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Acquaponics farming

Over view

While Hydroponics is the growing of plants without soil using nutrients from the soil in a solvent to suffice the soil, Acquaponics is a combination of aquaculture and hydroponics whereby the vegetables are grown using the metabolic wastes of fishes while the vegetables clean the water that go back to the fish. In an acquaponic system there are water tanks that store the fishes then the water is pumped all though a framework that holds the vegetables, so in other words you are at the same time growing your plant and growing your fish. This technology can now be monetized as it performs an opportunity for modern farmers to grow crops faster, and cheaper than normal land farmers.

Problem

What problem does this solve?

- It solves the problem of crop defects due to pests and weeds,
- It solves the problem of insufficient lighting from the sun
- It solves the problem of scarcity of such consumables
- It solves the problem of space
- It reduces the consumption of water

How does it solve these problems?

Because the crops are not going on soil hence there are no pests and weeds, of insufficient lighting because it makes use of LED lights to suffice the sunlight from the sun thereby providing all- round growth for the vegetables and crops that can be grown

through it. It solves the problem of scarcity of nearly extinct crops due to climate change as its growth is not caused by the weather but by favourable conditions provided by the system.

Advantages of aquaponics farming over land farming

- Environmentally responsible with low water usage and low power usage
- The primary inputs to the system are food and water
- It requires very minute labour and workforce
- It utilizes and saves land consumption
- Return on investments are very high
- It can be run on any geographical terrain

Today, aquaponics is becoming more popular and attracting many people as a way of growing food because of its sustainability and benefits such as eco-friendly, less use of water, low-cost maintenance, efficient, and organic way of producing food. Aquaponics has grown and developed not just for the hobbyist or backyard gardening but, most importantly, for commercial purposes to sustain the high demand for organic food by the growing population in urban areas.

Commercial Aquaponics can be profitable when done to a specific scale. Startup cost can be a challenge, but because it is a low maintenance cost, and efficient system that provides fresh organic yield much faster than any other farming method, makes it an ideal investment. As with any businesses, starting a commercial aquaponics system requires careful and extensive planning, commitment, capable team, and business plan to build and operate.

It is very interesting to note that acaquaponic farms produce double of what an average farm would produce if the same input is given to both farms. It is so because the crops are in good condition to grow and are not affected by night time rest as they are always growing, the vegetables come out healthier and faster, making it a good investment as return on profits are very high and cannot be affected by pests, plan defects and sometimes transport.

Perishable vegetables, some fruits and legumes can be grown on an aquaponics farm, as

well as fishes such as tilapia, eel, sardines and lots more can be reared on the aquaponics farm. The crops would be grown and the fishes would be reared simultaneously, both live in a symbiotic environment.

Example: if an average of 3000 tomatoes when grown on a land farm will take an average of three weeks to grow and yield fruit, it'll take half the time on an acaquaponic farm.

Also if it takes an hectare of land can worth of farming can be reduced to just a plot or even less depends on the engineering of the framework of the farm.

Resources

Commercial aquaponics is a business, and to be successful, you need business experience, or you may need to involve someone who has the experience and knowledge about aquaponics. Getting excited and carried away by the coolness and possible profitability of aquaponics does not guarantee success; knowledge, experience, and right business decisions do. Here are our tips on starting a commercial aquaponics farm.

Expertise and training. It is important to invest in education and training in aquaponics before you invest in building your commercial aquaponics farm. Knowing how aquaponics operates, what to look for, and knowledge in the science of aquaponics is critical to the success of your farm. Reach out to your local aquaponics farmers to get ideas to the day to day tasks of running an aquaponics farm. The right people can help you get started on the right track, so consult professionals with experience in designing, building. and operating aquaponics facility with your design team. The money you invested in professional consulting will be an important factor in the success of your farm.

Research. You can research the local market to know which ones are in demand, priced highly, or low in competition. Research on the latest trends, updates, and activities on aquaponics to gather information and knowledge in setting up the business.

What Plants and fishes can be grown and their commercial value

Fish production

The fish (tilapia, Oreochromis niloticus) is fed three times daily ad libitum for 30 min with a complete, floating pelleted diet with 32% protein (PMI Aquamax, Gray Summit,

MO). Details about fish size, initial and final weight are available on each particular study performed at the UVI Commercial Aquaponics System and used for the valuation of vegetable crops (Bailey et al., 1997, Rakocy et al., 1997). Fish waste products are the source of nutrients for plant growth.

Vegetable production

Vegetable crops are cultivated on styrofoam rafts floating on the surface of the hydroponic troughs. The rafts are 2.4 × 1.2 × 3.9 cm (an area of 2.97 m^2), prepared for planting by painting with white non-toxic roof paint (Cool-Cote 22-DW-9, BLP Mobile Paints, Mobile, AL). 4.8-cm diameter holes are drilled in the rafts at different spacing for the various plant requirements. Planting density range from 0.67 to 30 plants per meter square depending on the crop and mature plant size. Seedlings are produced in an open-ended, covered greenhouse. Seedling flats, 25.4 × 50.8 cm with 98 cells, 2.54 × 2.54 × 2.54 cm, are filled with ProMix® potting mix (Premier Tech Horticulture, Riviere-du-loupe, Quebec, Canada), a mixture of 79%-87% peat moss, 10%-14% perlite and 3%-7% vermiculite. Depending on the seed's requirement, they are surface seeded with a vacuum seeder (Seed E-Z Seeder, Inc. Baraboo, WI) or manually drill-seeded into 1.5 cm deep holes made in the ProMix® media. The seedling flats are watered to begin the germination process and then covered for 2–3 days until cotyledons emerged. The flats are then uncovered and the seedlings allowed to develop over a 2- to 3-week period. The seedlings are watered twice daily and fertilized once weekly with Peters Professional Plant Starter 4-45-15
Seedlings are ready to transplant when 1–2 sets of true leaves had developed and the roots had grown to encircle the media. They are transplanted into clean rafts in the aquaponic system. Pest management requires spraying once weekly with Bacillus thuringiensis subsp. kurstaki strain ABTS-351, fermentation solids, spores, and insecticidal on all crops to control caterpillars and with potassium salts of fatty insecticidal soap to control aphids and white fly on crops susceptible to infestations of those pests. Plants are grown in the system for the required period to come to maturity.

Leaf crops

Plants yield different mass quantities depending on the part of the plant harvested: whole plant, leaves, or fruit. Lettuce and pak choi (Brassica rapa subsp. chinensis) were harvested by removing the plant and cutting the roots from the stem. The plant is trimmed of old discolored or insect damaged leaves, and packaged for market. Other leafy plants were harvested by the "cut and come again" method which leaves 15 cm of plant stem to regrow or removes mature leaves and retains the young leaves to continued growth. Kale (Brassica oleracea), collards (Brassica oleracea), swiss chard (Beta vulgaris), and basil were harvested by this method. Basil 'Genovese'

was produced in staggered production for a 12- week trial (Rakocy et al., 2004b). Transplants were placed in one- quarter of the system for 4 weeks. After 28 days the first crop was harvested by the "cut and come again" method which allows for regrowth of the 15 cm of plant remaining after harvest. Each planting was harvested twice for a total of eight harvests.

Fruit crops

Okra, cucumber (Cucumis sativus), and zucchini (Cucurbita pepo var. cylindrica) yield fruits that are harvested frequently during production. Melon(Cucumis melo) and sorrel (Hibiscus sabdariffa) yield fruits to harvest at the end of a long growing period. Crops were harvested at maturity

Market prices

Fresh fruits and vegetables are shipped in commonly used containers designated by volume or product count and expected weight of the container (Table 3) (US Dept. of Agriculture [USDA]/Agriculture Marketing Service [AMS], 2015). Typical shipping containers include carton, ½ carton, carton with 24 units, basket, and cartons with 38.8 L (1/9 bushel), 35.2 L (1 bushel) and 17.6 L (1/2 bushel). Produce prices were obtained from USDA/AMS (2016). Weekly prices were obtained from the Miami Terminal Custom Report for the period May 1, 2015–April 30, 2016 (Table 3). The most frequently occurring low price and high price were sorted from each products' weekly prices as representative of the price most likely to be received by a farmer. St. Croix farm price is used as the price for sorrel value since this product is not included in the USDA market prices because of its low volume of sales.

Capital required: The "256" **costs** around $2,700 to build, or $3.27 per plant space, and "512" **costs** around $1,200 to build, or $2.48 per plant space,

Labour: as it is mechanized it'll require a team of not less than 15 persons to manage and general technician to control the lighting and the mechatronized irrigation.

So in lay man terms, the business is simply to set up a smart farm