



# What's next for Indian agri-tech?

Emerging opportunities and the way forward for  
India's agricultural technology sector

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# EXECUTIVE SUMMARY

Agri-tech start-ups are disrupting India's agriculture sector, beginning with market linkages to now becoming 'full-stack' providers, first movers in in-farm and novel farming innovations, and value-added services such as agri-fintech. Investments in India's agri-tech start-ups grew from US\$ 44 million in 2016-17 to US\$ 323 million in 2020-21. Traditional agriculture companies focused on the upstream and midstream value chain, such as agrochemical and farm-mechanization players, while still leading in biotechnology, are falling behind on business model innovations. They have only recently begun redressing the gap by increasing their investments in agri-tech.

While Indian agri-tech players' initial focus was on business model innovations to disintermediate the agriculture sector's fragmented supply chain, advanced economies such as USA and Israel have pioneered technological innovations in other areas of the agricultural ecosystem. Most global agri-tech activity is focused on sustainable inputs such as bio-stimulants, digital in-farm solutions, novel farming systems, seed-to-fork traceability, and agri-carbon. We believe that these categories, each with significant potential to improve farmers' incomes and livelihoods and ensure food security for the future, will drive the next phase of India's agri-tech growth, driven by several socio-economic, political, and environmental factors.

Funding to India's agri-tech start-ups continues to grow in the near term, but the sector must brace itself for a potential slowdown in the medium term, given the global funding crunch. Meanwhile, the government has begun mainstreaming agri-tech in Indian agriculture through new policies and schemes that promote private sector participation. As these trends materialize, we may see a 'battle of platforms' as start-ups compete for farmer attention. We are already witnessing consolidation in the sector, which will likely continue. In this context, agri-tech start-ups need a more acute focus on profitability and sustainable growth to survive. Traditional agriculture companies, too, must make calculated but swift decisions to keep pace with this rapidly evolving landscape. Whether they choose to deepen their expertise as specialized solution providers, or to expand into adjacencies, they must embrace technologies such as data analytics and digital networks. Based on their growth ambitions, these players can opt for capital investments, strategic partnerships, or corporate venturing to succeed across the agri-tech value chain.

We have organized this white paper into three sections: (a) the current state of Indian agri-tech, (b) the landscape of emerging opportunities, and (c) a recommended way forward—for traditional agriculture companies to succeed across the agri-tech value chain, and for start-ups to address the stiff competition ahead.



# INDIAN AGRI-TECH TODAY

**Agriculture accounts for an estimated 43% of India's employment,<sup>1</sup> and India is a net exporter of agri-products.<sup>2</sup> Despite its importance, however, the sector is fraught with challenges.** Indian farmers face increasing cost and margin pressures due to several operational issues and structural barriers.

**Rising input and production costs**, especially of inputs such as fertilizers, at a rate faster than the rise in prices for major crops, are lowering farmer incomes. This is exacerbated by the unavailability of key inputs during peak seasons, as evidenced by the severe shortage of di-ammonium phosphate during the sowing season in 2021, which even led to adverse law and order situations in some states.<sup>3</sup>

**Threats to sustainability due to climate change, intensive cultivation** and improper nutrient replenishment have manifested in the stagnating or declining yields of most crops. Growing incidence of extreme weather events, and a rise in temperature put additional pressure on farm productivity, causing about a 1.5 percent loss in GDP annually.<sup>4, 5</sup>

**Labor shortage and limited mechanization** are common features of small and marginal farms. As more youth migrate toward non-farm jobs, the proportion of prime working-age population in agriculture has reduced by more than one-third in many states during the period 2004-2019.<sup>6</sup> Farmers face a shortage of labor, especially during peak harvest and sowing periods. Small and marginal farmers are also unable to utilize mechanization solutions as they are typically capital intensive and existing financing options are inaccessible or unaffordable. Equally, tenant farmers are reluctant to invest in their farms because of tenuous land rights.

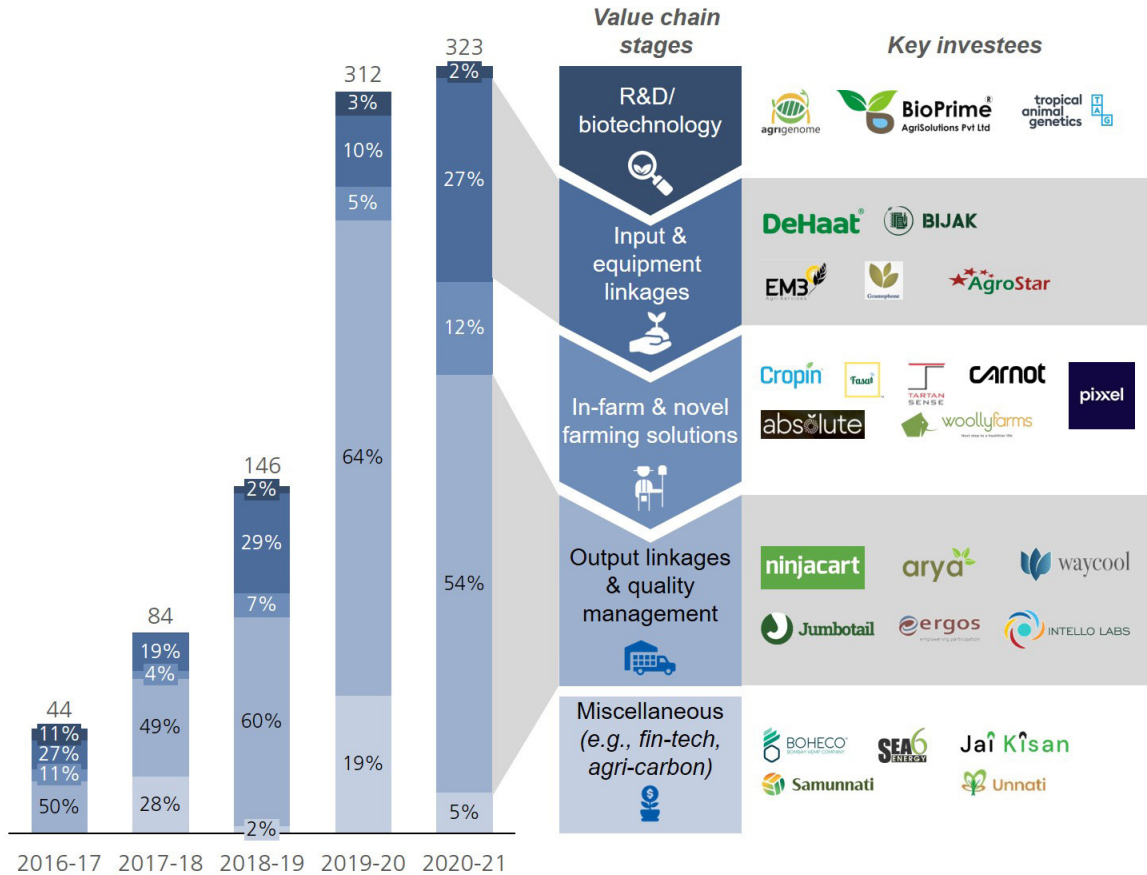
**Low share of the final price of produce** is a result of several underlying factors. First, small and marginal farmers often lack connectivity to wholesale markets, or *mandis*, situated at an average distance of up to 50 kilometers.<sup>7</sup> This results in a reliance on local collection centers, and creates information asymmetry, as there are no systems to allow price discovery. This prevalence of intermediary aggregators also undermines price premiums for higher-quality produce.<sup>8</sup> A lack of warehousing and storage capacity leads to wastage, and further limits farmers' bargaining power. Finally, an inability to predict crop demand and pricing, coupled with a lack of awareness and utilization of crop insurance, results in an inability to hedge against price volatility.

Agri-tech innovations, although relatively new, have the potential to address many of the key challenges faced by farmers. Next-generation agri-tech businesses are making better information and technology available in the hands of farmers, thereby providing opportunities to improve their

incomes, better their livelihoods, and engage in more sustainable food production.

**Start-ups are driving India’s agri-tech innovations and growth story, witnessing phenomenal investment activity.** Indian agri-tech start-up funding grew more than six times, from US\$ 44 million in 2016-17 to US\$ 323 million in 2020-21 (See Figure 1).

FIGURE 1: AGRI-TECH START-UP FUNDING IN INDIA, 2016-21 (IN US\$ MILLION)



Notes: Percentages may not total 100 due to rounding; Start-ups are categorized based on their primary business at the time of receiving funding. For example, although Dehaat now provides “end-to-end” solutions across all value chain stages, it is categorized within “Input & equipment linkages” since input sales accounted for a majority of its revenue during this period. Source: FSG Analysis based on data from Tracxn (2016-19) and AgFunder (2019-21)

**Most of the agri-tech funding between 2016 and 2021 was aimed at start-ups focused on disintermediating the agriculture supply chain** (i.e., reducing intermediaries by providing direct market linkages to farmers at the input- or output- stages). This influx of capital has created 5-7 late-stage start-ups (i.e., Series C+), such as Ninjacart, Dehaat, WayCool, Jumbotail, and Arya.ag, each valued between US\$ 300M and US\$ 800M. These start-ups leveraged early opportunities to transform the traditional supply chain through technology and business model innovations that addressed inefficiencies and gaps such as input shortages, wastages, and a low share of the final sale price for farmers.

**Some of these large, late-stage start-ups have now begun transitioning to ‘full-stack’ platforms** to increase their share of the farmer’s wallet and earn higher margins through value-added services.

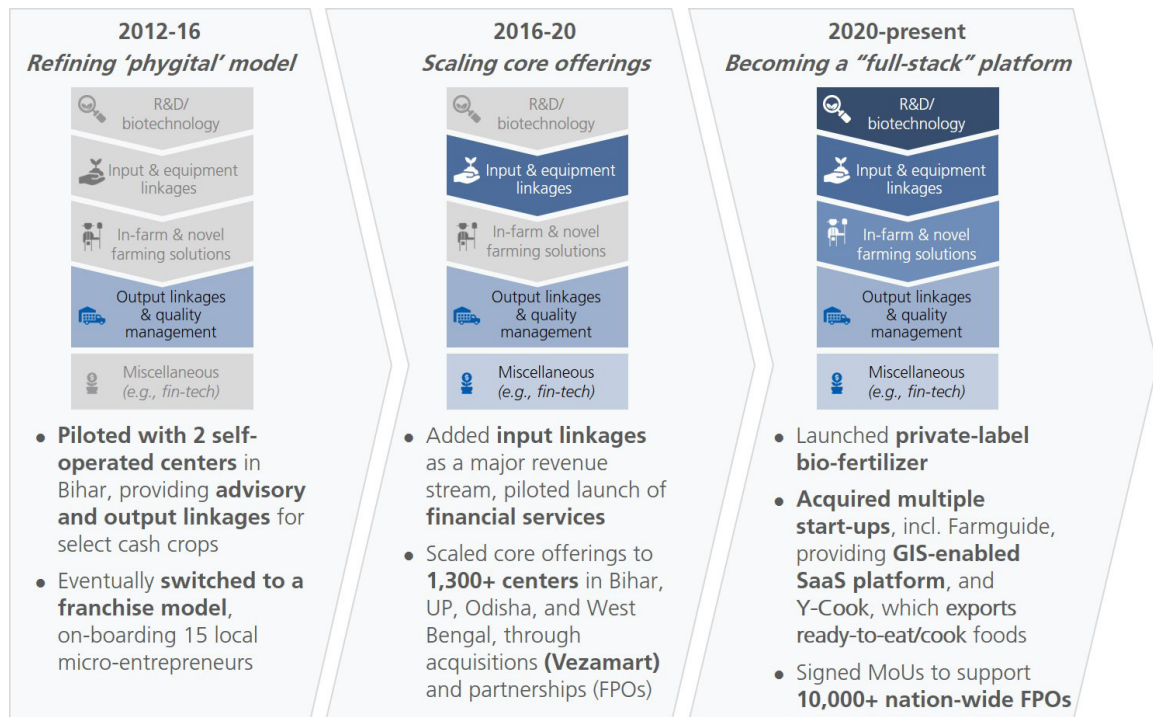
**Dehaat**, with its ‘seed-to-market’ aspiration right from the get-go, is a prime example of a successful transition from market linkage to ‘full-stack.’ Several start-ups are now emulating Dehaat’s ‘phygital’ model, which combines a ‘physical’ and ‘digital’ approach to building trust among farmers. As of 2022, Dehaat is capitalizing on its network of 650,000+ farmers to venture beyond market linkages. It has expanded into all stages of the value chain, from launching its private label of bio-inputs, to providing fintech, AI- and IoT-enabled farm management, and processing and packaging for exports (See Figure 2).

**WayCool**, which launched in 2015 to provide output-market linkages through B2B sales of fresh produce, has gradually begun moving upstream since 2020. Through targeted acquisitions, such as AI- and IOT-enabled farm management tool, GramworkX, it has expanded its capabilities into advisory services (e.g., soil testing) and farm management to enable seed-to-fork traceability.<sup>9</sup>

**AgroStar**, renowned as a specialized agri-inputs and advisory platform since the early 2010s, has also broadened its ambitions to become an end-to-end solution provider, starting with targeted fund-raises since 2020, and its recent acquisition of fruits and vegetables exporter, INI Farms. It has now scaled into in-farm traceability solutions and output-market linkages, connecting its network of 5 million+ farmers to domestic and international food supply chains.<sup>10</sup>



FIGURE 2: EVOLUTION OF DEHAAT'S BUSINESS MODEL SINCE ITS INCEPTION



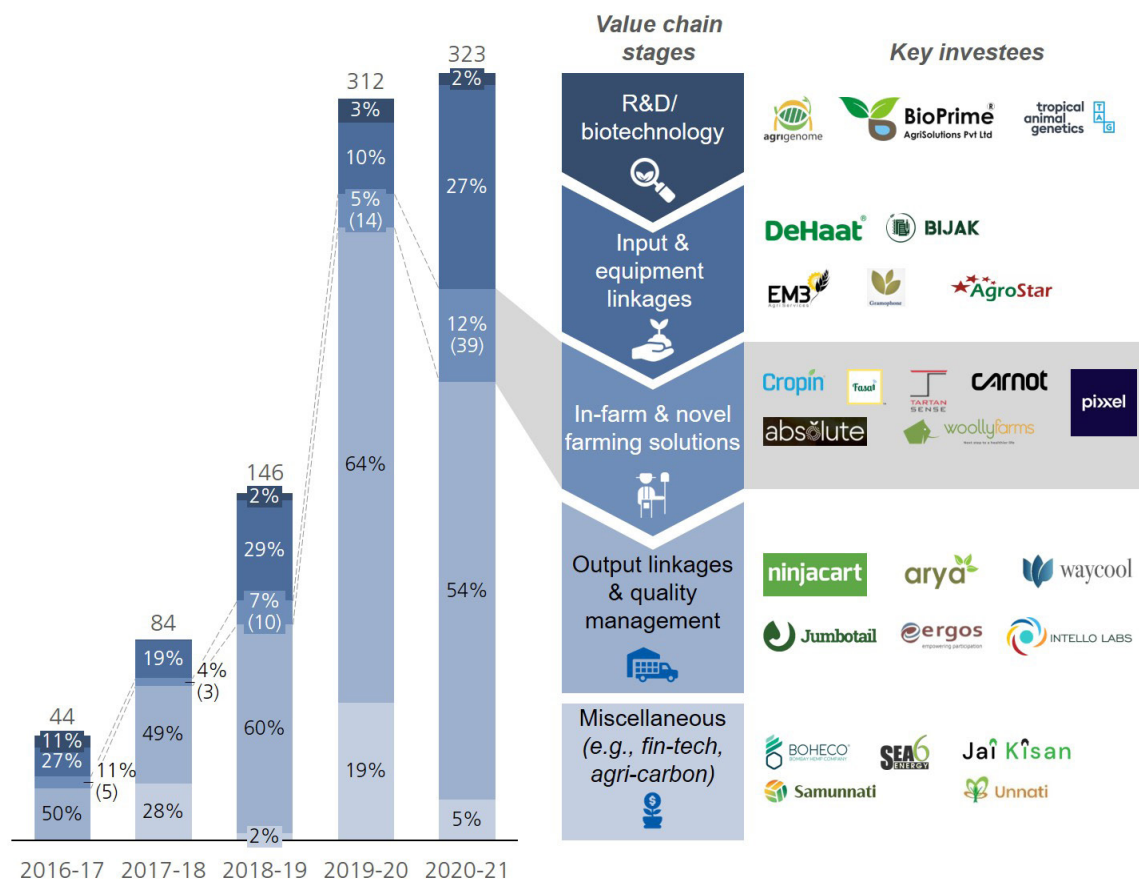
Sources: Singh, S., 2016; Emerald Emerging Market Case Studies, 2019; Statesman News Service Bhubaneswar, 2020; Krishi Jagran, 2022; YourStory, 2021; AgFunderNews, 2020; Dehaat website accessed in July 2022; VCCircle, 2022

There are, however, a few exceptions to this trend of market-linkage start-ups transitioning to 'full-stack.' **Ninjacart**, which has the highest valuation among its peers at US\$ 800 million, continues to remain a specialized player in the fresh produce supply chain, focused solely on disintermediating the post-harvest farm output market. **Jumbotail**, on the other hand, is building a 'full-stack' solution for *kiranas* and small shops rather than farmers.

**As with disintermediation, start-ups are first-movers in in-farm and novel farming solutions, offering a diverse but nascent range of innovations.** Investments in in-farm innovations, including artificial intelligence (AI) and Internet of Things (IoT) solutions, robotics/drones, and farm management software, have been growing exponentially. Between 2018-19 and 2020-21, funding to this category grew almost four times, from US\$ 10 million to US\$ 39 million (see Figure 3). In 2021-22, just the top 5-7 deals in this category exceeded US\$ 185 million,<sup>11</sup> accounted for by precision-agriculture hardware and software provider Absolute (US\$ 113M), hyperspectral imaging solution provider Pixxel (US\$ 53M), farm advisory solution BharatAgri (US\$ 7M), robotics start-up Tartan Sense (US\$ 5M), precision-irrigation advisory Fasal (US\$ 4M), and precision-livestock solution provider MooFarm (US\$ 2.87M).



FIGURE 3: AGRI-TECH FUNDING IN INDIA, 2016-21 (IN US\$ MILLION)

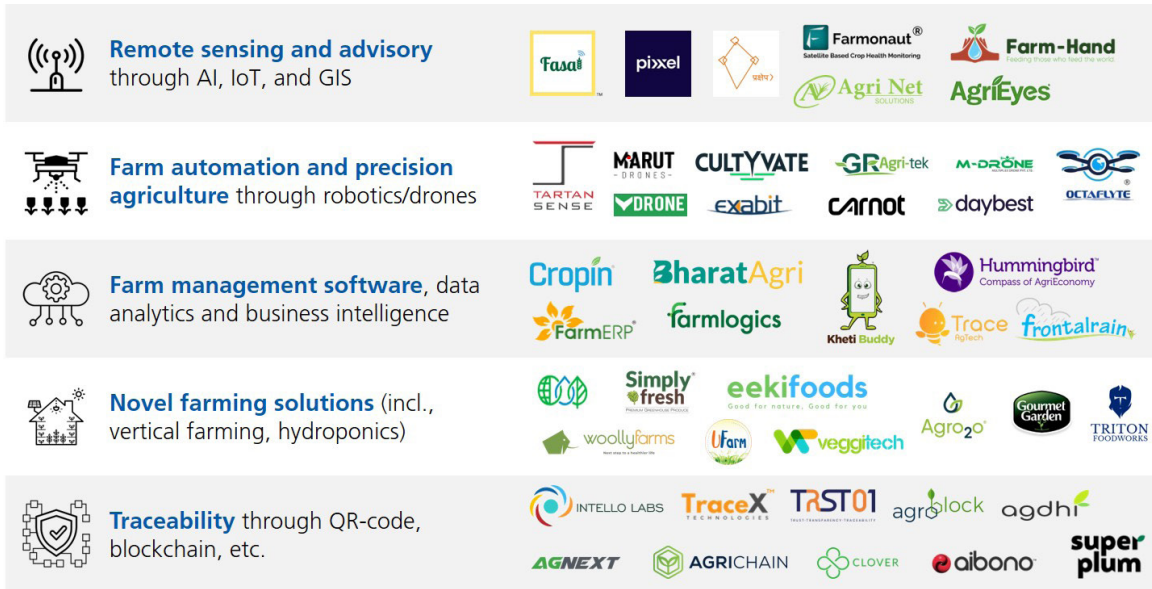


Notes: Percentages may not total 100 due to rounding; Start-ups are categorized based on their primary business at the time of receiving funding. For example, although Dehaat now provides “end-to-end” solutions across all value chain stages, it is categorized within “Input & equipment linkages” since input sales accounted for a majority of its revenue during this period. | Source: FSG Analysis based on data from Tracxn (2016-19) and AgFunder (2019-21)

There is significant diversity in start-ups within this category, ranging from SaaS (software-as-a-service) platforms to AI- and IoT-integrated hardware for sensing, monitoring, and farm automation (see Figure 4). Farm automation solutions address the growing labor shortage. Solutions such as remote sensing and monitoring and technology-integrated farm management software improve farmers’ ability to make data-driven decisions manage and plan their resources, and improve farm productivity. Most of these innovations, however, are early-stage. Traceability, for example, is an important use case for AI- and IoT-enabled technologies, which cuts across pre- and post-harvest stages, and improves farmers’ ability to demand higher prices for high-quality produce, but has very few at-scale solution providers in India. CropIn, the oldest start-up in this category, was among the first to introduce seed-to-shelf traceability using QR code stickers, but only did so in 2018-19.<sup>12, 13</sup>

Several more early-stage traceability start-ups have emerged recently, each with a different business model or technological innovation. For example, Superplum and Clover are B2B suppliers of demand-backed, traceable, high-quality fresh produce, while TraceX Technologies' blockchain-powered mobile application streamlines farmers' pre-harvest activities, and Intello Labs' image-recognition-based hardware and software automate grading of fresh produce.

FIGURE 4: ILLUSTRATIVE MAP OF IN-FARM AND NOVEL FARMING SOLUTIONS IN INDIA



Source: FSG analysis, based on data from AgFunder and Tracxn

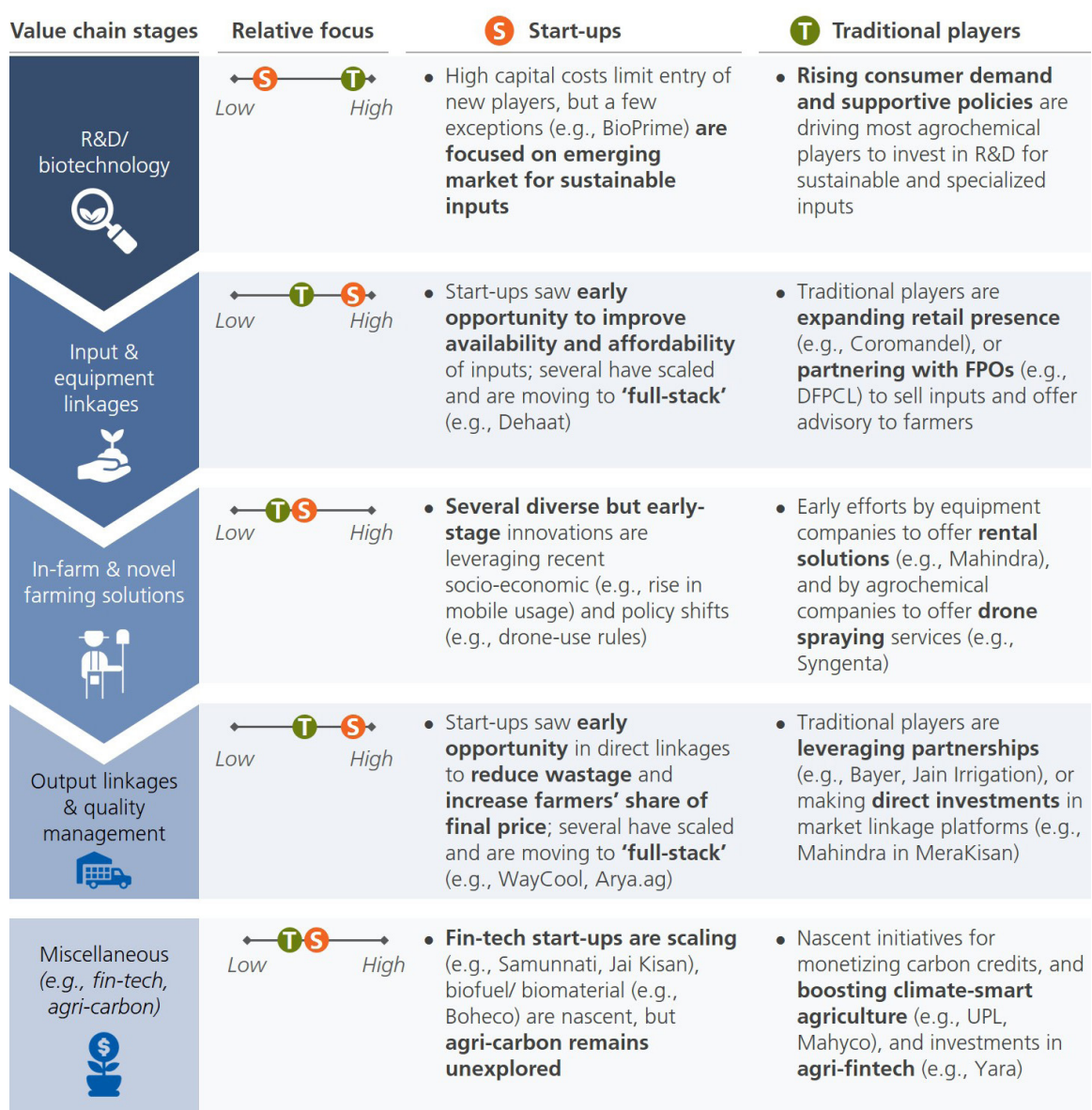
Although not a clear trend, it is worth noting that to achieve scale and profitability at a faster pace, a few in-farm solution providers are pivoting toward disintermediation, as agri-commerce has a shorter pathway to scale compared to in-farm technology solutions. Absolute, the highest funded start-up in the in-farm solutions category, began with a focus on precision agriculture and biotechnology, but has now built a significant output-market linkages revenue stream, procuring and selling 3,000-6,000 tonnes (or, US\$ 10.2 million) of fruits and vegetables every month, including exports of fresh produce worth more than US\$ 3 million.<sup>14</sup>

**Specialized 'agri-fintech' players have emerged quickly** in the wake of increased smartphone and mobile data usage, backed by a fast-growing interest from investors. For example, Jai Kisan, a digital, neo bank offering end-to-end supply chain financing to farmers, raised a US\$ 50 million funding round in July 2022, less than two and a half years since its first seed round of US\$ 1.44 million in 2019.<sup>15</sup> Rural insuretech start-up Gramcover raised US\$ 7 million in 2021, up from its first seed round of US\$ 1.2 million in 2016, with the ambition of growing from 3.2 million farmers to more than 10 million farmers insured through their platform over the next two to three years.<sup>16</sup> More mature agri-fintech players are now beginning to leverage their scale to offer market linkages as an extension of their core offering. Samunnati, an agri-centric NBFC which is present in 22+ states and has raised a combined equity and debt funding of over US\$ 180 million between 2016 and 2021, recently acquired Kamatan, an agri-e-commerce platform providing input and output market linkages.<sup>17</sup> In response to this increased cross-category activity from agri-fintech players and the vast opportunity in fin-tech, market-linkage start-ups have also begun to include financial services as a value-added service. Typically, they do this through partnerships with traditional players like banks and NBFCs. Arya.ag, a mature post-harvest linkages provider, was the first of its kind to offer a “buy-now-pay-later” facility for agricultural commodities.<sup>18</sup>



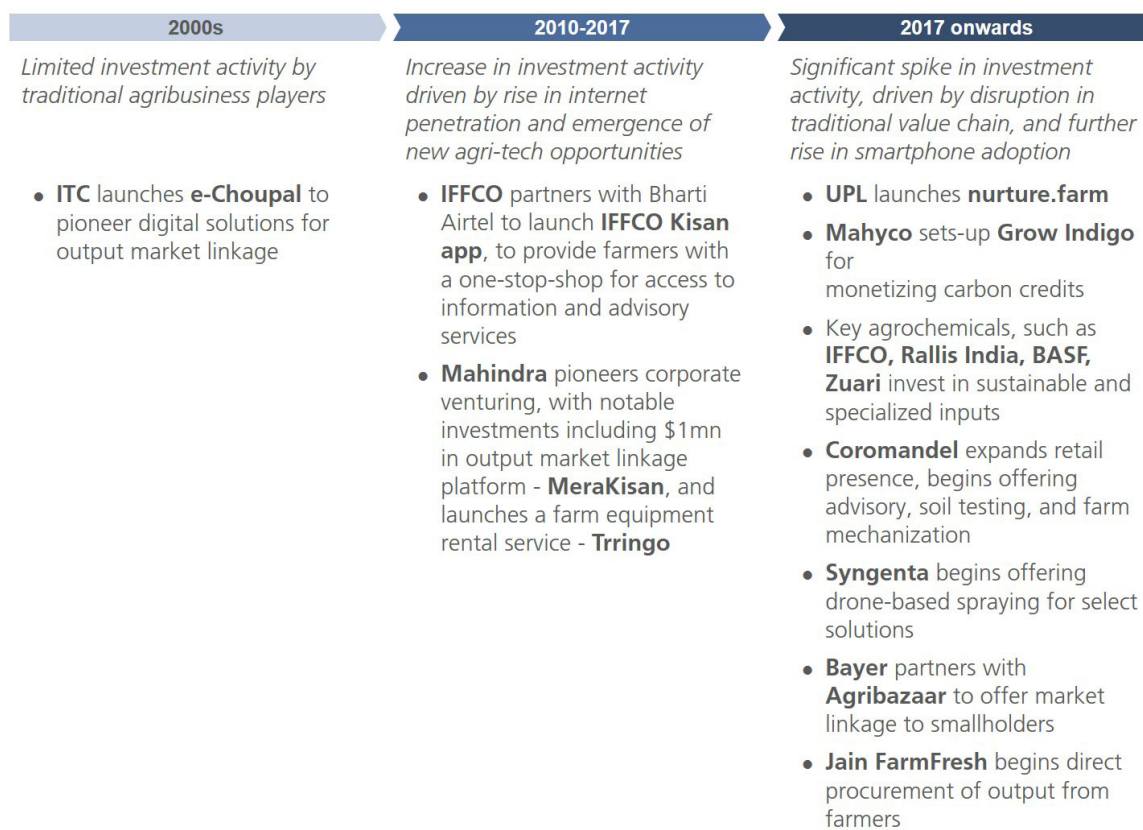
**Traditional agriculture companies lag behind in most categories.** Large agrochemical players benefit from in-house R&D and a greater investment capacity compared to start-ups. They are therefore ahead in developing, producing, and marketing sustainable and specialized inputs such as bio-fertilizers and organic fertilizers. However, traditional agriculture companies focused on the upstream and midstream value chain, including in-farm mechanization solution providers, lag behind start-ups in most other agri-tech innovation categories. Figure 5 provides a comparative summary of start-up and traditional player activity in the sector.

FIGURE 5: RELATIVE FOCUS OF START-UPS AND TRADITIONAL AGRICULTURE COMPANIES IN INDIAN AGRI-TECH



**Inorganic expansions, spin-offs, and pilot projects are on the rise**, as these traditional players try to catch up with agri-tech start-ups. Spurred by the disruption created by start-ups, and potential opportunities created by a sharp rise in smartphone adoption, traditional companies have recently increased their investments in agri-tech, through a mix of inorganic expansion, spin-offs, and pilot projects. Since 2017, there has been a spike in investments by traditional agribusiness players into agri-tech innovations adjacent to their core business offering (See Figure 6).

FIGURE 6: INVESTMENT ACTIVITY BY TRADITIONAL AGRIBUSINESS PLAYERS

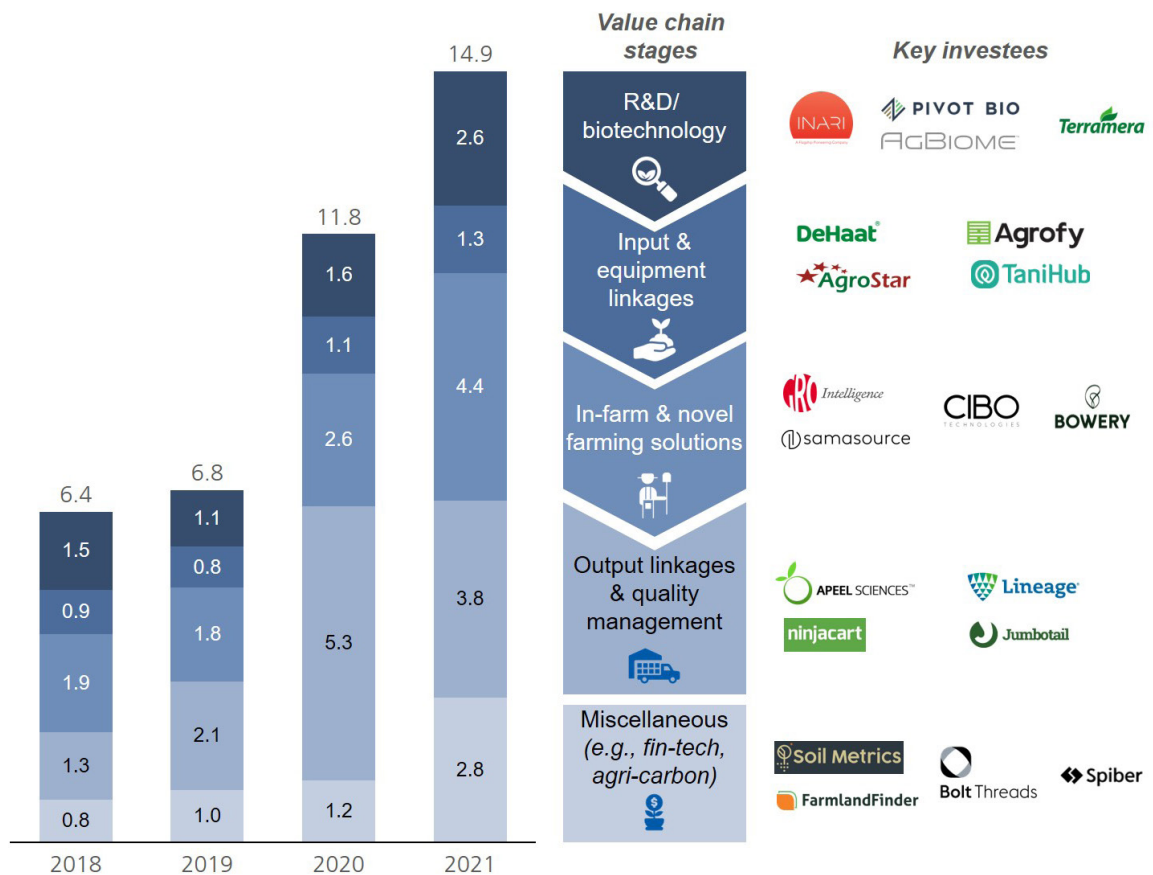


As interest in Indian agri-tech grows and more players enter the market, it is worth examining key developments, both globally and within India's broader landscape, to evaluate where the sector might be headed next.

# EMERGING OPPORTUNITY LANDSCAPE

**Global funding to agri-tech start-ups more than doubled between 2018 and 2021,** reaching nearly US\$ 15 billion (See Figure 7). In contrast with India, disintermediation is less relevant in advanced economies like the USA, as small and marginal farmers contribute a minority share of their food supply.<sup>19</sup> Instead, the key growth categories in global agri-tech are biotechnology (specifically, sustainable inputs), in-farm and novel farming solutions (incl. vertical farming), traceability, and agri-carbon.

FIGURE 7: GLOBAL AGRI-TECH FUNDING, 2018-21 (IN US\$ BILLION)



Note: Start-ups are categorized based on their primary business at the time of receiving funding. For example, although Dehaat now provides “end-to-end” solutions across all value chain stages, it is categorized within “Input & equipment linkages” on this chart since input sales accounted for a majority of its revenue during this period. | Source: FSG Analysis based on data from AgFunder



## SUSTAINABLE INPUTS

Global investments in sustainable inputs include genomics, gene editing, precision breeding innovations to develop better seeds with specific traits, and biological seed treatments such as herbal or organic plant growth promoters and regulators, herbicides, and fungicides. These investments focus on improving yield and disease- and climate-resilience. Multinational agrochemical companies remain at the forefront of chemical solutions and RNA-based seed modifications due to their significantly larger R&D budgets. In 2020, the combined R&D investments of Bayer, Syngenta, Corteva, and BASF exceeded US\$ 5 Billion,<sup>20</sup> while biotechnology start-ups raised only US\$ 1.6 Billion.<sup>21</sup> These large companies are taking the corporate venturing route to build their capabilities in biological treatments and solutions. Figure 8 provides key examples of recent investments by agrochemical companies in this category.

FIGURE 8: EXAMPLES OF RECENT INVESTMENTS BY GLOBAL AGROCHEMICAL COMPANIES IN BIOTECHNOLOGY START-UPS



Sources: Globes, Israel business news, 2019; Reuters, 2020; Bayer Global website, 2021, accessed in July 2022



## IN-FARM AND NOVEL FARMING SOLUTIONS

Global technological innovations in the in-farm category have focused on farm automation, precision agriculture, remote sensing, advisory, and farm management, through robotics, AI, IoT, and data analytics. Start-ups have led the way, with innovations ranging from autonomous and semi-autonomous tractors to IoT-enabled remote monitoring, AI-powered pest detection, and robot- and drone-assisted planting, spraying, weeding, and harvesting. However, agrochemical

multinationals are not far behind. Each of the four largest agrochemical companies has developed in-house digital farming solutions (viz., BASF's xarvio software,<sup>22</sup> Bayer's Climate FieldView and its partnership with Microsoft,<sup>23</sup> Syngenta's AgriEdge/ FarmShots,<sup>24</sup> and Corteva's Granular.<sup>25</sup>

Similarly, start-ups pioneered novel farming innovations, such as indoor farming, hydroponics, and aquaponics. Traditional players, recognizing the potential for novel farming systems, are now making strategic investments in the space. For example, in 2020, Leaps by Bayer, Bayer's impact investment arm, entered into a joint venture with Temasek to form a new company Unfold, which focuses on developing new seed varieties of vegetables tailored specifically to indoor vertical farms.<sup>26</sup>



## TRACEABILITY

The global food traceability market is expected to grow from US\$ 16.8 billion in 2020 to US\$ 26.1 billion by 2025, driven by a growing consumer population in the Asia Pacific region, and an increase in demand for traceable, quality fresh produce.<sup>27</sup> Global innovations include utilizing technologies such as blockchain, QR codes, near-infrared reflectance, machine learning, and AI to create immutable records across the supply chain and to measure, assess, and certify the quality of fresh produce. While traditional companies such as BASF and Corteva provide a limited suite of 'farm-to-retail' solutions for select crops such as cotton and oilseeds, start-ups worldwide are leading innovations in 'seed-to-fork' traceability solutions. French start-up Connecting Food, for instance, provides a third-party food transparency platform that connects farmers, food producers, manufacturers, and distributors with each other. It utilizes blockchain to create an immutable record throughout every production stage and big data to digitally audit quality standards before adding products to the blockchain record.



## AGRI-CARBON

Climate change has intensified the focus on agri-carbon innovations. In recent years, large agrochemical multinationals have launched pilot carbon farming initiatives such as Bayer Carbon Initiative, Corteva Carbon Initiative, BASF's Global Carbon Farming Program, and Syngenta's Good Growth Plan. However, innovative global start-ups are responsible for addressing systemic barriers and building the critical ecosystem required to scale the agri-carbon market. Figure 9 provides key examples of global agri-carbon innovations.



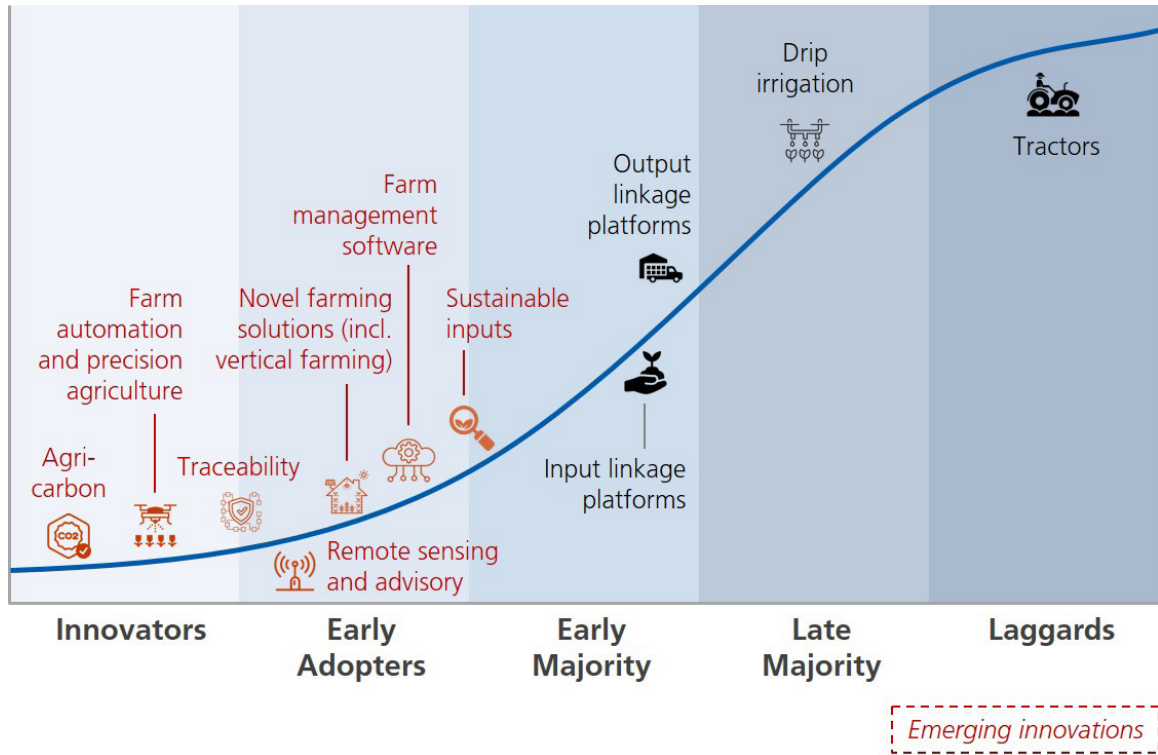
FIGURE 9: SUMMARY OF KEY INNOVATIONS IN THE GLOBAL AGRI-CARBON MARKET



Source: AgFunder News, 2019 and 2022















**So what might the potential journey for Indian agri-tech look like?** The proliferation of locally manufactured tractors in the late 20th century remains one of the most successful at-scale adoptions of technological innovations in Indian agriculture. This was due to several underlying socio-economic and policy shifts in favor of mechanization, including the advent of India’s ‘Green revolution’ and supportive government policies. Today, technologies are scaling at much faster rates. The input-market linkages platform, AgroStar, for instance, boasts of a network of 5 million+ farmers cultivated in less than a decade. We believe that the next wave of agri-tech growth in India will come from technological advancements in, and increased adoption of, sustainable inputs, in-farm solutions (incl. farm management software, remote sensing and advisory, and farm automation), novel farming systems, traceability, and agri-carbon. Figure 10 plots key innovations in Indian agriculture on a technology adoption curve, starting from mechanization solutions such as tractors, to the emerging and relatively untapped categories such as agri-carbon that will define the future of agri-tech in the country.

FIGURE 10: TECHNOLOGY ADOPTION CURVE FOR KEY INNOVATIONS IN INDIAN AGRICULTURE



Each of these emerging categories has the potential for positive impact and is poised for growth in India, driven by a range of socio-economic, political, and environmental factors. These growth drivers enable even traditional, risk-averse investors and large agriculture companies to enter the market and begin placing bets on innovations in these categories. Figure 11 provides a brief overview of the farmer challenges addressed and growth drivers for each of the five categories.

FIGURE 11: GROWTH DRIVERS FOR EMERGING AGRI-TECH CATEGORIES IN INDIA

Category	Farmer challenges addressed	Growth driver
Sustainable inputs	<ul style="list-style-type: none"> <li>Rising input and production costs</li> <li>Threats to sustainability due to climate change, intensive cultivation</li> </ul>	 <b>Increase in conscious consumers and their incomes</b> has led to a growth in India's organic foods market, from US\$ 200 million in 2018 to US\$ 820 million in 2020
		 <b>Capital investment subsidies</b> provided by NABARD and National Soil Health Management Scheme have aided formal market entry for innovative small- and medium-sized companies
		 <b>Introduction of a separate regulatory body and compliance requirements</b> for bio-stimulants will support organized players and reduce price competition from spurious products
In-farm solutions	<ul style="list-style-type: none"> <li>Threats to sustainability due to climate change, intensive cultivation</li> <li>Labor shortage and limited mechanization</li> </ul>	 <b>Increase in smartphone, mobile data, and mobile payment systems usage</b> , coupled with increase in agricultural households' income has reduced accessibility and affordability barriers
		 <b>Launch of the 'Unified Farmer Service Platform', and the new agricultural census</b> digitizing farmer and farm records, provide a boost to digital in-farm solutions
		 <b>Release of standard operating procedures, financial incentives, and a special conditional exemption from the Unmanned Aircraft System Rules, 2021</b> for use of drones in agriculture
Novel farming systems	<ul style="list-style-type: none"> <li>Threats to sustainability due to climate change, intensive cultivation</li> <li>Labor shortage and limited mechanization</li> </ul>	 <b>Reduction in arable land and average land-holding size, set against an increase in food demand</b> has increased the need for farming innovations that require less land
		 <b>Increase in risk of extreme weather events and unpredictable climate conditions</b> due to climate change make a compelling case for controlled-environment farming solutions
		 <b>Subsidies of up to INR 50 lacs from the National Horticulture Board</b> to encourage hydroponic farming systems provide further impetus to the market
Traceability	<ul style="list-style-type: none"> <li>Low share of the final price of produce</li> </ul>	 <b>Increase in conscious consumers and their incomes</b> has led to a growth in India's organic foods market, and demand for traceability solutions that can certify the 'organic' nature of foods
		 <b>Widespread negative reporting about "fake" organic cotton in India</b> has led to an intensified push for traceability in India's export-oriented crops such as maize and cotton
		 <b>Launch of government-led traceability initiatives</b> such as the central government's seed traceability mobile application and Telangana state's QR-code based seed certification system
Agri-carbon	<ul style="list-style-type: none"> <li>Threats to sustainability due to climate change, intensive cultivation</li> </ul>	 <b>A few recent private efforts to monetize agri-carbon credits have seen success</b> , such as UPL's nurture.farm, which successfully generated, validated, and sold carbon credits
		 <b>Passage of the Energy Conservation (Amendment) Bill, 2022</b> enables the development of India's own uniform carbon trading market, and improves the attractiveness of agri-carbon

 Socio-economic
  Policy
  Environmental

Note: In-farm solutions includes farm automation and precision agriculture, remote sensing and advisory, and farm management software | Sources: Centre for Science and Environment, 2022; Deccan Herald, 2021; IndBiz.Gov.In, 2021, accessed in July 2022; National Statistical Office, 2019; National Sample Survey Office, 2013; Economic Times, 2022; Ministry of Agriculture & Farmers Welfare Press Release, 2022; GlobeNewswire, 2022; World Bank data; National Horticulture Board website, accessed in July 2022; New York Times, 2022; World-Grain.com, accessed in July 2022; Krishi Jagran, 2021; The Hindu, 2021, 2022

**In the near term at least, funding for early-stage, deep tech, and emerging agri-tech innovations continues to grow.** Omnivore, India's first agri-tech focused venture capital firm that manages more than US\$ 110 million investments, has set up a new US\$ 130 million fund in April 2022, to support emerging agri-tech innovations in biotechnology, bioenergy and biomaterials, and novel farming systems.<sup>28</sup> In July 2022, Axilor Ventures, which backed start-ups such as Helicrofter (later acquired by Dehaat) and Pepper Farms, also launched a US\$ 100 million for emerging opportunities in specific categories, including agri-tech.<sup>29</sup> Just a month before Omnivore's announcement, Ninjacart, specializing in output-market linkages for agri-produce, launched its own US\$ 25 million seed fund for emerging agri-tech start-ups.<sup>30</sup> These recent positive developments hold promise, but agri-tech players must also watch out for more medium- and long-term trends to make informed business decisions.

# THE WAY FORWARD

**In the medium term, Indian agri-tech will see a funding slump amidst an overall slowdown in global investment activity, with mid-to-late stage start-ups already feeling the ripple effects.** Globally, agri-tech investments are expected to decrease by at least one-third in 2022 compared to 2021.<sup>31</sup> In India, mid-to-late stage start-ups across sectors including agri-tech have already begun experiencing markdowns, lay-offs, and deals falling apart.<sup>32</sup>

**Agri-tech mainstreaming will continue, with the government playing a key role,** as a facilitator for private sector participation. In its budget announcement for 2022-23, the central government revealed plans to set up a dedicated fund for agri-tech start-ups, and promote the use of drones for crop assessment, digitization of land records, and spraying of nutrients and insecticides.<sup>33</sup> Similarly, at the state-government level, we are seeing positive developments in most states, with a focus on data, public-private partnerships, and knowledge exchange with academic and research institutions. Key examples include Karnataka's E-Sahamathi platform with a digital database of 5 million+ farmers, Telangana's Agri-hub sandbox to provide technical backstopping to agri-tech entrepreneurs, and Maharashtra's Maha-AgriTech project for AI- and satellite-based monitoring, modeling, and in-farm decision support.<sup>34</sup>

**Faced with a 'battle of platforms,' start-ups need a renewed focus on profitability.** The first wave of India's agri-tech start-ups, focused on market linkages, raised funds based on 'gross merchandize value,' or 'gross value of goods sold,' although they typically earn razor-thin margins per trade.<sup>35</sup> They achieved substantial year-on-year growth on this metric because of readily available aggregation points such as traders and *mandis*. These relatively 'mature' start-ups now compete for farmer attention in a 'battle of platforms,' not only among themselves but also with a host of new entrants. As described in the previous sections, we are already witnessing some consolidation through acquisitions, which will likely continue. In this context, as agri-tech becomes mainstream while investors tighten their purse strings, only start-ups with an acute focus on profitability and sustainable growth will survive. For existing players and new start-ups planning to enter the market, it is imperative to take a long and hard look at their business model and growth ambitions with a macro-view lens (both global and local). For instance, a niche, 'deep tech' player inspired by global analogs, such as a digital in-farm solution, will benefit from understanding farmer pain points across

the supply chain to identify under-leveraged or high-margin opportunities which best fit its core capabilities.

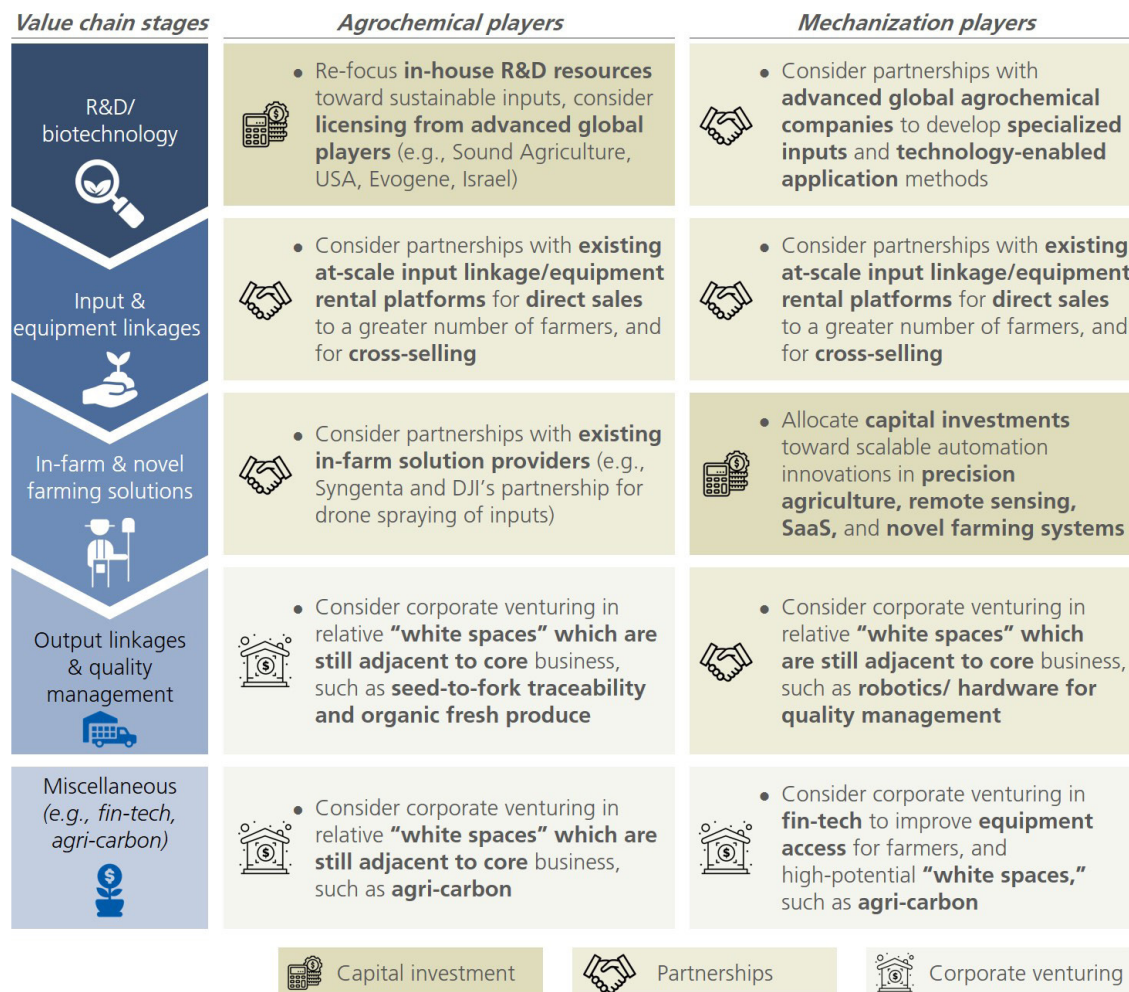
**Traditional agriculture companies must embrace technology to succeed.** Technology has irreversibly disrupted the traditional agricultural value chain – from how farmers access information and inputs to how they grow and sell their produce. Traditional players, such as agrochemical companies and mechanization solution providers, need to adapt to this digital transformation of agriculture. However, they must first define their future ambitions to determine the right pathway for their growth.

*Provide specialized solutions: Players with strong R&D, technical expertise, and capital investments may choose to double down on their strengths to become ‘specialized solution providers.’* This might mean an increased focus on sustainable and specialized inputs for agrochemical companies, and in-farm automation solutions for mechanization companies. For such companies, **data analytics at farmer-, farm-, and crop-level** will become critical to success. A nuanced understanding of farmers’ preferences, behaviors, and crop- or farm-specific challenges will ensure the ability to deliver targeted, customized, and relevant solutions. Successful companies will create a strong product portfolio that matches global advancements while being locally relevant and efficacious. Such players may choose to deepen their core specialization through increased R&D and capital investments, and augment their data strategy and distribution through partnerships with input linkage platforms and in-farm solutions.

*Expand into adjacencies, or provide ‘end-to-end’ solutions: Players with solid on-ground networks may choose to expand into adjacencies, gradually moving toward ‘end-to-end solution providers.’* Building farmers’ trust and cultivating last-mile networks takes considerable time and effort. Players who successfully manage this can leverage their hard-earned networks to occupy a greater share of the farmer’s wallet. They can provide their farmer networks with value-added products and services adjacent to their core business across the agriculture supply chain, from market linkages to digital finance. However, these companies will need to be innovative in **staying in touch with and expanding their farmer network through a mix of digital and in-person interactions**. Successful companies will be ahead of the curve in identifying emerging digital-first or direct sales channels and fostering new and innovative sales channels such as farmer collectives. These companies will also opt for strategic partnerships with and corporate venturing into existing high-potential start-ups rather than building from scratch.

Figure 12 below provides an overview of the various pathways available to traditional agriculture companies to succeed across the agri-tech value chain in India. Selecting the right pathway will depend upon each company's unique growth ambitions..

FIGURE 12: RECOMMENDED PATHWAYS FOR TRADITIONAL AGRICULTURE COMPANIES TO SUCCEED ACROSS THE AGRI-TECH VALUE CHAIN IN INDIA



Finally, both traditional players and agri-tech start-ups must keep an ear to the ground to stay abreast of the ever-changing trends and developments in the sector, and be ready to adapt and innovate. India's agri-tech advancements, if utilized correctly, present an excellent opportunity for sustainable and equitable growth, ensuring not only profitability for agribusinesses but also improved livelihoods for farmers.

# GLOSSARY OF TERMS

**Agri-tech:** Agricultural technology, or agri-tech, is the use of technology in agriculture based on agricultural science, agronomy, and agricultural engineering. Agri-tech innovations could be in the form of products, services, or applications, which aim to improve yield, efficiency, profitability, and sustainability of agricultural operations

**R&D/biotechnology:** Innovations in biogenetics to develop better varieties of seeds, biological/chemical treatments, agrochemicals, or animal inputs, to address challenges such as lower yields, pests, diseases, harvest loss, and difficult climates

**Input & equipment linkages:** Technology-enabled platforms providing farmers with market linkages for inputs (e.g., seeds, fertilizers, pesticides) and farm equipment

**In-farm & novel farming solutions:** Innovations such as artificial intelligence (AI), Internet of Things (IoT), robotics, and data analytics that manage risks and improve farm productivity and quality, and novel farming solutions such as vertical farming and aquaculture

**Output linkages & quality management:** Innovations focused on improving the post-harvest supply chain, including storage, quality management, processing, packaging, retailing, and selling (i.e., output-market linkage)

**Miscellaneous:** Innovations such as fin-tech for farmers, non-food extraction and/or processing of bioenergy/ biomaterials (e.g., biofuel, cannabis), feedstock technology, innovative food, and agri-carbon trading

**Agri-fintech:** Agri-fintech, or fin-tech for farmers, includes digital financial products and services across the agriculture value chain, such as input credit, supply chain financing, and insurance

**Sustainable inputs:** Sustainable inputs are bio-based alternatives to synthetic or chemical solutions such as fertilizers and pesticides. Sustainable inputs, or biologicals, are crop nutrition and protection solutions that use micro-organisms like fungi and bacteria, and RNA interference mechanisms

**Traceability:** Traceability is the ability to trace the origin of the food consumed or finished product purchased by the end-consumer, across value chain stages, from post-harvest back to the field, seed, and other inputs

**Agri-carbon:** Agri-carbon includes regenerative farming and soil health practices (such as no-till farming and crop rotation) which can restore carbon in the soil, biomass for energy and feedstock, and the trade of carbon credits



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