HOW BIG DATA CAN BOOST AGRICULTURAL GROWTH

Context:

▸▸ The rising farmers suicide due to agricultural distress and falling farmers income has made us to strike at new innovative technological ideas.

What is Big Data?

▸▸ Big data is a term for data sets that are so large or complex that traditional data processing application software is inadequate to deal with them.

▸▸ Big data challenges include capturing data, data storage, data analysis, search, sharing, transfer, visualization, querying, updating and information privacy.

▸▸ The data could be from social networks, web server logs, traffic flow sensors, satellite imagery, broadcast audio streams, banking transactions, MP3s of rock music, the content of web pages, scans of government documents, GPS trails, telemetry from automobiles, financial market data and so on.

▸▸ It answers specific questions such as the need of the customers, their opinion and image of the brand.

▸▸ For organisations, analysis of this hidden data may give an insight into things which were previously hidden due to its bulk and the subsequent cost required for its process.

Applications of Big Data in India:

▸▸ Elections: The political parties accurately mine data from almost every Internet user in the country, and used this data to accurately understand voter sentiments and local issues.

▸▸ Big Data for detecting water leakages: Various city corporations is using Big Data and predictive analytics technology to create systems for monitoring water distribution systems.

▸▸ Discoms in India are using data from last mile sensors to implement measures of cutting down aggregated technical and commercial losses.

▸▸ In Railways: In order to predict ticket confirmations for trains with near accurate probability, various service providers use big data, so that travellers may decide whether or not to book a wait-listed ticket.

▸▸ Recently, NITI Aayog also echoed the idea of evidence-based policymaking guided by Big Data.

What is Big Data in Agriculture:

▶▶ In agriculture, big data is often viewed as a combination of technology and analytics that can collect and compile novel data and process it in a more useful and timely way to assist decision making.

▶▶ This could cover everything — from when it is best to apply fertilizers, chemical and seeds, to from where in the field it is best to apply a rate.

▶▶ According to agriculture funders, the big data practice comprises capturing relevant data from a huge number of sources, collecting it today and translating it into actionable information to improve business processes and solve problems at scale and speed.

▶▶ Real-time insights to help performance optimisation advance analytics can show how farmers are utilising their inputs and what adaptations are required to take account of emerging weather events or disease outbreaks.

▶▶ To achieve this, advanced algorithms are needed to swiftly unlock the highly valuable insights for products to perform well on an ongoing basis despite changing conditions. The development of highly-specific customer segmentation set has become possible to tailor product offerings to meet customer needs.

Role of Data Analysis in Agriculture

▶▶ Application of science and new technologies is currently lacking within this space. Many companies and start-ups are looking to fill this information gap.

▶▶ If Big Data has made serious advancement in fields like information technology, healthcare, education and even sports, there is an obvious need for it in the agricultural industry too.

▶▶ While the vast majority of farmers and ranchers did great work for maintaining and increasing soil health using conservation practices alone, measurement tools will be instrumental in ensuring a sustainable farming future.

▶▶ To maintain yields and meet the food demands of a growing population while also protecting natural resources required, making additional changes and data tools can help determine what these changes should be.

▶▶ The end result of gathering data is to analyse it and come up with actionable solutions with better results. For example, a satellite image of a plot of land has several layers of data embedded into a single spectrum giving us a tonne of information to analyse.

▶▶ The geospatial approach and satellite monitoring of farms have led to major advancement in how farmers and companies make their decisions.

▶▶ Benefits include faster unearthing of valuable insights and the ability to develop and adapt products that meet specific customer needs on an ongoing basis.

- Robots can play an important role in control, but it can be expected that the role of humans in analysis and planning is increasingly assisted by machines so that the cyber physical cycle becomes almost autonomous.
- In this range, we can encounter autonomous vehicle devices farmers place in the ground to measure soil moisture and nutrient, predictive weather stations and image-capturing satellites and drones mapping out land and measuring crop health.
- These insights are extremely important since they tell the farmer when and how much to irrigate a field, crop health, weather predictions, pest infestations and even drought conditions.
- Considering the increasing labour shortages in the sector the capacity for big data analysis that lessens the need for physical manpower is of great advantage for agriculture.

Application in Agriculture and Food Processing:

1. **Seed Selection** – Big-data businesses can analyse varieties of seeds across numerous fields, soil types, and climates and select the best.
2. **Development of new seed traits** - Access to the plant genome with new ways to measure, map and drive information better products.
3. **Crop disease** – Similar to the way in which Google can identify flu outbreaks based on where web searches are originating, analysing crops across farms helps identify diseases that could ruin a potential harvest.
4. **Irrigation** – Precision agriculture aids farmers in tailored and effective water management, helping in production, improving economic efficiency and minimising waste and environmental impact.
5. **Weather** – Advanced analytics capabilities and agri-robotics such as aerial imagery, sensors help provide sophisticated local weather forecasts can help increasing global agricultural productivity over the next few decades.
6. **Climate change** – 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.
7. **Food tracking** - Use of sensors and analytics to prevent spoilage and food-borne illnesses.
8. **Effect on supply chains** - Seismic shifts in the supply chain of seed, crop inputs and food driven by the democratisation of technology and information

9. **Food processing**
▸ They help in 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.
▸ They also optimise production schedules based on supplier, customer, machine availability and cost constraints.

1. **Precision Farming:**
   ❖ Big data takes advantage of information derived through precision farming in aggregate over many farms.
   ❖ The resulting analytics, insights and better decisions can then be deployed through precision farming techniques.

2. **Loss control:**
   ❖ In India, every year 21 million tons of wheat is lost, primarily due to scare cold-storage centres and refrigerated vehicles, poor transportation facilities and unreliable electricity supply.
   ❖ Big Data has the potential of systematisation of demand forecasting thus reducing such losses.

3. **Pricing**
   ❖ A trading platform for agricultural commodities can link 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.

Challenges Encountered

▸ Inefficient infrastructure (data management centers) for data collection and management
▸ Constant evaluation of feedbacks generated from new data required - To use Big Data effectively for policymaking, the government must adopt a dynamic approach and be willing to be flexible regarding its policy structure and processes.
▸ Anonymization of data or invasion of privacy and Data security - Lack of proper virtual safety raise grave concerns as most of Data today is generated online.

Way Ahead:

▸ The opportunities of data is immense in a country like India with 638,000 villages and 130 million with 140 million hectares of cultivable land under 127 agro climatic regions capable of supporting 3,000 different crops and one million varieties.

- But the real potential is what happens when this data from thousands of tractors on thousands of farms is collected, grouped and analysed in real time.
- 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 standardise big data through an enterprise-wide data management strategy.
- The government must establish well-equipped data centres in order to segregate the relevant data from the irrelevant.
- Thus, big data can play a major role in rising farmer's income and also to reduce the rising rate of farmers suicide.