

Mukilan N

Department of Agriculture Engineering
Nandha Engineering College
Erode, Tamil Nadu
India - 638052

Dhananivetha M

Department of Agriculture Engineering
Nandha Engineering College
Erode, Tamil Nadu
India - 638052

Rabi Ahamed M

Department of Agriculture Engineering
Nandha Engineering College
Erode, Tamil Nadu
India - 638052

Corresponding Author

Mukilan N
mukilannatesan18@gmail.com

Relation Between the Population Growth and the Practice of Soilless Culture

Cultivating enough food to feed the world's population comes with high environmental tag. "Agriculture is the backbone of India". Food is the primary source of energy for every living organism in the world. Due to the increase in the population growth of world, the requirement of energy source and food need is rapidly increasing. This population rise leads to increase in industrialization and in need of comfortable living space. So, that the land area requirement is quite reducing for cultivation of agriculture produce. To meet the supply and demand, there is in need to increase the intensity of crop production with no compensation in quality and quantity of the produce. This paves a way for the soilless culture to meet the demand of food scarcity.

INTRODUCTION

Agriculture is the primary work of the human beings in the earlier stage. As humans evolved, their way of doing agriculture practices and farming also evolved. The agriculture practice of world has dramatically changed over the past decades. This still continues to change because of the driving force continues still in place. Social development, rapid industrialization and technological advancements are the driving force which continues to changes in agriculture. There is increase in demand of high – value foods and ornamentals of high productivity du to increase in world's population, particularly for out-of-season, high-quality products. The population growth of the world also increases parallelly. In India the population is about 1.21 billion as per census data. Based on interpolation of the latest United Nations data, the present population of India is about 1.40 billion as of January 28, 2022. Population has raised compared to the population of India as

of July 1, 2021. In later year, the population of India is about 1.39 billion. While the population was projected at 1.38 billion people during the year 2020. China leads as the most populous country in the world, where India still counting on that. Probably, by 2027, according to analysis India will become the highest population country in the world with 1.47 billion people. And by 2030, India will cross the 1.5 billion milestones. This population increase leads to the rapid development of industrialization and needs a comfortable living space. According to the general studies, reported area which can be used for actual land utilisation is 308 million hectares. Total Net Sown Area as per data is 142 million hectares. The net sown area is only about 46 percent of 308 million hectares. Other lands are coming under area under non-agricultural uses, barren lands. In this most of the farmers are comes under the category of marginal and small holding farmers in India. The average size of land holdings is very small (less than 2 hectares) and is subject to fragmentation due to land ceiling acts, and in some cases, family disputes. So that to increase the production intensity and stay be competitive in market, farmers are in need of providing chemical fertilizers. The applying of chemical fertilizers starts to eradicate the strength of micro-organisms in the soil to produce more yield and it paves a way for disease prone plants. Due to this the agricultural products are easily prone to insect and pest attacks. To avoid this and to maintain the quality, protected cultivation plays a major role like greenhouse cultivation, Soilless culture and nursery gardening. This kind of protected cultivation can be easily done in apartments or rooftop or even in kitchen itself with their organic waste. This improves the productivity and also can meet the demand of their needs.

SOILLESS CULTURE

Soilless cultivation generally refers to any method of growing plants without soil as a rooting medium. The major advantage of soilless culture is the final products are free from soil borne disease, pest, soil salinity and poor salinity of the soil. This is like uncoupling the plants growth from the soil and makes it free from the above-mentioned problems. Basically, agriculture practices are done in soil only. Soil was the primary medium for plant growth. But soil is just a medium which supports root to stay up and provides contains some mineral and minor nutrients to support the plant production. But most of the macro nutrients

are supposed to supply manually for the plant growth. As technology and human population evolves there are increase in demand and supply rate and decrease in the cultivation land. So there it comes the soilless culture which requires very less or no soil for plant growth. But in this practice, there is no such kind of problem. It also helps in temperature control. Since it is a protected cultivation, we don't have a problem of high evaporative losses and also it provides a protection against weather and other some natural calamities like bird or animals.

VERTICAL FARMING

Most of the developed and developing countries are running out of cultivable land as well as increase in the rapid development of urbanization, agriculture techniques are being evolved. One of them is vertical farming which practices a soilless culture. Since most of the cities are highly urbanized, many apartments are constructed. These apartments are the right place to practice this vertical farming technique which can help to meet their own demand with less energy and less amount of water. This technique will also be helpful in pandemic situation like Covid - 19, where it is riskier to buy vegetables and fruits form outside.



HYDROPONICS

Cultivation of crops by using a mineral nutrient solution in a controlled environment without using soil is known as "Hydroponics". At first roots are physically supported by inert media. Commonly used inert media are rice husk, perlite, coco peat, rock

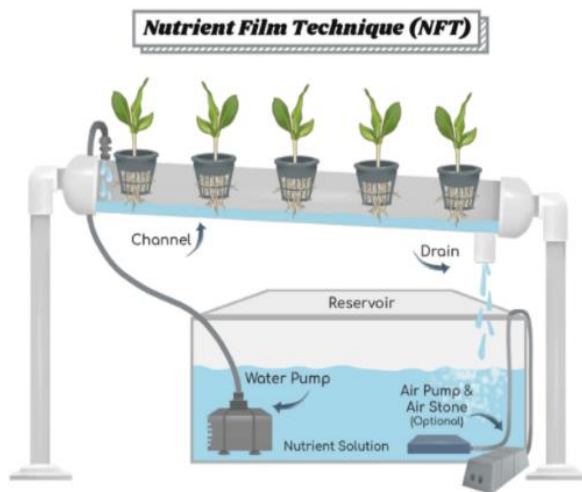


Figure 1. Nutrient Film Technique



Figure 2. Aquaponics

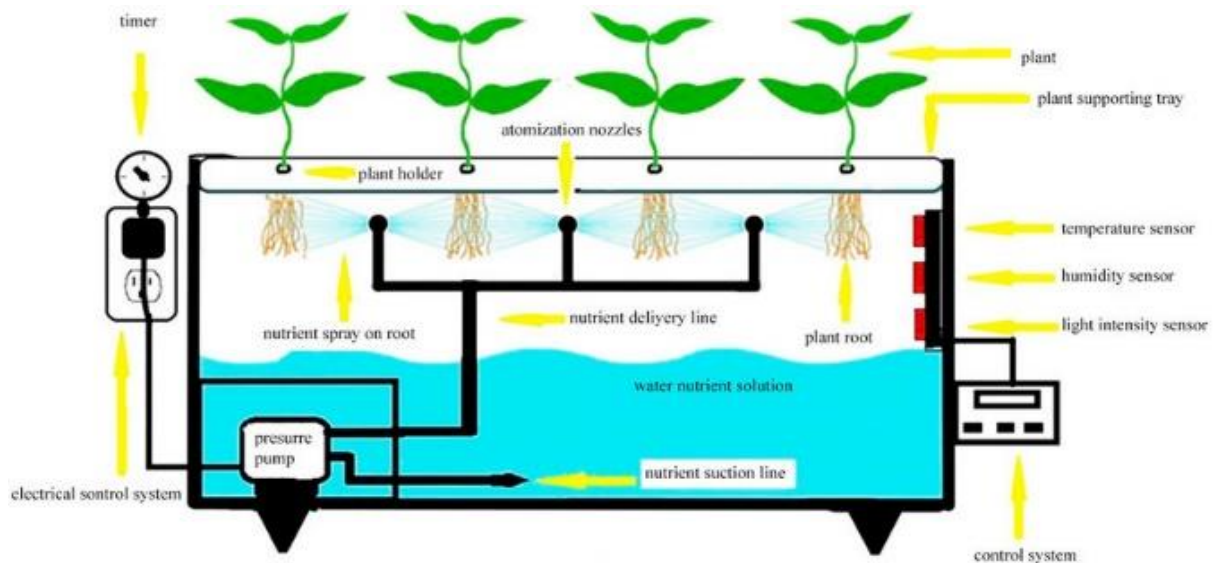


Figure 3. Aeroponics

wool which has good absorption and holding capacity of water. Then the roots will start to grow in the nutrient solution. This method requires much less water compared to traditional farming. Both chemical and organic fertilizers can be used in the form of solution. This is supplied manually through the growing medium. There are different techniques are followed to increase the production rate and to reduce the water usability.

STATIC SOLUTION CULTURE

This type of culture is like *Eichhornia crassipes* (water hyacinth). These plants are kept in a static container

like glass container, big size tubs. The plants are kept in the container where the nutrient solution is in static condition until the nutrient concentrations are reduced accordingly. These kinds of technologies are helpful where there are less technological accessories. These come under non circulating method. This includes root dipping technique, floating technique, capillary action technique.

CONTINUOUS FLOW SOLUTION CULTURE

In this culture technique plants are placed in series, where the nutrient solution passes continuously over the plants root. This has an advantage over the static

solution culture like the EC, temperature and pH can continuously monitored in a separate container. In this nutrient film technique (NFT) is highly used. Nutrient Film Technique [NFT] and Deep Flow Technique [DFT] are some of the widely used circulating method of soilless culture, which shows a good yield according to study (Figure 1).

AQUAPONICS

The combination of aquaculture and hydroponics is commonly called as aquaponics. This technique is also a form of hydroponics. This is like integrated farming technique, which has an advantage of culturing vegetables or fruits or fodder crops as well as fish culture. Every plant requires micro and macro nutrients in any of the way. In former technique, these are supplied manually or artificially. To improvise this, fish culturing helps a lot. The excreta from fish have a high amount of ammonia; this helps plants to perform a nitrogen fixation and increases the production. This is a form of continuous flow culture, ebb and flow method, run to waste method (Figure 2).

AEROPONICS

This is the process of growing plants with the moist air without soil medium. This technique requires much less water compared to above two techniques. Since most of the plant's roots are exposed to the moist air, there is a less risk of water borne diseases as well (Figure 3).

CONCLUSION

Due to the population growth and rapid urbanization, the land required for cultivating agriculture produce is decreasing. To meet the supply and demand of food scarcity there is need of technology development. In this way, soilless culture is the emerging technology in agriculture practice. Apartments and damaged containers are suitable place to practice this technique. Since water requirement is 10 times much lesser than traditional farming practice, these techniques can easily be practiced in any place where there is enough space. The water used in technique can be recycled and reused in the same production. So obviously there is no waste of water. By doing this protected cultivation practice the quality of produce can be maintained and enhanced.