

Big Data A Great Revolution in Precision Agriculture using Predictive Weather Analysis and Soil Analysis

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Abstract – The world doesn't need any more engineers and Technocrats. We didn't run out of planes and television sets and electronic devices... we ran out of food. In the 21st century the agriculture sector requires tremendous improvement in Decision making process. Big Data can provide new efficient decision making tools for helping agricultural development as well as biodiversity protection, that can required the large amount of data and information from different sources i.e. Weather, soils, plants, seeds, and other management systems. New acquired, aggregated and shared data is a breeding ground for extracting and sharing useful information and knowledge among different actors involved in agriculture or biodiversity domains, as well as for combining large data sources (thus obtaining new data sources) with advanced crop and environment models to provide actionable on farm decisions.

Keywords – Big Data, Precision Agriculture, Predictive Weather Analysis, Soil Analysis.

I. INTRODUCTION

In India at least two-thirds of the working population earns their living through agricultural works. In India other sectors have failed to generate large amount of employment opportunity the growing working populations. Agriculture supplies raw materials to various agro-based industries like sugar, jute, cotton textile and vanaspati industries. Food processing industries are similarly dependent on agriculture. Therefore the development of these industries entirely is dependent on agriculture.

II. BIG DATA

Big data is term of collection of large and complex data set it contains both structured and unstructured type of data. data comes from everywhere from sensors, social media networks, videos, digital pictures etc. this all data is identified as Big-data.

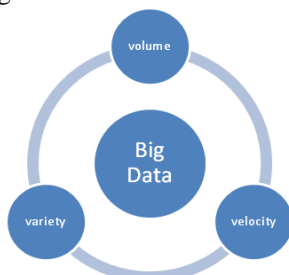


Fig. 1. 3V's in Big-Data

A. Volume refers to the amount of all types, so if the data generated from different sources and continue to expand. The benefit of gathering large amounts of data includes the creation of hidden information and patterns through data analysis .

B. Variety refers to the different types of data collected via sensors, smart phones, or social networks. Such data types include video, image, text, audio, and data logs, in either structured or unstructured format. Most of the data generated from mobile applications are in an unstructured format. For example, text messages, online games, blogs, and social media generate different types of unstructured data through mobile devices and sensors. Internet users also generate an extremely diverse to structured and unstructured data.

C. Velocity refers to the speed of data transfer. The contents of data constantly change because of the absorption of complementary data collections, introduction of previously archived data or legacy collections, and streamed data arriving from multiple sources.

III. PRECISION AGRICULTURE

Traditionally agriculture is an important industry in India, and the country has lot of agriculture resources are available to meet the needs of people to food and biodiversity products. In India agriculture is practiced by performing a particular task, such as planting or harvesting, against a predetermined schedule. But by collecting real-time data on weather, soil and air quality, crop maturity and even equipment and labor costs and availability, predictive analytics can be used to make smarter decisions. This is known as precision agriculture.

With precision agriculture, control centers collect and process data in real time to help farmers make the best decisions with regard to planting, fertilizing and harvesting crops. Sensors placed throughout the fields are used to measure temperature and humidity of the soil and surrounding air. In addition, pictures of fields are taken using satellite imagery and robotic drones. The images over time show crop maturity and when coupled with predictive weather modeling showing pinpoint conditions 48 hours in advance, IBM Research is able to build models and simulations that can predict future conditions and help farmers make proactive decisions.

IV. PREDICTIVE ANALYSIS

A. Optimizing Planting, Harvesting and Distribution

In order to grow crops optimally farmers need to understand how to cultivate those crops in a particular area, taking into account a seed's resistance to weather and local diseases, and considering the environmental impact of planting that seed. For example, when planting in a field near a river, it's best to use a seed that requires less fertilizer to help reduce pollution.

Once the seeds have been planted, the decisions made around fertilizing and maintaining the crops are time-sensitive and heavily influenced by the weather. If farmers know they'll have heavy rain the next day, they may decide not to put down fertilizer since it would get washed away. Knowing whether it's going to rain or not can also influence when to irrigate fields. With 70 percent of fresh water worldwide used for agriculture, being able to better manage how it's used will have a huge impact on the world's fresh water supply.

Weather not only affects how crops grow, but also logistics around harvesting and transportation. When harvesting sugar cane, for example, the soil needs to be dry enough to support the weight of the harvesting equipment. If it's humid and the soil is wet, the equipment can destroy the crop. By understanding what the weather will be over several days and what fields will be affected, better decisions can be made in advance about which fields workers should be deployed to.

Once the food has been harvested the logistics of harvesting and transporting food to the distribution centers is crucial. A lot of food waste happens during distribution, so it's important to transport the food at the right temperature and not hold it for longer than needed. Even the weather can affect this; in Brazil, many of the roads are dirt, and heavy rain can cause trucks to get stuck in mud. By knowing where it will rain and which routes may be affected, companies can make better decisions on which routes will be the fastest to transport their food.

3.1.2 The Future of Precision Agriculture

At this moment, precision agriculture advances are used by greater associations as it requires a solid IT establishment and resources for do the watching. Regardless, in fourth coming days when humbler farms and groups could use phones and gathering sourcing to streamline their own cultivating.

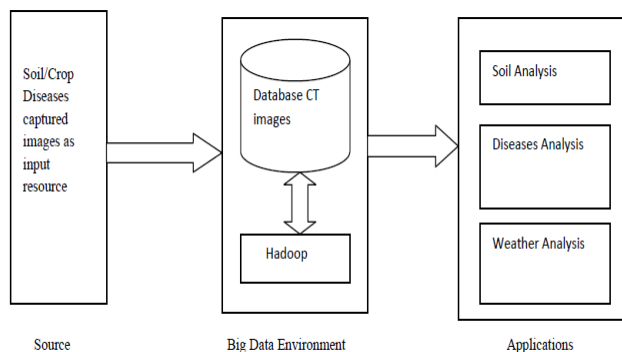


Fig-Big Data Environment for Precision Agriculture

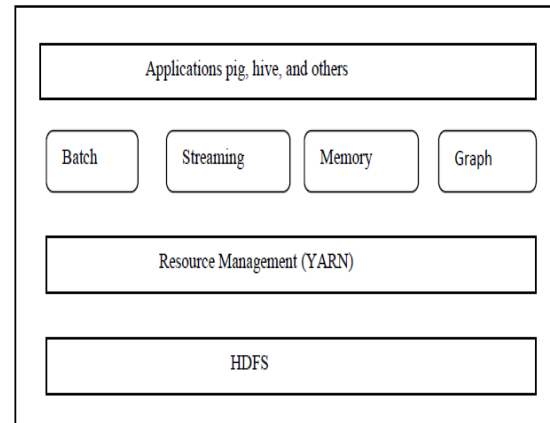


Fig-Hadoop Framework

"An agriculturist could take a photograph of a yield with his smartphone and exchange it to a database where an authority could assess the advancement of the item in light of its shading and distinctive properties. People could give their own examining on temperature and moisture and be a substitute for sensor data if none is available," he said.

With creating demands on the world's sustenance generation system, it's noteworthy to grow agribusiness resources sensibly. With capacity in first class supercomputing, computational sciences, and examination and headway, IBM Research is uncommonly prepared to fathom the complexities of cultivation and develop the right atmosphere appraisals, models and propagations that engage agriculturists and associations to settle on the right decisions. Enormous data is an expression that has composed the universe of advancement across over endeavors of late and years. It's about getting huge data from the gigantic number sources gathering it today, and making an elucidation of that into significant information to upgrade business shapes and shrewdly deal with issues at scale and speed. As an industry where farmers and agribusinesses need to settle on endless decisions reliably, cultivating has been an unquestionable concentration for tremendous data. Apparently harder air and thing esteem conditions are making it all the more vital for agriculturists to use any information they can get their hands on to settle on fundamental developing decisions. Gigantic data has been a key driver of the progress made in exactness cultivation, whereby agriculturists and agribusinesses are using the advantages accessible to them in the most beneficial course possible to get most prominent yields. So in seeing the massive potential favorable circumstances that access to tremendous data examination can have on the residence, different various immense data advancements have sprung up for farmers and their diverse organization providers to use.

On the gear side, you have sensors in various setups gathering data. These join contraptions you stick in the ground to evaluate soil so dryness and supplement thickness; devices fitted to a tractor that can gage alter yields; farsighted atmosphere stations; and picture finding satellites and robots mapping out land and measuring crop prosperity. By then there's the item side, which assembles, structures and separates the data, commonly with the

target of showing rich encounters to farmers in a consumable association. A couple of associations offer both hardware and programming in a vertically planned offering — and generally those offering gear will have an item program included — while others offer just the item. This item will use data from the gear sources depicted above, which is either controlled by the farmer or by hardware associations that the item provider will unite with, for instance, equipment creators. On the other hand it will use data gave by farmers, from outcast data affiliations, or from openly available resources, for instance, close-by governments. The way this data is then shown, or separated, vacillates depending upon the item. Regardless, most undertakings are at present accessible through PCs, tablets and PDAs, and every now and again fuse a movable dashboard of the diverse data sets he or she is taking after. Key decisions that item helps agriculturists make fuse when and the add up to water a field, in perspective of soil clamminess data, atmosphere figures, and item prosperity; and planting and harvesting decisions, in perspective of yield data or atmosphere. Excrement applications can be essentially more prescriptive, in perspective of factors, for instance, soil supplement thickness, enabling agriculturists to extra money on zones that don't require to such a degree, furthermore upgrade yield over a property.

Immense data examination can in like manner mindful agriculturists of issues on a particular field, for instance, a disturbance intrusion, or dry season conditions, decreasing the necessity for manual checks of every land distribute. With existing and extending work inadequacies in agribusiness, the limit with regards to gigantic data examination to make efficiencies that decline the prerequisite for physical work is a noteworthy preferred standpoint for the business particularly for broad scale operations.

The odds to improve developing adequacy are clearly interminable, which is the reason there are an extending number of choices accessible for farmers. Be that as it may, with that open entryway, comes an extent of challenges for the business as it makes.

V. CONCLUSION

The big data is massive tool with the prospective for creating various solutions for Farmers and decision makers, policy makers. A large amount of data set will improve the analysis and predictive decision making power of actors related with agriculture sector.

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