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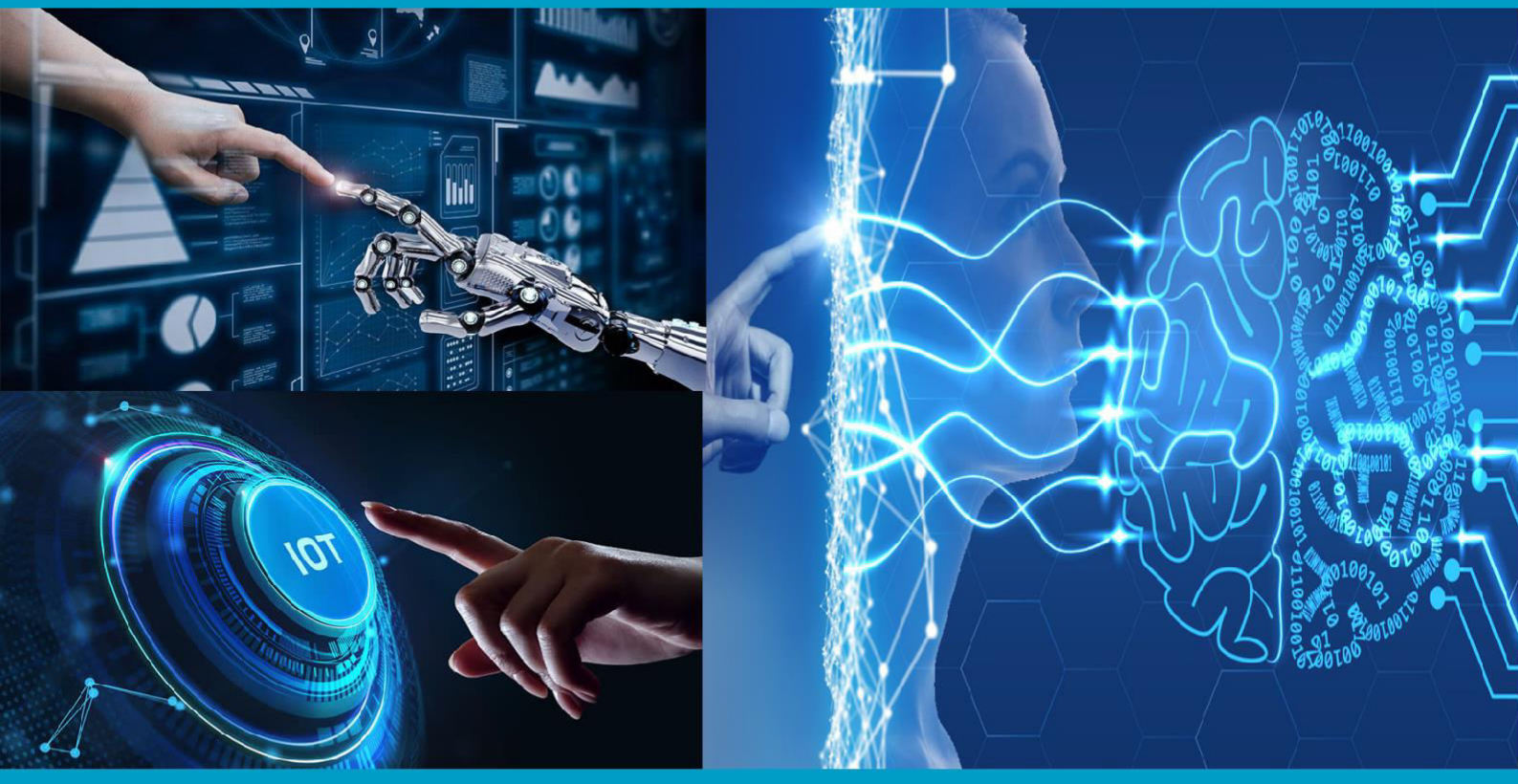


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# Crop Yield Prediction by Indian Agriculture Using Machine Learning

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**ABSTRACT:** As we are aware of the fact that, most of Indians have agriculture as their occupation. Farmers usually have the mindset of planting the same crop, using more fertilizers and following the public choice. By looking at the past few years, there have been significant developments in how machine learning can be used in various industries and research. So we have planned to create a system where machine learning can be used in agriculture for the betterment of farmers. The surveyed research papers have given a rough idea about using ML with only one attribute. We have the aim of adding more attributes to our system and ameliorate the results, which can improve the yields and we can recognize several patterns for predictions. Selecting of every crop is very important in the agriculture planning.

**KEYWORDS:** Crop information, Soil information, Nutrients, Data Collection, Data handling, Crops, Soil, Seasons, Area.

## I. INTRODUCTION

Crop production may be a complicated development that's influenced by soil and environmental condition input parameters. Agriculture input parameters vary from field to field and farmer to farmer. Collection such info on a bigger space may be a discouraging task. However, the environmental condition info collected in Republic of India at each 1sq.m space in numerous components of the district is tabulated by Indian meteoric Department.
The massive such knowledge sets may be used for predicting their influence on major crops of that individual district or place. There are completely different foretelling methodologies developed and evaluated by the researchers everywhere the globe within the field of agriculture or associated sciences. A number of such studies are: Agricultural researchers in alternative countries have shown that tries of crop yield maximization through pro-pesticide state policies have LED to hazardously high chemical usage.

These studies have reported a correlation between chemical usage and crop yield. Agriculture is associate trade sector that's benefiting powerfully from the event of detector technology, knowledge science, and machine learning (ML) techniques within the latest years. These developments return to satisfy environmental and population pressures round-faced by our society, wherever reports indicate a requirement for robust international agriculture yield increase to produce food for a growing population on a hotter planet. Most of the work tired the sector of yield foretelling via cubic centimeter makes use of some kind of remote sensing knowledge over the farm. Agriculture seeks to extend and improve the crop yield and therefore the quality of the crops to sustain human life.

## II. EXISTING SYSTEM

An agro-based country depends on agriculture for its economic growth. When a population of the country increases dependency on agriculture also increases and subsequent economic growth of the country is affected. In this situation, the crop yield rate plays a significant role in the economic growth of the country. So, there is a need to increase crop yield rate. Some biological approaches (e.g. seed quality of the crop, crop hybridization, strong pesticides) and some chemical approaches (e.g. use of fertilizer, urea, potash) are carried out to solve this issue. In addition to these approaches, a crop sequencing technique is required to improve the net yield rate of the crop over the season. One of existing system we identified is Crop Selection Method (CSM) to achieve a net yield rate of crops over the season. We have taken example of CSM to demonstrate how it helps farmers in achieving more yields.

**DISADVANTAGE**

- Nowadays many experts are applying automated farming.
- Since Decision Tree is an well-known algorithm it was used for prediction which is a supervised learning algorithm and multiple linear regression which is generalized prediction model.

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- An attempt has been made to research the influence made by decision tree induction technique of climatic parameters on soybean productivity

## III. PROPOSED SYSTEM

For easy understanding of end-user different kind of rules were created from the Decision tree. Selecting various attributes like land capability classification, soil depth, slope, drainage, texture, erosion, and permeability. Two supervised classification machine learning algorithms have been implemented in this study. Our system takes the necessary weather and soil properties data for a given coordinate automatically from an appropriate source. Another advantage is that their system worked on large regions, and provides forecasts at a resolution compatible with best input data resolution, which in the case is originally from the soil data.

**ADVANTAGE**

- Seasonal crops - crops can be planted during a season. e.g. wheat, cotton.
- Whole year crops - crops can be planted during the entire year. e.g. vegetable, paddy, Toor. c) Short time plantation crops - crops that take a short time for growing. e.g. potato, vegetables, ratio.
- Long-time plantation crops - These crops take a long time for growing. e.g. sugarcane, Onion.
- A combination of these crops can be selected in a sequence based on yield rate per day. Illustrates sequences of crops with cumulative yield rate over the season. CSM method, shown in may improve the net yield rate of crops using the limited land resource and also increases re-usability of the land.

## IV. SYSTEM OVERVIEW

Basically, in crop selection method makes use of technique where it recommends different set of crops for same area over the years. There are various options are available to select for farmers. They can choose one of the options and observe the results. The combination which will give high yield for same area is generated as output for that area The agricultural systems that significantly follows to the agriculture of India are subsistence farming, organic farming, industrial farming. Regions all over India differ in types of farming they use and many more.

**MODUELS:**

- Pre-Season Agriculture Yield Forecast
- Crop Yield Based On Climatic Parameters
- Precision Agricultural Model
- Optimized Crop Recommendation

**MODUELS DESCRIPTION:**

**PRE-SEASON AGRICULTURE YIELD FORECAST:**

. This explicit design was trained with historical information for many soil properties, precipitation, minimum and most temperature against historical yield labels at county level. When training, the model was tested in an exceedingly separate information set and showed comparable results with existing yield prognostication ways that create use of in-depth remote sensing data. the model might be able to learn AN implicit illustration of the cycles of the crops evaluated during this paper, considering the seasonal atmospherically information used as input.

**CROP YIELD BASED ON CLIMATIC PARAMETERS:**

The present study provides the potential use of information mining techniques in predicting the crop yield supported the environmental condition input parameters. the study indicating higher accuracy of prediction. The user-friendly web content developed for predicting crop yield may be utilized by any user their alternative of crop by providing environmental condition knowledge of that place.

**PRECISION AGRICULTURAL MODEL:**

The system is scalable because it may be wont to take a look at on totally different crops. From the yield graphs the simplest time of sowing, plant growth and gather of plant may be known.

## V. SYSTEM IMPLEMENTATION

**ANACONDA:**

Anaconda is a distribution of the Python and R programming languages for scientific computing (data science, machine learning applications, large-scale data processing, predictive analytics, etc.), that aims to simplify package management and deployment

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**ANACONDA NAVIGATOR:**
Anaconda Navigator is a desktop graphical user interface (GUI) included in Anaconda distribution that allows users to launch applications and manage conda packages, environments and channels without using command-line commands. Navigator can search for packages on Anaconda Cloud

**PYTHON:**
Python is an easy to learn, powerful programming language. It has efficient high-level data structures and a simple but effective approach to object-oriented programming. Python's elegant syntax and dynamic typing, together with its interpreted nature, make it an ideal language for scripting and rapid application development in many areas on most platforms

**THE NOTEBOOK INTERFACE:**
Now that you have an open notebook in front of you, its interface will hopefully not look entirely alien. After all, Jupyter is essentially just an advanced word processor. Why not take a look around? Check out the menus to get a feel for it, especially take a few moments to scroll down the list of commands in the command palette.

**TENSORFLOW:**
TensorFlow is a free and open-source software library for machine learning and artificial intelligence. It can be used across a range of tasks but has a particular focus on training and inference of deep neural networks. TensorFlow was developed by the Google Brain team for internal Google use in research and production

**Numpy:**
Numpy is one of the most popular Python data libraries, and Tensor Flow offers integration and compatibility with its data structures. Numpy ND arrays, the library's native data type, are automatically converted to Tensor Flow Tensors in TF operations

**Google Colab:**
Google also released Colaboratory, a Tensor Flow Jupyter notebook environment that does not require any setup. It runs on Google Cloud and allows users free access to GPUs and the ability to store and share notebooks on Google Drive

Out[5]:

| | Commodities | 2002 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Paddy (Common) | 550.0 | 560.0 | 570.0 | 580.0 | 645.0 | 850.0 | 950.0 | 1000.0 | 1080 | 1250.0 |
| 1 | Paddy (Grade 'A') | 580.0 | 590.0 | 600.0 | 610.0 | 675.0 | 880.0 | 980.0 | 1030.0 | 1110 | 1280.0 |
| 2 | Wheat | 630.0 | 640.0 | 650.0 | 750.0 | 1000.0 | 1080.0 | 1100.0 | 1120.0 | 1285 | 1350.0 |
| 3 | Jowar (Hybrid) | 490.0 | 515.0 | 525.0 | 540.0 | 600.0 | 840.0 | 840.0 | 880.0 | 980 | 1500.0 |
| 4 | Jowar (Maldandi) | 0.0 | 0.0 | 0.0 | 555.0 | 620.0 | 860.0 | 860.0 | 900.0 | 1000 | 1520.0 |

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Out[3]:

| | State_Name | District_Name | Crop_Year | Season | Crop | Area | Production |
|---|---|---|---|---|---|---|---|
| 0 | Andaman and Nicobar Islands | NICOBARS | 2000 | Kharif | Arecanut | 1254.0 | 2000.0 |
| 1 | Andaman and Nicobar Islands | NICOBARS | 2000 | Kharif | Other Kharif pulses | 2.0 | 1.0 |
| 2 | Andaman and Nicobar Islands | NICOBARS | 2000 | Kharif | Rice | 102.0 | 321.0 |
| 3 | Andaman and Nicobar Islands | NICOBARS | 2000 | Whole Year | Banana | 176.0 | 641.0 |
| 4 | Andaman and Nicobar Islands | NICOBARS | 2000 | Whole Year | Cashewnut | 720.0 | 165.0 |

## VI. CONCLUSION

We can improve agriculture by using machine learning techniques which are applied easily on farming sector. Along with all advances in the machines and technologies used in farming, useful and accurate information about different matters also plays a significant role in it. The concept of this paper is to implement the crop selection method so that this method helps in solving many agriculture and farmers problems. This improves our Indian economy by maximizing the yield rate of crop production.

## VII. FUTURE ENHANCE

1. Remote Sensing and Satellite Imagery: Utilize high-resolution satellite imagery and remote sensing data to gather information about crop health, vegetation indices, and environmental conditions. These data can provide valuable insights into the growth and development of crops, helping to improve yield predictions.
2. Internet of Things (IoT) Sensors: Deploy IoT sensors in the fields to monitor various parameters such as soil moisture, temperature, humidity, and nutrient levels. Real-time data from these sensors can be combined with predictive models to make more accurate yield forecasts.
3. Machine Learning and Artificial Intelligence: Implement advanced machine learning algorithms and AI techniques to analyze large datasets, identify patterns, and make precise predictions. Deep learning models, such as convolutional neural networks (CNNs) and recurrent neural networks (RNNs), can be trained on historical data to predict crop yields based on multiple factors.
4. Weather Forecasting Integration: Integrate weather forecast data into the crop yield prediction models. Weather patterns and climatic conditions significantly impact crop growth and production. By incorporating real-time weather data, you can enhance the accuracy of your predictions.
5. Crop Phenotyping and Genomics: Combine crop phenotyping techniques (measuring plant traits) and genomics (study of genes and their functions)

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