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Smart Forest Farming using Iot

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Abstract: ***One-third of our country's income is derived from agriculture. Due to the presence of many fertile lands and deltas, India has always been one of the largest producers of food. Agriculture is the means of living for people in India. Due to many constraints, the country's revenue from agriculture is always getting decreased. These barriers include sudden rain, fire damage, and loss of crops by animals, lack of capital and proper irrigation facilities and so on.*** **One step resolution for this problem is to innovate traditional farming with some modern technologies especially in the forest areas.** ***Automation in agriculture helps in solving the problems in farming. Internet of Things (IoT)'s intervention in farming can give a solution so that it reduces the problems faced by farmers in our country. IoT is a framework that deals with communication between things and these things include sensors, actuators and other digital machines. The proposed system consists of smoke sensor, soil moisture sensor and ultrasonic sensor, to understand events or changes in the environment such as soil moisture level, environmental conditions like presence of fire and the presence of animals in agricultural areas and send this information for further processing. Hence proper water pumping based on the soil moisture level, sprinkling of water to control the fire damage, activation of control mechanism to prevent the entry of animals into the fields, spraying of pesticides to control pests can be done. Therefore, this system mitigates the losses in agriculture in a better way and assures that this can contribute better yields, particularly near forest areas as the possibility of destruction by animals is high.***

Key Words: ***Internet of Things, Agriculture, Sensors, Processing, Moisture, Smoke-Sensing, Detrimental-entry***

I. INTRODUCTION

Agriculture is the major employment provider in India. With the increase in population, there is more demand for food. From the UN survey - Food and Agriculture Organization, world-wide production of food should be increased by 70% for the increasing population in 2050 [12]. The agricultural industry should be able to feed the 9.6 billion populations around the world by the next 30 years. Problems for the farmer include extreme weather conditions and rise in global climate change which should be overcome to meet the demand for food. Smart farming supporting IoT technologies will enable farmers and agronomists to return waste and increase productivity, starting with the amount of fertilizer used to travel agriculture [1]. To support a growing population, the amount of agriculture needed to be increased. Hence the need for water increases. Currently, agriculture accounts for 72% of the total water consumption in India. To conserve water better, it is necessary that only the necessary amount of water is given to the crop. Water regulation is an important factor to be considered. Also, forest fires have been the major curse for agriculture. About 8% of the crop is being destroyed due to these fires. Destruction due to animals is another major problem for farmers as it accounts for more than 7% of agricultural losses. Due to all these factors, our production is not able to meet the required level of production. There is a severe shortage of food and these losses are not digested by farmers and are the result of suicides. To control all these problems, agriculture needs to interfere with automation resulting in easy control of development. There is a need to regularly monitor the agricultural system. The use of the developed framework is to reduce wastage by automating the entire agricultural system. In addition, 21 percent of forest area in India is good for farming. Improvement of agriculture in these areas also improves the food production [8].

Development in the agricultural sector is necessary for the development of the country's economic condition. Unfortunately, many farmers still use traditional methods of farming resulting in lower yields of crops and fruits [13].

IoT is a platform where everyday devices become smart, every day processing becomes intelligent, and every day communication becomes informative. While IoT is still exploring its size, its effects have started making incredible progress as a universal solution media for an already connected landscape [15]. Applying knowledge of IoT to the field of agriculture can improve overall farming.

II. RELATED WORK

Ibrahim Mat et al., stated optimized way of spraying the fertilizers in required quantities to the fields by reducing unnecessary wastage. It also has shown the improvement in the crop production [1].

G.Sushanth et al., developed a GPS-based remote-controlled IoT vehicle for smart farming that controls the objects such as the birds and animals and controls the fields from environmental parameters[5].

Soumil Heble et al., spoke about sensing the field parameters with low power consumption so that the life of the battery operated system was improved [4].

Jan Bauer et al., build a system using IoT and Wireless Sensor Networks that monitors Leaf Area Index (LAI) so that proper measures can be taken to improve the growth of production in agriculture [2].

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Rahul Dagar et al., presented an IoT based agriculture in a poly house cultivation also spoken about various problems the farmers facing during agriculture [3].

Muthunoori Naresh et al., by surveying the problems faced by the farmer given a solution to use a remote sensor framework and controllers to check the environmental conditions and control them, also the information can be directly sent to the smart phone of the farmer [12].

Jaiganesh.S et al., stated that the agriculture implemented with the use of GPS, IoT and Cloud enables the growth of production and information regarding the utilization of manures in the historical backup of cloud enables the need for the amount of manure that is needed to be sprinkled in the future [7].

Amandeep et al., built a remote controlled vehicle that can be operated on both the modes, automatic and manual, for performing some of the operations like cutting, weeding, spraying etc. Also checks the moisture and temperature so that water can be supplied accordingly [6].

III. PROPOSED SYSTEM

Our system consists of various sensors such as temperature sensors, humidity sensors, ultrasonic sensors, and smoke sensors. These sensors realize the data from the fields and are collected by the system. The data obtained is verified with the already mentioned threshold values. If the moisture level is low, the water will be pumped to provide water to the plant. When the system receives sufficient moisture in the soil, the water pump automatically turns off. The presence of animal-like objects can be detected using ultrasonic sensors to perform further actions such as making high volume sounds or blinking high-intensity LEDs so that animals exit the fields. Ultrasonic sensors also monitor plant growth and the presence of pests that damage plantations, which can be controlled by spraying with appropriate pesticides. Also when any kind of fire is detected by the smoke sensor, water is sprayed using a sprinkler. Therefore we give an assurance that our work can help in the development of farming especially in areas like forest areas.

IV. BLOCK DIAGRAM

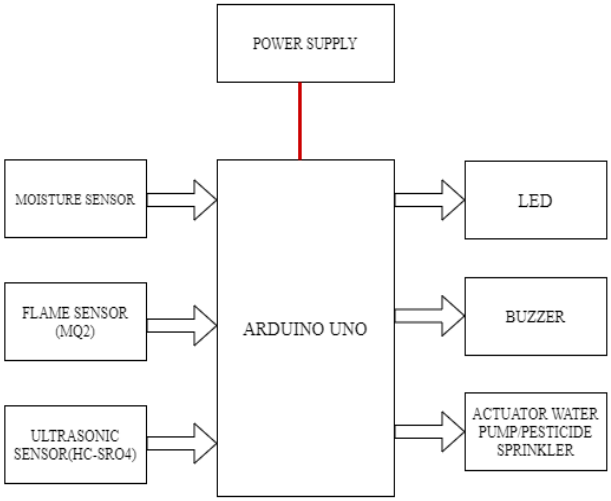

Fig. 1. Proposed System's Block Diagram

This block diagram shows the input-output devices for the proposed system. The input devices include moisture sensor, flame sensor (MQ2) and ultrasonic sensor (HC-SRO4).These are used to sense the environment parameters. The output devices that are connected are buzzer/sound system, LED and sprinklers/water pumps. These are meant to control the growth of the fields through their proper operation.

V. METHODOLOGY

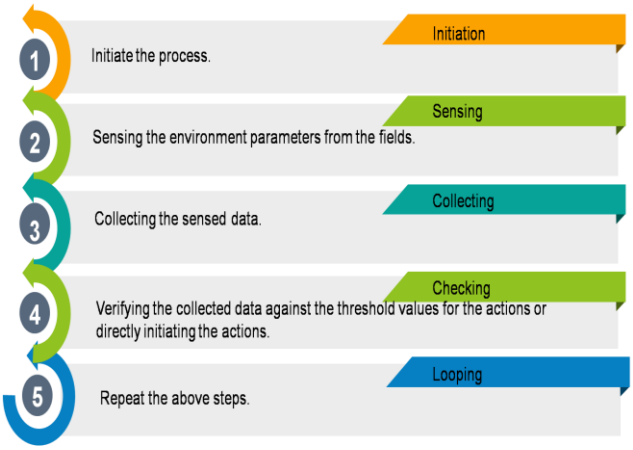

Fig. 2. Proposed System's Methodology

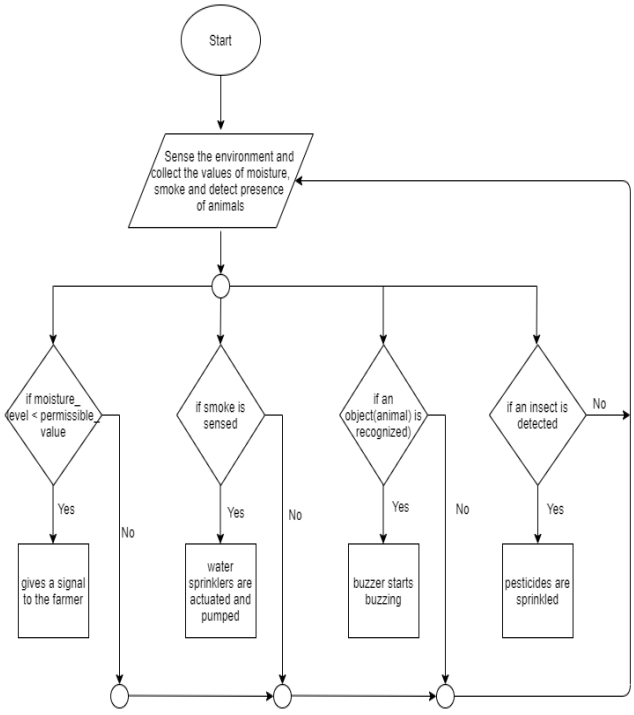

Fig. 3. Flow Diagram of Proposed System

CIRCUIT DIAGRAMS

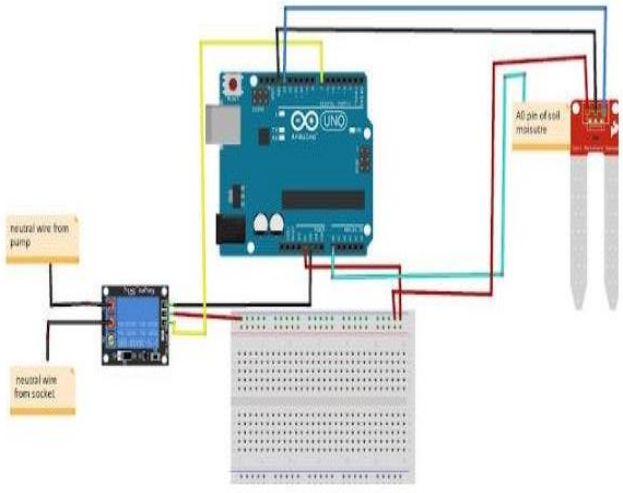

Fig. 4. Soil Moisture Sensing Circuit

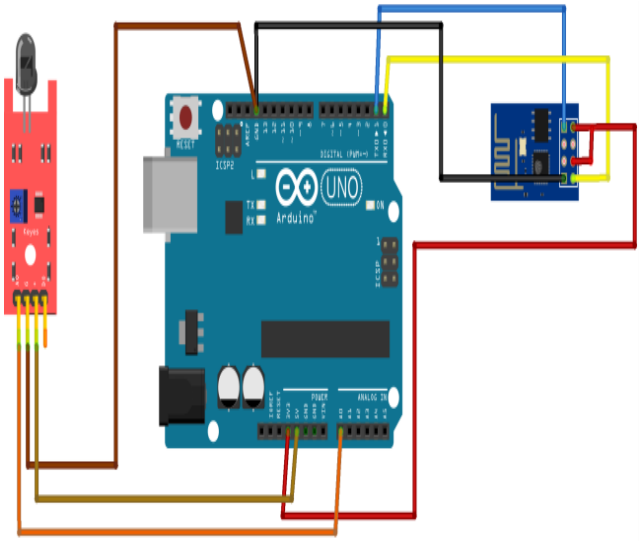

Fig. 5. Fire Alarm Circuit

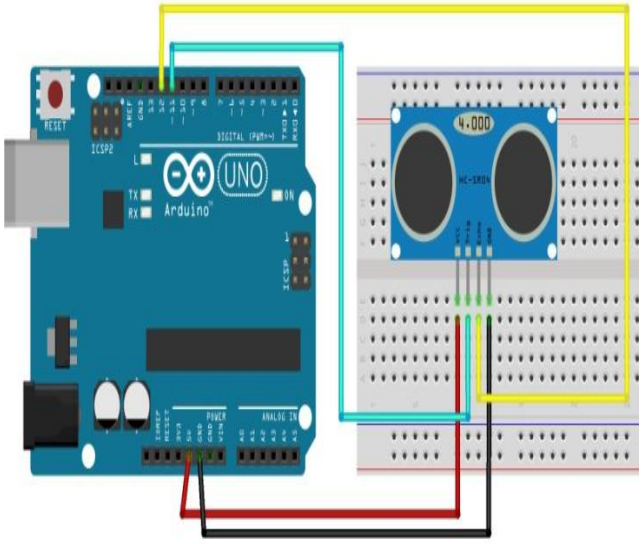

Fig. 6. Detrimental Entry Detection Circuit

IMPLEMENTATION AND RESULTS

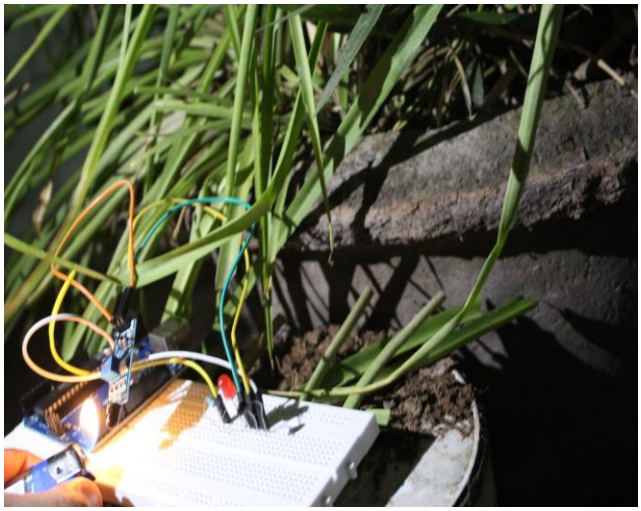

Fig. 7. Showing the working of Flame Sensor

Fig. 8. Showing the working of Soil Moisture Sensor

Fig. 9. Showing the workinz of Detrimental Entry

VI. CONCLUSION

Therefore, the purpose of the paper is to emphasize the advancement in the agricultural sector to improve crop growth, particularly in forest areas. This multipurpose green farm system gives an advanced method to monitor the behaviour of soil moisture, presence of fire and detrimental detection. The moisture sensor continuously senses the moisture levels based on which water pumping can be done.

The fire can be sensed, depending on the level of smoke content in the atmosphere. So that water sprinkling can be done to control the damage from the fire. The ultrasonic sensor detects the entry of the animals into fields so that an action can be taken to avoid the harm from them, Also it monitors the crop growth and the presence of pests that can damage the crop; this can be controlled by spraying pesticides needed. We assure that our system can contribute better yield than the various systems that are available. This system is most suitable for farming, especially in forest areas.

VII. FUTURE ENHANCEMENT

If the above system is continuously applied in the agricultural sector and data is collected, data analytics can be used to assess crop development. Also with the help of this data analytics, it is easy for the farmer to guess what to take care of the farm next time. Further sensing radius can be improved by replacing the sensors with the suitable sensors required. We can even avail GPS, Wi-Fi, WSN and other technologies to enlarge its services. An extension of our project with the concept of image processing can enhance the objective of the project by classifying the object or an animal entering the farm, such that pre-emptive measures can be taken accordingly.

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