IOT Based Smart Farming Monitoring System for Bolting Reduction in Onion Farms

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Abstract*- Internet of Things (IoT), a well-known branch of computer science has introduced smart farming to each and every farmer's neighborhood while offering constructive green agriculture. IoT depicts a self-configuring chain of components. The efficient implementation helps agriculture, a self-discipline as nicely as reducing human work and increasing crop cultivations. In onion farming, bolting is an insidious phenomenon that occurs in onion plants due to fluctuations in environmental factors such as temperature, humidity, and light intensity. Due to bolting, the flowering stem of an onion plant is produced before the crop is harvested, resulting in a poor-quality harvest and yield. Therefore, from a farmer's perspective, it is highly desirable to monitor and control the environmental factors to avoid bolting. In this paper, we propose and design a new prototype, namely, a smart farming monitoring system (SFMS) for bolting reduction, which is based on the generic three-layered IoT architecture. By using IoT (Internet of things) technology and careful remote monitoring, a more favorable environment can be provided to reduce and avoid onion bolting. To analyze the efficacy and performance of the proposed SFMS, a real test-bed implementation was carried out. The SFMS prototype was installed both in the open and in a greenhouse environment to monitor onion crops. Based on the data received via sensors, the percentage of onion bolting was recorded as 16.7% in the open environment while 3% in the closed environment. In the closed environment, optimal temperature, humidity, and light intensity were provided to the onion crops using the SFMS. For this reason, the percentage of onion bolting was reduced from 16.7% to 3%, consequently yielding better onion production. Moreover, the SFMS is a low-cost, easy-to-install solution that is developed with locally available hardware and resources, and we believe that this new solution can transform conventional onion farming into a more productive and convenient smart farming in the region.

***Key Words*: IOT, sensors, DHT11, Node MCU**

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INTRODUCTION

We are developing IoT-based smart farming monitoring system (SFMS) for bolting reduction in onion farms. With the advancement of mobile and communication technologies, with the concepts of the Internet of things and with the power of cloud computing, it is possible to develop low-cost solutions and applications in smart farming. Our proposed SFMS system's architecture is made up of sensors that collect data such as temperature, air humidity, and light intensity data. The raw data are transmitted through a gateway to a cloud platform for analysis. The farmer is then informed through e-mail or Short Messaging Service (SMS) or Mobile App to take any preventive measures accordingly. Perception, network, and application layers are the three generic architecture layers of IoT. Real-world events are collected using various sensors, etc. at the perception layer, also known as the "sensing layer." The network layer routes data over the Internet using Wi-Fi/Bluetooth, gateways, routing and switching operations, etc. The application layer directly interacts with the end-user. Each of these layers performs specific functions and tasks with their identified service. IoT-based smart farming/agriculture is highly effective compared to traditional approaches. IoT-based smart farming is

a network typically designed with sensors (light, humidity, temperature, soil moisture, etc.) to monitor the crop field and automate farming activities. The farmers are able to track the conditions in the field from anywhere. The standard IoT technology architecture has three (03) layers, i.e., perception layer, transportation layer, and application layer, as indicated in Figure 1. The perception layer is the bottom layer of IoT, consisting of RFID tags, wireless sensor network (WSN) technology, and GPS technology, which collects information/data from objects/things. The transportation layer or network layer is responsible for communicating over the IOT Based Smart Farming Morning System for Bolting Reduction in Onion Farmsternet or other network devices and servers. Finally, the application layer acts as an interface to provide different end-user services, such as data storage, data visualization, and analysis.

LITERATURE SURVEY

1. In 2021, Internet of Things enabled Onion Growth Monitoring System using Cloud, "Internet of Things enabled Onion Growth Monitoring System using Cloud", Many real-time applications recognize the various advances that have been made in many areas through the use of new technologies. This research work presents a remote internet of things (IoT) based onion growth monitoring method using Wireless Sensor Networks and Think speak Cloud. The proposed research work enhances the traditional approach to onion farming in rural areas with the help of internet of things and wireless sensor networks. This research work proposes the development and implementation of a thermal based Internet of Things system within the onion farms for the purpose of controlling devices such as fan and heater according to the optimal range of onion production and good onion growth. The proposed model is implemented and validated using the simulator. The results show that the proposed method is faster and that this proposed model provides a shorter simulation time with greater efficiency.

2. In 2022, Ratnakar Achary; Rohan R; Riya K; Pavan V, "Effect of Temperature and Relative Humidity on Onion farms and its Monitoring by using IoT Based Smart Farming System", Onion cultivation in many parts of India and Karnataka State have affected by a rapid change in the climatic conditions. The objective of this research paper is to analyze the effect of volatile atmospheric conditions such as temperature and relative humidity (RH) in open and greenhouse farming on onion cultivation and provide an early alert to maintain a favorable environment for better yielding of onion by using a smart farming system. The smart farming system developed by using IoT, is built for monitoring the onion crop with the help of different types of sensors. The data gathered by these sensors are analyzed to assess the favorable and adverse effect of the climatic parameters on the onion crop and making decisions for the cultivation of crops or maintain favorable environmental conditions in a greenhouse to minimize the loss due to crop failure. The system 3 IOT Based Smart Farming Morning System for Bolting Reduction in Onion Farms also provides an early information to the farmers about the variations in environmental factors and their effect on the crop in different stages of its growth. For an onion crop the variations of these parameters cause the bolting. This unfavorably conditions effect on the quality of the onion produced. The smart framing system proposed is suitable for monitoring the changes in the environmental factors, and to analyze the effect of these parameters both in a greenhouse and open environment. The result obtained by experiments of this research specifies that the percentage bolting is more in an open environment than a greenhouse. The greenhouse will produce a better yielding due to controlled parameters.

3. In 2021, M. Saravana Mohan; D. Abishek; J. Hemchander," IOT Based Onion Farming Solar Powered Hydroponics Monitoring System", Traditional method of farming has become outdated nowadays. It is a time-consuming process. Scientists are working hard to identify new methods to grow plants and to increase the yield. Hydroponics when compared with the traditional method of farming is considered to produce more yield. Due to the increase in population, importance must be given to higher productivity without compromising the nutrient value. Onions are considered as the most consumed and essential crop in India. Growing onions in hydroponics will produce a higher yield with higher nutrient value. The growth of onions in hydroponics can be monitored by using an IoT system. The system can be automated with sensors and microcontrollers to imply machine-to-machine communication and to control the hydroponics system automatically. The system is intelligent enough to provide the hydroponic system's control action based on several parameters. By using the solar supply to control water flow, the cost of electricity in this IoT-based system in hydroponics can be reduced and it is ecofriendly too. The system will automatically discharge the solution whenever the plant needs it. The user can monitor periodically.

PROJECT SCOPE

In onion developing, shooting is a tricky quirk that occurs in onion plants as a result of instabilities in regular variables like temperature, moistness, and light power. Due to catapulting, the blooming stem of an onion plant is made before the collect is gathered, achieving a bad quality accumulate and yield. In this way, as per a farmer's perspective, it is significantly appealing to screen and control the biological factors to do whatever it takes not to bolt. we propose and design another model, to be explicit, a splendid developing noticing structure for impacting decline, which relies upon the traditional three-layered IoT plan. By using IoT (Web of things) development and mindful remote checking, a superior environment can be given to lessen and avoid onion catapulting. To examine the reasonability and execution of the proposed framework a veritable demonstrating ground execution was finished. The model was presented both in the open and in a nursery environment to screen onion crop

AIM & OBJECTIVES

- To reduce the problem of time consuming.
- To make a centralized system to detect the condition of onion rodusting It will be enjoyable method without affecting their day-to-day life.
- To make a system for normal user who are lack of qualified personnel and adequate infrastructure in rural India

MOTIVATION

To avoid bolting in onions farm there are more efforts required to grow Onions. If it gets wasted, it affects not only farmers but also merchant associated with them, so it important to keep track of Onion crop development. To prevent the losses of onion and help more growth of onions and there production.

SYSTEM ARCHITECTURE

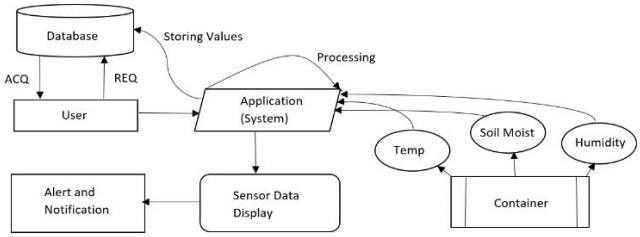
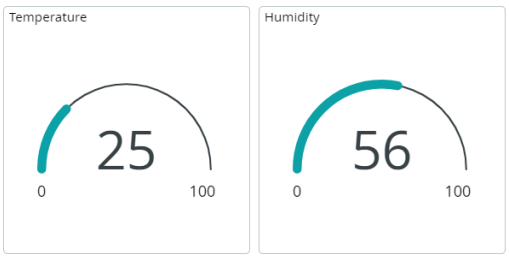
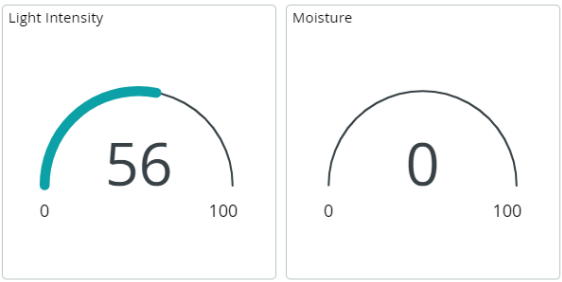


Fig -1: System Architecture Diagram

APPLICATION:

RESULT





CONCLUSION

Hence, we are overcoming the drawback of existing system, and providing a smart system that will not only monitor and control onion bolting with security but also send notification to user whenever necessary**.**

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