Humans and Aquaponics

A human crisis of unpredicted proportions is in the making. In fact, with more than 100,000 people being born every day, population levels only continue to increase, not staying at any consistent equilibrium. The earth is constantly having to adapt to new innovations and demanding needs of humans that place a halt on environmental security. While these numbers may seem shocking they are soon to become realistic as the earth is expected to hold up to 10 billion people by the year 2050. Additionally, by the year 2030 a "food security crisis" is also expected to become a worldwide problem. And yet people seem to overlook these possible outcomes and disregard the reasons behind why they are set to happen. This threat to life on earth will be caused by three main factors, diminishing arable land, water shortage, and population growth. At the same time, the fact that 1.8 billion people will be living in countries or regions with absolute water scarcity by the year 2050 (UN) will not be able to cross one's mind without concern. Such high numbers are emerging and without a sudden call to action our problems may be closer than we think.

Soil concerns are already beginning to become a worldwide problem, showing signs at a leisurely and harmful pace due to mankind's actions. Cases of farmers constantly becoming victims to poor levels of crop production are already spreading throughout the world. While decreasing levels of arable land and topsoil erosion are already here. With both high birth and death rates, cities are forced to expand and make more room for the growing population. Even though that is easier said than done when space on earth is limited. Already, large areas of land are being occupied every day which marks the first reason to believe that a food security crisis is soon to arise. Due to the vast urbanization across the globe, scarcity of land has led to increased

land prices in large cities (UN). These current increased land prices make it harder for farmers to be able to afford the land that is available to them and place limitations on their jobs. Secondly, even though an extensive amount of land is un-colonized, the land that is currently available cannot be used for agriculture due to the fact that the land lacks infrastructure or needs to be protected for forest cover and environmental reasons (UN). This brings us to the conclusion that humans need to be more efficient and utilize the land that is available to them. For example, land in urban areas that previously was not used for traditional agriculture now can be used because of a new sustainable technique. Lastly, an overpopulation of people will lead to many water concerns and issues which will add stress to soil that is being used in traditional crop production today. Moreover, according to the UN intergovernmental Panel on Climate Change, 70 percent of the world's water supplies is used by agriculture, and as more regions experience water scarcity, this percentage is only expected to grow.

If we as humans are so aware of our actions, why are there still so many environmental issues and concerns in the world? Why do we not want to respect the world that we live in? Why are people trying to destroy the planet instead of preserve it? What are some practical ways that humans can attribute to helping both themselves and the environment? Is it possible to solve two large global issues at once? At the same time? And still meet the requirements of being sustainable and eco-friendly? Does something so perfect seem impossible and too much of a dream? Is it even possible to solve the problem of world hunger, such a big, growing, and progressive issue? Or are there too many people in the world that have not taken initiative soon enough? Is this the end and is there no turning back to the damage that humans have already done? Could a thing called aquaponics answer all of our pondering questions?

To start off, solutions and progressing ideas need to be thought of to at least begin to decrease the level of severity of these many problems. With this in mind, aquaponics could be our light of hope! Aquaponics is a technique so ancient, that dates back to the 6th century and has been carried on for generations, but has never really been fully taken advantage of until now! We might be asking ourselves what is this aquaponics thing and how can it stand a chance to solve one, yet multiple of our global concerns. Aquaponics is a type of system that includes two components, aquaculture and hydroponics. While aquaculture is also known as fish farming, hydroponics is the technique of growing plants in water, and when these two ideas combine they create magic. Aquaponics uses aquatic species such as fish, shrimp, snails, and sometimes even clams, or a mix of creatures as one of its components. From all the species listed so far, fish, in particular Tilapia, are the most commonly used. You may be thinking that the second most important component for an aquaponics system is soil, but it is actually water! Water is extremely crucial to every living organism on earth, but even more so in aquaponics because it is was keeps the whole system in check and working. Aquaponics is one big consistent cycle that is recycling all of its materials. The function of the system is simple to understand, while the benefits to having one is easily seen. First, the waste that is excreted from the aquatic organisms get turned into nitrate from ammonia with the help of bacteria. The water from the fish tank is then cycled into the grow bed where the plants absorb the nitrate and use it as nutrients. After, the water is returned back into the fish tank with the ammonia removed, which creates a safe environment for the aquatic organisms to live in. The one thing that is great about aquaponics is that every single component in the system can be used. Depending on the type of living organism you choose to use, the Tilapia for example which provides nutrients for the plants can be eaten as

well as the plants, herbs, vegetables and fruits that you choose to grow. There are three main reasons as to why aquaponics is so sustainable. The first reason of sustainability is that there is no use of soil required which means that the current soil crisis does not occur as an issue. Secondly, due to the fact that 90 percent of water is conserved with the use aquaponics compared to traditional farming, water conservation is not a considerable issue. Although some water is lost due to evaporation, the levels are so minimal that water will not need to be added. There is a fear in the world of not having enough water one day, which would affect the production of food and lives of every living organism. With the water in the system constantly being reused and recycled, our levels of stress over this topic could begin to decrease. Lastly, no added fertilizers or chemicals need to be added which results in the produce being more natural and organic, and benefits the world by making it more pure! As a final thought, aquaponics can also be used to grow food everywhere and during any season, the options are endless! Aquaponics can be kept in a home, on the roof, in a classroom, or even outside! The seasons do not affect the growth of the crops if the system is well maintained and taken care of. This technique is great for the rapidly increasing population that is causing a decrease in arable land, because this would not be a level of concern anymore. Now the impossible can become possible when a powerful idea has the potential to solve many human and environmental problems.

The three different techniques of aquaponics gives variability and choice to citizens. The techniques include media-based, nutrient film, and deep water culture (raft technique). Media-based uses a choice of either gravel or clay pebbles for the base to hold the roots of the plants. This technique allows the plants to be within the gravel or clay pebbles, and a bell siphon is used to cycle the water and keep the roots wet so the plants are happy. The nutrient film

technique uses PVC pipes with drilled holes at the top to hold the plants. The water then flows through the pipes and back into the fish tank, allowing the roots to get wet. The last technique is deep water culture and because of its great support, it is most commonly used for large, heavy, and hearty plants with big roots. There is a raft with holes individually holding the plants, floating directly on top of the water. This technique allows the roots of the plants to be fully submerged in water at all times. Each technique works just as well and allows for all kinds and types of plants to thrive in growth. With today's advancing technology we need the help of others to bring this old technique back to life, making it better and more effective than ever! Allowing aquaponics to overcome some of the world's challenges due to an accumulation of unresolved complications. Aquaponics gives civilians the opportunity to give back to the community and creates a potential problem solving method for all.