PROMOTING AGRIPRENEURSHIP AND TECHNOLOGY COMMERCIALISATION

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INSTITUTIONAL SHIFT: FROM EXTENSION TO ENTREPRENEURSHIP

Unless the entrepreneurship competencies are added to the extension capabilities, the application of extension may not bear expected results, argues S Ramkumar

Agri-"culture" is increasingly changing to Agri -"business" in rural India. Though youth are generally apathetic to get themselves involved in agriculture, many are keen to pursue agribusiness as an enterprise. They consider agribusiness as a profession which bestows reputation in the society (amidst the competing IT and related sectors). It also offers better income. Such a change calls for an extension approach beyond the conventional thinking on "crop and livestock production" or "technology". Entrepreneurship development gains momentum in this emerging context. Hence approaches on developing entrepreneurship needs to be discovered and appropriately synthesized with extension so as to have a meaningful and relevant extension system that suits to the entrepreneurs who are engaged in agriculture, livestock and related activities. It is this realization that led the Kerala Veterinary and Animal Science University (www.kvasu.ac.in) to establish a Directorate of Entrepreneurship under it.

Box 1: Time, Technology and Territory

Extension is a product of time, technology and territory. The concepts and practice of extension has evolved through different contexts overtime. Approaches such as Transfer of Technology, Lab to Land, Land to Lab, Agricultural Knowledge and Information Systems etc have evolved to improve the contribution of extension at different points in time. We are currently in a period of time which is characterized by accelerated knowledge generation and dissemination aided by advances in information and communication technologies. Better technology design & delivery systems have opened up new possibilities to improve technical efficiencies and new territories to market farm produce. It is time now for extension to find new approaches that are relevant to these three "T"s. This calls for a paradigm shift in thinking and practice of extension.

Probably KVASU is the first university within the agricultural university system of India, which has an exclusive Directorate of Entrepreneurship, without a Directorate of Extension. All the activities associated to extension like farmer/stakeholder outreach programmes, capacity building, publications, e-learning are all implemented under the Directorate of Entrepreneurship. But there is a special focus on institutional innovations aimed at promoting entrepreneurship within all these activities. For instance, in Wayanad district, KVASU developed partnerships with Panchayat administration; initiated technology enabled learning courses; and enhanced capacity of resource persons on commercial dairy farming.

To improve milk production from crossbreed dairy cows (which are predominant in cattle population of Kerala), the conventional extension systems (through grass root level extension workers of animal husbandry department, Dairy development department, milk cooperative society etc) focus on improving production in terms of unit cost involved in feeding, breeding and management. But in the changing situation, the commercial dairy farmers (whose numbers are increasing) are more keen to know about project formulation, licensing, climate change, pollution control, budgeting, sources of funds, market rates, dairy machineries, value addition etc which are beyond the conventional thoughts of extension like increased milk production through feeding, breeding & management.

Essentially this means that the information, advice, technologies, ideas, practices being promoted by extension have to consider the market. Extension agents should also have a clear understanding of the risks and opportunities (including value addition and marketing) while promoting or advising an enterprise. Unless the entrepreneurship competencies are added to the extension capabilities, application of extension in such situations may not bear expected results.

One way of improving this capability would be through identifying topics of commercial agriculture and developing Industry-University partnerships. This will help in identifying areas of relevance, on which the knowledge and skills could be developed. Another approach is to develop a resource pool of veterinary professionals who are competent to advise on commercial dairy enterprises. KVASU is currently engaged in this activity. Initiating a Community of Practice (CoP) in Entrepreneurial Extension concepts is yet another approach worth considering.

Way Forward

- It is not the technologies per se that are going to make changes, but the innovativeness in applying these technologies among farmers with participation and support from different stakeholders. Extension workers have to build this capacity, rather than evading such a challenge.
- Extension has a large role to understand markets and analyse market trends as the present day agriculture is increasingly turning out to be a business proposition.
- Entrepreneurial extension is an essential area for capacity development among extension staff.

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TRANSFORMING AGRICULTURE INTO AN ENTERPRISE: LEARNING FROM ENTREPRENEURSHIP AND INCUBATING AGRI-ENTERPRISES

The proposed transformation of agriculture into an enterprise needs two significant shifts. Firstly, a conceptual shift in thinking on the role of the state and the market in agricultural transformation; and secondly, a critical rethink by the agricultural research and education systems towards learning, facilitation, and as co-creators of change, argues C Shambu Prasad.

The recent bold pronouncement by the Government of India in its Doubling Farm Income Report (GoI 2018) suggests a paradigm shift in the way we look at agriculture. Agriculture, the report suggests, needs to be seen as an enterprise and the farmer as an entrepreneur – necessitating adoption of business principles for positive net returns. The National Agricultural Research System (NARS), the report suggests, should take urgent steps to reorient and adopt a systems approach so as to include post-harvest management and monetisation, and furthermore, support farming as an enterprise and farmers as entrepreneurs. How prepared are our agricultural education systems for such a transformation and what would this mean for agricultural extension in India today? Are existing institutional arrangements in agriculture designed for productivity enhancement in any position? And, who could lead this change, given that their own experience in promoting entrepreneurship has been negligible? What should agricultural universities learn from ongoing experiments in entrepreneurial incubation and education? How should they customize this learning for the very unique contexts in agriculture today?

Just by sheer number, Indian farmers would constitute the largest community of private entrepreneurs in the world. They cope with vulnerabilities and practice their occupation with significant risks. These risks have multiplied with a drop in global commodity prices in recent years. It is not helpful that conventional agricultural economics treats farmers as risk-averse and facile policy recommendations that simple aggregation into a global value chain of agricultural commodity trade can enhance farm incomes and make farmers more entrepreneurial will not bring about the necessary change.

In this blog, I suggest that the proposed transformation of agriculture as an enterprise needs two significant shifts. First, a conceptual shift in thinking that goes beyond suggesting the state as the benevolent provider of sops and subsidies that can improve farm incomes, or the belief that the ubiquitous market can solve state failure. On the contrary, there is a need to reinstate the agency of the farmer and ensure that the farmer's ability to experiment, not just technically but institutionally, is valued and forms the basis of any structural transformation. Second, there is need for a critical rethink by the agricultural research and education systems to transform themselves into learning organisations so as to rework themselves as facilitators and co-creators of change, rather than just continuing with their erstwhile role as the sole source of agricultural innovation.

Entrepreneurship is closely linked to innovation, and while it is heartening to note that many agricultural universities today are setting up incubation centres and the curriculum in agricultural education is veering towards entrepreneurship, we need to also remind ourselves that most Indian agricultural universities have not been at the forefront of entrepreneurship in the past.

A change in the name of a scheme, a new Agriculture Grand Challenge alone without a change of institutions and mindsets is unlikely to lead to the desired transformation. It is here that agricultural extension can play an important role. This article argues that the NARS needs to do three things:

1. Map and understand the evolving entrepreneurial ecosystem and learn to avoid some of the common misconceptions about entrepreneurship;
2. Learn from some of the dynamic, but rich, insights on entrepreneurship from contemporary entrepreneurship education;
3. Create an ecosystem of learning, experimentation, and innovation – from what not to learn and what to learn – by working with farmers and other intermediate organisations to build innovative business models. In short, co-create a future where they are equal partners with farmers and other actors in the ecosystem.

These ideas have been elaborated upon below.

Entrepreneurship is Beyond Start-Ups and Technology

There is indeed a lot to learn from the dynamic changes in India's entrepreneurial ecosystem. The Flipkart-Walmart deal has been seen as a validation of India's start-up ecosystem and a recent report (over!) estimates the number of start-ups as 40,000 (Yourstory, 2018). The recent thrust by the Government of India has seen India shoot up in the Ease of Doing Business, and India prides itself as having one of the largest numbers of incubators in the world. The regular updates on the Startup India website indicate progress on diverse fronts, such as establishing tinkering labs, registering start-ups, Atal Incubation Centres, etc. Details of state-wise incubators in India is given below in Fig. 1.

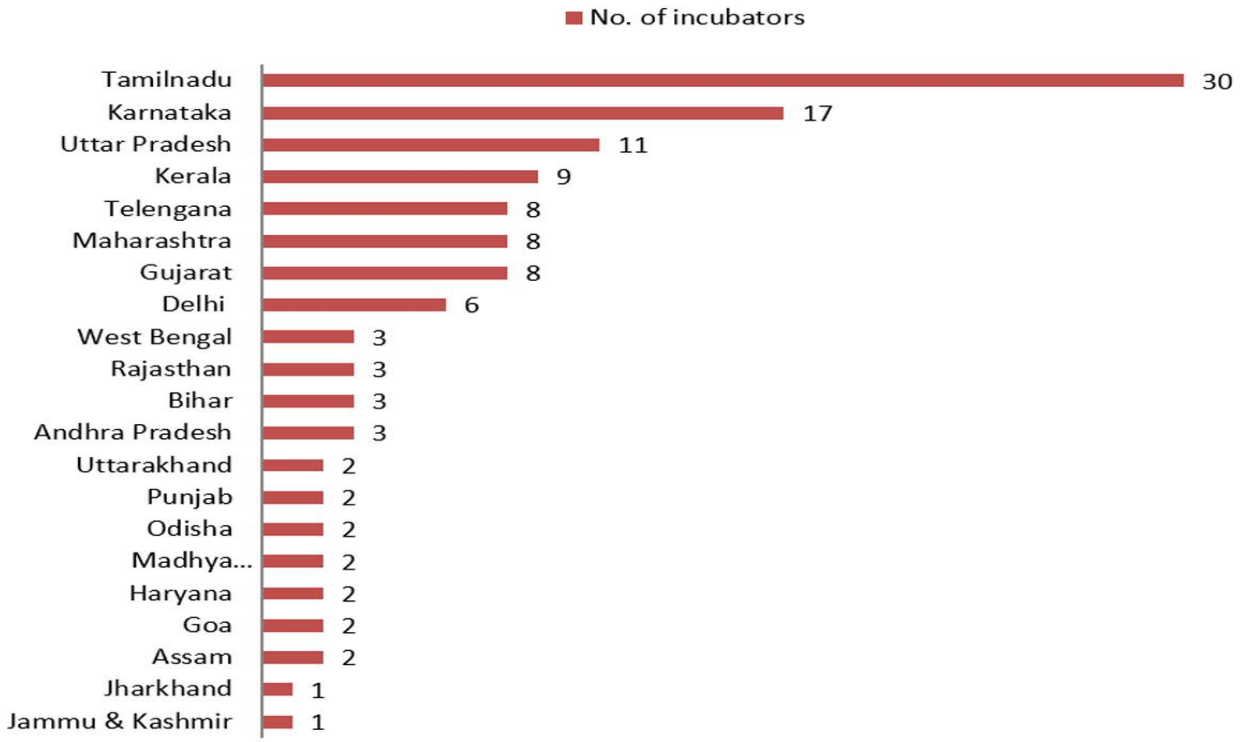


Fig. 1: State-wise incubators in India

Source: Collated from Startup India website, October 2018 (https://www.startupindia.gov.in/)

However, a closer look at these numbers reveals significant biases too. Rural, social and collective enterprises are rarely mentioned in these reports and much of the entrepreneurial buzz reveals a significant spatial bias that favours both capital cities and a disciplinary bias towards engineering colleges. The need for significant built-up space to house start-ups in incubation support schemes favours engineering and technical institutes with large laboratory facilities. This fails to recognise that incubation is more about intangible services, such as networking and mentoring, than tangible

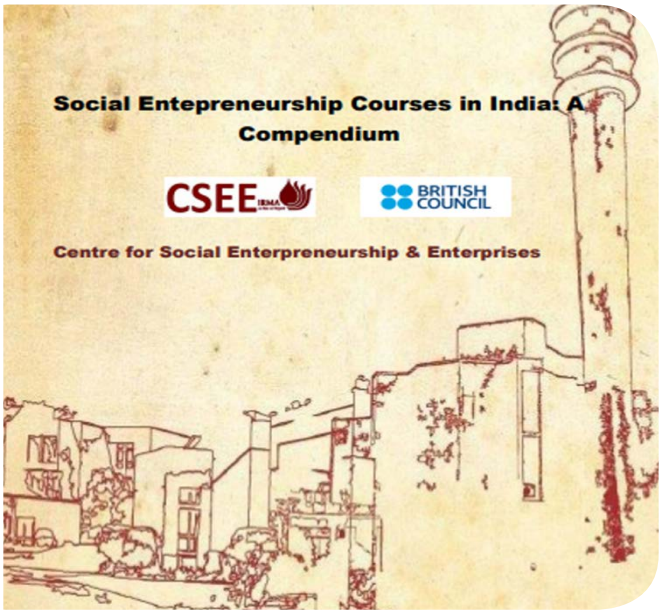
support such as space or funds. Further, it is important to realise that the need for incubation and entrepreneurship requires to be more inclusive in order to tap into the entrepreneurial spirit in rural and tribal India, as well as a recognition that not all entrepreneurship is about technology. While technology plays an important role in e-commerce or in those start-ups that have been invested in based on technological innovation, we do need to recognise that many innovations may not require significant technological change and investments. In fact, even in well-established set-ups in the US most investments by entrepreneurs are less than 50,000 US dollars and not many entrepreneurs prefer the venture capital route.

This is particularly important as we discuss entrepreneurship in agriculture. An ongoing study of sixteen social enterprises by the Vikas Anvesh Foundation (VAF) and the Institute of Rural Management Anand (IRMA) indicates that not all entrepreneurs in the agriculture space choose venture capital funding as the main source. Incubators need to promote entrepreneurship more broadly rather than favour and mentor only those that are scalable and venture-funded. In fact, a significant draw back in the Indian entrepreneurship space is the mistaken notion that the time from an idea to a scalable enterprise is small (3-5 years) and can be predicted. A bigger role for incubators (we are now realising at our own incubator), is in helping and supporting enterprises experiment so as to discover their business models. This alone can take a minimum of three years and involves significant experimentation and failure. How then should academic institutions look and learn in terms of teaching entrepreneurship? What useful lessons are to be had from existing entrepreneurship education?

On being Entrepreneurial about Teaching Entrepreneurship

There has been increased interest in entrepreneurship teaching and research in the last decade. It is important for agricultural extension professionals to keep abreast with these developments that have happened largely within management institutes. The change in the concept of entrepreneurship and strategy – from motivational training of potential entrepreneurs to providing a more systemic understanding and application of the entrepreneurial spirit to larger social change – lies at the heart of the emerging field of social entrepreneurship and entrepreneurship on the whole.

As traditional lines blur between non-profit enterprises, government, and business, it is critical that students and researchers of agricultural extension see and equip themselves to contribute to the fast-emerging social entrepreneurial ecosystem. My own experiences of teaching and innovating on pedagogy in social entrepreneurship for over a decade has pointed to the need for constant innovation in pedagogy and engagement with the external world and ecosystem. In short, academics need to be entrepreneurial as well. A big challenge often lies in trying to bring the exciting entrepreneurial world to the classroom and getting students to meet and engage with entrepreneurs through long conversations and learn first-hand from their experiments and failures. Significant learning consists in trying to link entrepreneurship with other fields of design, sociology, development, etc. For instance, the idea that start-ups are not smaller versions of larger companies and that they are often involved in the process of search and not execution. These insights have emerged in recent thinking by Steve Blank on what has been known as the 'lean start-up'.



Incorporating these insights and moving away from the conventional focus on the Business Plan to experimenting and reiterating with Business Model Canvases can open up greater possibilities for entrepreneurs who otherwise get put off by too many financial planning exercises. Our learning through four rounds of a customized Entrepreneurship Development Programme (EDP) on Building and Managing Social Enterprises (BMSE) in the last two years has been more important than entrepreneurial hard skills. It is creating a nurturing and empathetic environment for individuals to tap into and explore their entrepreneurial selves. A better focus on attitude can be acquired through peer learning and support and need not be competitive alone. Establishing this collaborative environment is often the key to entrepreneurial strategy and more effort needs to be put in that direction.

Co-Creating an Entrepreneurial Ecosystem

Entrepreneurship is new to most actors. It can be learnt and is better learnt together. It involves failures and hence one needs to have the attitude of an experimenter, having the ability to learn rapidly from failures and mistakes. Design thinking is an emerging discipline that is often an important first step for entrepreneurship. It is important that entrepreneur educators learn to root empathy for the customer, farmer, and other actors in the system. Design thinking helps reorient ourselves towards this key behavioural change.

Further, it is also important to recognise that while some broad ideas on design thinking, lean start-ups, etc., can help start our journey in entrepreneurship it is important that educators and extensionists create spaces for sharing and collaborative learning.

One of the important elements of IRMA's foray into entrepreneurship is in creating an ecosystem for social enterprises and entrepreneurship. Learning from other experiments in India, we have found that it is important to have spaces where academicians and practitioners think and brainstorm together, where we break the walls and boundaries of learning, and accept that we need to learn from each other. A significant design element of XLRI's National Conference on Social Entrepreneurship (NCSE) is a deliberate attempt to exclude academia from the platform. This strategic pause before action emphasises the need for educators to listen, unlearn, and reflect. Learning is critical to creating a different ecosystem. During the launch of IRMA's incubator, we brought out a compendium of course offerings on social entrepreneurship that put together how the subject is taught across Indian higher education institutions. The idea was not to standardise offerings but to initiate a dialogue on what we could learn from each other, even as we retainour own individual academic orientations and recognise institutional constraints. Agricultural universities need to have more dialogues with management and other institutions and create networks for learning. The National Entrepreneurship Network (NEN) has by-passed mostof the agricultural universities, and it might be useful to rework these conversations.

An incubator at an academic institution becomes a laboratory of ideas. This does not call fora large infrastructure, but ideas for change are imperative. In fact, the incubator can be an expression of newer thinking in entrepreneurial education and practice. An incubator needs to be seen as an innovation platform that combines education, training, research, and action on innovation. The first year or two of an incubator should be focused on active experimentation – especially to figure out one's own unique strengths and weaknesses. We at ISEED, (Incubator for Social Enterprises and Entrepreneurs for Development) and IRMA we, have found that we need to stick to what is unique, namely our focus on rural, social and collective enterprises rather than on following a 'metoo' process. With this conviction in place we know we have more value to add to this ecosystem than by just becoming another technology business incubator or TBI. We have found, through experimentation and trial and error, that not being able to invest in enterprises or claim as take enables us to have a different conversation with

our incubatees, or as we now call them 'social enterprise partners'. We have documented some of the learning of our ISEED journey. We have also found and reiterate our learning, saying that we should not own our incubatees, but actively work towards co-incubation. We are, in fact, glad to see them work with other incubators, for we do realise that entrepreneurs need several support structures and no single incubator can provide all of these. Some are good at funding; some are better in some domains and have a sectoral focus. Together, these incubators can help build an ecosystem but it is important to value the agency of the enterprise.

We have not shied away from technology but believe that this needs to be embedded suitably. One of the innovations we are proud of is a recent development, a multi-purpose grader with our partner Earth 360, an enterprise that works across the millet value chain. They had done most of the groundwork in identifying a problem from the field– the need for a grader that can enable community-level processing. This could lead to enhanced farm income. We supported the development of the grader through the incubator, and importantly, did this with other actors that included an engineering simulation partner, Altair, and a design partner, Big Stamp. We enabled the enterprise to work on their idea and helped them network with other opportunities. The innovation was a finalist at Startup India's agriculture Grand Challenge and won special recognition at the Vibrant Gujarat Summit 201. While we did not create the innovation, we added value through other ways and continue to support their new start-up, Millet Machine Tools, as they seek to transform the millet value chain through a bouquet of machines.

Finally, an entrepreneurial mindset is one that is also one that raises uncomfortable questions. We have been doing this in the Farmer Producer Organisations (FPO) space. For instance, we believe that an FPO needs the same, if not more, of a supportive environment as a start-up. They too could fail and they too need investments, mentoring, and support even if their institutional design does not allow for venture capital and other support. We thus would like to work with FPOs too and see how they could be incubated, or how resource institutions working with a few FPOs could benefit from these entrepreneurial insights.

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AGRIPRENEURS: WHO THEY ARE AND WHY THEY ARE IMPORTANT?

While entrepreneurship has been talked about since many years, agripreneurship is something which we started discussing only recently. Mahesh Chander explores the characteristics of Agripreneurs in this blog and he argues the need to encourage, support and promote agripreneurship by extension and advisory service providers.

Traditionally, agriculture is seen as a way of life especially in non-industrialized countries of Asia and Africa, where farmers are mostly focused on doing things better rather than doing new things. However, the situation is changing rapidly mainly because of the following reasons:

- Rising levels of literacy and education
- Economic liberalization and commercialization
- Deregulating or opening of agricultural markets
- Better means of communication and transportation.

With the changing market dynamics, many choices are available to the consumers. The agricultural producers and especially the Agricultural companies have to adapt increasingly to the market demand, changing consumer habits, enhanced environmental regulations, new requirements for product quality, chain management, food safety, sustainability, and so on (Lans et al 2011).

These changes have cleared the way for new entrants, innovation, and portfolio entrepreneurship (http://ir.canterbury.ac.nz/handle/10092/878). Politicians, practitioners as well as scientists have recognised that farmers and growers increasingly require entrepreneurship, besides sound management and craftsmanship, to be sustainable in the future (McElwee 2008; Pyysiäinen et al. 2005). Recent studies show that agricultural entrepreneurship is not only wishful thinking or a new hype: it has a profound impact on business growth and survival (Lans et al. 2011; Verhees et al. 2011).

Box 1: Entrepreneur

Entrepreneur is a French word, first used in 1723, to describe a person who organizes and operates a business by taking a financial risk. Entrepreneurship has traditionally been defined as the process of designing, launching and running a new business, which typically begins as a small business, such as a start-up company, offering a product, process or service for sale (Yetisen et al. 2015). It has also been defined as the "...capacity and willingness to develop, organize, and manage a business venture along with any of its risks in order to make a profit.

Entrepreneurship is a concept that encompasses transforming an idea or vision into a new business or new venture creation, or the expansion of an existing business, by an individual, a team of individuals, or an established business (Reynolds et al. 1999, cited by Global Entrepreneurship Monitor). By and large, today it implies qualities of leadership, initiative, and innovation in new venture design. But entrepreneurship, as opposed to self-employment, is also defined by the spirit of the entrepreneurs.

The entrepreneur either creates new combinations of production factors such as new methods of production, new products, new markets, finds new sources of supply and new organizational forms; or as a person who is willing to take risks; or a person who, by exploiting market opportunities, eliminates disequilibrium between aggregate supply and aggregate demand, or as one who owns and operates a business (Tyson et al, 1994). There is not one but in several ways entrepreneurship has been defined by many different professionals, yet all these definitions have some common elements (Box 2).

Box 2: Characteristics of entrepreneurs

The literature on entrepreneurship has described entrepreneurs having a number of characteristics viz Initiative, risk taking, leadership, business and profit orientation, unconventional or out of the box thinking, never say die attitude, willingness and ability to follow the new technology. The entrepreneurs have capability to turn their ideas into business. Many of them are daring enough to take a break from traditional jobs and venture into wholly new fields and make a success of it through their own ingenuity or with some institutional or state help. Entrepreneurs tend to be good at perceiving new business opportunities and they often exhibit positive biases in their perception (i.e., a bias towards finding new possibilities and seeing unmet market needs) and a pro-risk-taking attitude that makes them more likely to exploit the opportunity (Zhang and Cueto, 2015).

The entrepreneur is commonly seen as an innovator — a designer of new ideas and business processes. Entrepreneurs are usually creative, take opportunities and accept risks, and can quickly change business strategies to adapt to changing environments. They are often innovators (Kahan, 2012). As per Butler (2006), an entrepreneur is a complex combination of some interacting factors. For instance,

Personality: In terms of possessing resilience, tenacity, opportunity spotting, and risk taking;

Attitude: Havi ng awareness of the importance of customer focus, the application of creativity and imagination, defined personal standards and values, the perception of enterprise as a positive activity;

Skills: such as the ability to network, to think strategically, to gain access to resources, business knowledge and acumen, interpersonal skills and people management capabilities;

Motivation: personal drive and ambition, the desire to make an impact, the need for achievement or self-satisfaction, a desire for status, to create and accumulate wealth, and social responsibility.

The presence, combination and interaction of these factors determine both the way in which an entrepreneur engages in enterprising activities, and ultimately the degree of success that is achieved, concluded Butler (2006).

Agripreneurship

When talking about entrepreneurship in agriculture, it is termed as Agriculture Entrepreneurship or Agripreneurship. Agripreneurs, thus, do not differ from entrepreneurs in their basic traits. While profiling some of the agripreneurs (Chander, 2016, 2016a, b and c), I found them very articulate in personal, interpersonal and process skills. It is their pro-risk-taking attitude that makes them more likely to cash upon the opportunity available in new agricultural ventures compared to conventional farmers. They not only believe in new venture new gains, but also work consistently to prove themselves true. They are the trend setting farmers.

Recently I interacted with five such agripreneurs in India to understand what they do and why they are different.

1. Traditionally many farmers are growing cereal crops since generations in Upper Gangetic Plain Zone, often with declining profit margins. But breaking away from this trend, a farmer switched to vegetable cultivation and marketing and since then has been earning huge profits. He could not only recognize the business opportunity in vegetable growing, but also turned his idea into action by dint of his hard work and disregarding possible risk in new venture.

2. Raising pigs is considered dirty vocation and taboo, not considered good by many castes and communities in India. A young man in family dares to establish pig farm against this taboo and paves the way for improved earning to family enabling them to better standard of living from the extra income generated from this new enterprise in the locality. Looking at good profit prospects due to least competition, he got motivated and dared to defy and challenge the conventional thinking.

3. Instead of growing food crops with little earning, a farmer opts for growing fodder crops and selling it to peri-urban dairies for better profit margins.

4. A farmer chooses to diversify in farm-based tourism by making certain changes in his house to accommodate tourists and create some infrastructure for their relaxed stay and living at the farm. This change brings in better net returns compared to any other farming activity.

5. One retired Air Force officer set up an Organic Dairying Unit of indigenous cows, highlighting A2 milk properties (A2 type of beta-casein protein rather than the more common A1 protein commonly found in regular milk) and free from antibiotics, selling it as labelled and branded milk, at market premium. He is ahead of his counterparts in the region who continue with conventional milk production.

In all of the cases mentioned above, they were not at ease with their existing situation, so wanted to pursue the dream of making a difference in their life through change in their existing practice with chances of risk or failures. Since every case is unique in itself with the individual circumstances, there is no common formula for entrepreneurship for everyone. Each entrepreneur has to follow his own dream in his own unique way making it a unique case in a class of its own to be seen as a distinct story-mostly successful one!

Why Agriprenurship needs to be Promoted?

The need for an entrepreneurial culture in the agricultural sector has been recognized in recent decades (Bergevoet *et al.,* 2004; McElwee & Bosworth, 2010). By developing entrepreneurial and organizational competency, farmers are expected to be able to work in an organized manner and develop sustainable competitive advantages in order to compete successfully in regional, national and international markets. Sustainable development of the agricultural land requires the development of entrepreneurial and organizational competency in farmers.

However, the educational processes involved in such development have been insufficiently studied, especially in emerging economies (Díaz-Pichardo, 2011).

Even when farmers are innovative and creative, they often lack experiences, access to services, people, or markets, and skills to have realistic chances to succeed as entrepreneurs (Wongtschowski et al. 2013). In addition, agripreneurs are influenced by external, systemic factors, such as economic and social barriers, policies, and regulations (Kahan 2012). While these constraints affect all farmers and especially smallholders, women and youth are affected more. Farmers, thus, need support to

- Face multiple existing and emerging challenges in their farming activities
- Improve their livelihoods including turning themselves possibly into successful agripreneurs.

Promoting Agripreneurship: Current Initiatives in India

On February 26, 2010, Shri Sharad Pawar, the then Union Agriculture Minister honoured 101 enterprising men and women farmers from remote parts of the country, who by sheer dint of their innovation and hard work were more than inspirational for others. The Department of Agriculture and Cooperation, GOI has documented their success stories in shape of a Coffee Table Book titled "Harvest of Hope", with the sponsorship of NABARD (MoA, 2010). Referring to the success stories included in the book, Shri Pawar said that the basic thread underlying all the stories is the dedication, the zeal and the hope to harness resources, skills and enterprises. The path-breaking interventions covered by the true life stories in this book are not limited merely to crops, but cover the entire gamut of rural vocations as diverse as poultry, sheep and fish farming, floriculture and fruit orchards, oilseeds and pulses, and cotton and ayurvedic herb cultivation etc.

The entrepreneurial farmers are being felicitated and honoured by agricultural universities and research institutions and agricultural development agencies on different occasions like farmers' fairs (http://www.icar.org.in/en/node/10275). Almost all the SAUs, ICAR institutes and KVKs in India have list of enterprising farmers whom these institutions not only have awarded but a few of them utilize their services as resources persons too. The ICAR honours innovative farmers including agripreneurs under different categories every year on its Foundation Day on July 16. The farm magazines, radio, TV and YouTube videos profiling enterprising farmers have become very common in recent times (https://www.youtube.com/watch?v=7MmdNNfON0Y&spfreload=5).

The Director General, ICAR recently emphasized that the experience of successful entrepreneurs should be documented and disseminated in the form of success stories so that other budding entrepreneurs could be benefitted (http://www.icar.org.in/en/node/10875). An important challenge, however, is facilitating farmers' development of entrepreneurial and organizational capacities and attitudes. This requires economic support, beyond awarding and recognizing the successful farmers including a greater emphasis on their education, training and using their services proactively in RAS possibly with suitable remuneration. Research on the development of entrepreneurial and organizational competency in farmers is scarce, especially in context of the developing countries.

The government schemes must focus on attracting youth to the agriculture sector by transforming it into a business and offering them new avenues and opportunities to engage along the agriculture value chain. The Govt. of India has a large number of entrepreneurship development schemes for development in agricultural sector of which one is the Agri-clinics and Agribusiness Centres Scheme (AC&ABC). This is implemented by MANAGE in association of NABARD and it is an appreciable effort to take better methods of farming to farmer across the country (http://www.agriclinics.net/scheme-home.htm). Likewise, ICAR- National Academy of Agricultural Research Management (NAARM) has established a Centre for Agri-innovation a-IDEA to give incubation support services to the agri-entrepreneurs. This helps in developing their businesses and to provide access to knowledge and networking support services in innovation and entrepreneurship in agriculture towards fostering innovation and entrepreneurship in agriculture (http://www.naarm.ernet.in/index.php?option=com_content&view=article&id=117:a-idea&catid=2&Itemid=435&lang=en).

Attracting and Retaining Youth in Agriculture (ARYA) Scheme of ICAR aims to empower youth in rural areas to take up agriculture, allied and service sector enterprises for sustainable income and gainful employment. It enables youth to establish network groups to take up resource and capital intensive activities like processing, value addition and marketing. Rural and Entrepreneurship Awareness Development Yojana (STUDENT READY) is yet another scheme of ICAR. This is a skill development initiative to strengthen students with skills to take up global challenges and also to improve both their employability as well as ability to set up a venture. (http://www.gktoday.in/blog/2016-agriculture-schemes-terms-and-updates/#Attracting_and_Retaining_Youth_in_Agriculture_ARYA_Scheme)

Many similar schemes are under implementation by various Ministries including a range of schemes being implemented by Ministry of Agriculture and Farmers' Welfare (GoI, 2015).

Agripreneurs and Rural Advisory Services

Agripreneurs often look towards Extension and Advisory Services/Rural Advisory Services (RAS) for support as they can provide useful information and training to the farmers on the required skills. RAS generally link farmers to technical knowledge. Increasingly they are also linking famers to market information. But generally their ability to link potential agripreneurs to other

agripreneurs, financial services and value chain actors is limited. Rural Advisory Services need to considerably enhance their capacities to support agripreneurs. The RAS should also attain capacities to influence policies and regulations to create an agripreneurship friendly environment, reduce barriers, or change prevailing values in societies. Thankfully, in response to the multiple changes that are impacting on farming, extension services are recognizing the importance of business, management and marketing support to farmers. There is now a wide range of public and private organizations viz, extension services, input dealers and manufacturers, traders, financial and farmer organizations, and NGOs, which are taking interest in improving the efficiency of the farm business.

Considering the growing role and importance of agripreneurship in changing agricultural scenario, the Global Forum for Rural Advisory services (GFRAS) has chosen the topic, "The Role of Rural Advisory Services for Inclusive Agripreneurship" for its 7th Annual Meeting, Cameroon during 3-6 October 2016. This meeting will be an opportunity to discuss, learn, exchange, and formulate recommendations on the roles and required capacities of RAS for supporting inclusive agripreneurship as important element of sustainable rural development (http://www.g-fras.org/en/annual-meeting-2016.html).

The progressive farmers, innovative farmers, lead farmers and agripreneurs though differ fundamentally but all of them could be potential resource to motivate other farmers. Many extension services choose farmers to work with them in implementing their programs. For example, the Malawi Ministry of Agriculture works with more than 12,000 lead farmers (Franzel et al, 2014). In Malawi, a survey of 37 extension services found that 78 percent used some form of farmer-to-farmer extension (Masangano and Mthinda, 2012).

Entrepreneurship and links to the private sector are essential for the rejuvenation of agriculture, making it more attractive, profitable and moving away from the perception of agriculture as a low prestige career (Box 3). Educational institutions must include business skills and entrepreneurship into the agricultural curriculum and forge stronger links with the private sector. Educational institutions should stimulate potential entrepreneurs through networking opportunities, internship opportunities and business incubators (YPARD, 2012). The research institutes and agricultural universities in India are now increasingly paying attention to entrepreneurship development in rural areas. For instance, ICAR-Indian Veterinary Research Institute has been organizing entrepreneurship development meetings with prospective entrepreneurs on regular basis (https://drive.google.com/file/d/0B0TX5SvS4lMRV0RsQmsyTzFzN28/view?usp=sharing).

The approaches on developing entrepreneurship needs to be discovered and appropriately synthesized with extension so as to have a meaningful and relevant extension system that suits to the entrepreneurs who are engaged in agriculture, livestock and related activities. It is this realization that led the Kerala Veterinary and Animal Science University (KVASU) to establish a Directorate of Entrepreneurship under it. Unless the entrepreneurship competencies are added to the extension capabilities, the application of extension may not bear expected results. Thus, entrepreneurial extension must be an essential area for capacity development among extension staff (Ramkumar, 2013). KVASU has recently trained 100 field veterinarians to serve as a resource pool on "Entrepreneurial Advisory Resources on Livestock Farming in Kerala" (Murugan, 2016).

Box 3: Agripreneurs and private sector

Agriculture is business like any other ventures, it should be treated the same way we treat other businesses. One way to treat agriculture like a business is to get the private sector more involved in it, since government can't create agricultural transformation; it can only enable it by making more room for businesses to intervene. The government on its part can do best by putting right policies and regulations in place, by creating strong institutions, and by building sufficient infrastructure. Agricultural transformation has to be led by the private sector since farmers need access to finance, inputs, information, or markets, where government can't do much (Adesina, 2016). The private sector can do much by making available good quality seeds, agro-chemicals, processing facilities and developing markets and value chains for farm products. The Agripreneurs have been found to keep well in touch with these agencies in private sector, while having good liaison with public sector agencies too.

Way Forward

1. The extension services wings of agricultural universities, research institutions and development departments should organize meetings/workshops regularly to listen to experiences and problems of agripreneurs. In such meetings, line department officials, banks,

agro-input companies and farm machinery manufacturers should also be invited to facilitate meaningful discussions. The scientific and agricultural development agencies must consider benefiting from their experiences.

2. The experiences of agripreneurs can be utilized by RAS in framing extension and rural development strategies. The RAS may consider hiring services of these agripreneurs as consultants so that they feel motivated to contribute in agricultural development process.

3. The Agripreneurs may be trained by the RAS on communication and training skills so that they can effectively complement the efforts of RAS.

4. The educational processes involved in entrepreneurial and organizational competency in farmers towards sustainable agricultural development may be studied including by the student researches in agricultural social science disciplines like Extension Education and Agricultural economics.

5. Agriculture is going to be even more market oriented in future, where agripreneurship would matter more. Thus, the policies must be framed to facilitate market-oriented agricultural practices. The Rural Advisory Services should develop strategies to support farmers to become successful agripreneurs, at individual, organisational and system level.

6. The government schemes must focus on attracting youth to the agriculture sector by transforming it into a business and offering them new avenues and opportunities to engage along the agriculture value chain.

7. Agripreneurs can effectively complement the efforts of Extension and Rural Advisory Services. The EAS, thus, should identify agripreneurs, facilitate the business development processes including arranging for funding, while enhancing their capacities on communication skills and training towards enabling them to train farmers.

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FOSTERING ENTREPRENEURSHIP THROUGH AGRIBUSINESS INCUBATION: ROLE OF EXTENSION PROFESSIONALS

Development of competitive agribusiness enterprises is critical for creation of new jobs and promotion of farm livelihood diversification. Though extension professionals could play a very useful role in this endeavor, the field of agribusiness incubation hasn't yet got into the education and training curricula of extension professionals. P Sethuraman Sivakumar and I Sivaraman discuss the importance of agribusiness incubators and how extension professionals can support the incubation process in this blog.

India, being one of world's fastest growing and most populous economies of the World, is emerging as a potentially large market for global agricultural trade and investment. With the growth in Indian economy and liberalisation of investment regimes, India's Agribusiness is booming (Box 1). As "Venture Capital" and "Private Equity Funds" are the primary drivers for the growth of new Agribusiness ventures, there is an urgent need to develop start-ups i.e. early stage technology ventures to utilise the emerging opportunities.

Box 1: Indian Agribusiness

The major sectors of Indian agribusiness, namely, Biotechnology, seeds, organic fertilizers and pesticides, farm machinery and food processing are major sectors of Agribusiness witnessed significant growth in the recent years. Currently, India's Agribusiness market size is estimated Rs. 17.44 trillion and it is growing at 9% per annum driven by captive domestic demand and export opportunities. Indian Food Industry is the largest growing category in India, accounting for 31% share of the consumer wallet; approximately twice as high as any other category (Srinivas, 2011). The private equity investments in Agribusiness as a percentage of total investments have grown to 3.8 per cent in 2012 from 0.2 per cent in 2008. During the same period, venture capital investments in agribusinesses grew from 0.2 per cent to 1.6 per cent of total investments (KPMG-FICCI, 2013).

Many countries are promoting business incubators to create new technology based business start-ups. In the agricultural sector, agribusiness incubators are promoted to encourage enthusiastic entrepreneurs to initiate business start-ups. Promoting agribusiness and entrepreneurship is increasingly considered as a priority area for extension and there is a lot of interest in promoting agribusiness initiatives in developed countries. While many developed countries have rich experience of promoting agribusiness incubation, in India it is a recent phenomenon. Though ABIs are developed through National Agricultural Innovation Project of ICAR with the help of International Crops Research Institute for the Semi-Arid-Tropics (ICRISAT), Hyderabad, there is a need to expand this network to the grass root level to maximise its benefit to farmers. Extension professionals can play a major role in bringing the benefits of ABIs to farmers.

Promoting Agri-Technology Ventures

In general, technology based ventures are considered as key growth sectors that foster economic development through income

generation and job creation. Business Incubators (Box 2) are popular ways of creating new technology ventures and commercializing R&D outputs to foster socio-economic development. In the developed countries like USA, UK and other European counties, new technology ventures have created two-thirds of the net new jobs and 95% of the radical innovations in the last 25 years (Timmons and Spinelli, 2003). The business incubators vary in their objective and structure. Various types of business incubators are described in Annexure 1.

Box 2: Business Incubators

Business Incubators are organisations which create a supportive environment that is conducive to the ''hatching'' and development of new technology ventures (Chan and Lau, 2005). They eliminate the risk of business instability, especially among the start-ups by providing lab space, equipments and other business development support to budding entrepreneurs to help them to grow. Once a fledgling business is financially viable and the individual entrepreneur has developed the necessary survival skills, the technology venture is hatched into the open market, to stand on its own. Business incubators are originated in the United States of America in 1959 and proliferated rapidly during 1990s (National Business Incubator Association, 2009). Among the developing countries, China initiated the first business incubator at Wuhan in 1987 and India started its programme only during 2000s. Currently, there are over 8000 incubators in the World of which India has only 120 (Ryzonkov, 2013).

However, in India, technology based ventures are a rare phenomena. Though India has a vast pool of S&T infrastructure with over 800 technical institutions including around 200 universities, 400 national laboratories, over 1,300 in-house R&D units in the corporate and other sectors, there is a significant gap in commercialising the significant technological outputs into new technology ventures.

In the agricultural sector, the situation is still worse. Despite enormous scope for commercialising agricultural technologies, especially in the emerging areas of biotechnology and food processing, there are very few initiatives from the potential agri-preneurs. The main reason is that new technology based start-ups face greater problems at the initial stages due to technology volatility and they take longer time to commercialize as compared to other start-ups especially those focused on services. Other problems like inadequate product development experience, inability to map the markets, poor managerial skills, inadequate networking, as well as shortage of financial resources also prevent birth of new ventures.

Agribusiness Incubators

InfoDev (2013) defines agribusiness incubation as *a process which focuses on nurturing innovative start-ups that have high growth potential to become competitive agribusinesses by serving, adding value or linking to farm producers.* Agribusiness incubator is a specialised form of mixed-portfolio business incubators focusing exclusively on the agricultural sector. Like other business incubators, the agribusiness business incubators provide shared facilities and equipment, business development, market access, and technology assessment services, financial services; as well as mentoring and networking (Box 3).

Agribusiness incubation has generally been conducted in the same way that general business incubation has, although the conditions for business success are substantially different. Agribusiness takes place in a complex environment, involving farmers, intermediaries, government policy and markets and follows a value chain approach, rather than improving individual businesses. The agribusiness incubator helps in the identification and commercialization of significant technologies and services from public and private agricultural research institutions and universities to improve productivity in farmers' fields and increase the impact of research conducted in these organisations.

ABI Programme of ICRISAT

The Agribusiness Incubation (ABI) program of ICARISAT, Hyderabad is the most successful business incubator in India. Started in 2003, the ABI has over 140 clients, commercialised 113 technologies and supported over 180 business ventures. The ABI is also working with 22 Business Process Development (BPD) – an Agribusiness incubator, units of NAIP-ICAR under Network of Indian Agribusiness Incubators (NIABI) to promote start-ups in various parts of India (Karuppanchetty, 2012). The network of ABIs promoted by ICRISAT along with NAIP is displayed in Fig. 1. Award-winning BPD units in Tamil Nadu Agricultural University (TNAU), Coimbatore and Central Institute of Fisheries Technology (CIFT), Cochin are commercialising the agri-technologies at a faster rate and creating viable agriculture-based technology ventures.

Box 3: Structure and function of Agribusiness incubators

In general, the Agribusiness incubators will host about 20 or more technology start-ups in a centrally located business complex. They are like single window service providers, which offer the techno-business services like lab space, equipment and library facilities, technical collaboration with host Institution scientists, business development services and training, professional networking etc at a cheaper rate (Ayers, 2012). Any budding entrepreneur with a sound technology/idea with a high market potential can apply for a space in a business incubator. A high profile committee comprising of scientists, administrators and business managers will screen the applications and select the ideas based on (i) their market potential, (ii) ability of the entrepreneur to develop the idea into a viable business.

After selection, the companies will be invited to occupy an allotted space in the building. The rent for the space varies with the host organisation. The companies can set-up their laboratory and office inside the allotted space and utilize the centralised lab, equipments, INTERNET and other facilities; consult scientists and business experts; attend scientific, business development and client meetings organised by the incubators etc. to develop their technology product. A technology incubator will have large area under laboratory space while the Agribusiness and other incubators utilise more space for business development, demonstration units and training.

At a minimum, staffing should include a manager with business experience who has been trained in incubator operation, possibly an administrative assistant, secretary/receptionist, and at least one business counsellor who provides technical services directly to tenants. The start-ups will graduate from the incubators once they are acquiring an assured market for their products/services; develop sound business management skills and ability to sustain in the competitive market. The graduation time varies from 4 years (in case of software companies) to 8-10 years (for biotech products). Successful completion of a business incubation program increases the likelihood that a start-up company will stay in business for the long term: older studies found 87% of incubator graduates stayed in business (Molnar *et al.,* 1997).

Table 1: Specific roles of extension professionals in Agribusiness incubators

Mission	Level	Activity	In collaboration with	Specific extension method
1. Identifying and adopting technologies appropriate for specific agribusiness enterprises	National, Regional, State level	Technology prioritization; Demand – supply gap analysis; Value chain mapping	Policy makers, business Managers, scientists and agricultural Economists	Market survey; Field survey; Brainstorming; Delphi technique; Focus groups; Ex-ante assessment; Personal interviews; focus groups
	District and village level	-do-	Scientists and agricultural economists	Market survey; PRA; Personal interviews; focus groups
2. Identifying and motivating entrepreneurs in agribusiness enterprises, frequently in rural areas	National, State, District and village levels	Creating public awareness about incubator; Mobilising farmers and youth to develop business ideas; Selecting potential incubatees	Business Managers, scientists and agricultural economists	Field level and mass media campaigns; Mobilising farmers associations and training them to develop sound business proposals; Equipping farmers with necessary entrepreneurial skills through field and residential training
3. Building commercial conduits in the form of value chains which integrate new value creating activities in rural and urban spaces	National, State, District and village levels	Developing farmers associations; value chain mapping and analysis; Developing linkages with credit, input and marketing agencies; Developing market intelligence system	Policy makers, business Managers, scientists and agricultural economists	Team building activities; PRA; Focus groups; coordinating technical, financial and managerial training of incubatees and farmers; Training field staff to collect market data, conducting field work

The agri-enterpreneurship is developed through vertical strategy (service strategy) and a horizontal strategy (an outreach strategy based on partnerships in collaborative business incubation) (Sharma *et al.,* 2012). The service strategy focuses development on strategic areas related to the mandates of host organisation and its partners. For example, the ABI at the ICRISAT promotes (i) seed ventures, (ii) bio-fuel ventures, (iii) Innovative ventures on propriety products, (iv) farm ventures, (v) Agribusiness ventures and (vi) agri-biotech ventures. The outreach strategy of ABI is to collaborate with organizations locally and globally in business incubation (co-business incubation).

Role of Extension Professionals

In general, the Agribusiness incubators focus on viable technologies to develop agribusiness enterprises at the primary (e.g. farmer), secondary (e.g. processing) or tertiary (e.g. support service) level. It provides greater opportunities for extension professionals to perform multiple roles with a variety of stakeholders. As Agribusiness incubators are multi-disciplinary entities comprising of business managers, scientists, policy makers, input and marketing agencies, farmers and general public, the extension professionals can work in a collaborative environment to create viable start-ups. The extension professionals can play a major role in performing the outreach function of the Agribusiness incubators. Specific roles of extension professionals in Agribusiness incubation are given in Table 1.

Way Forward

Business incubators are vital catalysts for developing new agricultural technology enterprises. In the developing countries, the incubators have contributed significantly in transforming potential start-ups into viable technology ventures. In India, the Agribusiness business incubators are relatively new entrants into the technology business, but their numbers are increasing at a significant rate. Few successful agribusiness incubators like Agribusiness Incubator of ICRISAT and Business Planning & Development Units of TNAU and CIFT have contributed significantly to agro-enterprise development in India. Extension professionals can play a larger role in executing the service function of the Agribusiness incubators by creating awareness, recruiting, mobilising and training potential entrepreneurs, networking with credit, input and marketing agencies and provide market intelligence services. Extension professionals can contribute to improving the efficiency of Agribusiness incubators in the following ways:

Identifying potential entrepreneurs

In India, the agri-entrepreneurship extension programmes are traditionally focused on developing entrepreneurial abilities of the farmers, with the aim to maximise "producers' share" in the consumers' price of the product. As entrepreneurship requires specialised skills and attitude especially in the area of business idea development, financial management and marketing, we can't expect the small and marginal farmers (who are already faced with several struggles to manage their farms) to be a successful agripreneur. The value chain approach has demonstrated that the producer's share can be maximised by manipulating other processes. Agribusiness incubators provide a new platform and "state-of-art" methods to identify potential agri-preneurs, who can create new and efficient value chains to help farmers maximise their share in consumer price.

Revising extension entrepreneurship curricula

Most of the extension entrepreneurship training programs organised by premier extension Institutes provide very little or no information about Agribusiness incubation. There is also an inadequate understanding about the role of extension professionals in the Agribusiness incubation process and the skills required to maximise their role and efficiency. In this context, there is a pressing need to revise the extension & entrepreneurship training and education curricula by incorporating information and tools of Agribusiness incubation

Extension research on Agribusiness incubation

In India, Agribusiness incubation and value chains are often researched by agricultural economics and business management professionals. Extension entrepreneurship research is outdated and focused more on traditional extension topics like training need identification, assessing management/financial management skills, market skills and entrepreneurial abilities of farmers, etc. There is a need to strengthen research on value chain modelling-mapping and analysis, business opportunity identification, financial management tools and techniques, logistics and branding to maximise our role in the agri-incubation process.

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Annexure 1: Types of Business Incubators

Incubators vary in the manner they deliver their services, in their organizational structure and in the types of clients they serve. There are a variety of incubators, which are described in the following table.

Type	Aim	Objectives	Target sectors	Example
Mixed Portfolio Business Incubation	To reduce the business gap in environments where there is little entrepreneurial activity	Create start-up companies and Employment generation	Targets high-growth firms in the sectors that align with the overall regional or national competitiveness strategy	Foundation Chile and Technoserve of Mozambique
Technology Business Incubation	To reduce entrepreneurial gap in the areas where this infrastructure and human capital are weak	Create entrepreneurship, stimulate innovation, technology start-ups and graduates	Targets high-growth technology firms – IT and biotechnology	TBI, IIT-Delhi , India and Sid Martin Biotechnology Incubator, USA
Business incubation with university relationships	To bridge the gap between research and commercialization or technology transfer	Create entrepreneurship for university based technologies	Typically targets technology firm, but may work with other sectors	Rice Alliance for Technology and Entrepreneurship, Rice University, USA.
Agribusiness Incubation	To improve the livelihood of farming communities through agri-preunership	Commercialise potential agricultural technologies and create competitive Agribusiness SMEs	Targets Agribusiness SMEs that have potential to improve the value chains	Agribusiness Incubator@ ICRISAT, India and Rutgers Food Innovation Center, New Jersey, USA
Social Business Incubation	To bridge the social gap by increasing employment possibilities for people with low employment capacities	To integrate social categories; To create employment opportunities for people with low employment capacities	Creating socially valuable products and services in the non-profit sector	Social Incubator North, UK.
Basic research incubators	To reduce the discovery gap in a specialised area of study	To conduct blue sky research	High tech research sectors	DIBS Research Incubator, Durham, USA
Technology Parks	To accelerate growth of relatively mature businesses	For product advancement and innovation and to attract talent, ideas and financial resources and future clients	Focus on range of technology firms, but may target specific industries	Software Technology Parks of India

(Source: Ruby, 2004; Ayers, 2012)

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BUILDING ENTREPRENEURSHIP THROUGH AGRICULTURAL UNIVERSITIES AND RESEARCH INSTITUTES

Over the years, extension professionals have employed non-profit approaches for entrepreneurship development with non-IPR technologies for transforming farmers into agripreneurs. However, the true benefits of agricultural research will be realised only when the focus is shifted to creating technology-based start-ups with people having the essential entrepreneurial attributes. Extension professionals need to understand and master the process of technology commercialisation and entrepreneurship development in a systematic way, to support research in this endeavour, argues, P Sethuraman Sivakumar.

Since their inception in the 1960s, Agricultural Universities have developed significant technologies, which have gone on to enhance livelihood security of farmers and other stakeholders. Currently, India has 60 Agricultural Universities, four central and four deemed-to-be universities, and 98 ICAR research Institutes. The Agricultural Universities and research institutes are traditionally engaged in (i) creating competent and professionally qualified agricultural manpower; (ii) developing location-specific agricultural technologies; and (iii) applying viable agricultural technologies to promote farmers welfare. In recent years, there has been a significant structural change in agriculture, with increasing focus on enhancing the entrepreneurial advantage of this traditional profession. In line with this trend, there is growing interest among universities in pursuing commercial applications of the research products they have developed, including new venture creation.

Why Agricultural Entrepreneurship?

An Instrument of Poverty Reduction

Agricultural entrepreneurship through value addition has been promoted as an instrument for securing food security and reducing poverty. A World Bank study (Ravallion and Datt 1996) has estimated that a one per cent rise in agricultural value added per hectare results in a 0.4 per cent and 1.9 per cent reduction in poverty in the short- and long-run, respectively.

Rising Share of High Value Agriculture

High value products, such as fruits and vegetable crops, on average generate Rs. 3.30 lakh worth of output per hectare compared with Rs. 37.5 thousand in the case of cereals, and Rs. 29 thousand and Rs. 48.7 thousand in the cases of pulses and oilseeds, respectively (NITI Aayog 2015). These variations in value productivity indicate a very large scope for raising the value of agricultural output through a shift from cereals, pulses and oilseeds into commercial cultivation of fruits and vegetables.

Shift in Household Dietary Consumption Patterns

The nature of eating and composition of foods consumed has changed drastically over the years. India's gross national income (per capita), increased by about 2.3 times in the last decade (2000-10), leaving surplus money in the hands of Indian consumers. A National Sample Survey Organisation's study (NSSO 2014) indicates that cereal consumption has declined – by 16.3% in rural and 12.4% in urban areas – during the

1993-2012 periods. Pooled data indicate that per capita consumption rose by 21 per cent in the case of fruits, 14 per cent in the case of vegetables, 11 per cent in the case of milk, and 23 per cent in the case of meat, eggs and fish during the same period.

Box 1: What is Agricultural Entrepreneurship?

Entrepreneurship is the process of creating something new with value by devoting time and effort, assuming the accompanying financial, psychic and social risks and uncertainties and receiving the resulting rewards of monetary and personal satisfaction (Hisrich et al. 2005). Agricultural entrepreneurship deals with the entrepreneurial activities performed within and across agricultural value chains. The purposes of agricultural entrepreneurship are: (i) stabilising market prices of agricultural commodities; (ii) generating assured income from farm produce; (iii) creating opportunities to get additional income by utilising farm produce; (iv) utilising the additional revenue or surplus money to develop a viable business; and (v) generating adequate income to sustain farmers' livelihoods.

Changes in Demographic Composition of the Indian Population

Age-related factors play a crucial role in agricultural commercialisation because food consumption by an individual changes over his/her lifetime. A recent survey indicates that India has the world's highest number of 10-24-year-olds, at 242 million, making it the largest youth population in the world (Swissnex India 2015). Considering the creativity, innovativeness and enthusiasm of youth, a National Policy for Skill Development and Entrepreneurship (2015) has been formulated, and several programmes were initiated to motivate them to create new ventures (Ministry of Skill Development and Entrepreneurship, Government of India 2015).

Growth in Export Opportunities for High-Value Agricultural Commodities

In the last few decades, India has mastered its export competitiveness in agricultural commodities, especially in high value products, making it the world's 14th largest agricultural, fishery, and forestry produce exporter. A report prepared by a not-for-profit organisation, the Centre for Environment and Agriculture (Centegro) indicates that Indian agricultural commodities exports are likely to grow to Rs 6507 billion by 2022 from the present Rs 2342.7 billion (The Economic Times, 23 August 2017).

Emerging Agri-Food Retail Chains

Retail industry in India is expected to grow to Rs 23400 billion by 2020 from the current level of Rs 21613 billion, registering a Compound Annual Growth Rate (CAGR) of over 10% (Euromonitor International, February 2017). Grocery and food account for more than 50 percent of fast moving consumer goods (FMCG) sales, and together form the biggest retail channel in India.

Increase in the Foreign Direct Investment Inflow for Agri-Businesses

The FDI in agriculture is held in three sectors –food processing, agricultural services, and agricultural machinery. The food processing industry is one of the largest industries in India and ranks fifth in terms of production, consumption, and exports and contributes 14 percent of the Gross Domestic product of India. Food processing is a hallmark sector attracting FDI at an increasing level. FDI in the food processing sector rose from Rs. 3357 crore in 2014-15, to 4732.28crore in 2016-17 (Press Information Bureau, July 2017).

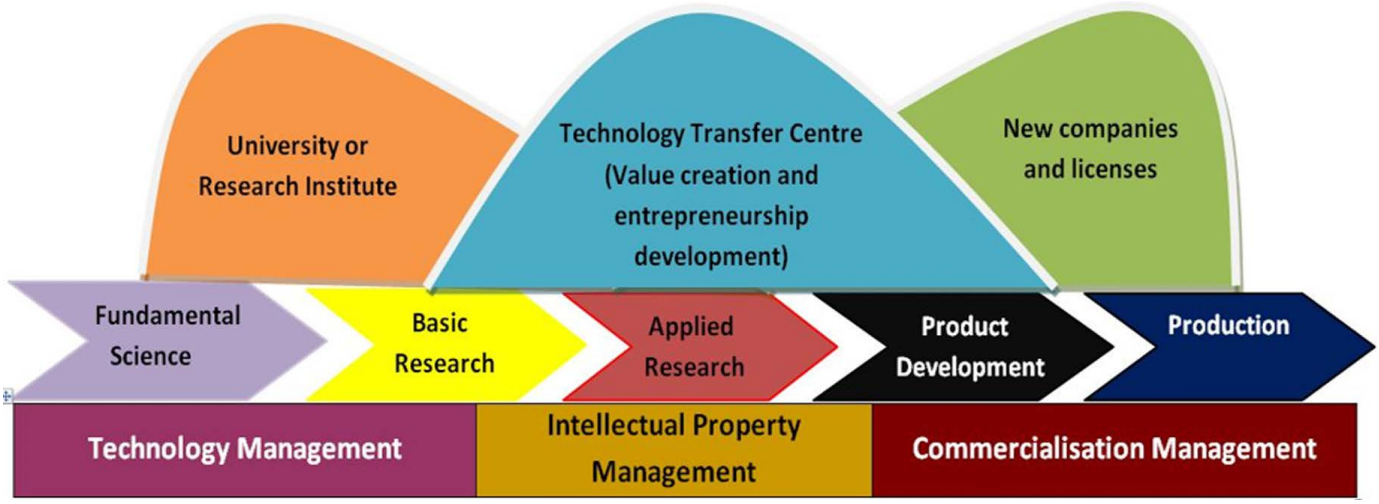

Fig. 1: Level of achievement in terms of adoption and constraints in adoption of checks

Entrepreneurship Development in Universities and Research Institutes

Traditionally, Universities and research Institutes are engaged in three primary functions of teaching, research and extension, which are now incorporating entrepreneurship development as their fourth function. The entrepreneurial development activities of universities and research institutes are channelized in three ways. The interrelationships among these core functions are displayed in Fig. 1. An overview of the entrepreneurship development process is displayed in Fig. 2.

(i) Technology management involves planning and executing stakeholder-oriented technology development strategies and programmes;
(ii) Intellectual Property (IP) management deals with protecting the intellectual property rights (IPR) of the viable technologies; and
(iii) Commercialisation management translates the products of research/technologies, including IP protected technologies, into commercial products and services.

Technology Management

Technology management refers to the planning and execution of stakeholder-oriented technology development strategies for generating high impact technological products and services. Strategies are formed by critically analysing the external drivers of technology and the existing infrastructure available in the organisation. Technology management is done by the Directorate of Research and Planning in Agricultural Universities, and the Planning, Monitoring and Evaluation (PME) Unit in ICAR Institutes.

Intellectual Property Management

IP management at the universities and research institutes is undertaken by an IPR Cell (Agricultural Universities) or Intellectual Property and Technology Management Unit (ICAR Institutes). In ICAR Institutes, the Intellectual Property and Technology Management Unit manages Intellectual Property and Technology Commercialisation at the institute level with guidance from the Intellectual Property and Technology Management Committee. The Zonal Technology Management Unit (ZTMU) at the regional level and the Intellectual Property and Technology Management Unit (IPTM) at ICAR HQ are the coordinating agencies at higher levels.

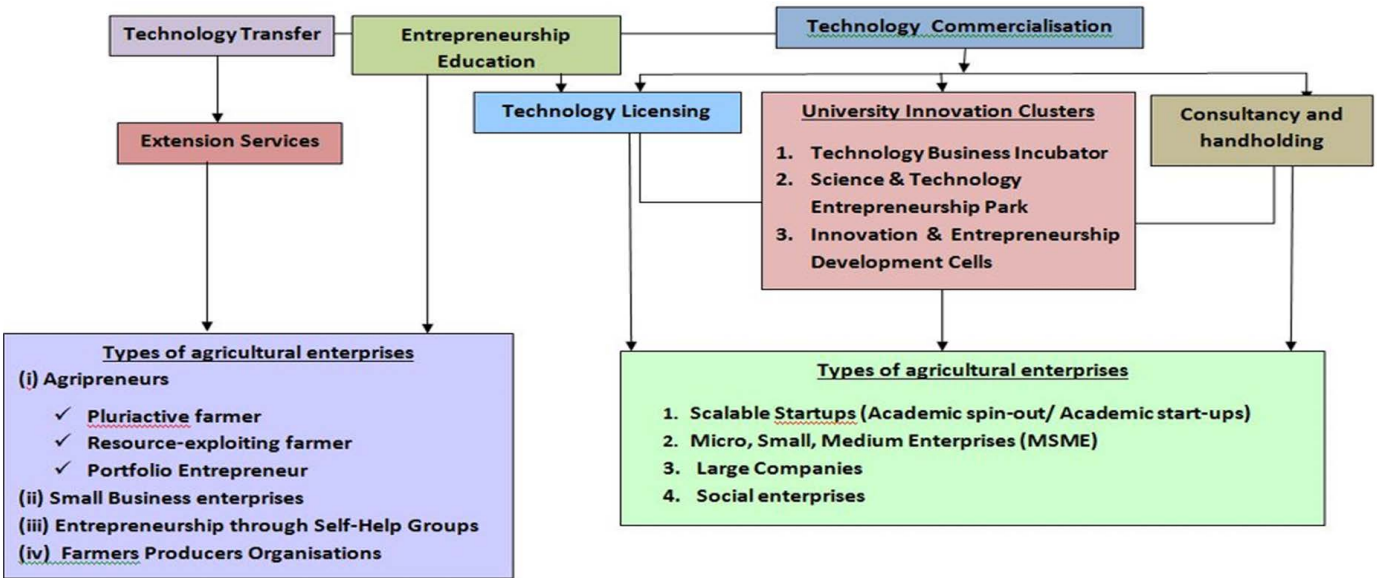

Fig. 2: Entrepreneurship Development in Universities and Research Institutes

IP management has three components:

Technology or invention disclosure

The inventor explains the details of the technology to a commercialisation committee in a confidential meeting. All the members provide an undertaking of non-disclosure of the technology details. During the meeting, the inventor(s) provide details of name of the invention, technical details, the inventors, source of funding for creating the invention, advantages of the technology over prior art, potential drawbacks, its scope of use, publication records related to the invention, proposed price, market potential and prospective buyers. After a critical discussion, the committee decides on whether to proceed for IPR protection. The technology non-disclosure clause is binding for protecting IPR of the technologies.

Intellectual Property Rights Protection

Intellectual Property Protection involves identification of potential technologies for IP protection through critical assessment of their market viability, selecting a suitable IPR protection

method, preparing and filing an IPR application, and managing the entire process until the IPR is granted. The purpose of IP protection is to safeguard the intellectual property rights of the technologies developed at the universities and research institutes from possible misuse by other parties. There are four common types of IPR: patents, copyrights, trademarks and Geographical Indications (Box 2).

Intellectual Property Portfolio Management

IP Portfolio management is the processes and tools that enable acquisition, analysis, and organization of IP information, available both inside and outside the universities and research institutes. The IP Portfolio managers analyse the current IP scenario of specific technological products and develop future IP management strategies. The IP Portfolio is a key function which determines the choice of technologies for protecting IP, guides decision-making on mode and extent of commercialization of technologies, and type of entrepreneurships created by the universities and research institutes.

Box 2: Common forms of Intellectual Property Rights

1. **Copyrights** protect original works of authorship, such as original literary, dramatic, musical or artistic work, cinematograph films, sound recordings, and computer programmes (treated as literary work). With copyright protection, the holder has exclusive rights to modify, distribute, perform, create, display, and copy the work. In general, the protection is valid for 60 years for most types.
2. **Patent** is a document, issued, upon application, by a government office, which describes an invention and creates a legal situation in which the patented invention can normally only be exploited - manufactured, used, sold, imported, with the authorization of the owner of the patent. "Invention" means a solution to a specific problem in the field of technology. An invention may relate to a product or a process. The protection conferred by the patent is valid for 20 years.
3. **Trademark** is a word, phrase, symbol, or design that distinguishes the source of products (trademarks) or services (service marks) of one business from its competitors. In order to qualify for patent protection, the mark must be distinctive. The registration for trademark is valid for 10 years and renewable for every 10 years. In addition to trademarks, the Certification marks (granted to anyone who can certify that the products involved meet certain established standards like ISO and ASTM), and Collective marks (owned by associations and the members allowed to use it to identify themselves with a level of quality and other requirements and standards set by the association) can also be protected.
4. **Geographical Indications** (GI) identify a good as "originating in a place" where a given quality, reputation, or other characteristic of the good is essentially attributable to its geographical origin. For example, Darjeeling tea and Mysore Silks are unique products protected by GI.

Source: Nishith Desai and Associates (July 2015)

The specific functions of IP Portfolio management (Burdon 2007) include technology scan, IP surveillance, licensing/business development IP support, patent development/patentability, patent landscape and managing infringement claims.

Commercialisation Management

The commercialisation management of technologies is the process of turning IP assets into value for both stakeholders and the university and research institute. Commercialisation management has two components: Technology Transfer, and Technology Commercialisation.

Technology Transfer

Technology transfer is a generic term which indicates the formal and informal movement of know-how, skills, technical knowledge, procedures, methods, expertise or technology from one organizational setting to another (Roessner 2000). It includes both 'for profit' and '"non-profit' forms and is used as a mechanism to apply the technological products to derive impacts which enhance the welfare of the stakeholders. While the 'for profit' forms represent technology commercialisation, the 'non-profit' forms are implemented through 'extension outreach' programmes. The differences between 'for profit' and 'non-profit' forms of technology transfer are displayed in Table 1.

The entrepreneurship development activities of extension services focus on the farmer's welfare. The technological products and services are provided at a reasonable cost or free, to help the stakeholders including farmers to maximise returns.

The types of entrepreneurships created through extension services are as follows:

a. Agripreneurs: Agripreneurs are primarily the farmers who are engaged in entrepreneurial activities associated with their farm. Agripreneurship development focuses on creating a new breed of farmers with core business skills in undertaking farm-based businesses for maximising their income.

Table 1: Differences between 'for profit' and 'non-profit' forms of technology transfer

Aspect	'For profit' technology transfer (Commercialisation)	'Non-profit' technology transfer (Extension and Outreach Services)
Purpose	To recover costs incurred in developing the technology and realize the value for the innovation	To enhance stakeholder welfare by applying technological products and services
Type of technologies	With or without IP protection	Only technologies which are not IP protected
Target group	Existing and new enterprises, individual entrepreneurs, public and private sector agencies which are interested in using the technologies for generating revenue	Non-profit public and private sector agencies like KVKs, state extension agencies, NGOs and other stakeholder groups
Mechanism of technology transfer	Technology licensing, contract research, direct and online sale of technologies	Extension outreach programmes

b. Small Business Enterprises: Small-scale enterprises focus only on a few commodities or services. They are created by agripreneurs or rural youth to sustain their livelihoods. This business doesn't require specialised skills and can run with farmers' own capital. Examples include: agri-clinics and horticultural nurseries.

Box 3: Types of Agripreneurs

According to Alsos et al. (2003), there are three types of agripreneurs: Pluriactive farmer, Resource-exploiting, and the Portfolio Entrepreneur.

PluriactiveFarmer: They derive a reasonable proportion of income from the off-farm income generating activists. The purpose of engaging in off-farm economic activities is to sustain their farming and/or to expand their farms to provide employment to their family members. This approach is used as a coping mechanism to sustain in adverse climatic conditions and other shocks which affect their livelihoods (Shucksmithet al. 1989). In the pluriactive approach, the farm business is owned by the family and is less capital intensive.

Resource Exploiting Entrepreneur: They are farmers who utilize the unique resources available in their farm to develop a new farm-based business. For example, livestock farmers can prepare compost from cow dung; or the farm can be used as an agri-tourism venue to generate additional income. The capital requirement for the business activity varies with the nature of the business.

The Portfolio Entrepreneur: They are progressive farmers who wish to exploit a novel but risky business idea. They develop teams to implement their ideas and are ready to invest large capital for translating these into a viable business. Though the ideas originate from farm, the new business is registered as a separate entity from the farm. For example, when a group of farmers create a mango pulp processing factory using their own produce at the initial stages, and then go on to procure from others when expanding production.

c. Entrepreneurship through Self-Help Groups (SHGs): An SHG is a village-based financial intermediary usually composed of 10–20 local women or men. The SHGs are formed by NGOs and financed by banks to undertake a specific entrepreneurial activity. SHGs mostly work on traditional agri-businesses and the profits earned are utilised in a collective way.

d. Farmers Producers Organisations (FPOs): The FPO is a collective of producers, especially small and marginal farmers, who have formed an effective alliance to collectively address many challenges of agriculture, such as improved access to investment, technology, inputs and markets. This collective can be registered as a company under the Company's Act and undertake farm-based business.

Technology Commercialisation

Technology commercialisation is a systematic attempt to translate technological advancements into commercial products or services targeted to satisfy the felt/unfelt needs of consumers. As indicated in Table 1, it is a special form of technology transfer, which occurs when the party transferring technology receives money in exchange for giving up some or all the usage rights to the technology (Speser, 2008). Technology commercialisation involves selling, licensing, or contracting of technology services, intellectual assets, and related-knowledge to potential users, i.e., independent entrepreneurs, companies or other public/private sector organisations.

Technology commercialisation management involves the following activities:

a. ***Technology valuation:*** It involves estimating the value of the technologies fromboth buyers and sellers perspectives for deciding the licensing fee. In the case of non-IP technologies, the technology price is determined through negotiation between the buyer and seller.

b. ***Developing technology commercialisation strategies:*** Technology commercialisation strategies area series of options that a university or research institute can employ to move its technologies from concept to the marketplace. The purpose of devising commercialisation strategies is to realize the value of Intellectual Property developed by the university or research institute and also to recover the costs incurred in developing those technologies. Various technology commercialisation strategies employed by Universities and Research Institutes are – (i) Technology licensing; (ii) Venture creation; and (iii) Consultancy and handholding.

(i) Technology Licensing

Technology licensing involves transferring rights of IP-protected technologies, technological knowhow (confidential information), copyrights, and registered or unregistered designs developed by the university or research institute to entrepreneurs. It is basically an agreement whereby an owner of a technological intellectual property (University/Research Institute) allows another party (Entrepreneur) by granting exclusive or non-exclusive rights to use, modify, and/or resell that IP in a particular market for a specific purpose in exchange for suitable compensation. The compensation may take the form of a (1) lump sum license fee; and (2) royalty, based on volume of sales. Such agreements are legally binding commitments by one or both parties to not use or disclose to others the confidential information that they have come to know during the negotiations. The period of licensing varies with the stage of technology development (Box 3) and its market potential.

Among the technology development stages, the technologies at the 'prototyping, formulation and compound' stage are directly licensed to interested entrepreneurs for large scale commercialisation. The stage 3 technologies need scaling up for making them 'market-ready'. Both stage 1 and 2 technologies require extensive research before they can be turned into a suitable commercial form.

Technology licensing and contract research with universities and research institutes may help agricultural enterprises to acquire valuable technology from them for improving existing businesses or to develop a new one.

In addition to technology licensing, universities and research institutions are also undertaking contract research with public sector or private agencies for developing a new technology/ assessing the existing technology for its viability and efficiency/upgrading these technologies in stages 1-3 for making them 'market-ready'.

Box 4: Stages of Agricultural Technology

Stage 1 - Early stage: An early-stage technology is an idea which is expected to work and solve an existing problem, or create a new need. For example, a plant extract known to have a pesticidal property, but the components and modalities are unknown.

Stage 2 - Proof of concept: Then this early stage idea could be researched and a new technology developed to the point that it shows signs of having the proposed effect. In this stage, a few components of the plant extract which cause insect morality would have been identified, but the mechanism by which they act is still unknown.

Stage 3 - Reduction to practice: In this stage, several experiments on the specific idea have been completed and the projected results have been reliably and repeatedly reproduced. The pesticidal properties of specific components of the plant extract have been identified, and a mode of action documented and validated.

Stage 4 - Prototyping, formulation and compound: The technology is now standardised and found reliable and valid and ready for commercialisation. In the previous stage, the components having pesticidal properties are extracted using a specific method and reformulated into a pesticide with target-specific claims.

(ii) Venture Creation

The entrepreneurship developed by universities and research institutes are largely technology-based with the aim of translating various technological products and services into sustainable businesses. Various institutional mechanisms for creating enterprises include: University Innovation Clusters containing Technology Business Incubators, Science & Technology Parks, and Innovation and Entrepreneurship Development Centre (IEDC) along with consultancy and handholding services. The types of agricultural enterprises created by university and research institutes are given in Box 5andFig. 2.

Mechanisms of Venture Creation

- University Innovation Clusters and its constituents

University Innovation Clusters are macro-interventions aimed to create an innovation network with multiple stakeholders, such as Industry, other Universities, R&D Labs, and others. The focus is on developing an innovation culture for developing novel products, processes, services, and delivery which will in turn enable growth and development (Office of Adviser to the Prime Minister on Public Information Infrastructure and Innovations 2011). Within each cluster, project teams made up of researchers, students, entrepreneurs, policy makers, extension agencies and funding agencies co-design new strategies for addressing a specific unmet need within a population.

The University here acts as the focal point of such a cluster and will be able to leverage the following (Office of Adviser to the Prime Minister on Public Information Infrastructure and Innovations 2011):

- Technology R&D and problem solving strengths of the University;
- The entrepreneurial spirit of the students and faculty;
- Collaboration with local industry, NGOs and others;
- The teaching and training capabilities of the University;
- Infrastructure and capital available locally;
- Government policy initiatives, more efficiently.

Several govt. agencies, including National Science Technology & Entrepreneurship Development Board (NSTEDB) - DST, Biotechnology Industry Research Assistance Council (BIRAC), and NAIF-National Agricultural Innovation Fund of Indian Council of Agricultural Research (ICAR), have created University Innovation Clusters on specific focal areas. Typically, a University Innovation Cluster is comprised of a Technology Business Incubator/Agri-Business Incubator, a Science & Technology Entrepreneurship Park (STEP), and Innovation & Entrepreneurship Development Cells (IEDC), which are linked to its stakeholders.

- Technology Business Incubator (TBI)

A Business Incubator is an organization designed to create, accelerate the growth and success of

Box 5: Technology Commercialisation - Types of agricultural enterprises created (Blank, 2010)

1. Scalable Startups

- Baby companies, which are developing innovative products or services based on a marketable idea, but yet to establish a concrete business model;
- Often registered as a Private Limited Company;
- Up to seven years from the date of its incorporation/registration;
- Annual turnover – maximum of Rs. 25 crores.

Types of start-ups

- Academic spin-out - A commercial entity that derives a significant portion of its commercial activities from the application or use of a technology and/or know-how developed by, or during, a research program of a university or non-profit, usually public, research organization.
- Academic start-ups – Technology-based enterprises created by the persons who have studied at a university or research Institutions. They are built upon technological knowledge derived from academic research.

2. Micro, Small, Medium Enterprises (MSME)

- A MSME is a permanent and structured business unit that focuses on the delivery of value to its already-known customers.
- As per Govt. of India guidelines, the MSME is classified based on investment. Micro: up to Rs 5 crore; Small: up to Rs 75 crore; and Medium: up to Rs 250 crore.

3. Large Companies

- Universities can help large companies to develop new ideas and business opportunities, leading to new business ventures and the improvement of organizational profitability, thus enhancing the competitive position of the existing firm.

4. Social enterprises

- A social enterprise is an organization that applies commercial strategies to maximize improvements in financial, social and environmental well-being of people, and maximizing social impact alongside profits for external shareholders.
- Social enterprises are not volunteer organizations in that they operate as an enterprise by selling in a market (profit or non-profit enterprises).

entrepreneurial companies through an array of business support resources and services that could include physical space, capital, coaching, common lab facilities and services, and networking connections. A TBI is a special type of business incubator, where the focus group consists of innovative, mostly technology-oriented, or knowledge-intensive service sector enterprises which constantly interact with the academic sector to bring innovative technology-based solutions to solve persistent problems of society. The impact of TBIs is assessed by the number of companies that have been founded and developed there, the number of created jobs, commercialised technologies or patents obtained. A few of the technology incubators maintained at Agricultural Universities and ICAR Institutes are listed in Table 2.

Table 2: Technology Business Incubators at Agricultural Universities and research institutes

Name of the TBI	Host Organisation	Contact details
Association for Innovation Development of Entrepreneurship in Agriculture (A-IDEA)	National Academy of Agricultural Research Management (NAARM) (ICAR), Rajendranagar, Hyderabad-500030, Telangana	Tel: +91-40-24581427 Email: coo.aidea@naarm.in
Society for Innovation and Entrepreneurship in Dairying (SINED)	National Dairy Research Institute Campus, Karnal – 132001, Haryana	Tel:+91-184-2259329 Email : tbi@ndri.res.in
Agri Business Incubation Society – TBI	Tamil Nadu Agricultural University (TNAU), Coimbatore- 641003, TN	Tel: +91–422–6611310 Email: business@tnau.ac.in
NIELAN –Technology Business Incubator (TBI)	Indian Institute of Millets Research, Rajendranagar, Hyderabad-500030, Telangana	Tel: +91- 8499895407 Email: nielan-tbi@millets.res.in

- Science & Technology Entrepreneurship Park (STEP)

A Science Park is an organization managed by specialized professionals whose main aim is to increase the wealth of its community by promoting the culture of innovation and the competitiveness of its associated businesses and knowledge-based institutions (International Association of Science Parks and Areas of Innovation 2017). The main task of STEPs is to create the scientific research infrastructure available for creating new companies. Further, technology parks are to provide students and university staff with the opportunity to do scientific-research cooperation with enterprises. STEPs are offering services like technology transfer, incubation, business support, and link with academics.

- The Innovation and Entrepreneurship Development Centre (IEDC)

IEDCs are promoted in educational institutions to develop institutional mechanisms to create an entrepreneurial culture in Science & Technology academic institutions and to foster techno-entrepreneurship. The IEDC programme is focused directly on entrepreneurship development in academic institutions by maintaining close relations with existing businesses and R&D practice.

(iii) Consultancy and handholding

Apart from licensing technologies to enterprises, Universities and Research Institutes also offer consultancy and handholding services for commencing commercial production of technologies. Consultancy services are offered on individual and institutional basis to help entrepreneurs solve specific problems. Handholding is the provision of careful support or guidance to budding entrepreneurs for establishing agricultural technology-based ventures. It involves technology transfer or licensing, extending farm advisory services, linking with funding agencies, establishing the industry, product planning and development, business mentoring, linking with marketing agencies and others.

Entrepreneurship Education

Entrepreneurship education in agriculture is offered by most of the Agricultural Universities, Private Universities and Institutes, and a few ICAR Institutes. This education and capacity development on entrepreneurial skills is: (i) a regular course in UG, PG and PhD level; (ii) a specialised course at Masters level; and (iii) continuous education programmes in technology commercialisation and entrepreneurship development.

Regular courses: Considering the importance of agricultural entrepreneurship, Entrepreneurship Development course is introduced in all agricultural and animal husbandry disciplines. The purpose of these courses is to sensitize UG students on the importance and techniques of entrepreneurship and equip them with critical skills in creating and managing enterprises.

In general, there are two components in teaching entrepreneurship. First aspect is to develop a fundamental understanding of entrepreneurship and business management by providing concepts, principles, structures and processes associated with entrepreneurship. The second aspect focuses more on creating entrepreneurship and managing the business where students are equipped to apply their fundamental understanding along with critical skills to create and manage enterprises. For example, teaching agricultural marketing develops a fundamental understanding of the concept, principles, channels, and structures associated with marketing of agricultural produce. However, the actual practice of marketing requires critical skills in understanding consumers, devising marketing strategies and managing market intelligence through proven strategies and methods/techniques. The current curriculum of entrepreneurship at the undergraduate level focuses more on creating a fundamental understanding of entrepreneurship and business management, but lacks in their application. Though post-graduate curriculum in extension covers both aspects in a general way, there is a need to enrich it with state-of-the-art approaches and tools with adequate hands-on experience for creating and managing successful agri-businesses.

Specialised course: A specialised MBA in Rural and Agri-business Management is offered in many universities to develop adequate business manpower to meet emerging demands. These specialised courses are well-designed so as to make the students competent in creating and managing agri-businesses. Apart from Agricultural Universities, the Deemed Universities under ICAR system are also offering MBA courses in agriculture.

Continuous education: The continuous education programmes on entrepreneurship are offered to equip professionals on critical skills in business planning, technology management, marketing, etc. The Indian Institute of Management (IIM) at Ahmedabad and Lucknow; Institute of Rural Management (IRMA), Anand; National Academy of Agricultural Research Management (NAARM) and National Institute of Agricultural Extension Management (MANAGE), Hyderabad; Indian Institute of Plantation Management, Bengaluru; CCS National Institute of Agricultural Marketing (NIAM), Jaipur, along with many public sector and private universities and colleges are offering specialised short term courses in business management.

Way Forward

Universities and Research Institutes have expanded their traditional roles of knowledge generation by teaching agricultural technology development and thereby producing quality human resources that can accommodate the fourth function of entrepreneurship development. Though entrepreneurship development is an essential component of both technology transfer and commercialisation, their objectives, reach, and impact are technically different. Over the years, extension professionals have employed non-profit approaches for entrepreneurship development with non-IPR technologies for transforming farmers into agripreneurs. Though this strategy has paid rich dividends, the true benefits of agricultural research will be realised only when the focus is shifted to creating technology-based start-ups with people having the essential entrepreneurial attributes. As creating technology-based entrepreneurship is a very complex process, it is essential for extension professionals to understand and master the process of technology commercialisation and entrepreneurship development in a systematic way prior to developing sustainable entrepreneurships.

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COMMERCIALIZATION OF AGRICULTURAL TECHNOLOGIES: INNOVATIONS IN BUSINESS INCUBATION AND START-UPS

Though the Indian National Agricultural Research System has initiated several measures to support commercialisation of agricultural technologies, a lot more needs to be done to strengthen these efforts. In this blog, Manoj Samuel, George Ninan and CN Ravishanker argue for a new framework to encourage start-up companies in agriculture.

Mrs. Omana Muralidharan was a homemaker at Ernakulam district of Kerala. One of the extension programs conducted by the ICAR-Central Institute of Fisheries Technology (CIFT), Kochi, changed her destiny. Many new fish processing and packaging technologies were discussed during the program. Her attention developed into interest and furthered her desire to start up a small business enterprise with CIFT technologies.

Box 1: Prawnoes – The Extruded Snack Products

ICAR-CIFT's technology for extruded snack food from fish was taken by a woman entrepreneur, Mrs. Omana Muraleedharan, Charis Food Products, Aroor, Kerala.

Before registering as an Incubatee at ZTM-BPD Unit of ICAR-Central Institute of Fisheries Technology (CIFT), Mrs Omana Muraleedharan was running a small-scale metal industry named Amruta Metal Works. She approached ICAR-CIFT with the idea to develop the extruded snack food flavoured with prawn. A brand named 'Prawnoes' was created and registered for trademark protection by ZTM-BPD Unit.

CIFT developed and standardized three varieties of Fish Kure for the Incubatee, 'Spicy Shrimp', 'Shrimp n Onion' and 'Prawn Seasoning'. The BPD Unit also helped the entrepreneur to carry out feasibility studies, prepare Business plan and DPR (Detailed Project Report) and helped her in mobilising seed funding from Canara Bank to start her own production facility in the Industrial area at Aroor, Kerala. The production facility was designed and machines were sourced through the BPD Unit. Some of the machines were indigenously designed and manufactured as per the suggestions from ICAR-CIFT. CIFT gave her technical guidance in developing the product, standardization of process parameters, testing, packaging solutions, ideas for branding, assistance in trademark filing and setting up their own production unit at Aroor.

The unit was inaugurated on 28 June 2014. Presently Prawnoes (www.prawnoes.com) is marketed in seven flavours and the produce is sold in four districts in Kerala. Mrs Omana Muraleedharan received the best woman entrepreneur award from the Government of Kerala State Prawnoes received excellent product reviews during its test marketing period and Mrs. Omana is planning to add more snack foods to her product range. With the support of all government institutions like the District Industries Centre (DIC), Ministry of Microm Small and Medium Enterprises (MSME), Banks and CIFT, she is now promoting a healthy snack food brand with a campaign "Save Children, Eat healthy snack".

However, the challenges were (a) no finances, (b) competition from big firms, (c) no infrastructure, (d) no machineries, (e) no skilled manpower, and (f) no trainings. At that juncture, the Agri-Business Incubator (ABI) attached to the CIFT has come to her rescue. Presently, she is one of the most successful women entrepreneurs of Kerala with the brand of "PRAWANOES" -- the extruded snack products in different flavours (Box 1).

Business Incubation in Agriculture

Agri-Business Incubators (ABI) open new entry points in the agricultural value chains, which in turn keep in accessing new markets (Box 2). There is no single "right way" to perform agribusiness incubation. Rather the work of agribusiness incubation depends on the state of development of the agribusiness ecosystem and changes over time as that ecosystem matures and develops. In its earliest phases, incubators demonstrate the viability of new business models and look to create and capture additional value from primary agricultural products.

In underdeveloped agricultural economies, incubators help by strengthening and facilitating linkages between enterprises and new commercial opportunities. They open new windows on technologies appropriate to agribusiness enterprises and help agricultural enterprises discover new, potentially more competitive ways of doing business. In subsequent phases of development, incubators operate as network facilitators by:

- Linking specialized service providers to agribusinesses and
- Linking separate agribusinesses to one another

Finally, in a more advanced state of business development, incubators operate as conduits for the exchange of technology, products, inputs and management methods across national borders.

Box 2: Agri-Business Incubation

The mission of agri-business incubation is improving the well-being of the poor through creation of competitive agri-business enterprises by technology development and commercialization. Agri-Business incubation is defined as a process which focuses on nurturing innovative early-stage enterprises. These enterprises have high growth potential to become competitive agribusinesses by serving, adding value or linking to farm producers.

The major objectives of agri-business incubation initiatives are as follows:

- Foster the innovation through creation, development of agri-businesses to benefit the farming community
- Facilitate agro-technology commercialization by promoting and supporting agribusiness ventures.
- Promote successful agribusiness ventures in order to benefit the famers through new markets, products and services

The commercialization including dissemination, transfer and marketing of technology has been evolving as a major pillar that supports the R&D systems. The commercialization process is linked to various activities in the technology management pipeline like protection, valuation, incubation, test marketing, technical and economic feasibility studies, showcasing, licensing and marketing of the technology. Incubation process helps nascent technology to fully evolve into a business product or service which can compete in real world environment. In a globalized economy, technology licensing and transfer of technology are important factors in strategic alliances and international joint ventures in order to maintain a competitive edge in a market economy.

Agri-Business Incubation and Tech Transfer in NARS

The National Agricultural Research System (NARS) in India employs about 4000 researchers in Indian Council of Agricultural Research (ICAR) and almost 15,000 academic faculty members in various State Agricultural Universities (SAUs). In view of changing circumstances and policies, the NARS has initiated steps to strengthen its IP portfolio management and encourage its researchers and academicians to develop and commercialize their innovations for the benefit of farming community. A more pragmatic system for business incubation and promoting start-up companies with respect to agricultural technologies have evolved in recent times within the National Agricultural Research System (NARS). Generally agricultural technologies are low-cost technologies and entrepreneurs are not much enthusiastic about it, considering the less purchasing power of the target market.

Since the implementation of the Eleventh Five Year Plan (2007-12) of Government of India, the three-tier IP management mechanism has been established in Indian Council of Agricultural Research (ICAR) towards developing an institutional setup for commercialization of agriculture research products/technologies generated from public research institutions.

Accordingly, Institute Technology Management Units (ITMUs) were established in its 95 institutes as a single-window mechanism to showcase the intellectual assets of the institute and pursue matters related to IP management and transfer/ commercialization. Five Zonal Technology Management and Business Planning and Development (ZTM&BPD) units were established at the middle-tier, in synergy with the ITMUs, in their respective zones. Twelve new BPD units have been initiated in 2013-14 to promote business incubation and technology commercialization. Subsequently the National Agricultural Innovation Fund (NAIF) has been schematized for the 12th Plan period (2012-17) by the Government of India and establishment Agri-Business Incubation (ABI) Units in 27 Agricultural research institutes and promotion of Grass-roots Innovations are the highlights of the scheme. Under the new initiative, sector wise Zonal Technology Management Centres (ZTMC) coordinate the technology incubation, protection, commercialization activities. Apart from these, Department of Science & Technology (DST) supported Technology Business Incubators (TBI) are set up in three NARS institutions and incubation and innovation centres are established at different State Agricultural Universities.

Support and services needed by bigger firms and investors for technology transfer as well as for incubation and funding can be addressed through the new flexible business innovation-incubation centres like "Agrinnovate India" and Technology Business Incubator under the NARS itself (Fig. 1). The requirement of incubation support by the bigger firms may also be met by these institutional innovations. Provisions were also made to protect the interest of farming community. The established mechanism helps to answer the questions, which may arise from the society on the righteousness and ethical issues of commercializing the public funded research outputs.

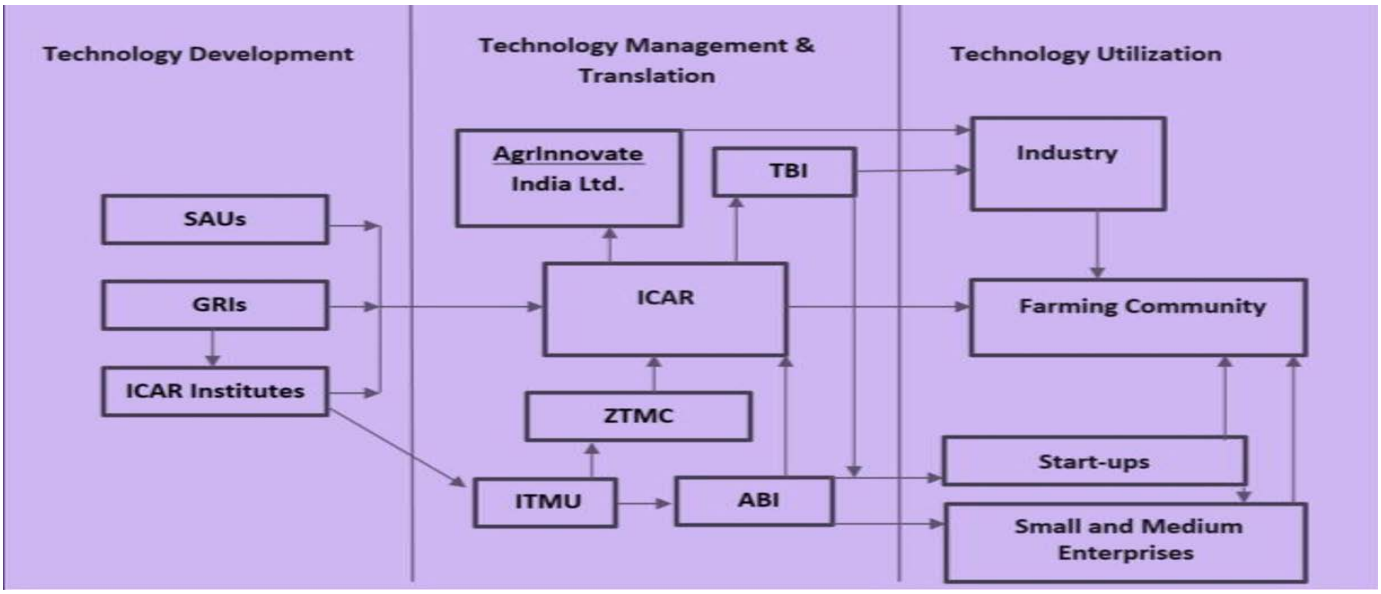

Fig. 1: Institutional framework for Tech transfer and commercialization

The Agribusiness Incubator Program under NARS seeks to provide business consulting services to agriculture-related businesses and helps to develop a strategic business plan. The new initiatives by the Govt. of India as well as ICAR have encouraged start-up companies in agriculture, especially by attracting rural youth to agri-entrepreneurship. Apart from guidance and consultancy services, the new initiatives also assist in making venture capital funds available to the start-ups. The local communities can also be involved in developing business ideas and entities with respect to agriculture.

Need for a New Framework

Though the existing framework works fairly well, more innovations are required for strengthening agri-Incubation and commercialization capacity of NARS in India in view of rapidly changing market dynamics- both nationally and globally, positively oriented government policies and expanding agri-business avenues. Though there are many agencies, schemes and government departments in the country to act as support mechanisms for IP protection and subsequent commercialization, the benefits are not extended to the needy entrepreneurs, especially in case of small and medium scale agri-businesses. See AESA Blogs: Sivakumar S and Sivaraman I (2014). Fostering entrepreneurship through Agribusiness Incubation: Role of extension professionals. Blog 33. Agricultural Extension in South Asia (http://www.aesanetwork.org/fostering-entrepreneurship-

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Though agribusiness incubators are important to promote entrepreneurship and commercialization of new technologies in agriculture, the incubators are yet to receive sufficient attention and funding in India. Lack of a positive ecosystem to nurture start-ups affects the functioning of agribusiness incubators (Srinivas, 2016).

Hence, an effective umbrella structure should be conceived as a nodal unit at the ICAR level. ICAR coordinated the technology commercialization activities under NARS. The nodal unit ensures the deliverance of governmental schemes and financial grants to the appropriate agri-enterprises and start-ups.

The new institutional and process innovations should focus on the speed and ease of commercializing developed technology and further doing business without much bureaucratic delays. The envisaged system should facilitate open communication and exchange of ideas among academia, research institutions, industry and farmers.

A novel approach is envisaged to encourage start-up companies in agriculture, especially by attracting rural youth to agri-entrepreneurship. Apart from guidance and consultancy services, the new initiative should also assist in making venture capital funds available to the start-ups. The local communities can also be involved in developing business ideas and entities with respect to agriculture.

The development processes in the suggestive framework (Fig.2) for the Agriculture Business Incubation (ABI) involve scouting of the technology, assessment and the valuation. The technology management services focus on the protection of the developed technologies having a commercial value. The technology generation cycle is the phase where product prototype developed out of the technology innovation undergoes continuous transformation leading into the final product development. The process such as innovation process; technology generation process; and agriculture business incubation are individual entities but complete a cycle of a business. Combining all these processes in a framework, a holistic approach for fostering innovation and incubation eco-system has been envisaged. Through this framework, the role of the individuals or public and private players at various levels and at various places are defined in the process of innovation of various technologies and products.

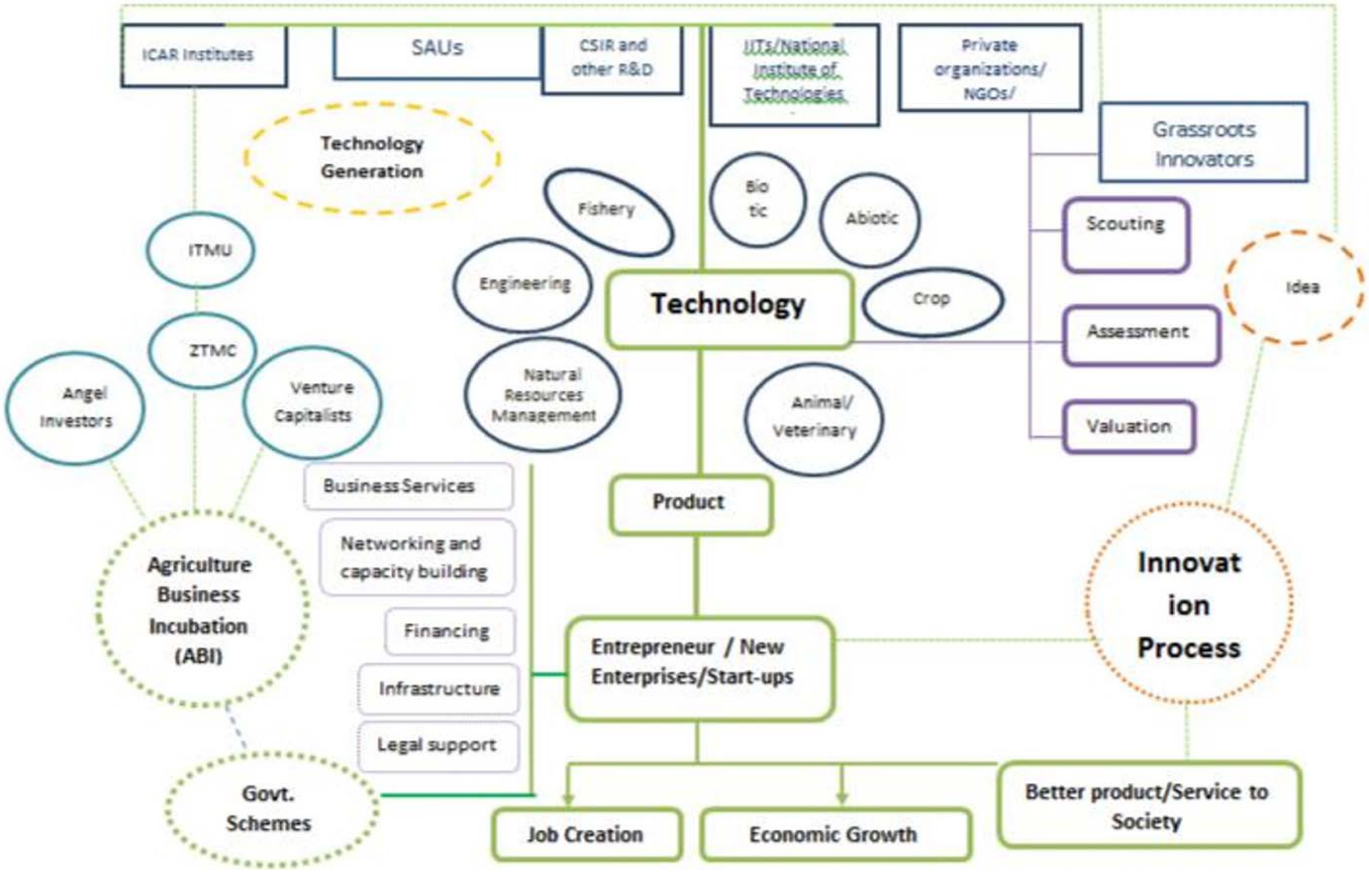

Fig. 2: Conceptualized framework for agri-innovation-incubation process

The nodal centre, which can act as a networking platform of technology managers in SAUs and ICAR institutes in line of a registered society will be helpful in networking relations and exchange of ideas and information related to IP management in agriculture. Further it can be extended by incorporating other areas of scientific organizations, institute of technologies, engineering colleges, law and business schools and traditional universities. Such a platform can be linked to similar organizations in other countries like Association of University Technology Managers (AUTM) in USA in order to explore the possibility of global technology transfer and commercialization. This initiative will also aid in updating with recent trends in IP regime, new changes in IP laws in a national and international perspective. The platform can also be extended to private companies to foster public-private partnerships.

The nodal centre can bridge the gap between research institutes, industry society, and the Government. It can play a proactive role in framing technology transfer and commercialization policy in coordination with Central and State agencies, government, business houses and other players in the industry. Nodal centres can be mooted in all research councils/organizations like CSIR, ICAR, ICMR etc. and which all can be pooled together to form a National level umbrella consortium under Government of India. The Consortia is envisaged to facilitate the convergence and effective deliverance of all schemes with respect to innovation, incubation and commercialization.

Way Forward

Translating research into technologies and then to product and services requires a coordinated and concerted effort by all stakeholders. An effective national-level umbrella structure should be conceived and established which ensures the deliverance of governmental schemes and financial grants to the appropriate agri-enterprises and start-ups.

A technology transfer protocol for forward integration with the Government machinery, policy makers and other clients and the backward integration with the framers, research institutes, NGOs and other organizations such as IIMs, IITs and business houses, has to be designed with clearly defined channels of communication and data flow.

Partnerships should be developed among the research producers, users, and funders both at the nodal centre and consortia levels. The scope of public-private partnerships in agriculture and biotechnology in the areas of technology development, protection, transfer and commercialization has to be explored.

Though extension professionals could play a very useful role in this endeavour, the field of agribusiness incubation hasn't yet got into the education and training curricula of extension professionals There is a need to strengthen research on value chain modelling-mapping and analysis, business opportunity identification, financial management tools and techniques, logistics and branding to maximise the role of extension in the agri-incubation process (Sivakumar and Sivaraman, 2014).

Public institutions under various platforms in India such as Department of Science & Technology (DST), Council for Scientific and Industrial Research (CSIR), Department of Bio-technology (DBT), ICAR, Ministry of Micro, Small and Medium Enterprises etc. should make sure effective flow of information, timely consultancy services and speedy delivery mechanisms to the grass-root level agripreneurs. Effective communication, coordination and cooperation among the various nodal centres, umbrella consortium and the industry are inevitable for the successful implementation of the schemes.

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AGRIBUSINESS INCUBATION IN INDIA: WAYS FORWARD

Though agribusiness incubators are important to promote entrepreneurship and commercialization of new technologies in agriculture, the incubators are yet to receive sufficient attention and funding in India. Lack of a positive ecosystem to nurture start-ups affects the functioning of agribusiness incubators, argues K Srinivas.

Agribusiness incubation is a process which focuses on nurturing innovative start-ups that have high growth potential to become competitive agribusinesses by serving, adding value or linking to farm producers (InfoDev, 2013). Agribusiness incubation entails directly working with early stage enterprises and facilitation of their growth through a number of services (shared facilities and equipment, business development, technology, finance, mentoring and networking). The incubation ecosystem for agriculture is in the nascent stages of development when compared to the incubation ecosystem in other sectors such as Information Technology, CleanTech and HealthCare. The start-ups in agriculture need sector-specific incubation support including access to the knowledge, resources and agribusiness networks. Many of the start-ups also need to reach out to a large number of stakeholders in the agriculture value chains. Many start-ups working in the agriculture incubation ecosystem lack agricultural background and hence need technical support including mentoring and technology validation.

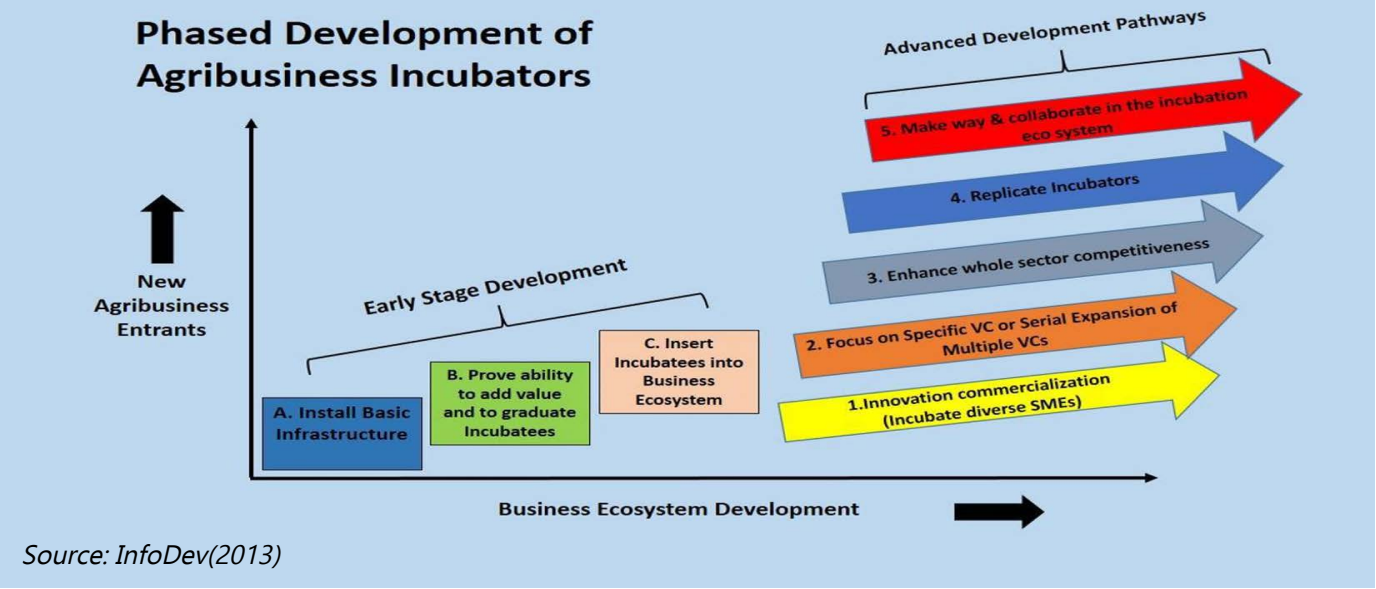
Agribusiness Incubators (ABIs)

Like other business incubators, the agribusiness incubators (ABIs) provide shared facilities and equipment, business development, market access, technology assessment services, financial services; as well as mentoring and networking (Sivakumar and Sivaraman, 2014).

ABIs play a major role in many ways:

- Entrepreneurship development
- Development of ecosystem in the area of agriculture technologies
- Commercialization of technologies (developed by various stakeholders in agriculture including scientists, students, and entrepreneurs) from lab to land
- Early stage support to the technology start-ups emerging in the area of agriculture.

ABIs evolve with changing agenda for enterprise development determined by changes in their business ecosystem and corresponding changes in incubator strategy. The figure below depicts three stages of "early stage development" and five alternative pathways for more advanced development and scale-up of agribusiness incubation (Fig 1).



Source: InfoDev(2013)

Fig. 1: Phased development of Agribusiness incubators

ABIs need the following capacities:

- Large Networks: a large network of agricultural stakeholders across the value chain with a pool of mentors, investors and other knowledge partners.
- Technological support for validation of technologies: A strong technological support drawn from the network of people/institutions for validation of technologies.
- Business support for scaling of start-ups: Access to wide networks of agribusiness support for scaling the start-ups (Box 1).

Box 1: Start-up?

A start-up is a young company that is just beginning to develop. Start-ups 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. In the early stages, start-up companies' expenses tend to exceed their revenues as they work on developing, testing and marketing their idea. As such, they often require financing. Incubators can provide start-ups with both the capital and the advice. A start-up that can prove its potential may be able to attract venture capital financing in exchange for giving up some control and a percentage of company ownership

(http://www.investopedia.com/ask/answers/12/what-is-a-startup.asp)

Challenges in Promoting ABIs

Many stakeholders spread across the value chains of agriculture makes it more challenging for the agriculture start-ups to test their technologies and products. Although many have knowledge of agriculture and agri-business, very few mentors have specific knowledge of agribusiness incubation.. Most of the promoters who are keen to invest in start-ups are yielding high rates of return (ROI) in a short span of time. However, in the case of agriculture start-ups more timeframe is required and the ROI may not be competitive enough.

ABIs in India

Over the past five years, several ABIs have emerged in India. The Agribusiness Incubation (ABI) program of ICRISAT, Hyderabad, is the most successful business incubator in India. Started in 2003, the ABI at ICRISAT has incubated over 200 agribusiness ventures so far, and facilitated funding to 23 ventures worth $18 million, trained more than 2300 entrepreneurs and assisted in the commercialisation of 194 agro-technologies (http://www.aipicrisat.org/agri-business-incubation-abi-program/abi-impact/)

In May 2015, the Indian Institute of Management, Ahmedabad (IIM-A) technology business incubator – Centre for Innovation Incubation and Entrepreneurship (http://www.ciie.co/) CIIE) – launched its first food and agri-business accelerator in partnership with a-IDEA – the business incubator at Indian Council of Agricultural Research's (ICAR) National Academy of Agricultural Research Management (http://www.naarm.ernet.in/). More than a dozen ABIs in the name of Business Planning and Development (BPD) units exist in select ICAR institute and Agricultural Universities in India.

a-IDEA, Technology Business Incubator of NAARM

a-IDEA (Association for Innovation Development of Entrepreneurship in Agriculture) is an initiative by ICAR-National Academy of Agricultural Research Management (ICAR-NAARM, GOI) with the support of Department of Science & Technology (DST,GOI) for fostering innovation and entrepreneurship in agriculture in India. a-IDEA operates under this initiative of Centre for Agriculture Innovation (CAI) and its objectives are as follows:

- Give incubation support services to the agri-entrepreneurs for developing their businesses.
- Scout and catalyse the commercial utilization of viable technologies developed at various research institutions in National Agricultural Research Systems (NARS).
- Build and accelerate the agri-business cluster across the ecosystem.
- Provide access to knowledge and networking support services in innovation and entrepreneurship in agriculture.

a-IDEA hand-holds entrepreneurs who come up with agri-startup ideas, mentor them and provide them research, managerial and technology support. They even guide entrepreneurs on financial aspects and link them to banks and other institutes for funds. Different services offered by a-IDEA are illustrated in Fig 2. The processes adopted by a-IDEA in identifying and supporting start-ups are indicated in Box 2.

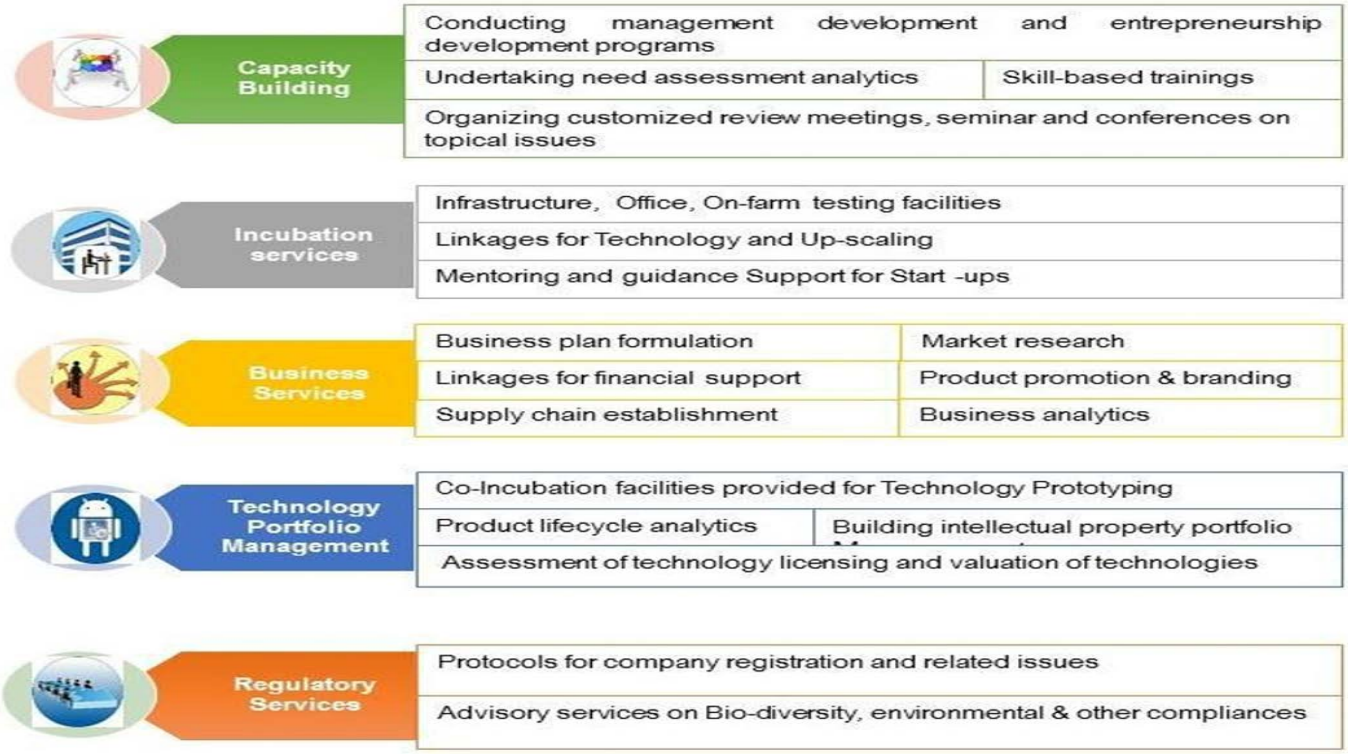


Fig. 2: Services offered by a-IDEA

Box 2: a-IDEA: Identification and support of start-ups

The start-ups approach a-IDEA either through a network, referrals of agricultural institutions/ incubators/start-ups or by accessing information available in print media or online/social media. a-IDEA provides Incubation and Accelerator programs for start-ups in agriculture.

The Accelerator program is a PAN India competition which is held yearly once, and the start-ups applications are reviewed and evaluated by the experts in the screening committee. The committee shortlists a cohort of the start-ups who are trained virtually for a period of four months. During this intense training period, the start-ups are provided access to training, handholding support through access to mentors, technology support, technology validation, business model development, product launch, networking, capacity building, pitching, access to funding resources followed by a Demo day which is an investor meet, where the start-ups happen to present before a group of empanelled investors ranging from High Network Individuals (HNI's), Angel Investors, Venture Capitalists etc. As a part of the accelerator a-IDEA also provides a seed fund to the start-up which emerges as the best of the start-ups in the accelerator program at the end of the program. The accelerator program is primarily held to support start-ups in agriculture that are in the stage of scaling up.

The incubation program is an ongoing program, wherein the early stage start-ups approach for the incubation support from us. As a part of incubation program, the start-ups which are keen to be a part of this program approaches a-IDEA followed by a general meeting/ telephonic discussion/ Skype call, followed by an Incubation template which is shared by the incubator to the start-up. Further the start-up needs to fill the form and submit to the a-IDEA. Once the filled-in application form of the startup is received, the application is sent for evaluation to the experts representing the industry, scientists, academicians etc. Based on the feedback of the experts, start-ups are supported in the incubation program through a MOU for a period of 18 months. As part of the incubation program, a range of services to the start-ups are offered. The services offered by a-IDEA to the incubates ranges from protocols for company formation, training, capacity building, office and shared spaces, research space for conducting trails, technology mentoring, access to institutional databases and resources, technology validation, business model development, product launch, channel management, planning of sales and distribution, marketing plan and any other needs chalked mutually by the startup, incubator team and mentors. Nominal incubation fee is charged per annum towards the infrastructure, support and services provided to the start-ups.

Since May 2015, a-IDEA is supporting closely 12 start-ups in agriculture.

The following is a snapshot of the start-ups a-IDEA is working with (Fig 3).

Fig. 3: Start-ups at a-IDEA

The agricultural start-ups of a-IDEA are working at the grassroots level. For instance, Inner Being Wellness, promoted by an entrepreneur Mr. Jadhav and his team, are promoting quinoa and other millets. As the demand for readily acceptable products at the customers end is growing, they are able to transfer the benefits to the farmers at the grassroots level. The disposable income of farmers is increasing through the sale of high value quinoa. At customers end, making quinoa available to them at an affordable cost due to establishment of good supply chain is beneficial as consumption of quinoa is considered to be a good substitute for Rice, especially for patients suffering from diabetes. InnerBeing Wellness is currently working on establishment of quinoa supply chain in the districts of Telangana state, which at a macro level could provide impetus to the dry land farming situations having scarce irrigation resources and fragmented land holdings.

Another incubate, Agrowbook provides an ICT platform with features such as Agri-on-mobile and AgrowTube for dissemination of agricultural related information to the farmers (Lode 2016). They are also offering marketplace for connecting farmers, dealers, distributors, agri-input companies, so that agri-input supply chain is streamlined with access to the availability and prices of the agri-inputs i.e., seeds, fertilizers, pesticides through this ICT platform using their smartphones. Agrowbook is working on the marketplace in Tallasingaram Taluka of Nalgonda district of Telangana state. Through this initiative, the farmers are likely to get effective information on availability and prices of agri-inputs.

Constraints impacting Agribusiness incubation in India

Very few ABIs in the country are present to support agriculture start-ups. ABIs in general have a limited funding support from the supporting organizations and largely work as not for profit organizations, limiting their own sustainability and scalability. Most of the ABI's in the country are relying on the debt format to support start-ups and equity based funding support to start-ups is largely not available in the ABI's in the country.

Overcoming the Challenges

There is a need to establish more ABIs to promote agricultural start-ups in the country. But at the same time, the existing ABIs need to be strengthened. Some of the following measure can go a long way in strengthening the existing ABIs:

- The funding support to agriculture focused ABI's be increased so that the limited number of ABI's in the country are capacitated better to support more Agri start-ups.
- Host institutions of the ABI's should complement a positive ecosystem to encourage the ABI's to support the start-ups financially through debt, equity as well as royalty formats.
- Agricultural colleges should sensitize their students on agricultural start-ups and agriculture incubation services by developing suitable courses and modules in this area. This could also encourage students to initiate agricultural start-ups.
- Organisations such as NAARM, ICRISAT, IIM-A etc having experience with ABIs should organize more capacity development programmes on Agribusiness incubation to enhance capacities of research agencies who are venturing to establish ABIs in the country.

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