ISSN No. 0974-035X
An Indexed, Refereed & Peer Reviewed Journal of Higher Education
Towards Excellence
UGC-HUMAN RESOURCE DEVELOPMENT CENTRE,
GUJARAT UNIVERSITY, AHMEDABAD, INDIA

A STUDY ON GREEN DATA REVOLUTION: OPPORTUNITIES AND CHALLENGES

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ABSTRACT

India is agriculture country. Big data has found its way to the agriculture industry. The problem of inflation, wastage, low productivity, soil fertility, productivity, financing to farmers and the lack of institutional farmers can be addressed through the data. However, while it can be helpful with full of opportunities on one level it comes with handful of challenges. The study focuses on challenges such as the use of collected data by farmers and companies, who collect and store data on everything from fertilizers, rate to yield to soil conditions. The study focuses on issues such as data security, data privacy and data analyzing. The paper also highlights challenges faced in agriculture data revolution, such as the approach of companies to sell the data to others or make a new product based on sensitive information.

KEY WORDS: - Big data, farmers, data privacy, data revolution.

INTRODUCTION:

More suitable agriculture is one of big challenges of global human population. Agriculture has to produce more food, feed, fuel, flowers etc. with less use of natural resources and with less adverse side effect on environment and society and the expectation is that precision agriculture and acronym smart farming will be necessary to achieve this [1] . Big data applications are likely to contribute to more efficient agro-food chains and, so likely to contribute to a more sustainable agriculture. Big Data is changing the scope and organization of farming through pull-push

[1]Kempenaar (2017);

mechanisms. Global issues Such as food security and safety, sustainability and the result of efficiency improvement are better addressed by big data analyses and applications. These issues make that the scope of Big Data applications extends far beyond farming alone, but covers entire supply chain.[2] The data revolution concept is shaped with a view both to sustainable development goals (SDG) and to private, open and big data for agriculture. According to FAO (2009) estimates, to feed a world's population of 9 billion in 2050, food production will need to increase by 70%. In this scenario, accurate agricultural information is essential for achieving sustainable agriculture and food security[3]. Big data is all about efficiency. There are many types of data available, and many ways to use that information. But one thing holds true — in just about every scenario, the whole point is to increase production, maximize profits, or both. With that in mind, it's not surprising that big data has found its way to the agriculture industry. However, while it can be helpful on one level, it comes along with a handful of challenges. On a consumer level, that could include information collected by tracking credit card activity or the way Smartphone is used. In agriculture, it's using machinery and technology gathering data on crops with hopes of making yields more efficient in the future.[4]

BENEFIT OF BIG DATA IN AGRICULTURE:

Big data refers to the *"*generation of enormous amounts of data due to new technologies for measurement, collection and storage" that is being accumulated in such vast quantities that they are impossible to assess using conventional analysis techniques.[5] Within agriculture, these technologies include sensors, geospatial datasets, as well as information from smart-connected devices (e.g. machinery) linked to the Cloud via *the* Internet of Things. Big data also encompasses datasets collected for other purposes (e.g. farm compliance data) which would have remained in silos but whose potential can now be used in other contexts to deliver real-time actionable insights for farmers and agricultural suppliers. There are many ways farms use big data to help make informed decisions to help improve production and profits, and they all sound downright futuristic. For example, farmers can now use data from satellite imagery to monitor

[2] Wolfert (2017).,

[3] Data needs of farmers, CTA, 2016.

[4] Matthews (2017);

[5] Russo (2013);

surface temperatures in fields, which can inform which sections are fine and which need more attention. They can also use sensors in fields or on particular types of crops to gather information like the availability of water, the number of pest infestations or whether a patch of land needs more or less fertilizer .Big data is even used after crops are harvested. Scales that weigh trucks full of crops can also analyze factors such as moisture content and production rates, in addition to how much it all weighs. Data could also be used to monitor whether crops meet the standards of consumers who prefer so-called "clean" foods. There are many factors that contribute to farmers' profitability. They are, finding effective hybrid Pesticides, Air moisture, Ground Moisture, Water availability, Temperature, Rainfall, Price forecasting, Government actions, Market Data etc[6] . From the above mentioned attributes Big Data framework and Machine Learning algorithms play a key role to arrive optimum decisions in farming, Crop recommendations, Intercropping recommendations, Selection of suitable Hybrids, Farming practices, Pests prediction and Management, Forecast the Agri commodity prices ahead of the season, Profitability Analysis, Policy recommendations. By using Big Data frameworks the huge volume, variety and veracity can be handled, and highly computational Machine Learning algorithms can be developed. Though many benefits can be derived by using Agriculture Big Data platforms, two major benefits are– Optimized Farming and Commodity Pricing.

OPTIMIZED FARMING:

By using big data technologies and Machine learning algorithms many attributes can be predicted in advance and associated together such as Weather, Monsoon behavior, ground water scarcity, Soil conditions, Labor & Machinery costs, intercropping decisions and Pests' management. By associating all these attributes optimized decisions can be taken at all phases of farming. An agricultural big data framework is the meticulous idea to collect all sorts of huge volume of historical and near real time data related to weather, soil, satellite remote sensing images, farming costs, and local pests' data.

This frame work can handle different formats of data like structure, unstructured and images. Various decisions can be taken in advance by processing Tera and Peta bytes of data which helps farmer in saving efforts, costs and increases the yield productivity. Below Mentioned attributes

[6]Gammadapu (2017);

can be best utilized to derive an optimum decision in farming. Weather has a profound influence on Agriculture in terms of growth, crop yields, impact of pests and disease, water needs and fertilizer requirements. Based on the weather and rainfall forecasting information, for different demographic regions different crops can be shortlisted for selection. Also, by predicting weather and rainfall farmer can be suggested when he needs to sow, harvest, transportation and other relevant information. Soil: Minerals, ph levels, phosphorus, potassium, magnesium, calcium and moisture level data will be considered to select suitable crop. Crop cutting: By processing image sensing data it can be predicted when the machinery or labor is required to cut the crop. Plant Health: Plant health can be monitored remotely by using remote sensing data. Pests Management: By considering Soil, rainfall moisture, local pests' patterns, appropriate decision can be taken; so that crop can be of more organic which gives good profits t farmer. Intercropping: by studying historical data and current soil and weather conditions experts can suggest the farmer for altering the crop. By computing all the above-mentioned attributes, optimized decisions can be taken at every phase. This will ensure profitability, Low production cost, very little or no pesticide residue is ensured, Reducing farmers' risk, Higher productivity, Effective utilization of land, machinery, labor and time

COMMODITY PRICING:

Farmers can be befitted with Forecasted Agriculture commodity prices, sharing the current prices of Agriculture commodities. Forecasting commodity prices. It is noticed that the prices of the commodities fluctuate significantly in the semi-arid farming zones, Monsoon based farming zones and also prices fluctuate due to decisions taken by the local governments such as MSP (Minimum Selling Price) etc**.** Forecasting price given well in advance for agriculture commodities is helpful in many ways. The price forecasting information will help farmer to know the price in advance that helps to take appropriate decision whether to sow that particular crop or not; if so, how much profit he can expects**.** The price forecasting information acts as input to governments and other authorities to take decisions on Minimum Selling Price (MSP), Imports Exports decisions and in other relevant areas.

The prices of the yield are not same across all the local markets. So, it is necessary to provide forecasted price information for local market wise, district wise, state wise and nation wise. To forecast the Agriculture commodities, it is required the past 7 to 10years of historical data for all

the variety of crops. To handle this huge data and high computations, the distributed big data platform can be leveraged. This also helps in computing the near real time data to find out the current prices of all variety of the crops.The prices of the agriculture commodities varies across the markets. In order to avail the benefit of higher prices in the local or nearest markets the current price of the commodity should be available. This type of information can be made available for all the crops by developing applications using big data. The web based or mobile based applications can be developed for the farmers' benefit where they can leverage the maximum benefits if they sell the crop in the local market or the other markets. This information can be passed to farmers in many ways such as Automation of e-mail or SMS alerts, Browsing Internet application or by mobile app**,** advertising in media through media analytics. By collecting local pricing in near real time and adding the transportation expenses, farmers can get the better prices for their crops without a mediator. Inclusion of Big Data & Machine Learning capabilities in an AgriTech system can prove to be highly beneficial for farmers. Such systems will lead to improved productivity with better farming practices, Improved Production with timely decisions**,** Commodities forecasting in various markets[7].From precision agriculture to real-time price updates, advanced data analytics can help farmers usher in a new era in farming. It is clear that the projected population growth and urbanization rates will have dramatic impacts on food security across the world by 2050. The impacts are multi-sectoral and extend well beyond food into infrastructure, healthcare, and technology.

However, technology has the potential to re-shape these trends for the benefit of society. Technology is disrupting all areas of agricultural value chain, driving countless opportunities and challenges particularly around profitably feeding the 9.6 billion people on Earth by 2050.At the same time, the growing demand for food and shifting food security needs are driving innovation in the resource space. World is now more inter-connected, spawning massive data and exploration of these data can help to drive decision making that can transform the farm source-to-consumer value chain. Agri-businesses are subject to numerous regulations and consumer requirements across their supply chain. Of the several touch points along the agri-value chain, each hold critical information that can help businesses make the most of their resources, provide greater transparency in their processes and protect consumers. Big Data has the potential to add

7 Gummadapu (2017)

value across each touch points starting from selection of right agri-inputs, monitoring the soil moisture, tracking prices of markets, controlling irrigations, finding the right selling point and getting the right price.[8]

Big-data businesses can analyze varieties of seeds across numerous fields, soil types, and climates. Similar to the way in which Google can identify flu outbreaks based on where web searches are originating, analyzing crops across farms helps identify diseases that could ruin a potential harvest. The challenges and opportunities of data is immense in a country like India with 638,000 villages and 130 million farmers speaking around 800 languages with 140 million hectares of cultivable land under 127 agro climatic regions capable of supporting 3,000 different crops and one million varieties. Self-driven vehicles can already drive themselves across fields using Global Positioning System (GPS) signals accurate to less than inch of error thus helping farmers plant more accurately, but the real potential is what happens when this data from thousands of tractors on thousands of farms is collected, grouped and analyzed in real time.

Precision agriculture aids farmers in tailored and effective water management, helping in production, improving economic efficiency and minimizing waste and environmental impact. Recent progress in Big Data and advanced analytics capabilities and Agri-robotics such as aerial imagery, sensors, and sophisticated local weather forecasts can truly transform the Agri-scape and thus holds promise for increasing global agricultural productivity over the next few decades. Farmers need accurate weather forecasts and accurate information on the inputs they can use. Optimizing input factors (e.g., nutrients, irrigation, and pest control) can help protect natural resources. The use of granular data (for example, data for every 100-meter square of a field) and analytical capability to integrate various sources of information (such as weather, soil, and market prices) will help in increasing crop yield and optimizing resource usage, lowering cost. Since, climate change and extreme weather events will demand proactive measures to adapt or develop resiliency, Big Data can bring in the right information to take informed decisions.

Big Data and advanced analytics are streamlining food processing value chains by finding the core determinants of process performance, and taking action to continually improve the accuracy, quality and yield of production. Big Data is already being used for optimizing

[8] Bordoloi (2017)

production schedules based on supplier, customer, machine availability and cost constraints. It can provide agri-business with greater visibility into supplier quality levels, and greater accuracy in predicting supplier performance over time. In India, every year 21 million tons of wheat is lost, primarily due to scare cold-storage centers and refrigerated vehicles, poor transportation facilities and unreliable electricity supply. Big Data has the potential of systematization of demand forecasting thus reducing such losses. A trading platform for agricultural commodities that links small-scale producers to retailers and bulk purchasers via mobile phone messaging can help send up-to-date market prices via an app or SMS and connect farmers with buyers, offering collective bargaining opportunities for small and marginal farmers. India should look at establishing a systematic mechanism to capture the data that could offer additional value-creating opportunities. In particular, rapid proliferation of mobile technologies in rural populations could let farmers in these areas to improve productivity based on decision made backed by better information grounded on Big Data. It also has the potential to change the agri-business models including revenue models, as businesses will have the opportunity to offer new products and services thus developing sustainable revenue streams. Proliferation of data offers unprecedented opportunities to understand consumer needs and preferences of farmers, and to deliver tailored services and products for organizations that can make sense of this data. Given all this, today is right time for agri-businesses to lead on defining what better practices on data use are available. There is need to formulate a business model wherein value can be captured from the scale of data being captured by different players in the agri-supply chain. Companies must act now to focus, simplify and standardize big data through an enterprise-wide data management strategy as Big Data poise to deliver the next revolution of farming.

CHALLENGES FACED IN IMPLEMENTING IN AGRICULTURE SECTOR.

Technologies are efficient, proven to work and revolutionary, one of the major challenges lies in their application in agriculture sector. Problem is not with technological solutions but the concern is in their proper application. Farmers readiness to embrace the new technology but also there is need to educate them on risk mitigation and potential upside problem with use of data hours of training to be given to the farmers. The training on use of devices, basic troubleshooting, use of data, use of smart phones and app problem like infrastructure, need of

uninterrupted power and internet connectivity and finance to manage technology will always be concern. The accessibility of data is also one of the issues of concern.[9]

Trust among the farmers is identified as a major obstacle. Big data offers plenty of opportunities to the agriculture industry, but it's not without its challenges.[10] For example, the tools, technology and machinery used to gather all this information can be quite costly, which could give larger farms an advantage. If larger farms can also afford to maximize efficiency with the use of big data, could that drive smaller farms out of business? Parsing through the data presents its own challenges. Yes, it's nice for farmers to gather all sorts of metrics and information, but actually using that data is a different story. Finally, another challenge is ownership. Does that data belong to land owners, or to those who own the equipment that collects the information? Or is it a combination of both? Big data is everywhere, and even if you don't realize it, there's a good chance it somehow effect on a day-to-day basis. In farming and agriculture, data could be a key driver in increased production — and that's always a good thing for the economy. With farmers and companies collecting and storing data on everything from fertilizer rate to yield to soil conditions, there are important concerns to consider: The issues like the security of the data, analyses of the data.

The role of companies regarding the sell of the data to others or making new products based on sensitive information. Privacy: Farmers need to know they won't be willingly revealing trade secrets when deciding to share data about their farming techniques. Format: Not all data collection platforms use the same language, so a uniform way to understand what is being collected must be created. Complexity: Many growers are intimidated by the vast quantity of data they collect, so we have to help them understand what matters and what doesn't.

[9] Halais (2015)

[10] Mathews (2017)

CONCLUSION:

Every system has its own advantages and disadvantages, as India is agriculture country. There is need of the agriculture data revolution to combat the problems faced. So initially the challenges have been discussed in detail in implementing it in the field of agriculture. And further if the implementation is done, what all consequences will be faced have been discussed in this paper.

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