

**IOT BASED SMART CROP PROTECTION SYSTEM
FOR AGRICULTURE**

IBM PROJECT REPORT

SUBMITTED BY

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IN

**ELECTRONICS AND COMMUNICATION
ENGINEERING**

INTRODUCTION

1.1 PROJECT OVERVIEW:

Crops in farms are many times ravaged by local animals like buffaloes, cows, goats, birds etc. this leads to huge losses for the farmers. It is not possible for farmers to barricade entire fields or stay on field 24 hours and guard it. so here we propose automatic crop protection system from animals. This is a microcontroller based system using PIC family microcontroller. The microcontroller now sound an alarm to woo the animal away from the field as well as sends SMS to the farmer so that he may about the issue and come to the spot in case the animal don't turn away by the alarm. This ensures complete safety of crop from animals thus protecting farmers loss.

1.2 PURPOSE:

Our main purpose of the project is to develop intruder alert to the farm, to avoid losses due to animal and fire. These intruder alert protect the crop that damaging that indirectly increase yield of the crop. The develop system will not harmful and injurious to animal as well as human beings. Theme of project is to design a intelligent security system for farm protecting by using embedded system.

LITERATURE SURVEY

2.1 EXISTING PROBLEM:

The existing system mainly provide the surveillance functionality. Also these system don't provide protection from wild animals, especially in such an application area. They also need to take actions based on the type of animal that tries to enter the area, as different methods are adopted to prevent different animals from entering restricted areas. The other commonly used method by farmer in order to prevent the crop vandalization by animals include building physical barriers, use of electric fences and manual surveillance and various such exhaustive and dangerous method.

2.2 REFERENCES:

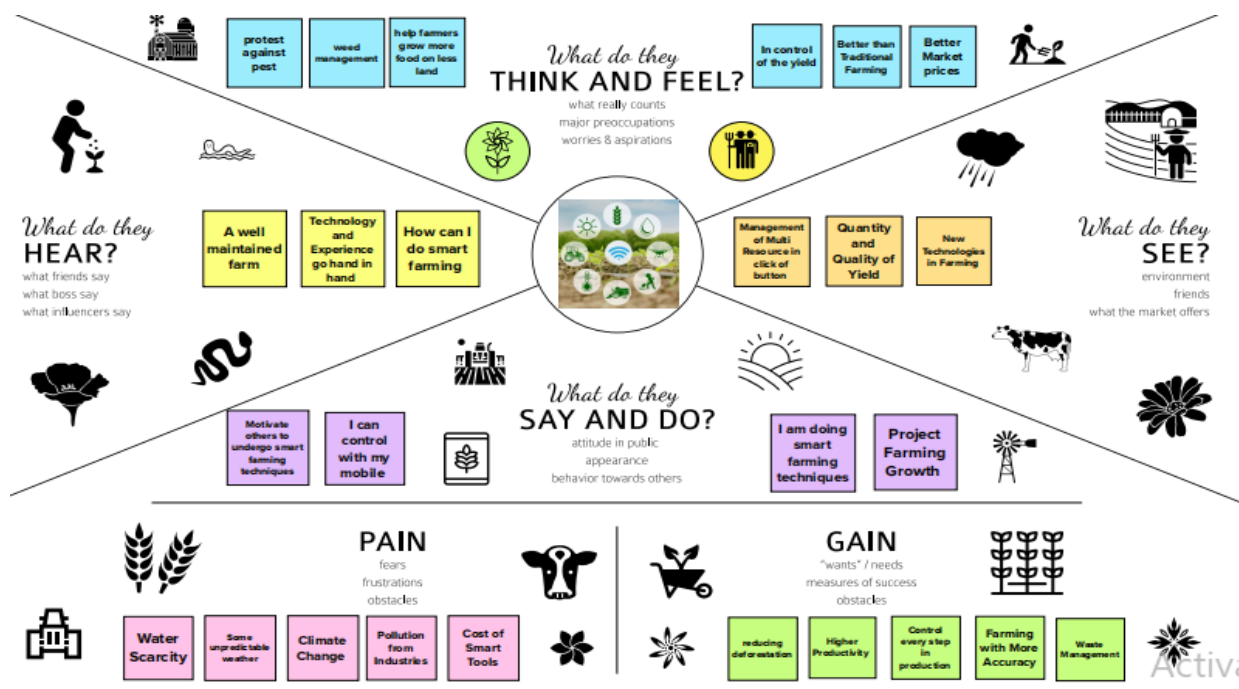
- [1] Mr.Pranav shitap, Mr.Jayesh redij, Mr.Shikhar Singh, Mr.Durvash Zagade, Dr. Sharada Chougule. Department of ELECTRONICS AND TELECOMMUNICATION ENGINEERING, Finolex Academy of Management and technology, ratangiri , India.
- [2] N.Penchalaiah, D.Pavithra, B.Bhargavi, D.P.Madhurai, K.Eliyas Shaik,S.Md.sohaib.Assitant Professor, Department of CSE,AITS, Rajampet,India UG Student, Department of CSE,AITS,Rajampet, India.
- [3] Mr.P.Venkateswara Rao, Mr.Ch Shiva Krishna ,MR M Samba Siva Reddy LBRCE,LBRCE,LBRCE.
- [4] Mohit Korche,Sarthak Tokse, Shubham Shirbhate, Vaibhav Thakre, S. P. Jolhe(HOD). Students , Final Year,Dept.of Electrical engineering,Government

2.3 PROBLEM STATEMENT DEFINITION STATEMENT:

In the world economy of many Country dependent upon the agriculture .In spite of economic development agriculture is the backbone of the economy. Crops in forms are many times ravaged by local animals like buffaloes, cows, goats, birds and fire etc. this leads to huge loss for the farmers.it is not possible for farmers to blockade to entire fields or stay 24 hours and guard it. Agriculture meets food requirements of the people and produces several raw materials for industries. But because of animal interference and fire in agricultural lands, there will be huge loss of crops. Crops will be totally getting destroyed.

IDEATION AND PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS:



3.2 IDEATION AND BRAINSTORMING:

Pratheesha

Agricultural Drones	Soil monitoring Sensors	Cloud Computing
Semi-automatic Robots	IoT-based Remote Sensing	Computer Imaging
Geofencing	Material handling	LoRa Development boards

Sowmiya

Internet of Things	Proper network	Blockchain
Data analytics	Software and Hardware system	Communication system
Data Collection	GPS Technology	Resource usage

Thulasimani

Data security	Wireless temperature sensor	Power distribution units
Precision farming	Machine learning	Pest control
Water management	Autonomous irrigation	Field equipment monitoring

Vinisha

Python	Greenhouse automation	Cattle monitoring and management
Crop management	Monitoring of climatic condition	Reduce manpower
Marketing survey	Data dissemination	Machine navigation

Andis



3.3 PROPOSED SOLUTION:

PROPOSED SOLUTION TEMPLATE:

Project team shall fill the following information in proposed solution template.

S.No.	PARAMETER	DESCRIPTION
1.	Problem statement(problem to be solved)	<p>In the world economy of many Country dependent upon the agriculture .In spite of economic development agriculture is the backbone of the economy. Crops in farms are many times ravaged by local animals like buffaloes, cows, goats, birds and fire etc. this leads to huge loss for the farmers.it is not possible for farmers to blockade to entire fields or stay 24 hours and guard it. Agriculture meets food requirements of the people and produces several raw materials for industries. But because of animal interference and fire in agricultural lands, there will be huge loss of crops. Crops will be totally getting destroyed.</p>
2	Idea/solution description	<p>Main solution:</p> <ul style="list-style-type: none">• Our main purpose of project is to develop intruder alert to the farm, to avoid losses due to animals and fire.• Agricultural fences are quite an effective wild animal protection

3	Novelty/uniqueness	<ul style="list-style-type: none"> Helps farmers to better understand the important factor such as water , topography, aspect, vegetation and soil types. It also supports verification activities, by connecting information through the supply chain so that production claims can be checked Control of weeds and integrated management.
4	Social/impact	<ul style="list-style-type: none"> Improve the productivity. Save lives of farmers. Increase the quality, by making maximum use of resources. Drones for farms by being able to cover hundreds of acres in one flight.
5	Business model (revenue model)	<ul style="list-style-type: none"> Community based solution Increase the proper products cost. Canvas a business model.
6	Scalability of the solution	<ul style="list-style-type: none"> The develop system will not harmful and injurious to animals as well as human beings. Low cost solution, lower dependency on power. Simple solution to suite the farmer community.

3.4 PROBLEM SOLUTION FIT:

Problem-Solution fit canvas 2.0		Purpose / Vision		TEAM ID: PNT2022MID17061	
Define CS, fit into CC	1. CUSTOMER SEGMENT(S) CS 1.corporate argo -SME (Small or medium scale enterprises 2.producers processors traders 3.farmers	6. CUSTOMER CONSTRAINTS CC The major constrains have been identified that contribute explaining yield gap i.e limited water availability,limited nutrient availability,inadequae crop protection, climate,temperature ,difficulties on storing product marketing in lagging region.	5. AVAILABLE SOLUTIONS AS live stock monitoring from animals by using agricultural fences like wire fences,plastic fences, electric fences. By using natural resources instead of mechanical or chemical protective pratices.	Explore AS, differentiate	
	2. JOBS-TO-BE-DONE / PROBLEMS J&P Monitoring the service work in real time and uses a series of sensors placed in the environment, including in the soil, air, water resources To incerase the quantity and quality of the products. To increase the commodity,import, export and make profit for farmers	9. PROBLEM ROOT CAUSE RC The main cause of the problem is crops in farms are many times ravaged by local animals like cow,goat,bird etc.. This leads to huge losses for the farmer. Major wildlife agents responsible for crop damage were wild boar,monkey ect..Monkey and wild boar alone accounted for about 50% to 60% of total crop damage in the village.	7. BEHAVIOUR BE 1. To ensure the safety,quality and quantity. 2. The main behaviour is to wildlife tracking system for animals to check the activities of the animals in their natural habitat.		
Identify strong TR & EM	3. TRIGGERS TR Agriculture can improve architecture process in more productive, efficient and sustainable way. the development of new functionalities requires the incorporation of security features.	10. YOUR SOLUTION SL To overcome this problem we need to use the automatic crop protection system from animals and fire. By using motion sensor to detect the wild animals approaching near the field and smoke to detect the fire	8. CHANNELS OF BEHAVIOUR CH 8.1 ONLINE Watching the field from home or any other places by using gsm,gps System and sensors 8.2 OFFLINE Reduce the time and improve the sustainability among the farmer by using more number of sensors	Extract online & offline CH of BE	
	4. EMOTIONS: BEFORE / AFTER EM To ensure the complete safety of crops from animals and from the fire thus protecting the farmers loss.				

REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENT:

FR-NO	FUNCTIONAL REQUIREMENTS	SUB-REQUIREMENTS
FR-1	Fertilizing frame service	Documentation requirements and assisting information
FR-2	Economical service	Assisting information
FR-3	Technology assessment service	Selecting fertilizing features
FR-4	Feature assessment service	Updated technical information and machinery selection
FR-5	Information acquisition service	Assisting information about fertilizing rules
FR-6	Farm and field customizing service	Potential data acquisition service
FR-7	Field inspection	Spatial field information
FR-8	Field observation service	Analyzed risks
FR-9	Assisting remote controlling	Inspecting and controlling fertilizing task
FR-10	Assisting “operational performance service”	Economical analysis of current technology

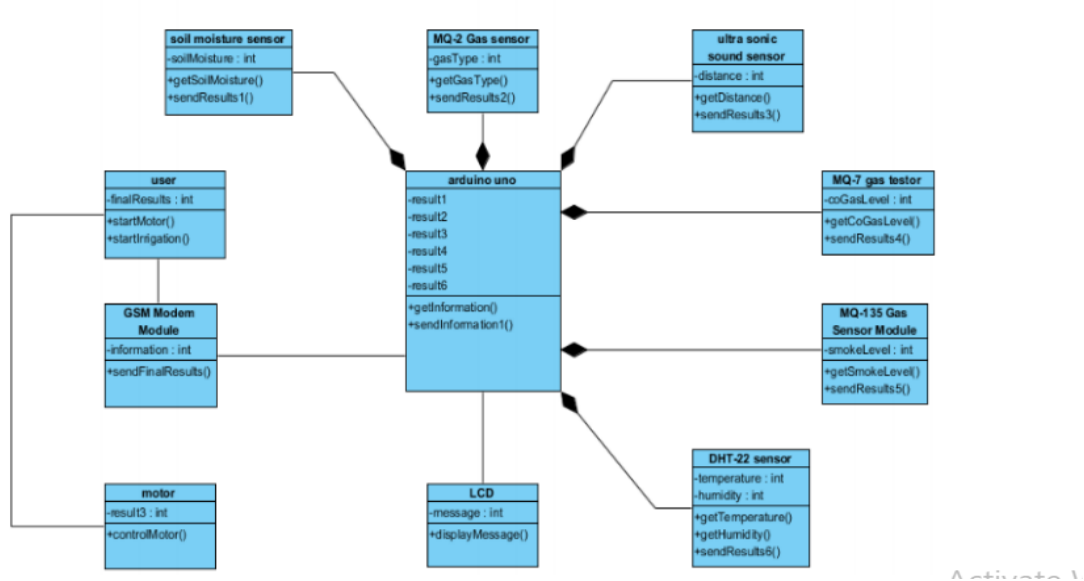
4.2 NON FUNCTIONAL REQUIREMENT:

NRF.NO	NON FUNCTIONAL REQUIREMENTS	DESCRIPTION
NRF-1	Usability	To use new technologies and increase the quantity and quality
NRF-2	Security	Protect the field from animals.

NRF-3	Reliability	Increasing the demand for food with minimum resources
NRF-4	Performance	Maintain good yield and provide sustainable quantity
NRF-5	Availability	Agricultural fences are quite an effective wild animal protection
NRF-6	Scalability	The develop system will not harmful and injurious to animals as well as human beings.

PROJECT DESIGN

5.1 DATA FLOW DIAGRAM:



5.2 SOLUTION AND TECHNICAL ARCHITECTURE:

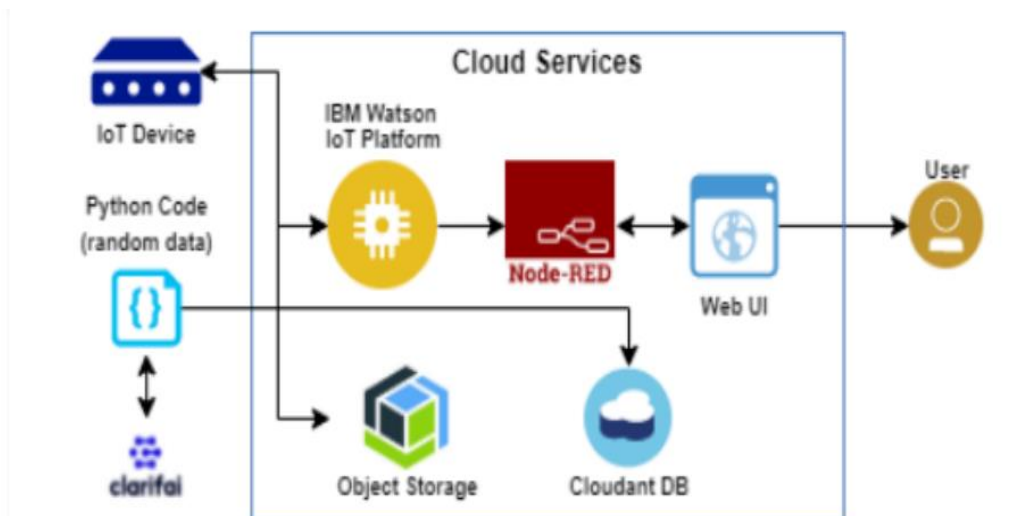


TABLE-1:

sno	components	description	Technology
1	User interface	Interacts with iot device	Html,css,angular js etc..
2	Application logic-1	Logic for a process in the application	Python
3	Application logic-2	Logic for process in the application	Clarifai
4	Application logic-3	Logic for process in the application	IBM Waston Iot platform
5	Application logic-4	logic for the process	Node red app service
6	User friendly	Easily manage the net screen appliance	Web ul

TABLE-2: APPLICATION AND CHARACTERISTICS

sno	Characteristics	Description	Technology
1	Open source framework	Open source framework used	Python
2	Security implementations	Authentication using encryption	Encryptions
3	Scalable architecture	The scalability of architecture consists of 3 models	Web UI Application server-python, clarifai Database server-ibm cloud services.
4	Availability	It is increased by cloudant database	IBM cloud services

5.3 USER STORIES:

SPRINT	FUNCTIONAL REQUIREMENT	USER STORY NUMBER	USER STORY/TASK	STORY POINTS	PRIORITY	TEAM NUMBERS
Sprint-1		US-1	Create the IBM Cloud services which are being used in this project.	7	high	Pratheesha Sowmiya Vinisha Thulasimani
Sprint-1		US-2	Create the IBM Cloud services which are being used in this project.	7	high	Pratheesha Sowmiya Vinisha Thulasimani
Sprint-2		US-3	IBM Watson IoT platform acts as the mediator to connect the web application to IoT devices, so create the IBM Watson IoT platform.	5	medium	Pratheesha Sowmiya Vinisha Thulasimani
Sprint-2		US-4	In order to connect the IoT device to the IBM cloud, create a device in the IBM Watson IoT platform and get the device credentials	6	high	Pratheesha Sowmiya Vinisha Thulasimani
Sprint-3		US-1	Configure the connection security and create API keys that are used in the Node-RED service for accessing the IBM IoT Platform.	10	high	Pratheesha Sowmiya Vinisha Thulasimani
Sprint-3		US-3	Create a Node-RED service	8	high	Pratheesha Sowmiya Vinisha Thulasimani
Sprint-3		US-2	Develop a python script to publish random	6	medium	Pratheesha Sowmiya

CODING AND SOLUTIONING

7.1 FEATURE-1

ARDIUNO AT Mega328P

ATmega328 is a single chip microcontroller created by Atmel in the mega AVR family. The Atmel 8-bit AVR RISC based microcontroller combines 32 kB ISP flash memory with read-while-write capabilities, 1 kB EEPROM, 2 kB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. The device achieves throughput approaching 1 MIPS per MHz.

SMOKE SENSOR (MQ-2)

A smoke sensor is a device that senses smoke, typically as an indicator of fire. Commercial and residential security devices issue a signal to a fire alarm control panel as part of a fire alarm system, while household detectors, known as smoke alarms, generally issue a local audible or visual alarm from the detector itself. The Analog Smoke/LPG/CO Gas Sensor (MQ2) module utilizes an MQ-2 as the sensitive component and has a protection resistor and an adjustable resistor on board. The MQ-2 gas sensor is sensitive to LPG, i-butane, propane, methane, alcohol, Hydrogen and smoke. It could be used in gas leakage detecting equipment's in family and industry. The resistance of the sensitive component changes as the concentration of the target gas changes. Sensitive material of MQ-2 gas sensor is SnO₂, which with lower conductivity in clean air. When the target combustible gas exist, the sensors conductivity is higher along with the gas concentration rising. Please use simple electronic circuit, Convert change of conductivity to correspond output signal of gas concentration.

GSM Module

SIM800 is a quad-band GSM/GPRS module designed for the global market. It work on frequencies GSM 850MHz, EGSM 900MHz, DCS 1800MHz and PCS 1900MHz. SIM800 features GPRS multi-slot class 12/ class 10 (optional) and supports the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4. SIM800 has 68 SMT pads, and provides all hardware interfaces between the module and customers' boards. SIM800 integrates TCP/IP protocol and extended TCP/IP AT commands which are very useful for data transfer applications.

PASSIVE INFRARED SENSOR (PIR)

PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and don't wear out. For that reason they are commonly found in appliances and gadgets used in homes or businesses. PIRs are basically made of a pyroelectric sensor, which can detect levels of infrared radiation. Everything emits some low level radiation, and the hotter something is, the more radiation is emitted. The sensor in a motion detector is actually split in two halves. The reason for that is that we are looking to detect motion (change) not average IR levels. The two halves are wired up so that they cancel each other out. If one half sees more or less IR radiation than the other, the output will swing high or low.

Features

Output: Digital pulse high (3V) when triggered (motion detected) digital low when idle (no motion detected). Pulse lengths are determined by resistors and capacitors on the PCB and differ from sensor to sensor. Power supply: 5V-12V input voltage for most modules (they have a 3.3V regulator), but 5V is ideal in case the regulator has different specs.

BUZZER

Specifications

- Rated Voltage : 6V DC
- Operating Voltage : 4 to 8V DC
- Rated Current* : $\leq 30\text{mA}$
- Sound Output at 10cm* : $\geq 85\text{dB}$
- Resonant Frequency : $2300 \pm 300\text{Hz}$
- Tone : Continuous A buzzer is a loud noise maker.

Most modern ones are civil defense or air-raid sirens, tornado sirens, or the sirens on emergency service vehicles such as ambulances, police cars and fire trucks. There are two general types, pneumatic and electronic.

DC MOTOR

Motor is a device that creates motion, not an engine; it usually refers to either an electrical motor or an internal combustion engine. In most common DC motors (and all that BEAMers will see), the external magnetic field is produced by high-strength permanent magnets. The stator is the stationary part of the motor - this includes the motor casing, as well as two or more permanent magnet pole pieces. The rotor (together with the axle and attached commutator) rotate with respect to the stator. The rotor consists of windings (generally on a

core), the windings being electrically connected to the commutator. The above diagram shows a common motor layout -- with the rotor inside the stator (field) magnets.

LIQUID CRYSTAL DISPLAY

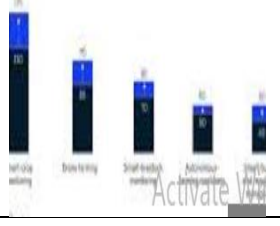
Liquid crystal display is a type of display which used in digital watches and many portable computers. LCD displays utilize two sheets of polarizing material with a liquid crystal solution between them. An electric current passed through the liquid causes the crystals to align so that light cannot pass through them. Each crystal, therefore, is like a shutter, either allowing light to pass through or blocking the light. The liquid crystals can be manipulated through an applied electric voltage so that light is allowed to pass or is blocked. By carefully controlling where and what wavelength (color) of light is allowed to pass, the LCD monitor is able to display images. A back light provides LCD monitor's brightness. Other advances have allowed LCD's to greatly reduce liquid crystal cell response times. Response time is basically the amount of time it takes for a pixel to "change colors".

7.2 FEATURE-2:

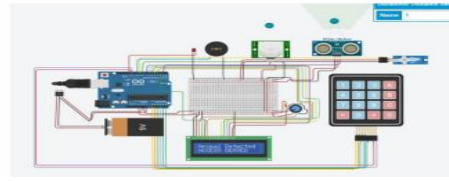
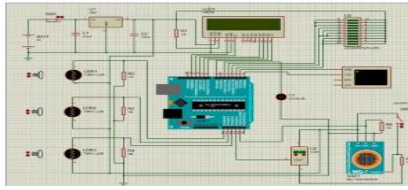
- Good sensitivity to Combustible gas in wide range .
- High sensitivity to LPG, Propane and Hydrogen .
- Long life and low cost.
- Simple drive circuit.

TESTING

8.1 TEST CASES:

sno	parameter	Values	Screenshot
1	Model summary	-	
2	accuracy	Training accuracy-95% Validation accuracy-72%	
3	Confidence score	Class detected-80% Confidence score-80%	

Simulation:



RESULTS

The problem of crop vandalization by wild animals and fire has become a major social problem in current time. It requires urgent attention as no effective solution exists till date for this problem. Thus this project carries a great social relevance as it aims to address this problem. This project will help farmers in protecting their orchards and fields and save them from significant financial losses and will save them from the unproductive efforts that they endure for the protection their fields. This will also help them in achieving better crop yields thus leading to their economic wellbeing.

ADVANTAGES AND DISADVANTAGES

Advantage:

Controllable food supply. you might have droughts or floods, but if you are growing the crops and breeding them to be hardier, you have a better chance of not straving. It allows farmers to maximize yields using minimum resources such as water, fertilizers.

Disadvantage:

The main disadvantage is the time it can take to process the information.in order to keep feeding people as the population grows you have to radically change the environment of the planet

FUTURE SCOPE

In the future, there will be very large scope, this project can be made based on Image processing in which wild animal and fire can be detected by cameras and if it comes towards farm then system will be directly activated through wireless networks. Wild animals can also be detected by using wireless networks such as laser wireless sensors and by sensing this laser or sensor's security system will be activated.