Myself-

**Introduction-**

The automated hydroponic farming is made to support non-professional farmers, city people who have limited knowledge in farming and people who are interested in doing vertical planting in very small areas in the city such as building tops, balconies of small rooms in high-rise buildings, and in small office spaces. Automated hydroponic cultivation needs to control humidity, temperature, water level, pH, and EC factors suitable for tropical climate. In order to grow qualified hydroponic plants, nutrient solution has to run through bottom channels constantly, and pH and EC factors in the solution have to control as the plant ages, the varieties of hydroponic plants and also the food safety qualification. In addition, tropical counties have hot climate almost the whole year; therefore, the greenhouse humidity and temperature have to be controlled.

With an expanding population and changing dynamics in global food markets, it is important to find solutions for more resilient food production methods closer to urban environments. Recently, vertical farming systems have emerged as a potential solution for urban farming. However, although there is an increasing body of literature reviewing the potential of urban and vertical farming systems, only a limited number of studies have reviewed the sustainability of these systems.

The significant decrease in agricultural land and the rapid development of hydroponic system technology such as Nutrient Film Technique (NFT), have brought huge challenge to farmers. This hydroponic system requires special attention to several parameters such as the water temperature, water level, acidity (pH), and the concentration of the nutrient (EC/PPM). We first monitor and collect information from NFT Hydroponic farmer and then systematically evaluate and analyze them. Unfortunately, it is still controlled by using the conventional way (human), for example in controlling the concentrations of nutrient has to be done at least once a day, so much time is wasted. In addressing these issues, we need a system that can be applied and used easily.

The human population significantly increases in crowded urban areas, causing a reduction of available farming land. Therefore, a landless planting method is needed to supply the food for society. Hydroponics is one of the solutions for gardening methods using water as a nutrition media. Traditionally, hydroponic farming conducted manually by monitoring the nutrition such as acidity or basicity (pH), the value of total dissolved solids (TDS), electrical conductivity (EC), and nutrient temperature.

Agriculture is the heart of India's economic activity and our experience during the last 60 years has demonstrated the strong relationship between agricultural growth and economic wealth. The present agricultural system is a mix of outstanding achievements and missed opportunities in India. If India want to become powerful economically in the world, our agricultural productivity should be equal to those countries, which are currently rated as economic power of the world. We need a new and emerging technology which can improve continuously the productivity, profitability, quality of our major farming systems. One such technology used in India is the greenhouse technology. Although it is centuries old, it is new to India. In India, dependence on agricultural productivity and geographical conditions contribute majors to underdevelopment and poverty. These can be achieved by alternative new and latest technology of farming such as hydroponics.

Cultivation, adding up to an important aspect in GDP (Gross Domestic Produce), has been affected tremendously over the past few decades due to the use of chemicals. Due to rapid urbanization and industrialization, arable land under cultivation is decreasing enormously. Organic farming, being the need of the hour, is opted as one of the widely chosen methodology to overcome the prevailing problem in cultivation. Advancements in agriculture have proven to serve the cultivators in a number of ways. Cultivation of crops is being done at home, which consumes limited amount of space and cost. To bring in another technological advancement by breaking all barriers, for organic farming is the Hydroponics where consumption of space and water are way too minimal. Hydroponics is a method of growing plants purely using water and nutrients, without soil.

The goal of this project is to design and construct a hydroponic system which is fully automatic that can be integrated into the agricultural curriculum while introducing business skills. Hydroponic cultivating offers many focal points when contrasted with regular cultivating. One of the principle points of interest is that products can be developed in spots with infertile or sullied arrive. Hydroponically developed plants are too more impervious to water with a high salt substance. Another advantage incorporates not having creepy crawlies, creatures, and infections for example, growths effectively exhibit in the developing medium. Work serious work, for example, working, developing, fumigation, and watering is not required for hydroponic cultivating. On the off chance that the framework is robotized utilizing pumps or even PCs, work expenses will diminish drastically. So automation in hydroponics is done to have many advantages for healthy growth of plants which leads to increase in yield of farm with proper amount of nutrient, light, water and in healthy temperature conditions.

The plants grown under this system is analyzed with traditionally grown ones and has been found that these plants grow a lot quicker with minimum requirement of nutrients. They are much cleaner with minimum chemical constituents using up only required water, preventing loss of water. Also the cost for cropping is nominal on consideration of its advantages. Hence this model encourages practicing of an alternate approach towards farming that is eco-friendlier and efficient on comparison with upcoming techniques.

Hydroponic is one of the farming method without soil, but it uses water that contain nutrition. Nutrient solution is very important to define the successful of hydroponic cultivation. One of hydroponic technique is Nutrient Film Technique (NFT). System NFT uses nutrient solution to drain on the root area. pH level which is good for lettuce is 6.0-6.5, meanwhile the Electrical Conductivity (EC) level which is suggested is 0.8-1.2. Factor of pH and EC need to monitor 24 hours during the growth period. Hydroponic system requires wide area. However, in urban areas, the hydroponic green house can’t get a wide area only in one place.

the significant incline on environmental awareness in agriculture and the rapid development of technology of food system have brought interest that arises. If done properly hydroponics can produce many benefits, both commercially and environmentally. But there are so many parameters that must be considered in hydroponic systems, which make practicing them, a challenge.

**Applied Internet of Thing for Smart Hydroponic Farming Ecosystem (HFE)-**

The Arduino microcontroller is used to control and analyze data from all interconnected devices and sensors.The Hydroponic Farming Ecosystem consists of three parts. The first part is about the detection sensors which include: air temperature, humidity, PH, Electrical Conductivity (EC), water temperature, ultrasonic and water flow sensors. The second part covers the control system which can be manipulated to regulate the system by monitoring the values form the sensors. The air temperature, humidity and concentration of nutrients can all be controlled so that they are in a specific range or threshold. The last part will look at the alarms in the application and notifications on a Smart Phone to inform the user of any changes. The user can control the devices in the HFE setup through the android application.

The same system can be further scale into stack farming where special warehouse or commercial buildings can be constructed to grow plants which would eventually lead to Smart City Farms. Like Tomato F1 Hybrid Suhyana crop we can grow other crops under hydroponic farming. This would help us to identify plants that are more suitable and having favorable growth rate under hydroponic farming.

For future research it is recommended to add addition of parameters that need to be manipulated, the most likely to be done immediately is the use of cameras and image processing to find out how healthy the plants are being cultivated. So that preventive measures can be carried out when the plants are in a bad condition. Besides image processing can help determine the harvest period, especially for fruits.

This report shows that professional, hobbyist, or ordinary people can have a hydroponic farm relying on IoT based system. It also shows how far sensors have progressed from the past, they are actually reliable and accurate on calculation making task in hand. It shows that IoT in application, for instance nutrient solutions is not easy to manipulate but with this system nutrient manipulation can be done in no time because sensors will capture the calculation and send data to computer wirelessly in almost no time at all, means calculation and action can be done immediately making this system of hydroponic farming virtually doesnt need labor.