# Smart Farming

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**Abstract**— The paper explains the application of Internet of Things (IoT) and Automation Technology pertaining to the field of agriculture. The Internet of Things - the idea used to connect various real world objects such as weather, crop and water, will assist the farmers in obtaining the relevant data, and organizing it effortlessly. IoT enables various agriculture oriented applications such as crop growth monitoring, crop selection, irrigation decision to perform concurrently. The Wireless Sensors Network (WSN) is used to build decision support systems. The concepts of electronic sensors, cloud storage, data processing using Arduino and remotely controlled Mechanical Actuators is combined to create a system that is capable to perform agriculture related activities on its own. The system calculates the optimum inputs using the sensor network and supplies them through the actuators. A database of relevant crops is stored on the cloud and sensor data is compared with the optimum data on the cloud.

**Index Terms**—DHT sensor, Internet of Things, Cloud storage, Knowledge Base

## 1 Introduction

More than half of the Indian population has agriculture as their main occupation or side business. The farmers can be regarded as ecosystem engineers who find new ways for cultivation of crops. Indian agriculture still faces the challenges in present time, following are some of the challenges: Dependence on monsoon, fragmented land farming and holding, traditional farming practices, poor infrastructure in rural areas and less usage of technology. Innovation in the field of technology will help farmers increase the crop gain. Farmers need agricultural information and pertinent knowledge to make knowledgeable decisions and to satisfy informational needs. In agriculture domain through the development of a knowledge management system, enquiries of farmers can be answered with the help of multimedia which is easily accessible.

## 2 Literature Review

The application of decision-making platform which includes smart and quick processing of information and cloud storage is explained in the paper of Field Monitoring and Automation [2]. The development of modern agriculture is greatly influenced by Information Technology.

The uses of safe monitoring system are explained in this paper [1]. This system can be used to manage the amount of fertilizer that has to be used for a particular crop, pest and disease monitoring, check the quality of crops produced. The cloud application service platform is developed for greenhouse environment control systems.

Centralized display system plays a major role while guiding the farmers. It also gives them information related to the public consumption of any particular crop, pests that may attack the crop and the various diseases caused because of these pests. This system helps to either prevent or control the damages to the crop [3].

## 3 Tools Required

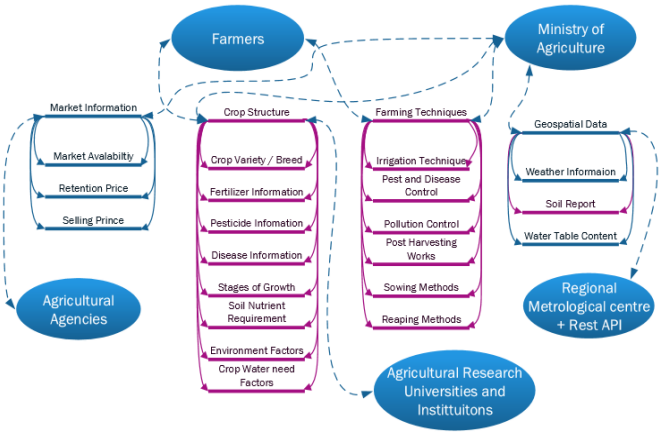
1. Arduino IDE Version 1.8.6
2. ESP8266 Wi-Fi Module/Node MCU
3. DHT11 Temperature and Humidity Sensor
4. KG003 Moisture Sensor to indicate soil moisture content.
5. Liquid level Sensor, Ball Float Type
6. BH1750 Module Digital Light intensity Sensor / LDR resistor.

## 4 Methodology

Data collection, observation and assessment of the system results in determining which approach is effective and where these adaptations are most needed. Therefore, ICT engaged interventions in agricultural sector are more productive than the typical methods. Technical and financial aids are vital need for the farmers to become adapt inclusive and effective method. In order to improve productivity and address challenges pertaining to social and environmental sustainability of farmer, ICT oriented Information Distribution facilities are used. The main sections of the architecture illustrated as knowledge base and monitoring system. Here, the main sections are elucidated in brief.

### 4.1. KNOWLEDGE BASE:

Knowledge Base can be defined as a complex combination of structured and unstructured information that is capable to assist farmers and also non-farmers. The Knowledge Base is constructed by acquiring suitable information in a correct manner. The relevant knowledge is distributed in an orderly and absolute manner. The knowledge-base system allows modification for future changes in agriculture and additional advisory services [2]. Knowledge base consists of facts regarding farming methodologies, Crop life cycle, and geospatial data.




### 4.2. REALIZED INPUTS:

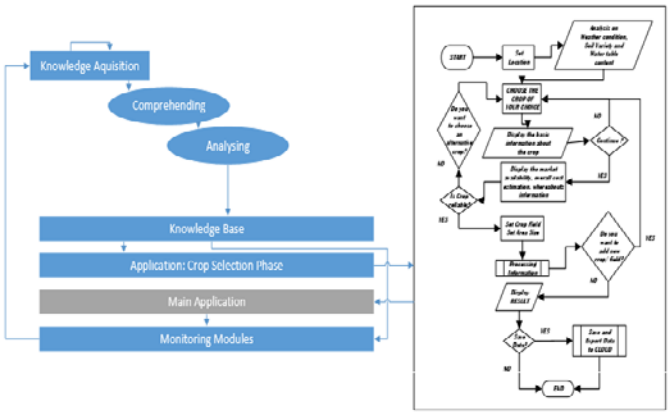
The primary objective of the system is to ensure that the best farming methodologies are practiced to attain maximum yield. This can be realized by adapting phase based farming methods and pest and disease control. Apart from this, market details such as cost, availability, demand and dealer's information will ensure high profitability of crops. Knowledge about crop life cycle, breeds, structures and soil nutrient is the key information to increase the yield. Knowledge of weather, water table content, soil composition and location of the farm are obtained after the farmer sets the Field Map. This knowledge is the deciding factor for the type of the crop that is to be grown.

### 4.3. KNOWLEDGE ACQUISITION:

The above knowledges are acquired through dependable sources through an integration of agricultural agencies, universities and ministry. The system is self sufficient to acquire these knowledgesand analyse them. These informations are recalled by the system as and when required.

### 4.4. KNOWLEDGE FLOW:

A Data Flow Model is prepared to represent the flow of knowledge in the system. The optimal information that the actuator system requires is obtained from this conceptualised network model. The actuator state will change with changing climatic condition. The interconnections and relations between the elements in the network are depicted in the Knowledge Flow Model. (Refer Figure 2)




## 5 CONCLUSION

In order to limit the human intervention during various phases of crop growth, farmers must be guided on a regular basis. An assortment of obstacles in agricultural domain was identified and architecture was framed meeting the obstacles. Knowledge base is structured with various crop details, which speak about knowledge acquisition, flow, various input like market availability, geospatial information and weather. Monitoring contains modules like remainder, monitoring plant growth in various stages, irrigation planner, crop profit

calculator, and calamity check and problem identifier. A comparative study was made between various applications available with current developed system considering various aspects like knowledge base, observation units, competence and consistency.

## Acknowledgment

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