

# GEARING UP TO SOLVE FOOD SECURITY CHALLENGES

Building agritech ecosystem for the global south

APRIL 2023



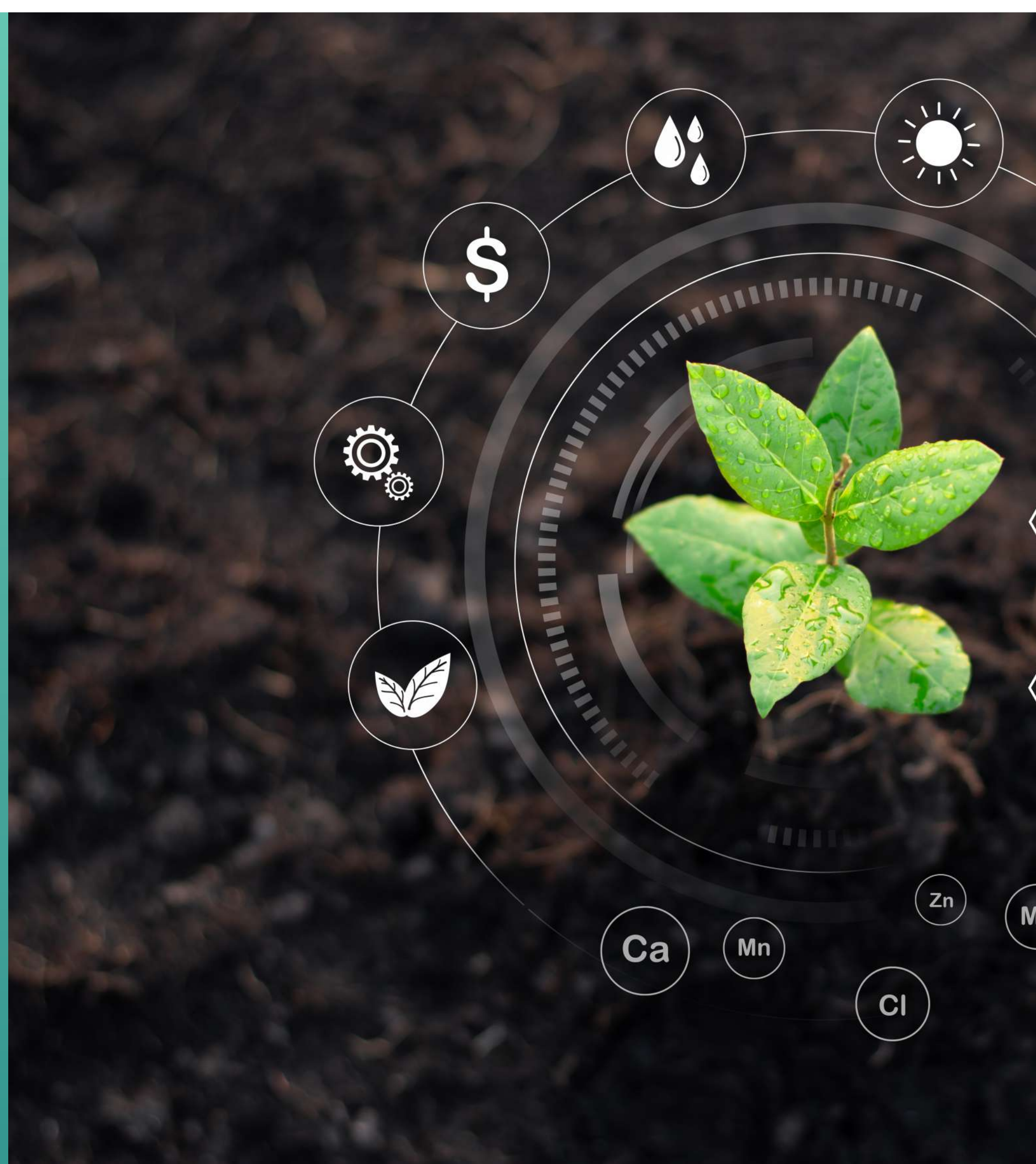
# Gearing up to Solve Food Security Challenges

Building agritech ecosystem for the global south

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# Message and Foreword

## Shri Piyush Goyal

Hon'ble Union Cabinet Minister of Commerce and Industry, Minister of Textiles and Minister of Consumer Affairs, Food and Public Distribution



Innovation remains key to India's sustained growth across sectors and socio-economic development of all sections of the society. Agriculture remains a crucial sector for the economy and a pivotal means of livelihood for millions of smallholder farmers across India. Several innovative agritech solutions in India are addressing these challenges and Atal Innovation Mission has been working with them to create an enabling ecosystem for them to scale. The Government of India (GoI) promotes 'Made in India' and 'Digital India' campaign to foster a culture of innovation.

With similarities in agricultural landscape across many emerging markets, there is tremendous opportunity to help successful Indian and other agritech solutions scale across borders that benefit smallholder farmers globally. In this regard, the Agritech Challenge by UNCDF and AIM is a step towards creating an environment to enable exchange of ideas and innovations across emerging markets.

The whitepaper is in right direction to build south-south collaboration where India plays an anchoring role and drives innovation and exchange of ideas globally. I would like to congratulate teams from Atal Innovation Mission, NITI Aayog, and UNCDF for outlining the steps to make India agritech leader.

# Message

## Shri Suman Bery

Vice Chairperson, NITI Aayog



Atal Innovation Mission (AIM) under the NITI Aayog umbrella has done tremendous work in building the start-up ecosystem in India and has ushered in the culture of innovation across industries. AIM's contribution to agritech start-ups across the country is commendable.

According to the data, approximately 80% of the farmers in Asia and Africa are smallholder farmers with several challenges. They lack access to quality inputs, formal market and often bear the risk of weather risks which usually wipe out their entire income. The supply chain and related infrastructure is poor and broken, resulting in post-harvest loss of around 20-30%. Due to India's vast geographical diversities, reaching out to smallholder farmers is an enormous challenge. These are intensified by climate change, and it requires the adoption of scientific methods of production for farmers to remain resilient.

As many countries' governments have digitised their economy and installed digital building infrastructure, it has spurred the growth of tech-enabled services in the agriculture sector. Specifically in India, we have launched the 'Digital India Mission', bringing the internet to rural areas. This has provided a unique opportunity for the agritech start-ups to connect with the farmers and provide their services. As a result, farmers can now access quality inputs, markets, and an efficient supply chain. As a result, India can boast several successful agritech start-ups in farm input supply, precision farming, financial services, supply chain, and quality control.

AIM, in partnership with the United Nations Capital Development Fund (UNCDF) and support from Rabo Foundation and Bill and Melinda Gates Foundation, has filled a significant gap in cross-border collaboration among the agritech start-ups. The goal of global food security and improving the financial health of the farmer cannot be achieved by working in silos but requires cooperation and mutual sharing of innovation and knowledge. UNCDF and AIM have taken the right step in this direction, and we look forward to several such success stories in the near future.

I would like to congratulate the team members of Atal Innovation Mission, NITI Aayog, and UNCDF for bringing out this white paper highlighting the challenges and opportunities faced by Indian agritech start-ups and the role of the Government of India (GoI). It is great to see that our agritech start-ups have taken the lead in cross-border collaboration, and I look forward to witnessing more agritech start-ups follow this path in the coming future.





# Message and Foreword

## Shri B.V.R. Subrahmanyam

CEO, NITI Aayog



The Government of India has emphasized innovation by nurturing agritech Start-ups through Atal Innovation Mission (AIM). These agritech start-ups are not only catering to the farmers of India but have expanded their base to the other countries too. AIM has successfully created an ecosystem for the continuous nurturing and growth of agritech start-ups engaged in solving critical challenges related to different aspects of agriculture.

Agriculture in India is unique as it spans diverse agro-climatic zones, each with its challenges. Agritech start-ups aim to solve these challenges through innovative solutions. NITI Aayog, through AIM, has successfully shown the collaborations between incubators and innovators to take startups across nations. Select start-ups have expanded their operations in other similar geographies/countries with support from the start-up ecosystem. The partnership has laid down a template to nurture start-ups for cross-border expansion and collaboration. Cross-border collaboration will not only improve the lives of smallholders in Asia and Africa but has the potential to achieve some of the SDGs related to poverty.

Cross-border collaborations can help in the transfer of technology or innovative solutions to least-developed economies without a significant time lag. It can result in increased production to address food security challenges. India has the right innovation ecosystem and a pool of successful agritech start-ups to lead the global South in terms of driving cross-border collaborations.

I congratulate the Atal Innovation Mission in NITI Aayog, UNCDF, Rabo Foundation, and Bill and Melinda Gates Foundation for the whitepaper on the importance of cross-border collaboration of agritech and the steps required to make India lead the global South collaboration efforts.

# Message

## Dr Chintan Vasihnav

Mission Director, Atal Innovation Mission,  
NITI Aayog



Atal Innovation Mission (AIM) is a key policy initiative of the Government of India (GoI), set up under the NITI Aayog umbrella to promote the culture of innovation and entrepreneurship across the Indian geography. AIM's primary objective is to create and encourage the entrepreneurship and innovation ecosystem nationwide across schools, universities, research institutions, MSMEs, and industry levels.

The agritech start-ups in emerging economies have successfully provided digital solutions to several agricultural challenges we have faced in the past. Even though the governments have supported the growth of agritech start-ups and helped them scale significantly, not much has been done on extensive collaborations between start-ups from different countries. AIM, in partnership with UNCDF, is a step towards creating an environment where start-ups from Asia and Africa can share ideas and generate significant opportunities in their respective countries. The Indian start-up sector also has the potential to play the role of a knowledge hub and support market development in less-developed start-up economies across the globe. AIM, an anchor of the south-south collaboration initiatives, works with partner countries – Indonesia, Malaysia, Kenya, Uganda, Malawi, and Zambia. The implementation modalities of the collaborations are cross-border engagement, knowledge exchange, and investments. Three broad categories of challenges in the agriculture sector – low productivity, poor risk resilience, and inefficient supply chain were selected. Twenty-five potential agritech start-ups solving critical challenges around production, supply chain, risk and climate change were selected while implementing the project. Several rounds of discussion with incubators in the partner countries were held to facilitate the implementation modalities. The partner countries have shown interest in these start-ups and are at various stages of cross-border engagement.

In India, 70% of the agriculture workforce are smallholder farmers. In other developing and least developed economies, the situation is similar. They face similar challenges around production, market access for their produce, and issues related to adverse weather conditions. The conventional solutions for these challenges faced by the smallholder farmers often have limited outreach among the large farmers. The improvement in digital infrastructure, internet penetration in rural areas, and reduced cost of the device has, in a way, revolutionized the agritech start-ups in their capability to build last-mile connectivity with the farmers. Numerous solutions to solving critical challenges in the agriculture sector have emerged in India providing services to farmers in diverse geographies.



The agritech start-ups work in market linkage, financing, precision agriculture, farm inputs, and supply chain techs. India's agritech sector, valued at USD 24 billion, has a significantly low market penetration of 1%. It indicates the vast untapped market. Therefore, the agritech start-ups have substantial growth opportunities for domestic and global expansion in similar geographies.

Even though the agritech start-ups have made significant progress, the market challenge remains. These challenges are related to the supply side as well as the demand side. The high cost of agriculture infrastructures like warehouses or digital infrastructure often limits the growth of the start-ups. In contrast, a lack of digital literacy often results in poor adoption of agritech solutions. The diverse geography of India makes the cost of client acquisition very high. The availability of farm and farmer-level data set is a big challenge, which is essential for any digital services. Drying of funding sources, lack of human resources, lack of farmer connections, and competition amongst the start-ups have often held back the growth of the start-ups. Improvement in technological solutions and devices coupled with the support of the GoI, the agritech start-ups will create enabling environment for the expansion of the agritech start-up sector in India. The white paper suggests a significant role in solving challenges faced by the start-ups and facilitating these start-ups at the national and international levels as a partner.

This white paper prepared by experts from AIM, NITI Aayog, and UNCDF presents steps for making India not only an Agritech innovation hub but also a global leader in sharing and expanding these innovations to the least developed countries in Asia and Africa. The global south-south collaboration initiatives will support high-impact agritech innovations to solve food security, supply chain, and climate change issues. In addition, it will make agriculture practices efficient, resilient, and sustainable for smallholder farmers across LDCs and developing economies.

## Message

### Prof Ramesh Chand

Member, NITI Aayog



Atal Innovation Mission (AIM), NITI Aayog is the Government of India's (GoI) flagship initiated focused on promoting the spirit of entrepreneurship and innovations by facilitating and promoting an entrepreneurial mindset. Together with UNCDF and supported by Rabobank Foundations and BMG Foundation, AIM is involved in the south-south agritech challenge to bring the culture of innovation to the least developed countries (LDCs) through sharing of knowledge and collaborating on finding a solution for challenges specific to agriculture.

Smallholder farmers constitute about 80% of the agricultural workforce in developing and least developed countries (LDCs) in Asia and Africa. Across the agriculture value chain, from production to post-harvesting to logistics, numerous challenges result in lower productivity and loss of food grain due to improper post-harvest practices. Some of the critical challenges faced by agriculture globally are related to inadequacies in production, supply chain, weather risk, and climate change. These challenges result in loss of income for the farmers and as a result affect their financial health. Given the diversity of geographies, connecting with all the smallholder farmers using conventional extension methods is a humungous task. These issues offer unique opportunities to the agritech start-ups to find a solution to challenges faced by smallholder farmers and bring efficiency across the value chain. Improvement in mobile internet penetration and smartphones in rural areas allows agritech start-ups to utilise digital media to increase their reach to many smallholder farmers. India's robust agritech start-up ecosystem supports and nurtures numerous start-ups solving critical agricultural challenges.

A collaboration across economies is required where the innovators, incubators, and investors come together and share their innovations and knowledge. It will solve developmental challenges and improve the farmers' financial health. The global south-south innovation challenge aims to act as a bridge in connecting markets within the global south. As a part of the south-south collaborative effort, India is best placed to act as an anchor to this effort considering its growing start-up sector and potential to engage in cross-border business opportunities. The Indian start-up sector also has the potential to play the role of a knowledge hub and support market development in less-developed start-up economies across the globe.

I would like to congratulate AIM, UNCDF, Rabobank Foundation, and BMG Foundation for supporting the publication of the white paper on making India an anchor for the global south collaboration effort in agriculture start-ups. The white document successfully outlines the challenges and opportunities of the Indian agritech start-up sector. It also highlights the role of the Government of India (GoI) in making India an innovation leader in agritech start-ups.



## Message and Foreword

### Shri Manoj Ahuja

Secretary Agriculture, Government of India



The Government of India (GoI) set up Atal Innovation Mission (AIM) under the NITI Aayog umbrella to promote the culture of innovation and entrepreneurship across India. AIM aims to create and encourage the entrepreneurship and innovation ecosystem across schools, universities, research institutions, MSMEs, and industry levels nationwide. A component of this, the Innovation and Agri-entrepreneurship Development programme, has been launched under Rashtriya Krishi Vikas Yojana to promote innovation and agripreneurship by providing financial support and nurturing the incubation ecosystem. Recently the GoI has decided to set up a dedicated fund for agritech start-ups. The fund will be used to finance start-ups across the agriculture value chain. The activities for these start-ups will include support for FPOs, machinery for farmers on a rental basis at the farm level, and technology, including IT-based support. These efforts have created a robust agritech ecosystem in the country.

The partnership of UNCDF and AIM to promote global south-south collaboration to promote an exchange of knowledge and innovation to improve the financial health of the farmers is a novel idea. It will make farmers more resilient and make the agriculture value chain more efficient and sustainable. Such collaborations will also help to rally various economies at the global level to mitigate the risk due to climate change.

As articulated in the white paper, India is well poised to play an anchoring role in this collaborative effort. I would like to congratulate the Niti Aayog, AIM, and the UNCDF team on their sincere attempt to highlight the challenges and opportunities faced by the agritech start-ups and the role of the GoI in making India a global leader in the agritech space.

## Message

### Bill and Melinda Gates Foundation



India's innovation ecosystem has matured rapidly over the last decade. The creativity and vigour of Indian entrepreneurs and researchers can play a critical role in solving some of the toughest societal challenges, supported by an enabling environment for innovations to test, pilot and scale.

The success of the Indian startup ecosystem, ably supported by the Atal Innovation Mission, NITI Aayog, and some other countries in South-South (Asia and Africa), provides opportunities to scale innovations across multiple countries. Moreover, many sectors and their need for innovative solutions are common across many emerging markets and thus create scope for deeper sharing of learning, ideas and practices.

We are proud of our partnership with AIM and UNCDF to enable a supportive ecosystem for innovations that have the potential to deliver impact across several high-impact sectors such as Agriculture, as well as facilitate south-south collaborations.



# Message and Foreword

## Rabo Foundation, India



The agriculture sector is a lifeline in India and many other developing countries. It, directly and indirectly, supports the livelihood of several smallholder farming households. Yet, it is also a high-risk sector.

The smallholder farmers remain vulnerable to a host of unpredictable factors, ranging from prices, policies, diseases, infrastructure, and information asymmetry to erratic weather and climate change. Moreover, the recent Covid pandemic has further aggravated the uncertainties for smallholder farmers.

The need to support innovative tech-based agritech and fintech solutions is thus crucial to help improve the lives of smallholder farmers. Rabo Foundation is pleased to partner with the Agritech Challenge, which is aligned with the bank's focus on innovation to help develop a more self-reliant and resilient agriculture ecosystem that can address the pressing issue of food security. This whitepaper is an effort in this direction to discuss some of the emerging agritech trends and highlight the solutions.

# Message

## Dr. Neelam Patel,

Sr. Adviser (Agriculture & Allied Sectors)



Atal Innovation Mission (AIM), under the aegis of NITI Aayog, has been at the forefront in creating and nurturing agri-tech start-up ecosystem in India. Currently, AIM is supporting thousands of start-ups working in diverse geographies and solving challenges faced by smallholder farmers.

Agriculture employs more than one billion people across the globe, and has linkages with various industries. More than 608 million smallholder farmers across the globe are working on less than two hectares of land, producing around 35% of world's food. These farmers are critical agents for achieving the Sustainable Development Goal (SDG) target of reducing poverty and hunger by 2030. The sustained growth of the agriculture sector is critical for fuelling GDP, sustaining livelihoods and ensuring food self-sufficiency in many emerging economies.

The agriculture sector faces multiple challenges of production, market linkages, supply chain, climate change, weather risks, etc., which cause significant loss to the smallholders. Significant support and investment are required to enhance the productivity of the smallholders and achieve the SDGs. Agri-tech start-ups have the potential to come up with innovative solutions to address these challenges. The emerging agri-tech sector in India has a huge potential to unlock values in terms of expansion opportunities.

The current partnership between AIM, NITI Aayog, and UNCDF has successfully demonstrated that cross-border collaboration and knowledge sharing can lead to the introduction of new technology in new geography to solve critical challenges faced by the agriculture sector. I hope such platforms are created for other sectors as well, enabling cross-border collaborations.

I congratulate the teams of AIM, NITI Aayog, and UNCDF for successfully bringing out the importance of cross-border collaboration among the agri-tech start-up ecosystem to improve the conditions of smallholder farmers. I deeply appreciate the support from Rabo Foundation and Bill and Melinda Gates Foundation.





## Acknowledgements

The white paper is the result of our experience working with start-ups in agritech sector while implementing the Agritech Challenge in partnership with Atal Innovation Mission, India (AIM).

We would like to thank our advisors, Prof. Ramesh Chand, Member, NITI Aayog, Dr Chintan Vaishnav, Mission Director, AIM, and Dr Neelam Patel, Senior Advisor Agriculture, for sharing their valuable inputs in structuring the White Paper. We would also like to thank Hemendra Mathur, Venture Partner, Bharat Innovation Fund, and Arindom Datta, Executive Director, Rabobank, and Marcella McClathey, Senior Programme Officer, Bill & Melinda Gates Foundation for sharing their valuable industry experience, which helped develop the way forward section of the white paper. In addition, we extend our acknowledge all other advisors for their rigorous review of the White Paper to ensure that it achieves its objective. Finally, we would like to thank Jaspreet Singh for his continuous support to the team and guidance to the team.

We would like to thank Anurag Wasnik, Innovation Lead, AIM, NITI Aayog and Anisha Bhasin, Young Professional, AIM, NITI Aayog Aayog for their continuous support in ensuring the project's success. They played a crucial role in coordinating the UNCDF, AIM team and the Ministry.

We would also like to mention the exceptional contribution of UNCDF staff at its offices in Asia and Africa for collecting data and information that enriched the white paper.

The white paper would not have been completed without the contribution from our cohort partners. We would like to extend our thanks to all our cohort partners for taking time from their busy schedules to provide insights. Likewise, the case studies would not have been complete without their valuable inputs.

A special mention is required for Rabo Foundation and Bill & Melinda Gates Foundation for their generous support for the project and its implementation.

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# Rabo Foundation, India

<b>AI</b>	: Artificial Intelligence
<b>AIM</b>	: Atal Innovation Mission
<b>API</b>	: Application Programming Interface
<b>B2B</b>	: Business to Business
<b>B2B2C</b>	: Business to Business to Customer
<b>B2C</b>	: Business to Customer
<b>CIIE</b>	: Centre for Innovation Incubation and Entrepreneurship
<b>CXO</b>	: Chief Executive Officer
<b>EY</b>	: Ernst and Young (Consultancy Firm)
<b>FAAS</b>	: Farm-as-a-Service
<b>FAO</b>	: Food and Agriculture Organisation
<b>FPO</b>	: Farmer Producer Organisation
<b>GDP</b>	: Gross Domestic Product
<b>ICRISAT</b>	: International Crop Research Institute for the Semi-Arid Tropics
<b>IoT</b>	: Internet of Thing
<b>IT</b>	: Information Technology
<b>JV</b>	: Joint Venture
<b>LDC</b>	: Least Developed Countries
<b>MANAGE</b>	: National Centre for Management of Agricultural Extension at Hyderabad
<b>ML</b>	: Machine Learning
<b>NASSCOM</b>	: National Association of Software and Service Companies
<b>NBFC</b>	: Non-Banking Finance Company
<b>NDA</b>	: Non-Disclosure Agreement
<b>NGO</b>	: Non-Government Organisation
<b>PMFBY</b>	: Pradhan Mantri Fasal Bima Yojana
<b>PoC</b>	: Proof of Concept
<b>SDG</b>	: Sustainable Development Goal
<b>UAV</b>	: Unmanned Aerial Vehicle
<b>UN</b>	: United Nation
<b>UNCDF</b>	: United Nation Capital Development Fund
<b>USD</b>	: Currency of United States of America
<b>VC</b>	: Venture Capital
<b>WEF</b>	: World Economic Forum

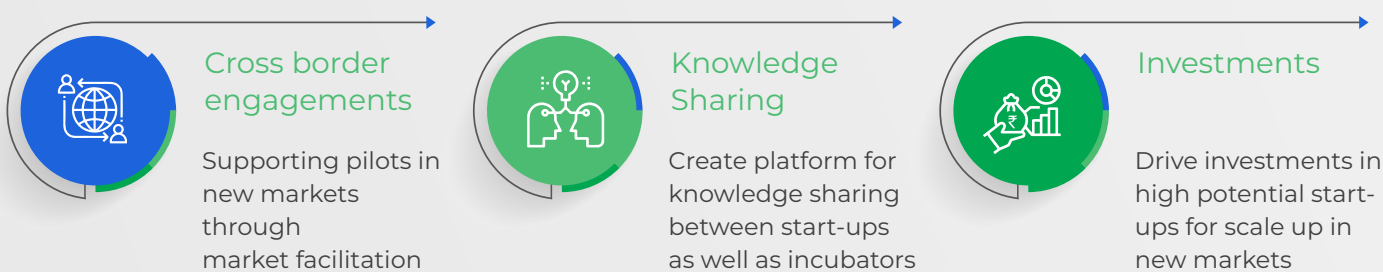




# I. Introduction

Over the past decade, start-ups in developing and emerging economies have experienced rapid growth and successfully provided digital solutions to address several developmental challenges. However, while the governments have done a lot across markets, peer-to-peer interactions, exchange, and collaboration between start-ups from different countries are yet to be achieved at a large scale. A productive innovation environment is when all the contributors and beneficiaries interact, involve, and share ideas to translate into sustainable solutions opportunities. In an era of a digital revolution, it is vital to realize that operating in silos is not advantageous, and the best way to reap the benefits of scaling innovations is to collaborate and share. It could be a significant catalyst when the mature innovative markets could share their experience with emerging start-up markets. Through technology, skills and capacity transfer, this exchange can fast-track market development in emerging start-up sectors, mainly in the least developed countries and address life challenges of under-served segments in these economies. At the same time, it also opens doors for ideas and technologies from least developed or developing markets to be tested in mature and large markets.



Agritech challenge is focused on the agriculture sector as it is a critical sector for emerging economies across Asia and Africa. Agriculture employs more than one billion people across the globe. More than 50% of Medium, Small and Micro Enterprises (MSMEs) in emerging economies are also engaged in agriculture. The majority of people employed in agriculture are smallholders who own less than two hectares of land, constituting 82% of total agriculture land holding. 49% of this farmland is in low-middle-income or low-income countries. In terms of production, smallholders play an essential role in driving agriculture productivity. On average, smallholders produce more than 50-60% of agriculture produce in lower-middle and lower-income countries<sup>1</sup>. The sustained growth of the agriculture sector is thus, critical to fuel GDP, sustain livelihoods and ensure food self-sufficiency in many emerging economies. The Agritech Challenge aims to act as a bridge in connecting markets within the global south. Agritech Challenge's focus will be to drive cross-border partnerships between innovators and incubators alike, to address development challenges and improve the financial health of individuals and communities. It will be achieved by creating opportunities for business collaborations and knowledge sharing supported by sustainable investments. It will drive south-south collaboration through the following three modalities:



<sup>1</sup> Sarah K. Lowder, Marco V. Sánchez, Raffaele Bertini, Which farms feed the world and has farmland become more concentrated?, World Development, Volume 142, 2021, 105455. <https://www.sciencedirect.com/science/article/pii/S0305750X2100067X?via%3DIihub> accessed on 5th May 2022

Though the Agritech Challenge would have a multi-country presence, it will focus on India, considering its growing start-up sector and its potential to engage in cross-border business opportunities. The Indian start-up sector also has the potential to play the role of a knowledge hub and support market development in less-developed start-up economies across the globe.

To drive collaboration to and from India, United Nations Capital Development Fund (UNCDF) partnered and aligned agritech challenge with Atal Innovation Mission (AIM) activities. The other partner countries are Indonesia and Malaysia from Asia, Kenya, Uganda, Malawi, and Zambia from Africa. Under the three implementation modalities, Agritech Challenge implemented the following activities specific to Indian start-ups:

<p><b>Cross border engagements</b></p> <p>Partnered with innovation hubs under AIM to create a pipeline of high-potential innovations that can be scaled in other countries. Agritech Challenge coordinated with AIM-supported Innovation hubs to orient possible applicants on the challenge, support them in applications and mentor them during the final selection stages.</p>	
<p><b>Knowledge Exchange</b></p> <p>It is essential that, along with innovators, Innovation Hub Managers also gain a detailed understanding of new high-potential markets. Specific to India, a strong community of Innovation Hub Managers was exposed to business potential and possible partners in new markets.</p>	<p><b>Investments</b></p> <p>Investors to support innovations to scale up in different markets; Partnerships with enablers in host markets will back the business case to invest in these start-ups.</p> 

Agritech Challenge had identified three broad categories of challenges in the agriculture sector - low productivity, poor risk resilience and inefficient supply chain. The selected agritech start-ups offer solutions relevant to the following challenge statements:

- Improving agriculture productivity to cater to increasing market demand and enhance smallholders' income
- Building resilience against climate change and natural hazard-induced shocks
- Improving supply chains efficiency and transparency





Two cohorts were established under the Agritech Challenge - the main cohort (Refer Annexure I) had ten matured start-ups having significant market presence and customer base, and the AIM cohort (Refer Annexure II) comprised 15 partners at various stages of maturity. The start-ups within the AIM cohort stage vary considerably from the Proof of Concept (PoC) stage to a stage where they have just entered the market.

**The objectives of the whitepaper are:**

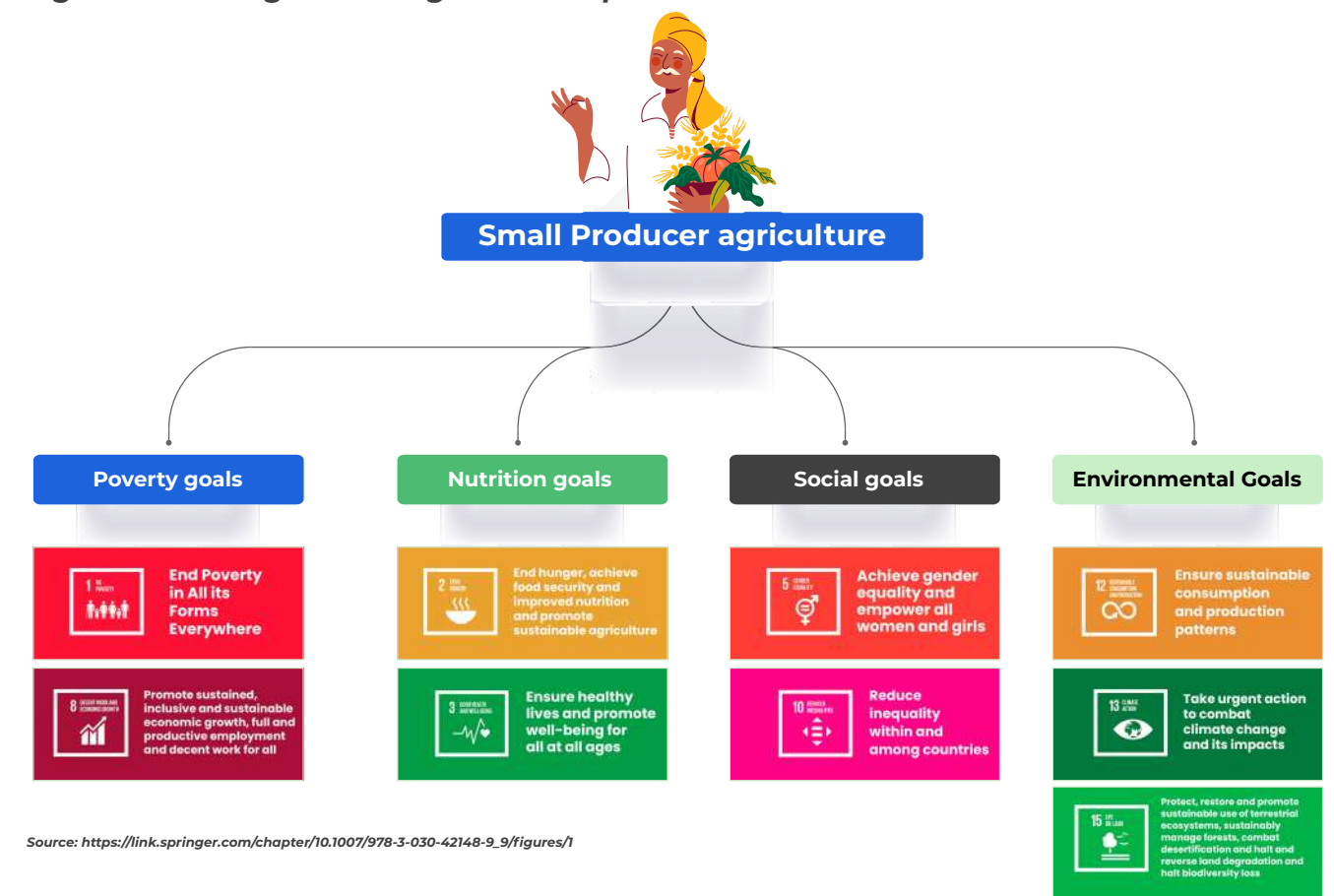
- To highlight the role of technology in agriculture as evident from the work of the cohort partners
- Ways agritech start-ups are working on solutions that can improve the economic condition of the smallholders.
- Highlight actionable items for the government to facilitate cross-border partnerships, and India becomes a torch bearer for the agritech start-up economy

## II. Significance of smallholder farmers

There are 540 million smallholder farms across the globe and are responsible for 30% of global food production<sup>2</sup>. The smallholder farmer manages 84% of the farms across the globe. In the case of our partner countries, they form the backbone of the rural economy, but still, many lack access to the formal market. As a result, the smallholder producers have challenges accessing input, credit, market, and technology. Moreover, a lack of income surplus makes them more vulnerable to natural calamities. A solution that breaks the barrier between the smallholders and the market will ensure efficient utilization of resources, make them resilient and improve food security.

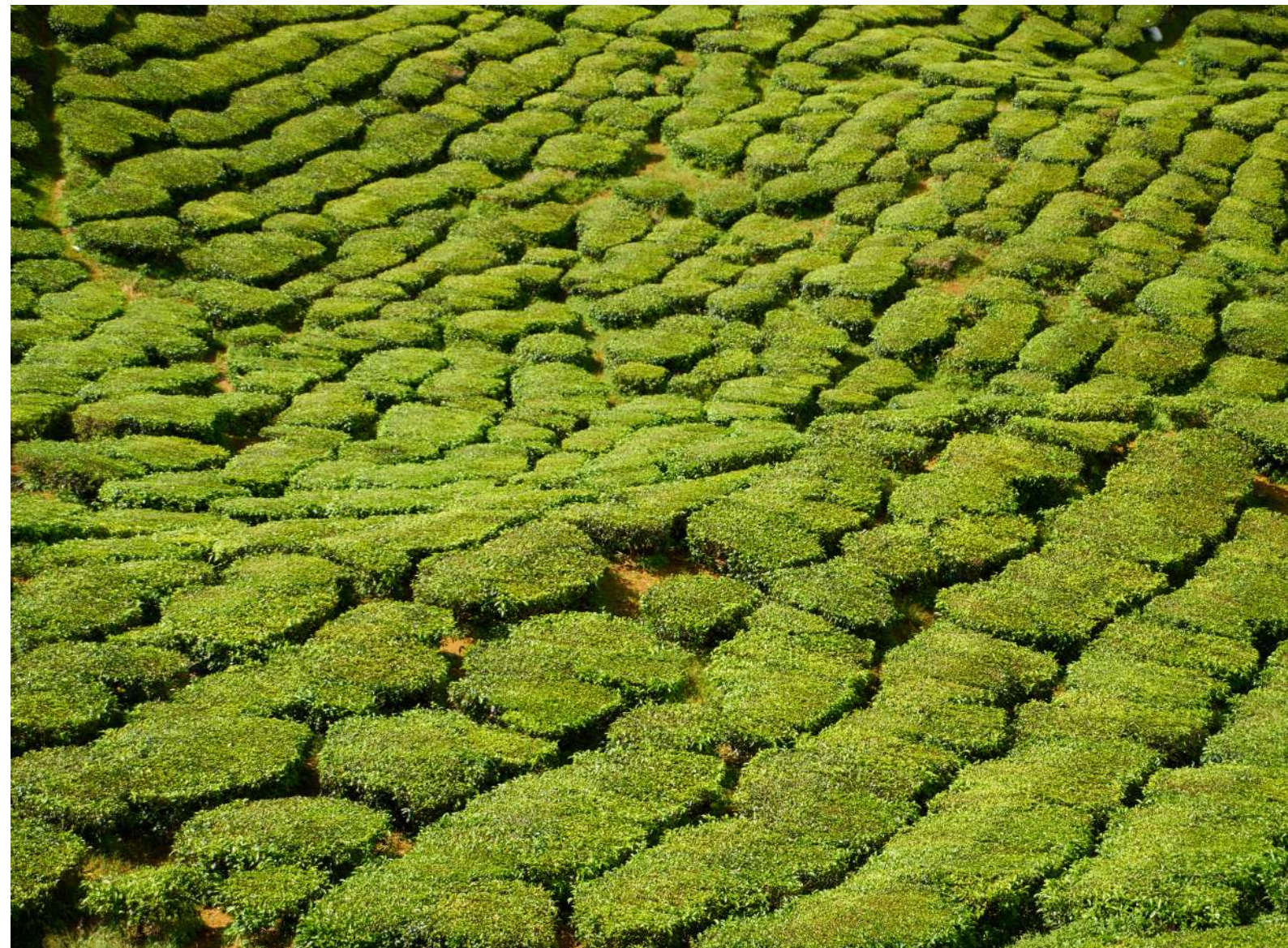
The United Nations (UN) Food and Agriculture Organisation (FAO) considers farmers one of the change agents in achieving the Sustainable Development Goal (SDG) target of reducing poverty and hunger by 2030. The picture below shows the linkage of smallholder farmers to 9 SDGs, broadly categorized as poverty, nutrition, social, and environmental goals. Therefore, to achieve the SDGs, significant support and investment are required to enhance the productivity of the smallholders.

**Figure 1 Showing the linkage of small producers with SDG**



Source: <https://link.springer.com/chapter/10.1007/978-3-030-42148-9/figures/1>

<sup>2</sup> Sarah K. Lowder, Marco V. Sánchez, Raffaele Bertini, Which farms feed the world and has farmland become more concentrated? World Development, Volume 142, 2021,105455. <https://www.sciencedirect.com/science/article/pii/S0305750X2100067X?via%3Dihub> accessed on 5th May 2022





# Profile of smallholder farmers in Asia and Africa

Each partner country is diverse in terms of agro-climatic zones and crops grown. Despite such diversity, the profile of smallholder farmers in these countries is almost the same. The table below describes the characteristics of a smallholder farmer in these countries

**Table 1: Showing the profile of a typical smallholder farmer**

Parameter	Characteristic
Average land holding	Fragmented landholding coupled with limited farm size: <5hectare and minimum is 0.2 hectare
Production level	Sustenance of small market surplus
Production system	Traditional
Access to market	Poor and often dependent on middlemen
Access to finance	Limited/No access to productive financial services
Diversification	It varies from country to country

With the increase in the internet users globally at 53%, smartphone users have increased significantly in all the participating countries. It offers a unique medium to engage with them to provide agriculture-related services. Therefore, it is essential to develop different levels of technological solutions to increase outreach and have a significant impact on the community.

## Critical challenges for the smallholder farmers

The smallholder farmers, who comprise 70% of the agriculture workforce, operate on less than 5 acres of land and often face production and market risk challenges. Challenges related to climate change and inclement weather risks cause significant loss to the smallholders. Nevertheless, the story of smallholders remains similar across the globe. The table below summarizes the challenges faced by the smallholder producers and farmers.

<sup>2</sup> Sarah K. Lowder, Marco V. Sánchez, Raffaele Bertini, Which farms feed the world and has farmland become more concentrated? World Development, Volume 142, 2021,105455. <https://www.sciencedirect.com/science/article/pii/S0305750X2100067X?via%3Dihub> accessed on 5th May 2022

**Table 2: Showing challenges faced by the small holders at different levels of the value chain**

Phases	Value chain level	Challenges	Outcome
Farm input	Seed	Lack of access to quality seeds and reasonable price; dependent on local stores for seed quality	Low productivity
	Fertilizer	The high price of fertilizer; non-availability of fertilizer	
	Credit	No credit; limited access to credit from the formal sources; often dependent on input suppliers or intermediaries for credit	
	Farm Machinery	Traditional equipment used for farm operations	
	Pesticides	Quality pesticides or insecticides are not available in the local market.	
Pre-harvest	Knowledge	Use traditional methods of production. Not aware of scientific production method.	<ul style="list-style-type: none"> <li>• Low productivity</li> <li>• High risk of crop loss</li> <li>• Low-quality produce</li> </ul>
	Disease and pest	Not able to identify the disease and pest or do not know the solution to overcome it	
	Disease and pest	Not able to identify the disease and pest or do not know the solution to overcome it	
	Crop selection	Limited varietal knowledge, no know-how about climate-smart agriculture, 'grow what everyone grows',	





Phases	Value chain level	Challenges	Outcome
	Harvest	Unscientific harvesting leads to poor quality of produce (Underripe or overripe produce with low quality and low shelf life)	
Harvest	Post-harvest loss	Loss in transportation and storage	<ul style="list-style-type: none"> <li>• Post-harvest loss due to poor supply chain Distress selling</li> <li>• Low quality of output</li> <li>• Loss in produce (in the case of fruits and vegetables)</li> <li>• Low-value capture</li> </ul>
	Access to market	Sell their produce to the local middlemen	
	Access to agriculture infrastructure	Limited facilities for storing and primary processing of their produce	
	Access to credit	No access to credit to meet their post-harvest requirement. Often result in distress in selling	
	Processing	No linkage with the processors for assured market	

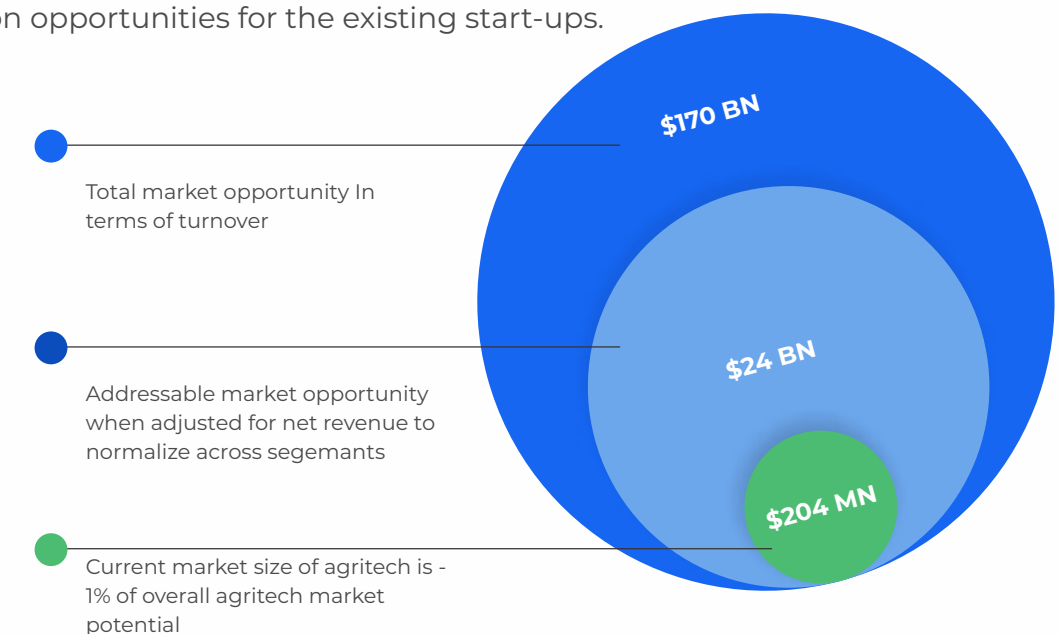
If we factor in the effect of climate change within these challenges, the problem for the smallholders increases significantly. For example, the recent heat wave in India in 2022 significantly impacted wheat production in India. Since India's weather records, the heat wave has been one of its kind in 122 years. The heat waves in March, when the wheat crop is sensitive to heat, have resulted in losses for the farmers. The heatwaves shrivelled the wheat grain by 20%, affecting the quantity and quality of wheat grain<sup>3</sup>. Similar incidence of extreme weather is increasing and poses a real threat to agriculture across the globe. It will require new tools and technologies to reach these smallholders and support them at each production level.

<sup>3</sup> <https://india.mongabay.com/2022/06/heatwave-takes-a-toll-on-north-indias-wheat-yield/> accessed on 10th June 2022



### III. AgriTech Landscape in India

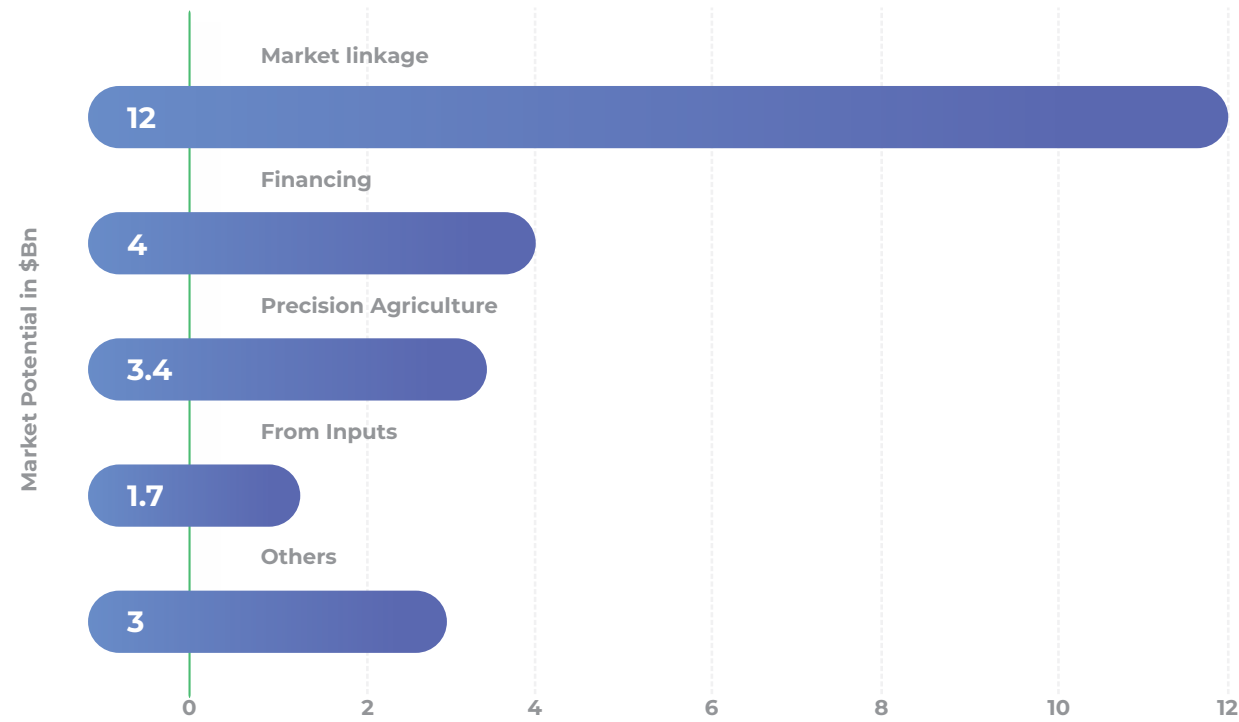
India's agritech sector opportunity, valued at USD 24 billion, has a significantly low market penetration of approximately 1%<sup>4</sup>. The vast difference in the potential and actual value realization indicates a massive opportunity for the many new agritech start-ups and business expansion opportunities for the existing start-ups.



Turnover includes the value of inputs, gross income from Agri loans and insurance, and values of the produce of Indian agritech start-ups  
**Source: Inc42 Plus, EY**

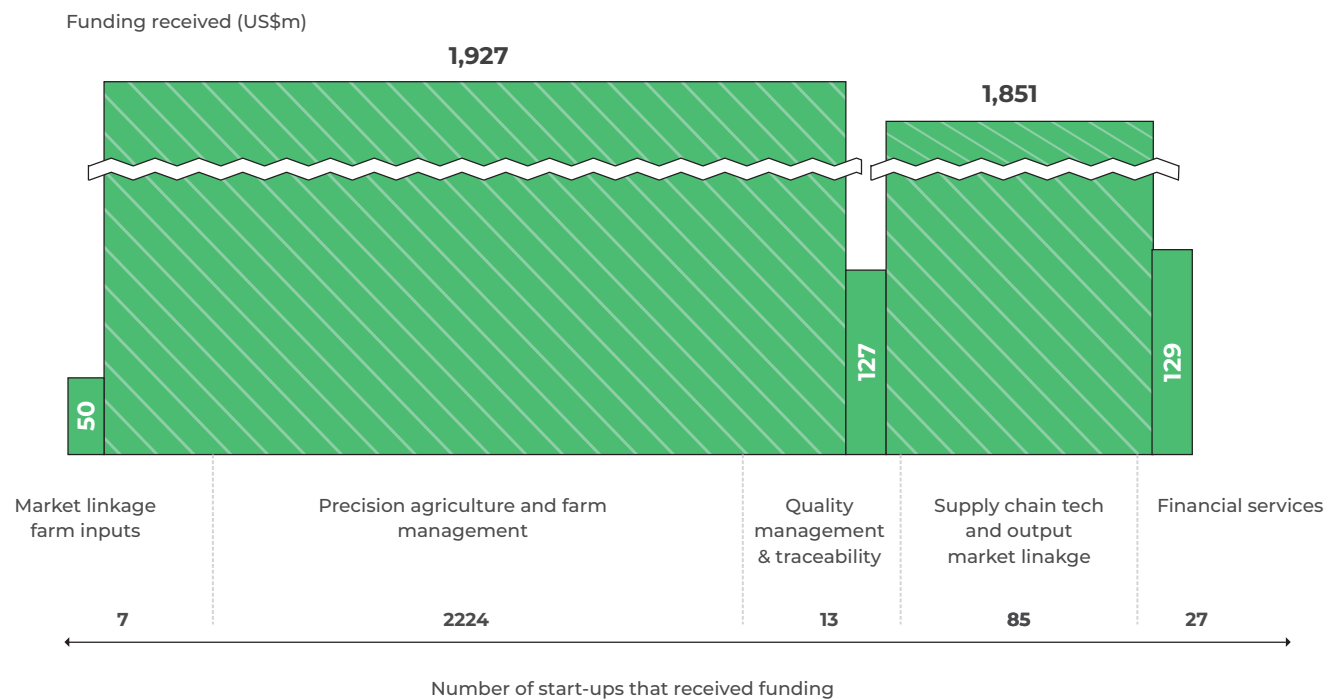
<sup>4</sup> "Agritech - Towards Transforming Indian Agriculture". Published by EY in August 2020

**Figure 3: showing funding received by Indian agritech players in 2020**



Source: Inc42 Plus

**Figure 4: showing funding received by global agritech start-ups in 2020**



Source: EY

Based on the global trend, in India, the value in agritech will be unlocked in the supply chain and farm management. Recent disruption in the global agriculture supply chain due to the Russia-Ukraine conflict also indicates that there will be more investment in the supply chain segment. It offers a unique opportunity for agritech start-ups to unlock the business potential in the supply chain segment. Most of our cohort partners are engaged in serving precision agriculture and supply chain segment with their products and services.

**Table 5: shows the cohort partners mapped to agritech segments**

Agritech segments	Number of cohort partners	Cohort partners
Market Linkage	4	Fruitfal, Agrosonic, Satvik Agro, Neeraventures
Financing	2	Gramcover, Farminfinity
Precision agriculture, including climate-smart agriculture	10	Krishitantra, CropIn, Boomitra, Satsure, WRMS, Skymet, Farmitopia, Chakras Farm, AI-Genix,
Farm inputs	1	Agrivijay
Supply chain tech	7	MLense, Ecozen, Butterpaper, Stellapps, Carritus mobility, Transity, Butterpaper
Others	2	Coorgexpress, Knotebooknetwork

Source: UNCDF and AIM research

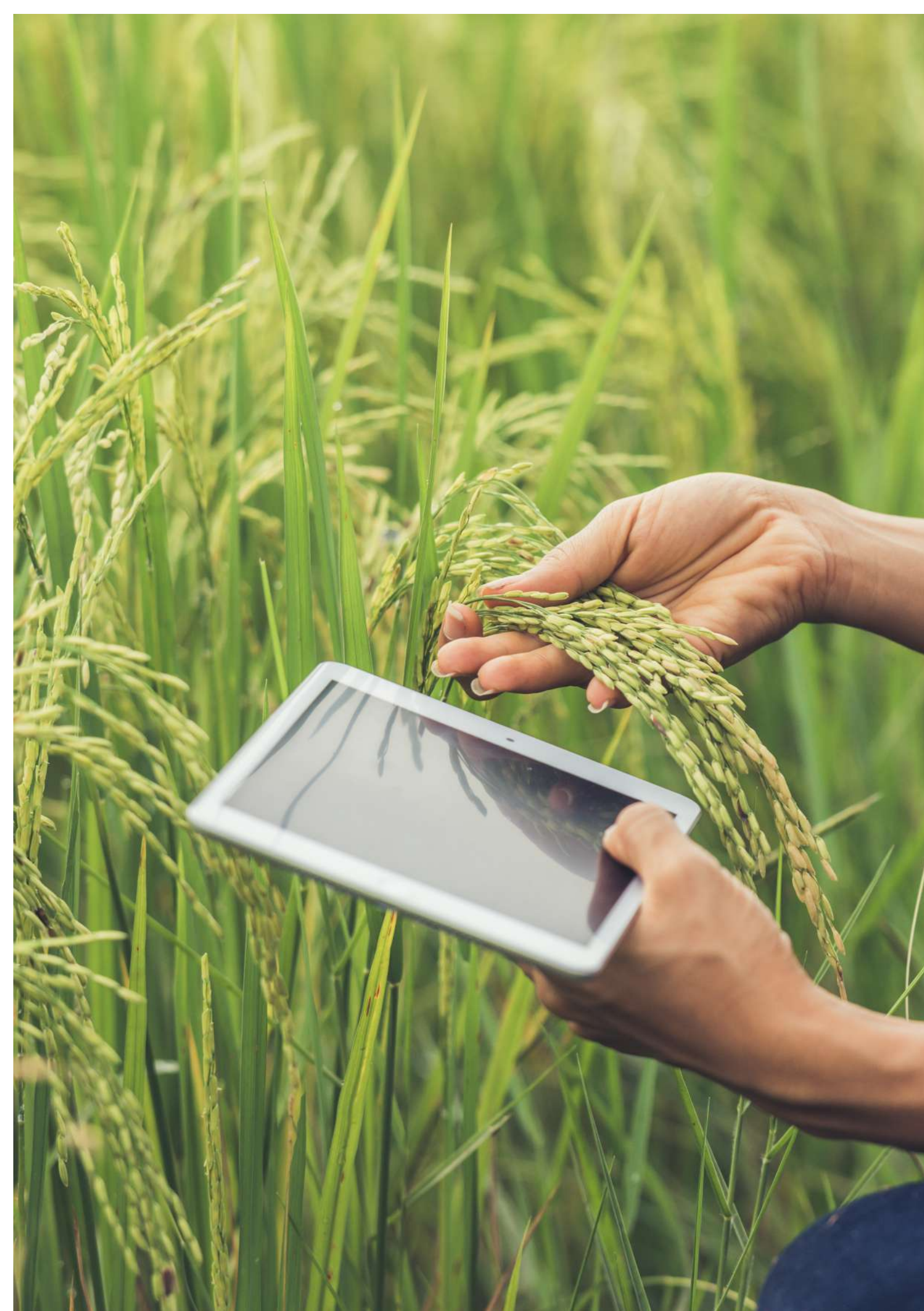
## Business models adopted by select Agritech and Agri-fintech Solutions

The cohort partners used various business models to target end-users rather than relying on just one model. The most popular business model for start-ups is B2B2C combined with B2B and B2C. The use of models is based on the size of the end-users, business volume per user, and ease of reaching the end-users. For example, Boomitra has adopted the B2B2C model for the Indian market, while it is B2C in the South American markets where the farm size is in thousand hectares. In addition, many cohort partners have adopted the “Phygital” model, where they have both physical and digital presence in the market. For example, Agrivijay is a digital marketplace for solar-based farm equipment. They have physical stores in their operational areas and an App-based solution to connect with the farmers.



Parameter	B2C	B2B	B2B2C
Flow	Agritech Farmer	Agritech Business to end users	Agritech Business to Intermediary to End Users
Stakeholders	Start-up, farmer, FPOs, Producer groups, and cooperatives	Start-up and business firm Business firms are financial institutions and corporates	Start-up, intermediary organization, and farm Intermediary organizations are FPOs, Cooperatives, NGOs, financial institutions, and corporates
Advantages	<ul style="list-style-type: none"> <li>•Reduce the cost of customer acquisition</li> <li>•Potential to scale up fast</li> <li>•No intermediary</li> </ul>	<ul style="list-style-type: none"> <li>•Niche market Cost-effective</li> <li>•Instant scale-up</li> </ul>	<ul style="list-style-type: none"> <li>•Potential to scale up</li> <li>•Higher adoption of the solutions a high level of trust between farmer and the business</li> <li>•The huge customer base at a single touchpoint</li> </ul>
Dependencies for roll-out and scale	<ul style="list-style-type: none"> <li>•Dependent on the digital literacy of the farmers</li> <li>•Training</li> <li>•Significant time and effort in customer acquisitions</li> </ul>	<ul style="list-style-type: none"> <li>•Very few businesses are eager to spend on R&amp;D</li> <li>•Limited market</li> <li>•Businesses have more control in terms of technology deployment</li> </ul>	<ul style="list-style-type: none"> <li>•High cost of customer acquisition</li> <li>•Dependent on the quality of the business partner</li> <li>•Investment in capacity building</li> </ul>
Cohort Partners	Agrivijay, AI-genix, Satvik Agro, Chakras Farm, Carritus mobility,	Krishitantra, MLense, WRMS, Satsure, Skymet, CropIn, Stellapps, Knotebook Networks, Transity, Butterpaper	Gramcover Boomitra, Fruitfal, Ecozen, Agrosonic, Farminfinity, Cropmint, Coorgexpress, Neeraventures,

Source: UNCDF and AIM Research





## Challenges for Agritech start-ups

More than 450 agritech start-ups have presented their POC and are in various stages of growth. Most of the challenges are specific to their stages, while few challenges are akin to the agritech market. Refer to table 7 for critical challenges faced by our cohort partners.

### Agritech market-related issues



#### The high cost of infrastructure and devices is a significant barrier to scaling of agritech solutions and subsequent adoption by the smallholders

The Agritech companies depend on agriculture infrastructure (cold storage chain, warehouses, sorting and grading machines) or tools like IoT devices, farm machinery, high-resolution satellite imageries, and IT infrastructure. However, all these infrastructures are costly and require substantial upfront investments. Therefore, the absence of such infrastructures prohibits the entry of the Agritech companies in those geographies or sub-sector.

Satsure works with several banks and insurance companies where the banks and insurance provide their services to the farmers, and Satsure monitors those farms. Satsure offers services for 22 different crops that do not have canopy cover. However, to provide a similar service for horticulture crops, Satsure requires high-resolution satellite imagery, which is very costly. Therefore, it increases the cost for the end-users (farmers) and limits the uptake of such products. Subsequently, it affects the adoption of Agritech solutions by the farmers.

Similarly, the companies providing farm management services depend on IoT devices to gather farm-specific information like soil moisture, soil nutrients, and weather condition. It increases the cost for the farmers who wants to adopt these solutions and therefore limits the adoption of Agritech solutions.

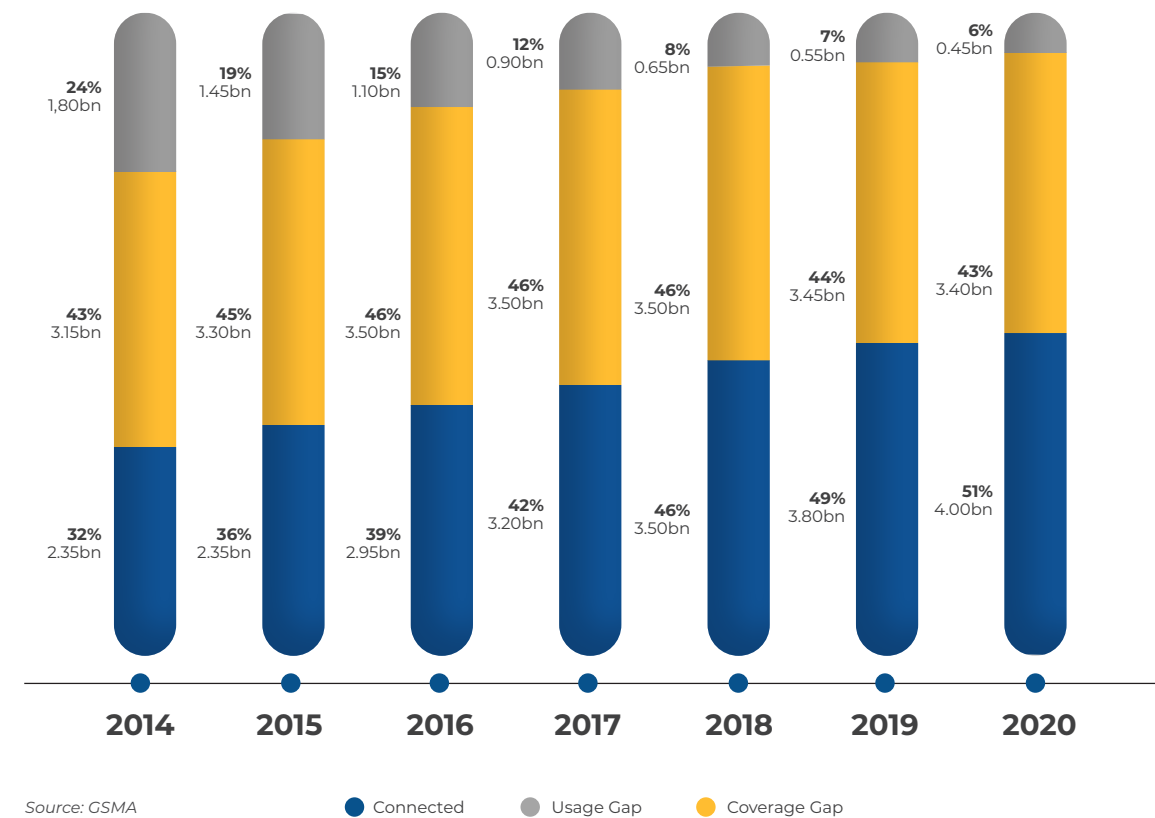
Start-ups engaged in input supply business through marketplace solutions must have licenses to sell certain chemicals. These licenses need annual renewals and are a challenging task.



#### Lack of digital literacy and cost of the device resulting in low adoption of Agritech solutions

There has been a significant increase in mobile internet coverage, and an estimate shows that mobile internet services cover 94% of the population<sup>5</sup>. The figure below provides the global mobile internet connectivity trend from 2014-to 2020.

**Figure 6: Showing evolution of global mobile internet connectivity, 2014-2020**



As indicated in the figure above, 43% of the population globally falls under the category of usage gap (area having adequate internet coverage, but the users are not using it for some reasons) in the year 2020. Furthermore, the gender gap in mobile internet stands at 15%, which becomes significant for smallholders as there are significant women engaged in agriculture as silent contributors. In India, the internet penetration is nearly 47%, from just about 4% in 2007<sup>6</sup>.

The primary reason for the high usage gap in the rural areas is that people are unaware of or understand the mobile internet and its benefit. The users also have a low level of literacy and digital skills. Other reasons are the affordability of a smartphone or service fees and the high usage gap. Concerns like safety and security also deter users from adopting digital technology. In addition, the recent increase in digital fraud cases using mobile devices has affected the trust in digital mode.

<sup>5</sup> <https://www.gsma.com/r/wp-content/uploads/2021/09/The-State-of-Mobile-Internet-Connectivity-Report-2021.pdf> accessed on 14th May 2022  
<sup>6</sup> <https://www.statista.com/statistics/792074/india-internet-penetration-rate/> accessed on 17th June 2022



A report by McKinsey indicates that improved connectivity in agriculture globally can unlock USD 500 billion in additional value to GDP by 2030<sup>7</sup>. Smart devices using mobile internet or broadband are central to the delivery of Agritech solutions in rural areas. However, low mobile internet usage and devices make adoption challenging for start-ups.

c

## High cost of customer acquisition

As we have seen earlier, the preferred business model for Agritech start-ups is the B2B2C model. However, the task of reaching out to farmers is formidable and daunting the agritech companies due to following reasons:

- The fragmented landholding coupled with diverse geographies makes connecting the smallholders with agritech companies a formidable challenge.
- The majority of the agritech companies do not have farmer connections, and hence connecting with them is a big challenge
- Farmers do not trust new companies and are averse to doing any transaction

The direct connection with the farmer is often the cheapest, but some farm-level issues do not support this model, so start-ups must depend on the B2B2C model. The primary reasons for the adoption of a high-cost model are:

- Lack of awareness about the quality of the produce among the farmers means procuring from an individual farmer means investing in primary processing. Often the start-ups lack the funds to establish such processing units.
- Since the landholding is too small, resulting in a small marketable surplus. Aggregating such produce from individual farmers will increase the cost pressure on the start-ups.
- Individual farm-level data involves various regulatory, political, and social issues. With the current trust deficit with technology, it is almost impossible for the agritech companies to get farm-level data directly in the initial stage.

Therefore, the high customer acquisition cost will exist for the agritech companies for 5-10 years.

d

## Inadequate farm and farmer level data set

Most start-ups are data-driven and require the latest data to improve their software and effectively serve end-users. In the context of India, the largest repository of data is the government. These data are related to land records, weather data, crop yield, and price. The community paper published by World Economic Forum (WEF) on Artificial Intelligence for Agriculture innovation indicates 15 critical Indian agriculture datasets. The paper refers to McKinsey and the National Association of Software and Service Companies (NASSCOM) research indicating that unlocking these 15 critical datasets could unlock 85 billion opportunities in Indian agriculture.



<sup>7</sup> <https://www.mckinsey.com/industries/agriculture/our-insights/agricultures-connected-future-how-technology-can-yield-new-growth> accessed on 14th May 2022

**Table 6: Showing 15 critical datasets to unlock in Indian agriculture**

High cost of customer acquisition	
Dataset	Description
Soil health	Agronomic details like soil-type and fertility, including nutrient availability (macro, micro, secondary), moisture content etc. for each farm
Satellite imagery	High resolution images to identify farm boundaries, crop distribution, yield etc.
Real time data on agriculture markets	Real time statistics on variety-wise market price and arrivals data from commodity trades
Crop yields	Data on actual yields for crop varieties per area harvest
Production & consumption data	Production and consumption volumes for crop varieties by month and location
Weather data	Climate details including rainfall, precipitation, humidity, sunlight, temperature, wind etc. at district level
Irrigation maps	High resolution irrigated area mapping to identify areas under irrigation, moisture levels in top soil, root zone etc.
Storage network details	Storage network details like crop varieties stored, maximum capacity, average utilization and safety buffer
Warehouse details	Warehouse details including locations, facilities like cold storage, capacity constraints, tariffs, operating and handling costs, fixed costs
Commodity profile data	Profile including standards for defects based on crop varieties & usage, shelf life, trade constraints, purchase limits, timing of production
Digital land records registry	Digital land records registry that establishes collateral and has legal validity with various departments (revenue, survey etc.)
Defect & pest images	Annotated dataset of images of different crop varieties for AI-based grading, diagnosis and defect identification

<sup>9</sup> [https://www3.weforum.org/docs/WEF\\_Artificial\\_Intelligence\\_for\\_Agriculture\\_Innovation\\_2021.pdf](https://www3.weforum.org/docs/WEF_Artificial_Intelligence_for_Agriculture_Innovation_2021.pdf) accessed on 18th May 2022

Agriculture market network	Agriculture market network by location, crop type
Import, export volume details	Import and export volumes for crop varieties by month and location
Historical purchase prices for crops	Historical daily purchase prices for crops by location, market type, level (e.g. farmer, middleman etc.)

Source: Community paper on Artificial Intelligence for Agriculture Innovation published by WEF

Even though government ministries and agencies like NITI Aayog have taken commendable steps to ensure access to data sets, start-ups often struggle to access data. The discussion with the cohort partners highlighted the following issues related to the data set:

- The available data set is not in a usable form, and hence it takes a lot of effort and guesstimate to arrive at a conclusion
- Many times, the land record data needs verification at the ground level, which adds to the cost
- Many states do not have digital land records available
- Lack of law around sharing of data often deters government officials from sharing the data with a private entity
- The data capture and storage mechanism varies from state to state

The data availability often determines the selection of the area of operations and the growth of the start-ups.







## Challenges in cross-border expansion

Many agritech start-ups have successfully established themselves in other countries. In addition, some of our main cohort partners are also in advance of cross-border expansion and will initiate pilots in a few partner countries. The success factors for cross-border expansion are as follows:

<b>PROVEN PRODUCT OR SERVICES HAVING A SOCIAL IMPACT</b>	<b>PARTNERSHIP WITH LOCAL COMPANIES OR MULTILATERAL AGENCIES FOR EASY ACCESS TO THE MARKET:</b>	<b>ABILITY TO CUSTOMISE THE SOLUTION TO MEET THE LOCAL NEED:</b>
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The product or services have an existing customer base and have created an impact on the ground. It instils confidence in the product or services. Few of the main cohort partners have a large customer base with proven solutions and have an international presence.	Partnership with multilateral agencies provides an opportunity to pool local resources and conduct pilots. It also allows overcoming some regulatory issues specific to the country. For example, WRMS introduced its services in Fiji in partnership with UNCDF.	The product or solutions can be customised to meet the local requirements. Boomitra customised its services in India for smallholder farmers, while its services in Mexico cater to large ranches.
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Therefore, the challenges for cross-border expansion are related to intrinsic and extrinsic factors. Intrinsic factors are the success of the product or service in terms of adoption by farmers. The extrinsic factor is the facilitation by an agency to establish in a new market. The facilitation takes care of regulatory and market-level challenges. In the absence of facilitation by an agency, the cost and time for entering a new market increases manifold. In addition, the facilitation agency can help find local partners, which is critical for success in new markets. The agency can be a multilateral development institution, incubator, financial institution or the government.

## Challenges specific to the growth phase



### Matured start-ups

 <p><b>I. LACK OF HUMAN QUALITY RESOURCES:</b></p> <p>The matured start-ups are in a phase of scaling up their operations. They require a new skill set to manage the growth, particularly at the CXO positions. The founders realise they do not have the necessary skill set to manage the large operations or specific parts of the operations like marketing. Often these founders must wear different hats to manage the start-ups. The unavailability of required talent in the market often delays their growth plan.</p>	 <p><b>II. CONNECT/NETWORK WITH GOVERNMENT DEPARTMENTS AND INSTITUTIONS:</b></p> <p>The matured start-ups in their growth stage require farmers' or farm-related data set or the support of state agriculture universities or farmers' associations. Establishing such a network is challenging and takes considerable time and effort. Moreover, it affects the start-up's growth plan.</p>
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## Initial stage start-ups



### I. FUNDING OR GRANT SUPPORT

The initial stage start-ups often test their concept or run pilots to prove the efficacy of their product and business models. So it is when they require funding or grant support of at least USD 15,000. Unfortunately, the founders are unaware of the source of such funding/grants or cannot secure such support as they are at a very initial stage. Therefore, many such start-ups cannot move up the ladder for a considerable period.



### III. COMPETITION:

The competition amongst the initial stage start-ups has increased tremendously. There exist several solutions for the same set of problems. More than 450 Agritech start-ups have presented their POC and are in various stages of growth. It means that the chance of a start-up with a strong team and proven concept to be successful is higher and often gets greater market acceptability.



### II. THE MARKET CONNECTS:

These start-ups often lack industry connections, and farmers connect. No one wants to take a risk with a start-up's untested product. It delays the adoption of their solutions and, hence, the VCs' investment. The incubation centre of initial investors plays a crucial role in helping start-ups navigate such challenges.



### IV. TEAM BUILDING:

Once the PoC is accepted and the pilot has been successful, the founders of initial stage start-ups face the daunting task of building a team with marketing and sales experience and domain expertise. Therefore, the candidate prefers a mature start-up over the initial stage start-ups. In addition, the start-up pays a higher salary to attract talents in such an environment.

**Table 7: Showing challenges faced by cohort partners**

Cohort partner	Stage	Critical challenge
<b>Main Track</b>		
Boomitra	Matured with a global presence	Lack of digitization of land records; customer acquisition; Difference between a record and ground truth
Fruitfal	Matured	Poor quality data related to demand of the horticultural crops; Significant amount of training of the intermediary organization; broken supply chain; lack of agriculture infrastructure; Lack of CXO level staff
WRMS	Matured with a global presence	Lack of digitization of land records; Satellite images are very costly; high gestation period; lack of rural infrastructure
Satsure	Matured with a global presence	Lack of digitization of land records; Satellite images very costly; Often, financial institutions are not eager to spend on the costly satellite image
Gramcover	Matured	Scaling up their crop and livestock insurance
Krishitantra	Matured	Scalability; lack of networking with government; adoption challenge in the Northern part of India
Crop in	Matured with a global presence	International facilitation; lack of CXO level staff; cross-border expansion and scaling up; funding
Ecozone solutions	Matured with a global presence	Not enough bandwidth to different countries; government support critical to selling product; lack of financing options for the end-users; affordability is a big challenge in cross-border expansion.
Stellaps	Matured	Internet connectivity in the rural area; scalability; lack of availability of data
Skymet Weather	Matured with a global presence	Access to granular level data set with government; lack of rural infrastructure; lack of cadastral maps; Cross-border expansion facilitation and capital



AIM Cohort partners		
Agrivijay	Matured with a global presence	Grant support to test some of its products and scale up the business; Business network to expand the B2B business
Farmitopia	Seed stage with product in the market	Grant support to test the product Network support to grow the business
Chakras Farm	Seed stage with product in the market	Fund requirement: network support to expand the business; lack of quality human resource
Mlense	Seed stage with product tested and ready for launch	Managerial capability: massive demand for the product but lack of capacity to meet the demand, Initial fund requirement
Satvik Agro	Seed stage with a customer base	A proprietorship firm; Need support in registering LLP; Fund to expand the processing business
Carrus Mobility	POC stage	Fund to test the product; market connect
Farminfinity	Early-stage with product in the market	Network and business partner support; Fund to expand the business
Agrisonic	Seed stage with a global presence	Grant support to expand the India operations; Investment to scale the business; Support in tying up with business firms
Ai-genix	POC stage; Few products in the market	Fund requirement for testing the product; network support and collaboration with agriculture universities to test the product; business network support
Coorgexpress	Early-stage with product in the market	Fund requirement for establishing experience centres; enrolling farmers; scalability
Neeraventures	Matured with products in the market	Lack of digital literacy; the language barrier
Transity	Early-stage with product in the market	Customer acquisition; networking challenge

Source: Own research

# Opportunities for Agritech start-ups

## 1 A large number of smallholdings

The FAO data suggests that 84% of the world's 570 million farms are smallholdings having less than 2 hectares of land<sup>9</sup>. It is humanely impossible to reach many such farmers and provide access to the latest farm-related information to boost production or make farming efficient. Instead, these smallholder farmers across the globe depend on local input suppliers or intermediaries for such information, which often is incorrect and has no scientific basis. Furthermore, these smallholder farmers lack access to formal credit, insurance, and the formal markets to quality inputs.

The Agritech start-ups, with their solutions, can create a disproportionate impact in the lives of the smallholders by providing access to credit, insurance, inputs, and market linkage at reduced cost with greater efficiency. Moreover, these start-ups have the potential to interact and communicate with millions of farmers across diverse geographies. Hence, the number of farmers and their challenges provide growth opportunities to Agri fintech, digital marketplace, and advisory services start-ups.

## 2 Impact of climate change

There is no doubt that the climate is changing rapidly, which has no good news for the agriculture sector. Weather patterns hurt productivity, so the situation required modern scientific tools to tackle the volatile situation. The way crops have been grown needs to be changed, and resilient methods must be adopted to mitigate climate risk.

With the advent of powerful AI and ML tools coupled with satellite imagery, weather predictions have become increasingly accurate. Therefore, an advisory based on the weather situation will help the farmers mitigate weather-related risks. Therefore, climate change allows agritech companies to mitigate weather-related risks and advise on climate-resilient agriculture practices.

## 3 Increased mobile internet and smartphone penetration

The number of mobile internet users has increased dramatically across the globe. Only 6% of the global population is in an area that does not have access to mobile internet<sup>10</sup>. Similarly, smartphone penetration has increased significantly, though affordability remains an issue.

<sup>9</sup> "Smallholders produce one-third of the world's food, less than half of what many headlines claim". <https://ourworldindata.org/smallholder-food-production> accessed on 14th May 2022.

<sup>10</sup> "The State of Mobile Internet Connectivity 2021". <https://www.gsma.com/ri/wp-content/uploads/2021/09/The-State-of-Mobile-Internet-Connectivity-Report-2021.pdf> accessed on 14th May 2022.

There are more urban users than rural users and a similar divide across gender. The adoption of mobile internet and smartphones is much higher among young people under 35 years of age, a unique opportunity for agritech start-ups to digitally connect with smallholder farmers through their unique and innovative solutions.

## 4 Consumer behaviour

The consumer preference for clean, chemical-free, and sustainably sourced food has increased with urbanization and income. The demand for organic food has increased among health-conscious individuals ready to pay the premium. It has allowed the smallholder to offer organic or chemical-free food at a higher price. As a result, the demand for fresh vegetables, fruits, fish, and meat has increased significantly. The increased demand has also flooded the market with products that claim to be clean, organic, or fresh but are regular products with a different marketing strategy.

It offers a unique opportunity for agritech start-ups to solve issues related to producing clean and chemical-free products, supply chain issues, and traceability. In addition, it will help smallholders produce sustainably by adopting the best technology and assure consumers that their products are clean, fresh, and sourced sustainably.

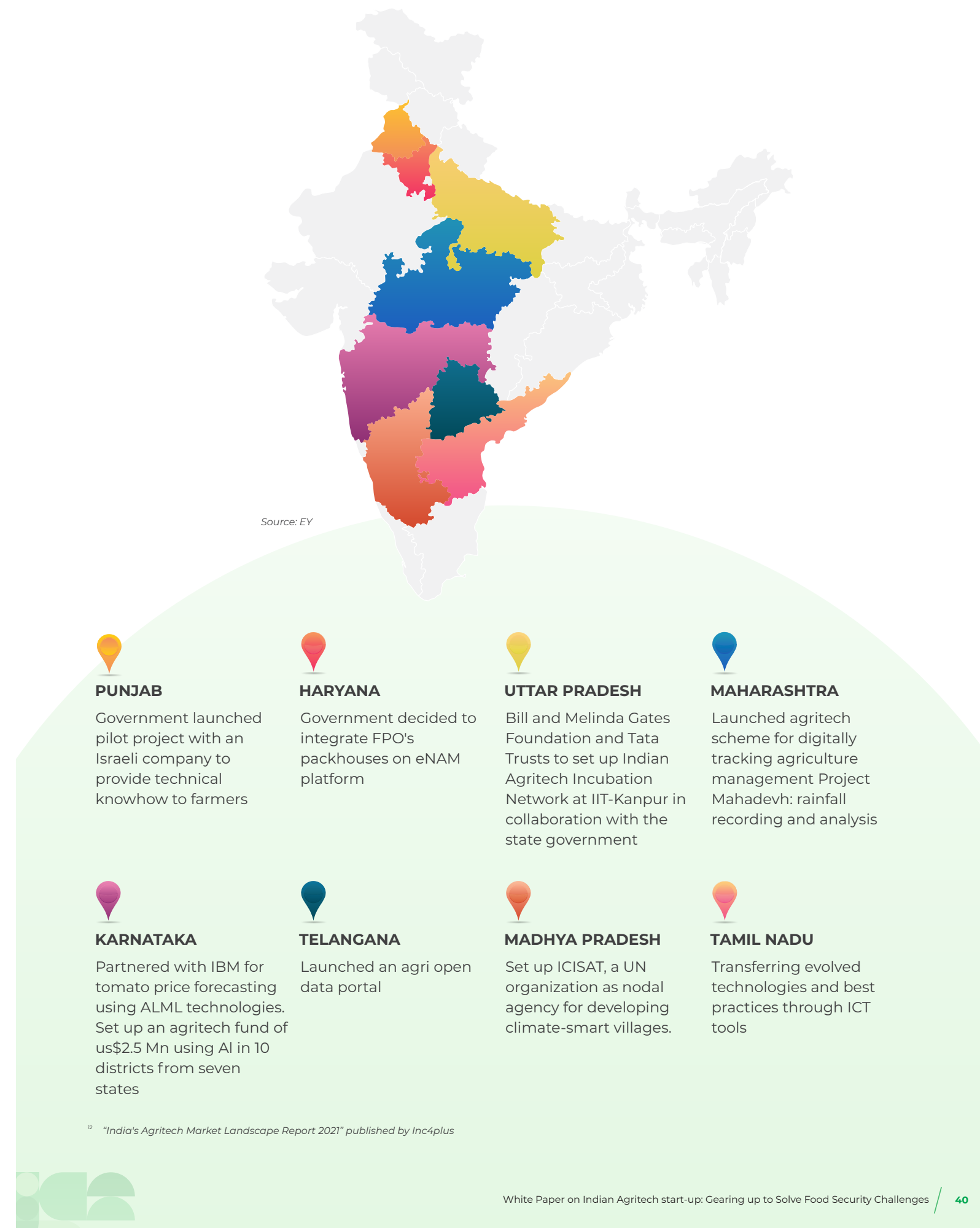
## 5 Increased support from the government and incubators

The government is also keen on agritech at the implementation and policy levels. Multiple government schemes, notably Aspire and AIM, promote agritech in India. Some of the critical accelerators and incubators for the agritech sector in India are AGRI UDAAN, Centre for Innovation Incubation and Entrepreneurship (CIIE), a-IDEA (Association for innovation development for Entrepreneurship in Agriculture), ICRISAT (International Crop Research Institute for the Semi-Arid Tropics), T-Hub, and Agri-Tech Start-up Accelerator CIE, Hyderabad, MANAGE Agri-clinics and Agri-Business Centre Incubation centre<sup>11</sup>.



<sup>11</sup> "Agritech Startups: The Ray of Hope in Indian Agriculture". Discussion Paper 10 published by MANAGE-Centre for Agricultural Extension Innovations, Reforms, and Agripreneurship (CAEIRA)

Figure 5: Showing various state-specific agritech initiatives in India<sup>12</sup>





# IV. Role of technology

Many agritech start-ups have taken advantage of increased internet penetration and digital outreach in rural areas to build solutions to tackle these challenges. The table below shows the role of technology in overcoming the identified challenges

**Table 3: Showing Own research issues related to a typical value chain and possible technology solution area**

Issues	Details	Possible Solution Areas
Supply chain efficiency	<ul style="list-style-type: none"> <li>Value leakage from post-harvest loss ranges from 20% to 50% in the partner countries</li> <li>It is primarily because of multiple intermediaries, fragmented value chain resulting in value leakage, lower net price realisation for farmers</li> </ul>	<ul style="list-style-type: none"> <li>A digital way of tracking the value chain (Traceability, Remote Sensing, Location Tracking)</li> <li>Affordable quality check tools (Sensors, IoT, Cloud-based to perform multiple aspects of quality check - optical/olfactory/density)</li> </ul>
Access to the market	<ul style="list-style-type: none"> <li>focuses on increasing the farmers' access to the market to derive higher value</li> <li>Intermediaries control the market, and hence the price</li> </ul>	<ul style="list-style-type: none"> <li>focuses on increasing the farmers' access to the market to derive higher value</li> <li>Intermediaries control the market, and hence the price</li> </ul>
Farm inputs	<ul style="list-style-type: none"> <li>Farmers lack access to high-quality agricultural inputs, farm machinery and other allied equipment, which leads to low agricultural productivity or low-quality crops</li> <li>Agricultural Machinery has an affordability issue for smallholder farmers due to small landholdings</li> </ul>	<ul style="list-style-type: none"> <li>Farming as a service (SaaS) model for high-cost implement access</li> <li>Sensor-based, remote/proximity sensing (moisture sensing) tools to reduce water usage for agriculture.</li> </ul>
Mitigate risk and climate change impact	<ul style="list-style-type: none"> <li>Low uptake of crop and livestock insurance; lack of awareness about insurance products</li> <li>Limited crops cover under insurance</li> <li>Low adoption of climate-smart agriculture like zero-tillage or natural farming to manage climate risks</li> </ul>	<ul style="list-style-type: none"> <li>Digital parametric and non-parametric insurance product</li> <li>Remote monitoring of weather and crops</li> <li>Advisory services to the farmers</li> <li>Monitoring of carbon sequestering and soil nutrient content remotely</li> </ul>

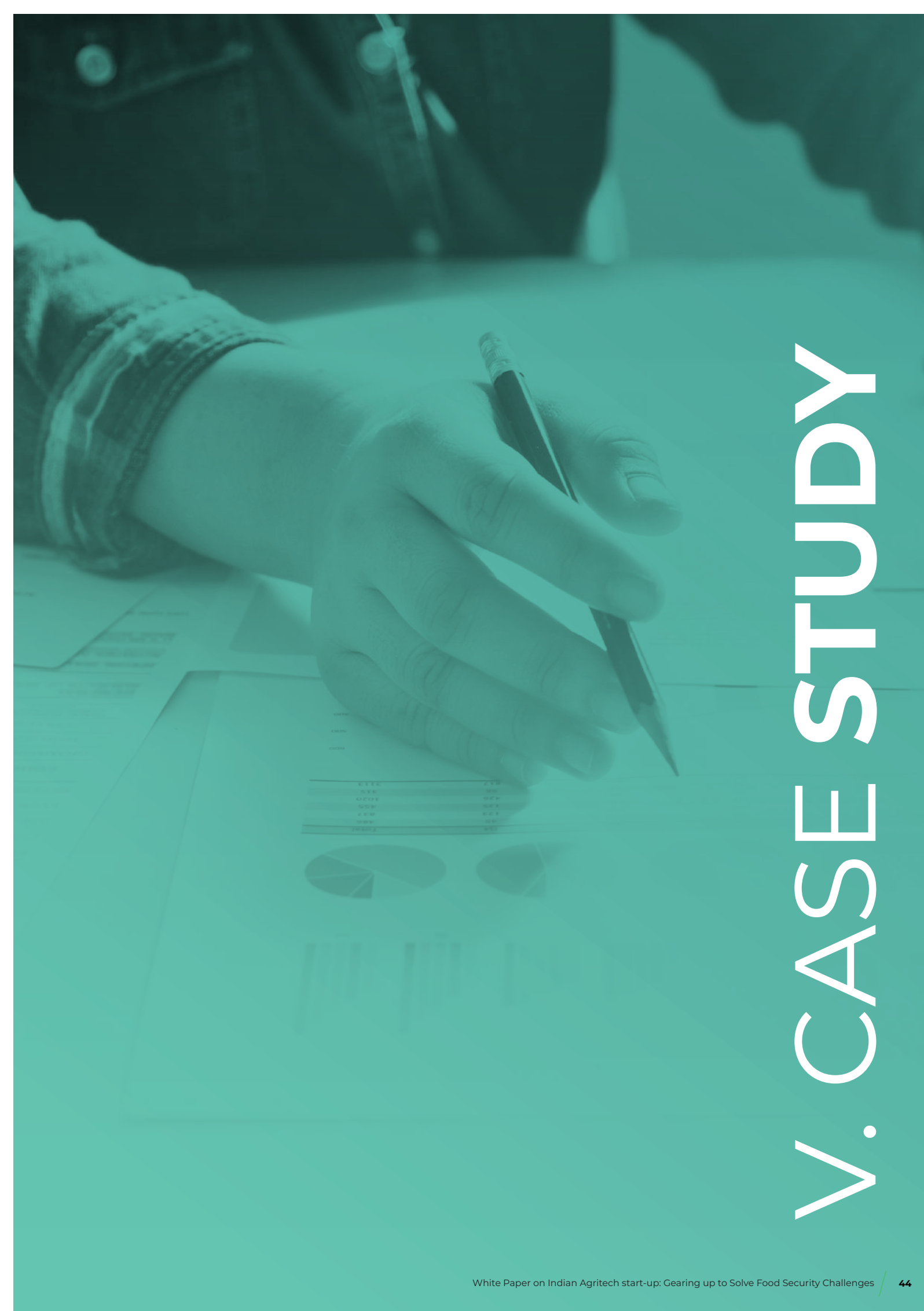
Agritech start-ups use various technology across the value chain to overcome smallholders' identified challenges. The table below maps the cohort partners, their technology, and their intervention in the value chain.

**Table 3: Showing agritech start-ups using different technology to solve real-world problems**

Value chain	Technology	Agritech start-ups from our cohort
Input	<ul style="list-style-type: none"> <li>Digital platform-based Livestock and Farm Management - centralizes, manages, and optimizes the production activities</li> <li>Digital App-Based Procurement Aggregation - to reduce fixed costs and focus on core kitchen and customer service operations</li> <li>Data-Driven Marketplace linkage Price Discovery</li> </ul>	Agrivijay, Fruitfal, Chakras Farms, AI Genix
	<ul style="list-style-type: none"> <li>App(mobile) based platform for expert agronomy advice</li> <li>Remote and Proximity sensing solution for crop monitoring During crop cycle.</li> <li>Satellite data-based estimation of harvesting time and yield.</li> </ul>	WRMS, Satsure, Boomitra
	<ul style="list-style-type: none"> <li>Digitizing and optimizing the Production, procurement &amp; cold chain Management through the IoT solution platform</li> <li>Automatically adjust the irrigation volume based on soil moisture, climatic conditions, last irrigation date and volume to provide the most optimal irrigation.</li> <li>Drones/ UAV surveillance</li> </ul>	Ecozone, Carrus Mobility, Transity
	<ul style="list-style-type: none"> <li>Digital Finance in Agriculture</li> </ul>	Gramcover, Farminfinity
Farm production	<ul style="list-style-type: none"> <li>Standard package of practices</li> <li>Alert Log &amp; Management (pest infestation, diseases)</li> <li>Soil testing</li> <li>Satellite and weather input-based advisory</li> <li>Real-time Crop reports &amp; insights</li> <li>Geotag-based accountability, predictability</li> <li>Adherence to Compliance &amp; Certification</li> <li>Livestock and farm management software</li> </ul>	CropIn Technology, Farmitopia, Agrosonic, Skymet, Krishitantra, WRMS, Satsure, Skymet, Stellaps



Value chain	Technology	Agritech start-ups from our cohort
Post-Harvest/ Processing	<ul style="list-style-type: none"> <li>• Satellite-based yield estimation</li> <li>• Sensor, data-driven harvesting time</li> <li>• Mobile Quality Testing Devices</li> <li>• Proactive AI-driven</li> <li>• Shipping information management.</li> </ul>	Satsure, Satvik Agro, Ecozone, Crop In, Farmitopia
	<ul style="list-style-type: none"> <li>• Digital Finance in Agriculture</li> <li>• Buyer-seller digital marketplaces</li> <li>• Digitally enabled value chain integration /</li> <li>• Market access (off-taker) integration</li> <li>• E-marketplaces / Input e-market place / place</li> <li>• Brand certification and management</li> <li>• Pay-as-you-go agricultural machinery</li> </ul>	WRMS, Satsure, Gramcover, Farminfinity, CropIn, Stellaps, Agrivijay, Satvik Agro
Supply chain	<ul style="list-style-type: none"> <li>• Blockchain-based supply chain management,</li> <li>• Farm-to-fork traceability of commodities.</li> <li>• Precision shipping forecast / Demand forecast</li> <li>• Livestock and farm management software</li> <li>• Shipping information management</li> <li>• Quality/compliance certifications</li> </ul>	Stellapp, Butterpaper, Mlense
Climate change	<ul style="list-style-type: none"> <li>• Greenhouse systems, Indoor/ outdoor farming, aquaponics</li> <li>• Reclamation of degraded, saline, and alkaline land</li> <li>• Climate-Smart Agriculture</li> <li>• Residue management</li> <li>• Waste Management/Water management technology</li> <li>• Risk management</li> </ul>	Boomitra, WRMS, SatSure, Skymet, CropIn



# V. CASE STUDY





# Case Study 1:

## Mitigating weather risk and incentivizing smallholders for climate positive action through Agritech solution

One of the challenge categories for the entire program is “Risk and Climate Change”. Agriculture in the partner countries is dependent on rain. In the case of India, the monsoon plays an essential role in agriculture. Any change in weather pattern results in a drought or flood situation affecting crop production. Therefore, it is important to reduce the production risk of the producers to the extent that losses are covered through the provision of insurance. The scientific community has come up with many sustainable climate-smart techniques that can help farmers reduce climate change's impact. However, it is also necessary for farmers to adopt these techniques to be sustainable in the long run.

The agritech start-ups have adopted the following models to develop an innovative solution to tackle the risk related to climate change and developed mechanisms to incentivize farmers to adopt climate innovative agriculture practices.

### A Agritech solution working closely with insurance companies to mitigate weather-related risks through an innovative insurance product

Many agritech start-ups use satellite images to monitor crop growth on a given land. These start-ups have leveraged the digitized land records and overlaid these details on satellite images to track individual plots. Once this is accomplished, various customized services can be offered to the smallholder farmers and insurance companies. It has solved a perennial problem of insurance companies related to monitoring individual plots over a larger area. These start-ups have a physical presence on the ground to validate the ground information related to soil type and land boundaries.

WRMS is one such solution which offers innovative insurance products through their SecuFarm application. The WRMS partners with FPOs and other agencies working closely with the farmers to provide its services. It offers parametric and non-parametric insurance and crop assurance product. WRMS offers farmers customized and timely alerts and forecasts, farm alerts, crop status, soil management protocols, insect pest management advisories and post-harvest assistance in gradation, packaging, storing, logistics, and getting the best market price. Crop assurance was included in the SecuFarm intervention to guarantee a minimum income level if the farmer adopts all the advisories. In this way, WRMS transferred the risks that could not be minimized. Its in-house expertise in risk profiling, agricultural sciences, & actuarial sciences and its significant on-ground presence. Agricultural scientists used historical & forecasted weather data to assess the crop risks due to pests and disease events. The historical data was used by underwriters for risk-profiling, designing crop-specific and offering the SecuFarm product to the farmers at lower costs.

WRMS leveraged its on-ground force of surveyors to provide real-time monitoring for farm-specific advisory and claim assessment. WRMS helps farmers reduce and transfer their risk to a third party to minimize their loss at various crop stages and reduce post-harvest monetary loss.

Skymet is another start-up which started its journey by offering weather-based advisory services for the news channel. Over the period, it built a vast repository of weather data for the entire country. Using its data analytics, Artificial intelligence, and satellite data, it has built risk models around various crops across the country. The insurance companies use it to offer conventional and weather-based insurance products to farmers.

**Satsure also offers satellite-based insurance services to the farmer.**

### B Agritech Solutions provides advisory services to the smallholder farmers as additional

Start-ups like WRMS, Satsure, CropIn and Skymet provide agromet advisory services to the farmers. The farmers can access this advisory service through their mobile applications or push notifications if they subscribe to their product. These advisory services can be generic or customized based on the start-ups. Some of the standard advisory services offered by these start-ups are as follows:



Weather forecast



Crop-specific agronomic advisories



Customized alerts specific to crop



Insect pest management advisories



Input specific advisories



Price-related advisories



Smart agriculture practices

WRMS provides advisory services to farmers who subscribe to their Secufarm application. The advisory includes intelligent agriculture practices to reduce the risk related to production. Skymet offers advisory services through its application that can be downloaded by the farmer using a smartphone. Satsure offers its advisory services bundled with its insurance product. CropIn not only helps farmers identify insect pests and diseases but also provides advisory services through its AI-based solution in partnership with financial institutions.



## Agritech solution incentivizing farmers to adopt climate-smart agriculture practices

Boomitra is a unique start-up that incentivizes farmers to adopt climate-smart agriculture practices. Boomitra monitors the soil carbon content with satellite imagery. It has partnered with carbon-sequestering agencies that certify the carbon sequestered and, thus, obtain carbon credit. These carbon credits are traded on carbon trade exchanges and bought by Fortune 500 companies that want to reduce their carbon footprint. Boomitra keeps its commission and pays the rest amount to the farmers. Boomitra is implementing this model in countries like Mexico, specifically for large ranches.

In India, implementing the business model becomes challenging as they work with smallholder farmers. The land size is small, and the land records in many states are yet to be digitized. The farmer's lack of awareness about carbon trading and scaling up is a big challenge for Boomitra. Boomitra has partnered with FPOs, NGOs, and other agencies working with farmers so that farmers can be convinced by the business model and enrol themselves to sell their carbon credit. This organization also helps with necessary documentation and consent regarding data sharing and privacy. Boomitra has its ground team, which does the ground truth of land boundaries to map the farm of the respective farmers correctly. Initial soil carbon is measured for each farm and is regularly monitored by Boomitra. Boomitra also provides advisories on climate innovative agriculture practices like zero-tillage to these farmers so that the soil carbon content increases over a period. After a year, the carbon content of the soil is measured again. Any increase means the farmer has gained carbon credit, which is certified by the certifying agencies from Washington DC. The carbon credit is sold in the market by Boomitra, and the farmer receives an amount in exchange for the carbon sold.

In this way, Boomitra is incentivizing farmers to create carbon-sequestering and improving soil health by increasing the carbon content of the soil. In addition, it will result in efficient fertilizer utilization, enhanced soil moisture retention capacity, and increased productivity.

## Case Study 2: Potential for cross-border expansion for Indian agritech start-ups

One hundred twenty million or 80% of the farmers in India are classified as small and marginal<sup>13</sup>. India has one of the most diverse climates ranging from tropical to alpine, with equally diverse ecosystems. It has led to diverse agriculture practices. For the Indian agritech start-ups to be successful and commercially viable, they must cater to the smallholder farmers across various geographies. Many successful start-ups have cracked the market with their innovative business models and solutions, which are customized to the farmer's needs. The domestic success in diverse conditions makes their solution feasible for many Least Developed Countries (LDCs) or developing countries with a significantly large number of smallholder farmers.

The table below highlights the state of agritech start-ups in the partner countries.

**Table Showing the status of the agritech sector in partner countries**

Countries	Overall Status of Agritech Sector	Detail
Indonesia	Nascent	<ul style="list-style-type: none"> <li>93% of smallholder farmers</li> <li>Indonesian agri-food tech start-ups raised USD 165 million invested across 26 deals in 2019.</li> <li>The Agritech sector positively impacted during Covid-19 and pushed teams to innovate as food security gained importance.</li> <li>Many solutions are in the early stage, with less than 10,000 users.</li> </ul>
Malaysia	Nascent	<ul style="list-style-type: none"> <li>97% of farmers classified as smallholder farmers</li> <li>20-50 active agritech start-ups implementing solutions on the ground; domestic investments coming up but not all start-ups funded; development funds driven</li> </ul>
Kenya	Intermediate	<ul style="list-style-type: none"> <li>80% of farmers are smallholder farmers</li> <li>More than 50 active agritech start-ups are implementing solutions: availability of domestic investments.</li> </ul>

<sup>13</sup> "India at a glance" <https://www.fao.org/india/fao-in-india/india-at-a-glance/en/> accessed on 7th June 2022



Countries	Overall Status of Agritech Sector	Detail
Uganda	Nascent	<ul style="list-style-type: none"> <li>• 85% of farmers classified as smallholder farmers</li> <li>• Ten active agritech start-ups implementing solutions on the ground; availability of domestic investments</li> <li>• 20 dynamic agritech start-ups implementing solutions on the basis; domestic investments coming up but not all start-ups funded; development funds driven</li> </ul>
Malawi	Intermediate	<ul style="list-style-type: none"> <li>• 2 million smallholder farm families</li> <li>• More than 50 active agritech start-ups implementing solutions on the ground; availability of domestic investments</li> </ul>
Zambia	Nascent	<ul style="list-style-type: none"> <li>• 95% of farmers classified as smallholder farmers</li> <li>• Lack of access to capital remains a significant barrier, and there is limited support for start-ups in the growth phase.</li> </ul>

Source: UNCDF and AIM Research

The Indian agritech start-up sector, even though it has not unlocked its full potential, is way ahead of many countries. More than 330 well-funded matured agritech start-ups spread across sub-sectors like supply chain, e-commerce, precision agriculture, quality management, and financial services. The business models of these start-ups are built around smallholder farmers. Also, the lack of a large number of matured start-ups offers a unique opportunity for Indian start-ups to explore these markets. The Indian agritech start-ups have set foot in South American and African markets. Start-ups like Boomitra, Ecozone, Skymet, Agrosonic, and Satsure have a presence in different needs. Some of the strategies that the Indian start-ups could adopt for cross-border expansion are:

- a. Collaboration with local start-ups: This can be done by forming a Joint-Venture (JV) with local corporates or start-ups where the solution belongs to the Indian entities, and sales and marketing are made by the partnering start-ups or corporate.
- b. Collaboration with local financial institutions: This is most suitable for the start-ups working in the agri-fintech space. Satsure and Skymet have partnered with financial institutions in different countries to offer their solution. In addition, other start-ups in the cohorts have signed a non-Disclosure agreement (NDA) with various financial institutions in Kenya and Malaysia.
- c. Direct intervention backed by investment: The start-ups with more disruptive products and services can directly open their offices in other countries. However, they need sufficient assets and backing from the funders to bear the cost. Boomitra and Ecozone, with their disruptive solutions, have entered different emerging markets with an outstanding response.

Though there are challenges in entering a new market, support by the Indian government in terms of policy and investment will help facilitate cross-border growth and collaboration.



13 "India at a glance" <https://www.fao.org/india/fao-in-india/india-at-a-glance/en/> accessed on 7th June 2022

## Case Study 3: Agri-Fintech Companies ensuring financial inclusion among the farming communities

Gramcover is an insurtech start-up that serves as an aggregator for various insurance companies and offers its product to its customer through its platform. The client can choose from +400 different insurance products. For farmers, it offers crop and livestock insurance through its platform. In addition, it provides Pradhan Mantri Fasal Beema Yojna (PMFBY) and weather-based insurance in partnership with various insurance companies. The fundamental steps are done digitally and without any paperwork. It also designs customized insurance products and gets them reinsured by the reinsurers. The business model adopted by Gramcover is as follows:

- a. Gramcover integrates its API with the partners to provide the services. Some of its partners are Business correspondents, small finance banks, NBFCs and banks acting as physical shops.
- b. The customer can download the Gramcover app and purchase any insurance product offered by different insurance companies.

Farminfinity is another start-up that has built its “credit scoring” platform. The solution tries to solve one of the significant challenges of agriculture financing: the lack of credit history of an individual farmer. Unfortunately, a large number of farmers have no credit history and hence, financial institutions hesitate to lend.

Farminfinity has developed a solution that does a credit scoring of such farmers based on set parameters and thus provides the financial institution confidence in lending such farmers. Farminfinity adopts two different business models, and these are:

- a. It offers API integration where the financial institution can link it with their platform for the credit scoring of the farmers. Farminfinity receives fees as revenue.
- b. Farminfinity acts as a Banking Correspondent, does credit scoring on its platform and manages the portfolio with the responsibility of collection. Farminfinity receives a small commission and income.

The above-mentioned solutions have led to the doorstep delivery of financial services to the farming community and have reduced the paperwork substantially.





## VI. Way forward

Agritech solutions available in the market are making the lives of smallholders better by improving access to quality input, access to market, reducing risks, access to information, and a host of other products and services, resulting in improved productivity and price realisation. Still, the agritech start-ups are not scaling up as fast as the start-ups in other sectors. They face challenges regarding access to quality data, regulations, and the absence of agriculture-related infrastructure.

To achieve the full potential of these start-ups and ensure food security following steps can be recommended as a way forward:

### 1 Improving last-mile connectivity

Due to fragmented land parcels and many smallholder farmers in India, it is challenging for start-ups to reach out to individual farmers. Therefore, most agritech start-ups rely on local institutions like Non-Government Organisations (NGOs) or FPOs or corporates having a significant farmer base to roll out their solution. The success of their model or interventions depends upon the quality of the institutions or corporates. For example, the quantity and quality of FPOs vary from state to state, affecting the start-up's operations. Therefore, to ensure that all smallholders can benefit from the services and products of the agritech start-ups, the government needs to put significant effort into building the capacity of local institutions like FPOs or cooperatives. These local institutions will act as a conduit between smallholders and start-ups. Still, they will also play a key role in enhancing the farmers' income aligned with the government's focus on doubling farmers' income. Also, the mission to promote 10,000 FPOs across the country<sup>14</sup> will go a long way toward boosting the start-up ecosystem. In addition, establishing the Ministry of Cooperation will improve the cooperatives across the country.

### 2 Access to public data

The government has vast data on farmers, land records, financial health, weather reports, meteorological data, market, price, and mandi data. This data is critical for AI-based start-ups or those start-ups that require maps and data related to land records and soil types. For example, Fruitfal is a start-up which uses AI to estimate demand and price for specific horticulture crops and requires historical data on production and price of the produce, which is available to the government but not in a usable format. Similarly, Boomitra maps the carbon sequestering at the farm level and sells the carbon to Fortune 500 companies. Farmers receive a large chunk of the revenue derived from the proceeds, providing an additional income for them by improving the soil conditions. However, Boomitra requires a digital land record with the government department but is not readily available. Therefore, the government should ensure that these start-ups access quality data.

<sup>14</sup> <https://pib.gov.in/Pressreleashere.aspx?PRID=1696547> accessed on 9th May 2022

A step in this direction at the national level could be an improvement in how data is collected, stored, and processed so that the start-ups can access these while maintaining the individual's privacy. The Karnataka government has implemented e-Sahamathi to solve the issue of data privacy, consent, and data sharing with an interested third party<sup>15</sup>.

### e-Sahamathi: Indian state of Karnataka shows the way

Lack of policy around data sharing by the public sector was resolved by the Karnataka government in collaboration with the World Economic Forum's Centre for Fourth Industrial Revolution India and other stakeholders. The solution, known as e-Sahamathi, provides guidelines to ensure privacy and data protection and at the same time creates enabling environment to leverage the value of data for social and economic good. E-Sahamathi allows citizen to provide her consent to the third party to use the data for specific purpose. Through an API, third party can access the data of those citizen who have consented. This ensures that the individual remains in the control of her personal data.

### 3 Promoting local level of infrastructure for farm-level processing

With the booming of agritech start-ups, there has been a significant jump in utilising local infrastructures like warehouses for storage or grading and sorting centre for primary commodities processing. Often, this infrastructure is one of the critical criteria for the start-ups to start their operations. The availability of such resources adds value to the product by improving the quality of the product and fetches a higher price in the market, reducing losses, improving the product's shelf life, and increasing farmers' income. Many start-ups are involved in procurement, and the revenue source is limited to margin. Therefore, they compete with local traders with no additional benefit to the farmers. The industry experts highlight that these agritech companies can be sustainable only after value addition at the local level. To create such values, they must partner with local institutions with agriculture-related infrastructures for primary processing. Therefore, these start-ups must adopt a model where they are physically present on the ground along with their digital presence. Thus, the government should promote the creation of local agriculture-related infrastructures by incentivising and providing financing from formal financial institutions. It will boost the farmers' income and ensure the start-ups' scalability and sustainability.

<sup>15</sup> "Data Sharing by PSUs – crossing the last mile" by Goel, A., Chawla, R. published by Business Line. <https://www.thehindubusinessline.com/opinion/data-sharing-by-psus-crossing-the-last-mile/article65051948.ece> accessed on 7th May 2022.

4

## The digitalisation of licensing regime

Many agritech start-ups working on the input side often face license-related challenges. These licenses require annual renewal, which is often cumbersome due to opaqueness in the entire process. In addition, it often limits the scaling up of their operations. As a result, many agritech start-ups avoid the input market, which still requires large-scale intervention to provide access to quality input at a reasonable price on a timely basis. Creating transparency around the licensing process by digitising the entire process will help the start-ups increase access to information to the smallholders.

5

## State-specific AgriTech policy to promote agriculture-based start-ups

Only a few states like Delhi and Maharashtra have start-up policies to promote and nurture start-ups. However, the agritech start-up needs a different kind of support where they depend on government resources (data) and infrastructures (warehouse and cold storage) to a great extent. Therefore, a distinct agritech start-up policy will go a long way in promoting and facilitating many such start-ups. It will also help the government departments work around the issues related to sharing of data, usage of data, and privacy issues by the private firms.

6

## Establishment of facilitation centre for agritech start-ups at local as well as global level

Many agritech start-ups struggle to find the proper government connection for their product and services. Many are unaware of the various schemes for the start-ups or the source of grants or laboratory facilities. A state-level facilitation centre should ensure that the start-ups can conveniently access public resources or leverage the government's infrastructure. These facilitation centres should act as a one-stop centre where they can process the request of the agritech start-ups, facilitate their meeting with concerned officials, and provide access to government infrastructure to support their business. The centre can also update the start-ups about various government initiatives and programs and facilitate their participation. In addition, the facilitation centre should conduct investor meets, donor programs, and mentorship programs for these agritech solutions. For example, the Maharashtra State Innovation Society<sup>16</sup> is a nodal government agency that supports start-up ecosystems on multiple levels. It brings the entire start-up ecosystem to one platform and allows the start-ups to participate in various government initiatives and access the VC network. Though it is not specific to agritech, a similar facilitating centre at the estate level can improve the success of agritech solutions.

Many Indian agritech start-ups have entered markets in Africa, South America, and Asia. However, there are numerous challenges that these start-ups face while exploring opportunities in other countries.

These challenges are primarily related to regulations, understanding the market and its size, and local facilitation. Regulation is a critical factor for start-ups while entering a new market. In addition, there are challenges that the facilitation can overcome in terms of finding local partners, meeting government officials of the respective countries, and support in terms of investment or grants. A central body working with industry associations, respective embassies, and multilateral organisations can go a long way in promoting start-ups to expand to other markets.

Within the Agritech Challenge, 8-10 workshops were conducted with financial institutions, private sector institutions, and development institutions from Indonesia, Malaysia, Zambia, Malawi, Kenya, and Uganda for cross-border collaborations. Some of these institutions are Agrobank in Malaysia, Standard Bank, Ecobank, One Acre Fund and Agra in Kenya, Malawi, Zambia, and Uganda, respectively. These institutions have signed NDAs with 4-5 start-ups from the primary cohort for piloting in the respective countries. These institutions will facilitate these start-ups in customising their solutions, support them in accessing market, and facilitate them searching for local partners.

<sup>16</sup> <https://msins.in/msins%20accessed%20on%209th%20May%202022>



## Annexure I: List of Main Cohort Track Partners

Cohort	Offering
Boomitra	Incentivising farmers on increasing the soil carbon content; advisory services on the adoption of climate-smart agriculture
Fruitfal	AI-based pricing of horticultural crops (fruits) by aggregating demands; training and advisory services to the intermediary on primary processing and packaging
WRMS	Insurance services; and assurance on guaranteed farm production through their App called Secufarm; advisory services to optimise input usage
Satsure	On-farm monitoring of the cropped area, weather data, soil mapping, and yield estimation using their algorithm. Application in credit and insurance business.
Gramcover	Insurance aggregator offering crop and livestock insurance
Krishitantra	Instant soil testing device and instant soil report; Farmers can access their soil report through the mobile app.
CropIn	Insect pest management services, insurance, crop growth monitoring
Ecozone solutions	Innovative solar-based cold chain container solutions
Stellaps	End-to-end solution for dairy co-operatives and companies to maintain quality, including digitisation of dairy value chain through its in-house app called MoPay
Skymet Weather	Insurance and Asset management services; agromet advisory services

## Annexure II: List of AIM Cohort

Cohort	Offering
Agrivijay	Grant e-commerce platform offering solar-based solutions like solar lights and solar water pumps; physical store at the district level for sales, marketing, and support services
Farmitopia	AI-based agro-advisory services to the farmers; support farmers in scheduling farm operations.
Chakras Farm	Urban gardening services, setting up of playhouse and introducing agriculture in schools for students
Mlense	Instant milk testing kit to test 6 different milk adulterants from a single drop of milk
Satvik Agro	Processing fruits and vegetables purchased from tribal farmers
Carritus Mobility	Cold chain containers are offered on a rental basis
Farminfinity	Credit scoring method for farmers and banking correspondents in partnership with NBFCs and Banks
Agrisonic	Goat farm management system and livestock bazaar; Advisory services specific to goat rearing
Ai-genix	AI-based insect-pest management devices
Coorgexpress	Eco-tourism in coffee-producing areas; experience centre offering a variety of coffee for sales
Neeraventures	Handheld device and IoT sensors to monitor micro-climatic conditions around crops with usage in the insurance sector and monitoring horticultural crop growth
Transity	Digital technology for dairy value chain; an end-to-end digital platform to manage the entire dairy value chain



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