

# Hydroponics

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By

Sara Camp

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## Hydroponics Outline

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Hydroponics has been around for centuries. In the early 1600's, scientists found that plants did not rely on soil to grow and live. A combination of nutrients and minerals is all that is needed in order to grow and cultivate perfectly healthy plants. Everything from lettuce to strawberries to cannabis is being grown in farms all across the world. Some countries have almost completely replaced traditional farms with hydroponic farms. Because of the nearly completely dry summer months, the country of Jordan has been implementing hydroponic farms instead of traditional farms. They have found that the hydroponic method uses around 70 percent less water than soil farms ("Brief: U.S. Embassy," 2015). From discovery to application, people have been developing new and innovative ways to expand on hydroponics and its byproducts. Even with some minor drawbacks, hydroponics is the future of farming.

Hydroponics is the technique of growing plants in a mineral and nutrient-rich water solution instead of soil. The seed is placed in a growing medium, which can be a gel solution, gravel, mesh, etc. A water pump feeds the nutrient and mineral water solution into the holders, providing the plants with needed food. The water pump is usually placed on a timer so as not to over-water the plants. If it is done correctly, the plants will thrive. As this method can be done in a greenhouse or indoors, any plants can be grown in any climate all year.

In the 17<sup>th</sup> century, Francis Bacon was one of the first people to discover that plants did not require soil to survive. His discovery was published shortly after his death, and it spurred other great minds to further investigate Bacon's findings. John Woodward, Julius von Sachs, and Wilhelm Knop were some of the first people to expand on Bacon's discoveries. Each of them developed his own hydroponic systems. Sachs and Knop were both botanists who worked on finding the specific nutrients plants need to grow. William Frederick Gericke was a 20<sup>th</sup>-century scientist who expanded Francis Bacon's ideas even further and was well known for his hanging tomato plants that he grew out of a special water solution in his backyard ("Hydroponics," 2007, pp. 454-457). Because of these discoveries, there are now huge industries all over the world continuing to expand and create better hydroponics. As seen in

Figure 1 below, hydroponics has even become almost a work of art. It has given hope to countries that have no water or soil source, but it has also become the preferred method used to cultivate abused substances.



Figure 1. Hydroponic Art. The structure is made up of PVC piping. Retrieved from <http://www.saferbrand.com/blog/wp-content/uploads/2014/01/safer-hydroponics.jpg>

In the Andes Mountains in the small village Jicamara, Peru, there is very little water for even basic needs. The locals lived off of food transported in only through the generosity of mission outreaches. June 2014, Zac and Mikaela Camp accompanied a group from Life Church in Ft. Myers, Florida, to bring food and some much needed help to Jicamara. They were there to teach the locals to build and maintain a hydroponic farm. As shown in the Figures 2-5 in the addendum, provided on pages 9 and 10, the group helped build a shelter that protects the plants from the sun as well as building the hydroponic structures for the plants. In Figures 6, 7, and 10, on pages 11 and 13, Pastor David Hodges, a permanently based missionary, is showing the fruits of their labor. Zac and Mikaela Camp were not only able to bring the Word of God to this remote village, but they also helped the villagers create a way to

support themselves. They can receive the nutrition they need right out of their very own community's hydroponic garden (Zac and Mikaela Camp, personal interview, May 2015).

Unfortunately, not all hydroponic gardens are built for the good of others. According to the *Slovak Spectator*, hydroponics is the future of illegal and legal substances. Cannabis can now be altered to produce more of the well-sought "high" while reducing its more redeeming qualities and visa-versa ("Drug market has changed," 2009, p. 3). Because of this ease with which illegal substances can be grown covertly in large quantities, hydroponics has gained a bad reputation. Entire drug syndicates are run completely underground as there is no need for large, open fields. It takes less time, effort, and fewer workers to cultivate a marijuana crop in an enclosed hydroponic facility than in a traditional farm. In the United States, as more and more states are legalizing marijuana, hydroponic companies like General Hydroponics are expanding their corporations in order to include the highly profitable drug (Malone, 2015).

Those who protest the abuse of hydroponics are now able to add more fuel to their fire. As more hydroponic farms are implemented, traditional farms are becoming more and more archaic. In Papua, New Guinea, one of the main income sources for the locals is produce. As hydroponic farms become more prominent, the traditional farmers continue to lose business. As long as they continue to cling to their traditions and refuse to change and grow along with the rest of the world, they will continue to lose income (David, 2013). The nutrients and minerals in soil, over time, are drawn out, and the ground is left fallow; the plants either will not grow, or they will be stunted. Hydroponics does not have this problem, so produce will continue to grow, and over time, it will only improve ("A Hydroponic Future," 2012, p. 32). How many times have people complained of back injuries from being bent and stooped over a garden, yanking on weeds? The dirt usually surrounding plants is full of weeds and bugs, so if the plant is not choked out first, the bugs will eat it. Of course, pesticides can be used to reduce weed and insect activity, but that is a potential health hazard. The best way to grow plants, virtually

free of these such problems, is to grow herbs, fruit, and vegetables either hydroponically or aquaponically.

Hydroponic gardens are most useful in large cities. Places like Chicago and New York City do not have as much open land available, so hydroponic gardens are built on rooftops and in warehouses. These gardens provide the local restaurants and stores with plenty of fresh fruit and vegetables. Hydroponic gardens are in a more controlled environment, so pesticides, growth hormones, and toxins can be avoided. The entire town of New London, Connecticut, is turning to hydroponics. They are hoping to cut down on gas for produce trucks and to boost the local economy with plenty of jobs (Howard, 2012). A hydroponic farm is perfect for teens looking for that extra income boost throughout the summer months. Because hydroponic farms are not just limited to the cooler months, those teens will have the benefit of retaining a position, if they choose, during winter break as well. In Kunai, Hawaii, the Kunai Country Farms is a huge hydroponic corporation that provides large amounts of produce to the surrounding islands ( <http://www.kunaicountryfarms.com/>). Hydroponics makes growing large quantities of exotic plants in greenhouses much easier. A person just needs to set up a sort of cascading garden or even like the hydroponic set-up in Figure 1 on page 4. In Alabama, there are several hydroponic farms. Owl Hallows Farm in Gadsden, Alabama, has a co-op set up with other local farmers where they sell their produce in a local market (<http://www.owlshallowfarm.com>).

Over the years, people have copied nature's methods in growing plants. Think of a koi pond sitting in someone's backyard. There are lily pads resting on top of the water and slippery fish twisting and turning around each other as they fight for the water bug that just broke the surface of the pond. The pond is clear and beautiful, and you can see all of the way to the bottom. The brilliant colors of the koi fish flash in the bright, buttery sunlight, streaming through the leave of the oak tree sitting nearby. Nature has perfected the art of aquaponics in this beautiful scene. The lily pads feed off of the fish's waste, and the fish live off of the insects the lily pads attract.

Aquaponics is a technique of growing plants that implements hydroponics with the application of raising various types of fish. It uses the excrement deleted from the fish as the nutrient, which is then combined with mineral-enriched water and pumped up to the plants above. The water then filters down on to the plant and down through the growing medium and back into the fish tank. This is a symbiotic relationship in which the plants provide clean water for the fish and the fish provide food for the plants. Figure 11, shown below, is an excellent example of aquaponics. The fish are bred and sold for protein and the vegetables are grown and sold to local stores and restaurants.



Figure 11. Aquaponic Farm. This is a truly symbiotic relationship that benefits both the plants and the fish. Retrieved from <http://imagineglobalaquaponics.com/wp-content/uploads/2012/08/AquaponicsSystems1-450x335.jpg>

Aquaponics has been around much longer than hydroponics. It was already prevalent in nature long before hydroponics was discovered. In China, there are miles and miles of rice fields that function aquaponically. Today there are several farms devoted to training others in aquaponics, like Green Acre Aquaponics in Florida. The couple who started this company wanted to do something to help others.

Now they feed hundreds of people and train even more to build and maintain their own farms (“About Us,” 2012). People are even showcasing their own creations, such as the Wulff family in Ashtabula, Ohio. They built a 200-square-foot aquaponic tank in their basement and opened it up for tour groups. It is called Tour de Tanks. They love all of the fresh produce they get every couple of months and the added enjoyment of watching the Koi fish in the 650-gallon pool that act as the food for the plants above (Terry, 2015). Can you imagine watching the fish in your own aquarium while munching on the tomatoes and lettuce floating on the surface?

This world is growing by leaps and bounds. The population is multiplying, and soon there will not be space for even the small community gardens. The future of farming is hydroponics and aquaponics. There will be no more toxins from the soil or the pesticides. Rooftop hydroponic gardens will replace the community gardens. Imagine an apartment building where the residents create and maintain their own community hydroponic and aquaponic gardens. Buildings will teem with life, and the residents will be healthy. Transportation costs for produce will be a thing of the past, and even astronauts will be able to maintain a healthier lifestyle instead of living off of freeze-dried ice cream and dehydrated fruit. Through time, people have created the most incredible ways to build on what nature has already provided for us. Aquaponics and hydroponics are and always will be the best farming method available.



Addendum-- Jicamara Photographs



Figure 2. Starting Out. This is the hydroponic garden in Jicamara, Peru. Used by permission of Zac and Mikaela Camp.



Figure 3. Setting Up. This is the framed cover set up in order to protect the plants from the hot sun in Jicamara, Peru. Used by permission of Zac and Mikaela Camp.



Figure 4. Finished Building. They have finished building and the hydroponic garden. Used by permission of Zac and Mikaela Camp.



Figure 5. Water Pumps. Setting up the water pumps and filtration system. Used by permission of Zac and Mikaela Camp.



Figure 6. Pastor David Hodges. The permanent missionary showing the locals some of the produce. Used by permission of Zac and Mikaela Camp.



Figure 7. Showing Roots. Pastor Hodges is showing the roots of one of the ripe vegetables. Used by permission of Zac and Mikaela Camp.



Figure 8. Strawberries. This is also showing the growing medium they are using to hold the plants in place. Used by permission of Zac and Mikaela Camp.



Figure 9. Eggplant. All sorts of vegetables growing in Jicamara, Peru. Used by permission of Zac and Mikaela Camp.



Figure 10. Pastor Hodges Showing Roots. Pastor Hodges is showing off the impressive root system pulled from the hydroponic garden. Used by permission of Zac and Mikaela Camp.

## References

About us. (2012). Green acres aquaponics: Offering commercial aquaponics training. Retrieved from <http://www.greenacreacquaponics.com/about-us>

Brief: U.S. embassy promotes hydroponic practices in Jordan. (2015, May 10). *Jordan Times*.

David, M. (2013). Hydroponics plant a threat to farmers. *Post-Courier* (Papa NewGuinea), p. 3.

Drug market has changed. (2009, July 20). *Slovak Spectator*, pp. 3-6.

Howard, L. (2012, December 7). Region targeted for hydroponic startup. *The Day* (New London, Connecticut).

A hydroponic future. (2012). *The Weekly Times* (Melbourne), p. 32.

Hydroponics. (2007). In *Biotechnology: Changing life through science* (Vol. II, pp. 454-458). Detroit: Thomson Gale.

Kayser, Z. (2014, June 6). Nolan challenger Mills visits Bemidji: Tours LaValley Industries, new Lueken's hydroponic greenhouse. *The Bemidji Pioneer*. (Minnesota).

Malone, J. (2015, April 4). Scotts subsidiary buys hydroponics firm. *The Columbus Dispatch* (Ohio).

Terry, S. (2015, April 17). Public invited to 'Tour de Tanks' at aquaponic garden in Ashtabula. *Star Beacon* (Ashtabula, Ohio).

## Images

<http://imagineglobalaquaponics.com/wp-content/uploads/2012/08/AquaponicsSystems1-450x335.jpg>

<http://www.saferbrand.com/blog/wp-content/uploads/2014/01/safer-hydroponics.jpg>