Smart Agriculture System with IoT

1. INTRODUCTION
   1.1 Overview

   As per the 2014 FAO world agriculture statistics India is the world's largest producer of many fresh fruits like banana, mango, guava, papaya, lemon and vegetables like chickpea, okra and milk, major spices like chili pepper, ginger, fibrous crops such as jute, staples such as millets and castor oil seed. India is the second largest producer of wheat and rice, the world's major food staples. India has shown a steady average nationwide annual increase in the kilograms produced per hectare for some agricultural items, over the last 60 years. These gains have come mainly from India's green revolution, improving road and power generation infrastructure, knowledge of gains and reforms. Despite these recent accomplishments, agriculture has the potential for major productivity and total output gains, because crop yields in India are still just 30% to 60% of the best sustainable crop yields achievable in the farms of developed and other developing countries. Additionally, post-harvest losses due to poor infrastructure and unorganised retail, caused India to experience some of the highest food losses in the world

   1.2 Purpose

   It is apparent that the tasks of meeting the consumption needs of the projected population are going to be more difficult given the higher productivity base than in 1960s. There is also a growing realization that previous strategies of generating and promoting technologies have contributed to serious and widespread problems of environmental and natural resource degradation. This implies that in future the technologies that are developed and promoted must result not only in increased productivity level but also ensure that the quality of natural resource base is preserved and enhanced. In short, they lead to sustainable improvements in agricultural production. Productivity gains during the 'Green Revolution' era were largely confined to relatively well endowed areas. Given the wide range of agro-ecological setting and producers, Indian agriculture is faced with a great diversity of needs, opportunities and prospects. Future growth needs to be more rapid, more widely distributed and better targeted.

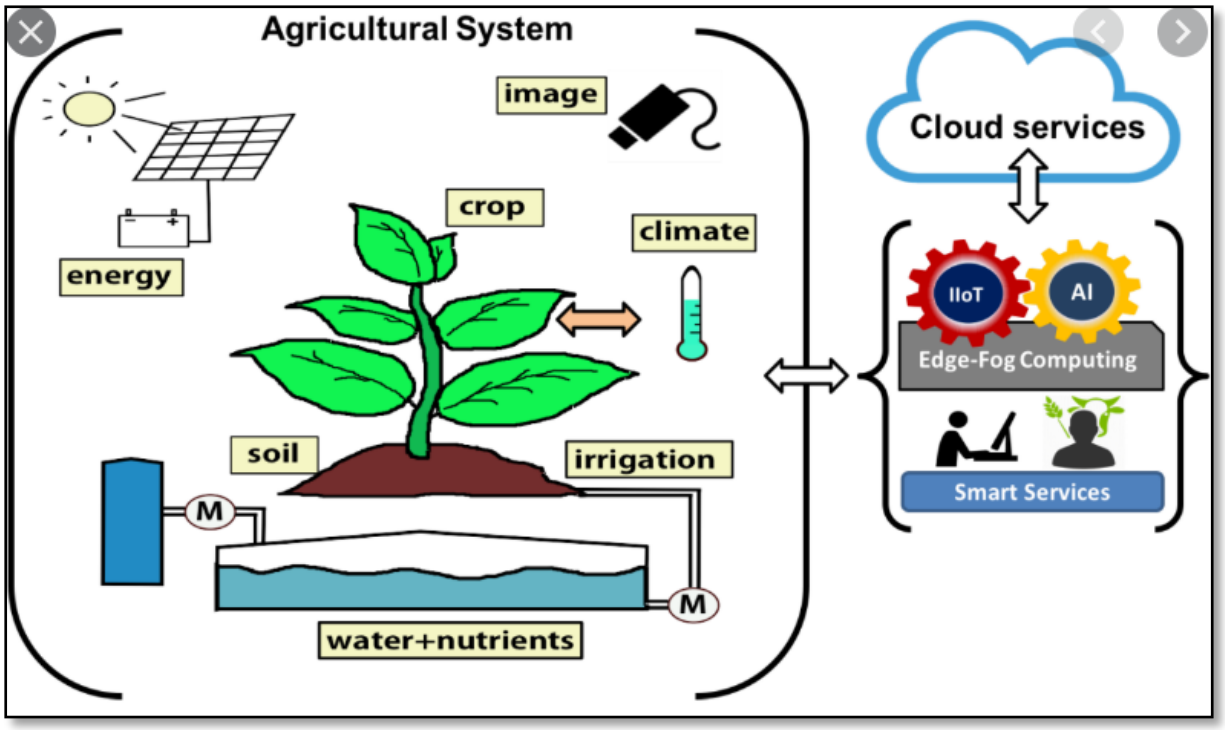
2. LITERATURE SURVEY
   2.1 Existing Problem

   Slow agricultural growth is a concern for policymakers as some two-thirds of India's people depend on rural employment for a living. Current agricultural practices are neither economically nor environmentally sustainable and India's yields for many agricultural commodities are low. Poorly maintained irrigation systems and almost universal lack of good extension services are among the factors responsible. Farmers' access to markets is hampered by poor roads, rudimentary market infrastructure, and excessive regulation. (World Bank: "India

Country Overview 2008") "With a population of just over 1.2 billion, India is the world's largest democracy. In the past decade, the country has witnessed accelerated economic growth, emerged as a global player with the world's fourth largest economy in purchasing power parity terms, and made progress towards achieving most of the Millennium Development Goals. India's integration into the global economy has been accompanied by impressive economic growth that has brought significant economic and social benefits to the country.[1]

2.2 Proposed Solution

The proposed solution reflects on one of the issues faced by farmers that is lack of incompetency faced by the due to increase in need of crops and productivity at large. By using this developed Web app, farmers can have access to the weather conditions such as temperature, humidity, and various other factors of the farm even being there physically. This will in-turn help the farmer to give an equal amount of attention to all the resources and handle various farms at a time which will increase its productivity at a large. By analysing the inputs from the sensor installed at the desired location, conditions will be monitored and commands will be prompted onto the device or screen, whichever will be activated. If this technology is used by a greater number of farmers, it would make the things go easier without any situations coming by. For eg. The weather like during the rainy season is unstable in rural areas, it's frequency of occurrence is indeterminant, so as this web app will enable them to have a look and control the motor conditions or some other electrical equipment.



3. THEORITICAL ANALYSIS

3.1 Block Diagram

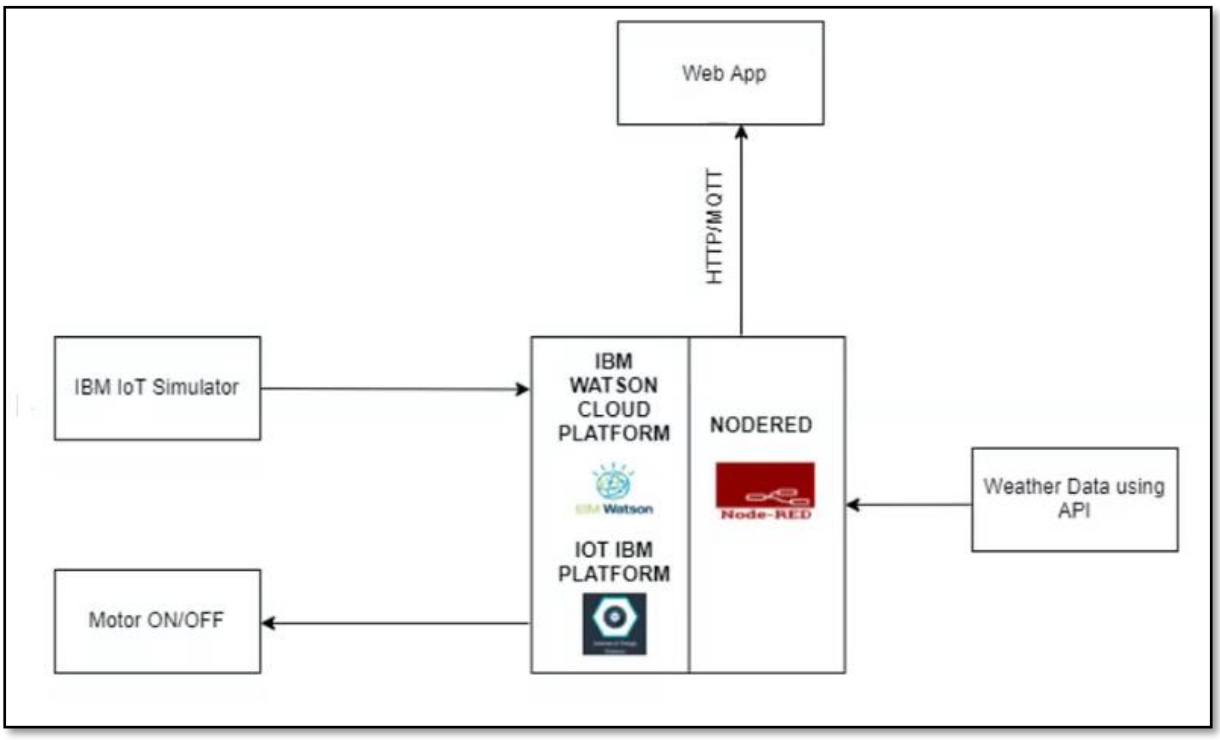


Fig. Block Diagram

3.2 Hardware/Software Designing

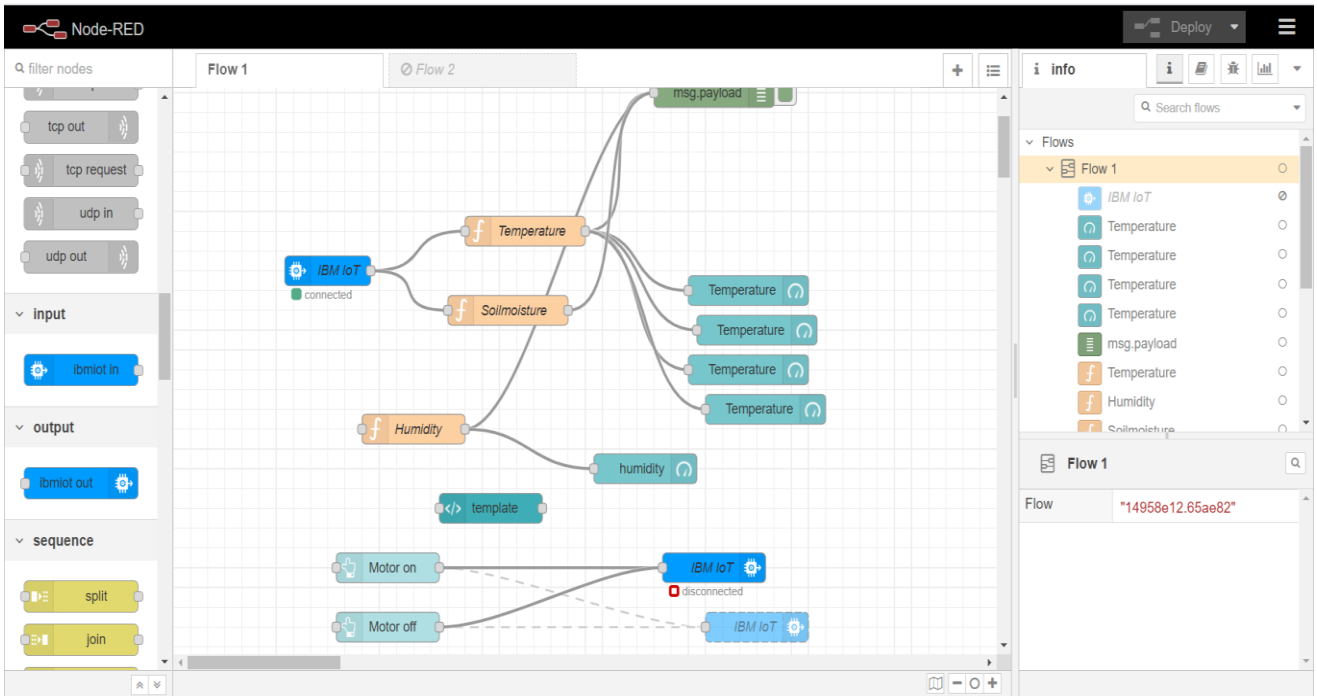


Fig. Node-Red Flow

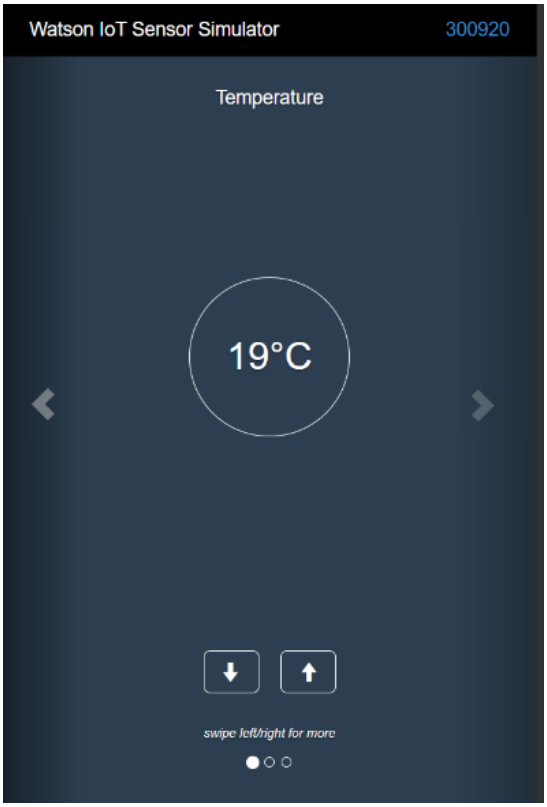


Fig. Temperature

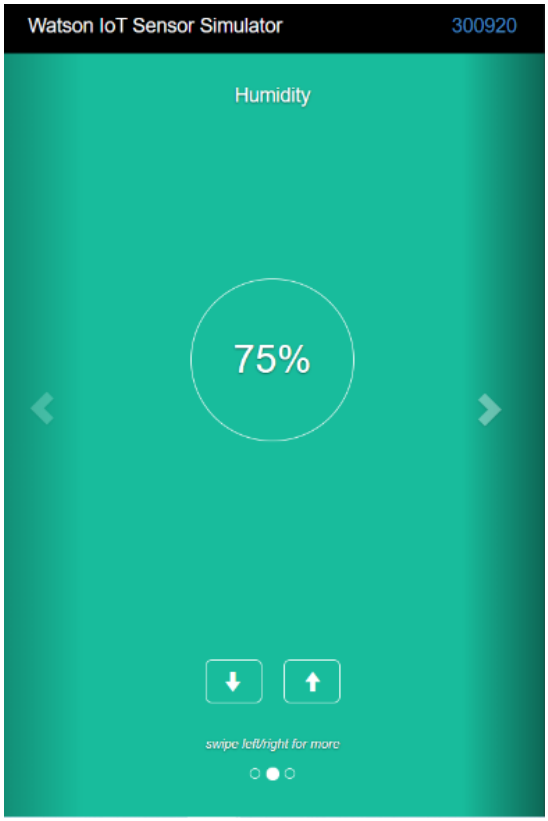


Fig. Humidity

4. EXPIREMENTAL INVESTIGATIONS

Different kind of problems faced by the farmers motivated us for the recommended system that are: the Indian farming is on the hitch because of the limited technical know-how of the best and efficient agricultural practices and moreover they are still dependent on conventional methods of agriculture that leads to lesser productivity of crops. So, by using upcoming technology the productivity of crops can be maximized at minimal cost. This also reduces burden of taking up of heavy loans on farmers which they have incurred on themselves in order to sustain their livings or to get good yields of their crops. Apart from these issues scarcity of resources also adds up in their problem causing hindrance or stopping framers from cultivating and hence Indian economy is also additionally getting influenced to large extent as most of the fruitful lands of the nation are being destroyed that forms the vital part of GDP. So through this framework we are presenting solution for this issue by introducing an automated and systematic farming strategies that enable farmers to cultivate in a productive way also with limited resources and greater yield which is assured and efficient. Different from ancient farming, most of the tasks in modern, large-scale agriculture are being done by heavy and urbane equipment, such as tractors, harvesters, and other robots which are fully or partially supported by remote sensing and other communication technologies. In precision agriculture, when tasks like sowing, fertilizing, irrigation, and harvesting are being performed, the operating vehicles are equipped with GPS and GIS facilities so that they can work precisely, site-specifically, and autonomously. In fact, the idea of site-specific crop management is not possible without involving the recent advanced technologies. The success of precision agriculture is based on the accuracy of collected data, which is usually done in two ways.

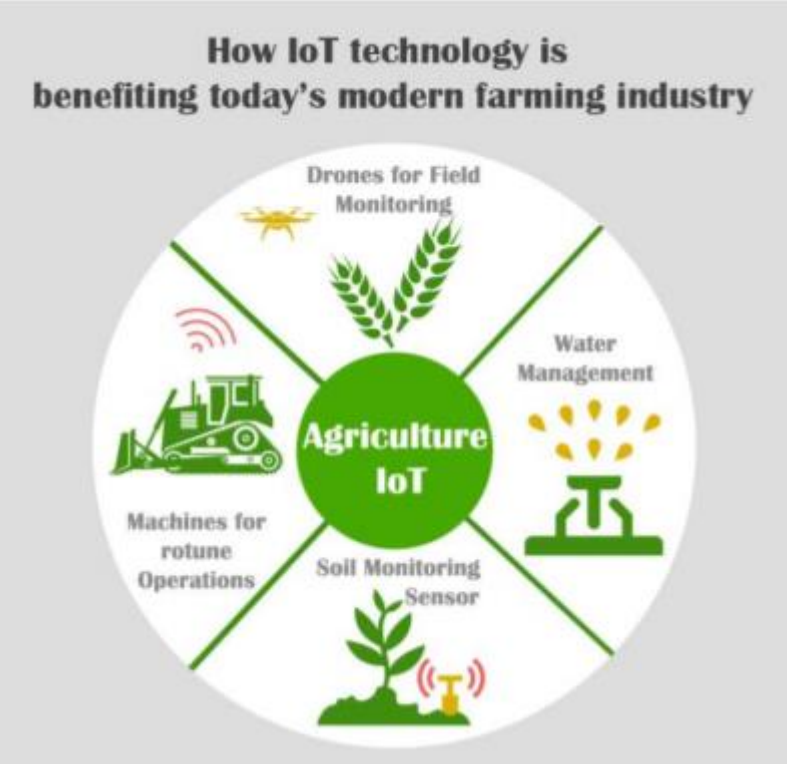
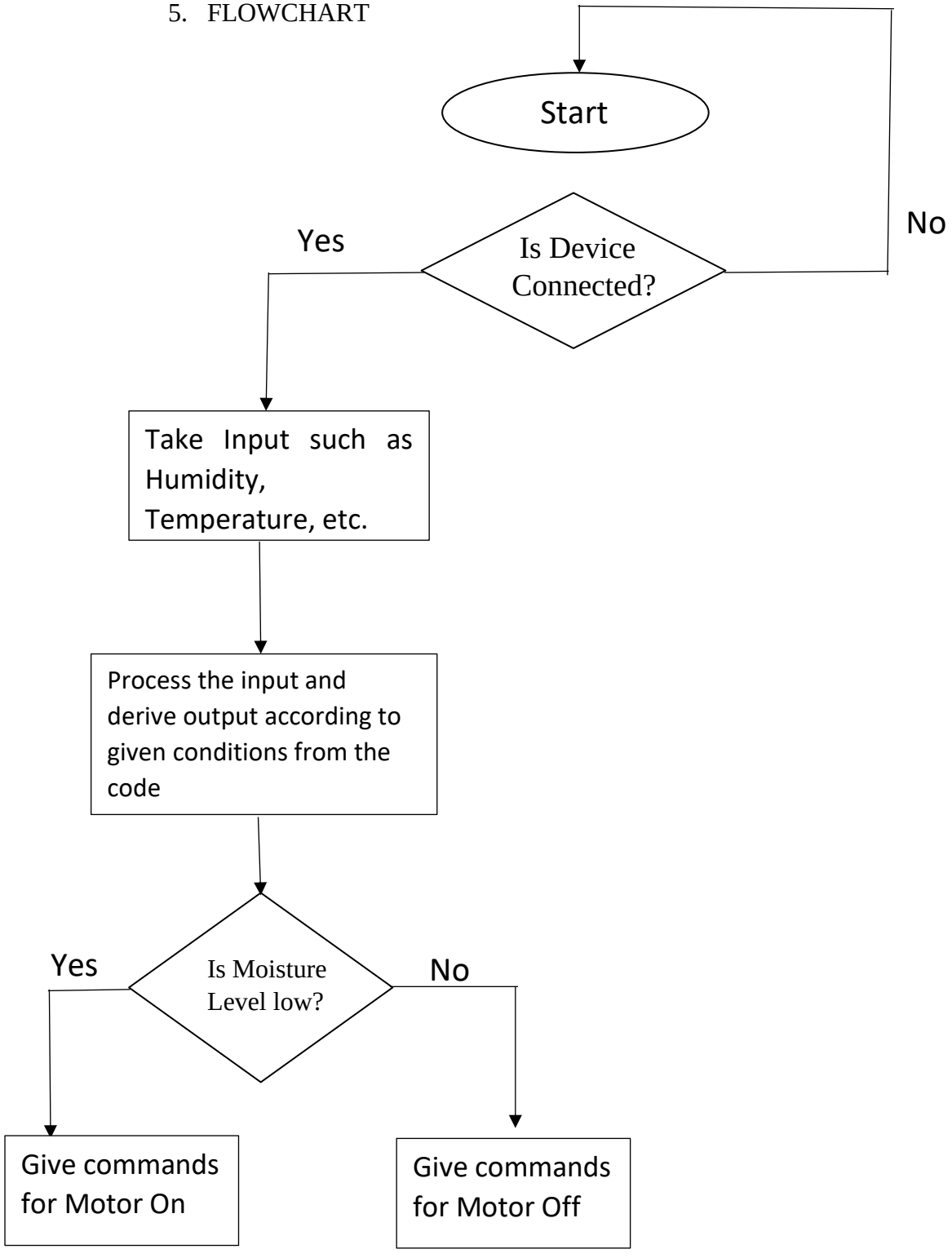


Fig. IoT's Wide Features

5. FLOWCHART


Start
Is Device Connected?
Yes
No
Take Input such as Humidity, Temperature, etc.
Process the input and derive output according to given conditions from the code
Is Moisture Level low?
Yes
No
Give commands for Motor On
Give commands for Motor Off

6. RESULT

IoT agricultural solutions consist of multiple monitoring, controlling, and tracking applications that measure several types of variables such as air monitoring, temperature monitoring, humidity monitoring, soil monitoring, water monitoring, fertilization, pest control, illumination control, and location tracking. The selected mainstream application domains in this SLR are monitoring, tracking, and controlling. Most of the studies have focused on monitoring (70%), controlling (25%), and tracking (5%).The primary focus of each IoT agricultural application concerning their domains (monitoring, controlling, and tracking) is discussed in this section. The main classification of these applications are Irrigation Monitoring and Controlling (16%), Precision Farming (16%), Soil Monitoring (13%), Temperature Monitoring (12%), Humidity Monitoring (11%), Animal Monitoring and Tracking (11%), Water Monitoring and Controlling (7%), Disease Monitoring (5%), Air Monitoring (5%), and Fertilization Monitoring (4%). It can be seen that most of the selected papers have focused on precision farming, irrigation monitoring, and controlling. Some representative examples of IoT agriculture applications are discussed in this Section. And hence by implementing this project, we can have all the statistics deployed above as per the survey and the recent data set.

7. ADVANTAGES & DISADVANTAGES

Taking into consideration the various factors and need of increase in agriculture field, there are a lot of advantages.

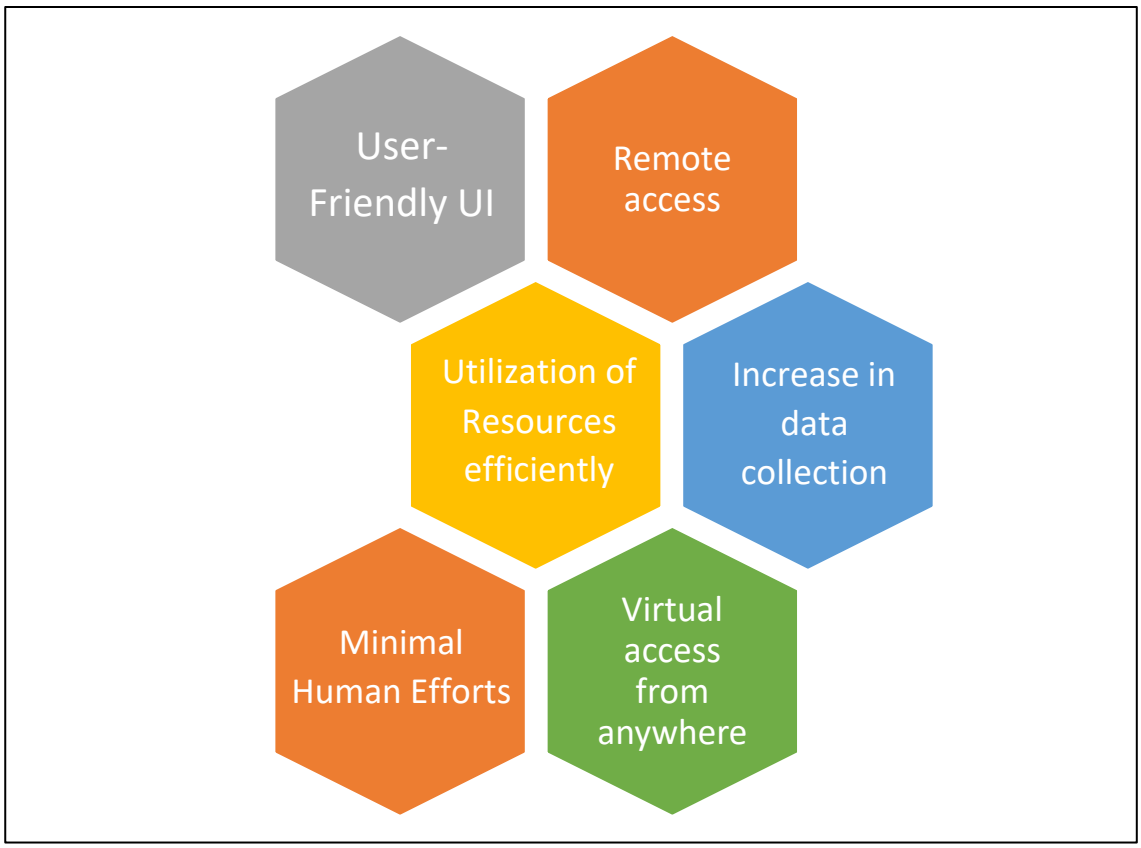


Fig. Advantages of Smart Agriculture System

DISADVANTAGES:

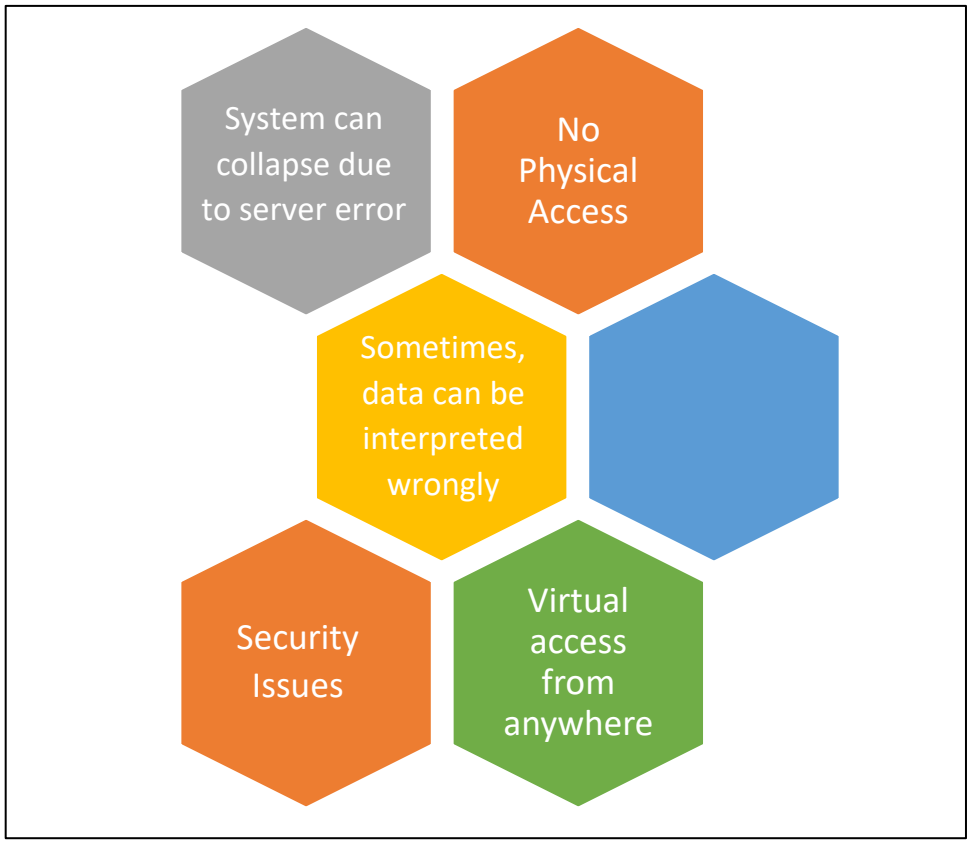


Fig. Disadvantages of Smart Agriculture System

8. Applications

Internet of Things has capacity to transform the lives of people in the world in an efficient manner. The ever-growing population would touch more than 3 billion in few years. So, to feed such an immense population, agriculture industry needs to embrace IoT. The demand for more food has to address challenges that include excessive climate conditions, weather change and different environmental affects that results from farming practices. The destiny of Indian agriculture must be worked with understanding and excessive cease technologies that can expand production and furthermore regains the attention of farmers in this industry. So, these smart farming techniques would assist farmers to lessen scrap and enhance capacity. It is basically a high tech and capital-intensive system for growing crops in a sustainable manner for masses. This technology can help farmers to monitor field conditions from anywhere with the help of sensors and can also irrigate fields with an automated system. It is the application of Information and Communication Technology into the field of agriculture.

Applications can be as follows:

- Precision farming
- Agriculture drones
- Livestock monitoring
- Smart greenhouses

9. Conclusion

The proposed model explores the use of IoT (Internet of things) in the agriculture sector. This model aims at increasing the crop yield by helping in predicting better crop sequence for a particular soil. Things speak helps in real time sampling of the soil and hence the data acquired can be further used for analysing the crop. We have also taken many readings of the soil moisture, temperature and humidity of the environment for various days at different times of the day. Data on the cloud also helps the agriculturists in improving the yield, evaluating the manures, illness in the fields. This system is cost effective and feasible. It also focuses on optimizing the use of water resources which combats issues like water scarcity and ensures sustainability. This model focuses on the utilization of IoT in agriculture and the solutions proposed in this paper will improve farming methods, increase productivity and lead to effective use of limited resources.

10. FUTURE SCOPE

The future scope of this project could be including variety of soil sensors like pH sensor, Rain sensor and then collecting and storing the data on cloud server. This would make the predicting and analysing processes more accurate. It also includes making different data mining algorithms suitable for data analysis in agriculture.

11. BIBILOGRAPHY

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APPENDIX

A. Source code:

```
import time
import sys
import ibmiotf.application # to install pip install ibmiotf
import ibmiotf.device

#Provide your IBM Watson Device Credentials
organization = "2s6bsj" #replace the ORG ID
deviceType = "NodeMCU"#replace the Device type wi
deviceId = "300920"#replace Device ID
authMethod = "token"
authToken = "Rutika*****" #Replace the authtoken

def myCommandCallback(cmd): # function for Callback
        print("Command received: %s" % cmd.data)
        if cmd.data['coomand']=='motoron':
                print(:MOTOR ON IS RECEIVED")

        elif cmd.data['command']=='motoroff':
                print("MOTOR OFF IS RECEIVED")

        if cmd.command == "setInterval":

                if 'interval' not in cmd.data:
                        print("Error - command is missing required information: 'interval'")
                else:
                        interval = cmd.data['interval']
        elif cmd.command == "print":
                if 'message' not in cmd.data:
                        print("Error - command is missing required information:
'message'")
                else:
                        output=cmd.data['message']
                        print(output)

try:
  deviceOptions = {"org": organization, "type": deviceType, "id": deviceId, "auth-
method": authMethod, "auth-token": authToken}
  deviceCli = ibmiotf.device.Client(deviceOptions)
  #.....

except Exception as e:
  print("Caught exception connecting device: %s" % str(e))
  sys.exit()
```

```
# Connect and send a datapoint "hello" with value "world" into the cloud as an
event of type "greeting" 10 times
deviceCli.connect()

while True:

        deviceCli.commandCallback = myCommandCallback

# Disconnect the device and application from the cloud
deviceCli.disconnect()
```

BY-

Rutika Balasaheb Pawar

Student B.E. (Thakur College of Engineering &Technology)

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