*PSYCHOLOGY AND EDUCATION (2021) 58(5), ISSN 1553 - 6939*
*Article Received: 22th November, 2020; Article Revised: 26th March, 2021; Article Accepted: 26th April, 2021*

# "Smart Farming Support System Using Iot"

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## ABSTRACT

India is a developing country and we know that in India most of the population is dependent on farming and related activities. In this digital era of technology we have to use technology for making farming easy and more productive. Using new technologies and we can save farmer's time and lives from doing dangerous tasks too. Using Internet of Things1 and mobile application we can create a system which a farmer can utilize for completing farming tasks. IoT is very productive and efficient technology through which one can achieve their goals. The combination of IoT and Mobile application is like Krishna and Arjun of Mahabharata2. IoT guides like Krishna and mobile application finishes the task like Arjun. This duo can make anything connected with internet and cloud storage. IoT and mobile application co-operatively makes system more efficient and effective. Efficient and effective system makes outcome bar high and decreases the workload and difficulties of tasks.

**Keywords**
IoT, Farming. Cloud storage, mobile application

*Article Received: 10 August 2020, Revised: 25 October 2020, Accepted: 18 November 2020*

## Introduction

India has very diverse eco-system convenient for agriculture. India has very long river ways from Himalayan Rivers to Bay of Bengal to southern river clusters. India also have very large coast line too. These factors affects agricultural activities and supports farming. After green revolution of 1960s and 1970s, Food and Agriculture activities achieved immense height and acknowledgement towards research and development.
India contributes a total of $ 367 billion annually in global agricultural output. After China India is second largest agricultural producer and it is more than the US, Brazil,
Nigeria and Indonesia respectively from 3rd position to 6th (Bureau, 2016). According to the Food Agriculture Organization of United Nations, more than 570 million farms are there in the world of those 80% of the world's food is produced by 70-80% of those farms which is held by a family which are family farms. Only 4% of these farms are in highincome countries, showing that family farming is the backbone of developing countries.
This Smart Farming concept can bring the third green revolution of the world. Smart system will save approximately 1.5-2 hours per day per farmer ending with 93.25 B man-hours annually.

## Objective

Objective of this system is precision farming and farming automation with providing digital facilities to farmers which makes remote and smart farming more easy and efficient. This system will provide water supply when it is necessary after sensing soil humidity and moisture using a sensor. This system will protect the crop from insects and birds through playing sound on loud speakers that makes birds fly away. This Smart Farming concept can bring the third green revolution of the world. Having a 24x7 observational and diagnostic system will take the farmer to producing vitamins rich and healthy organic fruits. Smart system will save approximately 1.5-2 hours per day per farmer ending with 93.25 B man-hours annually.

### Scope

The scope of this system is to managing crops by observation of field, measuring the level of substances in soil and atmosphere, and acting against many variable factors that affect them. Farmers can observe and analyze the data from anywhere. This project will save millions of man hours as it has automatically functioning ability. Sensing, processing and distribution of information is used for making this system more alive and responsive.

## System Development

This system is a combination of best duo, for next generation technology development, with IoT Hardware Devices and Mobile Application Software.

### Hardware

This contains configuration of IoT devices and a micro controller (Node MCU/ ESP-32). IoT devices is required for collecting information from field and transmitting it to cloud storage. IoT devices collects real-time data for monitoring and analysis. Data collected from IoT devices is forwarded to micro controller, that micro controller manages that data and stores in cloud storage. Cloud storage provides space for storing database online and access of the same using internet connectivity. After configuration of these devices it has to be placed on field. Placement of these devices on field requires specific spots and adjustment for accurate data collection and smooth working of devices.

**Software**

Software side of this system contains an android and iOS mobile application developed using flutter application development. This application displays real-time data fetched from cloud storage. User must have an active internet connection for getting data from cloud storage. Application contains access to the IoT devices for turning it on/off whenever it is required. User can also make the system automode or manual-mode as per his/her wish. In auto mode system will make decision by itself according to predefined parameters and values. In manual mode system will not make any decision, user will change devices' state.

## Existing Systems

Most of the existing systems are in growing phase. Those system theory mostly contains sensors and auto-driven vehicles like tractors, threshers, cutters, etc. Available systems are just a prototype with few sensors. Those systems works on GSM and our system will work on Wi-Fi. Existing system works with third party applications while we are providing application specially and solely developed for this particular system. Many companies are working in this field for making farming easy and more productive but they have big budget projects while our system is low budget project with maximum functionalities and efficiency.

## Literature Review

There are various multinational companies working on smart farming concept. Those are working towards automation of huge vehicles tractor, cutters and threshers. Many government organizations also working for it. Food Agriculture Organization of United Nations (UN-FAO, n.d.) said that India is world's largest producer of milk, pulses and jute. While second largest producer of wheat, rice, sugarcane, groundnut, vegetables, fruits and cotton. India has very diverse privileges with 7500 Kms long coastline, highest range of mountains in the world, in North the Himalayas is there, in West the Thar Desert is there, the Gangetic delta to its East and Deccan Plateau in the south, the country is home to vast agroecological diversity.

India's climate varies from temperate alpine in the northern to humid and dry in the south and has a great diversity of ecosystems. A total of 15 WWF global 200 eco-regions and four out of 34 global biodiversity hotspots fall fully or partly within India. Having 2.4 percent of land are of the world's area and harbors approximately 8% of all recorded species, includes 45,000 plants and 91,000 animal species.

## System Development

**System Diagrams and architecture:**

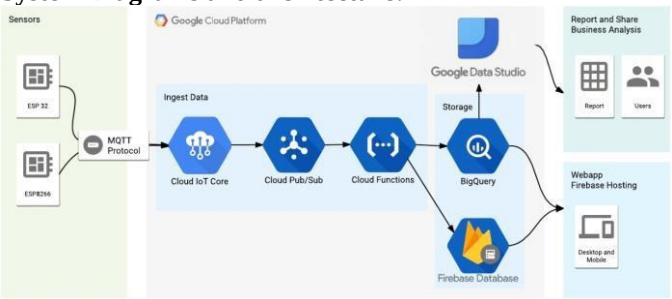



**Fig. 1**: IoT Architecture

The above fig. shows the flow of data from the micro-controller to the user device. Data detected from the sensors stored on cloud storage via microcontroller passing through MQTT protocol, using query processing and cloud functions for analysis of data processed data displayed on user screen.

## System feasibilities

**Technical Feasibility:**

Technically this system is useful as it contains a device ESP-32(Node-MCU) with analog and digital pins for connection of various sensors. It has a very compact design that can be installed anywhere without any kind of obstacles. This system is also light weighted hence it is easy to carry and move. Once a person purchases this system, the buyer will get the system already configured and he/she should have to sit in the field and make connections as per user guide. So it is easy to install and
configure for the common man

**Economic Feasibility**

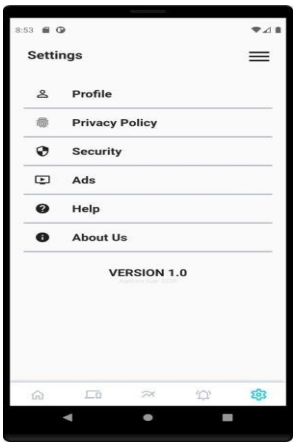
This system is feasible economically because it can be finished at very low cost so a middle class farmer can afford it. This complete system can be done in estimated cost of approximately ₹ 5000/- only. As this system is for farmers we had tried to make it less costly and economically light weighted.

**Operational Feasibility**

Operating this system is a little bit tough but not terribly hard. One can operate the system using an application developed for both iOS and Android. Users can manage systems through application. Application supports OS installed after iOS8 for iOS devices and Android 6.0.1 for Android devices.

## System implementation

**Software Modules**



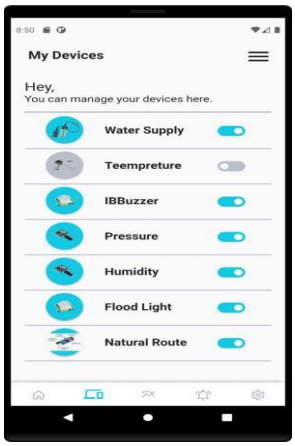
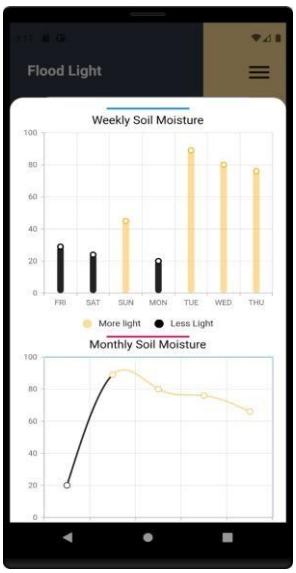




**Fig. 2:** Dashboard **Fig. 3**: Module for sensors
**Fig. 4**: Graphical Data Representation



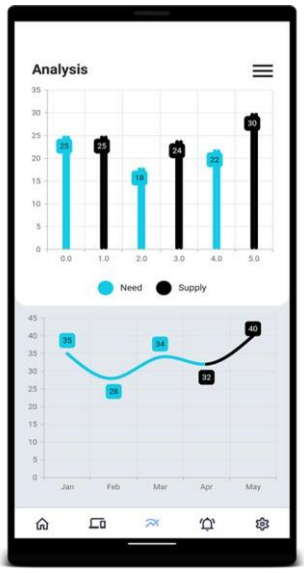
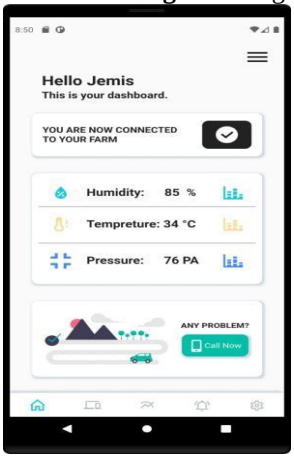
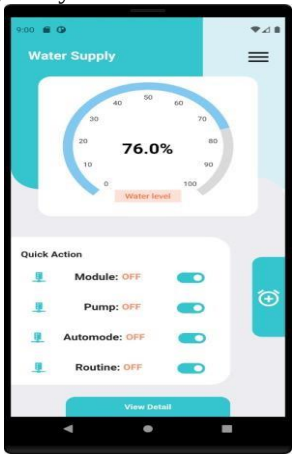




**Fig. 5** Settings **Fig. 6** My Devi




- *Registration*
- *Register/remove ESP-32*
- *Log Analysis*
- *Discover*
- *Life line – Water supply*
- *Smart Fencing*
- *Flood Light*
- *IB Buzzer*

**Hardware Modules**

- *ESP-32 configuration*
- *Sensors assembling*
- *System installation*

Fig. 5 shows the graphical representation of data fetched from cloud storage. It shows weekly and monthly values of field read by sensors. User can sort frequent pattern for requirements and can set fixed time slot for supply of water or light accordingly. Is also shows the analyzed data using an analysis algorithm. The analyzed data can be an important side for wise decision making process to user.
The above Fig. 3 shows the system UI. Dashboard is the first screen displayed when user logs in. Current values of humidity, temperature and pressure displayed on dashboard with graphical representation of weekly values. Fig. 4 is for managing system sensor activities. Here is the module for water supply, which contains options for turning on/off the whole module and pump, switching the auto mode with manual or vice versa, setting particular time for supply.
Here farmers can update their profile and other settings related with the application. User can change profile image, user name, mobile no, etc. User can set either notification shown to him/her or not. User can make changes in password too. User will have answers of frequently asked question, if there is some new questions user can reach us through mail, Instagram, Tweeter or LinkedIn. With help of discover module user can learn about technology that are used in his farm.

## Conclusion

We can create a system for farming which can make it more productive. Using IoT for farming will bring a great difference in agriculture field. IoT is the future key element of digital world, in this digital era it is not much far that we will have almost everything connected with Internet and cloud network. This makes it very vast domain to do something for anyone. This system is having advantage of IoT as we can directly use the current fetched data from field and display it on user screen and change the state of machines and sensors through cloud stored database.

## Future Scope

This Proposed system will definitely lead us to a new era of farming and monitoring crops remotely. This proposed system is not the ends here but it can be further more enhanced and improved. Implementation and maintenance

of this system can be the beginning of new version of such systems. Monitoring the working and outcome of the system for a while will lead us to every nook and corner of the system. Analyzing the outputs, we can get new ideas for betterment of the system. In future, this system can implemented with cameras for capturing images of field and machine learning concept for processing those images and prediction of total production and crop diseases. We can addon such feature using dynamic drone cameras, raspberry-pi cameras, fixed on field cameras and etc. Utilization of more and more IoT devices make the system more productive. Furthermore, automated vehicles could also be part of this system and make it more powerful.

## Future implementation

- Multi language support
- Land survey using GPS ● Land Mapping using automated Drone ● Surveillance using esp32 cam.
- IR Mapping of plant

**Plant health checkup using machine learning**

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