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"HYDROPONIC AND AQUAPONIC ANALYSIS"

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Abstract Aquaponics farming method is growing plants in soil less farming along with fishes. Plants are growing using mineral nutrient solutions and organic nutrients from fishes, water being the solvent. The smart aquaponics farming system consists of hydroponic growing system, aquarium and Arduino Uno as the controlling system monitoring essential factors affecting the plants. The main objective is to reduce human intervention during the implementation of hydroponic farming method. The factors like pH, water level is continuously observed and upon any variation that affect plant is notified to the user.

I. INTRODUCTION

Agriculture in India is still carried out in conventional way and lags behind in integrating modern technologies. Around 55 percent of Indian population has been engaged in agriculture and allied activities which constitute only 15 percent of GDP. Crops grown in traditional outdoor farming suffer from often suboptimal and sometimes extreme, nature of geographical and meteorological events such as undesirable temperatures or rainfall. Sustainable farming solutions in countries with arid climates such as India caused an increased interest in aquaponic farms, which are farms that practice growing plants without soil in nutrient rich water solution along with growing of fishes. It kindles a hope for food production in non-agricultural lands aa well as in urban areas.

One of the urban agricultural model is Aquaponic System that can use in small areas. The word "Aquaponic" defines as any means to grow plants via a medium that does not include the use of the soil but involves inorganic nutrients or nutrient solution along with the breeding of fishes. One of the basic principles for vegetable production, both in soil and in aquaponic systems is to provide all the nutrients the plant and fish needs. Several chemical elements are essential for growth and production of plants, in sixteen elements: carbon, hydrogen, oxygen, nitrogen. Among the elements mentioned above, there is a division according to their origin: organic, C, H, O and minerals; broken down into macronutrients, N, P, K, Ca, Mg, S and micronutrients, Mn, F, B, Zn, Cu, Mo, Ni, Cl. In Aquaponic crops, absorption is usually proportional to the concentration of nutrients in the solution near the roots, being much influenced by environmental factors such as salinity, oxygenation, temperature, pH and conductivity of nutrient solution, light intensity, photoperiod and air humidity and these nutrients from Aquaponics System act as nutrients for fishes. In providing nutrition, the content which must be controlled are pH, temperature. The

plant environment, temperature condition. Rapid developments in the IoT are propelling the phenomenon of what is called Smart Farming. Monitoring and controlling agricultural production and feed by using advanced sensor systems are further applications of IoT.

II. PROBLEM STATEMENT

Aquaponics gardening is the combination of hydroponics (growing plants in water without soil) and aquaculture (raising fish) in one integrated system. Conventional farming requires sample of space to grow but growing crops along with raising of fish in aquaculture requires less area of sample and water. In the present scenario, environmental issues have drawn attention of the nation's policy to minimize the adverse effect and propose parallel solutions. In this regard it is thought of arising inorganic farming, there the problem is formatted as "To demonstrate the model and to support organic farming with the aquaponics and analysis".

III. LITERATURE REVIEW

Sitthidech Phogsamsum, Phasawut Sureeratanakorn, "An Automated Solar-Powered Aquaponic System towards Agricultural Sustainability in the Sultanate of Oman" [7]: This paper describes about the automated solar-powered aquaponics system, designed and implemented to be cost effective and environmentally sound for local communities in. It presents the design, construction and implementation of the following modules: 1) water recirculation system that circulates water to an aquaculture tank and aquaponic beds; 2) aquaponics control and monitoring system using Arduino microcontroller interfaced with sensors, actuators, GSM shield and NI LabVIEW that allows plants and fish to grow together in an interdependent and controlled environment; 3) Solar energy conversion system that powers the whole project using the concept of renewable energy source; 4) Cooling and heating system that maintain the air and water temperature to acceptable level for plant and fish growth. The analyses of experimental data taken during summer and winter time show the sustainability of designed aquaponics system.

Mr. Rahul Nalwade, Mr. Tushar Mote, "Aquaponics Farming" [8]: this paper describes about present agricultural system is a mix of outstanding achievements and missed opportunities in India. If India want to become powerful economically I the world, our agricultural productivity should be equal to those countries, which are currently rated as economic power of thee world. We need a new and emerging technology which can improve continuously the productivity, profitability, quality of our major farming systems. One such technology used in India is the greenhouse technology. Although it is centuries old, it is new to India. In India, dependence on agricultural productivity and geographically conditions contribute majors to underdevelopment and poverty. These can be achieved by alternative new and latest technology of farming such as Aquaponics.

IV. METHODOLOGY

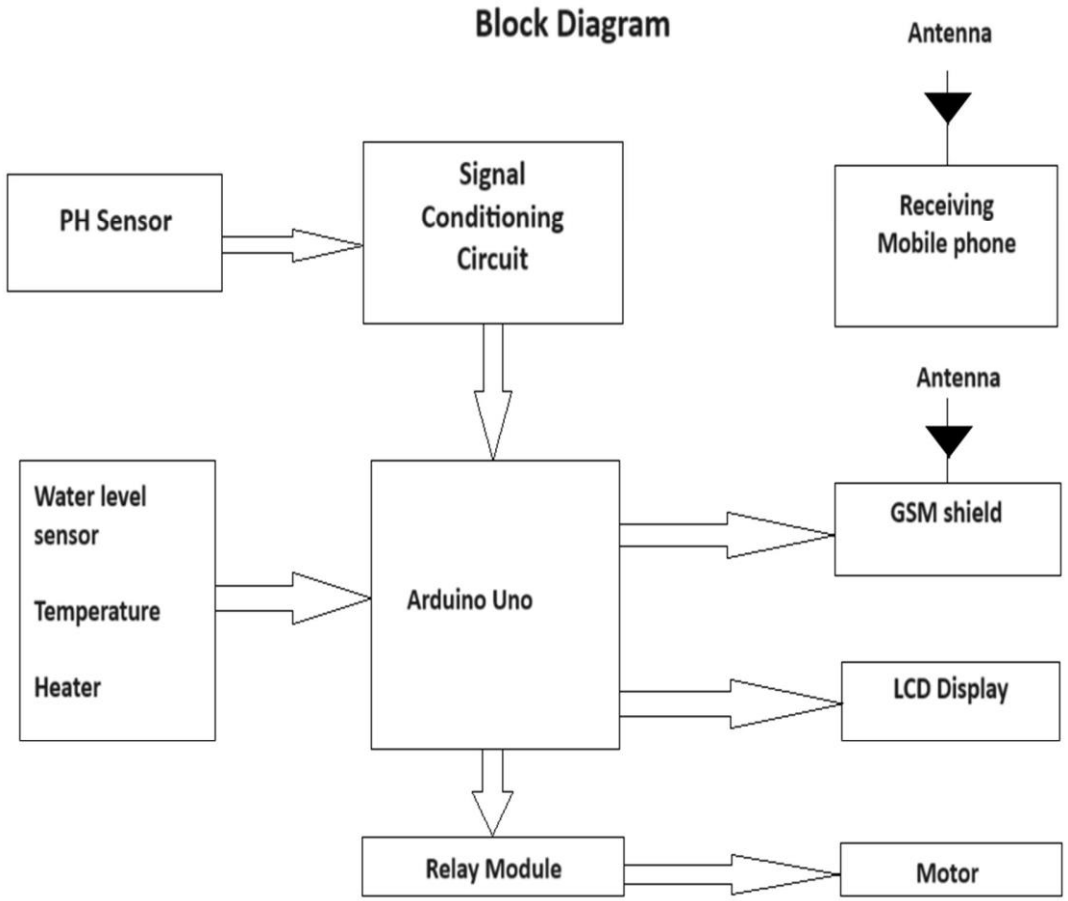
Aquaponics is the system where the plant can be grown without soil by providing nutrient solution and the solution fed to aquaculture. Our objective is to build an aquaponics system which will yield and can be easily implemented in urban areas. Our system refers to combined production of fish and plants. Nutrient-rich waste water from fish supports plant growth, while plants clean the water so that it can be safely returned to the fish.

It holds the promising of becoming an economically viable way to consistently grow sustainable, local and organic food. Though hydroponic gardening plants can be grown anywhere as long as their growth requirements are met. This technique does not require pesticides, fertilizers and other chemicals, as there's no chance of damage due to soil-borne diseases or pets.

V. WORKING

- In hydroponics initially, the seeds are allowed to get sprouted in starter cubes made p of coca peat.
- Once the seed is sprouted for example consider the sprouted mint then it is removed from starter and placed in enriched solution of nutrients which contains phosphorous, nitrogen, calcium and other nutrients.
- The fishes in the aquarium use the water and the oxygen pump helps them to survive in the water.
- The fish will get the clean water from the plants.
- The excreta of the fishes in the form of nitrogen is broken into nitrogen rich bi products bacteria convert ammonia and nitrite to nitrate which are essential for plant growth is mixed in the water and passes on to the hydroponics system with the help of pump.
- The plant use this water to grow fast.
- The temperature of the water is monitored using temperature sensor. So that the water remains at room temperature.
- The pH sensor will measure the pH value of the solution, the pH should be between 6.0 to 7.0.
- The notification will be sent to the mobile through SMS if any changes in the values of pH, water level and temperature changes.
- Then the values will be adjusted for the need of plants as well as fishes.
- Temperature to be maintained as per the required plant.

VI. BLOCK DAIGRAM



 COMPONENTS

1. Ultrasonic sensor-HCSR04
2. Infrared sensor(LM358)
3. ATMEGA 16µc(Arduino uno)
4. GPS and GSM module
5. Buzzer
6. Vibrator motor
7. Water sensor
8. Light sensor

VI. COMPONENTS DESCRIPTION

Hardware & Equipment's	Specifications	Working
Laptop	• Processor: i3 Core Processor. • Clock speed: 2.20GHz Monitor: 1024*764 Resolution, colour. • RAM: 8GB • Input Output Console for interaction	Access & monitoring parameters
Arduino Uno Board	• Microcontroller: ATmega328 • Operating Voltage: 5v • Input Voltage: 7-12volts • Digital I/O pins: 14 • Analog I/O pins: 6 • Clock Speed: 16MHz	Arduino function a control syst The W Level Se functions a measure of incoming w flow. pump functi to control water cont In this stu there several components that interconnec namely Proc Input Output. microcontro can also s data of f level (solut and temperature around plant smartphone android of owner of hydroponics plant.
PH Sensor	• Operation Voltage: 5v • pH reading: 0 to 14 • Connection: BNC-F	A pH se helps measure acidity alkalinity of water with value betw 0-14.

Water level sensor	• Operating Voltage: DC 5V • Sensor type: Analog	The w sensor is fi in aquaponic water flow detect w flow from g bed to the tank.
Temperature sensor	• Operating voltage: 3.3-5V • Temperature range: 50 degree Celsius • Supply current: 0.3mA	Detect measure coldness heat convert it an electr signal. temperature sensor hydroponic plants is detect temperature the stor container that temperature remains normal.
Buck converter	• Model number: GSM SIM800A Modem shield with antenna • Input voltage: 12V DC	The b converter u a transistor switch alternately connects disconnects input voltag an indicator
GSM shield	• Model number: GSM SIM800A Modem shield with antenna • Input voltage: 12V DC	The Ardu GSM sh allows Arduino bo to connect the inter send receive SI and make vo calls using GSM libr can data w low po consumptio
Motor	• Input: 12W Shaft	The w pump circulates water wi

		the aquapo system,
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	• Voltage: 165-250V/50Hz • Weight: 400g	ensuring fish have cl water plants rec the neces nutrients grow optimally.
LCD Display 16x2	• Power Supply: 7v • Input voltage: 5.3v • Dimension: 85.0mmx36.0mm	The LCD indicated pH, temperature siphon ou water flow.
Aquarium heater	• Type: Glass aquarium heater • Power: 100W • Temperature range: 18-32 degree Centigrade	Aquaponics water hea serve as thermostat ensures aquatic environmen remains wi the i temperature range for organisms supports
Jumper wire	• Connection point: 840 • Length: 100mm • Weight: 25gm	By placing jumper wire the circuit becomes possible control electricity, the operatio the circuit, operate circuit does operate ordinary wiring.

VII. Advantages

- Fish waste is utilized as plant feed rather than being wasted.
- Excellent crop quality – both in terms of taste and appearance.
- Provides a truly organic form of nutrients for the plants.
- Produces an organic product (no fertilizer or herbicides used)
- No soil-borne disease as there is no soil.
- No water is wasted or consumed by weeds.
- Low electric usage
- Systems do not require mechanical or biological filter – the process occurs naturally, saving money and resulting in a natural, stable environment.
- Low labour requirement.
- Relatively small space required as plant spacing can be intensive.
- Plants grow and develop relatively quickly.
- Constant production throughout the year.
- Ability to produce 'out-of-season' crops.
- Crops harvesting is quick and easy, regardless of weather outside.
- Crops can be grown all year-round. In most climates a greenhouse is required.
- Higher yields than conventional farming.
- Faster growth to market size due to optimal conditions being maintained.
- Root temperature very stable resulting in fewer disease issues than hydroponics.
- No crop rotation is needed and no weeds to pull out.
- Produce both a protein and vegetable crop.

VIII. Limitations

Some crops as well as fishes are not available for this method.
It needs to be installed professionally.
There is a risk of an unexpected failure.
Not good for root vegetables or tubers.
Not good for grains.
If one part fails then all fails.

IX. CONCLUSION

Aquaponics farming can grow the healthiest food possible in large quantities, in the smallest space and in a sustainable way along with aqua system. But most of the Indian farmers and horticulturists do not prefer aquaponic farming method as it requires high maintenance and expensive to set up. Therefore, our project aims to promote aquaponic farming in India.

A low-cost aquaponics system using Arduino microcontroller is successful designed. The program of Arduino is developed to monitor and control the water parameters. The system developed is capable of detecting pH value, water level which are useful for the users. The system will send message to user's mobile phone when the sensor values are out of range.

X. FUTURE SCOPE

Automatic control of pH and water level can be done in future. Additional sensors can be used to control aquaponic environment. Monitoring the growth of the plant and notifying the user with the message to user's mobile phone when the sensors vales are out of range. The website can be designed to access the current pH and water level of aquaponics system. Automatic feeding to the fish at certain time intervals.

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