Introduction of Hydroponic system and it's Methods

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***ABSTRACT*: With the advent of civilization, open field/soil-based agriculture is facing some major challenges; most importantly decrease in per capita land availability. In 1960 with 3 billion population over the World, per capita land was 0.5 ha sbut presently, with 6 billion people it is only 0.25 ha and by 2050, it will reach at 0.16 ha. Due to rapid urbanization and industrialization as well as melting of icebergs (as an obvious impact of global warming), arable land under cultivation is further going to decrease. Again, soil fertility status has attained a saturation level, and productivity is not increasing further with increased level of fertilizer application. Besides, poor soil fertility in some of the cultivable areas, less chance of natural soil fertility build-up by microbes due to continuous cultivation, frequent drought conditions and unpredictability of climate and weather patterns, rise in temperature, river pollution, poor water management and wastage of huge amount of water, decline in ground water level, etc. are threatening food production under conventional soil-based agriculture. The purpose of this study was to determine effect of factors on feasibility of hydroponics cultivation regard to training and research. The research population consisted of 176 experts in Agricultural Ministry, which were selected using census method. The methodological approach of this study was descriptive-correlative. Validity of the instrument was established by a panel of experts consisting of senior faculty members and research committee advisors.**

***KEYWORDS*: Aeroponics, feasibility, Hydroponics cultivation, Nutricultre, Open field agriculture, soil-less culture**

INTRODUCTION:

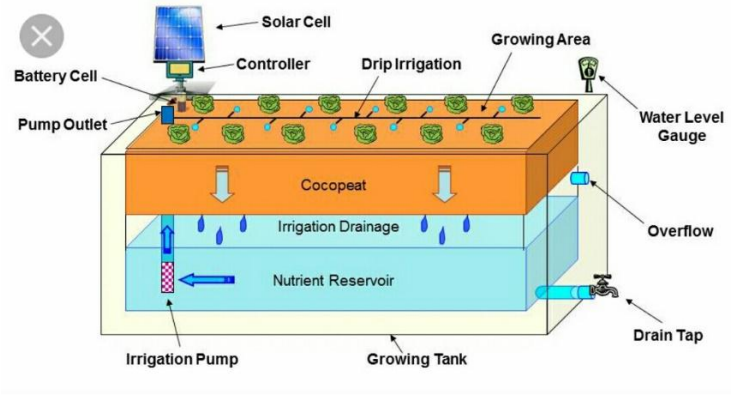
Soil is usually the most available growing medium for plants. It provides anchorage, nutrients, air, water, etc. for successful plant growth. However, soils do pose serious limitations for plant growth too, at times. Presence of disease causing organisms and nematodes, unsuitable soil reaction, unfavorable soil compaction, poor drainage, degradation due to erosion etc. are some of them. In addition, conventional crop growing in soil (Open Field Agriculture) is somewhat difficult as it involves large space, lot of labour and large volume of water. Moreover, some places like metropolitan areas, soil is not available for crop growing at all, or in some areas, we find scarcity of fertile cultivable arable lands due to their unfavorable geographical or topographical conditions. Of late, another serious problem experienced since is the difficulty to hire labour for conventional open field agriculture. Under such circumstances, soil-less culture can be introduced successfully.

Supplying food stuffs for growing population of the country and the need for achieving self-sufficiency in agriculture products and food protection demands the increasement of agriculture products in the country as much as possible. In this respect, quantitative and qualititative restraint of soil and meter resources are considered as the original groundwork of agriculture products. An excessive percent of formable lands in Iran are encountered with problems of sodium, saltiness and bilge of soil. Considering these requirements, it is crucial to take new principles and provide more suitable situation in order to obtain nutritive needs for plants. During the past years, there have been special attentions paid to the production of agriculture products. In controlled environment (green house), especially soil-less plantation systems or hydroponics of all kinds of ornamental flowers, vegetables, fruits and medical plants. Hydroponics plantation is an advanced form of agriculture which enables the option of exclusive supervision over the distribution and delivery of nutrition among the plants. Based on most of researchers' views, the hydroponic groundwork should be easily drained; it must have suitable ventilation power and good ability and capacity to preserve water, and must be free of harmful elements and weeds and also can be provide-able in cheap prices. Additionally, it is recommended to use groundwork with organic source instead of synthetic ones . Hydroponics, in spite of need for adequate expertise and relatively high investment, in comparison with soil based plantation has a lot of advantages such as high performance, the need for low labor force, simplicity of works.

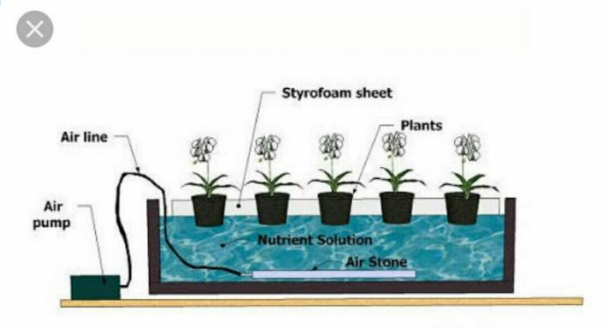
TECHNIQUES OF HYDROPONICS :

It is also known as Liquid Hydroponics_ method. Plants grown in solution culture have their roots suspended directly in a nutrient solution. It can further be classified intoi) Circulating methods (closed system)/ Continuous flow solution culture

a) Nutrient film technique (NFT) :
The N.F.T. system is quite popular with home hydroponic growers as well. Mainly because of its fairly simple design , However N.F.T. systems are the best suited for, and most commonly used for growing smaller quick growing plants like different types of lettuce. Along with growing lettuce , some commercial growers also grow different types of herbs and baby greens using N.F.T.

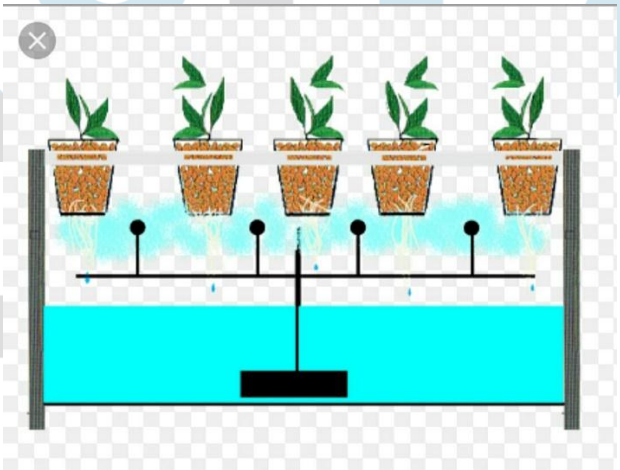


b) Deep flow technique (DFT):
This systems are one of the most widely used types of hydroponic systems around the world, both for home Growers as well as commercial growers alike.it won't limit limit your Imagination when u building your system.

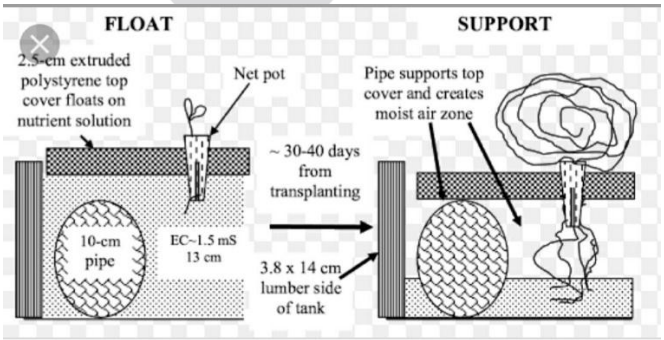


Non-circulating method (open systems)

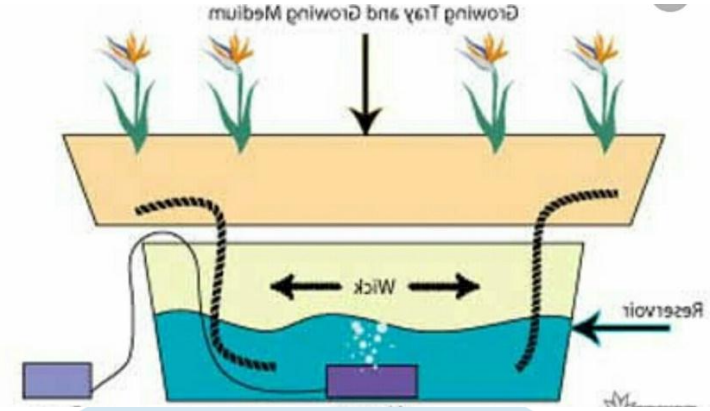
a) Root dipping technique



b) Floating technique



c) Capillary action technique



MATERIALS AND METHODS :

In relation to objective, this research is functional, since the results can be employed by programmer and policy makers. In order to reach precise and reliable data we used quantitative method. Because this research simply investigates existed conditions and defines them and there is no possibility to control or manipulate the variables, it is descriptive. Because the gathering of information about the views, beliefs, thoughts and behaviors or group characteristics of a society is statistical and also it is under recognition, so it is measuring. Furthermore, because it investigates and analyzes the relations between independent and dependent variables, it is correctional. Statistical society of this research involve all the gathering experts of minister of rural construction organization (N=176). In order to determine the authenticity we put multiple copies of the questionnaire at the disposal of masters and some of the experts of rural construction organization, and also established early exam for determining the validity of research equipments. We gave the questionnaire to 25 experts which were similar to statistical society in regional, economical, cultural and social conditions. After gaining the data concluded the Alfa kronbakh coefficient for all the variables with degree scale of 83% the independent variables were: social, economical, educational, factors and policy making and attitude toward the hydroponic plantation. Dependent variable was feasibility of hydroponics cultivation regard to training and research. In order to determine the social factor we measured 6 questions, 8 questions for economical factors, 9 questions for educational, 8 questions for policy making and 7 questions for attitudes toward hydroponic cultivation(none=0, very low=1, low=2, average=3, high=4, very high=5) . Consequently, the minimal score for social, economical, educational, policy making and attitude was zero and the maximal was 30, 40, 45, 40 and 35, respectively.

Feasibility of hydroponics cultivation regard to training and research:

The feasibility of hydroponics cultivation regard to training and research was measured by 8 questions including: 6 pieces spectrum of likret. Score giving to the mentioned spectrum was as follows: none=0, very low=1, low=2, average=3, high=4, very high=5. Then, the maximum score was 40, and the minimal was zero. Table 2 illustrates the mean, coefficient of variance (C.V) and the rank of every educational and study being required for hydroponic cultivation, from the viewpoint of experts. According to the table, managing seminars and conferences about hydroponic cultivation, establishing research stations of hydroponic plantation of green house products, and performing experimental studies in order to demonstrate the benefit of hydroponic technology are among the most important requirements for education and study of hydroponic cultivation. Table3 shows the feasibility of hydroponics cultivation regard to training and research. According to results, 82.3 percent of participants responsed that feasibility of hydroponics cultivation regard to training and research was appropriate, 13.7 answered that it was moderate and the last 4 percent answer was appropriate. The mean of feasibility of hydroponics cultivation regard to training and research was 13.1 and its measure standard deviation (SD) was 4.8.

The role of social, educational, economical, policy making and attitudinal factors on feasibility of hydroponics cultivation regard to training and research:

In order to predict the role of research variables on feasibility of hydroponics cultivation regard to training and research, we used step by step regression. Analyzing the regression enables the researcher to predict the variance of dependent variable through independent variables and determine the role of every independent variable in explanation of dependent variable. In step by step method, the strongest variables enter the equation one after another. This process goes on until the errors of meaning exam reaches to 5 errors. As you see in table 5, policy making and social factors enter the equation in steps one and two, respectively. This means that policy making factors have the highest influence on feasibility of hydroponics cultivation. This factor alone explained 21.5 percent of variance in dependent variable. Policy making and social factors communally explained 26.7 percent of variance in dependent variables, in step two.

Summary of using all methods :

All these systems still do the same essential thing, deliver a nutrient solution to the plant roots, and providing this in an oxygenated environment. Choosing which system to use has a lot to do with personal preference. The taking into account of your location is a good thing, in a cold environment a lot of water will be expensive to heat. On the other hand, a smaller buffer of nutrient solution will need more management to keep the values within the right range.

A good grower can probably have success with any of these systems in any kind of situation. An experienced grower, however, is more likely to pick a more simple system that has less chance of catastrophic failure. That is also the key to hydro, a small error in judgment or a power failure can result in mass plant death. A well-designed system has fail-safes to make sure this does not happen.

ADVANTAGES OF SOIL-LESS CULTURE:

There are many advantages of growing plants under soil-less culture over soil-based culture. These gardens produce the healthiest crops with high yields and are consistently reliable; gardening is clean and extremely easy, requiring very little effort. Here nutrients are fed directly to the roots, as a result plants grow faster with smaller roots, plants may be grown closer, and only 1/5th of overall space and 1/20th of total water is needed to grow plants under soil-less culture in comparison to soil-based culture. There is no chance of soil-borne insect pest, disease attack or weed infestation too. Overall soil-less culture provides efficient nutrient regulation, higher density planting, and leading to increased yield per acre along with better quality of the produce. It is also effective for the regions of the World having scarcity of arable or fertile land for agriculture.

LIMITATIONS OF SOIL-LESS CULTURE:

Despite of many advantages, soil–less culture has some limitations. Application on commercial scale requires technical knowledge and high initial investment, though returns are high. Considering the high cost, the soil-less culture is limited to high value crops. Great care is required with respect to plant health control. Finally energy inputs are necessary to run the system.

FUTURE SCOPE OF THIS TECHNOLOGY :

Hydroponics is the fastest growing sector of agriculture, and it could very well dominate food production in the future. As population increases and arable land declines due to poor land management, people will turn to new technologies like hydroponics and aeroponics to create additional channels of crop production. To get a glimpse of the future of hydroponics, we need only to examine some of the early adopters of this science. In Tokyo, land is extremely valuable due to the surging population. To feed the citizens while preserving valuable land mass, the country has turned to hydroponic rice production. The rice is harvested in underground vaults without the use of soil. Because the environment is perfectly controlled, four cycles of harvest can be performed annually, instead of the traditional single harvest. Hydroponics also has been used successfully in Israel which has a dry and arid climate. A company called Organitech has been growing crops in 40-foot (12.19-meter) long shipping containers, using hydroponic systems. They grow large quantities of berries, citrus fruits and bananas, all of which couldn't normally be grown in Israel's climate. The hydroponics techniques produce a yield 1,000 times greater than the same sized area of land could produce annually. Best of all, the process is completely automated, controlled by robots using an assembly line-type system, such as those used in manufacturing plants. The shipping containers are then transported throughout the country. There has already been a great deal of buzz throughout the scientific community for the potential to use hydroponics in third world countries, where water supplies are limited. Though the upfront capital costs of setting up hydroponics systems is currently a barrier but in the long-run, as with all technology, costs will decline, making this option much more feasible. Hydroponics has the ability to feed millions in areas of Africa and Asia, where both water and crops are scarce. Hydroponics also will be important to the future of the space program. NASA has extensive hydroponics research plans in place, 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 can support life in space, and the logistics of transporting soil via the space shuttles seems impractical, hydroponics could be key to the future of space exploration. The benefits of hydroponics in space are twofold: It offers the potential for a larger variety of food, and it provides a biological aspect, called a bio-regenerative life support system. This simply means that as the plants grow, they will absorb carbon-di-oxide and stale air and provide renewed oxygen through the plant's natural growing process. This is important for long-range habitation of both the space stations and other planets.

CONCLUISION:

Results from analyzing the Pierson correlation showed that social, educational, economical, policy making and attitudinal factor have 99 percent of positive and meaningful relation with feasibility of hydroponics cultivation regard to training and research. Results show that the correlation level of social, economical, educational, policy making and attitudinal factors to ward hydroponic cultivation with feasibility of hydroponics was equal to 0.39, 0.39, 0.38, 0.44 and 0.29, respectively. According to Davis table these correlations were in average level. Furthermore, the results of step- by- step regression illustrated that policy making and social factors clarified 26.7 percent of variance in dependent variable, through two steps. The industry is expected to grow exponentially also in future, as conditions of soil growing is becoming difficult. Specially, in a country like India , where urban concrete conglomerate is growing each day , there is no option but adopting soil-less culture to help improve the yield and quality of the produce so that we can ensure food security of our country. However, Government intervention and Research Institute interest can propel the use of this technology.

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