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Why Agri-Tech Startups Fail to Scale in Rural Markets in India: A Two-Tier Evidence Review

Shaayan Patel
shayaanpatel10@gmail.com

ABSTRACT

This review puts forth a question: what are the reasons why agri-tech startups in India have faced difficulty in turning the tide of early success into a profitable scale in the rural market? It uses a well structured evidence organisation. Tier 1 gathers 21 peer-reviewed journal articles from the management, rural sociology, agricultural economics, and technology-adoption fields, to identify the structural and theoretical drivers of these: (1) smallholder poverty and thin margins, (2) mismatch between venture-capital return timelines and agriculture's biological cycles, (3) technology-trust and adoption barriers, (4) founder capacity gaps, and (5) contested institutional/regulatory terrain. Tier 2 introduces a case-evidence layer composed of business journalism and funding-data aggregators as well as one methodologically transparent institutional research report (a CGIAR landscape-and-survey study) used specifically to answer questions the peer-reviewed literature can't: what really happened to named companies? A rural market is defined here as one in which farming households are the paying customers. The data from the two sources reveals that India's top three agri-tech startups in terms of funding (Ninjacart, DeHaat and WayCool) have collected significant amounts of money from 2020 to 2022. Agritech funding dropped by about 78% in 2023, while WayCool fired workers and expanded into their own consumer brands, and three smaller companies (Fraazo, Otipy, Deep Rooted) that did not cater to farmers across urban households shuttered. The drop is not indicative of a sectoral decline in capital as total Indian startup funding dropped by approximately 55% in the same set of data. This course is similar to some Tier 1 drivers, but not all. Finally, the review highlights the gaps in evidence on both tiers, primarily no unit economics for any named firm.

Keywords: Agri-tech startups; Rural markets; Scaling barriers; Technology adoption; Agricultural entrepreneurship

1. INTRODUCTION

Agriculture accounts for a significant portion of the workforce in India (46.1% of workers; National Statistical Office [NSO], 2024) and is characterised by a high percentage of small and marginal farmers (about 86% of the 146.45 million operational holdings in the 2015-16 Agriculture Census; Ministry of Agriculture and Farmers Welfare, n.d.), and there has been an increase of tech-enabled startups promising to boost productivity, reduce post-harvest losses, and enhance market reach for these farmers (Priyanka &

Gurupandi, 2026; Vasavi et al., 2025). The research published in peer-reviewed journals on this sector shows how continually small inroads into the problem are being made, despite the fact that many of the venture-capital financing models proposed to achieve profitable operation may be structurally unmatched to what agriculture requires (Fernandez-Vidal & Alarcon, 2025; Sippel & Dolinga, 2023). The peer-reviewed literature cannot answer the question alone, for two reasons: academic publication struggles to keep up with rapid business changes, and business/management journals have a low rate of publishing case studies of failed commercial enterprises, let alone enterprises that are India's best-funded and most prominent agri-tech ventures.

There are three terms to be defined. Here, a rural market is defined as a market where farmer-producer organisations or farming households in rural India are the paying customers of a market for inputs, advice, credit, storage or equipment services. Two other configurations are maintained separately: a supply-side configuration, where the farmers are suppliers to a firm that sells to urban retailers, restaurants or institutions and an urban consumer configuration, where the urban customer is a household. Most Tier 1 studies are related to the first configuration. Scale is the process of increasing revenue while aiming for operating profit without the constant need for fresh equity funding, in the market that the company is trying to serve. Failure to scale is assessed in three separate outcomes: closure, retreat (when most of a firm's revenue is no longer derived from the customer or product it was created to serve), and a stall (when a firm's revenue decreases or when a major equity round has not occurred for three years or more in a firm that is not yet profitable). A new line that contributes a small proportion of total revenue is recorded but is not considered a failure as a company can change its model and still survive and be successful.

This review thus raises two related questions. First (Tier 1, peer-reviewed): What are the recurring structural, market and organisational factors mentioned in the academic literature that are responsible for failure of agri-tech scalability in rural India? Second (Tier 2, case evidence): How do these structural dynamics manifest in the observable histories of particular named companies and does the case evidence support, extend or challenge the peer-reviewed account? Because every firm in the original sample had struggled, the second question can be answered fairly only if the sample also includes firms that did better, so the review adds farmer-facing comparison firms (Section 4.5) and states in advance what each Tier 1 driver predicts (Section 2). The two tiers have been sought to remain distinct (labelled, sourced, and referenced separately) and not be mixed into a single undifferentiated evidence base, since they have different levels of epistemic weight and are generated through different processes.

2. METHODOLOGY

Tier 1 (peer-reviewed academic literature) was identified through specific searches run in July 2026 through a general web search engine and followed to the publishers' own pages (ScienceDirect, SpringerLink, Frontiers, SAGE Journals, Taylor & Francis and RePEc/IDEAS), using the following key words: agri-tech startup India scaling, smallholder farmer technology adoption India, farmer producer organization India, base of the pyramid business model rural, venture capital AgTech financing, digital divide India ICT, and farm laws India political economy. An article was included if it appeared in a

peer-reviewed journal, was written in English, was published between 2014 and 2026, and addressed agri-tech startups, smallholder technology adoption, farmer producer organisations, the financing of agri-tech, or business models for low-income rural customers; reports, policy papers, theses and trade press were excluded. This was the only tier that contained articles in peer-reviewed journals. However, peer-reviewed research specifically on the issue of scaling of Indian agri-tech startups is limited, so Tier 1 also relies on peer-reviewed literatures that are closely related to the topic of scaling: smallholder technology-adoption studies, FPO research and base-of-the-pyramid business-model scholarship (including non-agri-tech rural India cases as structural analogues), marked explicitly when the source is adjacent and not directly on-topic. The search was purposive and not systematic. The number of records retrieved and screened was not logged, so a flow diagram cannot be reconstructed, and the 21 articles should be read as a reasoned selection and not as a complete census of the literature (Section 7).

Tier 2 (case and industry evidence) was created to provide the answers Tier 1 cannot: firm-level outcomes. It is based on (a) one institutional research report, a CGIAR Platform for Big Data in Agriculture study which was based on a 100+ source landscape review, a structured survey (n=42, of 21 startups and 21 investors), and semi-structured interviews (n=40) with respondents from that pool in Hyderabad, and is methodologically transparent and reported in sufficient detail to be analysed on its own merits, though it is not an academic journal article (Wong, Dhulipala, Southwood, & King, 2021); and (b) business/trade journalism and funding-data aggregation (Entrackr, 2025a; SMEStreet, 2025; The Ken, 2024) with total funding figures cross-checked against other data providers (Inc42, 2023; Tracxn, 2025). The figures of the Entrackr and SMEStreet are from the same source (TheKredible) and thus are not independent corroborating figures. Tier 2 is used solely for claims that can be checked for facts (business model pivot, lay-offs, funding totals), but is not used for analysis or cause claims (found in Tier 1). The one exception is the CGIAR report where the method is stated and limited claims regarding the views of their own respondents may be supported. An explanation from a journalist or executive that details why something occurred is reported as his/her interpretation and single-source claims are noted as such.

This structure is similar to the traditional secondary research structure in which theoretical and structural claims are supported by peer-reviewed academic literature, while empirical, firm-level claims are supported by case evidence that has been evaluated for the quality of the sources and cross-checked, where possible, against an independent dataset. Neither is given as being “more true” than the other; each responds to a different aspect of the guiding question and they are combined in Section 5.

Pattern matching (Yin, 2018) is used to test the second research question. Table 1 states what each Tier 1 driver predicts a firm would show if the driver were operating, and what it would show if it were not. When the prediction is incorrect, it is against the driver. The predictions are only for what Tier 2 sources can observe and the cases were selected prior to the actual predictions, making the test less stringent than a blind prediction.

Table 1. Predictions of each Tier 1 driver for firm-level evidence

Driver	**If the driver is operating, a firm would show**	**If it is not, a firm would show**
1. Customer economics (small, poor customers; thin margins)	Farmer-facing firms that earn most revenue by selling products to smallholders show thin or negative operating margins and a slow path to profit. Firms that earn fees or interest instead show better margins.	Farmer-facing firms selling products to smallholders reach profit on those sales alone.
2. Capital mismatch (venture horizons against agricultural cycles)	After the 2021–22 boom, agritech's share of all startup funding falls by more than the market as a whole, and growth-stage firms face long gaps between equity rounds.	Agritech's share of funding stays stable, so agritech funding simply follows the market.
3. Adoption barriers (trust, skills, awareness, connectivity)	Farmer-facing firms combine physical or human touchpoints (stores, centres, field staff) with digital channels.	Purely digital farmer-facing firms scale among farmers.
4. Founder capability (agricultural knowledge, institutional links)	Firms led by founders without agricultural knowledge or institutional links stall, while firms that recombine local and scientific knowledge grow.	Founders' backgrounds show no relation to outcomes.
5. Institutions and regulation (FPOs, farm laws)	Firms whose model depends on regulated marketing channels show disruption around the 2020–21 farm laws and their repeal.	Firms show no disruption linked to the laws.

3. THEMATIC SYNTHESIS

3.1 TIER 1: STRUCTURAL AND THEORETICAL DRIVERS

3.1.1 The smallholder customer base: scale, poverty, and thin margins

Economic constraints on customers can be seen in the peer-reviewed literature (5 of 21 sources, based on Table 6), however, constraints on technology adoption are reported more frequently (9 of 21). A study of technology adoption among India's small and marginal holdings (about 86% of all operational holdings; Ministry of Agriculture and Farmers Welfare, n.d.) reveals that farmers with limited resources lack access to technologies because of low awareness, budget constraints and lack of infrastructure, and technologies that work well in larger operations often do not perform well in smallholder settings without some cost-cutting efforts in the form of an intermediary (Vasavi et al., 2025). A survey of 130 agri-startup founders in Tamil Nadu showed that the items that received the highest mean agreement points were lack of skill to use new technologies (4.32), lack of financial services (4.30) and lack of membership in networks (4.29); the difference of 0.03 between the top three items is not big enough to be sure they are ranked in that order. The first factor of an exploratory factor analysis accounted for the highest percentage of variance when analysed separately (15.47%) and was labelled financial constraints. The share represents how closely funding related items are related, not the severity of the challenge as perceived by the founders, and both five retained components (46.7% variance) and six named factors (52.45% variance) are reported in the article, thus needs to be interpreted with caution (Priyanka & Gurupandi, 2026).

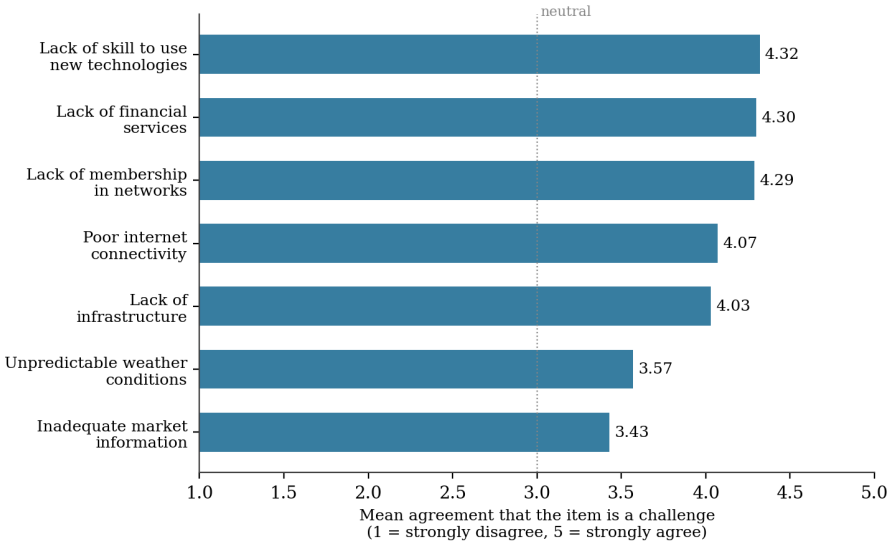


Figure 1. Mean agreement that each item is a challenge, Tamil Nadu agri-startup founders (n=130, Tier 1). The scale runs from 1 (strongly disagree) to 5 (strongly agree). Adapted from Table 2 in Priyanka & Gurupandi (2026).

The constraint is supported from another perspective by critical management studies on financing agri-tech. The narratives of venture capitalists and market commentators create "financialised imaginaries" around agri-food technology (narratives that frame smallholder-facing innovation as not only a business opportunity but a moral one) and don't always lead to venture scale returns (Sippel & Dolinga, 2023). It is a real dichotomy in the literature that poverty is viewed as a design/delivery problem that can be mitigated by making technology more affordable and providing institutional support (Vasavi et al., 2025), or as evidence that the investment logic may not be reconcilable with the clientele it claims to serve (Sippel & Dolinga, 2023).

3.1.2 Capital markets: venture capital's temporal and structural mismatch with agriculture

Three specific tensions emerge from a study of 71 semi-structured interviews with entrepreneurs, investors, farmers and policy makers on 5 continents: a mismatch between the temporal nature of VC investment periods (focusing on 5-7 years) and the development cycles of agriculture which are shaped by seasonal cycles and biologically determined periods; the lack of "patient capital" willing to support a longer period of validation of an agri-tech; and the high costs of adaptation across regions, as the solutions developed and adapted to one agroclimatic area require significant effort to be transferred to another (Fernandez-Vidal & Alarcon, 2025). Discourse analysis leads to a structurally similar conclusion: A narrative of an "agri-food tech investment rush" can lead to pressure to pursue growth paths at which the underlying economics of agriculture are unable to keep pace (Sippel & Dolinga, 2023).

This is reinforced by base-of-the-pyramid (BoP) business-model scholarship, which is not agri-tech specific, but is rather a close structural analog. In contrast to typical models of market entry, BoP ventures are usually characterised by a greater degree of local institutional embedding than is assumed (Kolk, Rivera-Santos, & Rufín, 2014). A longitudinal case study of a rural Bihar mini-grid enterprise reveals that rather than being optimised, the process of viable scale had to involve a series of "interim" business models, suggesting that rural BoP ventures may need to have longer time horizons and more experimentation with business models than those that typically characterise conventional VC-backed growth paths (Ausrød, Sinha, & Widding, 2017). Previous research on three rural Indian energy-access interventions also concludes that successful models were not found to scale up a single standard approach or financing structure (Goyal, Esposito, Kapoor, Jaiswal, & Sergi, 2014).

3.1.3 Technology adoption: trust, risk aversion, and the limits of standard adoption models

Economic and behavioural barriers are among the factors that have the most impact on adoption of UAVs for precision agriculture in rural India, according to a study involving focus groups, field visits and a hybrid Fuzzy Delphi/Fuzzy AHP framework (Puppala, Peddinti, Tamvada, Ahuja, & Kim, 2023). Precision agriculture adoption outcomes are dependent on the baseline digital skills of farmers, with technology literacy proving to be a key determinant in the adoption of precision agriculture among small-scale farmers in the world, according to a systematic review of 29 studies (John, Hussin, Shahibi, Ahmad, Hashim, & Ametefe, 2023).

Two studies using TAM in India follow this. The results of the survey of 230 Karnataka farmers on who adopts mobile-based agricultural extension services highlights that the extent of adoption is more a function of personal innovativeness, familiarity with the technology and perceived economic value as compared with classical TAM constructs (perceived ease/usefulness), which necessitates a significant adaptation of standard adoption frameworks for the application to rural populations of India (Cerjak et al., 2025). In a previous TAM research, a study of the same type of service revealed similar interaction between constructs and service context (Verma & Sinha, 2016). Low uptake of the climate-smart technology may be partly because of poor awareness, since awareness of the technology varies across farmer profiles (as revealed by a survey of 240 farmers in Gujarat), while at the same time it is possible that the awareness is high and the affordability gap is large (Hebsale Mallappa & Pathak, 2023). Results from a Pakistan comparator study of 275 smallholder households reveal that technology adoption is like a package deal, rather than a series of autonomous decisions, and that the absence of contact with extension service is a significant factor behind the slower rate of adoption of complementary innovations, alongside price (Bilal & Jaghdani, 2024).

3.1.4 Founder capacity: knowledge recombination and organisational readiness

In two in-depth case studies, urban-educated entrepreneurs without previous farming experience succeeded, in the context of limited resources, by recombining scientific/technical knowledge that is institutionally framed with agricultural knowledge that has been acquired locally, mediated through institutional networks. This provides an alternative perspective from which to view founder background as a gap that can be proactively addressed, and not as a fixed liability (Khan, Gupta, Birner, Shukla, & Daum, 2026). Two cases show how recombination worked in those two firms; they cannot show that such founders are more successful than others. A separate research study, using fuzzy DEMATEL on 25 literature-derived critical success factors, identifies policy coordination, rural ecosystem readiness, and innovation capacity as some of the most influential causal (driving) factors (Sharma, Gupta, & Joshi, 2025), consistent with the focus on institutional-network access as a root enabler reported above (Khan et al., 2026). A study of startups in Chhattisgarh, which has a smaller startup ecosystem than Karnataka, Tamil Nadu and Telangana (the states that dominate the rest of the literature), adds evidence from a less startup-dense state (Nikhil & Gauraha, 2024).

3.1.5 Institutional intermediaries: farmer producer organisations as a partial bridge

A systematic, bibliometrically informed review of the FPO literature reveals that FPOs are broadly believed to promote market access and input/output efficiency, while also highlighting that not all registered FPOs are achieving their goals and are facing governance challenges, such as a lack of human-resource capacity (Patil, Mehta, Pancholi, & Saxena, 2025). Another review reports that the marketing benefits FPOs provide are well documented but are not always realised, because they are undercapitalised, and lack in management capacity (Ashok & Kumar, 2019). This is relevant for agri-tech startups: demand-aggregation solutions that could solve the smallholder-scale problem (Section 3.1) rely on a channel formed by the FPOs (a second layer of institutions, which has its own problems of scaling up), and this literature reveals that this channel is not a reliable shortcut.

3.1.6 Digital divide and rural infrastructure

The digital divide is said to be multi-dimensional (Access, Affordability, Digital literacy, Locally relevant content) and must be addressed from all aspects (Asrani, 2022). In a Tamil Nadu survey, at the level of the founder, 4 items were found to be significantly different between rural, semi-urban and urban startups [F(2, 127) from 3.97 to 5.19] namely lack of infrastructure, lack of membership in networks, unpredictable weather and poor internet and mobile connectivity. There is no reporting of post hoc comparisons, so the test indicates that there are differences between groups, but not that some groups are different than others; the authors interpret the pattern as being higher difficulty for rural startups. The reported p-values (0.004, 0.002 and 0.004) are less than the values from the F statistics and degrees of freedom (approx. 0.021, 0.007, 0.013) for three of the four items, but still lower than 0.05. This study defines rural as the place where the startup is established (53.8% of all the sample) and does not necessarily equate with the location of the target customers, therefore, the results provide insights into the costs of operating in rural areas rather than farmer demand (Priyanka & Gurupandi, 2026).

3.1.7 Regulatory contestation and political economy

A special forum introduction places the farmer protests in India in relation to India's brief legislation on farm laws, which aimed to enable direct farmer-buyer transactions outside the APMC mandi framework, in a larger context of agrarian crisis and contestation of marketisation (Baviskar & Levien, 2021), and a special-issue editorial treats the protests as resistance to neoliberal agricultural reform (Kumar, 2022). The enactment of the three farm laws in September 2020 and their subsequent stay and eventual repeal by the Farm Laws Repeal Act, which received presidential assent on 30 November 2021 (Bar & Bench, 2021; The Tribune, 2021), was itself a sign of regulatory uncertainty for all startups based on farmer-to-buyer trade. Neither peer-reviewed source addresses agri-tech startups directly, but both are relevant because startups operated in the same contested regulatory space. This is the most obvious and clear tension in the Tier 1 literature, in which on the one hand the regulatory environment is a fixed backdrop around which to design, and on the other hand, it is a terrain that is subject to political-economy contestation, which is not just about better startup execution.

3.2 TIER 2: CASE EVIDENCE

3.1.1 The funding cycle: boom, then a 78% collapse

When viewed across industry sources, the trend seems clear: industry funding for agritech quadrupled from $155 million in 2020 to more than $630 million in 2021, and then increased 27% (the source reports 25%) to $802 million in 2022 (its highest point) before dropping 78% to just $178 million in 2023. Funding recovered by nearly 30% in 2024, to about $231 million (derived from the reported rise), and then fell by about 30% in 2025 to $160 million. The report also estimates that around 160 agritech startups raised over $2 billion across 253 deals in total between January 2020 and 2025, a majority of which (about 75%) were growth-stage deals; India has over 110 startups in the unicorn club across all sectors, none of which belong to agritech (Entrackr, 2026a).

Mid-2025 reports described a 58% fall in the first half of 2025, to about $96 million (SMEStreet, 2025). That figure matches a comparison of half a year ($96 million) with the estimated full year 2024 ($231 million), since 1 − 96/231 = 58%. The like-for-like full-year comparison (2025: $160 million; 2024: about $231 million) gives a fall of about 31%, so the half-year figure is not used here. The series is also revised between reports (DeHaat's total funding in September 2025 is estimated at $230 million and January 2026 is estimated at $270 million; Entrackr, 2025b; Entrackr, 2026a) and as such is approximate.

Both Entrackr and SMEStreet cite the same numbers, and their agreement does not validate the numbers or accuracy. Other providers are able to provide a total amount of funding to startups; thereby, a test of whether the agritech fall is unique to agriculture can be made possible. In the same TheKredible dataset, funding for all Indian startups was $11.1 billion in 2020, $38.0 billion in 2021, more than $25 billion in 2022, $11.3 billion in 2023, $14.4 billion in 2024 and $13.0 billion in 2025 (Entrackr, 2022; Entrackr, 2023; Entrackr, 2025c), so the market-wide fall from 2022 to 2023 was about 55%. Tracxn's final figures ($11.0 billion in 2023 against $25 billion in 2022) imply a fall of about 56% (Tracxn, 2025) and Inc42 reported 60% (Inc42, 2023); the 72% reported in December 2023 compared a partial year with a full year (Business Standard, 2023). Agritech's 78% fall was larger than the market-wide fall, but agritech's share of all startup funding (Table 2, Figure 3) was 1.4% in 2020, 1.7% in 2021, 3.2% in 2022, 1.6% in 2023, 1.6% in 2024 and 1.2% in 2025. This was the outlier in 2022, and following the fall the sector's share had come back to about the 2021 level. .

Table 2. Agritech funding and agritech's share of all Indian startup funding, 2020 to 2025

Year	**Agritech funding (US$ million)**	**All Indian startups (US$ billion)**	**Agritech share of total (%)**
2020	155	11.1	1.4
2021	more than 630	38.0	1.7
2022	802	more than 25	up to 3.2
2023	178	11.3	1.6
2024	about 231 (derived)	14.4	1.6
2025	160	13.0	1.2

Note. Sources: Entrackr (2022, 2023, 2025c, 2026a). The 2024 agritech value is derived from a reported rise of nearly 30%. The 2022 total is reported only as "over $25 billion", so the 2022 share is an upper bound.

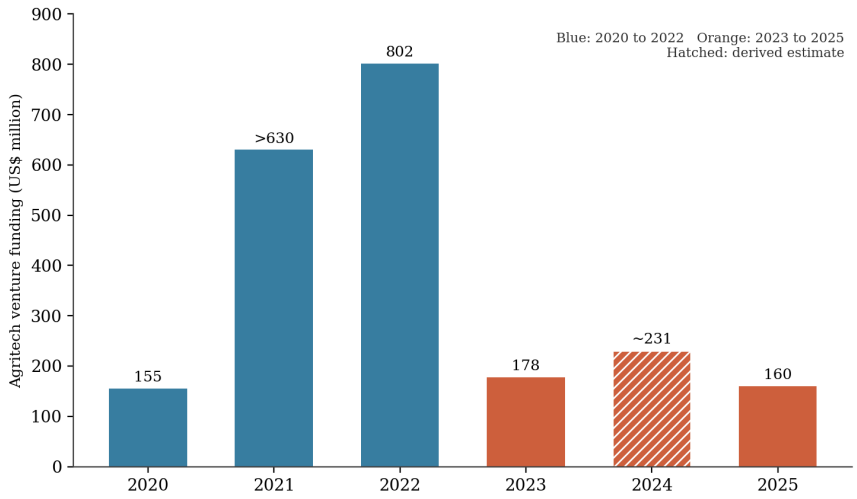


Figure 2. Venture funding into Indian agritech, 2020 to 2025 (US$ million, Tier 2). Blue bars mark 2020 to 2022 and orange bars mark 2023 to 2025. The hatched 2024 bar is a derived estimate and the 2025 bar is a full-year figure. Source: Entrackr (2026a).

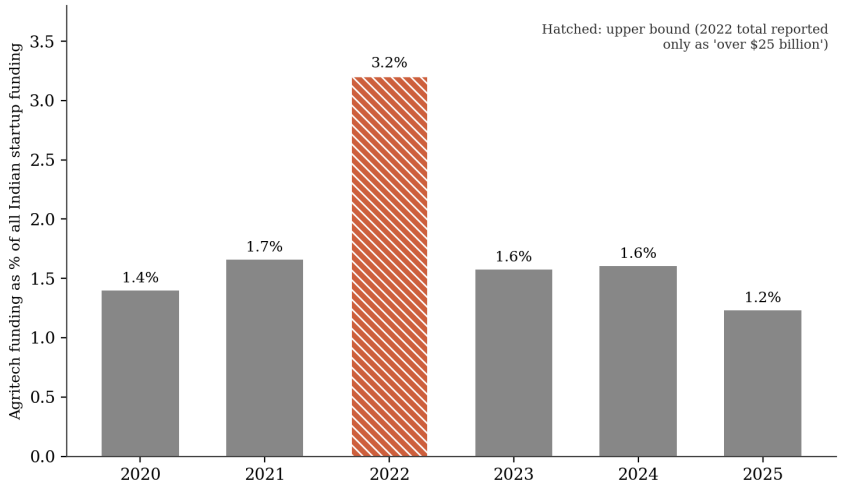


Figure 3. Agritech funding as a share of all Indian startup funding, 2020 to 2025 (Tier 2). The hatched 2022 bar is an upper bound. Sources: Entrackr (2022, 2023, 2025c, 2026a).

General explanations can account for the fall of 2023 with no connection with agricultural biology. A late-stage retrenchment would affect agritech more than the market, as three-fourths of agritech funding went into growth-stage investments and late-stage investments dropped by around 73% in 2023 (according to Tracxn). Valuation corrections and higher interest rates would also be a consideration, but this review lacks data to consider. The fall of 2023 should then not be interpreted as a disconnect between VC and agriculture.

3.2.2 The three bellwether firms: Ninjacart, DeHaat, WayCool

The three companies (Ninjacart, DeHaat and WayCool) are the most heavily capitalised and closest to becoming unicorns in the sector, with peak valuations of $700-815m reached in 2022 (Entrackr, 2026a). Ninjacart's final round was in May 2022 when WayCool received an equity investment from an existing investor to the tune of ₹210 crore in March 2026, marking their first significant investment in equity capital in nearly four years (Entrackr, 2026a; Entrackr, 2026b). . WayCool's journey is recorded in the most granular terms: its co-founder told The Ken that revenue was ₹1,600 crore in the year to March 2024, nearly a third of it from its own FMCG brands (Madhuram, Kitchenji, and Freshy's), making the company progressively look more like an FMCG business than a disruptor of the agri-supply chain it was founded to be (The Ken, 2024). The same source reports two rounds of job cuts within about a year (about 400 jobs, then 70), a cut of about 25% in warehouses, and a request for an extension to repay debt (The Ken, 2024), and Entrackr later reported a third round of more than 200 job cuts in July 2024 (Entrackr, 2026b). DeHaat and Ninjacart are said to have "diversified their focus" to different extents during the same period, but without the operational specifics that are provided for WayCool (The Ken, 2024). The revenue mix is based on one source, and on a management statement, as WayCool, according to Entrackr, had not released its annual results for two years, the latest covered back then was FY23 with a revenue of ₹1,251 crore and a loss of ₹685 crore (Entrackr, 2026b). As defined in Section 1, WayCool and Ninjacart experience a stall, while WayCool also experiences diversification and Ninjacart's operating scale for FY25 also decreased by 19% (2026a). There is no evidence to conclude whether WayCool's shift into branded products is a failure of its original business model or a successful adaptation since its accounts are not public.

3.2.3 Shutdowns among smaller, well-funded peers

There are at least 35 other well funded agri-tech startups outside of the top three (Fraazo, Otipy, and Deep Rooted) that are reportedly shut down completely after raising a lot of money. However, SMEStreet's interpretation (not used here as evidence of cause), is that they were unable to scale and be profitable in the low margin farm-to-fork market (SMEStreet, 2025). Each of these was used by an urban dwelling house. Other dark stores, such as Otipy, which had retail outlets in Delhi NCR and Deep Rooted, which operated in Bengaluru, Hyderabad and Chennai with a direct-to-consumer sales segment, shut down in 2022 and 2025 respectively (Inc42, 2025; Retail4Growth, 2021; Entrackr, 2026a; HortiDaily, n.d.). The closed firms did not have any farmers as their consumers and so the closures do not provide information on scaling in rural markets as defined in Section 1. Table 3 categorises the eight companies mentioned in this section based on who pays and where.

Table 3. Eight firms by market configuration and reported outcome

Firm	Paying customer and location	Configuration	Latest reported position	Outcome	Evidence
DeHaat	Farmers (inputs) and buyers of farm output; rural	Farmer-facing, mixed	FY25 gross revenue ₹3,010 crore (+12.5%); about 80% from farm outputs; adjusted net loss ₹207 crore (FY24: ₹245 crore); EBITDA margin −5.8%	Growing, loss-making	(Entrackr, 2025b), from filings; (The Ken, 2024)
AgroStar	Farmers (inputs, advice); 11 states; over 10,000 retail stores plus an app (company-reported)	Farmer-facing	FY25 operating revenue ₹853 crore (+14.2%), 97% from product sales; loss ₹143.5 crore (−56%); $30 million raised in November 2025 after almost four years	Growing, loss-making	(Entrackr, 2025d; Entrackr, 2026c)
Arya.ag	Farmers and FPOs (storage, loans against grain) and buyers	Farmer-facing, fee-based	FY25 net revenue ₹447 crore; profit after tax ₹32 to ₹34 crore; reported profitable since FY23; $80 million Series D	Profitable (company-reported)	(Entrackr, 2025e; Inc42, n.d.; The CapTable, 2025)
WayCool	Retailers, restaurants and brands; sources from farmers	Supply-side	FY23 (latest filed): revenue ₹1,251 crore, loss ₹685 crore. FY24 revenue ₹1,600 crore per co-founder, nearly a third from own FMCG brands. Layoffs; ₹210 crore rights issue in March 2026	Stalled, with diversification	(The Ken, 2024; Entrackr, 2026b)
Ninjacart	Urban retailers and businesses; sources from farmers	Supply-side	Last round May 2022; FY25 gross revenue ₹1,634 crore, operating scale down 19%	Stalled	(Entrackr, 2026a)

Firm	Paying customer and location	Configuration	Latest reported position	Outcome	Evidence
Fraazo	Urban households (Mumbai, Pune, Delhi NCR, Bengaluru, Hyderabad)	Urban consumer	Scaled back from 2022 and closed	Closed	(Inc42, 2025; Retail4Growth, 2021)
Otipy	Households in Delhi NCR	Urban consumer	Shut on 17 May 2025; $44 million raised in total	Closed	(Inc42, 2025)
Deep Rooted	Consumers in Bengaluru, Hyderabad and Chennai	Urban consumer	Ceased operations in March 2025	Closed	(Entrackr, 2026a; HortiDaily, n.d.)

Note. FY25 is the fiscal year ended March 2025. Company-reported figures are marked in the evidence column.

3.2.4 The CGIAR Hyderabad case study: micro-level evidence on why funding stalls

The CGIAR Hyderabad case study provides the most methodologically detailed micro-level evidence of how agri-tech financing works in India, through a survey of 42 respondents (21 startups and 21 investors) and 40 follow-up interviews with the respondents who participated in the survey (Wong, Dhulipala, Southwood, & King, 2021). There are three observations: First, eight of the 21 startups reported outside investment, 11 investments in all, and only 2 were made by commercial venture capital, both of which had received grants/social impact funds first, which indicates that in this sample, non-commercial capital came before venture capital. Second, two investors cited in the report outlined their standards: One said he doesn't think it's easy to keep growth at 10% to 20% per month, while another investor stated that investors want profitability at every level. These are individual perspectives and not thresholds measured. Third, the top three success factors that startups believe they faced and overcame changed significantly between 2016 and 2019, from technical skills and access to infrastructure to “business capacity” (67% of startups said it was their top three success factors in 2019, up 133% from 2016) and “access to finance” (62% of startups said it was their top three success factors in 2019, up 85% from 2016), against increases of 10% and 14% for investors. The survey was conducted in one city and the time period of 2016 to 2019, prior to the funding boom of 2021-22, and is therefore not reflective of investors' views in 2022 or 2023.

3.3.5 Farmer-facing firms and a comparison case

Three farmer-facing firms reached different positions in the same funding context. DeHaat's gross revenue rose by nearly 12.5% to ₹3,010 crore in FY25, with 80% of the proceeds coming from the sale of farm produce like spices and staples, and 20% in seed sales, fertilisers and pesticides. Excluding non-cash fair value adjustments on preference shares, Entrackr calculates a net loss of ₹207 crore (FY24: ₹245 crore) and an EBITDA margin of −5.8%, posting a net profit of ₹370 crore in the filed statements due to those adjustments (Entrackr, 2025b). Established in 2013, AgroStar has seen its operating revenue increase 14.2% to ₹853 crore, with 97% of that amount coming from product sales, and reduced its losses by 56% to ₹143.5 crore, spending ₹1.18 per ₹1 of revenue; it raised $30 million in November 2025, its first round of that magnitude in nearly four years (Entrackr, 2025d; Entrackr, 2026c). Founded in 2013, Arya.ag stores close to the farms and provides loans against stored grain, as well as trade with buyers, through the warehouses that it leases from third parties (Inc42, n.d.; TechCrunch, n.d.), reporting net revenue for FY25 of ₹447 crore and PAT of ₹32 crore to ₹34 crore (Entrackr, 2025e; Inc42, n.d.; The CapTable, 2025). The company executives estimate storage to be 50-60% of revenue and financing is 25-40% of the total (Inc42, n.d.; TechCrunch, n.d.; The CapTable, 2025) and is said to be profitable since FY23 (The CapTable, 2025). It raised a $80M round D (Inc42, n.d.).

The contrast is descriptive. AgroStar and DeHaat, the two companies with the largest proportion of their revenues coming from physical commodity sales, are still loss-making on the figures reported, while the company whose main source of revenue is fees and interest from storage and credit reports a profit. All three sets of figures are company reported or from company filings by journalists, Arya.ag holds a non-banking financial company licence (The CapTable, 2025), a feature that sets its model apart, but which is not shown to explain its profit, and three firms cannot show why one made a profit. DeHaat and WayCool also reacted differently to the same funding shock, but the sources report on what each firm did, rather than why, so that isn't a comparison the review is making.

4. CROSS-TIER SYNTHESIS

The cases were selected due to their struggles, therefore, this does not constitute evidence on its own. The case observations are thus not enough on their own to illuminate the peer reviewed literature, but the predictions from Table 1 are compared with the observations from Section 4 in Table 4.

On capital-market mismatch (Tier 1 §3.2): the 78% decline in 2023 (§4.1) is not indicative of capital-market mismatch as total funding for startups also declined by about 55% and agritech funding as a share of funding returned to 2021 levels. The CGIAR data (§4.4) reflect individual investors' opinions in the period 2016-2019 and do not provide information about the status of investors' opinions in 2022 or 2023. The longer wait for equity rounds at Ninjacart, AgroStar and WayCool is consistent with the driver, but late-stage funding fell market-wide.

The financialisation argument (Tier 1 §3.1-3.2) is consistent with the diversification by WayCool into branded products (§4.2) and the mix of revenue by DeHaat (§4.5), as well as the smallholder economics elsewhere (Vasavi et al., 2025; Priyanka & Gurupandi, 2026). However, these links between the supply

side companies (WayCool and Ninjacart) and the smallholder customers are indirect. When the firms are farmer-facing, the firms that sell primarily physical goods are in losses while the one that earns primarily fees is in profit, in line with the customer-economics driver, based on three firms.

The shift in the self-assessed priorities of founders in Hyderabad from 2016 to 2019 towards "business capacity" and "access to finance" (Tier 2, §4.4) is consistent with the focus on organisational and institutional-network capacity as success factors documented in Tier 1 §3.4 (Khan et al., 2026; Sharma et al., 2025). The CGIAR data (2016-2019) is geographically restricted (Hyderabad) and does not confirm if this capacity gap has been filled since then, or if this is why the closures reported in §4.3 (urban consumer firms) occurred.

Table 4. Pattern-matching results: predictions against observations

Driver	**Prediction tested**	**What the cases show**	**Verdict**
1. Customer economics	Product-selling farmer-facing firms are thin-margin or loss-making; fee-earning firms do better	DeHaat (EBITDA margin −5.8%) and AgroStar (₹1.18 spent per ₹1 of revenue) remain loss-making. Arya.ag reports a profit on mainly fee and interest income.	Supported, with limits: three firms and company-reported figures
2. Capital mismatch	Agritech's share of funding falls after the boom by more than the market; long gaps between rounds	Agritech's 2023 share (1.6%) equals 2024 and is close to 2021 (1.7%); the market fell about 55% against agritech's 78%. Ninjacart, AgroStar and WayCool waited about four years for major equity, but late-stage funding fell market-wide.	Not supported by the 2023 fall; funding gaps are consistent but not specific to agriculture
3. Adoption barriers	Farmer-facing firms combine physical and digital channels	AgroStar reports over 10,000 retail stores plus an app; Arya.ag stores grain near farms. DeHaat's channels were not assessed.	Consistent but descriptive, and mostly company claims
4. Founder capability	Founder background relates to outcomes	Tier 2 sources do not report founders' backgrounds or knowledge sources.	Cannot be assessed
5. Institutions and regulation	Regulation-dependent firms show disruption around 2020–21	Tier 2 sources do not link any firm's results to the farm laws.	Cannot be assessed

Driver	Prediction tested	What the cases show	Verdict
Extension	Not applicable	Closures occurred in an urban consumer configuration outside all five drivers; among farmer-facing firms, the revenue model (product margin against fees) separates outcomes.	Extends the Tier 1 account

Where the tiers cannot be triangulated completely: no source in either tier (peer-reviewed or trade press) provides actual unit economics (CAC, gross margin) for named firms. The Tier 2 case evidence shows that Fraazo, Otipy and Deep Rooted closed, but without financial data it cannot show why. Plausible mechanisms were provided by the Tier 1 literature but were not explicitly designed to be tested against these specific firms. The cases supplement the Tier 1 account in two ways: first, they were closed in an urban consumer configuration, not addressed by any of the five drivers, and second, in farmer-facing firms, the revenue model (product margin against fees and interest) splits results. They are not predictive of the capital-mismatch driver, and the founder-capability driver and regulatory drivers could not be tested in the 2023 funding collapse. The single largest evidence gap identified in this review is made clear, instead of being overlooked.

5. EVIDENCE TABLE

Table 5. Evidence table: design, scope, relevance and appraisal of each source

Source	Tier	Design / Method	Scope	Key relevance	Main limitation and weight
Priyanka & Gurupandi (2026)	1	Survey (n=130), ANOVA, factor analysis	Tamil Nadu	Highest mean agreement: technological skills, financial services, network membership; location differences on four items	Self-reported; no post hoc tests; some p-values inconsistent. Moderate
Khan, Gupta, Birner & Shukla (2026)	1	Qualitative case study (n=2)	National	Knowledge recombination as founder success mechanism	Two cases and no comparison group. Moderate (mechanism only)

Source	Tier	Design / Method	Scope	Key relevance	Main limitation and weight
Sharma, Gupta & Joshi (2025)	1	Fuzzy DEMATEL, expert elicitation	National	Policy coordination, ecosystem readiness as causal CSFs	Expert judgement; no firm-outcome data; panel details not examined. Moderate
Puppala et al. (2023)	1	Focus groups, Fuzzy Delphi/AHP	Rural India (UAVs)	Barrier categorization and ranking	One technology; expert-based ranking. Moderate
Cerjak et al. (2025)	1	Survey (n=230), hybrid TAM	Karnataka	Adoption driven by innovativeness/familiarity over classical TAM	One state; cross-sectional. Moderate
Vasavi et al. (2025)	1	Systematic literature review	National	Smallholder adoption barriers and mitigation strategies	Secondary evidence; review method not examined here. Moderate
Sippel & Dolinga (2023)	1	Discourse analysis	Global	VC financialization narratives vs. smallholder unit economics	Interpretive; not India-specific. Higher for financing argument
Fernandez-Vidal & Alarcon (2025)	1	71 interviews	Global	VC–agriculture temporal mismatch, patient capital gap	Not India-specific. Higher
Ashok & Kumar (2019)	1	Narrative review	National	FPO benefits and capacity gaps	Not systematic; pre-dates recent FPO policy expansion. Moderate
Patil, Mehta, Pancholi & Saxena (2025)	1	Systematic/bibliometric review	National	FPOs often fall short of objectives	Quality of included studies not re-appraised here. Higher

Source	Tier	Design / Method	Scope	Key relevance	Main limitation and weight
Kolk, Rivera-Santos & Rufín (2014)	1	Literature synthesis	Global BoP	Theoretical anchor: BoP needs deep local embeddedness	Not specific to agriculture (analogue). Moderate
Ausrød, Sinha & Widding (2017)	1	Longitudinal case study	Rural Bihar (energy)	Iterative business-model sequencing needed for rural scale	One firm in another sector (analogue). Moderate
Goyal et al. (2014)	1	Multi-case study (n=3)	Rural India (energy)	Tailored financing/delivery over standardized scaling	Three cases in another sector (analogue). Moderate
John et al. (2023)	1	Systematic review (29 studies)	Global incl. India	Technology literacy as central adoption determinant	Few India-specific studies. Higher
Hebsale Mallappa & Pathak (2023)	1	Survey (n=240)	Gujarat	Awareness gap precedes adoption gap	One state; correlational. Moderate
Verma & Sinha (2016)	1	TAM survey	National	Early India-specific TAM application	Early study; full methods not examined. Lower
Asrani (2022)	1	Literature review	National	Multi-dimensional digital divide framing	Not specific to agriculture. Moderate
Baviskar & Levien (2021)	1	Critical/interpretive	National	Farm-law protests in agrarian-crisis context	Introduction to a forum; not an empirical study of startups. Lower
Kumar (2022)	1	Editorial introducing a special issue	National	Special-issue framing of the protests as resistance to neoliberal reform	Not an empirical study. Lower

Source	Tier	Design / Method	Scope	Key relevance	Main limitation and weight
Nikhil & Gauraha (2024)	1	Empirical analysis	Chhattisgarh	Evidence from a less startup-dense state	Three-page note; full text not obtained. Lower
Bilal & Jaghdani (2024)	1	Multivariate probit (n=275)	Pakistan	Technology adoption as interdependent bundle	Different country (comparator). Moderate
Wong, Dhulipala, Southwood & King (2021)	2	Landscape review + survey (n=42) + interviews (n=40)	National + Hyderabad	Views of Hyderabad investors and startups (individual quotes); non-commercial capital preceded VC in the sample	Dated (2016-19); one city; small sample; not peer-reviewed
Entrackr (2025a, 2026a)	2	Funding-data compilation	National, 2020–2025	Quantifies boom (2020–22) and 78% collapse (2023); full-year 2025 data	One dataset (TheKredible); revised between reports; 2024 value derived
SMEStreet (2025)	2	Funding-data compilation	National, 2020–2025	First-half 2025 figure; outlet's view of closures	Not independent of Entrackr
Entrackr (2022, 2023, 2025c); Tracxn (2025); Inc42 (2023); Business Standard (2023)	2	Funding-data reporting by several providers	National, all startups	Market-wide totals and the 2023 fall	Different methods; early Tracxn estimate covered a partial year

Source	Tier	Design / Method	Scope	Key relevance	Main limitation and weight
The Ken (2024)	2	Investigative business journalism	WayCool (+ DeHaat, Ninjacart)	Firm-level pivot, layoffs, revenue mix detail	Revenue mix is a single-source management statement
Entrackr (2025b, 2025d, 2025e, 2026b, 2026c); Inc42 (n.d.); The CapTable (2025); TechCrunch (n.d.)	2	Journalism based on filings and company statements	DeHaat, AgroStar, Arya.ag, WayCool	Firm-level revenue, loss or profit, revenue mix	Filings summarised by journalists; Arya.ag figures company-reported
Inc42 (2025); Retail4Growth (2021); HortiDaily (n.d.)	2	Business and trade press	Fraazo, Otipy, Deep Rooted	Closures and customer locations	Press reports; some undated

Note. Weight is the author's judgement of how much each source can bear in Section 3, based on design, sample and relevance. Sources with lower weight are not used as the sole support for any claim.

Table 6. Coding of the 21 Tier 1 sources against the five drivers

Source	Context	1 Customer economics	2 Capital and finance	3 Adoption barriers	4 Founder capability	5 Institutions and regulation
(Ashok & Kumar, 2019)	India, FPOs					✓
(Asrani, 2022)	India, ICT use			✓		

Source	Context	1 Customer economics	2 Capital and finance	3 Adoption barriers	4 Founder capability	5 Institutions and regulation
(Ausrød et al., 2017)	India, analogue (rural energy)	✓				
(Baviskar & Levien, 2021)	India, farm-law protests					✓
(Bilal & Jaghdani, 2024)	Pakistan, farmers	✓		✓		
(Cerjak et al., 2025)	India, farmers			✓		
(Fernandez-Vidal & Alarcon, 2025)	Global, agri-tech		✓			
(Goyal et al., 2014)	India, analogue (rural energy)	✓	✓			
(Hebsale Mallappa & Pathak, 2023)	India, farmers			✓		
(John et al., 2023)	Global, small-scale farmers			✓		
(Khan et al., 2026)	India, agri-tech startups				✓	
(Kolk et al., 2014)	Global, BoP (analogue)					✓
(Kumar, 2022)	India, farm-law protests					✓

Source	Context	1 Customer economics	2 Capital and finance	3 Adoption barriers	4 Founder capability	5 Institutions and regulation
(Nikhil & Gauraha, 2024)	India, agri-tech startups	not coded	not coded	not coded	not coded	not coded
(Patil et al., 2025)	India, FPOs					✓
(Priyanka & Gurupandi, 2026)	India, agri-tech startups		✓	✓	✓	✓
(Puppala et al., 2023)	India, farmers	✓		✓		
(Sharma et al., 2025)	Agri-tech startups				✓	✓
(Sippel & Dolinga, 2023)	Global, agri-food tech		✓			
(Vasavi et al., 2025)	India, farmers	✓		✓		
(Verma & Sinha, 2016)	India, farmers			✓		
Sources reporting the driver (of 21)		**5**	**4**	**9**	**3**	**7**

Note. A tick means that the driver is among the source's reported findings. The coding is the author's and was not checked by a second coder. Nikhil and Gauraha (2024) is not coded because its full text could not be obtained.

6. GAPS AND DIRECTIONS FOR FUTURE RESEARCH

These unit economics for the firm level are never revealed in either tier of sources. This is the most crucial missing element in the review (see §5). In a future study, Tier 1 rigour, combined with Tier 2 firm access (e.g., researcher access to anonymised founder financial data) would allow for the field test of the mechanisms proposed elsewhere with actual cost structures (Fernandez-Vidal & Alarcon, 2025; Sippel & Dolinga, 2023).

The data from the CGIAR (Wong et al., 2021) is outdated and restricted to a particular geographical area. It provides the finest level of evidence available of investor behaviour, but it is evidence from the time period from around 2016 to 2019; it remains to be seen whether the investor views it documents have remained unchanged since the 2022 peak or whether they have changed.

The Tier 2 sources for companies outside of the top three are sparse. Detailed operational reporting like layoffs, revenue mix is available for WayCool (The Ken, 2024); DeHaat and Ninjacart are reported as "diversified in varying degrees" but there is no similar granular detail (The Ken, 2024). Fraazo, Otipy and Deep Rooted are listed as shutdowns but not evaluated on a case by case basis (SMEStreet, 2025).

Geographic concentration remains at both levels. Tier 1's case evidence is specific to Tamil Nadu/Karnataka/Gujarat/Hyderabad, Tier 2's case evidence is based on firms that function across the nation but are headquartered in large cities. Neither tier covers India's less digitally and institutionally developed agricultural states.

There are three additional restrictions. The Tier 1 search was purposive, unlogged and coding was conducted by a single person. The series of funding for agritech is derived from one dataset and was revised. The eight companies were selected for visibility in the trade coverage and some of the figures are company-reported; therefore, the sample cannot reveal the rates of success of the firms that are farmer-friendly.

7. CONCLUSION

When seen side by side, the two tiers provide a more comprehensive story than either one alone. The sector is structurally challenging, as the peer reviewed literature (Part I) demonstrates: farmers' ability to pay is limited by smallholder poverty; venture capital's timelines and expectations of the same types of scaling is poorly matched with the agriculture's cycles, which are seasonal and regionally diverse; farmer technology adoption is not fully understood by standard adoption models, but rather is shaped by farmer trust, awareness and digital-literacy gaps, which are the most frequently reported of the five drivers (9 of 21 sources); founder domain knowledge of agriculture needs to be deliberately built, rather than assumed; and the institutional and regulatory environment is unsettled (FPOs, contestation of farm law). The case evidence (Part II) is narrower than that account; agritech funding dropped 78% in 2023, the total amount of startup funding dropped by about 55% and agritech's share of funding dropped back to the 2021 level; the three firms that closed were urban oriented, not farmer oriented; WayCool expanded into consumer brands and stalled; and among farmer-facing firms, DeHaat and AgroStar, which sell mainly physical products, remain loss-making, while Arya.ag, which earns mainly fees, reports a profit. It's consistent with the customer-economics driver, but was based on three firms, and the founder-capability and regulatory drivers could not be tested. The one area that this review finds no data at all is unit economics for any named venture, and that is the most obvious place the sector would benefit from data that could take it from "the sector struggled" to "here's why."

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