# FOOD FOR A BILLION AND BEYOND

— Devneet Bajaj & Harshith Mallya

# Summary

*Indian agriculture contributes 18% of the GDP while employing 50% of the Indian population. Indian yield per acre is lower than US, Europe and China and improvement in productivity has been needed for a very long time. With increasing internet usage and rising smartphone penetration, AgTech startups can now acquire customers more easily and also offer real-time information to improve farm productivity*

*The Indian government has placed a strong impetus on agriculture aiming to double farmers' income to $3,000/annum by 2022-23 from $1,350/annum in 2015-16.*

*India is now among the top 6 countries globally with the most venture investments in Agriculture Technology (AgTech). Since 2013, India has seen over 350 new AgTech companies with more than 50% starting up between 2015 and 2017. Total funding in core AgTech from 2016 to 2018 was $205M, while the funding from 2013 to 2015 was $62 million*

*There are multiple drivers for AgTech in India including—*

→ **Rural mobile and vernacular penetration:** *In the past five years, 126 million new rural internet users have come online primarily because of the availability of affordable smartphones, data, and vernacular content*

→ **Rise in horticulture production and market value** *has led to an increase in "value per acre" grown by large groups of farmers across India. This has enhanced their purchasing power making B2F (business to farmer) and B2B2F (business to business to farmer) models plausible and scalable*

→ **Technology adoption** *due to lowered cost of core tech like sensors and robots*

## VC Investments in AgTech

The last ten years have seen remarkable growth in the number of AgTech investments worldwide. As AgTech financings have grown, so have the number of innovative new companies announcing their presence in this ecosystem. The infographic below gives a bird's eye view of the global interest in the AgTech ecosystem.

## Investments in India

India is among top 6 countries globally with the most deals in AgTech. Other top countries are USA, Canada, UK, Israel and France[2]. Since 2013, India has seen over 350 new AgTech companies with more than 50% starting up between 2015-17. The total funding by end of 2018 is expected to stand at $86.5M[3].

Funding seen in 2017 and 2018 were primarily focused on IoT, precision farming and market linkage platforms.

*While there are many AgTech business models, the following hold promise going forward—*

### Digital Marketplaces

Proven business model with the opportunity to invest in new players who can capture a large market with regional or crop specific specialty and value-added services like advisory and lending.

### Platform Tech with Embedded IoT

Large applicable markets like dairy, floriculture, horticulture where corporates are willing to pay for valuable data that allows them to predict output and estimate/reduce disease risk at large scale.
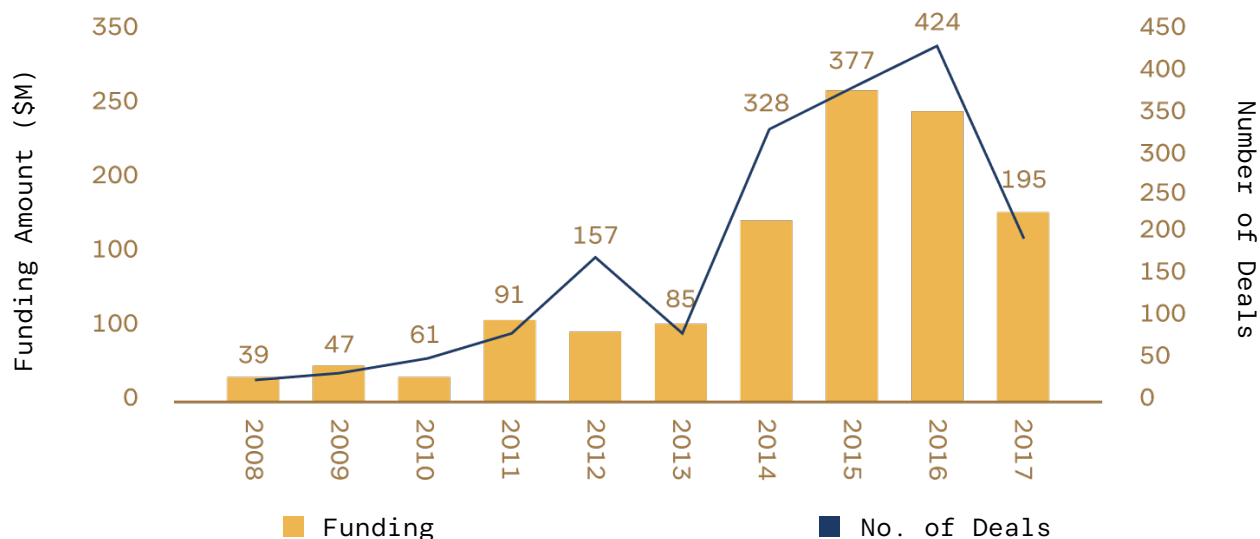
### Precision Agriculture

Huge impact on farm productivity and hence "high value" horticulture growers are inclined to adopt smart machines/devices to enhance farm yield.
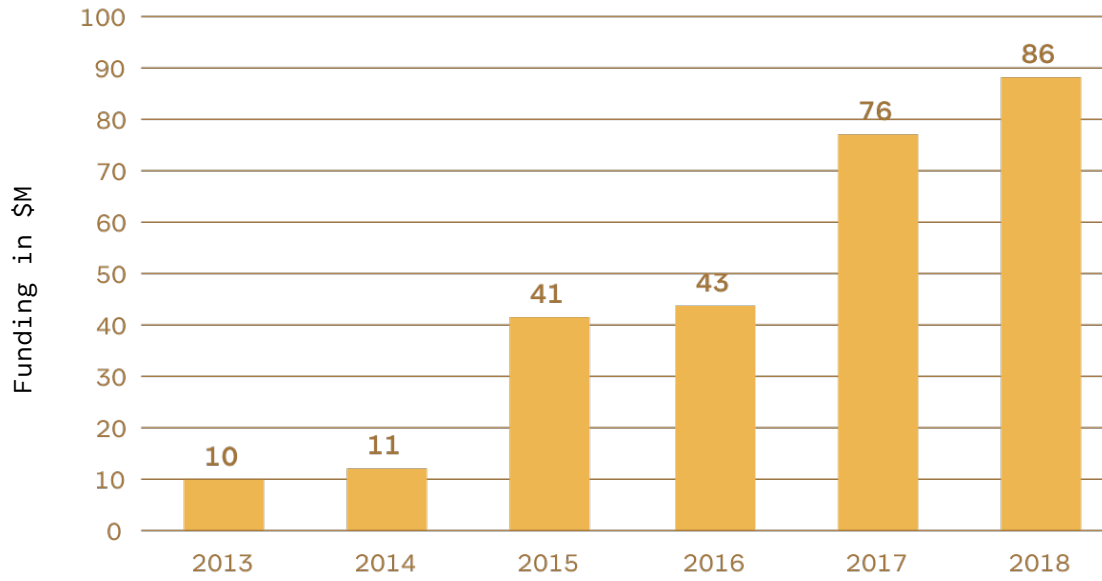
### Ag-FinTech

Significant addressable gap for new startups to leverage tech and provide rural agri supply chain focused lending and payment services.
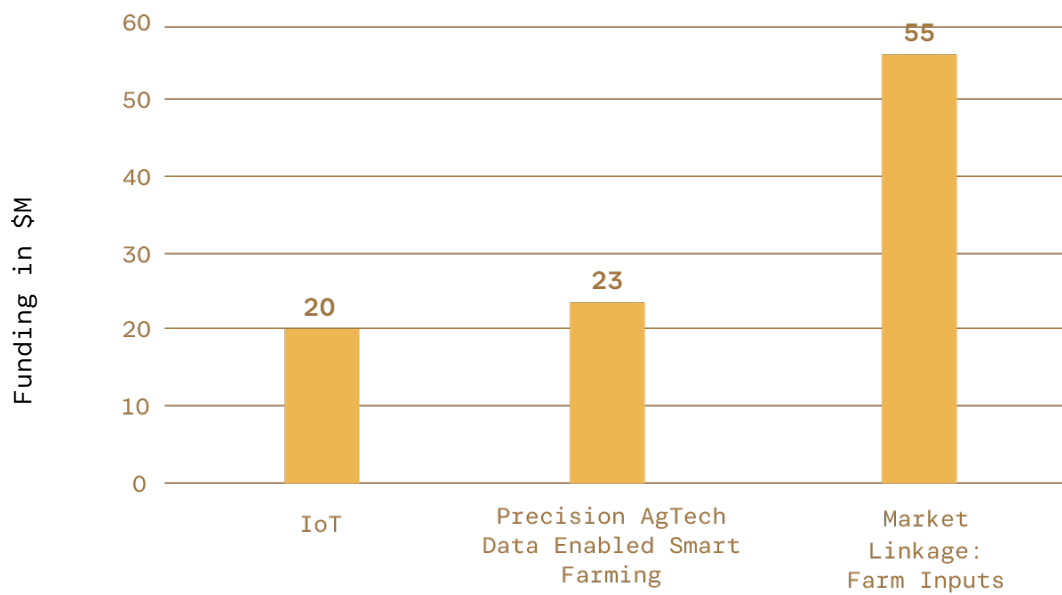
## No. of Deals and Funding in AgTech Companies Globally



Bar chart (Funding) and line chart (No. of Deals) by year. No. of Deals values: 2008: 39, 2009: 47, 2010: 61, 2011: 91, 2012: 157, 2013: 85, 2014: 328, 2015: 377, 2016: 424, 2017: 195. Y-axis left: Funding Amount ($M); Y-axis right: Number of Deals.

Legend: Funding | No. of Deals

## Indian AgTech Funding Growth from 2013



Funding in $M

| Year | Funding |
|------|---------|
| 2013 | 10 |
| 2014 | 11 |
| 2015 | 41 |
| 2016 | 43 |
| 2017 | 76 |
| 2018 | 86 |

## Funding across Key Sectors in Last 3 years



Funding in $M

| Sector | Funding |
|--------|---------|
| IoT | 20 |
| Precision AgTech Data Enabled Smart Farming | 23 |
| Market Linkage: Farm Inputs | 55 |

*Source: AgFunder, Kalaari Estimates*

## Indic Internet User Growth Potential



Users (M)

- 800
- 700
- 600
- 500
- 400
- 300
- 200
- 100
- 0

193

141

160

732

5X

Current Indic
Internet Users
(millions)

Potential New
Users (millions)

■ Urban          ■ Rural
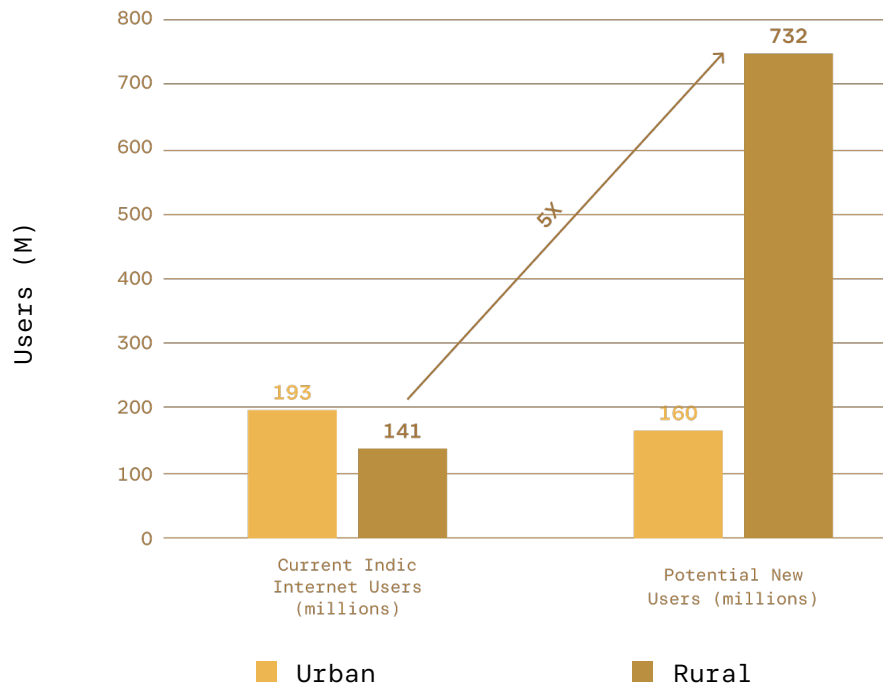
### Rural adoption of
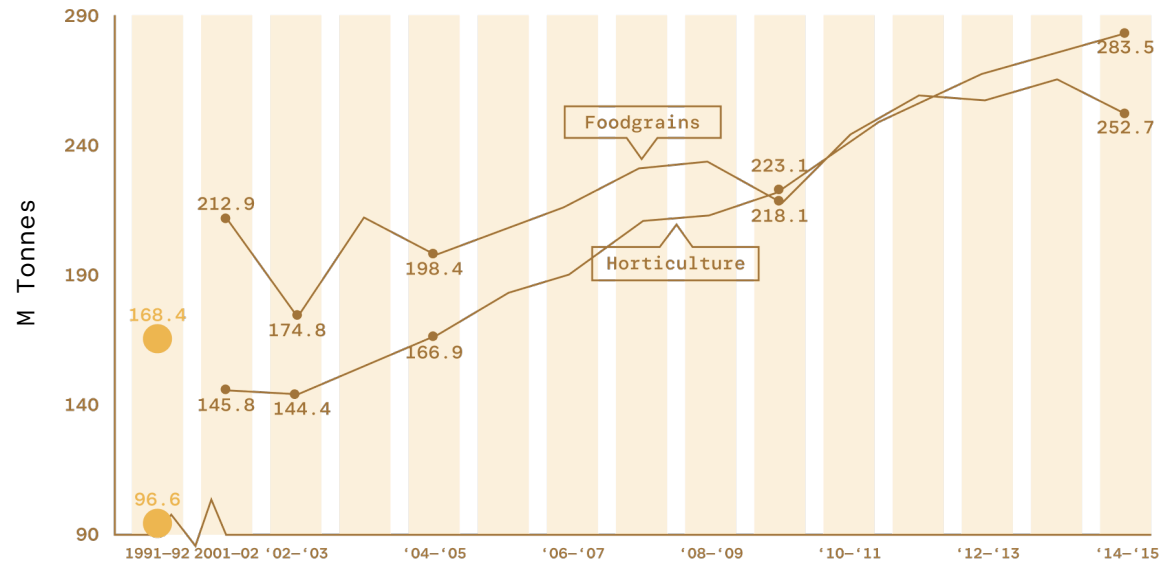### Internet and Smartphones

Easy availability of budget smartphones and access to inexpensive mobile internet connections has made it easier for rural India to get access to information and communicate on a real-time basis.

India had 59.6 million rural internet users in 2013. In the past five years, the number has grown to 186 million rural internet with 141 million of those internet users coming online primarily because of the availability of vernacular content.

Estimates are that it will be possible to activate 732 million potential new vernacular or Indic internet users in rural India in the near future.

With increasing internet usage and rising smartphone penetration, AgTech startups can now acquire customers more easily and also offer real-time information to improve farm productivity.

## Horticulture Production overtakes Agriculture in India



Chart: M Tonnes. Data points: 168.4, 96.6, 212.9, 145.8, 174.8, 144.4, 198.4, 166.9, 223.1, 218.1, 283.5, 252.7. Lines labeled Foodgrains and Horticulture. X-axis: 1991–92, 2001–02, '02–'03, '04–'05, '06–'07, '08–'09, '10–'11, '12–'13, '14–'15.

## Horticulture Growth

Consumer diet in India leans more towards fruits, vegetables and protein. Since the launch of National Horticulture Mission (NHM) in 2005-06, significant progress has been made in area expansion under horticulture crops resulting in higher production. Therefore, over the last decade, the area under horticulture grew at an average rate of 2.7% per annum and annual production increased at an average rate of 7.0% per annum. These small percentages are making a significant impact on creating pockets of income for AgTech startups.

Horticulture growth is boosting "value per acre" for farmers and enhancing their purchasing power to make B2F (business to farmer) and B2B2F (business to business to farmer) business models scalable. The graph below shows that horticulture has now overtaken foodgrain production in India and this means income of farmers now growing fruits and vegetables has gone up manifold.

# $9.8K
*A Pomegranate Farmer's Earning per acre/year[7]*

# $420
*A Rice Farmer's Earning per acre/year*

## Government Initiatives

The Indian government has placed a strong impetus on agriculture aiming to double farmers' income to $3000/annum by 2022–23 from $1350/annum in 2015–16. About 9 policies have been launched by the government to execute this plan. The plan has a 4 point strategy to support agriculture in India.

→ Processing Farm Wastes
→ Ensuring Profitable Prices for Crops
→ Reducing Cultivation Costs
→ Create non-farm source of income

Between 2005-2010, India invested $30B in irrigation and flood control. For 2018-2020, the government has earmarked $715M as an initial corpus towards a micro-irrigation fund for public and private investments in sprinkler and drip irrigation.

Some other key initiatives by the Indian government include setting up a dedicated Ag-tech infrastructure fund and the launch of e-National Agriculture Market (NAM) portal described below—

*e-National Agriculture Market (e-NAM)* is a pan India electronic trading portal which connects the existing 'mandis' to create a unified national market for agricultural produce. It will help ensure better prices for farm produce through a bidding system.

→ *585 markets across 13 states were integrated in the first phase with e-NAM by Sep'18.*
→ *5.1M farmers used e-NAM to sell their produce between April 17 - September 17.*
→ *Total traded value was $3.9B.*

## Access to Affordable Technology

A confluence of new technologies are enabling AgTech. Sensors are getting cheaper, robots are becoming more reliable and new technologies allow us to ingest massive datasets.

### Falling cost of sensors

Between 2004 and 2014, the average cost of IoT sensors dropped by more than half, from $1.30 to $0.60. Prices are expected to shrink another 37 percent to $0.38 by 2020.

Satellites, manned aircraft, drones, and ground sensors have emerged as alternatives to deliver new data types aimed at improving farming practices – data to drive precision agriculture. Ground sensors are active 24/7 and can extract more accurate and precise measurements than human scouts on variables such as soil moisture content or pH.

### Industrial Robots Supply is Growing

Industrial robots, including drones, autonomous tractors, and robotic arms, are increasing production yields for farmers. Robots can automate slow, repetitive and dull tasks for farmers, allowing them to focus on other tasks such as improving overall production yields.

### Average Cost of IoT Sensors is Falling
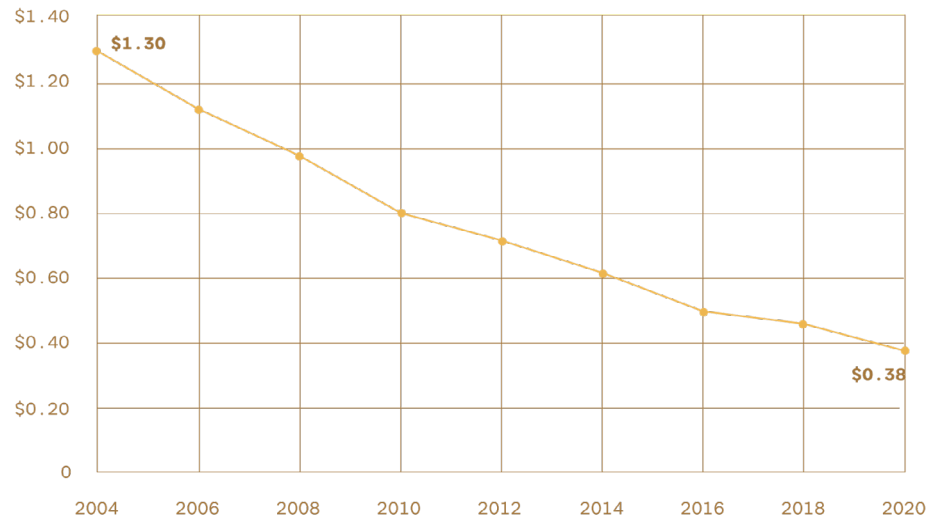


### Worldwide Annual Supply of Industrial Robots 2000—2018



*Source: Atlas, Goldman Sachs and Business Insider Estimates*
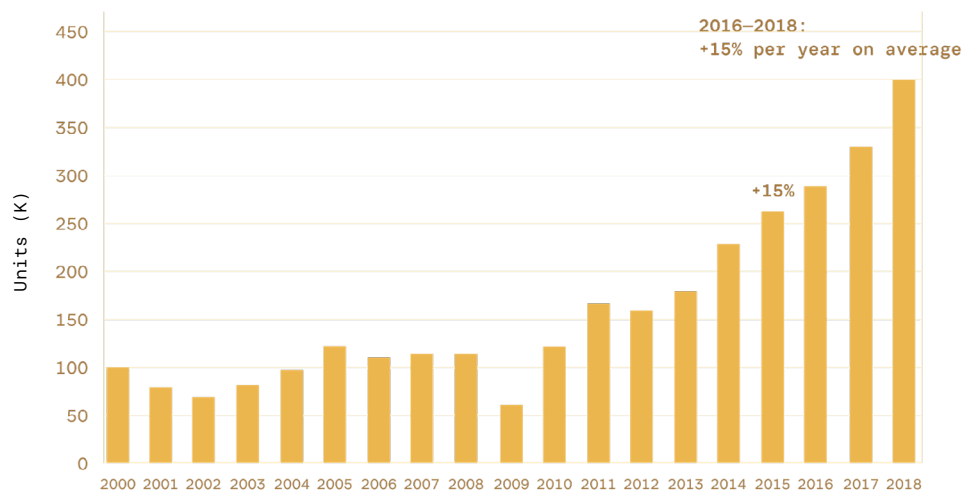
### Fintech Platforms

Offering applications and platforms that connect farmers digitally and provides them financial, agricultural and government-related services based on their crops and crop cycle

### Farming-as-a-Service

Offering farming services and machinery on rent for reducing capex and increasing affordability

### e-Commerce and Market Linkages

Providing platforms to farmers and merchants where they can buy agriculture inputs and sell products without involvement of middlemen

### Smart Machines
Providing remotely operated machines, operating with greater precision, and performing specific operations using harvesting robots, seeding machines, electrostatic sprayers, etc

### IoT and Big Data
Facilitating data collection and decision making using drones, sensors, IoT technology, and data analytics

### Precision Farming
Facilitating application of precise amount of inputs such as water, fertilizers and pesticides, at the right time for increasing productivity

*While various sub-sectors within AgTech have received funding in the last few years, we believe that the following areas should be focused on while deploying capital as they offer opportunities to use technology to build scaled-up businesses.*

## Digital Marketplaces

The market sizes below are for offline retail. Many startups are now focusing on capturing a small percentage of these markets online. Marketplace models in India have raised ~$55M in 2017–18. These startups have scaled to a point to prove that digital market-places are here to stay in Indian agriculture.
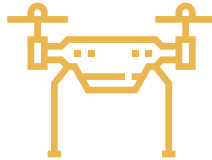
# $180B $250B

*AG Input
Market Size*

*AG Output
Market Size*

Last mile delivery is essential for these businesses to acquire and retain customers. In order to increase ARPU, marketplaces now are building an advisory based input selling platform for specialty high-value crops. Each crop specific region will take time to penetrate. Therefore, these full-stack businesses will be regional for the next couple of years and there is an excellent opportunity to invest in new startups that bring more innovation into the space and focus on new markets within India. For example, a startup that combines lending with input selling will have a strong value proposition for farmers, as a majority of them borrow informally from input dealers every season. We should also see many more output selling platforms arrive in other metro markets apart from Bangalore.

## Platform Technology with Embedded IoT

There are many large agri conglomerates like the Indian Tobacco Company (ITC), Tata Tea and Amul Milk who depend on contract farming supply of farm produce for their raw materials. It is critical for these companies to predict output and flag disease risk in order to ensure timely and predictable supply. For example, small percentage changes in supply can deeply imbalance their cost and pricing forecasts. Many startups have now successfully proven that this space can be monetized. Companies like AgNext (Kalaari is a investor) are running successful pilots in a variety of crops like tea, floriculture, spices and tobacco.

Startups using spatial (satellites or drones), temporal (sensors) or spectral (image recognition) to predict output, nutrition and disease risk are some specific areas of interest. The appropriate business model for these companies will be B2B2F (business to business to farmer), where corporates will pay for SaaS services and share action items with their growers. Each of these sub-sectors has potential for immense impact.

### Temporal Analysis

IoT Sensors -
Pests, Soil, Weather

### Spatial Analysis

Mobile Phones,
Drones, Satellites

### Spectral Analysis

Leveraging Image Recognition
to Assess Crop Quality

## Smart Machines/
## Precision Agriculture

India is mechanizing quickly due to a severe shortage of labour at the farm level as most migrant workers are moving to cities or securing jobs via MNREGA (Mahatma Gandhi National Rural Employment Guarantee Act). India is already the world's largest tractor market in terms of volume of units sold. The gap for startups to address is non-tractor mechanization like sprayers, harvesters, planters, etc. However, the first generation of startups in the space have been focused on simple machinery where distribution is highly fragmented and difficult to scale.

## Ag-FinTech

The age of fintech has arrived in India. Most startups today are focused on urban users as they do not understand rural digital behaviour. Many NBFCs have begun disrupting traditional bank lending in agri but they also come from traditional feet-on-the-street mindsets and hire ex-bank employees who use archaic risk analysis and distribution strategies. We believe there is significant potential for startups who will either directly lend or provide risk/payment/collection services to India's rural agri supply chain

# Recent Investment



**Sub-sector—**
*Agriculture Analytics and Big Data*

**What?**
*Started by Taran and Mrigank in 2016, **Agnext** is a data driven agriculture company providing accurate assessment in Agriculture and Food Supply Chain. Agnext's technology aims to make India the hub of agri-supply chain and data analytics. It provides full stack solutions with integrated hardware and software platform for disease analysis, crop and pest monitoring, crop models and damage analysis.*

**Why?**
*AgNext's cost-effective and unique technology can offer tremendous savings to agribusinesses and affiliated growers both at pre and post-harvest stages by improving quality and traceability across the agri value chain.*

**How are they doing?**
*Strong traction with customers including ITC, Punjab Agricultural University, Mjunction (partnership between TATA Steel and SAIL).*

# The Promise of AgTech – Event Highlights



*"India needs 3,500 startups and 6,500 Agtech companies to serve 130M farmers. Introduction of technology in agriculture can increase GDP growth by upto 1%"- Prof. M Moni*



*"Farms will become factories with precision farming, climate resilient farming. Agri will go back to basics with the ecosystem going full circle, from mono-farming to integrated farms"- S Sivakumar*

*"Unfortunately the stereotype of the Indian farmer is that of a poor farmer. Yes, there's a large chunk of poor farmers, but significant pockets of early adopters of tech exists in Nasik, Coastal Andhra, Punjab, etc. The same is true for even Silicon valley: your first customers are experimental adopters who eventually create momentum for a broader need in the market." - Mark Kahn*



*"To be able to be successfully sell to farmers, we created a digital experience as close to a retail shop as possible". Shardul Sheth from Agrostar tells a phenomenal tale of grit, ingenuity, patience & building a brand that is loved by farmers.*