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A Lucubration of the Agritech Startups in India

[*] Dr. Manisha Sharma
[**] Ms. Simrandeep Kaur Randhawa

ABSTRACT

Agriculture is the foundation of Indian economy as more than 58% of the population is dependent on it for their livelihood, yet it is facing a variety of problems including the use of outdated equipment, improper infrastructure, and farmers unable to access a wider range of markets with ease while making just limited profits on crop sales. The Government of India has been working incessantly towards upliftment of the farmers of the country but paramount encumbrances persist that has crippled the growth prospects of the agricultural sector. The era of social apps, digital media and pure internet companies have taken over the platform of marketable goods, but technology always remained aloof from the purview of agriculture. At this point of time when the population is continuously increasing exponentially and the demand for better quality and higher quantity of food is required, the performance pressure on farmers is increasing. Therefore, Agritech startups are emerging as the pertinent solution across the agricultural value chain and they can be in the form of a product, a service or an application. There is a decent growth of startups in the country which needs a strong push if we want the agriculture sector to flourish. India has already built a strong name for itself in the global startup community. It's time to make Agritech startups successful and propel India forward as a leader in the agricultural technology sector too. The paper is focused on studying the agricultural sector in detail with the objective of enumerating the challenges being encountered by the farmers of the country. The paper also focuses on studying the relevance of union of technology and agriculture in the form of Agritech startups. In addition to that, the paper also defines the varied sub-sectors of the Agritech startup Ecosystem.

Keywords: Agritech, Startups, Indian Economy

1. Introduction

Agriculture is the mainstay for livelihood of more than 58% of the population, yet it is facing a variety of problems including the use of outdated equipment, improper infrastructure, and farmers unable to access a wider range of markets with ease while making just limited profits on crop sales.

One of the more pressing challenges of the sector is infrastructure. The National Institute of Agricultural Management states that supply chain management in India is fraught with problems mainly due to the outdated habits of the agricultural industry. Now, a wave of agritech startups are addressing supply chain management and enhancing the sector's marketing infrastructure, key developments that will eventually raise farmers' incomes. The lack of these support and service networks has created an agrarian distress in the country and among the farmers. And during we notice a surge of Agritech Startups that have become a ray of hope in Indian agriculture.

A wave of Agritech startups in India has come in up last few years to address the problems of Indian agriculture such as supply chain management, use of outdated equipment, improper infrastructure, and farmers unable to access a wider range of markets with ease and enhancing the sector's marketing infrastructure has been developed in India which tackles

[*] Assistant Professor, Apeejay College of Fine Arts, Jalandhar
[**] Assistant Professor, Apeejay College of Fine Arts, Jalandhar

this issue and has the potential to change the face of Indian agriculture sector and eventually raise farmers' incomes.

Today, the sector demands a transition from just hard work to smart work. For years our farmers have been trying to improve the output of their farming, through self-learning alone. However, today, there is a need to bring them up to speed with advancements happening across the world. There are scientific and technological interventions such as farm mechanization, hybrid seeds and application of real-time information related to weather, soil and market prices which can help farmers in the efficient management of farms and increase the yield. Yet, India has been selective in adopting innovations, due to which Indian farmers and farm output have lagged global averages. We also tend to forget that advancement of the sector is essential to encourage the current youth, which is more tech savvy and progressive, to take up farming. The last decade has seen many developments in the agricultural sector, especially with digital and telecommunications revolution, which has added more dimensions to this sector. The troika of Smart phones, Internet and Connectivity is now a possibility in rural areas which is enriching farmers with a wealth of information to empower them with new platforms, channels, techniques and expertise. This makeover has been a result of the start-up boom that has mushroomed in the country over the last few years. Innovation in agriculture, spearheaded by start-ups, is getting supported by numerous Government initiatives. Even larger corporate entities in the agri-domain are recognizing this movement and supporting this cause.

2. Review of Literature

A total of 366 Agri-Based startups have come up from 2013 to 2017. It is to be noted that more than 50 percent of the startups in the last 5 years got started in year 2015 and 2016. (NASSCOM, 2018b)

In a bid to double the farmer's income by 2022, the Government of India is continuously looking for ways to boost agricultural production, food processing and marketing avenues through the integration of latest technologies and innovations; thus creating a huge scope for food and agritech startups in the country (Balaji, 2018). India has made a strong name for itself in the global startup community. India ranks amongst the top five countries in the world in terms of number of startups founded. It is estimated that India houses around 7200-7700 start-ups, creating more than 85,000 employment opportunities. It is projected that the number of startups in India will increase to more than 11,500 by 2020, with job creation from these entrepreneurs reaching 250-300K by 2020 (NASSCOM, 2018a; FICCI 2018).

Agriculture is one of the important pillars of the Indian economy. According to a report from FICCI, about 54 percent of Indian population depends directly on agriculture and it accounts for around 17.3 percent of GDP (FICCI, 2018). Although, agriculture in India has majorly seen a steady growth in the last few years, not much has been done in encouraging young, fresh and unique innovative ideas in the sector. It was only in 2007, when the era of start-ups saw a boost and things started to change. Young entrepreneurs are now quitting their jobs in IT sectors and MNCs to establish their own start-ups. These young entrepreneurs are now beginning to realize the fact that investing in agriculture is one of the very few safe and profitable businesses (MahyCo, 2018).

Several countries like Israel, China and the US have transformed 35 agriculture practices in their country with the use of technology. These countries have demonstrated that assortment of technology like hybrid seeds, precision farming, big data analytics, artificial intelligence, geo-tagging & satellite monitoring, mobile apps and farm management software can be applied at every stage in agriculture process to increase productivity and farm incomes (Kola, 2018).

Many agritech startups in India are mainly in marketplace segment where e-commerce companies provide fresh and organic fruits and vegetables procured directly from farmers. Very recently many startups have come up providing innovative and sustainable solutions for farmer's problems. Startups have provided solutions such as biogas plants, solar powered cold storage, fencing and water pumping, weather prediction, spraying machines, seed drills, vertical farming, etc (Sachitanand, 2018).

Agritech has the potential to address a number of challenges faced by the sector and, subsequently, change the face of the Indian agriculture. Upsurge in the internet usage, increase in smartphone penetration, emergence of startups and various government initiatives in rural areas are facilitating technology adoption in the farm sector (Ganguly, 2018).

Some of the most impressive new companies made waves recently, and with their innovation, it's easy to see why these are the startups changing the world (Kasteler, 2017). According to Didar (2016), it's a general perception that startups needs to be in developed country where all resources are available. But in reality, startups need to be in countries with greater needs which provide excellent opportunities. Underdeveloped or developing countries, countries in conflict or countries new to technological advancement prove to be an exceptional breeding ground for the startups. Each of these countries with their needs offer untapped problems that startups could offer and take advantage not to only just make profit but also make an impact on the socio-economic status of the country.

Not only these startups promote economics but also spur innovation and generate competition. Startups create a ripple effect on the socio-economic fabric of the demography in which they operate (Kola, 2014). Startups have a direct-impact on the cities that they make their homes. Look at how Infosys has changed Bangalore, Alibaba impacted Hangzhou, Microsoft changed Redmond and Google transformed Mountain View, California. They directly impact the growth of cities in which these startups grew. Employment opportunities increased, experienced talents also started moving to these places in pursuit of challenging and high growth career. As the demand for highly talented people increased in these cities, it saw a surge in inflow of recent graduates. As more and more college graduates started settling down in these cities, lifestyle patterns and culture also saw a wave of change. Startups can contribute to structural change by introducing new knowledge-intensive products and services (OECD 2013).

A research by the Global Entrepreneurship Monitor South Africa (2012), states that one third of dynamics of countries' economic growth can be attributed to the dynamics of startup entrepreneurship.

India has managed to retain its position as the 3rd largest startup ecosystem in the world with more experienced professionals taking entrepreneurial route as per the latest study done by NAASCOM in collaboration with Zinnov (NASSCOM, 2018a). It has also scrolled up three places in 2018 to position itself in the 57th rank in the Global Innovation Index from 60th position in the previous year (Pulakkat, 2018). Besides this, India also holds the title for the highest Unicorn holder of 8 ventures right after the US and China (NASSCOM, 2018a).

There is a new wave of budding entrepreneurs and emerging startups in the country that are leading the way to disrupting the agriculture sector in the country. They want to deploy technology in this sector and reform it for good. The important questions are - Can technology really change the sector? And why do these entrepreneurs and startups want to do this now? But to answer the question why enter the Indian agriculture space now — because the sector holds tremendous potential for technology adoption considering the sheer size of population involved. The present study is aimed at finding answers to these questions.

3. Objectives of the Study

Agriculture being the foundation of the Indian Economy still encounters certain bottlenecks that limit the primary sector's growth and contribution to the nation's Gross Domestic Product. According to the report of Economic Survey 2018-19, Indian agriculture sector accounts for just 14.4% of India's gross domestic product (GDP) as compared to the population dependant on it for livelihood which is 50% of the country's workforce. The contribution of agriculture to the GVA has decreased from 15% in 2015-16 to 14.4% in 2018-19. The paper is focused on addressing the key challenges being faced by the Agricultural startups. In addition to that, the Agritech start up ecosystem will also be analyzed and bisected. Hence, the main objectives of the study are:

1. To examine the challenges being faced by the Indian Agriculture.
2. To identify Agritech sub-sectors in Indian Startup Ecosystem.

4. Challenges of the Agricultural Landscape

The agri sector contributed 51% to Indian GDP in 1950 and currently it stands at 13.9%.However, a shift from an agrarian centric economy to an industry centric economy is inevitable with the advent of industries. Living in a country where cattle is worshipped, about 60% of population was dependent on agriculture as the main source of income in the 1950s. Today, agriculture is offering low returns and it is no more a profitable sector. Infrastructure costs are running sky high, small holdings of land, ineffective irrigation, lack of optimum usage of fertilizers has resulted in lower yields.

Scattered and Lower Landholdings

Growth of population and break down of joint family system leads to reduction in the size of agriculture landholdings. Size of Indian farms is less than 2 hectares on an average. Smaller size of farm leads too significantly low yields. Smaller size is uneconomic as well making the cost per hectare high. It affects the income of the farmers consequently. Thus, farmers are poor and running into debts.

Therefore, it is essential to increase the output and farm income. Government is supposed to support this by either physical aggregation of farms or through cooperative/community farming or farmer institutions such as farmer producer organization (FPO). The number of small and marginal land holdings in the country has registered a marginal increase.

Dismal Processing Percentage and Supply Chain Infrastructure

One of the reasons for lesser productivity of Indian agriculture is the glaring inefficiencies in the agriculture supply chains. It becomes very important when the goods are perishable. The level of processing for perishables continues to be small at around 10% and very less for fruits and vegetables that is 2%. The quantum of wastage of agricultural produce is over 15 billion annually which is most dominantly due to poor supply chain network. Critics allure the policymakers towards focusing on more glamorous urban industries like IT, Financial services and Construction at the expense of rural economy.

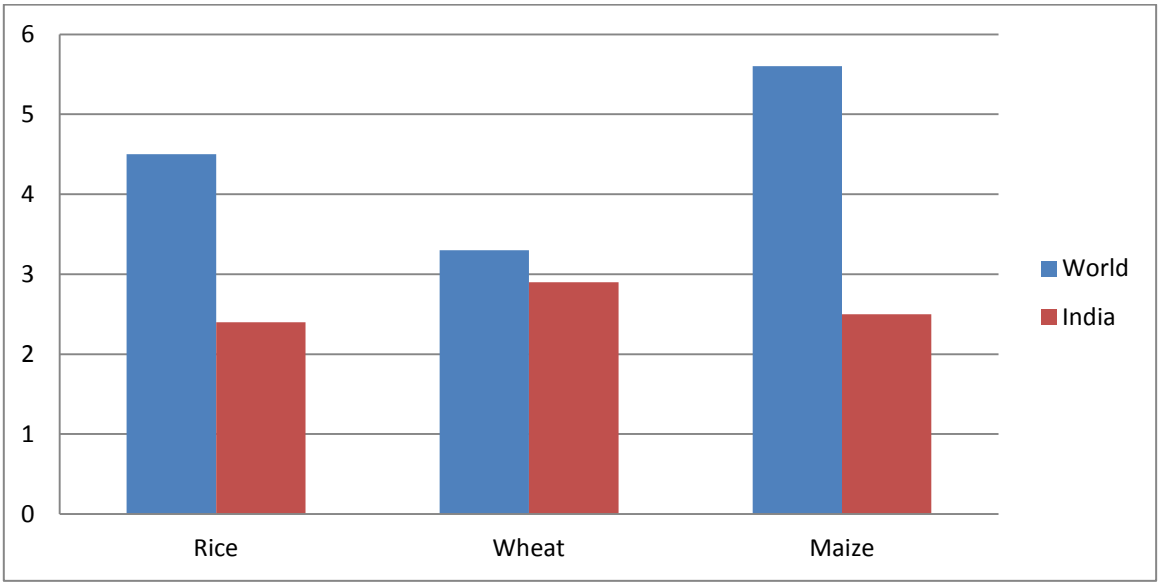
There are too many middlemen who distort prices, exploit farmers and prevent agricultural products and other items from reaching places where the demand exists. Also, forecasting is very weak and produce is pushed towards market without doing any analysis of the demand in that particular market. Such a convoluted supply chain with poor infrastructure needs digital and disruptive solutions.

Lower Productivity

Agricultural yield in India is lower than that of other large producing countries. According to Economic Survey of 2015-16, productivity of wheat in 2013 was 3075 kg per hectare which is lower than the world average of 3257 kg per hectare. In paddy production also, Indian yield

is lower than China and Bangladesh. India's top producing state Punjab has paddy yield close to 6000 kg per hectare whereas China's yield is 6701 kg per hectare. The demand for pulses has always outstripped the supply. The productivity downfall maybe attributed to lack of assured irrigation, institutional credit, tenancy issues and lack of technology in agriculture. The exhibit shows existing situation of Indian Agricultural productivity vis a vis world productivity.

Graph 1: Comparative yield analysis (World v/s India) FY- 2016-1



Source: USDA FES and PwC analysis

Crop	Area(in million Hectare)			Production (in million tonnes)			Yield (in Tonnes / Hectare)			
	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%
Total	568	85.1	15%	2510	218.5	8.71%				

Lack of awareness of social welfare schemes

Undoubtedly, there are abundant lucrative schemes of Government of India for the benefit of the poor farmers. But unfortunately, these don't reach the poor but are siphoned away by middlemen and corrupt officials. Various platforms such as Panchayat, Common Service Centre, Krishi Vigyaan Kendra seems limited in making available requisite products and services to the real beneficiaries.

The Centre for Study of Developing Societies (CSDS), 2018 states that benefits of government schemes are mostly given to big farmers, only 10% of poor and small farmers (1to4 acres of land) have benefitted from government schemes and subsidies. In such a situation, we need a setup and technology enablers who can help transfer the benefits of existing schemes to farmers.

Lack of adequate irrigation facilities

Our agricultural sector is largely dependent on rainfall which has been inconsistent owing to the ongoing environmental crisis. As a result, agriculture is deprived of its most important input that is water. Almost 89% of groundwater is extracted for irrigation. Further, crops such as paddy and sugarcane consume more than 60% of irrigation water available in India, which reduces water availability for other crops. There is an urgent need to focus on irrigation water

productivity (ratio of crop output to irrigation water applied by farmer) to improve agricultural productivity.

In India, two thirds of crops lack proper irrigation facilities. The Budget of 2016-17 has proposed to bring 2.5 million hectares under irrigation. Power minister Piyush Goyal also proposed to invest Rs. 75000 crore for provision of energy efficient irrigation facilities to farmers. The government has also announced that 30 million energy saving pump sets would be given to farmers and the cost would be recovered via savings in the electricity consumed. It would result in about 46 billion kwh of power being saved and creation of 20 lakh jobs.

5. Core Agritech Sub-Sectors in Indian Startup Ecosystem

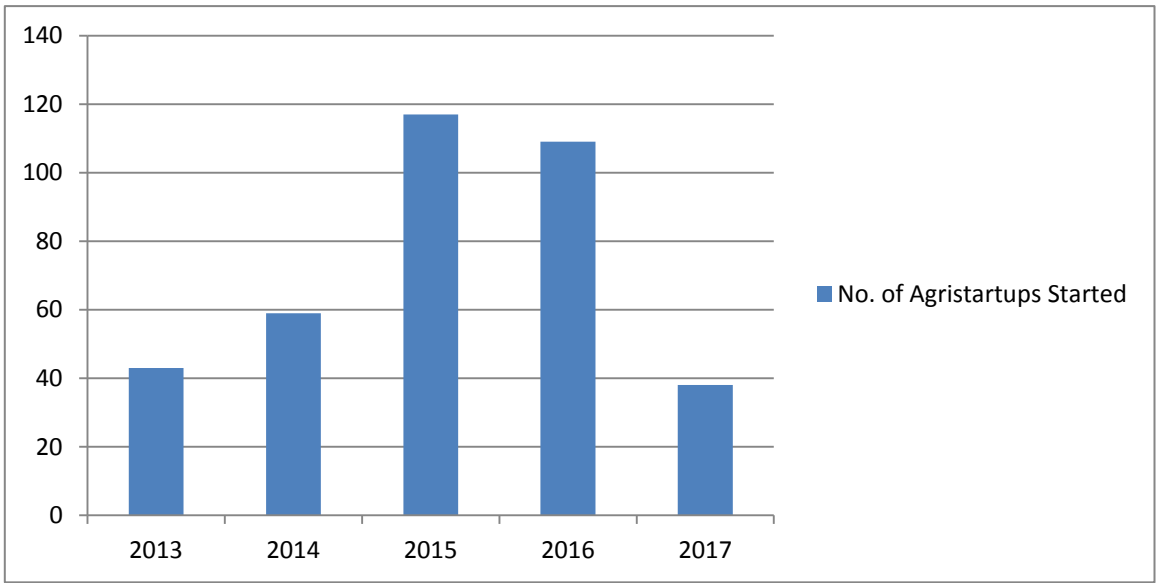
The development process in agriculture sector has always been restricted to upgrades of the existing framework of farming as technology always remained aloof from its purview. The world economies are growing at a phenomenal pace owing to the rapid technological advancements with equitable involvement of the agriculture sector but in India technology has been oblivious to the agriculture sector. Lately, the wave of technology has hit agriculture sector too and has lead to the evolvement of the Agritech startups, which spells new possibilities breaking the cobwebs of stagnant agricultural development. The ignition of education, passion and innovations has fired up the development process, owing to which Indian entrepreneurs and startups have decided to apply modern technologies to improve the farming experience in India.

Agriculture has greater dependence on natural resources like land and water. Rainfall being the main source of irrigation water, its untimely down pour has further crippled the wheels of agri sector. Also, agriculture sector has major loop holes in its supply chain infrastructure which needs immediate attention and makeover. Hence, it opens many doors for the agricultural startups. Startups are working on addressing issues of agricultural value chain and are focused to deliver efficient products. Different technologies and services are being developed for the farmers as well as the consumers, bridging the gap created by faulty supply chain structure.

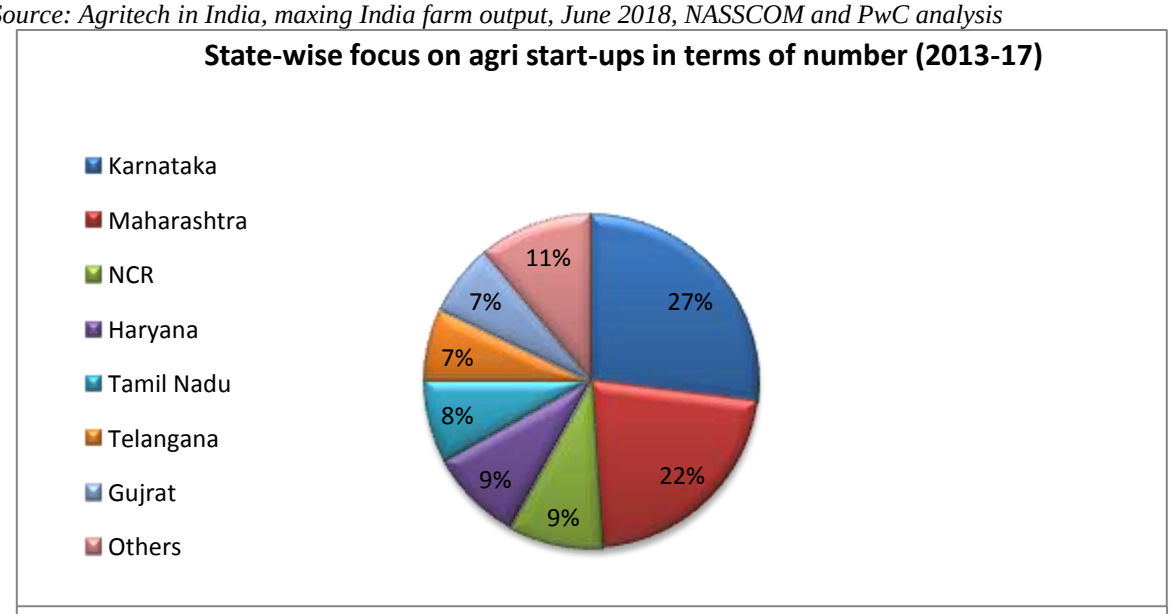
Infusion of innovation and passion into the agricultural sector has lead to numerous developments that has huge scope of success. Various initiatives like farm automation, a unified national agricultural market, mobile applications, weather forecasting and usage of drone for monitoring is working for the upliftment of the farming sector. In addition to that, the farmers are also being facilitated by retailing of inputs as well as renting of farming equipment so that farmers need not invest much time and money. Also, allied agricultural activities are also having a breakthrough in the form of smart poultry and dairy ventures. The consumer needs are also been catered through online vegetable marketing, improved processing and packaging. The technology driven agricultural startups are beginning to revolutionize the macrocosam of food processing and agriculture segment.

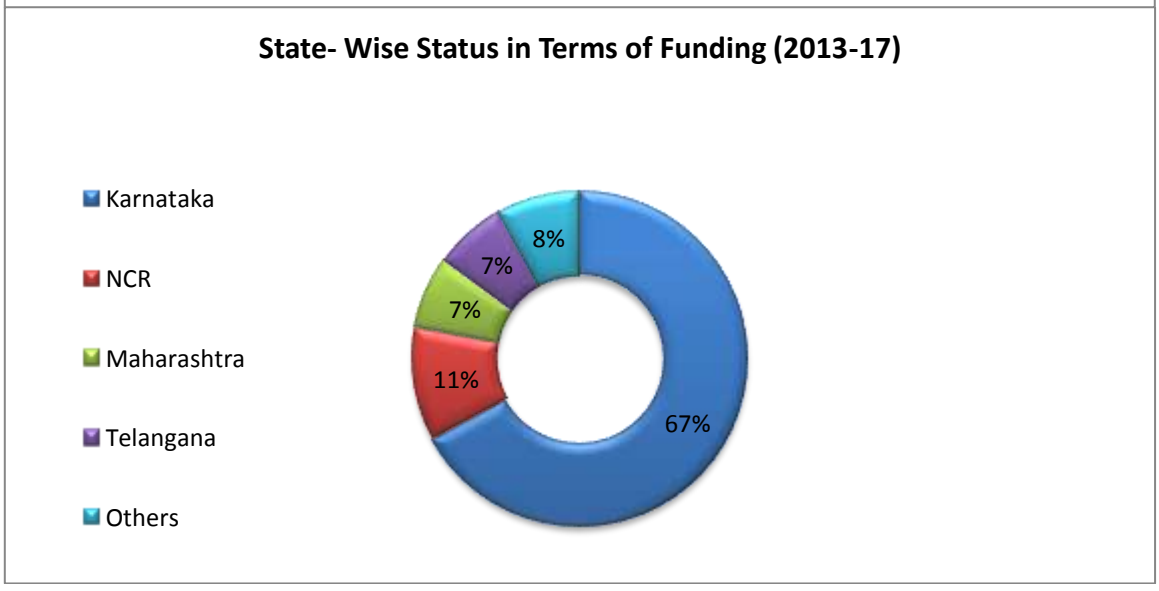
Ample of opportunities are available to agripreneurs on the domains of increasing crop production as well as the nutritional value of the crops. Apart from this, entrepreneurs can also work on reduction in input prices for cultivators, improving the overall process-driven supply chain and reducing wastage in the distribution system, that are amongst the major challenges of agricultural framework. Also there is a strong need of connectivity between the farmers and the non farming segment, which can be achieved through consumer-producer linkage across various formats such as retail, B2C and B2B marketplaces and digital agronomy platforms. Since the outset of Agritech startups in India, consistent efforts have already been made to overcome the input hindrances of agronomy by providing them with appropriate information and techniques for both pre harvest and post harvest stages.

Graph 2: No. of Agristartups Started Between 2013-17



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





Agritech startups are also garnering attention from investors, who find enormous potential in strategic focus of these startups towards transformation of the lives of the food providers of the nation. In order to facilitate their investment decision, a meticulous study of the Agritech sub-sectors is necessary. An overview of the Agritech sub sectors is as follows:

Farming as a Service [Faas] based Startups

Agritech startups are increasingly inclined towards providing assistance to farming activities in the form of allied services with technological revamping. Add on services like equipment lending has been prevalent since quite a few years but in addition to that crop care services are also hitting the farm market. The primary focus of such services is the infusion of technology in the pre and post stages of farming without compromising on the affordability aspect. This has enabled the small and marginal farmers to access these services because earlier input and equipment cost was fixed in nature but with the introduction of these facilities such costs can be categorized as variable costs owing to its availability on a subscription or pay-per-use basis.

Farming as a service (FaaS) was brought to India by a company named EM3 Agri Services, which offers various farming services and equipment rentals to farmers on a pay-for-use basis. The concept has popularized and other market players have also marked their presence in the field of agriculture equipment leasing and farm services startups, namely, Gold Farm, RAVGO, Oxen Farm Solutions, and FarMart.

Information Technology Enabled Agritech Startups

Key decisions in agricultural processes can be ameliorated with incorporation of information technology oriented tools. IT enabled tools can prove to be of paramount significance in the strategic areas of farm management. This is a step towards automation of the farming process as well as a progression towards smart farming. Various activities like crop control, data collection and farming automation through the use of information technology can be performed with high degree of precision and efficiency and thereby accelerating. Information technology can also be used to produce software based solutions for the issues concerning crop output and rainfall patterns. Also, pest infestation and soil nutrition can also be addressed using these technology enabled solutions and eventually improving farming techniques over time. Fasal, Fly Bird Innovations are participants in this category of Agritech startups.

Startups based on Supply Chain Model/Market Linkage Model

The most indispensable sector of Agritech startups is the market linkage model startups. This sector is of utmost importance as the major challenge being faced by crop growers of India is the faulty supply chain management system of the nation. Tools of technology are used to assist the farmers in timely and accurate estimation of sowing and harvesting in synchronization with consumer demand patterns. Such linkages operate at the two critical ends of the supply chain: input and output models.

The main objective of these models is the linkage of the producers with agencies or organizations which will yield them appropriate remuneration. In addition to that, these models aim to link producers to well paying buyers for the sale of their agricultural produce. It is quite evident that Indian agriculture is majorly supply driven and is away from market variables as compared to other sectors of the economy. This is the fundamental cause for seasonal food inflation as well as value loss and food wastage along the supply chain. Though demand is becoming more predictable in India over time but the supply of agricultural produce still remains significantly unpredictable. This offers an opportunity for the agripreneurs towards development of supply chain/market linkage models for farmers. Sabziwala, Mera Kisan, Dehaat are some of the startups who have demonstrated successful

aggregation in horticulture. There is existence of surmounting opportunities in optimizing these supply chains for viable solutions that can preserve the quality, reduce wastage, improving traceability in the supply channels, and improve shelf-life of the products, efficient aggregation, transportation and storage, etc.

Big Data based Agritech Startups

The world is being stormed with big data based startups which is a newly emerged technology aimed to develop a feasible business model which fulfills a marketplace need or problem. In the agricultural sector also big data analytics is making considerable technological impression on the startup community as there is existence of an opportunity to create a repeatable and scalable business model. Farm-specific, data-driven diagnostic models can be developed which can facilitate the determination soil fertility and crop health which is also an enormous opportunity area.

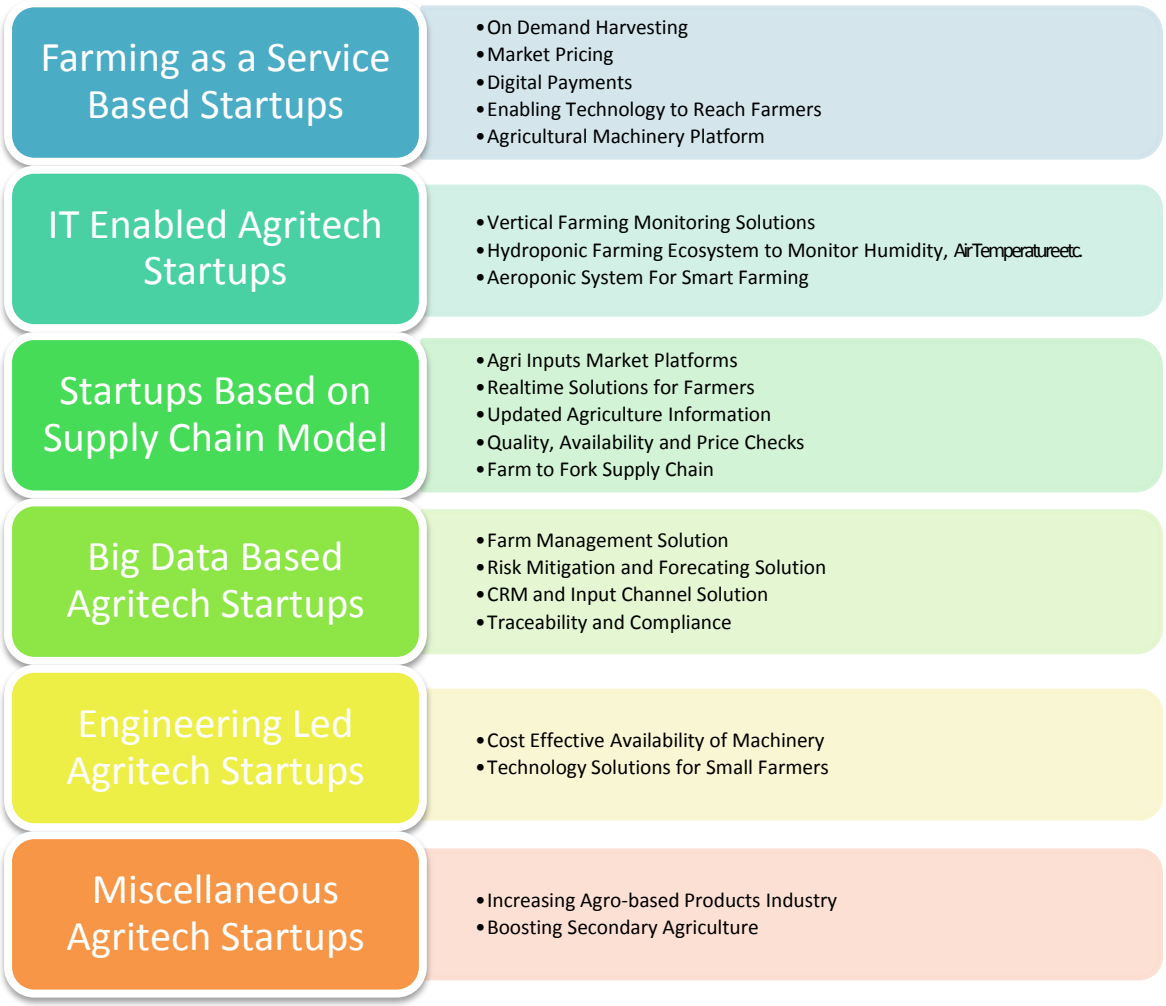
Usage of soil sensors, drones and livestock monitoring gadgets is gaining momentum as data driven farming facilitates agriculture business to make better and informed decisions and also enables them to garner advantages which are otherwise not available. The big data technologies are growing in number because they are aimed towards improving farming efficiency as well as removing supply chain bottlenecks. CropIn, AgRisk, AgNext, Skymet, Stellaps, and Airwood are some of the companies that are engaged in big data technology startups in the agricultural sector.

Engineering led innovation startups

India is one of the leading manufacturers of tractors across the globe, but less than 2 percent of the country's farmers use machinery in their farming practices. Engineering led innovation startups design and develop agricultural equipments which are an improvement to the traditionally available machinery and equipments that can considerably save time and money of the crop growers. Usually farmers with one to two hectares of land are unable to access modern technological equipments but startups have made it possible for the small farmers to access modern machinery such as mini tractors, handy planters etc. These equipments are proving to be a boon for the farmers who were struggling to find labour, irrespective of the size. Engineering led startups provide smart and cost effective solutions to overcome this issue. Kamal Kisan, Kheyti, DripTech, Nanopik are the companies that are working in this sector to accelerate the growth of the food providers of the country.

Miscellaneous Agritech startups

Apart from core agricultural sector, allied agricultural activities also need a boost. As a result, Agritech startups are also being encouraged to provide innovative and unique solutions to the poultry and dairy farming, fish farming etc. Development of technology driven methods, provision of advisory services and creation of one stop solutions to the farmers are the top priorities of the Agritech startups in this sector. The objective here is to increase the aggregate income and productivity of the farmers. Some of the successful startups under this sub sector are Suma Agro, La Veda, Cattle Mettle and Happy Farmer Labs.



Source: Industry discussions and PwC analysis

6. Conclusion

Technology has benefitted sectors like information technology, e-commerce and digital services space in India for a long time. Now, it seems that the Agritech is proving to be the next big space for startups. This is evident from the fact that Indian Agritech startups received funding worth $248 million as of June 2019, which is a 300% increase as compared to the previous year, according to a recent National Association of Software and Service Companies (NASSCOM) report. India presently has more than 450 start-ups in the Agritech sector. It is reported that B2B Agritech startups in the country are fast-maturing and generating decent revenue by making use of advanced technologies. Thus it is attracting foreign and private funds.

Some of the startups are working on enhanced supply chains, while others are using big data analytics and artificial intelligence to optimize farm management. One of the important things to help derive better farming strategies is the extensive use of data, and data being collected through IT sensors is being analyzed for anomalies and patterns. This is a valuable process to help farmers be ready for adverse weather phenomena, prevent spoilage and ensure the good health of crops. Start ups are working in these areas.

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About the Authors:

Manisha Sharma, (PhD) is working as an Assistant Professor at Apeejay College of Fine Arts, Jalandhar. She has a teaching experience of seventeen years.

Simrandeep Kaur Randhawa, is working as an Assistant Professor at Apeejay College of Fine Arts, Jalandhar. She has a teaching experience of two years at both college and university level.