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## A Study of 4<sup>th</sup> wave of revolution in the agricultural sector

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- **Abstract:** The use of conventional farming methods in India had traditionally led to comparatively less improvement in efficiency and agricultural yields resulting in low productivity of agriculture. Taking note of this, the government has initiated the **4<sup>th</sup> wave of revolution in the agricultural sector** to introduce technological advancement in the sector to improve yields. **Agriculture 4.0** is said to be a considerably advanced version of precision farming methods with the potential to transform the existing methods of farming.
- **Key Words:** Agriculture, India's economic growth, GVA, Revolution,
- **Introduction :**

Agriculture plays a significant role in India's economic growth. With around 54.6% of the total workforce involved in agriculture and allied sector activities, the sector contributes 17.8% to the country's Gross Value Added (GVA). During 2021-22, in the country's total exports agricultural exports contributed of to the tune of US \$ 50.2 billion with a 20% increase from US \$ 41.3 billion in 2020-21. In FY 2023, it is projected that the Indian agriculture sector will grow at the rate 3.5%.

The use of conventional farming methods in India had traditionally led to comparatively less improvement in efficiency and agricultural yields resulting in low productivity of agriculture. Taking note of this, the government has initiated the **4<sup>th</sup> wave of revolution in the agricultural sector** to introduce technological advancement in the sector to improve yields. **Agriculture 4.0** is said to be a considerably advanced version of precision farming methods with the potential to transform the existing methods of farming.

India's agricultural sector today is said to be on the verge of a breakthrough technological transformation. After decades of evolution, starting from Mechanisation and the Green Revolution, disruptive technologies are said to have ushered in Precision Agriculture. The new farm management approach uses Geopolitical Systems (GPS) and Artificial Intelligence-enabled software for precise mapping of farmlands, ensuring that individual fields or crops get precisely the inputs they need for optimum productivity.

- **Objectives of the Study:**

- 1) To Study the Agricultural sector of Indian Economy.
- 2) To Study the Introductory of 4<sup>th</sup> wave of revolution in the agricultural sector.
- 3) To Study the impact of 4<sup>th</sup> wave of revolution in the agricultural sector and national Income of our nation.

- **Data Collection :**

Data taken from used the secondary data collection sources.



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• **Explanation of the Paper :**

Agriculture plays a significant role in India's economic growth. With around 54.6% of the total workforce involved in agriculture and allied sector activities, the sector contributes 17.8% to the country's Gross Value Added (GVA). During 2021-22, in the country's total exports agricultural exports contributed of to the tune of US \$ 50.2 billion with a 20% increase from US \$ 41.3 billion in 2020-21. In FY 2023, it is projected that the Indian agriculture sector will grow at the rate 3.5%.

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India's agricultural sector today is said to be on the verge of a breakthrough technological transformation. After decades of evolution, starting from Mechanization and the Green Revolution, disruptive technologies are said to have ushered in Precision Agriculture. The new farm management approach uses Geopolitical Systems (GPS) and Artificial Intelligence-enabled software for precise mapping of farmlands, ensuring that individual fields or crops get precisely the inputs they need for optimum productivity.

Agriculture 4.0 is said to be a considerably advanced version of precision farming methods with the potential to transform the existing methods of farming. Precision farming focuses on a comprehensive approach towards maintaining the well-being of the field and the soil with a focus on improving the quality and quantity of yield with minimum environmental harm according to experts.

**The idea of 4<sup>th</sup> Revolution in agriculture according to experts involves:**

1. Use of the Internet of Things (IoT), that connects billions of physical devices around the world to the internet, all collecting and sharing data;
2. Big data, providing farmers granular data on rainfall patterns, water cycles, fertilizer requirements, and more;
3. Artificial intelligence to improve crop production and real-time monitoring, harvesting, processing, and marketing, and;
4. Robotic system that can perform tasks like ploughing, sowing seeds, applying fertilizers, and spraying pesticides with precision to accelerate and improve the efficiency of the activities throughout the entire production chain.

According to experts, Precision farming has the potential to transform the conventional farming industry. While the Conventional farming practices control watering of crops and spraying pesticides or fertilizers uniformly across the field, the farmers under Precision farming will need to be more targeted and data-driven in the context of farming according to them.

• **Future farms therefore will be more productive according to experts owing to:**

1. The employment of robotics,
2. Temperature and moisture sensors,



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3. Aerial photos, and;

4. GPS technology.

- **Prospects of Indian Agriculture:**

The continuous technological innovation in the Indian agriculture sector can play a critical role in the growth and development of the sector crucial for ensuring:

1. Increased agricultural production;
2. Generating employment, and;
3. Reducing poverty to promote equitable and sustainable growth.

- **Various Constraints to the achievement of this goal include:**

1. Diminishing and degraded land and water resources;
2. Drought;
3. Flooding, and;
4. Global warming.

These constraints, generating unpredictable weather patterns, present a significant barrier to India's agriculture to growing sustainably and profitably according to experts.

Under these circumstances, the future of agriculture seems to depend on the involvement of much-developed technologies like robotics, temperature and moisture sensors, aerial images, and GPS technology. Use of these, in the opinion of experts will make farms more productive, efficient, safe, and environmentally sustainable owing to the cutting-edge equipment, robotic systems, and precision agriculture.

- **Recent Trends in Agriculture:**

India's agriculture mainly depends on the nature. However changing climate and global warming are making farming unpredictable. The need to use modern technologies to increase productivity and profitability has therefore led to the adoption of Agriculture 4.0 in India.

There have been significant changes in India in the context of agriculture over the decades with development of many new technologies. Several new-age farmers are now using soil mapping software to determine the optimum level of fertilizers used in the farms.

Application of these emerging technologies in farming and agriculture has paved the way for more opportunities. The Agro-tech Start-ups and traditional farmers are now said to be using the latest solutions and trends to improve production in the food value chain, including the adoption of new technologies, such as cloud-based solutions which offer widespread access to weather forecasts and other critical information and other relevant advanced agricultural management techniques to increase farmer efficiency and produce more crops.

- **Some Examples include:**

1. Grape farmers in India have begun spotting and geo-locating crop diseases or pestilence, allowing them to control infestations earlier and in a more precise manner leading to lower use of harmful pesticides on the crop.



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2. Soil mapping software is used by several new farmers to determine the optimum level of fertilizer use in their farms.
  3. They are also using drones which allow spraying pesticides in a more targeted manner.
  4. Sugarcane farmers in India have started using technology to gauge the most appropriate time to harvest their crops, which allows them to better plan their harvest and maximize output.
  5. Several Indian farmers have also begun to use AI/ML-powered technologies to forecast crop yield, weather conditions and price trends in minds.
  6. A few farmers have also begun testing self-driving tractors and seed-planting robots to free their farms from the vagaries of labor shortages.

Emerging trends in the agricultural sector that are quite prominent in the post-liberalization era include increased production, increased investment, diversification of the sector, use of modern techniques, development of horticulture and floriculture, increasing volume of exports and development of the food processing industry.

- **The Top Global Trends Driving The 4<sup>th</sup> Revolution:**

Technological innovations are beginning to transform every link in the food chain, from seed to fork. In developed countries, digital technologies and analytics are making farm operations more insight-driven and efficient. Here are the five global trends catalyzing digital transformation in agriculture.

**Rising population and resulting :** increase in food demand. According to a UN FAO report, the world population is expected to rise to 10 billion by 2050 and boost agricultural demand by 50 percent compared to 2013, with an increase in **demand for proteins, fruits, and vegetables.**

**Declines in farm income :** Farm profits are at a record 12-year low. In the first forecast of 2018, the US Department of Agriculture (USDA) is predicting farm profits to dwindle 6.7 percent to \$59.5 billion, which is the lowest it's been since 2006.

**Digital disruption and consolidation:** Agricultural input retailers are facing pressure from increasing consolidation in the seed and crop protection industry and from changing demands from digitally native customers. Traders lack foresight into the crop volume and face highly volatile prices. And digitization across the value chain and expansion of in-house storage among farmers is disrupting their fundamental business model. Food loss and waste. According to UN FAO, about one-third of all food produced – approximately 1.3 billion metric tons — gets lost or wasted, while 795 million people go hungry. Every year, consumers in rich countries waste almost as much food (222 million metric tons) as the entire net food production of sub-Saharan Africa (230 million metric tons). Moreover, developing countries deal with a lack of cold chain infrastructure to transport fruits, vegetables and meat over long distances. The agriculture value chain, including total sales in billions over a single year. Precision farming and technological advancements along the supply chain can help address these challenges and meet



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rising global food demand, driving the next wave of agricultural revolution. Here are four major technology trends shaping the fourth agricultural revolution.

**Farm Robotics :** Robotics is getting better and better, and their viability is being explored across the agricultural value chain, from planting to harvesting, to meat processing and grocery logistics. John Deere spent \$305 million last year to acquire Blue River technology, a startup that makes robots capable of identifying unwanted plants and spraying them with high-precision herbicide, reducing input costs and increasing efficiency. There is also new demand for robotics as a service, especially when it comes to fruit picking. By 2024, robots are forecast to navigate the farm to the tune of an estimated \$5.7 billion agbot industry, five times the market size in 2016.

**Remote Sensing:** A myriad of remote sensing techniques, from in-field sensors to drones to satellite imagery, are allowing farmers to view their crops from multiple perspectives. With advances in computing and sensor technology, farmers can now get access to high-cadence, broad area coverage with field-level detail. All these provide farmers up-to-date information in real-time, so changes can be made accordingly to their crops.

**Machine Learning and Analytics :** Machine learning and advanced analytics are being used to mine data for trends in every sector, and agriculture is no exception. These can be applied before seed planting with plant breeders. Machine learning can predict which traits and genes will be best for crop production, giving farmers the best breed for their location and climate. At the field level, machine learning techniques that use satellite data to distinguish between crops, like corn and soy, providing valuable information for crop insurance, logistics, and commodity markets. The intersection of robotics and data from an increasingly connected farm will accelerate this trend even further.

**Block chain:** Earlier this year, one of the world's largest commodity traders, Louis Dreyfus (LDC) joined forces with ING, ABN Amro, and Society General to complete the agricultural sector's first block chain commodity transaction. The prototype was used to execute a soybean shipment transaction from the United States to China. Featuring no paper contracts, certificates, or manual checks, the soybean shipment transaction from seller LDC to Chinese buyer Shandong Bohi was completed at five times the speed of a paper-based trade using ING's block chain prototype, increasing transparency, traceability and efficiency along the supply chain.

Agriculture is undergoing massive transformation because of digitization, creating market dynamics that are difficult to predict. With investors putting more than \$700 million into agtech companies in 2017 (about double the previous year), more change and disruption are on the horizon.



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• **Findings and suggestions-**

1. The farmers must advantage of these technologies to productivity on their farms.
2. There is also new demand for robotics as a service, especially when it comes to fruit picking, which related to the 4<sup>th</sup> wave of revolution in the agricultural sector.
3. The precision farming or these cutting-edge methods will improve farm profitability, efficiency, safety, and environmental friendliness according to them. These together are referred to as advanced or high-tech precision farming are also related to the 4<sup>th</sup> wave of revolution in the agricultural sector.
4. The 4<sup>th</sup> Revolution in agriculture according to Use of the Internet of Things, Big Data, Artificial intelligence, Robotic system.
5. The constraints of 4<sup>th</sup> Revolution involved, generating unpredictable weather patterns, present a significant barrier to India's agriculture to growing sustainably and profitably

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