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THE VISION

Agricultural Prosperity in India

Agricultural prosperity is vital not only for ensuring food security and driving inclusive growth. As a land of diverse agro-climatic zones, India is endowed with fertile soil, ample water resources, and a long growing season, making it suitable for the cultivation of a wide variety of crops. Agricultural prosperity is essential for ensuring food security, generating employment, and promoting sustainable economic growth in the nation.

Agricultural prosperity is also essential to drive India to a leading global economy. Agriculture contributes around 18–20% to GDP and is critical for rural development. Crops such as rice, wheat, sugarcane, cotton, tea, and spices are not only essential for domestic consumption but also form a substantial portion of India's export basket, earning valuable foreign exchange.

Enhanced irrigation infrastructure, combined with innovations in farm machinery, precision agriculture, and mobile-based advisory services, have improved productivity. The use of satellite-based weather forecasting and drone technology has further modernized farming practices.

Diversification into horticulture, dairy farming, fisheries, and poultry has boosted incomes and created employment opportunities, particularly for small and marginal farmers. India is the largest producer of milk and one of the top producers of fruits and vegetables globally. The rise of agri-tech startups and digital platforms has enabled farmers to access better markets, financial services, and modern farming tools. These initiatives promote efficiency and reduce post-harvest losses.

Greater impetus to farmer-producer organizations (FPOs) shall enhance market access and bargaining power. Investments in rural infrastructure, cold storage facilities, and supply chains shall further minimize post-harvest losses.

Financial literacy and digital inclusion is greatly empowering farmers and ensuring sustained agricultural prosperity. We are witnessing that with the right mix of policy interventions, technological innovation, and farmer-centric approaches, India is transforming its agricultural sector into a global powerhouse while ensuring environmental sustainability and rural development.

M C Dominic
Founder & Editor-in-Chief

FROM THE MD

Millionaire Farmers Awards of India - Celebrating Agriculture's Heroes

The Millionaire Farmers Awards of India (MFOI), instituted by the Krishi Jagran Group, is an initiative to recognize and celebrate the success stories of farmers who have achieved remarkable financial prosperity through innovative and sustainable agricultural practices. This award acknowledges the critical role of farmers in driving India's agricultural economy and inspiring others to adopt modern techniques for better yields and profitability.

Agriculture is the backbone of India's economy, and despite numerous challenges, many farmers have emerged as role models by transforming traditional farming into highly productive ventures. The Millionaire Farmers Awards aims to highlight such success stories, including those who have excelled in organic farming, integrated farming systems, agritech adoption, and high-value crop cultivation.

Recipients of the award often showcase unique approaches, such as leveraging advanced technologies like drones, AI-based crop monitoring, or precision irrigation. Many have successfully diversified into allied activities like horticulture, dairy farming, floriculture, or aquaculture. Some awardees have tapped into global markets through exports of specialty crops or organic produce, while others have created direct-to-consumer models that bypass intermediaries and maximize profits.

The award also recognizes farmers who prioritize sustainability, resource optimization, and community development. These individuals often focus on practices like water conservation, soil health improvement, and reducing dependency on chemical fertilizers and pesticides.

By honouring these achievers, the Millionaire Farmers Awards not only applaud their efforts but also provide a platform for knowledge-sharing and motivation. The initiative encourages the farming community to innovate and align with India's vision of becoming an agricultural powerhouse. It further reinforces the belief that farming can be both rewarding and a viable path to financial independence when supported by innovation, hard work, and effective market strategies.

Shiny Dominic
Managing Director

EDITOR'S DESK

MFOI - Celebrating Visionary Farmers Who Have Redefined Agricultural Success

The Millionaire Farmers Awards of India, instituted by the Krishi Jagran Group, marks two successful years of recognizing and celebrating the achievements of visionary farmers who have redefined agricultural success. This initiative honours farmers who have not only achieved financial prosperity but have also become role models in adopting sustainable and innovative farming practices.

Over the past two years, the Millionaire Farmers Awards has emerged as a prestigious platform, shining a spotlight on the extraordinary stories of farmers who have turned challenges into opportunities. The awardees have demonstrated exemplary use of modern technologies, including precision farming, drone-based crop management, and AI-driven solutions, to achieve significant productivity and profitability. Many winners have showcased innovations in areas such as organic farming, horticulture, aquaculture, and agribusiness, proving that agriculture can be both sustainable and lucrative.

The initiative also emphasizes the importance of social impact and sustainability. Several awardees have actively contributed to their communities by creating employment opportunities, promoting resource-efficient farming, and fostering environmentally friendly practices like water conservation and minimal use of chemical inputs. Their success stories inspire others in the agricultural sector to explore innovative methods and adopt a forward-looking approach to farming.

The Krishi Jagran Group, the leading voice in Indian agriculture, has used this platform not only to honour achievers but also to promote knowledge-sharing. By showcasing these success stories, the awards encourage other farmers to break barriers and replicate similar success models.

As the initiative enters its next phase, it continues to align with the vision of making Indian agriculture globally competitive and financially rewarding, while also fostering sustainability and resilience in farming practices. The Millionaire Farmers Awards of India (MFOI) stands as a testament to the power of innovation, perseverance, and strategic agricultural practices.

Mamta Jain
Group Editor & CEO

Woman Farmer Nituben Patel Crowned as 'Richest Farmer of India' at MFOI Awards 2024, Marking a New Era of Woman Empowerment

Nituben Patel, the 'Richest Farmer of India,' receiving her award from Union Minister Nitin Gadkari at the MFOI Awards 2024

In a historic and inspiring moment for Indian agriculture, Nituben Patel, a visionary farmer from Rajkot district, Gujarat, has etched her name in history by being crowned the 'Richest Farmer of India' at the prestigious Millionaire Farmer of India (MFOI) Awards 2024. The award was felicitated by Nitin Gadkari, Union Minister of Road Transport and Highways of India, Ujjwal Mukherjee, Head of Marketing Services, Mahindra Farm Division, M.C. Dominic, Founder and Editor-in-Chief, and Shiny Dominic, Managing Director of Krishi Jagran, along with other dignitaries on the dais.

Nituben's achievement is a resounding testament to the transformative role of women in a field traditionally dominated by men. Her groundbreaking contributions and unwavering commitment to sustainable agriculture now serve as a beacon of hope for countless women aspiring to make a difference in the agricultural sector.

A Celebration of Excellence in Agriculture

The MFOI Awards 2024, organized by Krishi Jagran in collaboration with the Indian Council of Agricultural Research (ICAR) as Co-organizer and sponsored by Mahindra Tractors, was held from December 1-3, 2024, at the iconic IARI Grounds, Pusa, New Delhi. The three-day event brought together over 1,000 influential participants, including policymakers, industry leaders, research scholars, and progressive farmers, to celebrate innovation and collaboration in agriculture.

Nituben Patel from Gujarat has been crowned the 'Richest Farmer of India' at the MFOI Awards 2024—a historic milestone celebrating her pioneering contributions to sustainable farming and her inspiring leadership in empowering women to shape the future of Indian agriculture.

Nituben Patel, the Richest Farmer of India, proudly holding her RFOI Award

From a staggering 22,000 nominations, 400 exceptional individuals were honored at the event, with an additional 1,000 awards to be presented at state-level ceremonies in the coming months. Nituben Patel's recognition as the 'Richest Farmer of India' sends a powerful message across the nation, asserting that women are not just participants but pioneers in shaping the future of Indian farming.

Nituben Patel's Inspiring Journey

Nituben Patel, from a small village in Rajkot district, has carved a remarkable journey that blends tradition, innovation, and a deep dedication to sustainability. As the founder of the Sajeevan Foundation, she has spearheaded numerous impactful initiatives aimed at fostering environmental conservation and sustainable agriculture. One of her notable projects, Plastic-Free Rajkot, involves distributing 10,000 cotton bags annually to reduce plastic usage and promote eco-friendly alternatives.

She also organizes annual tree plantation drives, planting 1,000 trees with the active participation of students, fostering environmental awareness among the younger generation. Through her 'Rushi Krushi' initiative, Nituben has educated over 10,000 farmers across India about the benefits of pesticide-free organic farming, championing natural and sustainable agricultural practices. Guided by her mentor, the late Shri Dipakbhai Sachade (Dipak Dada), a pioneer of natural farming, Nituben embraced the concepts of Amrut Krushi and Magical Mitti, transforming agricultural waste into resources and significantly boosting productivity through organic practices.

Transformative Impact

Under Nituben's visionary leadership, the Sajeevan Foundation has accomplished extraordinary milestones, revolutionizing the agricultural sector. Within just 45 days, the foundation registered 84 Farmer Producer Organizations (FPOs), successfully connecting 100% organic farmers with the Government of Gujarat's initiatives. It has also established a thriving Farm-to-Plate model in Rajkot, setting a benchmark for agricultural entrepreneurs across the region.

Additionally, in collaboration with the Government of Gujarat, Nituben spearheaded the implementation of an Internal Cluster System (ICS), which has enhanced traceability and significantly reduced production costs for farmers. Her relentless efforts have positioned Gujarat as a frontrunner in natural farming, garnering international recognition and inspiring farmers across the nation to adopt sustainable practices.

Vision Behind MFOI Awards: A Movement for Change

The idea of the Millionaire Farmer of India (MFOI) Awards was conceived by MC Dominic, Editor-in-Chief of Krishi Jagran. His deep understanding of the agricultural landscape and his recognition of farmers' immense yet often overlooked contributions led to the conception of this groundbreaking initiative. The MFOI Awards celebrate the unsung heroes of Indian agriculture, shining a spotlight on the individuals shaping the future of farming.

Nituben Patel, the Richest Farmer of India along with Yuvraj Parihar (First Runner Up of RFOI Award), MC Dominic, Editor-in-Chief of Krishi Jagran, Shiny Dominic, Managing Director, Krishi Jagran and other dignitaries

The MFOI Awards 2024 celebrated excellence and sparked a movement for women's empowerment in agriculture. With leaders like Nituben Patel at the forefront, Indian farming is entering a new era of resilience, innovation, and endless possibilities. Their success inspires every farmer to dream bigger and redefine the future of agriculture.

YUVRAJ PARIHAR HONORED AS FIRST RUNNER-UP 'RICHEST FARMER OF INDIA' AT MFOI AWARDS 2024

Yuvraj Parihar, the First Runner-Up 'Richest Farmer of India' receiving award from Union Minister Nitin Gadkari at the MFOI Awards 2024

Yuvraj Parihar, a progressive farmer from Agra, Uttar Pradesh, epitomizes how hard work, innovation, and vision can turn dreams into reality. On December 3, 2024, he was honoured as the First Runner-Up 'Richest Farmer of India' at the Millionaire Farmers of India (MFOI) Awards 2024, earning the title of "Second Richest Farmer of India." The award was presented by Nitin Gadkari, Union Minister of Road Transport and Highways of India, Ujjwal Mukherjee, Head of Marketing Services, Mahindra Farm Division, M.C. Dominic, Founder and Editor-in-Chief of Krishi Jagran, along with other esteemed dignitaries on the dais. This prestigious recognition highlights Parihar's remarkable contributions to agriculture and his transformative journey.

A Celebration of Excellence in Agriculture

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Parihar's Journey: How It All Started

Parihar's journey serves as a powerful example of determination. Coming from a non-agricultural background, with his father being a doctor, he became inspired to modernize farming after witnessing the challenges faced by traditional farmers. Two decades ago, he embarked on his agricultural journey, transforming 400 acres of farmland in Uttar Pradesh and Rajasthan into centres of innovation. By focusing on high-demand crops such as potatoes, cabbage, and moong beans, and branding his produce under the name "Dr. BPS," he has established himself as a pioneer in modern agriculture.

Parihar's approach combines sustainable farming with cutting-edge technology. He implemented drip irrigation systems, precision farming, and soil health management practices that have significantly boosted crop yield and quality. His success has inspired other farmers in the region to adopt similar techniques, contributing to a more productive and environmentally friendly agricultural landscape.

Yuvraj Parihar along with with Nituben Patel (Richest Farmer of India) along with M.C. Dominic, Founder and Editor-in-Chief, Krishi Jagran, and Shiny Dominic, Managing Director, Krishi Jagran at the MFOI Awards 2024

Building Infrastructure and Investing in the Community

In addition to farming, Parihar has invested in infrastructure, building cold storages and warehouses to preserve produce and secure better market prices. These facilities have not only ensured that his crops are well-preserved but have also supported other farmers by providing storage solutions that reduce post-harvest losses. His vision extended to education; he established seven educational institutions aimed at providing skill development and opportunities for the younger generation, empowering them with knowledge and practical training to pursue careers in agriculture and related fields.

With an annual turnover of Rs 50 crore from agriculture alone and a total business turnover of Rs 100 crore, Parihar has become a symbol of agricultural success. His efforts have been recognized internationally, including an award for Best Potato Grower at the International Potato Conclave in 2020. This recognition, along with the accolades received at home, underscores his position as an influential figure in global agricultural circles.

His commitment to innovation and sustainable practices has not only improved his own prosperity but also set benchmarks for others to follow. Parihar's story serves as a powerful reminder that with the right approach, farmers can transform their livelihoods and contribute to the economic development of their communities.

Sustainable Agriculture and Youth Empowerment

Beyond personal achievements, Parihar is dedicated to advocating for sustainable farming practices and inspiring youth. He believes that the integration of technology and eco-friendly farming techniques is essential for the growth of Indian agriculture. He actively encourages young farmers to embrace modern methods, showing that adopting sustainable practices can lead to better financial and environmental outcomes.

Parihar's efforts are helping shape a future where agriculture is viewed as a progressive and profitable career choice. His emphasis on training and education is ensuring that the upcoming generation of farmers is equipped to tackle the challenges of modern agriculture. By sharing his journey and insights at seminars and workshops, he continues to motivate others to pursue innovation and excellence in the field.

Vision Behind MFOI Awards:

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Yuvraj Parihar, a progressive farmer from Agra, Uttar Pradesh, has been honored as First Runner-Up 'Richest Farmer of India' at the MFOI Awards 2024, earning the title of 'Second Richest Farmer of India.'

> Yuvraj Parihar's story is one of resilience, ingenuity, and impact. As he continues to lead by example, his contributions extend beyond personal gains, touching the lives of countless farmers and inspiring transformative changes in the agricultural sector.

Renu Sangwan, receiving award from Union Minister Nitin Gadkari at the MFOI Awards 2024

RENU SANGWAN RECEIVES 'NATIONAL AWARD' AT MILLIONAIRE FARMER OF INDIA (MFOI) AWARDS 2024

Renu Sangwan, a progressive dairy farmer from Kharman village in Haryana's Jhajjar district, has received the 'National Award' in the 'Millionaire Dairy Farmer of India' category at the Millionaire Farmer of India (MFOI) Awards 2024. This prestigious recognition was presented on December 3, 2024, during a grand ceremony at the IARI Grounds in Pusa, New Delhi. The award was conferred by Nitin Gadkari, Union Minister of Road Transport and Highways, alongside Ujjwal Mukherjee, Head of Marketing Services, Mahindra Farm Division, Shiny Dominic, Managing Director of Krishi Jagran, and other distinguished dignitaries.

A Celebration of Excellence in Agriculture

The MFOI Awards 2024, organized by Krishi Jagran in collaboration with the Indian Council of Agricultural Research (ICAR) as Co-organizer and sponsored by Mahindra Tractors, was held from December 1-3, 2024, at the iconic IARI Grounds, Pusa, New Delhi. The three-day event brought together over 1,000 influential participants, including policymakers, industry leaders, research scholars, and progressive farmers, to celebrate innovation and collaboration in agriculture. From a staggering 22,000 nominations, 400 exceptional individuals were honored at the event, with an additional 1,000 awards to be presented at state-level ceremonies in the coming months.

Renu's Journey in Dairy Farming

Renu's journey in the dairy industry is nothing short of inspiring. Starting in 2017 with just nine indigenous cows, she transformed Gokul Farm Shri Krishna Godham into a model of sustainable dairy farming in India. Together with her son, Dr. Vinay Sangwan, she focused on nurturing indigenous breeds like Sahiwal, Gir, Rathi, Tharparkar, and Hariana, known for their nutritious milk and cost-effectiveness. Today, the farm houses over 280 cows and stands as a testament to sustainable agricultural practices.

Expanding Global Reach with Premium Dairy Products

Dedication to innovation and animal welfare has been pivotal to their success. By incorporating modern technologies such as automatic milking machines and advanced cleaning systems, the farm ensures operational efficiency and hygiene. Additionally, it produces premium dairy products like ghee, paneer, and barfi, with its ghee finding demand in 24 countries. This diversification has propelled Gokul Farm's turnover to an impressive Rs 3 crore for the 2023-24 fiscal year. Renu and her son have also embraced cutting-edge practices like selling indigenous bull semen to promote quality breeding, all while maintaining high standards of animal welfare. Despite challenges like resource constraints and livestock health management, their focus on cleanliness, regular vaccinations, and high-quality fodder has been key to their success.

Recently, Renu Sangwan's remarkable contributions to dairy farming were celebrated with the prestigious National Gopal Ratna Puraskar 2024. This award was presented by the Government of India on National Milk Day, recognizing her dedication to promoting indigenous breeds and sustainable farming practices, marking her as a leading figure in modern Indian agriculture.

Vision Behind MFOI Awards:

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> Renu Sangwan, a progressive dairy farmer from Haryana, has been honoured with the 'National Award' at the 2024 MFOI Awards for transforming her farm into a Rs 3 crore sustainable enterprise with over 280 indigenous cows and international acclaim for high-quality dairy products.

Renu's story serves as an inspiration for aspiring dairy farmers to adopt indigenous breeds, prioritize animal health, and practice sustainable farming. As she continues to lead by example, her vision is to inspire farmers across India to embrace innovative techniques and diversify their income through value-added dairy products.

AQUACULTURE - AN EFFECTIVE TOOL IN THE RECLAMATION OF WASTE WATER

Aquaculture which is generally a rural activity relates to the farming of aquatic organisms, including fish, crustaceans , mollusks and aquatic plants under controlled or semi-controlled conditions. Although aquaculture in earthen pond watershed is the most common, other efficient production systems such as tank culture, cage and pen culture, raceway culture, integrated culture among others are also practiced simultaneously.

.In urban and peri-urban areas where disposal of increasingly generated domestic wastewater is a major concern ,efforts to recycle such graywater resource into utilizable biomass have gained importance not only for production of valuable foodstuff through aquaculture but also for wastewater reclamation with concomitant negative environmental impact. This has special relevance in the context of freshwater conservation as well as from the viewpoint of hygiene and public health .A general estimate indicates that about 100 litre of wastewater in the form are released per person per day in the towns and cities. With the sprawling of towns the total quantum of municipal wastewater generation will likely to be of enormous proportion in the foreseeable future. A tiny fraction of our planet's abundant water is only available to us as clean freshwater and that per capita availability of it has been continuously declining(our current per capita freshwater availability is about 2000 cubic metre per year which used to be about 5000 cubic metre per year during independence. This scenario explains why we need to be most careful in utilizing this precious resource which has no substitute .In this context recycling of wastewater for productive purpose is pertinent with regard to utilization of nutrients contained in wastewater for fish production ,for example and also using aquaculture as a tool in the sewage treatment.

Unlike other methods of biological wastewater treatment which are primarily based on degradation process ,here wastewater is reused instead of being disposed to the natural water bodies as such .In fact, recycling of city sewage in the eastern fringes of Kolkata city is an unique example in the efficient use of this concept..This is recognized as the world's largest natural resource recovery ecosystem by Ramsar Secretariat also.impacting positively the lives of millions. The domestic sewage flow here is allowed to pass through screen filter to sieve suspended solids followed by treatment with the fastest growing plants -the duckweeds ((Spirodella,/,Lemna,/,Wolffia) as an effective tool of phytoremediation. The photosynthetic actions under the sunshine act similar to bio-filters . Again, photosynthetically generated oxygen by these plants play a crucial role in the biodegradation of organic matter present in such wastewater The free floating Azolla pinnata is another wonder plant in this context -foliage of this fern having association with a nitrogen-fixing cyanobacterium also known as blue-green algae .Anabaen azollae has the additional capacity to trap atmospheric nitrogen directly and are able to release nitrogen along with other nutrient elements in aquaculture system. The rapid propagation of the fern enables growth of several fish species at virtually no additional cost towards exogenous feed application. Aquatic macrophytes (duck weeds, azolla, water hyacinth and several others) are plentiful in our ecosystem and studies indicated that such macrophytes may have role in the low cost wastewater treatment process which otherwise would have been prohibitively costly if mechanical treatment processes were to be employed in the reclamation before the treated water could be passed on to natural water bodies. Such macrophytes serve as nutrient pump reducing the eutrophication effect that such wastewater may otherwise likely to cause in the ambient water. Periodic macrophyte harvest may also substantially reduce unnecessary nutrient load from the water phase making further reclamation because of improved water quality compared to unharvested system thereby experiencing nutrient enrichment due to senescence of macrophytes and decomposition of aging plant residues.

ICAR – CIFA(www.cifa.in) successfully demonstrated an aquaculture sewage treatment plant (ASTP) comprising duckweed and fish culture. Duckweed culture helps in removal of chemical contaminant residues, if any, that otherwise might get into human food chain through consumption of such cultured fish. The wastewater with its B.O.D.– 5 level of about 100 mg/l can be brought down to about 20mg/l meeting the required standard for discharge into the natural waters. The duck weeds and Azolla could be used as biofertilizers and even to feed cyprinid species including Ctenopharyngodon idella. as well as for poultry birds /small animal rearing so common at our village homes. The treatment system through aquaculture therefore includes wastewater intake system, duck weed culture complex, controlled waste water – fed fish pond and then depuration pond for the purpose of cleansing before harvest and finally the outlet system towards natural waterbody.. Proper pond management through an understanding of nutrient dynamics in water /soil and their interactions as well as the role of microbes in these processes is essential for maintaining sustainability and ecological efficiency of this kind of ecosystem. The main factor governing the use of such treated sewage water for effective fertilization of fish culture pond is choosing a wastewater loading rate that allows the pond ecosystem to remain aerobic throughout the day and night during the entire culture period. The wastewater is taken either by the action of gravity (as is being done at the regional research centre of ICAR-CIFA in Rahara, Kolkata) or pumped through the intake system where it is retained from 2-3 days before allowing entry to the aquaculture ponds. Taking the benefits of high carrying capacity of such waste water – fed system fish production in a tune of 2-3000 kg of carps per hectare can be achieved in 5-6 months culture period. Production of fish in any culture system depends to a great extent on water quality management. Judicious selection of fish species is again a key factor for effective utilization of natural food organisms present in sewage-fed ponds. The system provides means for biological treatment with high potential of resource recovery in terms of duck weed/ azolla and fish species together . The advantage remains that small requirement of lands of about 1 hectare for treatment of 1 million gallon/ day and the revenue earnings makes the system ideally suited for treating the wastewater before being discharged into the river system The fact thatrisk from vector-borne pathogens e.g. malaria is nil to medium as mosquito larvae are readily consumed by fish.A limitation of such a biological treatment system ,however, has reduced efficiency of treatment during winter months..

Recycling of wastewater can provide plenty of freshwater suitable for production of human food of very high biological value at a remarkably low cost as long as we do not overload it with non-biodegradable wastes or withdraw water from underground store faster than it can be replenished. Perceptible climate change effects are already felt . The changing pattern of rainfall ,unbearable heatwave across the country during summer months ,occurrence of cyclonic storms quite often all are affecting country's freshwater resource utilization. The need for quality control of aquatic environment is crucial for the future of human food resources. There is now a dire necessity to implement whatever knowledge is available to improve and optimize the nutrient and precious water resource utilization at all stages through food production- more crop per drop.The government of West Bengal is making steps to prevent the discharge of industrial wastes into municipal wastewater and the risk from halogenated hydrocarbon and heavy metals do not exceed levels recommended by the Codex Alimentarius Commission.

Milk processing wastewater from Dairy plant for aquaculture has been successfully demonstrated at Metro Dairy Plant on Barasat-Nilganj Road near Kolkata. The semi-treated dairy effluent (about 10 litre of clean freshwater is used to produce 1 litre of processed milk)The quantity of wastewater (>50 MLD) that is generated from such a small dairy plant as a result of multiple operation system remains rich in nutrient elements like N and P in particular and offers offers excellent scope for fish production at an unbelievably low cost .In this resource recovery system, nutrients contained in the waste effluent are recycled to produce live food organisms -microalgae including blue-green algae-spirulina and vital zooplankton organisms like rotifer upon which fish thrive directly and thus cost of fish production is significantly reduced.The macrophyte coverage of about one-fifth of the pond surface area serve certain advantages like preventing water loss from the pond surface due to evapotranspiration ,maintenance of conducive water temperature due to canopy coverage during summer months. The produced macrophyte serve as biofertilizer playing a crucial role in carbon sequestration. They are also used as fish feed components thereby proving that such farming practices an ecofriendly friendly contributing to cleaner environment.

Pratap Mukhopadhyay
former Principal Scientist, ICAR-CIFA
(www.cifa.in) and currently
Advisor in Fisheries , WB Accelerated Development of Minor Irrigation Project
(IBRD-World Bank funded),
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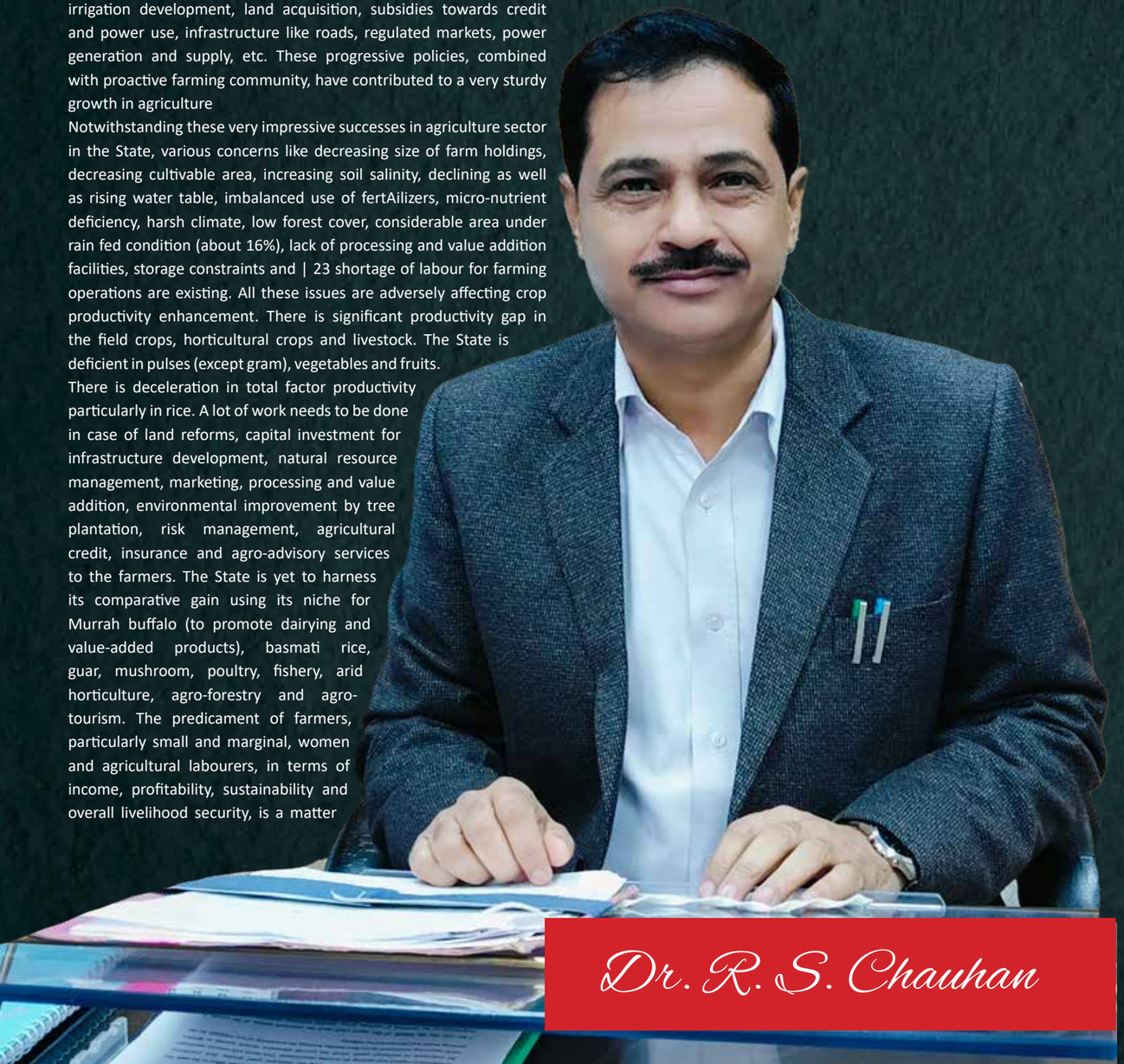
Making Agriculture Resilient An Approach for Farmers welfare with vision-2047.

Over the years, the State has followed progressive policies relating to augmenting investment in agriculture, strengthening of R&D system, public distribution system, irrigation development, land acquisition, subsidies towards credit and power use, infrastructure like roads, regulated markets, power generation and supply, etc. These progressive policies, combined with proactive farming community, have contributed to a very sturdy growth in agriculture

Notwithstanding these very impressive successes in agriculture sector in the State, various concerns like decreasing size of farm holdings, decreasing cultivable area, increasing soil salinity, declining as well as rising water table, imbalanced use of fertAilizers, micro-nutrient deficiency, harsh climate, low forest cover, considerable area under rain fed condition (about 16%), lack of processing and value addition facilities, storage constraints and | 23 shortage of labour for farming operations are existing. All these issues are adversely affecting crop productivity enhancement. There is significant productivity gap in the field crops, horticultural crops and livestock. The State is deficient in pulses (except gram), vegetables and fruits.

There is deceleration in total factor productivity particularly in rice. A lot of work needs to be done in case of land reforms, capital investment for infrastructure development, natural resource management, marketing, processing and value addition, environmental improvement by tree plantation, risk management, agricultural credit, insurance and agro-advisory services to the farmers. The State is yet to harness its comparative gain using its niche for Murrah buffalo (to promote dairying and value-added products), basmati rice, guar, mushroom, poultry, fishery, arid horticulture, agro-forestry and agro-tourism. The predicament of farmers, particularly small and marginal, women and agricultural labourers, in terms of income, profitability, sustainability and overall livelihood security, is a matter of serious concern to policy makers, planners and development agencies. In the backdrop of these concerns, a well planned approach is needed which will focus on agriculture and its allied sectors ensuring enhanced investment, improved production, productivity, sustainability, profitability and welfare of farmers.



Dr. R. S. Chauhan

Most significant issues, opportunities and recommendations which can bring a reform can be

1 Availability of good quality water in adequate quantity for use in agriculture will be highly crucial for attaining food and nutritional security in the near future. The State, on an average, receives about 545 mm of rainfall, of which hardly 30 to 35% is conserved and used for agriculture. There seems vast potential for in-situ and ex-situ rain water conservation. Development of multi-enterprise models for multiple use of water in agriculture including integration of crops, fisheries, dairy, horticulture, mushroom, bee keeping; rain water harvesting for ground water recharge and efficient use of irrigation water in agriculture is called upon. There is an urgent need to mobilize farmers towards adoption for micro irrigation systems in agriculture.

2 There is also a need to develop short duration water efficient crop varieties, replacement of rice areas with low water demanding crops such as cotton, soybean, maize, millets, oilseeds and pulses. An underground water quality map of the State should be prepared with focus on salinity and heavy metal contamination. Planning for 2047 will necessitate the need for complete analysis of waste water at the source point and its current use at the site, to develop a base line for action.

3 There is strong need to develop crop varieties having efficient nutrient mining and uptake systems so that they give same yield with 20% to 30% less fertilizer application. Fixing bench marks in all districts of the State to monitor build-up of heavy metals in the soil and devising timely preventive and management strategies is need of the hour. Intensification of nanotechnology and sensor based research to increase use efficiency of nutrients and water is urgently needed.

4 The future planning to make agriculture resilient to climate change in the State need to focus on screening of germplasm for traits linked with abiotic stresses and development of multi-stress tolerant crops and varieties using gene pyramiding approach-either by Marker Assisted Selection (MAS) or by transgenics. Development of multi-enterprise agriculture systems to cover risk of crop failure, to increase carbon sequestration/carbon trading and to ensure multiple use of resources by integrating livestock, fisheries, horticulture, mushroom and bee keeping etc is called upon.

5 Chemical input based agriculture in last about four decades has resulted in contamination and pollution of soil and water resources, recycling of heavy metals and toxins in soil-water-atmosphere-animal-human chain, development of resistance in pests and weeds & emergence of new diseases. There is need to reverse the damage already caused to our natural resources due to excessive use of chemicals in agriculture food system in the past and to tune agricultural production practices in harmony with nature. Promotion of organic and natural farming in the State seems an option of great promise to make agriculture sustainable and eco-friendly.

6 There is an urgent need to increase forest area in the State which is dwindling at 1.5 to 3.0 percent. Integrating trees with agricultural crops is an option of great promise to increase forest cover in the State and help sequestering green house gasses to make agriculture climate resilient. The Aravali hills in the south of the State offer good scope for increasing green cover of the State.

7 There seems no other option but to reduce area under rice cultivation in Haryana and to shift to other low water requiring alternate crops. The promising crops which have the potential to replace rice in the State are: maize, soybean, cotton, pulses, oilseeds and vegetables. There is strong need to develop diversification plan keeping in view cluster of villages/block/district concept instead of one blanket plan for the whole State.

8 Special emphasis is needed for in-situ management of crop residues to stop burning and resultant pollution of air. To promote use of crop residues for mulching, provision of subsidy on the same pattern as given on plastic sheets need to be extended for use of paddy biomass as mulch.

9 In spite of good intentions at the government level, the trade of spurious pesticides, weedicides, seed and fertilizers is flourishing. SOPs should be put in place for strict implementation of Fertilizer, Seed and Pesticide Acts for punishment of the traders engaged in the business of spurious agricultural inputs.

10 Livestock contributes about 18% of total green house gasses emissions. There is need to improve microbial rumen digestion efficiency. Establishment of State level disease surveillance and forewarning mechanism to ensure timely preventive actions to avoid outbreaks of animal diseases is need of the hour.

11 Energy is likely to become a limiting factor for agriculture in near future. Major emphasis will be required to generate solar, water, wind and biomass based renewable energy. Lot of cow dung is produced daily in Gaushalas in the State. This cow dung can be effectively converted into Bio CNG gas production by establishing a bio gas generation plant in each of the Gaushalas.

12 Post-harvest wastage in fruits and vegetables range between 15 to 35 percent and in case of food grains is 5 to 15 percent. There is strong need to make policy incorporating development of post-harvest processing facilities and creation of cool chain infrastructure in cluster of villages, block and district level mode. The individual farmers should be encouraged by providing incentives to develop primary processing facility to manage the perishable commodities they are growing.

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The Lost Story of India's Superfoods: A Journey Back to Our Roots

Once upon a time, Indian meals were a celebration of simplicity and nutrition, crafted with ingredients that were as humble as they were powerful. It wasn't fancy supplements or lab-manufactured protein powders that kept our ancestors thriving—it was the magic of grains, pulses, and seeds that had sustained generations. These everyday heroes, now recognized as "superfoods," were the backbone of a nation's health, delivering an unmatched blend of vitamins, minerals, proteins, and antioxidants.

But what happened to this legacy? As India embraced modernity, something vital slipped through the cracks. The pull of urbanization and the glamour of Western diets began to overshadow these age-old treasures. Superfoods, once staples in every Indian kitchen, were gradually pushed aside by the promise of convenience and the lure of processed meals. What changed? When did our ancient wisdom become a forgotten chapter in the rush for quick fixes?

Isn't it ironic that while the world rediscovers and celebrates these very superfoods, we, their original custodians, let them slip away? Where did our love for millet, amaranth, pulses, and flaxseeds go? Why do we now see them as outdated, when they hold the answers to so many of today's health challenges?

The question remains: can we reclaim what we've lost? Can we rediscover the strength in these forgotten foods and bring them back to our tables—not just as a trend but as a way of life? If the power of these superfoods has remained unchanged, why shouldn't we return to our roots and embrace them once more? After all, the key to our future health might just lie in the wisdom of our past.

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The Forgotten Heroes: Superfoods of India

India, a land known for its rich agricultural diversity, is home to a range of nutrient-dense superfoods. These staples had been the backbone of the Indian diet for centuries, but they were now being overlooked. Take millets, for instance. Once known as the "grains of the poor," they were a staple in Indian households. Whether it was ragi (finger millet), jowar (sorghum), or bajra (pearl millet), these tiny grains packed a nutritional punch. Full of dietary fiber, B-complex vitamins, and essential minerals like calcium and magnesium, millets were perfect for those managing diabetes or gluten intolerance. Despite being the world's largest producer of millets, India's consumption of these miracle grains has dramatically fallen, as urban preferences for polished rice and wheat overshadowed them.

Similarly, pulses and legumes—the cornerstone of vegetarian diets in India—have quietly slipped away from our tables. Rich in plant-based proteins, iron, potassium, and fiber, pulses like lentils, chickpeas, and black gram have been key players in heart health and blood sugar regulation. Yet, as lifestyles became more fast-paced, traditional meals that included pulses were replaced by instant noodles and ready-made snacks. The wealth of nutrients in these humble foods was forgotten in the rush toward convenience.

And then there is amaranth, an ancient grain that dates back 8,000 years. Once a trusted source of protein and essential minerals, it now finds itself overshadowed by trendier modern grains. Though it offers complete protein and vital amino acids for muscle repair, amaranth has fallen out of favor, especially in urban diets.

Even flaxseeds, which have seen a resurgence in modern health circles, are not native to India. Yet they've become popular for their omega-3 fatty acids and their ability to support heart health and digestion. Ironically, while we embrace imported foods like flaxseeds, we often forget about the equally powerful superfoods that grow in our own soil.

The Modern Shift: Why We Strayed from Tradition

Why did we stop consuming these traditional superfoods? The reasons are many, but it often comes down to convenience, perception, and marketing. In a world where time is money, people turned to faster, more accessible food options. The polished grains and processed snacks that fill supermarket shelves were seen as "modern" and "efficient." Meanwhile, the simple millet or lentil, once seen as nourishing, began to be viewed as old-fashioned or even inferior.

Marketing played a large role in this shift as well. Supplements, protein shakes, and energy drinks were sold as the ultimate solution to health problems, replacing the need for traditional diets. Urban dwellers started to perceive superfoods as outdated or associated with poverty, while synthetic alternatives were celebrated for their convenience and status.

But in this quest for modern solutions, we seem to have forgotten an important truth: the wisdom of our ancestors. "Don't eat anything your great-grandmother wouldn't recognize as food," said writer Michael Pollan, and it's a reminder that we need to rethink our relationship with food.

The Nutritional Power of Superfoods: Why They Matter

Despite being overlooked, these Indian superfoods continue to hold immense nutritional value. Ragi remains one of the best sources of calcium, essential for bone health. Bajra is rich in iron, making it a great food for combating anemia, while lentils offer both protein and fiber, supporting heart health. Amaranth provides all nine essential amino acids, making it a rare and valuable complete protein. The health benefits of these superfoods are undeniable, and yet, they remain underappreciated.

The Paradox: India's Production-Consumption Gap

There is a striking irony in the fact that although India remains a leading producer of nutrient-dense foods, its consumption of these superfoods has dropped dramatically. Research shows that millet consumption in India has decreased by 50% in the last five decades. Likewise, pulses, despite being plentiful, are not consumed at recommended levels. The consequences are clear: rising micronutrient deficiencies in the population, especially deficiencies in iron and vitamin D, commonly known as "hidden hunger."

Moving Forward: Rediscovering the Power of Superfoods

The time has come to reclaim the power of these forgotten foods. Public health experts are increasingly advocating for a return to traditional diets, and research supports this movement. Studies show that regular consumption of millets and pulses can reduce the risk of chronic diseases, such as diabetes and heart disease, by as much as 20%.

Awareness campaigns are crucial to promote the benefits of these superfoods. Policies like the National Millet Mission are already in place, aiming to encourage the consumption of traditional grains. Schools could also play a pivotal role by including superfoods in mid-day meal programs, ensuring that children grow up appreciating these nutrient-dense foods.

Conclusion: Back to Our Roots for a Healthier Future

In today's fast-paced world, where convenience often trumps nutrition, it's time we reconsider the foods we eat. The superfoods that once nourished India hold the key to combating modern health challenges. As we look ahead to the future, we must draw on the wisdom of the past. Our kitchens need these forgotten superfoods back on our plates, not only for their nutritional value but for the better health of future generations.

As the saying goes, "The food we eat makes us who we are." Let's honor our heritage by rediscovering these superfoods, ensuring they remain an integral part of our everyday meals, and embracing their powerful role in our health and well-being.

The Journey of a Farmer's Son from Gir Somnath,Gujarat to Global Markets

Success Story Of A 25-Year-Old

Chetan Kanjibhai Mendpara

This is the inspiring story of a young farmer from Jasapur village in Talala Gir, who has taken the world-renowned Kesar mango from Talala Gir to both national and international markets. Chetan Kanjibhai Mendpara, who pursued a master's degree in Horticulture from Navsari Agricultural University, decided to forgo a job and instead focused on exporting Kesar mangoes from his own orchards, as well as promoting Gujarat's Kesar mangoes globally.

Starting with his own farm, Chetan gradually expanded his venture, which proved beneficial to many farmers in the region. He began exporting not just his own produce but also the mangoes of farmers from neighbouring villages, ensuring they received better prices. Today, he exports Kesar mangoes to countries like Dubai, Canada, London, Europe, the USA, and Australia.

> **"THE FUTURE LOOKS PROMISING AS GUJARAT'S KESAR MANGOES ARE SET TO SPREAD THEIR UNIQUE AROMA WORLDWIDE. THE INCOME OF FARMERS WILL TRULY DOUBLE WHEN EDUCATED INDIVIDUALS GUIDE AGRICULTURE TOWARDS NEW DIRECTIONS.**

Flourishing Mango Export

Chetan's company now has two branches—one in Australia and one in the USA. He has signed MoUs with various Farmer Producer Companies across different districts. His company directly procures agricultural commodities from farmers and provides them with the necessary guidance to produce export-quality goods.

What began with mango exports has now grown into a business exporting a wide range of Indian agricultural commodities, including fruits, vegetables, spices, and grocery items.

A Vision that Transformed Farmers' Lives

Chetan's vision has become a boon for the farmers, aligning with Prime Minister Narendra Modi's mission to place Indian produce on every table across the world. Modi's vision is for Indian grains and food items to reach every corner of the globe.

The future looks promising as Gujarat's Kesar mangoes are set to spread their unique aroma worldwide. The income of farmers will truly double when educated individuals guide agriculture towards new directions.

Unlike many agriculture graduates who end up in marketing jobs for pesticide and fertilizer companies, Chetan had a different mindset. Times have changed; today, more people are choosing to be farmers, inspired by such success stories.

Mechanisation and the Future of Indian Agriculture

Smart Farm Revolution by 2029

India's agricultural sector has long been the backbone of its economy. However, despite its significance, farming practices in the country remain largely traditional, limiting productivity and efficiency. This is particularly concerning as agriculture still provides employment to around 50 per cent of India's population and contributes approximately 20 per cent to the national GDP. As the global population grows and climate change introduces new challenges, India's agricultural sector faces increasing pressure to innovate. Mechanisation, combined with smart farming technologies, offers a path forward, and by 2029, India's agricultural landscape could undergo a revolution akin to the Green Revolution of the 1960s.

Smart farming – using data-driven insights to optimise agricultural operations at a micro level – would play a crucial role. Precision farming, enabled by AI, sensors, and satellite imagery, empowers farmers to monitor crop health, predict weather patterns, and make real-time decisions. Research suggests that precision farming can boost crop productivity by 30-40 per cent, fostering sustainable, high-yield farming. India can learn from global leaders in smart farming. In the U.S. and Europe, precision agriculture leverages Global Positioning System (GPS), sensors, and satellite technology to manage resources like water and fertilisers efficiently. In Japan, automated tractors and IoT solutions tackle labour shortages, while the Netherlands excels in vertical farming and precision irrigation, optimizing resources and conserving water. Drawing from these models, India can fast-track its own transition towards technology-driven agriculture by 2029.

However, smart farming alone is not enough to meet future demands. Mechanisation – using machinery to streamline farming processes – minimises manual labour and enhances efficiency. While U.S. and China have mechanisation rates of 95 per cent and 57 per cent respectively, India's level lags at about 40 to 45 per cent. Regional disparities further highlight this gap - states like Punjab and Haryana, where agriculture is more industrialised and farms tend to be larger, have embraced mechanisation at a faster pace. Meanwhile, some states have much lower mechanisation rates due to smaller average landholdings, limited resources, and a lower maturity in adopting agricultural technology. This intra-country disparity underscores the need for region-specific approaches to make mechanisation accessible and effective for all farmers across India.

Addressing these regional disparities requires not only technology and financial support but also strategic policies that consider the unique challenges faced by each state. While programs like the Sub-Mission on Agricultural Mechanisation (SMAM) and Pradhan Mantri Kisan Samman Nidhi (PM-KISAN) have already made strides, a more targeted approach could prioritise regions with smaller, fragmented farms. Offering higher subsidies or tailored loan schemes for machinery in these regions can enable small and marginal farmers to afford essential equipment.

Promoting cooperative models and Farmer Producer Organisations (FPOs) is vital for pooling resources in states with small and fragmented landholdings. FPOs can enable farmers to jointly purchase and share expensive machinery, such as tractors and harvesters, reducing the per-farmer cost of mechanisation. Additionally, support for community-operated Custom Hiring Centers (CHCs), where farmers can rent equipment as needed, could be expanded. This solution provides small farmers in under-mechanised states with access to modern equipment without the financial burden of ownership.

Leveraging digital technology, a platform similar to ride-sharing models could be established specifically for hiring farm machinery. Such a platform would allow farmers, especially in remote areas, to book equipment on-demand. Several pilot programs in India have shown the viability of this concept, where mobile apps and digital hubs connect farmers with equipment owners nearby, bringing transparency and accessibility to the leasing process. This model could be scaled up to include a broader range of equipment and regions, ensuring that even the smallest farmers can access the latest machinery.

Addressing digital and physical infrastructure gaps is critical for any mechanisation solution. While the Digital India initiative has made significant progress, increasing rural broadband and mobile network penetration remains essential to support digital platforms for equipment sharing and smart farming solutions. Expanding rural electricity and ensuring reliable power supply is equally important, as much of the modern machinery relies on consistent energy. Government investment in rural infrastructure can make mechanisation and technology-driven farming viable for farmers across all states.

Education and awareness programs are equally crucial to help farmers understand the benefits of mechanisation and adopt new technologies confidently. Expanding the scope of the National e-Governance Plan for Agriculture (NeGPA) to include region-specific training programs can empower farmers with the skills needed to use mechanised tools and interpret the data generated by smart farming technologies. Additionally, awareness campaigns highlighting successful mechanisation models in similar-sized farms or regions can demonstrate the potential benefits and encourage adoption among hesitant farmers.

Finally, sustainable practices must guide the shift to mechanised, smart farming. Technologies such as precision agriculture and water-efficient irrigation techniques — used in countries like the Netherlands and Australia — can conserve resources and protect the environment. Indian agriculture must similarly adopt methods that boost productivity without compromising soil, water, or biodiversity.

In sum, with the right investments, policies, and innovations, India has the potential to become a global leader in sustainable agriculture, ensuring food security for its population and contributing to global agricultural supply chains. The journey to 2029 will require a concerted effort from the government, private sector, and farmers alike, but the rewards for Indian agriculture and its future generations are well worth the pursuit.

> With the right investments, policies, and innovations, India has the potential to become a global leader in sustainable agriculture

Mr Nilachal Mishra
Partner and Head of the Government & Public Services (G&PS) Practice, KPMG in India.

Building Vegetable Clusters

Empowering Farmers

In the Union Budget Speech for 2024-25, the government introduced an impactful initiative: the development of large-scale vegetable clusters close to major consumption centers. This strategic plan aims to streamline vegetable production and boost supply chain efficiencies by promoting Farmer Producer Organizations (FPOs), Co-operatives, and start-ups to support vegetable collection, storage, and marketing. Jivagro Marketing Head, Suryam Chapara, recently had the honor of speaking at the Post-Budget Webinar hosted by the Ministry of Agriculture & Farmers Welfare. He addressed a distinguished audience on the role of crop protection companies in sustainable vegetable production, outlining actionable strategies to improve farm profitability, ensure sustainability, and help farmers deliver high-quality produce to consumers.

Insights

Insights centered on critical interventions and technologies are essential for the sustainable development of vegetable clusters.

Below are the key themes that can be explored.

Maximizing Yield and Quality with Strategic Interventions

Achieving higher yields, quality and within MRL's is at the heart of successful vegetable cultivation. There us need to focus on a stage-by-stage approach for crop cycle management, highlighting the importance of crop protection at every step. Through targeted interventions in areas such as pest control, nutrient management, and post-harvest handling, farmers can unlock the full potential of their crops while maintaining a sustainable approach.

Leveraging Market Intelligence for Informed Decision-Making

Market intelligence plays a pivotal role in bridging the demand-supply gap and guiding farmers in crop selection.

There is need for data on:

Demand vs. supply metrics, which allow for better crop selection and planning.

Planted area data for vegetables, categorized by sowing dates, to align production cycles with market needs.

Digital Platforms

A digital platform for farmers to share crop pest statuses and track farming practices, especially regarding pesticide usage and post-harvest processes, can ensure safe, low-residue produce for consumers.

Integrating Advanced Technology into Vegetable Farming

Modern technology can revolutionize crop management. A suite of digital and precision agriculture tools can help in this regard.

Drones, pest imaging, and data analytics can monitor crop health and target interventions.

Real-time auto alerts and best-practice recommendations tailored to each crop stage, empower farmers to make informed decisions quickly.

Such technologies provide an invaluable digital connection for farmers, offering insights to optimize productivity and reduce environmental impact.

Branding Vegetable Clusters for Market Advantage

By establishing NHB (National Horticulture Board) branding on produce, consumers are assured of the produce's safety and quality.

In addition, dedicating a portion of each cluster to organic farming (around 10% of the area) allows for premium pricing, benefiting farmers and offering authentic organic produce to consumers.

Building a Collaborative and Inclusive Ecosystem

The future of vegetable farming lies in a collaborative and inclusive ecosystem that brings together diverse stakeholders. We must all be conscious of the importance of upskilling farmers and fostering partnerships across sectors—from input providers and infrastructure firms to exporters, NGOs, and government agencies.

By empowering farmers and Farmer Producer Organizations (FPOs) at the core of every initiative, this approach fosters innovation, resilience, and long-term profitability.

Moving Forward Together

With the shared mission of a sustainable and profitable vegetable ecosystem, we look forward to collaborating closely with stakeholders across the agricultural landscape.

Together, we are committed to building a resilient framework that empowers India's vegetable farmers, strengthens supply chains, and delivers premium-quality produce to consumers across the nation.

"The future of vegetable farming lies in a collaborative and inclusive ecosystem that brings together diverse stakeholders

AI Automation in Agriculture Cultivating the Future of Farming

> AI automation is revolutionizing agriculture, offering innovative solutions to enhance productivity, sustainability, and efficiency

Agriculture, the backbone of global food production, is undergoing a transformative shift thanks to artificial intelligence (AI) and automation. As the world grapples with increasing food demands, environmental challenges, and a changing climate, AI-driven innovations are emerging as crucial tools for modernizing agriculture. This blog explores how AI automation is reshaping the agricultural landscape and what the future holds for this vital industry.

The Role of AI Automation in Agriculture

AI automation in agriculture leverages advanced technologies to optimize farming practices, improve productivity, and address challenges ranging from resource management to pest control. Here's how AI is making a difference:

1. Precision Agriculture: AI-driven systems use data from satellite imagery, drones, and sensors to monitor crop health, soil conditions, and weather patterns. This data allows farmers to apply precise amounts of water, fertilizers, and pesticides, reducing waste and enhancing crop yields.

2. Predictive Analytics: Machine learning algorithms analyze historical data and real-time information to predict crop performance, disease outbreaks, and weather impacts. These insights help farmers make informed decisions, from planting schedules to harvest timings, improving overall efficiency.

3. Automated Machinery: Tractors, harvesters, and other farming equipment equipped with AI and robotics can perform tasks autonomously. These machines can plant, tend, and harvest crops with high precision, reducing labor costs and increasing productivity.

4. Supply Chain Optimization: AI enhances the efficiency of the agricultural supply chain by predicting demand, optimizing logistics, and minimizing waste. Automated systems streamline the distribution of produce from farms to markets, ensuring fresher and more affordable food.

5. Smart Irrigation Systems: AI-powered irrigation systems monitor soil moisture levels and weather forecasts to optimize water usage. This technology helps conserve water resources and ensures crops receive the right amount of hydration.

The Future of AI Automation in Agriculture

The future of AI automation in agriculture promises to bring even more transformative changes:

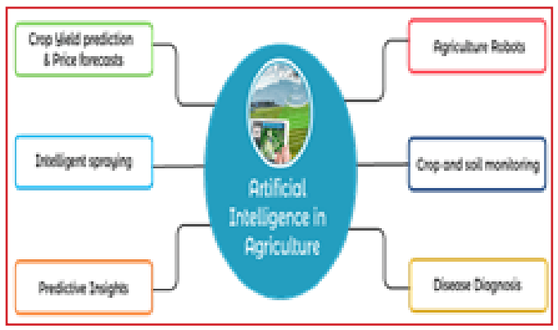
1. Enhanced Crop Genetics:AI will advance the field of genomics, allowing for the development of crop varieties that are more resistant to pests, diseases, and climate extremes. This innovation will improve food security and sustainability.

2. Autonomous Farms: The concept of fully autonomous farms, where AI-powered robots and systems manage all aspects of farming, is becoming more feasible. These farms will reduce the need for human labor while increasing efficiency and reducing operational costs.

3. Integration with IoT: The Internet of Things (IoT) will integrate with AI to create smart farming ecosystems. Sensors embedded in soil, crops, and equipment will continuously provide data, allowing for real-time monitoring and adjustments.

4. Sustainable Practices:AI will play a crucial role in promoting sustainable agriculture by optimizing resource use, reducing environmental impact, and supporting regenerative practices. Technologies will focus on minimizing the ecological footprint of farming activities.

5. Global Collaboration:AI-driven agricultural solutions will facilitate global collaboration to address food security challenges. By sharing data and insights across regions, farmers and researchers can tackle



issues like climate change and pest invasions more effectively.

Challenges and Considerations

While the potential of AI automation in agriculture is immense, several challenges need addressing:

1. Data Privacy and Security: The extensive data collection involved in AI-driven agriculture raises concerns about privacy and security. Ensuring that data is protected and used responsibly will be crucial.

2. Cost and Accessibility: The adoption of AI technologies can be expensive, particularly for small-scale farmers. Making these technologies affordable and accessible will be essential for widespread adoption.

3. Skill Development: As AI becomes more integrated into farming, there will be a need for training and education to help farmers and agricultural workers adapt to new technologies.

4. Ethical Implications: The use of AI in agriculture must be approached with ethical considerations, including the impact on labor markets and the environment. Developing frameworks to address these issues will be important.

Embracing New Technologies

AI automation is revolutionizing agriculture, offering innovative solutions to enhance productivity, sustainability, and efficiency. As we look to the future, embracing these technologies will be key to meeting the growing demands of global food production while addressing environmental and resource challenges. By navigating the associated challenges and investing in research and development, we can cultivate a future where agriculture thrives in harmony with technology and nature.

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From Fields to Futures

How Agricultural Challenges Drive Rural Youth Migration

> "Climate-resilient crops, water management, soil conservation and better access to coping mechanism like insurances and entitlements are vital

Dr Ashok Kumar

Director of Farm Prosperity, Transform Rural India, Designers for Regenerative Development

Prem Minj is a 30 years old tribal youth form Bakikona hamlet of Kersai block in Simdega district of Jharkhand. Farming is the main livelihood of his family. The paddy is just harvested and the total yield from his 3 acres of farm land is 40 quintals this year (2024). There are 6 members in his family. There is no irrigation facility for his farms. Prem needs to migrate to Lucknow for around six months every year to look for cash earning work. He comes back every year just before monsoon to cultivate paddy in his farms. He returns with around 30,000 Rupees earning from his works at Lucknow.

The story of Manish Lakra a 20 years girl is similar, she also needs to go to Goa to searching for employment after kharif paddy harvest is over in December. The small hamlet of Bakikona has 83 households and around 10 families have members migrating every year searching for work after the rainfed agriculture season is over.

Simdega district has become one of the hubs of migrating youth and farmers in Jharkhand.

Agriculture has been the cornerstone of India's economy, providing employment to over 58% of the workforce and contributing 17–18% to the GDP. Despite its vital role, the sector faces mounting challenges that compel rural youth to migrate to urban areas in search of better opportunities. This report delves into the key agricultural challenges—generational debt, declining productivity, economic disparities, price fluctuations, and climate vulnerabilities—and examines how they influence rural youth migration.

Agricultural Productivity

While India has seen moderate improvements in crop yields over the past decade, the gains are often outpaced by challenges such as resource depletion and climate variability.

Rice productivity increased from 2,394 kg/ha in 2011–12 to 2,659 kg/ha in 2020–21. Wheat productivity rose from 3,140 kg/ha to 3,493 kg/ha over the same period. Maize productivity grew from 2,550 kg/ha to 3,070 kg/ha.

However, these improvements are unevenly distributed across regions, with marginal and smallholder farmers who comprise 86% of India's farming population often missing out on the benefits. Factors such as erratic monsoons, deteriorating soil quality, and inadequate irrigation further undermine productivity. As agriculture becomes less lucrative, youth find little motivation to stay in rural areas. The seasonal nature of farm work also leads to underemployment, pushing many to migrate in search of steady income.

Rural-Urban Divide

The disparity between rural and urban economic opportunities is stark. Urban areas offer higher wages, career growth, employment opportunities making them attractive to rural youth. The average annual income in urban areas is roughly double that in rural regions. While agriculture employs 58% of the workforce, its contribution to GDP is only 17–18%, it highlighting the sector's inefficiency.

For rural youth, the limited scope for financial growth in agriculture is a significant deterrent. The migration rate among rural youth is approximately 45%, driven by aspirations for better education and emplyment opportunities.

Commodity Price Volatility

An Uncertain Livelihood, Unstable commodity prices further destabilize the agricultural economy. Despite the government's Minimum Support Price (MSP) mechanism, it benefits only a fraction of farmers. In 2018–19, around 38% of rice production and 20% of wheat production were procured at MSP. The remaining majority had to sell their produce at market rates, often lower than the cost of production. This unpredictability discourages young farmers from pursuing agriculture as a sustainable livelihood. With limited savings and no safety net, they are more likely to leave their villages for better-paying, less volatile jobs in cities.

A Legacy of Financial Strain

For millions of Indian farming families, debt is a burden that passes from one generation to the next. Over half of agricultural households (52%, according to the NSSO) were in debt as of 2018. The root causes include high input costs, reliance on informal loans with exorbitant interest rates, and inconsistent incomes. The average monthly income of an agricultural household was ₹10,218 in 2018–19, barely sufficient to cover expenses, let alone pay off loans. Young members of these households, witnessing the financial stress endured by their elders, often choose to leave farming behind, seeking urban jobs that promise stable incomes and a chance to break the cycle of debt.

Climate Change

Climate change is emerging as a critical challenge for Indian agriculture. The increased frequency of extreme weather events, such as high temperature, floods, droughts, and unseasonal rains, significantly disrupt farming activities. India experienced severe droughts in 2015 and 2019, affecting millions of farmers and resulting in substantial crop losses. Soil health is also deteriorating misuse of chemical fertilizers and pesticides. An estimated 30% of India's agricultural land suffers from soil degradation, leading to reduced yields.

Lack of Mechanization

Farming in India is still largely labor-intensive, particularly for women and smallholder farmers. Approximately 90% of smallholder farmers rely on manual labor, which is both time-consuming and physically demanding. The lack of access to mechanized tools, coupled with inadequate infrastructure for irrigation and storage, makes farming unattractive to younger generations. Government efforts to promote mechanization have had limited reach, leaving many farmers reliant on outdated methods.

Challenges

Agriculture in India faces immense challenges—generational debt, declining productivity, economic disparities, climate change, and infrastructural deficits. For rural youth, these issues make urban migration an attractive alternative. However, this trend has significant implications for rural communities, including labor shortages and weakened local economies and creating stress on urban infrastructure. By addressing these challenges and creating opportunities within agriculture, India can retain its rural workforce and ensure a more balanced, sustainable future.

Policy Shifts Needed To Address Reverse Migration

> *The over-dependence on agriculture will fathom its own viable pathways, provided the government is willing to put in adequate resources*

India is trudging back to its villages. In the past five year, the policy-backed trend to push workers from low productive agriculture to seek better employment opportunities in the urban centres stands reversed.

An indication to the swing in reverse migration first came at the time Covid-19 pandemic when millions of urban poor traversed long distances, mostly on foot, in what was seen as the largest movement of people since the days of the partition. The unprecedented inter-State and intra-State migration was believed to be temporary but defying the expectations of the workforce returning back to the cities once the pandemic was over, a majority of the migrants preferred to stay back.

Based on the data generated from the National Sample Surveys and the Periodic Labour Force Surveys, the International Labour Organisation (ILO) and the New Delhi-based Institute of Human Development (IHD) had in a report first quantified an increase in agricultural employment. Contrary to the popular perception, an estimated 56 million workers were added to the rural workforce between 2020 and 2022. It only showed that at a time of jobless growth, the employment opportunities available in the cities were no long attractive for the migrants. Whether it was because of a slump in manufacturing and a decline in construction sector jobs, the migrants thought it better to move back to villages.

Farmers' Anger Is Brewing

Subsequently, the Periodic Labour Force Survey (PLFS) 2023-24 showed a reversal of the population shift as per the economic design – moving a sizeable proportion of the agricultural workforce away from farming. Interestingly, while 66 million of the agricultural workforce migrated in search of menial jobs in the cities in a period of 13 years, between 2004-05 and 2018-19; economist Himanshu of Jawaharlal Nehru University estimated that in the next five years, between 2018-19 and 2023-24, more than 68 million people have returned to the villages. Not that agriculture suddenly has turned remunerative but the rate at which reverse migration has upturned the expected gains from the structural transformation underway, clearly showed that pushing people out of farm was not a viable strategy.

Although the PLFS survey report shows that the share of agriculture in the rural workforce has risen from 42.5 per cent in 2018-19 to 46.1 per cent in 2023-24, the absolute numbers added back to agriculture, and that includes a sizeable population of youth, sends a message that can no longer be ignored. While the popular economic thinking was based on a faulty design that had kept agriculture deliberately impoverished over the year in a quest to push people out of agriculture, recent spate of farmers' protests following the iconic farmers protest for over a year at the borders of New Delhi, which has shown farmers anger brewing over the continuous denial of rightful income.

It was in 1996 that the World Bank had wanted India to move 400-million people out of agriculture – equal to twice the combined population of UK, France and Germany – forcing them to migrate to the cities. Instead of creating economic conditions that facilitate out migration to the urban centres, the emphasis should have been on rebuilding agriculture by making farming a viable enterprise. This is what Mahatma Gandhi had wanted, and the rate at which migrants have returned, only shows how right he was. It is therefore time to dispense with the World Bank thinking, and shift the focus to revitalising agriculture and turn farming into a sustainable, viable and a profitable enterprise.

Changing Ground Realities

If you are still not convinced, let's look at the latest report of the All India Rural Financial Inclusion Survey 2021-22 of the National Bank for Agriculture and Rural Development (NABARD) that was released recently. Accordingly, the share of population engaged in agriculture has significantly grown over the years. From 48 per cent in 2016-17 to a high of 57 per cent in 2023-24, the quantum jump in the number of agricultural households clearly points to the return of the native. Barring Punjab, where the share of agricultural households has come down from 42 per cent in 2016-17 to 36 per cent in 2021-22; in Himachal Pradesh from 70 to 63 per cent; and by a trickle in Gujarat and Karnataka, the increase in farm household has been substantial in many States. In Goa, the percentage increase in agricultural households is from 3 to 18 per cent, Haryana from 34 to 58 per cent; Uttarakhand from 41 to 57 per cent; and Tamil Nadu from 13 to 57 per cent, most other States also show an increasing trend towards agriculture.

Whatever be the reasons, the three surveys and studies by the ILO, PLFC and the NABARD shows the importance of agriculture to meet the employment and livelihood challenges, and not to forget the sector's ability to ensure household food security.

While the dominant economic thinking is dismayed at the rate at which reverse migration has upset all the previous estimates to reduce the numbers in agriculture, the rise in employment in agriculture is being viewed as "worrying" and as a "cause for concern" by mainline economists and economic writers. This pattern of reverse migration being seen in India is unique for a low middle-income group but is a pointer to the growing need to resurrect economic policies so as to rebuild agriculture. It is time to acknowledge the changing ground realities.

The over-dependence on agriculture will fathom its own viable pathways provided the government is willing to put in adequate resources. First and foremost, economists must stop treating any increase proposed in agricultural budgetary outlays as enlarging the fiscal deficit. As per the Organisation for Economic Cooperation and Development (OECD), India is the only country among 54 major economies engaged in agriculture, where the losses farmers incur are not covered by budgetary provisions. As I have often said, farmers have been harvesting losses, year-after-year, for almost 25 years. This flawed economic deign that leaves farmers Bhagwan bharose must end.

Reverse migration has to be viewed as good news. It is now time to put in resources where it is needed most. That will eventually lead to Sabka Saath Sabka Vikas.

Mr Devinder Sharma
is India's leading agriculture, food policy expert, researcher and writer

Bayer Empowering India's Farmers to Grow & Earn More

The farming community has always been the backbone of our economy and the statement holds true now more than ever, as they take on the responsibility of not only feeding the world's largest population, but also meeting nutritional needs and providing the critical feed stock for bio-energy. Bayer recognizes the pivotal role they play in India's ambition of becoming a developed nation, keeping sustainability at the fulcrum of this exciting journey.

Sustainability is not just a catch phrase for Bayer, an organization which has been empowering farmers in India for more than 127 years now. The seed-to-crop protection and integrated agri-solutions institution has been at the forefront of supporting and guiding more than 25 million farmers, an overwhelming majority of whom are small and marginal land holders, to grow more, with less, while restoring more.

Bayer's Rice Carbon Program

Bayer's Rice Carbon Program is one such critical initiative. India has the largest acreage under rice cultivation in the world. The staple of choice, for not just Indians, but a very large section of the Asian continent, also happens to be largest agricultural contributor to greenhouse emissions, accounting for 25-33% of the total methane emissions in South & Southeast Asia. The crop is also the most water intensive crop, consuming 43% of the total 70% of freshwater used for agriculture in the world. Bayer has risen to the challenge of producing more rice to feed a growing population but doing so in a more climate friendly and resource efficient way.

Direct Seeded Rice (DSR), coupled with the latest agronomic practices not only helps reduce greenhouse gas emissions by up to 45%, but also reduce water consumption by at least 25%.

Farmer Experience

Jyothi, a farmer in Tripuraram, a village in the Nalgonda district of Telangana, is one of approx. 20,000 strong and growing community of farmers who have chosen to become a part of the Bayer Rice Carbon Program. A relatively early adopter in her community starting with one acre in 2022, she has now convinced other farmers in her area to forgo the traditional transplanted puddled rice system for DSR coupled with the more efficient agronomic practices. "Each summer is hotter and water scarcity in our region is becoming a real problem affecting agricultural production and the lives of local citizens. Starting with one acre of land in 2022, and witnessing the benefits of DSR, I have expanded the practice to not just six acres being cultivated by me, but as well as four acres of my brother's land. This transition helped me save ` 60,000 per year just in labour costs and significant reduction on water consumption", explains Jyothi.

> "Bayer, the seed-to-crop protection and integrated agri-solutions institution, has been at the forefront of supporting and guiding more than 25 million farmers, an overwhelming majority of whom are small and marginal land holders, to grow more, with less, while restoring more

Corn is another crop which has emerged as a critical row crop in the country, with multiple end uses including a more sustainable source of ethanol production, which is not just reducing fossil fuel dependence, but also helping India save precious foreign exchange by helping reduce crude imports into the country. It's farmers like Rapalla Rambabu who are making it possible.

Rapalla embraced Bayer's DEKALB® hybrids in 2008. The farmer in Manchala village, situated in Guntur district of Andhra Pradesh has successfully battled adverse weather, not only harvesting a bountiful crop but also witnessing a remarkable surge in yield — a leap from a meager 20-25 quintals per acre to an impressive 40-45 quintals per acre. The doubling of his earnings by ` 90,000 per acre bore witness to his newfound success. "I've been cultivating DEKALB® Corn for the past 15 years. Before I used DEKALB® HYBRIDS, I experienced tough situations in my farming during the initial years due to the vagaries of the monsoon, crop lodging, and high levels of pest and disease infestations resulting in lower yields. Once I started cultivating DEKALB®, it provided me with mental satisfaction and psychological safety by giving better yields, raising my family's standard of living. Recently, for the past 2 years, I have been growing a new DEKALB® Hybrid DKC 9217 in the Rabi season, which has performed extremely well, giving consistent yield and standability. I have planted it in 6 acres and plan to expand the acres in the coming Rabi too."

Jyothi and Rapalla are role models for not just their neighbours, but for the entire farming community, which is not just feeding more than 1.4 billion people, but also providing for fodder, feed and also energy, as India transitions to a sustainable and climate resilient ecosystem.

TUBER CROPS IN KERALA

Investment Opportunities and Market Demand for Sustainability



Tuber crops such as cassava, elephant foot yam, yams, sweet potato, colocasia (taro), Chinese potato (koorka) and arrowroot, are vital to Kerala's cultural, nutritional and economic landscape. Covering 68,247 hectares in 2022-2023 (about 8% of Kerala's food crop area), these crops are integral to local diets and provide essential income for small farmers and tribal communities. Thiruvananthapuram, Pathanamthitta, Kollam, and Palakkad districts are the leading districts for tuber crops cultivation in Kerala. Historically, tubers served as lifeline during food scarcity, offering a reliable, nutrient-dense food source. Today, as Kerala faces challenges from changing land use and climate variability, tubers remain crucial due to their resilience and adaptability. Thriving in diverse conditions with minimal inputs, they are hardy and drought tolerant, making them a sustainable choice for maintaining productivity amidst climate uncertainties. Rich in antioxidants, vitamins, minerals and dietary fibre, they also help in addressing malnutrition, particularly in rural and tribal areas. Furthermore, intercropping with plantation crops like coconut and banana enhances soil health, providing an insurance crop that mitigates risks from natural disasters and price fluctuations.

As demand for tubers are high in both domestic and international markets, these high-yielding and climate resilient crops offer good opportunities for sustainable economic growth and food security for the Kerala farmers.

Elite varieties for agri-food systems

In the context of climate change and the prevailing issues of food insecurity, malnutrition, hidden hunger and low productivity of food crops, climate resilient tuber crops with valued traits suiting to different agrifood systems are the pressing needs of the hour. Thus, the aim was to develop disease and pest resistant tuber crops with early maturity, longer keeping quality, high dry matter, starch, β-carotene, anthocyanin and low sugar contents. ICAR-CTCRI has so far released 71 improved varieties in tropical tuber crops and the popular tuber crops varieties grown in Kerala are .

- **Cassava:** Sree Jaya, Sree Vijaya, Sree Prakash, Sree Pavithra, Sree Swarna, Sree Reksha
- **Sweet potato:** Sree Nandini, Sree Vardhini, Sree Bhadra, Gouri, Sree Arun, Sree Varun, Sree Kanaka, Bhu Sona, Bhu Kanti, Bhu Krishna
- **Greater yam :** Sree Keerthi, Sree Roopa, Sree Shilpa, Sree Karthika, Sree Neelima, Sree Swathy, Sree Nidhi, Sree Hima
- **White yam:** Sree Subhra, Sree Priya, Sree Haritha, Sree Dhanya (dwarf), Sree Swetha (dwarf)
- **Lesser yam:** Sree Latha, Sree Kala
- **Elephant foot yam:** Sree Padma, Sree Athira
- **Taro:** Sree Rashmi, Sree Pallavi, Muktakeshi, Sree Kiran
- **Chinese potato:** Sree Dhara

Market demand of tuber crops

To assist farmers in making informed crop choices, a detailed analysis of the market demand and investment potential for Kerala's major tuber crops are presented

- **Cassava (Tapioca):** A staple food in Kerala, accounted for 55,713 hectares and produced 2.39 million tons in 2022-23, with a productivity of 42 tons/ha. The cost of cultivation is estimated at ₹1.5–2.0 lakhs per hectare, while the mean value of output is ₹4, 63,473 per hectare. Cassava's high productivity, low input cost, and growing market demand make it ideal for Kerala farmers. Processing and value addition in cassava offers profitable revenue generation to the farmers and entrepreneurs. The crop recorded a compound annual growth rate (CAGR) of 0.72% in area and 9.31% in production from 2017-18 to 2021-22, indicating a positive trend. The crop is also included in One District One Product (ODOP) of Thiruvananthapuram and Kollam districts of Kerala by Government of India recognizing its value.
- **Elephant foot yam:** Known for its nutritional profile, elephant foot yam is popular in local markets in its raw form. Resilient with stable demand, it yielded approximately 241 thousand tons from 4446 hectares in 2022-23. It's a high return crop due to its moderate input costs and consistent market demand. Despite, its negative (-0.46%) CAGR in area, production increased by 22.46 % between 2017-18 and 2021-22, indicating efficiency gains.
- **Sweet potato:** Rich in fiber and nutrients, sweet potato has a growing consumer base, especially among health-conscious individuals. Its shorter duration and compatibility with organic farming make it ideal for smallholders targeting niche markets. While area under cultivation increased slightly by 0.21%, production saw a slight decline of -0.62% from 2018-19 to 2021-22. Owing to its nutritional value there lies a great demand, particularly in urban areas which makes it a promising crop for 2025.
- **Yams (Dioscorea spp.):** Valued for their high starch content, yams have strong demand in both local and regional markets. Though they require a higher initial investment, yams offer favorable returns due to their long shelf life and market value. They are best suited for farmers who can commit resources to longer-term cultivation and have access to reliable distribution channels.
- **Colocasia (Taro):** Widely used in Kerala's traditional dishes, colocasia is valued for its fibre and nutritional benefits. With robust adaptability to the local climate and low input costs, it is a reliable crop that provides stable returns, presenting a low-risk investment option for farmers.
- **Chinese Potato (koorka):** A seasonal speciality, koorka has high demand in Kerala, particularly in winter. Although labor-intensive, it commands premium prices due to limited seasonal availability, medicinal value and high consumer preference. Due to awareness among the people about its health benefits, it is becoming increasingly popular, making it a worthwhile investment for farmers..
- **Arrowroot:** Valued for its medicinal properties and as a gluten-free thickening agent, arrowroot is gaining attention in health food markets. While its yield is lower than other tubers, its high market value compensates, making it ideal for farmers focusing on niche or health-conscious markets. Arrowroot's minimal input needs and climate adaptability enhances its appeal as a speciality crop for 2025.

Economic viability and investment options

Data from 2022-23 highlights the increased production and profitability of crops like cassava, elephant foot yam and others as given in Table below.

Area, production, market value, cost of cultivation and gross income of tuber crops in Kerala

Crop	Area (ha)	Production (tonnes)	Market Value (₹ in lakhs)	Cost of cultivation (₹ in Lakhs/ha)	Gross Income(₹ in Lakhs/ ha)
Cassava	55713	2390395	478.08	1.5-2.0	8.40
Sweet potato	150	2133	5.31	1.0-1.2	3.50
Elephant foot yam	4486	241435	48.29	2.0-2.5	9.40
Yams	1236	37080	11.12	1.5-2.5	9.00
Taro	5185	58024	11.60	1.0-1.3	2.20
Chinese potato	848	12720	3.82	1.5-2.0	4.50
Arrowroot	345	8625	3.02	1.0-1.5	8.75

Source: Department of Economics and Statistics, Govt. of Kerala and author's estimation

The investment options for tuber crops are

- Cassava: With low input costs and high productivity, cassava suits medium-to-large scale farming operations focused on both local consumption and processing for export.
- Elephant foot yam: Its moderate costs and market potential makes it attractive for local markets.
- Sweet potato: Ideal for smallholders, particularly those targeting health-conscious consumers.

> *Today, as Kerala faces challenges from changing land use and climate variability, tubers remain crucial due to their resilience and adaptability Thriving in diverse conditions with minimal inputs, tubers are hardy and drought tolerant, making them a sustainable choice for maintaining productivity amidst climate uncertainties*

- **Yams:** Offering a high price point and long storage life, yams are a sound choice for farmers with resources for long-term investment.
- **Colocasia:** A low-risk, steady-income crop, colocasia is adaptable to various soil types and provides stable returns.
- **Chinese potato (Koorka):** A high-return seasonal crop, ideal for farmers ready to handle its labor-intensive cultivation.
- **Arrowroot:** Recommended for niche markets, especially those focused on health or gluten-free products, where demand is on the rise.

Crop Selection and Diversification

To maximize returns, farmers should consider diversifying their crop portfolios based on market demand, soil type, and available resources. The following recommendations can guide optimal selection for 2025:

- **Large farms:** Cassava and elephant foot yam are excellent for larger farms with access to both local and export markets.
- **Smallholders:** Sweet potato and arrowroot are ideal for those targeting organic or niche health markets.
- **Seasonal high-demand crops:** Chinese potato (Koorka) and colocasia offer steady income with potential for premium prices during peak seasons.
- **Long-term investments:** Yams provide high returns and are suitable for farmers with resources for long-term investment and stable distribution.

Conclusion

Tuber crops contribute significantly to Kerala's agricultural sector, ensuring food security, income, and resilience to climate variability. Covering a substantial share of Kerala's food crop area, crops like cassava, elephant foot yam, and sweet potato not only provide a reliable income for small-scale and tribal farmers but also enrich their diets. Their adaptability to Kerala's varied growing conditions, low input requirements, and drought tolerance make them suitable for sustainable farming, especially as demand grows in local and health-focused markets. A strategic focus on high-yield and speciality tubers handholds Kerala's farmers to meet market demands while achieving economic stability and food security for 2025 and beyond.

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Success From Reliance On Jivagro's Complete Chilli Portfolio

I have been cultivating chilli on 12 acres for the past 15 years. Over the years, I faced several challenges, primarily due to thrips infestations and fungal diseases.

Despite spraying multiple chemicals across several rounds, I could only achieve medium yields.

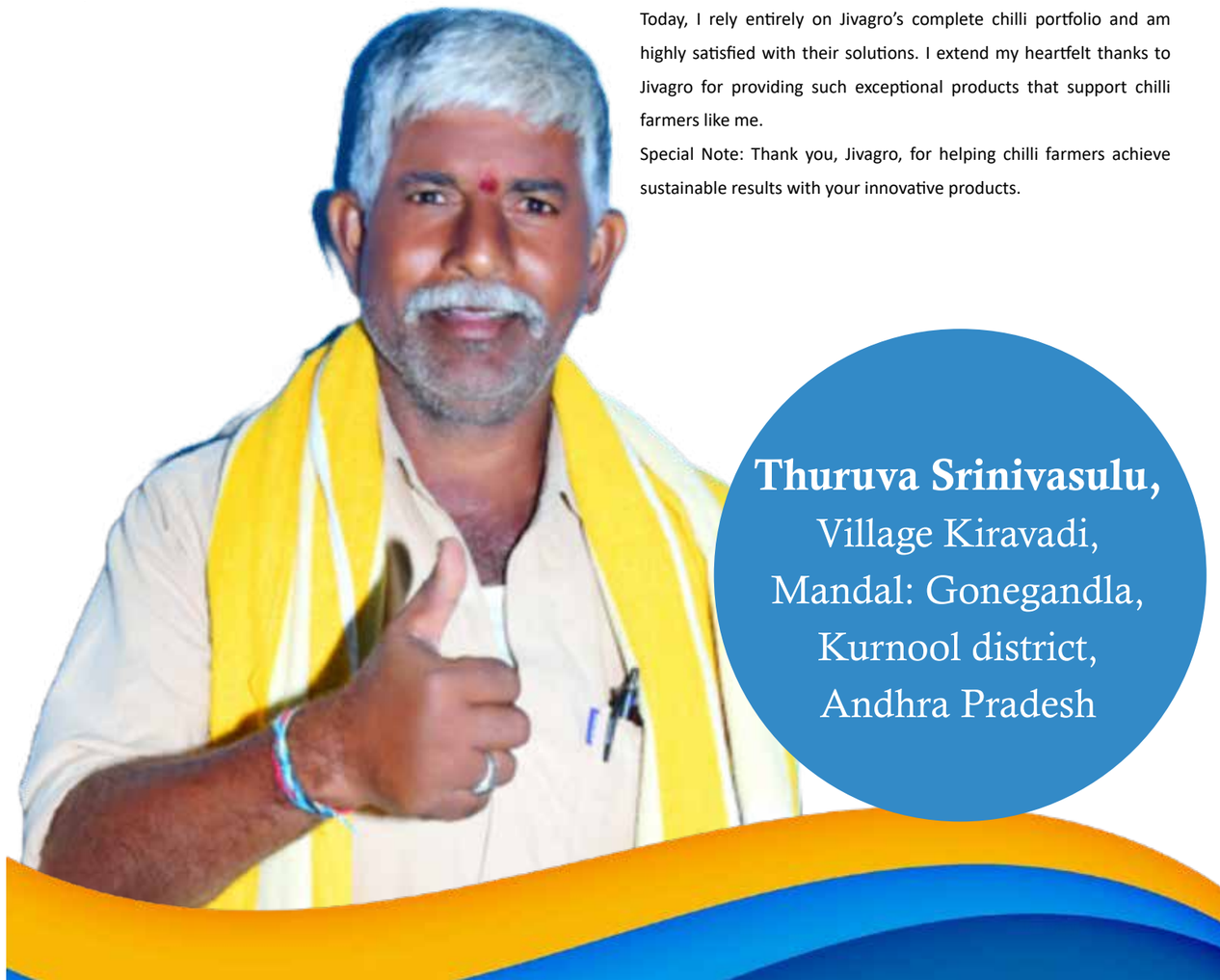
Three years ago, I began using Jivagro products for chilli cultivation, starting with Rapigro and Fantic M. After the first spray, by the 8th day, I noticed extraordinary results, which built my trust in Jivagro products.

Since then, I have consistently used their products, with regular guidance from the Jivagro team. Their frequent visits to my fields and with safe profile product recommendations have significantly improved both the quality and quantity of my yields.

When introducing Ultimare, I noticed substantial improvements, with the plants achieving optimal standards across all parameters. Additionally, Armatura which MRL exempted proved to be a game-changer. After using it, I achieved top-quality produce. Even when last year's market prices were low, my produce fetched the highest rates.

Today, I rely entirely on Jivagro's complete chilli portfolio and am highly satisfied with their solutions. I extend my heartfelt thanks to Jivagro for providing such exceptional products that support chilli farmers like me.

Special Note: Thank you, Jivagro, for helping chilli farmers achieve sustainable results with your innovative products.



Thuruva Srinivasulu,
Village Kiravadi,
Mandal: Gonegandla,
Kurnool district,
Andhra Pradesh

SMALL SPACES BIG IMPACT

Terrace gardens for climate resilience

Dr. Eilia Jafar is a Development Professional

“By integrating greenery into urban planning, we can create cities that withstand climate extremes while supporting a sustainable and healthier environment

India’s 2024 Climate Report highlights an urgent crisis: the country endured extreme weather events on nearly every day in the first nine months of this year, claiming more than 3,000 lives and damaging over 3.2 million hectares of crops. These severe conditions affected nearly all Indian states and Union Territories, underscoring the need for adaptable and immediate solutions. For urban communities—especially for those who work outdoors or live in temporary shelters—the risks of extreme temperatures are even more pronounced.

Strain Upon Cities

Cities across India are facing increased strain as temperatures continue to rise, overwhelming infrastructure and public health resources. Though state governments are implementing night shelters, adjusting school timings, and running awareness campaigns, these measures alone are insufficient against the mounting climate challenges.

Urban areas are increasingly looking toward green solutions like terrace and balcony gardens, which can play a crucial role in adapting to climate extremes. Studies reveal that integrating greenery into cityscapes can naturally regulate temperatures and contribute to urban resilience. Around the world, cities are finding success with similar strategies; for example, Copenhagen in Denmark has transformed its environment by promoting green roofs and encouraging residents to maintain these spaces themselves. This approach not only cools urban spaces but also encourages community responsibility and engagement. India has a real opportunity to adopt similar practices with terrace and balcony gardens, which are versatile enough to be incorporated into various types of housing and accessible across economic groups.

Benefits of Terraces

Terrace and balcony gardens offer significant benefits in the fight against climate extremes, especially during heat waves, which have become more intense in Indian cities. Vegetation on rooftops and balconies can reduce the surrounding temperature through natural shading and evapotranspiration, the cooling process of water evaporating from plants. Studies show that a green roof can lower surface temperatures by up to 20°C compared to traditional concrete, creating more comfortable conditions. This cooling effect not only improves air quality but also reduces energy consumption by cutting down the need for air conditioning, indirectly curbing greenhouse gas emissions. Urban balconies and terraces can easily host vegetables, herbs, and other plants, providing residents with fresh produce while also addressing the urban heat island effect. These spaces offer a chance to reconnect with nature, supporting better mental well-being and stress relief.

Beyond temperature control, terrace and balcony gardens provide insulation benefits during colder months, reducing indoor heating needs. Green walls and roofs act as a natural buffer, retaining warmth and helping to cut energy costs.

Green Roofs

Additionally, green roofs serve as windbreaks, softening the impact of chilly winds. While often valued for their cooling properties, these green solutions offer year-round benefits, helping to stabilize indoor temperatures and making them a valuable strategy for climate adaptation in urban spaces.

The environmental impact of these green spaces goes further by creating small ecosystems that attract birds, pollinators, and insects, which support biodiversity. Terrace and balcony gardens offer an opportunity to enhance ecological stability in urban centers, enriching daily city life and creating connections to the natural world. These gardens often become gathering points for neighbors to share gardening knowledge, exchange seeds, and collaborate, nurturing a shared sense of purpose and building community bonds around sustainability.

India’s cities could become leaders in adopting green spaces as a central strategy for climate adaptation. Supportive policies and incentives would help drive the adoption of green roofs and balcony gardens. Updating building codes to encourage green rooftops in new construction and offering subsidies or tax breaks to households retrofitting their terraces with plants would make these green spaces more common across urban areas. With the right backing, terrace and balcony gardens could quickly become a familiar sight in Indian cities, creating a low-cost, high-impact response to the immediate challenges of climate change.

Green roofs, terraces, and balcony gardens offer more than just aesthetic value; they are essential for strengthening cities against climate challenges. Expanding these practices can transform Indian cities into cooler, healthier spaces that soften the impacts of rising temperatures and unpredictable weather. With climate change posing serious threats, India’s cities have an opportunity to adopt green spaces on rooftops and balconies as a straightforward, effective approach. By integrating greenery into urban planning, we can create cities that withstand climate extremes while supporting a sustainable and healthier environment.

BioE3 Policy

The Biotechnological Economy Ahead

The union cabinet under the chairmanship of Prime Minister Narendra Modi approved the Biotechnology for Economy, Environment, and Employment Policy (BioE3) aimed towards 'Building High Performance Biomanufacturing' through with National mission of the Government of India including 'Net Zero' carbon economy and Mission LiFE (Lifestyle for environment). The policy was officially launched by S&T Minister Dr Jitendra Singh while addressing the media he also said "BioE3 policy will be a landmark not only for bio economy but a disruptor for Viksit Bharat @2047".

Union Minister Dr. Jitendra Singh launching the BioE3 policy

BioE3 (Biotechnology for Economy, Environment, and Employment) Policy is an initiative with an objective to lead biomanufacturing and biotechnology industry in the country of India. BioE3 policy is a step up from India's current biotechnology plan, aimed to capitalize on India's strengths in scientific human capital, biological resources, and growing economic prowess for a key global biotechnology player. This policy package aims at solving many national challenges at once: economic development, environmental protection, the food security challenge, the health challenge, and the challenge of employment.

It is expected that BioE3 policy will bring about revolutionary changes in food, energy and health sectors. Hence six themes have been identified and are provided as an overview of the policy, namely which are Bio-based chemicals and enzymes, Functional foods and Smart proteins, Precision biotherapeutics, Climate resilient agriculture, Carbon capture and its utilization and Futuristic marine and space research.

In the agriculture sector the policy aims at established genetically modified crop varieties that is resistant to climate change and that have high yields. This covers biotech crops that exhibit traits such as; drought resistance, pest resistance, and improved diet quality. As the means of decreasing chemical input in the agricultural system, the policy also extends the sale and utilization of biofertilizers and biopesticides. Precision agriculture is another important field due to the latest biotechnology-based sensors and diagnostics for soil and crops' health assessment in terms of diseases.

Healthcare

For healthcare, BioE3 emphasizes the development of affordable diagnostics and therapeutics, particularly for diseases prevalent in India. This would involve promoting the biosimilars to reduce healthcare costs, generation of new vaccines and exploration of traditional medicine through modern biotechnology. The policy also encourages genomics and proteomics research with a view to applying precision medicine, based on the genetic differences of the Indian population.

The policy in the industrial biotechnology sector fosters the use of bio-products as substitutes for products derived from petroleum. This comprises of bioplastics, bio-lubricants and the construction-based bio materials. Another thematic focus area is enzyme technology with its application in textile and Leather processing and food processing sectors. The policy also supports the application of biotechnology in waste and emission management, bioremediation, contaminated sites, as well as commercialization of biofuel processes.

Marine Biotechnology

One of the major areas defined by the BioE3 policy as a focus area of research is marine biotechnology which would involve programmes to prospect the extensive Indian coastline and marine species for new biologically active molecules of drug interest. The policy also seeks to develop the sustainable aquaculture and the new generation of mariculture products such as nutraceuticals.

In order to achieve such lofty objectives, more focused investments in infrastructure are planned and spelled out in the policy. This includes the setting up of one stop biotechnology park with necessary infrastructure for research and development and Pilot scale production. Biotechnology incubation centers are intended to promote biotechnology startups by offering them resources and mentorship. The policy also calls for establishment of regional biotechnology clusters, so as to facilitate biotechnology collaboration between universities, industry and the government.

Education and skill development are critical key drivers in the BioE3 strategy.

In the policy, special emphasis is placed on the issue of the regulation. It proposes streamlining approval processes for biotech products while ensuring safety and ethical considerations. This includes updating regulations to keep pace with emerging technologies like gene editing and establishing specialized committees for fast-track approvals of critical products. The policy also addresses the need for a robust intellectual property rights (IPR) regime, proposing measures to enhance patent filing from Indian institutions and companies.

Funding

A significant aspect of the BioE3 policy is funding. It proposes more government support for biotechnology-related basic and applied research, with an emphasis on high-priority fields that are in line with domestic need. In order to encourage private investment in biotech R&D, the policy also suggests establishing venture capital firms with a biotechnology concentration and offering tax breaks. It also offers strategies for public-private cooperation to close the knowledge gap between laboratory research and finished goods.

The emphasis is on international cooperation as a way to boost India's biotech industry. The policy suggests bilateral and multilateral agreements for cooperative research initiatives, especially in fields in which India is not an expert. It also recommends strong involvement in international biotechnology projects and conferences, as well as student and researcher exchange programs with top biotech nations.

Vision, Wider Targets

The BioE3 policy outlines a vision and challenging goals for the growth of India's bioeconomy. These are measurable outcomes that include more specific goals as to the intended contribution of the biotech sector to GDP, wider targets for biotech exports, and objectives for the generation of a set number of biotechnology start-ups and SMEs within a particular number of years. The policy also avows to align these goals with UN Sustainable Development Goals basically in the areas of food, health, energy and environment standards.

Public awareness and participation are yet another essential element of the policy. It suggests initiatives to raise public awareness of biotechnology and address genetically modified organism (GMO)-related issues by engaging stakeholders and maintaining open lines of communication. The strategy additionally endeavors to foster bio-entrepreneurship among young people by means of contests, mentorship initiatives, and early biotechnology exposure in educational settings.

The BioE3 policy gives special consideration to rural development. It suggests creating biotechnology-specific solutions to address issues in rural areas, like affordable water purification systems, biogas plants to meet energy needs in rural areas, and cottage industries centered around biotechnology. Additionally, the policy highlights the use of biotechnology to enhance health and sanitation in rural areas, including the creation of point-of-care diagnostic instruments for rural health centres.

A concerted effort involving many government agencies, academic institutions, and business associations is suggested to implement the BioE3 policy. The policy recommends setting up a high-level steering group to supervise its execution, with periodic evaluations and modifications made in response to advancements and new developments in the field of biotechnology worldwide.

Role Of Biotechnology

To sum up, the BioE3 policy is a thorough and ambitious plan to use biotechnology to further India's growth. Its success will rely on how well it is implemented, how long it is funded, and how well it can change with the quickly changing global biotechnology scene. Like any long-term program, its full effects might not become apparent for years, thus continuing evaluation and modification will be essential to achieving its objectives.

> "BioE3 policy is a thorough and ambitious plan to use biotechnology to further India's growth.

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Seed The Change

Cultivating Ideas For A Sustainable Tomorrow

The future of our planet lies in the hands of today's innovators, thinkers, and everyday citizens who have the power to nurture ideas that drive sustainable progress. "Seed the Change: Cultivating Ideas for a Sustainable Tomorrow" underscores the importance of planting seeds—whether in the form of small actions, innovative solutions, or forward-thinking policies—that will grow into lasting environmental and societal transformations.

Sustainability is no longer just a buzzword; it is a necessity. Climate change, resource depletion, and social inequalities are urgent issues that require collective action. The change we seek begins with the cultivation of new ideas—ideas that challenge conventional wisdom, encourage responsible consumption, and promote ecological balance. These ideas must be rooted in the principles of environmental stewardship, social equity, and economic viability.

Innovation plays a crucial role in this process. From renewable energy technologies like solar and wind power to green agricultural practices and sustainable urban design, we are witnessing a wave of creative solutions that have the potential to reshape industries and communities. However, innovation should not only be left to scientists or large corporations. Individuals, too, have a vital role to play by adopting sustainable habits, supporting eco-conscious businesses, and advocating for policies that prioritize long-term ecological health over short-term profit.

Ultimately, the key to a sustainable future lies in fostering a mindset that views change as an ongoing process—one that begins with each of us. Just as a seed requires nurturing to grow into something powerful, so too must our ideas for a sustainable tomorrow be nurtured with care, collaboration, and persistence. By seeding the change today, we can cultivate a world that thrives for generations to come.

Gujarat Green Summit, An Initiative Of Caravan Classroom

On November 21, Caravan Classroom, a registered NGO based in Vadodara organised the Gujarat Green Summit. The theme of the summit was 'Seed The Change: Cultivating Ideas For A Sustainable Tomorrow.'

Padma Shri Dr MH Mehta delivered the keynote address at the conference. He emphasised on the importance of scientific endeavour and community effort to build a sustainable future.

> On November 21, we organised the Gujarat Green Summit. The theme of the summit was 'Seed The Change: Cultivating Ideas For A Sustainable Tomorrow'

In our current times of concerns over climate change and sustainable development goals (SDGs), the summit was relevant in many ways.

1. It provided a platform for addressing environmental challenges.
2. It brought together leaders, experts, scientists and activists on a common platform to discuss issues of vital interest.
3. It emphasised renewable energy, reducing carbon emissions and ecofriendly practices.
4. It fostered collaboration and shares innovative solutions for a sustainable future.

The summit featured panel discussions on important themes. These included the following.

1. Economic Viability of Sustainable Farming: Challenges and Opportunities
2. Sustainable Urban Development: Roadmap To Building Sustainable Cities
3. Environmental Policy and Advocacy: Environmental Awareness & Education Fostering Sustainable Culture in All Age Groups.

Session On Promoting Social Impact Entrepreneurship

Author, Angel Investor, Mentor and Fund Advisor Nagaraja (Naga) Prakasam chaired the session on the vital need for promoting social impact entrepreneurship.

Mr Nagaraja Prakasam is a versatile and passionate leader with three decades of experience, of which he spent a decade in the US. Retired at 41, he is passionate about startups and as a lead angel investor, has invested in 31 startups, of which Uniphore became a Unicorn with 120x return. He has served on the boards of 12 companies, and has seen 8 exits and two write-offs.

Mr Prakasam has also authored a book "Back To Bharat - In Search of a Sustainable Future" that addresses the present economic dilemma for Indian entrepreneurs and consumers, looking at the past and present situation of both India and the developed world to find a way forward. He has also spearheaded impact thinking in Indian Angel Network and co-founded IAN Impact. His personal mantra is: "Startups should focus on India's strength - People, Problems, Tech (PPT)".

Promoting Social Impact Entrepreneurship

Social impact entrepreneurship is a powerful force for addressing some of the world's most pressing issues, from poverty and inequality to environmental degradation and public health crises. Unlike traditional entrepreneurship, which focuses primarily on profit, social impact entrepreneurship is driven by the goal of creating positive, lasting changes in society. Promoting this form of entrepreneurship is essential for building inclusive, sustainable communities and empowering individuals to become agents of change.

At its core, social impact entrepreneurship merges innovation with social responsibility. These entrepreneurs develop solutions that address social, environmental, and economic challenges while generating measurable social value. For example, businesses that provide affordable healthcare, renewable energy solutions, or educational resources to underserved communities are examples of enterprises that align profit with purpose. The success of these ventures is measured not just in financial terms, but by their ability to improve the lives of individuals and communities.

To promote social impact entrepreneurship, it is crucial to provide the right ecosystem of support. This includes access to funding, mentorship, and networks that help entrepreneurs scale their ideas. Impact investors, who prioritize social and environmental returns alongside financial ones, can play a significant role in making these ventures viable. Furthermore, governments and nonprofits can support these businesses by creating policies that incentivize social entrepreneurship, such as tax breaks for companies that focus on social good or providing grants for innovative solutions to global challenges.

Education also plays a pivotal role in promoting social impact entrepreneurship. Encouraging young people to think creatively about solving societal problems, and equipping them with the skills needed to launch and manage impactful ventures, can lead to a new generation of changemakers.

By fostering an environment where social impact entrepreneurship can thrive, we empower individuals to create sustainable solutions, ensuring a brighter future for people and the planet alike.

Ms Rajeshwari Singh
Founder-Director of Caravan Classroom Foundation and Real Heroes Empowerment Association

Empowering Farmers

The Journey of Jaivik Sri Farmers Producer Company Ltd

Jaivik SRI Farmers Producer Company, Ltd was as established in 2016, supported by Pragati, a NGO in Koraput District and NABARD with the vision "To empower and create dignified livelihood for the small and marginal farmers of South Odisha". The leaders of the company had the realisation that the small holder farmers faced huge challenges in accessing quality inputs, information, technology and above all the market. Working under very challenging situations, JSFPCL has evolved gradually and now has 1876 shareholders spread across 197 villages in Koraput District due to the hard work of the dynamic Board of Directors.

Business With Ethics

Business with ethics has been the driving force for JSFPCL. The Company has a diverse range of business activities include selling of inputs like quality seeds, organic manures, small farm equipment, aggregation, value addition and marketing of produces like aromatic rice, finger millet, small millets, pulses and spices. The Company owns an agro- service centre with equipment and farm machineries like tractor, power tiller, sprayers, chain fencing machine and millet thresher which the farmers can hire/purchase at fair prices. The farmer shareholders can access services like climate advisory, trader and market information, crop insurance etc.

Ginger, one of the major spices produced in Koraput District is being planned for value addition and marketing and also taking the product to export market. Process has been initiated for development of organic ginger clusters and certification with the vision to link with export market. With the support of Agriculture Market Development (AMD) an Indo-German Co-operation initiative and GAP Fund of IFAD, JSFPCL has set the vision to export organic ginger to the EU market.

GI Tag for Koraput Kalajeera Rice

One of the outstanding successes of JSFPCL has been the Geographical Indication (GI) Tag for Koraput Kalajeera Rice, the finest variety of aromatic rice cultivated and conserved by the farmers of Koraput District over generation. It has given a unique brand to the Koraput Kalajeera rice and its popularisation in national and international market

> "As JSFPC continues its journey, it has been honoured with many awards and accolades

JSFPCL has proved its success in production and marketing of millets as it is implementing the Special Programme for Promotion of Millets in Tribal areas of Odisha" supported by former Odisha Millet Mission, now known as the Shree Anna Abhiyan in Nandapur Block of Koraput District since June 2017. The Company has promoted System of Millet Intensification for more than 6000 farmers through support of quality seeds, trainings for adoption of improved package of practices, primary processing and enabling the farmers to access Minimum Support Price. JSFPCL has been recognised as the best FPO for market linkage by the Government of Odisha, department of Agriculture & Farmers' Empowerment.

Rice Intensification

System of Rice Intensification has been promoted in huge scale especially focussing on aromatic and indigenous rice, black rice and brown rice, enabling farmers to get additional income of 40% in comparison to their earlier practices. The visibility of the company has helped in mobilisation of projects from Government that included Direct Seeded Rice, Promotion of Indigenous and Aromatic Rice and Rejuvenating Watersheds for Agricultural Resilience through Innovative Development (REWARDS), recognition for its commitment and aptitude to work for the cause of small and marginal farmers.

The commitment for green agriculture has been one of the motivating factors for Jaivik SRI FPC is promoting renewable energy for reducing use of fossil fuels and GHG emission through creation of market for solar pumps and solar home lighting systems. More than 200 farmers have started using solar pumps and replaced diesel powered pumps. Home lighting systems are promoted through easy monthly instalments. A cadre of service providers, comprising local youth have been created for decentralised services and sustainability of green energy.

Pisciculture

Allied sector, i.e. pisciculture has gained momentum under the patronage of the Company. In association with Central Institute of Freshwater Aquaculture, Bhubaneswar fish farming has been promoted for 434 farmers of Borigumma, Jeypore, Kotpad and Koraput blocks. The Company provides trainings, fingerlings and fish feed to the farmers at subsidized price.

As JSFPC continues its journey, many awards and accolades have come on the way. Krishi Alerts award for its contribution in Sustainable Agriculture and Organic farming, which is jointly awarded by ICAR,APEDA and NITI AAYOG, recognition as the best FPO under Brand of Odisha, Pride of India by the SAMBAD media house, best FPO Award by the Odisha University of Agriculture and Technology, Best FPO Award by Odisha Government, ,department of Agriculture, Food Production and Farmers' Empowerment for promotion and market linkage of millets are the small feathers in the cap that encourages the Company to march ahead towards materialisation of its vision and mission.

Discovering Jivagro: A Game Changing Decision

Jillellamudi Rambabu,
Village Mandadi, Mandal:Veldurthi, Palnadu district, Andhra Pradesh

The Challenge: Battling Black Thrips

In 2021, black thrips became a recurring problem, devastating my chilli crop season after season. Despite trying numerous insecticides available in the market, I struggled to control this pest. Each spray brought little to no relief, leaving me disheartened and uncertain about how to save my crop. The pest not only reduced my yield but also impacted the quality of the produce, making it harder to secure a good price in the market.

By 2022, I realized I needed a better solution to tackle this persistent issue. It was around this time that I heard about Jivagro products. Initially, I was sceptical, as I had already spent significant amounts on various solutions without success. However, I am convinced by Jivagro's Thrips management approach. It is really difficult to control thrips considering the nature of pest, and faster life cycles during the season, I understood that there should be thrips management programme.

Remarkable Efficacy

I followed Jivagro thrips management program with Ultimare and Torpedo which helped to keep the thrips population low and ultimately control with fewer sprays when compared to others. The efficacy of these products was remarkable, and for the first time in years, I saw a significant reduction in the black thrips population in my chilli crop. This experience gave me the confidence to explore more products from Jivagro's portfolio.

Encouraged by the initial results, I began incorporating other Jivagro products into my crop management practices. Some of the key products I used included:

- **Armatura:** A highly effective biochemical fungicide that helped me control diseases in my chilli crop and helped grow healthy flowers and fruits.
- **Fantic-M:** A powerful fungicide that safeguarded my plants from fungal infections.
- **Siapton:** A product that boosted plant vigor and health.
- **Rapigro-L:** A growth enhancer that promoted healthy development and increased yield potential.

Transforming My Crop and My Livelihood

The shift to Jivagro products proved to be transformative, not just for my farm but for my entire livelihood. Here's how:

1. Pest and Disease Control:

Jivagro products provided superior control over pests and diseases. Unlike other products in the market, these solutions delivered consistent and reliable results, significantly reducing the damage caused by black thrips and other pests.

2. Improved Quality of Produce:

The quality of my chilli improved noticeably. Buyers could clearly differentiate my produce from that of neighboring farms, offering me a premium price of ₹800 more per quintal than other farmers in the area.

3. Higher Yields:

With the consistent use of Jivagro products, I achieved an impressive yield of 25 quintals per acre, a significant improvement over previous seasons.

4. Better Market Prices:

The high-quality produce fetched a price of ₹20,800 per quintal, allowing me to earn more profit from my harvest.

5. Financial Stability:

The increased income enabled me to clear all my debts, bringing a sense of financial security and peace of mind.

6. Recognition as a Progressive Farmer:

My success has not gone unnoticed. Farmers in my village now look up to me as a progressive farmer who has adopted modern and effective practices. Many of them have approached me for guidance, and I actively recommend Jivagro products to them for their chilli crops.

Gratitude to Jivagro

The transformation in my farming journey would not have been possible without the support and innovation of the Jivagro team with safe and sustainable solutions. Their products not only help control pests and diseases but also contribute to sustainable and quality farming practices. I am especially grateful for their continuous efforts to develop solutions that improve the lives of farmers like me.

Jivagro has shown me that with the right tools and guidance, farming can be not only a livelihood but also a rewarding and sustainable career. The use of their products has enhanced the quality of my yields and, in turn, the quality of my life.

My name is Jillellamudi Rambabu, and I am a farmer from Mandadi village, located in Veldurthi Mandal, Palnadu District, Andhra Pradesh, near Macherla town. My journey in farming began in 2004 under circumstances that were far from ideal. After the sudden demise of my father, I had to discontinue my education midway after completing my SSC to take up the responsibility of earning a livelihood through farming. My family owned 20 acres of agricultural land, and I stepped into the challenging yet rewarding world of farming.

For the past 20 years, I have been cultivating crops like chilli and cotton, gaining significant experience in managing and nurturing these crops. Currently, I focus on chilli cultivation, growing the crop on 10 acres of land. While I have faced many ups and downs in farming, the year 2021 brought one of the most severe challenges of my career—a massive outbreak of black thrips in my chilli fields.

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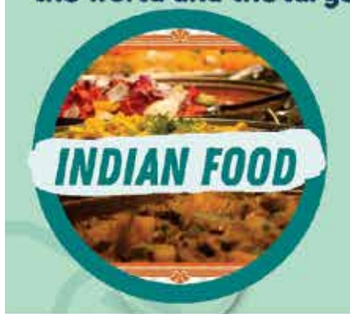

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