November 2018

Agri start-ups: Innovation for boosting the future of agriculture in India



pwc

FICCI

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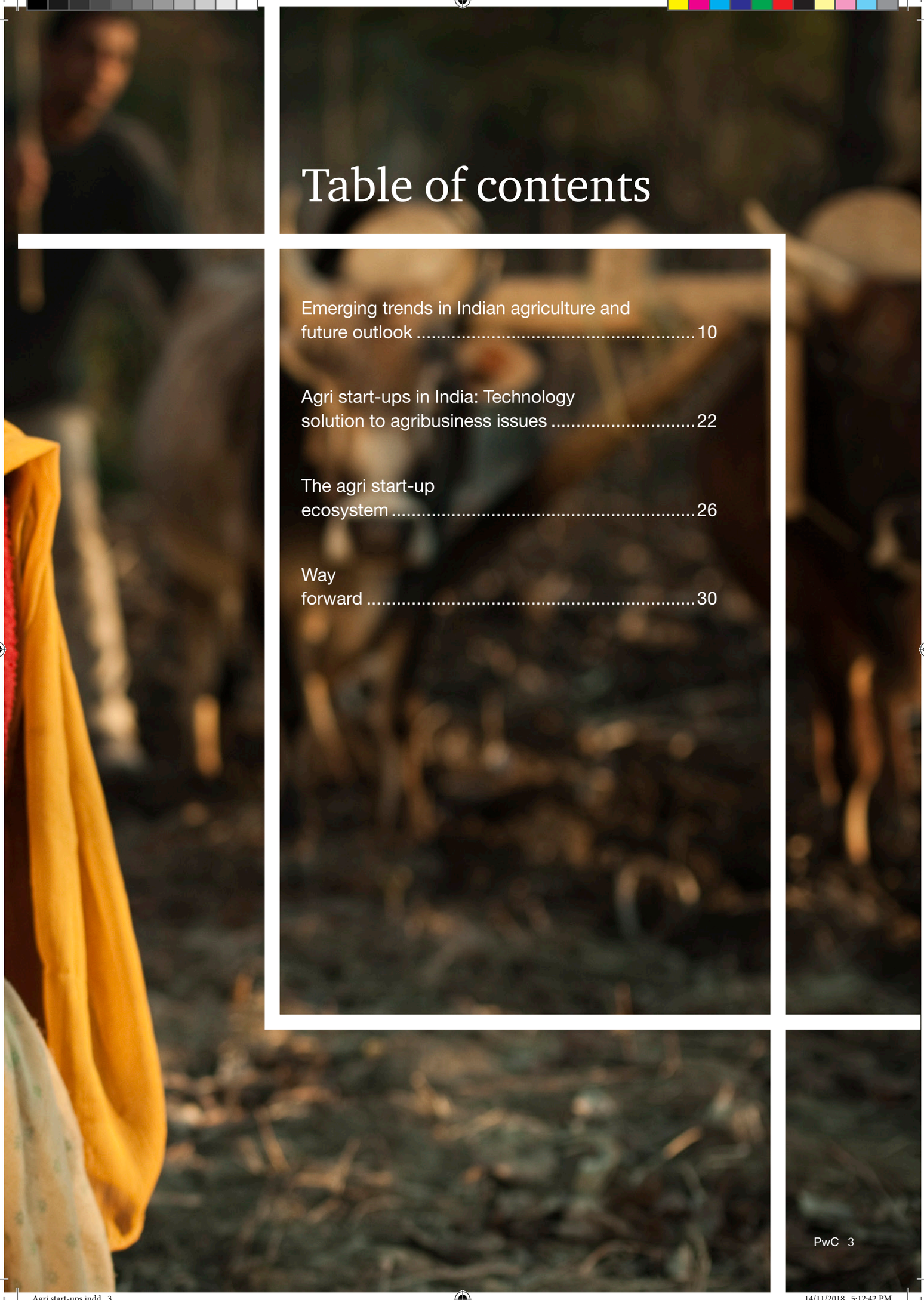


Table of contents

Emerging trends in Indian agriculture and future outlook 10

Agri start-ups in India: Technology solution to agribusiness issues 22

The agri start-up ecosystem 26

Way forward 30

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सुरेश प्रभु
SURESH PRABHU

सत्यमेव जयते

स्वच्छ भारत
एक कदम स्वच्छता की ओर

मंत्री
वाणिज्य एवं उद्योग;
एवं
नागर विमानन मंत्रालय
भारत सरकार, नई दिल्ली
MINISTER
COMMERCE & INDUSTRY;
AND
CIVIL AVIATION
GOVERNMENT OF INDIA, NEW DELHI

MESSAGE

Agriculture development is an overriding priority in India's development strategy. The prospects for increasing future agriculture growth will rely on a dual strategy of building partnerships with right actors and increased focus on innovations in agriculture sector.

Bringing innovation to agriculture not only underpins the creation of new opportunities for Agri Start-ups but also opens new markets. Therefore, a substantial part of our agricultural growth must come through application of innovative technologies at different segments of agriculture value-chain. This will be vital for our country to achieve rightful position in global trade too.

I am happy that keen interest has been evinced by Agri Start-ups to harness the potential offered by the agriculture sector. It is crucial to expose such Indian Agri Start-ups to international innovations in this sector. Therefore, there is a need to leverage synergies with different countries to collaborate and create value for each other. I believe, international exchange of innovative Agriculture best practices is the priority for the country.

I congratulate FICCI and PwC for coming up with a Report with a focus on *innovations by Agri start-ups for betterment of the future of Agriculture in India*. I am sure those concerned with leveraging innovative technologies for Indian Agriculture and developing a strong Agri start up ecosystem in the country, will find the Report useful.

(Suresh Prabhu)

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Agri start-ups.indd 4 14/11/2018 5:12:45 PM

गजेन्द्र सिंह शेखावत
Gajendra Singh Shekhawat

सत्यमेव जयते

कृषि एवं किसान कल्याण
राज्य मंत्री
भारत सरकार
Minister of State For Agriculture &
Farmers Welfare
Government of India

Message

"Innovative technology will drive value in evolving a robust agriculture value chain. In this journey, Innovations by Agri Start ups have great ability to make a strong on ground impact."

Even after achieving self-sufficiency in food grains, the profession that continues to represent an important part of our economy and provides livelihood to 60% of country's population, continues to face many challenges. I believe, technological innovation is one lever that can catapult Indian Agriculture to next level.

New Age technological solutions by Agri start-ups present new opportunities to build a smart agriculture value chain. However, for such innovations to succeed and scale, building a conducive Agri start ups ecosystem is imperative. While, Government is playing its part, Agribusiness industry should come forward and deepen its engagement with budding Agri start-ups. I congratulate FICCI and PwC for coming out with a knowledge report that will certainly help the next generation of Agri entrepreneurs step forward.

The prospects for increasing future growth in Agriculture sector will need to rely on partnerships. I am sure that partnership between Agribusiness industry, Government and Agri Start-ups will enable a strong transformation in Agriculture.

(Gajendra Singh Shekhawat)

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Message from FICCI

‘The time has come to enunciate agricultural strategies with innovations. Therefore, leveraging the efforts of agri start-ups is imperative.’

Indian agriculture has moved far beyond production of basic foodgrains. The past strategies have been successful in the sense that India transformed from import dependence to self-sufficiency. However, the key question that arises is whether our existing strategies adequately prioritise the key elements that have the potential to bring prosperity to farmers by providing cost-reducing solutions and achieving desired growth in future.

A substantial part of our agricultural growth evolves through application of new technologies. This will certainly change the way agriculture is done in our country and ensure future growth without compromising the man-machine linkage. However, such innovation-led growth of agriculture in our country should ensure all stakeholders in the agricultural chain contribute and benefit, starting with the farmer.

This signifies that sustainable and innovation-led growth of Indian agriculture would require a strong alliance with promising agri start-ups. This will certainly usher in game changers into the agribusiness arena and will inject new wave of transformation in the agriculture value chain.

T R Kesavan
Chairman, FICCI National Agriculture Committee
President and COO, TAFE Ltd.

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Message from PwC

‘Innovation by agri start-ups can change the future outlook of agriculture. It’s the right time to boost their confidence.’

By the year 2050, annual foodgrain production would need to grow to 333 million tonnes. Despite the fact that the contribution of key foodgrains in acreage terms in India is 15%, the production contribution is mere 8.7%. This indicates that the use of innovative technology is necessary to meet the forecasted demand in a sustainable manner and move Indian agriculture along the growth path.

It’s time to seek the right partnerships that add value through innovations and achieve shared goals through combined efforts. Agri start-ups are potential human capital in the Indian agricultural economy and certainly the right partners for innovation -led agriculture growth. It’s an opportune time to bring them together and inspire them to devise appropriate solutions for agribusiness issues.

Innovations by agri start-ups in form of products, services or applications can be a meaningful solution across the agricultural value chain. Therefore, the efficient use of this talent pool will be a key driver for improving competitiveness in the sector. Measures by the Government of India to develop start-ups have yielded impressive results; however, to realise their true potential, concentrated efforts by the right mix of partners and with clear objectives will help in achieving faster results.

The report identifies the holistic drivers for the agriculture sector – the demand pull, supply side push and an enabling conducive policy environment for its overall growth. While summing up the key trends and future outlook of the sector, the need for disruptive technologies to steer the agriculture sector has been emphasised. Characteristics and categories of start-ups, along with the key challenges faced by them, have been elucidated with a strategic way forward.

India has already built a strong name for itself in the global start-up community. It’s time to make agri start-ups successful and propel India forward as a leader in the agri technology sector too.

Ashok Varma
Partner, Government Reforms and Infrastructure Development
PwC India

Agri start-ups.indd 7 14/11/2018 5:12:45 PM

Executive summary

Agriculture has always been called the backbone of Indian economy, supporting the livelihoods of the majority of the population. Although India has a significant presence internationally in terms of production of key cereals, pulses, fruits, vegetables and animal products, at the same time, productivity is fairly low. Despite a conducive policy environment and strong demand pull for the sector, key challenges plaguing the sector involve smaller holding size, dismal primary and secondary processing infrastructure, a convoluted supply chain with multiple levels and intermediaries, and limited last mile delivery of services, to name a few.

With the increasing population and demand for better quality and higher quantity of 'food, fibre and feed', the performance pressure on farms is increasing remarkably. As per estimates from the Indian Council for Agricultural Research (ICAR), the demand for foodgrains would increase from 192 million tonnes in 2000 to 345 million tonnes in 2030 and hence in the next 20 years, production of foodgrains needs to be increased at the rate of 5.5 million tonnes annually.

In such a situation, where we have promising macro fundamentals in the sector but the enablers and catalysing sparks are missing, we need a segment of disruptive technologies/enablers who can leverage technology, leading to increase in productivity, efficiency and output.

Agritechnology start-ups are such a meaningful solution across the agricultural value chain and can be in the form of a product, a service or an application.

We have observed decent growth of agri start-ups in the country in five focus areas: supply chain, infrastructure development, finance and related solutions, farm data analytics and information platforms.

Supply chain start-ups broadly involve those working in e-distribution, e-marketplace and several linking platforms. The infrastructure developer sub-component largely encompasses those in a drip-like technology solution, system or components, hydroponics, etc. Finance-related solutions are around payments, revenue sharing and innovative lending, whereas farm data analytics comprises farm mapping, field operations and remote sensing involving interventions. Information platform start-ups are connected to the information dissemination business.

Nationally, a total of 366 agri-based start-ups have come up from 2013 to 2017 with more than 50% of the start-ups in the last 5 years started in 2015 and 2016. It is also to be noted that more than 90% of all funding is focused on seed stage and early stage start-ups.

Agri start-ups have received decent support from the government through supportive policies such as Start up India, Atal Innovation Mission, NewGen Innovation and Entrepreneurship Development Centre, the Venture Capital Finance Assistance (VCA) Scheme promoted by the Small Farmers' Agri-Business Consortium and ASPIRE scheme. Such schemes along with well-recognised accelerators, incubators and mentors identified for the agritech start-up ecosystem have been working in tandem to provide the best technical support and reduce the gestation period of agri start-ups.

Going forward, agri start-ups need to critically address the inherent issues like low landholding size, longer gestation periods, lower return on investments, lower affordability amongst target groups, and skill and knowledge gaps amongst farmers while developing and popularising their business models.

In order to make agri start-ups successful, it is crucial to enable seamless hybridisation of relevant technology by building a promising 'new-age distribution model'. We need to develop a new way for the farmer to buy products and get information as well as credit on one unified platform. Merely providing content on an app is not going to solve the issues of the farming community. Agri start-ups need to customize suitably for wading into a market that has scant technology adoption rate (due to limited budgets and inconvenience with its usage) and re-orient their methods of selling, which essentially will be different from urban India and start-ups operating there.



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Emerging trends in Indian agriculture and future outlook

Indian agriculture: Existing status and key trends

Agriculture plays a vital role in India's economy. Over 58% of the rural households depend on agriculture as their principal means of livelihood. Gross value added (GVA) by agriculture, forestry and fishing is estimated at 17.67 trillion INR (274.23 billion USD) in FY18.[1] The GVA of the agriculture and allied sector at constant 2011–12 prices grew at a CAGR of 2.75% between FY12–18. Union Budget 2018–19 allocated 57,600 crore INR (8.9 billion USD) for the Ministry of Agriculture & Farmers' Welfare, signifying its immense importance in the national socioeconomic context.

Looking at the current status and a few projections, it is evident that India stands at the threshold of emerging domestic agri output and input demand, backed by higher disposable incomes across the socioeconomic classes (SECs) and significant technological upgrade in farm practices.

Existing status and some projections for the Indian agriculture and allied sector

Current global position

- India is the largest producer of spices, pulses, milk, tea, cashew and jute; and the second largest producer of wheat, rice, fruits and vegetables, sugarcane, cotton and oilseed.
- India is currently the world's fourth largest producer of agrochemicals.
- India has the largest livestock population of around 512 million.

Increasing consumption

- Consumer spending in India is likely to reach 3.6 trillion USD by 2020.
- Private final consumption expenditure (at constant prices) increased by 6.1 % in 2017–18 and 8.6% in the April–June quarter of 2018–19.

Conducive atmosphere

- India has the 10th largest arable land resources in the world. With 20 agri-climatic regions, all 15 major climates in the world exist in India. The country also possesses 46 of the 60 soil types in the world. Growth in gross value added (GVA) by agriculture and allied sectors is estimated at 3% in 2017–18.
- Strategic geographic location and proximity to food-importing nations favour India in terms of exporting processed foods.

Record foodgrain production

- During the 2017–18 crop year, foodgrain production is estimated at record 284.83 million tonnes. In 2018–19, the Government of India is aiming for foodgrain production of 285.2 million tonnes.

Farm mechanisation

- India is one of the largest manufacturers of farm equipment such as tractors, harvesters and tillers. India accounts for nearly one-third of the overall tractor production globally.
- Tractor sales in the country are expected to increase by 11–13% in FY19, while the tractor industry is expected grow at 8–10% between FY17-22.

Source: : Ministry of Agriculture & Farmers' Welfare, Government of India, MOSPI, GoI, and industry estimates, PwC analysis

1 2nd advance estimates, Central Statistics Office (CSO)

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India's food grain production has been increasing every year, and it is among the top producers of several crops such as wheat, rice, pulses, sugarcane and cotton.

According to the Ministry of Agriculture & Farmers' Welfare, the total foodgrain production in the country in FY17–18 stood at around 284 million tonnes[2] and by the year 2050, the annual foodgrain production would need to grow to 333 million tonnes.[3]

Crop production (mn tonnes)	2011–12	2017–18	CAGR
Rice	105.30	112.91	1%
Wheat	94.88	99.70	1%
Total cereals	242.20	259.59	1%
Total pulses	17.09	25.23	8%
Total foodgrains	259.29	284.83	2%
Horticultural crops	257.3	307.2	4%

Source: Ministry of Agriculture & Farmers' Welfare (2018) and PwC analysis

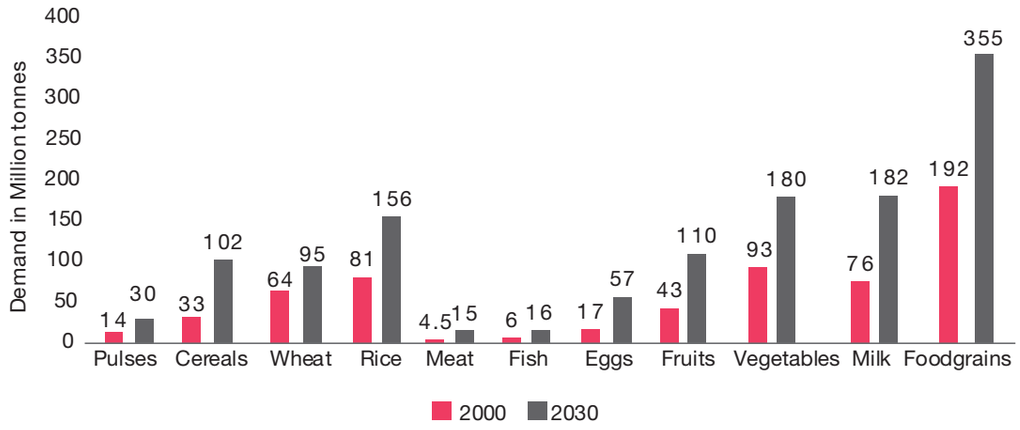
Since 2011-12, pulse production has increased with a CAGR of 8%. Production of horticultural crops is estimated at 307 million tonnes, with a CAGR of 4% between FY11–12 to FY17–18. India ranks second in global production of fruits and vegetables and is a leading exporter of mangoes and bananas. The country also exports grapes in a large quantity across the world. This remarkable growth in the agriculture sector is also well supported by the innate demand for more food, feed and fibre required for the burgeoning population, meeting export demands and the enhanced standard of living.

It is also to be noted that by 2020, the average Indian will be only 29 years of age, compared with 37 in China and the US, 45 in Western Europe, and 48 in Japan. Moreover, **by 2030, India will have the youngest median age of 31.2 years, while China's will be 42.5 years.** Most major economies will see a decline in working age adults (20–64 years).

Rise in demand for food and processed commodities

The demand for food and processed commodities is increasing due to growing population and rising per capita income. There are projections that demand for foodgrains would increase from 192 million tonnes in 2000 to 345 million tonnes in 2030. Hence, in the next 20 years, production of foodgrains needs to be increased at the rate of 5.5 million tonnes annually. The demand for high-value commodities (such as horticulture, dairy, livestock and fish) is increasing faster than that for foodgrains—for most of the high-value food commodities, demand is expected to increase by more than 100% from 2000 to 2030.

Demand estimation for food and high value commodities (such as horticulture, dairy, livestock and fish) in 2030



Source: Vision 2030, Indian Council of Agricultural Research, New Delhi

2 2nd advance estimates, Ministry of Agriculture & Farmers' Welfare

3 Transforming agriculture through mechanization, FICCI (http://ficci.in/spdocument/20682/agrimach.pdf)

Agri start-ups.indd 11 14/11/2018 5:12:48 PM

These commodities are all perishable ones and require different infrastructure for handling, value addition, processing and marketing. This is a challenge as well as an opportunity. The challenge is that it appears to be a difficult task for attaining huge targets. Opportunities would lie in augmenting farm incomes, generating employment and in involving a number of additional stakeholders in the food supply chain. For research and development, the key challenges would be (i) to develop promising technologies and management options to raise productivity to meet the growing food demand in a situation of deteriorating production environment at the lowest cost; and (ii) to develop appropriate technologies, create required infrastructure, and to evolve institutional arrangements for production, post-harvest and marketing of high-value and perishable commodities and their value-added products.

Such a positive demographic dividend backed by strong macroeconomic fundamental indicators make the sector worth investing in and 'looking forward to'—a suitable candidate for realising the dreams of a billion Indians.



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Engines of enhanced agricultural growth

Sectoral growth of Indian agriculture has been driven by three key contributing factors: **demand pull, supply push and enabling policy drive**

Growth drivers of agriculture and allied sector in India



The demand pull

Demand pull factors for the agriculture sector in India include the promising **population** growth, rise in **per capita** GDP, **better propensity and surge in agricultural exports.**

Increasing population is a key demand driver for agricultural produce in the country. India, the second-most populated country in the world has to meet the food, feed and fibre consumption needs of over 1,280 million people. In FY 2016, India's population stood at around 1.29 billion and is expected to reach 1.39 billion by FY 2021. This itself reflects the increasing need for agri commodities and the overall ecosystem required to support agricultural development.

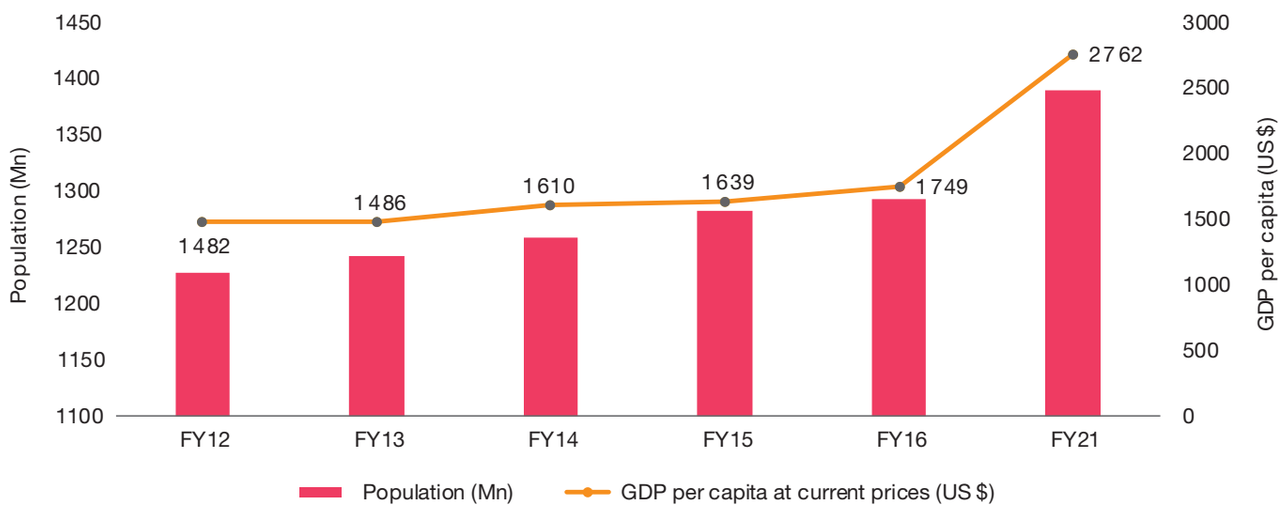
Strong growth in per capita income has resulted in greater demand for agri outputs. The per capita GDP of India is expected to reach 2,762 USD in 2021 from 2,135 USD in 2018.

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It is noteworthy that the population is expected to increase at a CAGR of 2% from 2016–21, whereas during the same period, the per capita GDP is expected to rise at a CAGR of 12%. Therefore, the higher propensity to expand, invest and buy will further support the overall sectoral growth.

Comparative analysis of population growth with per capita GDP



Source: Census of India 2011, World Population Statistics, TechSci Research, International Monetary Fund, World Economic Outlook Database (April 2018) and PwC analysis

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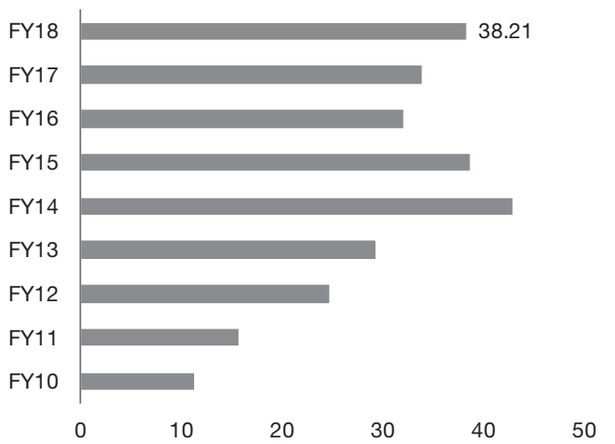
Surge in agricultural exports: Driving additional demand

India is among the 15 leading exporters of agricultural products in the world. **Total agricultural exports from India grew at a CAGR of 19 % over FY10–18 to reach 38.21 billion USD in FY18.**

As per the draft agriculture export policy, **the Government of India is aiming to achieve 60 billion USD in exports by 2022.** Marine products, buffalo meat and rice are the largest agricultural export items in terms of value. Other major export items are **spices, cotton, oil products, tea and coffee.**

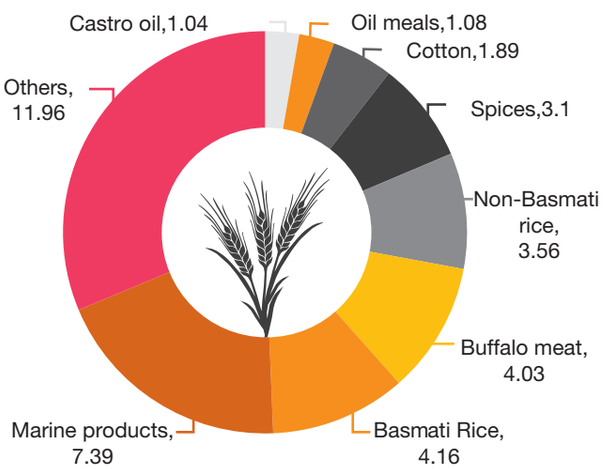
Marine product exports reached 7.39 billion USD in FY18, followed by Basmati rice at 4.16 billion USD and buffalo meat at 4.03 million USD. The increasing demands for agriculture exports will also enhance the incomes in this sector, thereby supporting the cause of better services and products provision.

Trend in agricultural exports from India (billion USD)



Source: Ministry of Commerce, WTO, Indian Budget 2016, Agricultural and Processed Food Products Export Development Authority (APEDA) and PwC analysis

Key agricultural and allied sector exports from India in FY18 (billion USD)



Source: Ministry of Agriculture & Farmers' Welfare, APEDA

Supply drivers: Supporting the increasing demands

Increased usage of improved farm inputs – from seed to implements

Farm inputs comprise seeds, fertilisers, crop protection chemicals, farm machinery, advisory/extension and credit services, which are essentially needed for undertaking crop production. Adoption of quality seeds, rapid farm mechanisation, growing area under irrigation and easy availability of institutional credit are the key supply side drivers. Increased usage of scientific inputs that are certified by competent authorities is an indicator of technological upgrade of the sector and enhanced adoption rate of technology farmers.

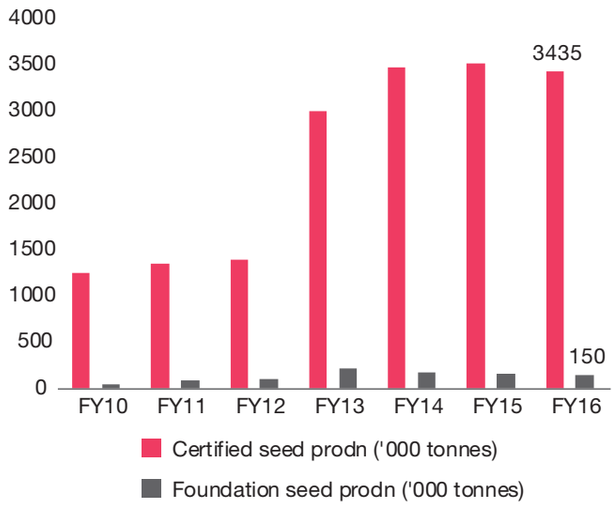
In FY16, production of foundation seeds reached 1, 50,000 tonnes from 51,400 tonnes in FY06, with a remarkable CAGR of 24%. During the same period, production of certified seeds has grown at a CAGR of 22%. There has been strong growth in the use of hybrid seeds due to their high yield and resistance to biotic and abiotic stresses. Usage of hybrid seeds has been more prevalent in cash crops than food crops. Usage of quality planting materials/seeds is critical as it defines the overall trajectory of agricultural production, processing and related systems.

Further, farm mechanisation helps in raising farm income by increasing productivity and limiting post-harvest losses and the country has been experiencing increased mechanisation of farms. **Sales of tractors have increased from 0.39 million units in FY 2010 to 0.57 million units in FY 2016, witnessing impressive growth at a CAGR of 8%.**

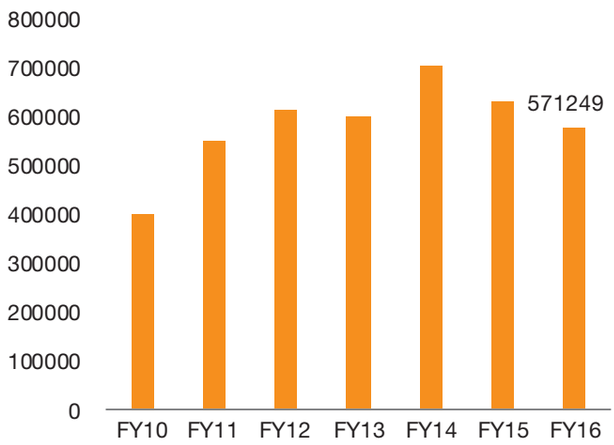
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The Government of India is focusing on increasing its reach of farm mechanisation to the regions where availability of farm power is low. Special focus has been allotted to the small and marginal farmers in its flagship schemes such as Sub Mission on Agricultural Mechanization (SMAM).

Trend in production of foundation and certified seeds (thousand tonnes)



Number of tractors sold in India

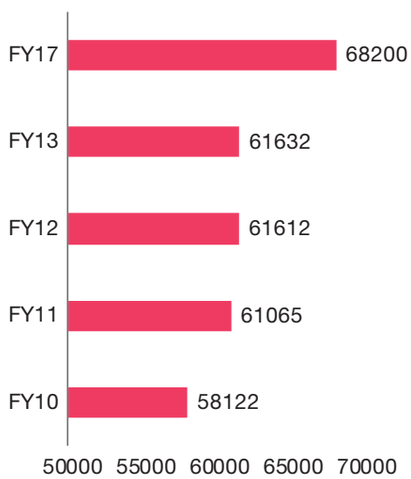


Source: Ministry of Agriculture, Cooperation & Farmers' Welfare, Government of India, industry estimates, PwC analysis

Growing area under irrigation: Insulating production from rainfall uncertainties

Agriculture in India is a fragmented activity spread across 6,00,000 villages and most of the regions still depend on rainfall for irrigation (~70%). At the same time, groundwater levels are also receding. This dependency, coupled with further temporal or spatial shifts in the rain, inflicts major consequences. In recent years, concerted efforts have been made to insulate these rain-fed areas from the vagaries of rainfall through creation of irrigation infrastructure such as canals, minor irrigation support as well as micro irrigation implements. Enhanced focus on irrigation through flagship schemes like Pradhan Mantri Krishi Sinchai Yojana **(PMKSY)** and **NABARD's 'Long-term irrigation fund' are worth noting.**

Insulating production against monsoon and rainfall shifts by increasing gross irrigated area under foodgrains (thousand ha)



- Gross irrigated area under foodgrains is estimated to have grown to **68.2 million ha in FY17 from 58.1 million ha** at a CAGR of 3%.
- Of the wide variety of crops in India, **rice** and **wheat** are the most irrigated. With growing investments in irrigation, the dependence on monsoons has declined considerably over the years.
- As per Union Budget 2018–19, **PMKSY** will be implemented in 96 irrigation deprived districts in the country, and 2,600 crore INR (401.6 million USD) has been allocated for this scheme.
- A long-term irrigation fund has also been set up in NABARD. In Union Budget 2017–18, the addition of 3.10 billion USD to this corpus was announced. Also, a dedicated micro irrigation fund will be set up in NABARD to achieve the goal of 'per drop more crop'. The initial corpus of the fund will be 775.67 million USD.

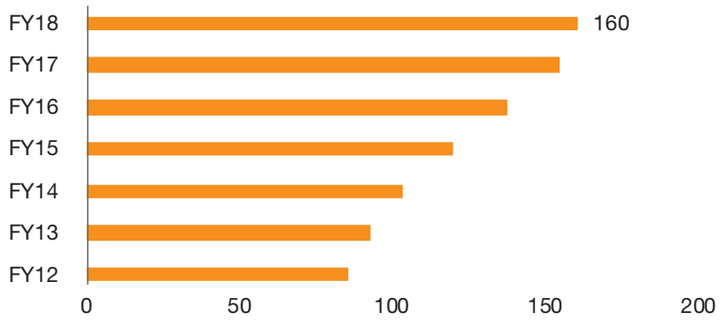
Source: Food and Agricultural Organization, Ministry of Agriculture & Farmers' Welfare, Government of India, Union Budget 2017–18 and PwC analysis

Agri start-ups.indd 16 14/11/2018 5:12:50 PM

Rise in institutional credit to agriculture and allied sectors: Key enabler of growth for India's agri capital formation

Apart from supply of quality agri-inputs, infusion of capital holds an important position for enhanced overall performance of the sector. Unavailability of easy and timely access to collateral-free credit is one of the key challenges in formalised agri financing. In the case of an informal credit system, it has been observed that farm input distributors usually charge higher interest rates as lenders. There has been consistent support from the government to push Kisan Credit Cards (KCC), agriculture loans are kept under the category of priority sector lending and each bank is mandatorily required to lend to the agri sector. Such a pro-agriculture strategy gets reflected in the overall increase in lending towards agriculture.

Credit to agriculture and allied activities (billion USD)



- Credit to agriculture and allied activities has grown at a remarkable CAGR of 13% from FY12 to FY18.
- The target for 2018–19 has been set at 11 trillion INR (170.67 billion USD).
- Farmers are allowed to avail crop loans at an interest of 7%.

Source: Ministry of Agriculture & Farmers' Welfare, RBI, National Sample Survey Organization (NSSO) and PwC analysis

Policy support: An enabling environment for agriculture

The policy drive for agriculture is well represented through the government's motive of **'doubling farmers' income'** by 2022. It has ushered increased Minimum Support Prices **(MSPs),** National Agriculture Market (eNAM) implementation, introduction of a revamped Animal Produce and Livestock Marketing – Promotion and Facilitation **(APLM)** Act, enhanced thrust on food processing infrastructure, and the creation and development of other enabling infrastructure. New policy initiatives like Paramparagat Krishi Vikas Yojana **(PMKVY)**, Pradhan Mantri Krishi Sinchai Yojana **(PMKSY)**, promotion of Farmer Producer Organisations (FPOs), tax incentives and other support have provided a significant push to the overall sectoral growth. A few of these catalytic policy measures have been discussed below.

Policy measures for enhancing production through productivity gains

During 2017, Rashtriya Krishi Vikas Yojana **(RKVY)** scheme has been approved for continuation for three years as Remunerative Approaches for Agriculture & Allied Sector Rejuvenation i.e. (RKVY-RAFTAAR) which aims at making the farming as a remunerative economic activity through multi-pronged approach along with holistic development of agriculture and allied sector. This extension aims at making farming a remunerative economic activity through strengthening the farmer's effort, risk mitigation and promoting agri-business entrepreneurship. Apart from RKVY, National Food Security Mission **(NFSM)** is targeted at increasing production of cereals, pulses, oilseeds, nutri-rich cereals, commercial crops, whereas Mission for Integrated Development of Horticulture **(MIDH)** is targeted at enhancing high growth rate of horticulture crops.



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Policy measures for reducing cost of cultivation

Insuring crop production and mitigating risks of farmers through Pradhan Mantri Fasal Bima Yojna **(PMFBY)** and integration of multiple efforts under **PMKSY** have been the striking feature under recent times. Under PMKSY, the micro irrigation component (1.2 million ha/year target) with the motto of 'Har Khet Ko Paani' (water to every field) for providing end-to-end solutions in the irrigation supply chain, comprising water sources, distribution network and farm-level applications, have been critical.

The focus of the government on balanced fertiliser application through issuance of **Soil Health Cards** under the National Mission on Sustainable Agriculture **(NMSA)** is aimed at ensuring judicious use of fertiliser application and thus saving farmers' money.

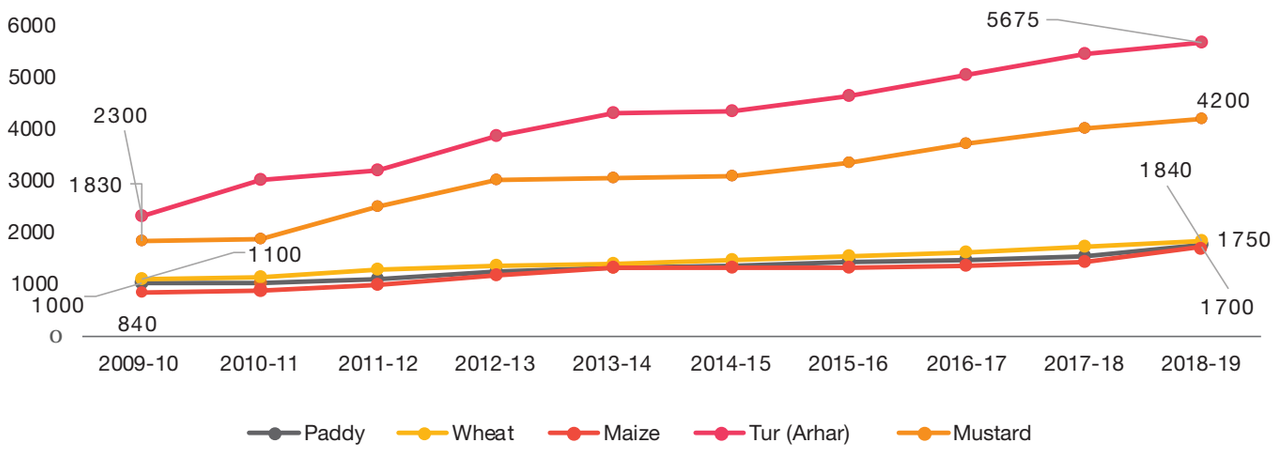
Neem-coated urea (NCU) (universal) is being promoted to regulate use of urea, enhance availability of nitrogen to the crop and reduce the cost of fertiliser application usage. The enhanced impetus to organic farming, increased usage of digital platforms, and Direct Benefit Transfer (DBT), and seeking solutions for multiple issues in agriculture from start-ups are worth noting. The spread of Jan Dhan Yojana, Aadhar and Mobile (JAM) throughout the country for efficient delivery of public facilities and for DBT of public support and subsidies has been remarkable.

Policy measures to ensure remunerative returns

Enhanced MSP with better realisation support: Catalysing rural prosperity

The MSP is announced well ahead of the sowing season, so that farmers can take informed decisions on cropping. The Indian government increases MSPs regularly to incentivise farmers to enhance production of crops and ensure that there is adequate supply.

Increasing MSP for major crops (in INR/quintal)



Source: Commission for Agricultural Costs and Prices (https://cacp.dacnet.nic.in/)and PwC analysis

With the new Umbrella Scheme Pradhan Mantri Annadata Aay SanraksHan Abhiyan (PM-AASHA)[4] announced by the Government of India, there is a robust mechanism available to enable farmers realise the MSP in fuller measure. The Umbrella Scheme consists of three sub-schemes, namely Price Support Scheme (PSS), Price Deficiency Payment Scheme (PDPS) and Private Procurement & Stockist Scheme (PPSS).

Giving a boost to farmers' income, the Cabinet Committee on Economic Affairs chaired by the Prime Minister has approved an increase in the MSPs for all rabi crops for 2018–19 to be marketed in the 2019–20 season. **By increasing the MSPs of notified crops to at least 50% return over cost of production, this farmer-friendly initiative will give an additional return of 62,635 crore INR to farmers and will aid in doubling their income.**

The Price Support Scheme (PSS) and Market Intervention Scheme (MIS) are for the procurement of oilseeds, pulses and cotton are undertaken by central agencies at MSP under the Price Support Scheme (PSS) at the request of the concerned state government. The Market Intervention Scheme (MIS) is administered for the procurement of agriculture and horticulture products, which are perishable in nature and are not covered under the PSS.

4 Press Information Bureau, GoI, Ministry of Agriculture & Farmers' Welfare

Agri start-ups.indd 18 14/11/2018 5:12:51 PM

Creating electronic and integrated agri produce market and strengthening marketing reforms

The National Agriculture Market Scheme was launched in April 2016 to create a unified national market for agricultural commodities by networking existing Agricultural Produce Market Committes (APMCs). eNAM is an innovative market process to revolutionise agri markets by ensuring better price discovery, bringing in transparency and competition to enable farmers to get improved remuneration for their produce moving towards 'One Nation One Market'. It is expected to promote uniformity in agriculture marketing by streamlining procedures across the integrated markets, removing information asymmetry between buyers and sellers, and promoting real-time price discovery based on actual demand and supply.

eNAM endeavours to integrate 22,000 rural haats as well as setting up a dedicated 2,000 crore INR agri market infrastructure fund. This will rightfully integrate – both physically and institutionally – the last mile to this larger marketing architecture. Dovetailing of various existing government infrastructure schemes will further boost performance under eNAM.

A new model, 'the Agricultural Produce and Livestock Marketing (Promotion & Facilitation) Act, 2017', has been released on 24 April 2017 for its adoption by states/UTs. This has been derived after many deliberations over the earlier model, the APMC Act, 2003, and the need for inclusion of progressive reforms required in the agriculture marketing sector. In the Model APLM Act, 2017, provisions include setting up of private markets, direct marketing, farmer-consumer markets, special commodity markets, declaring warehouses/silos/cold storages or such structures as market sub yards. The model act is in different stages of adoption by various states.

It also allows warehousing and post-harvest loans at a concessional rate of interest so as to discourage distress sale by farmers and to encourage them to store their produce in warehouses against negotiable receipts.

The **Model Agricultural Produce and Livestock Marketing (Promotion & Facilitation) Act, 2017**, introduced by the Government of India, incorporates various changes to reflect the agenda of eNAM besides facilitating alternative market channels, including opening up the system to the private sector as well for alternative online marketing platforms. Co-ordinated development of transport and logistics infrastructure for pan-India delivery of agri produce transacted on eNAM, coupled with arrangements for assaying, grading, storage, dispute settlement, among others, will enable progressive reforms that are aimed at farmers to have a tangible impact.

Big thrust to food processing and enabling infrastructure

To facilitate investment in the food processing sector, the Government of India has undertaken several major reforms and initiatives. One of the key economic reforms was permitting **100% FDI under the automatic route** in food processing industries and **100% FDI in trading, including e-commerce,** for food products manufactured or produced in India through the government approval route.

An important initiative has been the introduction of one umbrella scheme – the Pradhan Mantri Kisan SAMPADA Yojana (PMKSY) which is being implemented with an allocation of around US$ 1 Bn. This is a comprehensive package of support which will result in creation of modern infrastructure with efficient supply chain management from farm gate to retail outlet.

A number of fiscal incentives are provided to food processing and related activities to promote the food processing sector. In particular, 100% income tax exemption is permitted on profit for new food processing, preservation and packaging units for the first five years and 25% (30% in the case of companies) thereafter for the next five years. In addition, 150% investment-linked deductions are permitted on capital expenditure for setting up and operating cold chains. Under the GST regime, nearly 80% of raw and processed food products are covered in the lower tax slabs of 0%, 5% and 12%, indicating a huge push from the Government of India to the food processing sector, with an overarching objective of doubling farmers' income by 2022.

Policy measures towards promoting sustainable practices and risk management

PMFBY and Restructured Weather Based Crop Insurance Scheme (RWCIS) (cover 50% GCA by 2018–19) have been entrusted for providing insurance cover at all stages of the crop cycle, including post-harvest risks in specified instances and available to the farmers at very low rates of premium.

Paramparagat Krishi Vikas Yojana (PKVY) is being implemented with a view to promote organic farming in the country. This will improve soil health and organic matter content and increase net income of the farmer. These two key initiatives not only promote the sustainability of agricultural practices but also ensure risk mitigation measures for the farmers.

Despite the aforementioned positive connotations and strengths presented as demand drive, supply side push and enabling policy environment, the agriculture landscape in India is plagued by a few innate issues which require systemic as well as symptomatic resolutions. A few such key issues in Indian agriculture have been detailed next.



Agri start-ups.indd 19 14/11/2018 5:12:51 PM

Key areas of concern in the agri landscape

Scattered and lower landholdings

Indian farms are fragmented and small; nationally, more than 70% are less than 1 ha, while the national average land holding is less than 2 ha, resulting in significantly low farm yields. In Europe and the US, average sizes are 30 times and 150 times those in India. Due to the growth of population and break-down of the joint family system, continuous subdivision of agricultural land into smaller and smaller plots has occurred.

Moreover, most holdings are small and uneco¬nomic. So, the advantages of large-scale farming cannot be derived, and cost per unit **with 'uneco¬nomic' holdings is high and output per hectare is low. As a result, farmers cannot generate sufficient marketable surplus. Thus, they are not only poor but, in many cases, are in debt.**

Therefore, the increasing demand for agri outputs requires support for aggregation of farm operations for increased and sustained productivity. Such aggregation can either be achieved through physical aggregation of farms or aggregating operation through cooperative/community farming or creation of farmer institutions such as Farmer Producer Organisations (FPOs) or Farmer Producer Companies (FPCs).

Dismal processing percentage and supply chain infrastructure

On the supply side, India presents abundant sources of raw material to meet the demands of the food processing industry.
The production advantages are huge; however, the level of processing for perishables continues to be very miniscule at around 10% and even lower for fruits and vegetables (~2%). On the other hand, the level of wastage of agri produce is very high and is estimated at over **15 billion annually due to the dilapidated supply chain network.**

Warehousing and supply chain capacity in India has not kept pace with the production and procurement increase. The government buys grains from farmers but does not have adequate space to store them.

The preponderance of **middlemen and agents** in Indian agriculture renders the farmers and farming situations, still worse. Farmer needs on the demand-side are controlled by middlemen and agents who own the fragmented supply chains. They even control the produce pricing. **Such a convoluted supply chain with poor infrastructure needs digital and disruptive solutions for amelioration.**



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Lower productivity limiting per unit yields for growers

Nationally, India registers significant levels of production, but the agricultural yield is lower than that of other large producing countries and from the world averages. The contribution percentage of key foodgrains in acreage terms is 15%, but the production contribution is only 8.7%, which indicates productivity woes.

The productivity issue in agriculture is a **culmination of multiple issues in agriculture** and may be observed as an applied issue rather than a basic one. Some of the issues are lack of **assured irrigation facilities, institutional credit, tenancy issues, and available technologies in agriculture are a few.** The exhibit below explains the existing situation of Indian productivity vis-à-vis the global scenario.

Comparative yield analysis of foodgrains world vs India (FY 2016–17)



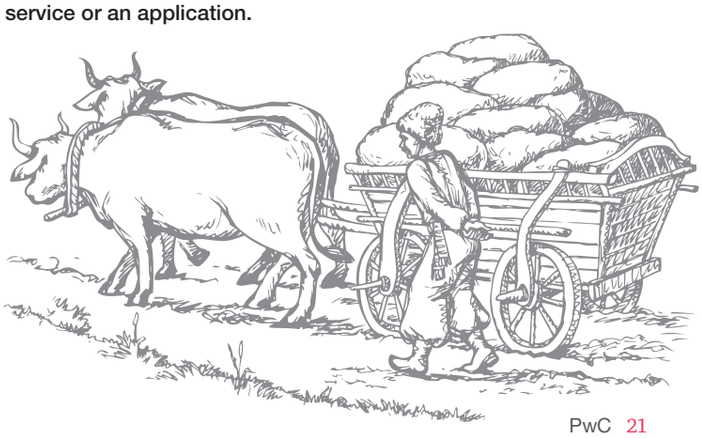
Source: USDA FES and PwC analysis

Crop	Area (in million ha)			Production (in million tonnes)			Yield (in tonnes/ha)			
	World	India	Contribution	World	India	Contribution	World	India	Difference	Difference%
Rice	163	44.5	27.30%	741	106.5	14.37%	4.5	2.4	2.15	89.95%
Wheat	220	30.4	13.82%	729	87	11.93%	3.3	2.9	0.45	15.79%
Maize	185	10.2	5.51%	1040	25	2.40%	5.6	2.5	3.17	129.36%
	568	85.1	15.0%	2510	218.5	8.71%				

Limited last mile delivery of products and services in agriculture

In India, farmers may not be aware of all the schemes that are implemented by the Central Government and state governments for their welfare. The existing platform at the panchayat/Common Service Centre/Krishi Vigyan Kendras (KVK)—that is, the Farm Science Centre/Department of Agriculture level—seems limited in making available requisite products and services to the real beneficiary. **This knowledge, digital and physical divide not only leads to market distortions but also product distortions and slippages, leading to multiple losses to agriculture.**

In such a situation, where we have a promising macro-fundamentals in the sector, but the enablers and catalysing sparks are missing, we need a segment of disruptive technologies/ enablers who can leverage technology leading to increase in productivity, efficiency and output. Agritechnology start-ups can be such a meaningful solution across the agricultural value chain and can be in the form of a product, a service or an application.



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Agri start-ups in India: Technology solution to agribusiness issues

Agricultural start-ups in India are still at a nascent stage, with about 300 agripreneurs trying to solve multiple emerging problems in the Indian agribusiness ecosystem. The combined revenue of all agritech start-ups in India is estimated to be less than 100 million USD, which is a drop in the ocean in a market worth more than 350 billion USD.[5] Thus, the opportunity to scale and disrupt is huge.

India has made a strong name for itself in the global start-up community. It ranks amongst the top five countries in the world in terms of number of start-ups founded. It is estimated that India houses around 4,200 start-ups, creating more than 85,000 employment opportunities. **By 2020, the number of start-ups in India is projected to increase to more than 11,500, with job creation from these entrepreneurs reaching 250–300 K by 2020.**

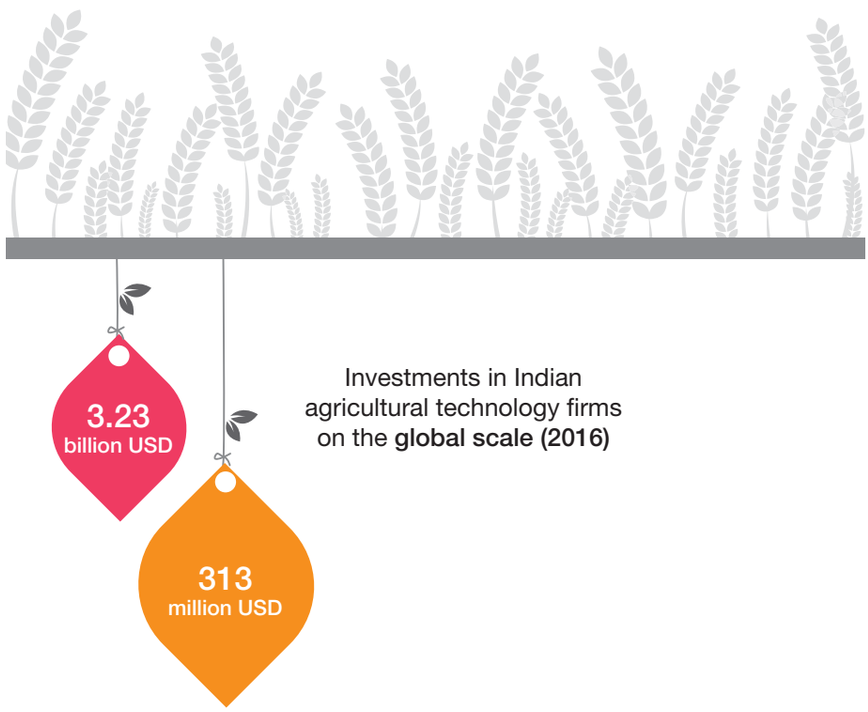
Deciphering the focus areas in agri start-ups

Globally, agricultural technology start-ups are prevalent in agricultural biotechnology, online farm-to-consumer, farm management software, sensing and IoT, robotics, mechanisation equipment, novel farming systems, food safety, and traceability, etc. **In 2016, the global agritech investment figure stood at 3.23 billion USD.**

India continues to be among the top six countries globally, with the highest number of deals in agricultural technology. (The US, Canada, the UK, Israel and France comprise the other five countries.) In 2016, within global investments, Indian agritech start-up firms contributed **around 9%,** valued at **313 million USD.**

Nationally, **the focus of agri start-ups** hovers around the following key sub-sectors:

Status of global and domestic investment in agricultural technology firms in 2016



Source: Agritech in India – maxing India farm output, NASSCOM (June 2018)

5 Startups: Transforming India's food processing economy, Feb 2018, Yes bank and FICCI

Agri start-ups.indd 22 14/11/2018 5:12:53 PM

Status and sectoral presence of agri start-ups in India

Supply chain
- E-distributor
- Listing platform
- Marketplace

Infrastructure
- Growing system and components
- Aquaponics
- Hydroponics
- Drip irrigation

Finance
- Payments
- Revenue sharing
- Lending

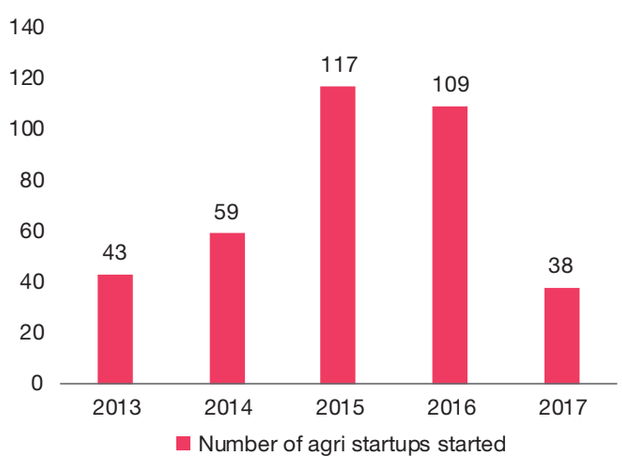
Farm data and analytics
- Integrated Platform
- Remote sensing software platforms
- Farm mapping
- Farm management solution
- Field operations

Information platform
- Information dissemination

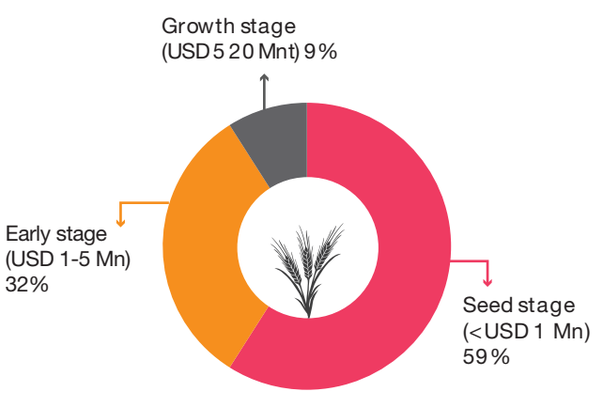


Amongst the different categories and stages of agri-start-ups, India has garnered reasonable support from fund providers and a majority of the start-ups are in the early stages.

Number of agri start-ups started between 2013–17



Funding pattern for agri start-ups from 2013–17 based on stage of start-up



Source: Agritech in India, maxing India farm output, June 2018, NASSCOM and PwC analysis

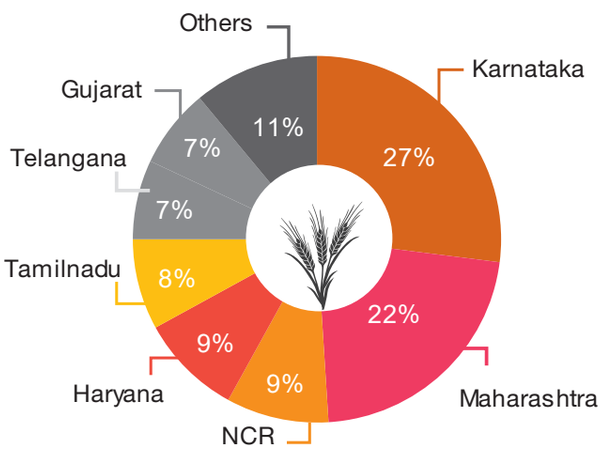
- A total of 366 agri-based start-ups have come up from 2013 to 2017.
- More than 50% of the start-ups in the last 5 years were started in 2015 and 2016
- 90%+ of all funding is focused on seed stage and early stage start-ups; there is an increased focus on quality and scale-up.

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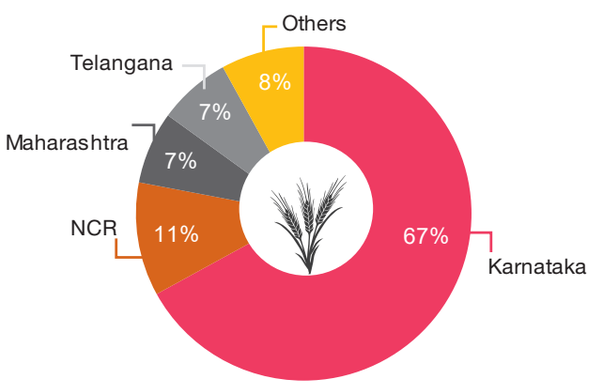


Looking at the geographical distribution, Karnataka and Maharashtra together account for almost 50% of the total agritech start-ups opened in the past 5 years. Karnataka accounts for two-third of the total funding received by start-ups in the past 5 years.

State-wise focus on agri start-ups in terms of number (2013–17)



State-wise status in terms of funding (2013–17)



Source: Agritech in India – maxing India farm output, NASSCOM (June 2018)

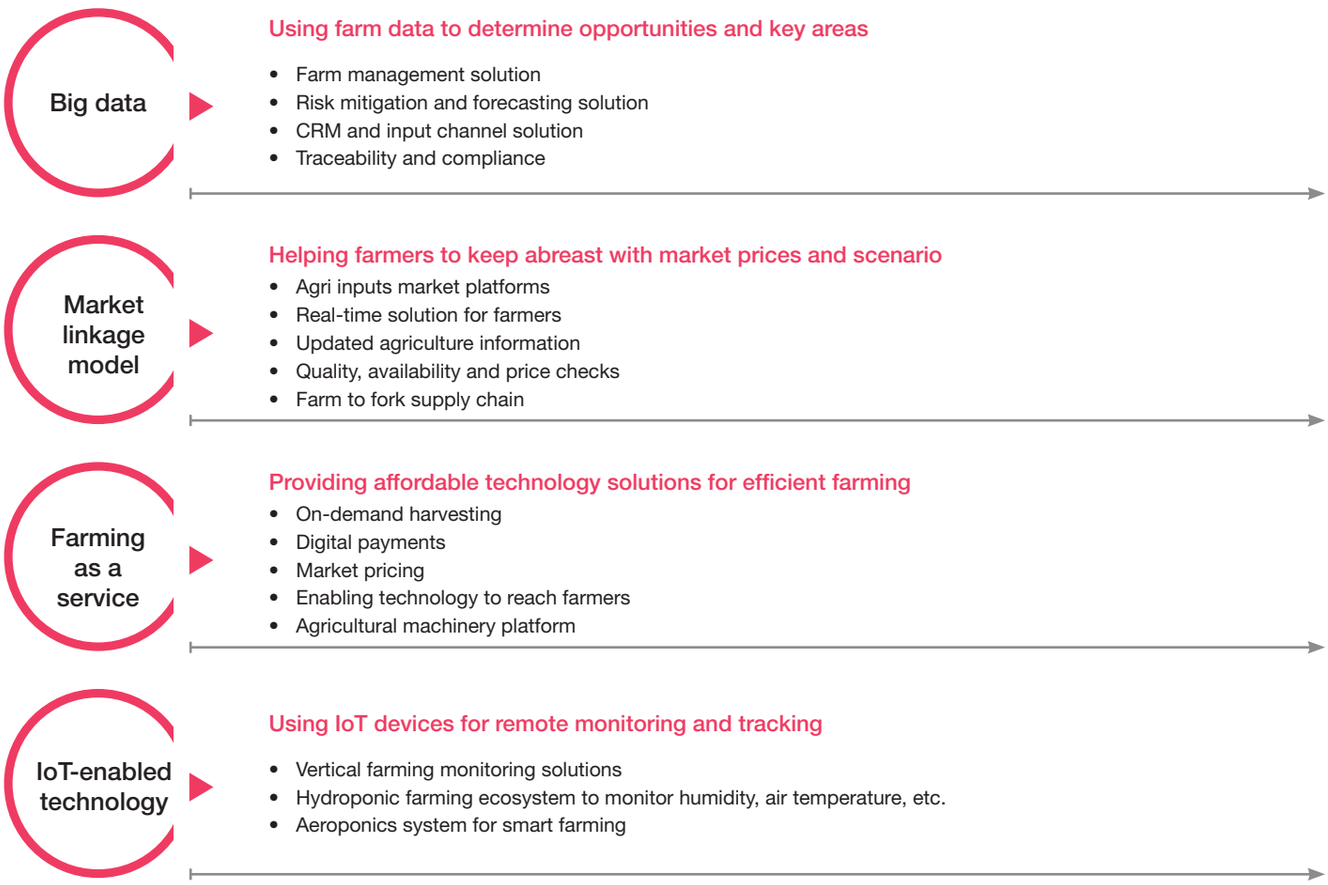
Keeping in view the **type, scale and diversification** of the agri start-ups in India, they may be broadly categorised into four **key sub-segments.** Such a categorisation is beneficial in understanding their offerings in totality and also to visualise their probable impacts in the agribusiness space.

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Broad categorisation of agri start-ups in India

Based on solutions provided to support the agri value chain, agri start-ups can be categorised into four segments:

Broad categorisation of agri start-ups based on solutions offered in the value chain



Source: Industry discussions and PwC analysis

Big data based agri start-ups

Development of farm-specific, data-driven diagnostics to determine soil and crop health has come up as a big opportunity area. Start-ups are leveraging drones or tractor-based solutions to get data (both on weather and agricultural) on field to determine risk. Growing smartphone penetration will enable precise decision making in farming activity, helping farmers to drive increased productivity and revenue while reducing unit costs.

Start-ups developed around the market linkage model

Innovations must be included to help farmers with timely and accurate estimation of sowing and harvesting in sync with consumer demand patterns. Such linkages operate at the two critical ends of the supply chain: input and output models. These models aim to link producers to remunerative sourcing agencies for procurement and to profitable buyers for output sales.

Start-ups developed around Farming as a Service (FAAS)

Specific farm practices are being identified for provision of technological breakthrough services. Activities such as equipment renting and crop care practices are areas likely to see market traction. FAAS seeks to provide affordable technology solutions for efficient farming. It converts fixed costs into variable costs for farmers, thus making the techniques more affordable for a majority of small farmers. Its services are available on a subscription or pay-per-use basis in three broad categories, which are crucial across the agriculture value chain.

IoT enabled technology based agri start-ups

Smart farming, including high-precision crop control, data collection, and automated farming techniques, will remove inefficiencies and bolster productivity. Information on crop yields, rainfall patterns, pest infestation and soil nutrition can be used to improve farming techniques over time. Low capex for predominantly software based solutions is the key feature for such solutions.

There are many examples of agritech start-ups in India under each of the above categories. **The overall ecosystem supporting such fledgling novel initiatives is promising and positive in the country; it is discussed in more detail in the subsequent section.**

Agri start-ups.indd 25 14/11/2018 5:12:55 PM

The agri- start-up ecosystem

Enabling government policies

Multiple enabling policies have been implemented to support agri start-ups, their early take off and successful operations. The salient features of important policy interventions are provided below:

Sr. no.	Name of scheme	Salient features[6]
1	Start Up India	Startup India is a flagship initiative of the Government of India, which aims to build a strong ecosystem for nurturing innovation and start-ups in the country, to drive sustainable economic growth and generate large-scale employment opportunities. Through this initiative, the government aims to empower start-ups to grow through innovation and design. The Startup India initiative is based on the following three pillars: • Simplification and handholding • Funding support and incentives • Industry-academia partnership and incubation
2	Atal Innovation Mission (AIM)	Atal Innovation Mission (AIM) including Self-Employment and Talent Utilization (SETU) is the Government of India's endeavour to promote a culture of innovation and entrepreneurship. Its objective is to serve as a platform for the promotion of world class innovation hubs, grand challenges, start-up businesses and other self-employment activities, particularly in technology driven areas. It has two core components: • Entrepreneurship promotion through Self-Employment and Talent Utilization (SETU) • Innovation promotion: to provide a platform where innovative ideas are generated AIM provides a grant-in-aid of 10 crore INR to each Atal Incubation Centre for a maximum of five years to cover the capital and operational expenditure cost in running the centre.
3	NewGen Innovation and Entrepreneurship Development Centre (NewGen IEDC) under National Science & Technology Entrepreneurship Development Board (NSTEDB)	The government's NewGen IEDC startup Program is implemented in educational institutions. A maximum of 20 new projects are supported in a year and the government provides one-time, non-recurring financial assistance, up to a maximum of 25 lakh INR to the institution for the establishment cost, furnishing of cubicles for start-ups, purchase of PCs with printers, library books, journals, laptop, multimedia projector, 3D printers etc.
4	Dairy Entrepreneurship Development Scheme promoted by National Bank for Agriculture and Rural Development (NABARD)	• 25% of the project cost as back-end subsidy restricted to a maximum of 10 animals, subject to a ceiling of 15,000 INR per animal for establishing a dairy unit (6 lakh INR maximum) • 25% of the project cost as back-end subsidy restricted to maximum 20 calves, subject to a ceiling of 6,000 INR per animal for establishing a dairy unit (5.30 lakh INR maximum)
5	Venture Capital Finance Assistance (VCA) Scheme promoted by Small Farmers' Agri-Business Consortium	Capital assistance will depend on the project cost, location and the promoter's status. It will be in the form of interest-free venture capital assistance up to 50 lakh INR or 26% of the promoter's equity, whichever is lower.
6	Aspire (MSME)	Aspire has been launched by the Indian government to set up a network of technology and, incubation centres, and to promote start-ups for innovation and entrepreneurship in rural and agriculture-based industry.

Apart from the available **schemes and policies** to support agri start-ups, an institutional mechanism has been created for smoother takeoff and successful implementation. A complete set of such institutions is indispensable for grounding of intents as start-ups to profitable enterprises.

6 Startups: Transforming India's food processing economy, Feb 2018, Yes bank and FICCI

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Institutional ecosystem for agri start-ups: Incubators/mentors/accelerators

The ecosystem for successful start-ups typically starts with proper mentorship with a mix of technological and managerial support. The broader agri start-up ecosystem includes a number of **think tanks, research labs, incubators and accelerators.**

Successful examples of accelerators/incubators/mentors in the food and agritech chain in India:

AGRI UDAAN –
Food and Agribusiness Accelerator 2.0

Agri-Tech Startup Accelerator CIE, Hyderabad



Last mile access accelerator

Centre For Innovation, Incubation & Entrepreneurship (CIIE)

International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) Food Processing Business Incubator/ Agribusiness Incubator (ABIO

Source: Transforming India's Food Processing Economy, February 2018 by Yes Bank and FICCI

Accelerators, incubators and mentors identified for the agritech start-up ecosystem, along with the pronounced policy and schemes, need to work in tandem with the start-ups to provide the best technical support and reduce their gestation period.

Apart from the existing knowledge, digital and financial gaps in the target segment (i.e. farmers), agri start-ups are also marred related to people, process and technology.

Agri start-ups.indd 27 14/11/2018 5:12:56 PM

Challenges faced by the agri start-up ecosystem

Selling products and technologies to farmers is widely recognised as a big challenge, and it is one area where many start-ups have not figured out a successful model. Aligning with farmers' needs and committing to improve productivity is not an easy task, as getting farmers to acquire the skills required to adopt these technologies involves a lot of effort.

Key challenges faced by the agri start-up ecosystem

Low landholding size

Small and scattered landholdings of farmers reduce the scope of technology scale up, leading to poor cost effectiveness.

Return for the investors

Rate of return on technology investment has not proven very profitable in case of agri tech startups as compared to other IT-based startups.

Talent retention

Agri start-ups and enterprises are finding it hard to retain technical talent working in this sector.

Long gestation period

Technology adoption and penetration is a very slow process which certainly diminishes investors' interest.

Technology affordability

High-priced technology solutions are unaffordable for a large user group, i.e. small and marginal farmers.

Skill adaptability

Making farmers adaptive to the required skills for working on advanced technologies requires significant effort.

Non- localised technologies

Most of the technology solutions available are not localised to emerging markets.

Regulatory and policy issues

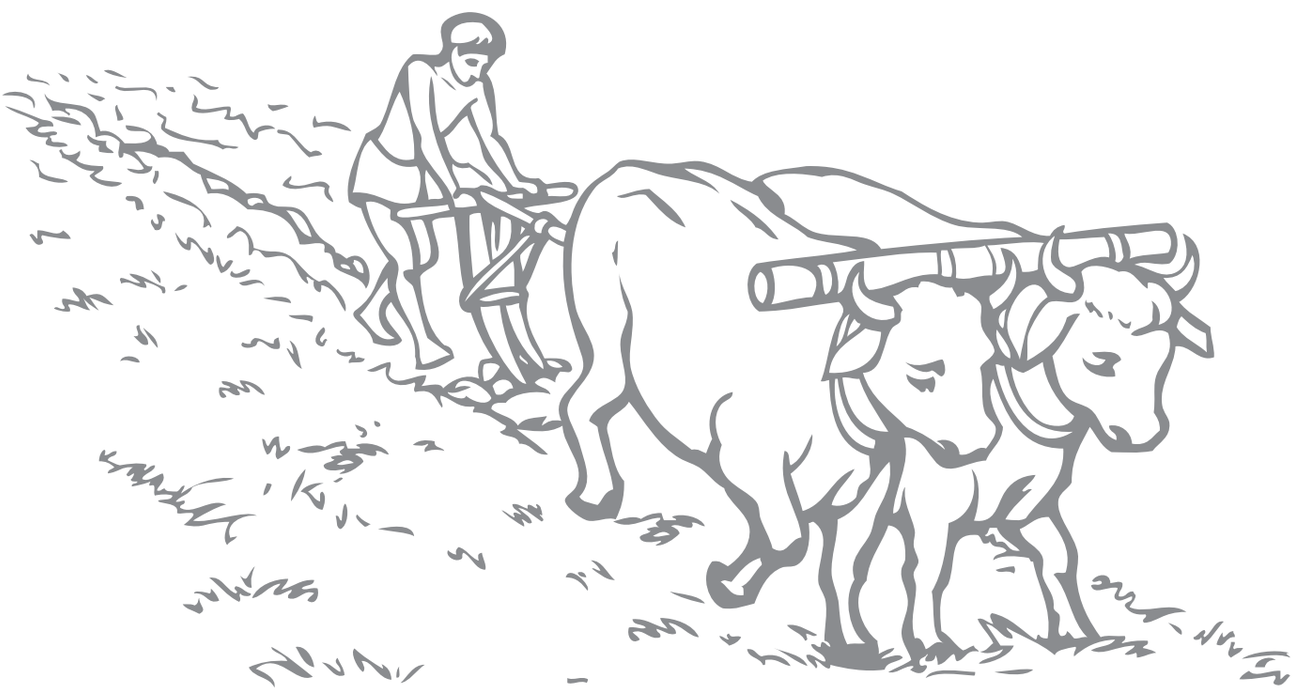
- Regulations are favourable, but are complex in nature.
- Facilitating adoption of proven technologies through subsidy is yet to gain momentum.

Deployment constraints

Equipment with proven technologies is largely deployed by service providers due to poor last mile reach of start-ups.

Source: Industry interaction and PwC analysis

The existing support activities under respective policies for agri start-ups need to be timely in order to instil confidence and trust amongst the investors as well as the start-ups.



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Way forward

With more than 350 start-ups and over 300 million USD in funding in 2016, the Indian agri start-up sector is witnessing sustained growth. Technologies in the field of supply chain, farm data analytics, and infrastructure and information platforms are preferred by investors. AI-based smart solutions, advanced farm analytics, and increased usage of new technologies like drones would define the next growth phase of the sector.

This is an opportune time to integrate different domains of knowledge and skills in agri-innovation. In addition to fresh farm produce, there are lucrative opportunities in processed products such as pickles, freeze drying, IQF as well as traditional processing methods. This calls for effective post-harvest management infrastructure such as storage, preservation, cold chain and refrigerated transportation clubbed with efficient technology solutions across the agri-value chains.

New models such as FAAS can lead to more sustainable profitability. The 'platform model' can leverage data analytics to identify emerging business trends and opportunities and thus attract more venture capital.

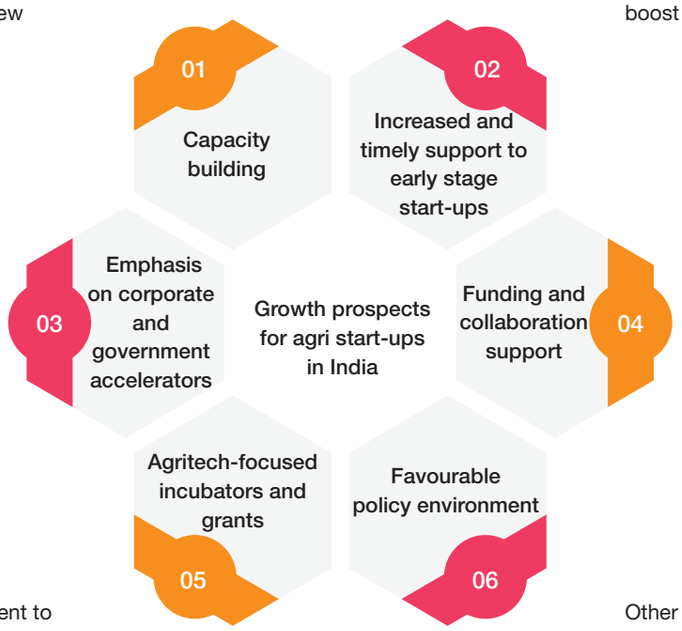
Smartphones powered by affordable mobile broadband networks are helping to improve the workflow of farms and dairies. This opens the door to new pay-per-use business models and innovation stacks, connecting the farm to the fridge and fork. More than 25% of farmers in India today have access to smartphones. There is a need to develop create mobile training programmes to educate farmers and help them adapt to and adopt new technological advancements.

Growth prospects/way forward for the Indian agri start-up ecosystem

More than 25% of farmers in India today have access to smartphones. There is a need to develop mobile training programmes to educate farmers and help them adapt and adopt to new technological advancements.

Only 9% of all funding in the last 5 years was focused on growth-stage start-ups. This emphasises the need for corporate and government accelerators to help agritech start-ups grow to the next level.

There is a need for the government to help set up agritech-focused incubators and grants. Also, academia should encourage more entrepreneurs to focus on this growing sector.

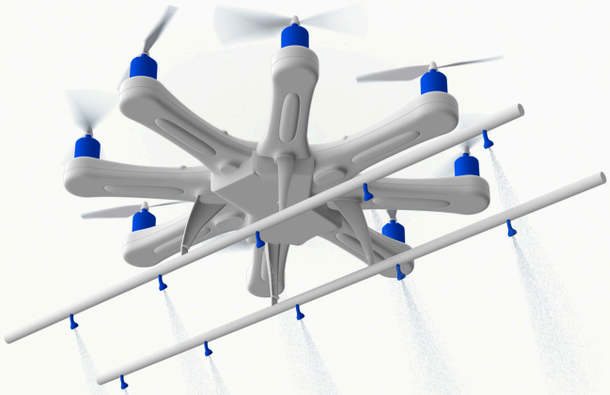


Globally, agri start-ups have come a long way both in terms of investment and technology. Increased and timely support to early stage start-ups will boost the sector further in India.

Funding in the Indian agritech sector is 10% of global funding but start-ups struggle to scale up. There is a need for large companies to effectively collaborate with start-ups.

Other Indian states need to come up with favorable policies to attract start-ups and investors similar to Karnataka (home to 70% of agritech start-ups).

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Moreover, banks and financial organisations also need to step up to the challenge and offer more creative models of financing for farmers, entrepreneurs, incubators, and accelerators. Schemes like the government's Startup Agri India scheme, the Digi Gaon (Digital Village) initiative, and Bharat Net Project can all work together to address the situation. Initiatives like agri-hackathons can also bring together aspiring entrepreneurs from diverse sectors. There is a need for the government to help set up agritech focused incubators and grants. Also, academia should encourage more entrepreneurs to focus on this growing agricultural start-up sector.

In order to make agri start-ups successful, it is crucial to enable seamless hybridisation of relevant technology by building a promising 'new-age distribution model'. We need to develop a new way for the farmer to buy products and get information as well as credit on one unified platform. Merely providing content on an app is not going to solve the issues of the farming community.

Moreover, this entire operation may not be done by the farmers from day one without a direct connection with the farmer and handholding. Agri-start-ups may build this connection with support from local entrepreneurs. This is essential to get farmers to adopt solutions and trust the products they are offered. Technology is just one component; an evolved distribution system with a human touch is what will make the model scalable over time.

Agri start-ups need to customise suitably before entering a market that has a very low technology adoption rate (due to limited budgets and inconvenience with usage) and re-orient their methods of selling, which essentially will be different from urban India and start-ups operating there.



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About the team

PwC India has a dedicated team and highly experienced team working in the agriculture and natural resources sector which provides advisory services related to agriculture and agribusiness management, long-term transformational project implementation, food processing, agricultural credit, agri policy, impact assessment, performance improvement, commodity trading, integrated resource management, farm inputs and agri infrastructure. The group consists of graduates and postgraduates in agriculture, agribusiness management and natural resources with extensive experience in various aspects of agriculture, including advisory in the agriculture and food domain, supply chain management, public private partnerships, policy advocacy, agri economics, agri retail, agri marketing, farm inputs and banking.

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