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KRISHIK - CROP RECOMMENDATION, FERTILIZER RECOMMENDATION AND DISEASE DETECTION

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Abstract - *The Krishik Project aims to revolutionize agricultural practices and empower farmers through the implementation of innovative technologies and sustainable farming methods. With the growing challenges faced by farmers in terms of climate change, resource scarcity, and market volatility, the Krishik Project offers a comprehensive solution to improve productivity, profitability, and environmental stewardship. With the help of this project, small and big farmers will be benefitted in terms of getting higher production of crop and also good profits with high quality product irrespective of preventing the diseases in the crop from the early days and also by providing the best nutrients and fertilizers in a required Quantity. A big extension to this is that the farmers can interact with this tool inorder to solve their queries and interact based on various problems.*

***Key Words*: (Farmers friend, Smart Farming, Advanced Techniques of Agriculture)**

1. INTRODUCTION

India is rich and wealthy country by its majority of the people living on the agriculture sector. This paper presents an integrated approach to revolutionizing agricultural practices through the convergence of crop prediction, fertilizer recommendation, and disease detection technologies. Leveraging machine learning algorithms and data analytics, the proposed system enables farmers to make informed decisions at every stage of the agricultural cycle. By forecasting crop yields based on environmental and historical data, optimizing fertilizer application through personalized recommendations, and detecting crop diseases through image analysis, the system empowers farmers to enhance productivity, maximize resource efficiency, and mitigate risks.

By analysing the soil and atmosphere in a given region, the best crop will produce a higher yield and the net yield of the crop can be predicted using Water level, distance depth, and soil ph. Through the seamless integration of these innovative technologies, agricultural stakeholders can cultivate sustainable practices, bolster food security, and thrive in an ever-evolving agricultural landscape. With the help of this project, small and big farmers will be benefitted in terms of getting higher production of crop and also good profits with high quality product irrespective of preventing the diseases in the crop from the early days and also by providing the best nutrients and fertilizers in a required Quantity. A big extension to this is that the farmers can interact with this tool inorder to solve their queries based on any part of information that is required for them and interact based on various problems and their queries.

This project is developed by the algorithms of :

1.Random Forest – Crop Recommendation
2.Decision Tree – Fertilizer Recommendation
3.Convolutional Neural Networks(ResNet Architecture)-Disease Detection
4. Search Query – SerpAPI

The advantage of the app is that it can be used in multiple languages. It is made in such a way that user can interact with the app in their native or desired language. The Translator converts the native language to a proper standard language, processes it and the output is also displayed in the same language or the native language.

2. LITERATURE SURVEY

Tanvi Daware , Pratiksha Ramteke, uzma Shaikh and Smita Bharne in the description " Crop Guidance and Farmer's Friend – Smart Farming using Machine Learning"[1] described the machine learning techniques to assist farmers in improving the crop yield ,providing fertilizers properly and also early detection of disease in plants by using the machine learning tools. The paper emphasizes the adoption of technology in agriculture, including the use of sensors, IoT systems, machine learning algorithms, and precision agriculture techniques to improve productivity and efficiency.

Shima Ramesh and co-authors in "Plant Disease Detection Using Machine Learning"[2] discussed the applications of machine learning techniques, specifically Random Forest, for the detection of diseased and healthy leaves in plants.

The authors emphasize the importance of accurately identifying crop diseases for food security, especially in regions with limited resources for disease management. The various methods used for plant disease detection, including traditional laboratory-based approaches such as polymerase chain reaction, gas chromatography, thermography. The authors mention that traditional laboratory-based approaches for disease identification are not cost-effective and are time-consuming. They highlight the challenges faced by agriculturists in detecting plant diseases and propose a solution that involves image processing and machine learning.

Nischitha K and their team in the paper of "Crop Prediction using Machine Learning Approaches" [3]presented the idea of utilizing machine learning techniques to revolutionize agricultural practices. The core concept revolves around developing a system that can predict suitable crops for specific lands based on factors like soil content, weather parameters, and historical data. By leveraging machine learning algorithms, the system aims to provide farmers with valuable insights such as crop recommendations, required nutrient information, market prices, and yield estimates. This innovative approach not only assists farmers in making informed decisions but also contributes to enhancing agricultural productivity and sustainability.

Prof. Kiran Somwanshi with their work of "Crop Prediction and Fertilizer Recommendation Using Machine Learning"[4] focused on utilizing machine learning algorithms, specifically Support Vector Machine (SVM), to predict crop yields and recommend fertilizers for optimal growth. By analyzing soil composition and other relevant parameters, the model can suggest the appropriate type and amount of fertilizer to be used for specific crops. This personalized fertilizer recommendation system aims to help farmers improve their agricultural practices, increase productivity, and enhance the quality of their crops. By providing tailored guidance on fertilization based on soil information, the research aims to empower farmers to make informed decisions that can lead to better crop yields and overall agricultural success.

The Writings of Prof. Swati Dhabarde , Swapnil Bisane , Arti Yadav , Devyani Pote , Akshay Gupta of "Smart Farming Using Machine Learning"[5] provides a comprehensive overview of the research conducted on smart farming using machine learning. It covers various aspects of the research, including the importance of agriculture in the Indian economy, the challenges faced by the agricultural sector, and the need to make agriculture a profitable enterprise. The document also discusses the objectives, problem statement, literature review, analysis and design, implementation, and conclusion and future scope of the research.

The literature review section provides valuable insights into existing research on crop yield prediction using machine learning algorithms, citing relevant papers and conferences in the field

3. Proposed Methodology

FEATURE	Method/Algorithm	Accuracy
Crop Recommendation	Random Forest	99.09 %
Fertilizer Recommendation	Decision Trees	97.30 %
Disease Detection	CNN(ResNet)	99.20 %
Search Query	SerpAPI	-------

3.1 Crop Prediction : The system will use the Random Forest and also XGBoost algorithm on moisture, PH values, the N-P-K values which are further used in the ensemble method technique which includes algorithms like Naive Bayes, logistic regression, ADA Boost, Random forest, Decision tree, and SVM for crop recommendation. Among all the models Random Forest and XGBoost are giving the highest rate of accuracy. So, for the crop recommendation we prefer Random Forest.

3.2 Fertilizer Prediction : The type of the soil and the nutrient contents of your soil and the crop you need to grow. The set of rules will inform which nutrient and the fertilizers the soil has extra or deficient. As a result the crop gets adequate amount of nutrients and strength to grow and give more product. This also gives the usage and the applications of the fertilizer and the impact of fertilizer on the particular Crop.

3.3 Disease Prediction : To determine the disease, upload a picture of the leaves of a plant. The algorithm processes the input image and results out whether the crop or leaf has any disease or not. If it's diseased, it'll inform you of the name of the disease and required measures can be taken to prevent or cure disease.

3.4 search query : This module helps the farmers to deal with any queries related to any topic of the agriculture and also the crops. SerpAPI is used inorder to carry questions to the web browser and returns the solution to the farmer in a easy ,simple and straight understandable way. This also supports the queries used to be typed manually in native languages.

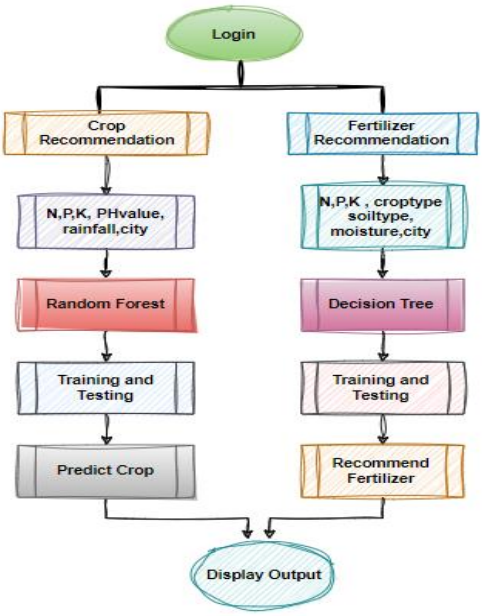

Fig -1: Flow chart for crop , Fertilizer Recommendation

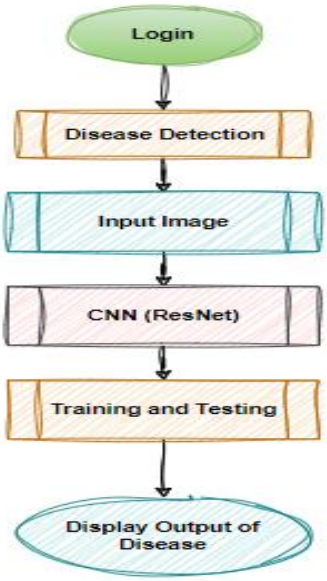

Fig -2: Flow chart for Disease Detection

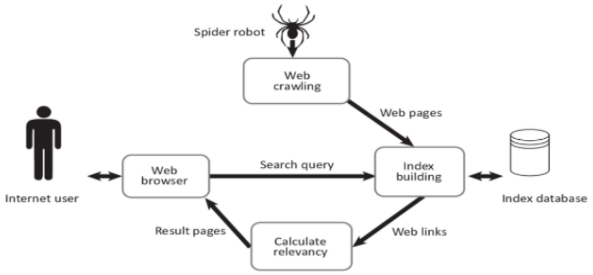

Fig -3: SerpAPI working flowchart

Fig -4: Dataset sample of Crop Recommendation from Kaggle

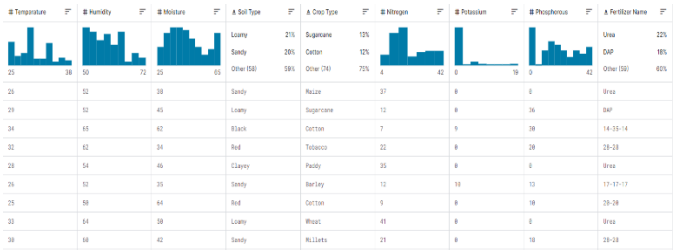

Fig -5: Dataset sample for Fertilizer Recommendation from Kaggle

Fig -6: Dataset sample for Disease Detection from Kaggle

3. CONCLUSIONS

The Agricultural sector and its demand and necessity is growing day by day to meet the needs of all humans. So Using these Machine Learning Techniques help the farmers to be precise in the agriculture work for better growth of proper crop and profitability in production.

The Proper crop recommendation and also proper providing nutrients or fertilizers in the accurate time help

the pants to grow in a high quantity. The Diseases can be detected in early stages and can be prevented by using the appropriate fertilizers. So By this, It would be a great help for the farmers to have an insights of Agricultural related problems and their eradication ways. The queries can also be solved by using this app. The Results are highly and extremely accurate to their high standards.

One of its uniqueness is it can be interacted in multiple languages. As a result it is user friendly and easy to use and can be implemented inorder to get high yields, quality Crops and in a high amounts.

KRISHIK is helpful to serve the Farmers who serve the Nation with the food. As the saying goes "Jai Jawaan Jai kisaan" , Krishik can be useful for the growth of Crops and help the farmers very effectively and support the farmers through out Agriculture works.

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