



The gadgetization of agriculture: Future frontiers of AgTech

by Raghavan Sampathkumar

When information technology meets agriculture, no day passes without newer applications, which once remained in the world of fantasy being discovered. Thus the “AgTech” space has become a hotbed for several technological innovations including high-tech precision farming, geospatial technologies, artificial intelligence, Big Data, IoT, drones, advanced gene editing techniques, and cloud computing. Globally, the AgTech sector is buzzing with huge investments aimed at nurturing greener and sustainable (environmentally and financially) business ideas.

It is evident from the growing investments in various food and agriculture technology start-ups globally, which nearly doubled from 2019 to a whopping US\$22.3 billion in 2020. According to Agrifood Tech Investment Review 2020 by Finistere Ventures, a third (33%) of the total funds raised went to companies operating in the food, feed, and fuel sectors. Around 29 percent was garnered by companies in the crop protection and production and 27 percent was secured by companies in the food chain logistics sectors.

Players working on the digital applications in agri-food tech space were able to raise nine percent while two percent went to fund companies innovating in the animal health and nutrition industry. Other sub-sectors of interest include indoor farming, alternative proteins and plant-based meat.

Rain & data clouds

For several millennia, agriculture remained dependent on rain-bearing clouds. In the 21st century, it will become dependent on two kinds of clouds - one for rain and another for data. In fact, the latter is the key to make agriculture improve its resilience against the vagaries of the former.

Globally, farming has started moving on the information superhighway and it is no longer just the ‘sow seeds and reap produce’ story but ‘plant sensors and harvest data’.

It is simply amazing to see the level of precision, may it be an individual tree (Such as in palm oil plantations) or a square meter plot and accuracy achieved by the latest technologies. At a time when resource use efficiency, environmental stewardship and sustainable practices in the supply chains assume greater importance, precision helps adopt variable rates of application

(VAR) to cut down excess and unnecessary application of inputs including irrigation, fertiliser, and chemicals.

Treatments can be site-specific or even tree-specific as data from the drones and other UAVs helps accurately pinpoint a site or a tree that needs attention. This high level of precision leads not only to huge savings on input costs and limiting the interventions within the targeted areas but most importantly prevents excess application which impacts non-targeted areas including sensitive or vulnerable spots for biodiversity.

Further owing to judicious application of inputs, environmental issues such as runoffs and leaching of nutrients are avoided to the extent possible. All these not only improve the profitability of the plantations but also ensure sustainable operations.

Other examples from Indonesia proved drainage designs can be improved with the use of high-resolution satellite imagery, which boosted yields besides preventing flooding in the plantations. Obviously, these insights can be applied for other crop sectors as well.

From the above example, it is evident that these technologies pave the way for significant improvements in efficiency of input-use. This will result in huge cost savings on inputs and precious resources like water, whilst also improving yields, food quality and ultimately, profitability in farming in general including the smallholders.

It is paramount to note mapping of soil, landscape and crops serve as the basis for all improvements that can happen on the farms. Further, accurate yield mapping for strategically important crops on a provincial level or country level can help the governments to improve the accuracy of their production forecasts and ensure sufficient availability of food stocks.

This is particularly most important in Asia and Africa where many countries are still vulnerable to even small-scale shocks in production, supply and price shocks of key food commodities.

Data-driven decisions

Investment in the very latest technologies cannot be justified unless decision support systems can convert massive amounts of raw data into easy to use, timely, relevant, and actionable insights. Furthermore, accuracy and reliability of the data collected will

be very critical for taking correct decisions at the right time. However, any improvement in these aspects will need to be continuous and cumulative.

Examples from several countries signify growing popularity of on-the-go “mobile-based” systems. Further, improved, and accurate surveillance through drones helps take timely decisions on proactive measures for example preventative or prophylactic chemical spraying when initial signs of pest attack or disease infestations show up.

Responsible businesses reap rewards

In terms of the conservation and sustainability aspects, the potential is rather enormous. For example, geospatial technologies were demonstrated to have helped accurately measure, map and track forest areas and help in efficient land use planning, administration and management of natural resources particularly in environmentally most sensitive regions of the world - like the Amazon or the rain forests of Southeast Asia.

This is particularly applicable to several palm oil plantations in Malaysia and Indonesia that widely use these technologies as a critical component of their commitment to sustainable production specifically, deforestation.

Enhanced HSE compliance and workers’ welfare

Application of drones has opened a wide range of benefits for the farmers and the companies operating in the crop protection and production sectors. For example, geospatial technologies combined with robotics and automation offers huge opportunities to limit or completely eliminate human labour involvement in agronomic operations.

Both in the broad-acre plots and plantations that are difficult to access, spraying can be done using UAVs whereby exposure to hazardous chemicals, indiscriminate or misuse besides avoiding unexpected or accidental release of contaminants or pollutants in the environment including waterways. GPS-guided drones and UAVs are of great utility particularly, such as in terrains that are unsafe or inaccessible for the labourers during heavy downpours.

The list of applications of AgTech innovations is getting bigger and bigger. However, to leverage the fullest potential of AgTech, all the food value chain stakeholders – both upstream and downstream – such as farmers, ag-input companies, aggregators, service providers, food processors, governments and research institutions need to collaborate and synergise if they are to feed the world sustainably.

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