

Hydroponics: An Exciting Solution to the Challenge of Urban Farming.

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Lake Texcoco, Mexico City, Mexico.



There's a new green food growing paradigm on the horizon, and with any luck, it's gathering strength and speed and heading to a town, city or urban center near you, packing a far more nutrient dense punch to produce than our culture has experienced to date! While the hydroponic growing of produce may not be a brand new idea, the new paradigm I am speaking of, I believe to be the way of the future, particularly for those who live in the more densely populated areas of this great land.

First, a definition and explanation of hydroponics is in order. The literal definition of the word, first coined in 1937 by William Frederick Gericke of the University of California at Berkeley, was formed in English from hydro, combining form of ancient Greek *hýdōr* meaning "water" + ponics from the ancient Greek term *geoponics* defined as "the art or science of agriculture."ⁱ

Hydroponics has been around for a long time. It is believed that the Hanging Gardens of Babylon (Mesopotamia circa 600 B.C.) may have functioned somewhat on hydroponic principles. The area was arid, seeing rain only rarely, but with the gardens being built on the Euphrates river (just the name conjures romance!), the gardens could be watered using a chain pull system, carrying water up from the river, and allowing it to trickle

down to each landing of the garden.ⁱⁱ The Aztecs developed floating garden systems in the largest city of their culture, Tenochtitlan, built on a swampy island in the middle of Lake Texcoco, founded in A.D. 1325 and now a part of present day Mexico City. Crops would not grow in the marshy soil so the Aztecs built rafts from reeds and roots, topped them with a bit of soil from the lake bottom, and then floated them out to the center of the lake, where the crops could grow on top of the rafts with the roots reaching down into the water.ⁱⁱⁱ Voila! Hydroponics, Aztec style! To this day, Aztec descendants still cultivate some of these floating gardens near Mexico City.

The 1627 book *Sylva Sylvarum* by Francis Bacon, printed a year after his death, is the earliest known published work on growing terrestrial plants without soil. Various botanists through the centuries discovered that plants grown in distilled water did not do as well as those grown in less pure, mineral nutrient rich solutions.^{iv}

First using the term aquaculture (later dropped, as the word was already being used) for this "new" way of growing plants, Gericke began promoting the idea that solution culture be substituted for agricultural crop production.^{v,vi} He created quite a stir growing 25-foot high tomato vines in his back yard, using

mineral nutrient solutions rather than soil.^{vii}

When two other plant nutritionists (Dennis R Hoagland and Daniel I. Arnon), also at the U of C, were asked to research Gericke's claims, they concluded that hydroponic crop yields were no better than those from good-quality soils, as they believed that crop yields were limited ultimately by factors other than mineral nutrients, primarily light.^{viii} These findings however, overlooked many other hydroponic advantages, not the least of which is that when implemented indoors, light sources can be controlled for hydroponic growing!

Here is a list of some of the additional advantages of hydroponic growing of plants:

- No soil is needed, allowing food to be grown virtually anywhere, including places where food has not traditionally been easily cultivated (inner cities, deserts, etc.)
- No toxic pesticides, herbicides nor fungicides need be used, as indoor growing/maintenance precludes the need for their use.
- There is no more fertilizer run-off, which pollutes ground water as well as waterways, all leading eventually to oceans.

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- A controlled environment is not subject to the extremes of weather (drought, flooding, heat, and cold) allowing consistent, stable, high yields.
- Control of nutrition values in the food is possible by the control of mineral nutrients in the growing solution.
- Water is conserved, as it remains in the system, can be filtered and reused, re-applying high-quality nutrient solutions. Hydroponic growing of plants only uses approximately 10% of the amount of water that necessary for soil-based agriculture.
- Ease of harvest takes less time and energy, and is easier on the workers.
- Shorter harvest times allow more yield, as plants grown hydroponically have direct access to water and nutrients and therefore, are not forced to develop extensive root systems to allow them to find the nutrients they need. This saves time and produces healthier, lusher plants in about half the time as traditional agriculture.
- Hydroponic crops are not subject to the usual air pollution so often present with regular agriculture.
- No pollution from farm equipment is released into the air; as such equipment is not necessary.
- Reduction in price and greenhouse emissions due to reduced transportation needs, as hydroponics allows food to be grown locally.

The only caution with regard to hydroponics that occurs to me is that without the buffer of soil, if the system fails for any reason, plant death is quite rapid. Also, although initial, up front costs for hydroponics are traditionally much higher than with soil-based agriculture, the costs are typically much lower over time.

NASA has extensively studied the use of hydroponics, which they conclude would benefit current and future space exploration in various ways, including possible extra-terrestrial colonization! As transporting soil is impractical, hydroponics would allow extended space travel with fresh, varied, nutrient dense,



food sources made available to the travelers. In addition, the growing of plants in the enclosed confines of space vehicles, space stations, and even stations on other planets, allows for the absorption of carbon dioxide and the providing of renewed oxygen, enabling humans to breathe in otherwise inhospitable circumstances. It is the stuff of science fiction becoming science-fact!^x

Well, we have briefly taken a look at the beginnings of hydroponics and projected ourselves into the possible future of hydroponics. All of these musings now bring me full circle to how I started this article, referring to the new hydroponics paradigm. What could possibly be new about something that has its roots firmly anchored in history? What other problems of our modern world can be addressed with the growing of plants in water rather than soil? What issues are uppermost on the minds of so many Americans these days?

Climate change is already affecting weather patterns with more violent shifts coming more rapidly. Extremes of heat and cold, rainfall and drought are negatively affecting crop growth. Mineral depleted soil from many decades of incorrect farming practices is rendering agriculturally grown crops far less nutrient dense than the crops of our ancestors. Forced hybridization and GMOs are further compromising food sources, causing untold suffering in human and animal populations. Chronic, debilitating diseases as a result of the overuse of pesticides, fungicides and herbicides in addition to the meddling of companies like Monsanto, are rampant, causing further misery with an enormous negative impact on our economy due to healthcare costs. Toxic run-off is polluting our oceans and waterways.

Overpopulation is depleting food sources at an alarming rate and it is projected that

by the year 2050 the world population will have reached 9.6 billion,^{xi,xii} three times what it was during my childhood! Climate change coupled with over-population, leading to a lack of food and water, will cause mass migrations of large groups of people, looking for water, food and work. Unemployment continues to be a great concern for the American people as well as for the rest of the world.

One solution that will help mitigate the effects of virtually all of the dire circumstances I have described in the above paragraphs is hydroponics. The vertical plant-growing method, which refers to the growing of greens in racks that can be stacked vertically, saving valuable space. Plants just need a blend of sunlight, water, carbon dioxide and minerals to work their magic through photosynthesis, allowing them to grow and be self-sustaining by transforming light energy into chemical energy.

Humans eat these plants to transfer the original light energy into themselves. The minerals required for the process can be found in soil, but soil itself is not required for the process. With proper attention paid to the quality of water, minerals, and sources of light, hydroponics allows for the fast growing of nutrient dense, living food in areas where people live. It does not have to be transported across great distances, at great expense and loss of nutrient content.

Intense growing of food in urban settings can create jobs in areas where formerly there were none. Populations with low incomes and high rates of unemployment are typically forced into eating health compromising fast foods, due to a lack of funds and access to toxic-free. Hydroponics allows them access to nutrient dense foods and the opportunity to not only find healthy food at

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reasonable prices near them, but also to find work in hydroponics companies right in their own neighborhoods, as under-utilized urban settings are ideal locations for hydroponic growing. In Japan, where the population growth is rapid, land is extremely limited and therefore valuable. The country has successfully turned to hydroponic rice and greens growing.^{xiii} Instead of the traditional single harvest of rice a year, there are now four cycles of harvests. Israel is also using hydroponics very successfully to grow nutrient-dense foods in the desert.

Now, we move on to the subject nearest and dearest to we NTP's; that of nutrient content. Epidemiological studies are showing that diet has a statistically significant influence on the prevention of chronic diseases such as heart disease, cancer, diabetes and Alzheimer's disease.^{xiv,xv,xvi,xvii,xviii}

We, as nutritional therapy practitioners know this already, but we also know that studies help to convince others who do not have our training and knowledge. Institutions such as Sloan Kettering, Mayo Clinic, Cleveland Clinic, Yale and Harvard are all finally making room for nutrition in their integrative practices.

Micro greens, which at present are the subject of on-going, specific studies with regard to their effects on health,^{xix} are proving to be an extremely powerful and unique source of phytonutrients, ones that even the USDA calls an emerging class of food that can reach pharmacological density in relatively small amounts.

In addition to my NTP practice, I am now a part of a new company dedicated to the hydroponic growing (from organic seeds) of micro greens, leafy greens and herbs in urban settings. With a goal of bringing health-giving and sustaining nutrition as well as jobs to communities that so desperately need them.

It is our mission to keep opening indoor hydroponic farms in urban areas across the USA. As an NTP and as a world citizen, I am proud to be part of this peaceful revolution; a new paradigm for food growing that can help save our



planet. My concern is that once big business sees the potential for great profits in this arena, hydroponics may be compromised for monetary gain. I urge each and every one of you to become involved and support local growers.

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