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# Aquaponic System

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***Abstract:*** *This project introduces the concept of aquaponics, including a brief history of its development and its place within the larger category of soil-less culture and modern agriculture. It discusses the main theoretical concepts of aquaponics, including the nitrogen cycle, electronic parameter and the nitrification process, the role of bacteria, and the concept of balancing an aquaponic unit. It then moves on to cover important considerations of water quality parameters, water testing, and water sourcing for aquaponics, as well as methods and theories of unit design, including the three main methods of aquaponic systems: media beds, nutrient technique, observing parameter and deep water culture. The project discusses in detail the three groups of living organisms (bacteria, plants and fish) that make up the aquaponic ecosystem. It also presents management strategies and troubleshooting practices, as well as related topics, specifically highlighting local and sustainable sources of aquaponic inputs.*

## 1. Introduction

Aquaponics means growing fish and plants together. In this project we used fish tank and plant bed. The fish are raise in a tank, wastage water of fish tank is pump to the plant by using submersible motor. In this water bacteria convert ammonia and nitrite to nitrate to the plant and plants absorb the nutrient rich water then filtered water of plant bed(consist of soilless nature, instead of soil we used coco wastage) is returned to the fish tank.

Aquaponic system is nothing but a cycle. This cycle form of wastage of fish is food for plant and wastage of plant bed is food of fish.

In fish tank various parameter are measure or it is necessary to maintain some parameter i.e oxygen level, ph level and temperature.

To observe this parameter we used sensors i.e Air pump, ph sensor and temperature sensor. All this sensors are interface to arm controller and level of this parameter is showing in LCD display. The submersible motor are interfaced with controller.

## 2. Survey

Travis hughey and Ed and Gloria haswell- How the aquaponic system work- total water uses in the system depends on several factors. First temperature tend to affect amount of evaporation and second is the amount of vegetation and vegetables being consumes will remove water from system.

Aquaponic gardening community- from this paper we have studied implementation of plant bed (plant bed consist of plastic tray) and plant bed material (plant bed material- coco wastage and wastage of fish tank).

Sylvia Bernstein- aquaponic gardening: step by step guide to vegetables and fish together.

Soilless culture is the method of growing the agriculture crops without the use of soil. Instead of soil various inert growing media also called as substrates, are used. This media provide plant support and moisture retention.

How to built and operate a simple small to large scale aquaponic system.

The initial cost, building materials, and reliance on electricity on input will also be important limitation to aquaponics, but in this case the need of chemical fertilizer is completely removed.

## 3. Relevant Work

Aquaponics is growing fish and plants in one system, with fish waste feeding the plants. It works in many variations of scale and form, though the basic concept does not change:

Fish, bacteria and plants working together in a re-circulating, soil-less system. It resembles a living organism, with a heart (the pump) and lungs (aeration). The bacteria remove waste like the kidneys and the liver. It will teach you a lot about food and this ecosystem.

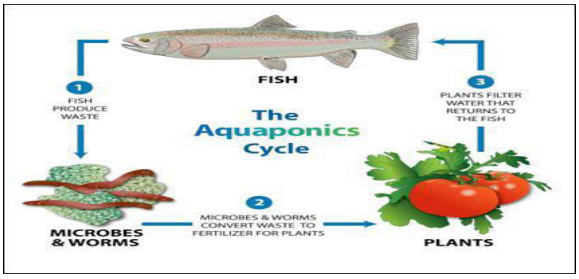
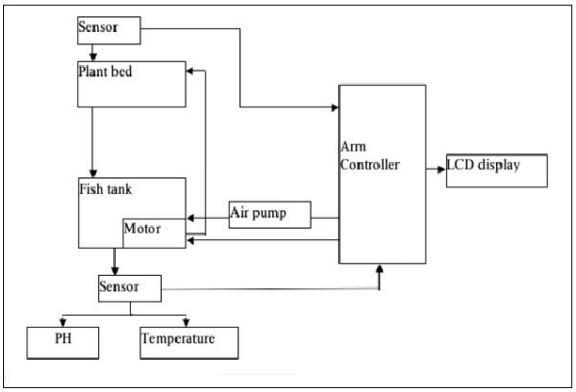



Fig shows Aquaponic cycle.

## 4. Block Diagram & Description




Fish tank- One of the more important components of any aquaponics system is the fish tank. Tanks come in every shape and size, limited only by the imagination. We have use square, rectangular and round tanks, made from everything from plastic and metal. If the tank does not have floor sloping to the middle or one side then it should be propped up so everything drains to one corner or side. This will facilitate in allowing the pump to remove solids. The tank should be configured to allow easy harvesting of fish and if need be cleaning although ours seems to be self cleaning. Fish- fish are an interregnal part of our system. Plant required nitrogen to grow and fish provide this with elimination of both urine and faces. As in any system, open or closed, this nitrate must be clean from the water or the fish will die.

Plant bed- Plant bed is important part of aquaponic system. Plant bed made up of plastic or metal. Plant bed consist of soilless culture, instead of soil we used coco wastage. Without plants the system cannot function properly. Even plant needing large amount of nitrogen, like tomatoes, can exit side by side with plant that required little, like lettuce. The nutrient rich water reaches all plants and because it only passes through, only what is needed is used. Even with good plant coverage there are a lot of nitrates flowing out the drains back to the fish tank, enough in fact to power up another of grow bed.

Temperature sensor (lm35)- The LM35 series are precision integrated-circuit temperature sensors, with an output voltage linearly proportional to the Centigrade temperature. Thus the LM35 has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full −55°C to +150°C temperature range. Low cost is assured by trimming and calibration at the wafer level. The low output impedance, linear output, and precise inherent calibration of the LM35 make interfacing to readout or control circuitry especially easy. The device is used with single power supplies, or with plus and minus supplies. As the LM35 draws only 60 µA from the supply, it has very low self-heating of less than 0.1°C in still air. The LM35 is rated to operate over a −55°C to +150°C temperature range, while the LM35C is rated for a −40°C to +110°C range (−10° with improved accuracy). The LM35 series is available packaged in hermetic TO transistor packages, while the LM35C, LM35CA, and LM35D are also available in the plastic TO-92 transistor package. The LM35D is also available in an 8-lead surface-mount small outline package and a plastic TO-220 package.

Soil moisture Sensor- The Soil Moisture Sensor is used to measure the volumetric water content of soil.This makes it ideal for performing experiments in courses such as soil science, agricultural science, environmental science, horticulture, botany, and biology. Use the Soil Moisture Sensor to:

- Measure the loss of moisture over time due to evaporation and plant uptake.
- Evaluate optimum soil moisture contents for various species of plants.
- Monitor soil moisture content to control irrigation in greenhouses.

PH Sensor- PH sensor measures the value from 0-14. PH sensor measure quality of fish tank water. i.e acidic, neutral or alkaline. A ph value number from 1-14, with 7 is the middle (neutral) point. values below 7indicate acidity which increases as the number decreases, 1 being the more acidic and the 7 for neutral water.

ARM Controller- The LPC2141/42/44/46/48 microcontrollers are based on a 16-bit/32-bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combine microcontroller with embedded high speed flash memory ranging from 32 kB to 512 kB. A 128-bit wide memory interface and a unique accelerator architecture enable 32-bit code execution at the

maximum clock rate. For critical code size applications, the alternative 16-bit Thumb mode reduces code by more than 30 % with minimal performance penalty. Due to their tiny size and low power consumption, LPC2141/42/44/46/48 are ideal for applications where miniaturization is a key requirement, such as access control and point-of-sale. Serial communications interfaces ranging from a USB 2.0 Full-speed device, multiple UARTs, SPI, SSP to I2C-bus and on-chip SRAM of 8 kB up to 40 kB, make these devices very well suited for communication gateways and protocol converters, soft modems, voice recognition and low end imaging, providing both large buffer size and high processing power. Various 32-bit timers, single or dual 10-bit ADC(s), 10-bit DAC, PWM channels and 45 fast GPIO lines with up to nine edge or level sensitive external interrupt.

Motor- Submersible pump are closed- couple units which are non self priming. The impeller in this pump can vary, depending on the impeller type required by the customer to suit a particular application. Usually, the pump are operated fully submerged. For short periods, they may run dry until the minimum filling level is reached.
Submersible pump are interface to ARM controller.

LCD display- A liquid crystal display (LCD) is a thin, flat display device made up of any number of color or monochrome pixels arrayed in front of a light source or reflector. Each pixel consists of a column of liquid crystal molecules suspended between two transparent electrodes, and two polarizing filters, the axes of polarity of which are perpendicular to each other. Without the liquid crystals between them, light passing through one would be blocked by the other. The liquid crystal twists the polarization of light entering one filter to all

## 5. Conclusion

This system is new innovation in agriculture field to earn more profit in Minimum cost. Aquaponics is proven worldwide as the most efficient and sustainable way to grow food, on any scale. Build a small system, because it's simple and it works.
Aquaponic system widely used in future for gardening level because of Personal agriculture is very important for shaping our future economy and environment. We used to have an economy based on food production. This system is very beneficial for future because of this system is continuously growth as well as productivity and profit both are increases sharply with minimum finance. This system produces good quality of product and its availability to local fresh food.

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