Agri Articles
(e-Magazine for Agricultural Articles)
Volume: 03, Issue: 01 (JAN-FEB, 2023)
Available online at http://www.agriarticles.com
©Agri Articles, ISSN: 2582-9882

Hydroponics Farming: A Holistic Approach and Effective Tool to Save Precious Resources of Agriculture

(*Senjam Jinus Singh, Prof. R.K. Imotomba Singh, Ningthoujam Sandhyarani Devi, Vandana Mutum, Kongkham Gobindchandra and Jack Ningthoujam)
School of Horticulture and School of Agricultural Sciences,
Pandit Deen Dayal Upadhyay Institute of Agricultural Sciences, Kameng Village and Utlou, Manipur, India
*Corresponding Author's email: singhsenjam@gmail.com

It is reported that half of the world's population will live in water-stressed areas by 2025. To prevent the worst situations such as drought, scarcity of water for irrigation which will make the cultivation of crops less profitable, it is crucial to conserve water. In irrigating plants, only about 0.1 percent of the water is taken in the root system of a crop. Some are then released into the air through evapo-transpiration and the rest wasted down deep into the surface.

In Hydroponics farming, the water is re-circulated and allows plants to absorb what they require, then the remaining water go back to the system. The water footprint evaluated that it takes about 68 liters of water to produce a kg of lettuce through traditional methods and 1 kg of tomatoes required 100 liters of water to produce. Also, for every 1 kg of potato we consume, 136 liters of water is required in the growing process. Hydroponic system can be easily accommodated within a hydroponic greenhouse or other structure or roof top and thus they can have their own micro-climates, protecting from many of the stresses that traditional growers mostly have to address. In dynamic balanced of micro-climates with controlled structures, crops can be grown for year-round with faster crop cycles, regardless of the climate or weather outside, thus, creating ideal conditions and ensuring hydroponics' plants to receive the balanced amount of nutrients at the proper schedule.

Water conservation is very crucial in this climate crisis era and hydroponics is an absolute tool and an agricultural solution to mitigate the consequences of climate change in India. Although many think that such smart soilless farming tools are costly and difficult to adopt, making it impractical in economically backward states mostly in North Eastern region of India, research reports at various regions have proved that with the use of hydroponics incorporated with smartly monitoring computerized tools has enabled to save grower's resources. This results in reducing the costs of irrigation, seeds, application of insecticides, reduction in excess fertilizer pollution of surface and ground water and thus simultaneously leading to reduction of soil and environment pollution and have better yields, and more net income per unit area by adjusting crop inputs in the hydroponics system over the traditional agriculture.

Above all consideration, the reduction of toxic insecticides as mentioned here puts production grown in this manner as good as with organic farming that could invite better produce and prices along with good health and environment friendly. From an economic point of view, the capability to manage the environment out-turns in a secure supply chain, price constancy, and durable commitment with merchandizer and retail markets, and high

income per square meter. Hydroponics systems, if built rightly, can lower labor liability and possible to build closer to urban areas. Such a win-win agricultural farming can be a resilience to climate crisis *viz.*, heat, flooding, droughts, pest epidemic and erratic rainfall. Moreover, one of the most frequently touted benefits of this farming is the sustainably use of water resources. For example, many vertical manner of hydroponics allows a 90%-95% reduction of water usage in comparison to open-field farming. In lettuce farming, according to Hoekstra, it was found that lettuce grown in an open-field setting required a global average of 130 L of freshwater per kilogram. In another findings, Barbosa *et al* reported that conventional lettuce grown in southwestern Arizona required 250 ± 25 L/kg *vs* 20 ± 3.8 L/kg for hydroponically grown lettuce.

Taking all these panacea mentioned above, for initial demonstration purposes in every districts of Manipur, a low-cost soilless farming system should be introduced and encourage the minds of younger generation and modern growers. With the objective to design, develop, adopt and analyze such a cost effective, scientific and climate friendly soilless farming system suitable for agro-ecological zones of North Eastern Regions, the soil, water, air and energy should be conserved for the future generation and ecosystem of the people.

The purpose of this article is to address the concepts and worth of soilless farming in its copious ways to ignite the mind of youth and farmers of Manipur to make our state resilient in the era of climate change. According to Council of Energy, Environment and Water (CEEW), Manipur ranks sixth and becomes the most vulnerable state to climate change in India. Being a drought affected zone, introduction of such holistic approach is an effective way to save the most precious resource of agricultural water and this "hydroponics" practices in every districts will helps lakhs of weaker section communities to mitigate climate change. Therefore, with the advent of climate crisis, supply chain upsets, skyrocketing in transportation levy, and the appetite to build sustainable agriculture in Manipur, soilless indoor farming is becoming an essential part of food production. Vertical way of hydroponics farms also allow growing on multiple levels by utilising the crowded space of city and high levels of control. Such farming system reduces the point-source production of GHG emissions *viz.*, methane, nitrogen, and carbon dioxide.

Therefore, it can be concluded that this farming mitigates the negative impacts of nutrients pollution, soil erosion and toxic pesticide use. Furthermore, this system of farming can stop the overly metamorphic destruction of existing land and forest for agriculture expansion. This also allows more lands to transform back to forest and promotes carbon sinking in the event of climate change.

References

1. W. Kern et al. (2016). Comparative evaluation of water footprint and produce losses in 'Española' lettuce cultivated under hydroponic and conventional soil systems. Acta Horticulturae. doi:10.17660/ActaHortic.2016.1141.31.
2. García-Caparrós, Pedro & Contreras, Juana & Baeza, Rafael & Segura, M. & Lao, Maria. (2017). Integral Management of Irrigation Water in Intensive Horticultural Systems of Almería. Sustainability. 9. 2271. 10.3390/su9122271.
3. Paolo Sambo et al. (2019). Hydroponic Solutions for Soilless Production Systems: Issues and Opportunities in a Smart Agriculture Perspective. Front. Plant Sci. https://doi.org/10.3389/fpls.2019.00923.
4. Mouroutoglou, C.; Kotsiras, A.; Ntatsi, G.; Savvas, D. Impact of the Hydroponic Cropping System on Growth, Yield, and Nutrition of a Greek Sweet Onion (Allium cepa L.) Landrace. *Horticulturae* 2021, *7*, 432. https://doi.org/10.3390/horticulturae7110432.

5. Huang Y, Miyauchi K, Inoue C, Endo G. Development of suitable hydroponics system for phytoremediation of arsenic-contaminated water using an arsenic hyperaccumulator plant Pteris vittata. Biosci Biotechnol Biochem. 2016;80(3):614-8. doi: 10.1080/09168451.2015.1107461. Epub 2015 Nov 7. PMID: 26549187.
6. Kreuzig, R., Haller-Jans, J., Bischoff, C. et al. Reclaimed water driven lettuce cultivation in a hydroponic system: the need of micropollutant removal by advanced wastewater treatment. Environ Sci Pollut Res 28, 50052–50062 (2021). https://doi.org/10.1007/s11356-021-14144-6.