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SMART AEROPHONIC AND HYDROPHONIC FARMING

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***Abstract*—** The nature of the paper is theoretical in nature and based on secondary data, the finding of paper shows that in Jammu & Kashmir agriculture is still narrow, backward and less the results of this study are useful for growing crops not only in technical parts, but also in physical part, it was evaluated by questionnaire using technology acceptance model. Using of sensors and actuators in the greenhouse to capture different values allows for the control of the equipment, it can also be optimized for growth at optimal temperature and humidity of various crops planted.

I. INTRODUCTION- Technology can link everything to the Internet called the Internet of Things (IoTs). This means that the human beings control any object using a wireless sensor network (WSN) which makes convenience to everyday life. Technology can be applied in many fields such as home, city, wearable, industrial, health, retail, farming, etc. We can integrate the physical world into the computer system and virtual resources available on the internet to provide both value-added data and functionality for users. The trend of 2020 IoTs usage will increase by 50 billion. The system must have an internet connection that the devices can send data and receive results to communicate with each other. Agriculture was interested in improving access to technology. Promoting agriculture on several aspects in developing countries, technology had crossed handles using wireless technology and networking to utilize energy and power consumption by equipment, which is helpful in the agricultural development. Jammu & Kashmir state is an agrarian state. It is 640 km in length from North to South and 480 km from East to West. The state ranks 6th in area and 17th in population among the states and union territories of India. The state is essentially a mountainous state in which about only 30% of the reporting area is under cultivation. the hilly and mountain areas differ the plains in topography, elevation and physiographic diversity of habitats for flora and fauna. Promoting agriculture on several aspects in developing countries, technology had crossed handles using wireless technology and networking to utilize energy and power consumption by equipment, which is helpful in the agricultural development. Aeroponics is a modern technique for growing agricultural plants by providing a nutrient solution in the air without soil. Plant roots receive a nutrient spray mist from an atomizing nozzle (Lakhia et al., 2018a). Shortly after its development, aeroponics became a valuable research tool and provided researchers with a non-invasive way to check the development of roots. The hilly areas is generally grown with grass, herbs and Serbs, maize, pulses and wheat to some extent. The plain areas is grown with rice, wheat, pulses, oil seeds vegetables. Smart aeroponic and hydroponic farming are advanced, soilless cultivation methods enhanced by IoT (Internet of Things) to automate nutrient delivery, environmental control, and monitoring. Hydroponics grows plants in nutrient rich water, while aeroponics mists suspended roots, both maximizing yields while saving water. The aeroponic system is the best system for producing potatoes (Buck Seth et al., 2016). Using this approach, plant roots can be quickly nourished under controlled conditions (Factor et al., 2007). Innovative soilless farming methods like hydroponics and aeroponics can help with problems like water scarcity and environmental degradation. Large demands on water resources and, by extension, the availability of food have led to the evolution of many novel farming practices, including intricate agricultural production systems. The art of soilless agriculture known as hydroponics involves growing plants in an aquatic environment similar to an aeroponic farming system, or in a medium devoid of soil. In hydroponic growing systems, plants are fed with mineral nutrient solutions in water or soilless media.

Fig.1 Vegetable grown in cold temperature

The greenhouses can work automatically and control via the applications controlled by the mobile device. The connections were able to control by Node MCU. Freely, no matter where we are around the world, you can control via Blynk, the top and middle part displays the current temperature and the status of the device, respectively, as shown in Figure 1. Remark that it is really simple to set up everything and start customizing. Blynk is one application instead of supports hardware of your choices whether your Arduino was linked to the Internet over Wi-Fi, Ethernet, or this new ESP8266 chip.

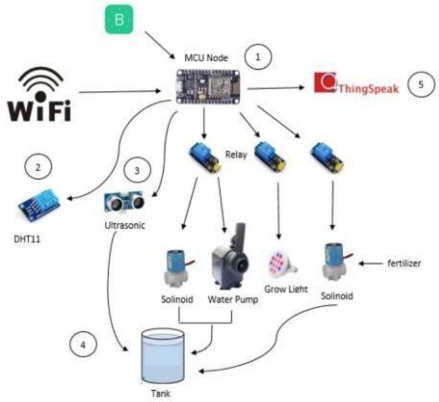


Fig. 2 Phototype of system

Hardware Requirements: The main components of the prototype as shown in the Figure 2. The details of each section is as follows:

* Node MCU is use to implement the monitoring modules. The following sensors and other peripherals were used to collect real time data from the field. * DHT11 is a relatively cheap sensor for measuring temperature and humidity values. * Four Channel Relay Board (5V) for switching AC/DC is used to high level trigger with AC motor (220V) to operate the electricity devices. * Ultrasonic Sensor Module (HC-SR04) includes an ultrasonic transmitter, receiver, and circuit. There are four pins measuring 5-700 cm. used to detect the water level in tank. * Grow light is an artificial light source used to keep plant growth at night by emitting an electromagnetic.

* Solenoid is the device controls the opening and closing of the water flow. * Water pump is water pushers move forward from the tank to the pipe hydroponics.

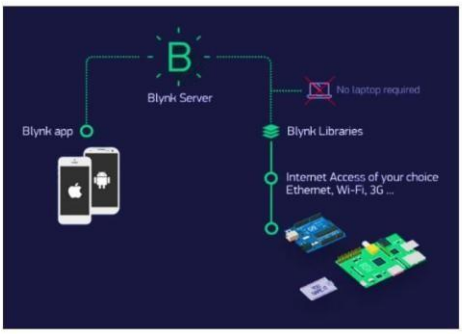


Fig.3: Blynk Platform

Software Requirements: Sending data from hardware to smart phone by using the Arduino IDE as a communication medium. Here, the smart phone application was called Blynk. Blynk is open-source electronics prototyping platform which is a modified version of Wiring/Arduino IDE with iOS and Android apps to control Arduino board using the Internet as shown in

Figure 3;

Figure 3: Blynk platform

Blynk platform with iOS and Android apps to control Arduino, Raspberry Pi, and the likes over the

Internet. It is a digital dashboard where you can build a graphic user interface for your research by simply

dragging and dropping widgets. Blynk is a comprehensive low-code IoT platform that allows users to quickly build, deploy, and manage connected devices via custom iOS/Android apps and a web dashboard. Supporting over 400 hardware types (e.g., ESP32, Arduino) and various connectivity options, it provides secure cloud infrastructure, firmware-over the-air (OTA) updates, real-time data visualization, and automated workflows, catering to both makers and enterprises.

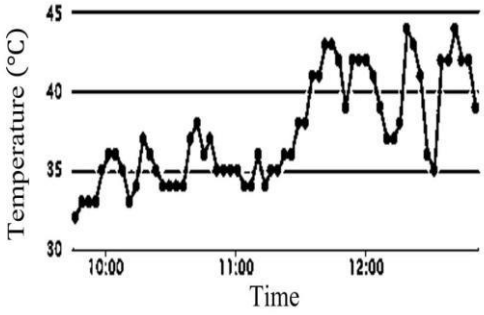
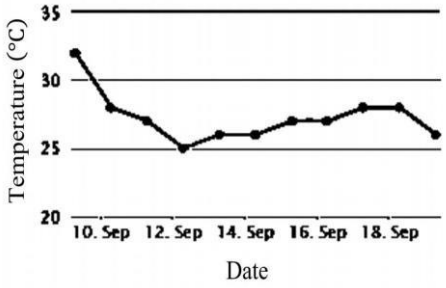


Fig.4: Temperature in the first week

First generation's Productivity: Due to the high temperature of the plant, 48 plants dying in the first week since maximum temperature is 44◦C measured from the sensor via the IoT. The DHT11 sensor was used to measure in the survival rate 0%.



The ultrasonic sensor monitors the amount of water in the tank if it is lower than normal as we set up for the suitable value of water level in the tank. After instant processing, the solenoid valve was working to add water until full of water. Both devices work reliably Ultrasonic sensor sends the up-to-date data which we can desire the duration time for collecting data into Thing Speak™. Temperature in the first week Next step, we created a 50% black SLAN UV filter mesh filter under the roof. Then the heat in the greenhouse is noticeably reduced, as shown in Figure 4. Temperature after installing filter UV 50% Second generation's productivity: After

reducing temperature by UV filtration inside a greenhouse, 48 plants can be survived 22 plants. This means that the survival rate is 45.83%. It can be seen that from the lower temperatures, the plants were more survived.

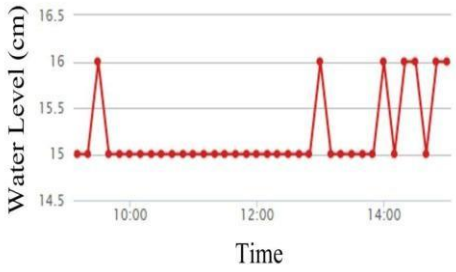
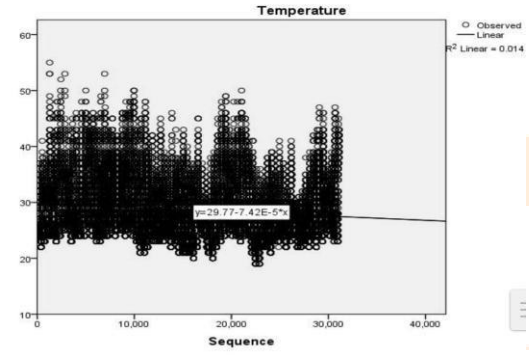
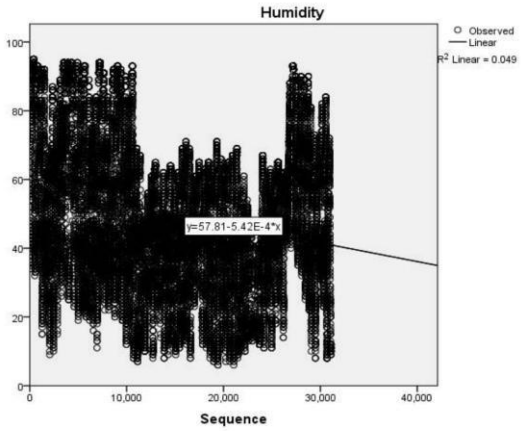


Fig.5 Water level usage





We brought all the data to create the chart for finding the appropriate value through the SPSS program. We plotted the graph for finding the correlation between temperature, humidity, growth with time as shown in Figures 11-13, respectively. Notice that the temperature reverse variation with
humidity. From the total variance explained the acceptance of correlation's observation with 70%, we can see the humidity was adapted growth extremely as well. However, the temperature is one of factor reacted with growth as necessary condition.

Conclusion- Sensor technology was intended for the automatic control devices via mobile accurate correctly. This technology will save time to look for vegetables which people can eat healthily. Farmers need some helps in the different stages of crop growth and the guidance should be given at the right time. Farmers are suffering a lot of problem; economy, social, and politics. Various challenges in the agricultural domain were identified. The architecture of the challenges mentioned above, knowledge-based structure has various details about agriculture, flow, various input such as market availability, geospatial information and weather prediction. The agriculture sector in J&K state is backward and under developed. As compared to other states of the country the agricultural productivity and yield rate is very low. Majority of population depends upon agriculture directly or indirectly for their livelihood. The future work of this study will be developed the sensor for using in public actually. We will study the process of using machinery or machinery to determine the growth of crops and harvest the crops in order to save time and labour. Each vegetable was calculated to get the right temperature for the vegetable.

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