

# Towards Precision Agriculture Indian Perspective

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**Abstract**— The Agriculture sector in India one of the strongest sectors, but its contribution towards the Gross domestic product of India is only 7.1 percent, but India's economic growth has lost its rate indicate a low pull factor on labor away from agriculture. In farming sector production problems arise due to illiteracy, lack of knowledge about the low input sustainable farming system, improper use of fertilizer, pesticides and water, poor forecasting of weather. Precision agriculture is the perspective of the to reduce over- application of farming inputs, optimize performance and enhance agriculture production. The Indian agriculture the farmers face the hazard of both production failure and market failure. The major issues in the Indian agriculture sector are low per hectare yield, outmoded techniques of production, fertilizers and pesticides used on an insignificant scale. We have proposed the drone-based precision farming system which helps to identify crop disease, increasing the crop production and also help to spray pesticides on crops..

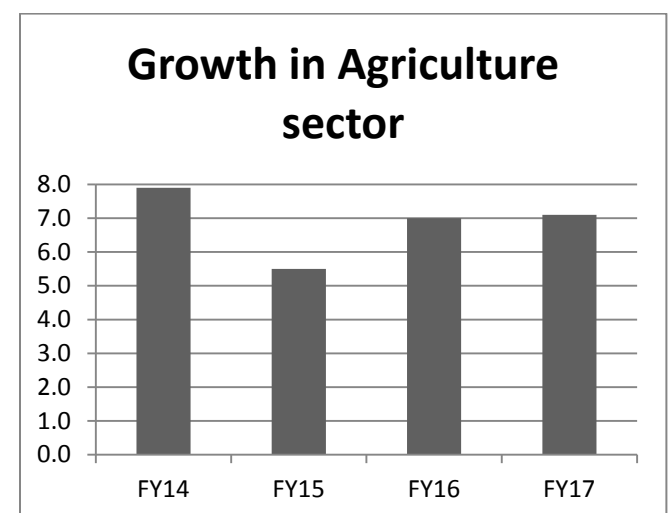
**Index Terms**— Agriculture sector, Agricultural innovation, Traditional machinery, Farming revolution, Technologies, Image analysis, Automatic system for detection and classification, use of aircrafts

## 1. INTRODUCTION

THIS Precision agriculture is assimilated data and manufacturing initial agriculture machine that changed into represented to increase long term, entire farm production and yield while lowering effects on wildlife and the environment. In India there are 70% population depends on agriculture. Agriculture sustained to play major role in Indian economy. The average growth rate of agriculture sector in 2016-2017 is 7.1 percent [1]. India have 1<sup>st</sup> rank in international in phrases of milk manufacturing. the second rank of India in terms of rice, cotton, wheat, tomato, tobacco and third rank in coffee production. India additionally 2<sup>nd</sup> ranks in most cultivable land in international but trouble in low productiveness, the produce is most effective 30% for each crop in comparison to international requirements. there are about 1.339 billion populations of India. there are about 116 million farms holding with average size of 1.4ha. the fertilizer expanding from less than 1 million tones of overall nutrient in mid-1960 to nearly 17 million nowadays.

The quality of compost utilization changes between regions. The watered zones are 40 percent of the

aggregate cultivating territory and get 60 percent of compost connected [2].



The Indian agriculture point of view the basic stresses mostly due to limited available useful things and the dependence of a large population on farming. The Indian land that was under development has been decreasing a

seemingly endless amount of time in view of more land is required for building houses, factories, roads etc.

On Indian land loose its fertility being put into producing crops continuously for years together. The Indian governments are providing the fertilizers to farmers. The utilization of these "chemical fertilizer" has expanded Indian agriculture create manifolds. The main problem with Indian farmer's that high labor cost, changes in climate, and lack of efficiency, flexibility in the crop protection methods [3].

In recent year, the impact of agricultural innovation has increased in India i.e. seeds, mechanization, pesticides which demonstrate the growth of production would be upwards. The major field of growing crops in India shown in table 1.

**TABLE 1.**

**PRODUCTION OF CROPS (IN TONS) ON YEARLY BASIS:**

Crop	2013-2014	2014-2015	2015-2016
Rice	11.34	23.45	34.01
Wheat	24.21	25.00	25.48
Cotton	12.76	13.96	10.07
Sugar cane	13.89	11.90	14.90

## 2. TRADITIONAL APPROACH

Traditional agriculture is technically very simple and time consuming. In traditional farming methods are more labor exhaustive and rising poor crop yield than modern method. The main elements of a traditional approach are machined. In India they are using basic machinery. The Indian farmer producing the seeds by themselves. The seed quality is very poor.

### 2.1 Traditional machinery

Past year Indian farmer for soil ploughing using Plough. There are two types of Plough wooden and iron play. Now days' ploughing is done by tractor-driven cultivator. The sowing seeds of seeds drill with help of a tractor. In India supply watering in farm with help of chain pump, moat,

dhekli, lever system. The diseases and insects are very harm full to the crops. The pesticides are sprayed by hand pump. That is very harm full for farmers.

### 2.2 Issues:

Precision agriculture can generating a crop manufacturing going through the provocation of a rising global populace and may assist farmers to attain the better productiveness, environmental protection, time saving. Traditional techniques are slow, reckless, exorbitant cost. In India farmers are uneducated they don't have much knowledge about crop health[3].to control the pests and diseases farmers are spraying pesticides but they do not have idea how much pesticides use .However, using unwanted pesticides is to be very harmful for health of people. The major issues are

- Growth monitor
- Crop failure
- Poor irrigation

## 3. PRECISION AGRICULTURE

Precision agriculture is new farming Revolution. Precision agriculture is moving from traditional to modern technique. Precision agriculture goal is to sustainability, safety of the environment, profitability. In precision farming depends on specialized machinery, software, and other services. Precision agriculture, farmers can deliver better yields and significantly less crop failure and further more help in fewer contributions alongside water, fuel, fertilizer [4].

As precision agriculture increase rule in 2017, here are the rewards of precision agriculture to advance agricultural yield and reduce feasible environmental risks.

- The use of different types of sensors which are help full in irrigation management[4].
- Precision agriculture goal is get real time data to increase yield [5].
- Precision Agriculture also helpful for social and working environment. For example, soil and crops types can be automatically optimize during sensors taken from Decision support system [5].
- Precision agriculture methods have profit to production efficiency and to increase quality [5].

### 3.1 Technologies

#### 3.1.1 Sensors and remote sensing

These technologies are used to accumulate statistics from distance for comparing soil and crop health. It is used to identify crop illnesses, moisture, nutrient. statistics

sensors can be setup on moving machines. Sensing technologies are developing rapidly.

### 3.1.2 Mapping and surveying

The process of using a map or survey crop by help of 3D mapping drone. Precision agriculture survey methods reduce time and maintaining the accuracy. Geomapping also assigns that information to exacting filed position.

### 3.1.3 High precision positioning systems

The high positioning systems like GPS technology which providing navigation and positioning of earth [1]. GPS equipment collects the information of irrigation system, disease crops and so on.

### 3.1.4 Variable rate technology

VRT have ability to get parameters for seeds and fertilizer according to exact variations in plant growth, soil types [5]. the mapping system uses maps of previously measured items and some strategies are on single information source while others involve a combination of source.

Today's era in precision agriculture using unmanned aerial Vehicles or Remotely piloted aircraft system vehicles or Unmanned Aerial Vehicle. The unmanned aerial system currently most talked about aerospace industry. The main groups of UAV are fixed wings, helicopters, multicopters, Quad copter and so on. Drones known as UAVs (Unmanned Aerial Vehicles), these kinds of vehicle do not need a person contained by to control.

India is the mainly cotton rising kingdom. About 80-90% of the infection occurs on the plants of cotton crops. It is very complicated to recognize for person eyes the accurate type of leaf diseases which are occur on the leaf of cotton crops. thus, in order to identify the cotton leaf diseases accurately by use of IOT and image processing. Drones helps in collecting information about conditions of cotton leaf diseases. Researchers in the IT department are partnering with agriculture services to create cameras mounted on drones. These cameras can automatically detect disease stages, and spraying pesticides on right location, before the disease damages the crop. First drone is use for capturing the image of cotton crops and detect cotton crops diseases based on image of their leaf. Second drone is use for spraying pesticides on affected cotton crops.

## 4. THE IMAGE ANALYSIS IN PRECISION AGRICULTURAL

The image segmentation techniques are extensively applied to agricultural science, and it has great perspective especially in the plant protection field, which ultimately leads to crops management [6].

Image analysis can be applied for the following purposes:

1. To detect diseased leaf, stem, fruit, root
2. To measure affected area by disease.
3. To find the boundary of the affected area.
4. To determine the color of the affected area.
5. To determine size & shape of fruits, root.
6. To identify the Object correctly

Automatic system for detection and classification of cotton crop diseases was proposed using canny and sobel technique for segmentation and support Vector Machine algorithm for classification to get the average efficiency of 98.67% [7]. Image acquisition, Image pre-processing, Image segmentation and Feature extraction steps of image processing are discussed in this section.

### 4.1 Image Acquisition

The process of acquiring images from various sources is known as image acquisition. Practitioner's researchers have used drone for capturing the leaf images [7].

### 4.2 Image Pre-processing

The aim of pre-processing is to improve the quality of image by removing unwanted noise from the image. Few researchers have worked on removal of background and shadow from the image. There are various types of noises which are present in the images such as Gaussian noise, Salt and Pepper noise, etc. To remove these noises, mean and median filters can be used.

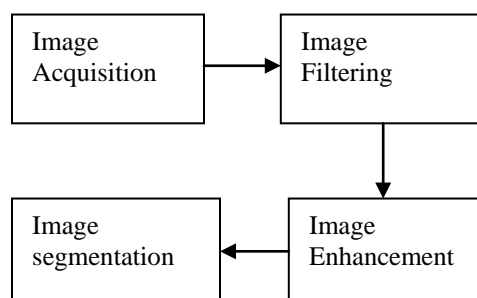


Figure 1 Proposed system

#### 4.3 Image Segmentation:

Image segmentation is used to divide the image into various segments. It can also be used to

- Identify the separate objects within an image
- Find the region of connected pixels with similar properties
- Find the boundaries between the region
- Remove unwanted region
- Canny and Sobel segmentation: Canny and Sobel are the edge detection techniques. The Canny edge detection algorithm is one of the most commonly used image segmentation techniques. It is also known as an optimal edge detector. The Sobel edge detection method finds the edges using a Sobel approximation to the derivatives. When Canny and Sobel segmentation is applied on the diseased part of leaf image, the edges of the diseased part are obtained.

#### 4.4 Classification

Classification after extracting color and texture features, the classification is performed by using Support Vector Machine (SVM). As the proposed system consists of 4 classes, the multiclass classifier is used for the classification [8]. For classification, the database is divided in training phase and testing phase according to 60-40 pattern for each class. All the training database images are processed through all these steps and finally feature vector is saved by labeling the class (type of disease). The test image also undergoes through same steps and its feature vector will get compared with the trained feature vector for the final disease [8].

The purpose of fertilizers and pesticides in farming areas is of major importance for crop yield. The use of aircrafts is becoming common in carrying out the task because of the speed, accuracy and effectiveness in spraying operation. The farmers are using the spraying bags to spray pesticides all over the farm [9]. The farmers have to carry the pesticide spraying bag which makes them get strained. Even then the farmers are unable to evenly distribute the pesticides all over the farm. And also it will be time consuming. The farmer can spray the pesticides using drone evenly all over the field [10]. It reduces the workload of the farmers and also completes the work very fast. There are different types of best sprinkler drones are available. In our system we are using DJI MG-1 drone which is an octocopter designed for precision variable rate application of liquid pesticides, fertilizers and herbicides, bringing a new level of efficiency and manageability to the farming.

The powerful forward motion system enables the MG-1 to carry up to 10kg of pesticides payloads.

The combination of speed and power means that area of 5000m<sup>2</sup> can be covered in just 10 minutes. The intelligent spraying system automatically adjusts its spray according to the flying speed so that an even spray is always applied [11].

The new radar sense system that provides additional reliability during air travel. The spraying system and flow sensor system ensure accurate operations. For accurate spraying the MG-1 spray nozzles can be chosen according to the properties of each liquid to optimize atomization, energy efficiency [11]. The MG-1 is ease of use flight controller integrated with the aircraft instantly and precisely responds to pilot's input. The MG-1 without human intervention records its current and retains information its past coordinates as it makes its way across the field. The MG-1 easily is resumed from the last point in its memory after changing the battery and refilling its tank.

## 5. CONCLUSIONS

The scope of this system is to identify the specific area where the crop's growth is not proper and need more focus. Initial priority is to monitor the growth of the crops and calculation of payload as per the growth. This system is to develop the user friendly interface for farmers. The MG-1 drone helps the farmer to spray the pesticides all over land so it reduces his work. The direction of development of drones in agriculture can create the greatest amount of jobs, organize the basic for many scientific researches, maximize efforts to protect the crops and increase crop yields.

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