# Growing Prosperity: Unleashing Agriculture's Potential with Cutting-edge Big Data Management Tools

**Saikiran Chintakindi[1]*, Rakesh Karravula[2], Sakshi Shastri[1], Shaik Muneer[3] and Uday Arava[2]**

*[1]Ph.D. Scholar, Dept of Agril. Extension, [3]Ph.D. Scholar, Dept of Agril. Economics, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.).*
*[2]Ph.D. Scholar, Dept of Agril. Extension, Prof. Jayashankar Telangana Agricultural University, Hyderabad (T. G.).*

Corresponding Author
Saikiran Chintakindi
Email: saikiran.52csk@gmail.com

OPEN ACCESS

**Keywords**

Agriculture, Data, Decision-making, Processing

*How to cite this article:*

Chintakindi, S., Karravula, R., Shastri, S., Muneer, S. and Arava, U., 2024. Growing Prosperity: Unleashing Agriculture's Potential with Cutting-edge Big Data Management Tools. *Vigyan Varta* 5(11): 34-37.

**ABSTRACT**

The transformative power of big data is evident across diverse industries, surpassing traditional data processing capacities. Challenges encompass capture, storage, analysis, curation, search, sharing, transfer, visualization, querying, updating, and information privacy. Significantly, the focus is on extracting value through advanced data analytics methods, emphasizing meaningful insights rather than sheer volume. Big data's significance lies in transformative actions, not just the information volume. Extracting data from diverse sources enables cost reductions, time efficiencies, innovative product development, and informed decision-making. The synergy of big data with analytics enables tasks like real-time failure analysis, personalized coupons, rapid risk portfolio recalculations, and pre-emptive fraud detection. In government, big data manages data influx from various sources for enhanced governance. In banking, it handles vast data using analytics for strategic decision-

making. Healthcare benefits from reduced silos and improved coordination. Telecom utilizes real-time analysis for predictive insights. Transitioning to agriculture, big data is transformative, surpassing traditional software capacities. Characteristics include large volume, variety, low value density, and high velocity. In agriculture, big data monitors conditions, issues early warnings, and optimizes resource utilization through precision farming. The integration of big data facilitates data-driven decision-making, benefiting the industry's development.

## INTRODUCTION

Big data is a term denoting dataset of such immense size or intricacy that conventional data processing software proves insufficient for their management. Challenges encompass various facets, including capture, storage, analysis, data curation, search, sharing, transfer, visualization, querying, updating, and information privacy. Notably, the term "big data" predominantly signifies the utilization of advanced data analytics methods such as predictive analytics and user behavior analytics to extract value from data. Importantly, it seldom pertains strictly to a specific size of the dataset, emphasizing the significance of extracting meaningful insights from large or complex data, rather than solely focusing on its sheer volume. Extracting data from diverse sources and analysing it offers opportunities for 1) cost reductions, 2) time efficiencies, 3) innovative product development, and optimized offerings, and 4) informed decision-making. The integration of big data with robust analytics enables businesses to achieve tasks like determining the root causes of failures in near-real time, generating point-of-sale coupons based on customer buying habits, recalculating entire risk portfolios within minutes, and detecting fraudulent behaviour pre-emptively. This synergy empowers organizations to derive actionable insights, fostering agility and competitiveness in today's data-driven landscape.

### The Application of Big Data in Agriculture

The application of big data in agriculture is transformative, as big data represents information that surpasses the acquisition, storage, management, and analysis capacities of traditional software and databases. It is an invaluable information asset, utilizing common software tools to capture, manage, and process data beyond tolerable time limits. Big data, fundamentally a vast dataset, exhibits characteristics that distinguish it from conventional data management and analysis techniques, as follows:

- Large Volume: Big data encompasses an exceptionally large collection that exceeds the capacities of traditional data processing methods or tools.
- Variety: It includes a wide range of data types, incorporating various categories, sources, and structures.
- Low Value Density: The vast amount of data may contain elements of low value, necessitating effective screening to extract valid and valuable information.
- Velocity: Big data processing is characterized by high-speed data processing, keeping up with the rapidly growing scale, and it is always in motion, with data being continuously produced.

Given the maturity and intelligence of big data technology, it has found applications in

diverse industries such as agriculture, metallurgy, mining, medicine, mechanical processing, and aerospace. In agriculture specifically, big data technology has been instrumental in addressing industry challenges and contributing significantly to its development.

**Presently, Agricultural big data finds application in:**

- **Agricultural Condition Monitoring:** Utilizing data to monitor and assess the conditions in agriculture.
- **Agricultural Product Monitoring and Early Warning**: Providing insights for monitoring agricultural products and issuing early warnings based on data analysis.
- **Precision Agriculture:** Employing big data for precision farming practices, optimizing resource utilization and enhancing overall efficiency.

In summary, the integration of big data in agriculture has proven to be a valuable tool, facilitating data-driven decision-making and significantly benefiting the industry's development.

**Implementing Big Data: 7 Techniques to Consider**

**Genetic Algorithms:** Genetic algorithms are techniques that is used to identify the most possibly viewed videos, TV shows and other forms of media. There is an evolutionary pattern that can be identified by genetic algorithms. Video and media analytics can be done by the use of genetic algorithms.

**Machine Learning:** Machine learning is another technique that can be used to categories and determine the probable outcome of a specific set of data. Machine learning defines a software that can be able to determine the possible outcomes of a certain set of events. It is therefore used in predictive analytics. An example of predictive analytics is probability of winning legal cases or the success of certain productions (Watson, 2014).

**Regression Analysis:** This is a technique that take the use of independent variables and how they affect dependent variables. This can be a very useful technique in determining social media analytics like the probability of finding love over an internet platform (Ratner & Ratner, 2011).

**Sentiment Analysis:** This is the ultimate technique that is used in text analytics. It looks at the actual sentiments of different people and then cross references them with the experience that is described in the text or audio response. Sentiment analysis is a categorization technique that is text based but can have applications in audio analytics.

**Social Network Analysis:** Social network analytics is one of the forefront techniques that can be used to determine the influence of an individual amongst others. The analysis of such kind of data can be very beneficial to the different parts of social interaction (Stimmel, 2015).

**Association Rule Learning:** This is the classification learning technique. It basically comprises of analysis of the data presented and finding relations between data presented.

The result is categorization of data with similar characteristics together. It has been used in different spheres of life. For example, the use of association rule learning can be used in text analytics. Websites that depend on user frequency to determine their frequency of users on the site and hence the productivity of a particular site over another (Ratner & Ratner, 2011).

**Classification Tree Analysis:** Classification tree analysis is the best way in which different

text data can be analyzed. Text analytics can also manifest itself in the form of classification tree analysis. Large historical data can be classified chronologically in through classification tree analysis (Watson, 2014).

## CONCLUSION

Big data analytics has been one of the most important breakthroughs in the information technology industry. The growth of the data that is being transferred the Information Communication Industry is getting to a point where it is becoming unmanageable (Watson, 2010). The use of big data analytics and extended storage spaces, like the Cloud has made it easier to manage the amount of data is processed in the internet. However, big data analytics cannot be the solution to all of the different problems are present due to the lack of storage space (Mohanty, Jagadeesh & Srivatsa, 2013). Compression should be incorporated in all analytic techniques so that the information that is realized at the end of analytic processing is reduced to a manageable size.

## REFERENCES

D. P. Acharjya, Kauser Ahmed P, 2017. "A Survey on Big Data Analytics: Challenges, Open Research Issues and Tools," International Journal of Advanced Computer Science and Applications (IJACSA), vol. 7, no. 2, p. 9

Gumma, M. K. et al. 2019. Agricultural cropland extent and areas of South Asia derived using Landsat satellite 30-m time-series big-data using random forest machine learning algorithms on the Google Earth Engine cloud. Gi science & Remote Sensing, v. 57, n. 3, p. 302-322.

Hou L, Wang XD, Gao Q, et al. 2018. Construction of agricultural big data mining system based on Hadoop. J Libr Inf Sci Agric; 30(7): 19–21.

Wang P, Zhao HL, Li PL, et al. 2018. Application of agricultural internet of things technology in soybean production. Soybean Sci; 37(5): 809–813.