

# Precision Agriculture Using Soil Moisture Measuring System for Indian Agricultural Scenario

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**Abstract:** The overall growth of any nation depends on the development of all domains with equal priority. Agriculture is one of the sectors which impacts the economical and social status of both rural and urban population, there by contributing to nation development. Half of the country's population is sustained by agriculture which serves a backbone in rising and balancing the rural economy with limited resources. The farmers in India are facing a lot of problems in both pre and post agricultural phases which is also influencing the GDP growth of the country. Through, in time availability of seeds, fertilizers, chemicals, machineries, markets, storage and guidance is the key challenge to agriculture in India, precision agriculture using user-friendly technology is need of the day. Since, Information and Communication Industry has reached all corners of India, adapting technology which is required by them brings the changes in their life. Need of technology in precision agriculture is related to pre and post agricultural scenarios by providing proper technological supports from village to further levels as defined governance by respective departments. This paper explores an idea on measuring moisture of the soil in the farmer field and managing periodic data through generic application so that precision in the water usage could be achieved. This system is developed using 'Bottom Up Approach' of Object Oriented Technology with necessary services with scope to enhance in future.

**Keywords** —Precision Agriculture, ICT, Rural Development, soil moisture sensor, mobile application

## I. INTRODUCTION

The agriculture in India is based on both traditional and modern practices from long time which has been in transcend mode over a period of decades. The income of this profession is still in stagnate as the famers are not getting themselves equipped with more modern technologies. Hence, faming is becoming less attractive for younger generations and making them to move to cities in search of other jobs. There are plenty of reasons behind this situation. Lack of recourses, poor marking system, unpredictable monsoon, lack of labors, high cost in using machines related to farming and poor network among farmers in exchanging the related information is putting the famers in trouble from many years. Small scale farmers are in financial crisis and lowering the life style reduces which is the issue being addressed now-a-days by the both State and Central governments.

In India, practice related to farming are used in a schematic way which is region specific and categorized as subsistence farming, organic farming and industrial farming. These farming types differ from region to region due to varying climatic conditions influencing the productivity depends on monsoon cycles.

However, there is a positive response from Governments for the welfare of formers in nationwide. Several farmer friendly schemes are introduced by Central Government to

support the farmers in time both in pre and post agricultural stages. The Central government is intended to double the income of farmers in coming years by helping them in time. In this view, there are several steps been taken and are in progress. NITI Aayog concerned with roadmap outline which provides measuring frame for increasing the farmers increase by 2022. Minimum Support Price (MSP) has been announced for many crops nationwide and in force from the year 2018-19. The scheme like Pradhan Mantri Fasal Bima Yojna (PMFBY) is helping the farmer when they are in climate distress and the performance evaluation of insurance companies has been made précised under this scheme.

However, India needs precision agriculture in all aspects where precise use of water is an issue which need to be immediately addressed. Development of small applications and integrating them is the need of the day in an integrated platform so that farmers are benefited and live the life with dignity. This paper proposes a technology for precise usage of water by measuring and maintains periodic data regarding soil moisture in farmer fields. A generic App proposed so that any number of different sensors related agriculture could be integrated in future, as enhancement.

The paper is organised as below. Section 2 highlights on Support rendered to farmers, Section 3

## II. SURVEY ON SUPPORT TO FARMERS RENDERED BY GOVERNMENTS

Both governments are striving hard to improve the farmers status by supporting them in many ways. Hence, India secures 2<sup>nd</sup> place in agricultural production and also India owns the strapping national research systems in the world. Currently, as of 2018, agriculture contributes around 17-18% for GDP (Gross Domestic Product) of our country. In May 2016, The Farmers Commission was organized by the government of India for an overall assessment of agricultural programme. The complications of agriculture and its marketing are being tackled by newly established business with Niche Technology. Employment opportunities are given a rise for the youth in agriculture based on their skills. The training centre's for farmers and building of regional office has strengthened the coconut cultivation as well as the industry.

Several MoU's [Memorandum of Understanding] has been signed by the cabinet led by Honourable Prime Minister Sri Narendra Modi recently in agricultural field and its associated areas, some of which are:

1. MoU between India and Kenya (2017),
2. MoU between India and Portugal (2017),
3. MoU between India and Italy for both agriculture and phytosanitary issues (2018),
4. MoU between India and Egypt (12-sep-2018). Along with the on field support, cashless transactions were promoted by taking certain measures by the Ministry of agriculture and farmers welfare. The financial plan for education in the field of agriculture has been increased by 47.4% this year (2018) as compared to 2013-14.

By understanding the need of Technology in Agriculture, National Programme on use of Space Technology for Agriculture (NPSTA), a latest integrated programme has been put forward by the department of agriculture, cooperation and farmer welfare, for the integration of space and Geospatial tools with agriculture, for the purpose of monitoring, mapping, management of crop cultivation, in the year 2018. Soil Health Card (SHC) mobile application has been launched on an instance of world soil day to measure the quality of the soil so that the farmer could use required amount of fertilizers during the crop cultivation. Its main goal is to give information regarding soil health to 120 million the devising of SHC in local dialect. The portal of SHC is in link with the integrated Fertilizer Management System ( iFMS ) and depending on the SHC advice as a pilot scheme, the fertilizers has been distributed in 16 districts. EIMA AGRIMACH INDIA 2017 was initiated where subsidy purchase of equipment through plan of Submission of Agricultural Mechanisation (SMAM) was done to promote farm mechanisation as well as models of customhiring.

An Online software for **AGMARK** was launched on 26-sep-2018 ,16:48, IST by Minister of agriculture and farmer

welfare Shri Radha Mohan Singh and is being executed in the country for controlling the quality control tasks. This system overcomes the time-consuming factors and physicality of already existing AGMARK certification system. Payments are received through a website named bharatkosh.gov.in.

## III. LITERATURE SURVEY ON ICT FOR INDIAN AGRICULTURE

Authors of [1] proposes a tool to manage different aspects of Indian Agriculture for both pre and post farming scenario. Authors says that systematic approach to agriculture is the current necessity which brings out a correct statistics on farmers, types of crops grown productivity and availability of commodities at region wise, which further helps in planning and execution of government schemes in a controlled manner. Further , they said that since telecommunication industry is already extended in every corner of a village, merging the technical developments with agriculture field is economic.

Authors of [2] implemented a Agricultural tool to manage different activities pertaining to agriculture. This paper proposes design and implementation of the model and finally the results are analyzed by considering with and without middleman as a parameter in the agricultural market.

Authors of [3] focused on the significance of technology of E-commerce in agriculture. They proposed a model of e-market for selling the produces online to eradicate the middleman.

Authors of [4] focuses on the problems of e-agriculture in rural Indian context. It provides facts on information asymmetry among farmers, regions and countries. The paper describes E-agriculture with the application of existing Information and Communication Technologies (ICT).

Authors of [5] proposed a project, namely-Kakashi . This project is on wireless sensor network technology to avoid damage to crops by animal to improve the production. The main goal of this project is to monitor the entire agriculture farm land and send the signals to farm owners when unwanted situation occurs.

Authors of [6] describe a mobile based application, namely Krishi Ville, for farmers community. This application updates various agricultural commodities, agricultural news updates, weather forecast updates and so on.

## IV. PROPOSED MODEL FOR SOIL MOISTURE MEASURING SYSTEM

The need of the day in our country related to agriculture is optimal use of the available resource. Water is one such precious resource on the earth getting depleted year-by-year because of over usage, even by the farmers. hence, the ground water is decreasing and scarcity of water arising everywhere in India. Precise use of water in agriculture

using available, cost effective technology is required and it is expected to be farmer friendly as most of them are illiterates. This project proposes a model using IOT which has two major modules, namely, Moisture measuring subsystem and an a mobile application as an interactive subsystem for the end user. The architecture of the project is as shown in the Figure 1.

The moisture measuring system measures the content and stores in the memory periodically. The content of the memory is accessed by the mobile system when ever required. When there is a fall in soil moisture, it would be alerted through mobile application. The mobile application would be made generic for other sensors and required security is provided at the user level.

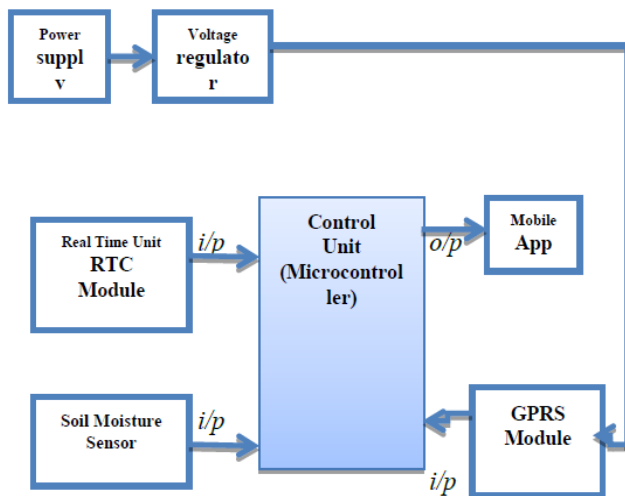


Figure1. Architecture of Soil Moisture Measuring Mobile App

### Advantages of the proposed Model

It is an effective Soil Moisture detection method in an intelligent remotely monitored system as sensor is plotted in the farmer field. The Microcontroller is connected to GSM (Global System for Mobile communication) wireless network, which allows the system to communicate with the farmer remotely using a mobile Application. This is environmentally friendly, efficient, cost effective and helps the farmers to control and monitor moisture level in real time environment.

Soil moisture content is the single most important factor determining plant growth. The proposed system is going to test the efficiency of Soil Moisture, in comparison to traditional method. The moisture measuring devices are programmed such that they can detect the arrange of moisture content and send signal to the microcontroller accurately. The proposed app is limited to measure and display the soil moisture content in the field and transfer the periodic data to mobile app.

### V. CONCLUSION

Agriculture is an important sector defocused by all sections of people in the society. Farmers in India are less privileged community, hence loosing the interest in the field gradually which is considered as dangerous issue in recent years.

They are facing the problems in both pre and post agricultural phases putting effort, but in vain. They are also facing many problems at ground level such as scarcity of resources. Water is now considered as an issue needs attention for its proper usage. There is an urgent necessity to equip the farmers for latest technology and encouraging them to transit from traditional to modern approach in all aspects of agricultural activities. This paper proposes such an application where moisture sensor is deployed in the field and soil moisture content is periodically measured. The necessary information would be sent to farmers through a generic mobile application which would be made farmers friendly. The model is later enhanced to make it more interactive to work with other actuators to minimize the direct human intervention.

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