**The problems in Agriculture domain and how we can help through AI**

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# Abstract

Agriculture is one of the most prominent occupations to be practised by people living in rural areas. More than 60% of the land in India is farming land and more that 70% of the people living in villages suffice on farming for their daily needs and that too for very small and marginal rates[[1]](#footnote-0). So by modernizing it will lead to getting the most out of land and increasing the profit to its greatest extent.

There are various factors which affect the growth of crops like soil parameters(nitrogen, phosphorus, potassium levels[[2]](#footnote-1)), climate change which cannot be predicted and several other factors. There is no proper solution and technologies to overcome the situation faced by us.

In India there are several ways to increase the economical growth in the field of agriculture. So in this article we will be focusing on problems faced by farmers because of their low agricultural output and their technological solutions. While Artificial Intelligence (AI) sees a lot of direct application across several different sectors, it can also bring a paradigm shift in how we see farming today. With the help of AI, farmers will be able to do more with less effort, and which will give direct benefits to the markets and by that quantity and quality of the crops will also be increased.

For eg:-Through an AI application a farmer can peek into the details regarding his farm, through which he can get to know the percentage of the crops that are ready for harvest against that are not and predict the quantity of crops which can be produced.[[3]](#footnote-2)

# Introduction

Agriculture is the backbone of every country but for a country like India whose revenue is mostly gained by the agriculture sector.[[4]](#footnote-3) Ancient people used to grow crops in their own land, but now after many inventions of new techniques and technologies in agriculture have led to degradation of crops cause more and more people are focusing on cultivating crops faster and easier so they use hybrids or use chemicals which work as catalysts in the farming.[[5]](#footnote-4)But after using these chemicals fertility of the soil is decreased to a great extent and the crops produced are also harmful to us, for eg a chemical widely used for artificially ripening the fruits like mangoes is Calcium carbide which goes by compound Cac2 which contains both arsenic and phosphorus and arsenic which can be fatal to human beings.[[6]](#footnote-5)

Through the application of artificial intelligence (AI) and machine learning (ML), farmers can access increasingly sophisticated data and analytics tools, which enables better decisions, improved efficiency, and reduced waste in food and biofuel production, all while minimizing negative environmental consequences.

Agriculture is seeing rapid adoption of Artificial Intelligence (AI) and Machine Learning (ML) both in terms of agricultural products and in-field farming techniques.[[7]](#footnote-6) Cognitive computing in particular, is all set to become the most disruptive technology in agriculture services as it can understand, learn, and respond to different situations (based on learning) to increase efficiency

Currently Microsoft is working with farmers in Andhra Pradesh to provide advisory help to the farmers for sowing and cultivation.[[8]](#footnote-7)

So at the end we can say that by using AI algorithms we will be implementing precision farming which will lead us to higher yield percentage of crops and which will further lead us to generation of better quality crops without exhausting more resources.

# Problem statement-1

Farmers want to know how much yield they will get from his expectation and when and how to harvest crops.

To prognosticate the crop yield per farm and determine most suitable time for harvest

# Problem Explanation

As the climatic, temperature, soil parameters change and also as the population increases farmers are also forced to cultivate more and more crops, but many of them don’t have the knowledge of new crops and benefits of farming them. Farmers are also being ignorant about natural occurrence and also they don’t know which crops are suitable to grow in their respective farm lands for greater productivity, so they end up growing wrong crops which leads to less productivity, there are many other causes for less crop yield like land degradation which leads to soil infertility also use of more chemicals(fertilizers) leads to increase in aridity, salinity and alkalinity which at end also effect in soil fertility. The uneven rainfall is also a bane to agriculture, basically farmers are exposed to the vagaries of monsoon,still in India only 48.3% of the total cultivated land comes under irrigation.[[9]](#footnote-8)

Crop yield prediction is the method or process to predict the yield of crops by using historical data and parameters like ph level, fertilizers, rainfall, temperature and other atmospheric conditions.[[10]](#footnote-9) There are many ways through which we can predict the yield of crops like we can apply association rule mining on our historical data or we can apply any machine learning algorithm like random forest but all these algorithms are more prone to error compared to any neural network algorithm which will be more accurate for forecasting crop yields.[[11]](#footnote-10)

An ANN back propagation algorithm is used to determine the weight to calculate the error derivative, crop monitoring and forecasting of crop yields is using low resolution satellite imagery.The combination of increased geographical coverage and increased temporal frequency making these pictures the most important choice for crop yield prediction.[[12]](#footnote-11)

Many companies like cropin, Intello labs and Agstack Technologies are working on the slight variations of this AI model.[[13]](#footnote-12)

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# Suggestions

This model can also be used for suggesting the fertilizers for the given farm land.

The selection of types of fertilizers to be used on the farm land is based on three soil minerals which are nitrogen, phosphate and potassium respectively.

If there are sufficient minerals in the soil then no fertilizers are required but if there is a deficiency of any one then fertilizers are required.

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# Future works

A generalized prediction model which can be used for the yield prediction of all the crops which will be having parameters like humidity and solar radiation.

To give info about micro nutrients also

Building the particular API in the regional language, so that it can be understandable by most of the farmers.

# Problem Statement-2

Labour Intensive part of farming which farmers have to bear day and night irrespective to temperature or any other climatic factors.

# Problem Explanation

The basic and most crucial problem which farmers have to bear is that they have to do a lot of labour on their farm lands to get the yield they desire[[14]](#footnote-13), irrespective of any weather conditions they have to work and have to guard their fields day and night, so to remove all these hardships faced by them we can take the help of AI.

# Existing Works

As per a study in PWC, it is said that the total market for drone related applications is 127.3 billion and for agriculture alone it is at 32.4 billion. So by using drone based solutions in agriculture will ease the work of farmers and drones will be much more efficient in managing and securing the crops in much more adverse conditions.[[15]](#footnote-14)

Many companies or agriculture based start-ups are using drones with the combination of AI algorithms to tackle the problem faced by farmers.

Like drones are used to create the 3D map of a farm, before the crop rotation to get the detailed map of terrain, drainage and irrigation. Drones can be programmed to spray liquids and seeds by adjusting and synchronizing the distance from the ground for the given terrain.

In combination with AI and Computer vision algorithms crop assessment and health monitoring is done. Cameras take high definition pictures of the field then this data is passed to a convolution neural network to find which crops need water and where are weeds located.[[16]](#footnote-15)

Companies like Airlitix and Above use AI driven drones for tackling agricultural challenges. Like Airlitix makes AI or machine learning enabled drones that fly though greenhouses and gather data regarding temperature, humidity and carbon dioxide levels which helps us in ensuring plants are being grown in an optimal condition.[[17]](#footnote-16)

# Suggestions And Future Works

Farming applications need to be more robust.

It should facilitate real time decision making and make use of appropriate application program interfaces for collecting historical data and live in a more efficient manner.

The solutions offered by data scientists or companies should be cost effective then only it can benefit farmers in all around manner.

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