Aquaponic Farming Using IoT: A Review

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Abstract— Agriculture is the main part of India's economical activity. Our experience demonstrated the relationship between agricultural growth and economic wealth .We need an advance technology which can improve continuously the productivity, profitability, quality of our major farming systems. One solution to improve this agriculture growth is Aquaponics. Aquaponics is the symbiotic integration of hydroponics and aquaculture to constantly produce plant and animal products. Hydroponics or soil less culture gives opportunities to provide optimal conditions for plant growth and thus higher yields can be obtained as compared to open field agriculture. Aquaponics gives a means of control over soil-borne diseases and pests. The objective of this venture is to develop an auaponic framework which will be completely programmed and coordinated for business aptitudes.

Keywords: Aquaponics Farming, Hydroponics Farming, IoT, Soil-Less Culture

I. INTRODUCTION

Aquaponic is the combination of aquaculture and hydroponics. Aquaculture is one of the most emerging sectors growing like industries, providing an ultimate livelihood option to a millions of peoples of India[2]. The word Aquaponics came from the two words 'Aquaculture – Growing fish in circulating system' and 'ponos' means labour. The word hydroponics it was first used in 1937 by Dr. William Frederick Gericke. The aquaculture industry has greatly improved performance over the past 20 years, producing more farmed fish per unit of land and water, lowering the share of fishmeal and fish oil in many aquaculture feeds [2]. Farmers are create the polypond for collecting the water which is used for the crops for watering. Some farmers are using that polypond for the fish farming. Polypond should be of half or 1 acres area. In this project, the hydroponic plant is place on the polypond. Because of that, land is not only used for the polypond, but also used for the hydroponic plant. So the farmer can do the fish farming and grow the plants on the same land. Hydroponics or soil less culture gives a means of control over soil-borne diseases and pests. Thus the costly and time consuming task of soil sterilization, soil amelioration, etc. can be overcome with aquaponics system of cultivation. It provides a clean working environment and thus hiring the labour is easy.

II. NITROGEN CYCLE

There are three stages of the nitrogen cycle as seen in figure:

1) Initial Stage:

The cycle begins when fish are introduced to the aquarium. Their feces, urine, as well as any uneaten food, are quickly broken down into either ionized or unionized ammonia. The ionized form, Ammonium (NH4), is present if the pH is below 7 which is not toxic to the fish. The unionized form, Ammonia (NH3), is present if the pH is 7 or above and is highly toxic to the fish. Any amount of unionized Ammonia (NH3) is dangerous and it will be fatal for the fish once the concentration reaches 2 ppm. Ammonia usually begins rising by the third day after introducing fish to the system.

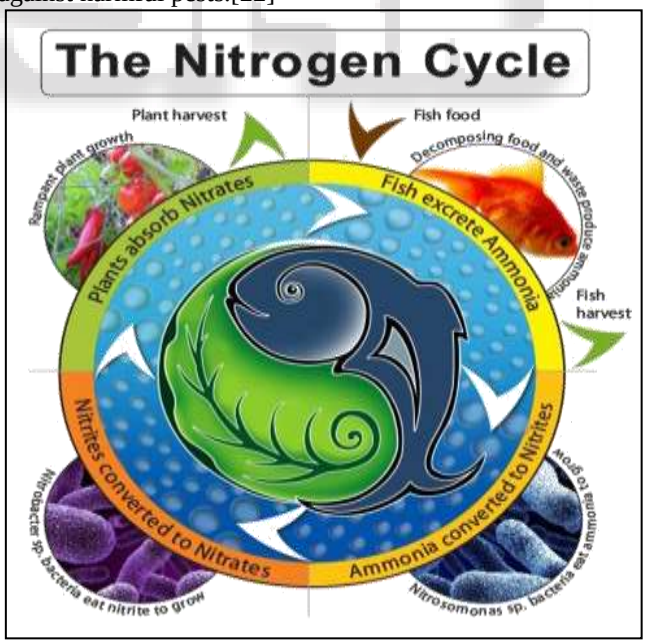
2) Second Stage:

During this stage, Nitrosomonas bacteria oxidize the ammonia and change it to nitrite, which is also highly toxic to the fish. Nitrites levels as low as 1 mg/l can be lethal to some fish. Nitrite usually begins rising by the end of the first week after introducing fish to the system.

3) Third Stage:

In the last stage of the cycle, Nitrobacter bacteria convert the nitrites into nitrates. Nitrates are not highly toxic to the fish, in low to moderate levels. Established tanks should be tested for nitrates every few months to ensure that levels are not becoming extremely high. With the nitrogen process established, plants will consume nitrates and provide the system with clean water. In order to maintain this dynamic system, the growing environment for both fish and plant must be balanced. To ensure this, temperate, pH, and chemical components of the system must be monitored.

If the pH levels become too acidic, nitrifying bacteria will suffer. Conversely, if the water becomes too basic, nutrient uptake of many micronutrients in the plants will be stopped. An ideal pH value of 7 is required to ensure a proper growing environment for the plants, fish and nitrifying bacteria. Additionally the fish are going to need to be fed regularly and the plants may need to be monitored against harmful pests.[22]



III. CONCLUSION

Aquaponics provide vegetable production system that integrates soilless cultivation. As the hydroponic plant is place on the polypond, land is not only used for the polypond but also used for the hydroponic plant. It is totally an environmental-friendly production system due to its full recycling capacity of waste and nutrients. Besides it saves water, eliminate soil problem and other difficulties faced in

traditional cultivation. And thus, the aquaponics system leads to a greater movement towards environmental, social and financial sustainability and which leads to overall sustainability.

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