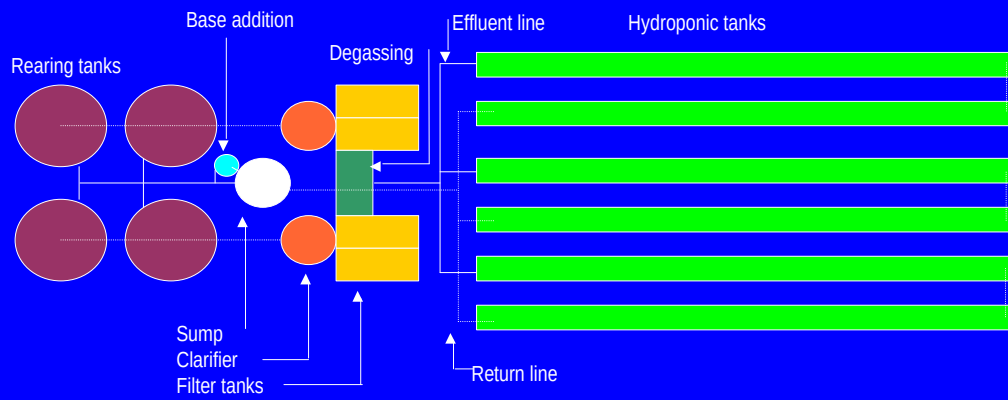


System Layout



Total water volume, 110 m³

Land area - 0.05 ha

The UVI Aquaponic System integrates fish rearing tanks with hydroponic vegetable tanks for sustainable production.



The hydroponic tanks are 100 ft. (30.5 m) long and can be used for the production of a wide variety of vegetables.



The fish rearing component consists of 4 production tanks that have been stocked at 6 week intervals for a nearly level input of feed and generation of nutrients.

Treatment Processes

- ◆ Air stones, 22 in rearing tank, 144 in hydroponic tanks
- ◆ Solids removal, three times daily from clarifier, filter tank cleaning one or two times weekly
- ◆ Continuous degassing of methane, CO_2 , H_2S , N_2
- ◆ Denitrification in filter tanks
- ◆ Direct uptake of ammonia and other nutrient by plants
- ◆ Nitrification in hydroponic tank
- ◆ Retention time: rearing tank, 1.37 h; clarifier, 20 min, hydroponic tanks, 3 h



The circular clarifier removes 50% of fish solid waste. The net tanks remove the remainder and allow mineralization of the solids into usable plant nutrients.



Solid waste from the clarifier is removed frequently from the system so that it does not contribute to poor water quality.



The vegetables in the hydroponic tank remove nutrients from the water which is returned to the rearing tank.

Production Management

- ◆ Feeding: three times daily *ad libitum*
32% protein, floating, complete diet
- ◆ Stagger production, 24 week cycle, 6 week harvest
- ◆ Stagger plant production, use biological insect control
- ◆ Monitor pH daily, maintain pH 7-7.5 by
alternate and equal additions Ca(OH)_2 and KOH
- ◆ Add chelated iron (2 mg/L) every 3 weeks
- ◆ Daily makeup rain water, about 1.5%



Fish are fed 3 times daily with a commercially prepared, nutritionally complete diet.



Staggered production of vegetables allows for uniform uptake of nutrients. There are no signs of nutrient deficiency nor toxicity with the production plan.



The pH is monitored daily and adjusted to 7.0.



Base, KOH or $\text{Ca}(\text{OH})_2$, is added into a small tank which receives a sidestream flow and allows a gradual addition which does not shock the fish or plants.



Red tilapia are stocked at 1 oz. (50 g) and harvested at 1 lb. (452 g) after six months.



Bibb lettuce seedlings are grown for 3 weeks in the system before harvest.

Energy Consumption

- ◆ One blower for fish and degassing, 1 hp
- ◆ One blower for hydroponics, 1 hp
- ◆ One water pump, $\frac{1}{2}$ hp
- ◆ Total energy consumption 2.5 hp

Important Principles

- ◆ Optimum feeding rate, 60 - 100 g/m² plant area/day prevents nutrient accumulation or deficiency
- ◆ Slow removal of solids increases mineralization
- ◆ Frequency of filter tank cleaning controls nitrate levels through denitrification
- ◆ Treatment capacity of hydroponic tanks is equivalent to 180 g of feed/day/m² of plant area