AN AQUAPONIC SYSTEM FOR FISH POND WATER TREATMENT AND PRODUCTION FISH MEAT AND FORAGE CROP

By

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ABSTRACT

Mahenor Arabiy Ebrahim: An Aquaponic System For Fish Pond Water Treatment And Produce Fish Meat And Forage Crop, M.Sc. Thesis, Department of Agricultural Engineering, Faculty of Agriculture, Ain Shams University, 2015

The aquaponic technology defined as, it's a integrated system combined between hydroponic and aquaculture systems in that system the waste water coming from the fish pond used as the nutrient for the plants in the hydroponic as well as the plants work purification of that water to reuse it in the fish pond. The experiment which started at the spring season of Egypt (April- 2013) in Giza governorate to study the benefits and the possibility of applied and use the aquaponic system to produce fish and forage crop. The main objectives of that study are to set up and construct an integrated system for fish and crop production as well as purification the waste water.

The study has been assisted to study the possibility of produce Barley crop by using influent waste water from fish pond as a nutrient for Barley. An integrated aquaponic system was installed. With main objectives to constructed an integrated system combined with fish and forge crop production and applied the phytoremediation techniques. The treatments under study were: the quantity of seeds (300 and 500 grams), the water duration inside the trays (3 and 5 days), and with (aeration or without aeration). The treatment 2.5kg/m^2 seed quantity with 5days for water time duration and with aeration gave the best result for crop yield (19.5kg / m^2). The pollution reduction range from 24.34-49.61% , 18.18-48.27% , 58.06-78.63% , 65.4-93.49% and 2.97-4.8 % can be achieved for the chemical oxygen demand (COD), total solids (TS), Nitrate - Nitrogen (NO_3^--N), Phosphate – phosphorus (PO_4^{3-}-P) and potassium oxide (K_2O), respectively. It's known that during one production circuit of fish we could cultivate the crop 4 or 5 times; the final fish production was 56.7 kg/m^3 for the total 3 cycles.

It's expected that according to the economical evaluation the net profit from one squire meter under the optimum condition using that aquaponic system will about 91.25 LE/m^2.year.

Key words: Aquaponic, Hydrioponic, Aquaculture, fish and Barley.

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INTRODUCTION

Investigate bio-integrated food production system to raising up organic food crops not only for exporting but also to produce a clean production to the local market. The aquaponic is a bio – integrated system as aquaculture – hydroponics component used in the modern agricultural process system provides an artificial controlled environment that optimizes the growth of aquatic species and soil – less plants, while conserving water. In this system, fish and plants are growing in a mutually beneficial symbiotic relationship. Aquaponic produce organic crops without any chemical or heavy metals as well as produce a fish meet safety.

Aquaculture at fish is considered one of the safeties means to contribute to save the required quantity of fish in order to reduce the gab between the local markets, needs and actual production.

The hydroponics unit designed to accomplish two functions first the unit must allow water to flow over the plant roots so essential nutrients can extracted by the plant. Second, the unit must provide the plants with mechanical support.

In Egypt, water is considered a natural resource for crop production. The agricultural sector uses about 85% of the total water resource. With increasing population, serious water shortage are developing and the dependence on this limited resource has became a critical constraint on future agricultural progress and threatens to slow down development, endangering food supplies and aggravation rural poverty.

Using hydroponics system raises the water use deficiency by reducing the water losses compare with traditional methods. Hydroponics led to agricultural vertical concentration and introduces the best way to treat the soils problems and able to planting the soil that could not planting.

Aquaponic it is an integrated system to cultivation fish with plant. The fish waste used as the nutrient solution for hydroponic plants and the plants helps to clean the water to reuse it in the fish tank.

Fish production of capture in Egypt 385000 Mg in 2010 (264000 Mg for inland and 121000 Mg for marine) and 920000 Mg for inland aquaculture (FAO, 2013).

Adler et al., (2003) mentioned that hydroponic plants have been widely used in wastewater treatment systems because they can efficiently absorb dissolved compounds in the wastewater as nutrients for plant growth.

Bhatnagar (2013) said that the optimum fish production is totally dependent on the physical, chemical and biological qualities of water to most of the extent. Hence, successful pond management requires an understanding of water quality. Water quality is determined by variables like temperature, transparency, turbidity, water color, carbon dioxide, pH, alkalinity, hardness, unionised ammonia, nitrite, nitrate, primary productivity, BOD, plankton population etc.

Ghaly and Farag (2007) defined that phytoremediation is a low tech, low cost emerging clean up technology for wastewaters. It is defined as the engineered use of green plants to remove, or render harmless, various environmental contaminates such as inorganic and organic