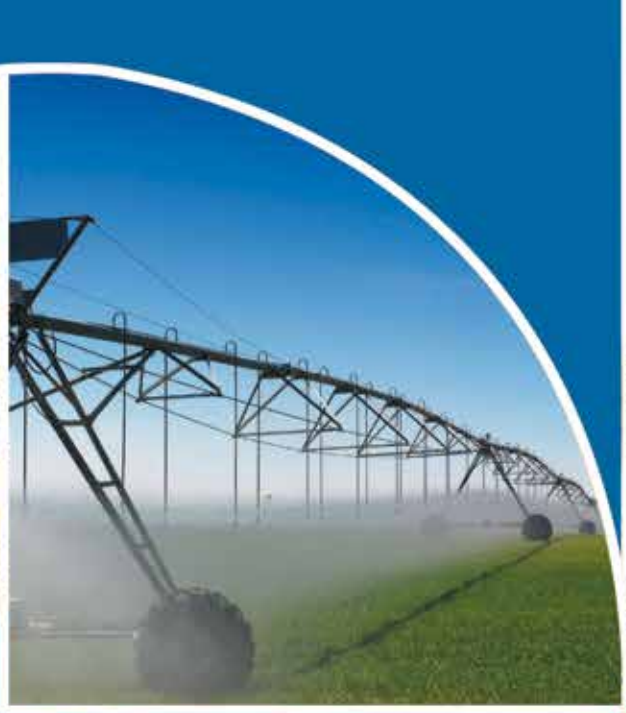

INNOVATIONS IN INDIAN AGRICULTURE:

Select Case Studies

Knowledge Partner

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NSFI National Skills Foundation of India

..enabling sustainable livelihoods

TITLE	Innovations in Indian Agriculture: Select Case Studies
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Foreword

Agriculture, as a significant contributor to employment and livelihood creation, continues to be the mainstay of India's rural economy. The sector remains crucial for the national economy, including its multiplier effect on the development of services and manufacturing sectors.

Despite its critical role, the agriculture sector faces numerous impediments and challenges on farming, resource management, post harvest management, marketing, value addition and infrastructure. In this context, it is imperative to focus on development, introduction, dissemination and adoption of appropriate & effective innovations across the agriculture value chain.

Application across precision farming, farm mechanization, use of ICTs, equipment technology, institutional innovations, cold chain & irrigation are ushering in a new era that will positively impact farmers' incomes, ensure sustainable farming, and improve their ability to compete in the global market. Many such innovations have changed the dynamics of farming for countless farmers including many small and marginal holders.

I am glad to present the YES BANK-NSFI Knowledge Report – **'Innovations in Indian Agriculture: Select Case Studies'**, which highlights key innovations and best practices in Indian Food and Agriculture space.

I am confident that the content of the Knowledge Report will provide important insights to all stakeholders, including policy makers, corporates, farmers, and technology developers to conceptualize and execute innovative models continuously for boosting growth and sustainable development of the Indian agriculture sector.

Thank You.
Sincerely,

Rana Kapoor
Managing Director & CEO YES BANK
Chairman YES INSTITUTE

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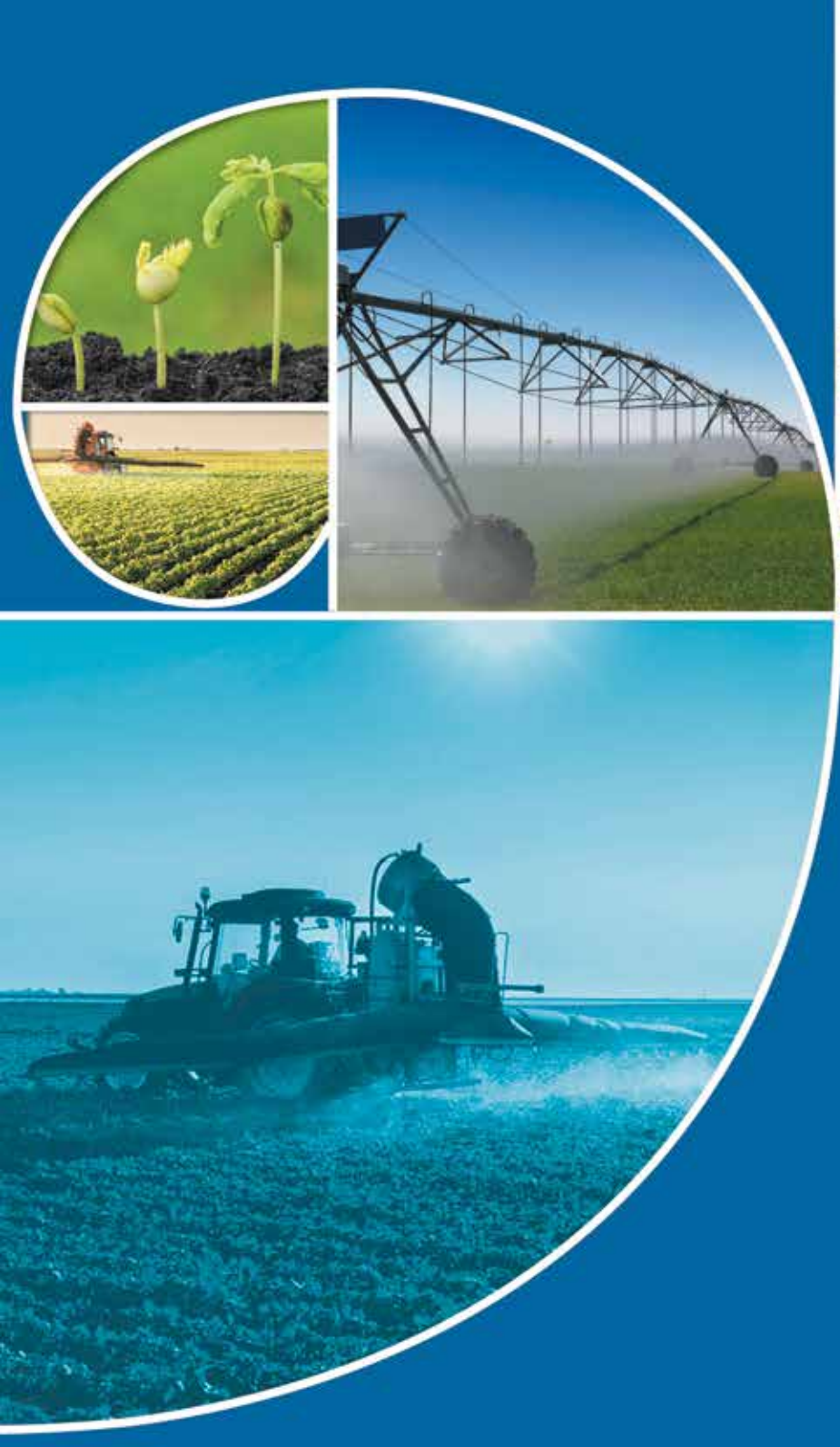

Information and Communications Technology (ICT)

1

Kisan Suvidha	
Name of the application	Kisan Suvidha
Name of the person/agency	Shilpa Mehta Senior Consultant, ICT Ministry of Agriculture and Farmers' Welfare Delhi
About the (person/agency) (Brief profile about the founders' experience/ background and start-ups)	✓ More than 11years of experience in Information & Communication Technology ✓ Extensive experience in implementing e-governance projects ✓ Proven expertise to manage multiple concurrent projects and multiple clients.
Products/services offered	✓ Market price of crops in nearby markets, maximum price in district, state and nation. ✓ Extreme weather alerts to farmers ✓ Crop management advisories ✓ Weather forecast
Issues addressed by the technology	✓ Lack of information at the right time ✓ Too much of textual data ✓ Information availability in cluttered manner ✓ Difficulty in accessing relevant information
How does this innovation address the mentioned challenges? (Value proposition and product/service specifications)	Despite availability of farming resources in nearby areas, there always remains a lack of agricultural information. Kisan Suvidha is an omnibus mobile app for farmers which provide relevant information to them quickly. It has a simple interface and provides information on five critical parameters: ✓ Weather ✓ Input dealers ✓ Market price ✓ Plant protection ✓ Expert advisories
How is this innovation a better alternative over the current scenario?	In earlier scenario, if a farmer wanted to know something related to say, market price of crop and weather forecast in his area, he would have to search it on web separately for market price and weather, which is very messy for a non-techy person like farmer. In Kisan Suvidha, all information is combined at a unified platform that opens up a common interface for farmers. In this way all information can be provided through a single window.

Beneficiaries of this innovation/technology: (Customer segments)	Farmer is the end beneficiary of this mobile app. With this mobile app, a farmer can get relevant information with the click of a button. Agriculture researchers and scientists are another set of beneficiaries who work for the benefit of farmers. They always need data for their research. So, this is like a one stop shop for them to cull out relevant data from one source point.
Impact generation capability of the technology	With over 900 million mobile devices in use at present, 377 million of which are in rural India, the mobile industry is posting a staggering growth of 43.23% annually. Almost 6 million new users are being added every month. Kisan Suvidha is developed to serve rural masses in a decent manner. From remote monitoring of crops to reaching out to potential markets, from last mile delivery of government services to addressing pest management issues ingeniously, Kisan Suvidha is being used in a host of ways to uplift and empower rural India.
Contact details for further information	Shilpa Mehta Senior consultant, ICT Ministry of Agriculture & Farmers' Welfare shilpa.mehta@gov.in

Awaaz De	
Name of the application	Awaaz.De: Voice messaging systems for farmer-driven agriculture extension powered by user-generated content
Name of the person/agency	Awaaz.De; Represented by Elliot Rosenberg, VP - Business Development
About the (person/agency) (Brief profile about the founders' experience/ background and start-ups)	✓ CEO/Co-Promoter: Dr. Neil Patel, Stanford University Ph.D. in Computer Science and ex-Silicon Valley engineer ✓ About Awaaz.De: A Gates Foundation- funded mobile tech company focused on last-mile communication; has made more than 6M calls to approximately 600K users across 23 Indian states and 6 different countries.
Products/services offered	✓ Forums (https://www.awaaz.de/voiceforum/): Front-end call system and back-end web console for moderated Q&A and P2P information sharing ✓ Streams (https://www.awaaz.de/ streams/): Voice broadcasting tool that collects touch-tone and voice responses from users
Products/services offered	✓ The high cost and ineffectiveness of traditional, in-person agriculture extension ✓ The unwillingness of small farmers to heed the advice of outside "experts"
How does this innovation address the mentioned challenges? (Value proposition and product/service specifications)	✓ Eliminates or reduces the cost of in-person extension through call-based system ✓ Uses experience and knowledge of other farmers to increase relevance and familiarity of farming advice
How is this innovation a better alternative over the current scenario?	Awaaz.De's agriculture extension systems can result in far greater reach and accessibility compared to government agriculture extension programs only reaching 6% of farmers in India (National Sample Survey)
Beneficiaries of this innovation/technology: (Customer segments)	Small farmers benefit through technology deployment by: ✓ Farmer support organizations ✓ State and Ministry of Agriculture ✓ Produce aggregators ✓ Agricultural input sellers

Impact generation capability of the technology	According to a Harvard Business School/IFMR randomized control trial (http://bit.ly/2drkx1k) on only Awaaz.De: ✓ ~1,000% ROI: every $1 invested into Awaaz.De's systems generates $10 in value for farmers ✓ Up to 26% increase in crop yields ✓ Decreased reliance on local pesticide dealers for farming advice
Contact details for further information	Elliot Rosenberg 104 Shanay-II (Indian Academy for Self Employed Women's Organization Building) OppGandhigram Railway Station, Behind Emerald Honda Service Center, Ashram Road, Ellis Bridge, Ahmedabad, Gujarat, India 380006 elliot@awaaz.de http://awaaz.de

Stellapps Technologies Pvt Ltd	
Name of the application	Full stack Internet of Things (IoT) solution for precision agri (dairy) & agri supply chain
Name of the person/agency	Stellapps Technologies Private Limited
About the (person/agency) (Brief profile about the founders' experience/ background and start-ups)	✓ Ranjith Mukundan – Co-founder, CEO – 20 years' experience in Telecoms & IT, Ex- Wipro. MS in Telecom & Software Engg. from Illinois Institute of Technology ✓ Ramakrishna Adukuri – Co-founder, Cloud Architect, 20 years' experience in Telecom & IT, Ex- Wipro. M.Tech from IIT Kharagpur ✓ Praveen Nale – Co-founder, CTO, 20 years' experience in Telecom & IT, Ex- Wipro. M.Tech from IIT Madras ✓ Ravishankar G Shiroor – Co-founder, Biz Dev Head, 20 years' experience in Telecom & IT, Ex- Wipro. M.Tech from IIT Madras ✓ Venkatesh Seshasayee – Co-founder, Solutions Architect, 20 years' experience in Telecom & IT, Ex- Wipro. B.E., Computer Science, Bangalore Univ.
Products/services offered	Internet of Things (IoT) based solutions for productivity improvement, cost optimization and supply chain efficiency improvement, such as: ✓ SmartFarms™ application (productivity improvement) ✓ SmartAMCU™ application (milk procurement optimization) ✓ Contrak™ application (cold chain management)
Issues addressed by the technology	✓ Milk supply chain optimization ✓ Animal productivity improvement ✓ Animal disease prevention ✓ Milk quality improvement ✓ Incentive for quality milk of farmers ✓ Farmer specific services ✓ Quality milk & energy efficient system
How does this innovation address the mentioned challenges? (Value proposition and product/service specifications)	Agile IoT platform acquires data from various sensors like milk analyzers, activity meter, milk meter, milk analyzer, load cell, volume and temperature. Data is then crunched & analyzed on the cloud platform via machine learning tools and algorithms, and alerts/advisories sent to stakeholders in the form of SMS/email, enabling ✓ Animal productivity improvement ✓ Premium milk production ✓ Preventive health care ✓ Real time payments ✓ Better RoI ✓ Improved cull value ✓ Insurance premium reduction

How is this innovation a better alternative over the current scenario?	✓ Cloud based, analytics & machine learning driven approach. ✓ Commoditized the hardware and shifts the center-of-gravity to software. ✓ Innovative, pay-as-you-grow business model (vis-à-vis capex driven business model) ✓ Our technology is embedded throughout the supply chain starting form production to cold chain ✓ No other player in the market is having agile IoT enabled cloud based system ✓ Had the technology not been present, transparent & efficient mechanism for each stakeholder in the entire supply chain would not be possible
Beneficiaries of this innovation/technology: (Customer segments)	✓ Farmers (small, medium & large) ✓ Milk collection agents ✓ Cooperative societies ✓ Private dairies
Impact generation capability of the technology	✓ Number of farmers benefited: 2,77,544 ✓ Number of cattle impacted:4,47,529 ✓ No of milk collection societies touched: approximately 6000 ✓ Liters of milk per annum: 980 million ✓ Productivity improvement of cattle-: 30% to 40% (average increment 3 to 4 liter per day)
Contact details for further information	Ranjith K Mukundan #3/1,2nd cross, Lakshmi Road, Shanti Nagar, Bangalore-560027 Ranjith.mukundan@stellapps.com www.stellapps.com

Media Lab Asia (MeitY)	
Name of the application	Interactive Information Dissemination System (IIDS)
Name of the person/agency	Media Lab Asia
About the (person/agency) (Brief profile about the founders' experience/ background and start-ups)	Media Lab Asia (MLAsia) is a not for profit organization set up by Ministry of Electronics & Information Technology (MeitY), Government of India. MLAsia with a decade of experience is pioneer in undertaking R&D in the area of 'ICT in Agriculture' in collaboration with several academic institutions. ICT Innovations by MLAsia includes proven technologies and models for agri. communities e.g. eSagu –a personalized agro advisory system, aAqua – Web, based discussion and advisory forum for farmers, AgroSense - Wireless sensor, networks for agriculture development, DEAL - Multimedia platform for creation, sharing and dissemination of agricultural information among farmers and experts and deployment of Community Radio for Agriculture etc. MLAsia has designed an Interactive Information Dissemination System (IIDS) after rigorous field study of major ICT initiatives in agriculture in India and information needs assessment of farmers with an objective to provide 'Information to the farmers as and when they require'.
Products/services offered	IIDS is an integration of Toll free Interactive Voice Response System (IVR), Smart Phone Application, mobile phone messaging and Web based agriculture advisory system. IIDS has two major components: ✓ Personalized Agro Advisory Service- Mobile and web interface for interaction between farmer and experts through multimedia & IVRS solutions interaction between farmer and experts through multimedia & IVRS solutions ✓ Information Services: Mobile interface to receive location specific information e.g. Input dealers; Local Weather Information; Market Price; Finance/ Insurance providers; Government Schemes; Latest News etc
Issues addressed by the technology	✓ Integrated system using Web, IVRS and Mobile Technologies to provide alternative options to the farmers ✓ Personalized solution based on the inputs provided by the farmers and his available profile ✓ Interaction in the native language through IVRS ✓ Farmers can record their queries in case experts are not available at lab or post office hours ✓ IIDS has specific features to cater location specific problems through the de centralized multimedia agro advisory labs ✓ IIDS is pull and push based system- agriculture related information can be pulled b y farmers by using phone o web (kiosks) and vice versa the specific information can be pushed by experts

How does this innovation address the mentioned challenges? (Value proposition and product/service specifications)	IIDS application features ✓ Smart phone application- Standalone application, offline query, data synchronization at hotspots, farmer registration and profile ✓ Interactive portal: Colour coded iconic based logins for various users, Expert support system, information dissemination and aggregation system, centralized common database ✓ IVRS based application: Call incoming facility on expert's mobile, call forwarding and recording facility, 24*7 query registration facility for farmers
How is this innovation a better alternative over the current scenario?	USP of IIDS ✓ Personalized 'Agro Advisory' Based on 'Farm and Farmer Profile'. ✓ Farm Profile includes Parameters of 'Soil Health Card' & 'Crop History'. ✓ Advisories in Local Language / Dialects ✓ Major Advisory Domain- Agriculture, Horticulture, Animal Husbandry & Fisheries ✓ 'Live Interaction' with Agri Scientists ✓ Facility to 'Refer Critical Problems' to relevant 'Crop Specialist' available virtually ✓ 'Round the Clock Query Registration Facility' through IVRS & Smart Phones ✓ Facility to 'Push Emergency Message' in text and voice based on 'Location and Crops' ✓ 'Network Independent' – Accessible from All Network
Beneficiaries of this innovation/technology: (Customer segments)	✓ Farmers ✓ Field Extension Workers ✓ Agri Experts ✓ Research Station/ KVK ✓ Agri Extension Department/ Agri University
Impact generation capability of the technology	IIDS was pilot tested (in 2013) with 1200 farmers from 12 villages of Andhra Pradesh and based on its utility and demand from the farmers as well as the institutions using IIDS, it is scaled up to 3700+ villages across 3 states (Andhra Pradesh, Telangana and Meghalaya) in India. IIDS is deployed with Annapurna Krishi Prasar Seva (AKPS) and Development and Deployment of Mobile Based Agro Advisory System (M4agriNEI) along with Central Agricultural University (CAU), Imphal. Farmer registration ~24700 (AKPS Service since Mar 2013) and 11400 (M4agriNEI Service since June 2013).
Contact details for further information	Dr T S Anurag, Senior Research Scientist Media Lab Asia 708-723, 7th Floor, Devika Tower 6 Nehru Place, New Delhi – 19 anurag@medialabasia.in www.medialabasia.in www.akps.in / www.m4agrinei.in

Level A Commodities Services Pvt. Ltd.	
Name of the application	"INFORMATION ON GO" - Trade & farm level information on mobile app as decision support system to last mile
Name of the person/agency	Level A Commodities; Amit Bhardwaj, Co-founder & CEO
About the (person/agency) (Brief profile about the founders' experience/ background and start-ups)	✓ More than 15 years of agro-based industry experience ✓ Successful implementation of technological interventions like remote sensing; farmer mobile app; trade Information dash boards with analytical contents ✓ International project experience in Africa
Products/services offered	✓ Knowledge management services ✓ Technological solutions ✓ Analytical reports ✓ Project management services
Issues addressed by the technology	✓ Manual crop estimation errors ✓ Untimely reports ✓ Reach to limited connects ✓ Unilateral communication
How does this innovation address the mentioned challenges? (Value proposition and product/service specifications)	✓ Outreach to lot of people instantly ✓ Scientific views on crop estimations ✓ Overall perspective of complete value chain through unbiased views ✓ Two -way communication
How is this innovation a better alternative over the current scenario?	✓ Outreach to lot of people instantly ✓ Scientific views on crop estimations ✓ Overall perspective of complete value chain through unbiased views
Beneficiaries of this innovation/technology: (Customer segments)	✓ All stakeholders in value chain ✓ Farmers / institutions / policy makers / traders etc
Impact generation capability of the technology	✓ Handy tools for farmers / institutes for quick decision making prior the event happened
Contact details for further information	Amit Bhardwaj Co-Founder & CEO Level A Commodity Services Pvt. Ltd. amit@levelacommodites.com Skype Id- a.bhardwaj26

Post Office Linkage Extension Model	
Name of the application	IARI-Post Office Linkage Extension Model
Name of the person/agency	ICAR-Indian Agricultural Research Institute, New Delhi
About the (person/agency) (Brief profile about the founders' experience/ background and start-ups)	✓ Involved in agricultural research, education and extension for last 111 years ✓ Leading institution in agricultural research and education in Asia ✓ Seat of Green Revolution
Products/services offered	✓ Effective technology dissemination to distantly located farmers ✓ Enhancing outreach of frontline extension system through branch post masters working as community extension agents
Issues addressed by the technology	✓ Low outreach of frontline extension ✓ Extension gap ✓ Technology dissemination not keeping pace with technology generation
How does this innovation address the mentioned challenges? (Value proposition and product/service specifications)	✓ Branch post masters after receiving capacity development interventions are helping in technology dissemination interventions at the grassroots level ✓ Frontline institutions are directly disseminating improved technologies to the remotely located farmers
How is this innovation a better alternative over the current scenario?	✓ This innovative model is supplementary to the existing system of public pluralistic extension system ✓ Even remotely located farmers are accessing quality seeds of improved varieties facilitating enhances seed replacement rate
Beneficiaries of this innovation/technology: (Customer segments)	✓ Small and marginal farmers ✓ Branch post masters of rural branch post offices ✓ Frontline extension system
Impact generation capability of the technology	✓ Coverage entire country ✓ Faster dissemination of technology 3-4 days ✓ Enhanced adoption, diffusion ✓ Technology backstopping
Contact details for further information	Director ICAR-Indian Agricultural Research Institute New Delhi – 110 012 director@iari.res.in www.iari.res.in

Equipment | 2

ecoZen Solutions Pvt Ltd	
Name of the application	Applying clean energy & technology to power cold chain and water pumps
Name of the person/agency	ecoZen Solutions Founded by : Devendra Gupta, Prateek Singhal and Vivek Pandey
About the innovator (Person/ Agency)	ecoZen is an innovation driven new technology venture, founded in 2010 to create affordable, reliable and efficient energy access. Devendra Gupta (CEO), Prateek Singhal (COO) and Vivek Pandey (CTO), all alumunus incorporated ecoZen Solutions with the objective to provide energy access in an efficient manner to the masses.
Issues addressed by the technology	Ecofrost is a solar powered cold room: ✓ It is designed to operate reliably in regions with challenge of quality power supply using solar energy and thermal energy storage backup. ✓ The product enables the customers in such regions to retain the quality of their perishable produce and derive more value for it by selling it at the right time to the right markets. ✓ It can be used in a packhouse, in a mandi or for refrigerated transport. ✓ The product aims to create value by reducing wastage, reducing logistics cost and improving price realization for the produce. Ecotron is a solar pump controller: ✓ The product ensures reliable operation of solar pumps on the ground by its intelligent monitoring system. ✓ Ecotron is reducing the downtime of the solar pumping systems by smartly identifying issues ahead of time and lead to accurate diagnosis ✓ Farmers can use Ecotron to charge a battery when they are not using the solar pumps.
Brief about the challenge the innovation/ technology is addressing	✓ Wastage of food product ✓ Dependency on grid electricity supply ✓ Inability to monitor stored product from remote location.
Products/Services Offered	Solar Irrigation (Ecotron) , Micro cold storage (Ecofrost)

How does this innovation address the mentioned challenges? (Value proposition and product/service specifications)	✓ Well integrated system to address minimum wastage of food product. ✓ Off grid access to alternative source of energy ✓ Stand alone efficient modular portable units to overcome challenges posed by insufficient availability of electricity. ✓ Easy monitoring of product stored in the micro storage units i.eEcofrost from remote locations.
How is this innovation a better alternative over the current scenario?	Ecofrost and Ecotron are great examples of green energy usage and transformation from non renewable to renewable energy. Currently almost all of the cold stores uses electricity generated from non renewable sources which are not cost effective and creates adverse impact to environment.
Beneficiaries of this innovation/technology: (Customer segments)	The product is primarily designed to target small farmers to serve their storage needs of agricultural produce in a affordable, reliable method with efficient energy access. It does not depend on grid electricity and after a 2-year breakeven, leads to over 40% increase in their profits. This innovative product can be suitably adapted for local conditions across the world.
Impact generation capability of the technology	Maintaining appropriate cold chain can reduce this wastage from 25-30% to 10-15%, which is almost equivalent to 4 bn USD p.a. Out of approx 10 million diesel water pumping sets in India; if 50% were replaced with solar pump sets, diesel consumption could be reduced by approx 225 billion litres/ year.
Contact details for further information	Devendrav Gupta Director & Co-Founder ecoZen Solutions Pvt Ltd Survey No.134/1,134/2,130/3, Tathawade, Pune, Maharashtra 411033 query@ecozensolutions.com

FlyBird Farm Innovations	
Name of the application	Smart Irrigation Controller
Name of the person/agency	FlyBird Farm Innovations; Satish K S Founder, CEO
About the (person/agency) (Brief profile about the founders' experience/ background and start-ups)	FlyBird Farm Innovations Private Limited is a social impact startup in agriculture sector, founded in 2013. Headquartered at Bangalore, FlyBird has developed a series of innovative products, to elevate the standards in agro irrigation. It mainly aims at integrating affordable technology for farmers that helps improve the crop yield/productivity, alongside saving farm resources like water, power, time (labor) and money with an orientation to conserve natural resources. ✓ Satish has more than 15 years of rich and insightful experience in product development & management of embedded & safety critical systems & engineering software. ✓ Satish has worked with HCL Technologies for more than 12 years in Avionics and Automotive domains ✓ He has vast experience in various aerospace and automotive standards prevailing in industry across US and European countries.
What problem does your technology solves?	✓ Poor crop yield ✓ Inefficient water management ✓ Expensive farm equipments ✓ Low income for agriculture livelihood ✓ Reduces labours ✓ Time intensive farming ✓ Weeds
About the (person/agency) (Brief profile about the founders' experience/ background and start-ups)	✓ Water scarcity ✓ Erratic power ✓ Excess irrigation/fertigation ✓ Increase in labour cost ✓ Irrigation at odd times ✓ Low productivity
Products/services offered	Smart irrigation controller, controls water flow and fertilizer flow precisely by measuring: soil moisture; soil temperature; air temperature and humidity & rain sensor. The products offered by flybird farm innovations are as follows: ✓ SIRI; Smart Irrigation Controller and Automation System ✓ Volume based irrigation controller ✓ Time based irrigation controller ✓ Mobile app & web login controller

How does this innovation address the mentioned challenges? (Value proposition and product/service specifications)	FlyBird Farm Innovations has developed a affordable and innovative product Smart Irrigation Controller. It has been incorporated with a vision to solve key problems of the agriculture sector focusing on ✓ Improving the livelihood of farmers ✓ Enhancing the crop yield / production ✓ Saving water and electric power ✓ Integrating affordable technology for farmers
How is this innovation a better alternative over the current scenario?	Automation of fertigation saved 25% to 30% of water and around 300 man hours per month. Also, crop yield has been increased by 15% post using Flybird's Irrigation Controller
Beneficiaries of this innovation/technology: (Customer segments)	✓ Farmers ✓ Firms engaged in high level corporate farming ✓ Agri inputs and equipment companies ✓ Government departments/ nurseries
Impact generation capability of the technology	✓ Number of farmers benefited ✓ Water saved ✓ Crop/yield productivity increase ✓ Electric power saved ✓ Reduction in agri inputs
Contact details for further information	Satish K S Co- Founder and CEO FlyBird Farm Innovations #887/201, 2nd floor, 9th Main, D Block, Sahakaranagar Bangalore, 560092, India satish@flybirdinnovations.com shekhar@flybirdinnovations.com

Aarav Unmanned Systems (AUS)	
Name of the application	Portable and electric Unmanned Aerial Systems (UAS)
Name of the person/ agency	Aarav Unmanned Systems (AUS)
About the (person/ agency) (Brief profile about the founders' experience/background and start-ups)	Co - founders — Nikhil Upadhye, Suhas Banshiwala and Vipul Singh — represented their college, IIT-Kanpur, at the Systems Engineering Awards competition organised by NASA in 2013. They had to design a UAV based on certain weight and payload specifications. The same year, the trio founded AUS.
Products/services offered	"Nayan" : A high performance, low-cost Quadrotor which have many applications in precision agriculture:
Issues addressed by the technology	The technology used can optimize the inputs – water, pesticides and fertilizer cost, and can enhance the output which is the central challenge that this technology tackles
How does this innovation address the mentioned challenges? (Value proposition and product/service specifications)	The technology has an autonomous flight controller, fixed wing and multi-rotor UAS platforms. The systems developed have been field tested for multiple projects. The flight control algorithms are developed as such that they follow the best data collection practices wherein high resolution geo-tagged multi-spectral images are taken at precisely computed locations as per the laws of photogrammetry. Methodology: System collects the data based on the desired accuracy, resolution and requirements of photogrammetry. On-board sensor data is constantly stitched with images taken. Entire project is executed in following major steps: Mission planning which includes selection of area, flight plan and placement of GCP markers UAS flight for data collection Data retrieval and post processing to obtain desired outputs Best resolution deliverable : 8 cm/pixel Output per day: It can currently cover upto 6 sq kms in a day from one system considering favorable flight conditions Final deliverables: ✓ NDVI orthomosaic ✓ NDRE orthomosaic ✓ NRG orthomosaic
How is this innovation a better alternative over the current scenario?	✓ High Performance ✓ Indigenous technology low cost as compared to other drones based services in agriculture ✓ Automated inspection of large area compared to the tedious manual inspections for preventive measures

Beneficiaries of this innovation/technology: (Customer segments)	✓ Agribusiness companies,Contract farming companies, Seed manufacturing companies, High value crop cultivators
Impact generation capability of the technology	Technology has several applications in precision agriculture which include: Plant stress assessment and monitoring, yield monitoring, chlorophyll indication, senescence analysis, drought assessment, biomass indication, leaf area indexing, nitrogen recommendation, phenology, growth monitoring & crop discrimination, tree classification, plant counting & weed detection, GIS and 3D mapping
Contact details for further information	Vipul Singh #35, 1st Floor, Jairam Nagar, Jakkur, Bangalore - 64 info@aus.co.in www.aus.co.in

Precision Farming | 3

Pneumatic Precision Planter	
Name of the application	Pneumatic Precision Planter
Name of the person/agency	Division of Agricultural Engineering ICAR-Indian Agricultural Research Institute, New Delhi-110012 CSIR- CMERI-CPCFM, Gill road, Ludhiana, Punjab
About the (person/agency) (Brief profile about the founders' experience/ background and start-ups)	✓ The Division of Agricultural Engineering ICAR-Indian Agricultural Research Institute was established in 1945 to develop and introduce appropriate machinery in Indian agriculture with a mandate for conducting strategic research on design and development of technologies/ equipment for farm mechanization. ✓ CSIR- CMERI-CPCFM, Gill road, Ludhiana, Punjab is one of the pioneer institute under CSIR and mandated to work on development of precision and conservation farm machineries.
Products/services offered	✓ Useful for planting of small vegetable seeds
Issues addressed by the technology	✓ Planting of small vegetable seeds requires lot of man hour and very tedious work which is drudgery prone.
How does this innovation address the mentioned challenges? (Value proposition and product/service specifications)	✓ Air suction is used for singulation during planting of small vegetable seeds with field capacity of 0.2 to 0.3 ha/h.
How is this innovation a better alternative over the current scenario?	✓ Saves costly seed and reduces cost of operation as compared to traditional method of transplanting of seedlings
Beneficiaries of this innovation/technology: (Customer segments)	✓ Large scale vegetable growers, ✓ Custom hiring centres
Impact generation capability of the technology	Saves costly seed up to 18 % as compared to manual planting and cost of operation is reduced by 35-40 %
Contact details for further information	Division of Agricultural Engineering ICAR-Indian Agricultural Research Institute, New Delhi-110012 www.iari.res.in

Pusa Solar Powered Vending Cart	
Name of the application	PUSA Solar powered vending cart
Name of the person/agency	Division of Agricultural Engineering, ICAR-Indian Agricultural Research Institute, New Delhi-110012
About the (person/agency) (Brief profile about the founders' experience/ background and start-ups)	✓ The Division of Agricultural Engineering ICAR-Indian Agricultural Research Institute was established in 1945 to develop and introduce appropriate machinery in Indian agriculture with a mandate for conducting strategic research on design and development of technologies/ equipment for farm mechanization.
Products/services offered	✓ Very useful in rural areas for storing and vending of fruits and vegetables even during extreme weather conditions
Issues addressed by the technology	✓ Shortage of electricity for storage of fruits and vegetables
How does this innovation address the mentioned challenges? (Value proposition and product/service specifications)	✓ Use of renewable energy where electricity is a scarce commodity
How is this innovation a better alternative over the current scenario?	✓ As compared to traditional vending cart it keeps fruits and vegetables fresh and increase self life.
Beneficiaries of this innovation/technology: (Customer segments)	✓ Road side vendors ✓ Small farmers
Impact generation capability of the technology	Reduces temperature inside vending cart in the range of 4 to 10 degree Centigrade as compared to ambient conditions
Contact details for further information	Division of Agricultural Engineering ICAR-Indian Agricultural Research Institute, New Delhi-110012 www.iari.res.in

Azotobacter Liquid Bionoculant	
Name of the application	Azotobacter Liquid Bioinoculant
Name of the person/agency	ICAR-Indian Agricultural Research Institute, New Delhi; Dr. Sangeeta Paul, Senior Scientist, Department of Microbiology
About the (person/agency) (Brief profile about the founders' experience/ background and start-ups)	✓ Involved in agricultural research, education and extension for last 111 years ✓ Leading institution in agricultural research and education in Asia ✓ Seat of Green Revolution
Products/services offered	✓ Azotobacter Liquid Bioinoculant ✓ It is a cyst-based liquid biofertilizer of Azotobacter
Issues addressed by the technology	✓ Used for seed treatment, root dip for seedlings in transplanted crops and soil treatment for trees ✓ Sticker is not needed for its application ✓ When applied as seed inoculant, it can add 15-20 Kg/ha of nitrogen to soil. ✓ It increases crop yield by 10-35%
How does this innovation address the mentioned challenges? (Value proposition and product/service specifications)	✓ It has a very high microbial load ✓ It is convenient to use unlike carrier based inoculants which are cumbersome to use ✓ It enables substantial plant growth
How is this innovation a better alternative over the current scenario?	✓ It has considerably enhanced shelf life of more than 3 years as compared to 6 months of carrier based formulations ✓ Bacterial protectants added to the formulation improve the shelf life, survival of the culture on seed and also help the culture regain active growth under favorable condition
Beneficiaries of this innovation/technology: (Customer segments)	✓ All stakeholders in value chain ✓ Farmers /institutions / traders etc
Impact generation capability of the technology	✓ With an increasing demand for organic produce, there is greater emphasis on use of microbial inoculants for providing nutrients to plant, hence this serves as a multipurpose inoculant which can be used for large no. of crops. ✓ It supplies both nutrients as well as stimulates activity of beneficial soil microorganisms thereby improving soil fertility.
Contact details for further information	Director ICAR-Indian Agricultural Research Institute New Delhi – 110 012, director@iari.res.in www.iari.res.in

Pusa Hydrogel	
Name of the application	Pusa Hydrogel
Name of the person/ agency	Division of Agricultural Chemicals, IARI Dr. Anupama Singh
About the (person/agency) (Brief profile about the founders' experience/ background and start-ups)	✓ Dr. Anupama Singh is currently Principal Scientist and Head, Division of Agricultural Chemical, IARI, N.Delhi ✓ She has worked in the area of polymer chemistry, design of experiments, product development, nanomaterials and integrated formulations.
Products/services offered	Pusa Hydrogel Technology
Issues addressed by the technology	✓ Suitable for semi-arid and arid regions ✓ Improves physical properties of soil and soil less media ✓ Improves seed germination and the rate of seedling emergence ✓ Reduces leaching of agro-inputs such as herbicides and fertilizers ✓ Reduces irrigation and fertigation requirements of crops. ✓ Reduces nursery establishment period ✓ Helps plants withstand extended moisture stress
How does this innovation address the mentioned challenges? (Value proposition and product/service specifications)	✓ 30-50% reduction in frequency of irrigation thus reducing drudgery in terms of labour involved in frequent irrigations, particularly, in vegetables. Reduction in the dosage of fertilizers to the turn of 22-30%. Improvement in soil quality
How is this innovation a better alternative over the current scenario?	✓ Outreach to lot of people instantly ✓ Exhibits absorbency at high temperatures (40-500C), suitable for semi-arid and arid regions ✓ Absorbs water a minimum of 350 times of its dry weight and gradually releases it ✓ Low rate of application (1-1.5 kg / acre) ✓ Improves physical properties of soils and the soil less media ✓ Improves seed germination and the rate of seedling emergence ✓ Improves root growth and density ✓ Reduces nursery establishment period ✓ Reduces irrigation and fertigation requirements of crops ✓ Delays onset of permanent wilting point
Beneficiaries of this innovation/technology: (Customer segments)	✓ All stakeholders in value chain ✓ Farmers / Institutions / Corporates / Traders etc.
Impact generation capability of the technology	✓ Low price, high durability and stability in swelling environment and during dosage ✓ Gradual biodegradability without formation of toxic species ✓ Ph neutrality after swelling in water ✓ Photostability and Re-wetting capability thereby having large potential for wider use in the context of current agricultural practices in India
Contact details for further information	The technology has been licensed to: M/s Earth International Ltd.; M/s Carborundum Ltd.; M/s SarpanchSamaj; M/s MadhusudanPvt Ltd., M/s NavabharatPvt Ltd. M/s Nagarjuna Fertilizers Pvt Ltd.

Others | 4

IDRC: Dept. Nano Science & Technology Tamil Nadu Agricultural University	
Name of the application	Nano-emulsion and nano-matrix (sticker)
Name of the person/agency	Dr. K.S. Subramanian Professor , Dept. Nano Science & Technology, Tamil Nadu Agricultural University, Coimbatore
About the (person/agency) (Brief profile about the founders' experience/ background and start-ups)	✓ More than 28years of experience in agricultural sciences, founder HOD of Nano Science & Technology, well-known expert in agricultural nano-technology
Products/services offered	✓ Design and fabrication of nano-based agricultural inputs with higher use efficiency ✓ Nano-emulsion, nano-matrix and nano-packaging to extend shelf-life mango and other fruits
Issues addressed by the technology	✓ Minimize post-harvest losses ✓ Lack of cold storage facilities ✓ Increase per capita availability ✓ Facilitate long-term transport ✓ Enhance family income of small and marginal farmers
How does this innovation address the mentioned challenges? (Value proposition and product/service specifications)	Pre-harvest spray or post-harvest dip in nano-emulsion or nano-matrix affixed to box of fruits, Minimize the post-harvest losses of fruits up to 10-15%,Delayed harvest by 6 weeks and late arrivals in the market provide lucrative price for farmers
How is this innovation a better alternative over the current scenario?	Currently, fruit shelf-life gets extended only through refrigerated storage and transport which is hardly possible in rural India. We have a basket of nanotechnologies to preserve fruits in the entire value chain
Beneficiaries of this innovation/technology: (Customer segments)	✓ Fruit and vegetable growers,retails chains and export houses, packhouses, packaging industries
Impact generation capability of the technology	Reduction in post-harvest losses, increased fruit yield,nnhanced farm income,increased per capita availability
Contact details for further information	Dr. K.S. Subramanian Professor Dept. Nano Science & Technology Tamil Nadu Agricultural University Coimbatore 641003 kssubra2001@rediffmail.com www.tnaunanoagri.in

Food Chain Partnership	
Name of the application	Food Chain Partnership as a business model
Name of the person/agency	Bayer CropScience Ltd.
About the (person/agency) (Brief profile about the founders' experience/ background and start-ups)	Bayer is a world-class innovation company with a more than 150-years of experience and core competencies in health care and agriculture sectors.
Products/services offered	✓ Seeds,crop protection chemicals, biological products, advisory services
Issues addressed by the technology	✓ At a broader level through food chain partnership projects, issues of food security, food safety and sustainability are addressed. ✓ At ground level, farmers are supported in terms of protection of their crops, thereby improving productivity, quality and net returns.
How does this innovation address the mentioned challenges? (Value proposition and product/service specifications)	✓ Farmers benefit through better market access, more secure income, better technological solutions, higher yields, and cost-effective, sustainable use of agrochemicals.
How is this innovation a better alternative over the current scenario?	In the current scenario, very limited options / sources are available where growers get end-to- end solutions within the value chain, including production and marketing of their produce. ✓ Partnerships with experts in the value chain bring the complete solution to the growers. ✓ Growers get higher productivity and returns ✓ Food chain companies are able to procure the produce as per their specifications and requirements ✓ Consumers gain benefit from high-quality and safe food
Beneficiaries of this innovation/technology: (Customer segments)	✓ Growers,food chain companies,consumers
Impact generation capability of the technology	Working with more than 35 food value chain players and have reached approximately 118,000 farmers across key crops like potato, chili, gherkins, grapes, other fruits and vegetables.
Contact details for further information	Yogesh Mohite Bayer CropScience Ltd Bayer House, Hiranandani Estate Central Avenue, Thane – 400607, India yogesh.mohite@bayer.com www.bayer.in

Gold Farm - AK Surya Power Magic Pvt Ltd	
Name of the application	Gold Farm - AK Surya Power Magic Pvt. Ltd.
Name of the person/agency	Karthik Ravindranath, Abhilash Thirupathy
About the (person/agency) (Brief profile about the founders' experience/ background and start-ups)	From a 2 people startup, the company has grown to a 100 people organization. Now Gold Farm is one of the fastest growing agri companies in India. It has touched the lives of thousands of farmers across India by converting 1000+ hectares of barren into cultivable land thus bringing happiness and prosperity to farmer.
Products/services offered	Solar Water Pumps, Honey Bee - Gold Farm
Issues addressed by the technology	Gold Farm empowers the farming community by bringing the transparency by creating the organized ecosystem.
How does this innovation address the mentioned challenges? (Value proposition and product/service specifications)	Gold Farm innovative platform is designed to address the real world challenges in bringing the shared economy model for the farm equipments into reality. A fully integrated based soft solutions from booking, dispatching and monitoring.
How is this innovation a better alternative over the current scenario?	Gold Farm enables smart booking experience, order scheduling and dispatching. Gold Farm enables transparency in billing, enables control over equipment, enables real time monitoring, enables customer satisfaction, enables increased utilization, enables profitability, enables scalability, integrates stakeholders and hence helps in developing shared economy ecosystem.
Beneficiaries of this innovation/technology: (Customer segments)	Farmers, farm equipment companies, asset owners
Impact generation capability of the technology	Number of farmers impacting at present - 2000 per month; aim to serve about 25000 farmers per month in less than an year.
Contact details for further information	AK Surya Power Magic 205, 2nd Floor, PSG - Step, Software park - 2 Peelamedu, Coimbatore - 641004

About YES BANK & Food & Agribusiness Strategic Advisory & Research Group (FASAR)

YES BANK, India's fifth largest private sector Bank with a pan India presence across all 29 states and 7 Union Territories of India, headquartered in the Lower Parel Innovation District (LPID) of Mumbai, is the outcome of the professional & entrepreneurial commitment of its Founder Rana Kapoor and its Top Management team, to establish a high quality, customer centric, service driven, private Indian Bank catering to the future businesses of India. YES BANK has adopted international best practices, the highest standards of service quality and operational excellence, and offers comprehensive banking and financial solutions to all its valued customers. YES BANK has a knowledge driven approach to banking, and offers a superior customer experience for its retail, corporate and emerging corporate banking clients. YES BANK is steadily evolving as the Professionals' Bank of India with the long term mission of "Building the Finest Quality Bank of the World in India by 2020".

As a part of its knowledge driven approach to banking, **YES Institute, a new practicing think-tank** is established as a **division of YES BANK, focuses on India's inclusive and green socio-economic development and growth**. A specialized Food & Agribusiness Strategic Advisory & Research group (FASAR) is domiciled within the Institute. FASAR works with corporates, small & medium enterprises, multinationals, Central Government & State Governments, multilateral agencies across sectors such as dairy, agri inputs, food processing & food services, food parks, agri-infrastructure, logistics, agri supply chain and rural retail among others. The team executes project advisory, strategic advisory & policy advisory across the food and agri sector. FASAR also conducts in-depth research on various sub-sectors of Food & Agri domain and publishes knowledge reports and research papers on key trends and developments in the sector.


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