



BACKGROUND PAPER

PROMOTING STARTUPS IN AGRICULTURE



INTRODUCTION

Agriculture plays a vital role in India's economy. Over 58% of the rural households depend on agriculture as their principal means of livelihood. As per the 2nd advised estimates by the Central Statistics Office (CSO), the share of agriculture and allied sectors (including agriculture, livestock, forestry and fishery) is estimated to be 17.3% of the Gross Value Added (GVA) during 2016-17 at 2011-12 prices. The GDP of agriculture and allied sectors was recorded at \$244.7 Bn in FY '16.

The Indian food and grocery market is the world's sixth largest, with retail contributing 70% of the sales. The Indian food processing industry accounts for 32% of the country's total food market, one of the largest industries in India and is ranked fifth in terms of production, consumption, export and expected growth. It contributes around 8.80 and 8.39% of Gross Value Added (GVA) in Manufacturing and Agriculture respectively, 13% of India's exports and six per cent of total industrial investment.

India holds the record for the second-largest agricultural land in the world, with around 60% rural Indian households making their living from agriculture. The agricultural sector in India employs half of our population and we are greatly dependent on the farmers and agricultural labourers to provide us with a means of sustenance. Yet, this is one of the riskiest sectors to be employed in because it is dependent on uncontrollable factors like weather, market fluctuations and topographical conditions. Efforts are being made to give this sector and its workers a much-needed boost. And the biggest way of doing this is through advancements in agriculture technology. Modern techniques and methods will surely elevate agriculture to the next level and ease the burden on farmers. This therefore creates a huge scope for Agriculture Startups in the country. Transformation of Agriculture to Agri-business is one of the important strategies where enterprising farmers practice profitable agriculture.

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

innovations and technology driven powerful startups set to revolutionize the food and agriculture sector.

MARKET OVERVIEW

Land under Cultivation: At 157.35 million hectares, India holds the second largest agricultural land in the world

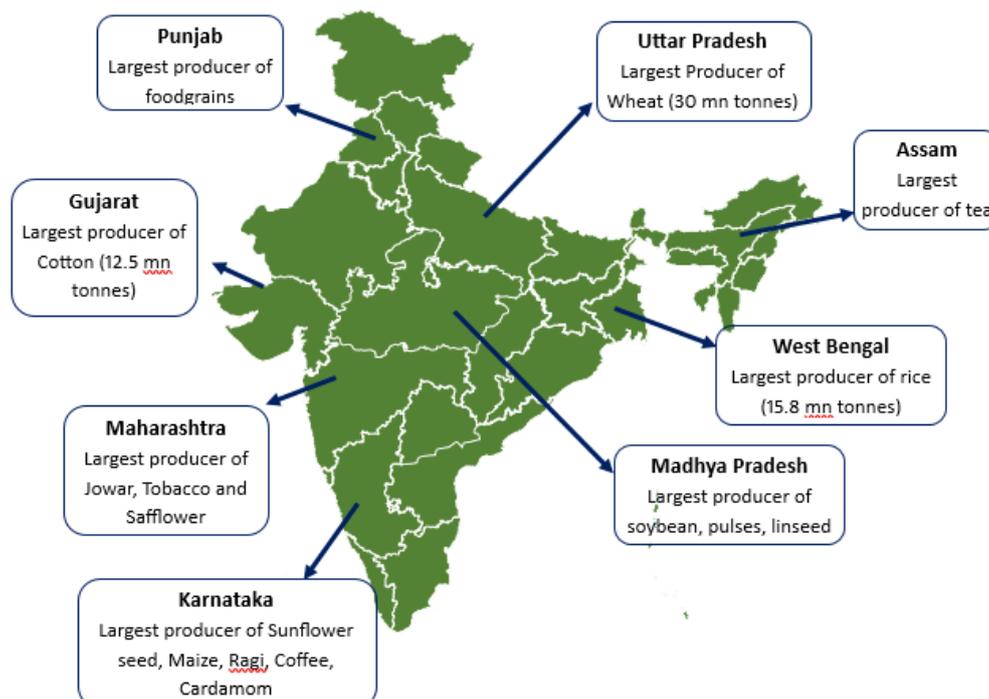
Varied Climatic Conditions: With 20 agri-climatic regions, all 15 major climates in the world exist in India. The country also possesses 46 of the 60 soil types in the world

Record Domestic Production: In FY '16, 253.16 million tonnes of food grain production was recorded in India, up from 252.68 million tonnes in FY '15. India is among the 15 leading exporters of agricultural products in the world

Main Products: India is the largest producer of spices, pulses, milk, tea, cashew and jute; and the second largest producer of wheat, rice, fruits & vegetables, sugarcane, cotton and oilseeds

Farm Mechanization: India is one of the largest manufacturers of farm equipment such as tractors, harvesters and tillers. India accounts for nearly one-third of the overall tractor production, globally, with the tractor production in the country estimated to increase from 0.57 million units in FY16 and reach to 16 million units by 2030

State Wise Output of Agricultural Produce in India¹



CHALLENGES IN AGRI/OPPORTUNITIES FOR STARTUPS

1. **Inefficient Supply Chain:** Powerful incumbents control farming resources such as finance, seeds, chemicals, distribution, and supply chain. These systems have complete access to the distribution networks that supplies to about 8 Mn kiranas across the country too.
2. **Middlemen and Agents:** The farmer needs on the demand-side are controlled by middlemen and agents who own the fragmented supply chains. They also control the produce pricing. For instance, organized retailers are estimated to source 20% of their produce directly from farmers, the rest of from mandis. But mandis are not ideal farmers' markets, Traders require a license to operate within a mandi but wholesale and retail traders and food processing companies cannot buy produce classified as notified agricultural products (cereals, vegetables etc.) directly from a farmer. Notified products are to be brought to the market committee and auctioned in the farmers' presence. Most of the market committees have failed to provide a competitive platform to farmers and lack transparency and technology intervention to ensure smooth and just trading.
3. **Lack of financing:** Distributors usually double up as lenders and most farm-debt is created because of using chemicals and seeds that are not pest-resistant. Additionally, domestic subsidies and investments announced in policies rarely reach the end customer – the farmer.
4. **Inadequate Irrigation:** Agriculture in India is a fragmented activity spread across 600,000 villages and most of the regions still depend on rainfall for water (~70%). While at the same time, groundwater levels are slowly receding from the 1,000 ft. avg. depth yearly.
5. **Farm size vs Productivity:** Studies have shown that there is an inverse relationship b/w farm size and productivity. Indian farms are fragmented and small; 70% are less than 1 Hectare, while national average is less than 2 Hectares, resulting in significantly low farm yields. In Europe and US, avg. sizes are 30x and 150x of those in India.

AGRI-TECH STARTUPS

AGRITECH SUB SECTORS

There are over 250 Agri-Tech startups in India across the value chain, leveraging the use of technology and innovation in business models to impact the large agri sector in India.

Sub-Sector	Startup
Upstream (Input) Marketplace model (Matching Agri-input sellers to farmers)	
Downstream (Output) 'Farm-to-Fork' supply chain model (Matching farmers to businesses or retail customers for fresh produce, processed food)	
Farming-as-a-service	
IoT/Big Data led innovation	
Engineering led innovation	

Miscellaneous (Innovation in agri products, dairy farming)

**SUMA
AGRO**

LaVeda



Cattle
Mettle

AGRI-TECH FUNDING

STARTUPS FOUNDED & FUNDING ROUNDS, BY YEAR

YEAR	COMPANIES CREATED	FUNDING AMOUNT (USD M)	NO. OF ROUNDS
2017	32	176.8	49
2016	171	2736.1	49
2015	193	129.0	35
2014	117	148.6	29
2013	87	86.6	29
2012	76	1069.0	21
2011	63	301.0	18
2010	63	151.5	17
2009	58	9.4	6
2008	41	8.4	7
2007	33	39.7	4

Source: Traxcn

FUNDING DEALS IN INDIA (2017)

According to AgFunder's AgTech Investing Report for 2016, over \$3.23 Bn was invested in agricultural sector worldwide of which, 53 Indian agritech startups raised \$313 Mn in venture funding¹. Some of the major deals in the sector last year are highlighted below,

Startup	Investment	Investor	Date
RML Agtech	\$4 Mn (Series B)	Ivycap Ventures	Jan-17
Paalak.in	Undisclosed Seed	Angels	Feb-17
Agrostar	\$10 Mn (Series B)	Accel, IDG, Aavishkar	Mar-17
Farmart	Undisclosed Seed	Indian Angel Network (IAN)	Mar-17
Waycool	\$2.7 Mn	Aspada Ventures	Apr-17
Ninjacart	\$5.5 Mn	Nandan Nilekani	Apr-17
Utkal Tubers	\$4.6 Mn	CapAleph, Zephyr Peacock	May-17
Crofarm	\$783 K (Pre Series A)	Factor [E] Ventures, Rajan Anandan, Jitendra Gupta, LetsVenture	Aug-17
EM3 Agriservices	\$10 Mn (Series B)	Global Innovation Fund, Aspada	Aug-17

¹ <https://research.agfunder.com/2016/AgFunder-Agtech-Investing-Report-2016.pdf>

Cropin	Undisclosed (Pre Series A)	Beenext, Ankur Capital, BSP Funds	Sep-17
Gold Farm	\$2 Mn Seed	Mahindra & Mahindra, Infuse Ventures	Oct-17
Farmtaza	\$8 Mn Series A	Epsilon Venture Partners, Tara India Fund	Oct-17
Gobasco	Undisclosed Seed	Matrix Partners	Nov-17
Farmlink	\$3 Mn	Pioneering Ventures, Syngenta	Nov-17

Source: News Research

SPLIT BY GEOGRAPHY

State	No. of Startups
Maharashtra	291
Karnataka	209
Andhra Pradesh	153
NCT	138
Tamil Nadu	130
Gujarat	128
Haryana	71
Uttar Pradesh	64
Kerala	44
Madhya Pradesh	43
Punjab	37
West Bengal	35
Rajasthan	26
Union Territory of Chandigarh	13
Odisha	12
Bihar	8
Chhattisgarh	6
Assam	5
Uttarakhand	5
Himachal Pradesh	3
Goa	2
Jharkhand	2
Daman and Diu	1
Manipur	1
Telangana	1
Union Territory of Puducherry	1

Source: Tracxn

FOCUS AREAS FOR AGRI-TECH STARTUPS

1. **BIG DATA:** Data, as we all know, is the new oil and going forward, development of farm specific, data-driven diagnostics to determine soil and crop health will be a big opportunity area. Startups are leveraging drones or tractor-based solutions to get data on field, pertaining to both weather and agricultural data to determine risk. Growing smartphone penetration will enable precision decision-making in farming activity to farmers and help drive increased productivity and revenue while reducing unit-costs.

Eg.: Agrostar, RML Agtech are investing INR 5 Cr (\$776 K) each in building ground-breaking image recognition technology that enables farmers to receive real-time data on the pest or disease that has affected a crop.

2. **FARMING-AS-A-SERVICE (FAAS):** Agri equipment renting is another area likely to see market traction. As longer gestation periods are a typical feature for this sector and modern equipment is expensive and unaffordable for the average farmer, renting can take the burden of the input costs away from the farmer.

Eg.: EM3 Agriservices offers farming services and machinery rentals to farmers on a pay-for-use basis. Other startups include, Goldfarm, Ravgo, Oxen Farm Solutions and Farmart.

3. **MARKET LINKAGE MODELS:** Innovations to help farmers with timely and accurate estimation of sowing and harvesting in sync with consumer demand patterns.

Eg.: MeraKisan.com helps consumers in India to order fresh food and goods sourced from local farmers.

4. **FINTECH FOR FARMERS:** Farm income is mostly in cash and it presents an opportunity for Fintech startups to digitize payments for farmers through payment gateways linked to their accounts. Such startups can also create the credit profile environment for funders and lenders.

5. **IOT FOR FARMERS:** Smart farming in agricultural business including concepts like high-precision crop control, data collection, automated farming techniques will remove inefficiencies and bolster productivity. Information on crop yields, rainfall patterns, pest infestation and soil nutrition can be used to improve farming techniques over time.

Eg.: Stellapps leverages cloud computing, data analytics and wearables to improve agri-supply chain parameters, including milk production, procurement, cold chain, animal insurance and farmer payments.

GOVERNMENT INITIATIVES

SCHEMES INITIATED BY GOVT

The Indian Govt. has placed a strong impetus on this sector and aims to double the income of farmers by 2022.

1. Pradhan Mantri Fasal Bima Yojana (PMFBY):

- a. Launched in 2016, the scheme provides financial support to farmers and cover their crop losses. The scheme covers rabi, kharif crops as well as annual horticultural and commercial crops.
- b. PMFBY is a crop insurance policy and premium payable on the principle amount to the farmers.

2. Pradhan Mantri Krishi Sinchayee Yojana (PMKSY):

- a. Under the scheme, allocation of USD7.64 billion has been made for investment in irrigation, expanding cultivable area, improve efficiency of on-farm water to reduce wastage, enhance adoption of precision irrigation, etc.

3. Paramparagat Krishi Vikas Yojana (PKVY):

- a. The scheme ensures the promotion of organic farming and balanced use of chemical fertilizers and enhance the quality of farm produce.

4. Agricultural Technology Management Agency (ATMA):

- a. This technique facilitates retrieval of data and data entry from the internet-based web portals without having internet by using a simple mobile phone.
- b. More than a dozen of services of innovative technology like USSD are being operationalized for farmers and other stakeholders.

AGRICULTURE GRAND CHALLENGE

Ministry of Agriculture in partnership with Startup India launched the Agriculture Grand Challenge on 15th December, 2017. The challenge is a unique opportunity for Agri-tech start-ups with a commercially viable solution to solve for innovative challenges in the sector. The objective is to support the technology base by funding/ providing incubation support to the best fundamental concepts while helping talented and creative innovations to

pursue promising avenues at the frontier of the technology. It will provide start-ups with access to priority infrastructure, and make Agriculture an attractive sector for the country's best brains.

Under this challenge, 12 problem statements were issued in the following areas

1. Development of simplified, sensor based quick testing method to test nutrients & micronutrients in soil

The 11th five-year plan [2007-2012] acknowledged the importance of proper soil management in agriculture for the first time. For this, Soil Health Management (SHM) scheme was devised to assist State Governments to set up new static Soil Testing Laboratories (STLs) and Mini Soil testing Labs (MSTLs).

However, it is found necessary to further reduce the collection, testing time required for the sample to ensure on the spot results to the farmers. In addition, simplification of soil testing protocols needs to be done.

For this, the challenge is seeking development of simplified, sensor based and quick soil testing methods to test the nutrients and micronutrients. A proven technology will be supported under Soil Health Management scheme so that states can procure directly from the developer at fixed price (as has already been done for mini soil health labs).

2. Real time assaying and quick grading solution for eNAM to effectively handle huge lots of agricultural commodities

Electronic National Agriculture Market (eNAM) is a virtual market with a physical market (mandi) at the back end, which networks the existing APMC/mandis to create a unified national market for agricultural commodities for pan-India electronic trading. The assaying of agricultural produce at the market level is of utmost importance to enhance the marketability of the produce and to enable the farmers to realize price commensurate to the quality of their agricultural produce.

Mandis handles huge volumes (lots) of arrival and smaller lots, hence it is essential to provide quick quality assaying solutions (preferably within a minute/ parameter) to promote online trading.

For this, the challenge is seeking development of quick grading & assaying solution for eNAM which can also be connected to the internet to increase the efficiency of the agricultural chain.

3. Development of e-marketplaces to connect food processors with agripreneur/farmers to bridge the value gap – Farm to Fork model

While self-sufficiency in agriculture has been a priority for the Government and several policy initiatives weave around this objective, the post-harvest management including agricultural marketing has not kept pace with the changes in economy, particularly relating to setting up of an efficient supply chain. The need to unify market both at State and National level is, therefore, important to provide better price to farmers, improve supply chain, reduce wastages and create a unified national market for agricultural produce.

In such a scenario, National Agriculture Market (NAM) would create a win-win situation for both i.e. agripreneurs and processors.

4. Price forecast system for Pulses /Oilseeds /Potato /Onion / Tomato at the time of sowing

In India, price of commodity is dependent on various external factors such as area, yield, production, Household food demand, feed demand, etc.

In this regard, a mechanism may be developed by startups who can use the data of past trends and other mentioned factors and bring up the prices forecast of the particular crop depending upon sowing, taken into consideration the sowing patterns, weather and other factor mentioned.

5. Dissemination of information to the last mile - Agriculture Extension, Scheme information, processes, hand holding support for benefit under different Government schemes

In India, farmers may not be aware of all the schemes that are implemented by Central Government and State Governments for their welfare.

In this regard, the challenge seeks development of an online platform at the Panchayat / Common Service Center / KVK level which will provide information to farmers regarding schemes and benefits that they are entitled to thereunder. Linking with Aadhar, Soil Health Cards and crop as well as health insurance etc. may be considered on this platform for the welfare of farmers.

6. Yield estimation modelling at village or farm level

The success of implementation of Pradhan Mantri Fasal Bima Yojana depends upon accurate yield estimates at village/farm level. However, crop yield estimation is a very complex activity, as yield is influenced by many factors, such as crop genotype, soil, weather, management practice and various biotic and abiotic stresses.

In this regard, the challenge seeks to develop a web based spatial decision support system which takes data from high resolution satellite, UAV, satellite based agro-meteorological parameters, sensor networks giving information, etc. to provide estimates of yield at farm level. The solution should be evaluated for 2-3 different types of crops taking a block/tehsil as the minimum implementation unit. The solution should be user friendly, upgradable and expandable to other geographical area and other crops.

7. Use of technology in sorting/ grading/ increasing shelf life of agriculture produce (fruits, vegetables, flowers)

In agriculture, post-harvest handling is the preliminary stage in a crop's lifecycle which immediately follows harvest and is important to extend the marketable life of any produce.

The challenge is seeking technological solutions to increase the efficiency of the agricultural chain and ultimately reduce waste while increase farmers' earnings

8. Use of technology to test adulteration of fresh produce

Food is essential for nourishment & sustenance of life. Adulteration of food cheats the consumer and can pose serious risk to health. Food is adulterated if its quality is lowered or affected by the addition of substances which are injurious to health or by the removal of substances which are nutritious.

The challenge is seeking for technological solutions to give the consumer an opportunity to detect common adulterants in food.

9. Availability of small agricultural implements/ micronutrients/certified quality seeds through online/call center interface – Custom Hiring Centres

Creation of regional Agri-Kiosk by the respective department to provide a kind of a one-stop shop for all agricultural needs providing services such

as soil testing, seed selection, appropriate pesticides, herbicides, and fungicides. Agri-kiosks can also provide the latest agricultural equipment on rent which make it easily accessible for women farmers.

The challenge is looking for solutions to improve the availability of agricultural inputs through Custom Hiring Centres.

10. Alternate usage of paddy straw (left in field after harvesting of paddy) to discourage farmers from burning the same especially in Haryana and Punjab.

Burning of agricultural biomass residue, or Crop Residue Burning (CRB) has been identified as a major health hazard. In addition to causing exposure to extremely high levels of Particulate Matter concentration to people in the immediate vicinity, it is also a major regional source of pollution, contributing between 12 and 60 per cent of PM concentrations as per various source apportionment studies. In addition, it causes loss of vital components such as nitrogen, phosphorus, sulphur and potassium from the topsoil layer, making the land less fertile and unviable for agriculture in the long run.

The challenge is seeking for technological solutions for alternative usage of paddy straw to discourage Crop Residue Burning.

11. Technology to substitute the use of pesticides & insecticides to prevent pre-harvest losses

Insect, plant pathogen, and weed pests destroy more than 40% of all potential food production each year. This loss occurs despite the application of approximately 3 million tons of pesticide per year plus the use of a wide array of non-chemical controls, like crop rotations and biological controls. Due to lack of effective, affordable and eco-friendly technologies to control pests, farmers are left with no choice but to continue spraying harmful and toxic pesticides on crops.

The challenge is looking for technology solutions to substitute the use of pesticides & insecticides to prevent pre-harvest losses.

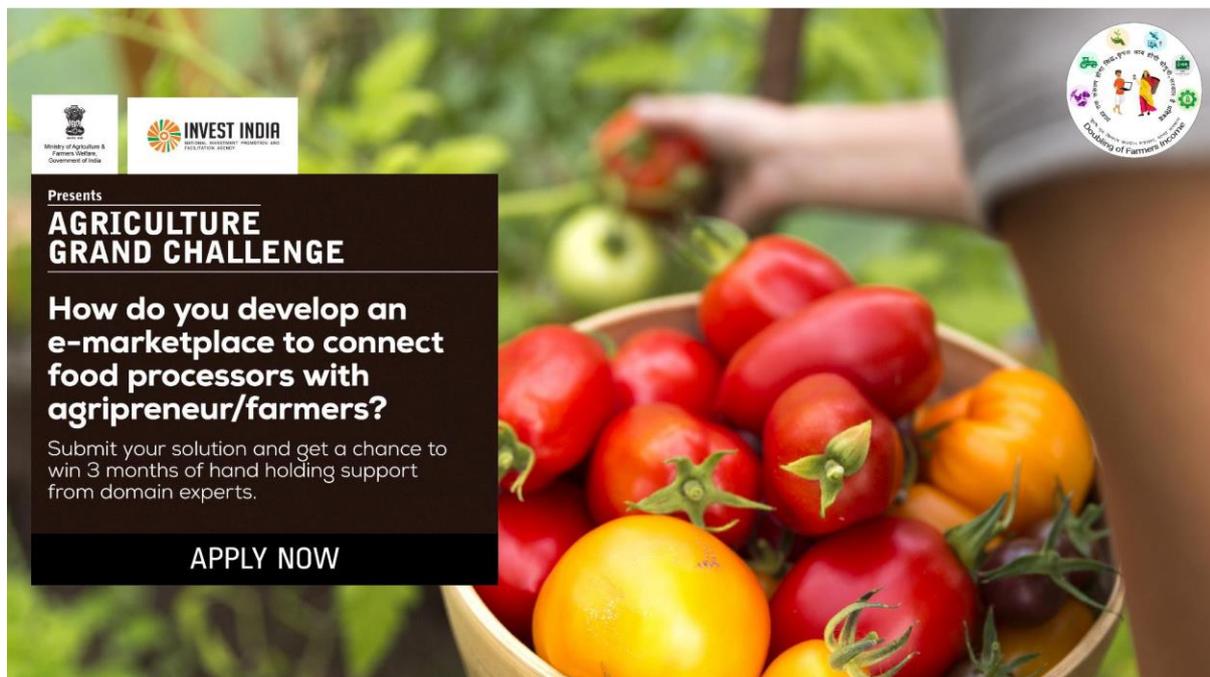
12. Seeking affordable, accessible, easy-to-use technologies, products or services to enhance agricultural productivity in India

One of the biggest issues facing the agricultural sector in India is low yield: India's farm yield is 30-50% lower than that of developed nations.

Average farm size, poor infrastructure, low use of farm technologies and best farming techniques, decrease of soil fertility due to over fertilization and sustained pesticide use, are leading contributors to low agricultural productivity. Indian farms are small (70% are less than 1 hectare, the national average is less than 2 hectares) and therefore have limited access to resources such as financial services, credit (or lenders), support expertise, educational services or irrigation solutions.

In the short-term, yield directly impacts a farmer's cash flow and the ability to respond to fluctuations in the market. Long-term, yield limits a farmer's ability to invest into their farm's future to increase productivity and decrease risks associated with their crops (via inputs such as seeds, fertilizer, crop insurance, market/weather info, livestock health support, etc.) but also to invest into their families in areas such as education, healthcare, training, etc.

The challenge is seeking affordable, accessible, easy-to-use technologies, products or services to enhance agricultural productivity in India.



Ministry of Agriculture & Farmers Welfare, Government of India

INVEST INDIA
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How do you get farmers the right information at the right time to handhold them through the risks of farming?

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How do you estimate yield at the village and farm level?

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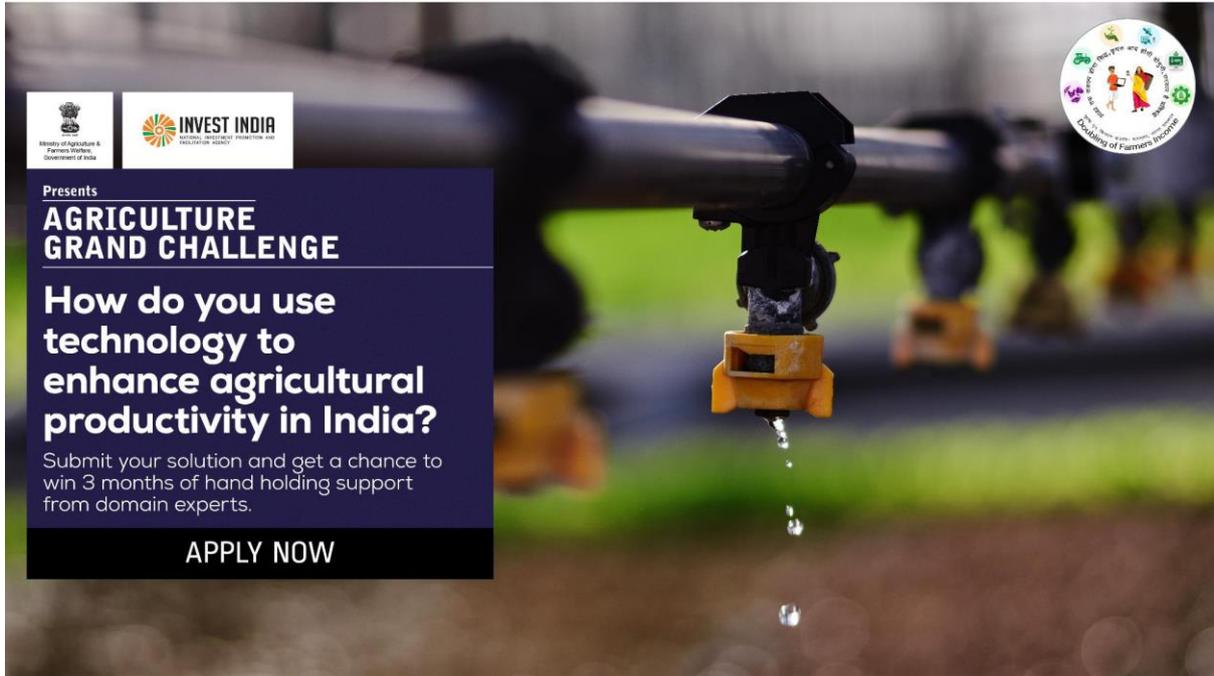
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How can technology be used to substitute the use of pesticides & insecticides to prevent pre-harvest and post-harvest losses?

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Submit your solution and get a chance to win 3 months of hand holding support from domain experts.

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How do you develop a simplified, sensor based quick testing method to test nutrients & micronutrients in soil?

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