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Indoor Vertical Orbeez Farming by Using IOT System

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ABSTRACT: Internet of Things (IoT) is network featuring interconnected devices making physical world transparent with less human effort. Submerging of this technology in the field of agriculture is bringing enormous changes. By the end of 2050, world population reaches 9.7 billion with additional land of 109 million needed if conventional farming practices are continued. We use IoT system in Vertical Farming. Orbeez is the trade name for gel beads that grow significantly in water. Orbeez are super absorbent polymer beads made of acrylic acid, sodium hydroxide and water, it is the water molecules that make Orbeez grow. This is a short review of Indoor Vertical Orbeez Farming using IOT system.

KEYWORDS: Orbeez, IoT, Vertical Farming

I. INTRODUCTION

Most challenging task for agriculture science today is to ensure the steady and enough food supply to our growing human population. Due to urbanization and globalization the farming lands are gradually reduced. Due to this we are forced to increase the food supply with the limited amount of water and in the integrated segment of area. For this we are introducing vertical orbeez farming by using IOT system. In this system, by using IOT system we can reduce the man power and water loss. Vertical farming is the practice of growing crops in vertically stacked layers. It often incorporates controlled-environment agriculture, which aims to optimize plant growth, and soil less farming techniques. Orbeez (Super absorbent Polymers) are small pellets that grow significantly in size when put in water. They can increase their diameter more than 150 times and reach a diameter of 14mm. It is non-toxic and biodegradable. These water beads which are invented for agricultural use to help the soil retain moisture and to reduce soil erosion. Orbeez can be used for growing fruits and vegetables as well as they are completely safe. The pigmentation they contain is not released in the soil and cannot pass into the fruit or vegetable grown. Orbeez release only water they have absorbed.

II. LITERATURE SURVEY

Aldrik [1] et al, in 2017, said that they present HARICOT, a simple, fast and cheap and the method is versatile. They provided proof of concept that they are working on the stability of the actuators and further studying the geometry and bending with different positioning of the Na Pa beads.

Anirudh Garg [2] et al, in 2014 said that these trends adjust that new innovation in agriculture are inevitable needed and these innovations should be integrated main stream agriculture. Vertical farming and farming are the research areas to fight these constraints. Vertical farming employees vertical stackings of the farms therefore small land can be utilized for more production. These techniques can be utilized for increasing the production and productivity to overcome the growing food demands. These trends along with increase in population pose a challenge to agriculture for more and better food.

Francesco Puoci [3] et al, in 2008 said that functionalized polymers are used to efficiency of pesticides and herbicides allowing us to use in very low amount and also protect the environment through filters (or) catalyst to reduce pollution and cleaning the existence of pollutants. This report shows use of polymers in agricultural areas.

Dr. N. Suma [4] et al, in 2017 said that agriculture is the primary occupation in our country for ages. But now due to migration of people from rural to urban there is hindrance in agriculture. So to overcome the problem we go for smart agriculture techniques using IOT. This project includes various features like GPS based remote controlled monitoring moisture and introducers scanning, security, leaf wetness and proper irrigation facilities. It makes use of wireless sensor

networks for noting soil properties and environmental factors continuously. This concept is created as a product given to the farmers welfare.

Bai Qu[5] et al, in 2020 said that chitosan is produced by diacetylation of chitin it is the second most abundant biopolymer on earth. It comes under reactive functional group, one amino group and both primary and secondary hydroxyl group. Chitosan based hydrogel beads widely used in food and agriculture sector. This paper provides an overview of chitosan based hydrogel beads.

T.M Neethu [6] et al, in 2018 said that hydrogel is basically water absorbent polymers hydrogels are preferred for its water retention capacity, they can swell of many times. Their original size hydrogel are otherwise known as super absorbent polymers. Hydrogel can swell to absorb huge volume of water or aqueous solutions.

A.A. Raneesha Madushanki [7] et al, in 2019 said that IOT can make agriculture and farming industry process more efficient by reducing human intervention through automation. In the study the aim to analyse the recently developed IOT based applications in the agriculture management and collecting data from the different sensors. Wifi has a highest demand of usage in agriculture and farming industry.

Fidelia Nnadi [8] et al, in 2011 said that polymer is a complex of cross linked carboxymethyl cellulose (CMC) and starch are synthesized to form super absorbent polymer. Performance evaluation of the response to the four starch types suggest that potato based SAP performed the best with 73% water retention while corn gave 56%.

Nikesh Goundchawar[9] et al, in 2016 said that agriculture plays a vital role in development of a country. In India about 70% of the population depends upon farming one third of a Nation comes from farming. Issues concerning agriculture have been always hindering the development of the country. The only solution to this problem is smart agriculture by modernizing the current traditional methods of agriculture. The project aims at making agriculture smart using IOT technologies. Secondly it includes smart irrigation with smart control. Thirdly smart warehouse management which includes temperature maintenance, humidity maintenance and theft detection in the warehouse smart devices are computer connected to internet and operation will be performed by interfacing sensors, wifi and zigbee modules camera and actuators with microcontrollers and raspberry Pi. Sensors in micro controllers of all three nodes are successfully interfaced with raspberry Pi.

Lucie Adenauer [10] et al, in 2013 said that with rising population demand for food and consumer preferences are building pressure on our resources. Vertical farming which means growing food in skyscrapers might help to solve problems. A farm 37 floors high was designed cost of production and market potential of these technologies. The economic environmental and social benefits of the technology, existence research is to optimize the production process. The prototype has been planned, discussed and a cost analysis developed.

Yap Shien Chin[11] et al, in 2017 said that vertical farming had become a hot topic among peak development countries. It is hard to practice because minor changes in surroundings may lead to big impact to productivity and quality of farming activity. In this system the variety of sensors will be used to detect current physical conditions and send data to microcontroller either in analog (or) digital input. The system also provides basic remote function where users could turn on/off the watering system and the LED light via. Web-based application. The IOT based vertical farming system could help to reduce the burden of users and provide accurate statistics and analysis. The convenience of the system is expected to increase the productivity and reduce water usage in agriculture field.

Prashaansa I Nachankar[12] et al, in 2018 said that this project is introduced to demonstrate the use of Internet of Things(IOT) in the field of agriculture. In this project sensors are used to measure the various parameters of the field such as temperature, humidity and soil moisture. The crop water requirement is calculated by the system using Penman Monteith algorithm. Based on the Soil Nitrogen, Phosphorous and Potassium values, the system recommends fertilizers to achieve optimum crop production. This project is implemental on a local scale where local farmers can utilize this IOT based analysis which provides new insights and improves decision making. Comparing conventional and IOT based method of farming, the efficiency of farming based on IOT is high. The irrigation schedule generated is dynamic and flexible as it allows as it allows the farmer to plan irrigations according to his needs.

Kurt Benke [13] et al, in 2017 said that solution for increasing food productions are exemplified by urban vertical farming which involves greater use of technology and automation for land use optimization. The vertical farm aims significantly increase the food productivity and reduce the environmental problems within the indoor and climate

controlled high rised buildings it works along with the advantages of clean and green foods along with biosecurity freedom from pest and droughts.

Kheir Al-Kodmany[14]et all, in 2018 said that urban agriculture as a solution to demand by increasing population, harmful pollution and unaffordable food price green house technologies such as hydroponics, aquaponics and aeroponics have provided a promising future to the vertical farm concept.

YD Chuah[15]et all, in 2018 said that Cyber physical system (CPS) can provide farmers with the frame work to remotely control and monitor the various factors affecting plant growth. The implement of CPS in vertical farming system in which an android based remote controlling system developed based on CPS using adrene ESP 32 and sensors through the Internet growth factors like ambient temperature, water temperature, humidity, PH level, light and carbondioxide are controlled and monitored by adreno and sensors that controlled parameters are displayed on phone.

Anupama H.S[16]et all, in 2020 said that new farming methods have to be incorporated from the conventional ways of farming to achieve efficient farming. So there is a need for smart water management system and conserving the system efficiently by using IOT based water management system.

Sabyasachi Behera[17]et all, in 2019 said that agriculture is one of the growing sector due to the requirement of food to meet the growing demands of the expanding global population super absorbant is a boon to agriculture sectors.

J.Woodhouse[18]et all, in 1991 said that super absorbant polymers are soil conditioners developed to aid plant establishment and growth in drought prone growing media the effects of starch co-polymer on the establishment and growth of lettuce and barley are investigated. The crops are grown under the limited irrigation.

William Mckee Doane[19]et all, in 2006 said that superabsorbent polymers for using agricultural applications and methods of making and using same are disclosed. Certain of (SAP's) include a monomer are a mixture of monomer often that acrylanitrile, that is graft polymerize onto a starch. In the presence of an initiator to form a starch graft copolymer that is cross linked and the SAP product is isolated.

C.Demitri[20]et all, in 2013 said that a preliminary evolution of the hydrogel potential as water reservoir in agriculture was performed by using the hydrogel in the experimental green houses desorption capability of the hydrogel with specific regard to two variables that might play a key role in soil environment that is ionic strength and Ph.

III. CONCLUSION

The vertical orbeez farming by using IOT system could help to reduce the burden of users, and provide accurate statistics and analysis. Besides, the system is able to offer immediate acces for the users because it is an online system. The system could also locate the equipment in use and track the sensors detecting crucial change on input. In addition, the system is either controlled by the users of taking action automatically when problems occurred. By using Orbeez reducing surface run-off water, soil erosion

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