

## **A new paper on aquaponics, which was published by the US North Central Regional Aquaculture Center (NCRAC), has just been published online**

Titled *Overview of Aquaponic Systems: Hydroponic Components*, it covers topics such as hydroponic components, aquaculture components, fish selection and management, as well as plant selection and management. The first publication in this series (NCRAC Technical Bulletin #123) is now available through the NCRAC website. Future installments will be advertised as they become available.

Author Allen Patillo told *The Fish Site*: “Aquaponics is an industry of growing interest worldwide, and as such people need access to high-quality, non-biased information. This publication was created with that purpose in mind.”

“The research was conducted both in my demonstration facility on the Iowa State University campus, as well as through collaborations with farmers throughout the United States,” he added.

“Aquaponic systems present a unique opportunity for year-round production of plants and fish. Out-of-season production of leafy greens, herbs, and vegetables can be a major source of income for aquaponic producers, as they can take advantage of much higher seasonal prices. The high quality and freshness of aquaponic produce is highly desired by chefs in metropolitan areas. If aquaponic producers can fill the seasonal gaps with fresh produce, buyers are more likely to keep them as a vendor, allowing producers to capture a larger market share. Additionally, the local foods movement and consumer willingness to pay more for a superior product is a major advantage to aquaponic producers,” he continued.

### **Overview**

Aquaponics is the union of hydroponics (growing plants without soil) and aquaculture (farming fish or other aquatic organisms) for a fast, efficient method of producing both plant and fish crops. Fish waste from the aquaculture portion of the system, is broken down by bacteria into

dissolved nutrients (eg nitrogen and phosphorus compounds) that plants utilize to grow in a hydroponic unit. This nutrient removal not only improves water quality for the fish but also decreases overall water consumption by limiting the amount released as effluent. Aquaponics shares many of the advantages that hydroponics has over conventional crop production methods including:

- 1) Reduced land area requirements.
- 2) Reduced water consumption.
- 3) Accelerated plant growth rates.
- 4) Year-round production in controlled environments.

This growing technique reduces crop production time considerably. For example, butterhead lettuce varieties can be produced in about 30 days, as opposed to the typical 60-day growing period needed under conventional methods. In temperate climates, aquaponic operations are typically operated year-round in a greenhouse or other controlled environment, which allow producers to take advantage of higher seasonal produce prices in the winter.

Aquaponics has additional advantages:

- 1) Operational efficiency with shared equipment.
- 2) Multiple crops produced simultaneously.

High-value herbs, vegetables, and leafy greens, as well as fish, crayfish, worms, and a number of other products can be produced to meet a highly diversified market. Because aquaponic systems are often closed-loop systems, nutrient effluence is virtually non-existent, allowing agriculture to take a large step toward environmental sustainability. Moreover, fish, plant, and waste solids can be captured and converted into fertilizer products for additional sale. These benefits make aquaponic systems a viable option for gardeners and producers who have limited space, giving more people access to locally produced, healthy foods.

### **Hydroponic growing methods**

There are many ways to grow plants hydroponically and many of these techniques have been adapted for use in aquaponic systems. The five most common categories of hydroponic growing methods used in aquaponic systems include flood and drain, deep water culture,

nutrient film technique, drip irrigation, and vertical growing systems. Each of these methods are effective at growing plants, but certain systems may be favorable under different scenarios.

**Flood and drain** (aka ebb and flow) irrigates the plants by filling the hydroponic unit with nutrient-rich water followed by a period of draining, which draws air into the root zone. The periodic emersion in water, followed by air exposure, introduces oxygen to the roots, producing an environment conducive to healthy roots. Flood and drain systems utilize the substrate for both root stability and the high surface area of the substrate for biological filtration.

**Deepwater culture** uses a floating or suspended platform with holes to support the plants and allows roots to be submerged in the water. Polystyrene insulation is typically used as the raft and plastic net pots support the plants, although some new food-grade materials have been developed. The rafts provide many benefits including ease of use, mobility, simple cleaning, and lower risk of plant mortality during power outages. Plants in a deep water culture unit may live up to 2 weeks without water flow or aeration as compared to hours or days in other systems.

**Nutrient Film Technique (NFT)** utilizes the contact of the root zone with a thin film of water that flows along a smooth surface where the roots of the plants can contact both air and water simultaneously. This is commonly done inside a channel or gutter style system made from white extruded PVC material. Plants like basil and lettuce can be grown in smaller channels, whereas tomatoes, cucumbers, and peppers are grown in larger channels to accommodate the larger root mass associated with the plants. Water is delivered into the channels via opaque tubing that ranges in diameter based on the clarity of the water source and biofouling from bacteria and algae.

**Drip irrigation** systems use a substrate for growing plants that provides the root zone with a constant supply of water and air. Common methods include bucket culture and slab culture, and are typically used for large fruiting crops like tomatoes, cucumbers, and peppers. Bucket culture combines the concepts of flood and drain and NFT, creating a modular, mobile growing method for large vining crops. Bucket culture substrates generally include perlite, pea gravel, expanded clay, or rockwool.

**Vertical growing systems** maximize the production output of a growing area by taking advantage of the 3D space, which may be important for farmers in urban areas where growing space can be expensive. Vertical growing may involve multiple layers of deepwater culture, NFT, flood and drain systems, or growing towers that involve aeroponic growing methods, in which the plant roots are suspended in the air and sprayed with nutrient rich water.

Lien article : <http://www.thefishsite.com/articles/2254/aquaponics-explained/>