



Hydroponics And Vertical Agriculture In Morocco And The World | By Carter And Henry Prillaman



By

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Our agricultural system as we know it has to change. We see a tremendous amount of waste in current practice from too much water, too many pesticides damaging the surrounding environment, and waste of products from imperfections or pests. This, combined with declining and, in some cases, stagnant increases in yields in soil systems around the world, will soon require extensive and rapid changes in cultivation methods. As our population continues to grow, food production will grow and our farming methods should also change.

Today we have methods at our disposal to not only change the way we grow produce for the better, but also to increase yields in a smaller space. Vertical farming through hydroponics or aeroponics gives us the opportunity to grow larger quantities of products in apparently unavailable spaces. On rooftops, indoors, in older warehouses – you can grow plants and stack them on top of each other for an even crop that produces quickly, year-round, uses less water and energy, is more resistant to pests, and can help some too alleviate the logistical difficulties of moving products to and from farms in all cities.

Cherry tomatoes are grown vertically and hydroponically in a greenhouse in Morocco.

Hydroponics and aeroponics are becoming increasingly popular with both commercial growers and researchers. They offer several benefits, the most important of which is water use efficiency, with some studies suggesting up to 70% and 95% less water use for hydroponics and aeroponics, respectively. A 2015 study conducted in Arizona, an extremely dry state in the United States, found that hydroponically grown lettuce as a system required ten times less water than soil-based lettuce crops. This is especially important because of the similarities between Arizona and Marrakech climates. Although this study found that the energy consumption of a hydroponic farm was significantly higher than that of land-based farms, this could be almost completely offset by reducing the amount of additional lighting in favor of currently available solar energy technologies.

Another advantage of hydroponic production in the greenhouse is the independence of the season, which allows a grower to achieve multiple harvests throughout the year by protecting the plants from seasonal changes through the use of LED lighting and heating and cooling of the greenhouse space. By using existing ideas for a closed hydroponic system that can be easily set up in any area of the world, it is possible to reuse almost all water and nutrients that are not absorbed and excreted by plants.

A study conducted in Indonesia suggested using such a system to more actively regulate water use and increase the cost-effectiveness of hydroponic production in a hydroponic system using Nutrient Film Technique (NFT). Water efficiency and year-round production and harvest are attractive, and depending on the design of the greenhouse, pest resistance can also be built in through the construction of the facility, which is not conducive to the accumulation of insects or microbes.

While reusing nutrients and water can be economically and environmentally attractive (by reducing agricultural runoff, one of the world's major sources of pollution), care must be taken to ensure a consistent yield over multiple harvest cycles. If improperly handled, the recycled nutrient solution can accumulate several phytotoxic (plant damaging) organic acids that are released from the roots of any plant to help regulate the microbial population of their roots. Studies have shown that using activated charcoal can help mitigate some of the harmful effects of these chemicals, although more research is needed to find a commercially viable solution.

Another promising area of research in hydroponics and aeroponics is potential disease resistance conferred by physical stress on constant flow or aerosolization. A recent study found that in aeroponic systems, the microbial population of the roots remained almost completely separate from the population of the nutrient reservoir, suggesting that the microbial population overlap very little, if at all.

Another recent study attempted to use a chemical intervention solution to mitigate possible *E. coli* contamination of lettuce crops grown in NFT systems. Although the chemical intervention was unsuccessful, a notable result was the complete lack of colonization of the root tissue and no uptake of harmful bacteria in the vegetative tissue of any of the plants tested. While these studies are new, they suggest that hydroponics may be much more resistant to pathogens than previously thought, resulting in a significantly lower risk of contamination for hydroponic growers and safer food for consumers.

The benefits of hydroponic and aeroponic farming are many, and new technologies are making such systems much more difficult to access, paving the way for a future generation of amateur and commercial growers to start farming anytime, anywhere.

Africa has seen wonderful agricultural and economic growth in some regions, but this is not sustainable with current practices. Based on the preliminary summit "Agricultural Transformation for Sustainable and Resilient Food Systems – United States Agency for International Development (USAID)" 2021, the need for a change in the direction of agriculture in the future was discussed. An increase in productivity of the areas already used for agriculture is required, which then leads to stronger and more sustainable economic growth.

All over the world we have unsustainable practices and the use of land for agriculture. The High Atlas Foundation, a foundation for the lasting and successful development of Morocco, has taken on this problem. They followed responsible practices and used new technology to increase efficiency through campaigns led primarily by women and youth. In addition, they are working to address the problem of climate change by monitoring trees that they have planted for carbon offsetting.

There is a need not only in Africa but worldwide to accept and use new technologies in order to increase the productivity of our country while saving our planet. The advent of hydroponics, aeroponics and vertical farming is a great way to address the pressing question of how do we grow crops when there is little water and little surface area. This provides the opportunity for many methods of urban farming, including vertical and hydroponic on roofs and lots of unused land that could be used for cultivation.

We only have one world so being good stewards and living sustainable lives is imperative. Expanding the use of hydroponics and vertical farming technology can provide smallholder farmers with much greater financial returns while helping to reduce the pressures of agriculture on the planet. There is only so much space in the world, but we can always grow up.

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A vertical aeroponic farm in Kenya.