



# MACHINE LEARNING TECHNIQUES FOR CROP YIELD PREDICTION

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**ABSTRACT:**

Agriculture is a sector that has a significant impact on the economy of our nation. Agriculture is the key factor in the development of civilization. India is a predominantly agricultural nation with a crop-based economy. As a result, we may argue that our country's economy can be supported by agriculture. Every crop must be carefully chosen while developing an agricultural project. The choice of crops will be influenced by a variety of factors, including market price, production rate, and government policies. To enhance improvements in our Indian economy, the agriculture sector has to undergo several modifications. Using machine learning techniques that are simple to use in the farming industry, we can enhance agriculture. Along with all the improvements in the tools and technology used in farming, precise and helpful knowledge about many topics is also crucial. The goal of this study is to put the crop selection approach into practice so that it may help farmers and agriculturalists solve a variety of issues. As a result, the Indian economy is enhanced by the highest possible agricultural yield rate.

**Keywords:** Agriculture, Artificial Neural Network, Convolution Neural Network, Crop Yield Prediction, Machine Learning Method

## [1] INTRODUCTION

The primary objective of agricultural planning is to maximize crop output rates while utilizing a certain amount of available land resources. Numerous machine learning techniques can

aid in increasing agricultural output rates. When there is a loss due to unfavourable conditions, crop selection can be used to minimize the losses. And under favourable circumstances, it may be employed to increase agricultural output rates. By maximizing yield rates, nations' economies are boosted. Some of the elements that affect crop output rate are in our control. They are crop selection and seed quality. Before sowing, we must examine the seed quality. As is well known, high-quality seeds increase yield rates. Additionally, the choice of crops is influenced by both favorable and unfavorable environmental factors. Hybridization techniques can also help with this. Numerous studies are conducted to enhance agricultural planning. Obtaining the highest crop production is the aim. The application of several categorization techniques also helps to maximize agricultural output. Crop production rates can be increased using machine learning techniques. To increase crop yield, the crop selection technique is used. Crop production may be influenced by the region's natural features, such as riverbeds, hilly terrain, or deep places. such as cloud cover, temperature, rainfall, and humidity. The kind of soil might be peaty, saline, sandy, or clay.Copper, potassium, phosphate, nitrogen, manganese, iron, calcium, ph level, carbon, and various harvesting techniques may all be found in soil. For various crops, a variety of factors are utilized to make various projections. Research studies can be used to examine these prediction models. There are two different categories for these forecasts. The first is a classic statistical approach, whereas the second uses machine learning methods. Single sample spaces can be predicted using traditional methods. Additionally, using machine learning techniques, many predictions may be made. In contrast to machine learning approaches, where we must take data model structure into account, classical methods do not need this.

## [2] LITERATURE SURVEY

In Crop Selection domain**,** J.P. Singh et. al., used classification techniques and parameter comparison to increase agricultural output rates. Bayesian algorithms may also be used for crop analysis and forecasting. The Bayesian algorithm, K-means method, Clustering algorithm, and Support Vector Machine are the algorithms employed. The lack of sufficient precision and performance is a drawback[1].

Subhadra Mishra et. al., studied on Applications of Machine Learning Techniques in Agricultural Crop Production with area with room to expand. The combination of computer science and agriculture aids in crop forecasts. Additionally, this approach aids in supplying information on crops and how to raise yield rates. Artificial neural networks, decision tree algorithms, and regression analysis are the algorithms employed. The drawback is that the process is not made explicit[2].

Karan Deep Kauri et. al., studied and examined the numerous machine learning applications in the agricultural industry. Additionally, it offers insight into the issues Indian farmers confront and how to address them utilizing these methods. By using more machine learning technologies, this strategy aids in developing the agricultural sector in nations. Artificial neural networks, Bayesian belief networks, decision tree algorithms, clustering, and regression analysis are the methods employed. Performance accuracy is less accurate, which is a drawback [3].

E. Manjula, S. Djodiltachoumy et. al., suggested and put into practice a rule-based system. and extrapolate agricultural yield output based on the gathering of historical data. The clustering technique and Kmeans algorithm are employed. The drawback is that less data is evaluated and thus is only appropriate for applying association rules[4].

Nishit Jain Amit Kumar et. al., discussed the aids in crop succession prediction, maximises production rates, and benefits farmers. Additionally, using machine learning to agriculture includes examining crop simulations, forecasting crop diseases, and identifying various irrigation patterns. Artificial neural networks and Support Vector Machine are the algorithms in use. The drawback is that exact precision is not stated [5]. Some authors and researchers are discussed and studied in Crop Yield Prediction in Agricultural areas [6-12], Data Mining [13],[14], [15],[16],[17],[18] Machine Learning[ 19],[20] , Big Data Analytics[21] Text Classification[22], [23] and Deep Learning [24] domains areas for Prediction problems and Forecasting Problems[25].

## [3] SYSTEM ARCHITECTURE

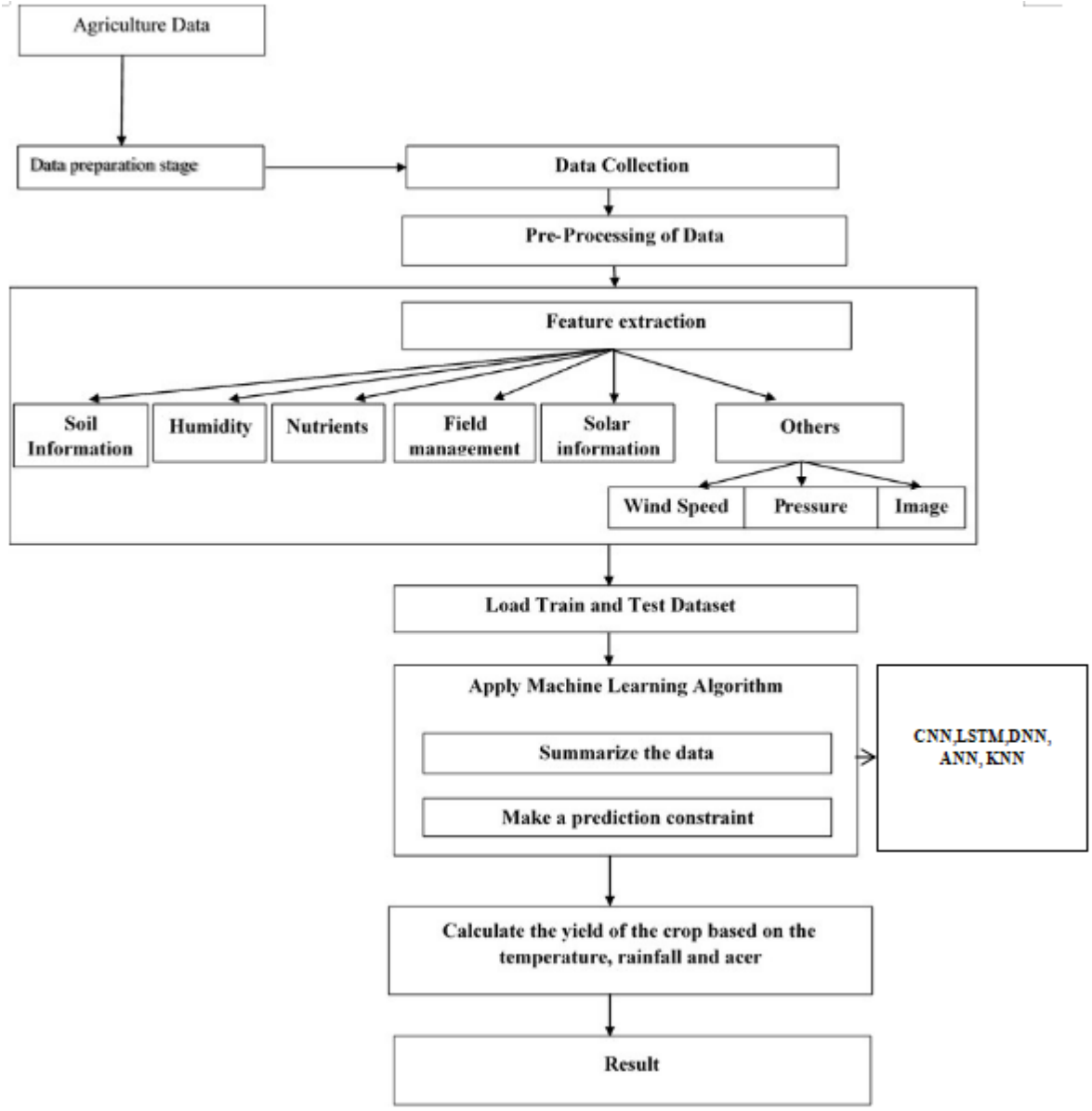


**Fig. 1 System Architecture**

## [4] IMPLEMENTATION

### 4.1 Modules Description

**i) Upload Crop Dataset:** Classification and regression algorithms are given the agricultural production dataset that is used to forecast the crop's name and yield.

**ii) Preprocess Dataset:** Studies using data from the Indian government have shown that the Random Forest Regression has the greatest yield forecast accuracy. Simple Recurrent Neural Network, a sequential model, is more effective at predicting rainfall than LSTM is at predicting temperature. It is possible to anticipate the yield for a certain region by considering rainfall, temperature, and additional factors like season and area.

**iii) Train Machine Learning**: This focuses on yield prediction at the district level for the crops cultivated there. For the provided crops, yield is projected district-by-district and for the highest yielding crops.

**iv) Upload Test Data &Predict Yield:** When all factors are considered, the results show that Random Forest is the best classifier. This will not only assist farmers in selecting the best crop to cultivate in the upcoming season, but it will also close the technological gap between the agriculture industry and the general public.

## [5] RESULTS

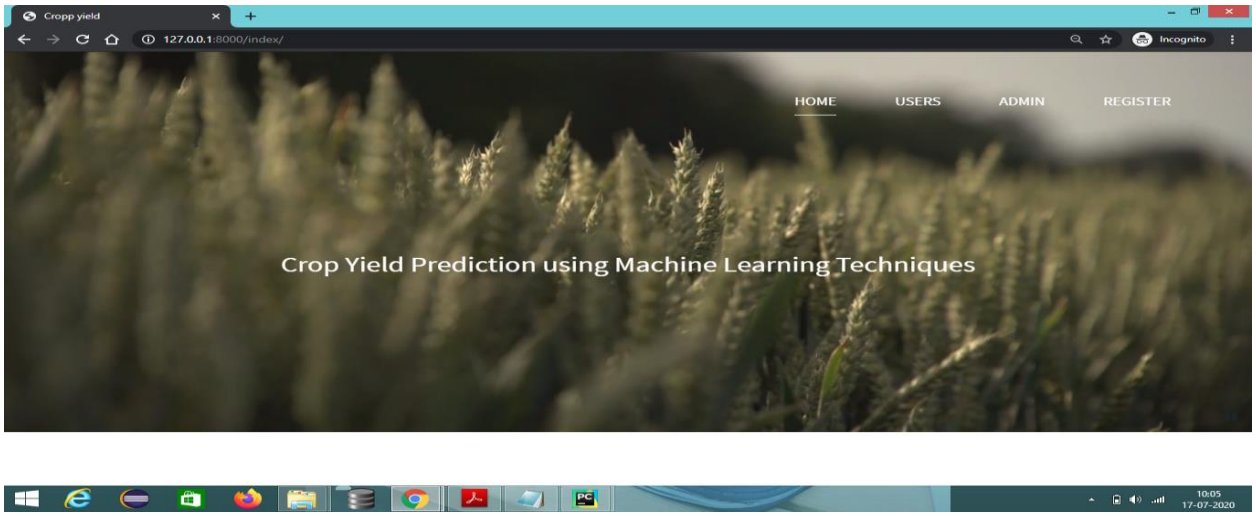


**Fig. 1 Home Page**

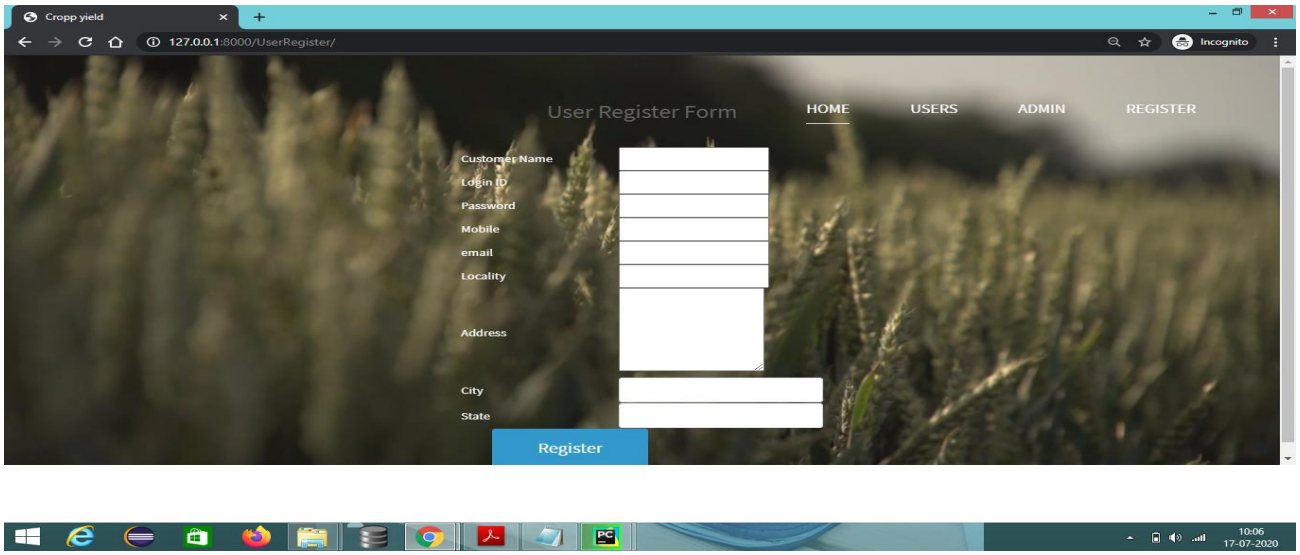


**Fig. 3 User Registration**

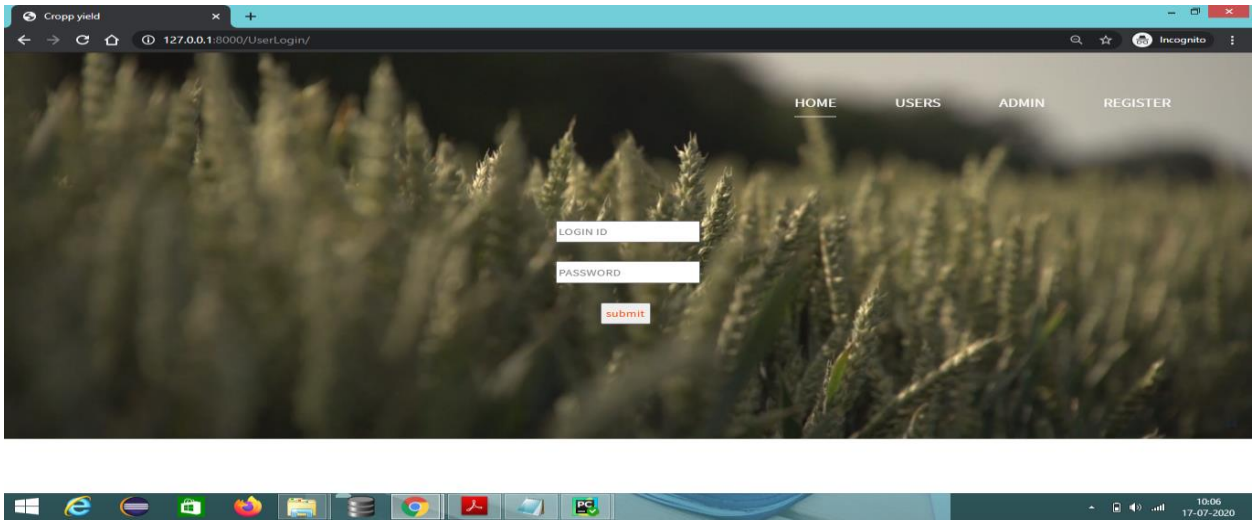


**Fig. 4 User Login**

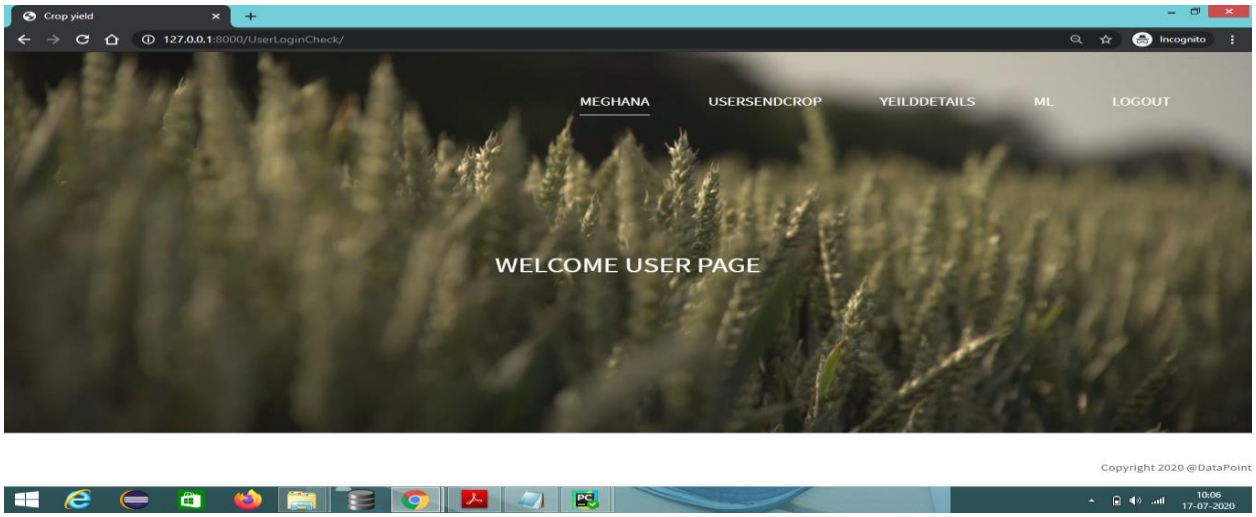


**Fig. 5 User Home**

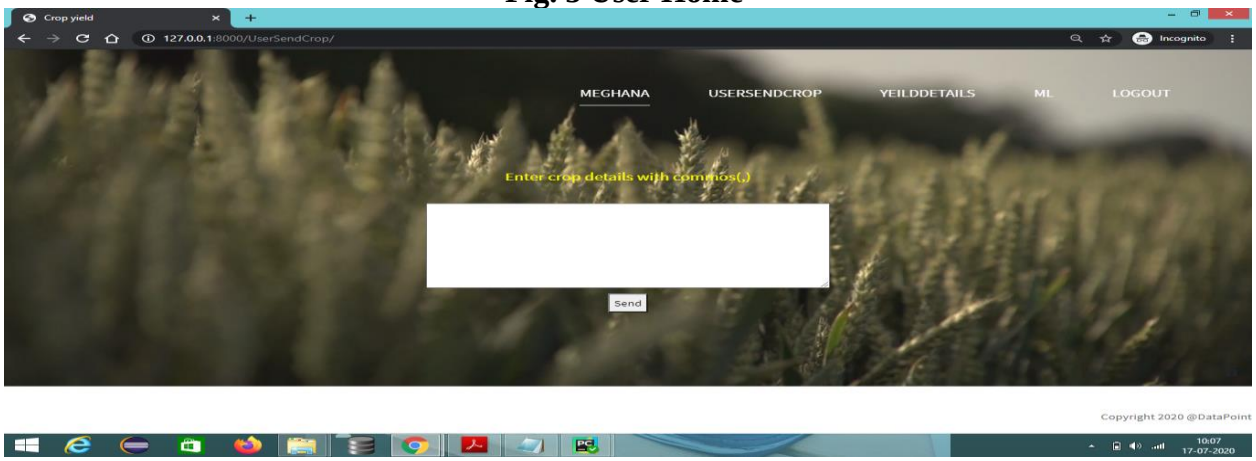


**Fig. 6 User Send Crops**

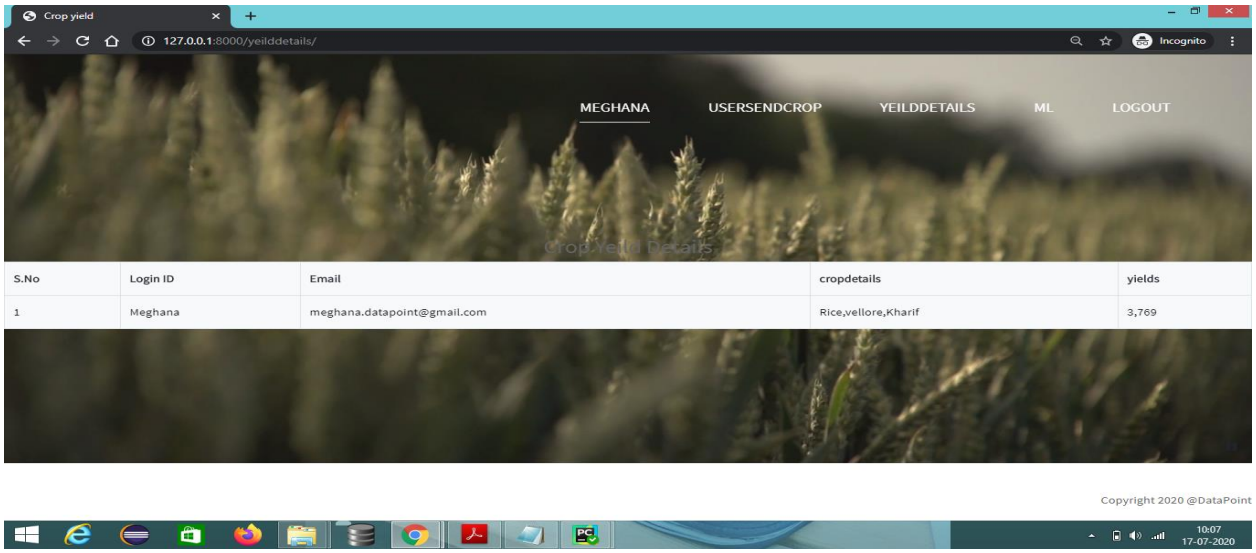


**Fig. 7 Yield Data**

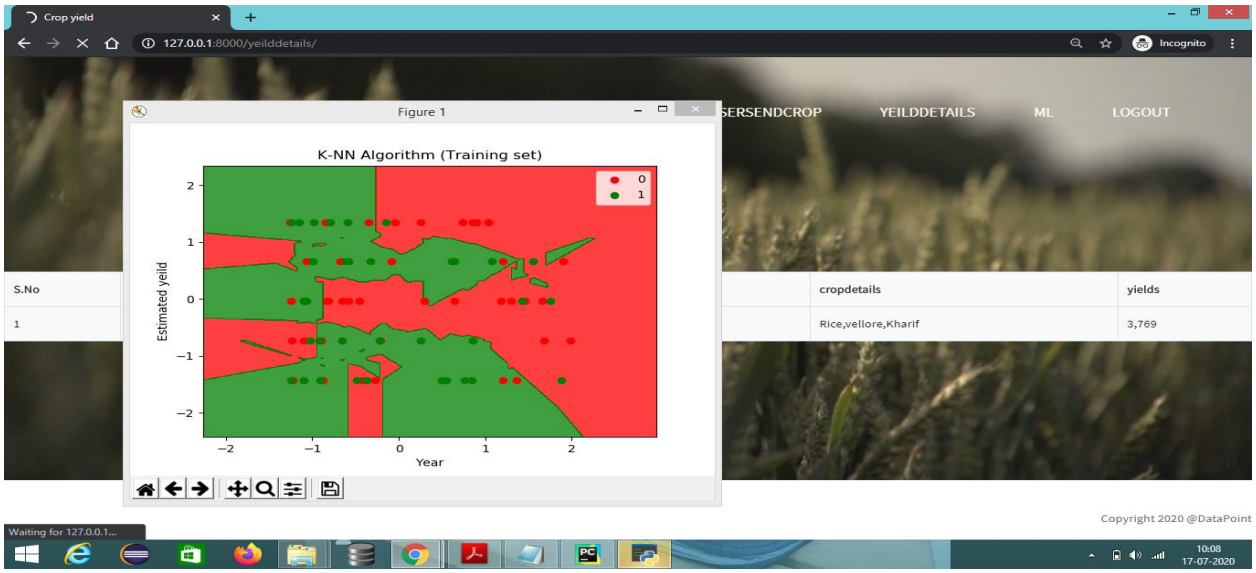


**Fig 8 Machine Learning**

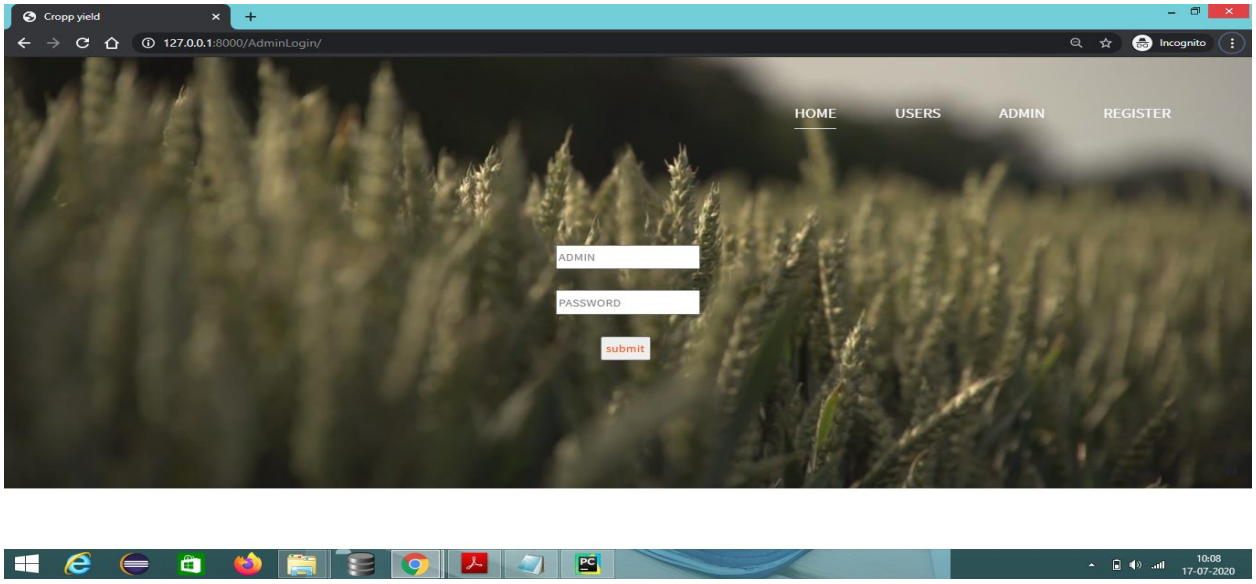


**Fig. 9 Admin Login**

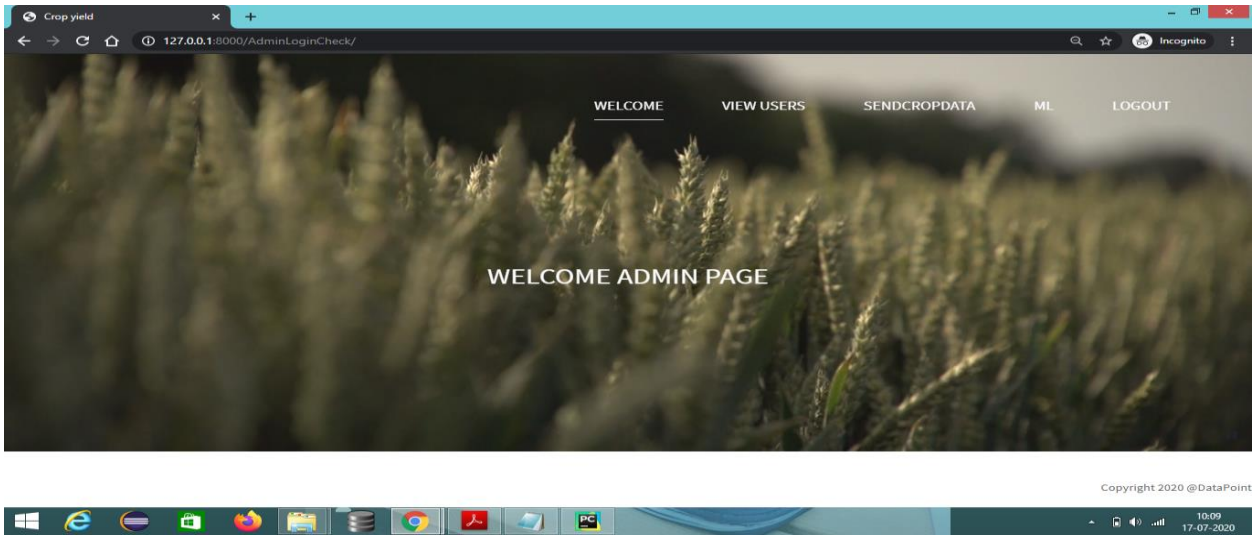


**Fig. 10 Admin Home**

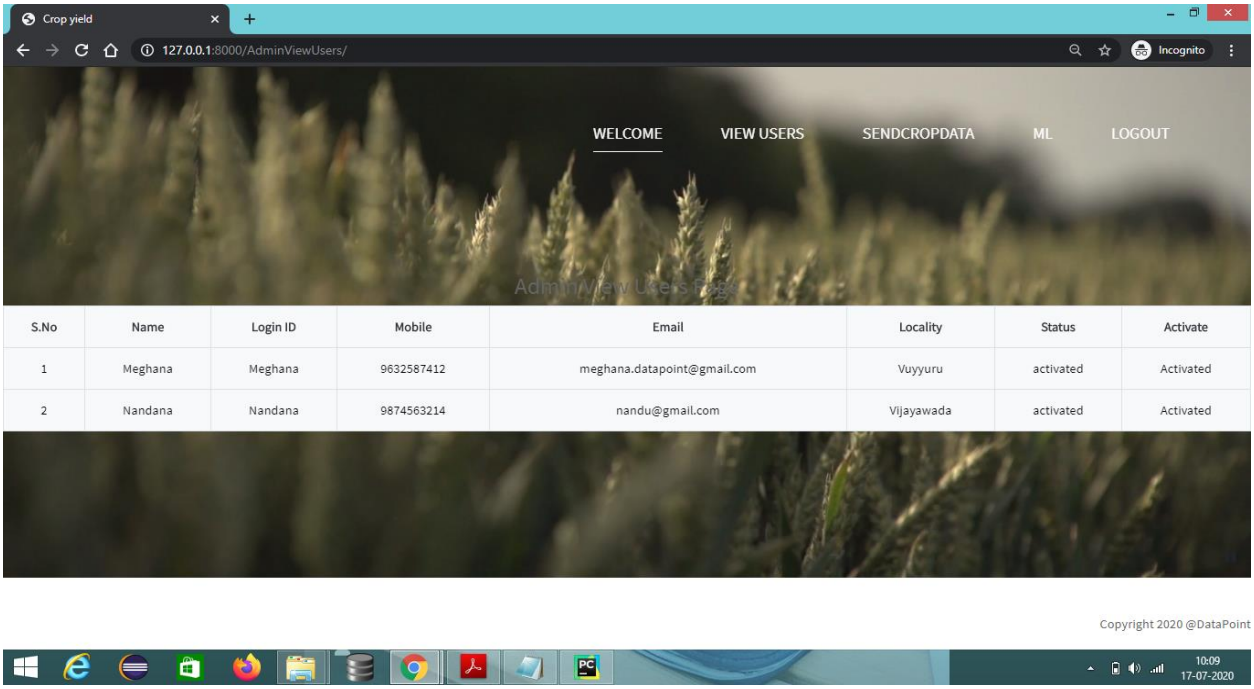


**Fig. 11 View Users**

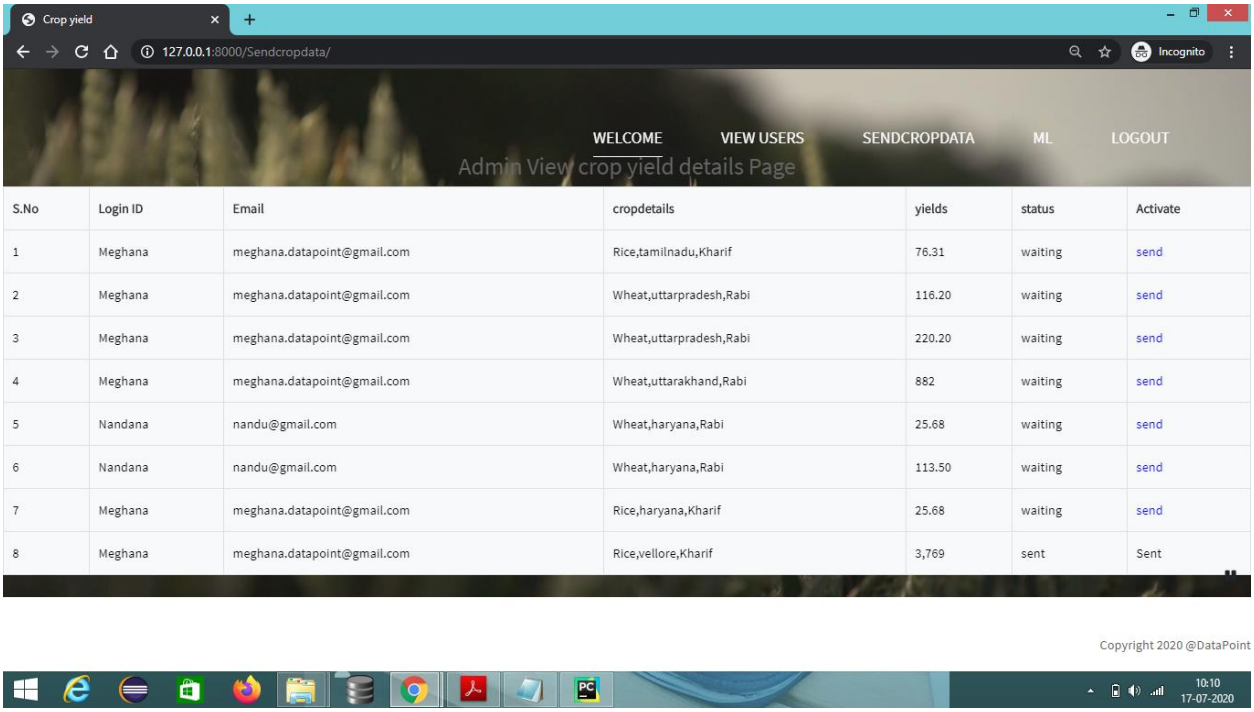


**Fig. 12 Send Crop Data**

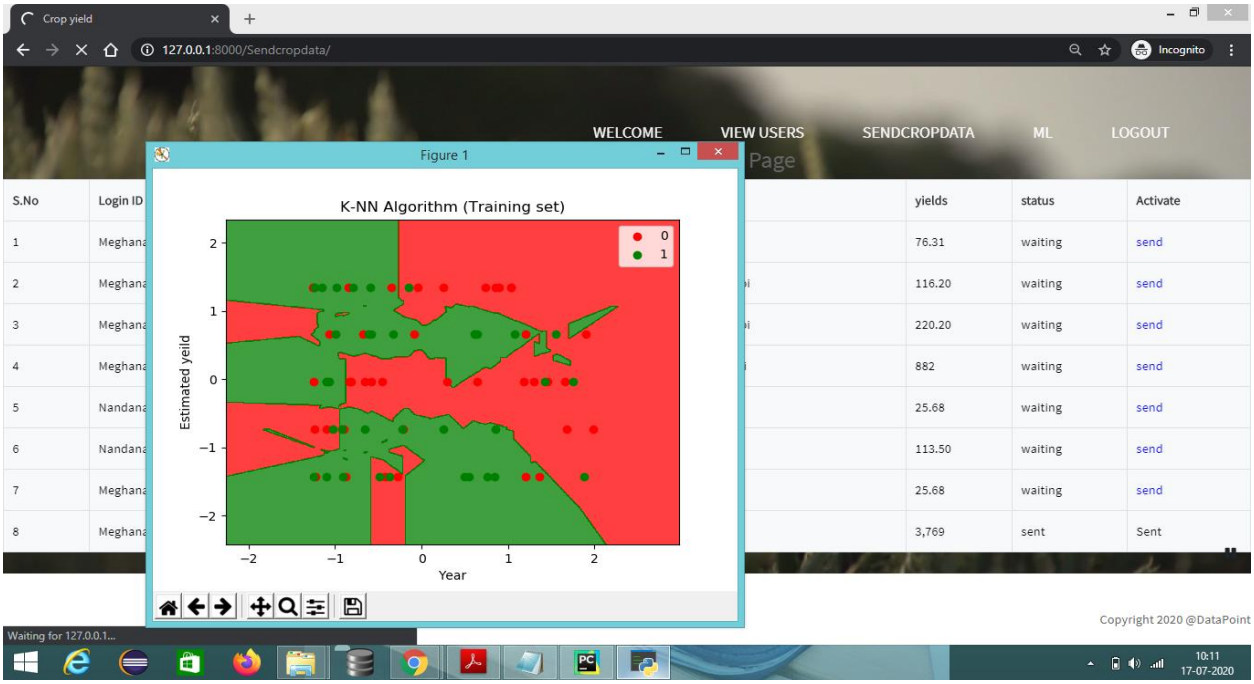


**Fig. 13 Machine Learning**

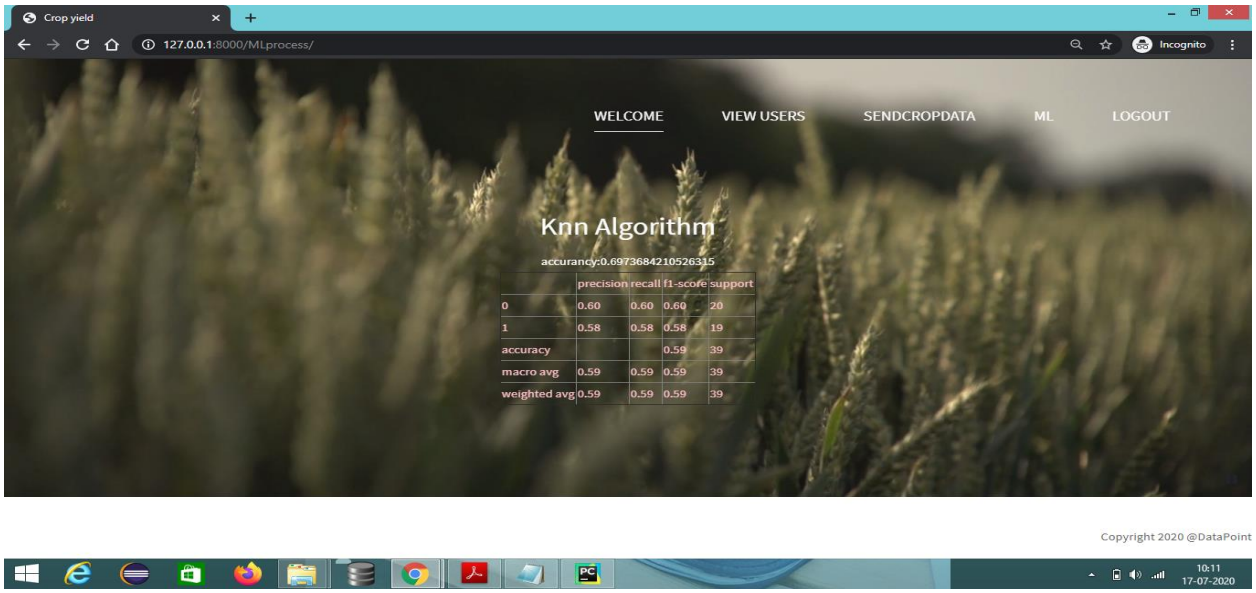


**Fig. 14** Accuracy

## [6] CONCLUSION

Our nation's economy benefits from the sector of agriculture. However, this lags behind in utilising current machine learning technology. Therefore, all of the latest machine learning technologies and other new methods should be familiar to our farmers. These methods assist in maximising agricultural productivity. Numerous machine learning approaches are used in agriculture to increase crop production rates. These methods can aid in resolving agricultural issues. By examining several approaches, we can also determine the yield accuracy. Thus, by comparing the precision of different crops, we can enhance performance.The use of sensor technology is widespread in agriculture. This study assists in maximising agricultural output rates. Additionally aids in choosing the right crop for their chosen site and season. These methods will address farmers' issues in the agricultural sector. This will contribute to our nation's economic growth being improved.

Quantify the variety recommendations: We currently know which parameters have an impact on yield. I want to measure these impacts in order to provide more exact suggestions. Add more weather-related factors: hours of sunshine, humidity, and temperature. Take into account soil data. Compile location-based variety data for recommendations: If all the varieties can be evaluated at the various places, varieties for which there wasn't data previously can be suggested to specific areas. Make an effort to employ mixed models (treating some predictors as random variables).

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