AQUAPONICS- A WAY FORWARD TO URBAN AGRICULTURE

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INTRODUCTION

Aquaponics system is considered to be a sustainable food production way that follows circular economy principles while reducing input and waste. Aquaponics is an efficient way of organic crop production, aquaculture and water consumption. The fish waste is recycled, used for plant growth and water consumption is lowering by recirculated in a closed system. Aquaponics is, therefore, a promising, sustainable food production technology, especially in developing/arid countries, where resources are limited, freshwater is scare and population is increasing.

AQUAPONICS SYSTEM:

The term "aquaponics" is derived from the "aqua" in aquaculture and "ponics" in hydroponics. Aquaculture is fish farming, where fish are grown in a controlled environment. A disadvantage of aquaculture is that the water must be treated to control ammonia, which is released in fish waste, in order for the fish to survive. In hydroponics, plants grow in water, but nutrients must be added to the water in order to feed the plants. Aquaponics (Fig.1) uses the fish waste in aquaculture (nutrients such as nitrogen-containing ammonia) as the food for plants grown in water (hydroponics). This process is the same as that occurring in nature, such as in a river or lake basin, where plants and fish live together. Along with the fish and their waste, microbes play an important role to the nutrition of the plants. These beneficial bacteria gather in the spaces between the roots of the plant and converts the fish waste and the solids into substances the plants can use to grow. The result is a perfect collaboration between aquaculture and gardening.

WORKING PRINCIPLE OF AQUAPONICS

In aquaponics, the plants are grown in the grow bed, and fish are placed in the fish tank. The water from the fish tank that contains fish waste is fed to the grow bed, where billions of naturally occurring beneficial bacteria break the ammonia down into nitrites and then into nitrates. Plants absorb these nitrates and other nutrients to help them grow. In return, the plants clean and filter the water in the system. The fresh, clean, and oxygenated water then recirculates back to the fish tank, where the cycle will begin again.

Aquaponics has the potential for higher yields of produce and protein with less labor, less land, fewer chemicals, and little water usage. Being a strictly controlled system, it combines a high level of biosecurity with a low risk of disease and external contamination without the need for fertilizers and pesticides. Moreover, it is potentially an useful tool for overcoming some of the challenges of traditional agriculture on account of freshwater shortages, climate change, and soil degradation Aquaponics works well in places where the soil is poor and water is scarce, for example, in urban areas, arid climates, and on low-lying islands. However, commercial aquaponics is not appropriate in all locations because of the availability and affordability of inputs, the cost and reliability of electricity, and access to a significant market willing to pay premium prices for locally produced, pesticide-free vegetables.

COUPLED AQUAPONIC SYSTEM:

Aquaponic produce is thought to contain supplementary value to the environment and consumer. Community gardens and urban farms have both problems and prospects, like reduce or increase of energy consumption, beautify neighbourhood, and improve water infiltration. Coupled aquaponics system integrates three classes of organism including bacteria, aquatic organism, and plants. Fig.2 shows the coupled aquaponic system with bacteria, aquatic organism, and plants in a closed recirculation of water.

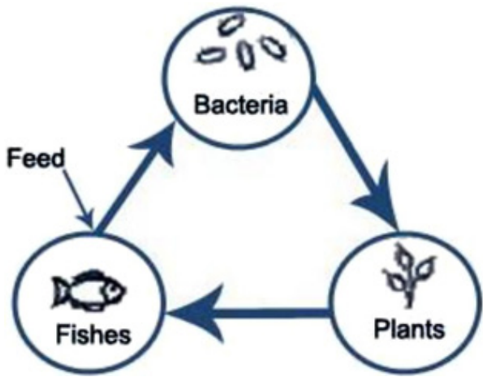

Fig. 2: Coupled aquaponic system.

Fig.3: Production in an aquaponics system

FISH AND VEGETABLES GROWN IN AQUAPONICS:

The fish used in aquaculture are freshwater fish, most popular being tilapia and barramundi because they tolerate better diverse water conditions and they grow fast. Trout can also be used especially for lower water temperatures. Other aquatic animals like snails and shrimps can be grown.

Fish can be fed with special that can be purchased in or other foods like water lettuce and duckweed. In an a small aquaponic based garden vegetables grown that don't need heavy nutrient input. Lettuce, decorative flowers, mint, herbs, okras, spring onions and leek, radishes, spinach and other small vegetables. Cabbage, tomatoes, cucumbers, beans, broccoli and cauliflower can require more nutrition and a well stocked or more advanced aquaponic system. Growing of plants that need acidic or alkaline water should be avoided because those levels of pH can definitely harm the fish

ADVANTAGES OF AQUAPONICS

1) Aquaponics is a way to grow own fish and vegetables at the same time. Feeding the fish and the fish will feed your plants through their waste output.
2) No need to use fertilizers because the fish provide rich nutrients for the plants.
3) In aquaponics, less water is used for the crops. Aquaponic gardens use 1/10th of the water that is required for soil garden.
4) Regular gardening pesticides or other chemicals can't be used because they would harm the fish results in healthier and organic vegetables.
5) No any soil borne diseases in aquaponics as there is no soil.
6) Plants can be grown in very small space with a great harvest.
7) Plants grow fast as they get very nutritious substances from the fish waste.
8) Plants and fish production can be done in a controlled temperature environment.
9) Water is used in a closed system and circulated effectively, reducing the consumption and the water bills.

DISADVANTAGES OF AQUAPONICS

1. Aquaponics is power-hungry, especially during the winter as water pumps, lighting and heating all consume a lot of power.
2. Aquaculture component takes up more space and is not as modular as many hydroponics systems. But it is still much more space-efficient than regular aquaculture or agriculture.
3. Water quality requires frequent testing and Regular monitoring is required in terms of water quality, mechanical parts of the system, pests and diseases attack to fish and vegetables.

CONCLUSION

Aquaponics is the ideal answer to a fish farmer's problem of disposing of nutrient rich water and a hydroponic grower's need for nutrient rich water. Essentially, aquaponics mimics every natural waterway on earth. It is used to grow food crops in a concentrated, yet sustainable manner. Aquaponics is a very efficient method of growing food that uses a minimum of water and space and utilizes waste, resulting in an end product of organic, healthful fish and vegetables. From a nutritional standpoint, aquaponics provides food in the form of both protein (from the fish) and vegetables.