

4. HOW HYDROPONICS IS DIFFERENT FROM CONVENTIONAL METHOD OF FARMING?

Recalling our studies related to photosynthesis learnt in school level, we can remember core elements to plant growth as Sunlight, Nutrient, Water and Carbon dioxide. Hydroponics follows the same basic formula (Ellis et al., 2011). In this process conventional elements of traditional agriculture are substituted with artificial ones where:

- x Instead of sun, plant receive energy from LED lights that is tailored specifically to the energy need of plant,
- x Despite of soil, Seeds are planted in soil free growth medium such as coconut husk to provide seedling with surface to attach its root.
- x Plant root is immersed \ sprayed with the nutrient solution to fulfill its nutrient demand.

5. COMPONENTS OF HYDROPONICS

Basic components that all Hydroponic will require:

1. Growing Medium- Most commonly used as growing medium are sand, Rice husk, Gravels, Bark, Coconut fiber, Vermiculite etc. It holds all the nutrients that is needed for the crop.
2. Growing tray – It serve purpose of holding the plants and for these small pots are used.
3. Fresh water- With Balanced pH (6-6.5). Adjustment according to the crop demand can be done.
4. Nutrient solution- It is responsible for holding all the necessary nutrients required by crops/ plants. Changing of solution at fixed time interval is important.
5. Light- Farming inside house requires lighting that resembles that of sun for the photosynthesis process to happen.
6. Pump- Serves as pumping water / solution from the reservoir.
7. Air stone- Serve the purpose of adding oxygen into nutrient solution.

6. SOURCES OF NUTRIENTS

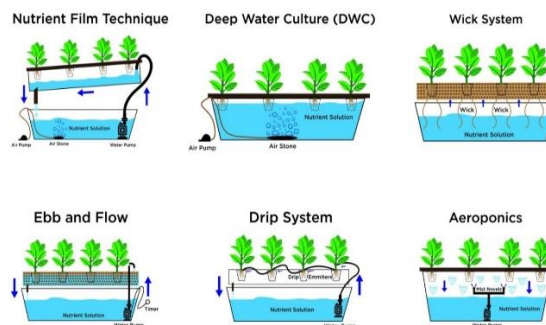
Source	Elements	Character
KNO ₃	N, K	Very soluble salt
Pot-phosphate, Monobasic (KH ₂ PO ₄)	P, K	Correct phosphorus
Mgso ₄	S, Mg	Cheap, Higher soluble
Iron chelate	Fe,	Best Iron source
Calcium Nitrate	Ca	Best calcium source
Boric acid	B	Best source of boron

7. TYPES OF HYDROPONIC FARMING

Most popular Hydroponics farming systems are:-

1. Wick system- It is the simplest of all, as nutrients are passively given to the plant from a wick or piece of string running up to the plant from the reservoir of solution. Capillary action is acting here to supply nutrient. This system work well for smaller plants, herbs.
2. Water Culture System- In this system, the root of the crops are completely immersed in the water and air is provided directly to the root by air stone.
3. Nutrient Film Technique (NFT)- In this method, the nutrient solution pass through the root continuously. A shallow stream of water solution containing all the dissolved nutrients required for plant growth is recirculated. The system is slightly tilted so that the nutrients run through shoot and down back to the reservoir. This system is commonly used for lettuce production.
4. Aeroponic system- It is a system where in roots are continuously or discontinuously kept in the environment saturated with fine drops of nutrients solution. This method require no substrate and entails growing plants with their root suspended in deep air with the root wetted periodically with a fine mist of atomized nutrients. Excellent aeration is the main advantage.

5. Drip system- Probably the most used hydroponic system: the nutrients solution and water are pumped from a reservoir to each plant using a small drip line. The pump is controlled by timer.



6. EBB and Flow system- EBB and Flow system is also known as flood and drain hydroponics, which is one of the highly recognized hydroponic systems. This hydroponics techniques works by flowing the growth media with nutrient solution for a certain period time and the unabsorbed nutrient is then fed back to the tank. Usually this hydroponics system uses timer for the water filling process which causes inefficient used of nutrient solution.

8. ADVANTAGE OF HYDROPONIC SYSTEM OVER TRADITIONAL SOIL GROWN CROP

- More efficient use of water up to 90%
- Production increases 3-10 times in same amount of space
- Produce healthy crop with high yield
- No chance of disease and pests
- Indoor farming is possible in controlled environment condition
- Environment friendly practice, no harm to nature
- Requires less labors.

9. POSSIBILITIES OF HYDROPONIC FARMING

- Training to the farmer for commercial level production using hydroponics
- Provide Hydroponic system at affordable rate or in subsidy
- Farming should be given more respectable profession so that youth can actively participate and contribute.

10. CHALLENGES

- ❖ Costlier system of farming
- ❖ Requires deep skill and practical knowledge for crop production
- ❖ Providing skill and training to all farmers is not an easy task

11. CROPS THAT CAN BE GROWN IN HYDROPONIC SYSTEM

- Tomatoes, Lettuce, radish, Spinach, Strawberries, Onions, Herbs, Kales, Cucumber, Beans, Cauliflowers, cabbage, etc.

12. HYDROPONICS FOR SUSTAINABLE FUTURE

Science and technology, in various forms have always played an important role in solving human issues and have exclusively been utilized for the development of novel strategies, method, tool, and products (Maharana and Koul, 2011). Using the hydroponic technology, we can grow crop in large scale in controlled environment and this technique is called as vertical farming. Vertical farms are building consisting countless number of hydroponic systems and can boost up the yield for the growing population (Singh and Singh, 2012).

13. TRENDING SCOPE IN HYDROPONIC SYSTEM

- In Tokyo, land is extremely valuable due to the increasing population. To fulfill calorie demand of the citizens while preserving valuable land mass, the country has switched to hydroponic rice production. The rice is harvested in underground vaults ignoring

the use of soil. As in the environment is perfectly controlled, four cycles of harvest can be performed annually, instead of the traditional single harvest.

- A company called Organitech in Israel has been growing crops in 40-foot (12.19-meter) long shipping containers, using hydroponic systems. They grow enough quantities of berries, citrus fruits and bananas, all of which couldn't normally be grown in Israel's climate i.e. dry and arid climate.
- NASA has extensive hydroponics research plans in space, which will benefit current space exploration, as well as future, long-term colonization of Mars or the Moon. As we haven't yet found soil that could support life in space, and the logistics of transporting soil through the space shuttles seems impractical, hydroponics could be key to the future of space exploration.

14. CONCLUSION

Hydroponic systems are highly effective technique used in several agricultural domains and also against the natural calamities like drought, flood, storms etc. It offers the pathway towards more sustainable agriculture. Although this system requires less numbers of labors but still expensive and very complex for normal farmers to use, but the productivity is high. It is possible to grow the vegetables crop round the

year in very limited spaces and low labours. This idea can be switched to commercial level of farming and availability should be made at affordable rate. Technical knowledge regarding this technique is to be disseminated among the peoples.

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