

# Smart Farming: A Techno Agriculture Advancement Powered by Machine Learning

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## Abstract

India is a country which has an arable land of 159.7 million hectares (394.6 million acres) which is the second largest country in the world but in terms of modernization and digitalization which hitherto has not developed in our nation, whereas world is in another level. India is the country still lacking in the adoption new technologies in farming and unable to make profits from them. So in this paper we are going to address few key issues with the help of machine learning we can use for getting profits in agriculture and we can do smart farming based on prediction and analysis of previous agriculture data available. In this paper we are focusing on Analyzing crop diversification and crop trends based on datasets of previous years, Requirement gathering from different people and providing them to agricultural officer. Analyzing the weather conditions and environmental changes with the help of artificial intelligence and machine learning and submitting the details to agricultural authority.

**Keywords** - Arable Land , Machine Learning, ,GDP, Datasets, Patterns , Classification Algorithms, Stocks-analysis, iphone weather graphs, Artificial Intelligence.

## I. INTRODUCTION

We as a nation have seen technological advancements in almost all the fields except the farming or agriculture. Agriculture is one of the major occupation in India where the insight of technology cannot be seen even after 71 years of independence. Their ignorance and the innocence is actually helping few self centered Mediators are working for their own profits and farmers[2] are not getting any benefits and profits from this procedure. This is the story since 1950 the major reason for this scenario is we are not using any technological advancements in Farming or we are not using any advanced machines to do smart farming. In paper we are making use of advanced technologies like Machine Learning and IoT[4] technologies which helps the farmers to fix their low productions, we can raise the standards of farming in India and we can improve the productivity. with the help of machine learning concepts we can accurately predict the Requirements, Markets trends, Climate conditions[10]. It gives the more clear information to the farmers and

they can have their own idea about the process of cultivation. Which is actually innate their ideology whereas concept of Machine learning adds the productivity to meet the requirements of Global standards. We concentrate more on agricultural officers who understands the results produced by the Machine Learning analysis and prediction. So the key aspects in agriculture are climate, required crop of that area[8], high commercial valued crops (Similar to the working of the stocks and exchange graph). The Clustering and classification algorithms also helps in predicting the climate of the area with the help of the previous years datasets like Iphone weather and they can learn about patterns of climatic change and produce reliable forecast to the agricultural officer to the farmer. Predicting[6] most profitable crop based on the place requirement, the industry and its commercial value which can be achieved by studying the industries and the main markets of that state. The following are the some of the important things we have to concentrate As we live in a subcontinent variety of people has variety of requirements for example if we consider west India the crops grown[9] and the food consumed are based on the crops which has low water content like chana, dal etc whereas if we consider the east india the majority of crops grown are situated on the hill stations like tea and coffee and the production and supply may be surplus or deficit. If we use Artificial intelligence[5][7] and machine-learning both technologies will help in analyzing all such requirements and produce an outcome to the agricultural officer of that area.

The **figure 1.1** gives the information about all these requirements are analyzed based on the datasets of their previous orders, and their consumption. We have seen the requirements of mushrooms based upon the recent food trend of a city where vegetarian food is mostly preferred. So based upon this type of orders the outcome is determined. The problem with the existing system is if we compare the agriculture sector of India and other developed countries we can observe that the intervention or implementation of the technology[8] has rapidly increased when compared with country.

The main reason for their surplus productivity and our deficit productivity is the lack of proper implementation of technologies. Our government has not trying to adopt new technologies in our agricultural sector .In my proposed work am going to accumulate the information from the previous datasets collected from sources like UCI, india.gov[2][3].

This datasets contains the information which is related to the crop requirements, crop diversification and climate changes of the previous year's most of the time in machine learning the accuracy of the prediction depends on the number of datasets considered so, it would be always appreciable to consider vast number of datasets continuously in order to produce the results or outcomes accurately.

The results are generated by applying different regression algorithms, Clustering algorithms and Classification algorithms. Based on these algorithms we can consider the outcomes which are given to the Agricultural officer who analyzes them and give the suggestion to the farmers about advantages and profits of that crop.

The system consists of below things for generating the results

- 1.Data sets collected from different sources
2. Predictive model for machine learning
- 3.Mining algorithms
- 4.Results and output

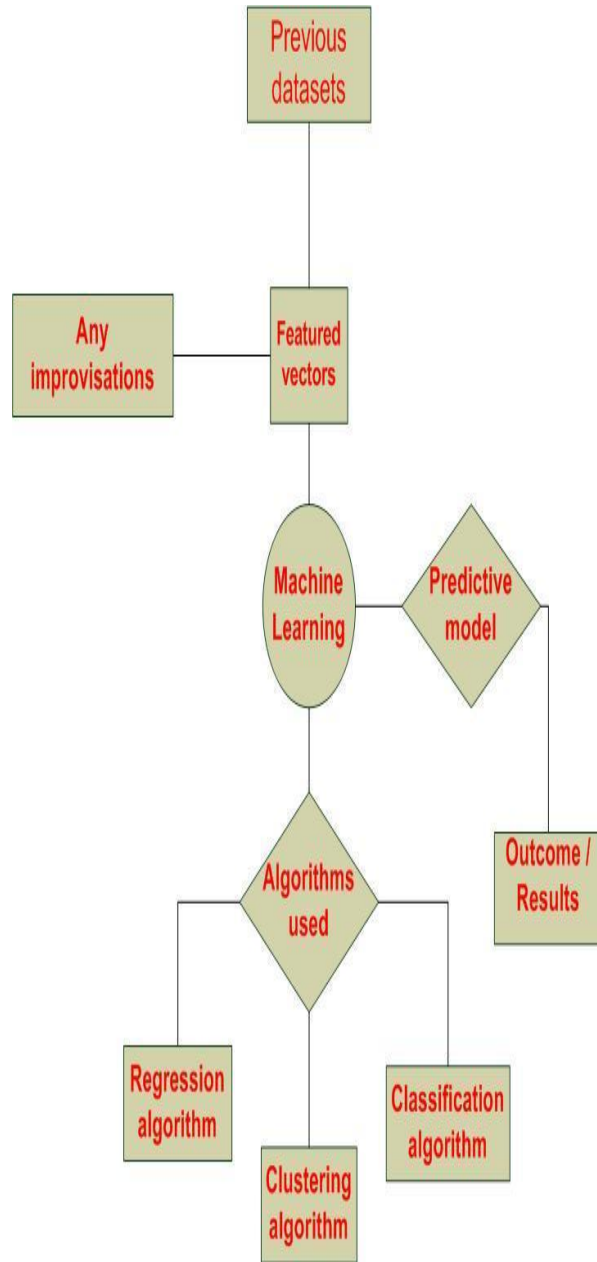


Figure 1.1 Input And Output Of The System

We can get a better idea if we consider the supervised learning model where the datasets given are climate of past 100 years in terms of months , market requirement week wise[10] , crop net profit value week wise

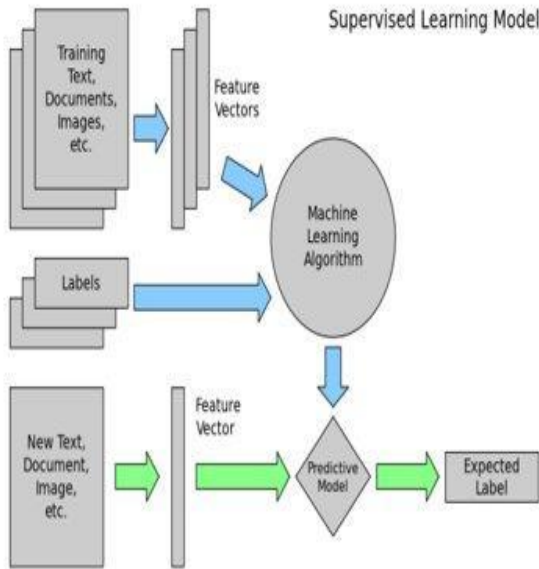


Figure 1.2 Supervised learning working approach

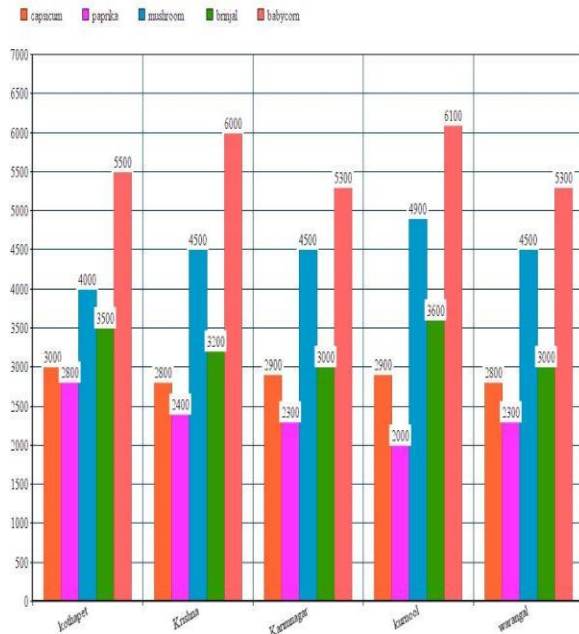


Figure 1.3 Year wise Price Increase

In our paper we provide the previous year's datasets as inputs to the machine which in turn learns about the diversified requirements and outcomes of the project. The predicted outcome is given to the agriculture officer of that place. The accuracy of the algorithm[5] depends upon the number of the input datasets. More number of datasets leads to less amount of ambiguity and more amount of accuracy.

## II. SYSTEM WORKING MODEL

Let us consider the Inputs and outputs of the market requirements. Here, we are considering the limited datasets of few markets and the crops usually sold in those areas. We have selected the markets in such a way that it would cover the entire district in terms of its production[4] and rates are taken from the local newspaper of that area. Let us look at them now. After analyzing those datasets we got the result or best possible outcomes in terms of bar chart. The Results or outputs are handled by **agricultural officer** because a farmer cannot understand all such details.

Figure 2.1 Crop Rate From News Papers

As already stated that the datasets has to be continuous

Group label	capsicum	paprika	mushroom	brinjal	babycorn
Item Name	Value	Value	Value	Value	Value
kottapet	3000	2800	4000	3500	5500
Krishna	2800	2400	4500	3200	6000
Kannemgar	2900	2300	4500	3000	5300
kumool	2900	2000	4800	3600	6100
warangal	2800	1300	3000	4500	5300

and large[7], because the fewer datasets leads to the imperfect predictions.

So, ultimately it leads to the loss **Profit predictions**. No matter whatever technology we rope in, it is the profits which matter at the end. So, the profits generated by the farmers after applying machine learning is used must be more than what it was before. So the development of the algorithms and successful working of that algorithms is in our hands. Let us now understand how the profit is predicted. Initially, we have the MSP that is the Minimum Support Price[9] which is actually levied by So as kharif crops like paddy, jowar, rice, maize, groundnut etc., prices are as follows. Government plays a major role.

Commodity (Fair Average Quality)	Variety	MSP
Paddy	Common	1750
	Grade A	1770
Jowar	Hybrid	2430
	Maldandi	2450
Bajra	-	1950
Ragi	-	2897
Maize	-	1700
Tur (Arhar)	-	5675
Moong	-	6975
Urad	-	5600
Groundnut	-	4890
Sunflower Seed	-	5388
Soyabean	-	3399
Sesamum	-	6249
Nigerseed	-	5877
Cotton	Medium Staple (Staple length (mm) 24.5-25.5 and Micronaire value of 4.3-5.1)	5150
	Long Staple (Staple length (mm) 29.5-30.5 and Micronaire value of 3.5- 4.3)	5450

Figure 2.2 Profit calculation for Crop

in the Profit predictions per the statistics of 2018-19 MSP on So we have the MSP here and the cost price of growing these crops differ from one place to Another and as per the sources[11] the cost price of paddy for 1 quintal is Rs.1266 at kothapet market We know the basic formula for profit is

**Profit= Selling Price(MSP)-Cost price (Production costs)**

Consider paddy it takes 1770 is the minimum price which farmer can sale the profit would be

The **profit** would be around  $1770-936=Rs.834$ .

Let us calculate for Bajra where selling price is 1950 and production cost is 990

So **profit** would be **Rs.960**

The Selling price for Ragi is Rs.2897 and cost for production is Rs.2391

The **profit** would be **Rs.578**

The Selling price of the groundnut is 4890 and the cost price is 4260.

The **profit** would be **Rs.630**

The Selling price of the soya bean is 3399 and the cost price is 2260.

The **profit** would be **Rs1139**

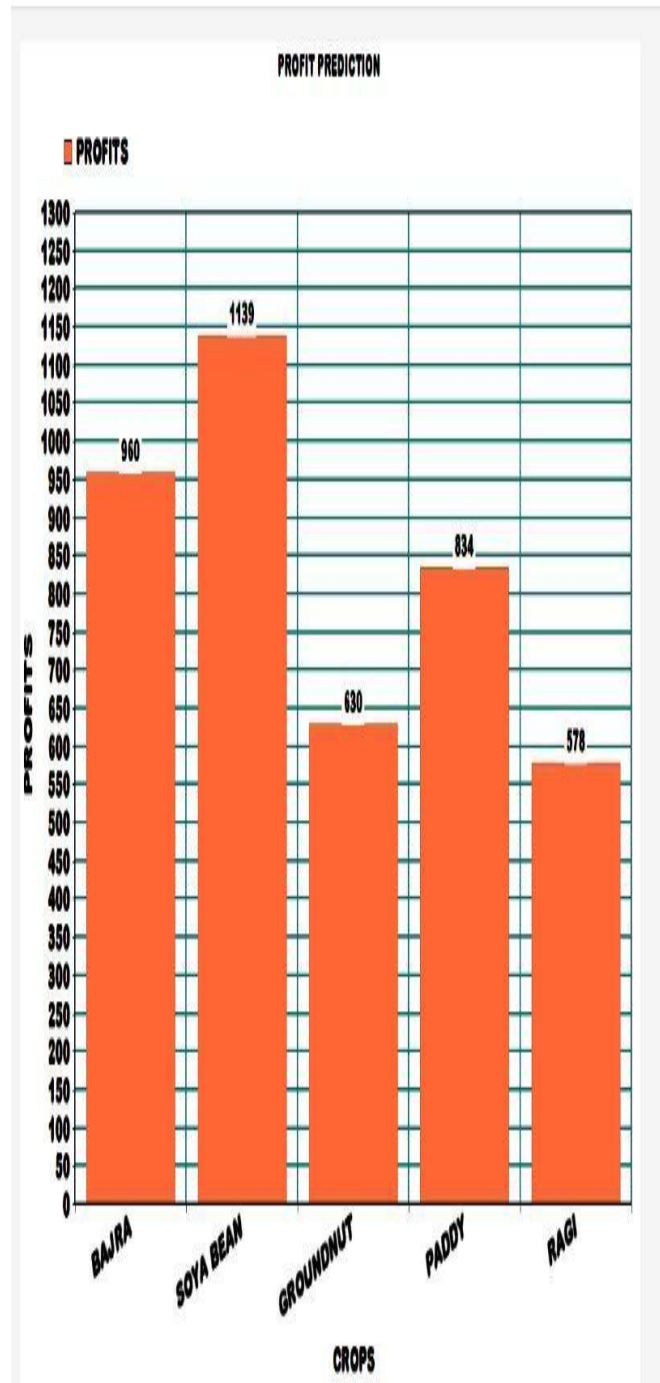


Figure 2.3 Estimated Profits

All these analysis part would be done by the algorithm with a simple formula **profit = selling price- cost price** and the source of selling price is MSP given by the government and the source of the cost price are from the newspapers.

### **III. TECHNO AGRICULTURE WHERE TRADITION MEETS TECHNOLOGY**

Farmers today have a more knowledge and skills which combines centuries of tradition with the most advanced digital tools available it results, modern agriculture[13] has helped reduce the impact of farming on the environment and increased the amount of food being grown day by day.

### **IV. IMPORTANCE OF MACHINE LEARNING**

Improvements in machine learning have seemingly endless possibilities. Researchers in modern agriculture are testing their theories at greater scale and helping make more accurate[12], real-time predictions with the help of different machine learning algorithms. The Modern agriculture has the potential to discover even more ways to conserve water, use nutrients and energy more efficiently[12][13], and adapt to climate changes.

Crop disease is a major cause of famine and food insecurity around the world. A core objective of modern agriculture is to create seeds and crop protection products that provide relief to these global challenges. One of the many benefits of machine learning, is how this technology can make more accurate and precise improvements to a process. In plant breeding, machine learning is helping create more efficient seeds[13]. Such advancements offer the potential to create even more adaptable, and productive seeds to better utilize our precious natural resources[14].

#### **A. Future works**

In a country like India Manual predictions are heavy and tedious jobs and moreover ,manual predictions are not that reliable . For example if it takes n% of accuracy in manual prediction it take (2n)% of accuracy in automated prediction and in less amount of time Basically Machine Learning can be applied when we have vast number of diversified datasets say like variety in crops diversification in food habits , which in our case is possible with the diversification of food crops, requirements ,climates and places . So if we consider the future prospect of this project it is going to have ample amount of scope provided if there are employees particularly working on it

The commercial value of this paper actually lies in the prediction of the outcomes and providing them to the agricultural officer.

We have to concentrate more on the practical application of various algorithms like regression , clustering , classification etc

The project actually predicts the outcome in best possible way and with utmost accuracy by using Machine Learning (Regression and classification algorithms ).These algorithm predicts the crops with

profitable outcome and gives the information to the agricultural officer

It can even analyze the climatic patterns and predict about the hourly details from the information of the previous years

For Example consider the Bing weather Application which gives us outcome by analyzing the previous year's information

Food Trends which are recent advancements can be easily recognized by the machine learning

They are the future works of this project every project has set of drawbacks so does ours

they are: The Datasets for processing must be vast so it requires regular upgradations. Any new food trend has to be efficiently recognized if it fails then outcomes might vary No matter what we do climate might change as it is related to nature but its adverse effects can be controlled by proper predictions . The entire outcomes are in the hands of agriculture officer who has to take the responsibility of sharing them with the farmers

### **V. CONCLUSION**

The main aim of the this paper is to introduce modern technologies into the agriculture sector. To improve the commercial value of the crops of the nation by accurate predictions we need a change from manual predictions to automated predictions and calculation by using machine learning. To raise the standards of the agriculture sector in India. To reduce the farmer suicides by making their crops self-sustainable and with added commercial value to them. To make India the hub of the techno-agricultural advancements.

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