

# AgriTech: India's Sunrise Sector

A Kalaari Capital Report



# Our AgriTech Portfolio

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***AGNEX*****T**



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by Vamshi Krishna Reddy

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# Overview & Introduction

by Vamshi Krishna Reddy

## OVERVIEW

I've spent more than 2 decades in the technology sector and my experiences have given me a decent understanding of digital solutions for a variety of problems. **One field that struck me as particularly ripe for technological disruption was agriculture.**






However, I had little on ground experience in agriculture. I've always felt drawn to this space and I was deeply passionate about learning about it. To get a better sense of the challenges farmers face today, I decided to get my hands dirty and take up farming. Of course, my profile is quite different from the average farmer. I have a background in technology and I'd read up a great deal about farming techniques. On paper, I started from a position of relative strength, armed with a lot of theoretical knowledge. It was time to put my theories to test.

About two years ago I purchased 2 acres of farmland. **85%<sup>1</sup> of farmers operate less than 5 acres and the average size of farm holding is estimated at a shade over 1 acre.** I had joined the ranks of India's small farmers, the backbone of our agricultural economy.

I started off growing organic vegetables like okra, brinjal and spinach. The positive was that I discovered I really enjoyed farming. We didn't have to buy veggies – we got everything we needed for all our meals at home. And this gave me a lot of satisfaction!



However, what I realised is that I just couldn't produce a commercially viable yield. **For 2 acres of land, I was able to get maximum of 1000KGs of output.** I was struggling to break even on my investment. **I made roughly Rs. 3,000 over a three-month period,** putting me well below the poverty line if I had to sustain myself on my farming income. And if you consider miscellaneous expenses like transport, I was in the red.

HOW MUCH I SPENT (1 Acre)			WHAT I EARNED (1 Acre)			
ITEMS		COST (INR)		OUTPUT	PRICE/KG	COST (INR)
	Farm Preparation: Tractor	3,000	Month 1	1,000 kgs/month	20	20,000
	Inputs (Seeds)	15,000	Month 2	800 kgs/month	20	16,000
	Manure etc.	5,000	Month 3	400 kgs/month	20	8,000
	Labour	15,000	<b>TOTAL ₹44,000</b>			
	Weed Removal	3,000				
<b>TOTAL</b>		<b>₹41,000</b>				

I had two options: one, **improve my yield** and two, **try and get better prices for my produce.**

To improve the yield, the first problem I encountered was sourcing seeds. Where do I get hold of decent seeds? The seeds sold locally weren't great quality. This is the first hurdle for farmers as well. Bad quality seeds result in poor yields. There's also the issue of what seeds to select, what should I grow? Adding to farmer's woes is volatility in input prices. This is a fragmented market, with lots of vendors.

I realised I needed help. **I paid Rs 5,000 to a consultant agronomist.** Not many farmers can afford this support, given their meagre earnings. As a result, farmers often face an uneven quality of produce. The agronomist I hired helped me source better quality seeds and advised me on ways to increase my yields, e.g ways to improve soil quality and use the right pesticides etc. While I was ready to take his help, farmers may sometimes be reluctant to change their traditional methods of operating. One farmer I worked with disagreed with the agronomist's advice – he flatly told me it wouldn't work. I convinced him to agree. Later on when the method didn't produce the results we desired, he felt vindicated.

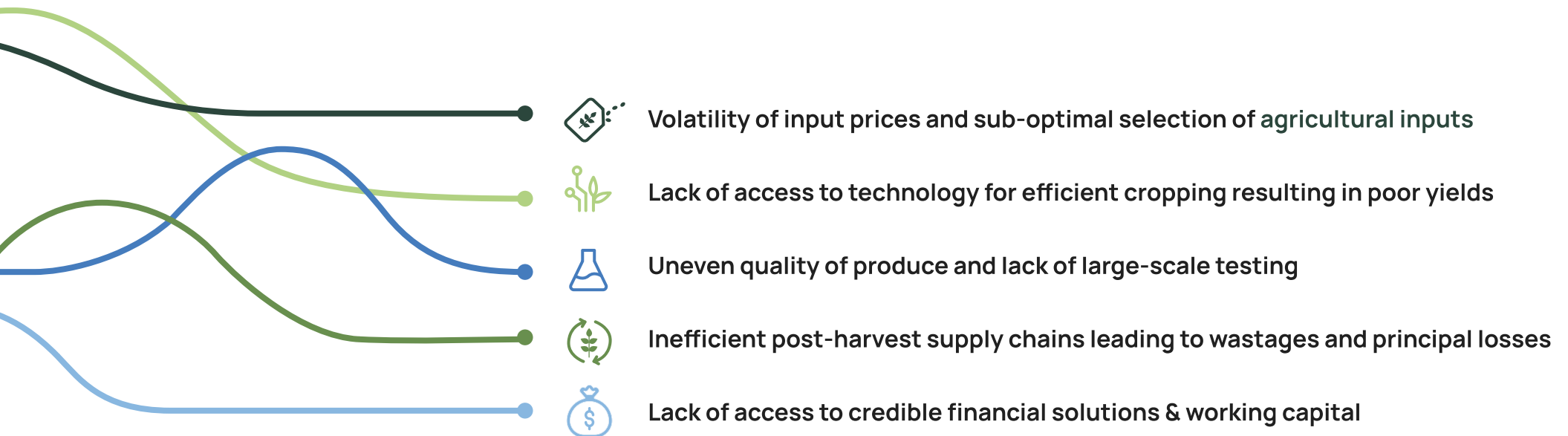
**“The next big challenge comes when harvesting crops. Weed management is crucial as weeds compete with crops for nutrients, soil moisture, solar radiation and space.”**

This, in turn, reduces the yield and quality of produce. Manual weeding is time consuming and labour intensive – it is also the most common technique in India. **Access to technology for efficient cropping is limited. I was initially harvesting my crops roughly once a week, but I realised that I should be doing this every 2-3 days.** But to do so, increases labour costs.

Ok, now my crops are harvested. Where and how do I sell them? I had to arrange to take my produce to the Mandi, hiring autos and tempos to transport it. This involved transport costs and the prices I was offered at the Mandi were as low as Rs. 1/kg. This reflects another major problem farmers grapple with today: **Inefficient post-harvest supply chains that lead to wastages and principal losses.**

Lastly, I began to understand the issue of **lack of access to credible financial solutions & working capital.** Given their income deficit, farmers are often left with no choice but to take inputs like seeds on loan. But then the farmer has to pay back the vendor, even if the crop fails. This sets off a vicious cycle where the farmer is caught in paying back input vendors, with little access to financial help and a crippling working capital deficit.

In summary, my farming experiences have given me insight into the biggest pain points for farmers and agri businesses today:



I've spent the last year and a half trying to adopt different models to make farm unit economics work.

My learning is that technology and digital business models are indeed critical enablers. **Such solutions create a \$24B AgriTech opportunity over the next 4 years for Indian startups<sup>2</sup>**. Among the key drivers of this growth are increased penetration of mobile internet, innovative founders, technology solutions, the adoption of newer supply chains and government's focus on farm-reforms.



# 1500

ACTIVE AGRITECH  
STARTUPS IN INDIA

# \$1.6 B

RAISED BY AGRITECH  
IN VENTURE CAPITAL

# 23%

OF TOTAL VENTURE  
FUND RAISED IN 2021-22

# 250+

INVESTMENT  
OPPORTUNITIES  
EVALUATED BY KALAARI

AgriTech companies received record levels of funding in 2021-22 and a handful of players are expected to achieve unicorn status in the coming years. **There are over 1,500 active AgriTech startups in India, of which more than 120 have raised institutional investment. AgriTech startups have raised \$1.6B in venture capital, with an influx of new global investors and growing interest in emerging sectors. The sector saw a 4x growth in total investment. The average round size at seed stage doubled to \$2M and the average series A cheque size was estimated at \$8M.**

Emerging sectors like precision AgriTech and aquaculture also hold immense potential in India. **These new themes accounted for 23% of total venture funding raised in 2021-22** with many interesting business models coming into play.

This is just the tip of the iceberg. We're still navigating the early stages of India's AgriTech opportunity, with headroom for significant growth in the coming decade. **At Kalaari, we have evaluated over 250 investment opportunities in AgriTech over the past year.** Through the lens of these conversations and my own personal experiences, we highlight the market's potential today and present our analysis of future trends in key sectors such as Input and Output Linkages as well as emerging sectors like precision agriculture and aquaculture.

Our attempt in this report is to highlight key opportunities, metrics and business models for AgriTech entrepreneurs/ investors today. Our learnings are presented in snackable pieces that can act as a guide for entrepreneurs building agri-businesses.



# AgriTech Opportunity & Investment Landscape in India

## UNDERSTANDING THE CURRENT LANDSCAPE AND OPPORTUNITY

AgriTech is one of the hottest sectors in India's startup ecosystem. It is a bright spot amid the recent economic slowdown and continues to record impressive growth. **Funding has surged, with a 9X increase in institutional funding in this sector over the past five years.**

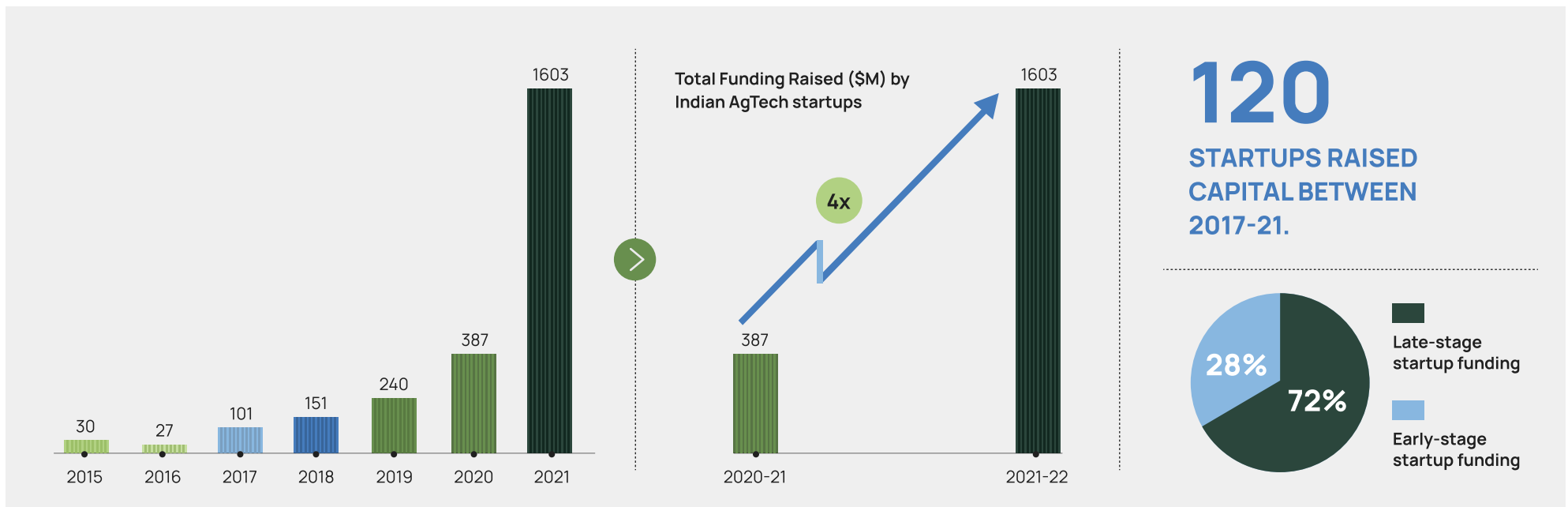
**Today, AgriTech in India represents a \$24B opportunity for startups over the next 4 years. However, this sector is still in its infancy with just 1.5% penetration<sup>2</sup>.**

As founders and investors look beyond the **first 50M consumers**, significant opportunities will emerge for technology-first companies to disrupt traditional models.

VCs & investors have long recognised the potential of Indian AgriTech. Indeed, as many as **120 startups** raised institutional capital between 2017 and 2021.

2021 was a watershed year for Indian AgriTech investment. Many new global and Indian investors pumped significant amounts of capital into growth stage companies, a sign that Indian AgriTech is maturing. **Late-stage startups accounted for 72% of the funding, whereas early stage accounted for 28%**<sup>5</sup>. Startups like DeHaat raised large rounds by proving strong efficiencies and marketplace moats. Given the vast potential for growth, early-stage startups also continue to hold significant appeal for investors, especially in light of the current slowdown in startup investments.

Exhibit 1: AgriTech Funding (\$M)<sup>6</sup>



**Input Linkages** attracted the largest share (~29%), of funding followed closely by **Output Linkages** (~18%). **Managed Farming** received 21%, while **emerging sectors (Precision Agriculture, Aquaculture)** attracted close to 24% of total funding<sup>7</sup>. This was the first time in 5 years the Inputs space received more funding than Output Linkages, traditionally a favourite of investors.

#### Notable Growth Stage Deals in 2021-22



Raised \$115M led by Sofina Investments



Raised \$70M led by Evolve



Raised \$100M led by Tiger Global and Prosus Ventures



Raised \$100M led by Prosus and Tiger



Raised \$117M led by Lightrock

#### Notable Early Stage Deals in 2021-22



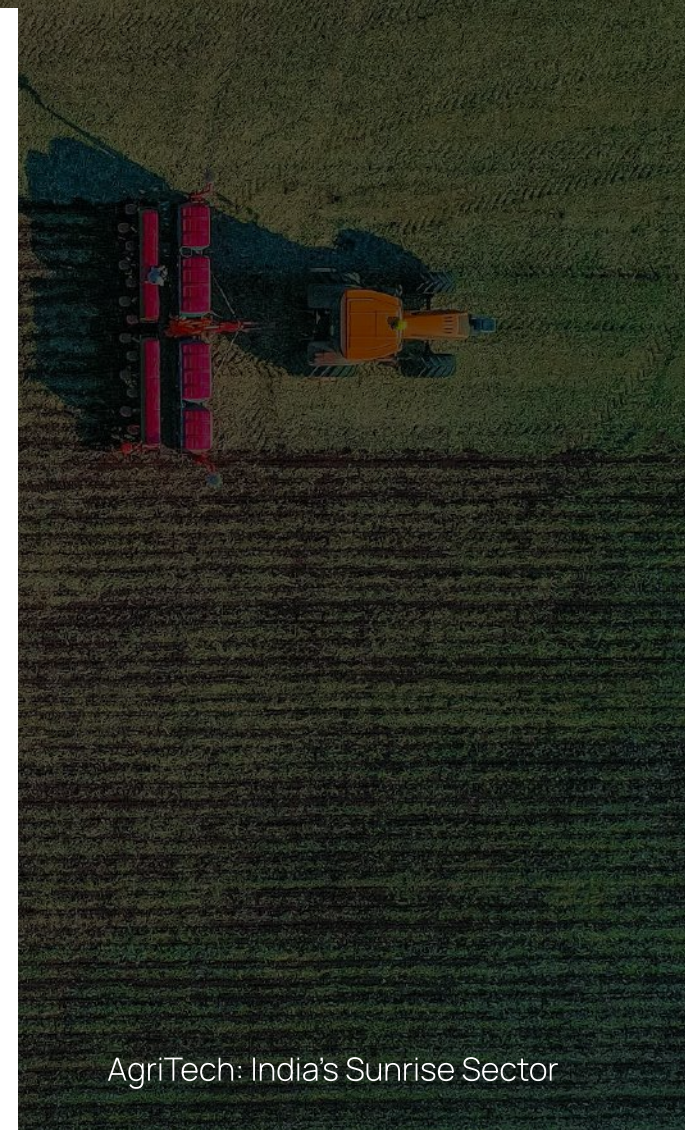
Managed farming with soil-less agriculture  
Raised \$2M Pre-Series A (Avaana)  
\$6.5M Series A (General Catalyst)



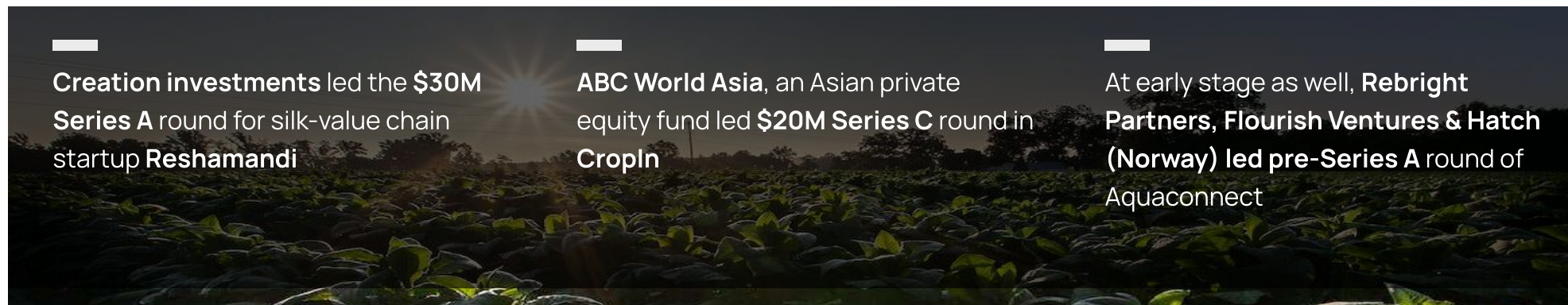
Micro-SaaS platform for Agri-input retailers  
Raised \$2.4M Pre-Series A (Omidyar)  
\$10M Series A, \$32M Series B (Gen. Cat)



Input linkages for aquaculture & animal husbandry  
Raised \$5M Pre-Series A (Sequoia)



Here are some significant global investors who entered into Indian AgriTech in 2021-22:



New areas also received funding: Aquaculture & Ag-BioTech

 Aquaculture & Seafood supply chain in particular attracted interest from investors. **Captain Fresh**, a B2B Marketplace for seafood, raised ~\$120M across 2 rounds of funding from **Tiger Global, Prosus, Accel**

 Omnivore set up a **biotech accelerator OmniXBio**, to back Ag-BioTech startups in India. **BioPrime**, a maker of microbe-based crop nutrition products, was among the startups to raise seed funding

Our field work involved interacting with 100+ farmers, wholesalers, retailers across many districts, mandis, dairies. These conversations helped us gain deeper insights into potential AgriTech solutions and develop an inside-out view of emerging opportunities.

**We overlaid our work in agriculture with our learnings from other key sectors like consumer-tech, deep-tech, B2B marketplaces and enterprise software, to develop our investment thesis and identify potential areas of disruption.**

In each section, we will first discuss the challenges faced by farmers, and then seek to understand how startups are currently trying to solve them. We analyse the challenges for AgriTech's unique business models from an investment or scalability perspective. Our objective here is to lay out what we think would be promising opportunities and winning business models.

**Based on our work, we have identified 4 key sub-sectors of Indian AgriTech:**



# We believe 3 factors are key to transforming Indian agriculture.



**Fair prices to farmers**, for inputs as well as outputs. This involves solving for accessibility and affordability of inputs and creating sustainable demand for Agri-produce with minimum wastage.



**Improving yields and products quality** - enabling farmers to sow and grow better as well as providing crop advisory to increase farming efficiency.



**Solving for financial inclusion** - providing farmer centric loans and insurance. This includes developing new techniques of growing crops such as hydroponics, aquaponics.

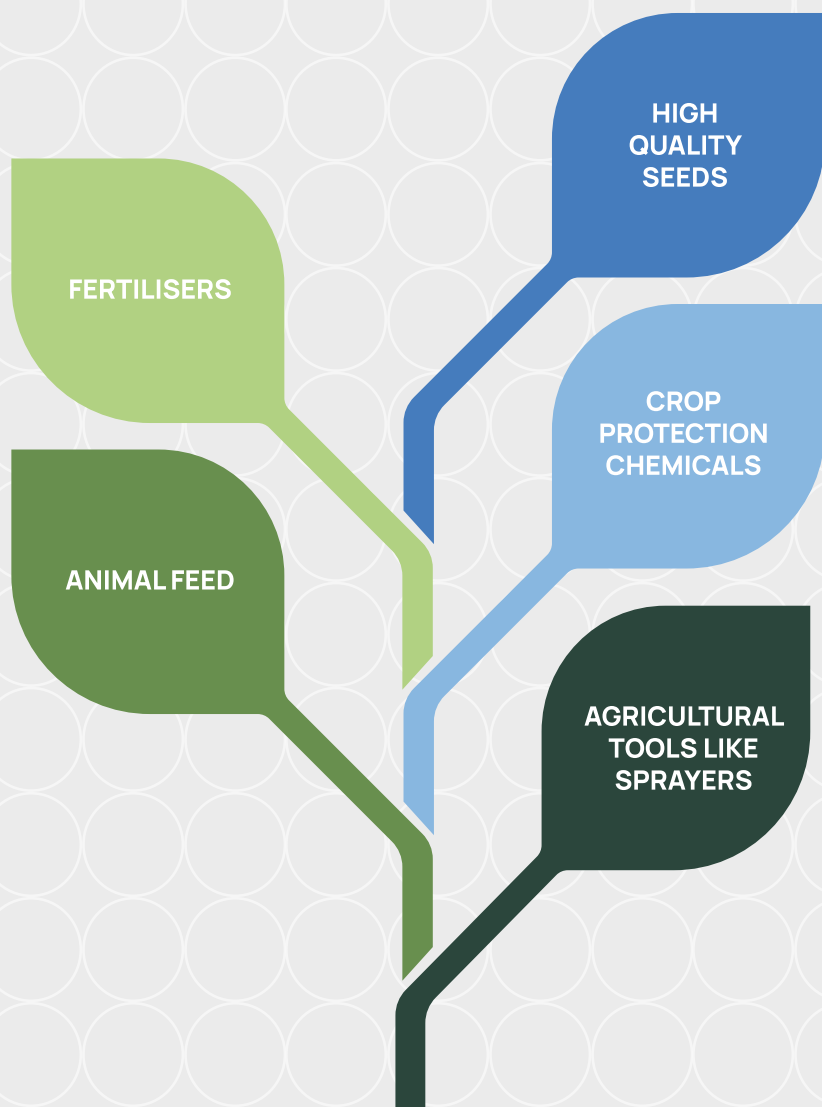




# Opportunity in Input Linkages

## INPUT LINKAGES

Agri-inputs is a **\$10B industry**<sup>8</sup> in India, encompassing **five categories**:



**India has over 3 lakh input retailers and more than 36,000 distributors of agri-inputs**<sup>9</sup>, but Indian farmers still lack access to quality inputs at the right time during crop cycles.

Accessibility isn't the only problem. Farmers often end up with a sub-optimal selection of inputs that leads to poor yields and low realisation. The quality and grade of outputs depend on a range of factors including the kind of seeds, soil health, crop protection measures implemented during the sowing cycle. Despite a slew of government-awareness initiatives and subsidies, the **under-use or over-use of fertilisers & pesticides** is common. Another key challenge is the **low levels of farm mechanisation**. Basic cropping tools like sprayers or sprinklers and machines like tillers and tractors remain inaccessible or unaffordable for many Indian farmers.

Many farmers still grow crops based on rule of thumb and traditional practices. Given the complex nature of Inputs, farmer education, combined with access to quality inputs, makes a key difference in improving yields. This points to a **pressing need for agronomy and crop advisory services** that are accessible and affordable.

While there are many layers of challenges, perhaps the most fundamental one is **improving the affordability and accessibility of high-quality inputs**. One of the chief issues is that the Agri-input supply chain is long and fragmented. Inputs change hands many times, leading to delays, losses in quality, adulterated products and higher prices. Herein lies the opportunity for startups to redefine Agri-input distribution. For instance, one of the key opportunities involves the **development of technology solutions** that can track farm dynamics and propose the right kind and quality of crops to sow as well as the place to procure inputs from.

If the input supply chain is optimised, we estimate that savings of

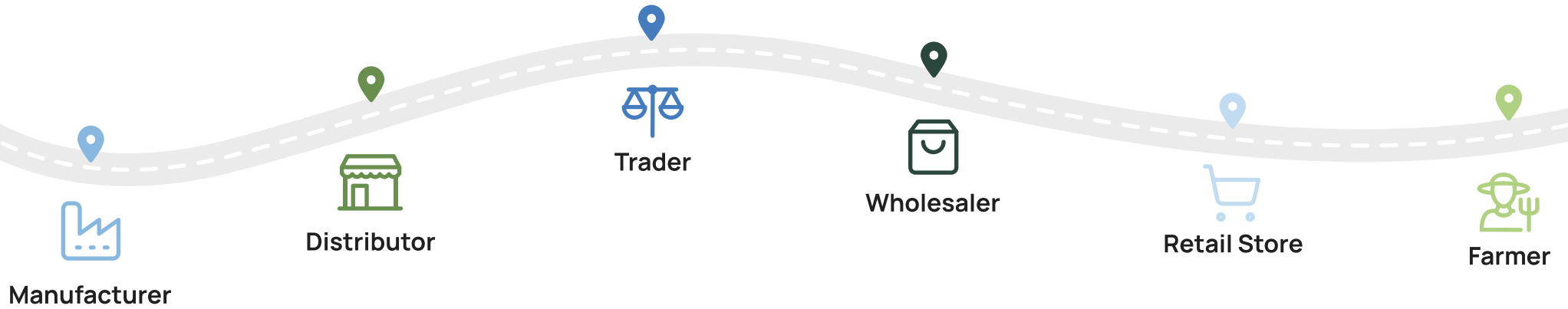
**30-40%**

can be achieved.



India is a unique market when it comes to the distribution of agricultural inputs. The supply chain consists of manufacturers, super stockists, traders, wholesalers and retailers who ultimately sell products to farmers.

INPUTS SUPPLY CHAIN



Product Information →

Exhibit 2: Traditional Supply Chain

Flow	Supply	Intermediaries			Demand	
Channel Player	Manufacturers	Wholesale/ Distributors	Traders	Super Stockist	Retailers	Farmers
Estimated No.	10,000	30,000	5,000	1,000	3,00,000+	12 Crores
Gross Margins	15 - 30%	6 - 12%	~2%	3 - 8%	10 - 20%	-

← Money & Product Feedback



### DIRECT TO FARM PLAYERS PIONEERED AGRITECH THROUGH M-COMMERCE & E-COMMERCE:

- In this model, **the player aggregates orders from farmers using mobile applications (bighaat, Faarms) or call centers (Agrostar).**
- These companies then rely on **third-party logistics providers** (or in some cases, their own logistics) to deliver seeds, pesticides, fertilisers to farmers in rural areas.
- These models can be hard to scale because of two reasons:
  - The cost of serving last mile farmers in rural areas is high – **order values and sizes are not commensurate with the cost of delivery, and logistics cannot be easily optimised, unlike in urban areas.** For example, each delivery point (farm) can be as far as 50 kms from one another which is not the case for urban e-commerce deliveries of consumer goods. High costs of warehousing, fulfilment centres and inventory hinder their ability to operate efficiently.
  - As they disintermediate retailers and the traditional feet-on-street model of Agri-input manufacturers, **they struggle to gain popularity in rural areas.** They are essentially competing with years-old established rural value chains. And as they start to get a foothold in the market, **they face competitive pressures from Agri-giants** like Mosanto and Bayer, who still play a huge role in determining last-mile margins and availability.

\*This graph is non-exhaustive



### THE MANAGED MARKETPLACE MODEL:

- The managed marketplace model has been highly successful across different industries. Think Oyo (for hotels), Cult.Fit (gyms) or Pristyn Care (medical care). **It was Bengaluru based DeHaat which pioneered this model in the rural, agricultural inputs space in 2012-13.**
  - **Local agri-retailers are rebranded as DeHaat centres or uStores by Unnati.** These retailers who have existed for many years in the villages already have the trust of farmers and rural stakeholders. DeHaat also enables micro-entrepreneurs to build a “DeHaat” local store.
  - Then these stores are provided inputs via the AgriTech player’s supply chain. The inputs are sourced from the manufacturer directly.
  - These models evolve into platform plays, as the centre who provides inputs can very well carry out advisory services and then also purchase the output from the farmers. They can thus monetise the same farmer base more effectively.
- However, **it is important to note that this will tap only 10-20% of higher-end agri-input stores or micro-entrepreneurs across specific areas.** Not all stores will become franchises. This model is also limited to scale in certain geographies due to local government and mandi factors. These stores focus on top quality inputs from MNCs or large national scale manufacturers.

\*This graph is non-exhaustive

### Retailer-focused Marketplaces



Manufacturer



Retailer

### B2B MODELS FOCUSED ON AGRI-INPUT RETAILERS:

- Some retailer-focussed B2B platforms have emerged in recent years. These models focus on the wider majority of Agri-input retailers.
- These companies either earn higher commissions by selling different branded or local products or by offering micro-SaaS platforms to drive engagements
- Agrim is one such B2B marketplace, aiming to solve for inputs supply via a simple digital interface, a robust fulfilment process, and embedded fintech solutions. It connects the manufacturers of Agri-inputs to retailers across the country.

### OUR INVESTMENT IN AGRIM

- Apart from the large multinational and national players, who control a small portion of the supply, **there are thousands of Agri-Input manufacturers in India. These are often regional and legacy family-run SMEs with an annual turnover of between Rs 5 and 100 Cr.** These manufacturers face unique challenges. They are unable to expand beyond certain geographies while their margins are squeezed by different stockists and wholesalers. **The need to invest capital upfront on ordering also hampers their ability to scale and rotate working capital faster.**

## OUR INVESTMENT IN AGRIM

**B2B marketplaces need to solve the twin challenges of access and efficiency for SMEs in agriculture.** Agrim's platform has seen increasing engagement & strong retention rates of retailers.

- We believe Agrim's B2B model will win because:



**Agrim has a unique go-to-market strategy of working with smaller manufacturers and less penetrated categories like Agri-tools.** It is solving critical supply issues for retailers while offering better prices and expanded reach to manufacturers, making it a win-win.



**Their moat lies in their first mover advantage, their go-to-market strategy and trust with manufacturers.** Other well-funded farmer platforms can be potential competitors if they venture into B2B, but it looks unlikely that they will pivot their business model.



In parallel, **Agrim is building an ecosystem for small agri-retailers to help them address their finance and working capital needs.** This in turn helps improve engagement and retention on the platform for these retailers.



## THE MOVE TO AGRIFINTECH

As we learnt from Agrim's journey, **unlocking financial solutions is key to spurring sustainable growth in the Agri-inputs space.** Traditionally farmers bought inputs on credit from local stakeholders who ultimately own the right to sell the farmer's produce and recover their cost from the realisation.

Today, a lot of mature and established AgriTech players are embedding financing / credit enabling as part of their core offerings through market linkages, post-harvest, agri input and data centric models.

**However, we still see low levels of activity in direct-rural lending to farmers or stakeholders. Only 30% farmers have access to institutional credit and the remaining 70%<sup>10</sup> remain dependent on informal channels of credit. In the last five years, value chain financing players like Sammunati and Jai Kisan have emerged, generating positive results. However, lending to small landholder farmers and agri-stakeholders remains a large, unsolved piece of the puzzle.**




Though technology cannot resolve the issue of loan waivers and defaults, it can certainly address other challenges faced by bankers in farmer financing. Improving access to quality data and digitisation of records can increase a banker's ability to lend many-fold through the support of AgriTech players. Bankers are wary of lending to farmers and other value chain players primarily owing to a lack of data, market linkages, high transactional cost of lending as well as recovery, along with unpredictable loan waivers by state governments. <sup>11</sup>

**Hemendra Mathur, Bharat Innovation Fund**


AgriTech players can help drive growth in lending and build credit history for rural stakeholders in the following ways:

### Unique access to data




**Agri-Input** and **advisory players** have precise information on **what the farmer is growing**, their land holdings and outputs with the seasonal sowing schedules. They can thus be an efficient source of first-hand data that is not available elsewhere. AgriTech players like DeHaat often develop **transaction histories** with farmers, of selling inputs and subsequently buying outputs - **crucial data for banks and NBFCs**. They can thus help banks & NBFCs lend far more confidently. **Key information like input use, crop and soil health, and quality of produce aims to build risk profile and credit-worthiness of small farmers.** This data is key for risk assessment and lending.

### Digitising physical records



Farmer and farm records are largely preserved in rural offices in physical forms, and the land often undergoes many divisions as generations pass. **Digitisation of land records, growing patterns and farmer identity hence become crucial for lenders to underwrite risk efficiently.**

### Unlocking credit through embedded finance



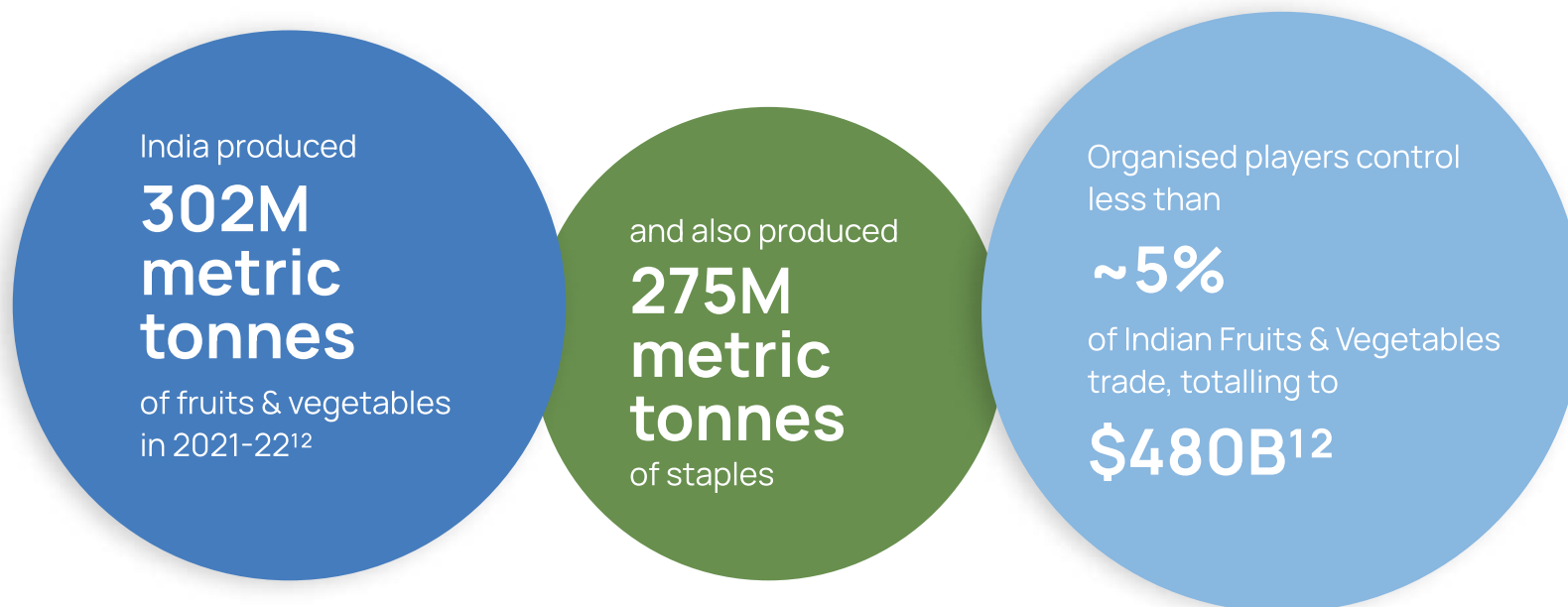
Using such information, banks/NBFCs and even neo-Agri-Fintech players can lend to farmers and rural stakeholders like Arhatiyas, commission agents effectively. **AgriTech players can develop and train their own algorithms**, using unique farm and transaction data. This can help them **underwrite risk better**, opening up opportunities to work in partnerships with public/private banks and NBFCs to lend.



# Opportunity in Output Linkages

The first principle in improving farmer incomes is to ensure that they get better prices for their produce with minimum wastage. Output linkages in India are an extremely complex supply chain, consisting of several players who interact and engage in almost every transaction. Startups have been active in this space for almost a decade. A few leading players like Ninjacart and Waycool were founded in 2014-15 and are building a B2B supply chain for fresh produce. This space also has seen several models of aggregators, logistics, cold chain providers, and trade platforms emerge and scale. They have also raised several rounds of institutional funding.

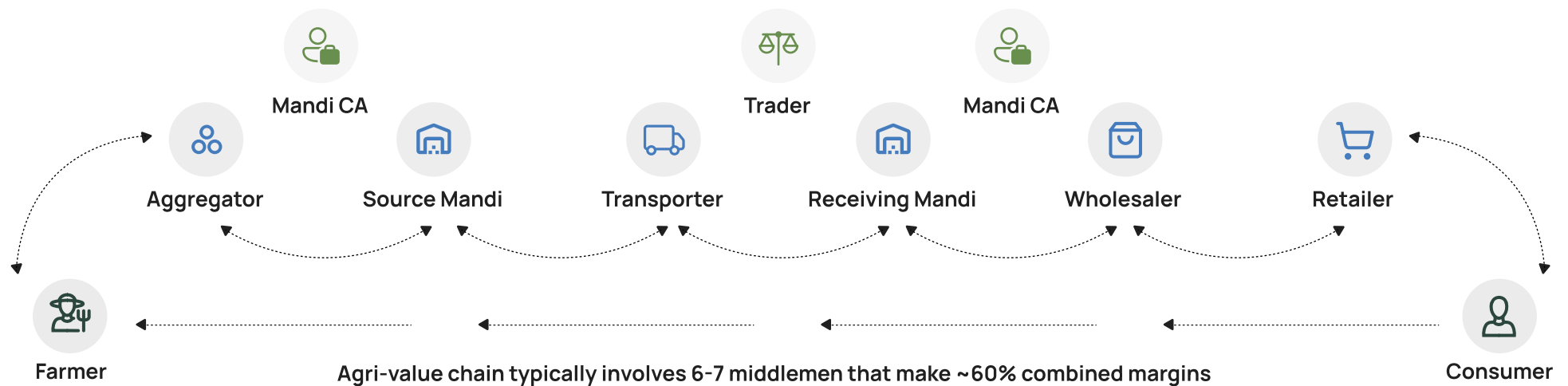
India is the world's second largest producer of fruits, vegetables and staples, producing 302M metric tonnes of fruits and vegetables and 275M metric tonnes of staples in 2021-22. However, organised players control less than ~5% of Indian Fruits & Vegetables trade that totals \$480B. For staples and processed outputs like pulses and wheat, the percentage is even lower.



**TO IDENTIFY OPPORTUNITIES TO BUILD LONG TERM VALUE, A DEEPER UNDERSTANDING IS REQUIRED OF THE UNIQUE CHALLENGES IN THIS COMPLEX SUPPLY CHAIN.**

- The agri-value chain typically involves several middlemen who make combined margins of ~ 60% from farmers to end-consumers.
- Despite various attempts to fix the supply chain, **the power and control over moment of goods largely remain with local wholesalers, mandi agents and retailers.**
- **In some cases, there are as many as 11 middlemen involved.** This creates challenges for different groups of stakeholders, summarised as below:

**Exhibit 3: Agri-output value chain**





To summarise, for every kilo of fresh produce, if the end-consumer pays ₹100, the farmer merely gets ₹58. This income loss of ₹42 or more than 40% is largely due to leakages in the supply chain and commissions charged at every stage.

### FARMER

- Sows crops based on past information and knowledge, unaware of the market demand
- Forced to take high interest debt to service the crop and to use traditional channels to sell the produce

### SUPPLY CHAIN

- Massive food wastage – Not grading the produce leads to lower quality produce that receives poor prices in the market
- Poor fill rates – Not able to service the complete basket
- High price volatility – Over-supply or lack of supply owing to market conditions

### CONSUMER

- Has to cover the costs of multiple intermediaries – many middlemen in the supply chain increase costs and adds to wastage, a cost that is ultimately borne by consumers
- Prone to supply shocks – shortage of key items at certain times

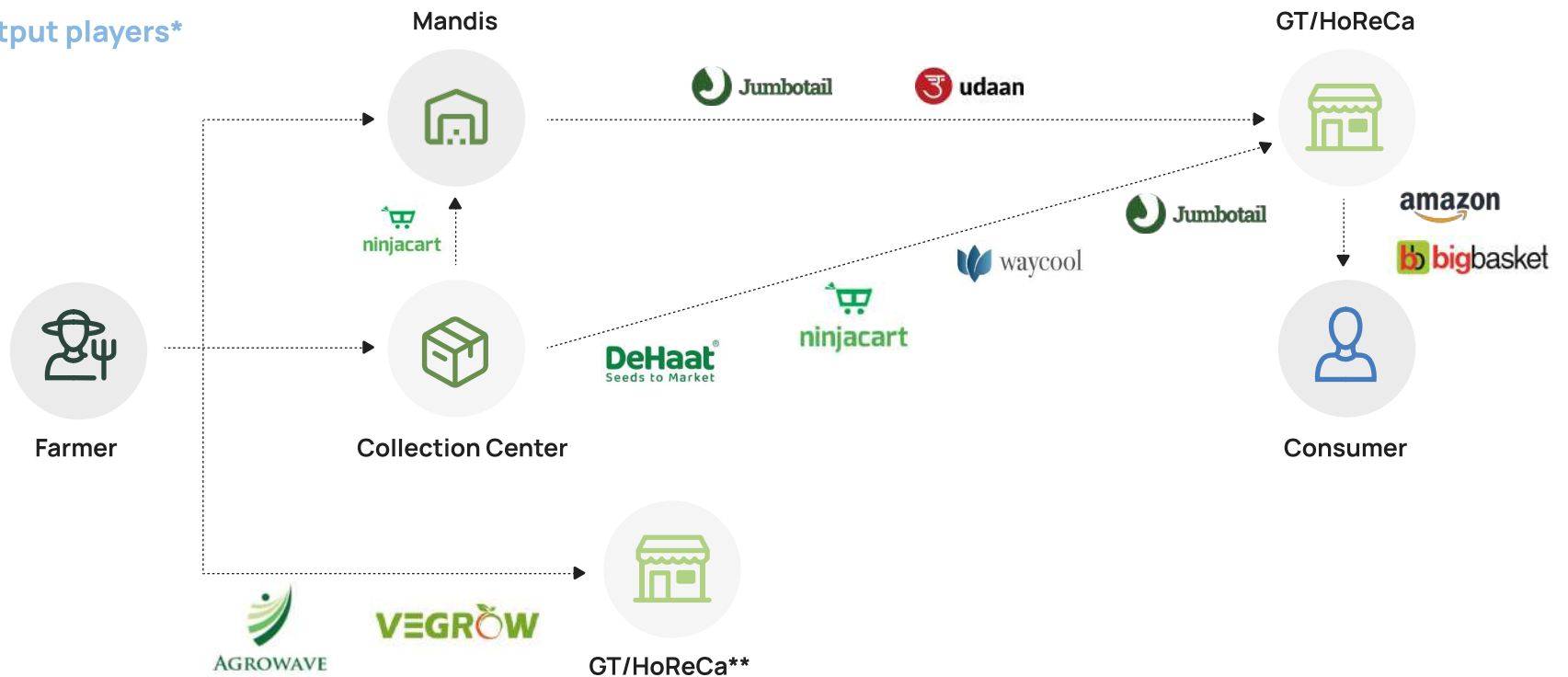
LANDSCAPE OF AGRI-OUTPUT PLAYERS

Some players interact directly with individual farmers at farmgate; a few have established collection centres or depots where farmers sell their produce while; some or all of them also purchase from other B2B players across the value chain.

We have mapped the various AgriTech players based on the part of the value chain they operate in.

Based on our assessment of market players, the output linkages landscape looks like this:

Exhibit 4: Agri-output players\*



\*This graph is non-exhaustive

\*\*GT: General Trade | HoReCa: Hotel, Restaurant, Cafe

B2B startups operate in various parts of the output supply chain. **We can broadly identify three business models:**

01

### MANDI TO BUSINESS

AgriTech players source produce from the local market and deliver it to various B2B partners like E-Commerce players, General Trade or HoReCa (hotels, restaurants or cafes)

02

### COLLECTION CENTRE TO MANDI/BUSINESS

AgriTech players have centres closer to production points in villages, where produce is dropped by the farmers. The players then transport this locally sourced produce to B2B partners

03

### FARMGATE TO BUSINESS/MANDI

A few AgriTech players procure fresh produce from farmgate, solving the problem of local transportation for farmers. They procure such produce and transport to businesses based on demand

While a lot of AgriTech players have set up collection centres closer to villages and production areas, sourcing at scale from the farmgate, remains a big challenge because of the cost and fragmentation of suppliers involved. Having collection centres helps in aggregation and reducing first mile cost. **However, local transportation from farmgate to mandi (local market) remains a pain point for farmers, and we see an opportunity here to move the goods from the farmgate to the selling areas (mandi, businesses) on an efficient and scalable manner.**



## DIFFERENT OUTPUT PLAYERS ACROSS VALUE CHAINS

Since every value chain in agriculture is worth multiple billion dollars, players focussed on one or two specific value chains have emerged in recent times. **There are a handful of startups in Fruit and Vegetable trade and many have set up operations in processed goods and non-perishable commodities.** The following graphic highlights a few startups working in different value chains or parts of the output value chain:

Exhibit 5: Output players across value chains



## WE BELIEVE LARGE OPPORTUNITIES EXIST IN A FEW KEY AREAS

### 1. BUILDING SCALABLE SUPPLY CHAIN FROM FARMGATE TO MARKETS

- **Currently output linkage players set up collection and fulfilment centres that are expensive to maintain;** Unit economics bleeds red.
- **Transport and pickup from the farmgate remains an untapped opportunity** as farmers still need to travel 50km or more in many cases to local markets to sell produce.
- **If a reliable, technology driven supply chain** can be created here, it **will create immense value-add for farmers especially in rural areas.**

AgriTech players can build scalable solutions for:



**Creating a safety net for farmers by procuring** their entire basket of produce. If a player does not take up entire production of the farmer, the trust factor is difficult to build. The farmer still has to rely on local channels like mandis and aggregators for selling his remaining produce. Capturing wallet share is thus critical for the player's success.



**Create quality specific supply linkages:** building swim lanes for different grades of produces. AgriTech supply chain & customer pools should be diversified so that all grades & quality of produce can be sold at reasonable market rates. For example, Top quality produce (grade A) is sent to consumers/supermarkets. Grade B quality (slightly ill-coloured, off shape but good quality) can be supplied to hotels, restaurants, and cafes. Grade C or lower quality produce could be liquidated through wholesale markets.

## 2. E-MARKETPLACE IN OUTPUTS

- **Modern supply chain players have tried to bypass and eliminate local mandi traders and arthiyas.** Traders and commission agents are often an overlooked aspect of supply chain.
- There lies an opportunity to **digitise and ease the workflow of these mandi- commission agents and APMCs.** If the transactions and accounting process is standardised, the supply chain can be productised and designed with a very simple UI linked with WhatsApp APIs
- **e-NAM** (e-national agriculture market) **hasn't taken off:** e-NAM is an online trading platform for farmers to sell their produce across the country. Designed to automate mandis, it hasn't created the desired impact yet.

**BASED ON OUR EXPERIENCE, SOME CRITICAL FACTORS ENABLE THE SUCCESS OF PLAYERS SOLVING FOR OUTPUT LINKAGES. A STARTUP POSITIONS ITSELF TO WIN IF IT IS ABLE TO ADDRESS ALL OR MOST OF THESE FACTORS:**



#### **Purchase entire basket of produce by farmer**

**This develops trust and dependability.** If the partner only takes a part of the produce of a certain grade, the farmer still has to rely on other sources to sell his produce – which does not develop stickiness to the platform .



#### **GM over GMV**

Given the size of the agri economy, it is relatively easy to build scale and achieve high growth rates in total gross merchandise value for output linkages. However, to do so efficiently at low levels of wastage, is the real challenge. **Entrepreneurs need to develop logistics, pricing and product models that deliver higher margins than standard offline bazaars.** Otherwise it is very difficult to compete with mandis in the long run given long working capital cycles.



#### **On-ground presence**

App-only services do not strike up familiarity and tend to struggle to gain the trust of farmers. **Having a local VLE or ground officer serves the dual purpose of acquisition as well as engagement.**



#### **Working Capital**

Working capital cycles in the B2B space tend to be 30-60 days and often lead to a significant capital crunch. Entrepreneurs need to manage their purchase/sale books and related clients to keep the WC cycle short.

### Locally dominant players have potential to win big



- We believe **local players** that build control over the supply to particular states/clusters of districts and scale through technology **will be winners**
- For example, **Rajasthan alone has 21m cropped area** ~ resulting in a market size of **\$380M<sup>13</sup>** for precision agri and **\$1.2B** for output linkages alone (2024)
- Current players have addressed **< 5% of TAM**. Many states like Andhra Pradesh, Kerala, West Bengal, Bihar remain **vastly underpenetrated**

### Technology is not the end, but the means to the end



- Technology will be a key enabler in scaling solutions and key applications like price modelling, optimising forecast and reducing wastage
- Technology cannot eliminate the layers in supply chain but de-risk it to a certain extent
- Currently the supply chain remains ops heavy and operates more on a phygital model

**Output linkages are a complex problem. Many solutions have been tried out, but with little luck so far in building a replicable business model. We believe part of the solution lies in creating technologies to predict demand from different sources, like Mandis, HoReCa, Local Markets etc.**

**Lack of predictability means farmers fail to harvest at the right time. This, in turn, leads to negative or no ROI. Among the key opportunities are solutions that enable farmers to know the real-time prices of produce and options to sell across different marketplaces, integrated with logistics and storage.**



# Emerging Sectors in AgriTech

## PRECISION AGRICULTURE

Precision agriculture involves the use of modern technology to ensure that crops and soil receive scientifically adequate nutrition. This, in turn, reduces costs of farming and increases per-hectare yield and output. Precision agriculture in India, today is limited to high value or horticulture crops. Horticulture is the branch of agriculture dealing with garden crops, generally fruits, vegetables, and high value crops.

As more farmers prosper and the government incentivises the adoption of higher value crops, the area under horticulture is increasing every year. **Area under horticulture in India has increased from 25M in 2017-18 to 30M hectares<sup>14</sup> in 2019.** Of this, around **14M hectares** of land is estimated to be under progressive horticulture.

The addressable market for precision agriculture can be roughly equated to the land under progressive cultivation in India. This results in an addressable **market size of \$3.4B assuming**, average cost of cultivation to be \$250<sup>15</sup> per plot.

AREA UNDER HORTICULTURE (ha)

**25M** ..... 2017-18

**30M** ..... 2019

AREA UNDER PROGRESSIVE CULTIVATION

**14M hectares**

MARKET SIZE OF PRECISION AGRICULTURE

**\$3.4B**



**Total land under cultivation** 160M ha



**Total land used for Horticulture in India** 30M ha



**% of farms assumed to be progressive (have micro irrigation)<sup>16</sup>** 47%

**TOTAL LAND USED FOR PROGRESSIVE HORTICULTURE** 14M ha

**CONSIDERING 1 ACRE AS THE AVG. PLOT SIZE, TOTAL NUMBER OF FARM PLOTS IN INDIA** 33.6M

Land under Progressive Agriculture

14M ha

x

Average cost of cultivation

\$250

=

TAM

\$3.4B

## A FEW NOTABLE FACTS ABOUT PRECISION AGRICULTURE IN INDIA



In India, this sector is largely untapped and under-funded (in terms of funding and startup activity). Only ~8% of total funding in AgriTech startups has gone to precision agriculture segment. In the US, precision agriculture startups raised 55%<sup>17</sup> of total AgriTech funding.



Startups are not able to unlock scale here and raise growth capital. However, a lot of innovation is happening in the space and economics for farm can work.



Role of technology is far greater in precision agriculture solutions than other subsections.



## TECHNOLOGY ENABLING PRECISION AGRICULTURE

Precision agriculture is usually driven through hardware or software support from technology. This is delivered through different modes, like drones or Internet of things-based hardware devices. The delivery models of precision technology have evolved over the last 5 years.

The first wave of precision agriculture technology saw the adoption of drones. The next wave brought IoT devices and satellite-based data to the fore. In terms of farm mechanisation and intelli-machines, we believe India is still a few years away from commercialisation and hitting operational feasibility for these devices.

Here are a few key takeaways from our analysis of various technology models:



## GLOBAL MARKET

Globally, the precision agriculture market is clocking a CAGR of 13% and is expected to be valued at more than \$23B by 2030. In the United States, the precision agricultural market is estimated to be worth around \$3.8B and is recording a CAGR of 7%.<sup>18</sup> The precision agriculture market in the US is a lot more mature than India's. In China, the precision agriculture market is also growing rapidly - estimated at \$548M<sup>19</sup> and clocking 18.7% growth year on year.

The Indian market for precision and modern agricultural tools and methodologies can potentially be as large as that of the US. To unleash India's true potential in precision agriculture, the following factors will be crucial:

- Indian market is still not ready for deployment of precision agriculture solutions at scale – the farm economics in small land pieces do not make sense for farmers to spend extra money on precision agri services.
- **Farmers in rural India should look for solutions like land-pooling where possible and similar schemes could be incentivised by government. For example, if five farmers with a 1-acre plot each pool their resource, they stand to benefit from the installation of IoT devices that give accurate weather, soil and crop protection information across five acres of land. The cost is also divided five ways, making it very affordable.**

- As technology permeates through rural India, the addressable market is rapidly growing. More farmers are now moving to horticulture crops and land is increasingly coming under progressive irrigation methods.
- **Mass adoption still requires government support, strong marketing campaigns and more affordable solutions for farmers. The government could consider supporting the purchase of products like drones, IoT devices and soil testing machines. They could also provide enrolment benefits to FPOs and launch adoption drives in key areas.**

## BASED ON OUR ASSESSMENT, THE FOLLOWING FACTORS ARE CRITICAL FOR SUCCESSFUL OUTCOMES IN PRECISION AGRICULTURE:



### **Building a farmer advisory platform, where integration is key**

- Players need to view farmers as a revenue-function and not as a cost-function, otherwise it is very difficult for them to build a long-term relation beyond transactions (like output linkages players).



### **Scalable farmer-digital advisory services**

- Farmers do not exist in a vacuum; they are very well connected to rural networks and are an integral part of a complex web of players.



### **Geo expansion to achieve scale**

- For each new territory, the player needs to provide a proof of concept with a group of farmers, and then the next step is to promote adoption in nearby villages.
- This pattern could be repeated in every new geography. Marginal cost of farmer acquisition is never zero in agriculture.
- AgriTech players, hence, should aim to scale in belts - for example, grapes in Maharashtra, chilli in Guntur, Apples in Himachal.



### **Pure play advisory might not work**

- To own the customer, market linkages and selling support needs to be provided by the AgriTech Players.
- Develop downstream channels that are critical to attain the right price for produce. Warehousing and cold storage are other avenues.



### Power of credit in rural India

- Build agreements with rural banks, explore tie ups with value chain financiers like Sammunati/Jai Kisan for financing purchase of equipment.
- Retail channels and stakeholders often have relationships with farmers beyond trade and business – they act as first source of trusted advice and informal credit. ~75% of marginal farmers take input credit.



### Global plays in controlled environment

- While in India monetisation is transaction/margins-based, startups can take their solution to global markets with a SaaS-based pricing. As food traceability takes centre-stage, there will be tailwinds for tech-first players.



### Evolving export market

- Cost advantage for Indian players like Fasal over global players like Arable (US, Series C, \$30M funded) is significant and should be leveraged in global markets.
- Indonesia, Bangladesh and plantations in Malaysia can prove to be the ideal expansion grounds for players.

## AQUACULTURE IN INDIA

“India’s fish and meat industry is worth \$95B but only 9% of the total produce flows through the organised supply chain.”<sup>20</sup>

### MARKET OPPORTUNITY

- India is the second largest aquaculture producer globally, after China, with more than 5M farmers engaged in aquaculture in India
- We have 15% share of world’s aquaculture production and 8% of global export market.<sup>20</sup>
- India is the largest producer of shrimp globally
- From a commercial perspective, aquaculture in India is a \$7B market opportunity and has been cited one of India’s “sunrise” sectors by the government. India’s share of total aqua exports has risen from 5.5% to 8% in 2021-22.<sup>21</sup> A huge coastline, strong domestic demand and favourable export conditions make India an attractive market from an aquaculture point of view.
- Globally too, we have seen positive tailwinds in this sector. In Southeast Asia, the growth of inland fish farming has been much better than marine aquaculture. In 2018, inland aquaculture contributed 51.3M tonnes of aquatic animals, accounting for 62.5% of the world’s farmed food fish production.<sup>22</sup>

**Technically, a subset of the Agriculture & Allied industries, aquaculture is unique in its challenges and opportunities. It has been brought to centre stage due to a few breakout companies and increased investor interest in the area.**

**Marquee investors like Tiger Global, Sequoia Capital and Prosus have made large bets in the space. In 2020-21, overall investments in the space have increased to \$140M. <sup>22</sup>**

In layman terms, **aquaculture is under water agriculture**. A major chunk of the domestic fish consumption in India is supplied through inland aquaculture or fish farming, not from oceans or rivers or lakes. Farmers in coastal belts as well as the inland states of Arunachal Pradesh, Uttar Pradesh and others have taken to aquaculture as it helps them gain additional income and diversify their earning source. The government has taken several initiatives to grow fish-farming and uplift fisheries and fishermen, from the **Blue Revolution to the PMMSY**. <sup>23</sup>

## FISHERIES AND AQUACULTURE ARE UNIQUE DUE TO MANY REASONS:



### Export Oriented Sector

**Supply is a constraint for domestic consumption.**

Quality supply is limited as most of it gets absorbed in exports.



### Technology is minimal

Use of technology is limited and there are **no micro-structures present** in the market. There is a need to create & support fundamental structures that are scalable



### Unorganised Market

Three things need to be streamlined: **information, product, and money flow**. Currently most of these flows are broken & fundamentally take place in an unorganised manner. There is a need to democratise channels, make economics work for smaller scale partners & work effectively with retailers.



### Localised Issues

**Aquaculture and its problems lie largely outside Tier I cities.** We need to engage with different channels & partners to solve for the issues present in supply chain

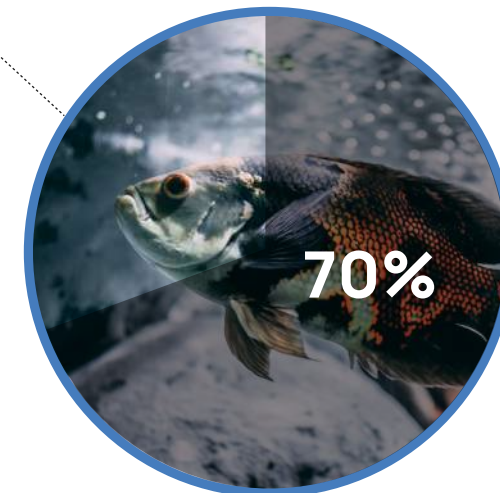
## HOW AND WHERE INDIA PRODUCES FISH?

Fisheries in India are mainly divided into two categories – **marine and freshwater.**



**30% of total fisheries are marine**, of which >80% of the supply is exported.<sup>24</sup>

**The other 70% fisheries are freshwater ones**, of which farmed shrimp is mostly sent to the export market (90% of a \$7B industry).

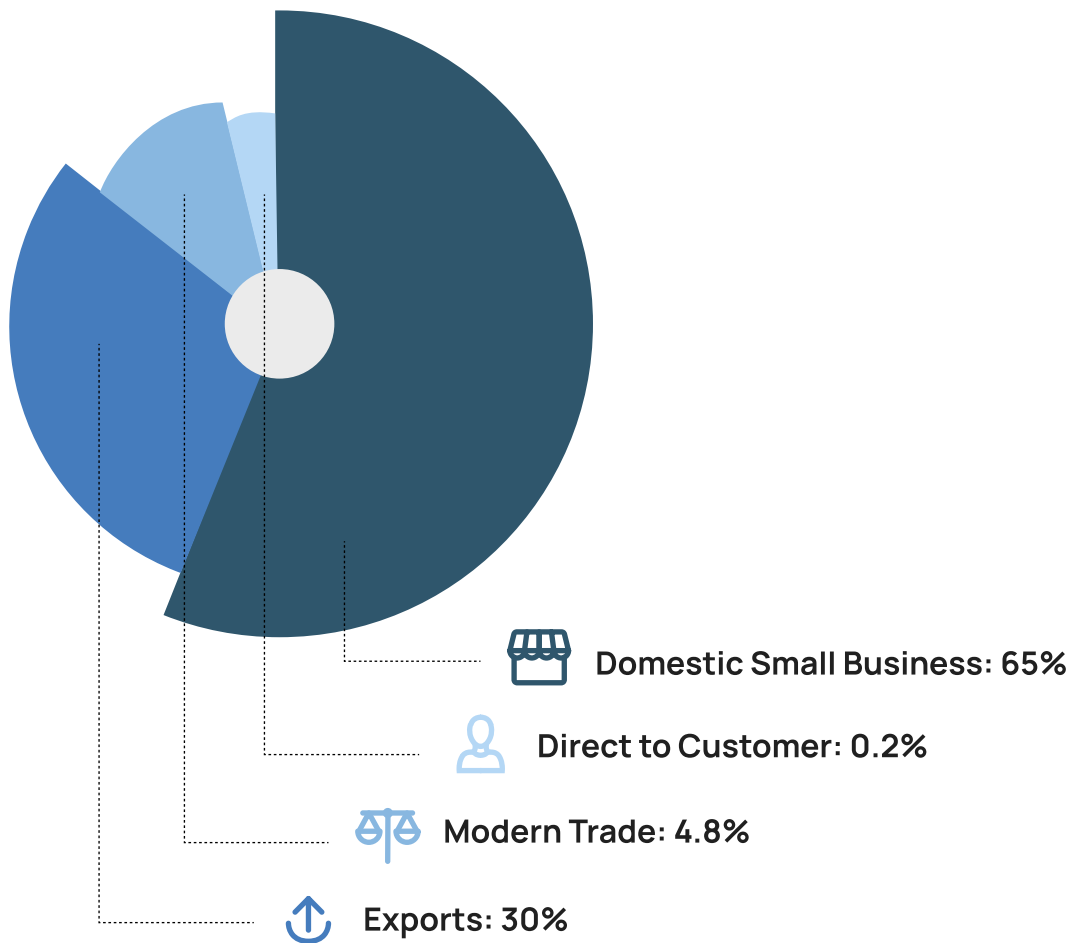


Freshwater fish and its supply chain remains more than **90%** unorganised and represents a huge market opportunity.



## HOW INDIA SELLS FISH

Exhibit 6: Market share of channels & players in a \$20B market:<sup>25</sup>



## SUPPLY CHAIN

- Place of production and the place of consumption are pretty far away
- Value chain stretches more than **1000 kilometres** and lacks trust
- **20-25%** of the total produce is wasted due to degradation and rejections

## LOCAL AGGREGATORS SOURCE PRODUCE FROM THE FISHERMEN. THEY ARE THE CRUCIAL COGS OF THE VALUE CHAIN BUT FACE MULTIPLE ISSUES:

- Lack of access to a large pool of buyers
- Logistics costs are high
- Unable to build discipline in credit recovery

### THE DEMAND SIDE GRAPPLES WITH SEVERAL CHALLENGES AS WELL:

- Demand forecasting and procurement are not easy and changes in demand lead to high wastage
- Ineffective last mile logistics.
- Buyers require particular grades and quality of produce.
- Cannot be assured of quality through traditional channels.

### FARMERS, TOO, FACE A NUMBER OF HURDLES:

- Lack of access to advisory services.
- The requirement for liquidity post harvesting limits the bargaining power of farmers.
- Lack of access to finance.

### Exhibit 7: Hurdles to overcome in Aquaculture



## MARKET MAP

## Producer focussed:

These startups aim to provide inputs, input advisory support to fish farmers. A few startups like **Aqgromalin** also provide diversification tool kits to farmers to begin aquaculture and subsequently supply inputs. **Aquaconnect** started as an advisory and IoT platform and evolved into an input-linkages model. Unique startups like **Numer8** also help fishermen to time and optimise their produce better through analytics and provide linkages.



## Supply Chain:

Like in the case of crops, the supply chain is long and intermediated. Startups like **Captain fresh** and **FreshR** aim to build a strong supply pipe for fish from areas of production to areas of demand. They add immense value by digitising the trade flow, however, this space, like in crops, is always under margin and wastage pressure.

Key issues to solve for are better catch, consistent supply at steady rates yielding better gross margins; optimising logistics cost and minimising wastage.



## Consumer brands:

Not directly related to aquaculture, but consumer brands like **Licious** and **FreshtoHome** have become a household name for supply of quality meat and fish. By ensuring quality, and freshness, with astute packaging, these brands have been able to scale across the country.



# Conclusion

India's AgriTech ecosystem has grown rapidly in recent years, but there is still a long way to go in terms of real value creation. We believe AgriTech will emerge as one of India's most exciting 'sunrise sectors' over the next two years.

A combination of factors will drive progress and success in Indian AgriTech:



### COLLABORATION AND CONSOLIDATION

Replicable business models will eventually converge. We expect to see consolidation both vertically as well as horizontally. Increased focus on EBITDA profitability will push aggregators to optimise logistics and expansion plans. Smaller input-advisory or Precision Agri startups may also be attractive targets for larger players looking to strengthen their range of offerings. E.g. DeHaat picked up farmguide for its B2B SaaS offerings as well as smaller input player helicrofter.



### EXPORT MARKETS PRESENT ATTRACTIVE OPPORTUNITIES

Exports is a key market opportunity, especially for startups in the managed farming and precision agriculture space. Advanced agronomy and proprietary growing techniques will help improve quality at affordable costs. Such produce can be branded and exported. For hardware-based players, pressing their cost advantage against players in Southeast Asian markets will be critical to scale.



## FOCUS ON LONG TERM VALUE & PROFITABILITY

In the past few years, a tremendous focus was placed on expanding aggressively, acquiring new customers and expanding the gross merchandise value (GMV). As the macro-economic environment changes, displaying positive unit economics and a sustainable path to profitability will be key. The focus is shifting to generating more recurring revenues, boosting retention numbers and becoming positive at a CM2 (contribution margin 2) level. Private labels and embedded fintech are among the emerging opportunities for startups to earn higher margins.



## INTEGRATION OVER AGGREGATION

Indian AgriTech startups adopted various versions of the aggregator model – commoditising suppliers of inputs, outputs and financial services. They expanded rapidly across geographies by acquiring new suppliers. There is now a move towards building integrated platforms that have the ability to monetise in a deeper manner and build a trusted platform for stakeholders. Integrators, focus on differentiation, providing personalised end-to-end services, across the agri-input and agri-output supply chain. <sup>26</sup>

**At Kalaari, we remain steadfast in our commitment to backing transformative startups in AgriTech. We are actively investing in differentiated models & disruptive solutions in this sunrise sector.**

**If you are an early-stage founder passionate about shaping the future of AgriTech, we would love to hear from you. Please reach out to us at [agtech@kalaari.com](mailto:agtech@kalaari.com)**

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# About Kalaari

Kalaari Capital is an early-stage, technology-focused venture capital firm based in Bengaluru, India. Since 2006, Kalaari has empowered visionary entrepreneurs building unique solutions that reshape the way Indians live, work, consume and transact. The firm's ethos is to partner early with founders and work with them to navigate the inevitable challenges of fostering ideas into successful businesses. At its core, Kalaari believes in building long-term relationships based on trust, transparency, authenticity, and respect.

If you are a founder with ideas that are uniquely Indian, we would love to speak to you.

Reach us at [recommend@kalaari.com](mailto:recommend@kalaari.com)



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