Big Dataand Smart Farming are the Future of Agriculture

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Abstract

Agriculture is the main source of income for the largest population of India and is major contributor to Indian economy. About sixty percent of the country's populations are dependent on agriculture for their livelihood. The present agricultural practices in India are neither prudentially viable nor environmentally supportable and the yields of many agricultural products in India are critically low. Big data analytics in agriculture sector is emerging research field. Big data analytics in agriculture applications provide a new insight to give advance weather decisions, improve yield productivity and avoid unnecessary cost related to harvesting, use of pesticides and fertilizers.The objective of this paper is to present the discussions on how big data analytics can be used as a tool to provide timely information not only to the farmers in getting better returns from agriculture but also to the policy makers to take decisions on export and import of agricultural produce.

Introduction

Agriculture plays a vital role in the overall economic and social being of any nation. As per the 2010 FAO world agriculture statistics India is the world's largest producer of many fresh fruits and vegetables, milk,

major species. India is the second largest producer of wheat and rice, the world's major food staples. India ranked in the world's five largest producer of over 80% of agricultural produce items including many cash crops such as coffee and cotton. India exported $ 39 billion worth of agricultural products in 2013 making it the seventh largest agricultural exporterworldwide.

Despite these recent accomplishments agriculture has the potential for major productivity and totaloutput gains, because crop yields in India are still first 30% to 60% of the best sustainable crop yields achievable in the farms of developed and other developing countries. Additionally losses after harvest due to poor infrastructure and unorganized retails cause India to experience some of the highest food losses in the world.

Predictive analytics can be used to make smarter decisions in farming by collecting real time data on soil and labor costs and availability which is known as precision agriculture.

Modern farming practices are intensely data driven. Precision agriculture practices have implemented such as GPS guided equipment geo-mapping etc. While the volume, velocity and variety of data generated in production agriculture have been available for years the ability to aggregate, analyze and distil value creating decision support tools from the data is still in early stages.

Big Data Analytics

Big data analytics is where advanced analytic techniques operate on big data sets. Hence, big data analytics is really about two things- big data and analytics- plus how the two have teamed up to create one of the most profound trends in business intelligence today.

Big data analytics is a collection of related techniques and tool types, usually including predictive analytics, data mining, statistical analysis and complex SQL. We might also extend the list to cover data visualization, artificial intelligence, natural language processing and

database capabilities that support analytics such as Map Reduce, in-database analytics, in-memory databases, columnar data stores.

Defining Big Data via the Three Vs

Big data isn't just about data volume but there are other important attributes of big data, namely data variety and data velocity. (See Figure 1)

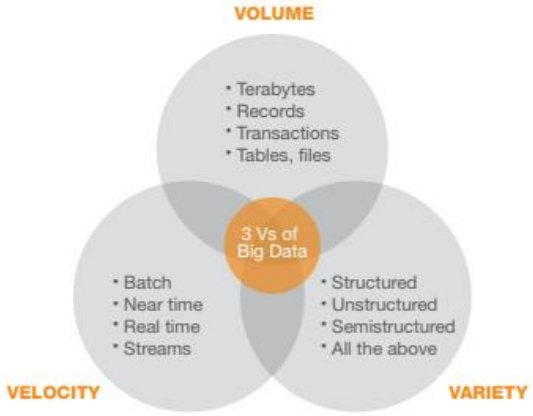

Fig1: The Three v's of big data

Volume

The amount of data generated as Big Data ranges from Terabytes to Exabytes and Zettabytes of data. The size has been increasing exponentially: up to 2.5 Exabyte of data is already generated and stored every day.

Velocity

Big data is growing rapidly, generating a weird of quantities needed to be stored, transmitted and processed rapidly. It also refers to the speed of generationof data or how fast the data is generated and processed to meet the demands and the challenges which lie ahead in the path of growth and development.

Variety

This refers to the variation which can be shown by the data at times. Data comes in variety of formatslike structured numeric data from traditional databases, unstructured text documents, emails,audio,video etc. In Big Data, the variety and heterogeneity of data sources and storage has increased fuelled by the use of cloud,web and online computing.

Big data is a phrase that has integrated the world of technology across industries in recent months and years. It is about capturing relevant data from the huge number of sources collecting it and translating that into actionable information to improve business processes and insightfully solve problems at scale and speed.

Agriculture

Agriculture is the backbone of the Indian economy and the development. However technological ventures still have to be grown and cultivated for agro sector in India. Although some initiatives have been taken by the Indian government for providing online and mobile messaging services to farmers related to agriculture queries like providing information of soil quality at each region. Properties of soil like amount of phosphorus, nitrates and potassium determines the quality of soil and type of crop production.

Environmental factors like temperature and moisture affect the production of cropsand crop diseases.The soil moisture information at various regions determines the amount of water necessary for different regions and avoids unnecessary wastage of water.

Big data in agribusiness refers to the collection and analysis of data generated from the farm to the end consumer. As an industry where farms and agribusiness have to make innumerable decisions every year agriculture has been an obvious target for big data. Tougher climate and commodity price are making it all the more relevant for

farmers to use any information they can get their hands on to help make critical farming decisions.

Big Data Analytics in Agriculture

Agriculture is one of the important sources of survival and one of the most important factors in the economic growth of the country.Big data is playing key role in the progress of precision agriculture where by farmers and agribusiness is using the resources at their disposal in the most efficient way possible to get maximum yields. Seeing the huge potential benefits that access to big data analytics can have on the farm, a number of different agriculture big data technologies have cropped up for farmers and their various service providers to use.

Hardware

On the hardware side you have sensors collecting data. These devices you stick in the ground to measure soil moisture nutrition density.Devices fitted to tractors that can measure crop yields, predictive weather stations and image capturing satellites drone mapping out land and measuring crop health.

Software

Then there's the software side which collects, process and analyzes the data typically with the goal of presenting rich insight to farmers in consumable format. Key decisions that the software helps farmer make include when and how much to irrigate a field based on soil moisture data. weather predictions and crop health and planting and harvesting decisions based on yield data or weather.

Fertilizer application can be much more prescriptive based on factors like soil nutrient density enabling farmers to save money on areas that don't need as much at the same time optimizing yield across the field.

Big data analytics can also alert farmers to problems on a certain field such as a pest infestation or drought conditions reducing the need for manual checks of every piece of land regularly.

Conclusion

This paper presents the scope of bringing Big Data Analytics to meet several challenges in the agriculture sector. It is found that the emerging big data analytics has a great positive impact on precision agriculture.Big Data Analytics solution helps farmers minimize their use of fertilizer, chemical and water while maximizing yields by analyzing a wider diversity of real- time sensor and historic data inputs. Through the use of rigorous big data analytics, that prescription usually enhances the farm's overall profitability.

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