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Domains of IoT Devices in the Field of Agriculture

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Abstract: ***As the world population is increasing, it is estimated that by the year 2050 it will reach up to 9 billion. This huge population's food requirement can't be satisfied with the current agriculture system only. As the area of Information Technology is enhancing in every field, agriculture filed is now not an exception to it. While talking about agriculture, it becomes necessary to think about limitations of communication in the mega farms/field. While talking about usage of IoT in the field of agriculture it is need to look after the devices which are required in the different domains. In this paper all the domains of the IoT device in the field of agriculture is discussed.***

Keywords: ***Sensors, Agriculture, crop, monitoring, controlling, IoT, WSN***

I. INTRODUCTION

With development of the human life, somewhere it creates questions for the future of human society. As the world population is increasing highly, it creates various issues. As per world population report, in the year of 2023, world population reach to the mark of 8 Billion and it is estimated that by the year 2050 it will reach at 9 Billions [1]. With the increasing in the population, demand of space and food is also increasing which resulted into decreasing of agriculture land. With that, question of food availability is also arson. To meet demand of this population it is now required to introduce usage of Information Technology in the field of agriculture[13].

In the country like India, where agriculture is primary activity of huge populations, there must need to change the ancient way with the modern technology. In India 58% people dependent on the agriculture [2]. With that Indian earn 41.25 billion US$ from the export of agriculture items in the year of 2021. Country like India where primary income source is agriculture it is necessary to introduce some changes to increase productivity. For that Information technology becomes blessing in the various way[3]. Here some of the ways are describe.

II. APPLICATION DOMAIN OF IOT IN THE FIELD OF AGRICULTURE

IoT can be used at various aspect in the filed of agriculture. It can help to record the temperature, humidity, presence of insect, weather forecasting, moisture in the soil, soil monitoring, fertilization, tracking the locations, etc. The following figure 1 shows the usage of IoT device in the field of agriculture for the various purposes.

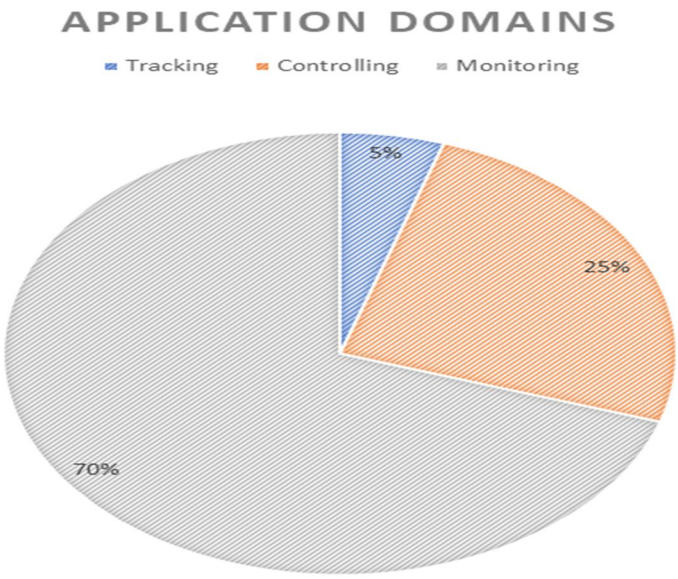


Figure 1 Application Domains of IoT

As shown in above figure 1, 70% IoT devices are used in agriculture for the monitoring of the filed and the crop. 25% IoT devices are used for the Controlling of various activities in the filed and 5% devices are used for the tracking. Monitoring includes, monitoring of temperature, humidity, moisture, fertilizers, pest, etc. Controlling include various devices that control everything on field, for an example, controlling of irrigation system, pesticide spreading etc. Only 5% devices are used for the tracking of various things like, tracking growth of the crop, amount of water supply etc.

As describe above there are 3 main domains. The main classification of these applications are describe in the following figure 2.

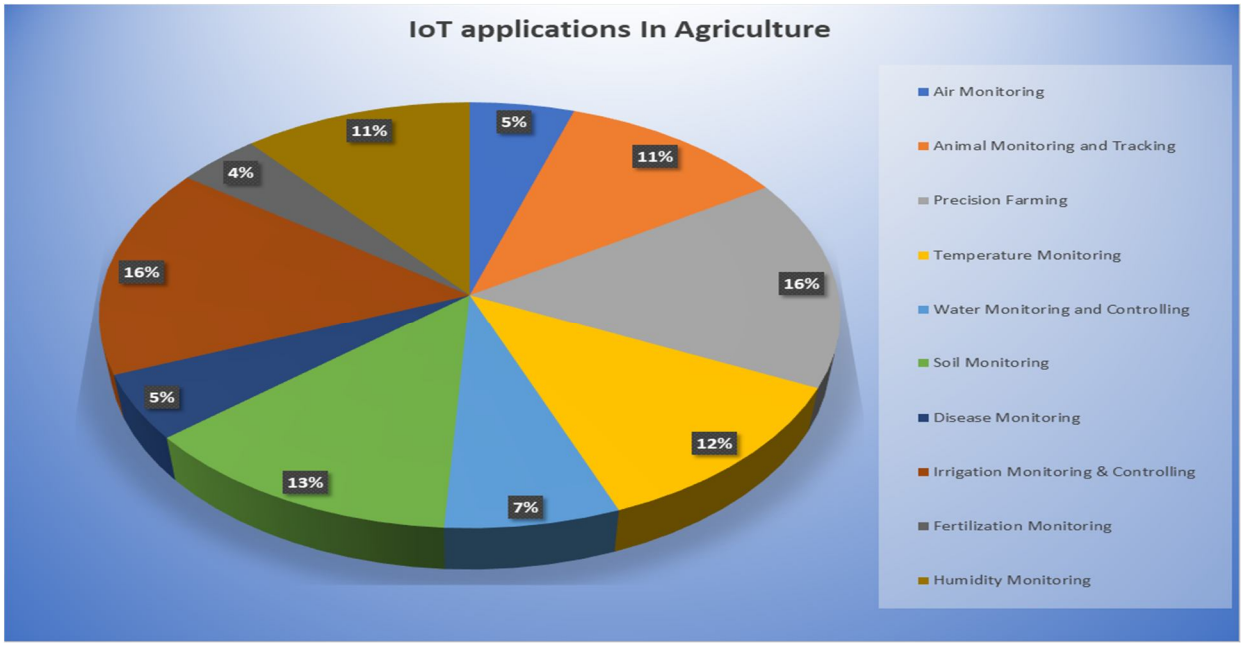


Figure 2 : IoT application in various area of agriculture

As describe in the above figure 2, classification of IoT device in the field of agriculture, 5% devices are used for the air monitoring, 11% devices are used for the tracking of the various animals in the field. There only 4% devices are available which can be used for the precision farming. For temperature monitoring 13% devices are used. For water monitoring and controlling in the field, 7% devices are used. For soil's care soil monitoring devices are used which is 13%. For disease monitoring and identification of disease there are 5% devices. For the irrigation monitoring and controlling there are 16% devices use. Last but one of the most important aspects in crop is fertilization monitoring, there are 16% devices.

III. AIR MONITORING

Main purpose of this sub-domain is to determine the air quality, because it affects a lot to the any crop growth. It is consisting of the various sensors like, temperature sensor, humidity sensor and WSN (Wire-less Sensor Network) [4]. This sensor can be powered by the solar panels.

IV. SOIL MONITORING

Here the solution for the soil monitoring is taken from the moisture and temperature monitoring sensors in the field with the help of WSN [5]. Here sensors are used in the soil for the temperature and presence of moisture in the soil. This system is maintain using the various communication technologies like ZigBee and internet[12]. This can also be accessible by the web applications[6,7].

V. WATER MONITORING

Water is the most important factor in the agriculture. In this area of water monitoring includes monitoring of water quality, PH level, temperature, pollution level of water etc. In this sub domain of IoT based solution for the water monitoring includes sensors for measuring temperature, conductivity and turbidity[8]. This solution is also based on the WSN. There is a web base solution is available for the sensors to measure the temperature, solar radiations, humidity and rainfall for the irrigation monitoring in the fields[9].

VI. DISEASE MONITORING

In country like India where crop disease are major issue for the farmers. As a solution of the same the LOFAR-agro Project is working on plan monitoring system[10]. This project is carried on the potatoes plant. It is monitoring data or weather, temperature and humidity and identifying fungal diseases on the crop.

VII. CROP AND PLANT GROWTH MONITORING

There are many methodologies to monitor the growth of the plant[11]. With the help of the historical data of the plant in particular filed, it is possible to identify the growth of the crop is in better direction or not. There are many Artificial Intelligent applications that support monitoring of the crops.

VIII. MONITORING GASES AND GREENHOUSE

In the develop cities, it is required to see weather condition according to pollution based as well. For monitoring pollution in the are of field sensors like GHG, gas sensor, Carbon Sensors plays a vital role.

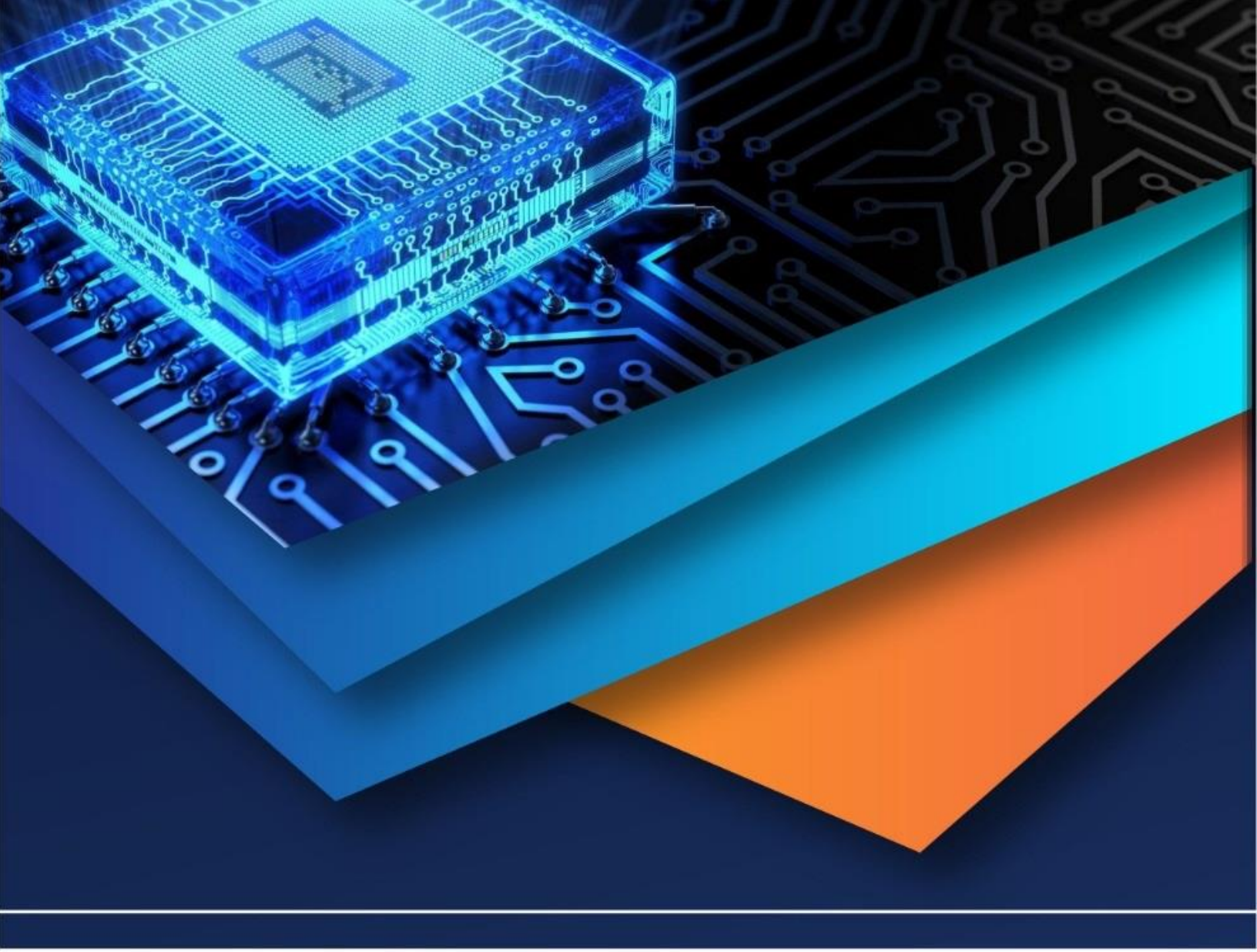
IX. CONCLUSION

All the domain area on the field of agriculture, various IoT devices are required. There are still required a lot of research for identifying the threshold values and systematic analysis. Communication between those devices is also an area of research. With the appropriate used of all IoT devices in the field will give a dramatical output in agriculture production

REFERENCES

[1] Web content available at : World Population Clock: 8 Billion People (LIVE, 2023) - Worldometer (worldometers.info)
[2] Web content available at : Agriculture in India: Industry Overview, Market Size, Role in Development...| IBEF
[3] Web content available at : How IoT can transform agriculture in India (indiaai.gov.in)
[4] Watthanawisuth, N.; Tuantranont, A.; Kerdcharoen, T. Microclimate real-time monitoring based on ZigBee sensor network. In Proceedings of the SENSORS, 2009 IEEE, Christchurch, New Zealand, 25–28 October 2009; pp. 1814–1818
[5] Chen, K.T.; Zhang, H.H.; Wu, T.T.; Hu, J.; Zhai, C.Y.; Wang, D. Design of monitoring system for multilayer soil temperature and moisture based on WSN. In Proceedings of the 2014 International Conference on Wireless Communication and Sensor Network, Wuhan, China, 13–14 December 2014; pp. 425–430.
[6] Thorat, A.; Kumari, S.; Valakunde, N.D. An IoT based smart solution for leaf disease detection. In Proceedings of the 2017 International Conference on Big Data, IoT and Data Science (BID), Pune, India, 20–22 December 2017; pp. 193–198
[7] Jayaraman, P.P.; Palmer, D.; Zaslavsky, A.; Salehi, A.; Georgakopoulos, D. Addressing information processing needs of digital agriculture with OpenIoT platform. In Interoperability and Open-Source Solutions for the Internet of Things; Springer: Cham, Switzerland, 2015; pp. 137–152
[8] Postolache, O.; Pereira, J.D.; Girão, P.S. Wireless sensor network-based solution for environmental monitoring: Water quality assessment case study. IET Sci. Meas. Technol. 2014, 8, 610–616.
[9] Fourati, M.A.; Chebbi, W.; Kamoun, A. Development of a web-based weather station for irrigation scheduling. In Proceedings of the 2014 Third IEEE International Colloquium in Information Science and Technology (CIST), Tetouan, Morocco, 20–22 October 2014; pp. 37–42
[10] Langendoen, K.; Baggio, A.; Visser, O. Murphy loves potatoes: Experiences from a pilot sensor network deployment in precision agriculture. In Proceedings of the 20th IEEE international parallel distributed processing symposium, Rhodes Island, Greece, 25–29 April 2006
[11] M. R. M, M. K. Saiteja, G. J, S. N and N. K. G N, "IOT based Crop Monitoring system for Smart Farming," *2021 6th International Conference on Communication and Electronics Systems (ICCES)*, Coimbatre, India, 2021, pp. 562-568, doi: 10.1109/ICCES51350.2021.9489004.
[12] Bairam, Shashi Kumar & Chunchu, Shivaji. (2022). IOT IN AGRICULTURE. 10.13140/RG.2.2.15314.89285.
[13] Rajack, B. & Subramanian, N. & Pragadesh, N. & Suvanesh, R. & Vignesh, S.. (2021). Implementation of IoT in Agriculture. 10.3233/APC210258.
[14] IoT-Based Smart Irrigation and Monitoring System in Smart Agriculture Futuristic Communication and Network Technologies, 2022, Volume 792, ISBN : 978-981-16-4624-9

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