

Indian Agriculture Industry and Technology Integration

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Being a South Asian nation, India is the seventh-largest country by area, the second-most populous country as of 2022, India's population stood at 1.417 billion people, and the country is projected to become the most populous democracy by 2030, home to more than 1.5 billion people in the world. India boasts of an immensely rich cultural heritage, including numerous languages, traditions, and people. The country holds its uniqueness in its diversity, and hence has adapted itself to international changes with poise and comfort. While the economy has welcomed international companies to invest in it with open arms since liberalization in the 1990s, Indians have been prudent and proactive in adopting global approaches and skills. Indian villagers have proudly taken up farming, advanced agriculture and unique handicrafts as their profession on one hand, while the modern industries and professional services sectors are coming up in a big way on the other. India is an agrarian economy at its core, with over half of its population engaged in agricultural activities, there are some challenges the agriculture sector has faced for a long time. These include unsustainable practices, lack of tech penetration, limited market access, and, most recently, the threat of insufficient food for the population. Recent years have seen the agriculture industry evolve and grow drastically due to increased digitization, awareness, and above all, agritech platforms and the government's increased focus on the sector's betterment.

Sectoral Advantage for India

Robust Demand of processed foods

Factors contributing to the sharp growth in demand for processed foods include increasing urbanization, increasing disposable incomes, changing spending patterns/ priorities, the emergence of nuclear families, and the growing need for convenience foods in dual-income nuclear families. The demand for organic products in the Indian market

is growing and is anticipated to rise with a CAGR of 25.25% between 2022-27.

Attractive Opportunities

Trends indicate a sharp increase in on-the-go eating, snacking in between meals, switching to healthier eating alternatives, pre-cooked ready-to-eat meals, and increasing consumption of organic foods. This has led to a host of new opportunities in the consumer foods market for both domestic and international companies to build a stake in this fast-growing processed food market.

Policy Support for Market Expansion

Online, Competitive, Transparent Bidding System with 1.74 crore farmers and 2.39 lakh traders put in place under the National Agriculture Market (e-NAM) Scheme. A new sub-scheme of PM Matsya Sampada Yojana with a targeted investment of Rs. 6,000 crore (US\$ 729 million) to be launched to further enable activities of fishermen, fish vendors, and micro & small enterprises, improve value chain efficiencies and expand the market.

Competitive Advantage in Processing Sector

India has access to several natural resources that provides it a competitive advantage in the food processing sector. Due to its diverse agro-climatic conditions, it has a wide-ranging and large raw material base suitable for food processing industries. India has the second-largest arable land resources in the world. With 15 agro-climatic regions, all the major climates in the world exist in India. The country also has 46 of the 60 soil types in the world. India is the largest producer of spices, pulses, milk, tea, cashew, and jute, and the second largest producer of wheat, rice, fruits and vegetables, sugarcane, cotton, and oilseeds. Further, India is second in the global production of fruits and vegetables and is the largest producer of mango and banana.

According to the Department for Promotion of Industry and Internal Trade (DPIIT), the Indian food

processing industry has cumulatively attracted Foreign Direct Investment (FDI) equity inflow of about US\$ 25.47 billion between April 2000-March 2022. India's agricultural and processed food products exports stood at US\$ 9,598 million in FY 2022-23 (April-July 2022), up by 30% YoY. Gross Value Added by the agriculture and allied sector is 18.8% in FY 2021-22 (until 31 January, 2022). India has the largest livestock population of around 535.78 million, which translates to around 31% of the world population

Current Scenario of Agriculture Industry

As the backbone of the Indian economy, the agriculture industry contributes to around 16.5% of India's GDP. As of 2022, the Indian agriculture market value stood at USD 435.9 billion and is expected to reach USD 580.82 billion by 2028, growing at a CAGR of around 4.9% between 2023 and 2028. Agritech has been a game-changer to the Indian agriculture industry, which has been relatively slow in terms of technology adoption and digitization compared to other sectors. Today, Agritech has become a promising arena for investors, entrepreneurs, the agricultural community, and all other stakeholders. According to data by NASSCOM, India had around 450 agritech startups in 2022, with the number growing at 25% year-on-year.

Greater Integration of Technology

Like other sectors, AI is a game-changer for the agriculture sector as well and given that technology penetration is lower in agriculture compared to other industries, AI can be incredibly beneficial in building meaningful solutions. For instance, AI can be transformative in helping the farming community optimize water usage and energy consumption and even determine what crops should be grown when depending on the weather conditions and soil quality. The technology is now revolutionizing the Agritech segment in several ways, including through predictive modeling, supply chain management, and automation to improve efficiency and minimize costs.

Similarly, blockchain is another groundbreaking technology in the Agritech

ecosystem. Its potential is only now being discovered. By leveraging blockchain, agritech platforms can reinforce the dynamics of Agri trade, which is necessary given the rise in demand for food supply and security and enable transparency in the agriculture ecosystem. In fact, blockchain is one of the only technologies that enable traceability in the food supply chain. With more agritech platforms integrating blockchain into their operations, the technology is likely to uplift the agriculture sector sooner than anticipated.

Apart from Blockchain and AI, technologies like IoT play a crucial role in the agritech segment. In agriculture, IoT is often used to efficiently measure and monitor soil health and data, the chemical and physical composition of the crops, and weather conditions. Further, agricultural robotics and drones are now being tested and deployed in certain areas of farming to minimize manual labor and enable farmers to make more informed decisions. These advanced technologies will become more than just passing trends; they are likely to shape the food ecosystem and drive agribusiness growth.

Sustainable/Green farming practices

While technology is advancing constantly and taking center stage, the alarming levels of global warming and climate change are anything to go by, it's high time to prioritize sustainable agriculture. For instance, concepts like regenerative agriculture, a holistic farming method that ensures the soil is healthy by replenishing resources, are gaining traction. Besides, regenerative agriculture also minimizes the usage of chemical inputs to avoid adverse impacts on the soil, water, and the environment. Farmers are also being educated on the effects of stubble burning and taught more sustainable farming practices.

Agriculture, Food Industry and Exports

The agriculture sector is the largest source of livelihood in India. The country is one of the largest producers of agriculture and food products in the world. In 2022-23, India's agriculture sector growth rate was estimated to be at 3.5% and it was 3.0% in

2021-22. The country produces many crops and food grains such as rice, wheat, pulses, oilseeds, coffee, jute, sugarcane, tea, tobacco, groundnuts, dairy products, fruits, etc. India's exports of agricultural commodities stood at US\$ 52.49 in FY23.

During 2021-22, India's tea production stood at 1,344.40 million kg. Coffee production during the same period was 3,420 lakh tonnes, a 2.39% YoY increase. During 2021-22, oilseeds production of India crossed the estimated 37.15 million tonnes while other products such as rice, wheat, maize, pulses, mustard, and sugarcane reached a record high production.

Key Trends Expected

1. Changing demand due to increase in income, globalization and health consciousness is affecting and going to affect more the production in future. Demand for fruits and vegetables, dairy products, fish and meat is going to increase in future.
2. Researches, technology improvements, protected cultivation of high value greens and other vegetables will be more. There will be more demand of processed and affordable quality products.
3. More competition will be there among private companies giving innovative products, better seeds, fertilizers, plant protection chemicals, customized farm machinery and feed for animals etc in cost effective ways at competitive prices giving more returns on investment by farmers. Use of biotechnology and breeding will be very important in developing eco-friendly and disease resistant, climate resilient, more nutritious and tastier crop varieties.
4. Some technologies will be frequently and widely used in future and some will become common in a short time while some will take time to mature. For producing the same products in other way so as to use resources judiciously and using new resources also like hydroponics, use of plastics and bio-plastics in production. There will be more of vertical and urban farming and there will also be efforts in long term to find new areas for production like barren deserts and seawater.
5. Precision farming with soil testing-based decisions, automation using artificial intelligence will be focused for precise application inputs in agriculture. Sensors and drones will be used for precision, quality, environment in cost effective manner.
6. Small and marginal farmers will also be using these technologies with the help of private players, government or Farmer Producer Organizations (FPO). Use of GPS technology, drones, robots etc controlled by smart phones etc. can make life of farmers easy and exciting with good results. These advanced devices will make agriculture be more profitable, easy and environmentally friendly.
7. Use nano-technology for enhancement of food quality and safety, efficient use of inputs will be in near future. Nano-materials in agriculture will reduce the wastage in use of chemicals, minimize nutrient losses in fertilization and will be used to increase yield through pest and nutrient management.
8. India has improved remarkably in its digital connectivity and market access has become very easy. The number of internet users is projected to reach 666.4 million in 2025. Farmers will be behaving more smartly with mobiles in hands and would be able to be more aware and connected with different stake holders. Government will be making wide use of digital technology for generating awareness among farmers, information sharing, government schemes using digital technology for direct transfers of money.
9. There will certainly be more work by government, village communities, agri startups and private players in conserving sharply depleting water resource. Use of

digital technology can make revolution in this direction. There will be use of satellites, IoT, drones for better collection of data regarding soil health, crop area and yield which will make cost for insurers less with better estimations and system will be more exact and effective.

10. There will be more of niche marketers in operations, area, and crop specific small equipment's which will make operations even at small farms easier and efficient. Food wastage will be less and better use of waste materials in agriculture will be more. Number of warehouses in private sector will be more and linkages between government and private warehouses will be increasing. This will help in balancing supply with demand and stabilization of prices of agri-outputs in the market.
11. Retailing in agriculture will largely be digitalized. A study estimates that over 90 per cent of Kirana stores across the country will be digitalized by 2025 with modern traceable logistics and transparent supply chain. Many players have already taken Kirana stores to the door steps of consumers like Amazon and Jio Mart.

Way Forward

Farmers need to be empowered to make informed choices about their crops, markets, inputs, technologies, and organizational forms. They also need to be protected from price volatility, climate shocks, pests and diseases, and other uncertainties. This can be achieved by strengthening the existing institutions and mechanisms such as Minimum Support Price (MSP), crop insurance, extension services, cooperatives, etc., as well as creating new ones such as contract farming, e-NAM, farmer producer organizations, etc.

In the Union Budget 2023, the government has announced that the credit target for the agriculture sector will be increased to Rs 20 lakh crore, with a renewed focus on animal husbandry, dairy, and fisheries. This will benefit the community immensely, seeing as how credit access has always been hard to come by for farmers. Additionally, the government also plans on adopting a cluster-based value chain approach which will facilitate collaboration between farmers, state, and industry inputs and market linkages. Overall, agri-techniques and industry is redefining the status quo of the ecosystem to ensure the betterment of the community and all its stakeholders. The future indeed seems bright for the industry.

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