



# Crop Protection and Monitoring From Animals Attacks by Using Iot Solutions

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**ABSTRACT:** Farm crops are frequently destroyed by neighborhood animals including buffalo, cows, goats, birds, etc. For the farmers, this results in enormous losses. Farmers cannot block entire fields or remain on the field all day to secure it. Hence, we suggest a mechanism for automatically protecting crops from animals. The sensor instructs the microcontroller to operate in this situation. The microcontroller now plays an alarm to tempt the animals out of the field and sends an SMS to the farmer so that he is aware of the issue and may react by being present at the scene in case the animals don't flee after hearing the alarm. This completely protects the crops from animals, preventing loss to the farmer.

**KEYWORDS:** Arduino Uno, Relay, Ultrasonic Sensor, IOT Module – ESP 8266 – 12E (NODE MCU), LCD Display, Soil Moisture sensor, Temperature sensor, Power Supply Unit

## I. INTRODUCTION

Agriculture plays a vital role in the economy, and farmers often face major losses due to crop damage caused by animals such as buffaloes, cows, goats, wild animals, and birds. These animals frequently enter agricultural fields and destroy crops, especially during night time or when farmers are not present. Continuous human monitoring of the field is difficult because farmers cannot stay in their fields throughout the day and night. Traditional methods such as fencing, scarecrows, or manual guarding are either costly, inefficient, or require constant human effort.

To address this problem, an automated crop protection system is proposed. This system is designed to detect the presence of animals near the farmland and alert the farmer immediately while also attempting to scare away the animals. The proposed system is based on a microcontroller platform using the Arduino family, which provides a cost-effective and reliable solution for farmers.

The system uses a motion detection sensor to monitor activity near the field. When an animal enters the detection range, the sensor detects the movement and sends a signal to the microcontroller. Upon receiving this signal, the microcontroller activates a warning mechanism. An alarm sound or buzzer is triggered to scare the animals and drive them away from the crops. At the same time, the system uses a GSM communication module to send an SMS alert to the farmer's mobile phone informing them that an intrusion has been detected in the field.

This notification allows the farmer to take further action if necessary, especially if the animals do not leave the area after hearing the alarm. The system works automatically and reduces the need for constant human supervision. It is designed to be simple, affordable, and energy-efficient, making it suitable for rural farming environments.

The proposed automated crop protection system helps reduce crop damage, minimize financial losses for farmers, and improve agricultural productivity. By integrating motion sensing, microcontroller control, and wireless communication, the system provides a smart and efficient solution for protecting farmland from animal intrusion.



## II. PROBLEM STATEMENT

Animal intrusion into farmland is a major issue affecting agricultural productivity. Domestic animals such as cows, goats, and buffaloes often enter nearby fields while grazing. In addition, wild animals such as deer, wild boars, and monkeys also invade agricultural land in search of food. These animals damage crops in different ways. Some animals eat the crops directly, while others trample plants while moving through the field. Even a small group of animals can destroy a large portion of crops within a short period of time. In many rural areas, farmers rely on traditional methods such as fencing, scarecrows, manual guarding, or lighting fires to prevent animals from entering their fields. However, these methods have several limitations. Fences can be broken or crossed by animals, scarecrows lose their effectiveness over time, and manual guarding requires farmers to stay in the field for long hours, including nighttime.

## III. EXISTING SYSTEM

In traditional agriculture, farmers use various manual methods to protect crops from animals such as cows, goats, buffaloes, and birds. These animals often enter agricultural fields in search of food and cause serious damage to crops. This problem is common in rural farming areas where farms are located close to villages, forests, or open grazing lands. Farmers typically rely on physical monitoring and traditional techniques to prevent animals from entering their fields. One of the most common methods used is manual guarding, where farmers or farm workers stay in the field to watch for animals and chase them away. This method is very time-consuming and requires farmers to remain in the field for long hours, including during nighttime. Continuous monitoring is difficult because farmers also have other responsibilities such as irrigation, harvesting, and maintaining crops.

Another method used by farmers is fencing. Some farmers install wooden fences, wire fences, or thorn fences around the field to block animals from entering. However, these fences are not always effective because animals may break them or find ways to enter the farmland. Installing strong fencing around large fields can also be expensive and difficult to maintain. Scarecrows are also used in many agricultural fields to scare birds and animals away from crops. While scarecrows may work temporarily, animals eventually become familiar with them and stop reacting to them. Therefore, scarecrows are not a reliable long-term solution for crop protection.

In some cases, farmers use noise-making methods such as beating drums, shouting, or using firecrackers to scare animals away. These methods require human presence and cannot operate continuously. They may also disturb nearby residents and wildlife. Due to the limitations of these traditional methods, crop damage caused by animals continues to be a major issue for farmers. The existing systems lack automation, real-time monitoring, and remote notification capabilities. Farmers cannot always be present in the field to protect their crops, which leads to significant economic losses. Therefore, there is a need for an automated and intelligent system that can detect animal intrusion and protect crops more effectively.

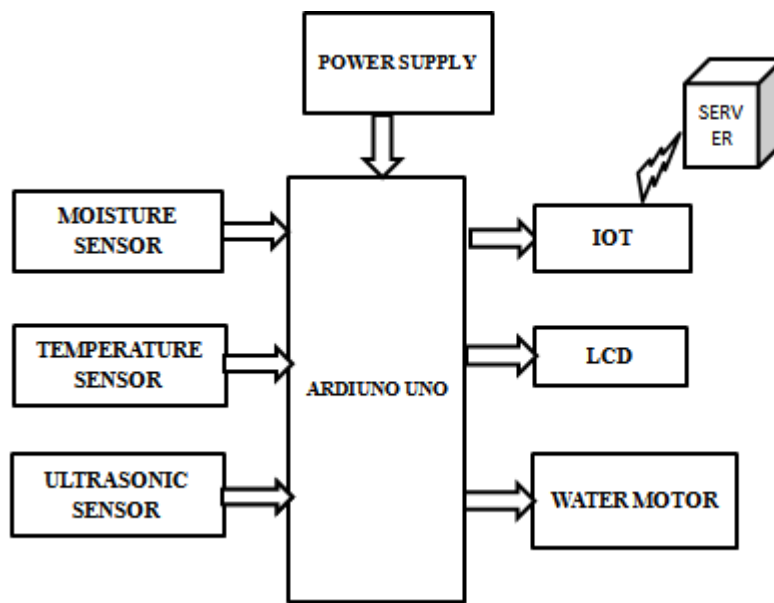
## IV. PROPOSED SYSTEM

To overcome the limitations of traditional crop protection methods, an automated crop protection system is proposed. The proposed system is designed to detect animals entering agricultural fields and automatically respond to prevent crop damage. This system uses modern electronic components such as sensors, microcontrollers, and communication modules to create a smart and efficient solution for farmers. The proposed system is built using the Arduino Uno as the main control unit. The microcontroller is responsible for receiving input signals from sensors, processing the data, and controlling output devices such as alarms and communication modules.

A motion detection sensor is used to monitor the area around the farmland. When an animal enters the detection range, the sensor detects movement and sends a signal to the microcontroller. The microcontroller then activates a buzzer alarm that produces a loud sound to scare the animals away from the crops. This immediate response helps prevent animals from staying in the field and damaging plants. In addition to the alarm system, the proposed system also includes a GSM communication module. When animal movement is detected, the system automatically sends an SMS alert to the farmer's mobile phone. This notification informs the farmer that an animal has entered the field so that they can take further action if necessary. The system operates automatically and continuously monitors the farmland both day and night. It reduces the need for farmers to remain in the field for long periods. The proposed system is designed to be low-cost, easy to install, and energy-efficient, making it suitable for use in rural agricultural areas.

By combining motion detection, automated alarms, and SMS notifications, the proposed system provides a more reliable and efficient solution for crop protection. This technology helps reduce crop loss, improve farm productivity, and support farmers in protecting their agricultural fields from animal intrusion.

#### V. BLOCK DIAGRAM



#### VI. WORKING

The measurement of accurate distance can be achieved by interfacing the HC-SR04 sensor with different types of Arduino boards. At first, give the power supply to the sensor to turn on and connect the GND pin of this sensor to the GND pin of the Arduino board. And the sensor module can be powered up with the voltage supply of the Arduino board when the current which is drawn through the sensor is below 15mA. So the Arduino current ratings will not affect the sensor.

Once the primary arrangement is set up then connect both the pins of sensors like Trig & Echo to the Arduino board's input/output pins. As we discussed earlier, the Trig pin in the sensor must be kept 10us in the beginning in order to start the measurement method. So, this sensor module will generate sound waves by the 40,000 Hz frequency around for every second from the source. When the sound waves return back, the Echo pin will activate until these waves are obtained by the receiver. The time will be measured with the help of an Arduino board.

#### VII. SOFTWARE INSTALLATION

The Arduino Uno can be programmed with the Arduino

Select "Arduino Uno from the Tools > Board menu (according to the microcontroller on your board). For details, see the reference and tutorials.

The ATmega328 on the Arduino Uno comes preburned with a bootloader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol You can also bypass the bootloader and program the microcontroller through the ICSP (In -Circuit Serial Programming) header;

The ATmega16U2 (or 8U2 in the rev1 and rev2 boards) firmware source code is available . The ATmega16U2 /8U2 is loaded with a DFU bootloader, which Can be activated by:

- On Rev1 boards: connecting the solder jumper on the back of the board and then resetting the 8U2.
- On Rev2 or later boards: there is a resistor that pulling the 8U2/16U2 HWB line to ground, making it easier to put into DFU modeFor many embedded projects, Arduino IDE is used as the development environment, while Embedded C is used as the programming language. These tools provide a simple and flexible platform for designing and implementing



embedded applications. The software continuously monitors input signals from sensors and performs operations based on predefined conditions. It also enables communication between the system and external devices such as displays, IoT platforms, or mobile applications. Proper software design ensures that the system operates reliably, responds quickly to changing conditions, and performs its functions efficiently. Therefore, selecting the right programming tools and developing optimized code are important aspects of embedded system development

```
Arduino IDE - Blink | Arduino 1.0
File Edit Sketch Tools Help

Blink
/*
 * Blink
 * Turns on an LED on for one second, then off for one second, repe
 * This example code is in the public domain.
 */

void setup() {
  // initialize the digital pin as an output.
  // Pin 13 has an LED connected on most Arduino boards.
  pinMode(13, OUTPUT);
}

void loop() {
  digitalWrite(13, HIGH); // set the LED on
  delay(1000);           // wait for a second
  digitalWrite(13, LOW); // set the LED off
  delay(1000);           // wait for a second
}
```

## VIII. RESULT AND ANALYSIS

The proposed automatic crop protection system was successfully designed and implemented to detect animal intrusion in agricultural fields and notify farmers in real time. The system was developed using the Arduino Uno as the main controller along with motion sensors, a buzzer alarm, and an IoT communication module. The integration of IoT technology enables remote monitoring and improves the efficiency of the crop protection system. During testing, the motion sensor effectively detected movement within its detection range. When an animal or object entered the sensing area, the sensor sent a signal to the microcontroller. The microcontroller processed the signal and immediately activated the buzzer alarm to produce a loud sound that helps scare animals away from the farmland. This response mechanism was observed to be quick and effective in preventing animals from staying in the field. At the same time, the IoT module transmitted the detection data to an online monitoring platform, allowing farmers to receive notifications on their mobile devices. This real-time communication system ensures that farmers are informed immediately when animal activity is detected near the field. The system demonstrated reliable data transmission and quick response times during testing.

Multiple experiments were conducted to evaluate the system's performance under different environmental conditions. The results showed that the system consistently detected movement and triggered the alert mechanism. The IoT-based monitoring also allowed users to track system activity remotely, which improves convenience and farm management. However, during testing it was observed that certain environmental movements such as strong wind or moving vegetation could occasionally trigger the sensor. Despite this limitation, the system still provides an effective early warning mechanism that helps farmers respond quickly to potential threats. Overall, the results demonstrate that integrating sensor technology, microcontroller processing, and IoT communication provides a reliable and efficient solution for protecting crops from animal intrusion. The system reduces manual effort, enables remote monitoring, and helps farmers safeguard their crops more effectively. Future improvements may include advanced sensors and intelligent detection techniques to further improve system accuracy and performance.

## IX. CONCLUSION

The automatic crop protection system developed in this project provides an efficient solution to the problem of crop damage caused by animals. Farmers often face significant losses when animals such as cows, goats, buffaloes, and birds enter agricultural fields and destroy crops. Traditional methods such as manual guarding, fencing, and scarecrows



are not always effective and require continuous human effort. To overcome these limitations, an automated system based on embedded technology and IoT communication was designed and implemented.

The proposed system uses the Arduino Uno as the main controller to monitor animal activity near the farmland. A motion detection sensor is used to detect movement around the field. When an animal enters the detection area, the sensor sends a signal to the microcontroller. The microcontroller then activates a buzzer alarm that produces a loud sound to scare the animals away from the crops. At the same time, the IoT module sends a notification to the farmer so that they are immediately informed about the intrusion. The system was tested under different conditions to evaluate its performance. The results show that the system can successfully detect movement and respond quickly by activating the alarm and sending notifications. The integration of IoT technology allows farmers to monitor their fields remotely, which improves convenience and efficiency in farm management. The system operates automatically and continuously, reducing the need for farmers to remain in the field for long periods.

The proposed system is simple, cost-effective, and suitable for rural agricultural environments. It helps reduce crop damage, minimizes financial losses, and improves crop protection. By combining motion detection, microcontroller control, alarm systems, and IoT communication, the project demonstrates how modern technology can be applied to solve real-world agricultural problems. In conclusion, the automatic crop protection system provides a reliable and practical solution for protecting farmland from animal intrusion. With further improvements such as advanced sensors, solar power support, and intelligent monitoring systems, the system can be enhanced to provide even more efficient and sustainable crop protection in the future.

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