International Journal of Trend in Innovative Research (IJTIIR)
Available Online @ www.ijtiir.com | ISSN: 2582-0354

Smart Irrigation System based on IoT

[1]Sk. Safiya Shaheen, [2]S.Bhagya Priya, [3]S. Harsha
[1,2,3]Department of Electrical and Electronics Engineering
[1,2,3]Sasi Institute of Technology and Engineering, Tadepalligudem, 534101.

Abstract-- The innovation for this review paper came from the countries which are evolving and whose wealth is mostly dependent on agriculture and meteorological conditions forex: India. In these countries, agriculture and farming production depend on making the right and timely operational decisions. Cultivation is an organized program designed to maximize the fertility of agriculture by tailoring the soil and crop management by observing environmental conditions. This paper highlights the vegetation in rooftops by using IoT (internet of things) sensors like humidity sensors, moisture sensors to remotely measure the environmental parameters such as soil moisture, temperature, humidity, and soil type. The information gained by the sensors is transferred directly to the cloud server by using IoT technology using technology in rooftop vegetation small crops like chilly, coriander, etc which grow easily and in this method we use suitable irrigation methods for vegetation to get the perfect crop.

Keywords-- *Rooftop vegetation, humidity sensor, soil moisture sensor, thermal sensor*

I. INTRODUCTION

In upcoming decades, the human population may increase hugely and the requirement for food increases rapidly. It has been determined that global food production must improve by at least 70% over the coming times to keep pace with this people's growth.

For many years there is no change observed in agricultural methods. Farmers yet use standard methods based upon expectations of the crop's nutritional demands. Giving the same nutrients input to the entire farm is not preferable because it may increase the use of pesticides, unnecessary water consumption, and high functioning costs. By implementing smart methods the above problems will be reduced. According to the bill 1947, it represents agriculture, including livestock breeding, dairy farming, seed breeding, and berry growing.

Cultivation aims to use most land and increase the gain. The farming sector needs to choose smarter and easy methods of cultivation and irrigation. Precision farming is an innovative procedure in agriculture, it is a farm administration method that uses information technology (IT) to assign resources and make sure that crops and soil obtain the required nutrients at the accurate time for food production. In current times rese archers have worked to improve habitual limitation watering systems for irrigation management using IoT technology; IoT can be defined as a system of autonomous objects that link and share data over the internet. The procedures for watering are drip irrigation, canal irrigation, sprinkling systems, and terraced methods. Conventional irrigation is classified by demand improvement for productivity, deficiency of water, and poor performance of agriculture practice. These all problems are solved by using an automatic irrigation system to increase production.

II. NEED FOR AUTOMATIC IRRIGATION:

(1) Saving energy and resources for utilizing in a piercing way. (2) Simply installation of the method on the field. (3) To implement the right amount of water at the proper time for purpose of easiness to manage farm and nursery on rooftops. (4) Pump or motor can be smoothly run with a sensor-based controller and no requirement for any investigation to manage irrigation systems for this kind of vegetation. Crop productivity includes a rise in the loss of the overwatering from the drenched soil and avoiding the incorrect point of watering to save more water and procure good crops.

In rooftop vegetation, we need not monitor or provide labor for the observation of crops. In these advanced irrigation techniques, everything is done automatically with the help of sensors. In this type of vegetation small crops and vegetables grow efficiently with sufficient water and with perfect humidity level in air and moisture in the soil. by observing all these conditions we provide water and according to the crop, we change irrigation techniques.

This study is aimed to support dynamic water management for rooftop vegetation. It strives to explain the various modern and sensor-based irrigation management systems and trace environmental parameters and implement warnings and information using remote sensor collection, wireless network, and data management plan as shown in the diagram

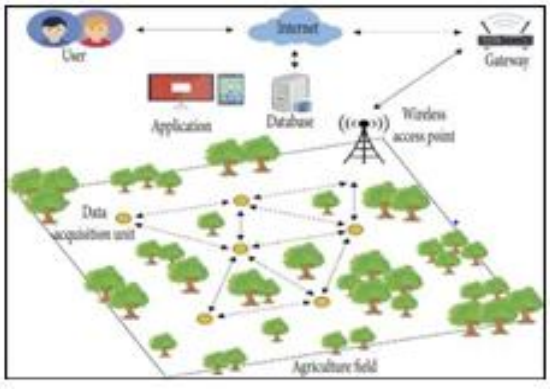

Figure 1: Wireless sensor network layout for the automated irrigation system

III. RELATED WORK:

An automated sprinkler is a unique irrigation procedure of smart agriculture. Mostly, it is followed by the researchers for implementing the test studies. A Wireless sensor network is conceived as a new concept in vegetation, which also encouraged many scholars to accomplish research in this zone. In this review, we use sensors like a humidity sensor and moisture sensor to measure the humidity in air and moisture present in the soil. To select a crop for vegetation roof needs to understand weather conditions and seasons. Based on these we can get the perfect crop according to season and temperature.

Rooftop vegetation is the best vegetation to establish on the roof of a building. The process of growing food on the rooftop is mentioned as rooftop farming. This method measures temperature, soil moisture, and air humidity. To measure air humidity we use humidity sensors.

IV. HUMIDITY SENSORS

A humidity sensor is an electronic gadget that estimates the humidity in its environment and changes its conclusions into a corresponding electric signal. Humidity sensors vary broadly in size and functionality; some humidity sensors can be seen in managed devices such as smart phones, while others are combined into a larger embedded system.

Humidity sensors are basic components of remote monitoring and creative asset management use cases. They can be deployed on assets for example pumps. In this vegetation, we place humidity sensors and observe the humidity present in the atmosphere and according to the water is provided to crop through irrigation system like sprinkling and drip irrigation system. In this vegetation, we use a thermal humidity sensor.

V. THERMAL HUMIDITY SENSOR

Thermal humidity sensors are also called as Absolute Humidity (AH) Sensors as they measure absolute humidity. Thermal humidity sensors estimate the thermal conductivity of both dry air and air with water steam. The variation between the specific thermal conductivities can be related to absolute humidity. The Working of thermal conductivity sensors is based on two thermistors that are present in it as shown in below internal diagram.

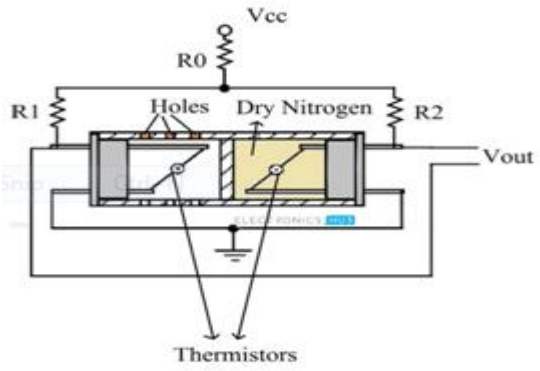

Figure 2: Internal diagram of the thermal humidity sensor

VI. SOIL MOISTURE SENSOR

Soil moisture sensors estimate the volumetric water content in the soil. Since the direct gravimetric analysis of free soil moisture needs removing, drying, weighing a unit, soil moisture sensors measure the volumetric water content indirectly by using some other trait of the soil, such as electrical resistance, or dielectric constant.

Measuring soil moisture is necessary for agricultural purposes to help farmers manage their watering systems more efficiently. Knowing the accurate soil moisture circumstances on their fields, not only are farmers able to generally use more limited water to grow a crop, but they are also capable to increase yields and the quality of the crop by advanced management of soil moisture during crucial plant growth stages. Hence these are used in rooftop vegetation. Moisture has been prognosticated from the climate prediction sensors located at the field.

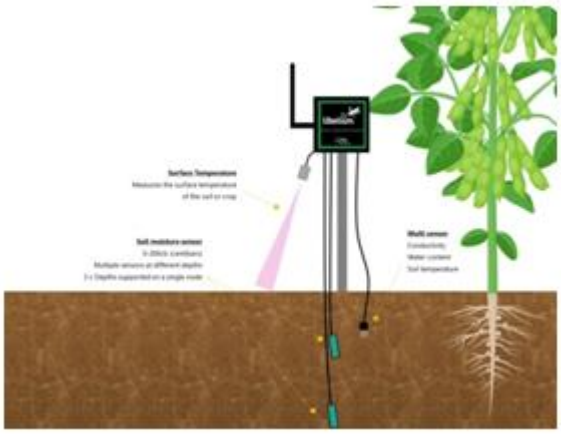

Figure 3: Soil moisture which measures the water content in the soil

Soil moisture has been prognosticated from the climate forecast sensors located at the farm. The soil moisture evaporation depends on air relative humidity, air heat, radiation, and temperature of the soil. A sensor-based and IoT built architecture has been developed for getting and processing and transmitting the different physical parameters of the farmland(rooftop area used for vegetation) related to weather forecast information for making efficient irrigation.

Relatively low-cost and easy devices that don't need a power source are available for reviewing whether plants have adequate moisture to thrive. After embedding a probe into the soil for around 60 seconds, a meter shows if the soil is too dry, moist, or wet for plants. By using this data we know how much water is required for our crop by this moisture sensing.

VII. TEMPERATURE SENSORS (THERMAL SENSORS)

A Temperature sensor is an electronic device that measures the temperature of its environment and

converts the input data into electronic data to record and monitor or signal temperature changes.

Figure 4: Insertion of probes in the soil to measure moisture content

Thermal sensors are frequently used to measure surface temperature and have identified active response variables to trace crop health and crop stress. Thermal remote sensing is a process of monitoring radiation emitted from the surface of the object and transmits it to its temperature without creating any contact with the object. All surface objects emit radiation above the temperature of degrees Kelvin(^{o}k) or 230^{o}C.

Figure 5: Thermal sensors

VIII. WHY SENSORS IN VEGETATION

Sensors are used in agriculture and irrigation to get data about real-time physical and environmental attributes, and they are also employed to acquire feedback and have regulators over the current situation. The above-mentioned all sensors are connected to the internet and by sensing we provide required water as needed to crop to grow in any condition by thermal sensors and temperature is sensed and according to that sensor we can arrange irrigation method. Same like this we sense humidity and moisture and according to that, we can change the crop by changing with a season to get an effective crop on the rooftop.

The agriculture sector convey numerous demand through sensors that are as follows

- Tracking of distributed land
- Gathering soil, crop, and weather data
- Multiple crops in a small area of the roof

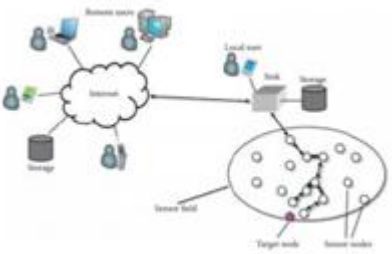

Figure 6: sensor network application in vegetation

IX. SOME CROPS BASED ON THE SEASON CAN GROW ON THE ROOFTOP

Rooftop vegetation is cultivating small crops in a small area with modern irrigation methods. In this small area and according to seasons and weather conditions we can grow small crops like beetroot, tomatoes, chilies, capsicum, coriander, spinach, capsicum, etc.

Crop parameters

Table 1: Crops and their cultivating parameters

CROP	**SEASON**	**SOIL TYPE**	**PH VALUE**	**HUMIDITY**	**MOISTURE**	**TEMPERATURE**
Tomato	summer	Loam & sandy	6.2-6.8	75%	35-45%	24^o-30^{o}C
Spinach	Rainy	clay	6.5-7	100%	45-55%	10^o-22^{o}C
Capsicum	winter	sandy	6-7	65%	15-25%	18^o-20^{o}C

Irrigation techniques

Table 2: irrigation techniques

Crop	*Irrigation type*	*Duration of crop*
Tomatoes	Drip irrigation	3-4 months
Spinach	Sprinkling	45-60 days
Capsicum	Precision type	7-10 months

X. BENEFITS OF ROOFTOP VEGETATION

1. It converts co2 emissions
2. It produces oxygen
3. It reduces the temperature of buildings and power costs
4. It reduces the ambient temperature

5. It captures and harvests rainwater
6. It reduces stormwater runoff and discharge
7. It gives a healthy and large amount of product in a small area

SUMMARY AND CONCLUSION

The objective of this research work was to highlight the development of rooftop vegetation and the usage of IoT in farming. A simple low-cost, sustainable farming control system that is extremely used for small area vegetation like on roofs. In the review paper, it's discussed how sensors are used and what is the purpose of sensors in farming. IoT means the internet of things that is the things which connected to the internet. In recent times, in abroad and developed countries, IoT plays a crucial role in day-to-day life. In upcoming decades, nearly after 5 years India also aware of IoTs. These IoTs help in monitor the connected devices with smart devices and it gives individual security to each device. In rooftop vegetation, by using IoT sensors we can monitor farms from anywhere and we can adapt to new standards. IoT provides better time management. The vegetation can be done by getting data from these sensors and accordingly we can change crops and can provide related irrigation methods. The improvement of sensor-based applications in farming makes it possible to increase productivity and efficiency. Rooftop vegetation is the best indoor farming for healthy and profitable crops.

References

[1] D. Spellman, K. kinzli, and T.kunberger. calibration of the 10HS soil moisture sensor for southwest Florida agricultural soils. Journal of irrigation and drainage engineering, June 2013
[2] Awasthi, P. (2013). Urban agriculture in India and its challenges. International journal of environmental science: development and monitoring(IJESDM),4(2), 48-51
[3] Review of sensor network-based irrigation systems using IoT and remote sensing, Wei Li, Muhammad Awais, WeiminRu, Saaduddin, and Chenchen Lu. September 2020.
[4] Green roof urban farming for buildings in high-density urban cities, dr.Sam ,sam s m hui, march 2011.