BE PROJECT – AGRO-GROW CROP RECOMMENDATION SYSTEM

1.Introduction

Agriculture is one of the major sources of livelihood for about 58% of our nation's population . As per the 2016-17, Economic survey the average monthly income of a farmer in 17 states is Rs.1700/- which results in farmer suicides, diversion of agricultural land for non-agricultural purpose. Besides, 48% of farmers don't want their next generation to take care of their agriculture instead want to settle down in urban areas. The reason behind this is that the farmers often take wrong decision about the crop selection for example selecting a crop that won't give much yield for the particular soil, planting in the wrong season, and so on. The farmer might have purchased the land from others so without previous experience the decision might have been taken. Wrong crop selection will always result in less yield. If the family is fully dependent on this income then it's very difficult to survive. Both availability and accessibility of correct and up to date information hinder potential researchers from working on developing country case studies. With resources in our reach, a system has been proposed to address this problem by providing predictive insights on crop sustainability and recommendations based on machine learning models trained considering essential environmental and economic parameters. Maharashtra underwent several fluctuations last year with respect to the retail price of onions. The price increased from Rs. 26 per kilo in the first half of the year to a whopping Rs. 50 per kilo in August . Observing the shoot in the price, many of the farmers in the state decided to grow onions on their farm, in the hope of making exorbitant profits. While this resulted in abundant supply in certain regions of Maharashtra, many other regions suffered failed crop output due to unfavorable conditions for growing onions. A subsequent shortage again in the following months had harsh ramifications on the lives of common man, as middleclass households could no longer afford onion- a frequently used commodity in their kitchen. This example just goes on to show that a farmer’s decision about which crop to grow is generally clouded by his intuition and other irrelevant factors like making instant profits, lack of awareness about market demand, overestimating a soil’s potential to support a particular crop, and so on. A very misguided decision on the part of the farmer could place a significant strain on his family’s financial condition. Perhaps this could be one of the many reasons contributing to the countless suicide cases of farmers that we hear from media on a daily basis. In a country like India, where agriculture and related sector contributes to approximately 20.4 per cent of its Gross Value Added (GVA) , such an erroneous judgment would have negative implications on not just the farmer’s family, but the entire economy of a region. For this reason, we have identified a farmer’s dilemma about which crop to grow during a particular season, as a very grave one. The need of the hour is to design a system that could provide predictive insights to the Indian farmers, thereby helping them make an informed decision about which crop to grow. With this in mind, we propose AgroGrow- an intelligent system that would consider environmental parameters (temperature, rainfall, farm’s latitude, longitude, altitude and distance from the sea) and soil characteristics (pH value, soil type and thickness of aquifer and topsoil) before recommending the most suitable crop to the user. Along with that we will also provide organic fertilizer recommendation based on what the soil lacks or has excess of.

2.Project concept

The project is basically divided into two parts :

Subsystem1: The user has to input in all the details of the soil and the system will predict the best crop to grow based on that data.

Subsystem2: For the fertilizer recommendation ,the user will input the soil data and the type of crop they want to grow and the application will then predict what the soil lacks or has excess of and will recommend improvements to be made to the soil.

2.1 Abstract

Agriculture plays a vital role in the socioeconomic fabric of India. Failure of farmers to decide on the best-suited crop for the land using traditional and non-scientific methods is a serious issue for a country where approximately 58 percent of the population is involved in farming. Sometimes farmers were failed to choose the right crops based on the soil conditions, sowing season, and geographical location. This results in suicide, quitting the agriculture field, moving towards urban areas for livelihood. To overcome this issue, this research work has proposed a system to assist the farmers in crop selection by considering all the factors like sowing season, soil, and geographical location. Furthermore, precision agriculture is being implemented with a modern agricultural technology and it is evolving in developing countries that concentrates on site-specific crop management.

2.2 Objectives

The objective of this project is to develop a model that will help the farmers to decide which crop will be best suitable for their soil and based on other conditions ,that will result in maximum yield for their harvest. The other objective is to propose a system which will give them fertilizer recommendation based on the soil nutrient conditions like what the soil lacks or has excess of and accordingly recommend organic ways to enhance the quality of the soil based on the crops they want to grow.

2.3 Literature Review

More and more researchers have begun to identify this problem in Indian agriculture and are increasingly dedicating their time and efforts to help alleviate the issue. In [3], the 2018 Fourth International Conference on Computing Communication Control and Automation (ICCUBEA) authors make use of Regularized Greedy Forest to determine an appropriate crop sequence at a given time stamp. The authors of [4] have proposed a model that makes use of historical records of meteorological data as training set. Model is trained to identify weather conditions that are deterrent for the production of apples. It then efficiently predicts the yield of apples on the basis of monthly weather patterns. The effect of temperature on the sugar content of apples is also taken into account to detect potential amount of damaged yield. The use of several algorithms like Artificial Neural Network, K-Nearest Neighbors, and Regularized Greedy Forest is demonstrated in [5] to select a crop based on the prediction yield rate, which, in turn, is influenced by multiple parameters. Additional features included in the system are pesticide prediction and online trading based on agricultural commodities. Another intelligent model, presented in [6], allows for the prediction of soil attributes such as phosphorous content. Here, the authors make use of different classification techniques like Naive Bayes, C4.5, Linear Regression and Least Median Square to achieve high prediction accuracy. This system can be very beneficial for farmers to determine the suitability of the soil to support a particular crop. One shortcoming that we identified in all these notable published works was that the authors of each paper concentrated on a single parameter (either weather or soil) for predicting the suitability of crop growth. However, in our opinion, both these factors should be taken together into consideration concomitantly for the best and most accurate prediction. This is because, a particular soil type may be fit for supporting one type of crop, but if the weather conditions of the region are not suitable for that crop type, then the yield will suffer. Similarly, there may be a case where the weather conditions are favorable but soil characteristics are not.

2.4 Problem Definition

Agriculture is a major contributor to the Indian economy. The mainstream Indian population depends either explicitly or implicitly on agriculture for their livelihood. It is, thus, irrefutable that agriculture plays a vital role in the country. A vast majority of the Indian farmers believe in depending on their intuition to decide which crop to sow in a particular season. They find comfort in simply following the ancestral farming patterns and norms without realizing the fact that crop output is circumstantial, depending heavily on the present-day weather and soil conditions. However, a single farmer cannot be expected to take into account all the innumerable factors that contribute to crop growth before reaching a consensus about which one to grow. A single misguided or imprudent decision by the farmer can have undesirable ramifications on both himself as well as the agricultural economy of the region. A combination of Data mining and Machine Learning can effectively help alleviate this issue. In this paper, we present an intelligent system, called Agro-Grow , which intends to assist the Indian farmers in making an informed decision about which crop to grow depending on the sowing season, his farm’s geographical location, soil characteristics as well as environmental factors such as temperature and rainfall. And also give fertilizer recommendations based on the soil nutrients that the soil lacks or has excess of.

2.5 Scope

PA for small farms can use small farm machinery and robots which will not compact the soil and may also run on renewable fuels like bio oil, compressed biogas and electricity produced on farms by agricultural residues. For small farms, precision agriculture may include sub-surface drip irrigation for precise water and fertilizer application, weed removal, harvesting and other cultural operations. Some of these robots are already being used on small farms in the US and Europe and it is expected that they may be deployed in large scale in the near future. For small farms, precision agriculture may help in sub-surface drip irrigation for precise water and fertilizer application and robots for weed control, harvesting and other operations. Similarly, drones have also been introduced in Japan and the U.S. for mapping the farms, identifying diseases and so on. Most robotic machines and drones are compact and thus suitable for small farms. India's small farms, therefore, are ideal for the large-scale application of precision agriculture. Precision farming in many developing countries including India has numerous opportunities for farmers to identify better high yielding location specific crops and infact a farmer turns in to a breeder to produce better and higher yielding varieties by using PA system.

2.6 Technology Stack

* Python 3.6
* Jupyter notebook
* Scikit learn- for ML
* Seaborn — For data visualization
* Pandas — For handling structured data
* NumPy — For linear algebra and mathematics
* VS Code

2.7 Benefits for environment and society

Modern agriculture’s huge reliance upon a few crops invites challenges, given changes in climate and the potential for harvest failures. New farming endeavors promise to battle the opposing problems of both malnutrition and obesity. To create better crop diversity for human health and food security, farmers are working to create markets for new crops. More environmentally friendly farming techniques offset climate challenges and protect local ecological systems while securing the food and water supply. Sustainable farming methods create better food diversity, preserve water with more efficient facilities and drought-tolerant crops, and encourage better livestock health. Farmers represent a front line to defend against the risks of climate change. The proposed system helps the farmers to choose the right crop by providing insights that ordinary farmers don't keep track of thereby decreasing the chances of crop failure and increasing productivity. It also prevents them from incurring losses.This helps the farmers from incurring losses and increase the crop yield and there by creating a positive impact on the economy of the nation.