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REVIEW ARTICLE

PHARMACOGNOSY

"HYDROPONICS"- A NOVEL ALTERNATIVE FOR GEOPONIC CULTIVATION OF MEDICINAL PLANTS AND FOOD CROPS

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ABSTRACT

The increased population, sub-urbanization of the forest (excluding land for commercial food production), improper agricultural practice which altered the soil pH, synthetic fertilizers, pesticides which drastically reduced the soil flora and fertility which made a quench for the new alternative technique for obtaining the food and medicinal plants of better quality, yield and for growing fresh produce in non-arable areas of the world. Consumption of herbal medicines is widespread and increasing. Harvesting from the wild, the main source of raw material is causing loss of genetic diversity and habitat destruction. Hydroponics was found to be better alternative and can be defined as the cultivation of plants without soil, which is being commercially used in the most of the western countries. This study explores the applications of this cultivation technique and to reveal its future importance. This technique can be adapted to almost all the terrestrial plants. Vegetable food crops like wheat, tomato, marijuana, dill and many more plants are being cultivated in commercial scale. The construction of a hydroponic system requires an initial investment, hard work, and care. Better the yield will be, if approached as it needs. It was recommended that this technique can be adapted as a step to produce the food crops and medicinal plants to meet the global demand, to control the global warming, and there by conserving the Mother Nature for the better future.

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KEY WORDS

Hydroponics, Terrestrial plants, Mother Nature.

INTRODUCTION [1]

The word 'Hydroponics' was coined by Dr. W.F. Gericke in 1936 to describe the cultivation of edible and ornamental plants grown in a solution of water and dissolved nutrients. It literally means working water; 'hydro' meaning 'water' and 'ponos' meaning 'labour'. For example, the hanging gardens of Babylon and the floating gardens of the Aztecs of Mexico and those of the Chinese. The first commercial hydroponic unit in the USA developed by Gericke in 1930. American forces employed this system in the Pacific to produce vegetables during World War II. In 1842 a list of nine elements believed to be essential to plant growth had been made out, based on the discoveries of the German botanists, Julius von Sachs and Wilhelm Knop. Solution culture is now considered a type of hydroponics where there is no inert medium. Today, it is a well know fact that in some parts of the world, plant life does not grow in the available soil.

One reason behind the drive to develop hydroponics was the need for growing fresh produce in non-arable areas of the world. Consumption of herbal medicines is widespread and increasing. Harvesting from the wild, the main source of raw material, is causing loss of genetic diversity and habitat destruction. Domestic cultivation is a viable alternative and offers the opportunity to overcome the problems that are inherent in herbal extracts, misidentification, genetic and phenotypic variability, extract variability and instability, toxic components and contaminants.

The use of controlled environments can overcome cultivation difficulties and could be a means to manipulate phenotypic variation in bioactive compounds.

When it comes to being environment friendly, hydroponics is beneficial over geoponics, mainly because these methods do not promote the use of chemicals fertilizers or pesticides. NASA have a list of 15 plants, grown using hydroponics that will save our life (should the need ever arise).

THE GREAT ADVANTAGES OF HYDROPONICS GARDENING OVER CLASSIC GEOPONICS GARDENING

SI.NO	HYDROPONICS	GEOPONICS
1.	Hydroponics gardening can be packed and kept it alive and fresh for longer periods of time.	Plant is killed when it is removed from the ground.
2.	Hydroponics gardening doesn't even use any kind of solid medium.	In this type of gardening we have to dispose, sterilize and reuse a solid medium every time.
3.	Full control of the plant's root system and in eye contact always.	Roots are hidden in the ground.
4.	No need to worry about over watering or under watering.	Always have to change and adjust your watering techniques according to the weather and the soil condition.
5.	It can be developed in areas where there's	Geoponics gardening should always be

	no quality soil present.E.g. In areas covered with snow or in a space station.	developed in quality soil in order to produce best crops.
6.	An excellent plant research and plant learning tool and can be transferred anywhere without any hassle.	Studies on geoponics plant you have to be conducted at the place where the plant grows.
7.	In hydroponics gardening there is no soil at all no weeds and no pesticides of course.	Plants grown with geoponics methods may suffer from all kinds of diseases, pesticides, weeds etc. caused by the presence of soil.
8.	The use of water to maintain and preserve the plant can be dramatically reduced.	Always more water is used than need for irrigation.
9.	A hydroponics garden may be set up with timer systems to automatically fertilize the plants.	Fertilizing the plants is always a pain and most of the times it must be done manually.
10.	Healthier because they receive a balanced and controllable portion of nutrients.	In geoponics the plant's nutrition cannot be assured because there are too many factors to consider, for example whether the soil already contains enough minerals to grow the plants or whether it should be enriched with the right mix of minerals etc.
11.	Stable, safe and high yields.	Unstable and the Yield vary according to surrounding condition.

The extension of the growing season is not the only advantage contributing to the growing popularity of hydroponics production with both growers and consumers. There are several additional advantages as well including nutritious, healthy and clean produce, improved and consistent vegetable quality and elimination of the use of pesticides and herbicides. Pesticides and other chemicals used in conventional agriculture have an adverse environmental impact; the runoff from these chemicals, contaminates groundwater supplies. Commercial hydroponics systems eliminate these toxic chemicals and contribute substantially to keeping the groundwater free from contamination.

SOME LIMITATIONS OF HYDROPONICS GARDEN

Hydroponics gardening usually relies in electrical systems like timers or pumps. These systems control critical aspects of the plant's nutrition routine. If any of the system fails it could result to the total destruction of the plant. In geoponics gardening water and is added and the soil will do the rest. For hydroponics gardening need more technical knowledge and information on various subjects (different solutions and mediums, types of irrigation, various materials etc.) while in geoponics gardening the rules are pretty standard and well known to almost everybody. Hydroponics plants require close attention, care and support and will die if not frequently monitored while geoponics plants do not require such close attention.

PLANTS GROWN HYDROPONICALLY [2] [3]

It is practically possible to grow any types of fruit, vegetable, herb etc. using this technique. *Hiercium pilosella*, *Hypericum perporatum*, *Arnica montana*, *Ocimum basilium* (basil), *Anethum gravel* (dill), *Chrysanthemum partherium*, *Aloe vera*, *Mentha spp*.(mint), *Rumex officinalis* (French. sorrel), *Rosemary officinalis* (rosemary), St.john's wort,

cucumber, spinach, chili, lettuce, broccoli, pepper, petunias, tomatoes, cabbage, green peas, echinacea, ginseng, thyme, tarragon, spearmint, peppermint, sorrel, sage, oregano, marjoram, mache, leman baln, coriander, chives, chervil, aurugula, potatoes, and many other are the popular choice of vegetables that can be grown using hydroponics. Similarly, fruits such as strawberries, watermelons and cantaloupes can also be grown using hydroponic gardening at home. Flowers show a better bloom when grown hydroponically. Growing plants hydroponically is not only easy but also effective in terms of end product. The entire hydroponic system can be made automated, so that it can be even controlled from another country. Mostly basic systems are preferred. Hydroponics allows us to grow vegetables and fruits inside our apartment.

HYDROPONIC TECHNIQUES AND THEIR CLASSIFICATION [4]

1. ***Wick Hydroponic System***
   The wick hydroponic system is the simplest and typically the most inexpensive system and it is a "passive system", which means that it does not have any moving parts. It works by drawing the necessary nutrients into the growing medium from a reservoir with a wick. This should only really be used for smaller plants that do not require much nutrients or moisture, as the wicks cannot supply the plants with these things very quickly.

2. ***Ebb and Flow Hydroponic System***
   The Ebb and Flow system, which is sometimes referred to as the "Flood and Drain" system, is a much more advanced and complicated system. This system works by using a pump that is placed into the reservoir to regularly flood the grow tray with the nutrient solution and then draining it back into the reservoir. The pump floods the tray or bucket at regular intervals for a set period of time by using a timer. The advantage of the bucket or modular system is that each plant is grown in its own container and therefore can be moved or handled much more easily.

3. ***Nutrient Film Technique***
   This system delivers a constant flow of nutrients to the plants with a pump, so no timer is required. This system doesn't require a growing medium; the plants are simply suspended in a plastic tray with the roots dangling in a nutrient solution.

4. ***Drip Irrigation Hydroponic System***
   In this system, a timer delivers the nutrient solution through the base of each plant through drippers. Continuous drip systems can be recovery or non-recovery, meaning that the used nutrient solution can either be returned to the reservoir or run off as waste. Recovery systems are more cost effective because they use the nutrient solution more effectively, but non-recovery systems require less maintenance because the pH balance and nutrient strength remains constant.

5. ***Aeroponic Hydroponic System***
   Aeroponics is a newer and more high tech method of hydroponic growing. There is no growing medium as like the nutrient film technique. The plants are suspended with the roots in the air and the nutrients and moisture are supplied in the form of a mist. A timer ensures that the pump delivers a new spray of mist every few minutes. Like the nutrient film technique, it is imperative that the pump is always functioning correctly, because even a brief interruption can cause the roots to dry out. Root Mist Technique (RMT) and Fog Feed Technique (FFT) are the two important Aerophonic Hydroponic Techniques in use.

6. ***Grow Bag Technique***

Thoroughly soak the medium in the grow bag with dilute nutrient solution, before inserting the plants. Plants should receive nutrient when required. Use a plastic watering can or drippers to apply the nutrient solution.

7. ***Sub-irrigation***

This system is based on the capillary action of the growing medium which carries the nutrient solution up to the root growing zone. In this particular method a pot is permanently left to sit in nutrient solution. When river sand is used as the growing medium, the nutrient will rise approximately 15 cm above the level of the solution.

8. ***Rock Wool Technique:***

Horticultural Rockwool can be used as a soilless growing medium. The Rockwool referred to is a horticultural grade of Rockwool capable of absorbing water and made to a specific density. Standard thermal Rockwool products should not be used as these are water repellent, and may have toxic fire retardants. The advantage of using Rockwool as a growing medium lies in the fact that the plants at no point need to be removed from the Rockwool.

Deep Flow Technique – (DFT), Root Dipping Technique, Floating Technique, Capillary Action Technique, Trench or Trough Technique, Pot Technique, Deep Water Culture (DWC), Surface Watering Technique and Soak and Drain are the other hydroponic techniques.

BASIC REQUIREMENTS OF HYDROPONICS [4]

Growing Medium

The growing medium for hydroponic gardening is an inert medium which does not provide any nutrients to the plant. It only provides the basis for the roots to grow in. Coco coir fiber, Rockwool, Perlite, Vermiculite, LECA, Expanded clay, Crushed granite, Sand, Scoria, Gravel are the various types of growing mediums available for growing plants hydroponically.

A growing medium allows us to add the correct amount of nutrients and also monitor the pH in a hydroponic system. In addition, using a growing medium other than soil has several advantages that include:

1. Prevention of root infestations,
2. Retention of adequate oxygen and water and
3. Increased aeration and draining.

Mineral Nutrients[5][7]

There are approximately seventeen elements required for proper growth of hydroponic plants.

A) Macro-nutrients

1. Carbon – Formation of organic compounds, 2. Oxygen- Release of energy from sugar, 3. Hydrogen- Water formation, 4. Nitrogen- Chlorophyll, Amino Acids and Proteins synthesis, 5. Phosphorus- Vital for photosynthesis and growth, 6. Potassium- Enzyme activity , 7. Calcium- Cell growth, cell division and the components of cell wall, 8. Magnesium-Component of chlorophyll, enzyme activation, 9. Sulfur- Formation of Amino Acids and Proteins.

B) Micro- nutrients

10. Iron- Used in Photosynthesis, 11. Boron – Vital for reproduction, 12. Chlorine - Helps root growth, 13. Copper- Enzyme activation, 14. Manganese- Component of

chlorophyll, Enzyme activation, 15. Zinc- Component of enzymes and auxins, 16. Molybdenum- Nitrogen fixation, 17. Cobalt- Nitrogen fixation.

Other elements like Sodium- Vital for water movement, Nickel- Nitrogen liberation, Silicon- Cell wall toughness, can also be used.

Nutrient solution[6]

Most herbs grow well with a basic nutrient solution. Many readymade choices are available. Care must be taken to avoid minor nutrient deficiencies. Several different herbs may be grown in a single nutrient solution.

Elements	N	P	K	Ca	Mg	Mn	Fe	Cu	B	Zn	Ma
ppm	210	70	300	180	67	1.25	3.0	0.26	0.5	0.40	0.06

The E.C. (electrical conductivity) of this formula should be approximately 2.5 and the pH adjusted to 5.5 - 6.5. If the day length is below 11 hours, the E.C. should be increased to 3.0-3.6, but the concentration of nitrogen kept at 210 ppm. Under these conditions, a smaller root system develops and more energy is available for shoot (vegetative) growth. The higher E.C. ensures adequate nutrition even with a smaller root system.

Following seeding or root cuttings, the first watering should be with a half-strength nutrient solution, pH 5.8; however, the phosphorous concentration should be maintained at 80 ppm. Following germination, or after the first root initiate on the cuttings, the full strength nutrient solution should be used.

Temperature

Temperature affects plant in two ways. High temperatures tend to accelerate the growth of the plant which increases the plant need for water. High temperatures also increase the plants consumption of water for cooling itself through evaporation.

Air

Wind or air movement has a dramatic influence on the plants consumption of water particularly when combined with high temperature in much the same way as clothes dry much faster on our clothes line on a windy day. In some plants it helps in pollination.

Shelter and support

Shelter for hydroponic gardening depends upon the type of cultivation to be carried out. The cultivation of the vegetables for the household gardening backyard waste land or the terrace is sufficient. The commercial production of the food crops and the medicinal plants requires the large area. Supporting arrangements can be made depending on the type of plant grown which may help in the increased yield.

Water

As a general rule, all water suitable to drink or used to irrigate greenhouses is ideal for hydroponics. To be more precise, water suitable for hydroponics should have conductivity less than 500 uS/cm, or a total salt concentration less than 350 ppm. Harmful amounts of sodium and boron can cause problems in some areas. Very soft water should be used with calcium-containing nutrients.

Light

Areas that already get sunlight will need fewer hydroponic lights than a hydroponic garden grown in a fully enclosed room. Remember that sunlight is less predictable than artificial lighting. If greenhouse is used to grow hydroponic garden, it won't need much artificial light during the spring and summer. Expect to supplement the sun with hydroponic lights once the amount of available light begins

to wane. Indoor growers often rely almost completely on artificial light, since limited amounts of sunlight gets to their plants.

LED (Light Emitting Diode) Grow Lights for Hydroponic Gardens[8]

LED grow lights are becoming very popular for hydroponic gardening due to cost of maintenance. The technology of LED grow lights is to emit only the color spectrum required for the plant photosynthesis. Hence, they consume less amount of electricity in comparison to the traditional lighting system and other grow lights. On an average, a LED grow light consumes less than 5 watts of power for operation.

In LED grow lights, wide-spectrum red light and narrow-spectrum blue light of specific wavelengths are configured in a particular manner. The red spectrum supplements natural sun rays, whereas the blue spectrum makes an ideal light for the plant growth. Thus, LED grow lights provide ideal light conditions for the better growth of all types of plants and/or crops. In addition, this lighting system contains no toxic mercury, which is used in fluorescent lights and metallic vapor.

Another advantage of LED grow lights is the less production of heat. With minimum heat production, water requirement also reduces due to less evaporation. The problem of high temperature root damage and plant dehydration is thus solved by using LED grow lights. Hence, with this lighting system, there is no need for installation of fans or cooling ducts.

As these grow lights are available readily with plugs, no ballast is required for the initiation and regulation of the lights. Thus, there is no problem for ballast burning and/or replacement, which is so in case of fluorescent bulbs. LED grow lights are long-lasting; a superior quality may last for 10-12 years. Overall, LED grow lights are easier to maintain and cheaper than other lighting systems used for hydroponic gardening.

Fluorescent bulb for small scale herbal garden HID (High Intensity Discharge) hydroponic lights for fruits and vegetables and metal halide for flowers and fruits are some of the other light sources.

PLANT PROPAGATION BY HYDROPONICS

The term propagation refers to starting of plants. There are two methods that are most widely used for plant propagation in hydroponics. These are seed germination and rooting cuttings (cloning).

Rockwool is the most popular propagating medium and is used as blocks or in loose or granular form. Rockwool blocks are 1" cube in size with a hole ¼" deep at the centre. A flat of 98 such blocks fit into a standard tray. The Rockwool blocks are soaked and pH balanced and one seed is placed in the hold. The seeds are then covered with a thin layer of Vermiculite or Perlite. The tray is then covered with a lid. When the seeds germinate the cubes are separated and placed into bigger growing cubes or other aggregate.

Blocks loose or granulated Rockwool is also popular with hydroponics producers. Loose or granulated Rockwool is taken in a standard plastic starting tray and the seeds are spread evenly on the medium. The seeds are then covered with a thin layer or Rockwool or Perlite and the tray is then covered to prevent loss of moisture.

Cloning is a method of asexual propagation in which stem cuttings from a healthy plant are taken and then rooted. Most plants can be propagated using this method of asexual propagation. Cloning produces plants that are exact genetic duplicates of the original. These mature much faster which saves a lot of time. As oxygen is vital to the development of roots air pumps are often used to provide a steady supply of oxygen to the cuttings. Rockwool cubes, pH balanced with their flats soaked in a diluted, high phosphorus nutrient solution are widely used as propagation medium.

Using a clean, sharp blade, a small branch consisting of a growing tip with two or

three leaves is cut. This clipping is then allowed to stand in water as the next clipping is cut. The procedure is repeated until the required number of clippings has been taken. A fresh cut is then made on each cutting just above the first cut. The clippings are then dipped in a rooting compound and inserted one inch deep into the rooting cube. The tray is then covered with a plastic dome to retain humidity and the plants are allowed to grow exposed to 18 hours of diffused light every day. As the plants will need fresh air for growth, the cover is removed for a few minutes every day. Mild foliar feed like kelp extract is used to mist the cuttings. The formation of roots can be checked by giving the plants a mild tug. Once the roots have formed the clones are transplanted. Following a good nutrient regime and keeping it simple will go a long way to ensure adequate uptake of all the essential nutrients. It is advisable not to use too many formulations as it may be very difficult to trace the exact cause of the problem if there are many additives and supplements in the nutrient mix.

Growth Enhancers, Boosters and Fortifiers

Certain commercial products have been developed that can stimulate faster nutrient uptake and speed up stem and leaf growth. Many of these products are best left to the advanced and experienced growers. Novice hydroponics enthusiasts approach such products like growth boosters with caution. There are several products available in the market that claim to work as bloom fortifiers. These formulations act to stimulate flowering and increase essential oils in plants. A bloom fortifier can be selected with an NPK (Nitrogen, Phosphorus, Potassium) ratio of 0-50-30. Such fortifiers have no Nitrogen and are rich in Phosphorus and Potassium. These essential minerals stimulate the formation of super blooms.

Organic Formulations

Organic gardening has caught on in recent years and the hydroponics industry has sought to integrate organic growing practices in hydroponics cultivation. Several organic formulations have been successfully developed, tested and marketed. Organic formulas for use in hydroponics should be soluble, stand-alone products that leave no sediment in the container. Ensure that the organic formula does not require shaking prior to use as any sediment is likely to clog lines and pumps. Also take note that organic formulations meant for soil cultivated plants are not suitable for use in hydroponics as these will clog the pumps and lines resulting in burning of plants.

OTHER CONSIDERATIONS

Plants need to have fresh nutrients available for healthy growth. Ensuring regular reservoir changes every week is essential. pH and electro conductivity should be checked while mixing the nutrient solution. While the electro conductivity reading will help determine the amount of dissolved nutrients, the pH reading will help in maintaining pH values at levels that will enable plants to absorb the nutrients. Leaching or rinsing should be carried out as required. This can be done using regular tap water through the system to wash out excess salts that remain in the growing medium. Keeping a gardening journal will help in avoiding mistakes and establish pointers to the right course of action. Making journal entries regularly will, in course of time, help build up a veritable treasure trove of valuable information on various aspects of nutrition, pH, E.C. etc.

COMMERCIAL HYDROPONICS

Successful application of hydroponics techniques in the 1930s the technique shifts in crop production from conventional geoponics or cultivation in soil to hydroponics or soil less cultivation. The first crops to be commercially harvested with hydroponics included tomatoes and peppers, but the techniques were soon successfully extended to other crops such as

lettuce, cucumbers and others. It was not long before hydroponics techniques were successfully adapted even to cut flowers production; in fact any plant can today be grown hydroponically.

COMMERCIAL SYSTEMS OVERVIEW

Commercial hydroponics systems can be classified into bare root systems comprising Nutrient Film Technique (NFT), Deep flow and Aeroponics systems and Substrate systems. Bare root systems do not use media to anchor the plant roots; the roots are left bare while in substrate systems plant roots are anchored in media such as Perlite, Vermiculite, Sawdust, Peat etc. Hydroponics is basically all about growing plants in a controlled environment and this is best provided outdoors in greenhouses that can incorporate several means to monitor, regulate and control the environment inside them. For instance, the air entering the greenhouse can be filtered to exclude entry to pests and parasites that can harm plant growth. Such means help provide optimal conditions for plant growth both in and out of season. Hydroponics allows cultivation throughout the year which makes for year round availability of hydroponically grown produce at all major supermarkets across North America. Valued at 2.4 billion dollars the hydroponic greenhouse vegetable industry has a growth rate of 10 percent per year and accounts for nearly 95 percent of the greenhouse vegetables produced in North America.

YIELDS

Commercial hydroponics systems have proved more productive than conventional systems of agriculture not only in the laboratory but even in actual practice. Most commercial hydroponics greenhouse facilities are built large to take advantage of economies of scale; typically these cover areas more than 10 acres while smaller ones measure around 2 acres. In the research greenhouse, yields with hydroponics techniques have averaged around 20 to 25% higher than in conventional soil cultivation. In actual commercial practice, however, over a number of years, the yield of hydroponically grown tomatoes can be more than double that of soil based systems due to the reduced turnover time between crops, better nutrition and crop management. Additionally commercial hydroponics growing techniques are also less demanding of chemicals for root zone sterilization and control of pests, weeds etc.

The dramatic increase in yields with hydroponics is best illustrated if we consider the actual production figures of soil grown and hydroponically grown produce. Field grown tomatoes average yields ranging between 40,000 to 60, 000 pounds per acre; on the other hand top growing hydroponics facilities in the US and Canada report average yields of more than 650,000 pounds of tomatoes per acre. Additionally, given the fact that only 10 years ago top hydroponics producers were producing around 400,000 pounds per acre, the increase in yields with improvements in growing practices has been truly phenomenal. Similar production figures can be quoted for other agricultural produce like cucumbers with 10,000 pounds per acre for field production and 200,000 pounds per acre for hydroponic greenhouse yields. Hydroponics lettuce and pepper yields too average around four times the corresponding yields of agricultural production.

AEROPONICS FOR ROOT CULTIVATION [10]

Aeroponics is a form of hydroponic plant cultivation in which plant roots are suspended in a closed chamber and misted with a complete nutrient solution. Aeroponics requires no solid or aggregate growing medium and allows for easy access to roots. The chamber and misting system provide complete control of the root zone environment, including temperature, nutrient level, pH, humidity, misting frequency and duration, and oxygen availability. 1) Clean root material free of soil, soil-borne organisms, or adulteration from

foreign plant species contaminants, 2) Potential for improved root yield and phytochemical consistency due to uniform nutrient and water availability, and reduced risk of diseases. The report show excellent in yield and phytochemical constituent uniformity.

GLOBAL TRENDS[11]

According to recent estimates countries having substantial commercial hydroponics production area include Israel 30,000 acres, Holland 10,000 acres, England 4,200 acres and Australia and New Zealand around 8,000 acres .The fastest growing area for commercial vegetable greenhouses is Mexico. There are several reasons for this including free trade and favourable winter conditions that attract vegetable growers in large numbers. Mexico has summers that are considered hot in the summer, but with greenhouses located at the right altitudes vegetables can be grown in the hot summers as well as the cold winters. Though much of the produce comes from low tech plastic houses, many of these greenhouses use hydroponics technology, which indicates the growing popularity of hydroponics in commercial food production.

FUTURE TRENDS

Rapidly reducing agricultural lands, decrease in the quality and quantity of the food crops and medicinal herbs yield due to poor agricultural practice with the use of artificial fertilizers, pollution of ground water reserve by the plastic and chemical contaminants from various sources, increasing global population, increasing global demand for the good quality medicinal plants in large bulk and the rapidly progressing technology may develop a trend to depend on this hydroponic technique for the agriculture in the future .

CONCLUSION

These days the land is lost at such a rapid rate, that there is no telling how soon the land will run out for develop. If the growth continued at such a speed eventually the only land that will still be able to be developed is farmland. We will have no more room for our crops that we grow to survive. This has been a potential issue for years which is why scientists have developed another way to grow food and plants without utilizing land which is a fast depleting resource.
The great thing about hydroponics growing is that anyone can do it. If you have the knowledge and the right equipment you can do it yourself out of your home. This means that individuals that live in downtown areas and have no yard space for a garden can grow vegetables and fruits and herbs without having to trudge down to the grocery every day.

The equipment to grow plants using a hydroponics system is easy to obtain and can be easily picked up at a local store or over the internet.

As previously stated, the land that we have here on earth is a valuable but rapidly depleting resource. There is no way to recover more once we use all of it up. The only answer to this is to learn alternate methods to do things that take up the majority of our usable land. Farming is that thing and hydroponics is a way to cure the problem.

Hydroponics is popular not just as a way to produce larger, healthier, and more flavorful foods on a large scale, but also as a household hobby. Simple hydroponic systems can help people grow herbs, flowers, or vegetables in their basement, in a large closet or even on their kitchen counter.

Many people look to hydroponics as the way the most food may be grown in the future. As the amount of arable land diminishes each year, hydroponics may be the answer to sustaining the world's food supply because of its ability to produce larger yields using a smaller amount of space. NASA has experimented with hydroponics as a means of growing vegetables in space.

With increased awareness of damaging chemicals and pesticides used in traditional gardening, the need arose for a better way of growing plants that will continue to evolve. The future of hydroponic growing is bright and is being embraced by many, from individual hobbyists to large factory farms. Hydroponic gardening has become one of the many ways people can go green. Hydroponics is the only way that in the future by which food crops and medicinal plants can be grown to sustain the earth. Hydroponics is the future of farming.

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