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Precision and Predictive Farming Techniques and Usage of Unmanned Aerial Vehicles in Precision Farming with Integration Artificial Intelligence

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Abstract:

To meet the growing demand for food we need to halt the crop loss which is due to farmers illiteracy hence to tackle this situation we use precision and predictive farming techniques to monitor crop, soil and weather and helps farmers for better understanding and better decision making for this we use technologies like artificial neural network and for prediction and remote sensing using satellite for UAVs.

Keywords: artificial neural network ANN, unmanned aerial vehicles UAVs

I. INTRODUCTION

According to the UN By 2050 global population hit 9.8 billion and agricultural production needs to double (70%) to satisfy demand[4]. due to several social conditions land and water resources are already seemly inadequate. A decrease in the production of food is already having destructive consequences on developing country. by using precision farming technique farmer can closely monitor soil composition, crop humidity and temperature help them to use the ideal amount of water and fertilizer on close monitoring help farmer to crate healthy

environment to crop which automatically leads to improve their production.

An AI system can be outlined as study and interpret the surrounding and take the action that boosts success rate artificially.

II. Related work

[1] In this author introduced a mobile app in which for a given input it processes the data and suggests the crop suitable for soil and weather condition and in other cases it advises about the fertilizers that need to be used in the crop.
[2]In this author analyzes different precision techniques, proper farm monitoring techniques and automation in precision farming to get good production to the cultivators.
[3]In this author talked about how technologies like **Unmanned Aerial Vehicles** show impact on food production.

III. Crop prediction by using ANN

[5] Similar to the human brain ANN (artificial neural network) has neurons interconnected to each other in different layers.
Ø Input layer
Ø Hidden layer
Ø Output layer

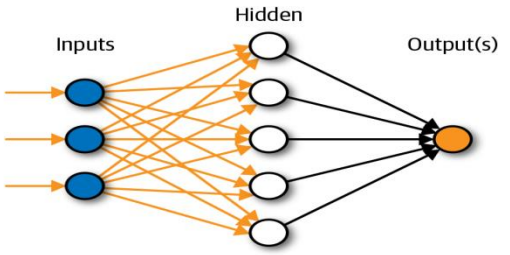

Figure 1: Layer connection of network

Here nodes in input and output represent variables of input and output, respectively.

In this method input taken is manipulated by ANN and process through the linear network at the input level. and that information is processed through hidden layers where we get output by applying a sigmoidal function.
In this application, we can suggest to the farmer the crop which is fit for the soil in another case if the farmer decided the crop it recommends the fertilizers need to be used based on Nitrogen, Phosphor and Potassium of the crop and it also predicts the productivity of crop[14]

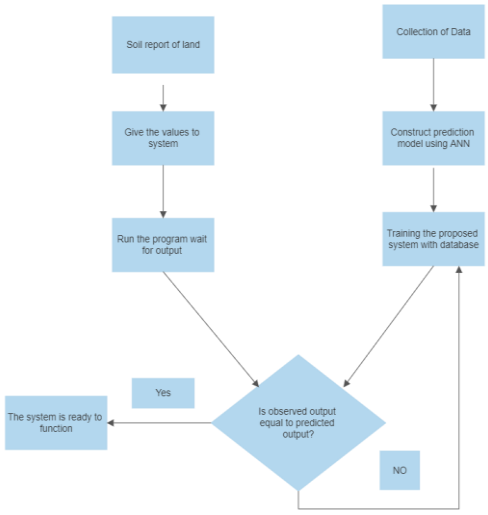

Figure 2: Flow chart of prediction model

IV. UAVs in Precision Agriculture

UAVs are electronically controlled devices of small size.

These UAVs are equipped with cameras to capture images and sensors to compile data and aid in farm monitoring and decision-making.
The size of a UAV is determined by the task it must complete. The size of the payload is affected by the size of the UAVs, which are operated by drones and radio controllers. drones can provide the farmer with a detailed view and disclose all problems from soil variation to irrigation problem that is not visible to the human eye and helps the farmer in better decision making and helps to improve productivity in cost-effective way[6]

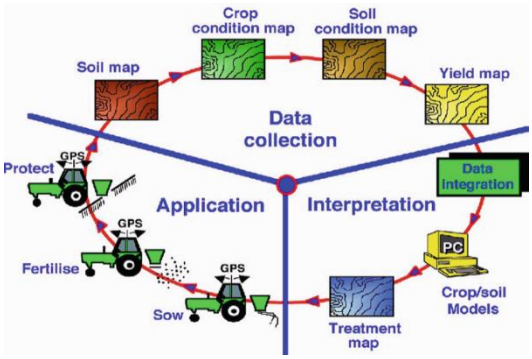

Figure 3: process of precision agriculture

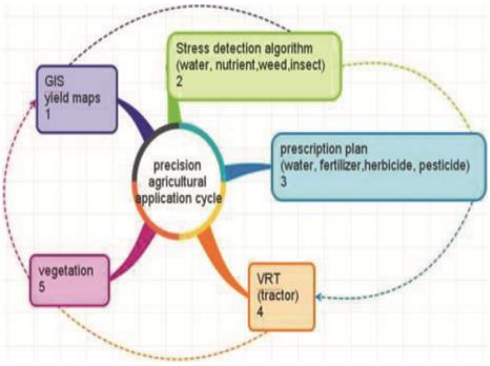

Figure 4: cycle of precision agriculture

V. Working of UAVs

1. It collects all input data from the field in the form of maps/visual images like soil map, crop condition map, soil condition map, yield map all this data capturing process is done by Geographic information system (GIS), global positioning system (GPS)and the Variable rate sensors[15]
2. It integrates all the collected data and process through crop/soil models
3. This gives output as a treatment map which contains precision plan needed to be done for better yield [7]

Figure 3: working of UAVs

VI. Social impact and advantages of precision farming

we can make a lot more positive impact on this planet if we can bring our ancient agriculture practice into precision and predictive way not only to improve food production but also it reduces the chemical fertilizers using in the field which helps to reduce pollution [8], it helps to take firm and quick decisions saves time and production cost of the cultivator as agriculture plays a momentous role in economy it also leads to increase of GDP. In addition to this, we can predict crop yield using prediction techniques that have a direct impact On International and National economies annually which further helps us predicting the GDP [9].further more it assists farmers in future activities planing like price structure and its distribution import/export decisions, crop procurement.

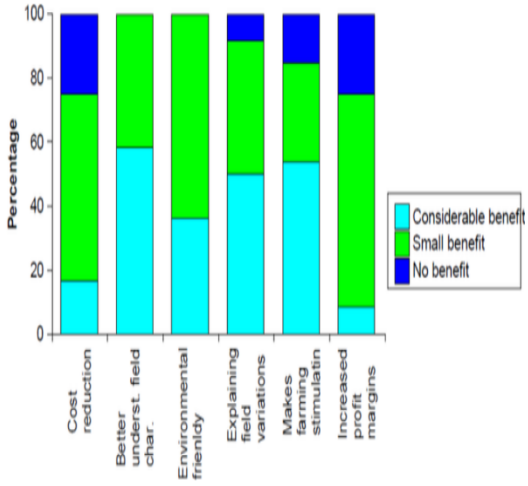

Figure 4: Benefits of precision agriculture

Precision agriculture comparison table	Difference in output	Difference in ouput due to technology	Difference in output due to inputs
With P.A	63.86%	33.71%	30.15%
Without P.A	28.14%	20.48%	7.69%
Margin Difference	35.72%	13.23%	22.46%

Figure 5: comparison table for vegetable farming with precision agriculture[12]

VII. Future scope in India

Precision agriculture in India is classified into two categories: namely, ‘soft' and ‘hard’[11]. It also said that the balanced use of soft and hard Precision agriculture will be the deciding factor for its success in India in order to achieve that we need to look at the social, economic and demographic problems like the unique pattern of land holdings, poor economic conditions of small farmers, lack of technical centers available,collecting data from remote areas is a challenging task[12], what may happen to the same seed and fertilizer at one state may not be suited for other states in another part of India due to different soil types [13],different temperature and so forth to aid this situation and attract more investments in precision agriculture in India approach like tax holidays, special crop loans are helpful.

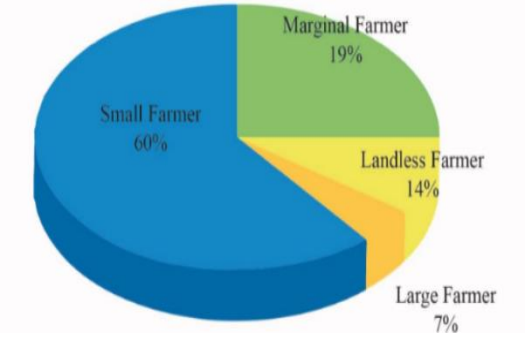

Figure 5: Land holding pattern in India

VIII. Conclusion

precision and predictive farming techniques are still an idea in many developing countries even though this agriculture technique can handle both environmental and economic issues, significant support from both private and public sectors are needed to elevate its rapid adoption. but the notion of “doing the right thing in the right place at the right time” has substantial appeal. in conclusionPrecision and predictive farming techniques allow the farmer to understand crops in a cost-efficient way and helps to improve yield in future this technology helps to reach the growing demand of food production.

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