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Smart Ventilation System for Onion Storage

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Abstract: *In terms of global onion production, India comesin second. In India, onions accounted for 6% of all vegetable production. It significantly affects both the national economy and the financial standing of farmers and consumers. The air that is hot, cold, and humid is exposed to the onions that are keptin onion sheds. Owing to ongoing climate change, things may decay. Once the process begins, it expands quickly and dramatically, causing unanticipated loss. This system can assistin preventing loss. Gas emissions are detected using a variety ofgas sensors. A designed system delivers an alert and notifies the owner when onions begin to decay. The three primary functions of the suggested system are detecting rotting onions through smell, alerting the user, and opening and closing curtains..*

Keywords: onion production

I. INTRODUCTION

After China, India has the second-highest population in the world. India is home to 1.37 billion people. In India, onions are one of the most important vegetable crops. India is the world's second-largest producer of onions. One of India's most significant commercial crops is the onion. In India, the onion crop is farmed over 1.20 million hectares, yielding 19.14 million tons of animal products annually at a productivity of 16.12 tons per hectare. Based on our survey, we found that between 60 and 75 percent of the onions produced are wasted. These are significant losses for our countries and farmers. We are working on this initiative in order to solve thisissue and protect the finances of our farmers and the country. Noses with electronics can be a Electronic noses have been used in the past to distinguish between various compounds in scents, making them a cheap tool for detecting smells. Onions experience deterioration, rotting, and a distinct smell due to postharvest infections. The e-nosecan track the smell of onions being stored. Data is gathered by the e-nose and transmitted to a computer. The outcomes are then calculated by the computer. Farmers must go to their onion storage when it starts to rain in order to cover the onion shed and keep the onions dry. Onions get wet when farmers are unavailable or unableto visit the onion shed in a timely manner, which results in onion waste and financial loss for the farmers.

Furthermore, farmers are unaware of the number of onions that spoilin storage. In this project, we will use wifi to check the weather andthen send a notification to a motor that will be mounted on one of the shed's four corners or on an onion shed. The curtains will be released to the bottom of the shed when the motor receives a signal. This method will shield the onion shed from the rain, mitigating the disadvantage of the manual method. Based on the poll, we examine the difficulties farmers encounter in identifying rottingonions or their inability to determine the extent of onion rot in storage. We will attempt to determine the amount of rotten onion in storage by employing a smell sensor. By taking into account their rangeand positioning the sensor on the shed. The system will use a sensor to gather data and then deliver it to the farmer via SMS so they can check and quickly receive notifications about the number of bad onions in storage.

II. LITERATURE REVIEW

Onions are the most widely traded crop in India. The goal of reducing waste in onion warehouses has always been the top priority in our nation, but it has never been easy to accomplish. Several technological advancements have been made to help with this task, one of which is thesmart system for onion storage [8–11].The current system separates the onions into multiple bunches and places each bunch next to a temperature sensor or humidity fan whenever the system senses changesin the weather. The onions are stored in a warehouse with adequate ventilation, exposed to hot, cold, and humid air depending on theclimate. notices the rain outside the storage facility and 346 S. M. Ahmed

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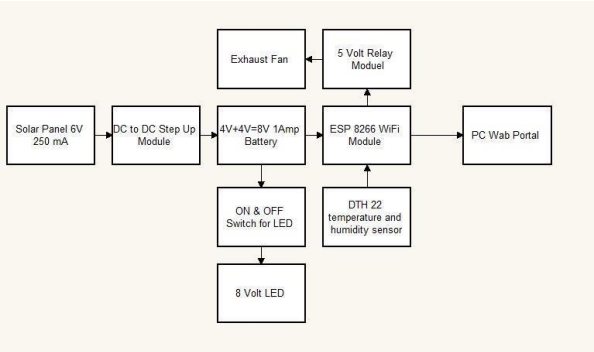
Additionally, the warehouse administrator receives an alert about the temperature and humidity levels within the warehouse, and they take the necessary action. Even though this mechanism lessens the likelihood of rotting, sprouting losses sprouting, which is typically inhibited when onions are subjected to high temperatures and humidity. For the purpose of storing onions, forced ventilation or natural ventilation can be used. When one onion begins to rot, it spreads across the group of onions and becomes uncontrollable

III. EXPERIMENTAL METHODOLOGY

Make sure you understand the experiment's goal. For instance, assessing how well a smart ventilation system maintains ideal conditions for onion storage to reduce spoiling could be the goal.

Identification of Variables: Determine the dependent variables (onion quality, rotting rate), controlled factors (starting onion quality, storage environment), and independent variables (temperature, humidity, ventilation rate).

Configuration for the experiment: Assemble the experimental setup, including the onion storage space, the smart ventilation system, and the environmental sensors.



Baseline Measurement: In order to create a point of comparison, measure the initial onion quality and baseline environmental conditions prior to adopting the smartventilation system.

Smart Ventilation System Implementation: In accordance with the manufacturer's instructions or the experimental design, install and turn on the smart ventilation system.

Data collection: Throughout the experiment, keep an eye on the temperature, humidity, air quality, and onion quality, including weight loss, sprouting, and decay.

Control Group: For comparison, if at all possible, add a control group in which onions are stored with conventional ventilation.

Data analysis: Utilizing statistical techniques, examine the gathered information to assess how well the smart ventilation system performs in comparison to the baseline or control group.

Concluding remarks and suggestions: Based on the data analysis, draw conclusions and offer suggestions for the smart ventilation system's practical application in onion storage facilities.

Validation and Iteration: Repeat the experiment to confirm the results, and think about modifying the experimental design in light of the results to enhance the smart ventilationsystem or the experimental process.

For future reference and publishing, make sure to document every step of the experimental procedure, including the methodology, findings, and conclusions.

IV. EXPERIMENTAL RESULTS AND DISCUSSION

This efficient monitoring of the production of onions kept in the warehouse helps to lower commercial commodity waste and increase reutilization, as preventing onion losses is a very important duty. The ESP32 microcontroller is coupled to the MQ135 and DHT11 sensors in Fig. 3, which are used to detect gasses and measure temperature and humidity. The experimentalsetup for the principal testing, which compares the temperature, humidity, and gas levels in a fresh and a rotting onion set, is shown in Figure 4. As shown in Fig. 5, a cloud channel called Onion warehouse monitoring is constructed using Thing Speak. As seen in Fig. 6, the measured values are updated to cloud ThingSpeak. This gadget will efficiently keep track of any modifications to the sensor values by The ESP32 microcontrolleris coupled

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