



IIT Ropar – Technology and Innovation Foundation

iHub – AWaDH

Agriculture and **Water** Technology **Development Hub**
(AWaDH)

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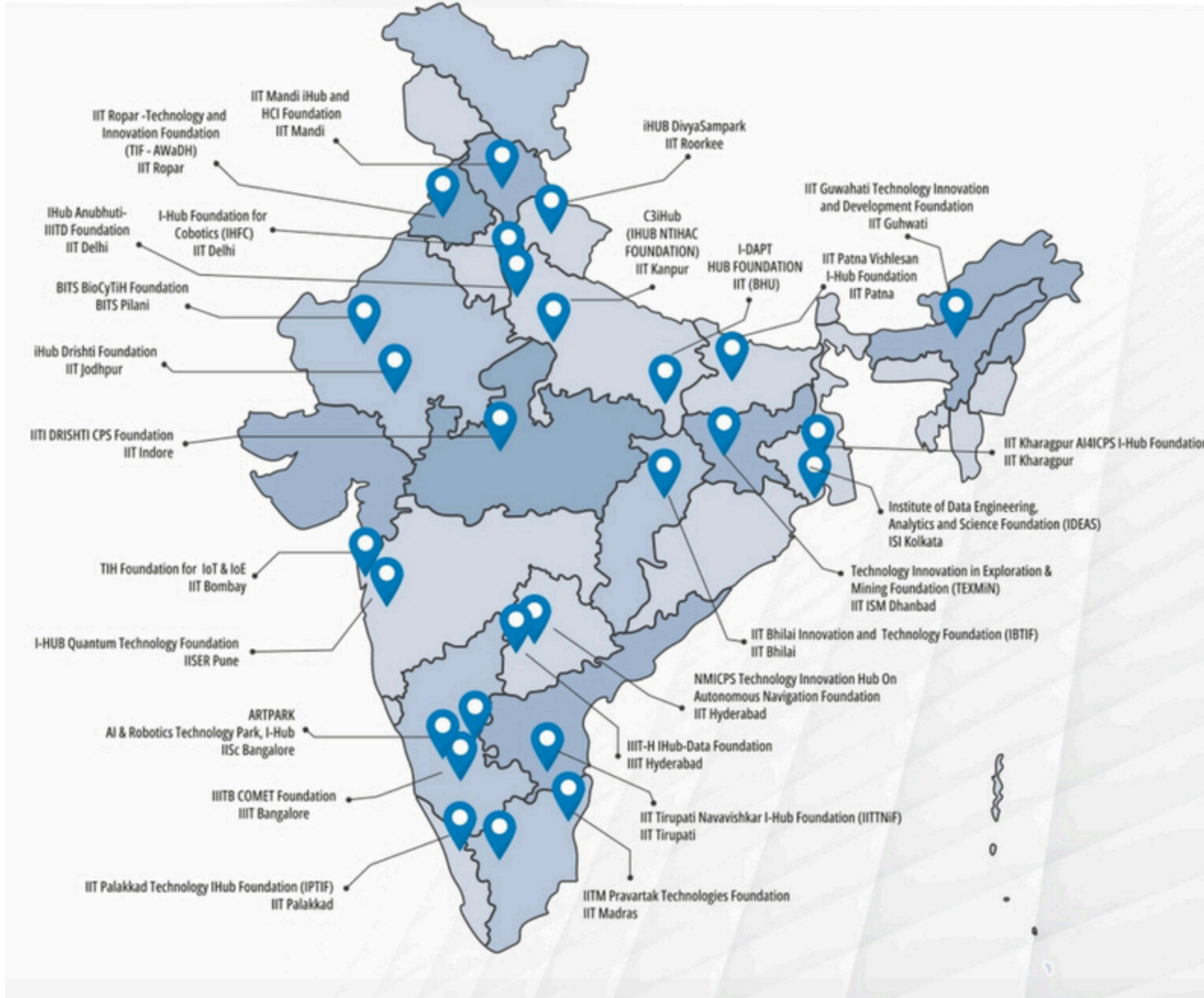
www.ihub-awadh.in



DST NM-ICPS: a Mission to drive India towards becoming Global R&D hub



25 Hubs | 3660 Cr (\$430M) of Budget | One Goal



\$1 = ₹83.57 (As of 11th July, 2024)

Agriculture



Defence



Environment



Healthcare



Infrastructure



Source: DST NM-ICPS



AWADH

IIT ROPAR - AGRICULTURE & WATER TECHNOLOGY DEVELOPMENT HUB

Quality Food • Sustainable Agriculture • Biodiversity

iHub - AWaDH

Water & Soil Quality Assessment Processes

Water Treatment & Management

Agri Residue Management & Urban Farming

Water/soil mapping - Hazardous substances

Agriculture Automation & Information Systems

Internet of Things (IoT)



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IIT Ropar at Glance



iHub AWaDH at IIT Ropar is a TIH under the **National Mission** on Interdisciplinary Cyber-Physical Systems (NM-ICPS) of DST with 110 Cr and supported by **Startup India / MeitY Startup Hub / DST NIDHI**

110 Cr (~\$13.25 M USD) 	05 Cr (~\$602 K USD) 	10 Cr (~\$1.20 M USD) 	640 Cr+ (~\$16.87 M USD) 	28 Cr (~\$3.37 M USD) 	1.4 Cr (~\$168 K USD)
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Technology Innovation and Skilling Landscape

90+ Tech Supported	150+ Publication & IP	220+ Partner	170+ Startup Supported	6000+ Skill Development	483+ CPS Research Base
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Entrepreneurial Landscape

Revenue & Startups 27 Cr+ (~\$3.08 M USD) 95 Cr+ (~\$7.42 M USD) by Hub by Startups 170 startups supported	Valuation and Investment 2200 Cr+ (~\$148 M USD) 0.30 Cr (~\$34.26K USD) Valuation Average Ticket Size	Investment in Startups 16.21 Cr+ (~\$1.95 M USD) 110.52 Cr+ (~\$12.59 M USD) Internal Investment (84 Startups) External Investment (46 Startups)
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IIT Ropar Accolades & Recognition



Indian Institute Of Technology Ropar receives the **Agriculture Leadership Award** from Agriculture Today Group



Innovation Program Leadership Award by Indian Chamber of Food and Agriculture (ICFA) on **31 August 2024**



Incubator, Research and Development Award and **Skill Development & Livelihood Award** at Social Impact Conference & Awards by The CSR Universe on **13 Sept 2024**



BHARAT Incubator Award by the Entrepreneurs Association of India EAI on **06 Sept 2024**



Best Incubator for significant contribution in Startup and Innovation by Confederation of Indian Industry on **23 August 2024**



Best Incubators, by **Munjal Birmingham** City University Centre of Innovation and Entrepreneurship & Ludhiana Angels on **12 April 2025**



Dr. Radhika Trikha recognised as **Women Leader of the 2025** by Prime Insights



IIT Ropar as Most Promising Institution in Agritech Domain - 2022 by Business Connect



Best Stall award in Academia in **VIVIBHA - 2024** on 16th November 2024



Dr. Mukesh Kestwal recognised as the **Top 10 Innovation Head** to Look in 2025 by CEO Insights



iHub - AWaDH recognised as **Top Agricultural Water Management Companies** in 2025



IIT Ropar TIF as **Leveraging Cloud Sustainability - Government**



IIT Ropar iHub - AWaDH is Recognised by **DSIR** as **Scientific and Industrial Research Organisation (SIRO)**



CEO Insights - Story of an Innovative Leader Redefining **Startup Ecosystem** by CEO Insights



Biodiversity Conservation Award at **CASCA25** by The CSR Universe on **24 April 2025**

Our Partners (200+)



Government Partners	 Department of Science and Technology (DST)	 Startup India	 IndiaAI	 MeitY Gol	 Bhashini	 MeitY Startup Hub
Academic & Ecosystem	 IIT Tirupati	 IIT Bombay TIH	 University of Petroleum Energy Studies	 NIT Delhi	 IISER Mohali	 IIT Indore TIH
Incubator & FPO Partners	 Wadhvani Foundation	 Innovation Mission Punjab	 Headstart Network Foundation	 AIC Nalanda Institute of Technology Foundation	 Vegetable Growers Association of India	 IIT Kanpur SIIC
Corporate Partners	 Modex3D	 GitHub	 Puri Oil Mills Limited	 COMSOL	 E2E Network Limited	 HDFC Parivartan
Investment Partner	 Blume Venture	 Real Time Angel Fund	 Unicorn India Ventures	 Seafund	 Factoryal	 3to1 Capital
Global Partners	 Syngenta	 Fraunhofer	 INRAE	 ESG Weise	 Segger	 Dassault System

Government, Academia & Industry Partner (220+)

Investment Partners (50+)

iHub - AWaDH (DST NM-ICPS Technology Innovation Hub)



50+ Investment Partner for SAMRIDHI and other investment activities

More Information at
www.iHub-awadh.in

Our Programs



Support In

- Technology Development
- Startup & Entrepreneurship
- Human Skilling & CSR Activities
- Collaboration & Partnerships

Technology Development



ICPS (Startup & Researchers)

Technology development and validation 360 degree support in CPS for enhancing TRL scale and commercialisation

Upto 1 Cr

Startup and Entrepreneurial



SPRINT
Incubation Program

Strategic Program for Research Innovation and Next-Gen Tech-Commercialisation

Investments upto 25 Lakh INR

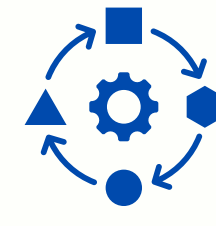


SAMRIDHI
Acceleration Program

Strategic Acceleration for 'Market, Research, Innovation & Development': a Holistic Initiative for ICPS Startups

Investments upto 50 Lakh INR

Human Skilling and HRD



ICPS (Students & Researchers)

Training and Internship Program for students and startups on ICPS Domain by national and international partners

Fellowships: 8k to 1.5 Lakh per month

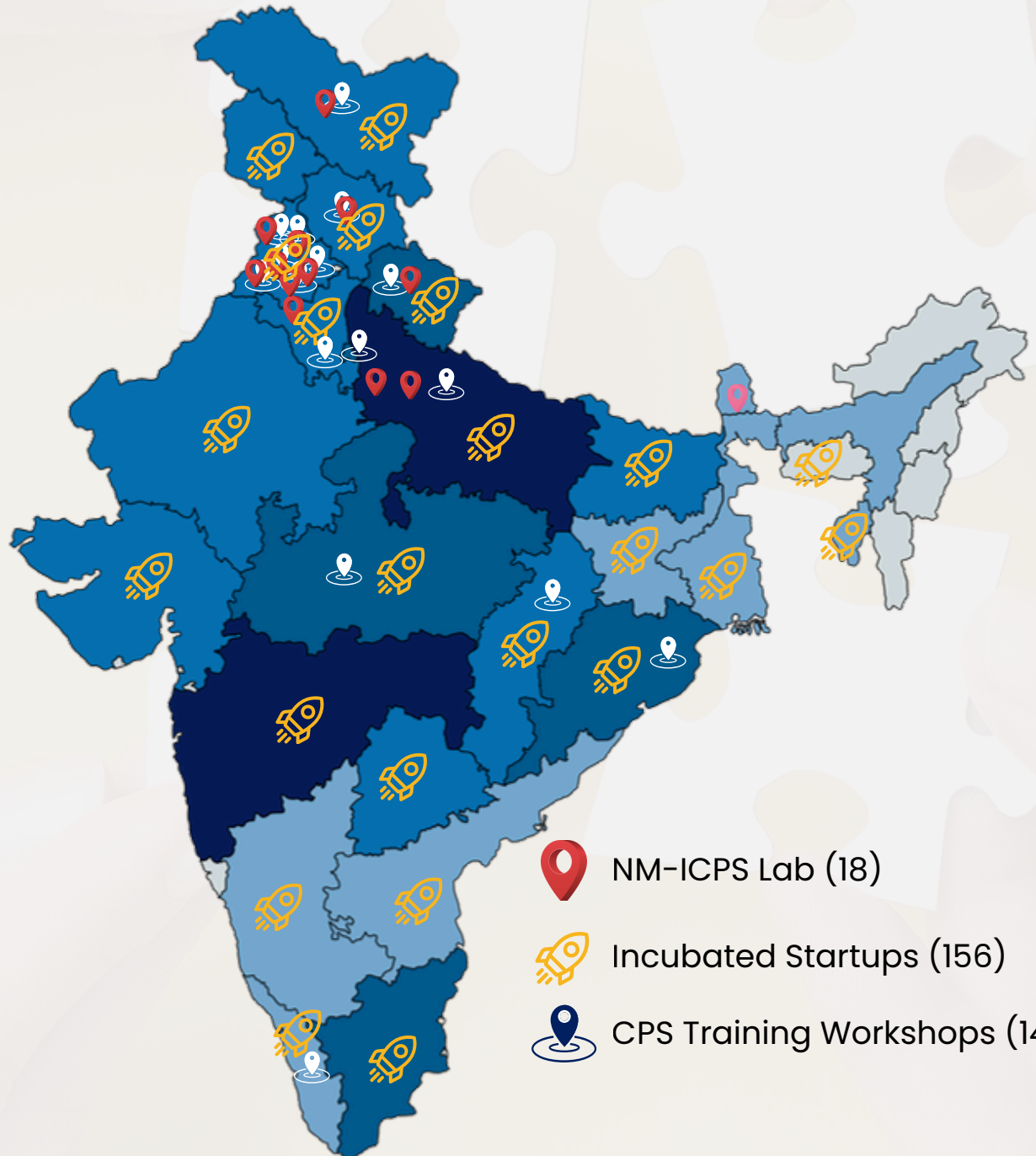



- Investment and financial support for Startups
- Support in Tech commercialization
- Technology Validation and Due Diligence
- Support from Prototype to product launch
- Partnership, Collaboration and Connects
- Testbed and support in joint technology Development
- Deployment of Market ready products
- Mentoring Support
- Technology Development
- Corporate & Govt. Network
- Extended Team
- Lab Infrastructure & R&D Support
- upto 50 Lakhs Grant/Debt / Equity per startup


Growing Spokes Institutes Network (SpINE) across India


NM-ICPS Lab (18)

-  National Institute of Technology Delhi
-  National Institute of Technology Jalandhar
-  Tula's Institute - Dehradun, Uttarakhand
-  Thapar Institute of Science & Technology - Patiala, Punjab
-  Chitkara University - Rajpura, Punjab
-  Baba Farid Group of Institutions - Bathinda, Punjab
-  University of Ladakh
-  Centre For Computers and Communication Technology (CCCT) in Chisopani, Sikkim
-  Khalsa College of Engineering & Technology, Amritsar
-  Indian Institute of Information Technology Una
-  Chamber of Industrial & Commercial Undertakings, Ludhiana
-  IILM, University Greater Noida
-  HRIT University, Ghaziabad
-  Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut
-  Acropolis Institute of Technology and Research - Indore, Madhya Pradesh
-  Hindustan Institute of Technology and Science - Chennai, Tamil Nadu
-  Model Institute of Engineering and Technology - Jammu
-  Shoolini University, Solan, Himachal Pradesh





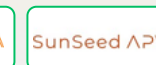









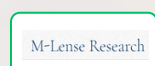

















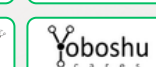

























 NM-ICPS Lab (18)

 Incubated Startups (156)

 CPS Training Workshops (14)

-  National Institute of Technology Agartala
-  Punjab Remote Sensing Centre (PRSC)
-  The Roorkee Institute of Technology, Roorkee, Uttarakhand
-  Guru Nanak Dev University, Amritsar
-  GBPANT, Pantnagar
-  SKUAST, Kashmir
-  The Jaypee University of Information Technology Waknaghat, Solan
-  National Institute of Technology, Uttarakhand
-  National Institute of Technology Srinagar
-  Punjab Agricultural University, Ludhiana
-  Guru Angad Dev Veterinary and Animal Sciences University Ludhiana (GADVASU)
-  Punjab Engineering College, Chandigarh
-  Islamic University of Science and Technology, Awantipora - J & K



responsible
consumption
and
production

sustainable
cities and
communi

zero

peace, justice,
and strong
institutions

and
economic
growth

affordable
and
clean
energy

good
health
and
well-being

reducing
inequality

Technology Development



gender
equality

life
below
water

quality
education

industry,
innovation

climate

no



Technology Development Landscape: TRL View
 Tech Commercialized so far: 12
 Market Ready Tech: 54
 Technology Projects: 90

TRL Stage	Technologies by TIH		Technologies by Startups (94)
	Agriculture	Water	Agri & Water Tech
TRL 1-3	12	05	0
TRL 4-6	19	06	23
TRL 7-9	42	06	71
Total	73	17	94

Domain-Wise Innovation Footprint at AWaDH



Agriculture Automation & Information systems

32.4%



Internet of Things (IoT) and Cyber Physical Systems (CPS)

17.6%



Water Treatment & Management

12.2%



Stubble Management Systems & Urban Farming

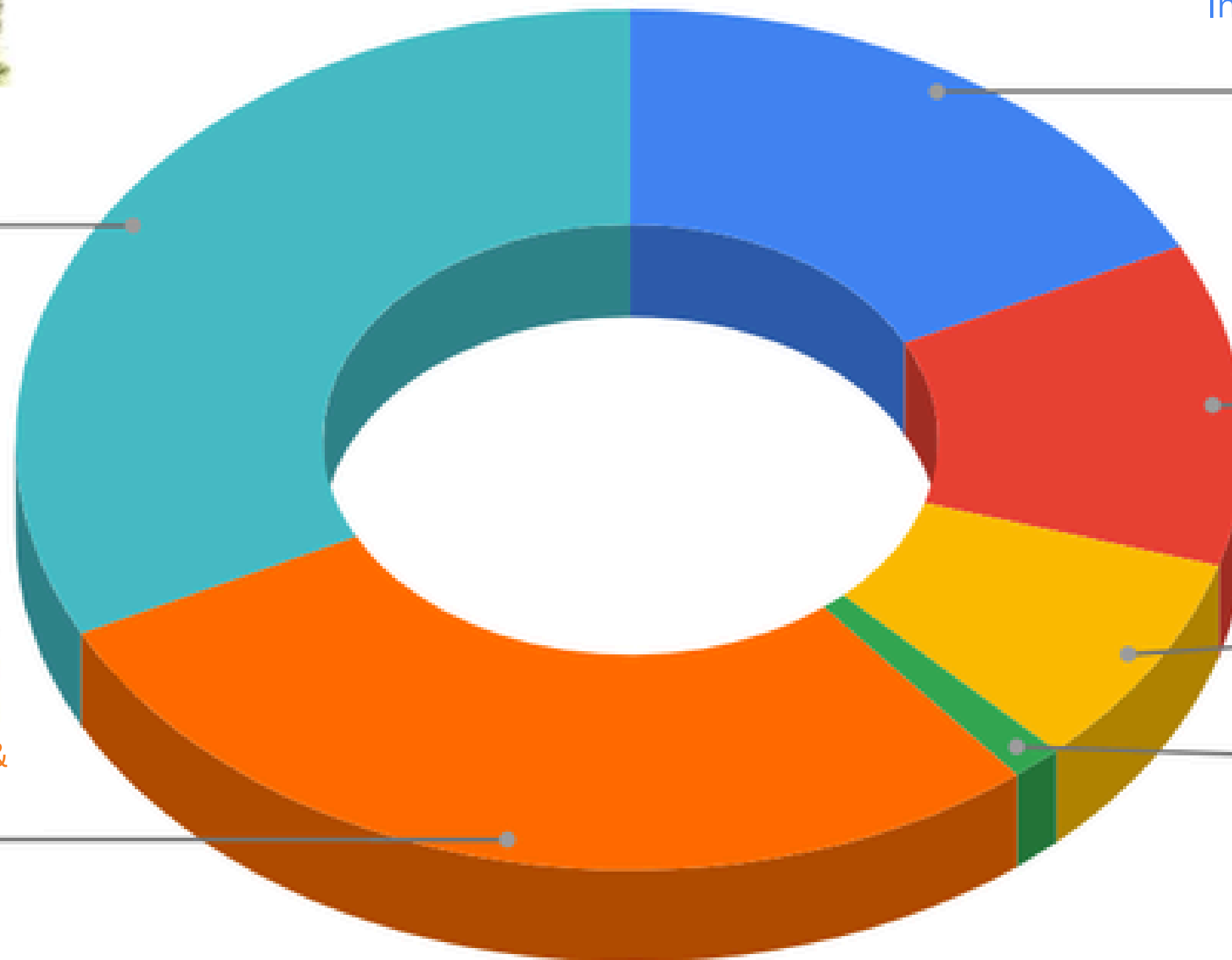
28.4%

Agriculture Automation & Information systems

8.1%

Others

1.4%



key Technologies Developed & Deployed by IIT Ropar TIH AWaDH

1. Digital Entomologist



- **Solar-powered Biodiversity Sensor** is encased in **weather-proof housing**, including a **motion-detection camera, internet connectivity, and a provision to connect peripherals**.
- The Device is generating **in-the-field time series biodiversity measurement data globally**.
- Technologies deployed **globally** providing a live feed of insects in fields from Pune and Ropar (India), Bazel (Switzerland), and Fraunhofer (Germany)]
- **Impact Generated:** Developing one of its kind **Biodiversity Index** (first in the entire world; Devices also deployed with Startups)
- **TIH Grant of 40 lakhs; 2 Cr contributed by Syngenta Global**
- Cost of the Device: 2.5 Lakh in INR, No competitor

2. Livestock Health Monitoring Device



- An **AI - powered livestock management CPS** to monitor the behaviour (Standing/Lying duration; Feed intake and feeding duration; Rumination duration, etc.) of the livestock.
- **Collaborative Project** with Guru Angad Dev Veterinary And Animal Sciences University (**GADVASU**) in Ludhiana & **NABARD**.
- **TRL>9**
- **Technology Transferred to MooFarm Pvt. Ltd.** with impact on > 150000 farmers
- **Cost Effective technology:** 3,000 INR Collar + 50,000 INR BLE Gateway (300 Channels); *Livestock monitoring devices in India are available at an average cost of INR 15000-18000.*

3. Nanobubble Technology



- **Nanobubbles, at 1,000 times** smaller than a human hair, are electrochemically active bubbles transforming water treatment.
- They generate **free radicals, degrading organic matter, eliminating pathogens, and oxidizing harmful chemicals**.
- First scalable nanotechnology
- Up to **400 % Oxygen Enhancement Plug and play installation** and easy maintenance
- **IoT system enabled** leading to better water distribution and reduced water wastage.
- **Emerged as Spin off company; technology transferred** from AWaDH to startup.
- Deployed in **various ponds and water reservoirs** in state of Punjab in collaboration with the Punjab Government

Bio Diversity Sensor Project



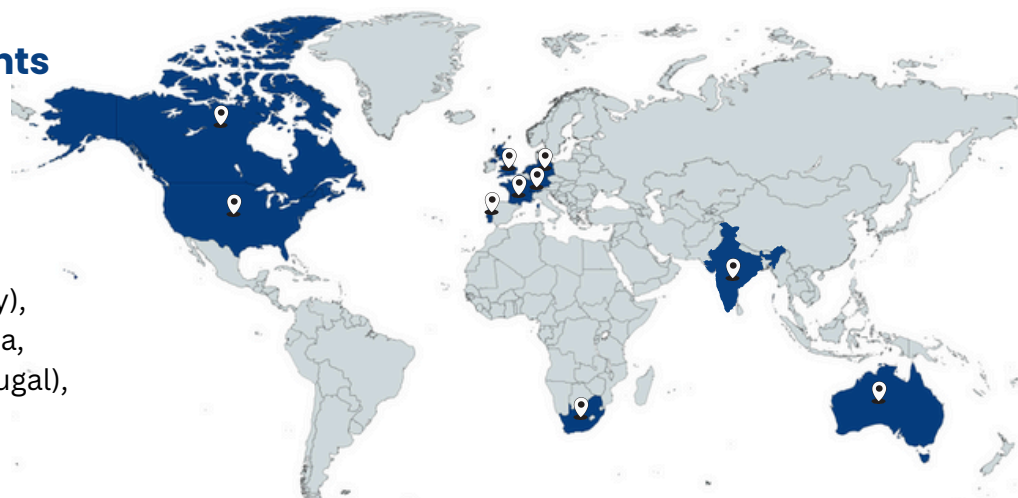
Funding: 28 Cr | TRL: 09

Accolades:

- Formal Launch at World Biodiversity Forum
- Prototype version 2.0 field tested
- Crop Science Awards 2022
- Runner-up in Best Innovation in Digital Farming Technology
- Runner-up Cloud Awards for Sustainability

Global Deployments (30+)

- Pune (India),
- Ropar (India),
- Bazel (Switzerland),
- Fraunhofer (Germany),
- USA, France, Australia,
- Idanha-a-Nova (Portugal),
- Netherland



Biodiversity Scanner Surges Globally, Revolutionizing Species Monitoring



United Kingdom
Deployment IDs - 112-115, 67-72, 84-85, 07-11, 81, 82, 13, 14



Switzerland
Deployment IDs - 26, 44, 17, 18, 19



Australia
Deployment IDs - 46-53

Department of Science and Technology Hub Indian Institute of Technology Ropar iHub AwaDH

NanoAqua Nanobubble Generator Nanokriti- In-house manufacturing

Call for potential distributor of our machines

- Energy Efficiency
- Improved Water Quality
- Chemical-Free Solution
- Material of Construction
- IoT System

Nanobubble Generator
Nano Cloud Enhanced Do level

Department of Science and Technology Hub Indian Institute of Technology Ropar iHub AwaDH

Bluetooth Low Energy Gateway

- Low Power Consumption
- Wireless Connectivity
- Compatibility
- Real-Time Monitoring
- Data Aggregation
- Firmware Over-The-Air
- Compact Design
- Range upto 1km
- 100+ Nodes Connected

BLE Gateway

STUBBLE REMOVING MACHINE

- Tractor Mounted for Easy Operation
- Effective Stubble Cutting & Collection
- Dual Crop Compatibility
- Cost & Fuel Efficiency
- Eco-Friendly Alternative to Stubble Burning

IQUA - WATER QUALITY AQUA MONITORING

- Municipal Water Treatment
- Industrial Water Quality Control
- Aquaculture & Fisheries
- Environmental Water Monitoring
- Wastewater Treatment

Parameters Measured

- Chlorine
- COD
- Dissolved Oxygen
- TSS
- BOD
- Hypochlorous Acid



Technologies Developed & Deployed by IIT Ropar TIH AWaDH

R&D and Tech Projects



#startupindia



Industrial IoT Lab Kits



- 24 plug-n-play modules for industrial automation
- Skilling, re-skilling, up-skilling
- Technology Transferred to Terafac
- Pvt. Ltd.
- Different model of sale for Academia and Industry

4 industry partners

Nano Bubble Generators: water quality improvement (spinoff)



Up to 400 % Oxygen Enhancement
Plug and play installation and easy maintenance
IoT system enabled

Fisheries
Wound healing in animals
Remediation of water / village ponds
Oxygen –recharging of water / high altitude application

Realtime Water Quality Monitoring



Stubble Removing Machine



The machine can be mounted on a tractor-trolley and can chop the stubble up to the height of few centimeters from the ground and automatically load it in the trolley thus saving labour and reducing extra spending on diesel, the two main concerns of farmers.

BLE Gateway

BLE Gateway seamlessly bridges Bluetooth-enabled sensors to the cloud, enabling real-time monitoring and data analysis



Automatic Weather Station

It involves techniques like soil sampling, laboratory analysis, and sensor technologies to evaluate parameters like nutrient levels, pH, and microbial activity.



Technology for Commercialisation



Technology Name
Digital Entomologist
MooSense 1.0 and 2.0, a CowHealth Monitor Device
Air Sense
Industrial IoT Lab
Nanobubble Generator
Nano-bubble Oxygen
Model: Nano Aqua N-10
Model: Vitus N-30
Model: Nano Booster N-15
AmbiTag USB
AmbiTag BLE
Aqua IoT 1.0
SaraloT 1.0
Pneumatic vegetable seed sowing machine
Stubble Removing Machine



Digital Entomologist



MooSense 1.0 and 2.0, a CowHealth Monitor Device



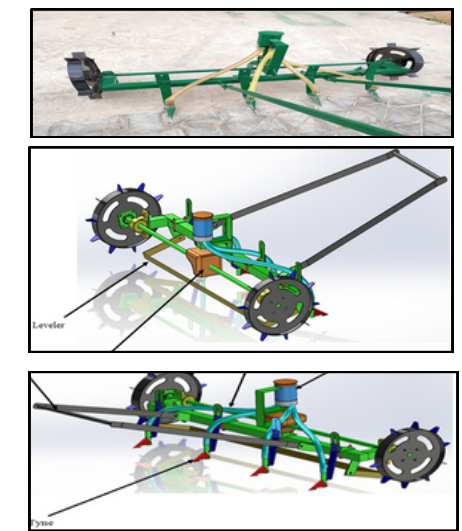
Stubble Removing Machine



Chloritron



Air Sense



Pneumatic vegetable seed sowing machine



BLE Gateway



Nanobubble Generator

Indian Institute of Technology – Ropar Technology and Innovation Foundation



Agriculture and Water Technology Development Hub

DST NM-ICPS Technology Innovation Hub

TECHNOLOGY COMPENDIUM

AmmoniQ

Technical Brief

Ref No: TechBrief/2025/07

Technology Summary

AmmoniQ is a smart, affordable ammonia detection system designed to protect livestock, farmers, and farm workers from the harmful effects of ammonia exposure. Developed at IIT Ropar – Technology and Innovation Foundation (AWaDH), it uses a MEMS-based sensor and nRF52 microcontroller to continuously monitor air quality in livestock environments. The system includes a built-in alarm for real-time alerts and offers mobile/cloud integration for remote monitoring. With TRL-9 and in-market use, it delivers high impact at low cost and supports goals of animal welfare, regulatory compliance, and environmental sustainability.

Background

Ammonia emissions in dairy, poultry, and livestock farming pose significant health risks to animals and humans, contributing to respiratory illnesses, reduced milk yield, and premature livestock mortality. Regulatory pressure and rising awareness have created demand for continuous, real-time monitoring solutions. However, existing systems are often expensive, complex, or inaccessible to small and medium-scale farmers. AmmoniQ fills this gap by offering an affordable, real-time, alarm-enabled ammonia monitoring system suitable for both smallholders and commercial farms.

Technology Description

AmmoniQ uses a compact MEMS ammonia sensor integrated with an nRF52 microcontroller, which processes and transmits data wirelessly via Bluetooth. When ammonia levels exceed set thresholds, the device triggers an onboard audible/visual alarm and pushes alerts to the cloud or mobile app. The device supports low-power operation, making it ideal for remote or off-grid settings. It is suitable for standalone use or integration into precision livestock systems, ensuring continuous air quality monitoring.

Market Potential / Proposed Deployment

- Global Ammonia Sensor Market: USD 163.27M (2024) → USD 231.60M (2031) | CAGR -6%
- Precision Livestock Farming Market: USD 6.9B (2023) → USD 11.2B (2028) | CAGR -10.2%
- Livestock Monitoring Segment: USD 1.65B (2025) → USD 2.57B (2031) | CAGR -7.7%
- Target Segments:
 - Small to large-scale livestock farmers
 - Dairy and poultry farms
 - Agri-tech platforms and vet consultants
 - Animal health NGOs and regulators

Applications

- Dairy Farms: Continuous ammonia monitoring to reduce animal stress and mortality.
- Poultry Farms: Prevent respiratory disorders and enhance compliance with air quality norms.
- Livestock IoT Integration: As a modular component within precision farming systems.
- Veterinary Use: As a diagnostic and preventive tool for monitoring barn conditions

Value Proposition

- Cost-Effective: Budget-friendly device with high-impact results.
- Real-Time Alerts: Instant notifications and alarms ensure timely action.
- Remote Monitoring: Cloud and app access for on-the-go tracking.
- Health & Safety Focused: Designed to prevent accidents and enhance animal welfare.
- Low Power & Reliable: Optimized for rural deployment with Bluetooth connectivity.

Technology Status

- Technology Readiness Level (TRL): 9 – In market use
- Testing: Self-tested and validated (no external/NABL certification yet)
- IP Status: No patent filed yet; open for licensing/collaboration
- Adoption: No pilots or partnerships yet, but field-ready for commercialization



Livestock Health Monitoring Device

Technical Brief

Ref No: TechBrief/2025/10

Technology Summary

MOOSense is an AI-powered livestock management Cyber-Physical System (CPS) designed to monitor and analyze the behavior of cattle in real-time. It tracks key activity metrics such as standing/lying duration, feed intake and feeding duration, and rumination duration, enabling data-driven decisions for herd health, productivity, and welfare. Developed as a collaborative project between IIT Ropar – Technology and Innovation Foundation (AWaDH), Guru Angad Dev Veterinary and Animal Sciences University (GADVASU), Ludhiana, and NABARD, MOOSense combines low-cost hardware with advanced analytics to deliver actionable insights to farmers. With a Technology Readiness Level (TRL) above 9, the technology has been transferred to Moofarm Pvt. Ltd., positively impacting over 150,000 farmers in India.

Background

Livestock productivity in India is often affected by undetected illnesses, poor feeding practices, and stress due to environmental and management factors. Early detection of behavioral changes can help prevent productivity loss and improve animal welfare. However, existing livestock monitoring systems are expensive, with devices costing ₹15,000-₹18,000 per animal, making them inaccessible to small and medium scale farmers. MOOSense addresses this gap by offering an affordable, scalable, and AI-driven livestock monitoring solution tailored for the Indian dairy sector.

Technology Description

MOOSense uses a low-cost sensor collar (₹3,000 per unit) worn by livestock to collect behavioral data. The sensors communicate wirelessly with a Bluetooth Low Energy (BLE) Gateway (₹50,000 per unit) capable of handling up to 300 collars simultaneously. Data is transmitted to the cloud for AI-powered processing, which analyzes activity patterns to detect anomalies in feeding, rumination, and rest. Farmers can access reports and alerts via a mobile app or web dashboard, enabling timely intervention. The system is energy-efficient, durable for field conditions, and suitable for both smallholder and commercial farms.

Market Potential / Proposed Deployment

- Global Livestock Monitoring Market: USD 1.65B (2025) → USD 2.57B (2031) | CAGR -7.7%
- Target Segments:
 - Small to large-scale dairy farmers
 - Veterinary hospitals and research institutions
 - Dairy cooperatives and agri-tech platforms
- Socio-economic Impact:
 - Health Benefits: Reduced disease incidence and mortality
 - Economic Gains: Higher milk yields and better herd productivity
- Affordability: Brings advanced livestock monitoring within reach of smallholder farmers

Applications

- Dairy Farms: Improve milk yield and reproductive health through behavior-based monitoring.
- Veterinary Use: Support early diagnosis of metabolic and digestive disorders.
- Livestock Research: Enable data collection for academic and commercial studies.
- Large-Scale Herd Management: Monitor hundreds of animals simultaneously with a single BLE Gateway.

Value Proposition

- Cost-Effective: Collar at ₹3,000 and BLE Gateway at ₹50,000 for 300 channels – far below the market average.
- Scalable: One gateway supports large herds, reducing infrastructure cost.
- AI-Powered Insights: Accurate detection of behavioral anomalies.
- Health & Welfare: Early alerts help reduce illness and improve animal productivity.
- Field-Proven: Successfully deployed with measurable impact on over 150,000 farmers.

Technology Status

- Technology Readiness Level (TRL): >9 – Commercialized and in large-scale use
- Testing: Field-validated in collaboration with GADVASU and NABARD
- IP Status: Technology transferred to Moofarm Pvt. Ltd.
- Adoption: Commercially deployed, benefiting >150,000 farmers across India



Stubble Removal

Technical Brief

Ref No: TechBrief/2025/05

Technology Summary

The Stubble Removing Machine is a tractor-mounted, high-capacity solution designed to manage crop residues sustainably and efficiently. It cuts stubble down to a few centimeters from the ground and simultaneously loads it into a trolley, eliminating the need for manual collection and reducing fuel consumption. Compatible with 40-60 HP tractors and capable of covering up to 1 acre per hour, this eco-friendly, cost-effective technology is ideal for managing both rice and wheat stubble across diverse field conditions.

Background

Post-harvest stubble management is a major challenge in Indian agriculture, especially in rice and wheat cultivation. Conventional methods, particularly stubble burning, have severe environmental consequences, including air pollution, greenhouse gas emissions, and soil degradation. Farmers face increasing pressure to adopt cleaner alternatives, but labor shortages and high operational costs often limit sustainable options. The Stubble Removing Machine addresses these challenges by offering a practical, farmer-friendly solution that improves field preparation while supporting environmental goals.

Technology Description

The machine features a robust mild steel frame, adjustable depth control, safety guards, and a hydraulic lifting system for ease of operation. It works with 40-60 HP tractors and has a working width of 6-8 feet, allowing it to clear approximately 1 acre of land per hour. With fuel consumption of just 1-1.5 liters per acre, it minimizes operational expenses. The chopped stubble is directly collected into a trolley, streamlining the residue management process. Easy blade replacement and low maintenance further add to its appeal for long-term use.

Market Potential / Proposed Deployment

- India Market: Punjab, Haryana, UP, and parts of Madhya Pradesh and Bihar present a massive market due to government restrictions on stubble burning and incentives for eco-friendly machinery.
- Global Market: Stubble management equipment market projected to grow alongside sustainable agriculture and conservation tillage practices.
- Estimated CAGR: Agricultural machinery market in India growing at ~8-10% CAGR; residue management segment expected to see double-digit growth driven by policy support and environmental compliance.
- Target Segments: State Agriculture Departments, Custom Hiring Centres (CHCs), Agri-startups, FPOs, and individual progressive farmers.

Applications

- Post-harvest stubble removal for rice and wheat crops.
- Integration with sustainable and conservation agriculture programs.
- Effective residue collection and transport for biomass processing or composting.
- Suitable for both smallholder and large commercial farms.

Value Proposition

- Eco-Friendly: Reduces air pollution by eliminating the need for stubble burning.
- Fuel-Efficient: Uses only 1-1.5 L of diesel per acre, reducing operating costs.
- High-Throughput: Covers up to 1 acre/hour with minimal labor input.
- Durable: Heavy-duty 2600 kg mild steel frame ensures long-term use.
- User-Friendly: Requires only one operator, with intuitive depth control and hydraulic lifting.
- Sustainable: Supports retention of soil nutrients and improves long-term soil health.

Technology Status

- Readiness Level: TRL 8-9 (ready for commercial deployment).
- Current Deployment: Operational prototypes with positive field feedback; suitable for immediate adoption by farmers and cooperatives.
- Scalability: Customizable for different crop types and farm sizes; potential for manufacturing scale-up and policy-linked deployment through state agriculture schemes.



Real-Time Water Quality Monitoring System

IQUA

Technical Brief

Ref No: TechBrief/2025/02

Technology Summary

The Real-Time Water Quality Monitoring System is an IoT-based sensor system for 24x7 monitoring of irrigation and drinking water quality. It measures parameters like pH, TDS, turbidity, temperature, conductivity, and heavy metals, providing mobile alerts and cloud integration. The technology is at a Technology Readiness Level of 8-9 (Field-tested, deployable).

Background

The fundamental challenge driving this technology is the escalating difficulty in ensuring access to safe and clean water, a problem intensified by increasing urbanization, industrial pollution, and overall water scarcity. The background problem is compounded by the severe limitations of traditional water testing methods. These conventional approaches are predominantly manual, resource-intensive, and infrequent. This results in a lack of real-time visibility into water quality, leading to critical delays in detecting contamination events, creating gaps in regulatory enforcement, and posing significant risks to both public health and the environment.

Technology Description

The IQUA system is an advanced, field-tested (Technology Readiness Level 8-9) solution for 24/7, real-time water quality monitoring. It is a modular, IoT-based system built with a suite of robust sensors to track a wide range of critical parameters, including pH, Total Dissolved Solids (TDS), turbidity, temperature, conductivity, heavy metals, Dissolved Oxygen (DO), Chemical Oxygen Demand (COD), Biological Oxygen Demand (BOD), and chlorine. Engineered for durability and autonomy, the system features self-cleaning, waterproof (IP68) sensors and is powered by a low-power (12V DC) design, making it ideal for solar-powered deployment in remote locations with minimal maintenance.

Market Potential / Proposed Deployment

- Global Market: The global market was valued between USD 5.67 billion and USD 6.18 billion in 2024. It is projected to expand significantly, with forecasts predicting it could reach over USD 12 billion by 2030, driven by a strong Compound Annual Growth Rate (CAGR) of up to 12.3%.
- Indian Market: In India, the market was valued at USD 224.0 million in 2023 and is expanding rapidly. It is projected to grow at a CAGR of 10.9% through 2030, fueled by national initiatives like the Jal Jeevan Mission and stricter industrial compliance rules.

Applications

- Agriculture: Prevents soil degradation and crop loss from poor water quality, ensures safe water use in irrigation and livestock, and promotes data-driven water governance in rural areas.
- Municipal Water: Ensures safe distribution & compliance with regulations.
- Industry: Useful for process water control in dairy, textile, and chemical industries.
- Aquaculture: Leads to improved fish health & productivity.

- Environment: Can be used for river and lake monitoring to track pollution.
- Wastewater/STPs: Helps in maintaining compliance with discharge norms.
- Healthcare/Labs: Ensures the availability of sterile, contamination-free water.

Value Proposition

- Portable and solar-powered, requiring minimal maintenance.
- Provides real-time alerts and AI-based analytics via mobile/web dashboards.
- Features self-cleaning, waterproof (IP68) sensors.
- Built on a modular, low-power (12V DC), and scalable design.
- Suitable for both farm and community water sources.

Technology Status

The system is at a Technology Readiness Level (TRL) of 8-9, indicating it is field-tested and ready for deployment.



Vitus Nanobubble Generator

Technical Brief

Ref No. 2025/AWaDH/OITC/030

Technology Summary

The Vitus Nanobubble Generator Series is a high-efficiency, compact gas-to-liquid nanobubble mixing system designed for process industries, wastewater treatment, and precision agriculture. It produces ultra-fine, stable nanobubbles (~80 nm) using air, oxygen, or other gases, achieving an oxygen transfer efficiency of 75-80%. By dramatically increasing solubility and mass transfer, it improves chemical reactions, enhances solid-liquid separation, and reduces reliance on external chemicals.

Background

Traditional aeration and dissolved air flotation (DAF) systems face efficiency bottlenecks, requiring higher energy inputs and chemical dosing to achieve desired water quality. Industries and farms alike struggle with scaling, biofilm, and nutrient distribution challenges. Vitus addresses these gaps by delivering stable nanobubbles that persist longer in solution, ensuring more uniform oxygenation and higher productivity across diverse environments.

Technology Description

Vitus uses a centrifugal pump with a gas compressor to infuse gases into water, creating nanobubbles at densities >1x10⁸/ml. The compact design supports plug-and-play operation, with flow capacities ranging from 5 m³/hr (Vitus 5) to 20 m³/hr (Vitus 20). Units are built with SS304/cast iron construction for durability, and operate at low power footprints, making them compatible with both small farms and pilot industrial setups.

Applications

- Process Industries: Improved mixing and aeration in chemical, pharmaceutical, and food sectors.
- Wastewater Treatment: Boosts performance of dissolved air flotation (DAF) and effluent treatment plants.
- Agriculture & Greenhouses: Enhances oxygenation, nutrient uptake, and suppresses root pathogens.
- Food & Beverage: Ensures more efficient cleaning, mixing, and disinfection.

Market Potential / Proposed Deployment

- Growing demand in industrial wastewater treatment and precision irrigation under sustainability mandates.
- Aligns with global push for chemical-free and energy-efficient water treatment.
- Suitable for both developing and developed market adoption.

Applications

- Process Industries: Enhances mixing, aeration, and reaction efficiency in chemical, pharma, and food sectors.
- Wastewater Treatment: Improves DAF performance, reduces chemical use, and lowers operational costs.
- Agriculture & Greenhouses: Boosts root oxygenation, nutrient absorption, and plant health.
- Food & Beverage: Improves cleaning, disinfection, and mixing efficiency.

Value Proposition

- Cuts chemical usage while lowering OPEX in ETBs and STPs.
- Improves root oxygenation and plant vigor in irrigation systems.
- Suppresses algae, pathogens, and biofilm in industrial water systems.
- Compact and robust, integrates seamlessly into existing setups with minimal modification.

Technology Status

- TRL 8-9: Commercial units deployed in agriculture and industrial pilots.
- Field validation shows improved dissolved oxygen, reduced chemical use, and stable long-term performance.



NVM-Based Architecture for Intermittent Computing

Technical Brief

Ref No. 2025/AWaDH/OITC/031

Technology Summary

This technology introduces a non-volatile memory (NVM)-based system architecture tailored for intermittent computing—devices powered by unreliable or harvested energy sources. The design efficiently integrates NVM into the processor pipeline to reduce checkpointing overhead, minimize energy waste, and enable reliable execution even under frequent power failures. It provides significant improvements in execution speed, energy utilization, and reliability compared to conventional intermittent computing frameworks.

Background

Intermittent computing devices, such as batteryless IoT nodes powered by solar, RF, or vibration energy, often face abrupt power losses. Existing solutions rely on checkpoint/restore techniques to save system state into memory during power failures. However, conventional approaches store data in volatile SRAM or in slow, energy-hungry flash memory, leading to high overheads and inefficiency. This NVM-based architecture directly addresses these challenges by providing fast, low-energy, persistent storage, ensuring smooth execution cycles for energy-harvesting devices.

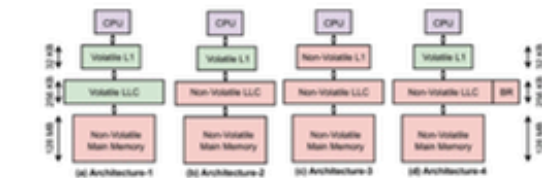
Technology Description

The proposed architecture integrates non-volatile memory elements into the system's critical path to preserve state seamlessly during power loss. Key features include:

- **Efficient State Retention:** Eliminates frequent checkpoints by leveraging fast-write NVM.
- **Energy-Aware Execution:** Dynamically adjusts memory usage and computation flow under energy constraints.
- **Reduced Overhead:** Cuts down energy consumption and performance penalties associated with traditional checkpoint/restore models.
- **Prototype Evaluation:** Implemented and tested under real-world intermittent power scenarios, showing substantial performance and energy improvements.

Market Potential / Proposed Deployment

- **Global IoT Market:** USD 662B (2023) → USD 1.38T (2030) | CAGR -11%.
- **Target Sectors:** Low-power embedded systems, IoT sensor networks, healthcare wearables, industrial monitoring.
- **Socio-Economic Impact:**
 - Enables long-lasting, maintenance-free IoT deployments.
 - Reduces environmental impact by eliminating disposable batteries.
 - Supports sustainable and scalable digital infrastructure in agriculture, healthcare, and smart cities.



Applications

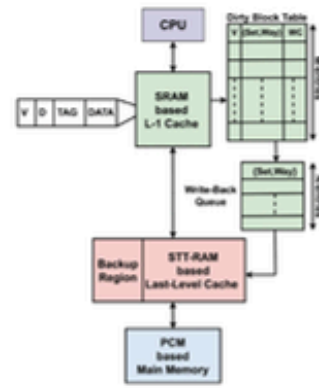
- **Batteryless IoT Devices:** Environmental monitoring, agriculture, industrial sensing.
- **Healthcare Wearables:** Reliable operation with harvested energy sources.
- **Smart Infrastructure:** Low-maintenance nodes in smart cities and transport systems.
- **Space & Remote Systems:** Devices deployed in inaccessible areas where batteries are impractical.

Value Proposition

- **Energy Efficiency:** Optimized architecture reduces wasted energy in power cycles.
- **Reliability:** Maintains system integrity across frequent power interruptions.
- **Performance Gains:** Faster execution compared to SRAM/Flash-based checkpointing systems.
- **Hardware Integration:** Compatible with existing microcontroller platforms adapted for NVM.
- **Sustainability:** Reduces dependency on batteries, supporting eco-friendly IoT deployment.

Technology Status

- **Technology Readiness Level (TRL):** 4-5 (validated via hardware simulation and prototypes).
- **Outcome:** Published experimental results show significant execution speedup and energy reduction.
- **IP Status:** Research publication; patent potential exists in NVM integration techniques for IoT processors.



Adaptive Framework for Anomaly Detection in Time Series Audio-Visual Data

Technical Brief

Ref No. 2025/AWaDH/OITC/026

Technology Summary

This technology presents a deep learning-based teacher-student network that fuses audio and visual data for adaptive anomaly detection in multimedia streams. The teacher model distills knowledge from a pre-trained visual network to lightweight student audio and image networks. Features are combined and compressed via PCA, then modeled using an adaptive Gaussian mixture model (AGMM) to capture scene dynamics with concept drift. The joint audio-visual representation significantly outperforms single-modality methods, enhancing accuracy and robustness in real-world, dynamic environments.

Background

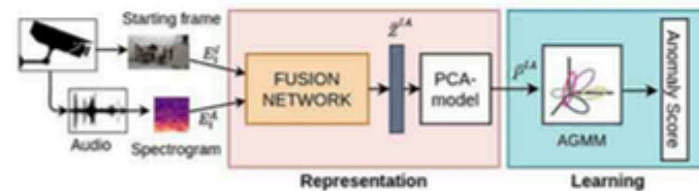
Audio anomaly detection traditionally struggles with concept drift—changes in data over time—limiting effectiveness in dynamic environments. Existing methods like AGMM require prior knowledge and lose long-term context. This work introduces a dynamic Huffman coding approach with node merging, enabling adaptive, memory-efficient detection of audio anomalies despite evolving data distributions, improving performance without heavy computational demands.

Technology Description

We present a novel anomaly detection method for audio data using dynamic Huffman coding to handle concept drift. Unlike adaptive Gaussian mixture models (AGMM), our approach is parameter-free, does not require predefined clusters, and adapts dynamically to environmental changes. A key innovation is a node-merging strategy that prevents forgetting past data while controlling tree size. Experiments on long-duration audio datasets with natural concept drift show that our method outperforms AGMM in detection accuracy, achieving higher AUC scores. Additionally, we contribute new datasets tailored for evaluating adaptive anomaly detection in realistic, non-stationary audio environments.

Market Potential / Proposed Deployment

- High demand in smart surveillance and public safety systems
- Applications in smart cities (e.g., noise, traffic, incident detection)
- Use in industrial monitoring for machinery faults and predictive maintenance
- Healthcare monitoring (e.g., elderly care, emergency detection)
- Valuable for defense and border security (e.g., gunshot, intrusion detection)
- Fits into the growing audio analytics market (CAGR > 20%)
- Edge deployment for real-time, low-latency detection
- Cloud/hybrid systems for large-scale learning and analysis



Applications

- **Smart surveillance:** Detect gunshots, shouting, glass breaking
- **Smart cities:** Monitor traffic incidents, urban noise
- **Industrial monitoring:** Identify machinery faults or failures
- **Healthcare:** Detect falls, distress sounds in patient care
- **Transportation:** Monitor for mechanical issues or emergencies
- **Defense/security:** Detect intrusions or suspicious activity

Value Proposition

- **Adaptive to Concept Drift:** Continuously learns and adapts to changing audio environments
- **Parameter-Free Design:** No need for prior knowledge of cluster count or distribution
- **Low Resource Requirement:** Lightweight and efficient for real-time edge deployment
- **Improved Accuracy:** Higher anomaly detection performance (AUC) than AGMM
- **Retains Long-Term Context:** Node merging avoids forgetting rare but important events

Technology Status

- TRL 4 – Technology Validated in Lab
- The proposed dynamic Huffman coding-based anomaly detection has been validated through experiments on curated audio datasets with concept drift in a controlled research environment.

Bricks and Tiles from Stubble

Technical Brief

Ref No. 2025/AWaDH/OITC/034

Technology Summary

The Brick and Tile innovation uses stubble residue (mainly rice straw) combined with clay, sand, plastics, and cement to create lightweight yet durable construction materials. By incorporating 11 wt.% stubble, these eco-bricks and tiles achieve reduced weight without compromising strength, offering a sustainable alternative to conventional materials. The technology directly addresses stubble burning by turning agricultural waste into value-added products. It has demonstrated functional prototypes of bricks and floor tiles with comparable durability to market products.

Background

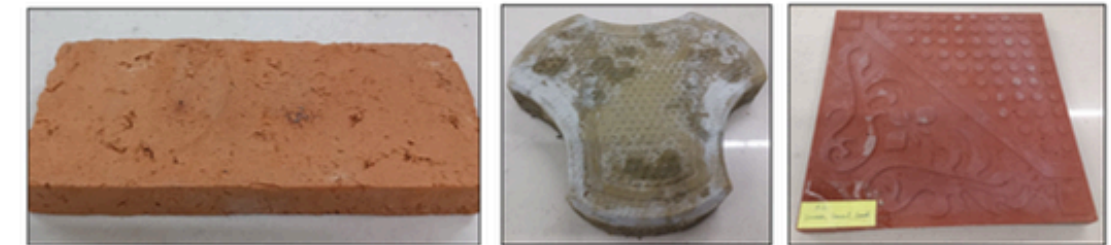
India faces a recurring problem of stubble burning, especially in northern states like Punjab and Haryana, contributing to severe air pollution, soil degradation, and greenhouse gas emissions. Traditional disposal methods have failed to create economic incentives for farmers. The use of stubble in construction materials presents a dual benefit: reducing environmental hazards while generating affordable, eco-friendly building solutions. With growing demand for sustainable infrastructure, such innovations fit well into national missions like Swachh Bharat Abhiyan and Smart Cities.

Technology Description

Bricks are manufactured by blending stubble, clay, and plastics, while floor tiles are produced using stubble (11 wt.%), cement (50 wt.%), and sand (50 wt.%). The mixture is molded and baked/cured to achieve high compressive strength with reduced weight. These products are engineered for good load-bearing capacity, reduced thermal conductivity, and resistance to wear. By substituting part of the raw material with stubble, the process reduces dependence on conventional inputs and lowers production costs. The end products are visually and structurally comparable to regular bricks and tiles.

Market Potential / Proposed Deployment

- **Global Green Building Materials Market:** USD 421B (2024) → USD 770B (2030) | CAGR -10.3%.
- **Indian Construction Market:** Rapidly expanding with focus on sustainable housing and infrastructure.
- **Target Segments:** Real estate developers, government housing missions (PMAY), eco-conscious builders.



Applications

- **Construction Industry:** Sustainable building materials for housing and infrastructure.
- **Rural Housing Schemes:** Affordable alternative for cost-sensitive government projects.
- **Urban Development Projects:** Integration into Smart Cities and eco-construction practices.
- **CSR & Green Building Programs:** Promotes corporate adoption of low-carbon building products.

Value Proposition

- **Waste-to-Value:** Provides an eco-friendly solution to manage stubble waste.
- **Lightweight yet Durable:** Reduced material weight with comparable strength to standard bricks.
- **Cost-Effective:** Uses agricultural residue, lowering raw material costs.
- **Environmental Benefits:** Reduces stubble burning, cutting air pollution and carbon footprint.
- **Scalable Production:** Adaptable to small-scale units and large industrial plants.

Technology Status

- **Technology Readiness Level (TRL):** 7 (Prototypes successfully developed and tested).
- **Outcome:** Functional bricks and tiles fabricated; further testing for durability and certification in progress.
- **IP Status:** Open technology; potential for patenting process improvements.

NanoAqua Nanobubble Generator

Technical Brief

Ref No: TechBrief/2025/03

Technology Summary

NanoAqua Nanobubble Generator is an advanced gas-to-liquid injection system that converts bulk oxygen or compressed air into nanobubbles (~80 nm). It achieves high oxygen transfer efficiency (75-80% OTE) to supersaturate water with dissolved oxygen (DO) without using chemicals, making it a sustainable solution for water treatment, agriculture, and aquaculture.

Background

Low dissolved oxygen levels in water bodies and irrigation systems lead to poor plant growth, disease spread, and reduced aquaculture yields. Traditional aeration methods are inefficient in transferring oxygen and often require chemical additives. Nanobubble technology addresses these limitations by providing ultra-fine bubbles that stay in water longer, improving oxygen solubility and overall water quality.

Technology Description

The NanoAqua Nanobubble Generator is an advanced gas-to-liquid injection system designed to efficiently convert bulk oxygen or compressed air into ultra-fine nanobubbles with an average size of approximately 80 nanometers. Utilizing a built-in oxygen concentrator delivering up to 95% pure oxygen, the system achieves a high oxygen transfer efficiency of 75-80%, enabling water to be supersaturated with dissolved oxygen without the use of any chemicals. This plug-and-play unit is engineered for easy installation and low maintenance, generating over 1x10⁹ nanobubbles per milliliter to ensure deep oxygen penetration in water. The technology's unique ability to enhance dissolved oxygen levels improves water quality, promotes root health and nutrient absorption in plants, suppresses harmful pathogens and algae, and supports healthier aquatic ecosystems. Available in multiple models with flow capacities ranging from 15 to 100 m³/hr, the NanoAqua series is versatile and scalable, making it suitable for agriculture, aquaculture, wastewater treatment, and environmental restoration applications.

Market Potential / Proposed Deployment

Global Market Size:

- USD 33.4B (2023) → USD 86B (2031) | CAGR -17%
- Alternate estimate: USD 81.2M (2024) → USD 477M (2034) | CAGR -17.6%
- Ultra-fine segment: USD 390M (2024) → USD 1.2B (2033) | CAGR -14.5%

Asia-Pacific (incl. India):

- Fastest-growing regional market with ~30%+ global share
- Driven by agriculture, aquaculture, and wastewater treatment demand
- India expected to contribute significantly due to irrigation and fishery applications

Key Drivers:

- Shift towards chemical-free water treatment
- Sustainable farming and climate-resilient aquaculture
- Government focus on water conservation and agri-tech
- CAGR Range: 10-18% globally, high double-digit growth in India/APAC

Applications

- Agriculture & Horticulture: Enhances soil aeration, root health, and plant vigor.
- Aquaculture: Improves water quality, increases dissolved oxygen, and reduces disease risks.
- Wastewater Treatment: Enhances aerobic digestion and reduces chemical requirements.
- Environmental Restoration: Revitalizes stagnant lakes and ponds.

Value Proposition

- Chemical-Free: Provides a sustainable and eco-friendly solution.
- High Efficiency: Achieves 75-80% oxygen transfer efficiency with low energy use.
- Versatile: Applicable across multiple sectors with easy scalability.
- Cost-Effective: Reduces input costs by improving water quality and crop/fish yields.

Technology Status

- Development Stage: Commercially available and deployed in multiple sectors.
- Readiness Level: High TRL (Technology Readiness Level 8-9) with operational units in agriculture and aquaculture.
- Future Scope: Potential for integration with IoT-based water monitoring systems and scaling to large industrial applications.



Soil Spectra

Real-Time Soil Quality Monitoring Device

Technical Brief

Ref No: TechBrief/2025/05

Technology Summary

Soil Spectra is a robust, multi-parameter soil sensing device developed by IT Ropar - Technology and Innovation Foundation (AWaDH). Designed for real-time, in-situ soil monitoring, it measures key agronomic parameters such as moisture, temperature, pH, electrical conductivity, and nutrient levels (N, P, K). Its compact, weatherproof build ensures compatibility with varied field conditions, and its data output can be accessed via smartphones, computers, or IoT systems enabling smart, data-driven decisions in farming and environmental monitoring.

Background

Agriculture in India and globally faces a critical data gap at the soil level, often leading to inefficient irrigation, overuse of fertilizers, and inconsistent yields. Traditional soil testing is manual, time-consuming, and infrequent, offering little support for dynamic, real-time decisions. With rising interest in precision agriculture and sustainability, there is a pressing need for real-time, field-deployable sensors that empower farmers and researchers with continuous soil health information.

Technology Description

Soil Spectra is a field-deployable, TRL-9 sensor that directly measures seven crucial soil parameters. It is embedded in the soil and continuously transmits readings via wireless protocols to mobile or web platforms. The sensor's durability, low power requirement, and multi-parameter capability make it suitable for both small-scale farms and large agricultural operations. The system is standalone and plug-and-play, offering end-to-end functionality without dependence on auxiliary infrastructure. It has been tested and validated under field conditions and is currently available for use.

Market Potential / Proposed Deployment

- Global Smart Soil Sensor Market projected to reach USD 12-15 Billion by 2030, growing at CAGR -12-14%.
- India Market: With ~150 million hectares under cultivation, digital soil health solutions are in high demand under initiatives like PM-KUSUM, Digital Agri Mission, and State AgTech Missions.
- Target Segments:
 - Small and commercial farmers
 - Agri-Tech platforms and startups
 - Precision agriculture solution providers
 - Government and NGO-led soil health programs
 - Academic and environmental research institutions

Applications

- Smart Irrigation: Real-time data enables precision watering, reducing water wastage.
- Nutrient Management: Optimize NPK usage based on actual soil availability.
- Soil Mapping: Generate localized soil health maps for advisory and research.
- Remote Monitoring: Ideal for large or hard-to-reach farmlands and greenhouse use.
- Educational Use: Training tool in soil science, agri-tech education.

Value Proposition

- Multi-Parameter Sensing: Measures moisture, temperature, EC, pH, and NPK-integrated in one device.
- Real-Time Monitoring: Enables immediate corrective actions.
- Plug-and-Play: Works with minimal setup; connects to common devices.
- Low Maintenance & Durable: Built for rugged use in Indian and global field conditions.
- No Auxiliary Labs Needed: On-field data reduces need for lab-based testing.
- Versatile Use Cases: From small farms to research-grade environmental studies.

Technology Status

- Technology Readiness Level (TRL): 9 - Ready for commercial deployment.
- Deployment: Validated in field conditions; currently in-market use.
- IP Status: No patents filed yet.
- Licensing Interest: Open to Exclusive/Non-Exclusive Licensing, Co-development, or IP Sale.



AirSense

Technical Brief

Ref No: TechBrief/2025/09

Technology Summary

AirSense is a high-precision CO₂ detection system based on Non-Dispersive Infrared (NDIR) sensor technology. NDIR sensors operate by measuring the amount of infrared light absorbed by CO₂ molecules, ensuring accurate and stable readings over time. The system is designed for continuous indoor air quality (IAQ) monitoring in diverse environments from office buildings and educational institutions to industrial facilities and underground spaces. Deployed widely across offices, basement stores, industries, academic institutes, and government offices in Punjab, AirSense supports better decision making for ventilation, safety, and energy optimization.

Background

Poor indoor air quality, especially elevated CO₂ levels, can cause fatigue, reduced cognitive performance, and long-term health risks for occupants. In industrial and enclosed environments such as coal mines or basement storage areas, excessive CO₂ can compromise occupational safety. Conventional monitoring systems can be expensive, require frequent calibration, or lack remote data integration. AirSense addresses these issues with a reliable, low-maintenance, and cost-effective NDIR-based solution that enables real-time monitoring, supports compliance with safety norms, and helps optimize ventilation systems for energy savings.

Technology Description

AirSense uses an NDIR sensor to detect CO₂ concentration by quantifying the absorption of specific infrared wavelengths by CO₂ molecules. The sensor module is paired with an embedded processing unit that converts the optical signal into precise ppm (parts per million) readings. Data can be displayed locally or transmitted to a building management system (BMS) or cloud platform for remote monitoring. The device features a color-coded indication system for quick visual interpretation of CO₂ levels:

- 400-1000 ppm - Green (Good air quality)
- 1000-2000 ppm - Yellow (Moderate; ventilation recommended)
- 2000-3000 ppm - Magenta (Poor; increased ventilation needed)
- 3000-4000 ppm - Blue (Very poor; take immediate action)
- 4000-5000 ppm - Red (Hazardous; evacuate/ventilate urgently)

Designed for minimal drift, extended sensor life, and low power consumption, AirSense is suitable for both standalone deployment and integration into large-scale monitoring networks.

Market Potential / Proposed Deployment

- Global Indoor Air Quality Market: USD 9.6B (2024) → USD 14.2B (2030) | CAGR -6%
- Target Segments:
 - Corporate offices & government buildings
 - Industrial workplaces & basement storage facilities
 - Educational institutions
 - Agricultural greenhouses
 - Mining sector & environmental monitoring agencies
- Socio-economic Impact:
 - Health Benefits: Improved occupant wellbeing and productivity
 - Occupational Safety: Reduced risk of respiratory distress in hazardous environments

Applications

- Buildings & Indoor Air Quality: Monitor CO₂ to optimize ventilation and maintain occupant comfort and productivity.
- Agriculture: Control CO₂ levels in greenhouses for enhanced plant growth.
- Coal Mines: Enhance worker safety by detecting hazardous CO₂ accumulation.
- Environmental Monitoring: Track emissions and indoor air quality for regulatory compliance.

Value Proposition

- Accurate & Stable: Reliable NDIR-based sensing with minimal drift over long-term operation.
- Real-Time Alerts: Instant notifications and color-coded visual warnings.
- Energy Efficiency: Data-driven ventilation control reduces energy costs.
- Health & Safety: Protects occupants from fatigue, poor cognitive performance, and occupational hazards.
- Scalable: Suitable for single-room use or large building-wide deployment.

Technology Status

- Technology Readiness Level (TRL): 9 - In market use
- Testing: Deployed and validated in offices, industries, and academic institutes
- IP Status: Technology transferred to Urban Air Labs Pvt. Ltd.
- Adoption: Active deployments in Punjab across multiple sectors



Multiponics System

Technical Brief

Ref No: TechBrief/2025/12

Technology Summary

The Multiponics System is an automated integration of aquaponics (fish farming) and hydroponics (soil-less cultivation) designed to create a sustainable ecosystem for both aquatic animals and plants. The system uses an array of sensors and controllers to maintain optimal conditions, automate feeding, regulate water flow, and prevent pollution. Powered by solar energy, it reduces manual effort and ensures efficient use of resources. The system is under the patent process.

Background

Conventional agriculture often relies on excessive water use, chemical fertilizers, and labor-intensive practices. At the same time, aquaculture and hydroponics are typically developed in isolation, limiting their efficiency. The Multiponics approach combines both systems to maximize resource recycling, reduce input costs, and minimize environmental impact. This integrated model addresses challenges of urban farming, resource scarcity, and sustainable food production.

Technology Description

The Multiponics system uses sensors for pH, water flow, temperature, water level, and nitrate concentration to continuously monitor environmental conditions. Based on sensor feedback, actuators automatically adjust fish feeding, water circulation, and pumping rates. A real-time alerting and display system informs users of critical changes. Solar panels provide the required power for motors and processors, making the system energy-efficient and sustainable. Both soil and soil-less modules can be integrated for plant cultivation, creating a versatile farming solution.

Market Potential / Proposed Deployment

- Global Hydroponics Market: USD 12B+ by 2030 | CAGR > 11%
- Target Sectors: Urban farming startups, agri-tech companies, universities, FPOs.
- Socio-Economic Impact:
 - Efficient food production in resource-scarce urban areas.
 - Reduced dependency on chemical fertilizers.
 - Empowerment of small-scale farmers and households with sustainable farming models.



Applications

- Urban Farming: Sustainable production of vegetables and fish in small urban spaces.
- Agriculture R&D: Model system for studying sustainable cultivation practices.
- Education & Training: Demonstration tool for universities and skill-development programs.
- Household/Farm Use: Small-scale food production system for homes and communities.

Value Proposition

- Integrated Solution: Combines aquaponics and hydroponics in one system.
- Automation: Reduces manual effort through real-time monitoring and automated control.
- Resource-Efficient: Recycles water and nutrients for sustainable farming.
- Renewable Power: Solar-powered design lowers operating costs.
- Scalable: Can be adapted for both small and large-scale operations.

Technology Status

- Technology Readiness Level (TRL): 6-7 (Prototype with patent filed)
- Testing: Functional prototype developed and validated in controlled conditions.
- IP Status: Patent under process.



Automated Desktop Herbal Garden

Technical Brief

Ref No: TechBrief/2025/13

Technology Summary

The Automated Desktop Herbal Garden is a compact, smart gardening system designed to utilize RO (Reverse Osmosis) wastewater for cultivating herbs and small plants indoors. Equipped with soil moisture sensors, microcontrollers, GSM modules, and cloud-based analytics, the system automatically regulates irrigation, temperature, and humidity for optimal plant growth. By repurposing RO reject water, it promotes sustainability while improving workspace environments through greenery. The system has been validated and presented in a conference paper.

Background

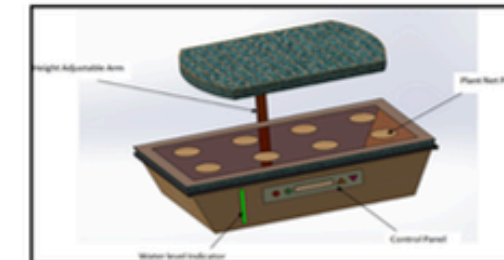
Urban workspaces often lack greenery due to limited space and difficulty in maintaining plants. At the same time, significant volumes of RO reject water are wasted daily, adding to environmental stress. Traditional plant care methods are inconsistent, leading to poor plant survival. The Automated Desktop Herbal Garden addresses these issues by combining smart irrigation with resource reuse. It offers stress reduction, improved air quality, and enhanced well-being for users, while ensuring water conservation and sustainable living.

Technology Description

The system integrates soil moisture sensors, microcontrollers (Arduino), GSM modules, and cloud servers to monitor and control irrigation cycles automatically. Based on threshold values derived from historical plant data, water is supplied in precise amounts to ensure healthy growth. Temperature and humidity regulation, as well as adjustable artificial lighting, provide the ideal environment for plants indoors. The system repurposes RO wastewater for irrigation, ensuring efficient use of resources. Real-time alerts and pattern analysis are available via cloud connectivity, allowing users to monitor their garden remotely.

Market Potential / Proposed Deployment

- Global Indoor Gardening Market: USD 2.9B (2024) → USD 5.1B (2030) | CAGR -9.8%
- Target Sectors: Offices, households, urban farming startups, CSR sustainability programs.
- Socio-Economic Impact:
 - Saves water through RO wastewater utilization.
 - Provides accessible greenery for urban lifestyles.
 - Enhances workplace health, creativity, and productivity.



Applications

- Workspaces & Offices: Improves air quality and reduces stress at desks.
- Households: Indoor herb gardening using recycled water.
- Educational Use: Demonstration tool for smart agriculture and IoT.
- Sustainability Programs: Promotes water reuse and urban greening initiatives.

Value Proposition

- Sustainable: Repurposes RO reject water for productive use.
- Automated Care: Reduces human effort with sensor-based irrigation.
- Compact & Scalable: Fits into small spaces while supporting multiple herbs.
- Health & Well-being: Improves indoor environment and productivity.
- Smart Integration: Cloud storage and GSM-based alerts for real-time monitoring.

Technology Status

- Technology Readiness Level (TRL): 5-6 (Prototype tested, research validated)
- Outcome: Validated through a conference paper; prototype system functional.
- IP Status: Not yet patented; potential for IP filing in IoT-enabled horticulture.

Semi-Automatic Seeder Machine

Technical Brief

Ref No: TechBrief/2025/14

Technology Summary

The Semi-Automatic Seeder Machine is a cost-effective sowing solution designed for small and marginal farmers. It reduces manual labor by automating seed placement with precision and consistency. A single universal seed plate handles both small and large seed types, eliminating the need for multiple attachments. The system supports adjustable tine depth and row spacing, making it versatile for different vegetable crops. Its low weight and simple operation make it suitable even for farmers with minimal training.

Background

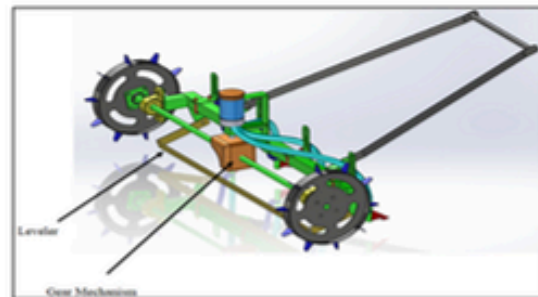
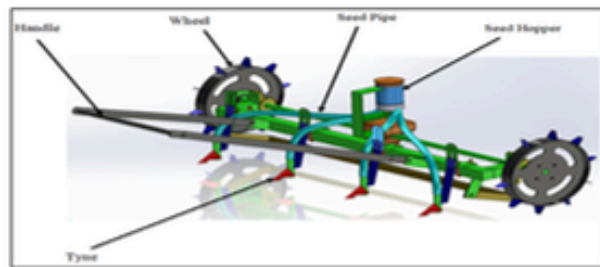
Indian farmers often rely on manual sowing, which is labor-intensive, costly, and inefficient. Commercial seeder machines are too expensive for smallholders, creating an accessibility gap. This machine addresses affordability and efficiency, offering farmers a simple, low-maintenance tool to improve sowing productivity. By reducing labor costs, it directly impacts farmer incomes while ensuring better germination rates and uniform crop growth.

Technology Description

The seeder is manually operated with a mechanical seed delivery system. A large-capacity seed hopper (2-3 kg) and a universal seed plate enable sowing of multiple seed types without frequent adjustments. The machine supports both small and large seeds with consistent depth and row placement. Lightweight design ensures ease of use in vegetable farming. The adjustable tine depth allows flexibility for different soil types and row spacing options, making it practical for varied farming conditions.

Market Potential / Proposed Deployment

- Indian seeding equipment market growing rapidly with focus on affordable mechanization for small farmers.
- Affordable option compared to ₹40,000+ commercial seeders makes it viable for wide adoption.
- Potential deployment through agri-startups, FPOs, and government-supported agri-mechanization schemes.



Applications

- Vegetable farming (tomato, brinjal, okra, etc.)
- Smallholder farms with limited access to machinery
- Community farming and FPOs

Value Proposition

- Low-cost solution (~₹18,000 without labor charges), significantly cheaper than commercial machines.
- Universal seed plate reduces equipment needs and enhances flexibility for diverse crops.
- Reduces labor costs by replacing manual sowing, increasing efficiency for small farms.
- Easy maintenance and farmer-friendly design ensures long service life and minimal downtime.

Technology Status

- TRL 7-8 (Prototype tested, ready for commercialization).
- Outcome: Under commercialization process with positive field validation.
- Demonstrated potential for scale-up through farmer trials in vegetable clusters.



AWaDH BLE Gateway

Technical Brief

Ref No: TechBrief/2025/06

Technology Summary

The AWaDH BLE Gateway System is a robust, field-ready wireless data communication platform designed to bridge Bluetooth Low Energy (BLE) sensors with the cloud, enabling real-time environmental monitoring across diverse sectors. Developed by IIT Ropar's TIF - AWaDH, the system consists of two primary components: a BLE Node that senses data (e.g., temperature, humidity, light intensity) and a BLE Gateway that transmits it securely to remote servers via Wi-Fi or GSM. With a range of up to 1 km (LOS), low power consumption, and over 100+ node connectivity, the system is ideal for smart agriculture, cold storage, logistics, healthcare, and industrial monitoring.

Background

In agriculture, warehousing, healthcare, and logistics, real-time monitoring of environmental variables is essential but often limited by connectivity challenges, power constraints, and complex system setup. Existing solutions are often high-cost, power-intensive, or lack adaptability for Indian field conditions. AWaDH's BLE Gateway System addresses this gap by offering a lightweight, scalable, and easy-to-deploy IoT communication solution optimized for rural and industrial settings.

Technology Description

- BLE Node: Captures environmental parameters such as temperature, humidity, and light intensity using compact, energy-efficient sensors.
- BLE Gateway: Acts as a central hub, collecting data from multiple nodes and forwarding it to cloud-based platforms using Wi-Fi or GSM networks.
- Wireless Firmware Updates: Enables over-the-air (OTA) updates for long-term deployment without manual servicing.
- Alert System: Sends real-time alerts for threshold breaches (e.g., temperature spikes).
- Coverage & Power: Up to 1 km communication range in clear conditions with minimal power use, making it suitable for remote deployments.
- Scalability: Supports 100+ BLE nodes simultaneously with seamless cloud/app integration.

Market Potential / Proposed Deployment

- IoT in Agriculture Market (Global): Projected to reach USD 30.8 Billion by 2032 | CAGR -10.8%
- Cold Chain Monitoring Market (India): Estimated to grow to INR 18,000+ Cr by 2027 with increasing adoption of sensor-based systems.
- Warehouse & Smart Logistics: Driven by food safety, e-commerce, and pharma supply chains.
- Target Sectors:
 - Smart Farming & Greenhouse Automation
 - Food & Pharma Cold Chain
 - Warehouse Environmental Monitoring
 - Telehealth and Remote Patient Monitoring

Applications

- Monitoring greenhouse conditions (light, humidity, temperature).
- Cold chain tracking for perishable goods in storage or transit.
- Remote patient vital monitoring in healthcare facilities.
- Ambient monitoring in industrial, warehouse, or institutional settings.
- Multi-node environmental sensing across large areas like crop fields or logistics hubs.

Value Proposition

- Reliable & Scalable: Connects 100+ nodes, supports GSM/Wi-Fi, and ensures secure long-range data transmission.
- Plug-and-Play: Easy setup with pre-configured sensor nodes and mobile compatibility.
- Power-Efficient: Low energy footprint enables long-duration use in battery-powered or solar-assisted setups.
- Durable & Adaptive: Performs under extreme conditions, from hot warehouses to freezing cold storage units.
- Real-Time Alerts: Enables instant notifications on threshold violations to prevent spoilage or system failures.

Technology Status

- Technology Readiness Level (TRL): 9 - Ready for commercial deployment
- Deployment: Field-tested; referenced in media by Press Information Bureau, ET Government, and Krishi Jagran.
- Customization: Firmware and hardware adaptable to different sensor types and sector-specific use cases.
- Licensing Interest: Open for exclusive/non-exclusive licensing, technology co-development, and commercialization.



Vegetable Pneumatic Seed Sowing Machine (Modified)

Technical Brief

Ref No: TechBrief/2025/15

Technology Summary

This improved Pneumatic Seed Sowing Machine is designed for vegetable nurseries, compatible with the standard 9-row tray system. Modifications include redesigned impression, seed tube, and nozzle brackets to improve efficiency and alignment. The machine ensures uniform seed sowing in trays, improving germination rates and nursery productivity. It provides a ready-to-use solution for nurseries that earlier faced compatibility issues with standard trays.

Background

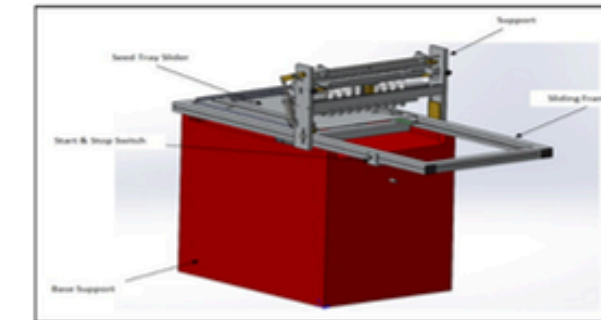
Existing pneumatic machines in vegetable nurseries lacked compatibility with traditional 9-row trays, reducing efficiency. Farmers and nursery operators faced difficulties adapting to the mismatch. This machine resolves the issue through precise re-engineering of components, making it directly usable for current nursery practices. By improving uniformity in seed placement, it supports the growing demand for high-quality seedlings in India's expanding horticulture sector.

Technology Description

The modified design allows accurate placement of seeds in 9-row trays commonly used in nurseries. Bracket and nozzle designs were improved for better seed distribution and machine compatibility. Reverse engineering methods ensure future scalability. The new design minimizes seed wastage, increases sowing speed, and ensures better synchronization with nursery tray standards.

Market Potential / Proposed Deployment

- Nursery sector in India expanding rapidly under protected cultivation schemes.
- Growing demand for mechanized seedling production in vegetable clusters.
- Strong potential in high-value states like Punjab, Haryana, and Maharashtra, where horticulture adoption is accelerating.



Applications

- Vegetable nurseries (tomato, capsicum, chilli, etc.): Achieves uniform sowing across crops.
- Seed tray sowing operations in greenhouses and FPOs: Increases efficiency for collective farming setups.
- Agro-based input companies: Helps companies standardize nursery practices with reliable mechanization.

Value Proposition

- Compatible with standard 9-row trays, reducing manual adjustment effort.
- Higher efficiency and reduced seed wastage, ensuring cost savings for nurseries.
- Improved design via reverse engineering allows long-term scalability.
- Easy adoption in existing nursery setups ensures minimal transition cost.

Technology Status

- TRL 8-9 (Field ready; technology transferred).
- Outcome: Improvements completed, technology transfer done.
- Successfully field-tested in vegetable nurseries, proving compatibility and efficiency.

Officially Certified as DSIR SIRO



Indian Institute of Technology Ropar
भारतीय प्रौद्योगिकी संस्थान रोपड़
DST NM-ICPS Technology Innovation Hub



Recognised as
SCIENTIFIC AND INDUSTRIAL
RESEARCH ORGANISATION (SIRO)



Department of Scientific and
Industrial Research
Ministry of Science & Technology
Govt of India

सत्यमेव जयते



*With **DSIR-SIRO** Recognition, We're More Empowered
to Lead India's R&D in Agriculture and Water Sector.*



सूचना का
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RIGHT TO
INFORMATION
दूरभाष/TEL : 26962819, 26567373
(EPABX) : 26565694, 26562133
: 26565687, 26562144
: 26562134, 26562122
फैक्स/FAX : 26960629, 26529745
Website : <http://www.dsir.gov.in>
(आईएसओ 9001:2008 प्रमाणित विभाग)
(An ISO 9001:2008 CERTIFIED DEPARTMENT)



सत्यमेव जयते

भारत सरकार
विज्ञान और प्रौद्योगिकी मंत्रालय
वैज्ञानिक और औद्योगिक अनुसंधान विभाग
टेक्नोलॉजी भवन, नया महरौली मार्ग,
नई दिल्ली - 110016
GOVERNMENT OF INDIA
MINISTRY OF SCIENCE AND TECHNOLOGY
Department of Scientific and Industrial Research
Technology Bhavan, New Mehrauli Road,
New Delhi - 110016



F.No. 11/1040/2025-TU-V

Date: 15th May 2025

The Director
IIT Ropar Technology and Innovation Foundation,
Room No. 316-317, 3 Floor M. Visvesvaraya Block,
Indian Institute of Technology-Ropar,
Rupnagar – 140001, Punjab

Subject: Registration of Research Institution, other than a Hospital, for the purpose of availing Customs duty exemption in terms of Government Notifications No. 51/96-Customs dated 23.07.1996; No. 24/2007-Customs dated 01.03.2007; No. 43/2017-Customs dated 30.06.2017; No. 42/2022-Customs dated 13.07.2022; No. 07/2024-Customs dated 29.01.2024; No. 38/2024-Customs dated 23.07.2024 as applicable and all notification, as amended from time to time.

CERTIFICATE OF REGISTRATION

This is to certify that IIT Ropar Technology and Innovation Foundation, Rupnagar, Punjab is registered with the Department of Scientific and Industrial Research (DSIR) for the purpose of availing Customs duty exemption in terms of Government Notifications No. 51/96-Customs dated 23.07.1996; No. 24/2007-Customs dated 01.03.2007; No. 43/2017-Customs dated 30.06.2017; No. 42/2022-Customs dated 13.07.2022; No. 07/2024-Customs dated 29.01.2024; No. 38/2024-Customs dated 23.07.2024 as applicable and all notification, as amended from time to time. The Registration is subject to terms and conditions mentioned overleaf.

This Registration is valid upto 31.03.2028.

Please acknowledge the receipt.

(Vinay Kumar)
Scientist - 'F'



Startup & Entrepreneurship

responsible consumption and production

sustainable cities and communities

zero

peace, justice, and strong institutions

and economic growth

affordable and clean energy

life below water

gender equality

quality

industry, innovation and infrastructure

no

good health and well-being

reducing inequalities

clean

partnerships

the goals

- 1 NO POVERTY
- 2 ZERO HUNGER
- 3 GOOD HEALTH AND WELL-BEING
- 4 QUALITY EDUCATION
- 5 GENDER EQUALITY
- 6 CLEAN WATER AND SANITATION
- 7 AFFORDABLE AND CLEAN ENERGY
- 8 DECENT WORK AND ECONOMIC GROWTH
- 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
- 10 REDUCED INEQUALITIES
- 11 SUSTAINABLE CITIES AND COMMUNITIES
- 12 RESPONSIBLE CONSUMPTION AND PRODUCTION
- 13 CLIMATE ACTION
- 14 LIFE BELOW WATER
- 15 LIFE ON LAND
- 16 PEACE, JUSTICE AND STRONG INSTITUTIONS
- 17 PARTNERSHIPS FOR THE GOALS

Entrepreneurship Development: Snapshot (170+ Supported Startups)

Revenue & Startups

27Cr+
(~\$957.2 K USD)
by Hub

95 Cr+
(~\$7.77 M USD)
by Startups

Investment Thesis

5.34Cr
Grant / Loan

10.97Cr+
Equity / OCD / CCD

0.30 Cr
Average Ticket Size

Investment of Startups

16.21Cr+
Internal Investment
(84 Startups)

110.52 Cr+
External Investment
(46 Startups)

Startup Portfolio: 170+



Funding Source (in Cr.): 15 Cr+

- Equity Investment: 9.53 Cr
- Startup India: 1.17 Cr

Grant Investment:

(Not calculated in above data)

- DST ICPS: 34 (0.73 Cr)
- Startup India: 3 (0.30 Cr)
- HDFC Parivartan: 5 (0.76 Cr)
- Punjab State Council: 2 (0.004)

Debt Investment:

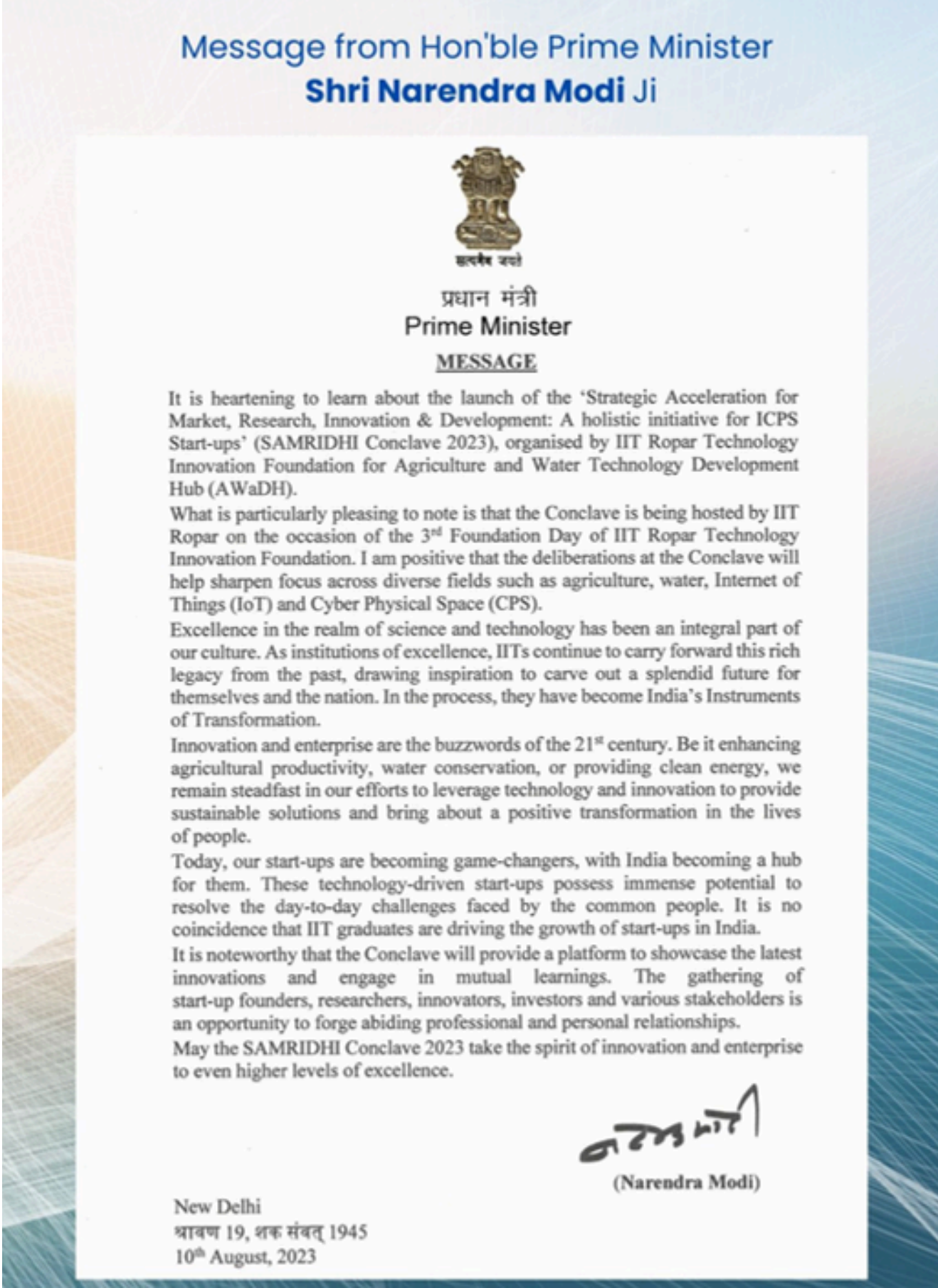
(Not calculated in above data)

DST ICPS: 25 (2.97 Cr)

Investment & Impact Driven Startup Programs



Received message from Hon'ble Prime Minister **Shri Narendra Modi Ji** for SAMRIDHI in August 2023



<p>#PRAGATI Micro Accelerator Program Puri Oil Mills and AWaDH Research for Agriculture Growth and Acceleration towards Transforming Innovation (Ongoing) Investment upto ₹25 Lakh</p>	<p>#SAMRIDHI Acceleration Program Strategic Acceleration for Market, Research, Innovation & Development: a Holistic Initiative for ICPS Startups (Ongoing) Investment upto ₹ 5 Cr</p>	<p>#DRONAGIRI National Geospatial Policy (NGP) Operation Dronagiri (Ongoing) Investment upto ₹50 Lakh</p>
<p>#SPRINT Incubation Program Strategic Program for Research Innovation and Next-Gen Tech Commercialization Investment upto ₹25 Lakh</p>	<p>#IMPACT Incubation Program Strategic Program for Research Innovation and Next-Gen Tech Commercialization Investment upto ₹25 Lakh</p>	<p>#WATER HDFC Parivartan Challenge Water and Agriculture Technologies for Eco Revolution Innovation Challenge Investment upto ₹75 Lakh</p>
<p>#SMART GIS IIT Ropar & IIT Tirupati Acceleratio Program Soil-Health & Mapping for Agricultural Research & Tech-Transformation through GIS Investment upto ₹2.5 Cr</p>	<p>#ASAP VC Driven Acceleration Program AWaDH Sustainability Accelerator Program (Supported by Factroyal & Seafund) Investment upto ₹10 Cr</p>	<p>#SWACH Acceleration Program Sanitation and Water Action for Conserving Humanity Investment upto 2.5 Cr</p>



शिक्षा मंत्रालय
MINISTRY OF
EDUCATION



भारतीय प्रौद्योगिकी संस्थान रोपड़
INDIAN INSTITUTE OF TECHNOLOGY ROPAR

100 DAYS 100 STARTUPS
FUELING INNOVATION ACROSS INDIA

100 Days 100 Startups;
VC Driven Program

Powered by



Mentoring Support



IP & Compliance Support



Lab Infrastructure & R&D Support



Partnership, Collaboration and Connects



Support from Prototype to Product Launch



Support in Tech Commercialization



Deployment of Market Ready Products



Investment and Financial Support for Startups



Market Access & Pilot Opportunities



Call for

Application for Startups

For **Startups** in Deeptech (Agri-Tech / Water - Tech & in ICPS Domain

bit.ly/IITRopar_100Days_100Startups

INDRA

1. Inphlox Water Systems Pvt Ltd. (Indra)

INDRA has developed **turnkey and affordable point of source, decentralized wastewater management, treatment, and re-cycling packaged solutions.**

Key benefits:

- Low energy consumption
- No added chemical requirements
- Minimal sludge generation
- Water recovery of more than 95%

External Investments: Emerald City Ventures, Mela Ventures, HDFC Parivartan ; DST / DBT Birac

Deployment Sites: Mitsubishi Electric ITC Hotels; Govt. of Telangana; Govt. of Maharashtra; Rama Pulp & Papers Limited; Sands Synergy Pvt Limited

DST Funding
0.25 Cr

Revenue Earned
16 Cr+

External Fund Raised
35 Cr+

Impact on TIH:
Collaborative Water Innovation Lab to be established in IIT Ropar



2. Aryav Ecofriendly Resources Pvt Ltd

- Aryav AWG specializes in DeepTech solutions for **manufacturing highly energy-efficient air-to-water generating machines worldwide, with Patented technology.**
- With a focus on sustainability, Aryav AWG supports companies in achieving goals such as net-zero water or water neutrality.
- Catering to the B2B market, the company offers a range of machines from 100 LPD to 10,000 LPD.
- Aryav AWG addresses three key challenges—water scarcity, health, and environmental impact—through its innovative machines.

DST Funding
0.30 Cr

Revenue Earned
0.32 Cr+

External Fund Raised
0.71 Cr+

Impact on TIH:
Collaborative Water Innovation Lab to be established in IIT Ropar



3. QZense Labs Private Limited

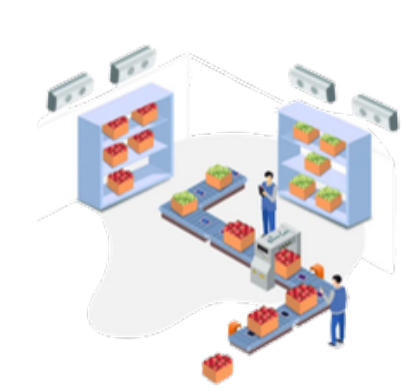
Leveraging **data capture and AI analytics** throughout the produce lifecycle.

Using a **combination of spectral and olfactory sensors**, and creating platform assesses internal quality and freshness, offering valuable insights to optimize inventory management.

With **proprietary machine-learning models, QZense accurately predicts spoilage and shelf life**, revolutionizing the efficiency of fresh food distribution.

Accolades:

Featured in **MIT Technology Review** for work with Dunzo; Featured on **Forbes Asia 100 to Watch List; National Technology Awards** -Awarded by Govt. of India & **NASSCOM**; Part of **Reliance Industries' startup program**; Part of **World's Biggest Hardware Accelerator, HAX**



DST Funding
0.31 Cr

Revenue Earned
3 Cr+

External Fund Raised
7 Cr+

Impact on TIH:
Collaborative Water Innovation Lab to be established in IIT Ropar

Success Stories of Startups



CaneBot



Name: Canectar Foods Pvt Ltd

Founded In: 2019

TRL : 9

Onboarding: SAMIRDHI

Accolades: Sharktank season 1, Cornell Maha60, National Startup Award 2024

Description: Deep-tech startup CaneBOT has developed an autonomous contact less smart kiosk that offers fresh and hygienic sugarcane juice.

Backed by **Venture Centre Pune**



CropRover



Name: Cropper Technologies P Ltd

Founded In: 2022

TRL: 7

Onboarding: SAMIRDHI

Accolades: Funded under SISF

Description: CropRover, A fully autonomous AI based Agri Robot, This would be doing all activities on the farm by itself from Pre- sowing to Post-harvesting.

Backed by **National Institute of Design**

ROHI RAHI



Name: R2E Technologies P. Ltd

Founded In: 2018

TRL: 8+

Onboarding: SAMIRDHI

Accolades: DOT, STPI Funded, 15+ IPs

Description:

A women-founded tech-driven startup working on tracking, monitoring and logistics.

Backed by **IIT Tirupati**

ubreathe

UBreathe



Name: Urban Air Labs Pvt Ltd

Founded In: 2022

TRL : 9

Onboarding: SAMIRDHI

Accolades: Shark Tank Season 1

Description: Plant-based air purifier backed with Indigenous patent.

Backed by **Technology Development Board, DST**

Success Stories of Startups



Agvisi



Indian Hemp Store



Ares System



AyuRythm



Name: Agvisi Technology P Ltd
Founded In: 2018
TRL: 7
Onboarding: SPRINT

Accolades: Funded under RAFTAAR Scheme

Description : AgVisi uses AI-driven models to create fruit clusters, reducing production costs, extending shelf life, and fostering farmer communities to tackle horticulture challenges



Name: Indian Hemp Store
Founded In:
TRL: 8
Onboarding: SAMRIDHI

Accolades: Best 20 Startup of Uttarakhand

Description: A Single Platform Which Can Solve All Issues Related To Hemp Industry. Amazon Of Hemp" In India. Connecting Govt Bodies, Buyers & Sellers under single platform.



Name: Ares System
Founded In: 2019
TRL : 9
Onboarding: SSIF

Accolades: Award Best Pitch, in pitching competition at Bangalore. Going to Paris to pitch the idea on Dassault Global forum sponsored by Dassault



Name: HourOnEarth Creative Solutions P. Ltd
Founded In: 2021
TRL: 9+
Onboarding: SAMIRDHI

Accolades: Incubated by Apple Design

Description: AyuRythm personalizes holistic wellness through Ayurvedic principles, offering tailored suggestions based on a quick pulse diagnostic test.



INDIA'S TOP 100 STARTUPS ANNOUNCE THEIR ARRIVAL

A new India has taken wings, soaring towards unseen possibilities and a better future. Leading the way are the country's innovators and entrepreneurs, who are using technologies of tomorrow to solve today's challenges. Their heroic endeavours finally found the stage it deserves, with Leap To Unicorn, a startup mentoring and funding program created by IDFC FIRST Bank, in association with Moneycontrol and CNBC-TV18, which has helped shine the spotlight on India's top 100 startups.

It began with 5500+ startups applying to be part of the program. About 600 were selected to undergo a month long bootcamp, during which business leaders and industry

veterans shared lessons in startup funding and operations. Another round of pitches later, an elite jury of investors and VCs selected the top 100 startups, representing different sectors and channeling unique solutions to solve health, financial, technological, logistical and sustainability challenges, while offering new consumer experiences and services as well.

The top 100 startups are true pioneers, who demonstrate the power of hard work and ingenuity. As the first batch of successful startups to emerge from the Leap To Unicorn initiative,

these 100 will continue to occupy a special place in the pantheon of India's startup champions.



iWebTechno

AyuRythm

PaperPro®

MANJHA
मत्स्य किसानों की एक नई उड़ान...



Human Resource Development (HRD)

Training, Capacity Building Programs & CPS Lab development for students, startups, institutions on ICPS Domain



The image features five silhouettes of professionals in various roles, including a person in a hard hat, a person in a suit, and a person in a lab coat, set against a backdrop of a city skyline at dusk. The silhouettes are filled with a blue and orange color scheme, and the city buildings are visible through them.

Human Resource & Skill Development: Overview

6000+

Manpower Trained

2000+

Job Created

450+

Outreach Activities

6K+

Students Energized

5000+

Startups Engaged

5000+

Nurturing CPS Leaders

Human Resource Development (HRD): Skilling Ecosystem

Awareness & Outreach

- School & college engagement (IoT for Schools)
- HARVEST
- Aarambh



IIT Ropar CPS Labs Initiative

- College/ Universities Labs
- Polytechnic Colleges Labs
- School Labs
- Industry Oriented Labs



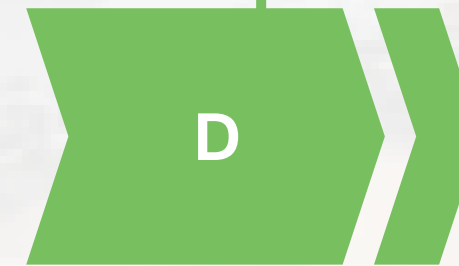
Certification & Training Courses

- AI 4 Agritech Course
- AI for HR
- AI for Sales & Marketing
- IoT Training Courses
- Digital Literacy Program
- Faculty Development Program



Conferences & Stakeholder Engagements

- Integrated Approaches for Crop Science Innovation (IASCSI) Conference (International Conference of Agriculture)
- ICA Conferences - 3 Editions



Internships Programs

- Summer & Winter Internships
- Domain Projects (AgriTech, WaterTech, IoT)
- Research & Startup exposure



Key Skilling Programs

Internships

Agriculture Cyber-Physical Systems (CPS)-

Impact: Trained 314 participants to adopt tech-based agriculture.

Internship on Sustainable Agriculture-

Impact: 54 participants adopted sustainable methods for better yield.

Internship on CPS & IOT-

Impact: 30+Students from Kurukshetra University successfully completed the internship.



Conferences

ICA-2023

Impact: Boosted collaboration in agri-tech

ICA-2024

Impact: Boosted collaboration in agri-tech

ICA-2025

Impact: 35 Paper Presentations, 5 Poster Presentations, 40+ Researcher Participants, 25+ Professors & Progressive Farmers.

IIASCSI 2025

Impact: 30+Students from Kurukshetra University successfully completed the internship.



Programs

Quality Improvement Programme (QIP)-

Impact: 481 faculty members improved teaching & research skills

Digital Literacy Program (30 Days)-

Impact: Boosted digital confidence and problem-solving among students at JNV Chandigarh

Life Programme(2024) -

Impact: 30+Students from Kurukshetra University successfully completed the internship.



Key Skilling Programs

Farmer Engagement

Farmers Engaging Session

Impact: Strengthened farmer engagement with emerging technologies

Fostered awareness of practical tech solutions for daily challenges

Promoted collaborative dialogue for sustainable agricultural growth



Faculty Development Program

Faculty Development Program (FDP)

Impact: Trained educators to bring CPS into classrooms

12 teachers improved their teaching methods using tech



Courses

Ai 4 Agritech

Impact: 21 Students Trained, 5 Poster Presentations, 3 Students Undergoing Training, 25+ Professors & Progressive Farmers Engaged

Residential Training Program in Industrial Automation and IoT

Impact: A Residential Training Program in Industrial Automation and IoT provides participants with a comprehensive understanding of automation technologies and their integration with the Internet of Things (IoT)

AI-CPS Certificate Course

Impact: 9-week online certificate course on AI and CPS for agriculture automation for employability enhancement of students and recent graduates



Training , Workshop & School Initiative

CPS Trainings at IIT Ropar CPS Labs

Total Trainings : 20+

Empowering Students through IoT Training at AWaDH CPS Lab, NIT Delhi

Impact: Empowering Students through IoT Training at AWaDH CPS Lab, NIT Delhi.

CPS Training for CCCT Sikkim

Impact: iHub – AWaDH @ IIT Ropar welcomed 30+ students from CCCT Sikkim for a month-long hands-on training in Cyber-Physical Systems.

CPS & IoT Training at CICU Ludhiana

Impact: Hub – AWaDH @ IIT Ropar conducted a hands-on CPS Training at CICU, Ludhiana, empowering 40+ participants with skills in IoT, BLE technologies, sensor integration, and industrial automation.



CPS Trainings through Ideathon Program

Total Workshops : 12+

Transforming Agriculture with IoT, Automation & Smart Irrigation

Impact: Participants gained valuable insights into leveraging IoT sensors, automation systems, and smart irrigation techniques

Uttarakhand THRIVE Summit

Impact: 5 days CPS Training, Skilling and Enabling Startups: Uttarakhand THRIVE Summit held at Uttarakhand by iHub-AWadh at IIT Ropar in collaboration with Runway Incubator

Workshop at National Institute of technology , Delhi

Impact: workshop was to provide an interactive platform for researchers, faculty members, and engineers to discuss cutting-edge developments in Internet of Things (IoT) and gain hands-on experience in both software simulations and hardware implementation.



School Initiative

Total School Initiatives : 30+

Joy of Computing

Impact: CPS awareness among school children, focusing on key areas such as artificial intelligence, internet of things, industrial automation, and machine learning.

Life Environment Initiative

Impact: Environmental Awareness & Outreach is a unique initiative designed to engage school children in the critical role of sustainability through the fascinating world of Environment IoT Kits and Industrial Automation.

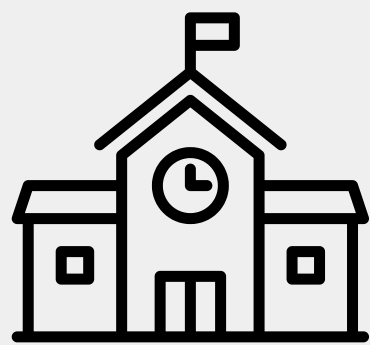
5 Days Digital Literacy Residential program-

Impact: Fostered innovation and problem-solving using digital tools.



IIT ROPAR CPS LABS

Powered by NM-ICPS

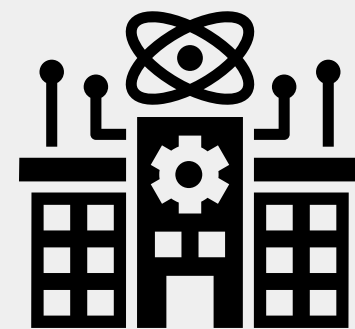


Schools

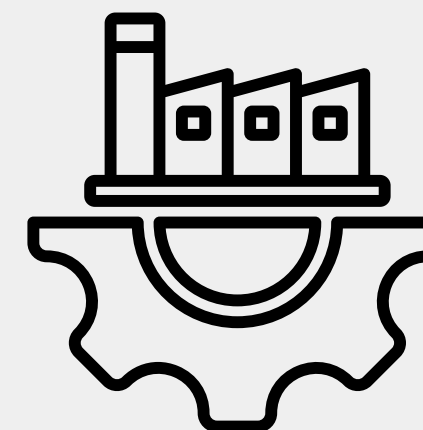


Colleges

*Engineering/Universities/
Research Institutes*



**ITI's &
Polytechnics
Colleges**



Industry

Human Resource & Skill Development: Overview



18
CPS Labs Established

8+
Entrepreneurs Supported

5+
Projects supported

400+
Faculty and Staff trained

800+
Students trained in CPS

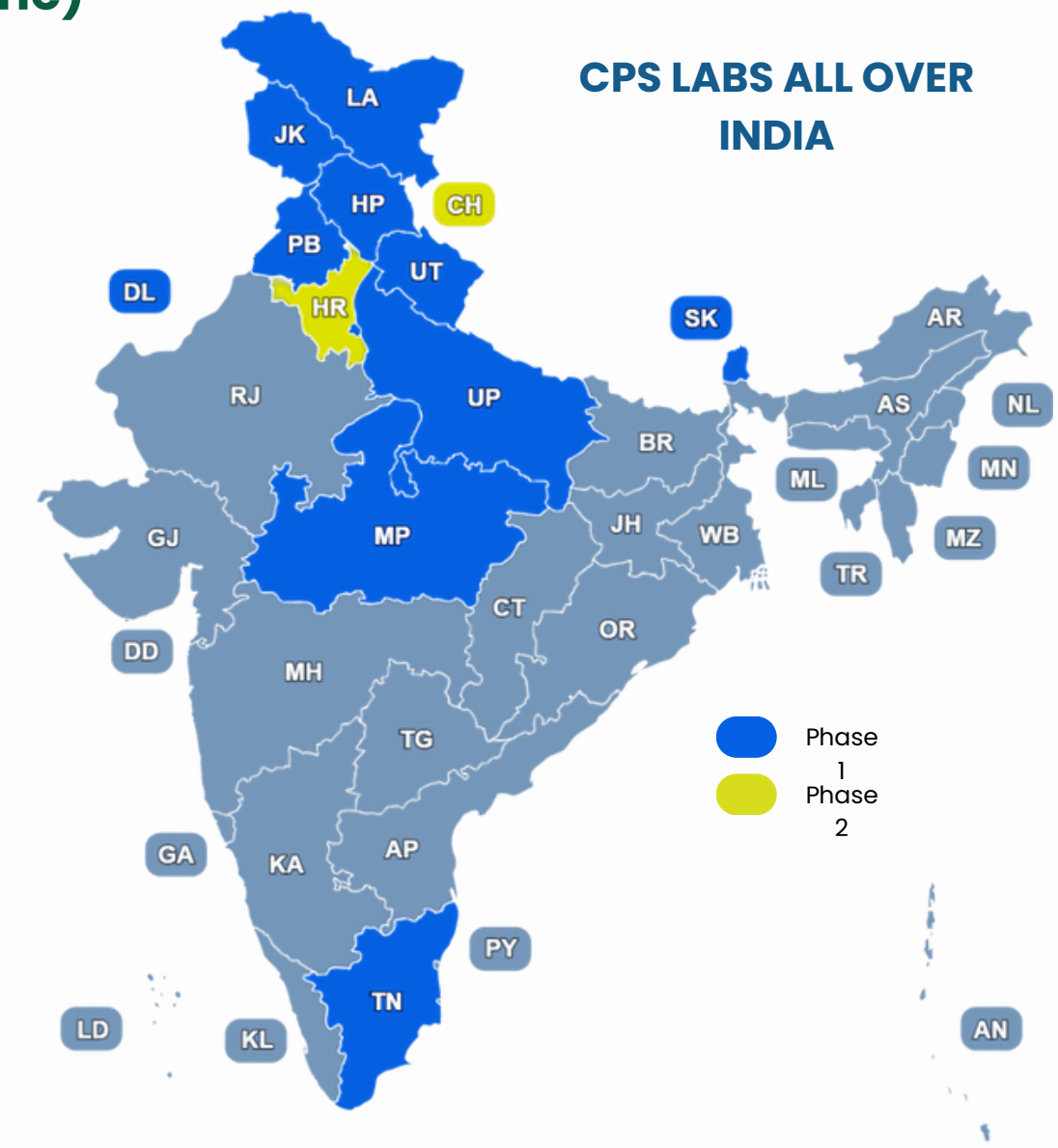
10 +
Labs in process

Phase 1 (Established)

 National Institute of Technology - New Delhi	 National Institute of Technology - Jalandhar	 Tula's Institute - Dehradun, Uttarakhand	 Thapar Institute of Science & Technology - Patiala, Punjab	 Chitkara University - Rajpura, Punjab
 Baba Farid Group of Institutions - Bathinda, Punjab	 University of Ladakh	 Centre For Computers and Communication Technology (CCCT) in Chisopani, Sikkim	 Khalsa College of Engineering & Technology, Amritsar	 Indian Institute of Information Technology, Una
 Chamber of Industrial & Commercial Undertakings, Ludhiana	 IILM, University Greater Noida	 HRIT University Ghaziabad	 Sardar Vallabhbhai Patel University of Agriculture and Technology, Merrut, UP	 Acropolis Institute of Technology and Research - Indore, Madhya Pradesh

Phase 2 (in Pipeline)

 Government Industrial Training Institute, Ropar	 Chandigarh University, Punjab	 Government Polytechnic College Bhiwini
 Entrepreneurship Promotion and Incubation Council Ambala College of Engineering and Applied Research	 PU-IIT Ropar Regional Accelerator for Holistic Innovations, Chandigarh	 Government Polytechnic College Amritsar
 Shivalik College of Engineering - Dehradun, Uttarakhand	 National Institute of Technology - Sikkim	 Government Polytechnic College Kotkapura, Faridkot
 Government Polytechnic College, Rupnagar		



CPS LABS ALL OVER INDIA

● Phase 1
● Phase 2

CPS Training Initiatives

Impact

18



Established IIT
Ropar CPS Lab

25



CPS Lab trainings

3



Chankya Interns

400+



Faculty Trained

800+



Students Trained



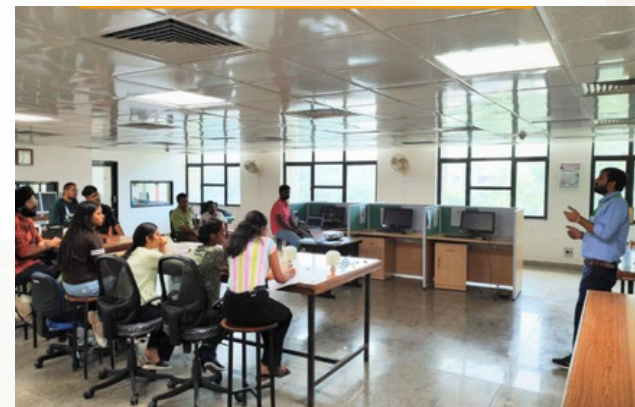
Training session at Tula's Institute



CPS & IoT Training at CICU Ludhiana



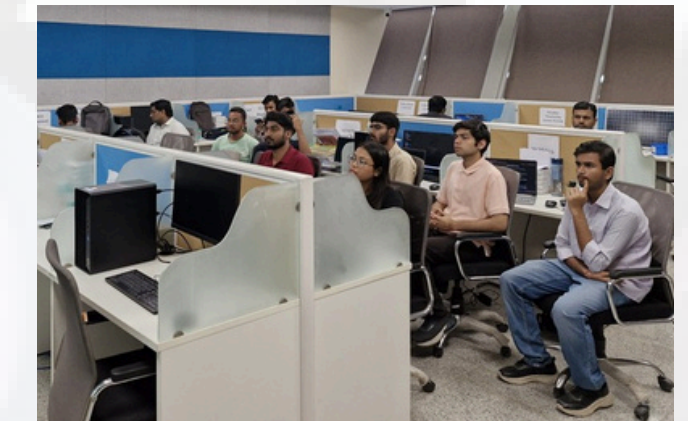
Thapar Institute of Science & Technology - Patiala, Punjab



CPS Workshop Empowers Students at Chitkara University



Workshop Training on BLE & 3D Printing at IIIT Una



Empowering Future Innovators through Hands-on Training at National Institute of Technology Delhi



Hands-on CPS & BLE Training at Khalsa College, Amritsar



CPS & IoT Workshop at Baba Farid College



Empowering Innovation: AI & IoT Workshop at AWaDH CPS Lab, NIT Jalandhar

Launch of Agritech Innovation Hub and Model Smart Farm In Sardar Vallabhai Patel University of Agriculture Technology , Uttar Pradesh





responsible
consumption
and
production

sustainable
cities and
communities

zero

peace, justice,
and strong
institutions

and
economic
growth

affordable
and
clean
energy

good
health
and
well-being

reducing
inequality

International Collaboration & Partnerships



gender
equality

life
below
water

life on land

quality
education

industry,
innovation

climate

no



International Collaborations





विज्ञान एवं प्रौद्योगिकी मंत्रालय
MINISTRY OF SCIENCE AND TECHNOLOGY



#startupindia

AWaDH
IIT Ropar-TIF



Manthan



Fraunhofer IGB and IIT Ropar



TIH Activities & Services

Bureau of Indian Standards (BIS)

- Working Group 2 on Standardization Strategy for SMART Agriculture (FAD 22)
- National Agriculture Code (NAC)
- Agricultural Systems and Managements Sectional Committee, FAD 22



16th meeting of Agricultural Systems and Managements Sectional Committee, FAD 22 at ICAR-National Institute of Biotic Stress Management, Raipur



17th meeting of Agricultural Systems and Managements Sectional Committee, FAD 22 at Indian Institute of Technology Ropar



Day long workshop for development of National Agriculture code (NAC) at National Institute of Training for Standardization(NITS), Noida

Pan India Survey on Small Farm Holdings

Collaboration with stakeholders for online data collection

- Krishi Vigyan Kendras: **46**
- Farmers Producer Organisation : **21**
- Farmers Producer Companies: **69**

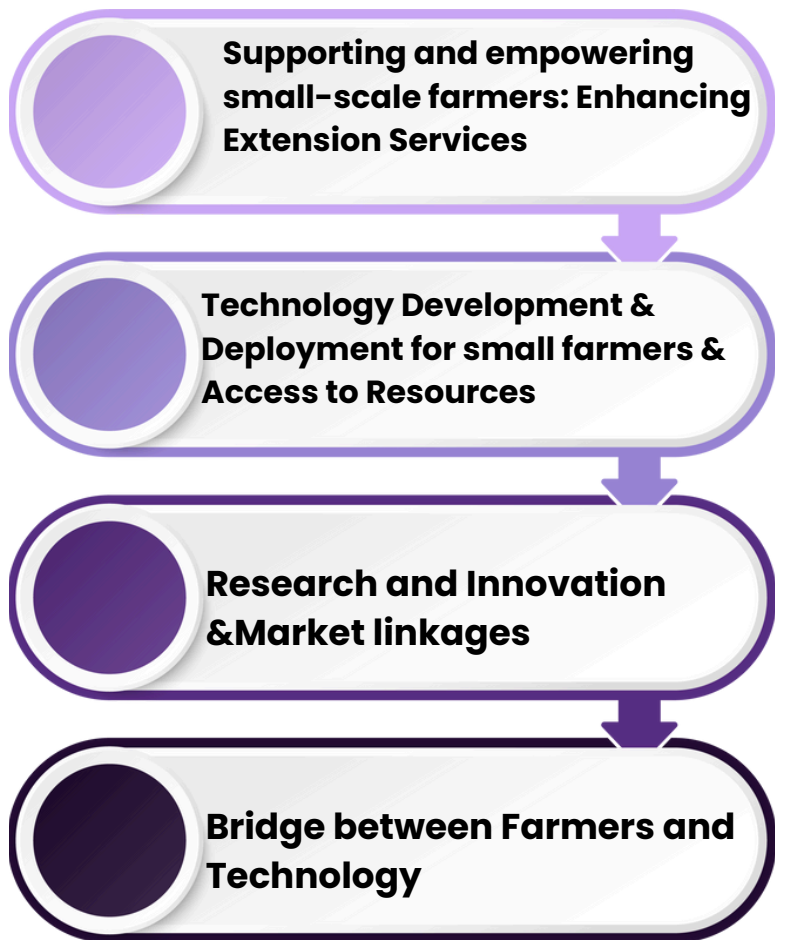
Survey Highlights

- Top 3 states with Small and Marginal farm holdings
- **UP** (739.8k) – **Bihar** (27.2k) – **Maharashtra** (227.3k) [Survey data]

Ground Data Collection (On ground Survey in Punjab)



Objectives of proposed CoE



Total Farmers
200+

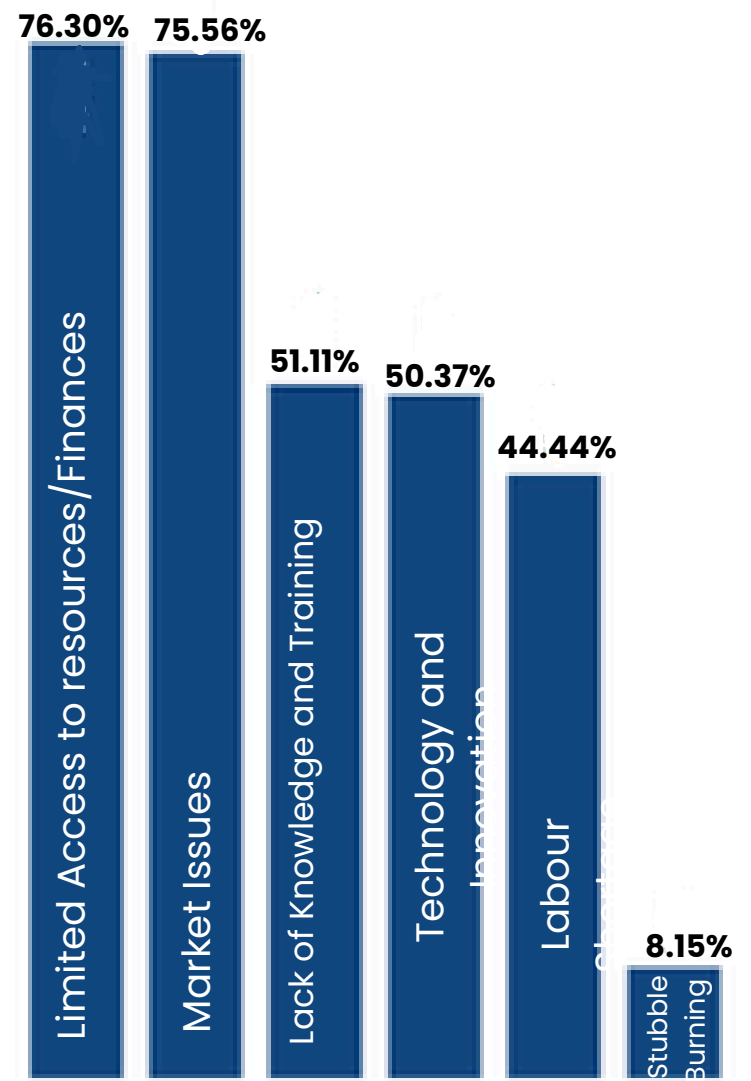
Total Districts Covered
8

Total small Farm Holders
105

Total Villages Covered
51



Major Challenges for small farmers



Total Farmers : 3.4 million

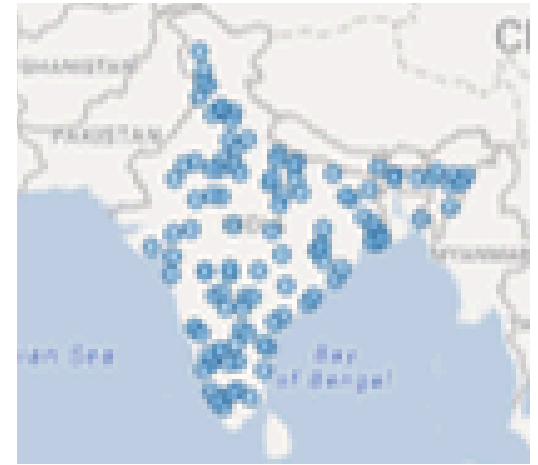
Online Data Collection (Through various Stakeholders Pan India)

Total Farmers
3.4M

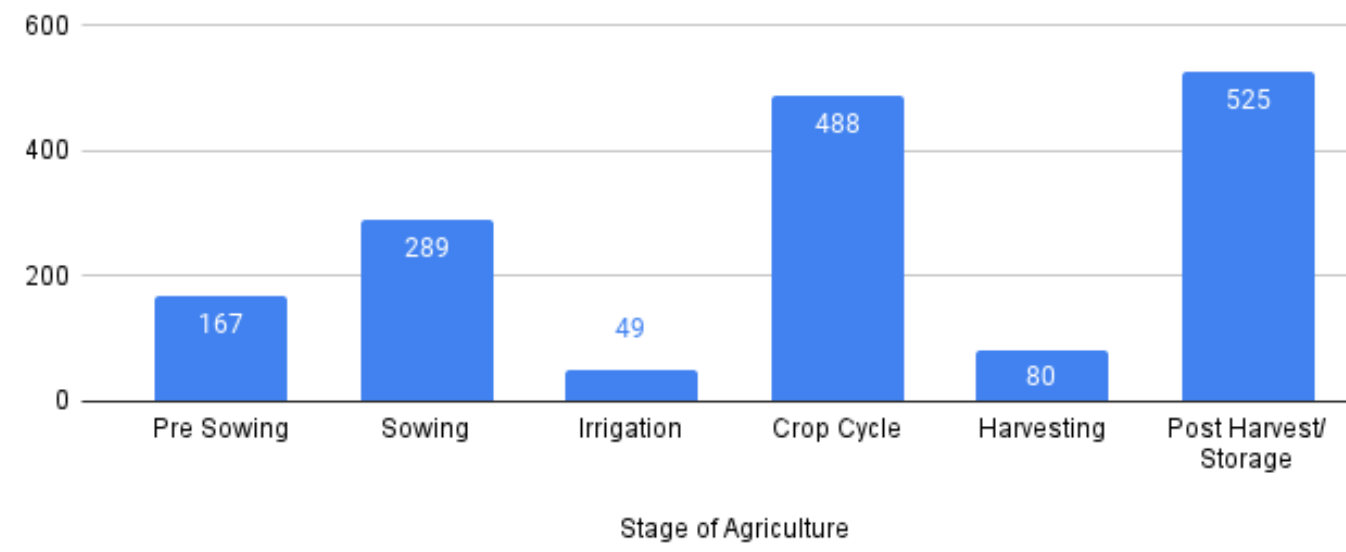
Total Districts Covered
115

Total small Farm Holders
1.5M

Total Woman Farmers
529K















































No. of Technologies vs Stage of Agriculture



Mentor SISFS ISMC (50+ Experts)



 <p>Somveer Anand Mission Director IM Punjab</p>	 <p>Vijetha Shastry Associate Director Standard Chartered Bank</p>	 <p>Hanisha Vaswani Founder & Managing Partner Majority Fund</p>	 <p>Shashank Randev Founder VC 100X.VC</p>	 <p>Sweta Tiwari VP - Venture Building Alteria Capital</p>	 <p>Zaran Bhagwagar AVP-Startup Ventures Xelpmoc</p>	 <p>Prof Rupinder Tewari Mentor, TEC, Panjab University, Chd.</p>	 <p>Dr Hemang Shah India Engineering Lead (Director), Qualcomm</p>	 <p>Dr Ritesh Kumar Pr. Scientist CSIR - CSIO</p>	 <p>Dr Jayant Singh Assistant Director Krishna University</p>	 <p>Suchiradipta B Policy Engagement Specialist, IWMI</p>
										
 <p>Kiran Joseph Digital Sustainability PM Syngenta</p>	 <p>Amit Mishra Co-founder & Partner 3to1 Capital</p>	 <p>Anubhav Tiwari Chief Innovation Offer NIELIT, MeitY, GoI</p>	 <p>Kiran Vuppala Head - Mazumdar Shaw Medical Foundation - TBI</p>	 <p>Saurabh Trivedi Founder, IP Samadhan Partner, Agility Ventures</p>	 <p>Rahul Singh Senior Marketing Manager Dell Technologies</p>	 <p>Mamta Bhardwaj Sr. Scientist C DST-Centre for Policy Research</p>	 <p>Vaniya Dangwal Head - Partnership Headstart Network</p>	 <p>Tushar Vadera Lead, Headstart Investor Circle; Co-Founder, SetMyCart</p>	 <p>Nikhil Muppavarapu AVP (Incubation) Tamil Nadu Technology Hub</p>	 <p>Harsh Pangi Founder IP - FY</p>
										

Comittee includes representative from:

- Government
- Corporate
- Startups
- Nomination from Incubator / TIH
- Academia
- Investment

Total Member of 50+ experts for the ISMC and for evaluation

IIT Ropar (iHub - AWaDH) Expenditure: Statistics

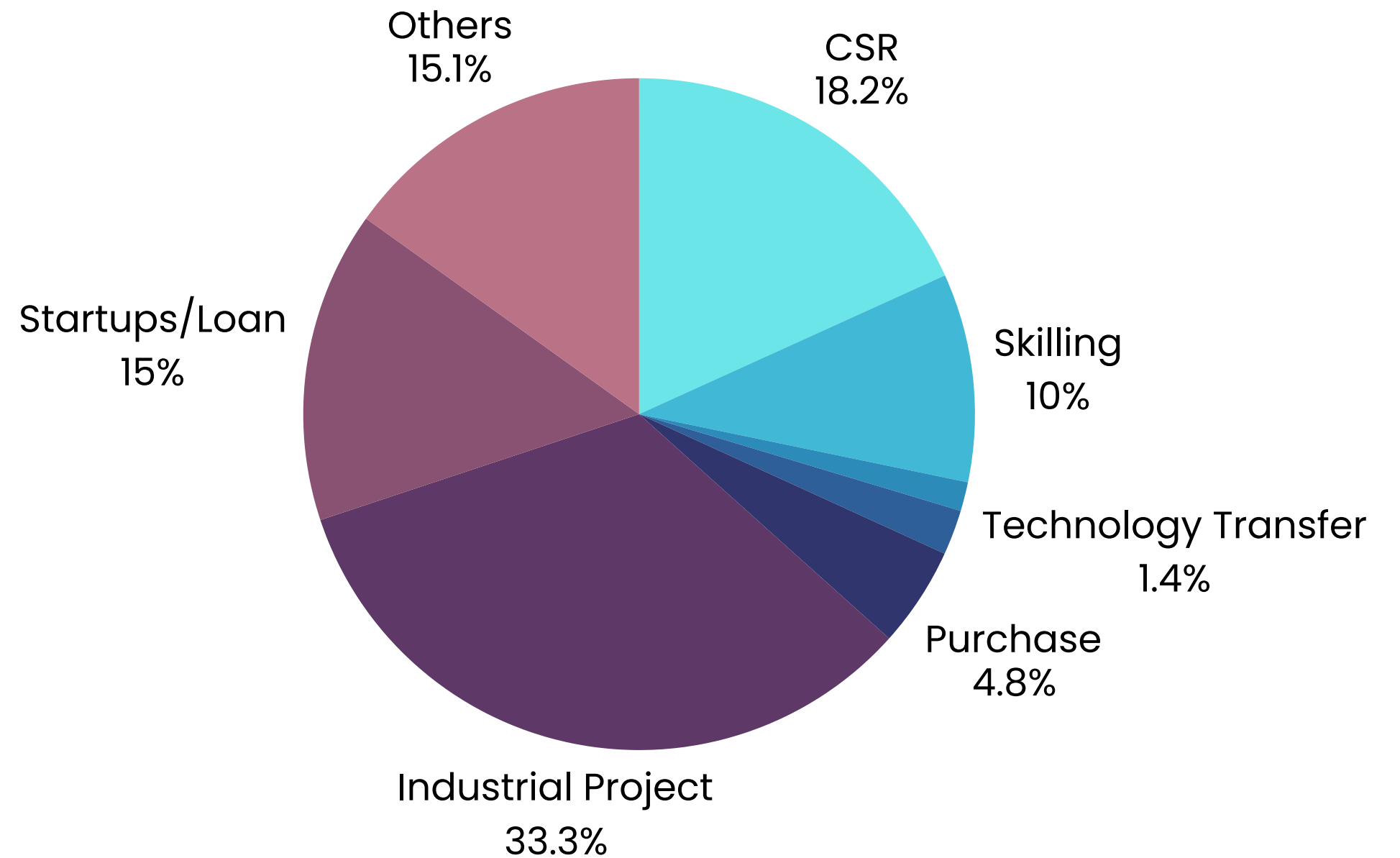
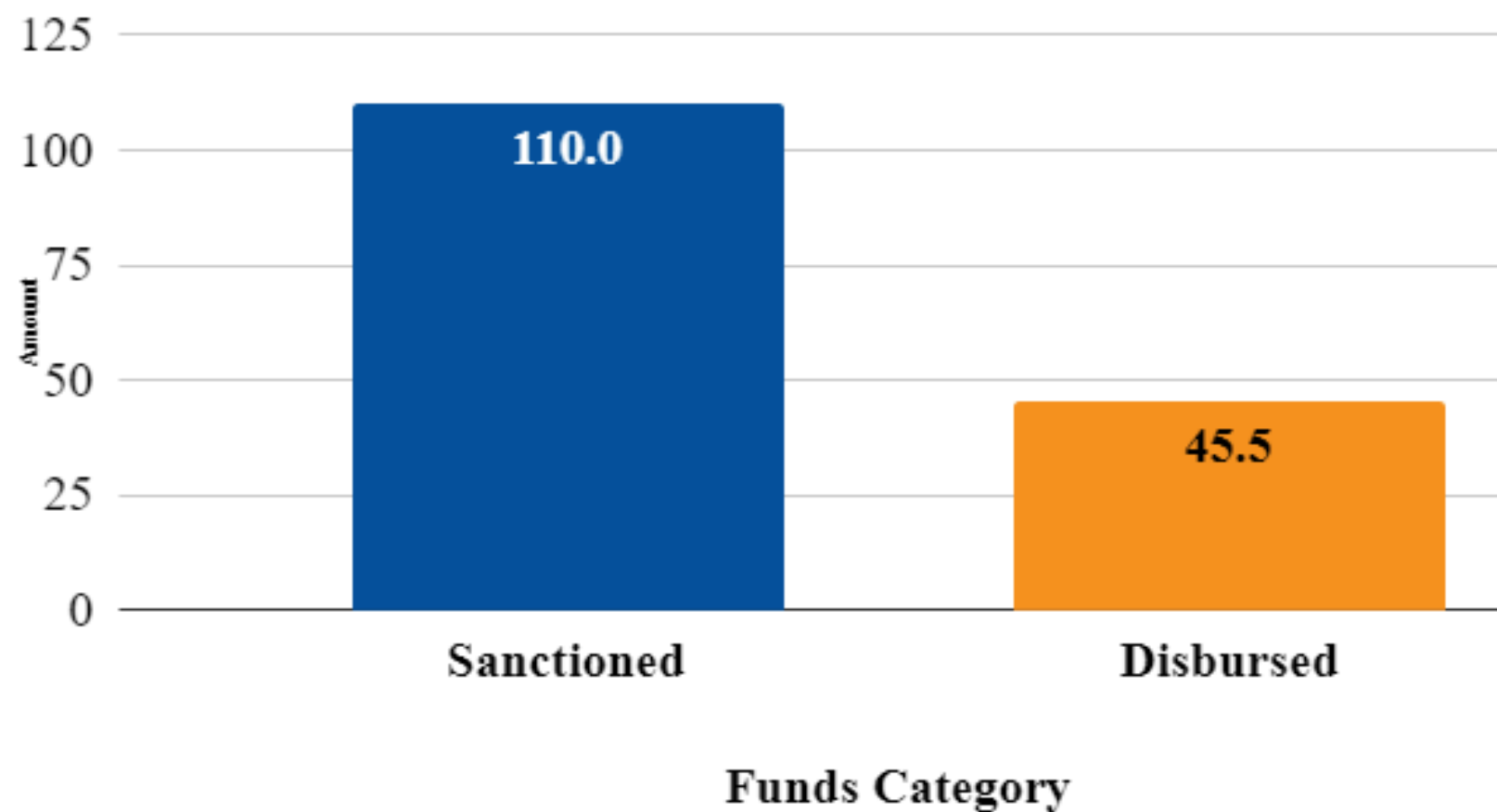
Financial Statement till FY 2023

	Funds Allocated	First Year	Second Year	Third Year	Fourth Year	Total Expenditure
Recurring	₹334,500,000.00	₹9,421,335.00	₹49,705,656.00	₹75,431,954.00	₹169,941,055.00	₹304,500,000.00
Non - Recurring	₹170,000,000.00	₹19,776,408.00	₹16,285,255.00	₹33,525,724.00	₹80,412,613.00	₹150,000,000.00

**Planned Expenditure
(in Cr) for FY 24-25**

**Recurring : 28 Cr+
NonRecurring 06 Cr+**

Funds: Sanctioned vs Disbursed



NEW INITIATIVES



Farm-of-Future Project

Syngenta Group | About | Sustainability | Regenerative Agriculture

Farm of the Future provides fertile ground for digital innovation

An industry collaboration for more efficient and sustainable dairy farms
Learn how "Dairy Feed In Focus" aims for best practices, supported by digital tools.

With data science we're on the way to climate-friendly agriculture
How data analysis and new technologies can help sustainable agriculture make a breakthrough.

Physical Space = 5 ac.
Investment from Syngenta = 8 cr.

Innovation Experience Centre

DASSAULT SYSTEMES

Field Operations Efficiency for a Bigger Business Success

Greater field operations efficiency, after-sales services and success in the Industrial Equipment market.

[Discover how](#)

Center of Excellence for Precision Agriculture

HEXAGON

precision agriculture starts with GNSS

TerraStar increases your GNSS accuracy

HxGN LIVE: Our digital solutions...

Welcome to the new reality

Digital Agritech Alliance





विज्ञान एवं
प्रौद्योगिकी मंत्रालय
MINISTRY OF
SCIENCE AND
TECHNOLOGY



AWaDH
IIT Ropar-TIF

annam.ai



Indian Institute of Technology - Ropar
भारतीय प्रौद्योगिकी संस्थान - रोपड़



MINISTRY OF EDUCATION, GOVT OF INDIA

AI Centre of Excellence (CoE) in Agriculture



Honb'le Minister **Shri Dharmendra Pradhan**, Ministry of Education with **Shri Sanjay Murthy**, (Secretary, MoE) & **Dr Sridhar Vembu** (Founder & CEO), Zoho, handing over the plaque and Kalpavriksha to **Prof. Rajeev Ahuja** (Director, IIT Ropar) & **Prof Pushendra P Singh** (Dean R&D, IIT Ropar)

15 October, 2024

Committed to building Agritech ecosystem & emerge as hub for:

- Digital Agriculture
- Precision Agriculture
- Skilling for Digital and Smart Agriculture Technologies
- Accelerating Agritech & Watertech startups

Team



Prof. Rajeev Ahuja
Director
IIT Ropar



Dr. Pushendra Singh
Project Director
IIT Ropar TIF (AWaDH)



Prof. Harpreet Singh
Professor & Director (TIF)
IIT Ropar



Dr. Radhika Trikha
Chief Executive Officer
IIT Ropar TIF



Mukesh Kestwal
Chief Innovation Officer
IIT Ropar TIF



Aditya Madan
Chief Liaison Officer

Domain Experts



Dr. Suman Kumar
IoT Systems



Dr. Neelkanth Nirmalkar
Water Treatment &
Management



Dr. Mukesh K. Saini
Agriculture Automation &
Information systems



Dr. Neeraj Goel
Agriculture Automation &
Information systems



Dr. Parbir Sarkar
Stubble Management Systems &
Urban Farming

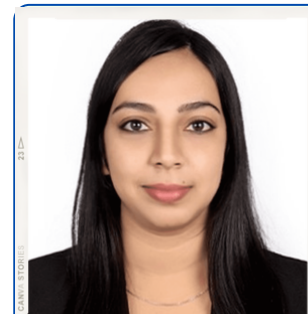


Dr. L. Vijay Anand
Water & Soil
Assessment Processes

Operational Team



Saurabh Arora
Incubation Manager
IIT Ropar TIF



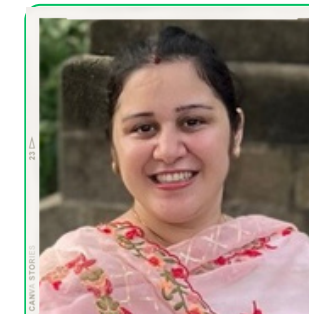
Dr. Shreya Sharma
R&D and Corporate Manager
IIT Ropar TIF



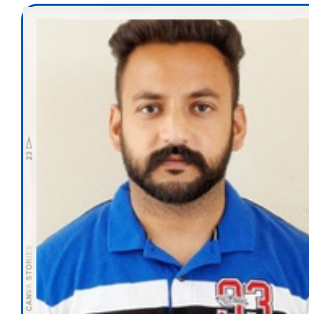
Parry Sood
Program Manager
IIT Ropar TIF



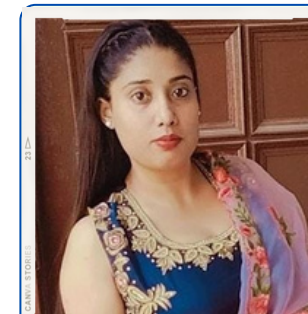
Varinder Saini
Compliance Manager
IIT Ropar TIF



Harpreet
Operational Manager
IIT Ropar TIF



Gagandeep
Purchase Manager
IIT Ropar TIF



Navjot
Assistant Manager - Accounts



Vardhman Jain
Senior Associate Manager
IIT Ropar TIF



Simranjeet Singh
Assistant Manager -
Startup

IIT Ropar – Technology and Innovation Foundation

(iHub - AWaDH)

FOLLOW US



Scan the QR

90



Tech Supported

150+



Publication & IP

220+



Partner

170+



Startup Supported

8000+



Skill Development

483



CPS Research Base

Enabling **Startups** | Fostering **Skilling** | Catalyzing **Research and Development**