Review on Scope of Data Science Applications in Agriculture Industry of India

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ABSTRACT: This paper is about scope of data science applications in agriculture industry in India. In India around 70 % to 80 % population lives in rural area and solely depends on farm crops. Environment conditions are also not predictable and many times farmers lose the entire crops due to various reasons like flood, drought, pollution of soil, unknown diseases etc. It is well known that many farmers have no proper knowledge about requirements of suitable conditions for the crops that has sowed, resulting in loss of the whole crops. This paper tried to focus on various factors that will helpful to the farmers to take necessary guidance about all aspects and to get optimum crops.
KEYWORDS: Data Science, Artificial Intelligence, Machine Learning, Automation, Condition Predictors, Computers Bases System

I.   INTRODUCTION

In India agriculture is the backbone of the country. Around 70 % of the population lives in rural areas and their main source of income is from crops from farms. Various parts of the country grow different crops, depending on the availability of water. Unfortunately in majority areas no proper source of water for irrigating farms is available and in such areas people totally depend on rain water. In such areas people used to sow crops by guessing about the rain and it has been observed that if rain does not arrive for a few days after sowing, the whole crops got burnt, suffering a great loss of farmers.

In many rural areas water levels are continuously going down day by day. In spite of various policies framed for farmers, farmers are unable to take advantage of it due to lack of awareness. Agricultural universities and institutions are regularly carrying out research to obtain proper solutions to all problems of farmers, but for a huge mass of diverse people it is not sufficient.

Institutions are lacking in attracting the attention of needy farmers. Majority banks are also not cooperating with the farmers when they are in need of loans for various purposes.

Agriculture, the largest sector in India, is taken very lightly by many and least supported by all. They are using traditional tools for doing the tasks. Technology has expanded at a rapid pace and is in use extensively in many sectors. The evolution of AI & ML and data science can be utilized for providing solutions to all problems in rural areas. [1] These techniques can be incorporated for developing automated systems for performing various routine tasks in the fields. Data science can be effectively utilized for providing awareness on various requirements and timely actions that will help to get better crops and hence the financial growth of farmers and people in rural India and hence helping to boost the economy of people in rural areas.

[2][3] For cropping, selection of suitable crop is essential for a type of soil. Data science can be effectively used to develop a system that can test a soil and advise its suitability for various types of crops and vice versa. Data science can be utilised to develop a smart machine that exhaustively analyses the soil of all parts of the country and recommends crops for that particular part. The system should suggest the various parameters of soil like sodium content, potassium content, magnesium content and other minerals required for the proper growth of plants.

This huge task is to be done extensively once by involving experts from agriculture, science and technology. The other major important parameter is water needs for the growth of plants and its requirements. AI & ML can develop robust algorithms to predict rainfall duration and other related aspects, that will certainly be helpful in deciding to sow the crops and hence avoid a loss

due to inadequate conditions that are essential for the growth of the plant.

When a plant grows properly under supervision, there is always a chance to spoil crops due to natural diseases due to unwanted and uncertain conditions. In many areas it has repeated in a typical pattern and at specific intervals. AI & ML can be a better tool to predict the occurrence of a disease and if it signals the condition and predict the future events, it will help farmers to take necessary precautions and avoid any kind of risk and will be able to use pesticides in time and avoid a crop from being infected.

Most of the crops can grow alone. But in the field there are many unwanted plants that automatically grow and they sucks the minerals from the actual crop and hamper the growth. In rural areas farmers used to observe these conditions and if he felt it was essential to remove such unwanted plants, he took action and by using traditional cultivation methods he used to remove them. But this action may not be in time and may provide unpredicted results. These types of conditions too can be easily identified and solved by using data science techniques.

Depending on the type of crop and environment conditions, at some point decisions are to be taken about harvesting them. In the recent past, harvesting has been a big issue in rural areas. When required, sufficient manpower is not available for harvesting purposes. Many times farmers have to wait for a very long time due to unavailability of manpower and in many cases it may happen that by the time crops get ruined and more than 50 % becomes useless and creating a great loss to farmers. Due to advancement in technology, many tools and machines are now available for harvesting purposes. By using AI based systems and using suitable data science techniques properly designed and developed automated machines can solve the harvesting problem.

II.   SMART FARMING

[4][5] Smart farming makes the use of new technologies like Artificial Intelligence & Machine Learning, Data Science, Internet of Things, Satellite imaging, cloud computing etc that facilitates the farmers to get better insights about the consequences of their actions and will eventually help farmers to make good decisions about crops. It helps the farmers to redesign the decisions based on real time predictive forecasts. The modern agriculture automated system have following components

i. Smart App to show information about all essential parameters, section wise / land wise
ii. Smart App also provide a mechanism to get feedback about various parameters like soil health, climate conditions, water level, dryness, wind direction, need of pesticides, etc
iii. An alarm system based on scheduling of various activities like watering plants, using fertilizers, using pesticides, cultivating, harvesting etc
iv. Controlling various equipments installed in farm for various purposes like watering plants, signaling wild animals by threatening them using some methods that gets automatically ignited when wild animal try to enter the farm, using pesticides, using tractors, harvesting etc
v. providing information about places in the market at the National level where farmers can sell their products, pricing of crops etc. This app should provide daily updates of pricing of all items selectively.
vi. farmers should be able to use the smart app to get online insurance of his crops and hence will be able to avoid loss due to any disaster conditions.
vii. information about transportation facility and from his own place he should be able to place his orders for various things
viii. farmers should be able to use banking using the smart app for selling and purchasing various items.
ix. a smart app should provide access to cloud storages to farmers that helps him to store his products till he intends to sell.
x. information about market from where to purchase good quality seeds, tools, fertilizers etc

III.   COMPONENTS OF SMART SYSTEM

To facilitate farmers with smart farming a smart system is required to be designed that makes use of smart sensors, computer communication network, specially designed and developed equipments that works smartly based on instruction of users.

Smart Farming System is shown in figure describing the essential components and interface that facilitates the farmer with all tools for well planned and systematic farming.

Smart Farming System for Agriculture
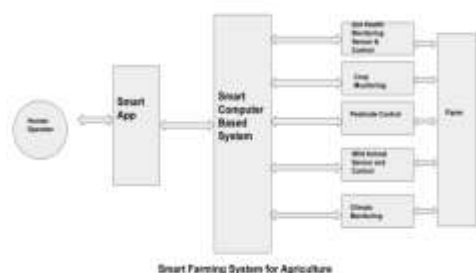
IV. CONCLUSION

Hence by systematically and intelligently using AI & ML techniques and data science analytics, majority problems in rural India can be solved. It must be supported by facilitating the farmers with satellite imaging aids that will guide the farmers about all conditions needed for smart farming. Through satellite transmission, farmers will be provided with information at their own location about soil parameters, through sensors placed in individual farm lands. They can get online feedback about adding some parameters to soil and get automatically added in required proportion by using a smart portable plant installed in the farm. The farmers can be facilitated with irrigation schedules and dynamically operated irrigation systems, which works automatically.

Farmers can use GPS operated tractors for various purposes like using fertilizers to disinfect plats, for harvesting and for cultivating etc. Strong monitoring system can make use of recent AI techniques to identify and record growth of plants, to sense the beginning of fruits and to control theft of anything, to protect plants from wild animals that may destroy the crops. The data analytics can predict the season of entry of wild animals and thereby provide advanced information to the land owners which will ultimately be a great help to farmers that protects their crops and avoid the loss.

Data science, hence can play a crucial role and can be effective tool in assisting farmers in rural area by providing them idea about future action to be taken by them and help them to become smart farmer having smart farm.

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