Smart Crop Cultivation and Security System

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ABSTRACT

This involves the idea of Smart Crop Cultivation and intelligent sensor techniques for Security System have achieved significant attention in agriculture. In smart crop cultivation ,Hydroponics is one of the methods of modern agriculture. In the system, hydroponics is a method of growing plants in a water based, nutrient rich solution. Hydroponics does not use soil, instead the root system is supported using an inert medium such as perlite ,clay pellets. The basic thing behind hydroponics is to allow the plants roots to come in direct contact with the nutrient solution and access to oxygen which are essential for crop growth. Also these project has Security System using intelligent techniques (wireless sensors). So, the farmer could monitor several parameters without using laboratory instruments, and the farmer could control the entire system remotely. Moreover, the technique also provides a wide range of information which could be essential for plant researchers and provides a greater understanding of how the key parameters of Hydroponics correlate with plant growth in the system. It offers full control of the system, not by constant manual attention from the operator but to a large extent by wireless sensors. Furthermore, the adoption of the intelligent techniques in the Hydroponics system could reduce the concept of the usefulness of the system due to complicated manually monitoring and controlling process.

Keywords : Smart Crop Cultivation, Hydroponics Concept, Wireless Sensors Easy Monitoring and Controlling Process In Agriculture

I. INTRODUCTION

We live In a world where everything can be controlled and operated automatically, but There are still a few important sectors in our country where automation has not been adopted because of several reasons and one of its reason is cost .One such field is that of agriculture. Agriculture has an ancient history of thousands of years. Advancement in agriculture has been done by implementing the several new systems, practices, technologies, and approaches with respect to time. Several studies reported Hydroponics as a modern and innovative plant cultivation technique. The growing food crisis due to increasing population and due to several reasons could be resolved with the intelligent techniques, Such as Hydroponics with the intelligent sensor techniques for security system can be used for Smart crop cultivation. Where, Hydroponics is a method for growing crops without soil where water serves as the substrate for growing the plants with the addition of fertilizers to supply the plants essential nutrients and promote its commercial success. Hydroponics farming fully provides required amount and type of nutrients that the plant need at a right time. Also soil related problems are solved by hydroponics. The intelligent sensor techniques that are used for monitoring and gathering information from hydroponics farm. To

assess the future using these data streams, intelligent technologies of sensors that identify the data as they occur is needed. On the other hand, hydroponics is one of the farming technologies that was considered as the quickest growing sector of agriculture and can give food production in the future. By combining hydroponics with the intelligent sensors for the security reason. it can make it successful smart cultivation.

II. PROBLEM DEFINITION

Several research studies concluded that overall world agriculture uses approximately seventy percent per year available fresh water to irrigate only seventeen percent of the land. Another side, the total available irrigated land is gradually decreasing due to the rapidly increasing of food requirements and effects of global warming . In other words, agriculture is dealing with new main significant challenges. FAO reported that world food production must be increased by seventy percent to provide sufficient food production for the fast-growing population and urbanization. The expected world population growth for the half of the present century is daunting. The primary motivation of this review is to provide an idea about the use of intelligent sensor techniques in the hydroponic system. It could provide an opportunity or full automation, scalability, anytime-anyplace access monitoring, and fault diagnostics in the Hydroponic system. Moreover, it would be helpful for the local farmer and grower to provide timely information about rising problems and influencing factors for successful plant growth in the Hydroponic system. The farmers could start to understand their crops at a micro scale and able to communicate with plant through accessible technology. To the best4 of our knowledge, this is the first work to provide a brief review of the use of intelligent sensor techniques in the Hydroponic system. Besides, several new techniques and application have been introduced and patented to improve the traditional agriculture practices.

III. RELATED WORK

Related work has been published with design and implementation of smart farm. The Hydroponics model and its design of smart farming with intelligent sensor applications to perform necessary task in smart crop cultivation .Relevant works has been published in designing and implementing smart farming. A conceptual model and system design for decision support of smart farming with network sensor applications in order to perform necessary tasks required for farmers has been proposed with a hydroponics model using intelligent sensors approach which will be applied to agriculture [5]. It measures the key parameters for crops such as temperature, humidity, heat level, soil moisture. The data acquired from the on-board sensors of the gardening rover are sent to the storage platform on a regular basis. Most of these works that were designed to have intelligent sensors framework for future smart farming applications .A hydroponics farm is integrated with the use of sensors and soft ware for the monitoring and controlling for governing the growth of the plants.

IV. OVERVIEW OF SMART HYDROPONICS SYSTEM

A. Construction of Hydroponics system

The construction of hydroponics system in farm has buoyant pads to support the plants which are immersed in the nutritional solution. Air pump is also given in the system foe the circulation of air for the plants and also the water circulation pump is also

given for the water circulation. The construction of the hydroponics system for the crop cultivation is as shown in fig.1
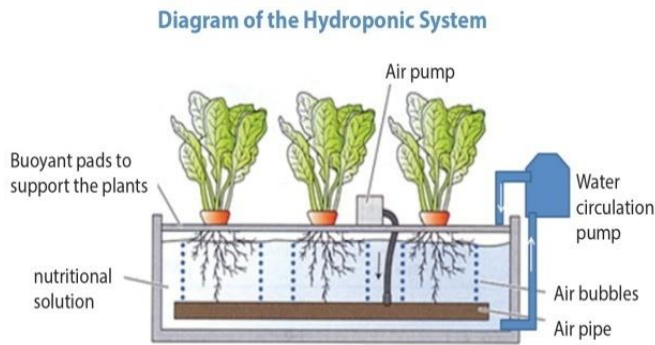

Fig.1 Basic diagram of The Hydroponic system for crop cultivation system

B. Hardware and sensor network

Hardware requirements are microcontroller , rectifier , relay driver, relay ,gas sensor module, moisture sensor module , LDR sensor module, LCD display . The software required are KEIL , PCB ARTIST, EMBEDDED C. These sensors are connected to a microcontroller using Raspberry Pi (Rpi) since it can handle large amount of data
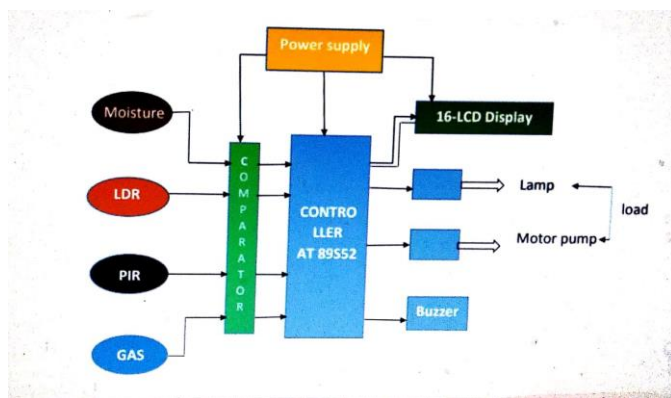

Fig.2 Block diagram of use of sensors for monitoring and controlling of hydroponics system

V. Advantages of Sensor Techniques in the Hydroponics System

In the world increasing food demand require improvement in the development of food production system. However, In Agriculture the quality and productivity of the cultivated crop must improved. People have found lot of modern technologies in crop cultivation. So that , One of the modern concepts of Smart cultivation in agriculture is Hydroponics. Thus, the hydroponics is one of the methods which uses only water for the growth of crop without any support of soil. In the hydroponics system, the nutrient solution and a water level is required for successful plant growth. For example, if the plant has some sudden stress and the farmer is not present at the farm then may that crop will die. Then to avoid this The farmer will use his knowledge and implements the hydroponics model with the use of wireless sensors like the gas level by gas sensors, soil moisture sensors, microcontroller for the data acquisition ,relay for any theft from the farm these things makes our Hydroponics concept more smarter.

For the security reasons of the crop For Example, save crop damage from pet or wild animals the relay and the LDR sensor with alarm are used. The wireless sensor network offer number of advantages with faster response to unwanted climatic conditions and good quality control of the crop that results the productivity of crop. This advancement in the hydroponics system through wireless sensor network is beneficial .This smart cultivation where the wireless sensors which will provide security to the crop cultivation. This sensors also offers environmental and nutrient parameters information which would be required for the study of plant growth.

VI. CONCLUSION

Hydroponic systems could be a solution to help increase crop security in agriculture. Simplified hydroponic systems have relatively low investment costs, are a sustainable way of growing produce, and offer an easy to learn, convenient growing method for an area with limited resources. Partial implementation of hydroponic systems with the use of intelligent sensor techniques in Farm .Smart crop cultivation and security system gives food security and access to fresh, nutritious crop however, further research must be done to investigate produce growth rates in the model systems as well as potential interest and funding of this initiative. farm. It is concluded that the crops yielded from using the automatic control is better than the crops yielded from manual control due to computed gain differences between 20% to 60% for all parameters used to evaluate good quality crops. Due to realized real-time data automatic acquisition and data analytics of hydroponics farm parameters and biological information, the farmers can achieved good economic and ecological benefits.

VII. ACKNOWLEDGEMENT

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