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EMPOWERING FIELDS WITH THE RISE OF FARM POWER TECHNOLOGIES

In the heart of India's vast farmlands and diverse other sectors of agriculture, a quiet revolution is underway. Farm power technologies are reshaping agriculture from a labour-intensive grind into a smarter, more efficient enterprise. These innovations are not mere gadgets; they are lifelines, amplifying human effort, boosting productivity, and fostering sustainability like never before.

Consider the smallholder farmer in Maharashtra's drought-prone regions. Equipped with a solar-powered irrigation pump, they now draw water sustainably, irrigating acres without the uncertainty of erratic monsoons or soaring diesel costs. Output? Up by 30-40%, as per recent ICAR studies, with water savings of up to 50%. In Punjab's golden wheat belts, GPS-guided tractors and auto-steer systems minimize seed waste, optimize fertilizer application, and till with pinpoint accuracy—slashing input costs by 20% while preserving soil health for future seasons. Drones, once the stuff of sci-fi, now hover over fields, scouting pest infestations and nutrient deficiencies in real-time via multispectral imaging, enabling targeted interventions that curb chemical overuse and protect pollinators.

This surge in mechanization extends beyond efficiency to true empowerment. Women farmers, often burdened by heavy manual labour, now master lightweight electric tillers and app-controlled sprayers, driving gender-inclusive farming and household incomes. Rural youth, lured away by urban jobs, are returning with tech savvy, launching custom hiring services that democratize access to high-end machinery. Even in Bihar's flood-vulnerable plains, elevated mini-tractors navigate waterlogged fields, harvesting rice before it spoils.

Yet, challenges loom: affordability for marginal farmers, skill gaps, and patchy rural infrastructure. Government schemes like Sub-Mission on Agricultural Mechanization (SMAM) and PM-KUSUM are game-changers, subsidizing equipment and promoting renewables—empowering over 2 million farmers since inception. Private players, too, are stepping up with affordable leasing models and digital marketplaces for shared machinery.

Farm power technologies herald a resilient future—one where Indian farmers don't just survive climate shocks but thrive, feeding a nation of 1.4 billion with pride and innovation. Let's champion bolder policies, widespread training hubs, fintech loans, and public-private partnerships to mechanize every field, ensuring no farmer is left behind.

Rajni Shaleen Chopra

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From the CEO's desk

The Evolving Face of Farm Power in India

Farm power lies at the heart of agricultural productivity, shaping everything from timely sowing and harvesting to irrigation, post-harvest handling, and value addition along the farm-to-fork chain. Across India, the energy mix that powers farming has steadily evolved to include mechanical, electrical, and increasingly renewable sources. This shift is helping farmers overcome shrinking labour availability, rising climate stress, and small, fragmented landholdings that once constrained efficiency.

Several key technologies are reshaping how power is generated, accessed, and used on farms, with wide implications for both productivity and sustainability.

Mechanisation remains the most visible change. Tractors, power tillers, combine harvesters, laser land levellers, and transplanters have moved beyond large farms to smaller holdings through rental models, custom-hiring centres, and government-supported machinery banks. These machines reduce operation time, improve seeding uniformity, minimise field losses, and enhance harvest quality, directly boosting yields and farm incomes. Precision planters, rotavators, and bed-forming equipment, often mounted on compact tractors or power tillers, are particularly suited to the 1–2 ha plots common across India. As tenancy and sharecropping arrangements grow more formalised, such equipment is increasingly leased or shared, enabling even smallholders to access modern farm power without heavy capital investment.

Parallel to mechanisation, renewable and decentralised energy is redefining farm power. Solar irrigation pumps, solar-powered cold storage units, and solar-driven milling and processing machinery are enabling farmers to move away from diesel and unreliable grid power. Off-grid solar systems, along with pay-per-use solar pumps, allow smallholders to irrigate more reliably, extend cropping cycles, and even generate surplus electricity or cold-storage services that can be monetised. Biogas plants and biomass gasifiers further diversify the energy basket, turning farm and animal waste into cooking fuel or electricity for lighting and small appliances. Such systems also reduce dependence on fluctuating fuel prices and contribute to cleaner village environments.

Digital and smart-power tools are also gaining ground. Auto-guided and GPS-equipped tractors, along with variable-rate applicators and drone-based sensors, optimize fuel and input use by matching field variability with precise power deployment. IoT-enabled pumps and inverters help monitor energy consumption, detect leaks, and schedule operations during off-peak or solar-heavy hours, cutting costs and improving system life. Agri-energy platforms and digital marketplaces now connect farmers with rental machinery, solar services, and maintenance support, making advanced farm power more accessible without large upfront investment. For policymakers and implementers, the challenge is to ensure these technologies reach small and marginal farmers through affordable financing, skill development, and robust service networks.

Haris Khan

Indogulf Cropsciences Ltd. enters into a MoA with Indian Council of Agricultural Research–Indian Agricultural Research Institute (ICAR-IARI) under Prime Minister's Fellowship for Doctoral Research

Indogulf Cropsciences Limited has entered into a Memorandum of Agreement (MoA) with the Confederation of Indian Industry (CII), Indian Council of Agricultural Research–Indian Agricultural Research Institute (ICAR-IARI) for the implementation of the "Prime Minister'-s Fellowship for Doctoral Research", a joint initiative of CII and Anusandhan National Research Foundation (ANRF), formerly Science & Engineering Research Board (SERB).

Under this MoA, Indogulf Cropsciences will support a full-time PhD scholar at ICAR-IARI, for a period of four years starting 1 January 2026 up to 31 December 2029. The fellowship aims to promote high-quality, industry-relevant research and strengthen academia–industry collaboration in Indian agriculture. This partnership underscores Indogulf Cropsciences' commitment to fostering innovation, advancing scientific research, and developing next-generation talent to address emerging challenges in Indian agriculture.

India feeds more than a billion people. It does so in the face of erratic monsoons, degrading soil, and a climate that grows less predictable with every passing season. The solutions to these pressures will not come from fields alone — they will come from laboratories, from data, from the kind of rigorous, patient science that takes years to bear fruit.

In the agriculture sector, ensuring food security amid climate change demands innovation—mitigation strategies such as Bio-stimulants for alleviating the adverse effects of drought and heat stress. The proposed research will also encourage young research scholars to work on scientific solutions which will

help in food security. This scientific collaboration would be under the direct mentorship of experienced researcher's with expertise in areas of Abiotic stress tolerance of Plants, Phenomics and Genome Editing.

This collaboration reflects Indogulf's long-term commitment to:

- Fostering innovation in Indian agriculture.
- Advancing scientific research that addresses real-world challenges.
- Developing next-generation talent equipped to tackle emerging issues in food security and sustainability.

Broader Impact

This initiative is expected to:

- Encourage young research scholars to pursue scientific solutions for food security.
- Strengthen academia–industry collaboration, creating a pipeline of innovations that can be commercialized for real-world agricultural applications.
- Contribute to India's vision of self-reliance in agriculture, reducing vulnerabilities to climate change and external dependencies.
- Position Indogulf Cropsciences as a thought leader and enabler of sustainable agriculture, beyond its role as a manufacturer and exporter of crop protection and plant nutrition products.

Food Security, Sustainability, and Resilient Agriculture

Today, Agriculture stands at the intersection of food security, sustainability, and resilience against abiotic stresses such as drought, salinity, and extreme temperatures. Ensuring food security requires not only higher yields but also crops that can withstand unpredictable climate conditions and resource limitations. Sustainable practices—like precision nutrient management, biological inputs, and eco-friendly crop protection—help preserve soil fertility and reduce environmental impact, while innovative technologies support farmers in adapting to stress factors that threaten productivity. By integrating science-driven solutions with sustainable approaches, agriculture evolves into a system that not only feeds growing populations but also safeguards natural resources, ensuring long-term resilience and stability for future generations.

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Indogulf Cropsciences Ltd.: Three Decades of Innovation in Crop Protection, Plant Nutrition, and Global Exports

Indogulf Cropsciences Ltd., which started operations in 1993, manufactures and markets an extensive range of products. We are into the manufacturing of crop protection products, plant nutrients and biologicals and sell them to retail as well as institutional customers focused on improving the crop yield.

A growing exporter of crop protection, plant nutrients and biological products, the company sells its products in 34 countries. Over the span of three decades, Indogulf has diversified its product portfolio and grown into a multi-product manufacturer of 259 crop protection, plant nutrients and biological products. Its innovative packaging solutions, protected by three packaging patents, enhance product quality, safety, and sustainability. These patented designs also contribute to its competitive advantage and provide added value to our customers. Indogulf has plants with international quality standards at Samba in Jammu and Kashmir; Nathupur and Badwasni in Haryana.

Safeguarding crops

Plant nutrients enhance soil fertility, stimulate root development and boost crop yields. The company makes various types of speciality fertilisers, biostimulants and performance products under this vertical. The Haryana plants are strategically situated near Delhi, a major transportation hub with access to highways, dry ports, and airports. This strategic positioning ensures seamless connectivity and efficient logistics operations, facilitating timely and cost-effective transportation of raw materials and finished goods.

THE AG REVOLUTION

HOW TECHNOLOGY IS REWIRING INDIAN AGRICULTURE

Dawn breaks over a rain-fed farm on the Deccan plateau. A farmer in his mid-fifties, soil under his nails and a government-issued soil health card tucked into his shirt pocket, raises a smartphone to a yellowing cluster of leaves. Within seconds, an AI-powered advisory app diagnoses a fungal infection, recommends a minimum-dose treatment, and flags a moisture alert for the adjoining plot. No agronomist visit. No guesswork. No wasted input. He acts and moves on.

This scene, now repeated across thousands of farms, is neither experimental nor futuristic. It is Indian agriculture in motion — adapting, digitizing, and scaling. A sector that feeds 1.4 billion people and contributes nearly 18% of national GDP is undergoing its most profound transformation in a generation. The revolution is quiet, but unmistakable, extending across the value chain from soil preparation to consumer plate.

The farm is no longer just land — it has become a living data platform.

Preparing the Ground: Precision at the Root

Every crop cycle begins with the soil, and technology is reshaping how farmers understand it. Government-backed soil health card programmes, now integrated with geo-tagged testing labs, provide field-level nutrient maps that replace blanket fertiliser use with targeted application. Satellite-based platforms add near-real-time insights into soil moisture, organic carbon, and field variability at costs that were unthinkable a decade ago.

Across Punjab, Haryana, and western Uttar Pradesh, GPS-guided laser land levellers are sharply

About the **AUTHOR**

Mr Rajan Aggarwal is ED&CEO, Milltech Machinery Pvt Ltd and Co-Convenor, CII Karnataka Agri and Food Processing Panel

improving water efficiency. Sub-centimetre leveling reduces irrigation requirements by 25–30%, a critical gain as groundwater stress intensifies. Variable-rate fertiliser applicators, still early in adoption, further refine inputs by applying nutrients precisely where sensors indicate deficiency, protecting both farm margins and groundwater quality.

Sowing Smarter: Data Over Instinct

Seed selection and planting decisions — long governed by experience and intuition — are increasingly driven by data. AI-based advisory platforms now recommend seed varieties aligned not only with soil and rainfall forecasts, but also with projected market prices at harvest. For progressive farmers and Farmer Producer Organisations (FPOs), this convergence of agronomic and economic intelligence represents a fundamental shift in how crop risk is managed.

Crop Care: Intelligence Above and Below

Agricultural drones have moved rapidly from novelty to necessity. Equipped with multispectral cameras, they detect crop stress, pest pressure, and moisture anomalies days before symptoms are visible on the ground. Precision-spraying drones reduce pesticide and fertiliser usage by 25–30%, lowering input costs while reducing chemical load on soil and water bodies.

The revolution is quiet, but unmistakable, extending across the value chain from soil preparation to consumer plate. The farm is no longer just land — it has become a living data platform

India's agricultural drone market is projected to grow at roughly 24% CAGR through 2033, driven by policy support including subsidised drone procurement for FPOs, standardised operating protocols, and accredited pilot training. Complementing aerial intelligence, IoT-based soil moisture sensors and microclimate weather stations relay real-time field data to farmers' smartphones, enabling decisions based on actual conditions rather than historical averages.

Harvesting: When the Farm Learns From Itself

Modern combine harvesters now integrate GPS and yield-mapping sensors, recording output plot by plot in real time. When overlaid with seasonal input data, farmers gain a granular performance audit of each field. This feedback loop informs seed choice, fertiliser scheduling, and irrigation planning for the next cycle. The farm, quite literally, begins to learn from itself.

Post-Harvest: Sealing the Biggest Leak

Post-harvest loss remains Indian agriculture's most persistent structural weakness, driven by poor storage and handling. Technology is now closing this gap.

India's cold chain market, growing at nearly 11% annually, is increasingly supported by IoT-enabled systems that track temperature and humidity from farm gate to retail shelf. Deviations trigger instant alerts, preventing silent spoilage. Solar-powered village-level cold storage units allow farmers to store perishables at source and avoid distress selling during harvest gluts.

Equally transformative is the rapid expansion of scientific steel grain storage. Conventional godowns lose 5–10% of stored grain to moisture, rodents, and infestation. Modern steel silos — sealed, automated, and aerated — reduce losses to below 1%. Under PPP models, the Food Corporation of India has expanded silo capacity nationwide. As of

mid-2025, 2.78 million metric tonnes are operational across 48 locations, with another 3.69 million tonnes under construction and tenders active for further sites. This infrastructure underpins India's long-term food security strategy.

Camera-based AI grading and sorting systems further strengthen post-harvest value by replacing slow, inconsistent manual grading with machine-consistent quality standards required by export and institutional buyers.

India is the world's largest producer and exporter of rice, with output reaching a record 149 million metric tonnes in 2024–25. Pulse production stood at 25.23 million metric tonnes. These figures represent not just volume, but opportunity — and processing is where that opportunity is either captured or lost.

Processing and Value Addition: The Margin Revolution

For decades, much of agriculture's economic upside was captured after the farm gate, with cleaning, milling, grading, and packaging controlled by downstream intermediaries. That balance is beginning to change as modern processing infrastructure moves closer to production. In rice and pulses, fully automated processing systems now integrate pre-cleaning, de-husking, grading, colour sorting, fortification, and packaging into continuous, low-loss flows. Compared with traditional huller mills, modern rice mills improve recovery rates by several percentage points, translating into meaningful commercial and nutritional gains at scale.

Technology will not solve every challenge. Land fragmentation, climate volatility, and rural infrastructure gaps persist. But the trajectory is clear. Indian agriculture is learning, adapting, and moving forward with intent

Companies such as AGI Milltec, one of the leading suppliers of grain and pulse processing systems in India, illustrate this shift. Its equipment is deployed across thousands of mills, enabling producers to improve yield recovery, meet consistent quality standards, and participate more directly in branded domestic and export markets. Similar advances in pulse processing are strengthening the competitiveness of Indian dal across institutional and retail channels.The result is not simply higher efficiency, but a gradual redistribution of value. As processing becomes more precis.e and less waste-intensive, a greater share of the margin remains closer to the farm, reinforcing the economic case for modern infrastructure investment.

Market Access: Rebalancing Power

Historically, Indian farmers were price-takers with little visibility beyond the local mandi. The e-National Agriculture Market (eNAM) is reshaping this dynamic. By end-2024, over 1,410 mandis across 23 states and four Union Territories were integrated, enabling transparent electronic auctions involving 1.75 crore farmers and 2.43 lakh traders.

Digital aggregators are going further, building direct farm-to-institution supply chains that connect farmer collectives to retailers, processors, and foodservice networks. Real-time price information, available in 12 regional languages, has narrowed information asymmetry.

Agricultural credit, once slow and opaque, is also being reimagined. Fintech platforms now use satellite land verification, AI-driven credit scoring, and digital KYC to approve crop loans in under 48 hours — a process that once took weeks.

The farmer on the Deccan plateau is not merely using a new tool. He is participating in a long-overdue rebalancing of power, where information, precision, and market access flow toward the cultivator. Technology will not solve every challenge — land fragmentation, climate volatility, and rural infrastructure gaps persist — but the trajectory is clear. Indian agriculture is no longer standing still. It is learning, adapting, and moving forward with intent.

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FARM POWER 2.0

Along with mechanization, intelligence is emerging as the new engine of Indian agriculture

For decades, farm power in India has been defined by horsepower. Tractors, power tillers, irrigation pumps, and mechanized implements transformed agricultural productivity and reduced human drudgery. Mechanization brought scale and efficiency, enabling farmers to cultivate more land in less time.

About the **AUTHOR**

Mr Praveen Rajpal is the Founder of Behtar Zindagi, when serves as a Knowledge & Advisory platform with support in over 17 regional languages; offers Utility & Information services; and serves as an E-Marketplace for Agri-Inputs. It functions as a "one-stop shop" where farmers can purchase high-quality seeds, fertilizers, pesticides, and cattle feed. It also features a wide range of machinery, from power weeders and brush cutters to Agribot drones for precision spraying

Come 2026, farm power is evolving beyond mechanical strength. A new dimension of power is emerging quietly yet powerfully — intelligence power.

Today, a farmer's smartphone is becoming as critical as his tractor. Artificial Intelligence (AI) is beginning to deliver expert-level agricultural advisory directly into the hands of farmers, in their own language, at any hour of the day. This shift represents not a replacement of traditional farm power, but its next stage of evolution.

How The Farming Landscape Is Changing

Consider a common rural scenario. A dairy farmer in Bundelkhand notices unusual lesions on his cow at 11 PM. The nearest veterinarian is 30 to 40 kilometers away and unavailable until morning. The farmer cannot determine whether it is a minor skin infection or the onset of Lumpy Skin Disease (LSD), which could spread rapidly through his herd. Traditionally, he would wait, worry, and hope the situation does not worsen.

This gap — between the moment a problem arises and the moment expert help becomes available — represents one of the biggest structural weaknesses in Indian agriculture.

At Behtar Zindagi, we addressed this challenge by building an AI-powered livestock health advisory system called Pashudhan Sahayak (Animal Husbandry Assistant). Its purpose is simple: to act as a first responder when a farmer's animal shows symptoms and professional help is not immediately accessible.

Through a live video interface, a farmer can show his animal to the system. The AI analyzes visible symptoms and flags potential conditions such as Lumpy Skin

Disease, ringworm, tick infestation, mastitis, foot rot, or pink eye. For manageable conditions, it recommends appropriate over-the-counter treatments commonly available in rural veterinary shops, along with clear dosage and application guidance. For critical conditions such as severe LSD, Foot and Mouth Disease (FMD), milk fever, bloat, or suspected anthrax, the system immediately advises urgent veterinary intervention.

The interaction happens in simple, conversational Hindi — the kind farmers actually use. In moments of distress, clarity and reassurance are as important as technical accuracy.

How Intelligence Becomes Farm Power

India has over 300 million bovines — the largest livestock population in the world. Livestock contributes more than 30 percent to agricultural GDP and forms a vital income stream for small and marginal farmers. Yet veterinary infrastructure is stretched thin. Approximately 65,000 veterinary institutions serve over 100 million livestock-owning households. Access gaps are inevitable, especially in remote areas.

During the 2022 Lumpy Skin Disease outbreak, thousands of cattle deaths occurred across several states. In many cases, delayed identification and response amplified losses. Even preventing a single livestock death can protect Rs 40,000–Rs 80,000 of farmer income — often the difference between sustainability and financial distress.

This is where intelligence becomes farm power.

AI does not replace veterinarians; it augments them. By enabling early symptom recognition, basic first-aid guidance, and timely escalation, AI reduces panic, prevents misinformation, and improves response speed. It strengthens the existing agricultural ecosystem rather than disrupting it.

The New Farm Power Paradigm

Livestock health is only one dimension of this new farm power paradigm.

The same intelligence layer can assist in crop disease detection through image-based diagnosis. A farmer can photograph a diseased cotton leaf or wheat crop and receive immediate analysis and treatment recommendations. AI can guide farmers in selecting appropriate implements based on landholding size, cropping pattern, and budget. It can assist in proper equipment usage, reducing misuse and extending asset life.

India's agricultural future will continue to depend on tractors, irrigation systems, and mechanization. Physical infrastructure remains foundational. But alongside these, intelligence infrastructure is emerging as equally essential

Beyond production, AI can democratize access to credit and government schemes. Farmers can check loan eligibility, compare financing options, and identify relevant subsidy programs without depending solely on intermediaries. This reduces information asymmetry and enhances transparency.

In essence, farm power in 2026 is increasingly about decision power.

When a two-acre dairy farmer in Bihar receives the same quality livestock advisory as a large commercial dairy operator in Gujarat, that represents democratization of knowledge. When a cotton farmer in Vidarbha detects pest infestation early and prevents yield loss, that represents risk mitigation. When a farmer chooses the correct medicine dosage or machinery option based on informed guidance, that represents economic optimization.

Responsible Deployment Is Critical

AI-driven farm power reduces the historical gap between smallholders and resource-rich farms.

However, responsible deployment is critical. AI systems must be trained on Indian agricultural realities — regional breeds, climatic variations, local cropping practices, and commonly available inputs. They must clearly distinguish between advisory guidance and emergency escalation. They must operate in languages and dialects that farmers trust. And most importantly, they must integrate with existing agricultural institutions — veterinarians, extension officers, cooperatives, and government programs.

In the coming decade, farm power will not be measured only in horsepower. It will also be measured in the speed, quality, and confidence with which farmers can make decisions.

When a farmer's phone becomes his veterinarian at midnight, his crop doctor during a pest attack, and his advisor before a major purchase — that is Farm Power 2.0.

ELECTRIC BULL TECHNOLOGY

Breaking Barriers with Affordable, Sustainable Farm Tech

About the **AUTHOR**

Mr. Tukaram Sonawane is the Founder and MD of Krishigati, and has developed innovative farm power and mechanization solutions designed for small and marginal farmers. His work focuses on improving on-farm productivity through affordable mechanization and practical field-ready equipment.

Agriculture remains the backbone of rural livelihoods in India, employing nearly 45% of the country's workforce, yet a majority of farmers operate on extremely small landholdings. According to the Agriculture Census, over 86% of Indian farmers are small and marginal farmers, cultivating less than two hectares of land. These farmers are particularly vulnerable to climate change, rising input costs, and limited access to modern agricultural technologies.

Climate change has emerged as one of the most significant challenges for smallholder agriculture. India is among the countries most affected by climate variability, with increasing instances of erratic rainfall, prolonged droughts, and extreme weather events. Studies indicate that climate change could reduce agricultural productivity by 10–25% in the coming decades, particularly affecting smallholder farmers who lack access to adaptive technologies and resources.

At the same time, the cost of agricultural operations is steadily increasing, largely driven by rising fuel prices. Diesel-powered farm machinery remains the dominant source of mechanization in India. However, diesel prices have increased by over 60% in the last decade, significantly raising the cost of cultivation for small farmers who rely on rented machinery or fuel-powered equipment for operations such as sowing, spraying, and soil preparation.

Labour shortages have further intensified these challenges. Rural labour availability for agriculture has declined as workers increasingly migrate to urban areas or shift to non-farm employment. According to the Economic Survey of India, the share of workers engaged in agriculture has steadily declined, leading to seasonal labour shortages and increased wage costs, particularly during critical agricultural operations.

Despite these challenges, access to farm mechanization remains limited. India's farm power availability is estimated at approximately 2.5 kW per hectare, significantly lower than in many developed agricultural economies. Small and marginal farmers often cannot afford tractors or mechanized equipment, and most available machines are designed for larger landholdings, making them unsuitable for fragmented farms.

Barriers Faced By Women Farmers

Women farmers face even greater barriers. Women constitute nearly 30–33% of the agricultural labour force and over 40% of the workforce in certain agricultural activities, yet they have limited access to productive assets, agricultural technologies, and mechanization tools. Most farm machinery is not designed with women users in mind, restricting their ability to participate fully in mechanized farming operations and limiting their opportunities for income generation and leadership within agricultural value chains.

In this context, there is a growing need for climate-smart, affordable, and

inclusive mechanization solutions that are tailored to the needs of smallholder farmers. Clean and electric-powered agricultural technologies offer a promising pathway to reduce dependence on diesel-based machinery, lower operational costs, and support climate-resilient farming practices.

The proposed initiative seeks to address these challenges by promoting women-led clean farm mechanization using innovative electric agricultural technologies, enabling smallholder farmers to adopt climate-smart practices while strengthening women's participation in agricultural entrepreneurship and rural livelihoods.

Structural Challenges

Indian agriculture continues to face structural challenges that particularly affect small and marginal farmers. Despite gradual progress in farm mechanization, many farmers still lack access to affordable, climate-friendly technologies that can improve productivity and resilience.

- **High dependency on diesel-based farm equipment**
- Agricultural mechanization in India relies heavily on diesel-powered machinery such as tractors and tillers. Nearly 85–90% of farm machinery operations depend on diesel, making farmers vulnerable to rising fuel prices while also contributing to greenhouse gas emissions and environmental degradation.
- **Increasing cost of cultivation**
- The cost of agricultural inputs has increased significantly over the past decade. Diesel prices alone have risen by over 60% in the last ten years, increasing the cost of essential farm operations such as sowing, spraying, and land preparation. Fuel and labour together account for nearly 20–30% of cultivation costs, placing additional financial pressure on smallholder farmers.
- **Limited mechanization for small landholdings**
- More than 86% of farmers in India are small and marginal farmers, cultivating less than two hectares of land. Most available farm machinery is designed for large farms and is often unsuitable or unaffordable for smallholders, forcing them to rely on manual labour or costly rental services.
- **Women farmers lacking access to technology and assets**
- Women contribute over 30% of the agricultural workforce, yet they often lack access to productive assets, agricultural technologies, and mechanization tools. Limited access to technology restricts their ability to improve productivity and participate in income-generating opportunities within the agricultural sector.

These challenges highlight the need for affordable, climate-smart mechanization solutions that are accessible to smallholder farmers and inclusive of women farmers, enabling more sustainable and resilient agricultural practices.

Affordable And Climate-Resilient Solutions

Smallholder farmers require affordable and climate-resilient solutions that can reduce input costs while improving agricultural productivity. Clean farm mechanization powered by electric agricultural tools offers a practical approach to address these challenges.

Electric-powered farm equipment reduces dependence on diesel-based machinery, lowering operational costs and minimizing carbon emissions associated with agricultural activities. By enabling timely and efficient farm operations such as sowing, weeding, and spraying, these technologies support climate-resilient and sustainable agricultural practices.

Lightweight and easy-to-operate tools also create opportunities for women farmers to actively participate in mechanized farming. When managed through women Self Help Groups (SHGs), these technologies can function as community-based farm service models, enabling women to generate income while providing affordable mechanization services to local farmers.

Primary Objective

- Promote climate-resilient farming through clean farm mechanization led by women Self Help Groups.

Secondary Objectives

- Enable women farmers to operate and manage modern agricultural technology.
- Reduce diesel dependency and carbon emissions in agriculture.
- Improve farm productivity and reduce the cost of cultivation.
- Build women-led rural agri-service enterprises that provide mechanization

services to local farmers.

Electric Bull Technology

The project proposes the deployment of the Electric Bull, an electric-powered agricultural toolbar designed specifically for small and fragmented farm holdings. The technology enables farmers to perform essential farming operations such as sowing, weeding, spraying, and soil preparation using a single compact machine.

Powered by electricity instead of diesel, the Electric Bull helps reduce operational costs, lower carbon emissions, and minimize dependence on fossil fuels. Its lightweight design and user-friendly operation make it suitable for small farms and enable women farmers to operate the technology effectively.

By introducing clean and accessible mechanization, the Electric Bull supports climate-resilient agriculture while improving farm productivity and efficiency for smallholder farmers.

Methodology and Implementation Timeline

The project will adopt a community-based implementation model that combines clean agricultural technology with women-led service delivery to promote climate-resilient farming among smallholder farmers. The implementation will follow a phased approach over a 12-month period.

Phase 1: Selection of Target Communities (Month 1)

The project will identify suitable villages with a high concentration of small and marginal farmers and active women Self Help Groups (SHGs). Priority will be given to areas where farmers have limited access to affordable mechanization services.

Phase 2: Mobilization of Women Self Help Groups (Month 1–2)

Existing SHGs will be mobilized and selected to participate in the program. Interested women members will be identified as machine operators and service coordinators to manage the Electric Bull units at the community level.

Phase 3: Deployment of Electric Bull Units (Month 2)

Building Women-Led, Climate-Resilient Farming Ecosystems

The initiative seeks to build women-led, climate-resilient farming ecosystems by combining clean agricultural mechanization with innovation-driven rural entrepreneurship. By enabling women Self Help Groups to operate electric farm machinery and provide affordable services to smallholder farmers, the project aims to improve agricultural productivity, reduce environmental impact, and strengthen rural livelihoods.

Through the collaboration between AIC Pinnacle Entrepreneurship Forum and Krishigati, the initiative demonstrates how technology, innovation, and community participation can come together to create sustainable and scalable solutions for the future of Indian agriculture.

Electric Bull machines will be deployed with selected SHGs to function as shared mechanization resources for the community, supporting farm operations such as sowing, weeding, spraying, and soil preparation.

Phase 4: Capacity Building and Technical Training (Month 2–3)

Women SHG members will undergo structured training on machine operation, basic maintenance, safety protocols, and service management. This will enable them to confidently operate the equipment and provide mechanization services to farmers.

Phase 5: Establishment of SHG-Led Farm Service Model (Month 3–4)

The SHGs will operate the Electric Bull as a community-based farm mechanization service. Farmers will be able to access the machine for specific farm operations at affordable service charges, creating a revenue stream for SHG members while supporting machine maintenance.

Phase 6: Farmer Demonstrations and Outreach (Month 4–8)

Field demonstrations and awareness activities will be organized to showcase the benefits of electric mechanization and climate-smart farming practices, encouraging adoption among smallholder farmers.

Phase 7: Monitoring, Data Collection, and Impact Assessment (Month 4–12)

The project will track key indicators such as the number of farmers served, acreage covered through mechanization services, income generated by SHGs, and reduction in diesel usage to measure the environmental and economic impact of the intervention.

Role of Women Self Help Groups

Women Self Help Groups will play a central role in the implementation of the project by managing and operating the Electric Bull units as community-based agricultural service providers. Selected SHG members will receive training on the operation, maintenance, and safe handling of the machines, enabling them to independently manage the technology.

Each SHG will operate the Electric Bull as a shared mechanization resource for the village. Farmers will be able to access services such as sowing, weeding, and spraying at affordable rates. This service-based model will allow SHGs to generate income while ensuring that smallholder farmers gain access to efficient and climate-friendly mechanization.

Through this approach, women will transition from being agricultural labourers to agri-service entrepreneurs, strengthening their economic participation while supporting improved productivity and sustainable farming practices in their communities.

Role of AIC Pinnacle Entrepreneurship Forum

AIC Pinnacle Entrepreneurship Forum will serve as the implementing and ecosystem partner for the initiative, bringing its expertise in supporting innovation-driven startups and deploying technology-led solutions for social impact. As a technology business incubator, AIC Pinnacle works with early-stage ventures that address critical national challenges across sectors such as agriculture, climate-tech, and rural livelihoods.

Through its incubation programs, AIC Pinnacle provides startups with mentorship, technical guidance, ecosystem connections, and opportunities for technology validation and market deployment. The incubator plays an important role in bridging innovation with real-world application by enabling emerging technologies to reach underserved communities.

By supporting startups like Krishigati and facilitating partnerships with development stakeholders, AIC Pinnacle helps translate technological innovation into scalable solutions that contribute to sustainable agriculture, climate resilience, and rural livelihood development.

The economic impact of this initiative is reduction in the cost of cultivation for smallholder farmers through affordable mechanization services, improved farm productivity through timely and efficient agricultural operations and income generation opportunities for women Self Help Groups managing mechanization services

About Krishigati

- Krishigati Private Limited is an agri-tech startup incubated at AIC Pinnacle Entrepreneurship Forum, focused on developing innovative solutions for small and marginal farmers. The startup has developed the Electric Bull, an electric-powered agricultural mechanization solution designed specifically for small landholdings, enabling efficient farm operations such as sowing, weeding, and spraying.
- Krishigati has been supported under the MeitY TIDE 2.0 program and received the TIDE Scale-Up Grant through AIC Pinnacle, recognizing the technological innovation and scalability of its solution. The Electric Bull represents a clean and affordable mechanization alternative that reduces reliance on diesel-based farm equipment while improving productivity for smallholder farmers.
- The technology aligns with key national priorities including sustainable agriculture, clean technology adoption, and rural livelihood generation, making it well suited for deployment in climate-resilient and community-based agricultural initiatives.

Expected Outcomes and Impact

The proposed intervention is expected to generate environmental, economic, and social benefits by promoting clean farm mechanization and women-led agricultural enterprises in rural communities.

Climate Impact

- Reduction in diesel consumption through the adoption of electric-powered farm machinery.
- Lower carbon emissions associated with agricultural operations.
- Promotion of climate-resilient and environmentally sustainable farming practices.

Economic Impact

- Reduction in the cost of cultivation for smallholder farmers through affordable mechanization services.
- Improved farm productivity through timely and efficient agricultural operations.
- Income generation opportunities for women Self Help Groups managing mechanization services.

Social Impact

- Development of women-led agricultural service enterprises in rural communities.
- Increased access to modern agricultural technology for small and marginal farmers.
- Strengthening of rural livelihoods through sustainable and community-driven farming solutions.

Alignment with National and Global Priorities

The proposed initiative aligns with key global and national development priorities. It contributes to the Sustainable Development Goals (SDGs), particularly SDG 2: Zero Hunger, SDG 5: Gender Equality, and SDG 13: Climate Action, by promoting sustainable agriculture, women-led livelihood opportunities, and climate-resilient farming practices.

The project also supports national priorities such as Doubling Farmers' Income, climate-resilient agriculture, and the promotion of Make in India and clean technology adoption through the deployment of indigenous, electric-powered farm mechanization solutions.

TRANSFORMING AGRICULTURE THROUGH INCLUSIVE, SUSTAINABLE INNOVATION

Stepupify Labs Pvt. Ltd. is emerging as one of India's most impactful agri-tech startups, combining deep-tech innovation with grassroots problem-solving. Founded in 2021 by Mr Ajit Kumar, a Mechanical Engineering graduate from IIT Kharagpur with a strong research background in Robotics and Artificial Intelligence, the Bihar-based company is redefining farm mechanization through affordable, battery-powered, and AI-integrated solutions tailored for small and marginal farmers.

Mr Ajit Kumar brings significant industry experience across the automobile sector and deep-tech R&D roles, including stints at leading organizations such as Tata Motors and robotics startups. His hands-on experience in product development, system design, and engineering innovation has played a critical role in shaping Stepupify's technology-first, problem-solving approach. This blend of deep-tech expertise and grassroots understanding forms the foundation of Stepupify's innovation ecosystem.

A Ground-Up Innovation Model

The genesis of Stepupify lies in firsthand farming experience during the COVID-19 lockdown. Returning to his native village in Bihar, Ajit Kumar began farming to explore opportunities in agriculture. This journey exposed him to critical challenges—labour shortages, rising input costs, lack of affordable mechanization, and significant crop losses due to theft and stray animals.

Despite achieving strong yields and favourable market prices, losses due to theft highlighted systemic gaps in farm-level infrastructure. This experience led to a clear insight: Indian agriculture requires accessible, efficient, and farmer-centric technology solutions.

Stepupify was thus built on a problem-first philosophy, ensuring every innovation is grounded in real-world needs.

Multi-Utility Farming Tool: A Game-Changing Innovation

At the heart of Stepupify's offering is the Multi-Utility Farming Tool (MUFT)—a modular, battery-operated platform designed to perform multiple agricultural operations through interchangeable attachments. These include:

- Reaper for harvesting crops such as wheat and paddy
- High-pressure sprayer for crop protection
- Power weeder for inter-cultivation
- Potato digger for root crop harvesting
- Tine cultivator for soil preparation
- Transportation wheel attachment for mobility and logistics
- Maize sheller for post-harvest processing

This integrated platform enables

Mr Ajit Kumar, a Mechanical Engineering graduate from IIT Kharagpur with a strong research background in Robotics and Artificial Intelligence, founded Stepupify in 2021. The company is a leading robotics and AI-based agritech startup headquartered in Bhagalpur, Bihar, is dedicated to modernizing Indian agriculture by developing sustainable, green farming solutions specifically designed for small and marginal farmers

farmers to carry out end-to-end agricultural operations using a single machine, significantly reducing capital expenditure and improving productivity.

30+ Smart Farming Solutions on a Common Battery Platform

Stepupify has developed a robust ecosystem of 30+ solar and battery-operated agricultural tools, covering the entire farming lifecycle—tilling, weeding, spraying, harvesting, processing, irrigation, poultry management, and even fishpond monitoring.

A key technological breakthrough is its common 48V LFP battery architecture, where a single battery powers multiple tools, along with e-mobility solutions and even basic home energy needs.

This delivers:

- High return on investment for farmers
- Reduced equipment ownership cost
- Easy battery swapping and uninterrupted operations
- Suitability for rural areas with limited electricity access

Women-Friendly, Ergonomic & Easy-to-Operate Design

Stepupify stands out for its strong focus on inclusivity. Recognizing that women contribute nearly 75% of farm labour, the company has designed women-friendly, ergonomic tools that are lightweight, low-vibration, and easy to operate.

Its plug-and-play systems require minimal training, enabling even first-time users to operate advanced equipment independently. This significantly reduces drudgery and empowers women farmers—an often overlooked but critical segment of the agricultural workforce.

Integrated Manufacturing, Patents & Deep-Tech Advantage

A major strength of Stepupify lies in its integrated in-house manufacturing, where both agricultural tools and battery systems are developed under one roof. This ensures:

- Superior quality control
- 30–40% cost reduction
- Faster product innovation cycles
- Strong supply chain resilience

Strong Intellectual Property Base

The company has built a strong intellectual property base, including:

- 3 patents (granted & pending)
- 3 industrial designs
- 2 trademarks
- ISO 9001:2015 certification

Its products are also FMTTI-certified by the Government of India, validating their performance, durability, and field readiness. Its patented low-heat, low-vibration design enhances machine efficiency, safety, and longevity—addressing common failure points in conventional equipment.

AI-Powered Smart Farming

Stepupify integrates intelligence into agriculture through its AI-powered farm surveillance system, capable of detecting and classifying human and animal intrusions with high accuracy. It provides real-time alerts, helping prevent crop theft and animal damage—key risks in Indian farming . Future capabilities include crop monitoring, irrigation automation, and weather-based insights, paving the way for precision farming.

Strong Traction & Measurable Impact

Stepupify has achieved significant scale and impact:

- 7,000+ farmers benefitted
- 1,000+ tools deployed
- ☐40+ crore fuel cost savings
- ☐2+ crore pesticide savings
- Presence across 26+ states

Benefits For Farmers

- 60–70% reduction in input costs
- Up to 10x cost advantage over manual farming
- Additional income through rental-based usage models

The company is supported by leading institutions such as Social Alpha, SELCO Foundation, Indigram Labs Foundation and RKVY-RAFTAAR, reflecting strong ecosystem validation .

Opportunities & Challenges

Stepupify operates in a massive and growing market:

- ☐85,000+ crore farm mechanization opportunity
- Rapidly expanding battery-powered segment
- Strong policy push toward sustainable agriculture

However, challenges remain in farmer awareness, financing access, and scaling rural distribution networks.

The Road Ahead

Stepupify is building a category-defining platform for small-farm mechanization—combining affordability, sustainability, and intelligence.

Driven by Mr Ajit Kumar's deep-tech expertise in robotics and AI, along with his real-world farming insights, the company is uniquely positioned to transform Indian agriculture at scale.

With its Multi-Utility Farming Tool ecosystem, women-friendly design, integrated manufacturing, patented technologies, and FMTTI-certified products, Stepupify is not just mechanizing farms—it is democratizing technology, empowering farmers (especially women), and creating a sustainable future for agriculture.

HE SEEDS IT RIGHT

HOW A RESOLUTE LAD OF A FARMING FAMILY IN A SMALL VILLAGE IN TELANGANA BECAME A GLOBAL SEED LEADER

Rajni Shaleen Chopra, Group Editor, Agriculture Today Group writes about the Inspirational Story of Indian Seed Scientist Dr Keshavulu Kunusoth

Dr. Keshavulu Kunusoth from India assumed office as the President of the International Seed Testing Association (ISTA) for the 2022–2025 term during the 33rd ISTA Congress held in May 2022 in the historic Egyptian city of Cairo. This marks a significant milestone in the history of ISTA, as Dr. Keshavulu is the first individual from the Asian region to be elected President of this international organization dedicated to seed science and technology. Upon taking office in 2022, he outlined his leadership approach and strategic priorities for the triennium 2022–2025. These included strengthening ISTA's role as the global leader in seed quality assurance, expanding its global reach, attracting younger generations, enhancing IT tools, advancing collaboration with affiliated organizations and stakeholders, and integrating new technologies into the ISTA Rules and expanding the adoption of ISTA Rules in regions and countries where ISTA has not yet reached, thereby supporting agricultural development in those countries. The ISTA Executive Committee (ECOM) has focused on en-

suring that ISTA continues to contribute to global food security and facilitates the international trade of quality seeds, and substantial progress has been made toward these goals.

The ISTA Strategy for 2022–2025, adopted during the Ordinary General Meeting (OGM), outlines six key goals to guide activities over the triennium: (1) develop scientifically sound rules and methods for seed sampling and testing; (2) contribute to and strengthen collaborations to enhance seed sampling and testing capacities worldwide; (3) strengthen and adapt the accreditation system to meet the needs of stakeholders and laboratories; (4) promote research and innovation in seed science and technology; (5) enhance understanding of the needs of members and stakeholders; and (6) support the integration of new technologies in seed testing.

Over the past few years, significant progress has been made under Dr. Keshavulu's leadership, with each of these goals pursued through targeted initiatives and special projects, supported by the commitment and contributions of ECOM members, Technical Committees, working groups, and, importantly, the Secretariat staff. We all of what ISTA have achieved together under the ISTA Presidency of Dr. Keshavulu.

ABOUT ISTA

The International Seed Testing Association (ISTA) is an international organization established in 1924 in Zurich, Switzerland. It is widely recognized as a key organization for seed and food security worldwide, working with a mission to support global agriculture and sustainable food production, thereby contributing to food and nutritional security. ISTA has membership comprising competent and dedicated seed scientists and analysts from 83 countries and distinct economies.

Dr. Keshavulu's Global Leadership and Transformative Contributions to ISTA

It is a matter of great pride and honour that Dr. Keshavulu is the first person from the Asian region particularly from India elected as President of the International Seed Testing Association (ISTA). This historic achievement marks a significant milestone not only for India but also for the global seed sector. ISTA, an internationally acclaimed organization, is dedicated to disseminating seed knowledge through modern technologies and innovative approaches aimed at promoting sustainable seed systems and global food security.

Dr. Keshavulu is widely recognized as a distinguished leader in the seed sector and agricultural development. His professional accomplishments and visionary leadership have established him as a sought-after expert in the field, guiding ISTA through a period of remarkable transformation and progress.

Celebrating a Century of Excellence

A defining moment of the triennium was the grand celebration of ISTA's centenary in Cambridge, United Kingdom in July 2024. This historic event brought together global seed professionals and included a Joint Centennial Forum with the International Seed Federation, highlighting a century of innovation, collaboration, and leadership in seed science.

Celebrating a Century: Dr. Keshavulu Kunusoth ISTA President Plants Tree to Mark ISTA's 100 Years of Seed Quality Assurance at NIAB, Cambridge

In commemoration of the ISTA's centenary celebrations, Dr. Keshavulu Kunusoth, President ISTA, symbolically planted a tree sapling (Parrotia persica bella) at National Institute of Agricultural Botany (NIAB) in Cambridge. This event marked a historic milestone, celebrating 100 years of ISTA's dedication to advancing seed quality assurance and looking forward to future advancements in supporting global agriculture, enhancing food security, and contributing to food and nutritional security for future generations. The ceremony was witnessed by Mr Mario Caccamo, Chief Executive of NIAB, other important dignitaries and worldwide participants.

The vision for ISTA's second century, articulated under the Presidency of Dr. Keshavulu, is: "Application of internationally agreed and validated methods for seed quality assurance to increase and sustain agricultural productivity, food security, and nutrition for all."

A Legacy of Growth and Vision

The 2022–2025 triennium stands as a period of remarkable growth and achievement for ISTA. Through visionary leadership, strategic initiatives, and strong global partnerships, Dr. Keshavulu has significantly strengthened ISTA's role as the leading authority in seed testing and quality assurance. Dr K. Keshavulu's presidency has not only advanced scientific excellence and innovation but has also reinforced ISTA's critical contribution to sustainable agriculture and global food security. As ISTA moves into its second century, it does so with renewed strength, expanded global reach, and a clear vision for the future.

Farmer's Son Becomes Global Seed Sector Icon

Dr. Keshavulu's journey—from a determined boy raised in a farming family in a small village in the Warangal district of Telangana, India, to becoming a globally respected leader in the seed sector—is truly inspirational. Growing up in an agrarian household, he was deeply familiar with the challenges faced by farmers from an early age. Motivated by a strong desire to serve the farming community, he chose agriculture as his career path, dedicating his life to improving seed systems and agricultural sustainability. Dr. Keshavulu Kunusoth holds a bachelor's degree in Agricultural Sciences, along with master's and doctoral degrees in agriculture, specializing in seed science and technology.

He further strengthened his academic credentials through postdoctoral research at the Department of Plant Sciences at the University of California, Davis, USA. Over the course of his career, he has published more than 130 research papers and delivered over 100 presentations at national and international forums, contributing significantly to scientific knowledge and professional discourse in seed science.

With over 29 years of experience in the seed sector, Dr. Keshavulu is widely recognized as a dynamic and accomplished leader. His expertise spans strategic management, seed supply chains, quality assurance, marketing, policy advocacy, international seed regulations, and global partnerships. He has also made substantial contributions to capacity building, institutional strengthening, and fostering international cooperation within the seed industry.

Key Leadership Positions

Throughout his career, Dr. Keshavulu has held several key leadership positions. He served as President /Vice President of the International Seed Testing Association (2019–2025), based in Zurich, Switzerland. He has been serving as Director of the Telangana State Seed & Organic Certification Authority in Hyderabad since December 2015 and also held additional responsibility as Managing Director of Telangana State Seeds Corporation Ltd. from 2018 to 2024. Earlier, between 1998 and 2015, he served as Principal Scientist (Professor)/Senior Scientist/ and Scientist at the Public State Agricultural University in Hyderabad, Telangana, India.

Dr. Keshavulu has demonstrated exceptional leadership in advancing ISTA's mission to develop, adopt, and publish internationally agreed rules for seed sampling and testing, thereby ensuring uniformity, reliability, and transparency in seed quality assessment worldwideHis work reflects not only deep technical expertise but also a strong commitment to building international partnerships and promoting sustainable agricultural development. He has played a pivotal role in ensuring the supply of high-quality seeds across more than ten Indian states and facilitating seed exports to several countries.

His contributions extend to research management, early generation seed multiplication, global seed certification systems, quality assurance, and marketing. He has also been instrumental in the development of national DUS (Distinctness, Uniformity, and Stability) test guidelines. In addition to his research and administrative roles, he has extensive teaching experience, having mentored students, designed research programmes, and supervised numerous postgraduate and doctoral dissertations.

Globally Acclaimed Seed Scientist

Dr. Keshavulu is an internationally acclaimed seed scientist and a globally recognized expert whose distinguished contributions have significantly advanced the seed sector and sustainable agriculture. He has led numerous national and international capacity-building programmes in collaboration with leading organizations such as the OECD, the ISTA, the USAID, and the Indo-German Project on Seed Sector Development. These initiatives have benefited both public and private seed industries, strengthening technical expertise and institutional capacity across regions. He also serves on several

A Legacy of Excellence

Over its 100-year journey, the International Seed Testing Association has promoted innovation, scientific excellence, and international cooperation. It has played a pivotal role in harmonizing global seed testing methods and building resilient seed systems worldwide. The global agricultural community remains confident that ISTA will continue to uphold its legacy, address emerging challenges, and contribute to global food and nutritional security.

Dr. Keshavulu's historic tenure as the first Indian—and among the first from the Asian region—to serve as President of ISTA (2022–2025) – has been a matter of immense pride for India and a privilege for the global seed community. His journey is truly historic, and the recognition he has earned will be cherished by the Indian agricultural and seed sector fraternity for years to come.

national and international committees and is widely respected for his advisory role in shaping seed policies.

With over 100 scientific publications, including research papers, books, technical bulletins, and training manuals, Dr. Keshavulu has made substantial academic and technical contributions to seed science and technology. His long-standing association with ISTA since 2007 includes key leadership roles such as Member-at-Large of the Executive Committee (2016–2019) and Vice-President (2019–2022). Notably, he played a pivotal role in successfully organizing as the Chair of the 32nd ISTA Congress in 2019 in Hyderabad, Telangana, India marking the first time the event was held in Asia. A recipient of several prestigious honors, including the Global CEO Award (2018), the Seed Policy Leadership Award (2020), and the Dr. M. S. Swaminathan Award for Environment Protection (2022), Dr. Keshavulu is widely acknowledged for his outstanding contributions to agriculture and the seed industry. His work has been instrumental in strengthening seed systems, contributing to India's emergence as one of the fastest-growing seed markets globally through innovation, improved access to quality seeds, and technological advancement.

Dr. Keshavulu Meets FAO Director-General to Strengthen Global Seed Systems and Food Security in April 2024

Dr. Keshavulu met with Mr Qu Dongyu, Director-General of the Food and Agriculture Organization, to discuss strengthening global cooperation in seed systems, agricultural development, and food security. The meeting focused on enhancing collaboration in seed quality assurance, capacity building, and the adoption of innovative technologies to support sustainable agriculture worldwide. Both leaders emphasized the critical importance of high-quality seeds in improving productivity, building climate resilience, and ensuring the livelihoods of farmers, particularly smallholders in developing countries.

Mr Dongyu appreciated ISTA's contributions and Dr. Keshavulu's leadership in advancing global seed quality systems. He reaffirmed FAO's commitment to working with international partners to promote sustainable agricultural development and resilient food systems.

Dr. Keshavulu highlighted the need for globally harmonized seed testing standards and stronger national seed systems supported by scientific innovation and institutional capacity building. He underscored the pivotal role of ISTA in developing internationally accepted seed testing procedures that facilitate global seed trade and ensure consistent quality assurance.

"Quality seeds are the foundation of sustainable agriculture and global food security. Strengthening seed systems through science, innovation, and international collaboration is essential to meet the growing food demands of the world," said Dr. Keshavulu.

The discussions also explored opportunities for joint initiatives to support developing countries in strengthening their seed sectors, improving access to quality seeds, and aligning efforts with global priorities such as the Sustainable Development Goal 2. This high-level interaction marks a significant step toward deeper collaboration between global organizations in addressing emerging challenges in agriculture. It reinforces the shared commitment of ISTA and FAO to advancing innovation, strengthening seed systems, and ensuring sustainable food production for future generations.

Dr. Keshavulu's journey exemplifies how dedication, vision, and scientific excellence can transform humble beginnings into global leadership, leaving a lasting impact on agriculture, seed systems, and food security worldwide.

Trailblazing Journey

Dr. Keshavulu's remarkable journey stands as a powerful example of how dedication, knowledge, and vision can transform humble beginnings into global leadership, making a lasting impact on agriculture and food security worldwide. In addition, Dr. Keshavulu has been instrumental in strengthening the Telangana seed sector, transforming the state into a global seed hub. Through strategic leadership and promotion of international standards, he has positioned Telangana prominently on the global seed map, enhancing its competitiveness, innovation, and contribution to agricultural development.

Contribution to the Sustained Growth of the Seed Industry

Dr. Keshavulu has made outstanding contributions to the sustained growth of the Indian seed industry by strengthening seed quality assurance systems, improving farmers' access to high-quality seeds, and expanding global seed trade linkages. He has actively collaborated with leading international organizations such as OECD, the ISF, the UPOV, the FAO, the APSA etc., thereby strengthening India's integration into the global seed ecosystem.

With over 29 years of distinguished experience, Keshavulu has played a pivotal role in advancing seed sector development, policy reforms, and institutional capacity building at both national and international levels. His contributions have significantly supported sustainable agriculture and global food security. A strong advocate of inclusive and resilient seed systems, Dr. Keshavulu has consistently emphasized the critical importance of quality seeds in enhancing agricultural productivity, improving farmer livelihoods, and ensuring environmental sustainability. As the Immediate Past President of the ISTA, he continues to promote global standards in seed quality assurance and access, particularly across Asia.

His vision is focused on strengthening seed infrastructure, enhancing quality assurance systems, and improving access to quality seeds for smallholder farmers, in alignment with the global objective of achieving Zero Hunger.

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REWRITING POPCORN MAIZE WITH FULL-CHAIN MECHANISATION

Created for the love of cinema, Gourmet Popcornica Private Limited was founded in 2014 with a promise to deliver the world's most delicious popcorn—grown and processed entirely in India. Today, headquartered in Chennai, it is India's largest popcorn company and ranks among the top four globally, sourcing popcorn maize from over 17,500 farmers across nine states and cultivating more than 36,000 acres of popcorn maize. A key pillar of this scale and success is deep-seated mechanisation, running from the field to the factory floor.

About the **AUTHOR**

Mr SBP Pattabhi Rama Rao is Managing Director, Gourmet Popcornica

Mechanisation at Maize Farms

Mechanization at Gourmet Popcornica began with a strategic partnership with Preferred Popcorn, USA, aligning global farming and mechanised practices with Indian conditions. From starting with 100 percent manual plantation in 2017, the company pioneered a shift toward machinery, with about 30 percent of farmers now using seed planters—from single-row to multi-row machines—thanks to technical support and input supply on credit. This not only reduced labour dependence but also improved plant-stand uniformity and yields, while Gourmet Popcornica committed to buying back 100 percent of the produce, reinforcing farmer confidence in the mechanised model.

The focus on mechanisation is now moving decisively into the harvest phase. In 2026, Gourmet Popcornica will introduce corn cob harvesters, with an initial target to mechanise the harvest of at least 10 percent of its 36,000-acre popcorn maize area. When combined with seed planters and drone-based spraying, this integrated mechanised approach has already helped farmers increase yields and incomes, while minimising field losses and labour stress.

Once harvested, the wet cobs move to the Musunuru, Andhra Pradesh, processing facility, which is one of the most mechanised and automated popcorn-maize lines in India. Over 90 percent of the popcorn maize processing is automated, covering drying, sorting, processing, and storage in cold storages before dispatch. This high-degree of automation ensures consistent kernel quality, food-safety compliance, and the

flexibility to offer customised popcorn recipes and flavours that cater to diverse cinema and retail demands.

Catering To Diverse Tastes

On the market side, Gourmet Popcornica's popcorn is now available in over 2,200 cinemas across India, making it the preferred supplier to the country's largest cinema chains, with customised flavours and blends. Premixed seasonings and flavour packages are developed in-house based on customer preferences, while the company also supplies large popcorn manufacturers, supermarkets, and over 100 bulk commodity traders nationwide, backed by on-ground and remote support plus a 100 percent product-replacement guarantee.

In the broader popcorn maize landscape, mechanisation-driven productivity has helped domestic production grow from 15,000 tonnes in 2015 to 85,000 tonnes in 2026, now accounting for 65 percent of the Indian market. As the company scales further, its model showcases how mechanisation, scientific farming, and assured procurement can transform popcorn maize into a reliable, profitable, and modernised crop for small and marginal farmers across India.

How Mechanised Operations Help Maize Farmers

Higher yields and less loss:

Mechanised harvesters pick cobs faster and more uniformly than manual labour, reducing field losses from shattering, lodging, and weather damage. This helps farmers harvest a larger share of the crop at the right moisture and maturity, translating into more saleable produce per acre.

Lower labour costs and timeliness:

Mechanisation reduces dependence on expensive, scarce seasonal labour, especially at peak harvest. Combined harvesters and planters can cover large areas in a short window, ensuring timely harvest and avoiding yield loss due to delayed picking.

Better quality and price:

Mechanised systems, especially when linked to rapid drying and processing, help maintain kernel integrity and moisture control, which is critical for popcorn expansion and premium pricing. With consistent quality, farmers can access contracts that pay better than uncertain open-market rates.

Encouraging popcorn maize as a commercial crop:

In popcorn maize, mechanised harvesting—along with seed planters and drone-based spraying—lowers the perceived risk of the crop, making it easier for smallholders to treat it as a profitable enterprise rather than just a niche option. Over time, this can shift popcorn maize from subsistence-grade farming to a high-value, market-oriented crop that meaningfully lifts household incomes.

Expanding the Mechanisation Frontier

Beyond the core operations of seed planters and corn-cob harvesters, Gourmet Popcornica is embedding mechanisation at every touchpoint where manpower and delays have traditionally constrained popcorn maize. The company actively promotes laser-guided land-levelling and rotavators/ploughs for seedbed preparation, ensuring uniform emergence and root development even on small, fragmented plots. This reduces the need for repeated labour-intensive tillage, lowers fuel and time costs, and helps farmers consolidate multiple short-window operations—land prep, sowing, and weeding—within a narrow window.

Mechanised harvesting can significantly boost farmer incomes in popcorn maize by raising yields, cutting costs, and improving market-ready quality

Within the fields themselves, drone-based spraying has become a key tool for nutrient and pest-management applications. Farmers deploying drones report sharper coverage with less chemical drift and lower input volumes, which in turn cuts spraying costs and improves residue management on the cob. Timely, precise spraying also reduces kernel damage and field infestations, translating into higher-quality cobs that command better prices at procurement.

Equally important is how mechanisation eases access for smallholders who lack large tractors.

TECHNOLOGY IS REDEFINING EGG QUALITY IN INDIA'S POULTRY INDUSTRY

About the **AUTHOR**

Mr. S. V. V. Dora Reddy is Co-founder, Abhi Eggs.

For many of us, eggs are a daily staple cracked open in the morning rush, whisked into meals, or chosen as a convenient source of protein. Yet, the journey behind that simple shell often goes unnoticed. What truly determines the quality of an egg goes far beyond freshness it begins at the farm.

The foundation of egg quality lies in three critical factors: bird health, feed quality, and the environment in which poultry is raised. Together, these elements determine the nutritional value, safety, and overall quality of the eggs produced. Birds raised in clean and balanced conditions tend to produce eggs that are nutritionally richer and of better quality.

This growing awareness is reshaping how eggs are perceived. Once treated as a basic commodity, eggs are now being evaluated through the lens of health, safety, and transparency. Consumers are increasingly seeking clarity on how their food is produced, driving demand for responsibly farmed and nutrition-focused eggs.

According to the Ministry of Food Processing Industries, India ranks second globally in egg production, with 142.77 billion eggs produced in 2023–24, reflecting a 3.17% increase from the previous year. The per capita availability of eggs has reached 103 per annum. Andhra Pradesh (17.85%), Tamil Nadu (15.64%), Telangana (12.87%), West Bengal (11.37%), and Karnataka (6.62%) together contribute 64.37% of the country's total egg production.

This growth is mirrored in the broader market outlook. As per IMARC Group, the Indian poultry market was valued at INR 2,304 billion in 2024 and is projected to reach INR 8,430 billion by 2033, growing at a CAGR of 12.6% during 2025–2033.

Expanding Poultry Industry

The expansion in the poultry industry is driven by increasing demand for affordable, protein-rich diets and a gradual shift towards more structured and organised poultry systems.

In response, India's poultry sector is undergoing a steady transition from traditional practices to precision-driven, technology-enabled systems. Technologies such as automation, IoT, and data-driven farm management are becoming integral to addressing challenges related to disease control, labour dependency, and productivity variability.

A key pillar of this transformation is scientific feed technology. Modern feed formulations are designed to strengthen bird immunity while enhancing the nutritional composition of eggs. By incorporating essential nutrients such as Omega fatty acids, Vitamin D3, B12, and Selenium, along with gut health support systems, this approach ensures stronger nutritional outcomes.

Equally important is the adoption of integrated farm-to-pack systems, where operations are managed end-to-end. This enables better control over bird health, feed, hygiene, and egg handling, ensuring traceability and consistency across the production cycle.

The shift towards preventive, antibiotic-free farming practices is another significant development. Instead of relying on routine antibiotics, farms are focusing on proactive health management through balanced nutrition, early probiotic support, and clean rearing environments. This approach improves bird welfare while reducing the risk of chemical residues in eggs.

Efficiency Through Automation

Technology is also enhancing farm efficiency through automation. Advanced feeding, watering, and climate-control systems help maintain optimal temperature, ventilation, and hygiene, ensuring a stable environment for poultry.

A strong focus on biosecurity and hygiene further supports these advancements. Controlled farm access, sanitised environments, and robust disease prevention protocols are essential for maintaining flock health and ensuring food safety. Water and environmental management practices, including the use of treated potable water and maintaining clean farm surroundings, also play a crucial role in preventing contamination.

Regular quality testing and transparency measures are now becoming standard practice. Eggs are routinely tested for antibiotic residues, chemical contaminants, and nutritional parameters, reinforcing consistency and building consumer trust.

Together, these developments signal a broader shift towards a structured, technology-led poultry ecosystem. As consumer expectations evolve, the focus on scientific nutrition, efficient farm management, and food safety will be central to delivering eggs that meet higher standards of quality and reliability.

The Road Ahead

Looking ahead, the future of egg production will depend on how effectively the industry integrates science, technology, and responsible farming practices. As consumers become more informed, expectations are no longer limited to availability they extend to safety, nutrition, and transparency.

For the poultry sector, this presents a clear opportunity to move beyond volume-driven growth towards value-driven production. Continued investment in scientific feed innovation, precision farming, and quality systems will be key to achieving this shift.

Ultimately, the true measure of quality lies in trust. When every stage from farm to table—is managed with care, consistency, and accountability, it transforms a simple everyday staple into a reliable source of safe and nutritious food.

FARM POWER, AGRI MARKETPLACE AND THE ROLE OF DIGITAL B2B PLATFORMS IN STRENGTHENING RURAL SUPPLY CHAINS

India's agriculture sector is going through a structural transformation where technology, supply chain efficiency, and financial access are becoming as important as farm mechanization itself. While tractors, implements, irrigation systems, and farm equipment form the backbone of farm power, the real challenge today lies in how these products reach farmers in an affordable, timely, and reliable manner. The traditional distribution system is fragmented, credit availability is limited, and small manufacturers often struggle to reach the market. This gap has created the need for a strong agricultural B2B marketplace that connects manufacturers, distributors, retailers, service providers, and farmers on a single platform. At Shoption – Infinite Agri Options, our focus is to build such an integrated ecosystem where farm power, agri inputs, rural mobility, and financial services come together through a digital B2B network.

About the **AUTHOR**

Mr Sharad R. Kale is Founder, Shoption Infinite Agri Options

Significance of a B2B marketplace

India has thousands of small and medium manufacturers producing pipes, wires, pumps, farm implements, drip irrigation systems, sanitary products, and construction materials used in rural housing and agriculture. However, most of these manufacturers depend on local distributors and limited dealer networks, which restricts their growth. On the other side, retailers in rural and semi-urban markets often face difficulty in sourcing the right products at competitive prices. The result is inefficiency, higher cost, and limited availability for farmers. A B2B marketplace solves this problem by creating direct connectivity between manufacturers and retailers, allowing transparent pricing, wider product choice, and faster supply.

At Shoption, we are developing a specialized agricultural and rural B2B marketplace designed specifically for this ecosystem. Unlike general e-commerce platforms, the rural market requires credit support, logistics coordination, and product knowledge along with supply. Our platform enables retailers to order farm power equipment, electrical goods, pipes, sanitary products, irriga-

tion materials, and agri tools from multiple manufacturers in one place. This reduces dependency on multiple distributors and helps retailers maintain better inventory with lower working capital.

One of the biggest advantages of a B2B marketplace is for small and emerging manufacturers. Many innovative companies have good products but lack a nationwide dealer network. Building distribution in India requires large investment and time. Through a digital B2B platform, such manufacturers can list their products, reach retailers across states, and expand without heavy infrastructure cost. This creates a level playing field where quality products can compete even without a large brand name. Shoption is actively working with small and medium manufacturers to bring their products into the organized supply chain so that rural markets get more choices and better pricing.

Fintech Support

Another important element in rural trade is credit. In most agricultural and hardware markets, transactions are not purely cash-based. Retailers need credit from distributors, and farmers often buy materials on delayed payment. Because of this, working capital becomes a major bottleneck. To address this challenge, Shoption is also building fintech support within the marketplace. Through partnerships with financial institutions, NBFCs, and fintech companies, we aim to provide structured credit to retailers and dealers based on transaction history and digital records. When credit is linked to actual business flow, risk reduces and access to finance improves. This system can help small retailers grow without depending only on informal borrowing.

The future of agriculture will depend not only on how machines are manufactured, but also on how efficiently they are distributed, financed, and serviced

Fintech integration also helps manufacturers. When sales happen through a digital platform, data becomes available about demand patterns, payment cycles, and product movement. This allows better planning, reduced inventory risk, and faster expansion into new regions. In the long term, such data-driven supply chains will make the agricultural equipment and rural materials market more organized and efficient.

Changing Face of Farm Power

Farm power itself is also changing with the entry of electric vehicles, mini tractors, battery-operated tools, and smart machines. These new products require better service networks and trained dealers. A digital marketplace can help identify service providers, connect them with customers, and ensure availability of spare parts. Shoption is working on a service-matching system where equipment owners, operators, and users can connect through the platform. This approach increases utilization of machines and creates additional income opportunities in rural areas.

The future of agriculture will depend not only on how machines are manufactured, but also on how efficiently they are distributed, financed, and serviced. India's rural economy is large, but it needs organized systems to unlock its full potential. B2B marketplaces, supported by fintech and digital logistics, can become the backbone of this transformation.

At Shoption – Infinite Agri Options, our vision is to create a unified platform where manufacturers, retailers, farmers, and financial institutions work together in a transparent and scalable ecosystem. By combining farm power, rural supply chains, and fintech support, we believe it is possible to reduce cost, increase access, and create new growth opportunities for the entire agricultural sector. The goal is not only to modernize farming, but to strengthen the complete rural business network that supports it.

TURNING TECHNOLOGY INTO FARMGATE VALUE

Designing Reliable, Affordable Machinery for Indian Farmers

About the **AUTHOR**

Mr. Sanjay Bhatnagar is the founder and owner of Kaizen Agro Solution, specializing in agricultural and horticultural machinery. He is a recognized figure in the field of farm mechanization and post-harvest technology

Indian farmers deserve worldclass machinery that is reliable, affordable and designed for their realities, not imported in abstraction. From day one, my mission has been to drive rural economic development by equipping farmers and FPOs with automation and innovation that truly work in the field, reduce drudgery and unlock better prices for their produce. What began as a private label for horticultural equipment has since grown into a recognised brand in India's highvalue agriculture, especially in the apple and nut sectors.

From our base in Ambala, I have worked to build an extensive dealer network across India so that farmers can easily access our product range—from rotary tillers for primary tillage and intercultivation to advanced postharvest systems. Over the years we have carved a niche in highvalue horticulture, and I am proud that Kaizen Agro is widely known today as one of the leading manufacturers of apple washing and grading machinery in the country. Our specialisation is the Apple Washing, Grading and Shining Line, which

we offer in multiple configurations: economic MSbody models, fully stainlesssteel lines, and compact, portable versions for smaller growers and FPOs.

Apple Lines: From Orchard to Market

Our semiautomatic apple lines handle the entire journey of the fruit—gentle washing, natural drying and shining, followed by accurate grading according to size and dimensions. Depending on the model, a line can handle from around 5 tons per day up to well over 1,000–1,400 boxes per day, with options like double graders, multiple driers, multicolour controls and up to seven grading categories.

With our compact economic grading lines and portable stainlesssteel machines, a grower or FPO can now complete washing, drying, shining and grading right at the village level—even within a farmhouse courtyard—because the machines do not require elaborate civil works or heavy infrastructure. They are designed for personal as well as commercial use and are priced at a fraction of big industrial systems, while delivering comparable grading outcomes.

This shift helps farmers secure better prices by offering uniform, wellpresented fruit; it creates additional income streams through custom hiring and local service provision; and it keeps more value at the farm gate instead of pushing it outward to distant facilities. Thanks to these advantages, our machines have been included under various Central and State subsidy schemes, making adoption more affordable for small and marginal growers.

Beyond Apples: Nuts and Soil

Beyond apples, my team and I have focused on other highvalue crops where postharvest handling can make or break farmer incomes. Our Walnut Peeling, Washing and Grading Machines are built on heavyduty MS structures and use multiple sharp blades for efficient peeling, an inbuilt washing system and threegrade output, all powered by branded singlephase motors and robust imported gearboxes. We also manufacture Almond Shelling/Cracking Machines for efficient, lowdamage processing that preserves kernel quality.

Our machines are userfriendly, compact, ultra hitech and highly costeffective compared to large, imported lines

On the land preparation side, our rotary tillers—typically in the 5–7 HP and 10 HP range—are designed for smallholders. These are lightweight, fuelefficient petrol or power tillers with interchangeable blades or tines, capable of tilling up to about 18 inches, making furrows and preparing seedbeds in orchards and small fields. Alongside these core machines, we support farmers with related items like packing machines, diesel generator engines and crates that complement the postharvest and onfarm power needs of our customers. The intent is to offer a small but coherent ecosystem of solutions—from soil to packhouse—rather than isolated machines.

Design Philosophy: Rugged, Simple, Serviceable

Our motto is that machines must be durable, easy to operate, portable where needed and backed by longterm warranties. They should serve both individual growers and collective enterprises such as FPOs with equal reliability, and they must be repairable and serviceable through local partners. This philosophy guides material choices, layouts and even the way we think about spare parts and aftersales support.

Our apple washing and grading lines, economic MSbody graders, walnut units, almond crackers and rotary tillers all reflect this approach: rugged construction for Indian conditions, simple controls so that any trained operator can run them, and performance that stands up to comparison with far more expensive imported systems. Matching this with competitive pricing is critical for us, because our primary customer is still the small or midsized grower, not just the large corporate packhouse.

Growth, Reach and Strategy

We began as a small horticulture label and have gradually positioned ourselves as one of the best companies in India for apple grading machines, with a clear identity around highvalue horticulture rather than generic farm tools. Our product portfolio has expanded from basic apple graders to integrated washing–grading–shining lines, walnut peeling and grading machines, almond cracking machines, rotary tillers and other fruit and vegetable processing solutions. Technically, we have upgraded materials, components and designs year after year—moving from large, coldstore type systems to compact, farmerlevel machines that can sit in small packhouses or courtyards in regions like Kashmir and Himachal.

Our market reach and acceptance have also expanded steadily. Today we have an extensive network of dealers nationwide, and our installations in hill districts are widely appreciated for saving time, labour and grading costs. Testimonials describe our machines as userfriendly, compact, ultra hitech and highly costeffective compared to large, imported lines. This feedback from growers and FPOs is what shapes our next round of improvements and keeps us grounded in realworld performance rather than just catalogues and specifications.

TRADITIONAL CATTLE-BASED FARMING

A REGENERATIVE PATHWAY TO HEALTHY SOIL, CROPS, AND COMMUNITIES

Traditional farming methods have significantly improved soil fertility and preserved the nutritional value of produce. Cattle-based farming is a synchronization between the cattle–soil environment and human health—a time-honoured agricultural system where cattle play a vital role in maintaining soil fertility, conserving water, boosting crop productivity, preserving human health, and sustaining ecosystem balance. Particularly in water-scarce regions, this sustainable approach ensures long-term agricultural viability. In recent years, apart from ploughing the land, we have refrained from using modern techniques, even for harvesting.

Grazing as Natural Fertilisation

To enrich the soil, cattle are allowed to graze and roam in designated areas during the off-season, ensuring the land is naturally fertilised with their dung and urine. This process is repeated annually, enhancing soil fertility. As a result, our crops exhibit superior grain quality, with increased size and weight compared to those produced through chemical farming.

Features of Natural Agriculture Methods

Direct application of cattle urine and dung in the field naturally enriches the soil, reduces the need for manpower, and eliminates fertilizer costs.

About the **AUTHOR**

Mr Satish Babu Gadde is an award winning farmer. His family has practiced traditional cow based farming for generations.

No pesticide usage is required, as crops develop strong immunity, minimising pest infestations.

Weed growth is reduced as the uniform spread of cattle urine acts as natural uric acid, effectively uprooting weeds without chemicals.

Stress-free grazing for cattle helps maintain ecological balance, as confining them for long periods can affect their health and productivity.

Allowing calves to suckle freely enhances their growth, boosts reproductive health at an early age, and accelerates cattle multiplication.

Increased cattle sales generate sufficient revenue, ensuring smooth reinvestment for future crop cultivation.

Crop-Specific Insights

Paddy – Coconut System

This follows a single crop pattern from June to November, after which green fodder is grown for cattle.

Every year, we witness a higher rice yield of 76% per quintal of paddy during milling, with significantly fewer broken grains.

Increase of 18% rice per quintal, providing the benefit of a double-crop output from a single crop cycle.

Maize - Single crop cycle

October–January cycle with minimal manpower requirements.

As the cropping and harvesting periods coincide with the off-season when a large workforce is readily available, we can work for longer hours, thereby minimising manpower expenses. This savings is equivalent to the profit from a second crop, providing additional financial benefits without actually cultivating a second crop.

Coconut (Perennial Crop)

No intercropping is practised; cattle grazing naturally enriches the soil.

The high calcium content from grazing dung and urine directly nourishes the root system, benefiting coconut plants and preventing flower and fruit drop.

Yield surpasses 280 coconuts per tree per annum.

When watered, the urine seeps into the roots and helps prevent infestations such as the rugose spiralling whitefly.

Cattle, Soil, and Sustainable Farming

Cattle and soil go hand in hand. We are capable of sending rockets into space, but we fail to enrich the soil because it is not in the hands of humans.

Naturally Regenerative Agriculture

Traditional farming practices play a vital role in enhancing soil fertility, improving crop nutrition, and ensuring long-term farm sustainability. By integrating cattle into farming cycles, we not only boost agricultural productivity but also conserve natural resources. These time-tested Indian farming methods are inherently regenerative, offering economic, environmental, and health benefits. Plants require higher inputs to produce more output, whereas cattle consume minimal inputs like grass and water yet generate abundant output in the form of dung and urine, which enrich the soil and benefit the environment. Additionally, cattle reproduction naturally multiplies the herd, further enhancing farm productivity. Fifty percent of water and power are saved for future generations.

Stress-Free Grazing

Continuous tethering of cattle leads to a loss of natural instincts, affecting their overall well-being. Cattle that lack freedom produce inferior dung, urine, and milk, which can negatively impact soil fertility and crop yield. Allowing free grazing ensures their natural behaviour is maintained, resulting in nutrient-rich dung, urine, and milk that promote healthy farming.

Disease Prevention

A long rope is tied between two iron rods fixed in the ground, with individual cattle tethered at six-foot intervals. Each morning, the cattle are shifted six feet ahead, ensuring even distribution of dung and urine across the field. This natural process prevents bacterial accumulation, significantly reducing the risk of diseases like mastitis—a major concern in dairy farming worldwide.

Natural Weed Control

Regularly shifting cattle ensures uniform urine distribution across the field, which acts as a natural herbicide. The uric acid content in cattle urine helps uproot weeds without the need for harmful chemical weedicides, which are known to cause cancer in humans. This method addresses the global weed problem while protecting human and environmental health.

Pest Resistance

Nutrient-rich manure strengthens crops, improving their immunity against pests and diseases without the use of synthetic pesticides. Over time, this practice promotes sustainable and pest-resistant farming.

Labour Efficiency

Traditional farming eliminates the need for manual labour to clean cattle sheds or to manually spread manure across the fields. Since dung and urine are naturally distributed, labour efforts are minimised, saving both time and resources and allowing farmers to focus on other productive tasks.

Improved Calf Health and Growth

Allowing calves to naturally feed from their mothers enhances their immunity, promoting faster growth and early conception (around 16–20 months). This practice boosts herd multiplication and farm profitability, ensuring a continuous and sustainable cattle cycle. Early and healthy reproduction results in consistent milk and manure production, strengthening farm economics.

Enhanced Water Retention

Healthy soil structure plays a critical role in water retention. When cattle graze and their dung decomposes, it creates organic tunnels within the soil, allowing rainwater to penetrate up to 15 feet deep. This stored groundwater, through percolation, gradually evaporates, ensuring a continuous water supply during dry seasons. This natural water cycle, facilitated by cattle, is a key aspect of traditional farming that ensures sustainable water management, especially in water-scarce regions.

A WOMEN FARMER PAVING THE WAY FOR TECH-ENABLED FARMING IN ODISHA

Across India, women farmers play a pivotal yet often under-recognised role in the country's agricultural economy. They constitute over 42% of the agricultural workforce, contributing not only through labour but also through seed preservation, crop diversification, and climate-resilient practices. Despite their crucial involvement, many women farmers continue to face challenges such as limited land ownership, restricted access to credit, technology, and organized markets.

In Odisha, where most women farmers still work on small plots and depend on local markets, earning a steady income from agriculture remains a challenge. Many women cultivate less than two acres of land, rely on traditional practices, and receive limited access to scientific advice or organised buyers. This often keeps farm incomes low and uncertain. But in Sambalpur district, one woman has quietly changed this story.

Ms Sankhajini Pradhan, a 39-year-old farmer from Jujomora block, began her journey on just 1.5 acres of family land which restricted both her income and her choice of crops. She had minimal exposure to modern agricultural practices, scientific advisories, or digital tools that could help her improve productivity. With no access to organized market links, she struggled to reach better buyers or secure fair prices. Her earnings remained low and unstable due to traditional methods and limited crop diversification. She also had no opportunities for training in new crops, off-season cultivation, floriculture, natural farming or pest and disease management, leaving her without the technical support needed to expand her livelihood.

Support Through FPO

In 2020, Ms Sankhajini joined Sabuja Sanatanpali Farmer Producer Company. Through the Promotion and Stabilization of FPOs (PSFPO) project, implemented by the Department of Agriculture and

With NABARD's support and Palladium's guidance, the FPO has successfully diversified into high-value crops and adopted modern agricultural practices. Palladium has played a key role in enabling marketing support—facilitating both domestic and international market access, including export of premium produce—which has significantly improved income opportunities for small and marginal farmers associated with the FPO.

- Shri Dhiren Kumar Dash, DDM NABARD

Farmers' Empowerment, Government of Odisha, with support from Palladium, she was connected to digital advisories and institutional buyers like Reliance Fresh. The project also aided her in improved planning, scientific crop production, better post-harvest management, and strong market linkages. Through this support she also adopted climate-smart and technology-enabled agriculture.

Ms Sankhajini began using the Krushi Samrudhi Helpline (155333), a dedicated farmer advisory platform, to seek real-time expert guidance on crop planning, pest and disease management, nutrient application and market trends. Access to timely technical advice strengthened her decision-making and reduced production risks, especially while expanding into high-value crops and floriculture. Her proactive use of digital advisory services positioned her as a technology-enabled farmer.

Encouraged by this, she leased an additional 10 acres of land and began diversifying into vegetables, floriculture, and mushroom cultivation. Today, her farm produces colourful cabbage, chilli, bitter gourd, okra, marigold, and mushrooms, crops that bring better returns and reduce income risk. Now she and other farmers in her FPO sell their produce to organised buyers, earning 30 to 50% higher prices and enjoying a more stable income.

Women's Leadership

Beyond income, her journey is also about women's leadership. Ms Sankhajini is now one of the Board of Directors of her FPO owing to her success with innovative farming methods. She has inspired many other women in her village to lease land, adopt new crops, and take farming seriously as a business. Her efforts were recognised when she received the Best Farmer Award from the Chief Minister of Odisha at Krushi Odisha 2022–23. During the Gates Foundation's visit in 2025, she also got a chance to interact with the team as a tech-user woman farmer, showcasing how digital solutions are empowering women at the grassroots level.

"With the right guidance and support from my FPO, even a small farmer like me could transform my life and lead others toward progress," Ms Sankhajini says. Her story shows how PSFPO is not just increasing farm incomes but also empowering women to become confident entrepreneurs and leaders, helping shape a stronger and more resilient rural economy in Odisha.

"The progress of Sabujasanatanpali Farmers Producer Company Limited in Sambalpur district reflects the impact of coordinated efforts in strengthening farmer collectives and enhancing rural livelihoods. With NABARD's support and Palladium's guidance, the FPO has successfully diversified into high-value crops and adopted modern agricultural practices. Palladium has played a key role in enabling marketing support—facilitating both domestic and international market access, including export of premium produce—which has significantly improved income opportunities for small and marginal farmers associated with the FPO," said Shri Dhiren Kumar Dash, DDM NABARD.

Reimagining INDIA'S FOOD FUTURE

If you travel through India's farming regions, you quickly realise that agriculture is not short of hard work or ambition. What it often lacks is certainty.

A farmer may know how to grow a good crop. What they don't always know is whether the rains will arrive on time, whether pests will strike, what price the market will offer, or whether their produce will be accepted for quality. This uncertainty—more than effort or intent—is what holds progress back.

Seen from this lens, the Union Budget 2026–27 feels different. It does not try to solve agriculture with one big announcement. Instead, it quietly focuses on reducing uncertainty—at the farm, in food processing, and all the way to the consumer's plate.

There are six areas that will strengthen the foundation of Indian agriculture:

Strengthening long-term investment in the agriculture sector

The nearly 7% increase in allocation to the agri sector signals a strong long-term commitment.

What stands out is how the Budget views farmers—not merely as beneficiaries but as informed decision-makers in the food system. With stable incomes, clearer market signals, and better risk protection, farmers are more willing to innovate, diversify, and upgrade their practices.

Prioritising high-value crops that improve farmer incomes

The Budget's emphasis on high-value crops—nuts, horticulture produce, coconut, cashew, and cocoa—marks an important shift. These crops offer higher returns and more diversified income streams, especially for small farmers. In combination with investments in irrigation, livestock, and fisheries, the message is clear: farming must be both productive and profitable.

About the **AUTHOR**

Dr Prithwi Singh is CEO & Co-founder, Khetika. The company offers a wide range of food products including batters, spices, chutneys, millet-based staples, makhana, and dry fruits developed through traditional stone-ground processes and clean-label innovation through a tech-enabled supply chain

Delivering reliable, localised information through technology

The launch of the AI-powered Bharat VISTAR advisory platform is a major step forward. Farmers often struggle because information is scattered—weather updates, pest alerts, and market prices come from different sources and often too late. Bharat VISTAR aims to unify and simplify this flow of information in local languages.

Technology builds confidence only when it is practical and reliable. When farmers see results—lower losses, better prices, improved crop quality—they adopt new practices more willingly, reducing hesitation and increasing trust.

This confidence at the farm level progressively strengthens food processing, a link that is often overlooked.

Good food starts in the field, not in the factory. Better-quality raw materials reduce the need for heavy processing, additives, and corrections. Indian consumers today are more conscious—they read labels and look for clean, simple, responsibly processed food. As this mindset grows, the entire system must protect quality at its source.

Reducing post-harvest losses through stronger infrastructure

A large share of India's fresh produce is lost due to gaps in storage, cold-chain facilities, and transport. These losses hurt farmers and degrade the quality available for food processing. The Budget's focus on logistics, storage, and rural enterprise financing directly addresses this silent erosion of value and nutrition.

The proposed MSME Growth Funds and expanded credit support acknowledge these realities and prioritise steady, responsible growth. This will hugely benefit India's food processing ecosystem

Boosting India's global competitiveness through export reforms

The export-friendly reforms—along with India's ongoing Free Trade Agreement negotiations—create major opportunities for food sectors such as spices, packaged foods, and value-added products. Faster customs processes, smoother courier exports, and better trade access will help small and emerging food brands reach global markets. The goal is not just to export more, but to export *better*—products that reflect quality, safety, and trust.

Enabling sustainable growth for food MSMEs

For food businesses—especially MSMEs—time, capital, and reliability matter far more than rapid scaling. Building trusted sourcing networks, consistent processes, and a loyal consumer base takes years. The proposed MSME Growth Funds and expanded credit support acknowledge these realities and prioritise steady, responsible growth. This will hugely benefit India's food processing ecosystem.

The Union Budget 2026–27 tells a clear story: farming, technology, processing, infrastructure, and markets must move in sync. When they do, the entire system becomes more resilient.

At its heart, India's food future rests on trust—trust that farmers will be rewarded for quality, trust that food is processed with care, and trust that policies and technology reduce risk rather than add to it.

India now has the opportunity to be recognised not just as a large food producer, but as a source of clean, responsibly processed food for the world. That journey begins on the farm, flows through honest processing, and ends at the consumer's plate—with confidence in every bite.

This Budget sets the foundation to place India at the centre of the world's food plate, making our farmers, food processors, and clean food brands a global success story in the years ahead.

THE EFFORT TO RESHAPE INDIA'S AGRICULTURAL WORKFORCE

For decades, India's agricultural workforce has run on informal networks, last-minute coordination, and a quiet assumption that labour will somehow show up when needed. That system is now visibly under strain.

Across the country, farmers are grappling with rising labour costs, increasing unpredictability, and a shrinking pool of skilled workers willing to undertake time-sensitive operations. At the same time, India is home to over 14 crore agricultural labourers—one of the largest informal workforces in the world—many of whom still lack stable employment, consistent income, or any structured pathway to upskilling.

This creates a paradox at the heart of Indian agriculture: farmers cannot reliably find labour when they need it, while workers cannot reliably find work when they want it. The issue is not absolute scarcity. It is coordination.

What is emerging in response is the opportunity for a new category of platform systems—not simply digital marketplaces, but full-stack labour platforms that bring structure to an otherwise fragmented ecosystem. These systems can organise labour supply, standardise agricultural work, and use data to match demand with far greater precision than has historically been possible.

From daily wage to work outcomes

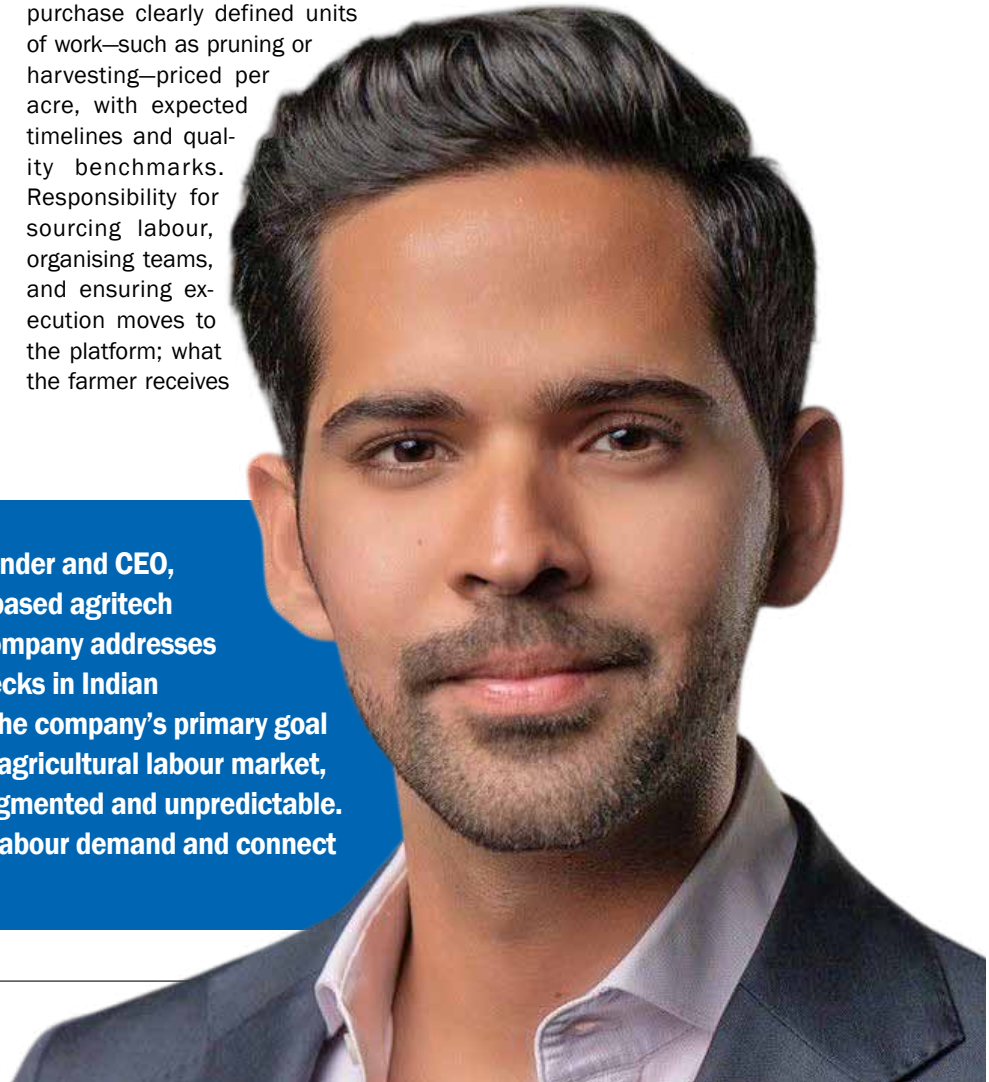
Traditionally, farmers have hired labour in units of time, paying daily wages while bearing the full risk of delays, inefficiencies, or poor execution.

Platform systems shift this model from "labour time" to "work outcomes". Instead of hiring workers for a duration, farmers purchase clearly defined units of work—such as pruning or harvesting—priced per acre, with expected timelines and quality benchmarks. Responsibility for sourcing labour, organising teams, and ensuring execution moves to the platform; what the farmer receives is a completed outcome.

For workers, this transition changes incentives. When labour is organised into teams with defined roles and performance tracking, earnings become linked to productivity rather than hours alone. Skilled workers can earn more, while also gaining access to more consistent employment.

Connecting supply, execution and demand

At its core, this shift is about connecting three parts of the system that have historically operated in isolation: supply, execu-



About the **AUTHOR**

Mr Azhaan Merchant is Co - Founder and CEO, Bharat Intelligence, a Mumbai-based agritech startup founded in 2024. The company addresses one of the most critical bottlenecks in Indian agriculture: rural labour crisis. The company's primary goal is to formalize and stabilize the agricultural labour market, which has traditionally been fragmented and unpredictable. The platform uses AI to predict labour demand and connect farmers with skilled work crews

tion, and demand.

Labour supply—local workers, migrant corridors, seasonal flows—remains largely unstructured and undocumented. Farmer demand is fragmented, seasonal, and often expressed too late. Between them sits execution, where work is defined and delivered.

When these layers begin to align, the system behaves differently. Workers can be mapped by skill and availability, farm activities can be standardised, and demand can be anticipated using crop cycles and historical patterns. Over time, what emerges is not just a marketplace, but a coordinated system—closer to a labour grid than a labour market.

Why this shift matters now

India's agricultural growth is increasingly driven by high-value crops—fruits, vegetables, and horticulture—which are far more sensitive to timing and labour quality than traditional commodities. Even short delays in critical operations can directly impact yield and income.

At the same time, labour mobility remains largely informal. Seasonal migration continues across states, but without structured systems to match workers to demand. The result is inefficiency on both ends: workers face underemployment, while farmers face acute shortages during peak periods.

If India is to sustain growth in high-value agriculture and improve rural livelihoods, the way labour is organised will have to change. This shift may be gradual, but it is already underway—and it could prove to be one of the most consequential transformations in Indian agriculture over the coming decade

Platform systems do not create new labour; they enable better utilisation of existing labour.

Technology as a coordination layer

The challenge, however, is not purely operational. Agricultural labour markets are shaped by trust, behaviour, and local dynamics. Workers often arrive with unclear expectations and limited training, while farmers have little visibility into labour quality. This reinforces a cycle of inefficiency and mistrust.

Any attempt to organise this space must therefore go beyond logistics. It must introduce basic structure—verification, training, performance tracking, and clear communication—while working within the realities of rural India.

Here, technology, particularly AI, acts as a coordination layer rather than a replacement. By translating fragmented signals—farmer requests, crop calendars, worker availability—into structured data, these systems can predict demand, allocate resources more efficiently, and reduce friction.

India is still in the early stages of this transition. Most platforms operate in limited geographies and crops, testing what works. But the direction is clear.

As more workers are organised, more agricultural tasks are standardised, and more demand is captured digitally, the foundations of a nationwide labour operating system begin to emerge—one where trust is built through execution, incentives align with productivity, and labour becomes a structured, reliable layer of the agricultural economy.

FIVE WOMEN FARMERS TURNED HARDSHIP INTO HOMEGROWN SUCCESS

Women farmers from Bundelkhand and Madhya Pradesh have transformed their livelihoods through sustainable agriculture and allied activities with support from HDFC Bank's CSR programs implemented in partnership with PRADAN.

Across the villages of Bundelkhand and Madhya Pradesh, five women have rewritten what it means to farm, to lead, and to thrive. Supported through HDFC Bank Parivartan's CSR programmes and implemented in partnership with PRADAN, their stories are not just of income transformation; they are of dignity reclaimed, communities changed, and futures redirected.

KAMLI PAL

From Migration to Model Goat Farmer

In the dry landscapes of Rajnagar block, Chhatarpur, where opportunities are few and migration is a norm, one woman's decision to stay back has turned her into a symbol of local resilience. Like thousands from Bundelkhand, Kamli Pal once travelled to cities like Delhi and Jammu in search of wage labour — years marked by hardship and family separation. Her earnings during those years: approximately Rs 80,000 annually. Her children stayed behind. Her land lay underused. "I never left to explore the world," she says. "I left because there was no work here," she said.

The Turning Point

Everything changed when the Madhya Pradesh government's Goat Unit Scheme (10+1 Yojana) came to her village. The scheme provided ten does and one buck to small farmers at subsidised rates. But goats alone were not enough — without shelter or veterinary support, losses were inevitable. "We'd raised goats before, but they rarely survived the monsoon," she recalls.

The difference this time was convergence. With support from HDFC

Bank Parivartan's CSR programme and PRADAN, Kamli built a sturdy goat shed, an investment of Rs 60,000, with Kamli contributing Rs 6,000 and the rest funded through the programme. She accessed veterinary care, learnt balanced feed management, vaccination schedules, and early disease detection. What had once been an uncertain practice became a sustainable livelihood.

Impact at a Glance

Income before (migration years): More than Rs 80,000 per year

Current annual income: More than Rs 1 lakh (milk + periodic goat sales)

Herd size today: 18 goats

Programme investment in shed: Rs 60,000 (beneficiary contributed Rs 6,000)

Goat sheds inspired by her model: 12 completed; 88 in progress under MGNREGA

Ripple Effect

The results were swift. In her very first year, she earned nearly Rs 40,000 from milk and goat sales. Today, she expects to cross Rs 1 lakh in annual income. More importantly, her journey is sparking change across her village: five families have begun goat-rearing after seeing her success. The veterinary officer and local officials now visit her shed as a model. Under MGNREGA, 12 new goat sheds have been built in her likeness, with 88 more approved and under construction.

Her story is not just about income. It is about dignity, staying with her land, and being recognised as a leader. For Bundelkhand, where migration has long defined survival, Kamli represents a different path — one rooted in choice, not compulsion.

PHOOLA PATEL

From Fields of Debt to Renewal

In Ontapurwa village, farming had long been defined by rising costs and shrinking returns. Like most families in the region, Phoola Patel depended on chemical fertilisers like urea and DAP, and pesticides that consumed nearly every rupee she earned. "We would spend heavily at the start of each season," she says, "but at harvest time, little remained at home." The cycle of crop loans and mounting medical expenses, compounded by poor soil health, had become a trap.

The Turning Point

What changed her story was an intervention by HDFC Bank Parivartan and PRADAN, which guided women farmers toward natural and regenerative farming practices. The idea of farming without chemicals was met with scepticism at first. Phoola began experimenting on a small patch, just 1 acre of her 2.5-acre landholding, learning to prepare bio-inputs such as jeevamrut (a microbial soil booster) and neemastra (a neem-based pest repellent).

"I always tell other farmers — try natural farming on even a small patch of land. You will immediately see the difference in taste, in soil, and in health."— Phoola Patel

"The first year was tough. Pests attacked our crops, and I thought maybe this was a mistake," she admits. But by the second season, the results began speaking for themselves: vegetable plants standing taller, soil texture improving, and expenses sharply reduced.

Impact at a Glance

Income before intervention: More than Rs 90,000 per year

Income after intervention: More than Rs 1.2 lakh per year

Input cost reduction: 40% on 1 acre under natural farming

Land under natural farming: 1 acre (of 2.5 acres total)

Women covered in Ontapurwa: 72 women farmers

Ripple Effect

Today, Phoola cultivates a combination of mango and guava orchards alongside seasonal crops such as chillies, brinjal, okra, and tomatoes, using natural methods. Input costs are down, production quality is up, and health outcomes have improved. "We don't have to spend on fertilisers anymore. The money stays with us, and my children eat fresh, chemical-free vegetables every day," she says.

Inspired by her success, 18 families in Ontapurwa have adopted natural farming on some portion of their land. Neighbours now consult her on preparing bio-inputs, and visitors come to see her demonstration plots. In a village where women's work was traditionally hidden behind household walls, she is now recognised as a knowledge-holder, her voice shaping decisions at farmers' meetings on soil conservation, water management, and diet.

MUNNIYA AHIRWAR

Where Earth Whispers Secrets of Renewal

Life as a farmer in Mau Masaniya was once fraught with difficulty for Munniya Ahirwar. "We had to spend so much on chemical pesticides and fertilisers. The costs were high, but our land kept getting weaker," she recalls. With repeated crop failures and declining fertility, hope for improvement seemed remote. Families invested heavily each season, only to see dwindling yields and mounting expenses.

The Turning Point

Munniya's journey shifted course when PRADAN brought organic farming practices to her village. Supported by hands-on guidance and training from HDFC Bank Parivartan's programme, she learned natural composting, pest control using bio-inputs, and techniques to restore soil health. "Without exposure to new ideas and support, we would have kept losing money. Organic farming taught us a better way," she explains.

> "You cannot progress without a willingness to learn and hard work."— Munniya Ahirwar

Gradually, Munniya began cultivating vegetables naturally — brinjal, tomato, okra, and chillies. The quality of her produce improved, and so did customer response. "People noticed the difference and they came back for my vegetables and told others."

Impact at a Glance

Seasonal income per crop cycle: More than Rs 15,000 – Rs 20,000 per season

Farmers inspired in Mau Masaniya: 30 farmers now using organic techniques

Urooj Women Farmers Producer Co. Ltd: Founded 18 January 2024

FPC shareholders: 518 as on date

FPC annual revenue (FY 25–26): Rs 92 lakhs

Leadership & Collective Action

Munniya is now a Board Member of Urooj Women Farmers Producer Company Ltd, a collective founded in January 2024 that today has 518 shareholders and has generated Rs 92 lakhs in annual revenue for FY 2025–26. As a board member, she actively participates in decisions that shape livelihoods for hundreds of women across the region.

Organic produce from Mau Masaniya is gaining recognition at local markets for its quality and taste, with village-level consumers now actively preferring it. The community has begun to break the old cycle of chemical dependence, and Munniya's leadership is at the heart of that shift.

PREETI KUSHWAHA

Breaking Barriers, Building Better Futures

In Bundelkhand's traditionally male-dominated agricultural landscape, especially in Chhatarpur, Preeti Kushwaha has not only cultivated a thriving organic vegetable farm, but she has also carved out an empowering identity as a woman farmer and financial anchor for her family. Her journey reflects what it truly means to assert oneself amid long-standing gender norms.

The Turning Point

Starting with her 40-decimal plot of land, Preeti embraced organic farming through support from PRADAN and HDFC Bank Parivartan. She learnt innovative techniques like multilayer farming, maximising yields by layering vegetables, fruits, and herbs vertically in the same plot, making efficient use of limited land.

The results of this method were striking; vegetable production jumped from 13 quintals to 16 quintals from the same 40-decimal plot. She also began preparing her own vermi-compost, significantly reducing input costs. Her fields now flourish with tomatoes, okra, gourds, chillies, brinjal, and more — all free from chemical fertilisers and pesticides.

"Farming organically gave me not just income, but a voice — and that voice has changed everything."— Preeti Kushwaha

Impact at a Glance

Total annual agricultural income: Rs 1.6 lakh

Winter vegetables: Rs 50,000

Summer vegetables (lauki + kheera): Rs 60,000

Kharif groundnut: Rs 25,000

Kharif vegetables: Rs 25,000

Yield improvement (same 40 dec): 13 quintals → 16 quintals

Beyond the Farm

The transformation extends well beyond income. Preeti now handles household finances and has increased her say in spending decisions, a quiet but profound shift in household dynamics. "People doubted at first that a woman could manage farming and marketing," she recalls. "But the respect I command today, at home and in the marketplace, is undeniable."

Perhaps the most telling sign of her family's changed fortunes: from April 2025, both her children, a daughter and a son- have been enrolled in a private school. "Farming organically gave me not just income, but a voice and that voice has changed everything," she reflects.

BETIBAI KUSHWAHA

From Isolated Farmers to Empowered Producers

With land under her care, Betibai Kushwaha has transformed her family's fortunes through organic vegetable cultivation. Until recently, like most farmers in Bagmau, she relied on chemical fertilisers like urea and DAP that often-ballooned production costs while eroding soil quality. "We thought these chemicals were necessary to grow crops," she says. "But the expenses mounted, and the land suffered."

The Turning Point

A turning point arrived when PRADAN and HDFC Bank Parivartan introduced her to natural farming techniques and collective marketing through a producer group. The shift to organic farming required patience and learning. Betibai embraced training in compost preparation, bio-inputs, and pest management without chemicals. Using mulching and crop rotation, her fields began producing healthier vegetables- brinjal, ridge gourd, tomato, and cucumber — that commanded better prices in local and district markets.

"Together, we farm better and sell stronger."

— Betibai Kushwaha

"We stopped using DAP and urea," she recalls, "and the crops started improving."

Impact at a Glance

Betibai's individual annual income: Rs 1.15 lakh

Producer group size: 27 women members

Total acreage under cultivation: 28 acres collectively

Group annual revenue: Rs 6–8 lakhs

HDFC Bank Parivartan investment: Rs 49,000 (micro irrigation Rs 25K + seeds Rs 15K + crates Rs 9.1K; 50% subsidised)

Primary market: Lavkushnagar block weekly market, Chhatarpur (every Thursday)

Collective Strength in Action

At the heart of Betibai's success lies the power of collective action. The producer group she is part of combines the efforts of 27 women farmers across 28 acres, pooling resources, knowledge, and market access to overcome the limitations of individual smallholders. One member has even purchased an e-rickshaw, now used on a sharing basis to transport produce to the Thursday market in Lavkushnagar, a small but powerful symbol of collective enterprise.

"Alone, it is hard to reach buyers or get fair prices," Betibai explains. "Together, we negotiate better deals, share risks, and support each other." This collective strength has enabled the group to generate annual revenues of Rs 6–8 lakhs, transforming local agriculture from a subsistence activity into a viable business. For Betibai, this is about more than income, it is about reclaiming control over land, resources, and destiny.

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FINANCING OF AGRICULTURAL EQUIPMENT THROUGH SMAM

OPPORTUNITIES FOR SMALL AND MARGINAL FARMERS

The Sub-Mission on Agricultural Mechanization (SMAM), a Centrally Sponsored component of Rashtriya Krishi Vikash Yojana (RKVY), provides financial assistance to farmers for purchasing agricultural machines and equipment, including the post-harvest and processing technologies, on an individual ownership basis. The SMAM aims to increase availability of agricultural machinery for small and marginal farmers, particularly in areas with low farm power. SMAM provides financial support for procuring machinery in low-mechanized regions and also supports the creation of Custom Hiring Centres (CHCs) and Village Level Farm Machinery Banks (FMBs) to enable farmers to hire out machinery and equipment as per their needs. Additionally, it offers financial support for demonstration of Kisan Drones on farmers' fields, purchase of drones by farmers, and establishment of Kisan Drone CHCs to provide drone-based agricultural services.

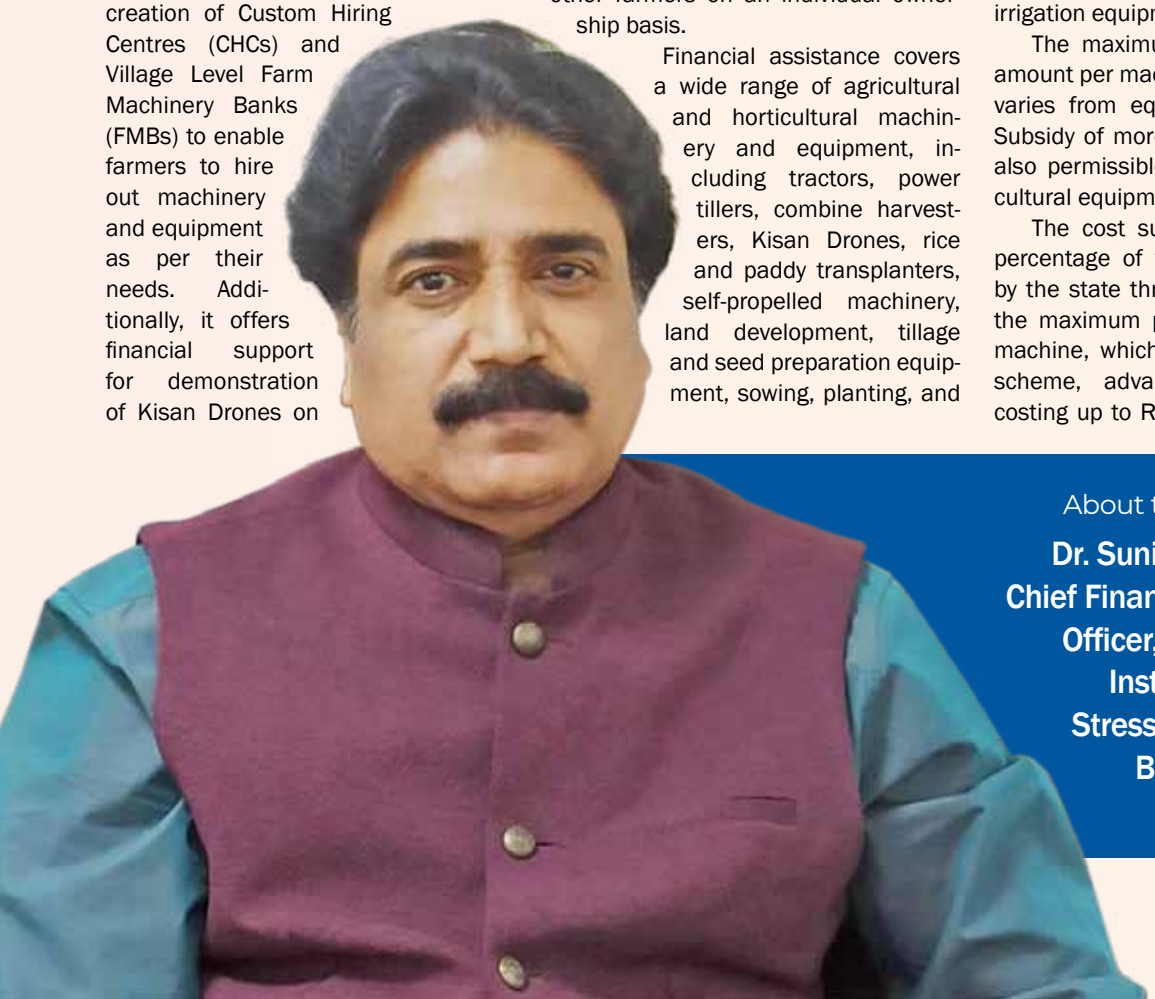
Financial Assistance to Farmers for Procurement of Farm Machinery & Equipment

Financial assistance under SMAM is provided for various type of agricultural machinery at the rate of 50% of machine cost for small and marginal farmers, SC/ST farmers, women farmers, and farmers of the Northeastern States and Himalayan Region, and 40% for all other farmers on an individual ownership basis.

Financial assistance covers a wide range of agricultural and horticultural machinery and equipment, including tractors, power tillers, combine harvesters, Kisan Drones, rice and paddy transplanters, self-propelled machinery, land development, tillage and seed preparation equipment, sowing, planting, and digging equipment, inter-cultivation equipment, residue management tools, hay and forage equipment, harvesting and threshing equipment (engine / electric motor below 3-5 HP and tractors below 35 BHP), chaff cutters, fertigation equipment, self-propelled and other power-driven horticultural machinery, manual horticultural tools, post-harvest and value addition equipment for food grains, oilseeds, and horticultural crops, mini rice mills, composite rice milling plants, mini dal mills, millet processing plants, indented cylinders, air screen cleaners, plant protection equipment, specialized agricultural machinery, and irrigation equipment.

The maximum permissible subsidy amount per machine under this scheme varies from equipment to equipment. Subsidy of more than Rs.10.00 lakh is also permissible for the following agricultural equipment:

The cost subsidy is limited to the percentage of the machine cost fixed by the state through price discovery or the maximum permissible subsidy per machine, whichever is less. Under the scheme, advanced small machines costing up to Rs 10,000 are promoted



About the **AUTHOR**

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to the benefit of small and marginal farmers, and these machines are distributed exclusively through various fairs and exhibitions.

Financial Assistance to FRA patta holders

Financial assistance of 90% of the machine cost is provided to farmers of Forest Rights Act (FRA) patta holders for purchasing farm machinery and equipment on an individual ownership basis. The list of beneficiaries is provided by the Ministry of Tribal Affairs and the funds for this support are utilized from the Development Action Plan for Scheduled Tribes (DAPST).

Establishment of Custom Hiring Centers (CHCs)

Custom Hiring Centers (CHCs) for location- and crop- specific farm machinery and equipment, Post-Harvest Technology (PHT), value-addition machinery and precision farming technologies including Kisan Drones are established in districts identified under the State Annual Plan (SAP). Villages with low farm power availability and a large area of small and marginal landholdings are prioritized for setting up CHCs. These centers are supervised by the District Agriculture Officer to ensure that hiring charges remain reasonable and affordable for small and marginal farmers. Each CHC maintains small, crop-specific machinery suited to local requirement to support mechanized farming in small and marginal holdings. The maximum permissible assistance per machine under the project is 40%.

Financial Assistance for Mechanized Operation

Financial assistance is provided to small and marginal farmers in low-mechanized regions at the rate of Rs 2000 per hectare for hiring drones from CHCs, women Self-Help Groups (SHGs). This support is available up to 2 hectares of land per year, and the amount of assistance is proportionate to the actual land owned by the farmer.

Model Villages of Farm Mechanization

State Governments prioritize villages with high potential for agricultural advancement through mechanization, particularly where farmers are willing to adopt new technologies and where farming operations can be efficiently mechanized. In such identified villages, the state governments purchase crop-specific machines and make them available to small and marginal farmers at very low rental rates or free of cost.

Type of Agricultural Machinery / Equipment	Financial Assistance for SC/ST, Small & Marginal Farmers, Women and Beneficiaries fromNorth Eastern States	
	Maximum permissible subsidy per Machine / Equipment per Beneficiary (Rupees in lakh)	Pattern of Assistance
Combine Harvester (Track Type > 6 feet cutter bar width)	12.50	50%
Combine Harvester for potato, groundnut, and other tuber (Tracker operated)	12.00	50%
Sugarcane Harvester (Self Propelled)-wheel type / track type (full/ half) (to be procured by CHCs only)	50.00	50%
Maize Combine Harvester (Self Propelled)	12.00	50%
Self-Propelled4 wheel tea leaf Harvester	15.00	50%

GOI's Sub-Mission on Agricultural Mechanization (SMAM) provides financial support for procuring machinery in low-mechanized regions and supports the creation of Custom Hiring Centres and Village Level Farm Machinery Banks

Promotion of Agricultural Mechanization in North-Eastern Region

Financial assistance of 100% of the cost of machine upto Rs 1,25,000 is provided to farmers and FRA patta holder in North-Eastern States for the procurement of farm machinery.

Other Provision of SMAM: The fund sharing pattern between Centre and State/UTs is 90:10 for North-Eastern and Himalayan States and 60:40 for other states, while Union Territories receive 100% funding from the Centre. States have the flexibility to add additional machines beyond those provided under SMAM within the appropriate categories. Manufacturers must ensure transparency in selling prices and provide product warranty along with after-sales services to farmers/ beneficiaries. Farmers are to choose any machine or equipment and its variants from State-empanelled manufacturers, negotiate the final price with the manufacturer or dealer and receive the applicable subsidy through Direct Benefit Transfer (DBT).

GRASSROOTS GUARDIANS

Panchayats Show the Way in How Farmers and Rural Communities Can Develop Local Solutions to Deal with Climate Change

Gram Panchayat representatives from Maharashtra's first net-zero village, Karnataka, Kerala, Bihar, Jharkhand and Odisha got together at Mumbai Climate Week held at Jio World Convention Centre in Mumbai and highlighted the vital role of community stewardship in shaping localised climate action.

A special 'Panchayat' session – 'Panchayats Leading India's Climate Charge' – held at the Jio World Convention Centre during the Mumbai Climate Week brought together grassroots leaders from six states, demonstrating that some of India's most effective climate solutions are emerging from village councils, not conference rooms.

The panel built on the Conference of Panchayats (CoP) initiative by Asar Social Impact Advisors, and Policy & Development Advisory Group (PDAG, continuing its focus on strengthening local leadership in climate action, and the growing importance of climate-smart local governance. Grassroots leaders from Maharashtra, Karnataka, Kerala, Bihar, Jharkhand and Odisha shared firsthand accounts of building climate resilience, from enabling solar-powered energy transitions to integrating sustainable agriculture into Panchayat planning. They highlighted how some of India's most impactful climate solutions are being driven by village councils. From India's first net-zero Panchayat in Bela Gram, Maharashtra, to solar-powered transitions in Kerala and Jharkhand, the discussion spotlighted community-led climate resilience in action.

Gram Panchayat representatives from Maharashtra, Karnataka, Kerala, Bihar, Jharkhand and Odisha highlighted the vital role of community stewardship in shaping localized climate action during the Mumbai Climate Week panel.

India's First Net-Zero Panchayat

Ms. Sharada Gaydhane, Sarpanch of Bela Gram in Bhandara district, shared the story of how her village became India's first net-zero Panchayat. "Climate change can be felt in the water we fetch, the food we grow, and the air we breathe. It affects our health, and that is my responsibility to do what's best for my village. For us, climate action begins at home. When the Panchayat takes responsibility and people participate, change becomes real," said Ms Gaydhane. Under her leadership, climate action became a way of life in Bela Gram.

"Every village festival, wedding, birth of a child, was marked by planting a tree and taking care of it. Over time, we planted almost 90,000 trees. We made concrete efforts to move away from chulas to LPG. We used panchayat funds for solar panels over anganwadis and panchayat offices. While waste began to be segregated at every doorstep, we took a vow to reject single-use plastics," she added.

In 2024, Bela Gram Panchayat won the first prize in the Carbon Neutral Vishesh Panchayat Puraskar at the National Panchayat Awards, placing the village on the national map as a model for grassroots climate leadership. Her story set the tone for the session, which went on to showcase similar examples of practical, community-led solutions from across the country.

Community-led Solutions in Focus: Shift to Renewable Energy, Restoring Ignored Lands

Mr Ramvriksh Murmu, Mukhiya of Siyari village in Jharkhand's Bokaro district, shared how his village confronted frequent power cuts that regularly plunged homes into darkness and disrupted children's education.

"Repeated conversations at the Conference of Panchayats helped us connect the recurring power disruptions to a larg-

er climate crisis and to the need for local, low-carbon responses. We prioritised the installation of 72 solar streetlights through CSR funds so children could study safely at night. The panchayat also took the decision to add solar systems to schools and community buildings, and a solar-powered lift irrigation pump was set up at the main pond, reducing dependence on unreliable grid electricity and costly diesel," said Mr Murmu.

Mr Murmu added that the Panchayat also mobilised villagers under the Birsa Mango Horticulture Mission, planting 2,880 mango saplings along with 800 other fruit and shade trees, while strengthening forest-based livelihoods. He noted that the Gram Panchayat Help Desk played a key role in guiding the Panchayat towards the right schemes and technical support to make these interventions possible.

Women's Collective Restores Unused Common Land

Ms Jayanti Nayak, an elected representative from Koraput, Odisha, described how a collective of indigenous women documented land use and identified over 10 hectares of unused common land for restoration. With Gram Sabha approval, the initiative was included in the Gram Panchayat Development Plan and funds were mobilised to generate local employment. The community has since planted 16,000 saplings, including mango, jackfruit, tamarind, bamboo, harida, bahada and amla, linking ecosystem restoration with livelihoods and long-term resilience.

Mr Sachith K K, former Panchayat President of Perinjanam in Thrissur, Kerala, shared how a community awareness programme turned into a participatory decision-making process that helped guide the panchayat's transition to being 'Solar Gramam' (solar village). After eight years of sustained efforts, 850 households in Perinjanam are rooftop solar prosumers, cutting electricity bills by up to 80 percent and collectively reducing emissions at scale.

Mr Suryanarayana Rao, a Gram Panchayat Member from Malur in Kolar district, Karnataka, highlighted efforts to strengthen village governance systems

"Climate change can be felt in the water we fetch, the food we grow, and the air we breathe. It affects our health. For us, climate action begins at home."

and integrate sustainable livelihoods, and Kapil Deo, an indigenous community leader from Harani in Jamui, Bihar, shared her work at the intersection of rural development and social empowerment.

The Power of Panchayats in Climate Action

Keynote speaker Mr Jagadananda, Co-founder & Mentor, Centre for Youth & Social Development, speaking about the power of Panchayats and frontline leaders in shaping climate action, said: "The future of climate resilience lies in climate-smart Panchayats, where land, water, livelihoods and people converge at the local level. A climate-smart India begins at the Panchayat, closest to the risks, resources and resilience. Our collective future depends on investing in and strengthening these institutions, where people, ecosystems and democracy come together."

Building on this vision of climate-smart Panchayats, Mr Arindam Banerjee, Co-founder and Partner, PDAG, outlined how the Conference of Panchayats was conceived to strengthen local governance systems where climate impacts are felt most directly.

"The Conference of Panchayats was designed to explore ways to enhance the capacity of local self-government institutions and actors to address emerging climate risks. It focuses on developing local, evidence-based solutions and implementing long-term climate initiatives, anchored within the local socio-economic and climate realities. We hope that this CoP will help drive a uniform nationwide local climate action platform by 2028 with the proposed global CoP33 to be held in India," said Mr Arindam Banerjee, Co-founder and Partner, PDAG.

Community Action for Lasting and Credible Solutions

Echoing the vision of locally anchored climate governance, Ms Vinuta Gopal, CEO, Asar, said, "From the farthest corners of six states, gram panchayat leaders took the stage to show that climate action is already being built on the ground - through every tree that is planted, solar panel installed, and village action plans formally adopted. Rooted in the institutions of local self-government, these efforts are protecting lives and livelihoods as climate pressures intensify. Such grounded models for scalable climate action offer hope that the most lasting and credible solutions are those that begin within communities and grow outward."

The Mumbai Climate Week marked India's first platform dedicated to accelerating climate action, empowering Mumbai, India, and the Global South. The initiative reimagined critical climate solutions as interconnected, scalable innovations rooted in the complex dynamics of the region and its economies.

FROM TRADITIONAL FARMING TO HIGH-DENSITY APPLE CULTIVATION

Project Unnati Apple in Uttarakhand Brings Prosperity to Local Farmer

Mr Virendra Singh Tomar, Village Korwa, Uttarakhand

In the hill village of Koruwa in Uttarakhand's Chakrata region, farming has long been part of everyday life for Mr Virendra Singh Tomar and his family, alongside running a small roadside shop. While agriculture sustained them, it was often uncertain and limited in its returns. A moment of unexpected discovery in 2021 would quietly change that trajectory.

While travelling through Tuini, Virendra came across an apple orchard established by Indo-Dutch Horticulture Technologies. The sight stopped him in his tracks – short plants, heavy with fruit, and apple varieties he had never seen before.

"Paudhe chhote the, par phal se bhare hue... mujhe yakeen hi nahi hua." The trees were short in size but were laden with fruits. I could not believe my sight, he recalls.

Driven by curiosity, Virendra visited the Indo-Dutch Centre, where he was introduced to Project Unnati Apple, implemented by Anandana – The Coca-Cola India Foundation, in collaboration with Indo-Dutch Horticulture Technologies. What began as curiosity soon became conviction.

First Farmer In Koruwa To Establish A High-Density Apple Orchard

Virendra decided to take the leap, be-

coming the first farmer in Koruwa to establish a high-density apple orchard using the Unnati model. The orchard was set up with wire and stake-supported plants, a sight unfamiliar to most in the village. "*Logon ko hairani hoti thi. Kehte the – ped bandh ke kaise ugte hain?*" he says. (People are really surprised to see these orchards. They think – how do these trees grow after they are tied.)

Unlike traditional apple farming, which often takes six to eight years to bear fruit, the high-density model began yielding much earlier, offering faster returns and renewed confidence in farming as a livelihood. "*Pehle kehte the, dada lagata hai aur pota khata hai. Yahan toh lagaya aur khud hi phal dekha.*" (Earlier it was said about apple trees – the grandfather sows the apple trees, and the grandsons eat the fruit – because the trees used to bear fruit so late. In these high-density apple orchards, the trees bear fruit fast. We plant the trees and soon we witness the fruit too.)

Virendra's success did not remain his alone. His orchard became a point of reference for others in the village. Farmers began visiting, observing, asking questions, and eventually following suit.

For The Farmers, These High-Density Apple Trees Are Miracles

Today, Koruwa has more than 20 high-density apple orchards, a shift that Virendra describes simply as, "*Ye sirf paudhe nahi, ye chamatkaar hai.*" (These are not just apple trees. They are miracles.)

Virendra credits Project Unnati Apple for providing the technical knowledge, confidence, and sustained support that enabled this transformation. His journey reflects how modern horticulture, local ambition, and long-term guidance can help hill communities build stable livelihoods, and a future rooted closer to home

To make the most of his land, Virendra also adopted integrated farming, growing vegetables such as brinjal, cabbage, capsicum, and beans between apple rows. "*Koi jagah khali nahi rehni chahiye,*" he says. "*Sab kuch kaam aata hai – ghar ke liye bhi, kamaai ke liye bhi.*" (No space should be left unutilized. Everything is of use. Either it is useful for the house or generates higher income).

With each passing season, the orchard has strengthened as a long-term asset. Production, which stood at around 250 boxes last year, is expected to reach nearly 500 boxes, with apples fetching Rs 1,800 – Rs 2,000 per box.

Higher Earnings Have Slowed Down Migration of Youths to Urban Centres

Beyond income, the change has had wider social meaning. With reliable returns from farming, migration from the village has slowed, and younger community members are reconsidering agriculture as a viable future. What Virendra calls a "*nayi laal kranti*" is taking shape quietly in the hills. A new red revolution.

He encourages fellow farmers to start small and learn steadily. "*100 ya 200 paudhon se shuru karo. Jaldi ka koi faayda nahi.*" (Start with 100 or 200 plants. There is no point rushing up with things.)

Virendra credits Project Unnati Apple for providing the technical knowledge, confidence, and sustained support that enabled this transformation. His journey reflects how modern horticulture, local ambition, and long-term guidance can help hill communities build stable livelihoods, and a future rooted closer to home.

Build Beyond America

WHY INDIAN BUSINESSES MUST DIVERSIFY NOW

India's entrepreneurs are operating in a world that has fundamentally changed. Global trade is no longer governed by predictable rules or stable partnerships. Tariff disputes, geopolitical realignments, currency swings, and sudden policy shifts are now structural realities—not temporary disruptions.

For Indian businesses, this moment demands strategic clarity, not emotional reaction.

For years, many Indian companies built their international growth on deep dependence on a single dominant market. That model once delivered speed, scale, and simplicity. Today, it represents concentration risk. Over-reliance

About the **AUTHOR**

Mr Sathya Yalamanchili is a Hyderabad-based entrepreneur, investor, and systems-builder working at the intersection of electric mobility, artificial intelligence, and sustainable infrastructure critical to India's next phase of economic and climate transition. He is the Founder and Promoter of BikeWo Greentech and Ampivo Smart Technologies and was recognised in Forbes 40 Under 40 for his contribution to India's evolving mobility and sustainability ecosystem.

Ampivo Smart Technologies aims to evolve into a farmer-integrated rural intelligence and carbon platform, leveraging AI agents, geospatial data, and inclusive green economy models

on one geography, one currency, or one trade corridor exposes businesses to shocks entirely outside their control.

The recent wave of global trade disruptions should be understood clearly: this is not a crisis to panic about. It is a signal to evolve.

The next phase of Indian global expansion requires a simple but decisive shift—Build Beyond America.

This is not an anti-market argument. It is a pro-India, pro-resilience, and pro-future strategy.

The Risk of Single-Market Dependence

The era of single-market thinking is over. What policymakers in any capital do today can now instantly affect tariffs, market access, compliance costs, supply chains, and currency flows anywhere on the planet.

Enterprises whose business models focus on a leading export outlet face increasing susceptibility to regulatory uncertainty, political risks, changes in trade policy, and exchange rate risks. These risks are not operational inefficiencies—they are existential vulnerabilities.

Globally competitive companies do not optimise for one geography. They design for diversification. Indian enterprises must now adopt the same mindset if they want to remain competitive in an increasingly fragmented world.

India's Expanding Opportunity Landscape

India has a great potential to expand its global economic sphere. Growth opportunities are expanding in the European Union, Canada, the ASEAN region, the Middle East, Africa, and Latin America.

Indian entrepreneurs must begin designing products, certifications, regulatory compliance, and supply chains with multiple global standards in mind—rather than tailoring everything to a single market's requirements.

The companies that do this early will build optionality. Those who delay will find adaptation far more expensive later.

What "Build Beyond America" Really Means

> The European Union, Canada, the ASEAN region, the Middle East, Africa, and Latin America – the next ten years will see these regions emerge as primary sources of demand, scale, stability, and partnership potential. Accessing them requires intent.

Building beyond America does not mean abandoning existing markets. It means building strength through diversification.

In practical terms, it involves designing products that meet EU, GCC, and ASEAN standards; developing multi-currency revenue streams; distributing supply chains across regions; and reducing dependence on any single trade corridor.

This approach transforms Indian businesses from being market-dependent to market-dominant. It also future-proofs operations against geopolitical shocks that are becoming increasingly frequent and unpredictable.

From Reaction to Strategy

The most damaging response to global uncertainty is emotional decision-making. The most successful leaders convert disruption into strategic advantage.

Indian founders and business leaders must now think like global risk managers—not just aggressive growth chasers. Revenue growth without resilience is fragile. The next generation of Indian multinationals will be built by leaders who understand that diversification is as critical as expansion.

In today's global environment, diversification is no longer optional. It is a core business strategy.

A Broader Mindset Shift for India Inc.

India is perfectly poised to increase the size of its global economic outreach. Opportunities for growth are increasing rapidly across the European Union, Canada, ASEAN countries, the Middle East (GCC), Africa, and Latin America. These regions are no longer considered secondary markets. In the next decade or so, it is anticipated that these regions shall rise to become sources of demand.

That means building companies that are globally diversified, currency-resilient, supply-chain flexible, and resistant to policy shocks. This is how India strengthens its long-term economic position—not by depending on any single nation, but by being connected to many.

The Moment to Act

This is a call to Indian entrepreneurs, exporters, manufacturers, service providers, and startup founders.

Now is the time to reassess market concentration, expand into new trade regions, invest in global compliance and standards, build multi-region partnerships, and design businesses for geopolitical resilience.

Those who adapt now will define India's global business leadership over the next decade. Those who do not will remain exposed to risks they cannot control.

Build Beyond America is not a protest. It is a strategy.

In a fragmented world, the future will belong to businesses built for many markets—not just one. India's moment to lead will be defined by strategy, not sentiment.

VEDAMRIT

STRENGTHENING RURAL LIVELIHOODS THROUGH SCIENTIFIC BEEKEEPING

For decades, agriculture has been the economic anchor for rural India, yet many small and marginal farmers continue to struggle with inconsistent incomes. Fragmented landholdings, unpredictable weather, and rising input costs leave very little room for stability. In my interactions with farmer communities across Jharsuguda, one message has been consistent: agriculture alone is no longer enough.

Ensuring sustainable income through Vedamrit – bee keeping initiative

Vedamrit was conceptualised as an income-generating activity to enhance the income of marginal farmers. It is designed to tap into the district's natural advantages, including its rich forest cover and agrarian heritage, and convert them into a reliable livelihood opportunity through scientific beekeeping. What began as an idea to supplement incomes has now grown into a robust livelihood model, with a dedicated Farmer Producer Company (FPC) that today engages more than 500 farmers. Our aim is to scale this to 1,500 farmers in the coming year, creating one of the region's strongest community-led honey enterprises.

Beekeeping is not new to rural India, but what often limits its potential is the absence of organised systems, scientific management, and reliable market access. Vedamrit was built to bridge these gaps. For farmers, women, and rural youth, the initiative provides knowledge, modern tools, and structured market linkages, ensuring that beekeeping is not treated as an auxiliary activity, but as a dependable, income-generating enterprise. Beyond income, the role of

bees in improving agricultural productivity through natural pollination has been remarkable. The benefits have shown up quickly: healthier crops, better fruit setting, and visibly improved biodiversity around participating villages.

Beekeeping fits neatly alongside traditional agriculture because it demands minimal land, works in harmony with existing crops, and enhances natural productivity. When farmers introduce bee colonies near their fields, they are not just producing honey, they are also strengthening the ecological cycle that underpins their farms. This dual impact of income enhancement and ecological improvement is what makes Vedamrit a robust and future-ready model.

Enhancing productivity through technology deployment

A major part of unlocking value for farmers has come from the introduction of modern farm power and processing technologies. Traditional honey extraction methods are labour-intensive, often unhygienic, and can damage the combs, forcing bees to rebuild and reducing yields. Under Vedamrit, farmers now work with mechanised extraction systems, including centrifugal extractors equipped with Variable Frequency Drives (VFDs) that protect combs while improving efficiency. This ensures higher yields, healthier colonies, and a smoother workflow for farmers.

On the processing side, we have deliberately adopted methods that preserve honey's natural properties. Gravity filtration, for example, has been a gamechanger. Instead of subjecting honey to excessive heat or chemicals, this slow and natural filtration process protects its aroma, nutrients, and medicinal qualities - values that today's consumers increasingly seek. For thicker, crystallised honey, we use indirect heating turbolizers, ensuring quality is never compromised. Vacuum evaporators maintain ideal moisture levels at low temperatures, allowing us to deliver a consistent and premium product under the Vedamrit brand.

Quality packaging is often an overlooked but critical part of accessing organised markets. By installing automated packaging systems, we've ensured that farmers shift from selling loose honey at low margins to supplying a professionally packaged, branded product that fetches higher value and earns consumer trust. This shift alone has significantly improved price realisation for our communities.

The strength of Vedamrit lies not just in technology, but in its cluster-based implementation model. Farmers from neighbouring villages are grouped into clusters, allowing for regular training, technical monitoring, and peer learning. Our field teams work closely with them on hive management, colony care, seasonal practices, and harvesting techniques. Consistent support has helped farmers gain confidence and adopt scientific practices with discipline.

A value driven intervention catalysing transformation

Today, more than 500 farmers collectively manage over 500 bee boxes across Jharsuguda. With peak flowering season

In Vedamrit, we are witnessing a model where science, community participation, and modern farm power come together to create meaningful, lasting impact. It is not just a honey project; it is a pathway to rural prosperity, ecological stability, and economic dignity.

in March and April, we are targeting a production of around 5,000 litres of honey by the first quarter of FY27.

What excites me most is the environmental ripple effect. Bees bring back biodiversity. They strengthen ecosystems, regenerate flowering plants, and restore natural balance. Farmers are increasingly adopting bee-friendly practices and becoming more mindful of pesticide use. These small shifts create long-term ecological resilience, a commitment that aligns strongly with Vedanta's broader sustainability vision.

In Vedamrit, we are witnessing a model where science, community participation, and modern farm power come together to create meaningful, lasting impact. It is not just a honey project; it is a pathway to rural prosperity, ecological stability, and economic dignity.

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