

Alpine Aquaponics

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Identifying the opportunity and proceeding to utilize the vacant “green house” at Sierra Nevada College, we have made efficient use of this space by having engineered an agricultural application integrating aquaculture and Hydroponics. Taking the name Aquaponics, this system uses a synergetic approach between the waste produced from fish, the naturally occurring nitrogen cycle, and the uptake of nutrients from plants. The result is a zero impact system that has the capability to sustainably harvest truly organic produce and fish protein, utilizing a fraction of the water and energy required by traditional agricultural methods. It is the only system that I know of that can honestly claim “zero” impact on the environment because it is a completely closed loop system. We are simply providing the ideal environment for a natural occurring process to thrive, in man-made containers. That being said, this application is appropriate for a much larger range of environments than a plowed field being restricted to open, fertile land. Aquaponics can essentially be done anywhere provided that climate conditions are sufficient.

This concept involves the symbiosis of two practices. The first is the practice of aquaculture, essentially the rearing of fish, or aquatic life in a closed system. While this can be done efficiently and produce quality proteins (fish), large amounts of fish waste are generated as a bi-product. Second is the agricultural method of cultivating plants; hydroponics. Hydroponics uses a soil-less medium in which the plants grow, obtaining all of their nutrients from the water that their roots are suspended in. No soil means nutrients cannot be depleted, and hence crop yields are increased in shorter time periods as opposed to growing in soil. This method however also generates waste in the form of large quantities of water mixed with toxic fertilizers, and commonly are synthetic. Aquaponics is simply the integrating of the two practices, and eliminating the wastes generated by each. The fish excrete waste that the plants uptake as nutrients and in doing so filter and cleanse the water as it is returned to the tanks where the fish are being raised.

By measuring nutrient levels involved with the nitrogen cycle, Ph, and other variables in the aquatic environment, we are enabled to monitor this system and maintain both the aquatic and the vegetative environments to produce energy (food) most efficiently. Our research will enable us to educate the public on the efficiency and appropriateness of aquaponics, as well as develop a model that can feed and sustain a community.