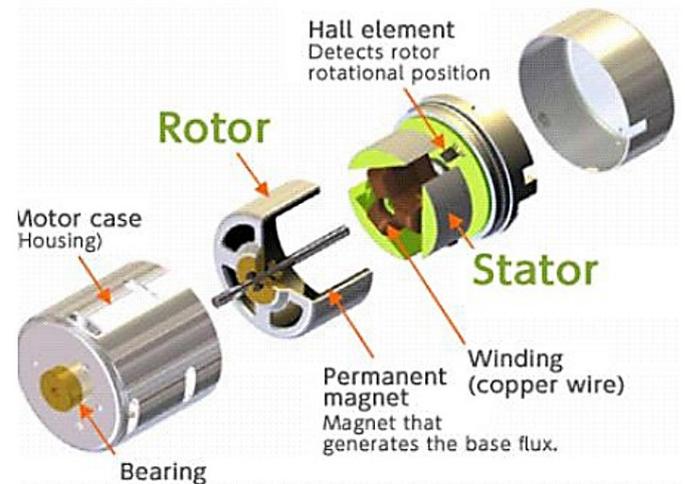


Figure 4. DC Motor

It is an AC synchronous electric motor that from a modelling perspective looks very similar. DC motor is a rotary electrical machine that converts direct current electrical power into mechanical power. Here BDLC

motor is used which is a high quality brushed motors and efficient.



**Figure 5.** Power Supply

Power supply is a reference to a source of electrical power. A device or system that supplies electrical or other types of energy to an output load or a group of loads. This is operated at 240 Volt AC supply.

## CO<sub>2</sub> SENSOR



**Figure 6.** CO<sub>2</sub> Sensor

The most common principles for CO<sub>2</sub> sensors are infrared gas sensors (NDIR) and chemical gas sensors. Measuring carbon dioxide is important in monitoring indoor air quality. CO<sub>2</sub> sensors can be used to monitor the quality of air and the tailored need for fresh air. Based on the outcome of CO<sub>2</sub> sensor the oxygen supply for the plant will be monitored.

## pH SENSOR



**Figure 7.** pH Sensor

A **pH Meter** is a scientific instrument that measures the hydrogen-ion concentration (or pH) in a solution, indicating its acidity or alkalinity. The pH meter measures the difference in electrical potential between a pH electrode and a reference electrode. pH sensors are normally used for measuring the pH content of water. It is used in various fields. Specially it is used in agriculture field.

## III. RESULTS AND DISCUSSION

### Explanation

In this system the MSP430 plays a major role. Temperature is sensed by using a temperature sensor [LM35] and humidity level is sensed by digital humidity sensor. Both the sensors sense the range and gives input to the MSP430. The MSP430 analyses the range and if the temperature increases above [22-28 degree/C] and humidity level decreases [85-95] then the MSP430 gives the instruction to the motor to run. When both the levels reaches the normal state the motor gets off. The growing techniques and storage that has a positive impact in order to encourage farmers to increase employment opportunities and generating income with low capital investment. CO<sub>2</sub> sensor maintains the oxygen supply for plant. If CO<sub>2</sub> level is high means input is given to MSP430 and it again turn ON the valve until the plant gets the normal oxygen supply. Nutrient content of the plant is maintained and proper water will be supplied to the plant. Thus it reduces the manual power.

## IV. CONCLUSION

This work is a good solution for those who aim to save, time, man power, money. This is a complete automated solution for plant growing. It will be interactive platform. By this method we can cultivate and preserve

the plants in secure manner for our future uses. This reduces man power and yield will be high which will help farmers to use this technology with low cost.

## V. REFERENCES

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