

Agritech Startups: The Ray of Hope in Indian Agriculture

Discussion Paper 10

MANAGE-Centre for Agricultural Extension Innovations, Reforms,
and Agripreneurship (CAEIRA)



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About the Publication

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Director General's Message

Smt. V. Usha Rani, IAS

Director General, MANAGE

I congratulate Mr. Anupam Anand, MANAGE Intern and Ph.D. Research Scholar, Punjab Agricultural University, Ludhiana for selecting relevant topic of the day "Agritech Startups: The Ray of Hope in Indian Agriculture" and conducting good field survey and analysis of data and relevant literature for the study.

Increasing demand of innovation in agriculture and declining last mile delivery to farmers has put up a pressure on the public extension system to perform beyond its designated role of disseminating information on technologies. The new role demands organizing user/producer groups, linking farmers to markets, engaging in research planning and technology selection, enable changes in policies and linking producers to a range of other support and service networks. But however, the Indian extension system has been considerably weakened over the last two decades in terms of human resources and capacity. Huge vacancy levels in public extension system particularly in remote and disadvantaged regions have further constrained the extension support and services to farming community. 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.

Agritech Startups are providing relevant and innovative solutions to a number of challenges faced all across the agricultural value chain. A new wave of budding entrepreneurs and emerging startups in the country are leading the way in disrupting the age old agriculture system with innovative ideas and affordable solutions. These startups have become the missing link between the farmers, input dealers, wholesalers, retailers and consumers connecting each of them to each other and providing strong marketing linkages and quality produce on time.

The paper in detail analyses the prevalent Agritech sub-sectors in Indian startup ecosystem. Agritech startups are leveraging technology in the area of market linkages such as retail, B2C and B2B marketplaces and digital agronomy platforms. Big Data Analytics, Supply Chain/Market-linked Model, FaaS, IoT Enabled, Engineering-Led Innovation and Miscellaneous other are the major sub-sectors where agritech startups are coming up. The detailed description of the 20 startups featured in this study reveals that from ICT apps to farm automation and from weather forecasting to drone use and from inputs retailing and equipment renting to online vegetable marketing, they do all and everything. Multiple enabling policies have been implemented to support agri startups, their early take off and successful operations both by the Central as well as State Governments. Apart from the available schemes and policies to support agritech startups, an institutional mechanism has been created for smoother takeoff and successful implementation.

Let me congratulate Dr. Saravanan Raj, Director (Agri. Extn.), MANAGE for guiding the intern in selecting right topics, applying right research methodology to collect relevant information, analyzing and suggesting appropriate way to move forward. It's high time to make agritech startups successful and propel India forward as a leader in the agri technology sector too.



(V.Usha Rani)

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Abstract

The startups are an exemplar that great things are done by a series of small things brought together. Taking one small step at a time, moving from one problem to another and solving the issues by disruptive innovation is what these startups are trying to achieve. The startups are not only creating new jobs which means more employment but are also leaving a ripple effect on the socio-economic fabric of the demography in which they are operating. The world has become a playfield for these young entrepreneurs as the global startup revolution continues to grow. Underneath this continued growth, fundamental shifts are occurring. The fuel that incited the first and second generation startup revolution have started to decline and a new third wave is taking over the world stage. The era of social apps, digital media and pure internet companies which were part of first and second generation revolution are being taken over by sectors viz. FinTech, CleanTech, Cybersecurity, Blockchain, etc. This change is not only limited to sectors but is also shaking things geographically too. The dominance of West viz. Silicon Valley and USA is witnessing a decline and the East with leaders like China and India is on the rise. With this rise, India has become the third largest startup ecosystem hub. India is home to highest number of unicorn startups after US and China with 26 unicorns out of 250+ total unicorns globally. At a time where with the increasing population and demand for better quality and higher quantity of food is required, the performance pressure on farms are increasing. Agritech startups are such a relevant 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 agri 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 agri technology sector too.

Executive summary

Startups play a key role in promoting innovation in a society. Through innovation these startups are not only challenging the reign of big corporates but are also providing simpler solutions to the problems they answer. The startups are equipped with novel ideas, are constantly understaffed, never have enough hours in a day and still possess pragmatic approach which compels them to find new ways to solve the issues. These startups with their innovation have come to the aid of stressed farmers and answering to the problems of Indian Agriculture. The new wave of entrepreneurs and startups have taken upon themselves to lead the way for disrupting the agriculture sector in India. These startups want to deploy technology and improve this sector. But with the entry of the startups in the sector, the important questions that need to be answered are Can disruptive technology bring reform to sector? And why the startups have started focusing on agriculture sector now which has been always neglected in past?

The answer to above questions lie in the results exhibited by the countries like Israel, China and US which have transformed agriculture practices in their country with the use of technology. Nevertheless the results have not occurred only with the development of new technology but by taking them to the end users, farmers in this case, at a cheap and affordable price. The time has come to enunciate agricultural strategies with innovations. Therefore, leveraging the efforts of agritech startups is imperative. In this backdrop, the study has brought to light some of these startups that are working tremendously in changing the face of Indian agriculture by providing farmers with low-cost farming solutions. This study has highlighted on the prevalent agritech sub-sectors in the Indian startup ecosystem. It is noteworthy that the startups have decided to employ the Deeptech in solving the problems faced by farmers. The startups are touching every stage through the agricultural value chain. The findings revealed that from providing information and knowledge about various agronomic practices to farmers on one hand. On the other, they are also being connected directly to input dealers who are providing them with whatever they require right on their doorstep. These startups have also moved one stage forward and have now connected the farmers to market accessibility which is one of the biggest problem faced by them. Equipping the farmers with right tools to grade, assort and even transport their produce, the startups are empowering them and ensuring that they receive a remunerative price for their produce. Big Data Analytics, Supply Chain/Market-linked Model, FaaS, IoT Enabled, Engineering-Led Innovation and Miscellaneous other are the major sub-sectors where agritech startups are coming up. From weather forecasting to drone use and from inputs retailing and equipment renting to selling fruits and vegetables online and from farm automation to protected cultivation, assaying and grading, these startups are revolutionizing Indian agriculture. Notwithstanding the efforts of startups, even the government have stepped up to support them. In a bid to double the farmers' income, the GoI has made 22 regulatory reform to support startups, launched Startup India with 19 Points Action Plan and hosted an Agricultural Grand Challenge to provide the startups with an ecosystem to flourish in. Moreover, the State Governments are not far behind and therefore 27 states and 3 UT have made tremendous policy reforms to uplift the startup ecosystem and improve the

livelihood of not only farmers but all of them who are directly or indirectly involved with startups. The startups need to keep on innovating. Meanwhile government needs to provide them with a conducive environment if we need the ecosystem to flourish and reap the benefits. Agritech startups can change the outlook of agriculture by constant innovation. Therefore it is the right time to boost their confidence.



Small Setup and Big Impact: Startups Changing the World

As the famous saying goes, big things come in small packages. This proves to be very true for the emerging startup companies. The startups are proving to be the change engines of the world. These small setup companies are revolutionizing their industries with new ideas and development of disruptive technologies. 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 need to be in developed countries 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.

It is well known that startups are small companies but they play a significant role in the economic growth. They are responsible for creating new jobs which mean more employment which leads to improved economy. 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). These startups boosted the economy with revolutionary technology and created new industries over time. And when they went public, they truly became money-making engines for not just the owners but also for the employees and shareholders. 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. They also contribute to the promotion of the research and innovation system and introduce values of proactivity into the society. Startup companies are thus those that have ambition and potential to become gazelles that can, with quick growth, create a large number of new jobs. The majority of developed countries in a knowledge-based society encourage startup ecosystem from the aspect of investment into the future as well as from the aspect of actively designing long-term economic policy. This prompts for the underdeveloped as well as developing countries to increase investment in these startups to promote innovation,

new jobs and economic growth, encouraging competitive dynamics into the economic system, to promote research-innovation system and to develop a sense of proactivity into the society. Startups can reshape the world and in coming years more numbers of startups will emerge with innovation and creativity. Entrepreneurship is the only way to enhance the economic growth of a nation. And a small idea can be termed into big innovative solution which can change the future.

Defining a Startup: The Meaning

The Oxford Dictionary defines startup as “a newly established business” while according to Merriam-Webster, startup means “the act or an instance of setting in operation or motion” or “a fledging business enterprise”. The American Heritage Dictionary suggest it is “a business or undertaking that has recently begun operation.” But the question here is what really comes to our mind when you hear the word “STARTUP”? The common answers that which we usually get are influenced by popular media, depicting startup as unsecured job, failed companies, free food, beanbags, Friday beers, open office landscapes and sleeping pods whereas no one recognizes the hard work put on by the guys grinding in their garage. While from the words of Eric Ries, the creator of the Lean Startup Methodology, “A startup is a human institution designed to create a new product or service under conditions of extreme uncertainty.”

As cited in the OED (1989 edn) start-up, in the business sense, is first recorded in 1976:
1976 Forbes 15 Aug. 6/2 The unfashionable business of investing in startups in the electronic data processing field.
Start-up company arrived a year later:
1977 Business Week (Industr. edn) 5 Sept. : An incubator for startup companies, especially in the fast-growth, high-technology fields.

(Source: Anonymous, 2017)

At present the word startup can be defined in several manners and according to different circumstances, but according to Investopedia, “a startup is a young company that is just beginning to develop. Startups are usually small and initially financed and operated by a handful of founders or one individual. These companies offer a product or service that is not currently being offered elsewhere in the market, or that the founders believe is being offered in an inferior manner” (Anonymous, 2018a). The website “startup commons” defines startup as “a team of entrepreneurial talent developing new innovations, in identifiable and investable form, in progress to validate and capture the value of the created innovation - with ambition to grow fast with scalable business model for maximum impact” (Anonymous, 2018b). When it comes to defining a startup, you can either think about it in terms of the actual business or you can focus on the spirit and mentality. However, a startup mentality can include existing businesses, as long as they operate with the same attitude on which they were founded. And what are those key principles? These are fast-paced decision making and problem-solving attitude, founders idea to create a change, self-funded or receiving funding from potential investors, idea that can be applied and marketed globally,

quick growth, engulfed with limitations in initial years, solve a problem through a new, or better product or services than what is currently available, collaborative team culture and lastly the most important principle of uncertainty, risk and failures associated with any new business or a startup (Waterworth, 2016; DeMers 2017; Cook 2018). With all of the above taken into account, it's worth pointing out that change is the core to the startup meaning. Therefore, in the end it's difficult to say whether a startup is definitively one thing or another, except for the fact that these startups have the ability to bring change and be different. The enthusiasm, energy, and sense of possibility empowers them to the feeling that anything could happen and that there is a solution to every problem.

Startups: Gateway to Innovations

Startups play a key role in innovation processes (Colombo and Piva, 2008; Davila et al., 2003; Mustar et al., 2008). According to the well-known definition by Steve Blank (Blank, 2010) a startup is a company, a partnership or temporary organization designed to search for a repeatable and scalable business model. Through the startup phase, new ideas are brought to the market and transformed in economically sustainable enterprises. New firms are artefacts for transforming entrepreneurial judgement into profit (Spender 2014).

Innovation is a strong pillar to the success of every startup known in the world, Business that are not able to invest in research and development dies in the striving market. The capital cycle has become the main feature of the innovative market, as indicated by Gompers and Lerner, 2004; Kaplan and Schoar, 2005; Gompers et al., 2008.

It is to be noticed that these independent startups are performing well in innovating things compared to big companies who have deep pocket and well established and dedicated R&D labs. According to Schuyler Brown, VP of marketing at NOMi (pronounced "know me"), the startups are effective in innovating is because the people working in startups work with the feeling that they are about to change the world which acts as a strong motivator (Hessman, 2014). Startups are constantly understaffed, never enough hours in the day and there are never enough resources which compels to find new ways to solve the issues leading to innovation (Goeldi, 2018).

Paul Schwada, Director of Business Innovation Consultancy Firm Locomotion Solutions adds that the advantage is not that the startup has better people or necessarily even a more innovative spirit (Hessman, 2014). But it's what they lack. Specifically, he mentioned that it comes down to three things:

- **Precedent:** Well established business use highly constructed and complicated tools to solve the problems for decades. That alone precludes them from envisioning a new disruptive tool or method to solve the same problem. Whereas as startups have no fixed method or tool to solve the problems, it ultimately leads to development of an innovative method.
- **Momentum:** The highly constructed tools employed by these big companies are too

expensive, and the business is usually centered on the price it takes in construction. Any disruptive method employed can destroy those balance sheets.

- **Processes:** Even if somehow, the established companies are able to get past the above mentioned two things, they will still have the entwined web of legal systems and processes to overcome. And this point alone proves as a significant agility advantage for the startups (Anonymous 2014; Koziy, 2014; Anonymous, 2016).



AirBnB: Disruptive Innovation in Tourism Accommodation Sector

AirBnB, which was founded in 2008, has its presence online and provides hospitality services and rental services. It is a San Francisco-based online website. It allows the hosts to post their apartments, homes and cottages on their site and renters can take those homes or apartments on rent. AirBnB do not own houses, it just acts as a broker and takes commission on every house that is rented. Earlier, it was only focusing on low-value customers, but eventually, it started focusing on high value customers as well. At AirBnB, one can find the houses of low price, medium price as well as high price. Renters can select homes or apartments on the basis of location and the money they want to pay. The company is very much famous nowadays, because of its innovation. AirBnB is giving tuff competition to the hotels in the hospitality industry. The existing hotels are not able to cope up with the competition given by AirBnB because they are not able to match with the innovation of AirBnB. The appeal of AirBnB to the customers is also very distinct. It addresses the customers as, using AirBnB will lead to the cost savings, local experience as well as household facilities. The company, which boasts nearly 5 million lodging options across 81,000 cities in the world, was reportedly valued at \$29.3 billion as of February, 2019. AirBnB has made such an impact that the name is synonymous with the word hospitality these days.

(Source: Ma, 2018; Thompson, 2018)

Schwada further adds that the problem for big companies is not getting the innovation going inside, but the real problem lies in getting it to the street. In simple words, he explains that a well-established business follows the flywheel analogy. When a company is used to pushing the flywheel in one direction and getting the momentum going, it becomes difficult to suddenly start pushing the flywheel in other direction. But a startup, on the other hand, has no momentum to overcome, no process in place and no precedent to contradict, can push the flywheel in any direction that they like (Hessman, 2014; Anonymous 2016).

Nair (2016) in his article mentions that there are over 100 million new business are launched every year, which translates into roughly 11,000 startups being launched every hour. Therefore, it is essential for startups to keep innovating if they want to survive. According to Nair (2016), the advantages any startup can gain from innovation are as follows:

- **Competitive edge:** Many new startups have managed to grab a new market by launching a totally disruptive or new technology, but have failed to retain their edge later since they were not able to keep up with the pace of innovation in the market. This lack of constant innovation in the startups acts as one of the main reason for the startup exit from the competition

or market. It is always noticed that innovation provides startups with an edge over their competition and helps them to become a market leader.

- **More efficient startups:** If innovation is the core of your startup, it becomes easier to solve the problems as well as huge challenges. When the full force of the startup is focused on bettering the end product or process, it will eventually lead to greater process, products or services and huge advantage for the business.
- **Creates entry barriers for competitors:** When you are a constant disruptor or innovator, it becomes the best way to stay at the top and become an industry leader. The zeal to develop next level of innovation and experiment ensures that you stay ahead of competitors.
- **Compete with larger well-established companies:** Well-established companies have more resources at their disposal and can easily implement and adopt new technologies. In order to compete with them, startups need to be step ahead and adopt a culture of innovation.

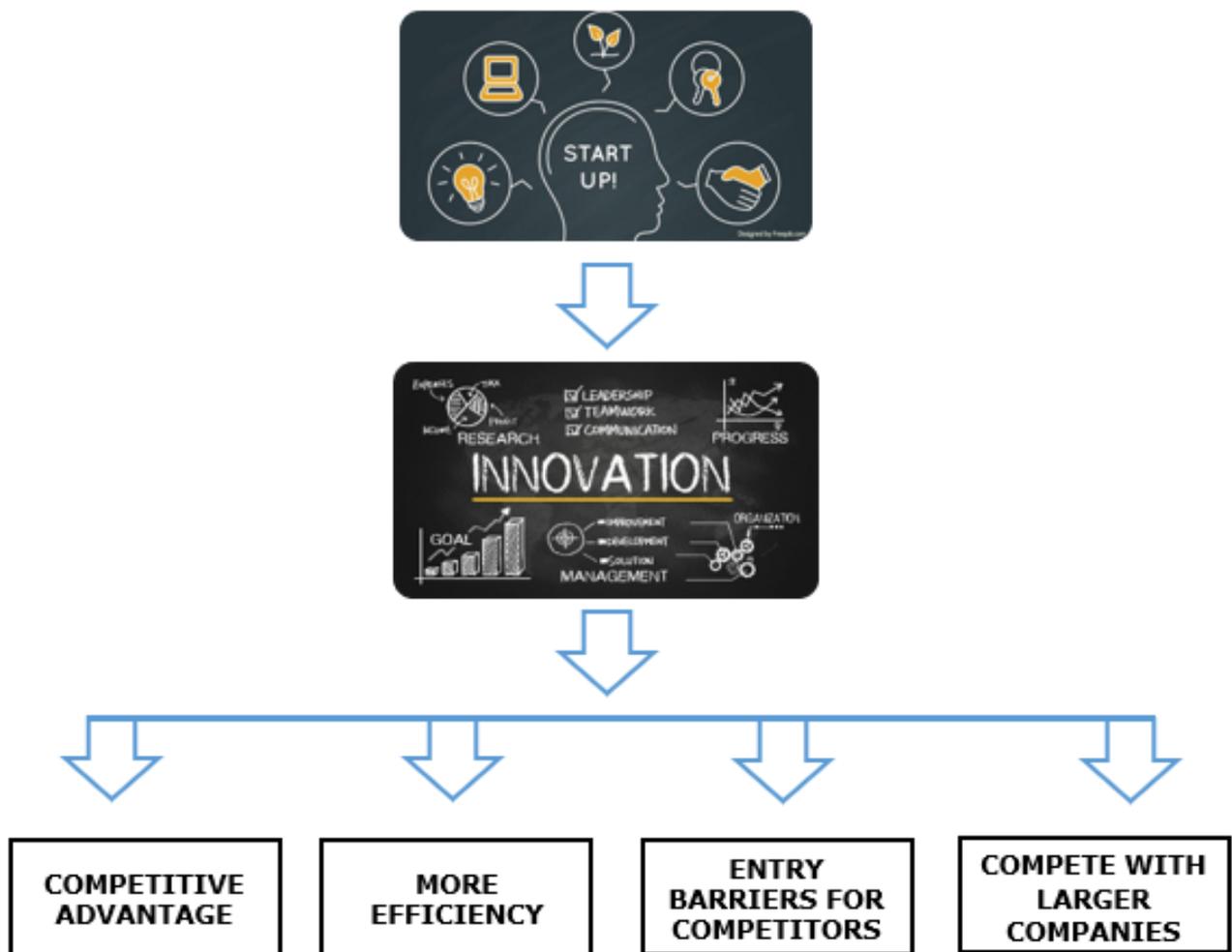


Fig. 1: Startups constantly promoting Innovation

Majority of the startups fail after sometime due to lack of ideas to better their product, process or services. So it's very simple math that if a startup wants to stay in competition, it needs to adopt a culture of innovation in its DNA (Nair, 2016).

Development of a Startup: The Build Up

Startups are never successful overnight and it's important to understand that running one is a process that requires patience, perseverance, and a realistic evaluation of its evolutionary stage (Yasuda, 2016). The website "startupcommons.org" describes the development of a startup in the perspective of "idea to product, to growing business" and from "talent to team, to real organization" in balanced manner. Like any other growing thing, businesses have lifecycles. Startups, in particular, follow a specific set of stages as they develop. Though the time spent in each stage will be different for every growing company, there are six main phases. Why does it matter what Startup stage your company is presently in? "Knowing where the startup is in its journey will help manage time and resources efficiently." With a sense of what's to come, the development can be effectively planned for success in later phases. Here's a look at the six stages of a Startup and what can be expected from each one (Segal 2016; Anonymous, 2018c).

Table 1: Key features of development stages of startup

Stages	Name	Key Features of Development
Stages I	Ideation	<ul style="list-style-type: none"> • Entrepreneurial ambition of the founder(s) • Potential development of the product or service idea for a big enough target market • Some initial business models and ideas on how the idea would create value or make money • Presence of single person or a vague team • No confirmed roles or commitment in the team structure yet.
Stages II	Concept development	<ul style="list-style-type: none"> • Defining of mission and vision of the startup with initial strategy • Setting up of key milestones and goals for next few years • Formation of core team consisting of co-founders with complimentary skills and ownership plan and rights • Inclusion of some additional members for the requirement specific skill sets along with ownership.
Stages III	Commitment	<ul style="list-style-type: none"> • Committed skills balanced founding team sharing same vision, values and attitudes • Building the MVP or Minimum Viable Product for the users to test their business idea • Signing of SHA: Shareholder Agreement among the co-founders <ul style="list-style-type: none"> • It includes milestones that need to be achieved • Commitment of time and money shared by each shareholder • SHA signed for next three years with vesting terms
Stages IV	Validation	<ul style="list-style-type: none"> • Most important stage from the point of view of the founder(s), employees, initial customers and angel investors through initial user growth • Initial Key Performance Indicators (KPIs) identified • Founders are struggling to find the right product strategy & brand positioning that would allow them to attract potential Series A/B venture investment • Most of the startups lose their plot during this stage of business.

Stages V	Scaling up	<ul style="list-style-type: none"> Focus on KPI based growth in terms of users, customers and revenues or market share in the target market Potential to grow fast Received series A funding for the startup Maximum time involved in hiring resources, improvement and distribution of product to target population and implementing new or established process.
Stages VI	Establishment of startup	<ul style="list-style-type: none"> Have achieved great growth that can be expected to continue Easy to attract funding and customers now Depending on vision, mission and goals will continue to function "like a startup" Founder(s) or Investors may decide to exit or continue with the company

Source: Aggarwal, 2015; Segal, 2016; Yasuda, 2016; Anonymous, 2018c.

A minimum viable product (MVP) is a development technique in which a new product or website is developed with sufficient features to satisfy early adopters. The final, complete set of features is only designed and developed after considering feedback from the product's initial users.

(Source: Aggarwal, 2015)

Startup Funding: Putting the Fuel in the Startup Engine

Every startup, regardless of the nature and size of its operation, requires funding to convert its innovative ideas into reality. It is relatively very easy to have a startup idea, however, it is quite complicated to bring the startup through the stages of funding to bear fruits. Most of the startups generally fail because of their inability to raise sufficient funds. After all, you need some money or capital to keep your business going at every stage (Anonymous, 2014; Zenn, 2017).

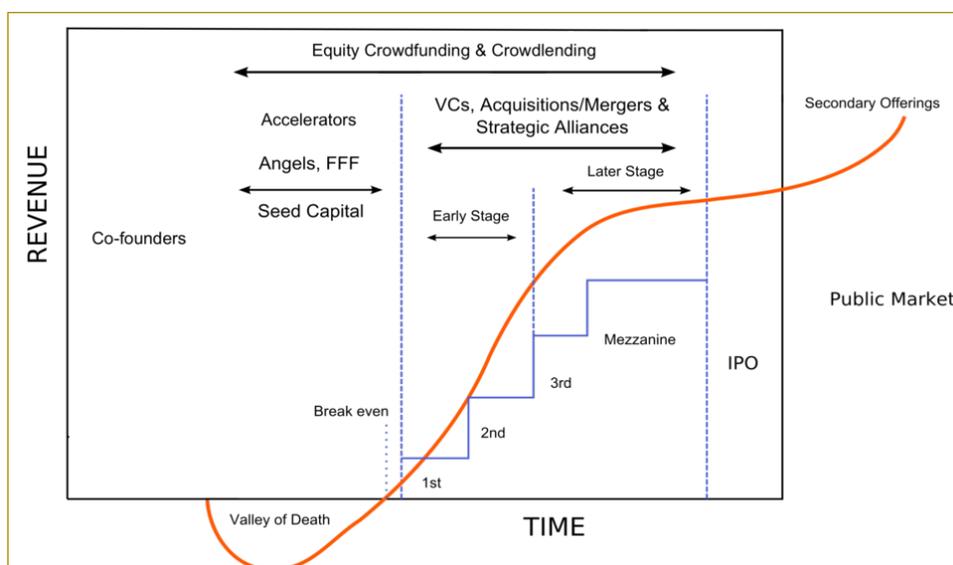


Fig. 2: Startup financing cycle (Anonymous, 2019)

The startup funding landscape has changed significantly over the past few years in world. While five to ten years ago the options available to startups were few, lately we've witnessed an important surge in Venture Capital available for startups at all stages. From seed to growth, from Series A to Series C.

This increase in capital has been accompanied by the creation and development of alternative financing vehicles such as crowdfunding, investment syndicates and new and fresh Venture Capital firms that bring different approaches to the market (Novoa, 2017).

Q4 2018 Closes Out a Record Year for the Global Startup Funding

Make no bones about it: 2018 was one heck of a year for the global startup investment market, and the fourth quarter closed it out on strong footing. It was a year of superlatives: the most amount of money invested in the highest number of private tech company financing events on record; the largest venture capital deals in history; the rise and rise of supergiant venture rounds; and the elephantine funds that shake the market with every deal they make. A resurgence in late-stage venture funding drove the global market's dollar volume totals higher in the final quarter of 2018. Crunchbase projects that roughly \$91.4 billion was invested in Q4, up about 2.4 percent from Q3. The YoY change from 2017 to 2018 saw a increase of 42.9 percent. This rounds out two solid years of quarter-over-quarter growth. According to Crunchbase data, global dollar volume figures increased every quarter since Q4 2016. Zooming out to annual numbers for a moment, the results of that consistent growth become readily apparent. In 2018, private companies raised over three times as much capital as they did just four years prior.

(Source: Rowley, 2019)

The main concern for these startup firms is not only limited up to the fact that how these sources of finance are successfully acquired but also how these sources are effectively implemented once they are made available, since the startup firms lack both the experience and expertise in dealing with the core business operations (Goldberg, 2018). Financing for startups is clearly entering a disruptive period. In a scramble for precious resources, a startup may find itself drawing on a hybrid combination of financing sources, and these sources may come into play in no set order. As a precursor to understanding the new age of startup financing, we feel it is still important to become familiar with the different investment phases. The major investment phases of a startup cycle are as follows:

PRE-SEED STAGE (Early stage, Pre-product)

This stage is considered to be the starting point where the founder(s) tries to convert the idea into a business opportunity. The founder and certain key personnel are the main employees of the firm. This stage requires a small funding for the research where the viability of an idea is assessed, it is determined whether similar thing has been done before, costs of the product development are determined and a business model is formulated. In this stage the possible forces of funding

are mostly self-financed (savings), FFF (Family, Friends & Fools), angel investors, accelerators and lately a new breed of funding method known as crowdfunding. The risks of failure to survive and transit into the next stages are very high. As the funds are low during this stage, refinement and (re)alignment of the product should be the main focus. Better adjustments are needed to upgrade the product and avoid the "Valley of Death" where perfectly good concepts lie fallow due to lack of funding (Yasuda, 2016; Zenn, 2017, Kelly, 2010; Itti; 2017).

The "valley of death" is a common term in the startup world, referring to the difficulty of covering the negative cash flow in the early stages of a startup, before their new product or service is bringing in revenue from real customers. During the death valley curve, additional financing is usually scarce, leaving the firm vulnerable to cash flow requirements.

(Source: <https://www.investopedia.com/terms/d/death-valley-curve.asp> <https://www.forbes.com/sites/martinzwillig/2013/02/18/10-ways-for-startups-to-survive-the-valley-of-death/#45ef713669ef>)

SEED STAGE (Early stage, Immature product)

This stage focuses on orienting the company in the broader marketplace and developing a deeper understanding of what the customer wants and how to refine the product according to their taste. This is one of the early stage where we have a product or service which may be almost complete or be immature. Although the product or idea is still immature, it has got a name, a brand, but most of the funding at this stage still comes via bootstrapping or the generosity of friends, family or through some crowdfunding, incubator, accelerator money. Micro venture capital firms and investment syndicate have also started appearing in this stage to fund the startups. The focus of this stage is achieving a product market fit as well as building it overall. Another important key aspect of this stage is gaining traction in the target market. The seed stage is also the time when you should find any necessary partners such as development companies, designers or creative agencies, and potentially public relations and market research firms (Yasuda, 2016; Zenn, 2017, Kelly, 2010; Itti; 2017).

According to crunchbase report, pre-seed stage and seed stage deals accounted for approximately 59 percent of all deal volume but only five percent of the total dollar volume. What angel and seed-stage deals lack in size, they make up for in number.

Between Q3 and Q4 of 2018, both number of deals and investment declined somewhat by 5.3 percent and 3.2 percent respectively. But on the other hand, YoY change saw a growth of 44.9 percent and 30.7 percent increase in capital invested and number of deals from 2017 to 2018 respectively. Approximately 20,250 angel and seed-stage transactions took place in 2018. For the entirety of 2018, \$14.94 billion was invested in seed-stage deals. That's an over 50 percent increase from 2017's total of \$9.717 billion. The most active angel and seed investors in 2018 were "Y Combinator" and "500 Startups" with 266 and 202 rounds of deals globally. Of course, there's also the largely incalculable amount of money solo founders and fledgling companies raised from individual angel investors and through informal

“friends and family and fools” rounds. Those small but numerous transactions are difficult to track, but they no doubt add up.

(Source: Rowley, 2019)

EARLY STAGE DEALS

SERIES A (Early stage, Maturing product)

The goal of the Series A stage funding is to position the startup for future growth, get all the cards settled in a row and prepare for expansion in the next stages. By this stage the idea should be gaining traction and should be creating a good amount of buzz among the tech or business press and amongst the key influencers for the target group. This is also the stage where business needs to be optimized, counterbalance any financial deficit, correct the mistakes that were made along the way and most importantly starting to explore new markets and demographics. During the Series A stage, the startups are working with venture capitalists and angel investors to further refine and improve the original concept, grow the team, find partners, and decrease the burn rate of the investment by VC and establish solid unit economic principles. Basically, now is the time to set the startup up for future growth and success. This is also the stage where the company starts getting recognized in the main target audience and starts expanding to other groups beyond the initial target group. Various publications start spreading the news about the startup growth and its USP. This stage depicts growth of the seedling of idea off the ground into a viable business (Alisha, 2016; Anonymous, 2017c; Zenn, 2017; Troung, 2016).

SERIES B (Early stage, Established product)

By the time startup enters this stage, the company and the products should be fairly well established, and the main focus should be on expanding both internally by growing the team and externally by growing in target audience more or by possibly acquiring complimentary or competing companies and/or technology. As the previous rounds have been fuelled by relatively preliminary signs of growth, from a promising idea, through leading indicators of product-market fit, to early traction and first signs of revenue growth. This is the time for continued growth in every way, shape, and form. In practical terms, Series B investment might allow a startup to make expansive hires (across business development, strategic accounts, marketing and customer success), expand into different market segments or experiment with different revenue streams, and in dramatic instances, even buy-out businesses that offer a competitive advantage. In layman language, the investors are looking for the next stage of growth: the ability to take everything that has been learned from previous stages and make it work at a larger scale. Therefore this stage attracts increase in funding from sources like investment banks, private equity firms, and larger venture capital companies (Alisha, 2016; Anonymous, 2017c; Zenn, 2017; Troung, 2016).

In Q4 of 2018, early stage deal volume accounted for approx. 33 percent of all deal volume whereas it had a share of 32 percent in total dollar volume. There was an increase of 38.5 percent in the YoY change in capital invested and an increase of 26.5 percent in the number of deals at early stage. According to Crunchbase, 2018 was a record setting year for early stage investment. The data indicated that approx. 11,250 early stage transactions took place worldwide which was significantly higher jump from 2014-17. The total dollar volume investment also went up with \$117.65 billion invested in the early stage during the course of 2018. It was estimated to be 57 percent more than the 2017's total of \$74.9 billion. Over 8,500 unique investors contributed to early-stage funding rounds in 2018. "IDG Capital" and "Y Combinator" topped the charts of most active early stage investors in 2018 globally with 69 and 60 count of rounds respectively.

(Source: Rowley, 2019)

LATE STAGE DEALS

SERIES C, D, E.... (Late stage, Fully matured product)

During Series C+ investment, the owners, as well as the investors, are pretty cautious about funding this round. The more the investment rounds, the more release of the business' equity takes place. Series C rounds are done to fuel large scale expansion, like moving into new market (commonly international) or to encourage acquisitions of other complimentary or competing businesses. After Series C, there's theoretically no limit to the number of investment rounds a startup can raise: some companies will go on to raise investment through Series D, E and beyond. Given the relatively low number of startups that make it to this point, there's also a huge amount of variance in the amounts raised, with investment determined on a case-by-case basis (Alisha, 2016; Chauhan, 2017; Zenn, 2017; Troung, 2016).

In the Q4 of 2018, late stage was proven to be the king of all with late stage dollar volume accounting to be 55 percent of all total dollar volume although when the deal volume accounted for just 7 percent of all total deal volume. According to projections from Crunchbase, approx. 2,330 late-stage transactions took place in 2018. That's an over 40 percent jump from 2017's projected total of just over 1,600 deals. Yearly totals for late-stage dollar volume rose. For the entirety of 2018, Crunchbase projections indicated that a staggering \$192.2 billion was invested in late-stage deals, worldwide. Jumping over 80 percent, 2018's late-stage deals hauled in nearly twice 2017's total of \$104.9 billion. In 2018, more money was invested in late-stage ventures than the entire global VC market invested in 2016 (approximately \$168 billion, total). More than 3,200 unique investors participated in late-stage venture deals in 2018. "Tencent Holdings" and "Goldman Sachs" led the list of most active late stage investors in 2018 globally with 47 counts of rounds held by each of the two equally.

(Source: Rowley, 2019)

BRIDGE LOANS & MEZZANINE FINANCING (Later stage, Maturing to Mature product)

Bridge financing is when investors invest in a startup business with a short term loan in order to help it reach the next round of funding, on the basis that they will receive their money back. Basically, it is used to 'bridge' the gap between investments to keep a startup company afloat. Startups use bridge financing or a 'bridge round' in order to help them get to a significant round of funding such as an equity funding or the sale of the company. On the other hand, Mezzanine financing is generally offered to companies that have a track record in their industry, an established reputation and product, a history of profitability and a viable expansion plan for the business, such as through expansions, acquisitions or an Initial Public Offering (IPO). These types of loans last six to twelve months and are typically paid back by funds raised during an IPO, since they serve to bridge the gap between the end of late stage and the point of a business reaching maturity. At this point, a startup (if it can still be considered a startup company once it has reached this stage) is typically worth at least \$100 million (Alisha, 2016; Chauhan, 2017; Zenn, 2017; Troung, 2016).

IPO (Late stage, Fully matured product)

An initial public offering of success is a crucial moment for a startup. It's a sign of success. It also comes with its share of costs. This is when you're ready to become a publicly traded company, have been valued at over \$100 million, and are getting to the point where your brand might be a household or at least commonly recognized name in your vertical or niche. Once the company is listed on one of the international stock exchanges, it is time to celebrate and join the public market, and even consider launching more products, approaching secondary markets, and/or expanding to new regions of the world. This is the end of the road, at least for many entrepreneurs, once the company goes public. It's not only about the money. A successful IPO spells out success for a company. It generates interest and can be a signal to the top talent in the industry that this company has made it. This can also be a boost to employees' pride, especially after sticking with a startup through thick and thin (Alisha, 2016; Chauhan, 2017; Zenn, 2017; Troung, 2016; Yasuda, 2016; Reiff, 2019).

Earlier this year, it was too early to tell if the 2018 IPO cycle would bear out. Few startups went public, and a horde of richly-valued unicorns sat on the sidelines simply waiting. The year 2018 has produced a host of technology IPOs. The year has seen a host of Chinese companies going public domestically, a brace of hardware IPOs, and SaaS has done well in terms of offerings, and results. Startups such as Tencent Music, MOGU, Weidai, Niu.com, SolarWinds, Anaplan, Elastic, UpWork, CooTek, SurveyMonkey, Viomi and 37 others went public in 2018. The list is not complete as it was not possible to cover every countries IPOs offering. Some big names likes Xiaomi's IPO, Jia.com and others also went public.

(Source: Wilhelm et al., 2018)

Sources of Startup Funding: The Fuel

A brief description about the various funding sources/agencies at various stages of startup growth:

Table 2: Sources of startup funding

PRE-SEED & SEED STAGE
<p>Personal Investment & FFF (Family, Friends & Fools) A founder will often invest personal cash balances into a startup. This is a cheap form of finance and it is readily available. Investing personal savings maximizes the control of the founder over the business. It is also a strong signal of commitment to outside investors or providers of finance. Friends and family who are supportive of the business idea provide money either directly to the founder or into the business. This can be quicker and cheaper to arrange (certainly compared with a standard bank loan) and the interest and repayment terms may be more flexible than a bank loan. However, borrowing in this way can add to the stress faced by an entrepreneur, particularly if the business gets into difficulties.</p>
<p>Angel Investors An angel investor is an affluent individual who provides capital for a business startup, usually in exchange for convertible debt or ownership equity. Angel investors typically use their own money, unlike venture capitalists who take care of pooled money from many other investors and place them in a strategically managed fund. Though angel investors usually represent individuals, the entity that actually provides the fund may be a limited liability company (LLC), a business, a trust or an investment fund, among many other kinds of vehicles. The effective internal rate of returns for a successful portfolio for angel investors ranges from 20 percent to 30 percent. Though this may look good for investors and seem too expensive for entrepreneurs with early-stage businesses, cheaper sources of financing such as banks are not usually available for such business ventures. This makes angel investments perfect for entrepreneurs who are still financially struggling during the startup phase of their business.</p>
<p>Accelerators Accelerators have proven to be of vital importance for new ventures, and their assistance has often the crucial difference between success and failure in the entrepreneurial circuit. One of the main reasons that entrepreneurs and founding teams choose the accelerator path is for the money. Accelerators typically offer seed money in exchange for equity in the company. This may range from \$10,000 to over \$120,000.</p>
<p>Crowdfunding Crowdfunding is a method of raising small amounts of capital from a large number of individuals to finance a new business venture. This approach taps into the collective efforts of a large pool of individuals primarily online via social media and crowdfunding platforms and leverages their networks for greater reach and exposure. There are more than 600 crowdfunding platforms around the world, with fundraising reaching billions of dollars annually, according to the research firm Massolution.</p>
<p>Micro VC Firms Exactly like it sounds – a Micro VC fund is a smaller version of a traditional VC fund. Sometimes they are referred to as “seed stage funds.” The generally accepted characteristics of a Micro VC are: a. fund is under \$100M (though many are less than \$50M), b. investments range from \$25K to \$500K and c. initial investment at the seed stage.</p>

Micro venture capital is money invested to seed early-stage emerging companies with amounts of finance that is typically less than that of traditional venture capital. Most micro venture capital firms pursue startups that are at their seed stage because of their lower initial cost basis. Though there is a high probability that the majority of these startups will not survive long enough to reach a Series A round of funding, micro venture capital firms are willing to make the investment because startups generally do not require large sums of capital to bring a product to market, and because they believe that it requires only a few successful companies for them to see profitable returns.

EARLY STAGE

Venture Capital Firms

Venture capital is financing that investors provide to startup companies and small businesses that are believed to have long-term growth potential. Venture capital generally comes from well-off investors, investment banks and any other financial institutions. However, it does not always take just a monetary form; it can be provided in the form of technical or managerial expertise. Venture capital firms or funds invest in these early-stage companies in exchange for equity, or an ownership stake, in the companies they invest in.

LATE STAGE

Private Equity Firms

A private equity firm is an investment management company that provides financial backing and makes investments in the private equity of startup or operating companies through a variety of loosely affiliated investment strategies including leveraged buyout, venture capital, and growth capital. Firms can keep the holdings, or sell these stakes to private investors, institutional investors (government and pension funds), and hedge funds. Private equity firms can either be privately held, or a public company listed on a stock exchange.

Source: Zwilling, 2010; Anonymous, 2015; Zwilling, 2015; Anonymous, 2018d; Shane, 2019

Startup Ecosystem: Cultivating Ideas

A startup ecosystem is formed by people, startups in their various stages and various types of organizations in a location (physical or virtual), interacting as a system to create and scale new startup companies. These organizations can be further divided into categories such as universities, funding organizations, support organizations (like incubators, accelerators, co-working spaces etc.), research organizations, service provider organizations (like legal, financial services etc.) and large corporations (Anonymous, 2019). Different organizations typically focus on specific parts of the ecosystem function and startups at their specific development stage(s).

Composition of Startup Ecosystem

- Ideas, inventions and research, i.e. Intellectual Property Rights (IPR)
- Entrepreneurship Education
- Startups at various stages
- Entrepreneurs

Organization and Activities Involved with Startup Activities

- Universities
- Advisory and mentoring organizations
- Startup incubators
- Startup accelerators

- Startup team members
- Angel Investors
- Startup mentors
- Startup advisors
- Other business oriented people
- People from other organizations with startup activities
- Startup events

- Co-working spaces
- Service providers (consulting, accounting, legal, etc.)
- Event organizers
- Startup competitions
- Startup business model evaluators
- Business angel networks
- Venture capital firms
- Equity crowdfunding portals
- Corporates (telos, banking, health, food, etc.)
- Startup blogs
- Other facilitators

People from these roles are regarded as linked together through shared events, activities, locations and interactions. As startup ecosystems are generally defined by the network of interactions among people, organizations and their environment, they can come in many types but are usually better known as startup ecosystems of specific cities or online communities (Anonymous, 2017d).

In addition, resources like skills, time and money are also essential components of a startup ecosystem. The resources that flow through ecosystems are obtained primarily from the people and organizations that are active part of those startup ecosystems. By events and meetings with and between organizations and different people, these interactions play a key role in the movement of resources through the system helping to create new potential startups or strengthening the already existing ones and hence influencing the quantity of startups build. Failures of Startups, release people with improved skills and time for either establishing a new Startup or joining an already existing one (Raaghav, 2016).

External and Internal Factors Controlling Startup Functioning

Startup ecosystems are controlled by both external and internal factors. External factors as financial climate, big market disruptions and big companies transitions, control the overall structure of an ecosystem and the way things work within it. Startup ecosystems being dynamic entities— invariably, they are initially in formation stages and once established are subject to periodic disturbances (like the financial issues) passing afterwards to the recovering process from some of those past disturbances (Goyal, 2015; Raaghav, 2016).

Startup ecosystems in similar environments but located in different parts of the world can end up doing things differently simply because they have a different entrepreneurial culture and resources pool (Ressi, 2017). The introduction of non-native people knowledge and skills can also cause substantial shifts in the ecosystem functions.

Internal factors not only control ecosystem processes but are also controlled by them and are often subject to feedback loops. While some of the resource inputs are generally controlled by external processes like financial climate and market disruptions, the availability resources within the ecosystem is controlled by internal factors like people and organizations ability to contribute towards the ecosystem. Other internal factors include startups success and failures succession along types of people and available skills. Although people exist and operate within ecosystems, their cumulative effects are large enough to influence external factors like financial climate (Anonymous, 2018e; Debb, 2017).

Startup ecosystems provide a variety of goods and services upon which other people and companies depend on and thus, the principles of startup ecosystem management suggest that rather than managing individual people or organizations, resources should be managed at the level of the startup ecosystem itself.

Global Startup Ecosystem

The global startup revolution continues to grow. The Q4 of 2018 saw a whopping \$91.4 billion investment compared to overall investment of \$140 billion in the year of 2017. The total value creation of the global startup economy from 2015 to 2017 reached \$2.3 trillion. Underneath this continued growth, fundamental shifts are occurring. The types of companies that fueled the first and second generation of global startup ecosystems viz. social media apps, digital media, and other pure internet companies are declining. Top startup hubs like Silicon Valley, London, and New York continue to dominate top-level activity and maintain their status as the top performers for most sub-sectors. But we see strong up and coming ecosystems in specific sectors like Fintech, Cybersecurity and Blockchain (GSER, 2018).

Highlights of Global Startup Ecosystem

Top 4 Growing Sub-Sectors

- #1 Adv. Manufacturing & Robotics (189% 5-year increase in early stage funding deals)
- #2 Agtech & New Food (171% 5-year increase)
- #3 Blockchain (163% 5-year increase)
- #4 Artificial Intelligence, Big Data & Analytics (77.5% 5-year increase)

Top 3 Declining Sub-Sectors

- #1 Adtech (35% 5-year decline in early stage funding deals)
- #2 Gaming (27% 5-year decline in early stage funding deals)
- #3 Digital Media (27% 5-year decline in early stage funding deals)

These declining sub-sectors are primarily associated with first and second wave of the internet. Agtech and New Food, not shown on this graph, had an even higher quarterly revenue growth,

despite a smaller number of IPOs. Top accelerators like Y Combinator also reflect this shift on some level: 18% of YC’s most recent batch of companies are in Biotech and Health (GSER, 2018).

Distribution of Startups Worldwide in 2018, by Industry

This statistic shows the distribution of startups worldwide in 2018, by industry. In 2018, Fintech startups accounted for 7.1 percent of all global startups, whereas only 2.1 percent were Cleantech startups.

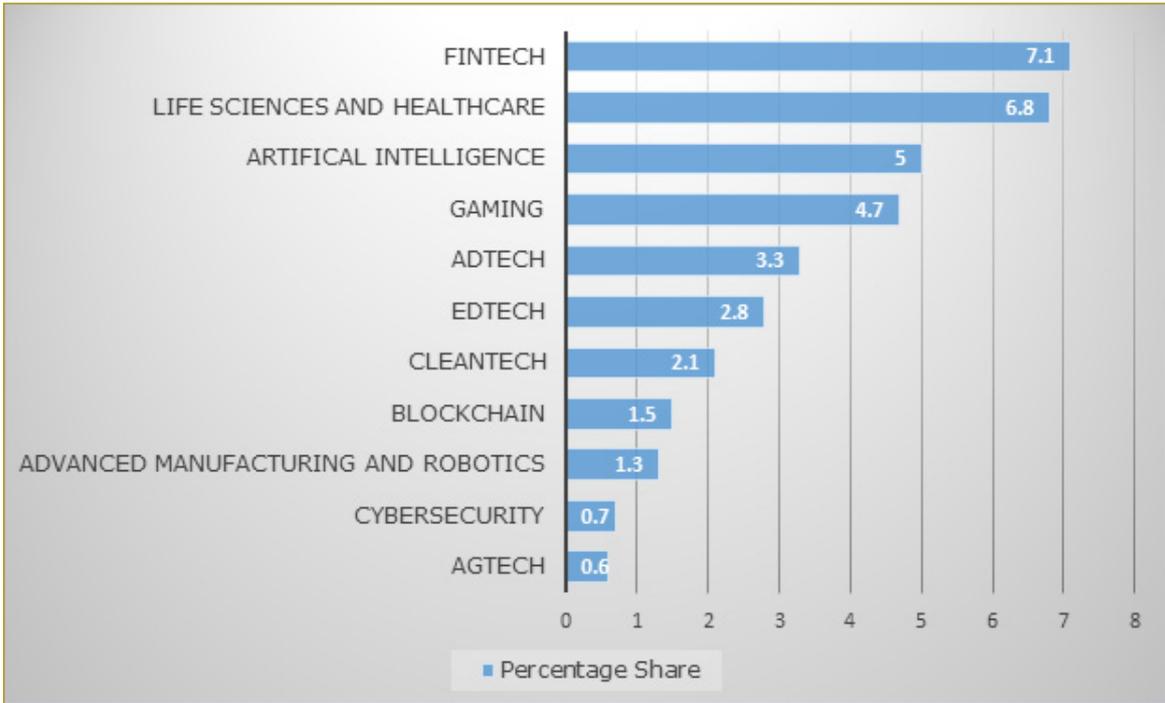


Fig. 3: Distribution of startups worldwide in 2018, by Industry (Anonymous, 2018f)

Startup Sub-sector Overview Globally, 2018

The startups sector is majorly divided into 11 sub-sectors as depicted in Table. The perusal of the data in Table reveals that Fintech sector had the maximum global share of 7.1 percent whereas the least global share was of Agtech with 0.6 percent of the global share. The highest funding value growth for 2012-17 was shown by Advanced Manufacturing & Robotics sector with 1386 percent while the average funding growth was at 377 percent. It is interesting to note that the Agtech sector had the least share of the total global share of startups by industry but was also the least in global share of startup exits with just only 0.5 percent of the total global share of startup exits. The sub-sectors viz. Health and Life Sciences, Cleantech, Gaming and Adtech showed declining startup growth with -0.3 percent, -9.7 percent, -4.2 percent and -6.9 percent respectively. Health and Life Sciences sector saw the maximum share of startup exits at 10.9 percent suggesting that maximum number of startups exited in this sector. The minimum funding growth was seen in the Adtech sector with 50.3 percent growth.

Table 3: Startup Sub-sector Overview Globally, 2018

Sub-Sector	Startup Output		Funding	Exits
	Global Share	Startup Growth*	Total Funding Value Growth#	Global Share of Exits
	Avg.: 4.3	Avg.: 4.5	Avg.: 377	NA
Artificial Intelligence	5.0	12.9	463	8.2
Blockchain	1.5	17.9	1321	1.3
Advanced Manufacturing & Robotics	1.3	15.3	1386	1.4
Agtech & New Food	0.6	14.3	1143	0.5
Fintech	7.1	6.8	460	7.9
Health and Life Sciences	6.8	-0.3	312	10.9
Cybersecurity	0.7	4.6	332	1.6
Cleantech	2.1	-9.7	147	NA
Edtech	2.8	7.4	291	2.1
Gaming	4.7	-4.2	225	2.9
Adtech	3.3	-6.9	50.3	5.4

Source: GSER, 2018, *2008-16 annual average, #2012-17, figures are in percentages

Growth and Decline of Sub-Sectors

These sub-sectors, just like products and startup ecosystems, evolve through lifecycles. The first phase of the lifecycle is spurred by some sort of catalyst, a sub-sector emerges and begins to develop. The catalyst could be a new technological advance, or perhaps a regulatory change, or even a shift in resource costs. The second phase occurs when a new sub-sector amalgamates as something distinct, and it grows. In the third phase of the lifecycle, a sub-sector matures: startup creation and early-stage funding slows down, while exits and Series B+ funding rounds continue to be strong. Finally, the sub-sector enters the decline phase. Early-stage funding drops with exits eventually following suit. Not every sub-sector is destined to decline, of course. A new technological development within the sub-sector may open a new era of growth, just like a new product feature may regenerate a fading product. But without new developments, the original upstarts become incumbents, and the disruptors eventually get disrupted.

Growth Sub-Sectors

- Advanced Manufacturing & Robotics
- Agtech & New Food
- Blockchain
- Artificial Intelligence, Big Data & Analytics

These four sub-sectors are experiencing tremendous growth, but the nature of that growth differs. Advanced Manufacturing, Agtech, and Blockchain are still in the emerging phase of the lifecycle, and are growing from smaller bases in terms of the number of startups. These sub-sectors have shares of 0.6 percent to 1.5 percent in all global startups as estimated from the data. Artificial Intelligence, Big Data & Analytics, meanwhile, is also growing strongly, but the sub-sector is much bigger and closer to the mature phase, with 5 percent of all global startups. Digging deeper into this sub-sector, it becomes apparent that AI companies are driving growth.

Mature Sub-Sectors

- Biotech
- Health and Life Sciences
- Fintech
- Cybersecurity
- Cleantech
- Edtech

Startup Sub-Sectors in the mature phase are relatively large in size and some of the biggest value creators globally. Because global startup ecosystems are growing worldwide, mature sub-sectors continue to experience growth. Some geographies (e.g., Edtech in Asia) and segments (e.g., crypto-related Fintech) within a sub-sector may be growing faster than the aggregate mature sub-sector.

Decline Sub-Sectors

- Adtech
- Gaming
- Digital Media

Startup Sub-Sectors in the Decline phase are those that are experiencing negative growth in Early Stage Funding deals, even though exits may still be increasing. In addition, because overall venture capital is growing globally and just hit a decade high of over \$140 billion worldwide in 2017, some of these sub-sectors may still have strong investments and exciting startups, despite the fact that they are underperforming compared to others. Like Mature Sub-Sectors, Decline Sub-Sectors may be still be growing in certain parts of the world. For example, Asia has a lot of activity in Adtech despite the slowdown in much of Europe and North America. Of course, at any time new technologies can renew a sub-sector and take it to the Growth Phase again. For example, while activity for Adtech is declining, new channels like Virtual Reality and Augmented Reality can infuse new energy and growth. Similarly, specific segments of these sub-sectors may still be growing.

East vs. West: The Rise of China and Diminishing U.S. Dominance

A major way we see the map of entrepreneurship changing globally with new hubs of excellence is

the increase of activity in Asia and the decline of U.S. preeminence. The United States and Silicon Valley are still the top value creators in the global startup ecosystem but their dominance is not as sharp as it once was. For the past six years, the share of funding going to Asia-Pacific countries grew, while the U.S. share declined. In 2017, VC funding for startups in the United States compared to the Asia-Pacific region were even, with each accounting for 42 percent of investment value. The USA is still a bit ahead but China is the primary growth driver in this shift. In 2014, only 13.9 percent of current unicorns were from China. In 2017 and 2018 so far, that number has grown to 35 percent while for the United States it has decreased from 61.1 percent to 41.3 percent (GSER, 2018).

Indian Startup Ecosystem: Announcing Its Enormity to the World

According to a report released by Startupblink, a global startup ecosystem map with tens of thousands of registered startups, coworking spaces, and accelerators, the Indian startup ecosystem is ranked at number 37 and the global ranking of its top three cities are Bengaluru, New Delhi, and Mumbai for the year 2018. Interestingly, India ranks below Latin American countries Mexico (30th) and Chile (33rd). Its neighbours, China (12th), Singapore (10th), South Korea (17th), and Japan (20th), are in the top 20 list (Menon, 2018). 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). Indian unicorn list is expected to add 10 more businesses by the end of 2020. India has recorded a jump of 23 positions against its rank of 100 in 2017 to be placed now at 77th rank among 190 countries assessed by the World Bank. India's leap of 23 ranks in the Ease of Doing Business ranking is significant considering that last year India had improved its rank by 30 places, a rare feat for any large and diverse country of the size of India (Anonymous, 2018g).

This indicates the flurry of new Startups and innovations that has been going on in India in recent years. The Indian start-up ecosystem has evolved, being driven by factors such as growth in number of funds/angels, evolving technology, higher smart phone and social media penetration, growth in incubators and accelerators and younger demographics. India's rank indicates that more has to be done in terms of ease of doing business, startup policies, and complicated tax compliance. The Indian startup ecosystem is also yet to see major exits which is seen as important measure to gauge the maturity of a startup ecosystem.

The Ecosystem Analysis

The idea is not to criticize but to introspect and analyze the startup ecosystem of India. India is way behind in numbers when compared to other leading countries. Moreover, there's no system in place to gauge the quality and competency of the startup ventures in India. Young startups,

perhaps need guidance, direction and exposure more than financial support. While funding is an important aspect, pro-active government policies and private players have to step in to create a more sustainable environment for start-ups. But first let us define Startup according to Government of India (Anonymous, 2019b).

An entity shall be considered as a **“STARTUP”** when it fulfills the following criteria as mentioned below:

-  Upto a period of ten years from the date of incorporation/registration or upto ten years in case of Biotechnology sector
-  Incorporated as either a Private Limited Comany or a Registered Partnership Firm or a Limited Liability Partnership
-  With an annual turnover not exceeding Rs. 100 crore for any of the finanacial years since incorporation /registration
-  Entity should not have been formed by splitting up or reconstruction of a business already in existence
-  Working towards innovation, development or improvement of products or processes or services, or if it is a scalable business model with a high potential or employment generation or wealth creation

Startup Landscape in India

India’s startup ecosystem has become a talking point for the entire world. With hundreds of innovative youngsters choosing to pursue the path of entrepreneurship instead of joining the multinational corporations and government ventures, the business world has witnessed an explosion of ground-breaking startups providing solutions to the real problems at a mass level in the past years (Pasquier, 2015). While India observed a slowdown in 2017 when only 1,000 tech startups were added to the system, the nation caught up in 2018 with the inclusion of 1,200 new tech ventures. Adoption of advanced technology in B2B startups and improving support structures are driving growth in the Indian Tech Startup ecosystem. India, today, proudly stands as the third largest startup ecosystem in the world after the United Nations and the United Kingdom with a total of 7,700 tech startups in 2018. According to the Inc42 ‘The State of Indian Startup Ecosystem 2018’, India currently has more than 49,000+ startups, 1500+ investors, 250+ incubators, and 26 unicorns (NASSCOM, 2018a; Inc42, 2018a; Srivastav, 2018).

Growth drivers for the boom in startup ecosystem

- 8.2 percent YoY growth rate in Q2 of 2018 proving India is world's fastest growing major economy.
- Presence of approx. 500 Mn internet users in India for the year 2018 is more than the population of USA.
- More than 100 percent YoY increase in total startup funding (Jan-Sep) depicting increased growth stage funding in 2018 especially beyond Series C funding.

Key Trends of Indian Startup Ecosystem

- Indian Tech Startup ecosystem is witnessing 50 percent YoY increase in Advanced Tech startups in the year 2018. New Startups providing solution with the implementation of AI/ML, IoT, AR/VR, Blockchain and 3D printing have emerged in last 1-2 years.
- Indian Startups are focusing more on B2B solutions which is evident from the rising percentage of B2B startups which now share 43 percent of total tech startups in 2018 compared to 40 percent in 2017.
- Digital transformations of every sector encouraged by GoI is driving growth of B2B startups and solutions.
- There has been tremendous upsurge in growth stage funding in 2018 which has almost doubled from 2017. The growth in late stage funding has resulted in 8 Indian startups becoming unicorns in 2018.
- The startup support structures has also showed promising growth in recent years with an 11 percent YoY growth in Incubators/Accelerators. India Startup Ecosystem has also gone way ahead in establishing 14+International Startup exchange missions, 75 percent out of which were incepted in last two years from 2016-18 (NASSCOM, 2018a; Inc42, 2018a, 2018b).

Vertical Analysis of Indian Startup Ecosystem Landscape

Enterprise Software, FinTech, Marketplace and HealthTech together comprise of ~50% of total Tech Startups. It is evident from the chart below that the maximum share of the total Tech startups in the year 2018 was held by Others sector. Others included Automotive, Travel, Media & Entertainment, Adtech, Real Estate, gaming, Security, etc. Enterprises are increasingly looking for digital solutions to their enterprise problems, and Indian start-ups are tapping into this market. In 2017 and 2018, the no. of FinTech startups incepted have been more than the no. of Enterprise Software startups.

It is to be noted that the Enterprise Software sector shows a high growth rate pertaining to growth drivers such as horizontal and vertical SaaS based startups solving enterprise problems. Government of India push on financial inclusion and innovative tech solutions accelerating the pace of payments, lending and banking has provide a high growth rate for startups in the FinTech sector. Marketplace and EdTech startups are experienced a medium growth rate in 2018. But increase in internet penetration in the Indian population (~500 Mn users) has paved for better infrastructure regarding

digital transactions. While increasing adoption of technology among the young population usually below 29 years of age is pushing the EdTech sector to come up with innovations solutions for the end users. Others sector which includes Automotive, Travel, Media & Entertainment, Adtech, Real Estate, gaming, Security, etc. has also witnessed a growth due to rapid increase in consumer software, more travel and tourism and increasing demand in the field of media & entertainment (NASSCOM, 2018a).

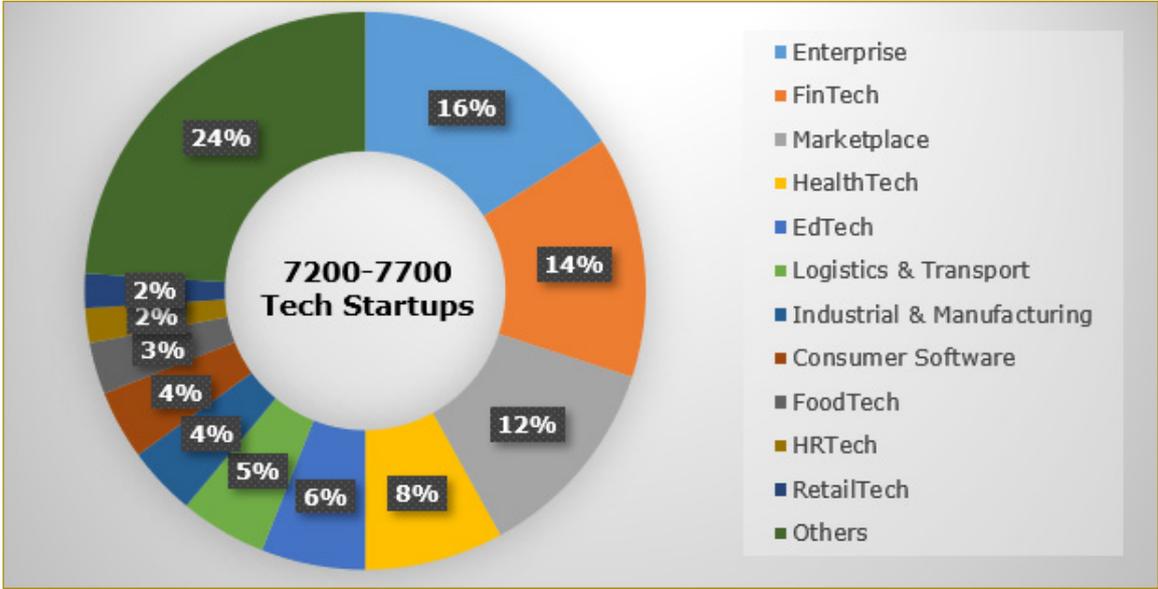


Fig. 4: Distribution of Startups in Indian Ecosystem 2018, By Industry (NASSCOM, 2018a)

India’s Performance in Advanced Tech

Artificial Intelligence, Data Analytics and IoT are witnessing fastest adoption across Industry verticals. There has been a 120 percent increase in YoY funding growth for AI Start-ups in 2018 (Over \$150 Mn invested). Also an increase of 500 percent YoY (\$2 Mn to \$11 Mn) growth was witnessed for Blockchain funding (though on a smaller base).

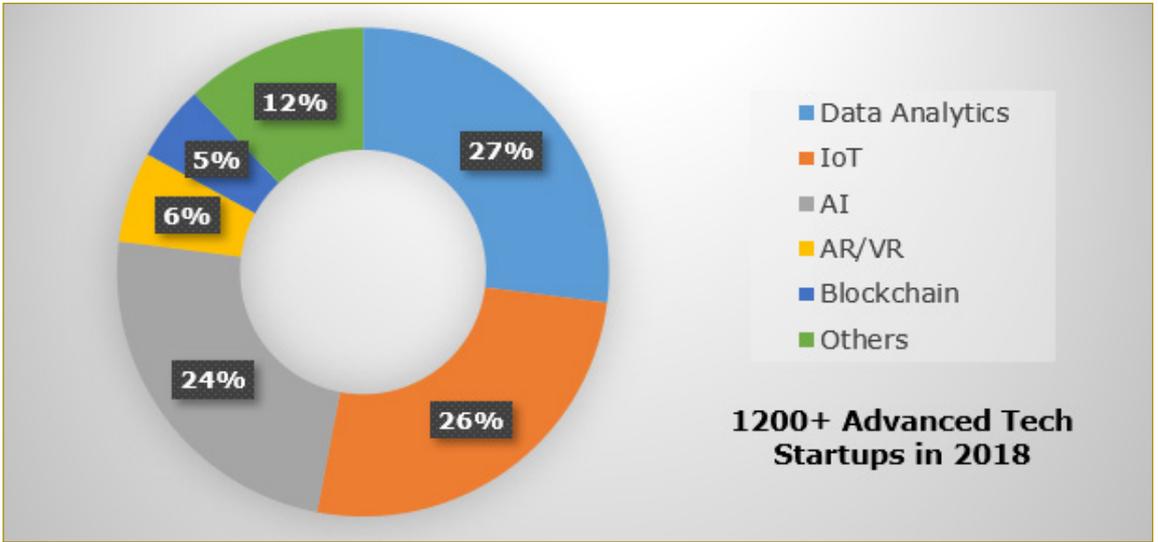


Fig. 5: Distribution of Startups in Indian Ecosystem 2018, by Advanced Tech (NASSCOM, 2018a)

Advanced Technology startup pool is expanding rapidly at 40 percent CAGR since 2013. The 5 year CAGR analysis revealed that the number of startups in Data Analytics increased by 18-20 percent performing in key sectors such as Enterprise, FinTech and RetailTech. Key sectors such as Fintech, Enterprise and AgTech witnessed an increase more than 100 percent in startup working in Blockchain as revealed by 5 year CAGR conducted by Zinnov CoNXT Research & Analysis. IoT segment showed a growth of 15- percent usually in the Industrial, Home Automation and HealthTech sectors. While AI showed a growth of 54-58 percent in the Enterprise, FinTech and HealthTech sector. AR/VR tech showed a growth of 26-28 percent in the EdTech, RetailTech and Real Estate sector.

Key Locations of Startup Hubs in India

Bengaluru, Delhi NCR and Mumbai continue to remain primary Tech Startup hubs. These three constitute for 25 percent, 21 percent and 14 percent presence of all the tech startups in India. According to GSER, 2018, Bengaluru is traditionally home to the Indian headquarters of many global technology companies. Driven by its large talent pool, Bengaluru is also the number one hotspot for Indian entrepreneurs to start and scale their company. Bengaluru thrives on a high cost efficiency for engineers. However, it's not cost benefits that capture Bengaluru's key competitive advantage, it is its engineering prowess. 94 percent of Bengaluru-based founders have a technical background, the highest rate in the world. The ecosystem has been maturing, led by Unicorns like Flipkart, Inmobi and Ola.

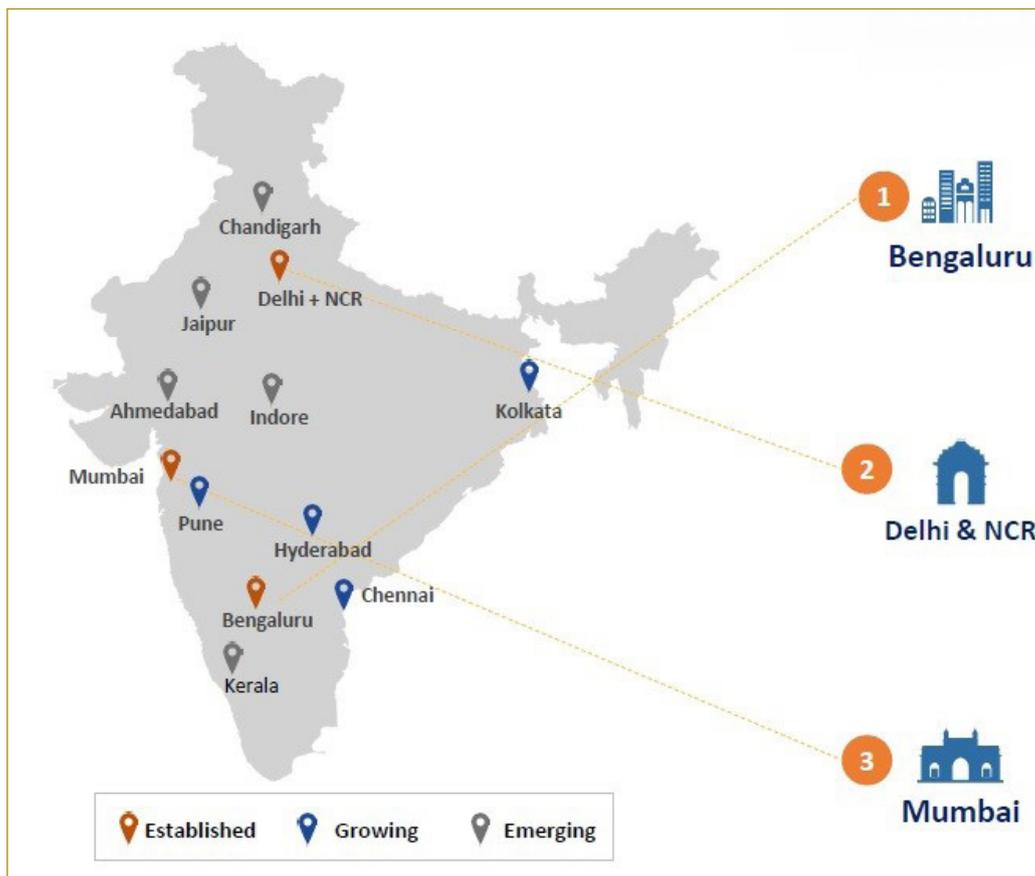


Fig. 6: Key Locations of Startup Hubs in India (NASSCOM, 2018a)

Table 4: Key Trends and Growth Drivers of the Tech Startup Hubs

Established Hubs (More than 10% of total Startups in India)		
	Bengaluru	<ul style="list-style-type: none"> Home to some of the country's biggest technology companies (100+ MNCs), Bengaluru has a ripe pool of technology talent Ranks among top 3 cities globally for launch of tech startups High density of entrepreneurs and investors attracts budding entrepreneurs
	Delhi & NCR	<ul style="list-style-type: none"> Strong presence of startup incubators/accelerators run by Corporates, Govt., Educational institutions, and Venture capitalists Growth of Gurgaon and Noida as startup hubs has put Delhi NCR on the startup map of India
	Mumbai	<ul style="list-style-type: none"> Financial, commercial and entertainment capital of India Advantage of a huge consumer base In a few verticals like FinTech, Media & Entertainment, FoodTech, and Travel, Mumbai is competing with established hubs like Bangalore and Delhi NCR for the top spot
Growing Hubs (More than 2% of total Startups in India)		
	Hyderabad	<ul style="list-style-type: none"> T-Hub & RICH (Research & Innovation Circle of Hyderabad) are playing a crucial role in strengthening Hyderabad's position as a startup hub
	Chennai	<ul style="list-style-type: none"> Chennai has evolved as the SaaS hub of the country with companies like Zoho & Freshworks becoming successful
	Pune	<ul style="list-style-type: none"> Presence of good engineering & management schools supported by emerging IT infrastructure is driving growth start-ups in the city
	Kolkata	<ul style="list-style-type: none"> Govt. supported incubators, IIM-C Innovation Park, and Calcutta Angel's Network (CAN) are some of the driving forces for startup growth in the city
Emerging Hubs (Less than 2% of total Startups in India)		
	Kerala	<ul style="list-style-type: none"> With government-led initiatives like Kerala Startup Mission, Kerala Technology innovation Zone, the startup ecosystem in the city is growing fast
	Jaipur	<ul style="list-style-type: none"> Rajasthan Govt. announced a framework for a Rs. 500 crore start-up fund in 2018, with a special focus on "Women Start-up" and "Green Startups"
	Chandigarh	<ul style="list-style-type: none"> Presence of many educational institutions, investors, and good infrastructure is driving the growth of start-ups in the city

Source: NASSCOM, 2018a; Inc42, 2018a, 2018b

Indian Tech Startup Funding

The Indian tech startups raised about \$13.5 Bn in funding across 885 deals in 2017. The amount invested in 2017 is almost 3 times than what it was in 2016, while the number of deals reduced by 7.14 percent. However, if we remove the top fundings of 2017 including the near billion dollar cheques infused in the Indian startups like – Flipkart (\$4 Bn across two rounds), Paytm (\$1.4 Bn), Ola (\$1.1 Bn) and Phonepe (\$500 Mn), the funding amount falls down to \$6.46 Bn which is technically a rise of 38 percent in comparison to the funding raised in 2016.

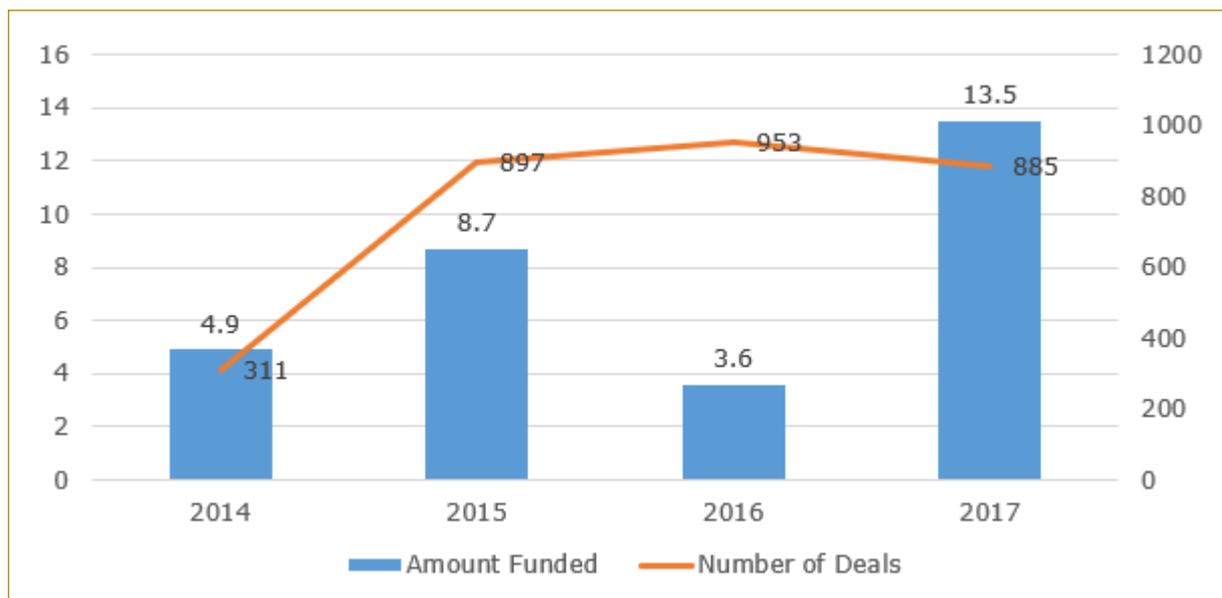


Fig. 7: YoY Deals and Amount of Indian Startup Funding (Inc42, 2018b), Amount is in Billion dollars

The data presented in Figure clearly reveals that 2017 performed exceptionally well for Indian Startup funding. With 885 number of deals, Indian Startup Ecosystem was able to raise a whopping \$13.5 Bn in funding. Although when compared to the previous year of 2016, the number of deals were 953 but the Indian tech startups were only able to raise \$4.6 Bn in funding.

Before we delve further into this, let's take a quick look at the key highlights from the Indian Startup Funding in 2017.

- Total Number Of Deals: 885
- Total Funding Raised: \$13.5 Bn
- Startup Funded Each Day: 2
- City With Maximum Number of Deals: Bengaluru
- Sector With Maximum Number of Deals: FinTech
- Total Number of Investors Participated: 1078
- Total Number of M&As Reported: 133
- Total Number of New Funds Announced: 34

As per Inc42 Datalabs, since 2014, Indian tech startups have raised over \$32.2 Bn across 3,048 deals. Interestingly, out of the total funding, about 42 percent of the funding was raised in 2017 alone. An imperative finding which we got by delving into the startup funding data of the past four years is that there was a significant dip in the amount per deal (avg. ticket size) in 2015 and 2016, however, in 2017, things came slightly closer to what it was in 2014. While, in 2014, the average amount per deal was \$15.8 Mn, it fell to \$10.2 Mn and \$4.9 Mn in 2015 and 2016 respectively. However, in 2017, the average amount per deal touched \$15.2 Mn, which is still less than 2014 (Inc42, 2018b).

Sector wise Breakdown

In terms of sectors, enterprise tech took the first spot. The segment raised a combined funding of \$531 Mn across 131 deals. The second stage was taken up by the healthtech sector which secured over 111 deals, a rise of 35 percent in comparison to 2016. The healthtech sector was closely followed by the Fintech sector – which secured 111 deals in 2017, a 21 percent rise in comparison to 2016. Surprisingly, hyperlocal and ecommerce took the fourth and fifth spot with 99 and 79 deals respectively. Coming to the top sectors based on the total funding amount being raised, as expected, ecommerce leads the charts here with over \$4.6 Bn being invested, followed by Fintech which secured \$3.01 Bn in total funding. The third spot was taken up by the transport tech which secured an amount of \$1.65 Bn in funding across 37 deals. Followed by the online travel and enterprise tech which reported a total funding of \$796 Mn and \$531 Mn respectively (Inc42, 2018b).

Geography Breakdown

Smoothly perched on the top position, Bengaluru scored 366 deals in 2017 followed by Delhi/NCR raking up a total of 223 deals. Other major cities such as Mumbai, Hyderabad and Pune took the third, fourth and the fifth rank respectively. Even in terms of the total funding being raised for startups, Bengaluru tops the chart with an outstanding figure of \$7.5 Bn funding. The second and third spots in the chart were taken up by Delhi with a total investment of \$4.3 Bn and Mumbai with \$582 Mn. Besides these top three cities, other major cities such as Hyderabad, Chennai, Pune and Kolkata are also gearing up and appear to be quite on track to become good startup hubs for startups in the country. As far as Tier II and Tier III cities are concerned, the funding for these cities fell down by 46 percent with just 28 deals in comparison to 2016. However, the average ticket size for these startups showed some good insights, it stood at \$10 Mn in 2017 which is a rise by 1,000 percent (Inc42, 2018b).

Growth of Unicorns in India

India has the highest number of unicorn startups after US and China with 26 unicorns out of 250+ total unicorns globally. 8 Indian start-ups turned Unicorn in 2018 (till Sep.), highest addition in a single calendar year. The Indian unicorn list is expected to add 10+ members by 2020. Some of the prominent names are Druva, Rivigo, Big Basket, Delhivery, Mobikwik and Practo (NASSCOM, 2018a; Inc42, 2018a).

A "Unicorn" Startup is a privately held startup company valued at over \$1 billion.

Table 5: Growth of unicorn startups in India (2014-18)

2014	2015	2016	2017	2018	2019 (E)
Snapdeal YoI: 2010	PayTM YoI: 2010	Hike YoI: 2012	ReNew Power YoI: 2011	Udaan YoI: 2016	Druva YoI: 2014
Ola YoI: 2010	Quikr YoI: 2008	Shopclues YoI: 2011		Swiggy YoI: 2014	Big Basket YoI: 2011
Immobi YoI: 2007				Zomato YoI: 2008	Delhivery YoI: 2009
				OYO YoI: 2013	MobiKwik YoI: 2009
				Freshworks YoI: 2010	Practo YoI: 2008
				PayTM Mall YoI: 2010	BillDesk YoI: 2000
				Policy Bazaar YoI: 2008	Rivigo YoI: 2017
				BYJU YoI: 2008	



2018 has been a landmark year for growth of Unicorns in India

Udaan: The Fastest Startup in India to become a Unicorn

B2B e-commerce startup Udaan has just touched a valuation of \$1 billion (Rs. 7,000 crore). Udaan reached the milestone after a fundraise of \$225 million from Russian billionaire Yuri Milner and Lightspeed Global Growth. It had raised \$50 million in series B funding in February 2018. While it got the Series A funding back in November of 2016. Udaan is a web platform that connects small businesses with wholesalers and manufacturers, traders, and retailers. It currently has a presence in two categories, mobile accessories and fashion products, and is looking to expand its portfolio. The company has a seller base in over 80 cities and delivers to more than 500 cities. More remarkably, Udaan is now the fastest Indian startup to become a unicorn in just 26 months which was only founded in 2016. Udaan was founded by three high-ranking former Flipkart employees — Sujeet Kumar was the President of Operations at Flipkart, Amod Malviya was Flipkart's Chief Technology Officer, and Vaibhav Gupta had been Flipkart's SVP of Business and Analytics before they quit to launch Udaan. Udaan's business model of providing a B2B ecommerce platform for manufacturers to sell directly to shop owners and merchants is seeing increasing competition from the likes of Amazon Business, Metro Cash & Carry, Walmart and Alibaba.

(Source: OfficeChai, 2018; Bansal and Chanchani, 2018)

Incubators and Accelerators: Startup Ecosystem Enablers

As India matures to become a start-up hub, Incubators/Accelerators (I/As) play an important role in this growth by providing mentorship, nurturing ideas, providing technical support, generating funds and thus, helping acquire new customers. While incubators provide support across the life cycle, accelerators are more focused on 'Growth & Acceleration' stage (NASSCOM, 2017). Incubators and Accelerators are the crucial support centres of the start-up ecosystem. Incubators are responsible for providing support across a startup's life cycle, while accelerators are focused more towards growth and acceleration of the startup. A typical duration for an Incubator program is 6-36 months while for an Accelerator program it is 3-12 months. The incubators and accelerators are currently technology-driven, and seem to be industry agnostic. I/As can be broadly classified into four categories: Corporate, Independent, Academic, and Government-supported. Corporate and Independent mostly work on accelerator model, whereas Academic and Government-supported have an incubator-like model (Rao, 2018; Navani, 2018).

I/As Landscape in Indian Startup Ecosystem: Quick Facts

- As per the data compiled within DIPP, as of November, 2018, India has over 270 incubators and accelerators managed by academic institutes, corporates, private players and Government. Majority of these incubators are supported by Central and State Governments through capital and operational grants under several schemes.
- Corporate and Govt. supported Incubators/Accelerators have grown significantly
- Advanced tech. is the emerging focus area with most of the new Incubators/Accelerators focusing in AI, IoT, AR/VR, etc.
- ~38 percent of Incubators/Accelerators are based out of Tier 2/3 cities
- ~60 percent+ Incubators and Accelerators focusing on deeper technologies
- I/As solving India centric problems-Across sectors such as agriculture, healthcare, education, and banking
- Bengaluru, NCR, and Mumbai continue to be the leading hubs, with 40 percent+ incubators/accelerators
- Corporate Accelerators seeing growth of ~35 percent YoY
- In the past 3-5 years, many large multinationals have set up incubator and accelerator programs. Corporates are seeking the latest in innovation and offering technical expertise to take Startup solutions to the next level.
- Large corporates have collaborated with Government and academia at T-Hub, Hyderabad. International and Indian Corporates also run their dedicated incubator and accelerator programs in India (NASSCOM, 2017).

Table 6: Incubators/Accelerators by Type

	Corporate	Private	Academic	Govt. Sponsored
Number of I/As	50+	50+	95+	20+
Proportions of I/As	~80% are Accelerators	~62% are Accelerators	~97% are Incubators	~82% are Incubators
Physical Support	<ul style="list-style-type: none"> • Shared Resources • Cloud Support • Developer Tools • APIs 		<ul style="list-style-type: none"> • Dedicated Office Space • Hi-speed internet • Research Labs & Library Access 	
Networking Support	<ul style="list-style-type: none"> • Investor Connect • Customer Showcase Opportunity • VC Sessions • Road shows 		<ul style="list-style-type: none"> • Start-up Boot Camps • Investor Networking & Pitching Sessions • eSummits (attended by CEOs, investors, startup founders) 	
Mentorship Support	<ul style="list-style-type: none"> • Business Leader Mentorship • Corporate Support • CEO Coaching 		<ul style="list-style-type: none"> • Alumni Mentorship • Faculty and Industry Advisor Support • Technical & Leadership Training 	
Focus Areas	<ul style="list-style-type: none"> • Technology: AI/ML, Big Data Analytics, Cloud • Verticals: EdTech, FinTech, HealthTech, AdTech, RetailTech • Segments: B2B and B2C 		<ul style="list-style-type: none"> • Technology: Analytics, 3D Printing, IoT, AI/ML • Verticals: Manufacturing, HiTech, HealthTech, Energy • Segments: B2B 	
Duration	3-12 months		6-36 months	
Famous I/As in segment	Cisco Esselerator	Govin Neoleap	IIIT, Hyderabad IIT, Bombay	C-CAMP NSIC

Source: NASSCOM, 2017; NASSCOM, 2018a

Note: List of active Incubators/Accelerators in India is presented in Appendix I and Appendix II

Government Initiatives and Policies to Promote Startup Ecosystem in India

India has been very active in creating a healthy startup ecosystem, and the growth in the number of startups is increasing year on year. In fact, it is among the top five startup communities in the world. The Government of India decided to boost the startup ecosystem in the country and help India become a nation of job creators rather than job seekers. The Government through various initiatives and policies aims to empower startups to grow through innovation and design and to accelerate spreading of the startup movement. National start-up policies have started to show on-ground impact. Multiple enabling policies have been implemented to support startups, their early take off and successful operations (Startup India, 2019a). Illustrative examples of some policy intervention of the Government of India is shown below.

Startup India



ATAL INNOVATION MISSION



New Generation Innovation and Entrepreneurship Development Centre



MAKE IN INDIA



Biotechnology Industry Research Assistance Council (BIRAC)



SFAC Venture Capital Assistance



The salient features of important policy interventions are provided in Appendix III

Collaboration with International Giants to Boost Indian Startup Ecosystem

One of the key objectives undertaken by the Government of India through its flagship Startup India program is to help connect Indian Startup ecosystems to global Startup ecosystems through various engagement models (Startup India, 2019b). Key international partnerships have been executed by Startup India and their benefits are described below.

Indo-Israel Innovation Bridge

Israel-India Innovation Bridge is a tech platform to facilitate bilateral co-operation between Indian and Israeli Startups, tech hubs, corporations and other key innovation ecosystem players. The Innovation Bridge is housed in the Startup India Portal. During 2017, the partnership resulted into a bilateral innovation challenge inviting Israeli and Indian Startups to combine forces to develop solutions for critical problems in the field of agriculture, water and digital health. Within each of these areas, two problems statements were presented to innovators. 18 Startups were selected as winners and they received mentorship and incubation support apart from cash prizes of up to INR 2 - 5 lacs



India Singapore Entrepreneurship Bridge

India Singapore Entrepreneurship Bridge is a digital platform to enable Startups, investors and aspiring entrepreneurs of both countries to connect with one another with the focus on:

- Knowledge exchange,
- Networking opportunities, and
- Capacity building

The first initiative was the ASEAN India Grand Challenge to support ASEAN Startups with a commercially viable solution to solve India's priority sectors through a market access program in 5 States of India. The themes for the challenge are as follows:

- IoT for smart cities
- Financial technology & financial inclusion
- Renewable energy
- Agriculture & rural development
- Digital health & Clean India



India Portugal Startup Hub (IPSH)

IPSH will enable Startups, investors, incubators and aspiring entrepreneurs of both countries to connect with one another and provide them with resources to become global Startups.



Sweden-India Startup Sambandh Hub

The digital platform focuses on deepening engagement among stakeholders in both ecosystems. It will provide favorable business environment and necessary guidance to Startups from both the countries for sustainable growth of their businesses.



Indo-Dutch #StartUpLink

The Indo-Dutch Startup Link will act as a one stop platform for Startups from India and Netherlands. The initiative will enable Startups, investors, incubators and aspiring entrepreneurs of both countries to connect with one another, facilitate knowledge exchange, and provide pilot opportunities for Startups. Startup India Hub and Netherlands Enterprise Agency would act as single points of contact for their respective countries. The initiative will assist Startups through their lifecycle with specific focus on aspects like funding, market expansion, feasibility testing, business structuring advisory, enhancement of marketing skills, and technology commercialization.



Japan India Startup Hub

The Japan India Startup Hub is an online platform to bridge the gap between Indian & Japanese startup ecosystems and enable meaningful synergies to promote joint innovation in both economies. The Hub was conceptualized as part of a joint statement signed between the Ministry of Economy, Trade, & Industry (Japan) and Ministry of Commerce & Industry (India) on 1st May 2018. The Hub will enable collaborations between startups, investors, incubators, & aspiring entrepreneurs of both countries and provide them requisite resources for market entry & global expansion.



India Korea Startup Hub

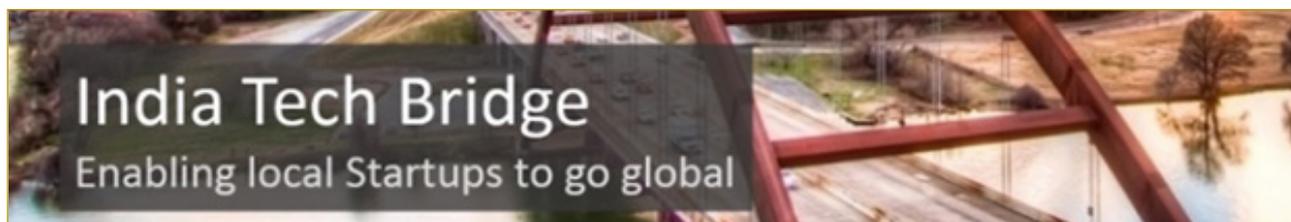
The India-Korea Startup Hub is a one-stop platform to bring the Indian and Korean start-up ecosystems closer and to facilitate joint innovation between the two economies. The Hub was conceptualized as part of a joint statement signed between the Korea Trade-Investment Promotion Agency (KOTRA) and Invest India on 9th July 2018. The Hub will enable collaborations between startups, investors, incubators, & aspiring entrepreneurs of both countries and provide them requisite resources for market entry & global expansion.



India Tech-Bridge

The India Tech-Bridge will bring together Indian and American entrepreneurs by helping them seamlessly transition to a US presence. The main focus of the program lies in the go-to-market

process in the US and providing end to end facilitation for the shortlisted startups. Invest India along with International Accelerator has entered into a strategic alliance to help Indian startups and entrepreneurs succeed by connecting them with the best "in-class incubation support" in India, followed by a go-to-market acceleration program in the US along with support from regional industry leaders, mentors as well as accelerators.



AgriTech Startups: Redefining Indian Agriculture through Technology Solution

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). Agriculture is a crucial sector of our economy and the demand for agricultural products is never expected to reduce.

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?

To answer the first question, several countries like Israel, China and the US have transformed

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).



Fig. 8: Agritech startup opportunities in Indian agriculture (Kaalari, 2018)

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.

AgriTech is the idea of applying modern technologies to the agricultural sector with a view to enhance produce, efficiency and revenue. The concept extends to any applications, practices, products and services that enhance any aspect of the agricultural process, be it an input function or the output received.

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). The major aspects of an agricultural value chain that is affected by technology intervention requirement are:

Table 7: Scope of technology intervention in agricultural value chain

Value Chain Stage	Technology Intervention required
Inputs / Knowledge	<ul style="list-style-type: none"> • Getting agriculture inputs directly on phone • Weather forecast through weather apps • Decision support solution for farmers like selling crops at appropriate rates • Pest Management Solution and Nutritional Management Solution • AI based sowing advisories
Harvesting and Transport	<ul style="list-style-type: none"> • GSM Mobile controlled motor • Hi tech irrigation systems like drip, sprinkler etc. • Auto Steering Tractors powered by GPS • Crop Counting Machines • Machine-learning algorithms to differentiate between weeds and crops
Processing and Storage	<ul style="list-style-type: none"> • Machine based Imaging technology to sort based on color, size, type etc. • Wireless sensor to monitor crops connected with smartphone • Measuring grains moisture content
Distribution, Packaging and Handling	<ul style="list-style-type: none"> • Web and mobile applications to sell directly farm products • Price forecasting model to prevent inflation • Dynamic product pricing • Online marketplace for grain • Using data to track

Source: NASSCOM, 2018a

The technology solutions for most issues in agriculture are present but the challenge is for these solutions to reach every farmer in a larger scale and not just only one farmer.

Status and Sectoral Presence of Agritech Startups in India

Agritech startups globally 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 was 3.23 billion USD. India continued to be among the top six countries globally, with the highest number of deals in agricultural technology. In 2016, within global investments, Indian agritech startup firms contributed around 9 percent, valued at 313 million USD which was raised by 53 startups. By 2017, this had increased to \$10.1 billion for agri food-tech startups, spanning across 994 deals from 1,487 unique investors, clocking 29 per cent YoY growth. Of this, \$2.6 billion went into agritech alone. Nationally, the focus of agritech startups hovers around the following key sub-sectors:

Table 8: Key areas for startups in agricultural activities

Sub-Sectors	Key areas for startups
Supply Chain	<ul style="list-style-type: none"> • E-Distributor • Listing Platform • Marketplace
Infrastructure	<ul style="list-style-type: none"> • Growing Systems & Components • Aquaponics • Hydroponics • Drip Irrigation
Finance	<ul style="list-style-type: none"> • Payments • Revenue Sharing • Lending
Farm Data and Analytics	<ul style="list-style-type: none"> • Integrated Platform • Remote Sensing • Software Platforms • Farm Mapping • Farm Management Solution • Field Operations
Information Platform	<ul style="list-style-type: none"> • Information Dissemination

Source: FICCI, 2018

Startup Scenario in India

With 350+ Agritech startups in India, many startups are now targeting for breakeven point as the investors show continuous interest for further rounds of funding. According to NASSCOM, more than half (59%) of the investor funding rounds that took place from 2013-17 was focused on startups in

seed stage. It was followed by early stage which occupied 32 percent of the investor funding rounds. A small percentage of 9 percent of the funding rounds was covered by the startups in the growth stage. It was concluded that more than 90 percent of funding was focused on seed stage and early stage startups which increases focus on quality and scale up.

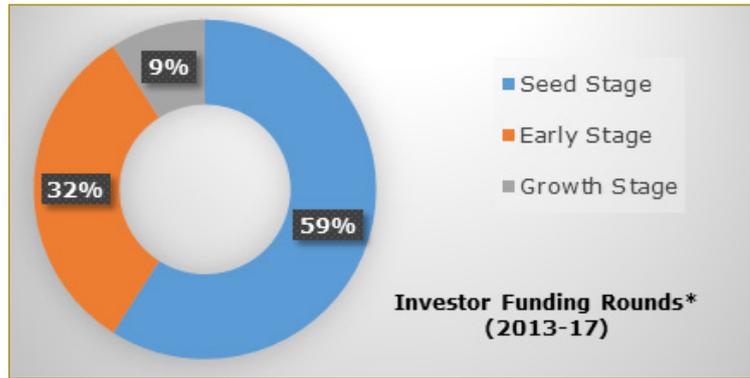


Fig. 9: Distribution of Agritech startups according to investor funding rounds (NASSCOM, 2018ab) *Seed Stage <\$1 Mn, Early Stage \$1-5 Mn, Growth Stage \$5-20 Mn

Increasing Number of Agritech Startups

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

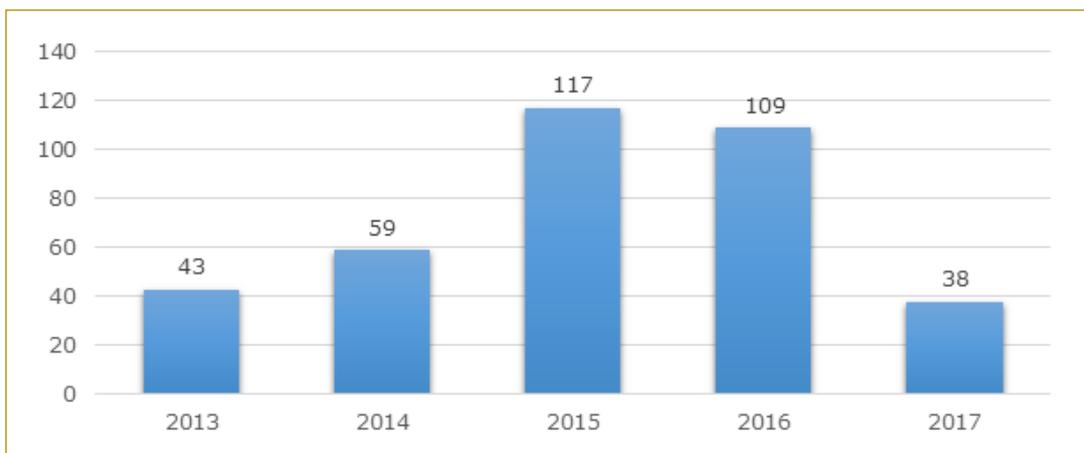


Fig. 10: Number of Agritech Startups (2013-17), Source: Traxcn Data; NASSCOM, 2018b.

A total of 366 agri-based startups have come up from 2013 to 2017. The perusal of data presented in the Figure revealed that the year 2015 saw the maximum number of startups (117 Nos.) getting started. It was followed by 2016 which also presented a good number of startups (109 Nos.) getting started to answer the concerns associated with Indian agriculture. 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.

Key Indian States Focusing on Agritech Startups

Looking at the geographical distribution, Karnataka and Maharashtra together account for almost 50 percent of the total agritech start-ups opened in the past 5 years. As we have learned earlier from

the analysis of Indian Startup Ecosystem Bengaluru (Karnataka) is one of the established startup ecosystem hub in India along with Mumbai and Delhi & NCR.

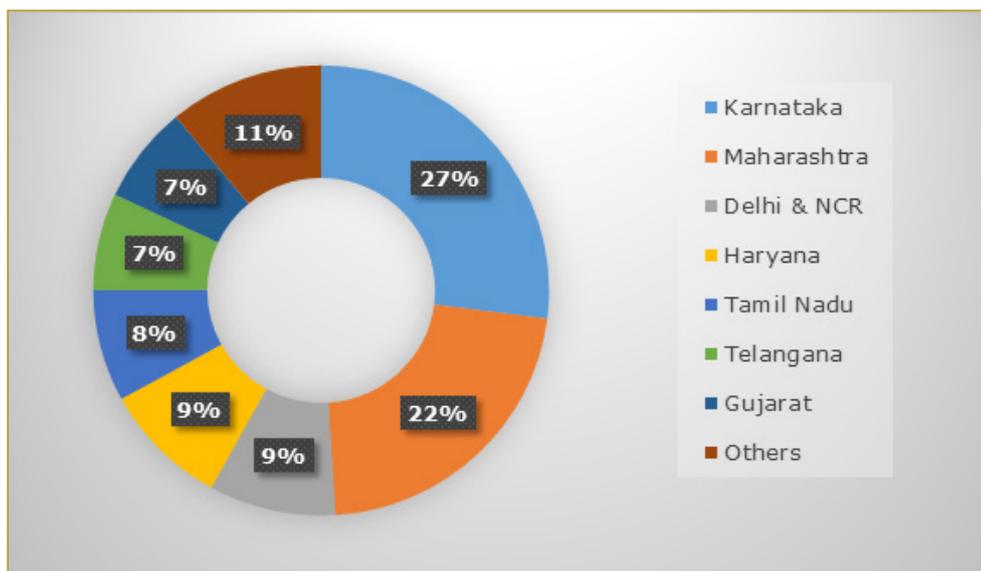


Fig. 11: Key Indian States Focusing on Agritech Startups (NASSCOM, 2018b)

Same trends can be noticed in the area of agritech startups where the three established ecosystem hubs are leading the charts with more than 50 percent of startups established in India. The major three states are followed by Haryana (8%), Tamil Nadu (7%) and Gujarat (7%). It is interesting to note that although Gujarat has only 7 percent of share in agritech startups, it is the “best performing state” in Indian startup ecosystem according to State Startup Ranking Report 2018 published by The Department of Industrial Policy & Promotion (DIPP), Ministry of Commerce, GoI.

The Agritech Startup Ecosystem in India

Institutional Ecosystem for Agritech Startups: Incubators/Accelerators

Enablers such as Incubators/Accelerators are also important partners in the overall Startup ecosystem which supports and accelerates successful development of businesses. It provides array of business services, technology and infrastructure support including office space, mentoring and funding (equity or debt) through grants or investor networking opportunities. Accelerators, incubators and mentors identified for the agritech startup 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), agritech startups are also marred related to people, process and technology. Some successful examples of Incubators/ Accelerators in the agritech chain in India are depicted below. Also a comprehensive list of Incubators/Accelerators present in Indian Startup Ecosystem is provided in Appendix I and II.

Table 9: Some of the key Accelerators and Incubators for agritech sector in India



AGRI UDAAN

AGRI UDAAN is India's 1st Food & Agribusiness accelerator organised by NAARM, a-IDEA and IIM-A, CIIE in partnership with Caspian Impact Investment and supported by DST. The program focuses on catalyzing scale-up stage Food & Agribusiness startups through rigorous mentoring, industry networking and Investor pitching. The impact of AGRI UDAAN includes that 200 agribusiness startups have applied for the accelerator program, 40 startups mentored, end to end capacity for 8 startups in their value chain and 3 out of 8 startups mentored received a total of funding worth ~2.5 Cr INR. Focus Areas includes: Sustainable Inputs, Precision/ Smart Agriculture, Innovative Food Technology, Supply Chain Technology etc. Some shortlisted incubatees from this cohort are Gen Agritech; Delmos Research Pvt Ltd; Agricx; Intello Labs; Smoodies; Jivabhumi; Yukti Harvest; RF Wave technologies; Odaku; Growyi, etc.



Centre for Innovation Incubation and Entrepreneurship (CIIE)

CIIE is a collective of interventions in the space of innovation-driven entrepreneurship in India. It has its genesis at the Centre for Innovation Incubation and Entrepreneurship ("Centre"), IIM Ahmedabad - an academic center focused on research in innovation and entrepreneurship. CIIE continues to support the research and learning undertaken by the Centre. The impact of CIIE includes 500 ventures trained, incubate or accelerated, 3000 jobs generated, 100 startups seed funded and many more. It has launched a food and agri-business accelerator in partnership with a-IDEA - the business incubator at National Academy of Agricultural Research Management (NAARM).



a-IDEA (Association for Innovation Development of Entrepreneurship in Agriculture)

a-IDEA (Association for Innovation Development of Entrepreneurship in Agriculture), is a Technology Business Incubator (TBI) hosted by ICAR-National Academy of Agricultural Research Management, Hyderabad (ICAR-NAARM) & Department of Science & Technology, Govt. of India (DST, GOI). a-IDEA has been housed in the Centre for Agri-Innovation at ICAR-NAARM for fostering innovation and entrepreneurship in agriculture in India. a-IDEA aims to help entrepreneurs ideate, incubate and accelerate their innovative early stage startups that are scalable to become competitive food and agri-business ventures through capacity building, mentoring, networking and advisory support.



International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)

In December 2002, the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), a non-profit organization, joined forces with the Department of Science & Technology (DST), an Indian government agency, to develop an agribusiness incubator (ABI) at ICRISAT. The incubator is supported by DST's National Science and Technology Entrepreneurship Development Board, which promotes the development and commercialization of indigenous technologies by providing financial assistance through public-private partnerships. ICRISAT launched Innovation Hub (iHub) to support agricultural tech entrepreneurs, scientists and technology experts can collaborate to innovate cutting edge ideas across the whole agriculture value chain



T-Hub

The T-Hub is a unique public-private partnership between the government of Telangana, three academic institutes-IIIIT-H, ISB and National Law University, Nalsar and key private sector leaders. These entities have come together with a clear vision to create an innovation ecosystem centered around Hyderabad, leveraging the City's traditional strengths in technology, education and entrepreneurship, as well as its position as a preferred destination for multiple national and international businesses across sectors. T-Hub is designed to support technology-related start-ups, and its mission is to catalyse the creation of one of the tightest and most vibrant entrepreneur communities in the world in order to encourage and fuel more start-up success stories in India.



Agri-Tech Start-up Accelerator CIE, Hyderabad

IIIT-Hyderabad and National Institute of Agricultural Extension Management (MANAGE) have signed an MOU to start an Agri tech startup accelerator programme. The Agri Tech Startup Accelerator Programme will identify, support and facilitate idea-stage enterprises using latest technologies and innovations to solve agriculture specific issues faced in India.

Source: NASSCOM, 2018b; FICCI, 2018

Enabling Government Policies

In India, Central and State governments are playing an active role in Startup ecosystem development. The key objectives of the Government are as follows:

- Spur entrepreneurial activity to accelerate job creation
- Create enabling environment by reducing regulatory burden and introducing new policies
- Build capacity through infrastructure creation and training
- Provide funding support and fiscal incentives
- Facilitate all members of the Startup ecosystem to collaborate and connect

With increased allocations and measures announced towards agriculture sector, rural infrastructure in the Union Budget 2018 was one of the most appropriate ways to provide support to agritech startups working in the area. The continued focus on agricultural sector reform is appreciated, especially the government's effort to integrate rural haats to the eNam and increasing the purview of MSP for comprehensive coverage of agri commodities. The farmers can look forward to better price realization now. Thus, agritech startups that are already working on enabling better farm produce prices for farmers will get greater scope of working with the government to achieve the common goal. Secondly, by doubling the allocation for food processing, the government will further give a thrust to the food processing supply chain and the agritech startups involved in it. Regulations and archaic rules impede the growth of Startups (Goyal, 2018). Government through its ease of doing business initiatives and business friendly policies is creating a conducive regulatory framework for Startups. Recently in October 2018, Indian made a staggering a record 53 rank jump in just two years to reach 77th position in the doing business ranking from World Bank. A comprehensive list of government policies supporting the growth of agritech startups is presented in Appendix.

Agriclinics and Agribusiness Centres: Better Farming by Every Farmer



The Ministry of Agriculture, Government of India, in association with NABARD and MANAGE has launched this unique scheme to take better methods of farming to each and every farmer across the country. This programme aims to tap the expertise available in the large pool of Agriculture Graduates. Irrespective of whether a person is fresh graduate or not, or whether he/she is currently employed or not, they can set up their own AgriClinic or AgriBusiness Centre and offer professional extension services to innumerable farmers. Committed to this programme, the Government is now also providing startup training to graduates in Agriculture, or any subject allied to Agriculture like Horticulture, Sericulture, Veterinary Sciences, Forestry, Dairy, Poultry farming, and Fisheries, etc. Those completing the training can apply for special start-up loans for venture (ACABC, 2019).

MANAGE AC & ABC Incubation Centre: Taking Farming to Next Level



MANAGE Agri Clinics & Agri Business Centre is situated at National Institute of Agricultural Extension Management (MANAGE), Hyderabad. MANAGE has trained nearly 53,544 professionals, of which, approximately 23,246 started their own enterprises through its ACABC scheme (<http://www.agriclinics.net/>). To fast-track growth in these, the institute is taking it to next level by providing them incubation support through the in-house incubation center. MANAGE intends to nurture all interested potential agripreneurs to setup their own enterprise or startups (MANAGE, 2019).

VISION

To enhance the agri-entrepreneurial ecosystem by strengthening the agro-advisory services

MISSION

To provide incubation and business support services to agri-entrepreneurs

To build up the network of partners and associates to support agri-entrepreneurs

Focus Area of MANAGE Incubation Centre

The MANAGE Incubation Centre focuses development of startups in following major areas:

- Agri Input
- ICT in Agriculture
- Animal Husbandry
- Nutrition and Health
- Farmer Service Centre
- Post-Harvest Technology

- Farm Mechanization
- Supply Chain Management
- Fishery
- Warehouse Management

Benefaction of MANAGE Incubation Programme

- Infrastructure
- Capacity Building
- Technical Monitoring
- Business Monitoring
- Regulatory and Advisory Services
- IPR Facilitation
- Networking
- Funding

Startups Incubated at MANAGE Incubation Centre

For more details regarding the MANAGE Incubation Centre please visit <http://www.manage.gov.in/incubation/incubation.asp> or refer to different Incubation Programme Brochure. MANAGE’s Incubation Centre has also released a publication titled “100 Startups by Agripreneurs” which contains an exhaustive list of 100 startups started by agripreneurs under the Agri-Clinics and Agri-Business Centres (AC&ABC) Scheme.



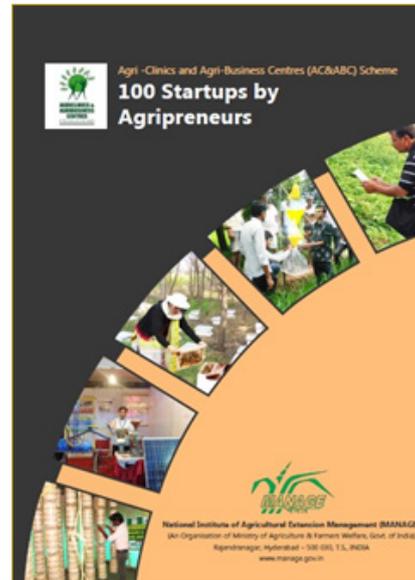
(<http://www.manage.gov.in/incubation/incubation.pdf>)



(<http://www.manage.gov.in/incubation/impulse.pdf>)



(<http://www.manage.gov.in/incubation/krishivikas.pdf>)



(<http://www.manage.gov.in/misc/agri-startup.pdf>)

Agriculture Grand Challenge

In order to promote innovation and entrepreneurship in agriculture, a Grand Challenge was launched. The objective of Agriculture Grand Challenge was to create opportunity for Agritech startups with a commercially viable solution to solve for innovative challenges in Agriculture and to support the technology base by funding and mentoring the best fundamental concepts, while helping talented and creative innovators to pursue promising avenues at the frontier of technology. Ministry of Agriculture, Govt. of India is looking for new concepts & innovations in 12 different areas. The challenge would provide startups with access to priority infrastructure, and make Agriculture an attractive sector for the country's best brains (Startup India, 2019).



How can agri startups benefit?

A joint initiative by Ministry of Agriculture and Startup India Hub, the programme is designed for budding agri entrepreneurs as well as existing agri startup founders. Early-stage startups can apply for the idea stage whereas others can apply for ready-market stage. Twelve startups from each of the early stage, and ready-market stages (24 in total) would be selected to address the 12 themes (key problems) at the programme.

The idea-stage startups will get three-month incubation support to go from idea to prototype, with hand-holding from experts of agriculture sector and real-time testing of proof of concept. The ready-market solutions will get to be part of a three-month market access programme aimed at easy adoption of their innovation, mentoring by domain experts, and easy access to agriculture market. Apart from the 24 startups that are selected for the programme, the remaining participants will get to be part of a series of agri-masterclasses. These would be organised across the country to provide networking and mentoring opportunity to agritech startups.

The 12 themes for the challenge

The initiative is looking for new concepts and innovations in the areas of simplified soil testing methods; assaying and grading solution; development of e-marketplace; price forecasting during sowing; last-mile information dissemination; yield estimation; sorting and grading of produce; adulteration testing; custom hiring centres; crop residue disposal; prevention of pre-harvest and post-harvest losses; and enhancing agricultural productivity.

Timeline of the Challenge

The challenge was hosted at Startup India Hub and the last date to apply is February 28, 2018. The programme amassed interest from over 500 startups and the Startup India team highlighted that they plan to roll out more such programmes and provide a business-to-government platform to nurture the startup ecosystem in India.

Results of the Challenge

Theme	Winning Startups
Assaying & Grading	Aspire Business Solutions AgriCx Private Limited
Farm to Fork	Rajiv Bhatia "Bachat" Wooly Farms
Last Mile Dissemination	Vasudhaika Software Pvt. Ltd. Roshni Agri Information System
Soil Testing	Knoxia technologies Pvt. Ltd. A Soumya Rao "Colometric Based Device"
Sorting & Grading	Coolcrop S4S Technologies
Substitutes for Pesticides	ATGC Biotech Pvt. Ltd. Triithi Robotics
Testing Adulteration	SANSAAVI Bioresearch Pvt. Ltd. Micro Life Innovations
Yield Estimation	Satsure Analytics Pvt. Ltd. BKC Aggregators
Custom Hiring Centre	Greenday – Kisan Ki Dukan Pradwan technologies Pvt. Ltd.
Price Forecast	Tejaswini M "AgriApp" Randomtrees

Rationale of Study

New trends are shaping India into a more holistic Tech Startup ecosystem. It is now getting increasingly clear that India's startup ecosystem has become vibrant and mainstream in many ways – in terms of job creation, in terms of solving consumer problems, and in terms of creating products for the rest of the world. Global investors are realizing this and have made a beeline for India. The increasing ease of doing business is also bringing in investors in some much-needed but neglected areas. The wheels of the government machinery too have begun cranking. The government is acting with speed and a sense of urgency. Following the launch of the Startup India programme, state governments too began formulating startup policies. Several states had a startup policy even before the Union government announced the initiative. With one of the largest populations and consumer bases in the world, India has enough potential to be both producer and consumer, which means that Indian startups have a wide range of consumer classes, products and services, and business models to choose from. This being said it is now clear that India has become the 3rd largest startup hub in the world. But still the majority of India's population is directly or indirectly involved in agriculture sector. The sector with majority population under it but contributing the least to GDP of the country. This is one of the riskiest sectors to be employed in because it is dependent on uncontrollable factors like weather, market fluctuations and topographical conditions. Efforts are being made to give this sector and its workers a much-needed boost. And the biggest way of doing this is through advancements in agriculture technology which is promoted by these upcoming startups. There is a need to analyse the roles of these startups in changing the face of Indian Agriculture and how they are uplifting the farmers' livelihood. So, to answer these questions a research problem entitled "Agritech Startups: The Ray of Hope in Indian Agriculture" was undertaken with the following objectives:

1. To identify prevalent agritech sub-sectors in Indian Startup Ecosystem.
2. To conduct case studies of selected agritech startups in the cities of Bengaluru and Hyderabad.
3. To examine the startup policy changes and implementation by central and state government.

Research Methodology

A carefully planned and well documented methodology acts as a torch in hands of the researcher to carry forward the investigation process. After thoroughly studying the available literature, the suitable research methods and appropriate tools were selected to conduct this study. The purpose of this section is to describe the research methods and techniques used in conducting this research.

Locale of the Study

The study was conducted in the two cities of Bengaluru, Karnataka and Hyderabad, Telangana. The selection of the two cities was done on the basis that the former comes under the category of established startup ecosystem hub while the latter is one of the fastest growing startup ecosystem hub in India. The presence of a strong community of engineers with global work experience, savvy customers and growing pools of early-stage capital in Bengaluru, have transformed the city into a global startup hub. Bangalore has heaps of highly trained professionals in data analytics, social media and digital security, something the world leaders recognize. Home to some of the country's biggest technology companies (100+ MNCs), Bengaluru has a ripe pool of technology talent and ranks among top 3 cities globally for launch of tech startups. Bengaluru is also the number one hotspot for Indian entrepreneurs to start and scale their company. Bengaluru thrives on a high cost efficiency for engineers. For instance, salaries are about 13 times cheaper than in the Bay Area and 4 times cheaper than the average salary across Asia-Pacific. However, it's not cost benefits that capture Bengaluru's key competitive advantage, it's its engineering prowess. 94 percent of Bengaluru-based founders have a technical background, the highest rate in the world. While Hyderabad, the once-wealthy and princely city of Nizams also known as the "City of Pearls" for its diamond and pearl trade, is now gearing up to become India's top startup hub. Hyderabad has a growing network of investors who are now open to investing in startups. The city also has the right kind of support system with a growing number of accelerators, incubators, and coworking spaces to nurture young startups. The Telangana Government has invested \$6 Mn in building the biggest incubator facility in the country, T-Hub. Experienced professionals and executives from Hyderabad are playing the role of mentors, guiding and advising at T-Hub. T-Hub & RICH (Research & Innovation Circle of Hyderabad) are playing a crucial role in strengthening Hyderabad's position as a startup hub. Hyderabad is also host to many startup events like Startup Saturday, August Fest, Devthon, TiE which provides a platform, all of which are very crucial to young startups. In all, Hyderabad has positioned itself as one of the top hubs for entrepreneurs, and, as a result, startups in the city have started to boom.

Selection of Respondents

As this study only focused on agritech startups in India, a list of Agritech sub-sectors was prepared by using secondary data. The next step involved identification of various startups in the field of Agritech in India and their categorisation according to the identified agritech sub-sectors. The

startups were then selected randomly for this study. The selection was ensured in such a way that majority of startups present in both the cities were undertaken for the study. Thus, a sample size of 20 startups using simple random sampling were selected for this study.

Research Design

Descriptive research is used to describe characteristics of a population or phenomenon being studied. It addresses the questions 'what' and 'how' but cannot describe why a situation is caused. Descriptive research generally precedes explanatory research i.e. findings of a descriptive research leads to explanation of many situations and predictions, and before writing descriptive research survey, an investigation is conducted. In this study, non-experimental research design (descriptive research), one which describes, records, analyses and interprets the conditions that exist were adopted to discover the relationship between existing variables without manipulating the condition.

Data Collection

In this study, semi-structured interview schedule with closed-ended and open-ended questions was used for data collection. Secondary data was obtained to explore various agritech sub-sectors in which these startups are working. It helped to provide a basic background of information about the startups. The primary data was collected by conducting face to face interview with the founders of the startups. Focus group discussions and observation method were also carried out for data collection.

This section deals with the results of the study which emerged after the analysis and interpretation of data. For better comprehension of the results, these have been presented under different sections. Each section gives a detailed account of the results of the study and presents an analytical view of these results by discussing their various dimensions and giving relevant references at the appropriate places in agreement or disagreement of the results. Keeping in view the objectives of the study, results and discussion have been presented under the following heads:

1. Identification of prevalent Agritech sub-sectors in Indian Startup Ecosystem

Developments in the agricultural arena have always been upgrades on existing practices: better machinery, better-yield seeds, and better irrigation systems. Development, so far, has been positive but confined within the existing definitions of possibility. But now, here we are: making the old and mundane new and exciting. The introduction of agritech as not only a concept but initiatives by different administrations and institutions spells new possibilities for the farming industry, making it a viable sector for future generations to explore. Indian entrepreneurs and startups have decided to follow in the footsteps of their international counterparts and apply modern technologies to improve the farming experience in India. Both the need for and the potential of Agritech in India are defined by the large size and population of the country.

Over the last decade, the sector is being streamed with the stream of educated youth, fired by the ideas, passion and innovations to launch newer kinds of technology and business models to lift the face of agriculture from primitive to hi-tech one. Startups are providing missing links in the agri value chain and delivering efficient products, technologies and services to the farmers on one hand and the consumers on the other hand. From ICT apps to farm automation and from weather forecasting to drone use and from inputs retailing and equipment renting to online vegetable marketing, and from smart poultry and dairy ventures to smart agriculture and from protected cultivation to innovative food processing and packaging, its proliferation of all innovations and technology driven powerful startups set to revolutionize the food and agriculture sector.

The opportunities lie in areas like how to increase crop production, improving the nutritional value of the crops, reduction in input prices for farmers, improving the overall process-driven supply chain, reducing wastage in the distribution system, making easy farm mechanisation available, and enabling last mile connectivity of farmers with the non-farming population by interlinking the consumer and producer.

Agritech startups are also leveraging technology in the area of market linkages such as retail, B2C and B2B marketplaces and digital agronomy platforms. Agritech startups are now able to address input challenges of agriculture in India from the very beginning. They are able to provide correct

information, techniques, and efficiencies to farmers both for pre-harvest applications and post-harvest use cases.

Impact investors are paying close attention to Agritech because of its enormous potential to transform farmers' lives. When funds are thinking about their strategic focus, they need to first consider all Agritech sub-sectors which are as follows:

Big Data based Agritech Startups

Big data analytics is making a huge technological impact in the startup community to create a repeatable and scalable business model. Big Data based startups are a newly emerged technology that aims to develop a viable business model to meet a marketplace need or problem. Development of farm-specific, data-driven diagnostics to determine soil and crop health has come up as a big opportunity area. There are also a growing number of big data technologies aimed at improving the efficiency of farming and in supply chain such as drones, sensors, and other IoT technology, and data analytics to provide decision support to farmers and other players in the supply chain. CropIn, AgRisk, AgNext, Skymet, Stellaps, and Airwood are some of the examples that are working on this theme.

Startups based on Supply Chain Model/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. Indian agriculture is supply driven and less market-driven compared to other markets. This is the primary reason for seasonal food inflation as well as significant food waste and value loss along the supply chain. Though demand is becoming more predictable in India given the homogenization of consumption trends, supply is less predictable.

This presents an opportunity for developing supply chain/market linkage models for farmers. This in turn could require innovations to help farmers with the timely and accurate estimation of sowing and harvesting in the context of patterns in consumer demand. Sabziwala, MeraKisan, Dehaat are some of the startups who have demonstrated successful aggregation in horticulture. There is need to optimize these supply chains for effective solutions that can preserve the quality, reduce waste, improve traceability, and improve shelf-life efficient aggregation, transportation and storage, etc.

The Supply chain model/market linkage model can be further divided into two sub models:

- Upstream (Input) Marketplace model: It matches agri input sellers to farmers upwards in the agricultural value chain. Bighart, AgroHub, Crofarm are some of the startups in this category.
- Downstream (Output) 'Farm-to-Fork' supply chain model: Matching farmers to businesses or retail customers for fresh produce, processed food. Ninjacart, Bharat Bazaar are some of the names in this category.

Farming-as-a-Service (FaaS) based Startups

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. "Farming as a service (FaaS)" was introduced to India by a company called EM3 Agri Services, which offers farming services and machinery rentals to farmers on a pay-for-use basis. The concept has caught on and there are other agriculture equipment leasing and farm services startups in the space including Goldfarm, Ravgo, Oxen Farm Solutions, and FarMart.

IoT Enabled Agritech Startups

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. Fasal, Fly Bird Innovations are some of the name in this category.

Engineering-led Innovation Startups

Although India is the largest manufacturer of tractors globally, less than 2 percent of the country's farmers use machines. Labour shortage is a reality in rural India and farmers bear the brunt of it. Agritech startups in this category provide cost-effective and smart mechanisation solutions to small and marginal farmers to counter lack of good technology and increasing labour costs. Kamal Kisan, Kheyti, Drip Tech are some of the startups in this category.

Miscellaneous Agritech Startups (Innovation in Agri Products, Dairy Farming, etc.)

Startups based under this category are providing innovative and unique solutions in developing agro-based products, better dairy, poultry or fish farming methods, providing advisory services, creating one stop solutions for farmers involved in secondary agriculture, etc. Suma Agro, La Veda, Cattle Mettle, Happy Farmer Labs are some of the successful startups in this category.

Broad categorisation of agri startups based on solutions offered in the value chain:

BIG DATA	Using farm data to determine opportunities and key areas <ul style="list-style-type: none">• Farm management solution• Risk mitigation and forecasting solution• CRM and input channel solution• Traceability and compliance
-----------------	---

SUPPLY CHAIN/ MARKET LINKAGE	<p>Helping farmers to keep abreast with the market prices and scenario</p> <ul style="list-style-type: none"> • Agri inputs market platforms • Real-time solution for farmers • Updated agriculture information • Quality, availability and price checks • Farm to fork supply chain
FAAS	<p>Providing affordable technology solutions for efficient farming</p> <ul style="list-style-type: none"> • On-demand harvesting • Digital payments • Market pricing • Enabling technology to reach farmers • Agricultural machinery platform
IOT	<p>Using IOT devices for remote monitoring, tracking</p> <ul style="list-style-type: none"> • Vertical farming monitoring solutions • Hydroponic farming ecosystem to monitor humidity, air temperature, etc. • Aeroponics system
ENGINEERING-LED INNOVATION	<p>Using engineering methods to provide low-cost farming solutions</p> <ul style="list-style-type: none"> • Cost effective availability of machinery • Technology solutions for small farmers
MISCELLANEOUS	<p>Using innovative solutions to increase farmers' income</p> <ul style="list-style-type: none"> • Increasing agro-based products industry • Boosting secondary agriculture

2. Selective Case Studies

After data collection, the primary and secondary data were analysed concurrently. A case study narrative was constructed to present an in-depth explanation about the startups. The startups are described on various aspects such as year founded in, who are the founders, where it is situated, what are the products of the startup, technology used, mode of action, active regions, funding, impact, etc.

CropIn Technology Solutions



Founded In	2010
Founders	Krishna Kumar, Kunal Prasad and Chittaranjan Jena
Headquarters	Bengaluru, Karnataka
Product Name	Smartfarm, Smartrisk, mwarehouse, Smartsales, AcreSquare, SaaS
Technology Used	Big Data Analytics, AI, ML, Remote Sensing
Objective	To make every farm traceable and maximizing per acre value
Startup Description	

The agritech startup provides farm businesses a farm management software and mobile app, which enables them to do connected and data-driven farming. The startup has developed and put on offer a low cost pay-as-you-use product on an IT platform on Cloud integrated with Android based smart mobile app. The company harnesses cutting-edge technologies – Big Data analytics, Machine Learning, Geo-tagging & Satellite monitoring to revolutionize the agri-ecosystem. CropIn's SaaS-based system is not a one-time intervention but a sustainable solution. The intuitive, intelligent, ever-evolving and self-learning system takes in information from various sources like weather, satellite and ground data and delivers targeted solutions to the agribusinesses.

With a robust range of products, CropIn largely works on a B2B business model, catering to agricultural businesses at different levels of the agri-ecosystem. The product portfolio includes:

- **SmartFarm:** An award winning robust & flexible farm management solution which enables complete digitization of farms, empowers data-driven decision-making, and provides complete visibility of people, processes and performance on the field. It ensures management of standard package of practices, adherence to compliance and certification, pest and crop health management.
- **SmartRisk:** An agri-business intelligence solution that leverages agri-alternate data and provides risk mitigation and forecasting for effective credit risk assessment and loan recovery assistance. Proprietary machine learning algorithm built on satellite and weather data is used to give insights at plot and region level.
- **Mwarehouse:** A Comprehensive solution for pack house, processing & export companies that enables Farm to fork traceability & compliance, quality control and flexible inventory management.
- **SmartSales:** A comprehensive CRM & input channel management solution, that helps predict and improve sales and ensures end-to end performance management of sales team
- **AcreSquare:** A unique farmer application that helps companies interact directly with their farmers, share content, educate them and provide consultation, thus enabling companies to extend the power of technology for their farmers and build farmer loyalty.

Mode of Action



Active Regions

29 countries, 265 Crops, 3500+ Crop varieties

Funding

\$8 Mn (Series B) by Chiratae Ventures & Bill and Melinda Gates Foundation

Impact

185+ clients, 3.1Mn acres land digitized, benefitting 2.1Mn farmers globally

Website

www.cropin.com



Ninjacart

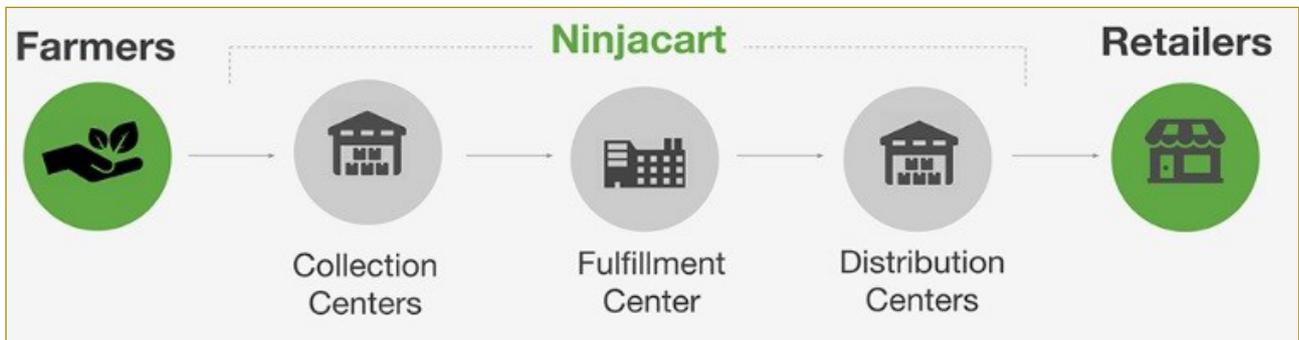


Founded In	2015
Founders	Ashok Prakash, Ashutosh Vikram, Kartheeswaran K, Sharath Loganathan, Thirukumaran Nagarajan, Vasu Devan
Headquarters	Bengaluru, Karnataka
Product Name	Ninjacart Mobile App
Technology Used	B2B e-Commerce platform, Mobile platform
Objective	To provide more income to farmers and less price to retailers by creating an efficient supply chain

Startup Description

Ninjacart is a B2B agri-marketing platform that connects farmers to businesses. Ninjacart is India's Largest agri marketing platform, solving one of the toughest supply chain problems through technology. It connects vegetables and fruits farmers directly with businesses. At one end, Ninjacart helps farmers get better prices and deal with consistent demand and on another end, It helps retailers to source fresh vegetables at competitive prices directly from farmers. Ninjacart does this effectively at lower cost, better speed and larger scale using integrated supply chain powered by technology, data science, infrastructure and logistics network. The Ninjacart supply chain operation involves the following major stages: Forecasting, Pricing, Farmer Harvesting, Collection Centers, Fulfillment Centre, Distribution Centers, Delivery to Retailers.

Mode of Action



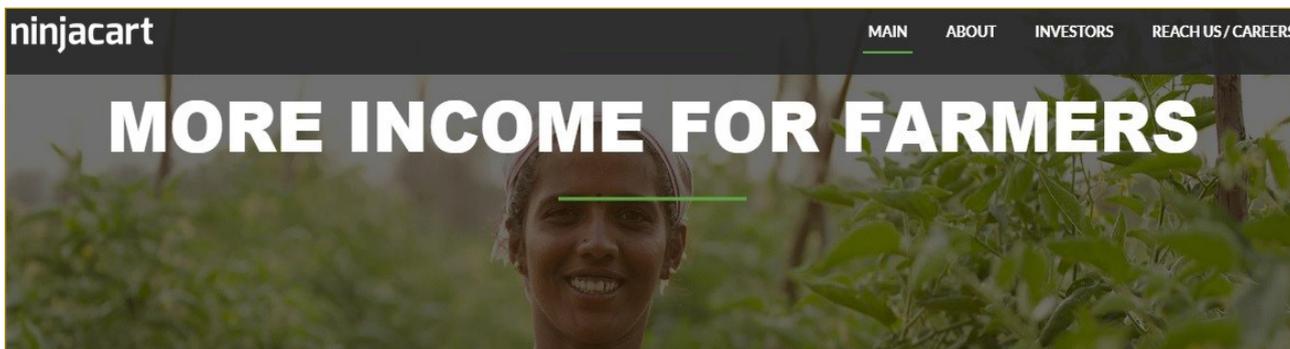
How it Works



Ninjacart supply chain process starts with weekly forecasting, where the sales team publishes the customer growth plans for the week. Analytics combine growth plan with historic demand data and market conditions to prepare the weekly sales and procurement forecast at SKU (Stock-keeping Unit) level. The founders mention that the forecasting stage is a very crucial stage for them as it helps them in purchase planning to reduce wastage and it also helps in planning the supply chain in much more efficient way. Once the forecast is done, the next step involves the

procurement team which goes on to give weekly indent to the farmers based on the existing farmer harvest calendar. Two days before the actual delivery date based on the existing market condition such as availability and price fluctuations, the procurement forecast gets revised once again. After it's revised, the procurement team again goes on to re-issue indent to the farmers to re-confirm it once again. The next step involves setting prices where product prices are collected from various markets, a day before the delivery date. This price information is then used to set the purchase and selling price simultaneously to avoid price risks. Based on the indent, the farmer harvest the produce, grades as per Ninjacart quality standards and brings it to the nearby collection centers. Once the product arrive at collection centers, the items are checked for quality, then weighed and transferred to Ninjacart crates in front of the farmer to ensure transparency. The farmer gets a receipt immediately and the money is transferred to his bank account in 24 hours. The items are then batched and loaded into truck enabled with real time tracking. Items from multiple collection center arrive at fulfillment centers and are moved into inventory. Items are batched according to distribution center wise and as per the customer demand using Ninjacart's in-house "queuing technology" and this ensures huge volumes are processed without any error. Items are picked and packed as per customer orders. Mini trucks arrive at distribution centers early morning and items are loaded route wise into the vehicle. Mobile phones are issued to drivers to manage the deliveries. On the way back, the driver collects empty crates and cash from the customers and deposit the same to the distribution centers and thus completing the supply chain. With the new funding, Ninjacart aims to expand to more than 10 cities, open around 200 distribution centres across India and scale hiring and onboarding talent in the near future.

Active Regions	Bengaluru, Chennai and Hyderabad
Funding	\$34.6 Mn (INR 250 Cr) (Series B) by Accel US, Syngenta Ventures, Neoplux, ZIGxN founder Jo Hirao, HR Capital, Trifecta Capital, Nandan Nilekani and Qualcomm Ventures
Impact	3000 farmers, distribution to 4000 retailers, movement of 300 tonnes of fresh produce on a daily basis in less than 12 hours
Website	www.ninjacart.in



Fasal – Climate Smart Precision Agriculture Solution



Founded In	2018
Founders	Ananda Verma and Shailendra Tiwari
Headquarters	Bengaluru, Karnataka
Product Name	Fasal Microclimate System and SaaS
Technology Used	AI, ML, IoT and Data Analytics
Objective	To increase and improve the quality of per acre yield

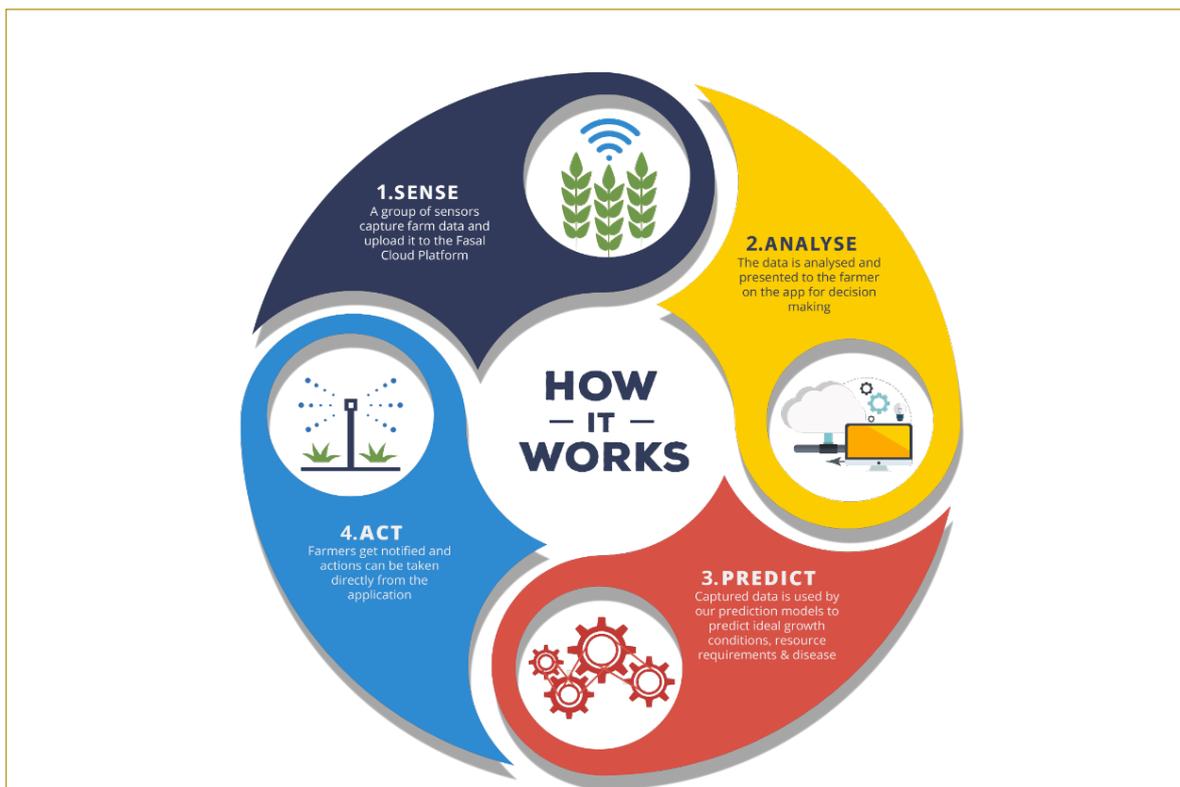
Startup Description

Fasal is a smart agriculture solution which when installed, starts recording variety of microclimatic parameters like temperature, humidity, air pressure, leaf wetness, soil moisture, soil temperature, wind speed, wind direction, and rainfall.

It then uploads this data to our cloud server, where our predictive engine runs machine learning and AI algorithms to help farmers in :

1. Predicting Crop diseases, and pest outbreaks
2. Ideal time to sow and harvest any crop
3. Optimizing resource utilization like water management, pesticides, fungicides, and fertilizers etc. For example, it informs farmers what is the right time to irrigate or spray pesticides.
4. It provides real-time alerts based on farm, crop, and weather conditions to take preventive actions against reacting to situations by the farmer.
5. Online Farmer's network, where farmers all across India can ask questions, share new agriculture practices etc. learn about mandi rates as well as various government schemes.

Mode of Action



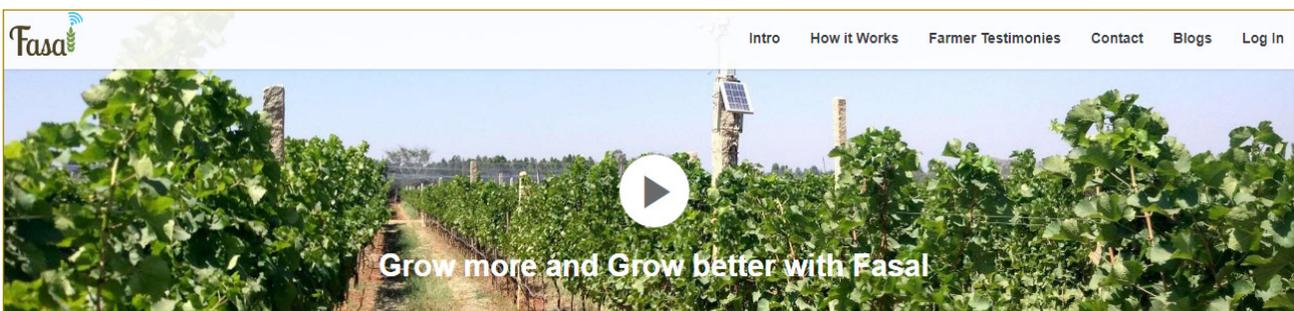
Step by Step How Fasal Works

Sense: Fasal monitors critical microclimatic parameters, including Temperature, Humidity, Rainfall, Soil moisture at various levels, Leaf wetness, Soil temperature etc., 24x7x365 from your farm and uploads it to Fasal cloud platform.

- 1. Analyse:** The data is then analysed and presented, making your crop's health accessible to you anytime, anywhere on any device for decision making like irrigation management, resource optimization, increasing yield, increasing quality of yield etc.
- 2. Predict:** Captured data is used by our prediction models to predict the ideal growth conditions, resource requirements including fertilizers, Crop diseases, and microclimatic weather predictions.
- 3. Act:** Farmer gets notified on his device and actions can be taken directly from it, like switching on drip irrigation etc.

Their business model includes a nominal monthly subscription fee. There is no upfront charge or deposit. It is a pay-as-you-go model. For large scale and institutional farmers, they also offer to sell their IoT device and charge less subscription on software usage. It has worked pretty well for the startup to penetrate the Indian agriculture market which is very price sensitive. Fasal is competing against Indian startups like Yuktix and Exabit Systems, while the competition worldwide includes CropX, Pycno, The Yield technology Solutions, and more.

Focus Crops	Tomato, Capsicum, Potato, Onion, Chilli, Pomegranate and Grapes
Active Regions	Bengaluru and Chhattisgarh
Funding	Friends And Family: \$45,000, Zeroth.ai Pre-Seed Funding: \$120,000
Impact	20 Independent Farmers, 4 B2B Farmers and Grover-Zampa, One of the Largest Vineyards of India is Fasal's customer
Website	www.fasal.co



AgriCx Lab



Founded In	2016
Founders	Ritesh Dhoot and Saurabh Kumar
Headquarters	Bengaluru, Karnataka
Product Name	AgriCx Certification Software
Technology Used	AI and SaaS
Objective	To remove subjectivity out of the quality assessment process and make it reliable and easy-to-use, in order to enable a standardized and fair value (grades, price etc.) to different kinds of produces.

Startup Description

AgriCx provides a quick, accurate, portable and easy-to-use quality assessment tool. The solution currently involves imaging of produce using a standard smart phone and assessment using state-of-the-art deep learning and computer vision-based algorithms, making it extremely quick, portable and scalable. Agritech startup agriCx is helping farmers get a fair price by grading and certifying their produce with its AI-based SaaS solution. AgriCx, is striving to bring in a reliable crop-grading system in India, with the aim of eliminating middlemen in the supply chain and enabling farmers to earn a fair price for their produce. Ritesh Dhoot and Saurabh Kumar, who started AgriCx in 2016, realised that the main reason for unfair pricing of agriculture produce was the fluctuating quality and standard of the produce, an acute problem, according to the duo.

AgriCx has developed an artificial intelligence (AI) and machine learning (ML)-based SaaS solution to simplify the grading system and eliminate variability in the quality of produce sourced. The core idea behind AgriCx's business model is to streamline the procurement process by establishing accurate and precise grading systems with the help of technology. AgriCx lab seeks to be a bridge between farmers and cold storages on one side and procurement specialists on the other, helping the latter procure their requirements in an efficient manner with the use of technology.

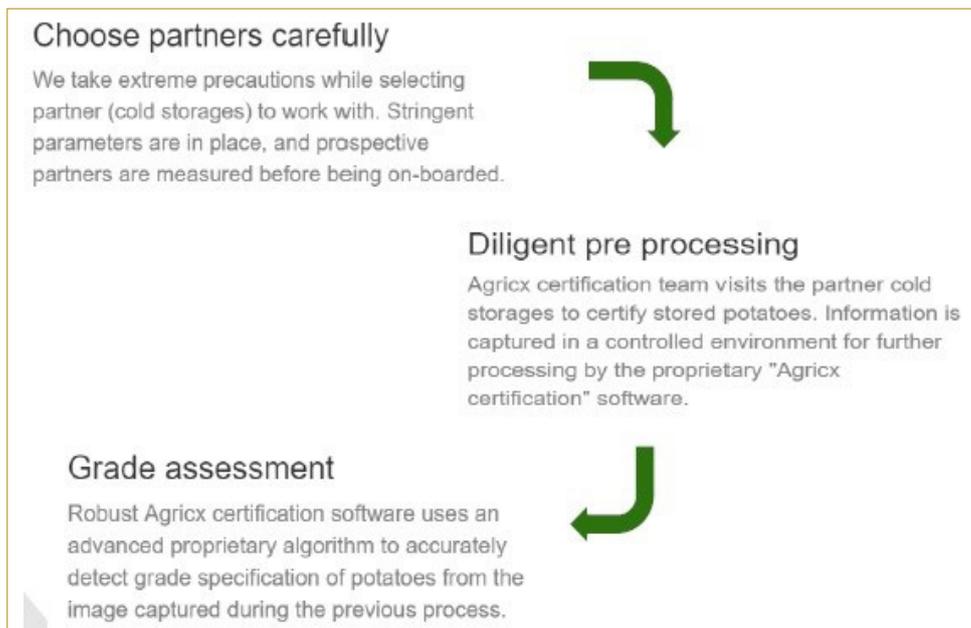
For this, the startup has partnered with cold storages (who are measured against stringent parameters) across India and listed their certified potatoes on its platform. AgriCx also provides an additional offline service where their internal team visits cold storages to double check and evaluate the produce. However, this is an on-demand service and is provided over and above their technological solutions. The startup's core service is completely based on the SaaS application it has developed. The application enables cold storages to click images of samples and grading is done based on some pre-determined measures. The data is then stored for future reference. The data contains information such as:

- Who graded the sample
- The quantity of sample used for assessment
- When and where the grading was done

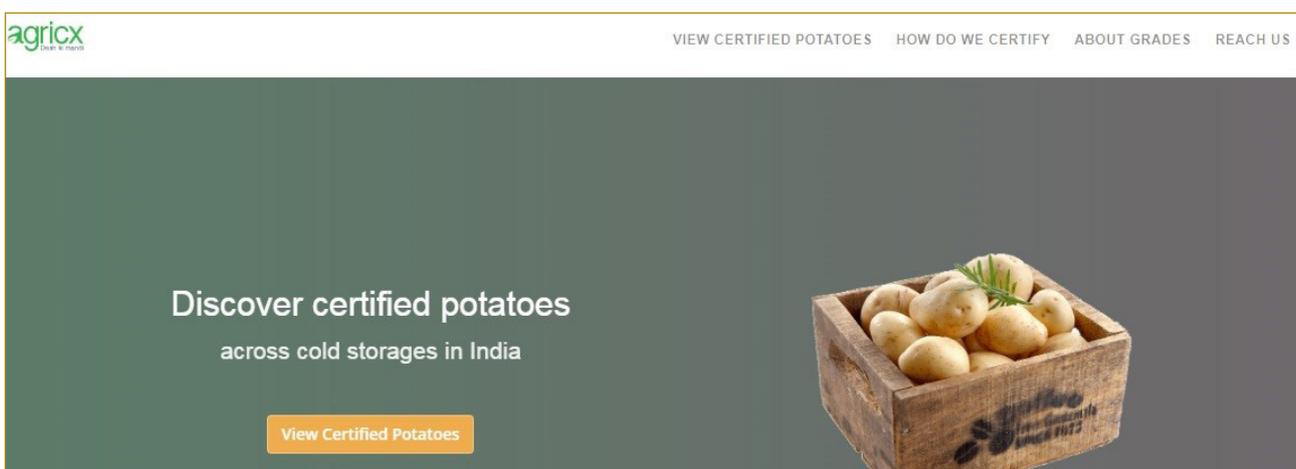
The certification software uses an advanced proprietary algorithm to accurately detect grade specifications of potatoes from the images captured.

The application is also easily scalable as it can grade high volumes and different types of samples in minimal time, thereby establishing a reliable and transparent grading system. A single image of the produce can be evaluated just within 30 seconds. Agricx's USP is its deep learning technology. The startup's convolutional neural networks (CNNs/ConvNets)-based algorithm aid in image processing, classification, and segmentation of produce. For the uninitiated, CNNs are artificial intelligence networks that analyse visual imagery. In this case, they help determine the quality of produce by evaluating the crop images.

Mode of Action



Active Regions	North India (UP, Delh-NCR, Agra, Gujarat, Mohali etc.) & Karnataka
Funding	INR 3.25 Cr till now from the Centre for Innovation Incubation and Entrepreneurship (CIIE) and Ankur Capital
Impact	Clients such as Mccain India, Mahindra, and over 100 cold storages in the country an also have already certified over 2 Mn Kgs of Potato in India
Website	www.agricx.com



Kamal Kisan



Founded In	2013
Founders	Devi Murthy
Headquarters	Bengaluru, Karnataka
Product Name	Vegetable Planter, Mulch Layer, Raised Bed Maker, Mulch cum Bed Maker, Backpack Weeder and Sugarcane Planter
Technology Used	Engineering-Led Innovation
Objective	To develop cost-effective, smart mechanization solutions for India's small and marginal farmers, to reduce labor dependence and increase profitability.

Startup Description

Kamal Kisan aims to develop a series of farm equipment especially targeted towards small farm owners. These equipment will then be provided as a mechanized service directly on the farm. The equipment can substitute farm activities which are heavily labour-dependent and contribute a significant amount to the total cost of crop production. Kamal Kisan works with a franchise-based model to deliver farm equipment, which can substitute the farming activities carried out by labour, as a service to the farmers. The rationale behind choosing the service model is to effectively deliver equipment to the farmer as a variable expense rather than a capital investment, which can be extraordinarily challenging for small and marginal farmers. The founder feels that "a business must not exist for the sole purpose of earning revenues but must also create an impact on the ecology in which it exists."

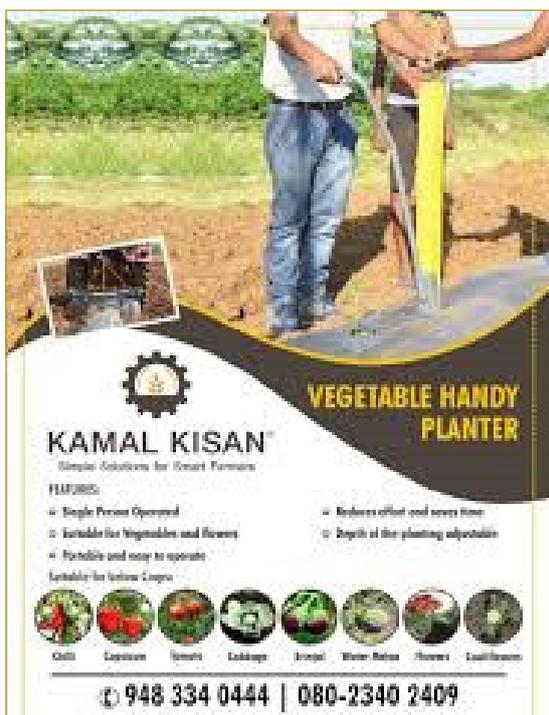
Kamal Kisan's India focused innovation in agricultural equipment delivers unique, mechanical devices that offer at least 50% increase in process efficiency, resulting in at least 50 percent cost benefit to farmers. This become a valuable proposition in the face of 23 percent migration of rural labour to urban centres. With farmers spending over 40 percent of their total cultivation cost on labour alone, the profession is no longer profitable and hence over 100,000 farmers give up farming every year. With lack of relevant technology, and the cost of labour doubling every 3 year, the food security concerns of the country will become a reality by 2020. Kamal Kisan vision is to be restore profitability in agriculture and restore the pride of the farmer.

Kamal Kisan is a registered as a brand name under Simple Farm Solutions Private Limited. Kamal Kisan develops, manufactures and sells a series of farm equipment specially targeted towards small farm owners (<2 Ha). This equipment will be chosen to substitute farm activities that have the following characteristics: 1. Have heavy labor dependence, 2. Contribute significantly to total cost of production and 3. Do not have any relevant mechanized solution

The design of the products have the following features: 1. Suitable for use on small farms, 2. Minimal dependence on fuel, 3. Ease of self-maintenance to reduce dependence on post-sales service, 4. Integrated with existing farming practices to lower adoption barriers and 5. Cost-effective. The Bengaluru-headquartered Kamal Kisan has six products in its portfolio: Vegetable Planter, Mulch Layer, Raised Bed Maker, Mulch cum Bed Maker, Backpack Weeder and Sugarcane Planter. The products are priced between Rs. 2,000 (vegetable planter) and Rs. 50,000 (a tractor attached with bed-cum-mulch layer). Kamal Kisan follows an interesting business model: design the machinery, get it made by small factories and sell to big farmers.

Big farmers often rent them to small farmers. So far Devi has sold items to 3,000 farmers and her machinery has reached over 10,000 farmers via rentals in Karnataka and Andhra Pradesh. Kamal Kisan has direct (farmers) and indirect (those who rent) beneficiaries. The rental model was set up with the help of Tata Trusts and Social Alpha, and is currently operational in Jharkhand and Andhra Pradesh. The founder also mentioned that farmers are generally reluctant to use equipment. They were accustomed in using cheaper imported machinery, which had no post-sales services. They were left with a feeling of mistrust. Kamal Kisan design the products in such a way that even a blacksmith can fix them.

Mode of Action



Active Regions

Rental service in Jharkhand and sales service in Karnataka and Andhra Pradesh

Funding

INR 5 lakh (Seed Fund) by IIT Madras’s Rural Technology and Business Incubation Centre.

Impact

3000 farmers benefitted from Kamal Kisan and help them cumulatively save more than Rs. 10 lakh

Website

www.kamalkisan.com



FlyBird Farm Innovations



Founded In	2013
Founders	Satish KS
Headquarters	Bengaluru, Karnataka
Product Name	Siri – Digital Motor Starter, Siri Nano – 4Channel Controller, Siri – Sensor Based Irrigation Controller, Siri – Volume Based Irrigation Controller, Siri – Timer Based Irrigation Controller, Siri Link – Mobile App & Web Login Controller and Siri – Smart Nutigator - Fertikit
Technology Used	Micro-irrigation System, Web App/Mobile App Controllers, IoT, Timer Based Machine
Objective	To make every drop of water count with affordable, simple & reliable irrigation controllers for every farmer (marginal to large) which will save water and energy

Startup Description

In an effort to improve the plight of the farmers, and to address to the agriculture's key challenges like water scarcity, labor shortage and low production of crop, Bangalore based FlyBird was founded in April 2013 by Satish KS. FlyBird Farm Innovations is social impact agriculture startup and has been incorporated with a vision to solve main problems of the agriculture sector. Through innovations and technology, they are focusing on

- Improving the livelihood of farmers
- Improving the crop yield / production
- Saving water and electric power
- Integrating affordable technology for farmers

Irrigation and applying fertilizers to plants/crops are very important and critical tasks in any cultivation. The firm is focusing on creating smart devices for these tasks and automating the entire processes and bring in the precise irrigation and fertigation to any farm. These sensors developed by FlyBird innovations for example, allow farmers to observe moisture content levels and consequently spell out their irrigation requirements. FlyBird Innovation's technology helped farmers save 25-30 percent of water and improve crop yield or productivity by 10-15 percent. So far, we have installed 350-400 controllers in villages in Karnataka and Tamil Nadu.

Siri is an automated precision irrigation and fertigation controller. It controls the water pump and pipe valves based on how you program it.

- Timer based program: Siri will irrigate your field for a fixed time period
- Volume based program: Siri will irrigate the field with the exact amount of water you specify
- Sensor based program: Siri will decide how much & when to irrigate your field based on soil moisture / temperature levels and in greenhouses, also based on humidity. It is so intelligent that it will postpone irrigation if it is raining.

Siri can automate your fertigation needs, controlling up to 5 tanks independently. It comes with multiple options for add-on modules and sensors and can be controlled remotely through the

Siri Link web/mobile interface. It can also be customized to be affordable for the marginal farmer and scaling up to manage large corporate farms. Basic model starts from Rs 15,000 and it goes up to Rs. 26,000 (sensor based). Farmers shall be able to get returns in less than 6 months with promised reduction in cost of power, labor and water Right now small farmers are showing keen

interest in our product but asking for the subsidy. Presently subsidy is available only in the state of Karnataka. There are two variants available viz. 8 channel/valves and 16 channel/valves to manage and control 1-5 acre and 10 acres farm respectively. Technical staff of 6 people promptly reaches farmer for after sales service, being offered with/without service charge depending on product warranty tenure. Presently company is focusing sales in Karnataka, Andhra Pradesh and Tamil Nadu. It plans to expand its sales operation in other states too in coming months. The application of Siri ranges from Agriculture to hydroponics, Poultry and even certain areas of Urban & Commercial setup.

Mode of Action



Sensor Based Irrigation Controller

Active Regions

Andhra Pradesh, Karnataka and Tamil Nadu

Funding

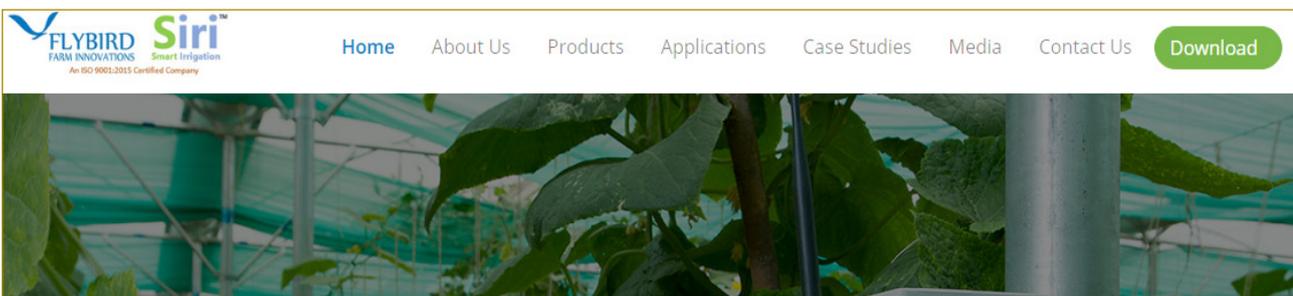
INR 1 Crore by Villgro, Rianta Capital's Artha Initiative, IIM Ahmedabad's incubation centre (CIIE), National Academy of Agricultural Research and Management's a-IDEA and Centre for Incubation and Business Acceleration.

Impact

350-400 controllers installed

Website

www.flybirdinnovations.com



vDrone



Founded In	2017
Founders	Kunal Sharma and Pranav Manpuria
Headquarters	Bengaluru, Karnataka
Product Name	Agricultural Aerial Mapping
Technology Used	Aerial Robotics and Mapping Technology
Objective	To provide farmers with actionable data through mapping technology

Startup Description

Started by two engineers, vDrone uses drones to take pictures of the field, which are then fed into the software developed by the startup and used to extract thermal images of the plants. Using innovative mapping technology, the Bengaluru-based startup quickly analyses areas of the farm which need attention, and helps the farmer cater to these needs. Thermal imaging is used to assess a crop's yield by determining the condition of the seeds, the soil, the cropping pattern, the weather, access to water, use of fertilisers, and the lack of pests. vDrone Agro develops custom-built drones to map farms for precision agriculture, and provides farmers with actionable data to improve crop health and increase yield.

The firm charges farmers Rs 400-800 per acre for drone deployment. It has developed a software which analyses the data collected to provide details to farmers about the health and quality of land and crop, such as which portions are less fertile, what portions have stunted growth, etc. The drones are lightweight multirotor quadcopters. The start-up has so far tested and deployed drones at farms in Karnataka, where over 500 farmers have used their services. It is now working with some agro-companies in Andhra Pradesh as well. Though the civilian use of drones has been banned by the directorate general of civil aviation, the founder said that vDrone Agro is one of six drone companies working with the regulatory body to set up a platform for such companies.

With vDrone, farmers are able to get a better understanding of crop health by monitoring the data mapped through drones. The enterprise seeks to improve productivity and efficiency by permitting a more focused approach to farming through data. The International Centre for Entrepreneurship and Technology (iCreate), an incubation centre for technology businesses, helped vDrone with resources and mentorship. vDrone develops and designs drone-based systems for the agriculture sector with services like crop health data analysis, mapping, analytics solutions, etc.

With the Rabi crop harvest just around the corner, these two engineers are now flying their drones across a five-acre field. Some might say what a drone can do on a farm other than take pictures of the field. But Pranav and Kunal have built a software into their drone cameras which read thermal images of the plant making food. Once the drone lands, they collect the images from its SD card and start mapping the farm on their laptops. Next, they analyse the images and are able to tell the farm owner which areas of farm are fertile and which are not. The startup works in 4 steps:

- Order a Scan: Place an order through website, or via a call.
- Deploy Drone: The firm plans the flight path and deploys the drone.
- Scan Farm: The autonomous drone scans the land in minutes.
- Actionable Data: The scan is processed to provide actionable data.

The startup has figured a business model that is based on the visualisation of the image and the recommendations on top of those images. Most of the recommendations will be about the energy produced in the plant and what should be done. The vDrone is built in Bengaluru and works on a pay load of less than 6kg. It is built on light materials and is a civilian drone.

Mode of Action



Active Regions

Karnataka

Funding

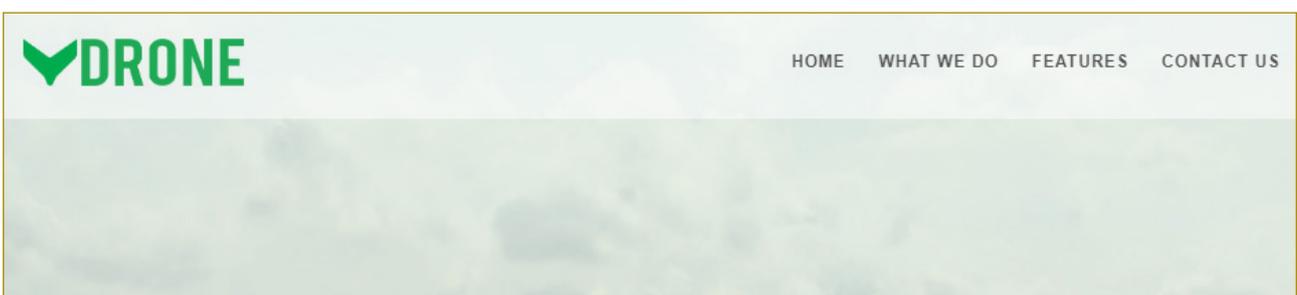
Undisclosed

Impact

500 farmers have used the service in Karnataka

Website

www.vdrone.xyz



Founded In	2016
Founders	Bhoopendra Kumar and Jyotiska Khasnabish
Headquarters	Bengaluru, Karnataka
Product Name	KrishiHub Mobile App
Technology Used	B2B e-Commerce Platform, AI and Mobile App Platform
Objective	To provide farmers with end to end managed supply chain for better returns and reduced crop wastage

Startup Description

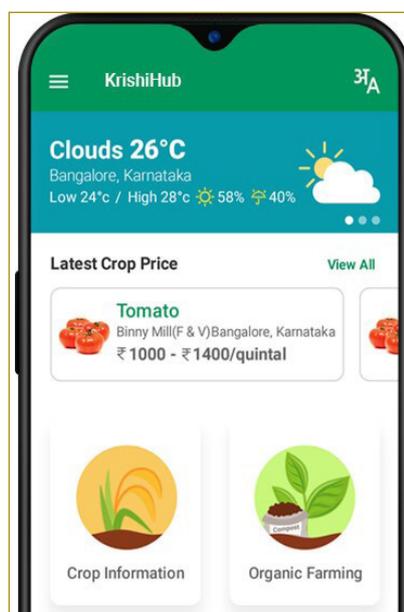
KrishiHub is building an agricultural ecosystem with the implication of technology, design, and data science for Indian farmers. The vision of the company is to empower farmers across the country by improving their socio-economic status and providing agri-inputs for better farming productivity. Through a demand-driven platform, KrishiHub delivers fresh vegetables to businesses like restaurants/hotels/canteens/hostels/government institutes/cafeterias etc. directly from farmers, who are spread across different districts in Uttar Pradesh. KrishiHub's Artificial Intelligence (AI) powered supply chain enables farm-to-doorstep delivery in less than 12 hours along with up to 25 percent reduction in vegetable wastage compared to the traditional system. This also allows deploying proprietary algorithms for determining delivery routes for each delivery agent for logistics cost optimization and ensuring on-time delivery. KrishiHub employs a combination of mobile apps and cloud based platform to manage the end-to-end supply chain ensuring transparency and better control. The firm use a combination of multiple proprietary algorithms to ensure on time delivery, optimized routing and failovers for better logistics management. By removing middlemen from the supply chain, it empowers them to give more income to farmers for their crops. The Agri Advisory section of KrishiHub which is AI powered and strives to provide information on better farming techniques, rich insights and forecast and to help farmers get more yield. The agri advisory provides the following features:

- Crop Information: Information, management and best practices for growing 100+ non-organic and organic crops
- Mandi Price Forecast: Explore crop prices and up to 6 months of forecasts for crops across all mandis in India
- Weather Info & Alerts: Get updated weather information, forecasts and alerts anywhere in India
- Agri inputs Directory: Listings of seeds, fertilizers sellers, farm equipment dealers, cold storage & soil testing labs nearby your area
- Discussion Forum: Discuss farming problems, explore solutions and participate in discussion with farmers & agri experts
- Agri News & Videos: Links to various new and videos related to agri sector

Targeting the businesses like restaurants, hotels, kirana stores, online marketplaces, local vegetable vendors and hyperlocal retailers, the company endeavours to be a technology platform

that is responsible for managing end-to-end supply chain. Through the app, the company enables its customers to place orders, make online payment, track & create order subscriptions. Additionally, the company adds value in terms of cleaning, grading, sorting and packaging by ensuring quality products. What's more is with its subscription based model KrishiHub assures its customers on the products they placed to get delivered at their door steps at chosen frequency and delivery slot. The major target is to build the entire agricultural ecosystem with the inclusion of information and decision support systems for farmers on all agricultural needs. In the coming months, the startup is going to put more efforts on R&D to improve technology platform. Soon they are planning to explore possibilities to start operations in Tier-2 cities and collaborate with state governments for better outreach and to export Indian agri products to the rest of the world.

Mode of Action



Active Regions

Uttar Pradesh (Agri Supply Chain), PAN India (Agri Advisory)

Funding

Undisclosed Seed Funding from IIT Kanpur INVENT accelerator and Villgro Innovation Fund along with a few angel investors and HNIs

Impact

Agri Supply Chain: 30,000+ transactions, 9000+ MT crops delivered, procures from 600+ farmers

Agri Advisory: 20,000+ farmers on the platform using the advisory services in 7 different languages

Website

www.krishihub.com



Farmizen

Founded In	2017
Founders	Shameek Chakravarty, Gitanjali Rajamani and Sudaakeran Balasubramaniam
Headquarters	Bengaluru, Karnataka
Product Name	Farmizen Mobile App
Technology Used	Mobile App Platform
Objective	To build a food eco-system that's better for consumers, better for farmers, and better for the planet.



Startup Description

Farmizen is a mobile based application that enables an individual to grow chemical-free organic food in a mini-farm. Situated on the periphery of Bengaluru city, Farmizen manages five farms of 10.5 acres, divided into mini farms of 600 sq ft each. By paying Rs 2500 as a monthly subscription fee that includes the monthly rent to the farmers, the individuals can grow vegetables of their choice as per the season in the twelve beds allocated to them in their mini farm. They control the farm through an app just like Farmville and can visit the farm anytime and harvest their own chemical-free produce. The Farmizen team ensures that the consumer knows how and what reaches from their farm to their fork and has a system of adequate checks and balances in place against any violation. The information is well substantiated with pictures and live videos of the process.

The information is substantiated with pictures and live videos of the process and has a system of adequate checks and balances in place against any violation.

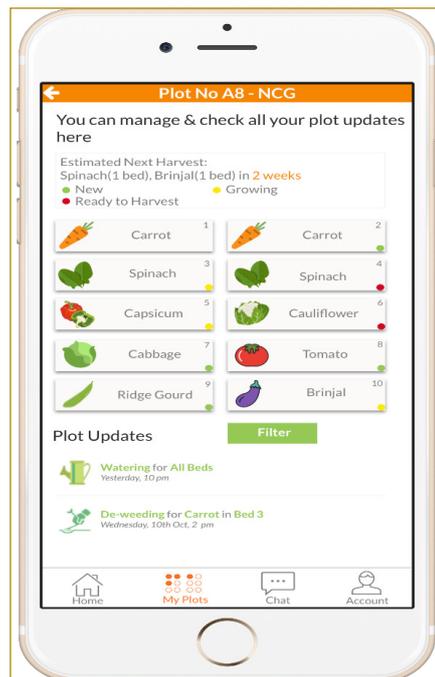
A comprehensive technology stack built by them includes consumers' app on Android and iOS, a farm management app for farmers (also available in regional languages), unmanned aerial videography using drones, image processing to identify crop growth stages for remote monitoring, a driver app for optimising delivery routes, and managing the last mile delivery.

The core of the platform is the Farmizen brain, which understands planting regimen for various crops and is able to orchestrate the entire process, and recommend actions to farmers based on real-time inputs from the field as well pre-defined schedules for over 50 different types of crops. A fixed amount paid to farmers every month would thus incentivise the farmers to adopt the best techniques for production, instead of the most cost - effective practice. The partner farmers of Farmizen make a minimum of three times more income from their farms compared to traditional agriculture. Most farmers with small landholdings eke out an average profit of Rs 7,000-8,000 per acre per month. The founder claims that in the Farmizen model, farmers can earn three to five times that. On the other hand, consumers get access to safe, , traceable food they can trust. Every week they get fresh, locally grown seasonal food, free of chemicals - delivered directly to their doorstep or harvested by them at the farm. Farmizen offers farming of 40 vegetables, including brinjal, cauliflower, cabbage, lettuce, and kale. The list keeps changing according to the season. The app recommends crops that would suit the subscriber's needs, a feature likely to

come in handy for farming greenhorns. To obtain farmlands, the company enters into rent-share agreements with farmers. It also provides the farmer with agricultural equipment in exchange for a higher share of the revenue. Farmers then grow the vegetables as per subscribers' requests.

A farmer with, say, 3 acres of land usually grows only 2-3 crops at a time. With Farmizen, the company claims, he can grow up to 20 crops using natural methods. This also improves the quality of the soil. Multiple crops also help from the risk management perspective. If there are 30 crops growing on a farm and three fail, the rest compensate for the loss. The app supports bilingual and voice-based instructions to help farmers manage the mini-plots and adopt better agricultural practices.

Mode of Action



Active Regions

Bengaluru

Funding

Undisclosed seed fund by VC firm Venture Highway, former Canaan Partners managing director and Indifi co-founder Alok Mittal, founders of gaming portal adda52.com Mohit Agarwal and Anuj Gupta, and a few other angels.

Impact

750+ customers

Website

www.farmizen.com



HOME
FAQ
OUR FARMS
IN NEWS
BLOG
ABOUT US
GIFT-A-FARM
DOWNLOAD APP

Farm, Together

Grow your own fresh, chemical-free food. In a mini-farm you control.

Farm Taaza



Founded In	2015
Founders	Kumar Ramachandran
Headquarters	Bengaluru, Karnataka
Product Name	Farm Taaza Supply Chain Management
Technology Used	B2B e-Commerce Platform, Mobile e-Commerce Store Front
Objective	To create an efficient B2B entity focused on increasing the value to both the farmers and business customers

Startup Description

Launched in August 2015 by Silicon Valley veterans, Farm Taaza is a wholly owned subsidiary of Gram Suchana Solutions operating in the fresh produce supply chain segment. It focusses on increasing the value to both farmers and business customers. It currently operates in Bengaluru, Chennai, Hyderabad and Ooty. At present, the agritech startup receives more than 200 orders a day from suppliers and clients, which amounts to around 20 tonnes of produce daily. Farm Taaza works with over 1,400 farmers to source and supply nearly 150 varieties of fruits and vegetables to clients. It services a long list hotels, hospitals as well as supermarkets, including Big Bazaar, HyperCity, Manipal Hospitals and Apollo Hospitals, among others. Around 60 percent of the startup's net revenue currently comes from the neighbourhood Kirana stores, with the rest contributed by bigger retail outlets. The startup prides itself to work directly with farmers and source at market leading prices to ensure higher quality sourcing and higher prices for the farmers. Farm to Market time of 8-22 hours ensures freshness of produce. To reduce spoilage, the firm packs, grades and ships produce directly from the sourcing centers. They are able to assure high fill rates through sourcing from multiple competing sourcing centers. Whole sale ordering made easy through the mobile e-commerce store front. The predictive technology helps us in staying competitive by reducing logistics and wastage costs. Farm Taaza's sorting, grading and packing processes are specifically designed to meet the demands of the customers. Farm Taaza, has reportedly raised \$8 Mn Series A funding in a round led by Epsilon Venture Partners. The round saw participation from IL&FS Investment Managers' Tara India Fund IV and other angel investors. With the Series A funding, the firm wants to enable a seamless supply chain from farm to store and the next focus will be to leverage machine learning, AI and data analytics for improved decision making. It is also looking to utilise the funding for expansion across the southern part of India. The financing will also enable the startup to further develop its tech stack. Farm Taaza at its core is targeting the agricultural sector, especially the small farmer by bringing technology in play to significantly reduce if not totally eliminate the inherent inefficiencies in the supply chain from farmer to the store front and thereby passing on that savings to the small farmer in terms of higher sale price for their produce, lower pricing for the end consumer while also allowing Farm Taaza to establish and grow a strong enterprise. Essentially, it was a win-win situation for both the parties.

Mode of Action



Active Regions

Bengaluru, Chennai, Hyderabad and Ooty

Funding

\$8 Mn Series A funding in a round led by Epsilon Venture Partners

Impact

Working with 1400 farmers to supply 150 varieties of fruits and vegetables

Website

www.farmtaaza.com

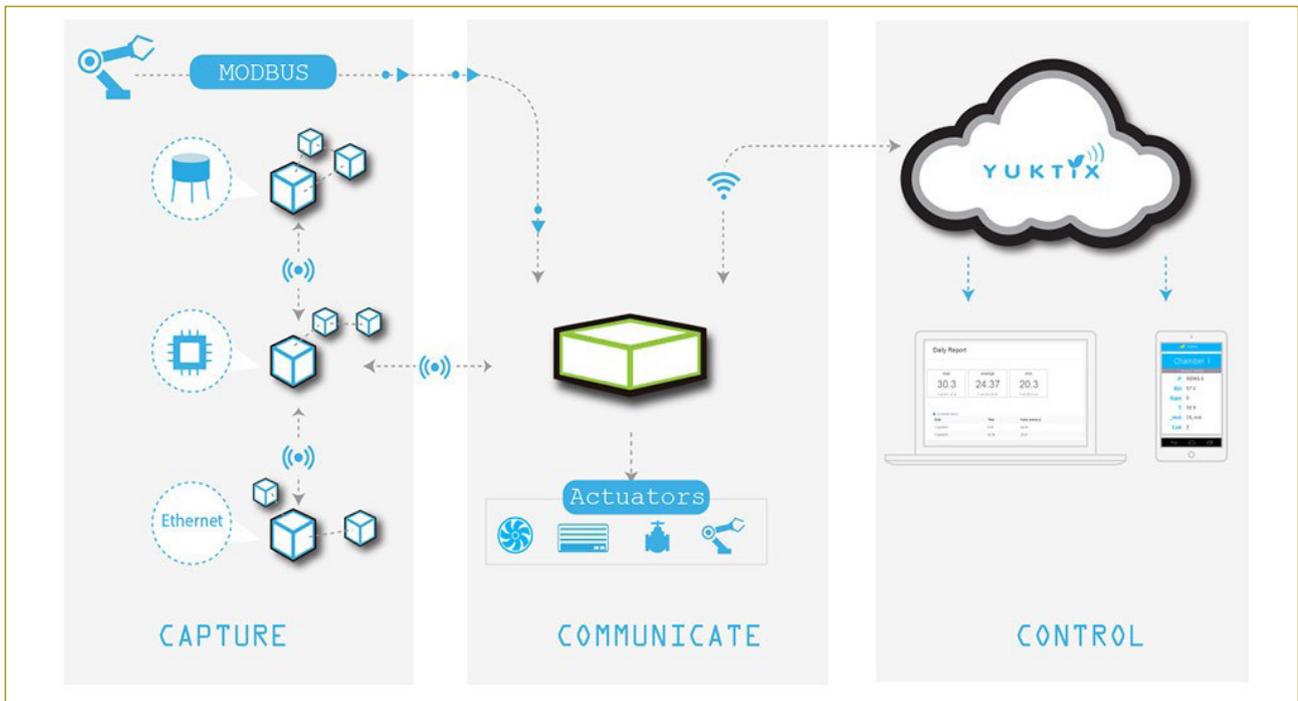


Founded In	2013
Founders	Rajeev Jha
Headquarters	Bengaluru, Karnataka
Product Name	Automatic Weather Station, Air Quality Stations, Wireless Data Logger and Sensor Catalog
Technology Used	IoT and Wireless Sensing
Objective	Providing hardware to farmers to reduce the post-harvest losses by measuring indoor environment of Cold Storages and Warehouse

Startup Description

Yuktix Technologies was founded in October 2013. The firm has been working to create indigenous remote monitoring solutions for emergent markets. It provides data capture and communication solutions for remote monitoring and environment sensing. Yuktix weather stations collect meteorological information such as temperature, humidity, rain, wind speed every 15 seconds and up to 12 samples are taken for each transmitted reading. They provide data parameterized to conform to standards set by the Indian Meteorological Department (IMD) and the World Meteorological Organization. The station was designed with enough flexibility to be used as an air quality or water quality-measuring device simply by adding the pertinent sensors. The stations can serve as ready-to-deploy templates for smart cities and urban monitoring. The startup is currently dealing in three sectors, namely Agriculture, Urban and Industrial. In regard to the environmental aspect, agricultural indicators are used to assess the ways in which agriculture affects environmental quality and how changes in agricultural practices change the environment. 1) Crop Disease Prevention, 2) Smarter Greenhouse, 3) Post Harvest Monitoring and Remote Management can make any agricultural activity capable of producing more and keeping the environment safe for more production. Yuktix provides sensors based smart devices for climate control and precision agriculture which can measure climate variables inside the greenhouse and control light (Lux), humidity, temperature, water pumps, cooling pads and shade nets inside your greenhouse to maintain ideal climate conditions. Yuktix has developed a device along with a compatible sensor catalog to monitor environment variables inside greenhouses. The device can interface to Temperature, Humidity, Lux, Soil Temperature and Moisture, CO₂, Leaf wetness and soil pH etc. sensors. A greenhouse operator can monitor environmental conditions inside the greenhouse from anywhere on a mobile device. Yuktix also provides cellular and long range radio (wireless) communication options. The company is monetising by providing automated data. The team deploys the device, generate data and gives it to the user. Moreover, the services are charged for once during the rollout and then the company pays a recurring cost for using those services. The startup is dealing in a device subscription based model.

Mode of Action



Active Regions

Bengaluru, Chennai, Hyderabad and Ooty

Funding

Undisclosed

Impact

-

Website

www.yuktix.com

YUKTIX PRODUCTS APPLICATION AREAS ABOUT US BLOG CONTACT

Transforming Agriculture

Monitor weather and field variables to accurately predict crop disease onset.

YUKTIX

Founded In	2014
Founders	Ashok Jayanthi, Sriram Chitlur and Srinath Setty
Headquarters	Bengaluru, Karnataka
Product Name	Green Unit, Agri Asset Management Sevices and Agri Services
Technology Used	Asset Management
Objective	To create a unique green investment venture which allows people to buy land and take up agriculture

Startup Description

Originating from the Kannada terms 'hosa' which means 'new' and 'chiguru' which means 'sprout', Hosachiguru is a leading agricultural asset management startup that is running over 30 sustainable green projects on 800 acres of land. Hosachiguru bridges the gap between the demand and supply of horticultural produce that is safe, traceable and meets global standards. The startup does this by management practices and scientific farming techniques. The management practices includes features such as Climate Smart Agriculture, Automation of the farm, Perma Culture, Bio Dynamic Farming, etc. These Hi-tech farms generate commercial returns, preserve the environment and maintain social values by generating rural employment and training. Hosachiguru also follows sustainable farming methods such as drip irrigation, organic mulching, pesticide free farming, rain water harvesting, etc. which focuses on soil health and water conservation to ensure production of safe horticultural produce. The group partners with individuals who are existing farm land owners or want to own farmland who want to generate green ROI. The partnerships are in three form of Green Unit, Agri Asset Management and Agri Services.

Mode of Action



How it works



Hosachiguru follows a simple three-step process in its agri-investment model. First, it procures land for its investors. The land is chosen on the basis of water availability, soil conditions, and the budget of the investor. If a client already owns land, Hosachiguru takes on the management of that land. It then designs and develops the land, depending on the crops selected for cultivation. It prepares the soil for farming, sets up a drip irrigation system or borewell, hires labourers to work on the farm, obtains an electricity line for the farm, and so on. After the land is acquired and prepared, Hosachiguru manages the operations for three months. Hosachiguru’s farming practices are careful and precise. It adopts cutting-edge techniques to ensure maximum productivity. It employs the use of precision farming – a method that helps to grow more crops by using fewer resources and reducing production costs. For those with smaller budgets, the company cultivates short-term horticultural crops like banana, melon, ginger, papaya, etc. And for who have more time and money to invest in farmland, Hosachiguru plants timber – teak, sandalwood, Melia Dubia, etc. To do what it does best, Hosachiguru consults experts from various fields. It has set up sound irrigation practices with inputs from Ayyappa Masagi – the Water Warrior of India. Also, H.S. Anatha Padmanabha, a renowned scientist, guides the company on sandalwood cultivation. Hosachiguru’s revenues depend on the final harvest. Here, it takes a profit only if the investor makes money too. For horticultural crops, the company shares 50% of the profit with the client. For long-term crops, it takes a smaller share. Though the company doesn’t completely practice organic farming, it intends to get there in the future. As the land bought from farmers is usually contaminated by the prolonged use of various pesticides, the company works towards neutralising the soil and restoring its quality.

Active Regions

Bengaluru

Funding

Undisclosed

Impact

100+ Customer base, More 2000+acre of land management, uplifting livelihood of 300+ farm labourers

Website

www.hosachiguru.com



BigHaat



Founded In	2015
Founders	Sachin Nandwana and Sateesh Nukala
Headquarters	Bengaluru, Karnataka
Product Name	Seeds, Plant Protection, Plant Nutrients and Farm Machinery
Technology Used	Supply Chain, e-Commerce Platform, Web and Mobile Platform
Objective	To empower every farmer to achieve more productivity, yield and income.

Startup Description

BigHaat is founded by a team of avid entrepreneurs in the year 2015. BigHaat is India's largest Agri Inputs Marketplace Platform providing wide choice of quality inputs to farmers at their doorstep. BigHaat is bringing accessibility of quality agricultural products and personalized advisory by leveraging its Technology offering for farmer empowerment. BigHaat has adapted multichannel strategy to reach out growers across India and addressing their Agricultural Input needs. The portfolio offering includes broad range of Seeds, Plant Protection, Plant Nutrition and Agri Implements. Its clientele includes farmers, nurseries, FPOs, NGOs and other institutional growers. BigHaat has partnered with leading Indian and Multi-National Agricultural Input brands comprising of DuPont-Pioneer, Monsanto, Dow Agro Sciences, Tata Rallis, UPL Advanta, BioSeed, Mahyco, Seminis, Namdhari, Semillas Fito, Known-You, Tata Agrico etc.

BigHaat Technology Platform is driving efficiencies of Agri Inputs manufacturers in the areas of distribution, marketing and operations with data-driven business intelligence. The data strategy enables various stakeholders of Agri value chain to come together and build end to end ecosystem for farming community and driving sustainable agriculture. The platform works on a hybrid model. It accepts online orders and also from their 'feet on the street' model, where sales people directly interact with farmers to help them place orders for products they need. For last-mile logistics and delivery, the startup works with its own logistic teams and also relies on partners like India Post and Ship Rocket. BigHaat has so far shipped about 10,000+ orders with an average ticket size of Rs 10,000, to over 20 States, including remote locations like Jammu and Kashmir and Andaman islands. BigHaat also provides call centre support from Bengaluru and Hyderabad and has a 'missed call' service through which farmers can request for a call back. While BigHaat's most in-demand products are seeds, there is also good interest in other product categories. On the whole, BigHaat aims to connect farmers to verified suppliers directly and reduce travel periods required to procure their desired products. After the transaction, BigHaat also provides post-sale support to farmers and helps suppliers by providing 'demand forecasts' based on their data. The startup currently has an Android app and going forward wants to further enhance its app experience and also develop an iOS app, to reach out to more customers and partners. For the farmers benefit, BigHaat also aims to develop an in-depth knowledge base about best practices and other relevant information. It currently does this on a smaller scale through 'know how' and 'news' sections on their website. The startup's long-term goal for the coming years include developing a full-fledged SMS-based offline ordering system to help consumers and farmers in areas where there is intermittent or no Internet connectivity. Also in the pipeline are location tagging information systems and a buyback product platform.

Mode of Action



Active Regions

PAN India platform serving across all geographies including Jammu Kashmir, Andaman Nicobar etc.

Funding

Undisclosed (Ankur Capital and Green Agrevolution)

Impact

Have impacted the lives of more than 5 lakh farmers

Website

www.bighaat.com



Intello Labs



Founded In	2016
Founders	Milan Sharma, Nishant Mishra, Devendra Chandani and Himani Shah
Headquarters	Bengaluru, Karnataka
Product Name	Intello Labs Grading App and SaaS
Technology Used	AI (Smartphone based)
Objective	To provide advanced image recognition technology that can recognize objects, faces, flora and tag them in any image

Startup Description

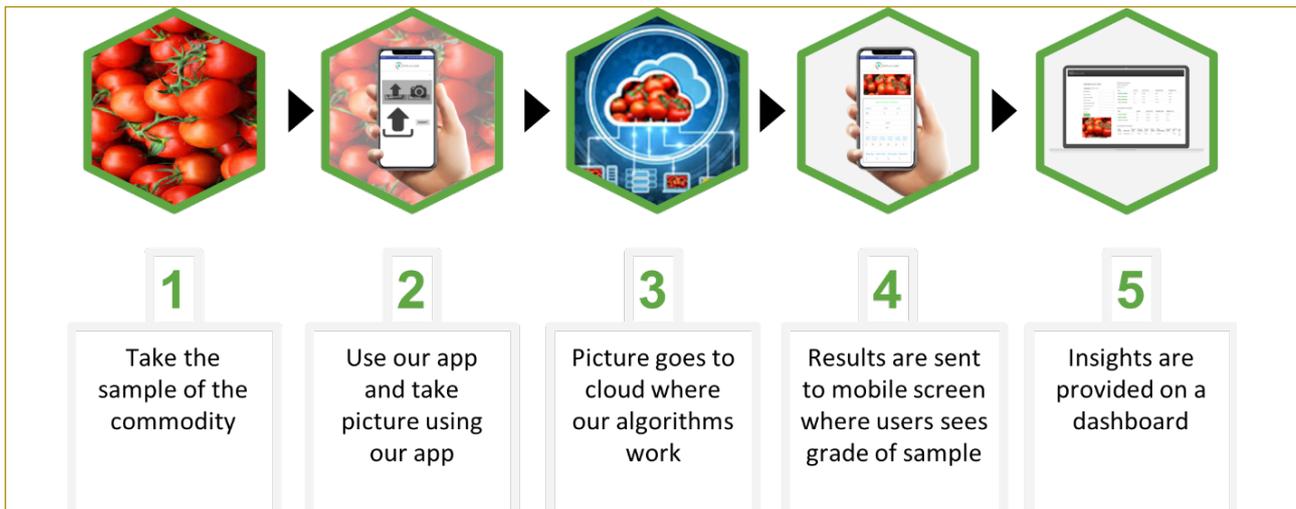
Intello Labs is India's Most Awarded Agritech Venture. Intello Labs started its journey in 2016 to investigate markets where AI adoption will be welcomed in the early stages of its technology life. They began with use cases where to build, test and deploy AI solutions rapidly before launching into chosen markets with confidence. Intello Labs is recognized as a de-facto business for expert AI capability in solutions that satisfy real world challenges in near real time.

Intello Labs has invented a pioneering first-in-the-world app & equipment to test, grade and analyse the visual quality parameters of agri commodities. They currently offer services for testing and grading of wheat, corn, tomato, soybean, potato and onions. The firm is also in the process of adding one commodity per month to their portfolio, thereby widening product portfolio and client base. Intello Labs pride itself in customizing the product for each individual company and each location on the basis of their requirements – thereby deepening the knowledge of the commodity. The invention adds tremendous value to the food and agribusiness industry by :

- Reducing the time taken for quality testing from 15 minutes to 2 minutes.
- Real time sharing of data across multiple locations and screens.
- An accuracy of 95 % and more beating the human eye.
- Removal of subjectivity in quality assessment.
- Promoting a shared understanding of the visual quality parameters.
- Eliminating disputes thereby saving managerial time and legal fees leading to increased productivity.

The revenue/pricing model follows the B2B SaaS model. They charge a set-up fee for every implementation. Following that, there is a monthly fee depending on usage (i.e. number of images processed). Typically, the firm works with corporates who implement these solutions; even if the farmer uses the application, the costs are borne by intermediaries. The firm currently have paid project with Government of Rajasthan for implementation of the product in Mandis under Rajasthan APMC to bring in objectivity in grading of grains traded at the mandis while capturing mandi transaction data in digital manner. This could then extend to 250 of 7500 Mandis registered under eNAM. The have gone to work with 10,000+ farmers for wheat and grains grading in Rajasthan. The founder mentioned that the fundamental challenge is to convince people of the product viability. Since the idea is new and disruptive, people are usually skeptical, to begin with.

Mode of Action



Active Regions

Worldwide

Funding

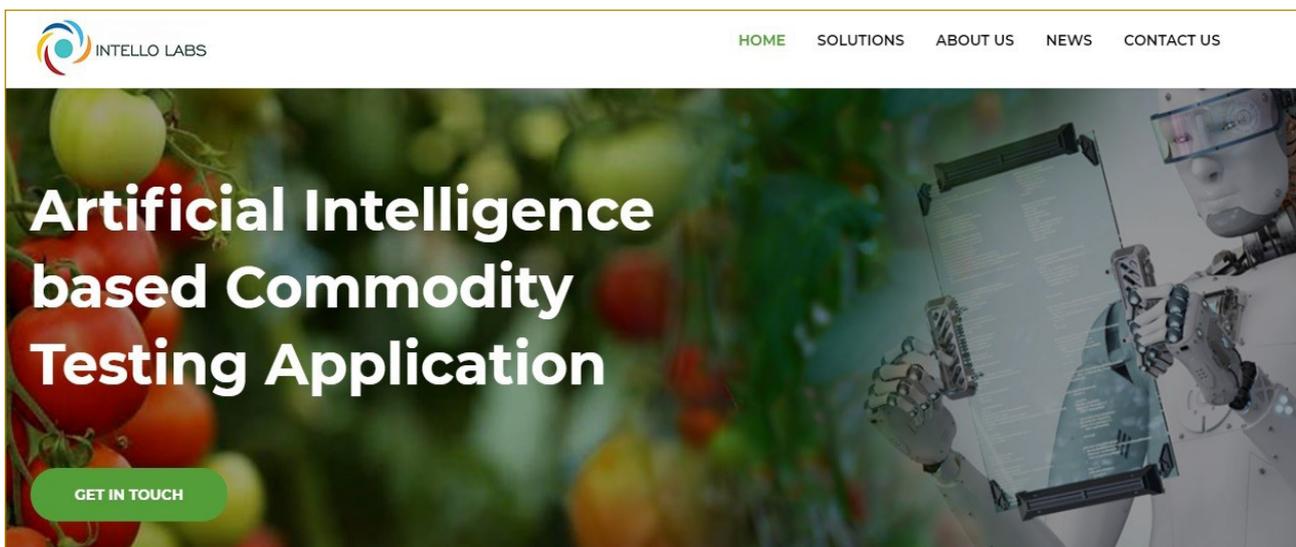
INR 2.5 Crore (2 rounds of Angel Investment)

Impact

1 Million readings daily, 10+ countries worldwide, 25+ brands associated and 1 Million SKUs and counting

Website

www.intellolabs.com



eXabit Systems



Founded In	2014
Founders	Amulya Mishra, Avinash Agrawal, Prashant Sahoo, Satyajeeet Mahapatra
Headquarters	Bengaluru, Karnataka
Product Name	RobotiX and TactiX
Technology Used	IoT and ML
Objective	To help improve farmers economic condition with software application for complete pre-harvest tracking and monitoring

Startup Description

eXabit has created an IoT platform which helps in resolving the broader problems of agriculture such as fragmented land management, irrigation controls, seed behavior and move towards sustainable agriculture. RobotiX in conjunction with TactiX makes the IoT platform. They are the first movers in India to build an end-to-end IoT platform for agriculture, enabling smart precision farming and smart control.

RobotiX: An IoT device, which captures micro-climatic data, soil condition data & real-time controls to make it conducive for a better crop growth. RobotiX is made with tremendous amount of research and field trials, capable to withstand varied weather conditions. Made for both open-field and hi-tech farming, RobotiX is moving closer towards a cognitive IoT solution.

TactiX: Software platform that comes with different modules for managing post-harvest and pre-harvest processes. Modules help in management of distribution, logistics, inventory, storage, and billing are few to highlight about. Dynamic reporting and analysis helps in keeping a tap on what is happening within your enterprise.

RobotiX is a solar powered product, two kg in weight and 40 cm tall, comes equipped with sensors that monitor crop health, but also soil temperature and humidity, and the microclimatic conditions such ambient Temperature and humidity. It also provides the farmers with real-time data through phone notifications and also the company's android app is available in five languages- Telugu, Tamil, Kannada, Hindi and English-helping them make the right decision like the right time and level of irrigation, required, among others.

eXabit's TactiX-eHarvest helps farmers geo tag farmland, check the nearest market, railways, road or canal, connect to a farm consultant, record and analyse crop progress and access crop advisory services. TactiX-SCM enables various agri-allied services to manage the entire agri supply chain, with modules such as POP, inventory, logistics, warehousing, processing, distribution, invoicing and POS. Moreover, it's BI (Business Intelligence) module can analyse all the data gathered at every step in the supply chain. eXabit solutions have enabled farmers with updated information on local weather forecasts, hyper-local or farm micro-weather details, along with crop advisory three times a day. They have claimed that their technology has helped farmers increase their overall gross margin by 25 percent. eXabit mainly works in four major areas of Crop Management

& Advisory, Precision/Smart Farming, Farm Automations and Agri Analytics. And these all are achieved with the judicious application of Farm Management, Agri-Input Management, Cropping Process Tracking, Farm-Field Equipment Controlling, GIS And Map Based Search And Pre-Harvest Cropping Process Planning which are the special product features of eXabit Systems.

Mode of Action



Active Regions

Worldwide

Funding

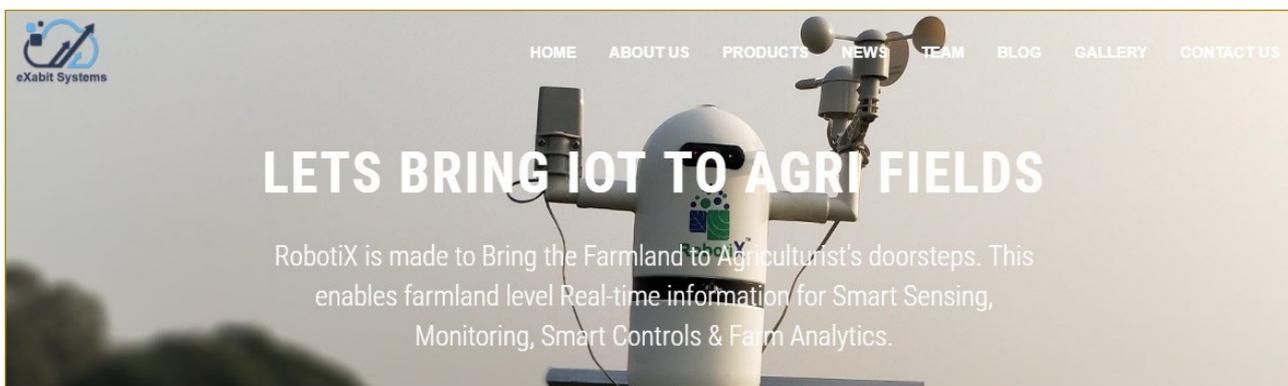
Undisclosed

Impact

8000 farmer digitized, 37 Robots deployed, 15,164 acre land monitored and 91 smart app user

Website

www.exabit.in



Gold Farm



Founded In	2015
Founders	Abhilash Tirupathy and Karthic Ravindranath
Headquarters	Coimbatore, Tamil Nadu and Bengaluru, Karnataka
Product Name	Farm Equipment on Rental
Technology Used	Mobile-based Application
Objective	-

Startup Description

Moving from a single product company (solar water pumps) to a digital platform for agri products and services, Gold Farm is making it easy for farmers to book farm equipment. Brainchild of founders Abhilash Tirupathy and Karthic Ravindranath, Gold Farm was started in September 2015. Gold Farm was born with the idea of using the sharing economy (the 'Uber', 'Airbnb' business model) to make it resource efficient for farmers to access farm equipment. This is a mobile-based application that helps farmers get farming equipment on rental basis. The farmers, using the app, can identify available equipment in their area, make bookings, and make payments. The equipment owner is able to rent out his equipment and is able to monitor its utilization. Gold Farms is to the farming community what Uber and Ola are to the urban mobility space in India. Gold Farm has equipment hiring centres in 11 villages across Kolar and six in Gadag in Karnataka. Using the Gold Farm app or by dialing the call centre, farmers up in a 30 km radius from these centres can book tractors and other equipment. From a two-person startup, Gold Farm has now grown to a 100-people company. Its aim is to provide farmers with products and services through a convenient platform and have a positive impact on their lives. Its platform has benefitted over 1000 farmers on ground. Through its mobile application and a call service, the startup provides an easy way to book a farm equipment. For this, it collaborated with the local people and created a network of booking agents, who had a sound knowledge of using a smartphone and carrying out online transactions. They helped the farming community get access to the mobile app. At present, there are over 250 booking agents and over 500 tractor owners connected with the mobile app. It also works closely with the government and farm equipment manufacturers to make farm mechanisation affordable to small and marginal farmers. Gold Farm offers a range of implements such as rotavators, disc harrows, rotary tillers and MB ploughs. The services are charged on an hourly basis, based on the tariff fixed by a local panel that includes a government representative, mainly the District Agriculture Department officials. Further, each tractor registered on the platform is attached with a hardware device which collects data about the land holding and size of the farm. Through IoT, in the future, the founders hope to accurately predict the efficient farm equipment model required by a farm based on its shape and size.

Mode of Action



Active Regions

Tamil Nadu and Karnataka

Funding

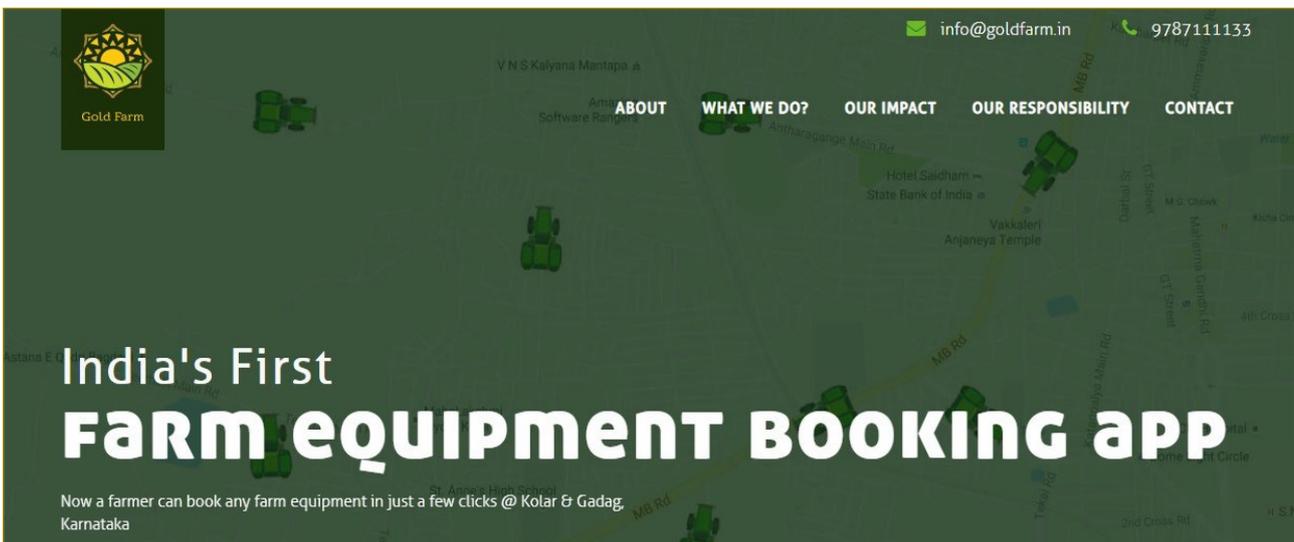
\$2 million (Rs 13 crore) in seed funding from farm equipment and automobile manufacturer Mahindra & Mahindra and early-stage venture catalyst Infuse Ventures

Impact

100 tractors, 150 farm implements, 13 CHSE centres, 1000+ farmers benefitted

Website

www.goldfarm.in



Thanos Technologies



Founded In	2016
Founders	Harish Alladi, Prathyush Akepati and Pradeep Palleli
Headquarters	Hyderabad, Telangana
Product Name	Agricultural Aerial Spraying
Technology Used	Aerial Robotics
Objective	To provide farmers with innovative aerial solutions to conventional terrestrial problems.

Startup Description

Thanos Technologies is an Aerial Solutions provider using drones to offer innovative solutions to conventional problems. Using a mix of Hardware and Software platforms, the firm is redefining services which are conventionally catered to by terrestrial solutions. Thanos Technologies is a start-up that hopes to help farmers with its drones. The IIT Hyderabad Centre for Innovation and Entrepreneurship and ICRISAT incubated start-up incorporates the finesse of aeronautics in making life easier for farmers. The team works primarily in the areas of agri-tech, agri-automation as an aerial spraying platform, agri-intelligence in terms of crop monitoring and plant count, apart from its more ambitious projects of working on army military and defense fields. The aerial spraying platform covers an acre of land in a uniform and efficient manner in just 15 to 20 minutes. This helps reduce input costs for the farmers, and also possibly improving the yield and soil health. A mobile app is used to mark the boundaries of the land that needs to be sprayed. Once marked, a couple of settings like the height and speed of the drone are entered. After this, all basic checks are performed and the drone lifts-off. No manual intervention is necessary during the spraying activity, and the drone comes back to the starting point by itself, or can be brought back manually if needed. Typically, the conventional method of spraying requires nearly 100-150 liters of pesticide (High-Volume Spraying) to be sprayed per acre. Apart from being incubated in CIE IIIT and ICRISAT, Thanos is also supported and mentored by RICH (Research and Innovation Circle of Hyderabad - A Telangana Govt. Initiative), and also by Surge Impact Foundation and Berkeley Smart AP. While quite a few companies seem to have either imported drones or built crude versions that are not market ready, thanos has it a point to design, build and test in-house a market-ready product. This is done to keep the capex low and the revenue model more financially viable. However, most of the components required to build Unmanned Aerial System (UAS) platforms are not manufactured or even sold in India, and they have to be imported from China. Some of the materials we have imported include 3K carbon fibre sheets, DC motors, propellers and other minor electronic components. One of the critical components of the drone is the Flight Controller (the brain of the system), which is also being procured from China and other countries. The company is now working on high-endurance drone prototype (one hour or more flight time) that can be useful in surveillance applications for different types of users (Police, Army, Municipalities). They are also looking closely at drone delivery and AI-based solutions. The team has a spraying-as-a service model, where they intend to charge Rs 500 to Rs 600 per acre.

Mode of Action



Thanos's In-house built Spraying Drone

Active Regions

Telangana and Andhra Pradesh

Funding

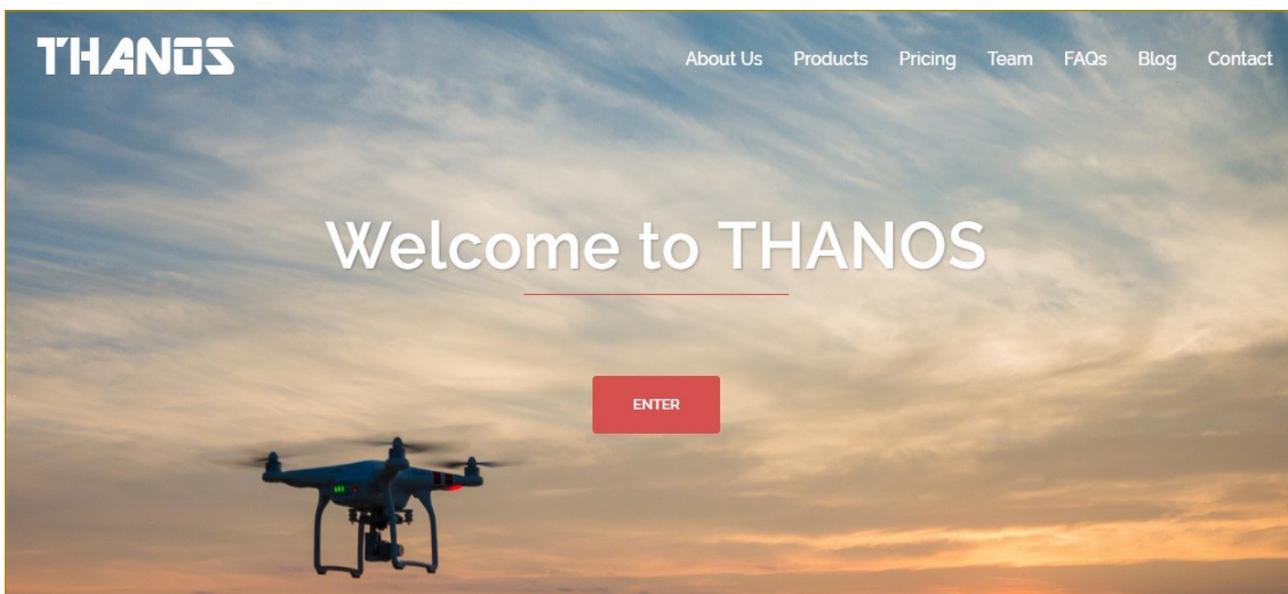
Bootstrapped

Impact

25 farmers; area covered under commercial spraying: 180 acres

Website

www.thanos.in

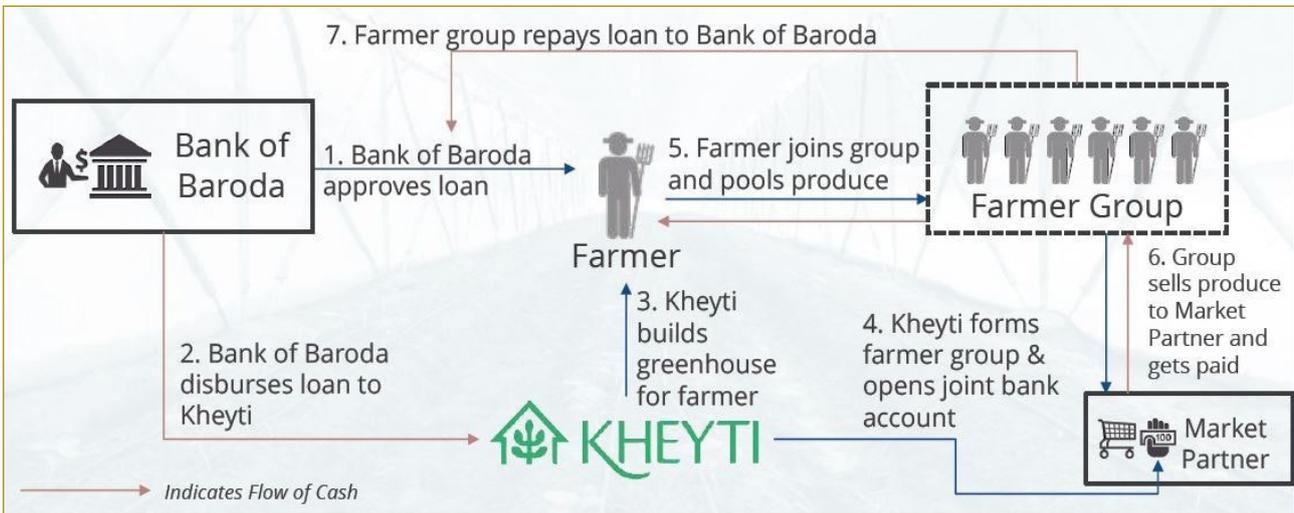
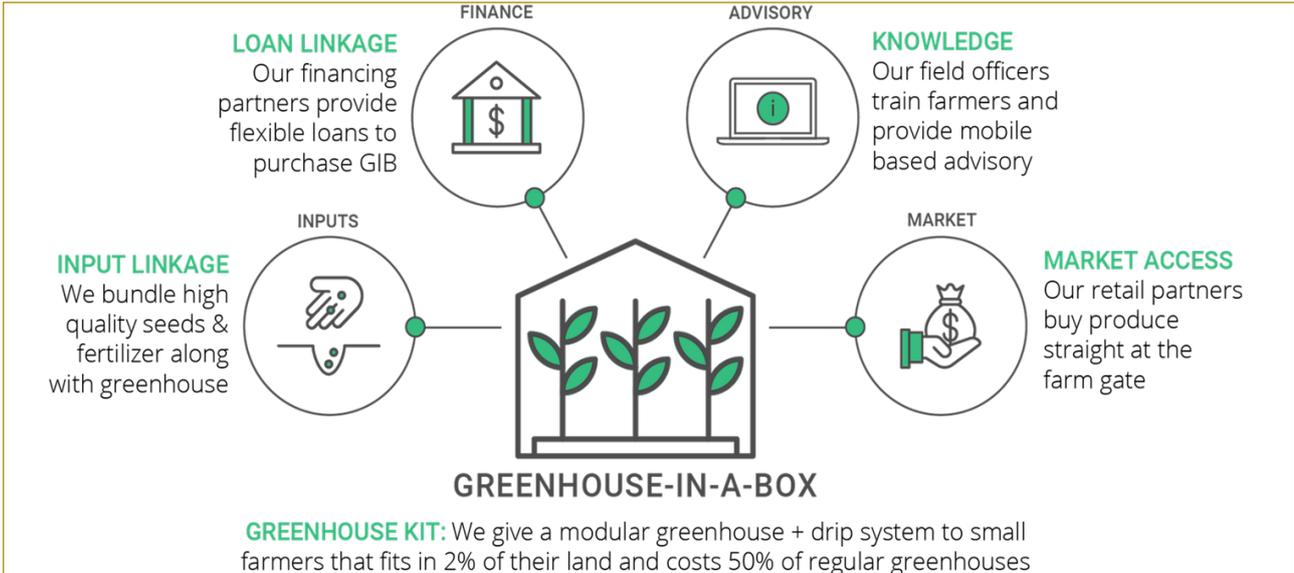


Founded In	2015
Founders	Ayush Sharma, Kaushik K, Sathya Raghu Mokkalapati and Saumya
Headquarters	Hyderabad, Telangana
Product Name	Greenhouse-In-A-Box
Technology Used	Greenhouse, Protected Cultivation
Objective	To provide low-cost farming solutions to help small farmers increase yield and protect them from the impact of climate change

Startup Description

Kheyti design, adapt and implement low-cost farming solutions that help small farmers increase yield and predictability of produce. They combine these technologies with end-to-end support to give these farmers a seamless path towards income increase. Kheyti has developed a "Greenhouse-in-a-box" – an affordable, modular greenhouse bundled with full stack services that uses 90 percent less water, grows 7 times more food and gives farmers a steady dependable income. Kheyti has created several scaled-down versions that range from 258 to 553 square yards, an area that takes up just two to five percent of a typical small farm there. The size reduces the investment risk - farmers are still able to grow other crops on the rest of their land. Kheyti introduced Greenhouse-in-a-Box (GIB), a low-cost, modular greenhouse integrated with end-to-end support, to battle income variability. This initiative by Kheyti, unlike other existing schemes by private and public organisations, offers small-size greenhouses. The smallest size that the other competitors provide is around 1/4th of an acre. Kheyti's greenhouse is 1/16th of an acre, and it occupies just 2 percent of land. Each GIB costs Rs 1,60,000. A farmer is required to pay a down payment of Rs 30,000. The balance is given as a loan by Kheyti's financing partners with a repayment term of three years. Kheyti will earn through the sale of the GIBs to farmers and commission charged on annuity from input companies on input linkages and market linkages. Apart from GIBs and financing, Kheyti also provides input linkages to help farmers get timely access to qualitative seeds and fertilisers. It provides training and ongoing advisory to help farmers grow the right way and helps them with market linkages with organised retailers to create a reliable marketing channel. Innovation has not stopped here for Kheyti. It is working on further reducing the cost of GIBs and make it more economical and efficient. Kheyti is working with Stanford on this front.

Mode of Action



Active Regions

Telangana

Funding

Undisclosed

Impact

300 farmers

Website

www.kheyti.com



KHETHINEXT

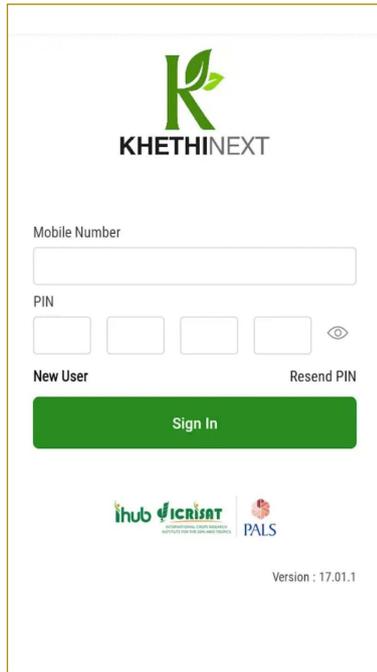
Founded In	2017
Founders	Phanidhar Palakoti
Headquarters	Hyderabad, Telangana
Product Name	KHETIAPP
Technology Used	Mobile App Platform
Objective	To support small farmers by improving their crop productivity through virtually connecting with rest of the agriculture ecosystem



Startup Description

KHETHINEXT Platform enables digital agriculture transformation, is a product of PALS AGRI eCONNECT Private Limited. This platform supports small farm holding farmers to reduce their cultivation costs, connect with financial institutions, obtain higher remunerative prices and improve their crop productivity through virtually connecting with rest of the agriculture ecosystem, likes input agencies, financial institutions, produce buyers, agriculture experts, policy makers and government extension officers. An incubatee of the Agri-Business Incubator of the ICRISAT farmers. It also helps the farmers find the buyers for their produce. With tie ups with farmers, it also extends loans and insurance services to farmers. KHETHINEXT is also getting mentored from the Research and Innovation Circle of Hyderabad, an initiative by Government of Telangana. Farmers, through KHETHINEXT can buy farm inputs, get access to government schemes, good practices, weather alerts and market prices. They can also use the same platform for selling produce, seeking farm advice, training, insurance and other services. Each farmer group has generated Rs 50 lakh through input sales and Rs 2 crore worth of agri produce sale. It now reaches farmers in Telangana, Andhra Pradesh and Haryana through its 25 farmer groups including Sehamihta, Pothana NGO, eFresh, Nilagiri, Prerana, Girijana Vikas, CCD, SARDS, Sangameswara Famers Producer Company Limited. The firm is hoping to add about 100 FPOs/ NGOs in a year to 15 months from 2018. The number of farmers registered will increase manifold in three years as the firm targets to spread its activities across India and also tap Africa. Currently, input agencies like the Rallis, SWAL, Coromandel, Suma Agro, Delta Seeds and Pro Turf among other, custom hiring agencies and buyers like Olam, Terravana, Big Basket, Freshplus are partners with KHETHINEXT. There are over 150 products available for farmers to procure which are required for cultivation

Mode of Action



Active Regions

Funding

Impact

Telangana, Andhra Pradesh and Haryana

\$5 million (about Rs 32 crore) from a Dubai-based firm

Currently around 65,000 farmers are deriving benefits from the services of KHETHINEXT platform while 4.72 lakhs farmers are registered on the app.

Website

www.khetinext.com



Cheruvu



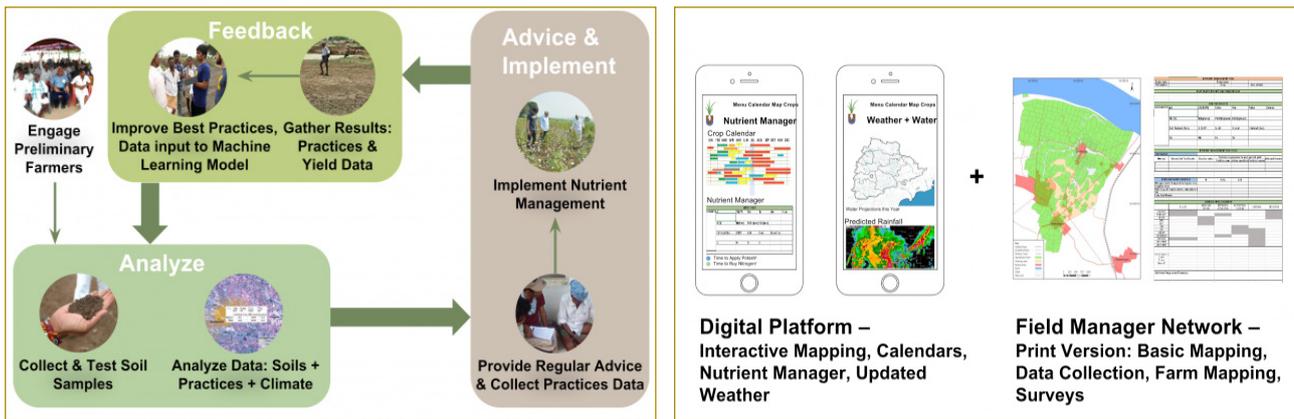
Founded In	2014
Founders	Samhita Shiledar, Aditya Dahagama, Kavya Vayasi, Shamitha Keerthi, John Monnat
Headquarters	Hyderabad, Telangana
Product Name	Comparative Yield Assessment and Soil Testing
Technology Used	Agricultural Technology, Machine Learning, Decision Making
Objective	To improve economic, environmental, and social sustainability of farmers in developing countries.

Startup Description

Cheruvu is an integrated precision agriculture solution for each farmer, combining four types of data: soils, weather, satellite imagery, and farming practices. They conduct soil tests and based on the results, soil health cards are provided to farmers, helping them understand their soil. Cheruvu provides services of soil testing through on-field soil sample collection & analysis and subsequently analyzes this data along with data from other sources to provide decision support for nutrient management in farm fields. The company provides a digital platform for disseminating information related to best practices for nutrient management in farm fields and combines the additional data obtained from soil sampling of a farm field to update the listed best practices. The company claims to use machine learning algorithms for analyzing the data. The digital platform has modules for geo-tagged farm mapping, nutrient management, workflow management, and dissemination of updated hyper-local weather information.

The product is a site-specific precision agricultural tool that provides best nutrient practices for small farmers in developing countries. In this process, Cheruvu tracks farming inputs and operations such as tilling, sowing, weeding, fertilization, pesticide application, irrigation, and harvesting. In the long run, the firm aims to leverage this high-resolution data on practices, soils, climate, inputs, and outputs to address other inefficiencies across the agricultural value chain. Cheruvu has established relationships across political and administrative functionaries in India, designed and conducted a survey of 1,100 small farmers to understand pain points, co-created survey to document agricultural practices of local farmers, developed a web application for data collection, hired field managers from local communities, established an ecosystem of partners for local outreach, collected 2,700 soil samples from farmers and conducted soil tests, designed an individualized farmer nutrient application guidance tool, tested and installed weather stations, created partnerships with local scientists and universities to collaborate on key research, conducted customer discovery interviews and developed a business model. Currently, they are validating the business model by selling service to farmers and conducting crop experiments to further evaluate the efficacy of service model. The business model addresses the shortcomings of the governmental program by developing farmer friendly communication methods through co-creation and continuous feedback. Cheruvu test soil, engage farmers and their communities, and build trust with locally influential farmers to engage a wider community. The result is action by the individual farmers who are participating in a comparative assessment of their yields, while providing and learning from local best practices.

Mode of Action



Active Regions

Telangana

Funding

Undisclosed

Impact

3600 farmers associated, conducted testing in 54 villages, 2700 soil test performed

Website

www.cheruvu.in

Home Project What We Do Team About Blog

CHERUVU

We work with small farmers in developing countries

We mitigate risk for farmers in developing countries by increasing informational access for agricultural decisions.

3. Startup Policy and Implementation by Central and State Governments to boost Indian Startup Ecosystem

Role of Central Government

Central Government is playing a key role of channeling the energy, aspirations and vision of the youth. The measures propagated to build a pro-entrepreneurship environment are targeted to:

- Reduce regulatory barriers;
- Facilitate opportunities for learning and development;
- Develop large scale innovation driven infrastructure facilities; and
- Promote active collaboration among entrepreneurs, industry and academia

Government of India under the Startup India initiative is collaborating with various ecosystem stakeholders across different parts of the country to ensure that all the above components are available for entrepreneurs and Startups to engage with and utilize to its full potential. The Department of Industrial Policy and Promotion has been actively taking requisite measures to encourage entrepreneurship and promote innovation. There are over 16,200 Startups recognized till date under Startup India that are spread across 479 districts, covering all 29 States and 6 UTs. In order to provide growth stage funding to Startups, a Fund of Funds (FFS) of INR 10,000 Crore has been setup. This is supporting innovators and risk takers in their path towards the creation of a New India. In order to improve regulatory regime, an institutional mechanism has been established within Startup India. A Committee of Secretaries (CoS) chaired by Finance Secretary, for dealing with regulatory issues facing Startups has been constituted. Over 22 regulatory amendments have been made to support all the ecosystem stakeholders. The detailed progress of Startup India Action Plan and Regulatory Amendments can be obtained from the website of Startup India (www.startupindia.gov.in).

Role of State Governments

States have a vital role to play in promoting the Startup ecosystem. One of the core strengths of India lies in its diversity, leading to enormous opportunities for cross-learning from each other.

Only four State Governments were actively supporting Startups before the launch of Startup India through a State Startup policy. The Startup movement across the country was fragmented and there was a need for consolidating standalone efforts. Emphasis was



also required simultaneously to encourage more and more States to undertake new initiatives. The national priority initiative has led to a wide spread movement across the country and presently 22 States have their own Startup policies. Many other States and Union Territories (UTs) are in the process of drafting their policies and operating guidelines. The core functioning of an enabling ecosystem in a State is a function of the policy framework and effective implementation of the same. In the journey of developing a conducive Startup community, it is important that States and UTs exchange and adopt good practices undertaken by each other.

Recently, The Department of Industrial Policy and Promotion conceived the States Startup Ranking Framework with the key objective to encourage States and Union Territories to take proactive steps towards strengthening the enabling Startup ecosystems within their jurisdictions. There were 38 action points categorized into 7 broad pillars such as Startup Policy and implementation, Incubation support, Seed Funding, Angel and Venture Funding, Simplification of Regulations, Easing Public Procurement and Awareness & Outreach. The ranking methodology was aimed at creating healthy competition among States to further learn, share and adopt best practices. A total of 27 States and 3 Union Territories participated in the exercise. Evaluation Committees comprising of independent experts from Startup ecosystem did a painstaking assessment of responses across various parameters. Many parameters involved getting feedback from beneficiaries. More than 3200 calls were made in 9 different languages to empathetically connect with beneficiaries to get a real pulse at the implementation level. Result of the Ranking exercise of the states according to 7 pillars are as follows:

Pillars	States with exemplary performance in the respective category*
Startup Policy and Implementation	Andhra Pradesh, Chhattisgarh, Gujarat, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Odisha and Rajasthan
Incubation Hubs	Andhra Pradesh, Delhi, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Odisha, Telangana and Uttar Pradesh
Seed Funding Support	Bihar, Gujarat, Jammu & Kashmir, Karnataka, Kerala, Odisha, Rajasthan and Tamil Nadu
Funding Support– Angel & Venture Funding Support	Chhattisgarh, Gujarat, Jharkhand, Karnataka, Kerala and Rajasthan
Simplified Regulations	Andhra Pradesh, Chhattisgarh, Gujarat, Haryana, Himachal Pradesh, Jharkhand, Karnataka, Odisha, Telangana, Uttar Pradesh and West Bengal
Easing Public Procurement	Chhattisgarh, Gujarat and Odisha
Awareness and Outreach	Andhra Pradesh, Chhattisgarh, Gujarat, Karnataka, Kerala, Odisha and Telangana

*States are presented in alphabetical order

A small outlook on the various policy changes in the Southern States of India to promote Startup Ecosystem:

Pillars	States with exemplary performance in the respective category*
Andhra Pradesh	<ul style="list-style-type: none"> • The Government shall develop physical incubation infrastructure through Public Private Partnerships. • The Government shall establish at least one world class Accelerator/ Incubator by inviting global Accelerators and Incubators to set up their programs in the state. • The government will create an Initial Innovation Fund of Rs.100 crore (1 billion) for entrepreneurs and businesses. • A single window clearance will be provided for VAT, Labour, Municipal and other local registrations and compliances. It would be supported by state-of-the-art centralized help desk on 24x7 basis duly leveraging the e-Biz portal set up by GoI. • Reimbursement of VAT/CST on goods supplied to the Incubator or incubatee and on sale or leasing of goods by Incubator to incubatee would be provided. • An empowered 'Andhra Pradesh Innovation Council (APIInC)' would be formed with the representatives of industry, incubators and the other stakeholders.
Karnataka	<ul style="list-style-type: none"> • For Domestic Patents: The cost of filing and prosecution of patent application will be reimbursed to incubated startup companies upto a limit of Rs. 2 lakh per Indian patent awarded • The reimbursement will be done in 2 stages - 75 percent after the patent is filed and the balance 25 percent after the patent is granted • 30 percent of the actual marketing costs including travel incurred in international marketing through trade show participation will be reimbursed on submission of valid claims. This incentive will be subject to a maximum of Rs. 5 Lakhs per year per company. • Service Tax paid by startups incubated in Government of Karnataka supported incubators and CIFs whose annual turnover does not exceed Rs. 50 Lakhs for the first three years will be reimbursed
Kerala	<ul style="list-style-type: none"> • The government shall give Rs. 2 Lakhs per innovative idea /startup and this shall be to startups within the state. The funds shall be disbursed through KSUM to startups registered in the ecosystem. • The government shall continue to provide pre commercialization funding through KSUM and this service shall be extended to startups registered in the state startup ecosystem. • KSIDC is offering seed funding to any new ventures promoted by young entrepreneurs subject to a maximum of Rs. 25 Lakhs per venture or 90 percent of the initial cost of the project, whichever is lower. • A delegation of 25 startups from schools/colleges will be identified through a contest and exposed to Silicon Valley through Silicon Valley Visit Program. • The government proposes to give subsidized infrastructure for the scale ups in terms of built up space in government owned/assisted parks. The subsidizing could be in terms of reimbursing part of the rent (a maximum of 50 percent or Rs. 20 /sqft) whichever is lower.

- Telangana
- The Startup can pay SGST to the relevant department and avail reimbursement on a yearly basis for a maximum total turnover of Rs. 1 cr per annum for the first three years of operation.
 - Reimbursement of 30 percent of the actual costs including travel incurred in international marketing through trade shows, with a maximum limit of Rs. 5 lakh per year per company.
 - The cost of filing and prosecution of patent application will be reimbursed to the incubated startup companies subject to a limit of Rs. 2 lakh (0.2 million) per Indian patent awarded.
 - Startups that record a year-on-year growth rate of 15 percent, as per audited accounts, shall be eligible to get a grant of 5 percent on Turnover, subject to a limit of Rs.10lacs within a period of three years from the date of incorporation.
 - To promote idea stage companies, the government shall offer recruitment assistance of Rs. 10,000 per employee for the first year.
- Tamil Nadu
- A 'One-Stop-Shop' guided by a portal and ably supported by a help-desk will be set up to facilitate registration, compliances and certification.
 - TANSIM will recognise / register a Start-step or Startup within 10 days from receipt of online application.
 - A Policy research group (Think Tank) shall be set up to carry out research on startup ecosystem.
 - Industrial organisations and private commercial organisations will be encouraged to setup Incubators/Accelerators using funds allocated under schemes of Niti Aayog, DST, DBT, DEITY and MSME-DO of Government of India.
 - The State will set up Tamil Nadu Startup Fund of Funds of INR 250 crore to be managed by a professional financial agency such as SIDBI.
 - The mission shall aim for a minimum of 1,00,000 high skilled direct and indirect job creation in the startup ecosystem.
 - Startups with a women founders or co-founders shall be supported for product development and marketing/ publicity/participation in fairs and exhibitions.

Centre and States are making considerable efforts in creating awareness about entrepreneurship among students. More than 100 boot camps have been organized by various State Governments since the start of Startup India initiative. The buzz of Startup culture has now reached 340 districts, where more than 600 entrepreneurship cells have been established by State Governments. The role of entrepreneurship cells is to foster the culture of innovation among students, who can use the space for conducting workshop, training, and sessions. As part of this collective initiative, Center and States would need to work together and build required infrastructure, dedicated system, pool of intellect and financial resources for all age groups across the country. Center and State Governments would need to adopt targeted approach for new emerging technologies, social issues and distinct demographics to scale up the Indian Startup Ecosystem.

Recommendations

- Lack/Ignorance of farmers' usage about smartphones leads to marginal utilization of the startup services mainly provided on mobile based platform/application. Therefore, there is a strong need to develop mobile training programmes to educate farmers and make them capable to adapt new technological advancements especially in using smartphones.
- The startups face a lot of problems regarding the awareness and outreach of their products and services to farmers. In order to make startups successful, it is crucial to enable seamless hybridisation of relevant technology by building a promising 'new-age distribution model'. It is the need-of-hour to develop a new way for the farmer to buy products and get information as well as credit on one unified platform.
- There is a need for the government to help set up agritech-focused incubators and grants which are currently less in number. Also, academia should encourage more entrepreneurs to focus on this growing sector.
- Accelerators, incubators and mentors identified for the agritech startup ecosystem, along with the pronounced policy and schemes, need to work in tandem with the startups to provide the best technical support and reduce their gestation period.
- 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.
- Governments should provide better incentives to startups that are coming up effective post-harvest management infrastructure such as storage, preservation, cold chain and refrigerated transportation.
- States with the presence of emerging and growing startup hubs viz. Telangana, Tamil Nadu, Maharashtra, Kerala, etc. have to come up with favorable policies and implement them soon enough to attract startups and investors similar to Karnataka which is home to majority of Agritech startups.
- Being profit based organization, startups lay their major focus on large and medium farmers. But in order to alter the scenario of the Indian agriculture it will be required of them to emphasize more on small and marginal farmer who form the majority in Indian agriculture.

Conclusion

A total of 366 agri-based startups have come up from 2013 to 2017 answering to the problems of supply chain management, use of outdated equipment, improper infrastructure, etc. Bengaluru (Karnataka) is one of the established startup ecosystem hub in India alongwith Mumbai and Delhi & NCR. Looking at the geographical distribution, Karnataka and Maharashtra together account for almost 50 percent of the total agritech startups opened in the past 5 years. Karnataka accounts for two-third of the total funding received by start-ups in the past 5 years. Agritech startups are also leveraging technology in the area of market linkages such as retail, B2C and B2B marketplaces and digital agronomy platforms. Big Data Analytics, Supply Chain/Market-linked Model, FaaS, IoT Enabled, Engineering-Led Innovation and Miscellaneous other are the major sub-sectors where agritech startups are coming up. The detailed description of the 20 startups featured in this study reveals that from ICT apps to farm automation and from weather forecasting to drone use and from inputs retailing and equipment renting to online vegetable marketing, they do all and everything. Multiple enabling policies have been implemented to support agri startups, their early take off and successful operations both by the Central as well as State Governments. Apart from the available schemes and policies to support agritech startups, 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 startups to profitable enterprises. Going forward, agritech startups will 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. Selling products and technologies to farmers is widely recognised as a big challenge, and it is one area where many startups have still not figured out a successful model. Aligning with farmers' needs and committing to improve productivity is not an easy task, and getting farmers to acquire the skills required to adopt these technologies will involve a lot of effort.



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List of Top Active Accelerators in India

Sr. No.	Name	Launched In	Headquarters	Focus Area(s)
1.	500 Startups	2010	California	Consumer Commerce, Education, Design, Bitcoin, Payment And Financial Service, Adtech, IoT/Drones /Hardware, Onlive Video, Foodtech, Digital Healthcare, Cloud Service, International And Emerging Markets.
2.	50K Accelerator	2016	Hyderabad	Payments, Security And Business Interoperability
3.	Aarambh Ventures	2016	Greater Noida	Fintech, Cleantech, SaaS, AI, Big Data
4.	AIM Smart City Accelerator	2016	Ashoka University, Sonapat	Education, Healthcare, Transport & Logistics, And Infrastructure
5.	Amplifi Asia	2015	Mumbai	B2B SaaS
6.	Ansclerator	2016	Bengaluru	Edtech
7.	Appy Hours	2016	Bengaluru	Web, Mobile, Robotics, Wearables, Blockchain, VR And IoT
8.	Autodesk Entrepreneur Impact Program	N/A	California	Energy, Water, Transportation, Waste, Agriculture, Built Environment, Health & Well-Being, Marine
9.	Avishkar	2016	Hyderabad	Deeptech, Machine Learning, AR/VR
10.	Axilor Ventures	2015	Bengaluru	Consumer Internet, Enterprise, Fintech, AI, Healthtech
11.	Brand Capital GSV	2016	Silicon Valley	Edtech, Healthtech, Consumer Services And Fintech
12.	Brigade REAP	2016	Bengaluru	IoT, Cleantech & Renewable Energy, Nanotechnology, Visual Computing, Logistics & Supply Chain
13.	Business World – BW Accelerate	2014	Delhi	Sector-Agnostic
14.	CATALYST – SG GSC Accelerator	2016	Bengaluru	AI & Machine Learning, Big Data/Data Visualisation, Voice-To-Text Transcription, Client Sentiment Analysis
15.	Cisco Launchpad	2016	Bengaluru	Networking And Infrastructure, Collaboration, Security, IoT, Video, Analytics, Cloud, Machine Learning/Deep Learning/Natural Language Processing, Visualisation/UX, Virtual Reality, Smart Things, Last-Mile Connectivity
16.	DesignGild	2016	Pune	Startups From Any Sector And Stage Are Eligible To Apply

Sr. No.	Name	Launched In	Headquarters	Focus Area(s)
17.	Edugild	2015	Pune	Edtech, Augmented Reality, Virtual Reality, Learning Analytics, Adaptive Learning, Skills Assessment, University Destinations, Robotics, Corporate Learning Solutions In Knowledge Management
18.	ESpark-Viridian	2015	Noida	Sector-Agnostic
19.	First Light Accelerator	2012	New Delhi	Startups From Any Sector And Stage Are Eligible To Apply
20.	five.eight Accelerator	2016	Bengaluru	Mother And Child Care, Cardiology, Oncology, Radiology, Surgery And Primary Care
21.	Forge Innovation	2015	Coimbatore	Connected Devices, Industrial Internet, Digital Businesses
22.	GenNext Hub	2015	Mumbai	Digital Technology
23.	GHV Accelerator	2014	Gurugram	Healthtech, Edtech, Fintech, IoT, AR/VR, AI, Big Data, SaaS
24.	Govin Capital Startup Accelerator Program	NA	Singapore	Edtech, Medtech, Foodtech, IoT, Ecommerce, Virtual Reality, Thin SaaS, Fashiontech, Tourism
25.	GSF Global Accelerator	2012	Gurugram	Internet, Mobile
26.	Hax Hardware Accelerator	2012	China and San Francisco	Hardware + Software, Mobile, Consumer Electronics, Wearables, Robotics
27.	HealthStart	2014	Hyderabad	Digital Healthcare, Medtech, Wellness, Disease Management, Fitness, Innovative Distribution
28.	HP Haven Startup	2015	California	Big Data
29.	Indus Net Labs	2016	Kolkata	Digital Technology, Software
30.	Intel India Maker Lab	2015	Bengaluru	Education, Sports, Health, Agriculture, Banking, Financial Services And Insurance (BFSI), E-Governance, Internet Of Things (IoT), Cloud, And Client Compute.
31.	ISDI Creative Accelerator	2015	Mumbai	Innovative Design, Technology
32.	Jaarvis Accelerator	2015	Gurugram	Fintech, Bitcoin, Blockchain Technology, IoT, Agritech, Data Analytics, AI
33.	Kyron Global	2012	Bengaluru	Retail, Fintech, SMAC, AR/VR, IoT, Blockchain, AI
34.	Launchpad Accelerator	2015	Sao Paula, Alagos	Mobile Apps
35.	LEAP	2015	Bengaluru	Mobility, Big Data, Omnichannel, Supply Chain, Marketing, And Security
36.	Lowe's Innovation Labs	2016	UK and Bengaluru	Augmented And Virtual Reality, 3D Printing And Scanning, And Robotics

Sr. No.	Name	Launched In	Headquarters	Focus Area(s)
37.	Microsoft Accelerator	2012	Redmond, Washington and Bengaluru	Technology Enabled/Technology Startups That Are Later Stage Or Enterprise Ready
38.	NeoLeap	2016	Kolkata	Across Sectors
39.	NUMA Global Accelerator	2015	Paris and Bengaluru	Sector-Agnostic
40.	Oracle Startup Cloud Accelerator Program	2016	Bengaluru	Technology
41.	Quintype's SpeakWrite	2015	Bengaluru	Digital Media Startups
42.	Revvx Hardware Accelerator	2016	Bengaluru	IoT, Augmented/Virtual Reality, Robotics, Drones, Blockchain, Wearables, Connected Automobiles
43.	Rise Accelerator	2016	Mumbai	Lending, Digital Banking Solutions, Trading, Enterprise Mobility, Cybersecurity, Data Analytics, Payments, Cryptocurrency, Insurance, And Wealth Management
44.	SAP-SINE Social S-Cube	2016	Mumbai	Healthcare, Clean Energy, Environment, Agritech And Foodtech
45.	SAP Startup Studio	2016	Bengaluru	IoT, Big Data, Cloud, As Well As Verticals In Retail And Healthcare
46.	Scale Up	2014	Pune and Noida	Customer Information Management, Mobile, Data Analytics, Location-Based Services, Ecommerce Management, Machine Learning
47.	Spark10	2015	London and Hyderabad	Software Technology-Driven Startups
48.	Shell Make The Future	2017	Bengaluru	Cleantech
49.	Startup bootcamp FinTech	2016	London	Foodtech, Fintech, Healthcare, Ecommerce, Smart Transportation, IoT, Cyber Security, Insurtech
50.	Swiss Re InsurTech	2016	Zurich and Bengaluru	IoT Innovative Distribution Channels & Robotic Advisors And Analytics
51.	Target Accelerator	2014	Bengaluru	Marketing, Omnichannel, Mobile, Big Data Analytics And Merchandising, Supply Chain Technologies
52.	The D.N.A	2016	Berlin	IoT, Deep Learning, Analytics, Cloud, Machine Learning/Artificial Intelligence, Virtual/Augmented Reality, Blockchain
53.	Thought Factory	2016	Bengaluru	AI, Big Data And Analytics, Mobility, Blockchain, IoT, Open API, Networking
54.	TLabs	2011	Noida	Internet, Mobile
55.	VentureNursery	2012	Mumbai	Media & Entertainment, Retail, Ecommerce, Consumer Technology, Education, Cleantech

Sr. No.	Name	Launched In	Headquarters	Focus Area(s)
56.	Y Combinator	2005	Mountain View, USA	Sector-Agnostic
57.	YES Fintech	2017	Hyderabad and Mumbai	Payments, Lending (Consumer + SME), Trade Finance & Forex Solutions, Wealth Management, Regulatory Technology Or Reg-Tech, Customer Value-Added Services
58.	ZDream	2015	Gurugram	Technology, Media & Telecommunications
59.	Z Nation Lab	NA	Mumbai	IoT, Big Data Analytics, Machine Learning, Consumertech, Edtech, Fintech
60.	Zone Startups	2014	Mumbai	Consumer, Enterprise, Social, Financial, Health, IoT, Media, Technology, Education, Data Analytic

Source: Startup India; Inc42; Yourstory; Indianweb2.com

List of Incubators in India (Only 100)

Sr. No.	Name	Launched In	Headquarters	Focus Area(s)	Startups Incubated Till Date	Notable Startups Incubated
1.	Amity Innovation Incubator*	2008	Noida	Rural Innovation And Social Entrepreneurship, ICT, Social Media And Ecommerce, Mobile Computing And Technologies, Analytics, Cloud Computing And Big Data, Edtech, Foodtech, Biotech, Nanotech & Material Science	100+	ApnaCircle.com, Anduril Technologies
2.	Amrita TBI*	2008	Kollam	Technology, Social Welfare, Agriculture, ICT	45+ & 181 mentored	Skillovators, Pin 'N' Park, Nikkos
3.	BAIT-TBI*	2007	Tamil Nadu	Application Of Biotechnology In Agriculture, Industry & Rural Development	24	N/A
4.	Centre for Cellular And Molecular Platforms (C-CAMP)*	2012	Karnataka	Life Services, Healthcare, Agriculture, Pharma, Biopharma, Diagnostics, And Medtech	100+	Cisgen Biotech, Sea6energy
5.	Centre for Entrepreneurship Development (CED)	1979	Gujarat & Tamil Nadu	Industry, IT, Textile, Jewellery, Environment/Social Welfare	200+	RBT Wires, Bhagirath Solar Systems
6.	Centre for Entrepreneurship and Development by ALEAP	2003	Hyderabad	CED Conducts EDP, REDP, PMRY, WEDP, EAC's, TOT's, Agri-Clinic And Agri-Business Development Programmes	160 Micro, Small, Women Entrepreneurs	N/A
7.	CET - TBI	2009	Kerala	Green Technology	N/A	N/A
8.	Center for Incubation and Business Acceleration (CIBA)	2000	Goa	ICT, Food Processing, Cleantech	16+	Food Buzz, Garage Guy
9.	CIIE IIM-A*	2007	Ahmedabad Pune	ICT, Cleantech And Social, Big Data, Cloud, Payments, And Fintech	500+	Travelyaari, Innoz, Thrillophilia
10.	Coimbatore Innovation and Business Incubator	2014	Kumaraguru College of Technology (KCT)	Electronics (Iot) And Technology Services (Industrial/Engineering Design, Automation)	1000+ Incubated, Mentored, Boot camped	Plasmatech, Skaas
11.	Composites Technology Park	2008	Bengaluru	Composites Based On Coir, Bamboo, Jute	N/A	N/A

Sr. No.	Name	Launched In	Headquarters	Focus Area(s)	Startups Incubated Till Date	Notable Startups Incubated
12.	DA-IICT Incubator	2011	Gandhinagar	ICT	6	Alma Connect Solutions Pvt. Ltd, PlayPower Labs India Pvt. Ltd.
13.	DLabs Incubator	2013	Hyderabad	Human-Centered Design, Design Thinking	20+	Gruhaa, Millet Bowl
14.	eHealth TBI PES University-South Campus	2008	Bengaluru	Biopharma, Medical Devices, And Healthcare	40	N/A
15.	Foundation For Innovation And Technology Transfer, IIT-D	1992	Delhi	Science And Engineering	90+	EkamEco Solutions Pvt. Ltd., Faros Technologies
16.	Global INcubation SERVICES (GINSERV)	2010	Bengaluru	Ecommerce	40+	MineWhat, Carbon Clean Solutions Private Limited
17.	GNEC-STEP	1987	Ludhiana	Mechanical And IT	N/A	N/A
18.	IAN Incubator	2010	Delhi	Sector-Agnostic	60	Mukunda Foods, India College Search, Senisibol
19.	IIM Calcutta Innovation Park	2014	West Bengal	Social Enterprises, MSME's	10+	Doctors for you, Edwell solutions, Utopia
20.	IIT Hyderabad Incubator	2007	Hyderabad	IT, Big Data, Cloud Technology, GIS, Healthcare, Events	10+	Cloudgust, The Atlanta Foundation, ScribLeaf
21.	IIT Madras Incubation Cell (IITMIC)	2013	Chennai	Technology And Knowledge-Based Ventures	500+	Airwood, Neomotion
22.	IIIT-H Foundation*	2012	Hyderabad	Ai, AR/VR, Gaming	13	Ziffy, EBHASHA, Nanohealth, tourity
23.	IIT Gandhinagar Incubator	2012	Gandhinagar	High Growth Technology Companies That Generate Commercial And Social Impact	8+	Cubeit, Tinker Tank, 4DEA

Sr. No.	Name	Launched In	Headquarters	Focus Area(s)	Startups Incubated Till Date	Notable Startups Incubated
24.	IITG-Technology Incubation Centre*	2009	Guwahati	Biotechnology, Pharmaceutical, Information Technology, Polymer Products, Fruit Processing, Herbal Medicines, Electrical Appliances, Metal Utensils/ Accessories, Agriculture Implements, Cane & Bamboo Products, Engineering Industries, Product Development, Testing & Trials, Test Marketing, Mentoring	20+	Xeality IT Technologies Yantrabot Technologies Blynq Technologies Quantsolar Technologies
25.	Incube Ventures	2010	Ahmedabad	Healthcare Deliveries, Clean Energy, Sustainable Rural Business	15+	N/A
26.	Indavest	2007	Bengaluru	E-Commerce, Mobile Applications, Customised Gifting And Branding Solutions, Software Products	10+	Vyomo, General Sentiment
27.	Innovation & Incubation Centre	2015	Gandhinagar	New And Renewable Energy, Oil & Gas, Agricultural, Healthcare & Pharmaceuticals, Transportation, Computer Technology, Information Technology, Chemical, Education, Material Science, Civil & Infrastructure, Ecommerce, Art, Automobile Technology, Aerospace Technology, Communication, And Electronics.	20+	PowerTree, Yobo
28.	iCreate (International Centre for Entrepreneurship and Technology)	2012	Ahmedabad	Information Technology, Electronics, Biotechnology, Nano-Technology, Robotics, Non-Conventional Energy – Green, Bio-Medical Equipment & Devices, Agro & Food Processing	17	Bioways India, Purple Docs, Hubilo, Alma Shines
29.	JSSSTE-STEP	2000	Noida	AI, Edtech, Electronics-IOT, Fintech, Healthcare Logistics, NLP, Security, Travel, Voicetech	50+	Unify Cloud, Zolt, RailYatri
30.	Kerala Startup Mission (KSUM) (formerly Technopark Technology Business Incubator)	2006	Trivandrum	IT, Electronics, Bioinformatics, And E-Learning	220	Mobme, Innoz, Waybeo

Sr. No.	Name	Launched In	Headquarters	Focus Area(s)	Startups Incubated Till Date	Notable Startups Incubated
31.	Khosla Labs	2012	Bengaluru	Mobile Payment & Banking, Retail Efficiency, Healthcare Delivery, And Big Data Analytics	N/A	N/A
32.	Life Science Incubator at IKP Knowledge Park	2006	Hyderabad	Pharmaceutical And Biotechnology	50+	Biomax Life Sciences, i-Trace Nanotech Pvt. Ltd., Magellan Life Sciences™ Pvt. Ltd.
33.	Malviya Centre for Innovation Incubation & Entrepreneurship, IIT BHU	2008	Varanasi	Firms That Can Create Jobs, Commercialise New Technologies, And Strengthen The National Economy	10	Art Eye Solutions, Edulution
34.	Manipal University Technology Business Incubator	2010	Manipal	Information Technology, Renewable Energy And Energy Conservation System, MEMS/Nanotechnology	10+	Manipal Printronics Pvt. Ltd, The Smart Techies Pvt. Ltd., Fracktal Works Pvt. Ltd
35.	MICA – Incubator	2010	Gujarat	Communication Service Technologies, Communication Product Technologies, Communication Equipment, Applications Tools For Communication Business	30+	Shabda Nagri, Don't Scratch Your Head
36.	NASSCOM 10,000 Startups Warehouse	2013	Bengaluru, Noida, Gurugram, Kolkata, Navi Mumbai, Chennai, Hyderabad, Pune, Kochi, and Vizag	Sector-Agnostic	200+	Headway, Bigtrade, Cashfree, Tovico
37.	National Centre for Aerospace Innovation and Research	2010	Mumbai	Aerospace And Related Sectors	5	N/A
38.	NDBI (NID Incubator)	2004	Ahmedabad, Bengaluru, Gandhinagar	Young, Design-Focused Entrepreneurs	10+	Dhama Apparel Innovations Pvt. Ltd, Robots Alive Consulting Pvt. Ltd

Sr. No.	Name	Launched In	Headquarters	Focus Area(s)	Startups Incubated Till Date	Notable Startups Incubated
39.	NITK-Science Technology Entrepreneurship Park	1994	Mangalore	Information Technology, Electronics & Robotics, Multi-Disciplinary Technology Integration, Engineering Design, And Consultancy	40	N/A
40.	NIT TREC-STEP	2004	NIT Campus, Tiruchirapalli	Cleantech, IT, Engineering, Biotech	20+	Pure Tech, Green Connect
41.	NSRCEL, IIM Bangalore	2002	Bengaluru	Sector-Agnostic	10	Amagi, Just books, Milaap, Zoojoobe, Gamatics
42.	PadUp Ventures	2016	NCR	Technology And Mobile Startups	10	MYTAT.in, Neuron, Homestat.in
43.	Periyar Technology Business Incubator*	2006	Tamil Nadu	Herbal, Health Products, Biotechnology, Food Processing, And Agro Ventures	N/A	N/A
44.	Progress Software's Incubator	2015	Hyderabad	Programme Software, IT	20+	CashHere, Hello Tractor
45.	PSG-STEP	1998	Coimbatore	ICT, Electronics, And Mechanical	36	Cloud Assert India, LifeTex
46.	Sardar Patel Technology Business Incubator*	2015	Mumbai	Education, Health, Energy, Livelihood And Smart City Technologies, IOT, Ecommerce , Innovative SaaS, Big Data, Cloud Computing, Artificial Intelligence, Hybrid Business Models With Technology At Its Core, Social Startups, Women-Led Startups	15+	Mime360, Genecorp, Quirk House
47.	Sathyabama University-TBI	2013	Tamil Nadu	Marine, Biotechnology, Engineering And Tech, Waste Management	21	N/A
48.	Rural Technology and Business Incubator (RTBI)*	2006	Tamil Nadu	Rural/Underserved Societal Segments, Leveraging ICT	42	Desicrew, MobilTrain, Edutor, Invention Labs
49.	Science And Technology Entrepreneurship Park	1989	Kharagpur	Technological Ideas Or Technologies Under Development To Enable Them To Reach The Marketplace	20+	Ikure Techsoft Pvt.Ltd.
50.	Science & Technology Park, University of Pune	1994	Pune	IT & Innovative Technologies	17	Omni Bridge System Pvt. Ltd, Probity Soft Pvt. Ltd.

Sr. No.	Name	Launched In	Headquarters	Focus Area(s)	Startups Incubated Till Date	Notable Startups Incubated
51.	Seedfarm	2006	Mumbai	Consumer Internet, Ecommerce, Sports, Education, Healthcare, Financial Services, Analytics, Services And Online Ticketing	20+	MyDentist, Chumbak, Carwale
52.	SIDBI Innovation & Incubation Centre, IIT Kanpur	2000	Kanpur	Technology Related Ventures	50+	Aarsh management solutions, Messiah Labs
53.	Shriram Institute for Industrial Research		Shriram Institute for Industrial Research, Delhi	Plastics And Rubbers, Speciality Chemicals And Formulations, Waste Management	N/A	N/A
54.	SMVDU TBIC	2015	Jammu and Kashmir	Biotechnology (Microbial, Plant, Medical Genetics And Diagnostics), Engineering (Electronics, Robotics, Ecommerce, GSM/GPRS Based Technology, Alternative Energy Management, And Business Development.	7	N/A
55.	Society For Innovation and Entrepreneurship, (SINE)	2004	Mumbai	Sector-Agnostic	82	Sedemac Mechatronics, Seclore Technology, IdeaForge
56.	Society for Innovation & Entrepreneurship in Dairying (SINED) Technology Business Incubator*	2008	Karnal	Dairy And Food Processing, Feed Technology, Dairy Farming, Fish Farming, Apiculture & Honey Processing, Biofertilisers, Biopesticides & Panchgavya Products Based On Dung And Urine	20+	Agati Healthcare Pvt. Ltd., Vikrant Pawa Enterprises
57.	Startup Oasis Rajasthan*	2015	Rajasthan	AI, IoT, Blockchain, Edtech, Cleantech, ICT	160	Seva Service, House Up
58.	Startup Village	2012	Kochi	Sector-Agnostic	69	Finrobotics (Neyya), Exploride, iTraveller, Mindhelix (Rico)
59.	STEP-Birla Institute of Technology	1987	Ranchi	Mechanical Engineering	N/A	N/A
60.	STEP, Thapar University*	2004	Patiala	Agri Bio-Technology, Bio-Fertiliser, Food Biotech, Tissue Culture	25	N/A

Sr. No.	Name	Launched In	Headquarters	Focus Area(s)	Startups Incubated Till Date	Notable Startups Incubated
61.	Tagore Centre for Green Technology Business Incubation	2013	West Bengal	Sector-Agnostic	20+	EWT Solar, Nayan Eye Centre
62.	TBI, BITS Pilani	2005	Pilani	Embedded Systems and VLSI Design	10+	redBus
63.	TBI, Centre for Biotechnology, Anna University	2002	Chennai	Biotechnology, Bioprocess Technology, Molecular Biology, Cell Biology, Immunology & Genetic Engineering	15	N/A
64.	TBI, Graphic Era University, Dehradun	2014	Uttarakhand	Biotechnology, IT, Environment, Ecology	10+	N/A Tele ICU Services(P) Ltd., Mash Virtual Pvt Ltd.
65.	TBI, IIT-D	2000	Delhi	Technology, Research, Industry	20+	ekam, Inkilab Technologies, Planin
66.	Technology Incubation and Entrepreneurship Training Society (TIETS)	2008	West Bengal	ICT And Electronics, Wireless Communication, Image Processing, And Medical	100	Abzooba India Infotech, Ikure Techsoft
67.	TBI, KIIT University*	2008	Bhubaneshwar	Agriculture, IoT, Cleantech, Healthcare, Water, Energy	30+	Roboticwares Pvt. Ltd., Hello doctor24x7 Pvt. Ltd.
68.	TBI, NIT Calicut	2004	Calicut	Technology, Knowledge	30+	Neologic, Eden Technologies, DE 3.2
69.	TBI for Medical Devices & Biomaterials	2008	Kerala	Medical Devices, Biomaterials, Healthcare	10+	ellipsor, indriyam
70.	T-HUB*	2015	Hyderabad	Sector-Agnostic	70+	LifeCircle, PayMatrix
71.	TBI, University of Madras	2006	Chennai	Health-Related Herbal And Biotech Industries	N/A	N/A
72.	TBI, VIT Vellore	2003	Vellore	Automotive Engineering, Biotechnology, ICT, and Manufacturing	50+	Chalkstudio, Finix
73.	UnLtd Hyderabad	2013	Hyderabad	Social Welfare	20+	N/A
74.	Venture Center	2006	Pune	Materials, Chemicals And Biological Sciences & Engineering	50+	Antfarm, Divish Mobility

Sr. No.	Name	Launched In	Headquarters	Focus Area(s)	Startups Incubated Till Date	Notable Startups Incubated
75.	Venture Studio	2011	Ahmedabad	Innovation That Accelerates Regional Economic Development And Creates A National And Global Impact	20+	OoWomaniya (a product by Impetus Wellness), cruxbot, Wockito
76.	Villgro Innovations Foundation	2001	Chennai	Social Enterprises	100+	Onebreathe, Skillveri
77.	Wadhvani Centre For Entrepreneurship Development	2008	Hyderabad	Technology	20+	Orka
78.	Zone Startups India	2015	Mumbai	Sector-Agnostic	100+	Areysun, shieldsquare, Neuron
79.	(a-IDEA) Association for Innovation Development of Entrepreneurship in Agriculture*	2014	Telanaga	Agriculture And Allied Sectors	50+	Agrowbook, Agmart
80.	Centre for Innovation and Entrepreneurship, IIIT-H*	2011	Telangana	Gaming, Machine Learning, IOT, Medtech, Deeptech	80+	Thanos, indiryin
81.	Development of Entrepreneurs Through Incubation (DETI@ACE)	2011	Tamil Nadu	GPS And ICT-Based Systems	11	N/A
82.	DKTE Technology Business Incubator	2009	Pune	Biotechnology, Ayurveda, Biomedicine, Renewable Energy, Environment, IT, Engineering And Electronic Sectors, Along With Textile & Garment Technology	N/A	N/A
83.	Ekta Incubation Center, Maulana Kalam Azad University of Technology	2007	West Bengal	Biotech And IT, Bio-Informatics, Computer Sciences, And Material Sciences	20+	XESP Embedded Solutions, TechnoCratz
84.	Entrepreneurship Development Cell (EDC)	2012	Rajasthan	Electronics And ICT	N/A	N/A
85.	Golden Jubilee Women Biotech Park	2016	Tamil Nadu	Biotechnology And Allied Areas	10	Greenwrap, Aduvo Diagnostics
86.	HBTI-STEP	1987	UP	Paints, Chemical, And IT	N/A	N/A

Sr. No.	Name	Launched In	Headquarters	Focus Area(s)	Startups Incubated Till Date	Notable Startups Incubated
87.	Vel Tech Technology Incubator	2010	Tamil Nadu	E-Waste, Bio-Waste, Plastic Waste Management, 3D Printing, Embedded Systems/VLSI, MAV/ Robotics, Automobile, Renewable Energy And IT/ITES.	100+	E-Soft, Enmart, Life Hack, N-Technologies
88.	Hindustan College of Engineering and Technology	2015	Tamil Nadu	Technology	8	N/A
89.	Incubation Centre, IIT-Patna	2015	Patna	ESDM With Focus On Medical Electronics	N/A	N/A
90.	Agri-Business Incubator, ICRISAT*	2003	Hyderabad	Dairy Farming, Organic Agriculture, Agri-Tech, Food Processing, Others	52+	Higene Seeds, IAC Agro Services
91.	NIET Technology Business Incubator	2014	Noida	ICT & Bio-Technology	100	N/A
92.	ROLTA Innovation and Incubation Centre	2014	Madhya Pradesh	Engineering	N/A	N/A
93.	STEP-SJCE	1987	Mysore	Electronics And IT	N/A	N/A
94.	TBI, Krishnapath Incubation Society	2007	Ghaziabad	Information Technology, Electronics, And Mechanical Engineering	11	Vizortex R&D Pvt. Ltd.
95.	TBI, Tamil Nadu	2003	Tamil Nadu	Electronics And ICT	12	Multiversal Technologies
96.	TIDES Incubation Centre	2011	Uttarakhand	Sector-Agnostic	15+	Log 9 Materials, MadGuy Labs, The Indian Iris
97.	TNAU Technology Business Incubator	2011	Tamil Nadu	Agriculture And Allied Areas	11	Ecolive Spirulina, Madurai Pandian Appalam
98.	MANAGE Centre for Innovation and Agripreneurship	2017	Hyderabad	Agriculture And Allied Sectors	14	easyKRISHI, Kultivate, Kamdenuvu
99.	Trident Business Incubator	2015	Odisha	Biotech, Internet Startups, Engineering Industry	N/A	N/A
100	Society for Innovation & Development (SID)	2004	Karnataka	Bioinformatics, Image Processing And Recognition, Materials, MEM's, Organic Electronics, Early Detection Of Diseases, Drug Design, Mobility, & Renewable Energy	18	azooka, General Aeronautics, lab2market

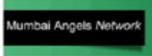
Startup Policies by Government of India to boost up Indian Startup Ecosystem

Startup India	<p>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.</p> <p>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:</p> <ul style="list-style-type: none">• Simplification and handholding• Funding support and incentives• Industry-academia partnership and incubation
Atal Innovation Mission (AIM)	<p>Atal Innovation Mission (AIM) including Self-Employment and Talent Utilization (SETU) is the Government of India's endeavor 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:</p> <ul style="list-style-type: none">• Entrepreneurship promotion through Self-Employment and Talent Utilization (SETU)• Innovation promotion: to provide a platform where innovative ideas are generated <p>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</p>
NewGen Innovation and Entrepreneurship Development Centre (NewGen IEDC)	<p>The government's NewGen IEDC startup Program is implemented in educational institutions by National Science & Technology Entrepreneurship Development Board (NSTEDB). 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.</p>
Make In India	<p>The initiative has been created with an aim to transform India into a global design and manufacturing center. The Make in India initiative has made sure to replace the outdated and obsolete frameworks with latest and user-friendly methods. The arrangement behind Make in India was one of the biggest embraced in late history. And in turn, this has helped in procuring investments, fostering innovation, developing skills, protecting intellectual property and building the best manufacturing infrastructure.</p>

Biotechnology Industry Research Assistance Council (BIRAC)	It carries out programmes to encourage strategic research and innovation in the biotech enterprises, and reduce the current gaps between industry and academics. The initiative has facilitated several rapid developments in medical technology and helped various biotech startups to expand and build a good base for themselves. The programme is backed by the Department of Biotechnology, New Delhi.
Trade-related entrepreneurship assistance and development (TREAD)	The programme provides credit to the interested women with the help of non-governmental organizations (NGOs). The women can receive the support of registered NGOs in both accessing loan facilities, and receive counselling and training opportunities to initiate the proposed undertakings.
Venture Capital Finance Assistance (VCA)	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. The scheme is promoted by Small Farmers' Agri-Business Consortium
Pradhan Mantri Kaushal Vikas Yojana (PMKVY)	The Ministry of Skill Development & Entrepreneurship (MSDE) has started the programme PMKVY which aims to train the youngsters in order to inculcate industrial skills in them to enhance opportunities for livelihood creation and employability. Training and Assessment fees are completely financed by the Government under this scheme.
Support To Training And Employment Programme For Women (STEP)	The primary purpose of the scheme is to educate and train women who don't have access to formal skill education, particularly targeting the rural sector. The programme provides knowledge and training in various segments including agriculture, horticulture, food processing, handlooms, traditional crafts like embroidery, travel and tourism, hospitality, computer and IT services.
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.
India Aspiration Fund	India Aspiration Fund (IAF) is a Fund of Funds, which would invest in Venture Capital Funds for meeting the equity requirements of MSMEs, especially Startups.

Source: Startup India; Inc42; Yourstory; Indianweb2.com

Key Agritech Investors in India

Source: NASSCOM, 2018b



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