SMART CROP PROTECTION SYSTEM FOR AGRICULTURE

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Abstract—A smart crop protection system should contain yield monitoring equipment to protect farms from animal attacks and climate change. In the current structure, electrical fences kill animals. In comparison to the other system, the proposed approach employs a device that combines a PIR sensor and a sound sensor simultaneously soil moisture sensor, DHT11 used to detect the heat of the soil. The data obtained by the sensors will be supplied to the farmer via application via wired and communication technologies. It saves flexibility and money by reducing the amount of human labor. As a result, the farmer's mobile device database will be generated in order to take the necessary action.

Keywords—PIR,DHT11,Soil moisture sensor.

I. INTRODUCTION

Agriculture provides a living for around 58% of India's population. Agriculture is a significant sector of the Indian economy, accounting for approximately 17% of GDP. Agriculture also employs 60% of the population. Farmers, meanwhile, are suffering significant losses as a result of numerous weather changes and animal interference. There areSeveral ancient farming methods, such as scarecrows and electric fences, are still in use.Farmers in some locations utilise smoke to protect their farmland when they burn elephant dung or other things that produce a lot of smoke. In some locations, people utilise natural emulsions of fish or garlic, as well as castor oil, to repel animals.Yet, these are ineffective in saving farmland from animals. As a result, we created this low-costCropson farms are frequently devastated by local animals such as buffaloes, cows, goats, birds, and so on. This results in massive losses for the farmer. Deforestation happens as a result of overpopulation, resulting in a lack of food, water, and shelter in forest areas. As a result, animal interference in residential areas is increasing, threatening human life and property, resulting in human-animal conflict. But, according to nature's rules, every living species on this planet plays a crucial function in the ecosystem. Elephants and other animals coming into touch with humans have a negative impact in a variety of ways, including agricultural depredation, damage to grain reserves, water supply, buildings, and other assets, and human injury and death. As a result, we suggest an automatic crop security system against animals.Simultaneously, This system is designed to irrigate at a time of regular intervals for predefined period of time. n this technique, moisture sensor are placed at the root zone of the plant and near the gateway unit handles the sensor information and transmit data to the controller which in turn control the water pump. The system is used in many processes factors like soil moisture, salinity, humidity, temperature, intensity etc. This needs to repeat the task and have to work in abnormal weather conditions. Soil has to overcome the flaws in the irrigation system, the land based on the soil humidity and at the same time the status of irrigation is updated. The main objective is to apply the system for improvement of health of the soil and hence the plant via multiple sensor. Appropriate soil water level is a necessary pre-requisite for optimum plant growth. Also, water being an essential element for lifesustainable, there is vast necessity to avoid Its undue usage Irrigation is a major user of water. This necessitates the regulation of water supply for agriculture purposes. The fields should not be over or under-irrigated. The goal of this thesis is

to create a simple, easy-to-implement system for continually monitoring and indicating the level of soil moisture in order to attain the maximum amount of water in the land environment.

II. RELATED WORK

Several strategies have been put forth to stop animals from getting into and ruining crop crops. The method primarily uses alarm situations and loud noise. To keep animals away, some systems employ smoke and egg sprayers.Yet above all of these technologies, producing unpleasant ultrasonic frequencies for animals is dependable and effective. For every animal, these frequencies are distinct.We developed a system prototype that generates ultrasound frequencies and yields the greatest results.

A. Jayprakash D. Sonone, Dattatray A. Patil, and Kantilal P. Rane

The "irritating and hearing frequency identification and generation to avoid animals accident"[1] method created by Jayprakash D. Sonone, Dattatray A. Patil, and Kantilal P. Rane safeguards animals against motor vehicle accidents.The device frightens the animals by using a PIR sensor, an ARM7 processor, and an audio frequency generator.If there are any animals on the road, the PIR sensor will detect them. The ARM7 CPU detects motion, and an audio amplifier then generates the appropriate ultrasonic sounds in response. An audio amplifier is utilised to boost the frequency, and a sound buzzer is employed to produce the ultrasound.

B. P. Divya, P. Usha Kiran, and P. Praveen M.

The "Iot-based wild animal entry detection system" [4] by P. Divya, P. UshaKiran, and P. Praveen M. proposed a system that continuously monitors agriculture fields. The system is used to detect animals and notify farmers.To find animals, the system makes use of PIR sensors. The system's processing unit is an Arduinomicrocontroller.When an animal is spotted, the camera is triggered, and an image is delivered for analysis and animal classification. Once the wild animal has been identified, the appropriate repellent system is next used. The repellent system may consist of a sound buzzer or a bright light emitter. Also, the system would alert farmers by sending SMS through a GSM module.

C. Soil Volumetric water content

Volumetric water content is a numerical measure of soil moisture. It is simply the ratio of water volume to soil volume.Another equally valid measurement is GWC, gravimetric water content, which measure weight rather than volume. Graphing the VWC for a soil sample is a simple. The gravimetric soil water content is expressed per unit mass of oven-dried soil.

D. IoT-based wild animal intrusion detection system

P. Divya, P. UshaKiran, and P. Praveen M, in their paper "Iot-based wild animal intrusion detection system", described a system that continuously monitors crop fields. The system is used to identify animals and notify farmers.

PIR sensors are used by the system to detect animals. The system's processing unit is an Arduino microcontroller.

When animals are detected, the camera is activated, and the image is sent for processing and identification. Once the wild animal has been identified, the repellent system is applied. The repellent system can consist of either a sound buzzer or a bright light emitter. The system will also notify farmers via SMS using the GSM module.

E. The soil's ph level, temperature, and moisture

The pH of the soil is a measurement of the number of hydrogen ions (H+) present in the soil solution and is used to determine how acidic the soil is. On a negative logarithmic scale, pH is measured from 1 (acidic) to 14 (alkaline), with 7 being neutral. Acidity increases when pH decreases. A pH of 5.5 to 8 is ideal for the majority of plants.

D. Stefano Giordano et al,

This paper's motive is to design IOT based system to prevent animal intrusion in the crop field and providing weather conditions. Every year in Italy animal intrusion causes huge loss. The current systems for prevention of animal intrusion are cruel and large amount of installation and maintenance cost is required. This system is based on an ultrasounds generator, which is not harmful for anyone in any way. Repelling system consists of a low power state-of-the-art Cortex ARM M0+ microprocessor which handles frequency production and the networking operations.

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Passive Infrared Sensor (PIR) sensor generates signal only when an animal is detected. Device can be tuned according to the animal that is desired to be repelled. Open source operating system called RIOT is used as it has features such as multi-threading, efficient network stack and memory allocation which are compatible for Real-Time use. One thread is used for the detection using a PIR and transmitting a multicast message to the gateway and the nodes. Another thread is used for receiving multicast messages from other nodes. Since our devices are producing data in real time, a Time-Series Database ' OpenTSDB' is selected and a column family database 'HBase' as a long period storage. Weather monitoring system includes the device and the back-end. The device is a solar powered ESP-8266 Ardunio based board connected to various sensors. it communicates over Wi-Fi to the back-end system. It provides a real-time weather conditions via email notification. Main goal is to provide repelling and monitoring system.

E.Mr. P. Venkateswara Rao et al,

The purpose of this system is to build a system to detect movement of animal and produce sound. Camera and microcontroller are used to detect the animal. System consists of Arduino, camera, GSM and buzzer. Movement detected by camera module after detection of movement system produce sound to divert animals and by GSM model SMS is generated by the system to alert the owner. This system provides an early warning about possible intrusion and damage by animal. This system is not harmful for anyone in anyway. A camera is basic requirement for this project. The camera module is set in a location where the animals enter into the farm. Prohibit the entry of the animal and give alert to owner of the farm. The main problem of crop vandalization by wild animal tried to solve in this project. This system provides urgent attention and effective solution. System designed a smart embedded farmland protection which is low cost and also consumes less energy. Such system will be helpful to the farmer in protecting their field and save them from significant losses. This system help in achieving better crop yields thus leading to their economic well being.

F.P. Rekha et al,

Proposed a system for preventing agricultural land from animal and automated irrigation system. By using arduino, GSM module, IR sensor and soil moisture sensor, senses the environmental data and send to arduino. This system makes the use of IR sensor for detection of animals and soil moisture sensor to find the moisture of soil and automatically control the water pump for auto irrigation system. But this system does not utilize advanced technologies for alerting the farmer and detection of animals in farm.

G.TejasKhare et al,

Proposed automated crop field surveillance using computer vision. In this system the long range camera are placed at the corner of field or land with considering maximum field of view of camera. When animal is detected by the camera the distance between camera and speaker is calculated. The speaker nearest to the animal is identified. The object detection is carried out by pre-trained model YOLO V3 and COCO dataset. If animal is detected the speaker nearest to the animal makes sound. But this system doesn't work in different circumstances like in the night or dark (shadow).

III **LITERATURE REVIEW**

Agriculture is one of the country's significant economic challenges because it is the source of income for around 54% of Indians. Even today, this sector is underdeveloped and plagued by numerous issues, resulting in low agricultural output. As 43% of land in India, is utilised for agricultural yet generates only 18% of the nation's GDP. Indians are concerned about the country's terrible agricultural situation. Rural farmers in India are impoverished, and the majority of them are uneducated, thus there is a shortage of good extension services. Crop Vandalization, or wild animal attacks on crops, is becoming increasingly widespread in Tamil Nadu, Himachal Pradesh, Punjab, Haryana, Kerala, and other states. Wild creatures such as monkeys, elephants, wild pigs, deer, wild dogs, bison, nilgais, estray animals such as cows and buffaloes, and even birds such as parakeets inflict extensive crop damage by running over, eating, and entirely vandalising them. This results in low crop yields and considerable financial losses for agricultural owners. a variety of other factors, including.Another big

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issue that Indian farmers confront is their reliance on nature and a badly maintained irrigation system. Present agricultural practises are not economically or environmentally sustainable, and yields for many agricultural commodities in India are low.

Among the factors to blame are a poorly maintained irrigation infrastructure and an almost universal lack of adequate extension assistance. Inadequate roads to market from villages, rudimentary market facilities, and heavy regulation are just a few of the concerns facing India's agriculture sector.The following factors contribute to India's low productivity: According to the World Bank's "India: Priorities for Agriculture and Rural Development," India's massive agricultural subsidies are impeding productivity-enhancing investment. Agriculture's overregulation has increased expenses, pricing risks, and unpredictability. The government makes interventions in the labour, land, and credit markets. India's infrastructure and services are deficient. According to the World Bank, water allocation is inefficient, unsustainable, and inequitable. The irrigation infrastructure is in disrepair.

Illiteracy, overall socioeconomic backwardness, poor progress in implementing land reforms, and insufficient or inefficient farm finance and marketing services.

Due to fragmentation, land ceiling statutes, and family disputes, land holdings are quite small (less than 20,000 m2). Such tiny holdings are frequently overstaffed, resulting in unemployment and low labour productivity. Farmers' illiteracy and ignorance of contemporary agricultural practises and technology, hampered by high expenses and impracticality in the case of small land holdings. Insufficient irrigation facilities and farmers' reliance on the monsoon season, with a good monsoon resulting in rapid growth and a weak monsoon resulting in slow growth for the economy as a whole. The Ministry of Agriculture is also attempting to enhance farmer conditions through several programmes such as the Insurance Plan and the ITC Limited Plan. Farmers farming wheat, fruit, rice, and rubber are covered by the Agricultural Insurance Corporation of India's insurance plan in the case of natural disasters or catastrophic crop failure. ITC Limited plans to connect 20,000 villages to the Internet by 2013, providing farmers with up-to-date agricultural pricing for the first time, reducing losses from neighbouring growers selling early and facilitating rural investment. ITC Limited plans to connect 20,000 villages to the Internet by 2013, providing farmers with up-to-date agricultural pricing for the first time, reducing losses from neighbouring growers selling early and facilitating rural investment.ITC Limited plans to connect 20,000 villages to the Internet by 2013, providing farmers with up-to-date agricultural pricing for the first time, reducing losses from neighbouring growers selling early and facilitating rural investment.

IV BACKGROUND THEORY

A.*PIR sensor*

Passive infrared sensors or passive infrared detectors are other names for PIR sensors. It is an electrical sensor that detects the infrared light that things emit. PIR sensors are frequently employed in motion detection systems. For the purpose of object detection, it does not emit radiation. There are two IR-sensitive slots on PIR sensors. Both slots will measure the same quantity of IR while the system is not in use. One part of the sensor is intercepted when an animal passes in front of it. resulting in a favorable difference in both halves. As the animal walks away from the sensor, the opposite occurs and a negative difference is produced.

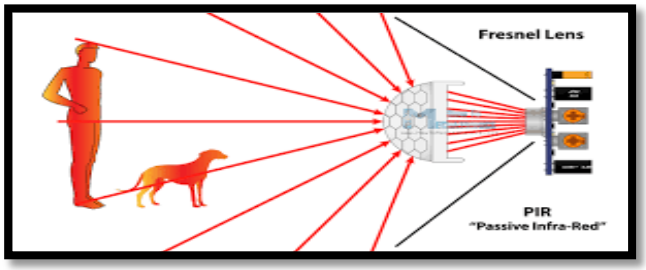

FIG 1 : PIR SENSOR

B.ESP8266

The ESP8266 WiFi Module is a self-contained SOC with an integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. The ESP8266 uses a 32bit processor with 16 bit instructions. It is Harvard architecture which mostly means that instruction memory and data memory are completely separate. The ESP8266 has on die program Read-Only Memory (ROM)

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which includes some library code and a first stage boot loader.

FIG 2 : ESP8266

C.DHT11

In the fields of measuring and analysis of emerging technologies in agriculture, humidity sensors are gaining popularity. The humidity sensor detects, monitors, and records both humidity and air temperature. Measuring humidity and controlling temperature are critical aspects of growing crops.

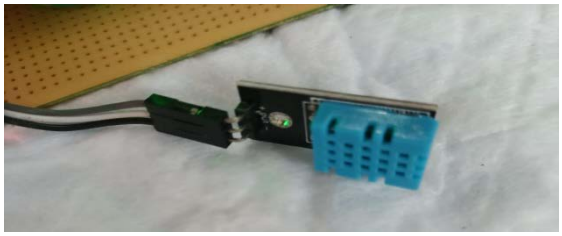

FIG 3 : HUMIDITY SENSOR

D.Soil moisture sensor

Soil moisture sensors estimate the volume of water content based on the dielectric constant of the soil. The dielectric constant indicates the soil's capability to transmit electricity. As the water content of the soil increases, the dielectric constant of the soil increases, because the dielectric constant of water is much larger than the other soil components, including air. Therefore, the measurement of the dielectric constant gives a predictable assessmentwatercontent.

FIG 4 : SOIL MOISTURE SENSOR

E.DC Motor

DC controlled siphons utilize direct current from engine, battery, or sun oriented ability to move liquid in an assortment of ways. It works on 30 psi which the flow of water is varied to its size and its input to output power energy optimal battery.

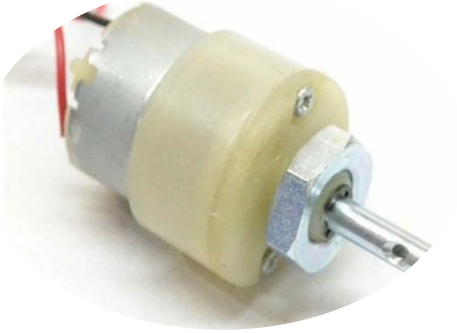

FIG 5: DC Motor

IV EXISTING SYSTEM

This project is a smart crop protection system to protect the farm from animals as well as an unknown persons. This projects contents Arduino UNO, Nodemcu, LCD display, PIR sensor, flame sensor, sd card module, solar panel, and solar charges converter. This whole project is working on 12v dc supply from the battery. We used solar panels to charge the battery. The other components used are as follows.

Components Required

1. Arduino UNO

The Uno R3 development Board is the low-fee version of the famous Uno R3 Arduino. it is assembled with the CH340 USB to Serial converter chip, in preference to the use of an Atmega16U2 chip. This can help to process the sensor data of projects and show the action on an LCD display. We have used lots of these low-fee Arduino boards with CH340 chips, and have discovered them to paintings perfectly.

V PROPOSED SYSTEM

We used the ESP8266 as the system's main heart in this. This project benefits farmers since it eliminates the need for farmers to stay on the field 24 hours a day, seven days a week. For motion detection, we used a PIR sensor. If motion is detected after processing, the camera will immediately switch on and a command will be sent to capture the image. The captured image will be analysed using Open CV to determine if the motion was caused by animal or human influence. If it is due to animal interference, a buzzer will ring to scare the animal away, and an alert message with that image will be sent to the farmer. . Throughout the night, LED will be employed to capture better images and to simulate the presence of humans. If the motion detection is caused by a human, the system will continue to detect the

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motion. To monitor water content and heat in the soil, we employed a soil moisture sensor and a humidity sensor.

VI IMPLEMENTATION AND RESULT

When the soil is completely dry. When the soil moisture sensor detects a dry situation, the motor starts immediately

(ON). As the animal enters the ranch zone, we propose our work. When the PIR and camera identify the presence of an animal, an input signal is sent to the controller. The buzzer alert will suddenly sound to detour the creature's communication network. Finally, by using these sensors, manpower is drastically reduced, and the crop is also protected.

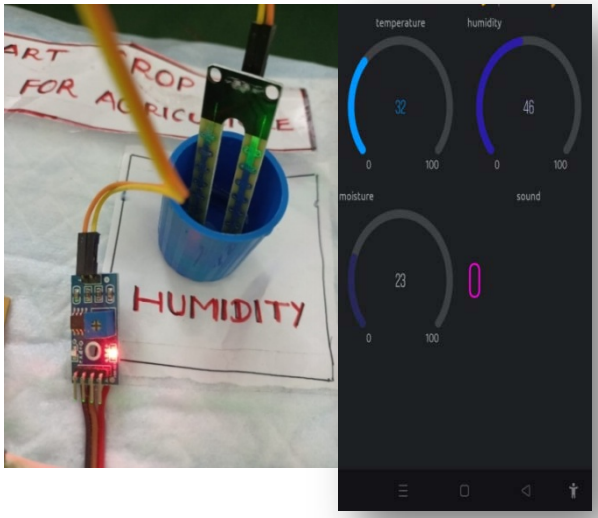

FIG 7: Crop statistics

The PIR sensor is kept in the field to monitor animal movements. It begins alarming when it detects any movement recorded in the PIR sensor.

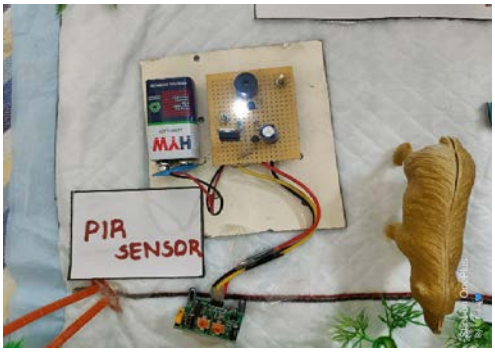

FIG 8 : ANIMALS DETECTION

The humidity sensor measures the heat of the soil and converts its analogue measurement to digital before sending a message to a mobile phone.

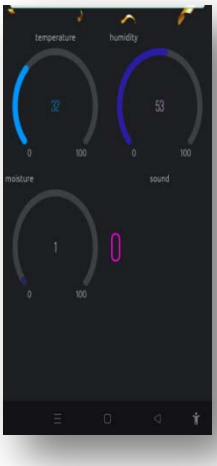

FIG 9 : HUMIDITY DETECTOR

FIG 6 : Circuit Connection

The sensors are linked to the ESP8266, which is supplied by an external 5V DC source. The moisture and water level measurements sensed are transferred to the cloud and shown in the Mobile App. The motor automatically irrigates the crop based on the measured values. A Driver circuit was placed in the field with the motor. The whole system was linked to the Internet. Figure shows the app display for the state crop, and Figure 7 shows crop statistics.

Table Type Styles

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Fig. 1. Example of a figure caption. (*figure caption*)

Figure Labels: Use 8 point Times New Roman for Figure labels. Use words rather than symbols or abbreviations when writing Figure axis labels to avoid confusing the reader. As an example, write the quantity "Magnetization", or "Magnetization, M", not just "M". If including units in the label, present them

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V CONCLUSION

Crop vandalism by wild animals and moisture has become a major social issue in recent years. It requires immediate attention because no effective solution to this problem exists to date. As a result, this project has a high social impact because it aims to address this issue. This project will assist farmers in protecting their orchards and fields while also saving them money.This will also help them achieve higher crop yields, which will benefit their economic well-being.These sensors collect information that is useful to farmers and can be aware of farm land from anywhere in the world.It aids farmers in producing more crops.Lesslabor results in more crops, and more crops result in a healthier life.

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