

# An Experimental Investigation of Bio-Filter Plant with Base to Treat Aquaponic Water

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## ABSTRACT

Aquaponics is a recirculating aquaculture system. This is a new technology in Indian agriculture for fish farming. In this plants fish are produced from the same water. In these systems the plant acts as part of the biological filter. Aquaponics is made up two words aqua plus phonics aqua means fish production and phonics means vegetable and any plant production. In this, we give daily food to the fish. After eating the fish, we send that waste water to the root of our plant through a lifting water machine. Due to which the plant gets food and the water gets filtered. Again, the same water is released into the fish tank. Due which 95% water is saved which is very important for our country. This system is less then capture of landfill and any place movement. there is no need to change the water frequently in this farm house and always the same water keeps circulating day and night. And we use bobbles in it so that our fish can stay alive for a long time. Water always comes from oxygen form and there is no yellowing in the address of the plant. This farm house can be built anywhere where the climate is suitable and sunlight temperature climate. In this, first of all, small plants are taken by keeping the waste of coconut in the net cup keep the plant in it. In which coconut wastes which cannot be solvent in water.

## INTRODUCTION

Aquaponics is an integrated fish and plant production technology, essentially comprising of two sub-system "Aquaculture and Hydroponics". The underlying principle is to efficiently utilize water to produce two crops rather than one and to partition and share nutrient resources between fish and plants. This farming system is commonly used in resource limited and urban areas to raise both fish and vegetable in an integrated system. Aquaponics involves culture of horticulture plants along with fishes. Many plants are suitable for aquaponics systems, though which ones work for a specific system depends on the maturity and stocking density of the fish. Green leafy vegetables with low to medium nutrient requirements are well adapted to aquaponics system including capsicum, tomato lettuce, cabbage, spinach, basil, chives, herbs and watercress. It is basically a recirculation culture system, wherein fish are fed with quality floating pellet feed and waste generated from fish are pumped into bio-filter troughs having horticulture plants, the flow rate of water is to be adjusted with the help of the timer. The fishes and plants grown in aquaponics system are totally organic even though the initial investment of the system is high, the recurring cost is less and gives reasonable returns. This system is having the advantages of using less water, lesser area of land, waste renewal, less labour, etc. plants and animals in an Aquaponics system have a symbiotic relationship with each other. The fish excreta provide nutrients for plants, while the plants clean the water, creating a suitable environment for the fish to grow.

## LITERATURE SURVEY:

The idea of combining fish and vegetable production into an integrated system is far from new. Ancient precedents for integrated aquaculture include the chinampas of Mexico and the integrated rice paddy systems across part of Asia.

But how did gate from these sorts of ancient land-based systems all the way to backyard aquaponics?



Aquaponics is a term that was coined in the 1970s, but the practice has ancient roots although there is some debate on its first occurrence.

The earliest example of one branch may be the lowland Maya, followed by the Aztecs, who raised plants on rafts on the surface of a lake in approximately 1,000 A.D. The Aztecs cultivated a system of agricultural islands known as chinampas in a system considered by some to be the first form of aquaponics for agricultural use. Chinampas are networks of canals and stationary artificial islands that receive water from the canals.

In the early chinampa systems, plants were raised on stationary (and sometime movable) islands in lake shallows. Nutrient-rich waste materials dredged from the chinampa canals and the surrounding cities were then used to manually irrigate the plants above.

#### Methods:

Sustainable alternatives to conventional farming are in higher demand than ever as being environmentally friendly gain popularity.

Traditional field farming has a reputation for damaging natural ecosystems.

Concerns about the impact of harmful chemical soil erosion and heavy water consumption on the environment motivate the development of sustainable alternatives.

Sustainable or environmentally friendly farming refers to conservative water use, maintaining soil health, and minimizing air and water pollution.

In this article, we will compare the environmental aspects of three types of sustainable farming: organic, permaculture, hydroponics, and fish farming.

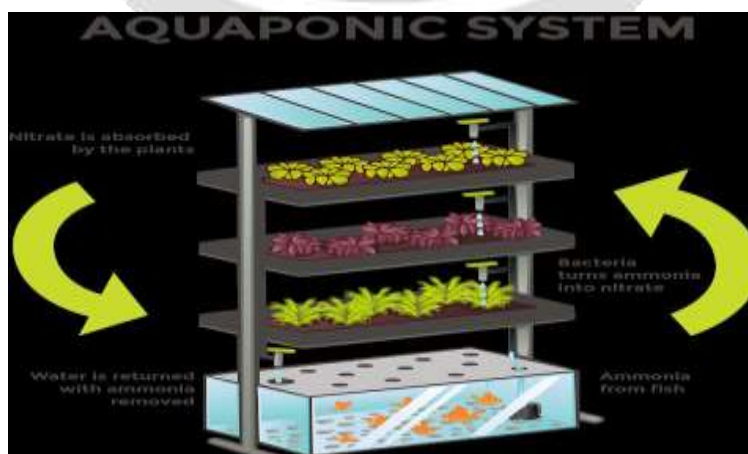


Fig: -aquaponics system

**Organic farming: -**

Organic farming refers to cultivating crops without the use of harmful chemicals, such as synthetic pesticides.

These toxic chemicals make their way into our air, ground and water when they are sprayed, run off with field water and are not discarded properly.

Organic farming is incredibly popular because it doesn't use too many different farming approaches than conventional farming.

However, this is also a downside as this means it still employs damaging farming techniques like tilling.

Tilling is common practice for traditional and organic farms alike.

It's when soil is prepared for agriculture by digging, stirring and overturning it, like when using a hoe or rake.

But it damages the soil by destroying its natural structure, which makes soil erosion too much tillage even causes the soil to lose nutrients and organic matter.

In sum, while organic farming may limit the earth's exposure to harmful chemicals, it still subjects the land to other harmful practices.

**Permaculture:**

Permaculture focuses on designing farms to mimic natural ecosystems.

It's set of principles used to minimize human intervention in food cultivation while maximizing harvests.

Part of permaculture means using only renewable energy and wasting nothing.

Because permaculture aims to maximize the natural features earth, such as collecting and using rainwater, it's a popular option for those searching for sustainable farming solution.

Like organic farming, it doesn't use harmful chemicals.

Permaculture also allows insects to naturally pollinate plants, while using companion planting to protect crops from infestations.

However, there isn't much credible research to suggest it's viable option for commercial farming.

And critics question the effectiveness of permaculture when it comes to growing substantial food crops.

As a result, permaculture is better in theory than on paper, offering small solution to a big problem.



**Fig: - Permaculture**

**Hydroponics:**

Hydroponic farming cultivates plants without the use of soil.

It does this by dissolving nutrients in water and delivering that water to the plants.

Hydroponic is already frequently used in large-scale commercial farms, especially for growing lettuce and tomatoes.

It's thought to be one of the most sustainable farming systems due to its emphasis on water conservation, lack of harmful chemicals and lack of soil damages.

Even though hydroponic farms rely on water to deliver nutrient to plants, they actually use up to 95% less water than conventional farms.

This is because hydroponic systems are able to collect water for reuse, whereas traditional farms cannot.

Additionally, hydroponic farms are typically indoors, so pests are much less of an issue making it easier to control pest invasions without the use of pesticides.

Plus, because it doesn't use soil, there is no risk of soil damage from unsafe practices like tilling.

However, critics argue that because indoor hydroponics farms tend to use a lot more energy to operate than traditional farms they are not completely environmentally friendly.

But it's important to note that studies show this issue is easily solved by using renewable energy sources, like electricity.

Obviously, hydroponics is the strongest competitor when it comes to environmentally friendly farming.

**Water:**

Rainwater and potable pH neutral well water are the best choices for filling an aquaponic system. Many of us, though, are limited to our city tap water to charge the system. While in some regions this water may be ready to use right out of the tap, most municipal sources add chlorine and chloramine to the water for disinfectant purpose. These compounds make the water safe for use to drink, but unfortunately they are toxic to fish and to the nitrifying bacteria in the bio-filter. In the old days we could just let the water sit overnight with a bubbler and the chlorine would dissipate right out chloramine (chlorine and ammonia bonded together), however, has been in use since the 1980s and requires a little effort to gate it out of the system.

There are a number of water conditioners available through aquarium and pond supply shops normally these are the go-to for aquarists and pond keepers. Most of this products, however, are not certified for use with fish and plants that are intended for human consumption, and it says just that right on the bottle.

**Fish:**

To build a successful aquaponics system, you will need to carefully select the fish that will thrive in your climate, location, and availability. Fish and plants thrive at different temperatures and pH levels, so it is essential to plant that kind of vegetables you want to grow with your fish it is also necessary to know and plant out the purpose of the fish in your system. Are the fish you are raising for home use, commercial use, or recreational use? Here are some key things to consider in selecting the best fish for your aquaponics system.

**Advantage:**

- Trout testes good and is loaded with protein and omega fatty acid.
- Trout are ideal in colder climates.
- They feed on various diets, including fish, insects, and soft-bodied invertebrates.
- It is easily movable on any surface
- This also saves spaces.
- It also saves water.

**Disadvantage:**

- It is costly to set up and maintain.
- Some crops as well as fish are not available for this method.
- It consumes a lot of electricity

**Conclusion:**

Aquaponic farming in India is still at a nascent stage. One of the factors influencing the low adoption rate of this technique is its high initial capital investment. However, once the initial investment is done, the operating cost of running the system is comparatively lower than that of the conventional farming system. There are fewer risks involved in aquaponics in terms of pest and disease attacks, weeds, climate uncertainty, etc. Hence, it drastically decreases the cost of cultivation.

As we are going towards urbanization, the food demand is constantly increasing in these areas. While on the same side, the average landholding of the farmers is decreasing. Hence the gap between supply and demand is anticipated. In this scenario, growing food in urban areas in closed conditions to fulfil the demand gap makes sense. The future of aquaponic farming in India seems to be bright. It is just a matter of time when people slowly turn towards growing their food at their house, terraces and balconies and Aquaponics makes this possible.

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