

**Proceedings and Key Learning**

# **AGRI-STARTUP AND ENTREPRENEURSHIP CONCLAVE**

**Unleashing Potentials in Agriculture  
for Young Agripreneurs (UPAYA)**



**INDIAN COUNCIL OF AGRICULTURAL RESEARCH**  
New Delhi



**Proceedings of  
The Agri-Startup and Entrepreneurship Conclave:  
Unleashing Potentials in Agriculture for  
Young Agripreneurs (UPAYA)**

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**Organized by:**

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Indian Council of Agricultural Research**

## **AGRI-STARTUP AND ENTREPRENEURSHIP CONCLAVE**

Unleashing Potentials in Agriculture for Young Agripreneurs (UPAYA)

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# PROLOGUE

Indian agriculture in comparison to other sectors is more supply driven than market demand. In the last two decades, powered by the governmental policies and strong engagement of the industry and institutions, agriculture has rapidly transformed into agribusiness in terms of approach and structure. The Indian startup ecosystem has also shown tremendous growth in the past few years, with India emerging as one of the top three countries globally, in terms of the number of startups established.



However, sector-wise breakup of the startup ecosystem of the country indicates that the agricultural sector has been overlooked by various stakeholders, particularly by investors. The major reasons are lack of scope for scaling up coupled with higher perceived risk, climate risk, high degree of fragmentation of farming land, and lack of data and transparency in the supply chain etc.

A major paradigm shift has been observed in Indian agriculture, which is witnessing a change in mind-set of young entrepreneurs. The novel approach of developing new agri-entrepreneurs, is a prerequisite to accelerate the process of access to new technologies by farmers for realizing the goal set by Hon'ble Prime Minister of India of doubling farmers' income by 2022.

The Indian Council of Agricultural Research (ICAR) has taken the stewardship of promulgation of IP and technology commercialization process, by institutionalization of the policy through development of operational guidelines and establishment of a governance mechanism in a three tier mode across all the institutes of ICAR. Further, support is being provided for technology incubation activities and nurturing the techno-entrepreneurs in network of 25 Agri-business Incubation (ABI) Centers established in ICAR institutes, keeping in view the spectrum of technologies, available infrastructure and the core competency of the institutes. These incubators provide an effective platform for fostering the growth of sustainable business endeavor and provide a wide range of services such as research support; business planning; office space; access to information and communication technologies; and advice on management, marketing, technical, legal, and financial issues.

On the occasion of World Food Day, ICAR organized a two-day Agri-Startup and Entrepreneurship Conclave for *Unleashing Potential in Agriculture for Young Agripreneurs* (UPAYA) during 16-17 October, 2018 at National Agricultural Science Complex, Pusa, New Delhi. About 700 participants attended the Conclave which included agri-startups / entrepreneurs / licensees from different corners of the country nurtured by ICAR-ABIs. It brought together agri-professionals, business experts, researchers and Farm Producers Organizations (FPOs) in face-to-face interactions with country's highest policy makers, finest mentors, angel investors, and venture capitalists in different technical domains. An exhibition

was also set up to showcase various products and services of agri-startups /entrepreneurs / licensees ranging from farm machinery, fish gadgets, plant protection methods, post-harvest technologies, food processing, seed planting material and creating wealth from wastes.

The Conclave provided a unique platform to the entrepreneurs, industry and startups in food and agriculture sector for sharing their success stories and exploring business and marketing linkages, technology and financial tie-ups and partnership opportunities. The Conclave created awareness and helped creating an entrepreneurial environment particularly in the agriculture sector with the participation of government agencies, corporates, educational institutions, researchers, venture capitalists, entrepreneurs and various stakeholders interested in joining hands for building a strong sustainable ecosystem.

The conclave also witnessed thought provoking presentations and deliberations in plenary and technical sessions and panel discussions in various themes such as Seed, Planting materials and crop husbandry technologies; Food processing and post-harvest management; Animal diagnostics and vaccines; Farm machinery and equipment; Precision farming (block chain technologies, artificial intelligence, internet of things); Poultry breeds; Fish strains and fishing gadgets; Innovations in input and output markets (Supply chain technologies, storage, transportation etc.); Organic farming (bio-fertilizers, bio-pesticides, zero budget based farming, natural farming etc.); and Investment and finance models in startup ecosystems.

I appreciate the support, untiring efforts of the team of IP&TM Unit, DKMA ICAR Hqrs and NAARM, Hyderabad. I am hopeful that the Conclave will go a long way in developing the ecosystem of agri-business incubation, agri-startups and entrepreneurs in NARS as a whole and ICAR in particular. This is a beginning and it will create lasting impacts on agricultural growth and development by developing a network of agri- entrepreneurs throughout the nation and help achieveing the target of doubling the farmers' income in the country.

The deliberations held during the Conclave have been documented and presented in the ***Proceedings of the Agri-Startup and Entrepreneurship Conclave: Unleashing Potentials in Agriculture for Young Agripreneurs (UPAYA)***. It would be useful to all the stakeholders, especially for shaping the policy, guidelines, procedure related to agri-business incubation, entrepreneurs, start-ups in agriculture. The stakeholders also from R&D and academic institutions related to agri-business incubation activities would use it as reference document to further the cause of agribusiness which is the demand of future.



**(Dr Trilochan Mohapatra )**

Secretary (DARE) and Director General, ICAR  
Chairman Organising Committee

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# Inaugural Session



Celebrating the World Food Day, Agri-Startup and Entrepreneurship Conclave for Unleashing Potentials in Agriculture for Young Agripreneurs (UPAYA) was organized during 16-17 October, 2018 at NASC Complex, Pusa, New Delhi. It was inaugurated by Shri Radha Mohan Singh, Hon'ble Union Minister of Agriculture and Farmers' Welfare, along with Shri Parshottam Khodabhai Rupala, Hon'ble Union Minister of State for Agriculture and Farmers Welfare on October 16, 2018.



In his inaugural address, the Hon'ble Union Minister of Agriculture and Farmers' Welfare, Shri Radha Mohan Singh emphasized that the purpose of celebrating the Food Day this year is to reaffirm the global commitment to eliminate hunger by the year 2030. He further elaborated that the present government is working in a phased manner in this direction. He appreciated the contribution made by the ICAR and



hard work of the farmers in enhancing agricultural production and ensuring food security in India. Hon'ble Union Minister reiterated the government's resolve to transform India's agricultural sector contributing to the achievements of the global environmental objectives and informed about the launch of a new project 'Green Agriculture: Transforming Indian agriculture for global environmental benefits and the conservation of critical

biodiversity and forest landscapes in association with FAO, India office.

He also commended the achievement in the food grain production of 284.83 million tonnes in 2017-18, which according to the fourth advance estimate is 20 million tonnes higher compared to 2013-14. The Minister pointed out that India occupies the top spot in horticulture production and highlighted the record production of 307 million tonnes for this year, contributing significantly to the nutritional security. He also stated that in the year 2015-16, the production of pulses was 16.25 million tonnes, which increased to 25.23 million tonnes in the year 2017-18, which is about 9 million tonnes higher compared to the production achieved in the year 2013-14. The role of high quality crop variety, seeds and technology has been a significant contributor to achieve this feat. He added that 795 crop varieties were released for production during 2014-18 compared to 448 crop varieties during 2010-14. The demand and production of breeder seeds during 2013-14 was 8,479 tonnes and 8,927 tonnes respectively which rose to 10,405 tonnes and 12,265 tonnes in 2016-17.

Addressing the agricultural entrepreneurs present at the conclave, Hon'ble Union Minister stated that the government has initiated the startup program to create an atmosphere and support for the agriculture startups to set up the enterprises. In this context, the Skill India Scheme was launched by the government on a large scale. He iterated that there is tremendous



potential for startups in the field of seeds and plant production, food processing and post-harvest management, veterinary, farm machinery, poultry, fish production, biological products, and so on.

According to statistics, there is requirement of 22 lakhs skilled youth in the agricultural sector and to meet this demand, training and skill development is being conducted in various employable areas with the help of the agriculture department, ICAR

and the Krishi Vigyan Kendras (KVKs). Though a record production of food grain has been established in the country, the government is working on development of sustainable value chain process.



‘Through the mega food parks the government plans to link agro-processing clusters with key production centers. This will offer immense value proposition in crops such as potato, pineapple, oranges and apples. The farmer groups are being encouraged to set up units in these parks, thereby reducing wastage and transportation costs, and creating new jobs’, the Minister said.

Encouraging digitalization in the domain of agriculture, the minister stated, “There is a plan to link our villages through broadband connectivity, within a clear time-frame. Digitalizing land records and providing various services to the people on mobile platforms has also been achieved. These steps are building momentum towards real-time transfer of information, knowledge and skills to farmers. The e-NAM, our national agriculture e-market, is connecting our agricultural markets nationwide, thereby giving our farmers the benefit of competitive pricing, and freedom of choice”.



On this occasion, Shri Parshottam Rupala, Hon'ble Union Minister of State for Agriculture and Farmers' Welfare said that the country is emerging as a food exporter by self-reliance in food grains. He congratulated ICAR for organizing the conclave and mentioned that many more startup entrepreneurs are the need of the day. He reiterated that as agriculture policy in country, Hon'ble Prime Minister has set the target of achieving the goal of doubling

of farmers' income which would require not only increase in productivity but also enabling the farmer to capture maximum value on the farm produce. In this endeavor of improving post-production value-addition startups and entrepreneurs can play crucial role. Mentioning the participation of various startups in the exposition organized, appreciated their efforts in filling the gaps in the value chain through product diversification, value addition, packaging



and marketing. He highlighted the traditional values and the changing food pattern globally and extolled the efforts made by entrepreneurs and startups; and appealed that they provide effective linkage between farmers and market for agriproducts. He further emphasized that linking the entrepreneurs and startups in agriculture with other Government of India Schemes such as the mid-day meal Scheme would help in sustaining them.



Dr. Trilochan Mohapatra, Secretary (DARE) & DG (ICAR) highlighted the initiatives taken by ICAR in propagating innovative farmer friendly technologies. He took pride in the role of ICAR for taking up proactive steps through three tier mode of governance for the protection of IP and technology commercialization process and spearheading technology incubation activities for nurturing the techno-entrepreneurs through its network of 25 ABI centres.

Dr. Mohapatra emphasized that the two days' conclave has specifically been designed to provide a unique platform for bringing entrepreneurs together not only with the technology developers from R&D institutions but also some of the investors, and other support services. He apprised that the technical sessions have been planned in such a way that the views of all stakeholders such as the policy makers, corporates, startups, entrepreneurs, venture capitalists, legal and marketing professionals and academic institutions are expressed. A notable line of expert speakers including successful entrepreneurs, industry leaders, leading investors (VCs, PE, Angels & Banks), senior corporate professionals and academia would address the diverse attendees on topics critical to inspiration and innovation. He hoped that the initiatives taken by ICAR in tandem with national policies such as National Intellectual Property Rights (IPR) Policy and Startup India would create a culture of innovation in R&D organizations encouraging more Industry-Academia Partnership and creating new generation of the entrepreneurs. These initiatives would help in improving farmers' lives in India to achieve the target of doubling the average farmer's income by 2022 as envisaged by Hon'ble Prime Minister of India.



In beginning of the programme, Shri Chhabilendra Roul, Special Secretary (DARE) & Secretary (ICAR) welcomed the dignitaries on the dais and the participants. He appreciated the keen interest of the ministers about the happenings of ICAR research in traditional food items and their support in pushing nation forward in entrepreneurship and skill development. While emphasizing on the role of innovation led technological progress in

the growth of the economy, Mr. Roul also made a special mention of Nobel Laureate (Economic Sciences) Paul Romer, for his contribution in the economic theory “Integrating technological innovations into long- run macroeconomic analysis”. He expressed hope that the innovations and technologies developed by ICAR may reach the farmers benefitting from the agri value chain. He further encouraged the researchers, entrepreneurs, investors, farmers, policy makers and all stakeholders to contribute and gain maximum benefit from the two days conclave in bringing out various policy points from the sessions, deliberations, panel discussions and exhibition.

Shri Bimbadhar Pradhan, Additional Secretary & Financial Advisor, DARE/ICAR concluded the session with a vote of thanks to all the dignitaries and the participants for making the event a successful one.

A book “Agri-startups: Reflection of ICAR technologies in market (AgRIM)” showcasing 100 successful startups of ICAR was released on the occasion. Further, a natural coloured cotton ‘utpad’ (jacket, 100% eco-friendly without any chemical usage) developed by ICAR-CIRCOT, Mumbai and a ‘Pustika’ briefing its technology were also released.



*Highlights success stories of 100 selected ICAR nurtured entrepreneurs. It provides a glimpse of the startup panorama of India with the objective of inspiring the new & budding agri-entrepreneurs to endeavor into agri-business ecosystem to foster the economy of the country and spread the movement of Agri-Start Ups.*

# Plenary Session 1



## Agri-startup ecosystem and role of incubators in Indian context

*Objective: To understand development of startup ecosystem in agriculture business and understand how Incubators have been helping startups and entrepreneurs.*



The session was graced by Shri Dharmendra Pradhan, Hon'ble Minister of Petroleum and Natural Gas; Minister of Skill Development and Entrepreneurship, Government of India as the Chief Guest; and presided over by Shri Parshottam Rupala Hon'ble Union Minister of State for Agriculture & Farmers' Welfare and Panchayati Raj. Dr. Trilochan Mohapatra, Secretary DARE & DG ICAR, in his opening

remark welcomed and introduced the Chief Guest and the speaker of the session.

Hon'ble Shri Dharamender Pradhan, applauded the ICAR for giving a new dimension to the World Food Day by organizing the Conclave on agri-entrepreneurship and appreciated

the efforts of ICAR by bringing together all stakeholders that would create the much required awareness and provide an apposite platform for building a robust entrepreneurial ecosystem, particularly in agriculture sector. He hoped that this wave will extend throughout the country so that technology plays a greater role in agriculture. He desired that innovative products coming out of research should reach the market and should achieve the scale that benefits the society, for which a strong linkage between agriculture and entrepreneurship is important. Mentioning the participation of more than 100 Startups in the exposition organized on the occasion, he appreciated the efforts of ICAR for providing an opportunity to the entrepreneurs with innovative food products and solutions in the agriculture sector, to showcase their innovations and deliberate on this important area. Agriculture in India is undergoing fundamental shift, and we have moved from a paradigm of food deficit to food surplus. He agreed to the observations made by Dr. K Vijay Raghavan on these aspects and ensured that the ministry would extend wholehearted support if any stakeholder would come with practical proposals in the areas of energy sector.

Addressing the plenary session, the keynote speaker Prof. K. Vijay Raghavan, elaborated on three main issues, the startup ecosystem in the country during the last four years; role of biotechnology and agriculture in transforming the world at large and the opportunities thereof and; how agri-startups can capture those opportunities in scaling up to become a commercial success.

Appreciating efforts of the current Government, the speaker said that there has been major thrust on entrepreneurship, innovation, incubators and startups since the last four years.

This is evident in DBT, DST, Atal Innovation Mission, ICMR, ICAR and other state governments taking up schemes to kick-start the startup movement all over the country. There is a visible situation wherein the science and technology developed in the colleges and universities are being pushed in the startup ecosystem. For example, 10 years ago, IIT and IIM graduates used to take up jobs or go abroad after their graduations, but now many of the students are taking up entrepreneurial ventures and many successful startups are on rise. However, most of the startups have focused on e-commerce and few have ventured into addressing core issues and problems which needed an urgent solution due to various challenges faced especially in the social sectors. The challenges include resource constraints and slow returns on investments from venture



**Prof. K. Vijay Raghavan** is a renowned Biologist and a member of the Management Board of the ICTS-TIFR, also the Principal Scientific Advisor (PSA) to the Government of India. He was honored with “Padma Shri” in 2013 by the President of India for his significant contributions to the field of Developmental Biology.

capitals. He thus, stressed the need for effective government interventions such as tax breaks for startups, procurement policy etc., so that the budding entrepreneurs get proper incentives to venture into such sectors. He cited a successful example of second generation ethanol developed in the local context using agri-wastes and how the venture caught the attention of various investors. The Institute for Chemical Technology, Mumbai worked with DBT using agri-wastes to make ethanol. This initiative led to setting up of a pilot project in Khashirpur and now oil manufacturing companies have taken it up making it a huge commercial success.

The speaker highlighted various opportunities for startups in science and technology with a focus in agriculture sector. Appreciating the role of ICAR in revolutionizing agriculture production and technology since independence, he encouraged the need for diverging from traditional agricultural model which is mostly vertical model to more interactive models within the ICAR and startup ecosystems. Agriculture being the oldest of human industry, there has been a tremendous transformation in terms of biomass and green house gas contribution. He encouraged the young entrepreneurs by stating the fact that all science and technology taken place in laboratories provide tremendous opportunities for the startups to take up knowledge-driven industries, serving the farming communities at large. He cited an example from Odisha where use of pheromones traps has been successful in dealing with pests in various regions. Wherein both classical learning and novel technology was used in venturing into successful business.

Another area where there are great opportunities for startups are in the application of ICT apps, IoT, farm automation based on AI and machine learning and use of weather forecasting apps to drones application for furthering efficiency in agri-value chain. In India, Ministry of Science and Technology in collaboration with ICAR and MoA are coordinating the collection of data from soils, seeds, markets, geo-spatial data, meteorological data etc., and integrating these data, analysed and feed back through APIs and big data analysis so that farmers can take decision in a composite manner. These technologies need to be integrated into the tools and implements of the small and marginal farmers, so that the all the tools and implements they use become cyber-physical. Therefore, there is enormous business opportunities for those who use APIs and big data analysis in decision making. He encouraged the young startups to go for knowledge driven strategies using the laboratory developed technologies to help farmers in their field.

Prof. Raghavan reiterated that the decisions which are made objectively with the help of these data provided by advanced technologies such as AIs, APIs, IoTs would reduce cost for the farmers and make the farming profitable. He concluded by congratulating ICAR under the leadership of Dr. T. Mohapatra for bringing together high quality science and technology research applications so that agri-startups can serve the country in the manner in which other startups are serving the nation.



Shri Bimbadhar Pradhan, Additional Secretary & Financial Advisor, DARE/ICAR acknowledged the time and interest spared by dignitaries and all the participants in his vote of thanks to conclude the session.

### KEY LEARNING POINTS

- ◆ There should be a platform where different advisories and other initiatives for startups working in agriculture sector could converge in harnessing each other to achieve SDGs.
- ◆ Ministry should provide incentives to encourage startups working in the area of energy generation from agri-wastes. There should be proper mechanism to nurture such startups.
- ◆ Effective government intervention required to scale up startups in core sectors.
- ◆ Enabling provisions for solving different problems encountered by entrepreneurs via proper Incubation policy for utilizing the network of incubators is the need of the hour.
- ◆ There is a need for transformation from traditional agricultural model to more interactive models where big data and decision making apps such as ICT apps, farm automation based on AI and machine learning and use of weather forecasting are integrated into the tools and implements used by farmers. We should find ways and means to apply these technologies especially in small farmer's field.

Rapporteurs: Dr. K Srinivas and Dr. Shiv Datt

## Technical Session I



### Scaling up issues in seed, planting materials and crop husbandry technologies startups including plant protection

*Objective: To understand how the latest technologies can be transferred at an accelerated pace by converting them into a business proposition for entrepreneurs*

The coordinator of the session, Dr. A K Singh, DDG (Hort. Science and Crop Science) ICAR, gave a brief introduction about the Chair, Dr. Panjab Singh, Former Secretary DARE & DG ICAR, and the lead speaker, Dr. S.K. Rao, VC, RVSKVV, Gwalior. He welcomed all the participants of the session, highlighting the relevance, objective and outcome of the topic.

He also identified the core issues in the area of seed, planting

**Prof. Panjab Singh** is currently the President of NAAS, Chancellor, Rani Lakshmi Bai CAU, Jhansi; President, Foundation for Advancement of Agriculture and Rural Development, Varanasi, since 2008. He is endowed with large number of notable awards such as Krishak Bharati Barani Kheti Award, World Food Day Award, ISCA The Millennium Plaque of Honours; Observer Awards. He has been awarded D.Sc. (h.c.) from Banaras Hindu University, Varanasi, Tamil Nadu Agricultural University, Coimbatore, and was Chairman/Member of several Professional - International, National and State Level Committees



materials and crop husbandry technologies based startups. The discussants Dr. S. Mauria, Former ADG(IP&TM), ICAR; Dr. D.K. Yadav, ADG (Seed) ICAR; Dr. T. Jankiram, ADG (HS) ICAR; Shri L.K. Pandey, Annanya Seeds; and Shri Sriram Gopal, Future Farms were present in the session.

Dr. Panjab Singh in his introductory remarks emphasized the need to create an enabling environment for startups and entrepreneurs in agriculture to link the production with market and ultimately consumers to enable a win-win situation for all the stake-holders. He urged to save the over-produced stock and to work on utilizing the surplus in Indian agricultural scenario through value addition, market linkages and exports. He reiterated that the meeting will help in framing the policy for agri-business entrepreneurship and provide employment opportunities to rural youth, thus help in achieving the target of doubling the farmers' income.



**Prof. Surapaneni Koteswara Rao** is an accomplished plant breeder by profession and an able research manager as well as administrator. He was awarded Department of Atomic Energy Scholarship for his Ph.D. program. He has developed several crop varieties, Established Agribusiness incubator and developed JNKVV seed and bio-fertilizer consortium. His contributions have been recognized with several awards such as Rafi Ahmed Kidwai Award and large number of other awards.

Dr. S. K. Rao in his lead lecture highlighted the global and national status of seed sector including the challenges and opportunities for startups in seed business. He pointed out that the Indian seed industries are mainly dominated by Govt. Sectors such as NSC, SSCs, State Oil Federations, NARS, State Seed Farms apart from some private seed companies. Few small scale seed producers and some other small organizations are also making their presence visible in this sector. In the recent years, the value of seeds and seedlings sold in India has reached more than Rs. 15,000 Crores. Talking about the global seed market scenario, Prof. Rao stated that in emerging markets and untapped regions such as China, India, Japan, Australia, Africa, wherein innovations in seed science has been on the rise and fast growing market segments have been observed.

He mentioned that the seed replacement rate in the country is only around 25 % and a huge opportunity exists for young entrepreneurs and startups to bridge this gap in providing quality seeds to the farmers. There are several other opportunities at each stage of the seed value chain and exports which can be captured in seed business. However,

seed business has a highly competitive market due to lack of entry barriers and consolidation of multinational companies leading to acquisition and merging. Further, it is faced with the challenges that include largely seasonal activity, perishable commodity, long production lead-time and vulnerability to environmental stresses, lengthy process in development and registration of new products, strict regulatory production, quality assurance systems, lack of in-time accessibility to quality seed, etc. Nevertheless, in addition to seed business, there are opportunities for creating agribusiness and startups based on technologies that produce crops with less water, less fertilizer and other inputs, methods to enhance disease and pest tolerance and to reduce labour and enable mechanization.

Speaker highlighted certain scaling up issues such as raising of required capital, requirement of quality human resources, database on seed production, production strategies, quality assurance systems, processing, packaging and branding, competitive pricing and trade, warehousing, logistics and product placement, penetration into existing markets to increase the market share and profitable business preparation.

During the discussion, various important issues and topics were brought up including those related to the growth and challenges in scaling up of seed, planting materials and crop husbandry enterprises. It was mentioned that, with the improving startup ecosystem, many startups are now emerging to cater various farm related services ranging from providing farm equipment at affordable prices to ensuring crop protection through advanced technologies. These startups are not only helping to make farming more sustainable and profitable, but also are able to make profit for themselves. There is also increased interest from investors who are ready to invest in companies which offer technology driven solutions in farming sector.

It was also expressed by the startups in seed industry that there is lack of incentives for producing quality seeds which discourage them from producing quality seeds commercially. Market segmentation especially in seed market also inhibits in-time accessibility to quality seeds produced by the public sectors for multiplication and commercialization. The issue was also raised about the lack of fund for scaling up of business especially in seed industry and discrimination between private seed enterprise and government seed agencies and corporations.

There has been a surplus production of cereals and fruits in the country, however, it should not stop the efforts in bringing out quality seed and planting materials which are climate resilient, pest and disease resistant. Further, there are emerging opportunities for startups in areas such as production of quality seeds and planting materials in horticulture crops, minor pulses, nutri-cereals; growing trends towards organic foods; growing interest in urban kitchen garden; greater awareness towards greenery in the society.

In order to encourage sustainable agriculture, many biocontrol agents and bio formulations have been developed to improve plant growth, increase crop yield and decrease severity

of diseases and pests. The dissemination of these technologies to the farmers' field will require their transition from laboratory to industrial scale. While the startups can play key role in this, the major constraints faced by them in addition to the technical difficulties are the high cost associated with the production and the regulatory frameworks in product registration.

### KEY LEARNING POINTS

- ◆ Startups should be encouraged to promote commercialization of improved varieties seed developed by ICAR-NARES. A policy for early access of varieties/ hybrids and pre-breeding lines to start-ups may be developed to encourage and facilitate them in competing with the existing seed giants.
- ◆ Incentives can be given to those graduates who are interested to take up entrepreneurship in seed sector, so that their professionalism and updated knowledge are best utilized. A mechanism may be developed which may provide easy linkage with the university/institutes and hand holding for such entrepreneurs. Such motivated individuals can be nurtured through ABI network.
- ◆ To encourage startups in seed production area, special fund can be created for startups in scaling up of business. A mechanism can be devised to rebate the licensee fees or royalty to enable startups for acquiring seeds and planting materials owned and IPR protected by public sector research institutes.
- ◆ For effective transfer of sustainable input technologies, a policy could be framed to incentivize those startups offering innovative solutions for low-cost bio-fertilizers and bio-pesticides benefitting farmers.

Rapporteurs: Dr. Sandeep Lal and Dr. Shailesh Tiwari

## Technical Session II



### Innovations in skill development, farm advisory and communication

*Objective: To understand how startups can assimilate the technologies and knowledge to cater regional diversity and contribute in agriculture sector*

Dr. A. K. Singh, DDG (Agricultural Extension) ICAR, the session coordinator welcomed the delegates and introduced the Chair, Dr. Pramod Kumar Joshi, Director for South Asia, International Food Policy Research Institute (IFPRI), New Delhi and the lead speaker, Mr. Pawan Duggal, famous lawyer in the field of Cyber & E-Commerce law. Dr. V. P. Chahal, ADG (AE), Dr. R. Kalpana Sastry, Former Joint Director, ICAR-NAARM, Mr. Viswajeet Sinha, CEO, Oxen Crop Solutions were the discussants of the session.

The Chairman of the session, Dr. Joshi briefly highlighted the efforts taken by ICAR with

**Dr Pramod K. Joshi** is the Director for South Asia, International Food Policy Research Institute, New Delhi.



Previous to this, he held the positions of the Director of the National Academy of Agricultural Research Management, Hyderabad, India, and the Director of the National Centre for Agricultural Economics and Policy Research, New Delhi.



respect to farm advisory services in the past and the limitation of a common advisory system as Indian Agriculture is highly diverse in terms of not only climatic and crops grown but the technology requirements. In this context, there is a need for micro-level understanding of crops in providing advisory services to the farmers at affordable and accessible manner. He invited all the stakeholders present in the session to come forward with innovative ideas in providing farmers with effective advisory services at their doorstep.

While inviting the lead speaker to the podium, the Chairman implored the essentiality of data management and data protections for the start-ups as their services are based on digital data management. Hence, the knowledge on cyber security and legal issues and IT is required for the start-ups.

The lead speaker mostly concentrated his lecture on cyber security and related issues and how as an individual or innovator should be educated on the subject so as to protect oneself and the data from the such attack. Mr. Duggal opened his lecture by highlighting the



**Shri Pavan Duggal** is an advocate specialized in the field of Cyber law, E-Commerce law. He is also a member of NOMCOM Committee on Multilingual Internet Names Consortium (MINC). Pavan is famous and recognized face as an English newsreader with the Indian state run television network Doordarshan. Pavan Duggal is the Conference Director of the International Conference on Cyber law, Cybercrime and Cybersecurity organized by Cyberlaws.Net.

recent trends in growth of cybercrimes in India. He reported that India has witnessed tremendous growth of cybercrimes in the last decade and that Cybercrimes in India have become far more sophisticated focused and professional. There is a need for cohesive, comprehensive approach in tackling cybercrimes in terms of having a stringent legislation and effective enforcement. This also calls for an enormous need for empowering the relevant stake holders with the relevant awareness, tools and wherewithal for ensuring the successful convictions of such cyber criminals.

The speaker educated the delegates about various cyber offenses which are covered under the national Information Technology Act, 2000. Under this Act, the punishment for tampering computer source documents and hacking covers imprisonment up to three years, or fine which may extend up to two lakh rupees, or both. The Act has been amended by providing far more exhaustive coverage of cybercrimes in the law. However, the amended Information Technology Act has not been very effective as far as treatment of cybercrimes is concerned. There is a need for strengthening the law as large number of cybercrimes are still not

covered, which includes, social media crime networking and other financial crimes.

In the light of these, he cautioned that, despite the laws and regulations provided by the government, the ultimate protection from falling prey to such cybercrime is due diligence from our side as individuals, startups or companies. He concluded by reiterating that the Techno-Legal Risks are imminent in today's business environment. There is a humongous responsibility to have a systematic plan to measure risk of exposure to the same. Due Diligence and Compliance is the only mantra of survival in today's E- world.

During the discussion, it was brought about that extension and advisory services for agriculture being an important factor for improving farm performance have evolved over the years. In addition to public advisory services, there is an emergence of private players including startups providing innovative solutions to various challenges faced by the farmers. These services range from providing access to quality farm inputs, monitoring soil and crop health, pest and disease management, accurate weather related advisories, market access assuring better prices, etc.

There has been emerging use of modern ICTs in accessing and exchange of technical information on agriculture. However, efforts should be taken to make extensive use of modern technologies such as use of mobile phones to provide farm advisory services at farmers' doorsteps.

There is also a huge need for innovation and skill development in farm mechanization in order to combat the problem of increasing labour costs. Mention was made about the promotion of custom hiring centres as an innovative and transparent way of renting farm equipment. The skill development of rural youth is professionally undertaken by Central Institute of Agricultural Engineering, Bhopal, which makes them qualified for bank loan. The scheme is helping in retaining rural youth in villages by giving them opportunities to run business and promoting these centres as technology transfer unit at village levels. Seeing the success now many states are replicating this model. Further, leading farm equipment manufacturers such as Mahindra and Mahindra, TAFE, Escorts and John Deere are also trying out different models of custom hiring.



## KEY LEARNING POINTS

- ◆ The startup ecosystem should be nurtured to facilitate the exchange of information and knowledge between farmers and community groups, research institutes and other intermediary organizations or service providers. Considering the broad spectrum of topics beyond agricultural production technologies, there should be professional management in the ABIs to cater varied needs. Accordingly, there is a need to have professional incubation managers, who have the desired expertise of enterprise management in varied agricultural sectors.
- ◆ ICTs have to be integrated into the delivery of information mechanism to realize its potential to strengthen the linkage between research, extension and farmers. Appropriate capacity building is necessary for formulating potential business ventures for diffusion of innovative solutions and advisory services in agriculture.
- ◆ More cohesion and collaboration is required in the farm advisory/helpline services offered by different central /state and private agencies to ensure their reach to remotely located farmers. National level ranking framework for extension advisory services is required for ensuring quality advisory messages. Self-sustaining model should be developed in such a way that farmers learn to appreciate/acknowledge the value of farm advisory services and contribute towards cost sharing of services rendered.
- ◆ A mechanism may be developed involving ICAR Institutes/SAUs for developing the content and ensuring technically sound quality of the content being broadcast by DD Kisan. Regional centres of DD Kisan may also be formed for broadcasting such programmes in vernacular language.
- ◆ Gathering and storing valuable scientific and advisory service data in the current digital environment comes with a huge responsibility and requires effective data management and protection. This would require creating appropriate awareness on IT Act/Rules/Notifications, Information Technology Security Policy, Legal Authentication of E- records, Retention of E-records as per law.

Rapporteurs: Dr. R R Burman and Dr. Kadirvel

## Technical Session III



## Challenges in Incubation and Commercialization of Animal, Dairy, Poultry, Fisheries Value Chain

***Objective: To enlist the challenges in technology transfer and commercialization of non-vegetarian section***

The coordinator of the session Dr. J.K. Jena, DDG (Fisheries and Animal Sciences) while welcoming the dignitaries and the participants introduced the Chair, Prof. A.K. Srivastava, Chairman, ASRB and speaker, Shri. Vijay Sardana, well recognized and experienced senior corporate director and an expert on global, international, national and rural economy, policy and legal issues. The discussants present were Dr. Ashok Kumar, ADG (AH), ICAR, Dr. P. Pravin, ADG (Marine Fy), ICAR and Shri. Sanjeev Kumar, Founder, The Goat Trust.

The lead speaker presented an analysis of the supply and demand gap in the livestock sector which covers milk, fish, egg and meat. He said that based on the recent estimate, there is a need to accelerate the growth of over and above 2.38 %, 0.39 %, 1.19 % and 0.60 % in milk fish, egg and meat production, respectively in order to meet the increasing demand. He also highlighted the current scenario & and the varying actors in the value chain in different livestock value chain including dairy, broiler, small ruminants and fisheries in



**Dr. A.K. Srivastava** served as Director and Vice Chancellor, ICAR- National Dairy Research Institute, Karnal, Recipient of many awards like ICAR Jawahar Lal Nehru Award; International NOICL Award for his excellent academician. He also served in many organizations in different positions and various capacities including Indian Agricultural University Association, Indian Dairy Association (NZ); Probiotic Association of India; Executive Council Punjab Academy of Sciences; J&K Council of Science and Technology; International Dairy Federation; BIS, Government of India.

the country. He said that much attention has been given to the farmers or producers while focus should be on every actor involved in the supply chain. While products come from the farmers/producers, the money or the remuneration comes from the consumers. Hence, it is important that the consumer satisfaction is met in every supply chain which is lacking in the present system. He reiterated that when every actor/stakeholder in the chain are benefited, then there will be a sustainable business in this sector.

The major challenges highlighted in livestock value chain were labour intensiveness, small scale production, low margins for dairy producers, traditional marketing channels, poor quality and safety standards of products for high end domestic market and lack of credit support for the small scale producers and traders. The product adoption cycle is also rather lengthy which needs to be addressed through effective research and communication. There is a necessity to diverge from the conventional wisdom to big-bang wisdom integrating all factors affecting the production chain. Exploration of knowledge for fundamental research driven by feedback must be strengthened for enabling discoveries to be commercial products. In the mid of various challenges, umpteen opportunities exist for the

startups in various stages of the value chain starting from supply of feeds and other inputs to retailing. There are several avenues for this with the revolution in IT sector such as internet, e-commerce platforms, IoT, AIs and Machine languages.

Some important factors for successful commercialization of Animal, Dairy, Poultry, Fisheries Value chain are: increase the pace of incubation and commercialization by scrapping unnecessary formalities and regulatory policies/process, attention to the factors inhibiting the system and networking or partnerships with the right stakeholders. He challenged the scientific community of the ICAR & startups to recognize the potential of “Power of Partnership” in order to enhance the competitiveness of firms by increasing productivity and innovation so as to create wealth and employment for the nation. The speaker also pleaded the leaders of ICAR to review the mandate, policies and approval



**Shri. Vijay Sardana** acquired a legal professional qualification from WIPO, Geneva and Harvard University, with wide global experience of more than 20 years in various leadership positions in corporate world. He was also conferred first ever 'Distinguished Alumni Award' of his college. His contribution is recognized in the corporate world, among policymakers and NGOs and by many national and international forums and has received various recognition and awards.

systems of all its institutes to make them relevant in fast changing society to make them powerhouse for the country.

The chairman of the session, Prof. Srivastava invited discussants and audience for an inhibition-free discussion to address the specific issues related to the topic given. He emphasized that ICAR has been a leader in development for agri-technologies. Lack of consumer awareness is one of the prominent drawbacks and ICAR needs to work on that as well along with technology development and its management.

During the discussion, issues were raised and brought forth from various stakeholders. In India, the traditional livestock chain consists of input suppliers, producers/farmers, distributors, retailers and consumers. The sector has a potential pathway to alleviate all these actors involved in the value chain system from poverty in a variety of ways that extend far beyond income generation. However, marketing and processing activities are most quibbling in India since most livestock producers are small, resource poor, and often unable to establish their own linkages with markets, processors, and consumers. Further,

marketing of livestock and livestock products are still mostly unorganized, conventional, and disconnected, with a few exceptions. There is a need to speed up the research process in order to meet the fast changing and diverse demand of the consumers in agriculture by using cutting edge technologies such as IoT and Block chain technologies, AI, big data analysis through machine learnings, 3D printing etc.

Special mention was made about the major concerns with respect to goat marketing and goat value chain. Numerous challenges which were highlighted include small average holding, lack of quality breed, lack of market information, perceived lack of transparency in price setting during weekly markets and sense of weak bargaining power in market. However, there were reports of the potential market for the goat skin from Black Bengal goats which has very high quality and attracts a premium price for leather industry. Some industrial houses have therefore, shown interest in promoting Black Bengal breed of goats with an objective of improving quality of their skin. This can help in increase returns from the goat farming.

There was also a mention regarding the major delay and complications in obtaining licence for animal vaccines, which may take more than 5 years in some cases. This delay inhibits industries from launching products for commercialization and thereby reducing the utility and reliability of the technology during the process. This issue should be addressed with urgent attention. The major issues of compliance with the trace-ability, and the infrastructural needs to be addressed with proper policy framework.

The export market value chain for high value fishery products is well organized and linked. However, fishes harvested in many areas cannot be easily linked to industry. Many technologies of value addition meant for small scale entrepreneurs are not supported by the industry for want of scale, quality, uniformity of supply and infrastructural requirement.

### KEY LEARNING POINTS

- ◆ Development of improved breeds in animals, poultry and fisheries should have more focus in R&D and regular updatable database on quality breed-able animal should be developed.
- ◆ Attention should be given for goat value chain with proper pricing mechanism in case of its meat and milk.
- ◆ Regulatory mechanism should be re-framed so that the undue delay in obtaining licence for animal vaccines may be avoided which may inhibit startups in the commercialization and scaling.
- ◆ Restriction in age for the slaughter of animals limits the farmers to dispose non-productive animals causing loss in profit. The farmer may be allowed to decide in this matter based on their evaluation and preference on the productivity of animals.
- ◆ Regular business interface with business counselors at institute level could be organized to encourage entrepreneurial skills and knowledge among the graduating students, farmers and other key stakeholders in the area of value addition of meat and meat products, poultry and fisheries. There is also a need for regular interface meeting with scientist-farmer-industry to identify weakness and solving issues in the value chain. Stakeholders other than scientists should take the lead in such interface meeting.

Rapporteurs: Dr. A K Singh and Dr. B B Nayak

## Technical Session IV



### Validation and scale up issues in Farm Machinery, Equipment and Precision Farming (Block chain tech., AI and IoT)

*Objective: To understand models of validations that would be practical, and more inclusive for startups and lead to enhanced use of farm machinery and latest technology in precision farming*

Dr. N.S. Rathore, DDG (Agricultural Education), Coordinator of the Session opened with a note of introduction about the Chair, Dr. A.K. Sikka, Former DDG (NRM), India Representative IWMI and the lead speaker Dr. L.R. Gupta, Executive Dean, Lovely Professional University, Jalandhar. The discussants of the session, Dr. K.K. Singh ADG (AE), Dr. S.K. Choudhary ADG (S&WM), Mr. Taranjeet Singh, AgNext Technologies, Shri Srivastva T.S.

**Dr A.K. Sikka** is currently IWMI Representative-India, and Principal Researcher, IWMI, former Deputy Director General (NRM). He was also fellow of UNDP, Soil Conservation Society of India; Indian Association of Soil and Water Conservationists. He also served in various capacities in renowned organizations such as CWC, CGIAR, National Rain-fed Area Authority, Planning Commission.





Jeeva Bhumi, Mr. J.S. Minhas M/s JPG Biotech Producer Co. Ltd, and Mr. Nitin Gupta, Sickle Innovation were also introduced.

Dr. Rathore, highlighted the importance of technologies such as Block Chain Technology, Internet of Things (IoT), Artificial Intelligence and Machine Learning (AI & ML) in agriculture sector. He emphasized that these advanced technologies are emerging as an important area where there are enormous opportunities for the startups.

Dr. Sikka emphasized that startups can play a vital role in generating and capturing data, data mining and predictive analysis through latest computational intelligence to optimize farm production, improve resource use efficiency and reduce cost of production. While the application of IoT, AI & ML for predictive analysis is on the rise in agriculture, it is still being explored for providing practical, proactive and cost-effective decisions with high degree of confidence which will increase the opportunities and efficiency across the farms.



**Dr. Lovi Raj Gupta** is the Executive Dean, in Lovely Professional University. He holds a Ph D in Bioinformatics. His research interests are in the areas of Robotics, Mechatronics, Bioinformatics, Internet of Things (IoT) and Gamification. He received coveted the MIT Technology Review Grand Challenge and Infosys Infy Makers Awards. He has 8 patents to his credit.

The Lead Speaker, Dr. Gupta explained about the next generation precision farming based on decision support system developed using Block Chain Technology, IoT & IOE (Internet of Everything), AI & ML through sensors, image processing and feature engineering. He narrated on how the Smart farming through the use of these technologies is helping farmers to reduce waste generation and enhance productivity. This is achieved through the use of tons of data collected by sensors in assessing weather conditions, soil quality, crop's growth progress or livestock's health. This results in better control over the internal processes and, consequently, lower production risks. IoT/IOE are also applied to foresee the output of production and to plan for better product distribution, cost management and waste reduction, visualization of anomalies in the crop growth or livestock health and mitigate the risks of low yield. There has been increased business efficiency through process automation by automated multiple processes across the production cycle, e.g. irrigation, fertilizing, or

pest control. Enhanced product quality and volumes are enabled through better control over the production process and maintaining higher standards through automation.

He further emphasized on the increased significance and application of block chain technology through which auditable data can be stored in different units called blocks. Through this technology, transactions between unfamiliar parties can be performed in a secured environment. This technology has been widely applied in various sectors such as financial, manufacturing, energy etc., and it is also being applied in agriculture sector including agriculture supply chains, land registrations and agricultural insurance systems. Specifically, in supply chain management, it plays an important role in improving the traceability from the farm gate to the consumer. With the growing consciousness of customers towards food safety, a vital role can be played by block chain technology for farming to improve transparency, efficiency, competitiveness and sustainability of agri-food sectors. There is a huge opportunity for the startups to capture these technologies and provide services to stakeholders of varied needs.

From the discussion various important issues were brought forth. Integrating the information from various areas such as soil health management, organic farming and water management would need more cohesive efforts by applying block chain technology so that the leakage of resources are minimized.

The power of data capturing, data mining and big data analysis using latest technologies and software need to replace traditional ways of performing various tedious task such as manual field data collection and laboratory analysis. Hyperspectral imaging, like other spectral imaging has been used to collect and process information from across the electromagnetic spectrum. Its applications in agriculture range from vegetation mapping, crop disease, stress and yield detection to component identification in plants and impurity detection.

There is growing interest in hyperspectral imaging for the safety and quality assessment of agro-food products. The data captured through such sensor image analysis is useful for prediction in the farm sector. Mention was made about AgNext Technologies, as a successful example of a startup which have used these technologies in analyzing the quality of tea leaves from farm to factory, in collaboration with the Tea Board of India. There is high potential of use of AIs for varied applications in the agricultural sector. But, require data points for this purpose and ICAR has the potential to capture such technologies as it has regional centres across the country in numerous subject areas.



## KEY LEARNING POINTS

- ◆ Treasure of scientific and technical archival inter-temporal and spatial data relating to agriculture domains are existing in various public sector institutions. All these available data (especially archival non-digitized data) should be brought into digital domain in a usable/standard formats.
- ◆ A policy need to be framed/restructured for easy sharing/accessibility of such data along with the new startups/entrepreneurs who can provide innovative solutions to various problems in farm sectors using advanced Information Technology tools.
- ◆ Presently, the application of Block Chain Technology, AI and IoT in agriculture are mostly at proof of concept stage or small scale pilots; and require not only technological scalability but also social scalability (the number and type of users). Therefore, there is a need to create an enabling ecosystem through appropriate policies and investments for implementation of these technologies. Incentives mechanism could be strengthened for those entrepreneurs who can scale up such technologies to address various problems in farm sectors in a transparent, efficient, competitive and sustainable manner.
- ◆ As AI, automation, block chain, and digital solutions emerge as the future drivers of agriculture growth, capacity building and skill development is critical to ensure that these technologies permeate to the stakeholders at various levels. A Center of Excellence on digital futuristic technologies may be established that would network with various academia, universities and private sector across the globe and encourage collaborative research programs/innovation and provide experiential learning opportunities to students.

Rapporteurs: Dr. P.C. Bargale and Dr. P.P. Biswas

## Technical Session V



### Emergence of startups in Food Processing and Post-Harvest Management

***Objective: To understand the status in the food processing sector and Post-Harvest management.***

The session's coordinator, Dr. K. Alagusundaram, DDG (Engg.) ICAR opened the session with a welcoming note to the dignitaries and the participants along with a brief introduction of the Chair, Sh. Ashish Bahuguna, Former Secretary, DAC and Chairman FSSAI. He also introduced Mr. Vijay Pratap Aditya, CEO of 'Ekgaon' as the Lead speaker for the session and informed the house about the impactful work of Ekgaon in villages and under-served communities. Dr. S.N. Jha, ADG (PE); Sh. Sai Krishna Popuri, CEO, Health Sutra; and Dr. Chaitra Narayanan, Codagu Agritech were present among the discussants for the session.

Following the welcome and introductory remarks from the session's coordinator, the Chairman Mr. Bahuguna outlined

#### **Shri Ashish Bahuguna**

joined the Indian Administrative Service in 1978 and served in various capacities in West Bengal, Rajasthan and Delhi. He has also served in the Ministry of Agriculture in Government of India in several positions. Superannuated from the post of Secretary in February, 2015 he was appointed as the Chairperson of Food Safety and Standards Authority of India (FSSAI) in July 2015.



the importance of agriculture and food sector for the country's economy. He emphasized on the increasing entry of entrepreneurs in this field. In the light of increasing agriculture and food waste, prices and decreasing autonomy of farmer, he raised a very relevant question on how the ecosystem could be re-structured in order to provide solutions to these problems. He admitted that the issue is not about the absence of innovations in the system but being highly unorganized. The need of the hour is to create startups which can efficiently and effectively cater to the problems around these innovations. The Chairman then invited the lead speaker to deliver his lecture on the idea behind the project Ekgaon, the challenges faced during its establishment, the growth, ideas and suggestions for the emerging startups in food processing sector.

Mr. Aditya in his talk quoted some of the media references presented during the agrarian crisis, problems etc. He reiterated that though ICAR has mostly emphasized on production side needs to work on the market side also. He claimed that agriculture topped the list of Return on Government Investments, however, it has been overlooked. He also said that domestic food economy of the country has grown to \$250 Bn but exports in 2017 has been reduced by 10% in comparison to 2016. Currently the size of the agri and food exports is one-fifth of US exports. The decadal growth of food processing sector is quite significant at 12% however, overlooked because the primary base is in a deprived state.



**Shri Vijay Pratap Singh** Aditya is the Ekgaon's co-founder/ Director and Chief Executive Officer. He was named Ashoka-Lemelson Fellow in 2008. Ashoka Fellow's work is over 60 countries around the globe in every area of human need.

This is mainly due to three reasons i.e., growing population, decreasing farm size and deteriorating farm economics. The farmers are migrating and switching to other income generating activities because of bigger families, owing to the fact that the income from agriculture is insufficient to meet the increasing demands. He narrated the works of Ekgaon along with farmers from last sixteen years in collaboration with Tamil Nadu Agricultural University. Ekgaon is a unique 'For Profit' social enterprise focused on providing utility services for farmers, rural businesses, underserved rural women and the large urban migrant labour population of aspiring consumer. It is the first company to provide mobile phone enabled financial services delivery platform in South Asia. Its market connect platform Ekgaon.com provides high quality 'Direct from Farm Produce' that is healthy, organic certified and naturally grown produce from farms of small farmers to urban customers.

Ekgaon offers crop based voice or mobile advisory to reduce the site-specific cost of production. Due to their intervention, there has been 15-20% increase in crop yield. After 2012, they started working on the full value chain of the produce that ensures the traceability of the products. They are working with 60 FPOs with multiple crop clusters. Mr. Aditya also stated that agriculture value chain being a huge sector, effective B2B models are missing and hence it is being controlled by Arhatiyas (Commission Agents).

Mr. Aditya further, explained on how the farm level processing can play a key role in solving the problems. He hinted that investment efforts by the Indian Government on agricultural R&D is still negligible compared to other fast developing Asian countries like South Korea, China and Japan. These countries are investing a huge share of GDP in agriculture R&D, which is evidenced in their economy growth. He concluded by emphasizing on the importance of new innovations in agriculture and stressed upon taking suitable measures to build a strong ecosystem.

During the discussion and interaction with all stakeholders, it was agreed that there is a rising vibrant presence of startups in the food processing and post-harvest management ecosystem. The spectrum of activities taken up by startups in this sector range across the value chain. They are not only creating new products, but also providing innovative solutions for supply chain including packaging, processing technology, equipment, storage and logistics, food safety, distribution and retail marketing using various platforms of e-commerce. Considering the country's diverse climatic and cultural scenario, there are difficulties and inefficient mechanisms in checking the agri produce supply chain. There is an urgent need to address the problem of too many intermediaries in the agri supply chain and the role of entrepreneurs is vital in order to tackle this issue.

The consumption pattern of food in India is rapidly changing. While there is an upswing in demand for processed food, pre-cooked food kits, functional/fusion foods etc., there is an equally vibrant market developing for traditional /indigenous ingredient based foods, millets based products and traditional Indian cuisines. Another area where startups can play a vital role is in efficient handling of the food processing chain through automation, indigenizing and developing low cost processing equipment and new age packaging technologies which would require technical collaboration with the right technical institutions so as to ensure reliability, quality and scalability. Further, startups in the food processing and post-harvest sector through aggregation models on both demand and supply side in B2B and B2C segments can provide efficient solutions across the value chain, thus helping the farmers in getting better prices for their produce and also efficient discovery of prices.

## KEY LEARNING POINTS

- ◆ There is a crucial need to encourage startups for transforming the agriculture sector of the country by linking farmers and producers to the markets, new product development, value addition in agriculture and horticulture produce, efficient processing for reducing wastages and creating effective supply chain models. In order to increase success quotient of the startups and enterprises, strengthening and opening up of new incubators in agriculture food processing sector to provide backup technical support is of utmost importance for accelerating, nurturing and investing in innovative early stage startups.
- ◆ There are many agencies which support and facilitate idea-stage enterprises using latest technologies and innovations specifically in food processing and post-harvest management sector in India such as, Upaya Social Ventures, Angel Investors, Food and Agri Value Chain Funds: Orkla Foods Fund, SEAF India Agribusiness International Fund, Rabo Equity Advisors, Omnivore Capital, Aspada Investments, Allfresh Proterra Investment Partners, Motilal Oswal Agri Fund, Parag Foods Standard Chartered PE etc. To create awareness about the startup funding sources in the country, a platform could be established that will enlist all the avenues available for the startups in this sector.
- ◆ The academia and startups linkage is necessary for reducing the gap between scientific research and its translation into marketable product and processes. There is also an essential role of established industry in the food sector for a resilient startup ecosystem and widening the impact of new innovative technologies. There is a need to institutionalize a collaborative mechanism which may provide an opportunity for regular interactions between these stakeholders and discuss ground challenges through sharing of experiences.

Rapporteurs: B. Dayakar Rao and Akriti Sharma

## Technical Session VI



### Technology transfer to startups for commercialization and IP issues

*Objective: To understand the overall scenario of technology commercialization and IP issues in Agriculture*

The session was moderated and coordinated by Dr. Ch. Srinivasa Rao, Director, NAARM, Hyderabad who opened the session with a welcome address and brief introduction about the Chair of the session, Dr. K.V. Prabhu, Chairperson, PPV&FRA.

Dr. Prabhu briefly outlined the objective of the session and the expected outcomes from the lectures and the following discussion as he introduced the lead speaker Dr. Pushpender Rai, Former Director, WIPO. He reiterated that this platform would provide the opportunity for all stakeholders to discuss the working of ICAR in its 3 tier system of technology management and the issues that need to be answered in present scenario. The policy

#### **Dr K.V. Prabhu**

is presently  
Chairperson,  
Protection of Plant  
Varieties and Farmers'  
Rights, Authority,  
Government of India,



Ministry of Agriculture and Farmers Welfare, New Delhi. He was Officer-in-Charge of prestigious National Phytotron Facility. He has been the recipient of prestigious awards including ICAR Jawahar Lal Nehru Award; IARI B. P. Pal Award; V.S. Mathur Memorial Award; ISCA Platinum Jubilee Lecture Award; A.S. Cheema Award; Borlaug Award and Rafi Ahmad Kidwai Award.



advocates promotion of a holistic and conducive ecosystem for catalyzing the intellectual property for economic, socio-cultural development and protecting public interest. This said that session will deal in the overall IP management process in general and particularly Indian agricultural scenario.

The session had five discussants, Dr. R.C. Agrawal, Registrar General, PPV&FRA, Sh. Yeshwant Parmar, TIFAC, Dr. Avinash Kumar, DRDO, Sh. Kardam, Senior Controller Patents & design, Patent Office, New Delhi & Dr. Sudhir Kochar, Former NC-NAIP.

The session deliberated on various issues in technology development, protection, transfer and commercialization with specific reference to the Indian system. In the session it was also discussed that how startups in agri sector would be affected by these policies in IP and Tech Management.

Dr. Pushpendra Rai opened his lecture by highlighting the global growth trends in technology commercialization and IP issues for the last 200 years. He reasoned that there is widening inequality since the 19th century as a result of asymmetrical innovation diffusion. Citing the example of Singapore's success in achieving fast economic growth, he opined that innovation is critical for sustainable growth of the economy. However, the spur in growth has been attributed by innovation in other sectors especially industry but not significant from agricultural sector. In the past, it was observed that almost 90% of startups in India had failed due to lack of competence to meet the demand of the consumers. This calls for startups to acquire the right kind of technology and in order to optimize gains from transferred technologies. A startup should possess sufficient absorptive capacity, human capital to apply the technology, organizational and managerial know-how, ability to undertake incremental technological and organizational innovation to adapt to specific needs. He also pinpointed four specific issues with reference to the technology development, transfer modalities, which included Research funding, Disclosure: Incentives for invention or innovation, Development: funding,



**Dr Pushpendra Rai** has about 37 years of professional experience in national and international institutions serving in the cadre of Indian Administrative Service for more than 21 years. He has also worked as the National Project Director - UNDP/WIPO; Member, Governing Council, National Institute of Design; Member Secretary, Foreign Investment Promotion Council; Executive Director, National Renewal Fund; National Negotiator at WTO/WIPO; and Secretary General, Quality Council of India

transfer of technology support, patenting and Commercialization: risk of failures and licensing. In case of patenting, he mentioned that startups face challenges such as, limited in-house IP resources, lack awareness for procedures, difficulty in identifying the rights, large expenses, complex regulations, inadequate resources for protecting patents aggressively. He mentioned about the creation of loan guarantee scheme to encourage start-ups and cover the risk of genuine failures in commercialization based on IPRs as mortgage-able assets as given in section 2.16.3 of National IP Policy.

He concluded with a remark that more focus has been given on patents, and little attention to other IP elements such as trademarks, GI, trade secrets and test data. There is a need to address on these broader elements of Intellectual property also.

The lecture was followed by a deliberation by all stakeholders present in the session on each issue of the topic under discussion. It was observed that innovation based R&D would require substantial risk as the end result is not always certain and commercial success is not often assured right in the beginning. Therefore, the academic institutions, particularly in public sector have adopted an over-cautious, risk-averse and safety-first approach focusing on “sure projects”, or “low hanging fruits”. The private sector however has shown much more risk taking capacities and commercialized innovative technologies. While private-sector investment will continue to play a critical role in agricultural innovation, the public sector will also need to increase its R&D spending, making investments in basic scientific research for developing and commercialization of agriculture and supporting technologies.

Most of the startups have low awareness about the issues related to IP. Thus, they face difficulties in developing certain product or service without the protection of innovation and are prone to misappropriation of their idea by the competitors. Having a comprehensive understanding of intellectual property and an IP strategy that aligns with the business, should essentially be an integral element in the business plan for a startup. Particularly in technology based startups, it is extremely important to legally secure the innovations and the core intellectual assets. Effective management of intellectual property can significantly influence the increase in competitiveness in the market and also avoid the risk of third party intellectual property issues.

Department of Industrial Policy and Promotions (DIPP), Government of India’s Make in India initiative, in January 2016, for facilitating Startups Intellectual Property Protection (SIPP) was mentioned. This Scheme is an effort for simplification of the process of creating new entrepreneurs. The three main objectives of this program include, simplification and handholding; funding support and incentives; and industry-academia partnership and incubation. An important component is to reach out to startups to protect and promote their IPR and encourage creativity and innovation among themselves. The startups can now avail patent filing on a reduced rate i.e. 50% less as compared to the other companies, after getting a certificate of recognition from DIPP. Further, Government invited advocates



and patent agents to sign up for the SIPP scheme in order to introduce the IP law and to provide the cost effective assistance to the startups. Consequently, several members of the IPR practicing community are now part of this scheme and registered themselves as “Facilitator”. When any startup files their patent application with the help of appointed facilitator, no extra fee shall be paid to the facilitator and only the official fee is to be borne by the startup. The government has fixed the professional fee for the facilitator at INR 10000 which include consultancy, searching, drafting and filing services.

### KEY LEARNING POINTS

- ◆ Recognize that the young entrepreneurs and startups appreciate and value the worth of their potential IP assets. Startups need to be provided with professional qualified IP counselling to help identify needs and guide solutions from the early stage.
- ◆ The IP strategy should be integrated in the business plan and related to the specific goals of the company, its size and business profile.
- ◆ The public sector needs to increase its R&D spending, especially in risk taking research projects to encourage innovation for developing and commercialization of technologies which may enhance the performance of agriculture.
- ◆ Technology commercialization strategy should be inclusive where all stakeholders can be on board. Efforts needed to be taken up to address IPR elements such as Trademarks, GI, Trade Secrets, and Plant Varieties in agriculture sector.
- ◆ More awareness and utilization of provision of loan guarantee scheme/equity participation to cover the risk of genuine failures in commercialization - based on IPRs as mortgage able assets given in section 2.16.3 of National IP Policy.

Rapporteurs: Dr. Sudha Mysore and Dr. Vikram Singh

## Plenary Session 2



## Business Strategy Investments and Markets for Startups

*Objective: To understand how an aspiring entrepreneur needs to develop a business strategy that is attractive for potential funders, is accountable and can achieve the set objectives*

On this occasion, the Chief Guest of the Plenary Session, Hon'ble Union Minister of State for Agriculture and Farmers Welfare, Shri Gajendra Singh Shekhawat congratulated ICAR for organizing the Conclave, which is highly relevant for the country. He gave very succinct view of agricultural growth in India and stated that we have come a long way from food deficit country to export surplus country. However, there is a need of paradigm shift to make agriculture more attractive. Start up and entrepreneurship have great potential in attracting youth in agriculture sector. It is heartening to see that many IIT graduates are becoming agripreneurs. Understanding



the need, ICAR and Agricultural Universities have introduced courses in graduation on entrepreneurship. However, India needs thousands of startups specifically in the field of post-harvest and efficient marketing of agricultural produce. Since public research institutions have certain limitations in this space, startups and agripreneurs' role become more imminent in addressing these issues. He hoped that the public investment driven by the scientific invention and innovation will take the nation to great heights to become the powerhouse of agriculture especially in nutritional index. He also indicated that there is a need to establish new institution for skill development and entrepreneurship in agriculture sector.

The session started with welcome address and introductory remarks by Dr. Trilochan Mohapatra, Secretary, DARE & DG, ICAR, who introduced the Chief Guest, Shri. Gajender Singh Shekhawat, Hon'ble Union Minister of State for Agriculture and Farmers Welfare, GoI. Shri B. Pradhan, AS&FA, DARE/ ICAR introduced the key note speaker, Mr. Mark

Kahn, Co-Founder of Omnivore Partners and welcomed him to the podium for his lecture.



**Mark Kahn** is a Founding Partner of Omnivore, an impact venture fund that invests in Indian startups developing breakthrough technologies for food, agriculture, and the rural economy. He is also Co-Chair of the HBS Impact Investing Alumni Group, a member of CII National Council on Agriculture, and a member of the Ag Innovation Showcase Advisory Committee.

The main objective of the session was to sensitize the audience about the business strategy and investment opportunities for startups. Proper business strategy, timely and adequate investment are very important for the startups for its growth. The speaker, Mr. Mark Kahn opened his address by expressing admiration for the quality of research, the professionalism of researcher and open mindedness of ICAR institutions across the country during his interaction in the last 12 years stay in India. He applauded ICAR and Agricultural Universities for generating several wonderful technologies in agriculture, which have the potential of scalability. While introducing about Omnivore, he said they have launched a venture capital fund because they recognized that venture capital in India was directing all focus to startups that address the needs of the top quartile population of urban consumers only. There were young entrepreneurs who wanted to launch business to focus on agriculture and allied sector which constituted 20% of the Indian economy and 50% of the population, however there was no venture capital available for them. With this backdrop, they launched the 'Omnivore' which has helped 12 companies such as Skymet, Stellaps, Y-cooks to mention a few. He credited their success to the initial investors



such Godrej, NABARD, SIDBI, LIC and many others who helped to raise the initial fund of 260 crores rupees. He said that over these years, Omnivore has been able to prove that Indian startups related to agriculture and food can scale to greater heights and are worthy of private investment as cited by the success stories of startups supported by Omnivore.

While addressing about some broad perspectives of venture capitals on startups, Mr. Kahn said that startups is a highly misunderstood and overused term and there is general misunderstanding with MSMEs. Differentiating between MSMEs and startups, the speaker stated that while MSMEs are huge and critical component of the economy focusing on employment and profitability, startups are engaged on either a new technology or new business model which is capable of exponential growth. The purpose of the startup process is to test, trial, iterate and adjust if it is necessary and hence success is not an easy task. Further, startups are initially externally funded, not focused on profitability until they get to scale. Therefore, if someone is looking investment from venture capitals, they must stand firm as startups, where fast scalability is imminent.

The keynote speaker added that the startups must be clear in their strategy about what they should not do even more than what they should do. Entrepreneurs most often remain in illusion about their business in terms of doing many things at the same time. Startup should

focus on one thing rather than doing many things in order to be successful. For early stage support, there are many good accelerators in India like aIDEA-NAARM and CIIE-IIMA which are doing great job in providing right support to the startups. He emphasized the need for more professional ABIs in country. Citing an example of AgNext, a startup founded by IIT and IIM alumni, incubated at aIDEA-NAARM, in which some of the IIT faculty are working part-time and are having equity share. Mr. Mark suggested that ICAR and AUs should also allow their scientists and faculty to join hands with startups, so that startups can get full benefits of the knowledge of the public research system.

Finally, the speaker concluded by saying that right mix of dedicated and passionate people are the most important elements for the success of any startup. The team members should have experience, education and attitude. Idea alone doesn't matter unless good team are behind that idea. The team members should be ready to work 24x7, without having any sight of profitability in the initial stage.

A summary of key learning points arisen from various sessions in the two day conclave was presented by Dr. Sanjeev Saxena, ADG (IP&TM), ICAR before the dignitaries and the participants. Dr. Mohapatra also expressed his gratitude towards the organizing committee for their efforts and time made by for making the conclave a great success.

The session ended with a vote of thanks by Dr. Shiv Prasad Kimothi, ADG (TC), ICAR.

### KEY LEARNING POINTS

- ◆ There should be a strategy and policy framework to bring in funds/capital from general venture capitalists, MNCs and other investors to scale up startups focusing in agriculture and food sector.
- ◆ ICAR institutes and SAUs should allow their scientists and faculty to give their expertise service to startups, so that full benefits of the knowledge built up in the public research system can be utilized and harnessed.
- ◆ The technology on which idea is based should be of high level of differentiation. Therefore, startups focusing on the applications of robotics, IoT, AI, Breeding, etc. having high potential for transformative change should be encouraged with incentives.
- ◆ More focus on skill development and entrepreneurship training institute in the field of agriculture sector is required.

Rapporteurs: Dr. Ranjit Kumar and Shri Ravinderjeet Singh



## EPILOGUE

The organization of Agri-Startup and Entrepreneurship Conclave for *Unleashing potential in agriculture for young agripreneurs* (UPAYA) had been an exhilarating experience as each and every details had to be conceptualized and managed to achieve the desired objectives. As the Member Secretary of the organizing committee, I would like to express our cordial thanks to all who helped make this conclave a success.



At the outset I take this opportunity to express my gratitude to the Chief Guests, Shri Radha Mohan Singh, Union Minister of Agriculture and Farmers' Welfare; Shri Dharmendra Pradhan, Minister of Petroleum and Natural Gas & Minister of Skill Development and Entrepreneurship; Shri Parshottam Khodabhai Rupala, Union Minister of State for Agriculture and Farmers Welfare; and Shri Gajendra Singh Shekhawat, Union Minister of State for Agriculture and Farmers Welfare, who spared their valuable time to guide the deliberations of the Conclave.

Academic and technical component of the conclave was the focus of all activities. The technical sessions could be successful with the cooperation of my committed and sincere colleagues in the Subject Matter Divisions under the guidance of the respective Deputy Director Generals who appositely steered the discussions as Session Coordinators. I am equally indebted to the Chairperson, Keynote Speakers, Discussants and rapporteurs of various technical sessions and plenary sessions who made their best effort to participate and share their expertise that stimulated such a dynamic and fruitful Conclave.

Sincere thanks are due to Directors/ Principal Investigators/ In-charges and staff of ABI centers who are an integral part of the ICAR-ABI Network; they contributed substantially to the quality of the Conclave. They kept in touch efficiently with all the participants, particularly the Start-ups, and the professionalism displayed by them enhanced the effectiveness of our interactions with the stakeholders by. It is difficult to put in words the valuable and diverse contributions that each and every one of them provided.

I also express my gratitude to Agri-Startups, entrepreneurs, industry and participants who as individuals and organizations were generous to share their time, experience, and materials for the purposes of this Conclave. I am sure that this relationship would further evolve over time and through collective wisdom we would be able to give the desired impetus to the Agri-business ecosystem in the country.

Certainly, organizing a Conclave of this magnitude is not an easy task, and encompass many activities. This difficult task had been made easy particularly due to untiring support of Dr Ch. Srinivasa Rao, Director, NAARM and Dr Shiv Prasad Kimothi ADG (TC)

and their team of committed colleagues. My colleagues Dr K. Srinivas; Dr Shiv Datt, Dr Vikram Singh, Dr Tejbir Singh, Dr S.K. Yadav, Lungkudailiu Malangmeih, Neetu, Ravi K. Dobriyal, Jitender Kumar, Rajesh Kumar, Girish Bhatt, Ajay Verma to name a few, worked intensively for months to manage the Conclave, and always accomplished the tasks before the timelines set, making the task of organizing committee much easier.

Special thanks go to the Administration and Finance Units of ICAR, led by Shri Chhabilendra Roul, Special Secretary (DARE) & Secretary (ICAR) and Shri Bimbadhar Pradhan, Additional Secretary & Financial Advisor (DARE/ ICAR) respectively, who helped us to stay on the course through apt management of the conclave finances and making perfect logistical arrangements. Their timely advice and assistance to the organizing committee both before and during the Conclave is sincerely acknowledged. This not only helped solve many problems smoothly but also ensured a hospitable atmosphere during the entire Conclave. I also extend my sincere thanks to V R Srinivasan, Director (Finance)/ Acting & DDF (I) for support in all financial matters while organizing the programme.

Last but not the least I would like to express my gratitude to Dr Trilochan Mohapatra, Secretary (DARE) & Director General (ICAR). But for his inspiration, motivation, vision and direction the organization of a Conclave of this magnitude would not have been possible. Right from the day the Conclave was conceptualized, he made continuous efforts on his part to see that everything went on well, and very kindly agreed to be the Chairman of the Organizing Committee. We owe the entire success of the Conclave to him.

**Dr Sanjeev Saxena**

*Member Secretary Organizing Committee*



# ACRONYMS AND ABBREVIATIONS

ABI	Agri-business Incubator
ADG	Assistant Director General
AI	Artificial Intelligence
a-IDEA	Association for Innovation Development of Entrepreneurship in Agriculture
API	Application Programming Interface
B2B	Business to Business
CIIE-IIMA	Centre for Innovation Incubation & Entrepreneurship- IIM Ahmedabad
CIRCOT	Central Institute of Research on Cotton Technology
DARE	Department of Agricultural Research and Education
DDG	Deputy Director General
DG	Director General
DIPP	Department of Industrial Policy and Promotion
DRDO	Defence Research and Development Organisation
FPO	Farm Producers Organizations
FSSAI	Food Safety and Standards Authority of India
ICAR	Indian Council of Agricultural Research
ICAR-NAARM	National Academy of Agricultural Research Management
ICAR-NARES	ICAR-National Agricultural Research and Education System
ICMR	Indian Council of Medical Research
ICT	Information and Communication Technology
ICTS-TIFR	International Centre for Theoretical Sciences -Tata Institute of Fundamental Research
IoE	Internet Of Everything
IoT	Internet Of Things
IP	Intellectual Property

IP&TM	Intellectual Property & Technology Management
LIC	Life Insurance Corporation
MSME	Micro, Small and Medium Enterprises
NABARD	National Bank for Agriculture and Rural Development
NAIP	National Agricultural Innovation Project
NASC	National Agricultural Science Complex
NSC	National Seed Corporation
PPV&FRA	Protection of Plant Varieties & Farmers' Rights Authority
R&D	Research & Development
RVSKVV	Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya
SEAF	Small Enterprise Assistance Fund
SIDBI	Small Industries Development Bank of India
SSC	State Seed Corporation
TIFAC	Technology Information Forecasting and Assessment Council
VC	Vice Chancellor
WIPO	World Intellectual Property Organization





