International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 06 Issue: 05 | May - 2022 Impact Factor: 7.185 ISSN: 2582-3930

SMART IRRIGATION SYSTEM FOR VERTICAL FARMING

Priyanshu Pallav[1], Dr. Neeraj Kumar[2], Yogita Sharma[3]
Department of Electronics and Communication Engineering
Dronacharya Group of Institution, Greater Noida, India

Abstract—Vertical farming is the method of producing different types of fruits and vegetables and many more on vertically inclined surfaces. Instead of farming vegetables and other foods in traditional manner such as in a field or a greenhouse, this method produces foods in vertically stacked layers commonly integrated into other structures like a ladder. The primary aim of vertical farming is to minimize the space and maximize the crop output. In Vertical farming, the farmers face the issue of proper irrigation because of the height of vertical stack layers. Therefore, In this research, a IOT based smart irrigation system is proposed to dissolve this issue. The proposed irrigation system is based on IoT and it is a very clever irrigation system capable of doing automate irrigation procedures by analyzing the moisture level of soil and different weather conditions and the weather circumstance.

Keywords: Vertical farming, Agriculture, IoT, Smart agriculture, Irrigation system, Inundation System, Spraying, Sprinkling.

I. INTRODUCTION

India is a developing country, the majority of its population is from rural area, and their primary work is related to agriculture. But it's been decades since these rural people have been living the same way they lived 30 years ago. This is because agriculture is not a profit making business in india anymore. The biggest problem facing the farmers in India is the lack of large farm area, non-availability of good quality seeds, lack of modern equipment, poor irrigation facilities, small and fragmented holdings of land, dealing with local traders and middlemen, lack of storage facilities. In a traditional farming system(fig.1), the crops are planted in an open field and by using natural sunlight and an irrigation system the plants are grown. It uses a large area of field and produces a small amount of output. The Large numbers of manpower is required to cover a huge amount of area(fig.3), by which the overall cost of the field increases day by day. The amount of money that is spent in the fields does not get as much money as the farmers spend on planting that crop. Due to this, the farmers are going into losses. This also takes a lot of time and after that if irrigation is not done at the right time, many times the plants get spoiled. To overcome these problems, most of the farmers use a modern technique of farming which is vertical farming(fig.2). It requires less area as compared to traditional farming. It uses less water than traditional farming and it is possible to do a lot of farming in a small space. But, the main problem faced by farmers in vertical farming is proper irrigation(fig.4). Vertical cultivation is done in a steep layer, due to which every plant does not get enough irrigation because many plants which are in the upper layer, those plants are away from our sight so sometimes they are not properly taken care of and they get spoiled. The proposed irrigation system is designed to provide proper irrigation to each layer of plants.

Fig.1

Fig.2

Fig.3

Fig.4

II. Proposed Irrigation System for Vertical Farming

The proposed smart irrigation system is based on IoT. This smart irrigation system is capable of doing automate irrigation procedures by analyzing the moisture level of soil and different weather circumstances(fig.5)(fig.6). While the power is at the controller, it examines the soil moisture content material. If the moisture content is not as much as the threshold then it makes the motor get on automatically and turns off routinely if it reaches the threshold stage. While the weather circumstance is such that it is raining far then the controller puts off the

motor until it is raining. After rain it tests for threshold and makes a significant speed up. If the power distribution stops unexpectedly, the controller automatically turns on after the power is turned on, there is no need to manually turn on the motor. The advantage of these technologies is that it is a cost-powerful irrigation controller, reduces development efficiency and wastage, is easy to screen, minimizes human charges, reduces runoff water and vitamins.

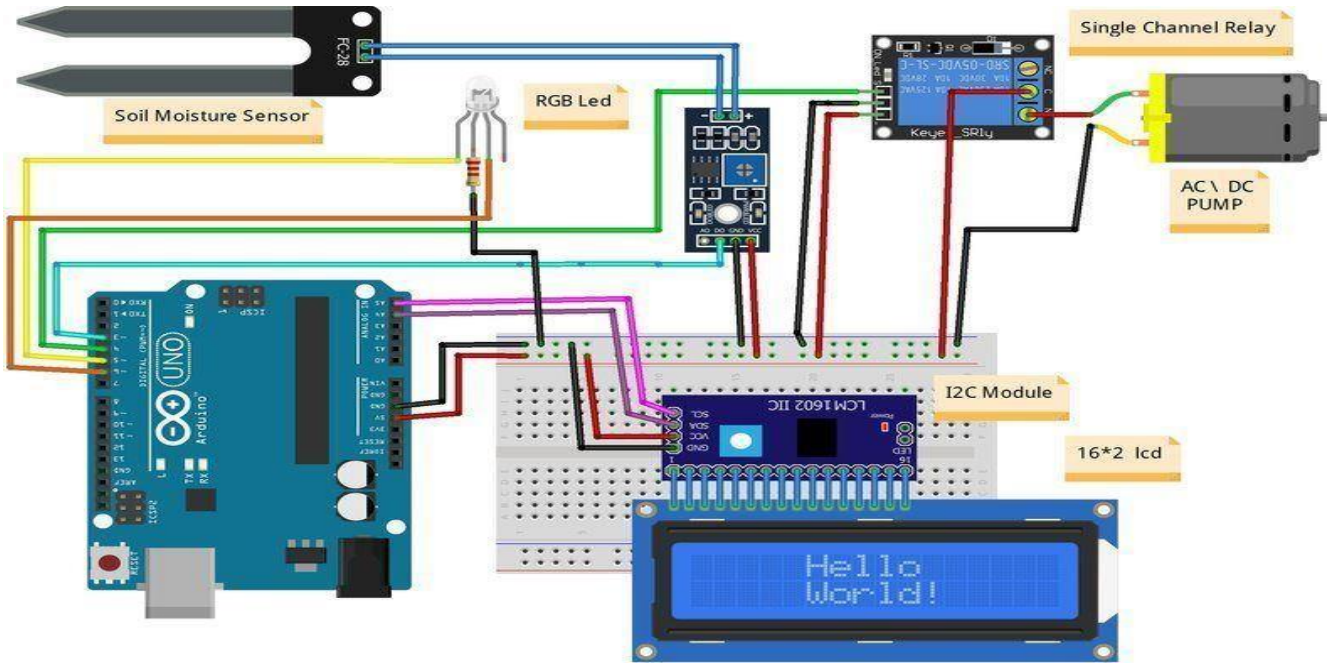
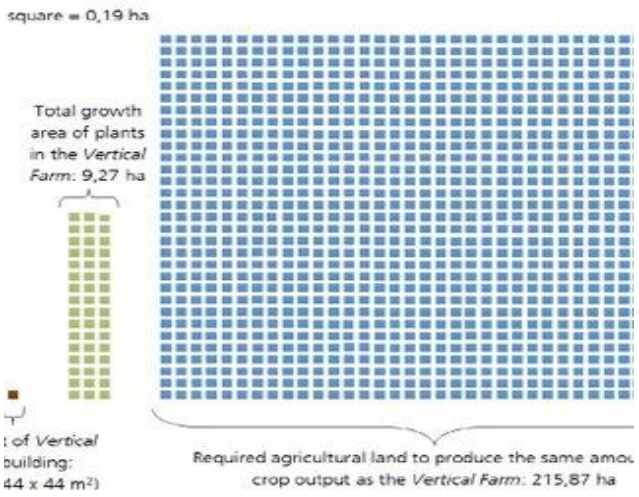


Fig.5

Fig.6

III. PERFORMANCE COMPARISON



The growth process of conventional farming takes place in 70 days whereas in vertical farming this growth process takes place in just 21 days by using IOT technology. The number of crops in traditional farming is 18 per square meter while in vertical farming it is 25-300 per square meter. In traditional farming only seasonal crops can be grown but in vertical farming it is possible to grow all the crops 365 days. Water usage in traditional farming is up to 35 liters but using IOT technique in vertical farming it can be reduced to 1.5 to 2 liters. Traditional farming can be done in an open field. But with IoT technology, vertical farming can be done everywhere in a small area. By using IoT technology in vertical farming, we use a minimum amount of water which is reducing wastage of water.

COMPARISON TABLE :-

Parameters	Conventional farming	Smart irrigation system for vertical farming
Growth process	70 days	21 days
Number of crops per meter square	18	25-300
Crop cycle	Season	All season (365 days)

Water usage	35 l.	1.5 l.
Pesticides/herbicides	Often use	Not often use
Location	Open field	Everywhere
Post-harvest handling	High	Low

IV. CONCLUSION

According to the survey, there will soon be some shortage of land used for agriculture in the next 20 years. But the world population is doubling day by day. Therefore, to meet the shortage of food grains, vertical farming is the only solution to these problems. In order to run vertical farming forward rapidly, we have to integrate the agriculture sector with IoT technology, which minimizes human effort and speeds up the entire process automatically. IOT smart farming solutions are a system designed to automate crop field monitoring with the help of sensors. Here are four important areas for understanding how vertical farming works: First step is physical layout, second is lighting, and then growing medium, and at last but not the least sustainability features by which our future generation can also use it for a long time. First, the primary goal of vertical farming is to produce more food with good quality. To fulfil this goal, crops are cultivated in vertical layers in a tower life structure. Secondly, to maintain the perfect level of light in the room a perfect combination of natural and artificial lights are required. Third, instead of soil, non-soil mediums are very common in vertical farming. Moss, shredded bark, mushroom compost, vermiculite, sand, coir, nut husks, and animal manure are some variety of material used as a soil replacement. At last, the vertical farming method uses various sustainability features for growing food in large amount as well as maintaining high quality. It uses 95 percent less water than commercial farming. We can predict soil moisture level, irrigation systems can be monitored, increased productivity, high quality crop production, water conservation /optimize water use, profit to farmers.

V. REFERENCE

01. Zeidler, C., Schubert, D. & Vrakking, V, . Feasibility Study: Vertical Farm
a. EDEN, DLR internal report, Bremen, Germany, 2012
02. D. Despommier, "The rise of vertical farms," Sci. Am., vol. 301, no. 5, pp. 80–87, 2009
03. Nuvvula, J., Adiraju, S., Mubin, S., Shahana, B., & Valisetty, V. (2017). Environmental Smart Agriculture Monitoring System Using Internet of Things. International Journal of Pure and Applied Mathematics, 115(6), 313-320
04. Haris, I., Fasching, A., Punzenberger, L., & Grosu, R.. CPS/IoT Ecosystem: Indoor Vertical Farming System. In 2019 IEEE 23rd International Symposium on Consumer Technologies (ISCT) pp. 47-52, 2019, June
05. Chuah, Y. D., Lee, J. V., Tan, S. S., & Ng, C. K., Implementation of smart monitoring system in vertical farming. In IOP Conference Series: Earth and Environmental Science Vol. 268, No. 1, p. 012083. IOP Publishing, 2019, June
06. Priya J, S Chekuri, "Water Level Monitoring System Using IOT", International Research Journal of Engineering and Technology, Vol. 04, Issue. 12, pp.1813-1817, 2017
07. T Shetty, P Wagh, A Dudwadkar,"Water Level Monitoring System", International Research Journal of Engineering and Technology, Vol. 05, Issue. 08, pp.1712-1714, 2018
08. Abhishek A M , Chandrakanth R , Mahesh C , M M Marigiri , Ramya B K ,"Smart Vertical Farm Using IOT ",International Journal of Innovative Research in Computer and Communication Engineering, Vol. 6,Issue. 4, pp.3593-3597, 2018
09. M Sandeep, C Nandini , Bindu L , Champa P, Deepika K H, Anushree N S , "IOT Based Smart Farming System", International Research Journal of Engineering and Technology , Vol. 05, Issue. 09, pp. 1033-1036,2018
10. A. Sarkar and M. Majumder, Journal of Advanced Agricultural Technologies, 2, 98-105, (2015).
11. Divya J., Divya M.,Janani V."IoT based Smart Soil Monitoring System for Agricultural Production" 2017.

12. H.G.C.R.Laksiri, H.A.C.Dharmagunawardhana, J.V.Wijayakulasooriya ”Design and Optimization of loT Based Smart Irrigation System in Sri Lanka”2019
13. Anushree Math, Layak Ali, Pruthviraj U ”Development of Smart Drip Irriga- tion System Using IoT”2018.
14. Dweepayan Mishra1 ,Arzeena Khan2 Rajeev Tiwari3 , Shuchi Upadhay,”Automated Irrigation System-IoT Based Approach”,2018.
15. Vaishali S, Suraj S, Vignesh G, Dhivya S and Udhayakumar S, ”Mobile Integrated Smart Irrigation Management and Monitoring System Using IOT”,2017
16. Anurag D, Siuli Roy and Somprakash Bandyopadhyay, “Agro-Sense: Precision Agriculture using Sensor-based Wireless Mesh Networks”, ITU-T “Innovation in NGN”, Kaleidoscope Conference, Geneva 12-13 May 2008.
17. International Journal for Research in Applied Science & Engineering Technology (IJRASET) ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887 Volume 6 Issue III, March 2018
18. G. Eason, B. Noble, and I. N. Sneddon, “On certain integrals of Lipschitz-Hankel type involving products of Bessel functions,” Phil. Trans. Roy. Soc. London, vol. A247, pp. 529–551, April 1955
19. G. Vogel, “Upending the traditional farm,” Science (80-.)., vol. 319, no. 5864, pp. 752–753, Feb. 2008
20. Venkata Naga and Rohit Gunturi, "Electronics and communication engineering department Anna University Chennai", *Microcontroller Based Automatic Plant Irrigation System International Journal of Advancements in Research & Technology*, vol. 2, no. 4, pp. 194, April 2013, ISSN 2278-7763.
21. S. V. Devika et al., "Arduino Based Automatic Plant Watering System", *International Journal of Advanced Research in Computer Science and Software Engineering*, vol. 4, no. 10, pp. 449-456, 2014, ISSN 2277128X.