

Agribusiness

embracing digital technology

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Adoption of digital technologies in agriculture has been increasing at a rapid pace. Precision agriculture technologies are changing the way that farmers manage their crops and being adopted at a growing rate. Technology in agriculture, also known as AgTech has rapidly changed the industry. People in the industry—farmers, food producers—must embrace the digital transformation trends in agriculture. By using technology as a sustainable and scalable resource, we will be able to take agriculture to new heights. Internet of things (IoT) is simplifying and streamlining the collection, inspection and overall distributing of agricultural resources using sensors on equipment and materials. Robotics within agriculture would improve productivity and would result in higher and faster yields. Robots used for spraying and weeding can reduce agrochemical use incredibly. Most innovative pieces of the digital transformation is the ability to use machine learning and advanced analytics to mine data for trends. This can start way before the planting seed, with plant breeders. Machine learning can predict which traits and genes will be best for crop production, giving farmers all over the world the best breed for their location and climate. Machine learning algorithms can also be used within the manufacturing aspect of agriculture, where consumers purchase their products. Time is now that we really need to move with a sense of urgency to apply these new tools to accelerate the pace of agriculture development.

Key words: Agriculture, Drone, Farmer, Internet of Things, Sensors

GROWING world's population, both in developed and developing nations, will increase the demand for fairly produced, preservative-free and sustainable food. This change will impact global food demand and security. In India, where the farmer is not yet equipped with the latest technology nor trained to adopt it fast, digital farming is

slowly entering Indian farms to assist farmers in better decision making. Digital technology holds tremendous potential to transform the Indian agricultural economy and impact the lives of Indian farmers. Major challenges confronting Indian agriculture include unsustainable usage of resources, diminishing and degrading natural resources,

declining farm productivity, a rapidly growing demand for high-quality and safe food, stagnating farm incomes and fragmented land holdings, can be overcome through sustainable and scalable deployment of digital technologies and infrastructure.

Digitalization of agribusiness, which involves leveraging the massive amounts of data from agricultural

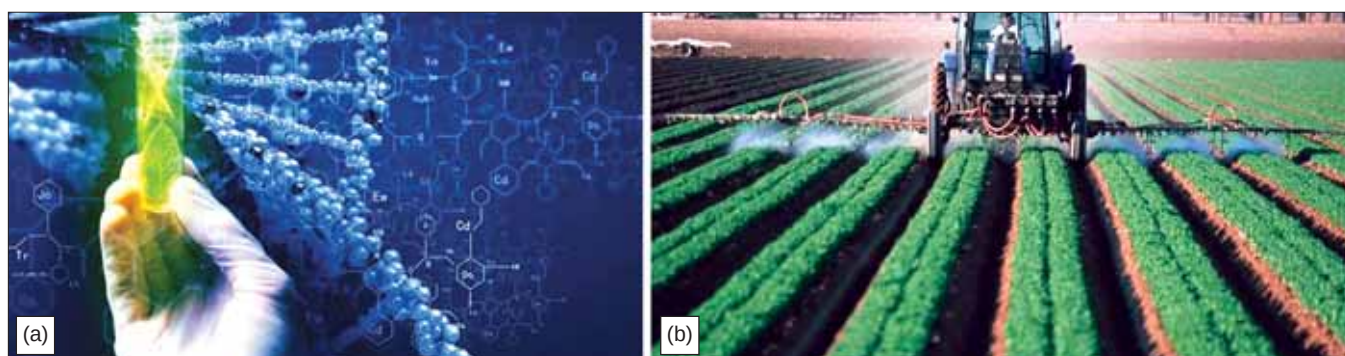


Fig. 1. Biosciences (a) and (b)



Fig. 2. AG Tech: 100+ Technology Companies Changing the Farm

equipment, soil, weather, seeds and chemicals and using modern computer science to automate agriculture, is playing a key role in meeting global food demand. Indian agtech start-ups—nearly 300 of them—in the hunt for a sustainable farming solution to a rapidly rising population are changing the face of agriculture. With the global smart farming market set to grow at a compound annual growth rate of 13.27% to reach \$12 billion by 2021, India is at the threshold as it is home to one-fifth of the global smallholder farmers. Numerous farm-level applications of digital technology, including remote sensing, GIS, crop and soil-health monitoring, and livestock and farm management, have been making their mark. At the pre-harvest stage, digital technology can recommend crop and input selection

and assist in obtaining credit and insurance. Weather advisories, disease and pest-related assistance through data generation as well as the advanced analytics allow farmers to make smart decisions about farming and benefit from an economical use of inputs and labour.

However, farmers are always challenged to grow more while coping with volatile weather to meet the rising demand for more food of higher quality. This demands of improving efficiency on inputs and outputs and various technologies have evolved in order to improve the efficiency. The Indian agribusiness sector stands to greatly benefit from the numerous innovative digital technologies across farm, post farm, processing, market and logistics that have emerged in the recent past. Here, the study highlight some key

digital technologies that can truly transform India's agribusiness sector:

Biosciences: It offer great potential to significantly impact on agricultural technology, particularly biotechnology. To increase yields and reduce costs, farmers are using a wide variety of new bioscience technologies that optimize inputs to agricultural production. A Bengaluru-based startup has developed a product in bio-stimulant segment to provide growers with a reliable solution to improve crop quality and productivity. Providing inputs to farmers on crop and soil management during their entire cropping cycle by a startup led to remarkable results in Madhya Pradesh, achieving increased yields of 40% for garlic.

Farm optimization and monitoring services: Leveraging IoT, big data, cloud and mobility are increasingly use to improve farm output.

A range of service providers on the **Farming-as-a-service (FaaS) model** are leveraging digital technology to provide innovative farm-to-fork solutions to farmers and agri businesses.

Precision agriculture: It is adopted by the farmers to optimize their use of resources, be it water or fertilizer, aiming to bring efficiency to the farm in terms of cost, yield, etc. Further, it support decision making in irrigation, crop management, water optimization, and the like. Precision agriculture technologies ranging from robots, sensors, drones, satellite imagery, big data and Internet of Things (IoT), among others, are employed in various stages of agriculture from environment analysis, irrigated landscape mapping, soil analysis, to crop health analysis. These technologies bring in reliable

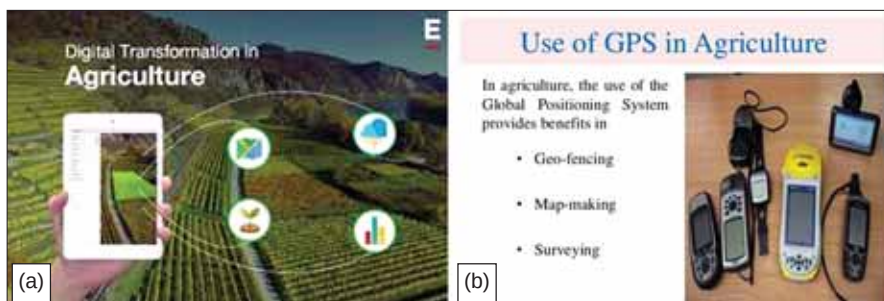


Fig. 3. Use of GPS in Agriculture (a) and (b)



Fig. 4. Precision Technology in agriculture (a), (b) and (c)



Fig. 5. Precision technology agriculture; Drone spraying chemicals on crops

quality data which help in timely crop damage assessment, advance crop planning, diversification and contingency planning. Here are few examples of technologies in precision agriculture.

- *Weather forecasting and monitoring*, thus providing agri-risk solutions with a high level of accuracy in the short, medium, and long term too is an important innovation.
- *Numerous innovators with solar-powered phase change* enabled materials are offering products for irrigation and cold storage, with the aim of catering to smallholder farms and regions with limited or no electricity.
- *Eco-friendly crop protection methods* are also coming up, that have the potential to minimize a significant proportion of the damage caused by pests and diseases without overdosing crops and plants with chemicals, thus preventing soil and water contamination.
- *Sensor* capable of providing farmers with information about crop yields, rainfall, pest infestation, and soil nutrition are invaluable to production and offer precise data which can be used to improve farming techniques over time.
- *IoT* is leveraged to remotely monitor sensors that can detect soil moisture, crop growth and livestock

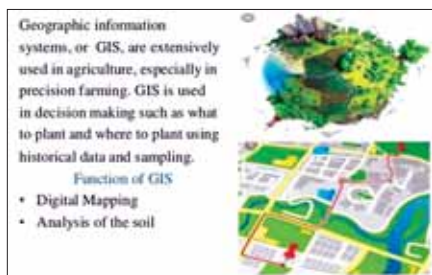


Fig. 6. Use of GIS in Agriculture

feed levels, remotely manage and control their smart connected harvesters and irrigation equipment, and utilise AI-based analytics to quickly analyze operational data combined with third party

information, such as weather information, to provide new insights and helps in decision making that is crop selection, crop outputs, etc.

- *Drones* is an invaluable tool for farmers as they help them scan fields, monitor crops, seeding and analyze plant health, among others. Drones with advanced sensors and imaging processing capabilities can capture highly accurate images of the field, which expose everything from irrigation problems to soil variation and even pest and fungal infestations by seeing crops from the air. Drones are also being used to spray chemicals on crops while being careful not to penetrate groundwater. Recent studies have shown that drones can increase the speed of spraying by five times compared to other types of machinery.

India has recently unveiled its 'Drone Regulation 1.0' policy. These guidelines will foster technology and innovation in the development of drones devices which have an extensive range of applications ranging from disaster relief to agriculture. A Hyderabad-based engineering design service company and a leading fertilizer company in south India are working together on a precision agriculture project to monitor farms using drones in order to monitor and act on crop health.

Data enabled agriculture to combines the application of sensors' connectivity, drone, data storage and aggregation, optimization hardware, software platforms, big data analytics and IoT, converting traditional farming into smart farming.

The Indian government is also serious about leveraging new-era

digital technologies for agriculture. In May 2018 the NITI Aayog, the government's main think-tank, signed an agreement with one of the big software firms to develop a model for crop-yield predictions using artificial intelligence (AI) so that farmers can be provided real-time advisories.

Internet usage by 2020 in rural India is expected to be 315 million and it may lead to penetration in rural areas and that would be the inflection point for the agtech market in India. Agriculture startups can unleash umpteen opportunities to strengthen the supply chain in Indian agriculture. We really need to move with a sense of urgency to apply these new tools to accelerate the pace of agriculture development.

The common barriers to commercialization and scaling up of technology are access to finance, cash flow management, gaps in technology infrastructure, limited access to institutionalized farmer networks, amongst others. For innovation and entrepreneurship to be effective in transforming agriculture in India, it will be important to address these issues and create an enabling environment in which they can grow and flourish.

SUMMARY

Uptake of technologies at market prices in a sector that has traditionally been heavily subsidized remains challenging, but farmers are prompt to identify what works in their interest and are ready to pay for it. Digital technologies offer the potential to achieve the necessary conditions for scale, with distributed low cost and customized delivery, thus attracting private investment in agri-innovation. The challenge before India lies in balancing high growth with inclusive growth in agriculture, which can be achieved by an effective policy framework, innovative financing and enabling technology ecosystem which can empowered Indian farmers and make agriculture sustainable.

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