KhetiValah
Global Agri Magazine
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GOVT Policies
Agri News
Agri Innovations
Volume: 03
Issue: 03
April 2026

GIRAS
Global Initiative for Regenerative Agriculture & Soil Resilience

FARMER SCIENTIST
RECOGNIZING FARMERS AS KNOWLEDGE LEADERS

A FARMER'S IKIGAI

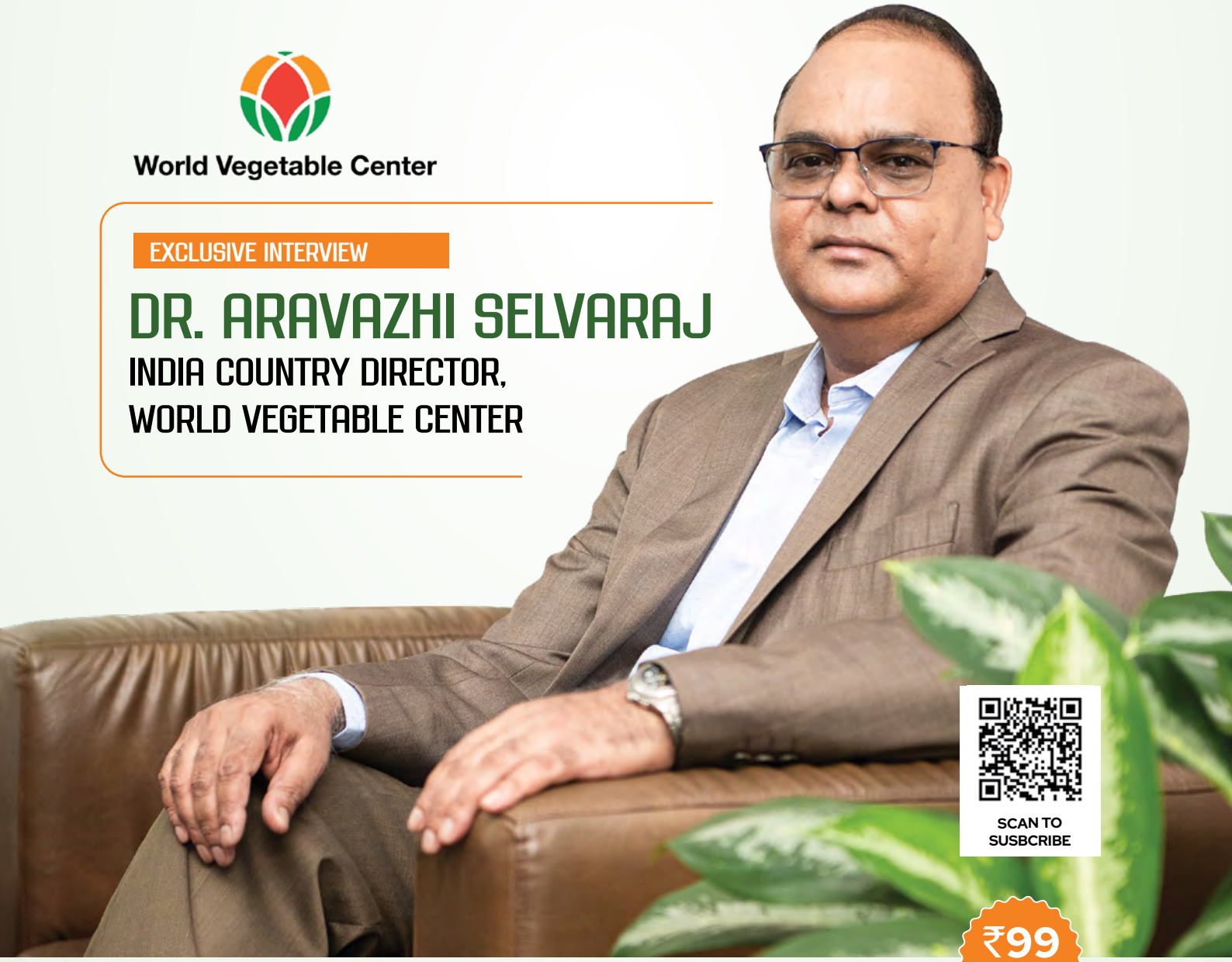
"A reason for begin"

World Vegetable Center

EXCLUSIVE INTERVIEW

DR. ARAVAZHI SELVARAJ

INDIA COUNTRY DIRECTOR,
WORLD VEGETABLE CENTER



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KhetiValah
Global Agri Magazine
Volume: 03 - Issue: 03

Founder's Note

Dear Readers,

As we present the April 2026 edition of KhetiValah Global Agri Magazine (e-magazine), we continue our journey of strengthening agricultural knowledge while building meaningful connections across borders. Every issue teaches us, inspires us, and motivates us to improve content quality while reaching a wider community of agriculture enthusiasts worldwide.

This month, we are honored to feature a Cover Story interaction with Dr. Aravazhi Selvaraj, India Country Director, World Vegetable Center, whose insights on sustainable agriculture and resilient food systems add valuable perspectives to this edition. We also thank Neil Palmer, Lead – Strategic Communications, for his support in facilitating this interaction.

We extend our sincere appreciation to contributors, researchers, experts, and authors from across the world whose knowledge strengthens this platform.

We are pleased to share that KhetiValah Global Agri Magazine (e-magazine) and KhetiValah Dialogues have entered into a Knowledge and Supporting Partnership with the Centre on Integrated Rural Development for Asia and the Pacific (CIRDAP), headquartered in Dhaka, Bangladesh. We express our gratitude to Dr. P. Chandra Shekara, Hon'ble Director General, and the CIRDAP team for their continued support.

As we strengthen our role within the global agricultural ecosystem, we are gradually evolving from an article-focused publication into a feature-driven knowledge platform. While we continue to welcome quality articles, we are introducing more interactive sections for readers.

This edition introduces KrishiGuru, a monthly expert advisory feature connecting readers with global agricultural specialists, and KrishiYashas, a platform dedicated to careers, professional development, and opportunities in agriculture and allied sectors.

We remain committed to building a stronger agricultural knowledge community through collaboration, innovation, and shared learning.

Join us in building a "**Wealthy and Healthier Globe**."
Jai Bharat 🇮🇳

Regards,
Lakshman K
Founder & Chairman of KhetiValah.

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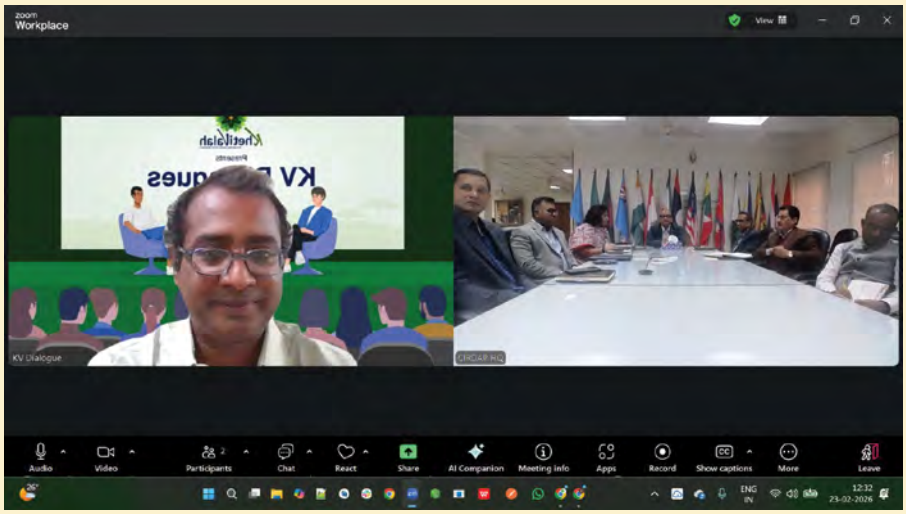
STRENGTHENING REGIONAL KNOWLEDGE COLLABORATION: KHETIVALAH AND CIRDAP FORMALIZE PARTNERSHIP



KhetiValah Global Agri Magazine and KhetiValah Dialogues have formally entered into a Knowledge and Supporting Partnership with the Centre on Integrated Rural Development for Asia and the Pacific (CIRDAP), marking an important milestone in advancing regional cooperation for agriculture and rural development.

Headquartered in Dhaka, Bangladesh, CIRDAP is an intergovernmental organization of 15 member countries across the Asia–Pacific region. The institution works extensively on integrated rural development through research, capacity building, training, knowledge dissemination, and policy support. Its regional mandate and long-standing institutional experience make it a key platform for cross-country learning and collaboration.

THE MOU SIGNING CEREMONY

The Memorandum of Understanding was formally signed in the presence of distinguished members of the CIRDAP leadership and the KhetiValah team. The ceremony was graced by **Dr. P. Chandra Shekara**, Hon'ble Director General of Centre on Integrated Rural Development for Asia and the Pacific (CIRDAP), whose continued encouragement and guidance have played a significant role in shaping this collaboration.

Representing **KhetiValah, Lakshman K**, Founder & Chairman of KhetiValah, formally participated in the signing ceremony, reinforcing the shared commitment toward knowledge exchange, sustainable agriculture, and rural development.

Also present during the signing were:

Dr. Ganga Dutta Acharya, Director Research, Nepal
F. A. M. Zakirul Huq, Head of Administration
Dr. Babu Kazi Thapa, Program Officer Research, Nepal
Dr. Venkatamallu Thadaboina, Program Officer Learning, India
Shishir G. Saha, Finance Officer
Ms. Hurain Jannat, Communication Officer
Dr. Usharani Boruah, Librarian, India
Dr. Lt. A. T. Kishore, Advisor, KhetiValah, India

Their presence reflected institutional commitment and collective support for strengthening knowledge-driven rural development initiatives across the region.

SCOPE AND SIGNIFICANCE OF THE PARTNERSHIP

Under this MoU, CIRDAP joins as a Knowledge and Supporting Partner for:

- **KhetiValah Global Agri Magazine**, a monthly knowledge platform dedicated to agriculture and rural transformation
- **KhetiValah Dialogues**, a multilingual global dialogue series connecting farmers, researchers, policymakers, and development professionals

The partnership aims to promote structured knowledge exchange, regional learning, and policy dialogue. By leveraging CIRDAP's institutional expertise and regional networks, the collaboration will enhance the quality, credibility, and outreach of knowledge dissemination across member countries.

This partnership is rooted in a shared vision to strengthen sustainable agriculture, rural livelihoods, and inclusive development through informed dialogue and collaborative action.

FUTURE DIRECTION OF THE PARTNERSHIP

The formalization of this partnership marks the beginning of a long-term engagement focused on capacity building, institutional collaboration, and dissemination of best practices across the Asia–Pacific region.

Through this alliance, KhetiValah platforms will amplify regional insights and transform them into practical knowledge resources that benefit farmers, rural communities, and development stakeholders.

Together, KhetiValah and CIRDAP reaffirm their commitment to advancing sustainable agriculture and resilient rural futures through knowledge-driven cooperation.

KrishiGuru
The Master of Agricultural Wisdom

KRISHIGURU – THE MASTER OF AGRICULTURAL WISDOM

Introducing KrishiGuru

A Global Expert Advisory Feature by KhetiValah Global Agri Magazine & KhetiValah Vidhyalaya

KrishiGuru is derived from two words: "*Krishi*", means agriculture, and "*Guru*", means teacher, guide, or master. Together, KrishiGuru represents "The Master of Agricultural Knowledge", reflecting a platform built to share trusted expertise and practical guidance across the global agricultural community.

Knowledge grows stronger when shared.
With this vision, *KhetiValah Global Agri Magazine (e-magazine),* in collaboration with KhetiValah Vidhyalaya, proudly introduces KrishiGuru – a dedicated monthly feature designed to connect agricultural knowledge seekers with global experts across the farming ecosystem.

KrishiGuru is more than a magazine section. It is a growing knowledge network that brings together farmers, scientists, researchers, students, agri-entrepreneurs, and domain specialists around the world.

Each month, this feature will dedicate **3 to 4 pages** to practical advisory, expert guidance, and field-driven solutions covering **-360degree agriculture and allied sectors**.

KrishiGuru will include expertise from crop science, horticulture, floriculture, livestock, aquaculture, agri-finance, insurance, post-harvest management, agri-inputs, agri-tech, AI in agriculture, smart farming, entrepreneurship, government schemes, policy issues, value addition, marketing, and sustainable farming practices.

How KrishiGuru Will Function Every Month

Each edition will feature:
Global KrishiGuru Experts
Every month, we will introduce newly joined KrishiGurus from different countries and agricultural disciplines, building an international network of trusted expertise.

Questions from Readers
Farmers, students, researchers, and agri-professionals can submit their questions related to agriculture and allied sectors.

Expert Answers & Advisory
Selected queries will be answered by KrishiGuru experts and published in the magazine, providing practical solutions and knowledge that benefit the wider agricultural community.

Knowledge Beyond Borders
KrishiGuru aims to create a bridge between scientific knowledge and field realities by making expert insights accessible to readers worldwide.

Calling Global KrishiGuru Experts

We invite agricultural experts, scientists, consultants, researchers, and practitioners from around the world to become part of the **KrishiGuru** network.

If you are passionate about sharing your expertise and guiding the agricultural community, join us as a **KrishiGuru**.

Send Your Questions | Become a KrishiGuru
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Whether you are seeking advice or ready to share knowledge, **KrishiGuru** welcomes you to become part of this growing global agricultural learning platform.

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KRISHIYASHAS - CAREER PATHWAYS FOR THE FUTURE OF AGRICULTURE

A Dedicated Career & Placement Feature in **KhetiValah Global Agri Magazine (e-magazine)**

Agriculture today extends far beyond traditional farming. The global agri ecosystem now offers diverse career opportunities across agribusiness, agri-technology, food processing, sustainability, exports, research, supply chains, precision farming, rural entrepreneurship, and international development. As the agriculture industry continues to evolve, there is a growing need to guide aspiring professionals toward meaningful career pathways while connecting talent with industry opportunities.

To support this vision, **KhetiValah Global Agri Magazine (e-magazine)** proudly introduces **KrishiYashas,** a dedicated feature focused on career guidance, professional development, and placement opportunities in agriculture and allied sectors.

KrishiYashas is designed to become a trusted platform for students, graduates, agri professionals, institutions, startups, companies, and organizations seeking to build stronger connections within the global agriculture ecosystem. Through this feature, readers will gain practical insights into industry expectations, emerging job roles, future-ready skills, and career opportunities available across agriculture and allied industries.

Every month, KrishiYashas will spotlight one agriculture-related career segment and provide valuable guidance on growth opportunities, skill requirements, professional pathways, and industry trends. This monthly focus will help readers explore sectors such as agronomy, agribusiness management, agri-finance, agri-tech innovation, farm advisory services, exports, sustainability, food systems, agri-marketing, livestock, horticulture, and many more.

One of the key objectives of KrishiYashas is to bridge the gap between industry requirements and emerging talent. Companies, organizations, agribusinesses, startups, institutions, and recruiters are invited to share their hiring needs, internship openings, placement opportunities, and skill requirements directly with our readers. This creates a meaningful platform where industry leaders can connect with a focused agriculture audience while helping aspiring professionals discover real opportunities.

KrishiYashas will also function as an interactive career support platform. Agriculture students and young professionals from around the world can submit their career-related questions, seek expert guidance, and receive practical direction for building successful careers in agriculture and allied sectors. Selected questions may be featured in upcoming editions, allowing readers to benefit from shared learning and expert advice.

Through this initiative, KhetiValah Global Agri Magazine (e-magazine) aims to create a strong ecosystem where learning, opportunity, mentorship, and professional growth come together. KrishiYashas is not only a feature but also a long-term effort to build industry-ready agri professionals and connect global agricultural talent with meaningful career pathways.

Connect With **KrishiYashas**

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Registration & Participation

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Stay connected with **KrishiYashas** and become part of a growing agriculture career network that supports talent, opportunities, and professional success across the global agri ecosystem.

MilletsCorner is a dedicated initiative of **KhetiValah Global Agri Magazine** focused on promoting millet-based knowledge, sustainable farming practices, nutrition awareness, value addition, and market opportunities.

Through this platform, we aim to connect farmers, researchers, institutions, and entrepreneurs to strengthen millet ecosystems and encourage climate-resilient agriculture, healthier food systems, and sustainable livelihoods.

YOUR PLATE IS YOUR MEDICINE

THE MILLET WAY TO A HEALTHIER LIFE

Dr. Johnson Stanley
CEO Nutrihub & Principal Scientist, ICAR-IIMR

Dr. Johnson Stanley is Director/CEO of Nutrihub and Principal Scientist at the **ICAR-Indian Institute of Millets Research**, Hyderabad, India. He is an experienced scientist specializing in technology innovation, millet value addition, crop protection, intellectual property management, and agri-business incubation. Through Nutrihub, he has supported over 120 start-ups and facilitated the commercialization of more than 100 agricultural technologies.

Dr. Stanley has contributed extensively to research, innovation, and entrepreneurship in the millet sector, with more than 30 scientific publications and several books on millet enterprises and technology ecosystems. His work has earned recognition from leading scientific bodies, including the National Academy of Agricultural Sciences and the Royal Society of Entomology.

Dr. Veeresh S. Wali
Chief Business Manager, Nutrihub – ICAR-IIMR

Dr. Veeresh S. Wali serves as Chief Business Manager at Nutrihub, ICAR-Indian Institute of Millets Research, Hyderabad, India. An agricultural economist with expertise in food policy and business strategy, he specializes in millet-based entrepreneurship, value chain development, and innovation management.

At Nutrihub, Dr. Wali leads initiatives supporting agri-business incubation, millet missions, and start-up ecosystems across India. His work connects policy, research, and enterprise to strengthen sustainable millet value chains and promote rural entrepreneurship.

Ms. Akkisetty Vyshnavi
Research Manager,Nutrihub, ICAR-IIMR

Ms. Akkisetty Vyshnavi is a Research Manager at Nutrihub, ICAR-Indian Institute of Millets Research, where she works on millet-based product development, food innovation, and functional foods. She holds an M.Tech in Food Processing and Food Engineering, with expertise in millet processing, value-added products, and nutraceutical formulation.

Her research focuses on improving nutritional quality, shelf life, and sustainable food processing technologies. She has contributed to scientific publications, book chapters, and research presentations, with particular interest in nutrition-sensitive food innovations and millet valorization.

Introduction

"Let food be thy medicine and medicine be thy food" has regained relevance in the context of rising non-communicable diseases, which account for nearly 74 percent of global deaths. This has led to growing attention on diet-based prevention and management strategies. Millets which primarily include sorghum (Sorghum bicolor), pearl millet (Pennisetum glaucum), finger millet (Eleusine coracana), and several other minor millets. Collectively termed ‹nutri-cereals,› are increasingly recognized as nutrient-dense functional foods. Their importance has been reinforced globally, including recognition during the International Year of Millets 2023, highlighting their role in nutrition security and sustainable food systems (Witkamp and Van Norren, 2018; World Bank, 2025).

Evidence indicates that regular millet consumption supports cardiometabolic health by improving blood glucose, lipid profile, blood pressure, and body weight, largely due to their high fiber content and slow digestibility. They also contribute to better gut health and help address micronutrient deficiencies. In contrast to modern diets dominated by refined foods, millets offer a balanced nutritional profile, positioning them as a practical dietary choice where everyday food habits contribute directly to health outcomes, making the concept of "your plate as your medicine" both relevant and actionable (Samtiya et al., 2023, Bhattacharya, 2023).

Recent systematic reviews further support their therapeutic benefits, reporting significant improvements in glycemic control and cardiovascular risk factors (Anitha et al., 2021a; 2021b). These findings position millets as functional foods with dual potential to address both lifestyle diseases and micronutrient deficiencies.

Section	Key Benefit	Mechanism	Specific Outcomes
Low Glycemic Index	Supports diabetes management	Slow release of glucose into bloodstream	Prevents blood sugar spikes; suitable for type 2 diabetes prevention and control
Dietary Fiber Rich	Improves gut health	High fiber content aids digestion and gut function	Better digestion, reduced constipation, improved gut microbiota, enhanced satiety and weight management
Micronutrient Dense	Addresses nutrient deficiencies	Contains essential vitamins and minerals	Iron for anemia prevention; Calcium for bone strength; Zinc for immunity; Magnesium & B vitamins for metabolism and nerve function
Gluten-Free Nature	Suitable for special dietary needs	Naturally free from gluten and easy to digest	Ideal for gluten intolerance and celiac disease; suitable for children, elderly, and patients

Nutritional Excellence

a. Macronutrient & Protein Quality

Millets exhibit superior nutritional density compared to conventional cereals. Protein content ranges from 6.3%–22.3% across varieties; pearl millet averages 15.5%–significantly higher than rice (7–8%) and wheat (10–12%) (Singh et al., 2024). Millets contain 50% higher methionine and cysteine than legumes, and millet-legume combinations (3:1 ratio) achieve protein digestibility scores exceeding 95%, rivaling animal protein sources (Anitha et al., 2022b).

b. Micronutrient Density

Finger millet provides exceptional calcium (38–450 mg/100g), while pearl millet delivers substantial iron (24–145 mg/kg) and zinc (22–96 mg/kg). A meta-analysis of 22 human intervention studies showed millet diets produced a 13.2% increase in haemoglobin versus only 2.7% in control groups (Anitha et al., 2021b). Traditional processing–fermentation and germination increase bioavailable iron by 3.4 times and 2.2 times respectively, addressing micronutrient deficiency without synthetic supplementation.

Evidence-Based Therapeutic Benefits

a. Diabetes & Glycemic Control

Millets have a mean glycemic index (GI) of 52.7 ± 10.3–approximately 36% lower than milled rice (71.7) and refined wheat (74.2) (Anitha et al., 2021b). Long-term consumption reduces fasting blood glucose by 12% and post-prandial glucose by 15% ($p<0.01$). In prediabetic individuals, regular millet consumption reduced HbA1c from 6.65% to 5.67%, potentially preventing progression to type 2 diabetes. These effects stem from high fiber (up to 38%), resistant starch (53–81%), and α-glucosidase/α-amylase inhibition.

b. Cardiovascular Health

A meta-analysis of 19 studies confirmed that millet consumption over 21 days to 4 months significantly improved lipid profiles: total cholesterol fell 8%, LDL by 10%, triacylglycerol by 9.5%, and HDL rose 6% (all $p<0.01$). Systolic and diastolic blood pressure declined by 4–5%, and BMI reduced by 7%. Polyphenols, flavonoids, and phytosterols in millets modulate cholesterol metabolism, while research in animal models revealed anti-atherogenic effects through the FGF-2/PI3K/Akt pathway.

c. Weight Management & Gut Health

Foxtail millet consumption over 12 weeks reduced body fat (22.1 to 21.1 kg) while preserving muscle mass. Millets promote satiety through elevated leptin levels and their high fiber

content. Additionally, millet›s prebiotic effects—through resistant starch and fiber—increase Bifidobacterium and Lactobacillus populations while reducing pathogenic bacteria. Enhanced short-chain fatty acid (SCFA) production supports intestinal barrier integrity, reduces inflammation, and improves glucose metabolism (Chen et al., 2022).

d. Cancer Prevention

Polyphenols and phenolic acids in millets exhibit antioxidant and anti-inflammatory activity. Foxtail millet protein showed anti-proliferative effects on cancer cell lines; browntop millet metabolites demonstrated anti-cancer activity particularly against breast and colorectal carcinoma cells. Millet compounds modulate NF-αB and Nrf2 pathways and have shown efficacy in relieving colitis through gut microbiota regulation.

Sustainability & Global Impact

Millets require 30% less water than rice, thrive in temperatures up to 45°C, and grow in marginal soils with minimal inputs making them ideal for climate-vulnerable regions. Their low environmental footprint aligns with global sustainable agriculture goals. From a public health perspective, wider millet adoption could substantially reduce healthcare costs associated with diabetes, cardiovascular disease, and micronutrient deficiencies, offering a cost-effective, population-level intervention.

Conclusion

The scientific evidence firmly supports millets as functional foods capable of preventing and managing chronic diseases. Their low glycemic index, exceptional micronutrient density, cardioprotective properties, and prebiotic effects position them as powerful tools for preventive medicine. Traditional food as medicine wisdom now has modern, evidence-based validation. Coordinated efforts among researchers, clinicians, policymakers, and food industry stakeholders are needed to translate this evidence into practical dietary interventions—making the plate our medicine, one grain at a time.

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Dr. Annangi Subba Rao is a distinguished soil scientist and former Director of the ICAR–Indian Institute of Soil Science, Bhopal, with a distinguished career in soil fertility, plant nutrition, and sustainable nutrient management. He has led several national and externally funded research projects and has made significant contributions to developing farmer-centric technologies for balanced fertilization and soil health improvement.

Dr. Rao has authored and co-authored numerous scientific publications, technical bulletins, and extension materials, contributing to both academic research and field-level application. His work has been widely recognized for advancing integrated nutrient management practices and promoting resource-efficient, sustainable crop production systems across diverse agro-ecological regions.

A.Subba Rao

Ex.Director
ICAR-IISS ,Bhopal

Potassium role and importance

Potassium is the third major nutrient, after nitrogen and phosphorus, required in large amounts for growth,

development, and production and quality grains/seeds of crops The K is needed for improving photosynthesis, water regulation and enzyme action in plants. Potassium is also needed for disease resistance and drought tolerance under stress environments in crop plants. Potassium requirement of crops generally exceeds that of N and P. Crop plants meet their K requirement from soil and external application of fertilizer and organic sources like manure, compost and crop residues. Muriate of potash (KCL) is a common potassic fertilizer source used in India which is 100% imported. In India potassic fertilizer consumption declined by 48% from3.6 million tonnes in 2009-10 to 1.9 million tonnes in 2023-24, resulting in further imbalanced crop K nutrition.

What is organic recycling

Organic recycling in agriculture involves converting various kinds of organic waste such as cereal crop residues, organic manures, wood ashes, industrial byproduct organic wastes like food and sugarcane industries and food scraps into valuable nutrient sources like compost, vermi-compost and returning them to soil to enhance soil health and to reduce reliance on chemical fertilizers. Organic recycling through return of crop residues or manures and compost application may substantially reduce the fertilizer K requirement and save valuable foreign exchange.

Organic recycling is a vital and sustainable method for managing potassium (K) nutrition in crop plants, recycling 70-80 % of K from crop residues or wastes. The key sources include crop residues (straw and stalks), animal manures and wood ash. This approach reduces fertilizer dependence, improves soil fertility and is highly efficient as K from organic resources is readily released and made available to plants.

Key aspects of organic waste recycling

Agricultural and horticultural wastes, often considered by- product biomass, are rich sources of organic potassium. Utilizing these materials in their raw, compost, ash or biochar forms provide a substantial, cost-effective alternative to commercial mineral fertilizers, with many sources containing as high as 1 to 7%K.

Sources of organic K

The major sources of organic potassium are crop residues, domestic/kitchen waste, industrial organic waste, animal waste, wood ash and biomass ash. Among organic residues, straw, nutshells and husks are prime sources .Wood ash and biomass ashes are highly concentrated sources of K.

Recycling and sustainability

Organic recycling converts wastes into nutrient rich composts reducing environmental risks due the dumping these wastes. The common techniques of recycling are composting, vermi-composting and biomethanation.

Composting: Microorganisms, under aerobic condition, breakdown organic wastes into value added compost, reducing the waste volume at least by half.

Vermi-composting: Utilizing earthworms for faster, more nutrient rich and eco-friendly waste conversion to compost. Composts constitute a readily available source of K for plants.

Biomethanation: This process produces biogas for energy and slurry as a nutrient source.

Release Efficiency

Potassium ions K+ are highly mobile and readily solubilize from plant materials into soil solution, thus easily available to crop plants.

Nutrition and health benefits

Organic amendments improve soil fertility, soil structure and water infiltration and retention along side nutrient supply.

High potassium demanding crops

High potassium demanding crops in India include tuber crops (potato, sweet potato, cassava) fibre crops(cotton and jute),plantation crops(banana, coconut, rubber, tea, coffee) and sugar crops(sugarcane).These crops require high K for their enzyme activation ,sugar transport, water regulation ,yield and grain/seed quality.

Potassium –rich crops include staples like rice, wheat and maize, along with high-demanding crops such as soybean, sunflower and turmeric. Leafy vegetables like spinach and amaranth as well as legumes (lentils) also contain high potassium levels. These crops require substantial potassium for their high yield and quality, especially under intensive farming.

Crop residues and their K supplying potential

Cereals

Rice, wheat and maize are major consumers of K and the K concentration in plant tissues (straw, stalks and husk)vary from 1.22 to 3.8 %.Rice

straw contains significant amount of K(2.1-2.7%.Similarly wheat straw contains 1.2-3.7% K making it a valuable source of organic K. Maize residues (straw and stalks)provide a substantial amount of K(around 1.5%K) .In cereal crops more than 60% of the K taken up by the crop will be in straw portion. So returning of straw portion of cereals to soil helps in provision of around 60% of their K requirement.

Oilseeds:

Soybean is high K demanding crop and the crop K uptake is 60-70 kg/

ha when crop yield level is greater than 2500kg. After harvesting, 50 % K remains in the crop residues and is readily available for recycling.

Horticultural Waste

Banana peels and stems contain exceptionally high amount of K. Banana removes as high as 400 kg K per ha. The pseudo-stem I is re-

tained in the field while the banana bunches are removed from the field. The stem portion of papaya and pineapple also can be retained and fruits be harvested. Considerable amount of K can be retained in the field (Around 400kg/ha). In case of Banana the central core stem can be processed into various by products and the peel is a source for composting or producing high-K fertilizer.

Papaya and pine apple both fruits and the plant residues contain substantial amounts of K. A papaya fruit may contain140-182 mg K per 100g of raw fruit .Pine apple also contains around 140 mg per 100g fruit.

Grape stalks and pomace from wineries are high in K with wine lees containing as much as 7.3% K.

Citrus pulp and various market wastes are rich in K. Dried citrus pulp typically contains 9.4g/kg to 12g/kg dry matter.

Cacao husks are highly rich in potassium, the concentration ranging from 2.8to 7.7 %, making them excellent organic soil amendment.

Coffee husk and pulp, coffee by-products are also a K rich source, with husks contains around 3.47 to 4.57% K.

Spinach and amaranth are very rich in K, providing around 550 mg per 100g (raw).

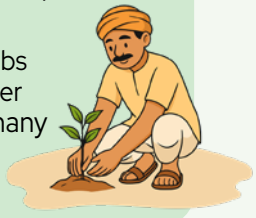
Potassium derived from molasses ,a byproduct of sugar industry ;has a minimum of 14.5% potash and can be used as alternative to potassic fertilizer. Sugarcane industry waste is being used to supplement nutrients. Press mud is composted.

Commercial Crops

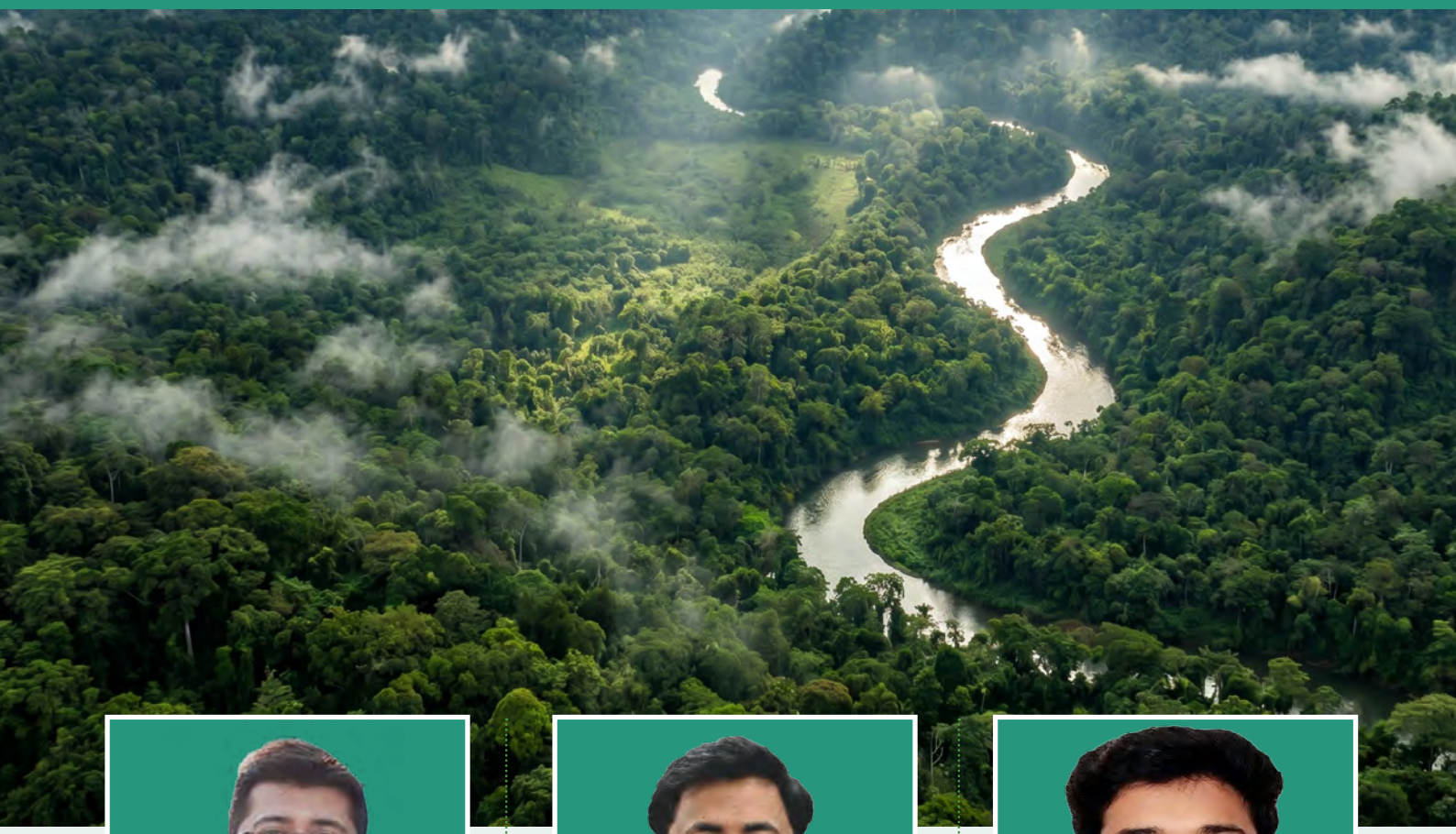
Turmeric, grown in Andhra Pradesh and Telangana require high amounts of K for enhancing rhizome weight and curcumin content. Tobacco stems are also very good source of K with K concentration of 7.0%.

Agri Facts

- India supplies nearly 80% of global guar gum used in food and oil drilling industries.
- Iceland grows vegetables using geothermal-powered greenhouses.
- Bamboo absorbs more carbon per hectare than many tree species.



THE AI-POWERED CANOPY REVOLUTIONIZING FOREST HEALTH AND YIELD PREDICTION



Dr Yogesh Yadavrao Sumthane
Assist. Professor cum Scientist
Department of Forest Products,
College of Forestry Banda,
University of Agriculture and
Technology Banda,
Uttar Pradesh, India.

Dr. Arjun Paul
Assistant Professor,
Training & Placement Incharge
Mahamaya College of Agricultural
Engineering & Technology,
ANDUAT, Kumarganj, Ayodhya, (U.P)

Dr. Ashish Pawar
Assistant Professor, CTAE, Agriculture
University, Jodhpur, Rajasthan, India

Abstract

Forests are vital ecosystems that regulate climate, support biodiversity, and provide essential economic resources. However, forest health is increasingly threatened by climate change, pest outbreaks, wildfires, and illegal logging. Traditional forest monitoring methods, largely based on ground surveys, are slow, labor-intensive, and limited in spatial coverage. Recent advancements in Artificial Intelligence (AI), remote sensing, and cloud computing have enabled a transformative approach known as the AI-Powered Canopy. This system integrates satellite imagery, drone-based monitoring, LiDAR scanning, and IoT sensor networks to provide real-time assessment of forest conditions. Deep learning algorithms can detect early disease symptoms through spectral anomalies, predict wildfire risk, and improve timber yield estimation using 3D inventory models. Furthermore, AI-driven biomass quantification enhances transparency in carbon credit markets. Despite challenges such as data standardization and computational costs, emerging technologies like edge computing and digital twins promise to advance precision forestry. AI-powered canopy intelligence is becoming a crucial tool for sustainable forest ecosystem stewardship.

Keywords: AI-Powered Canopy, Precision Forestry, Remote Sensing, Deep Learning, Forest Health Monitoring, Yield Prediction, Wildfire Risk Prediction, Digital Twins

1. Introduction

Forests are often described as the "lungs of the planet" due to their critical role in carbon sequestration and oxygen production (FAO, 2020). They provide ecological services such as biodiversity conservation, watershed regulation, and climate stabilization **(Pan *et al.*, 2011).** In addition, forests support global economies through timber production and non-timber forest products **(Kleinschmit *et al.*, 2016).**

However, forest ecosystems worldwide are facing unprecedented threats. Climate change has intensified drought conditions, increasing susceptibility to pest infestations and wildfires **(Allen *et al.*, 2015)**. Illegal logging continues to degrade forest cover, reducing ecosystem resilience and accelerating biodiversity loss (Nellemann, 2012). Conventional forest monitoring methods rely heavily on manual field surveys, which are time-consuming, expensive, and limited in spatial scale **(Wulder *et al.*, 2012).** To overcome these limitations, the integration of AI with remote sensing technologies is driving a new era of precision forestry. The concept of the AI-Powered Canopy represents a paradigm shift where forest health and growth patterns can be continuously monitored, analyzed, and predicted using intelligent systems **(Gartner & Reif, 2021)**. This approach enables proactive forest management, allowing early intervention before ecological damage becomes irreversible

2. The Challenge of Conventional Forest Monitoring

Historically, forest inventory has been conducted through ground-based sampling plots, where foresters measure tree diameter, height, and species composition **(Avery & Burkhart, 2015)**. While accurate at local scales, such surveys provide only limited snapshots of forest conditions and require extrapolation across vast landscapes, introducing uncertainty **(McRoberts *et al.*, 2010)**.

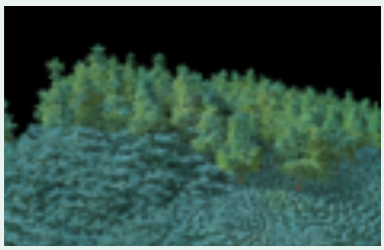
The challenges of traditional monitoring include:

- Delayed detection of pest and disease outbreaks, often after visible symptoms appear **(Raffa *et al.*, 2008)**.

Figure 1 : Workflow of AI-Powered Canopy System

Satelite Capture

LIAV



IoT Sensors

- Limited capacity to assess large forest regions efficiently **(Wulder *et al.*, 2012)**.
- Inaccurate timber yield predictions due to lack of high-resolution structural data (White et al., 2016).
- Difficulty in quantifying carbon stocks, which is essential for climate mitigation and carbon credit systems **(Gibbs *et al.*, 2007)**.

These limitations highlight the urgent need for advanced technologies capable of monitoring forests at scale with high precision.

Table 1. Technologies Used in AI-Powered Canopy System

Technology	Application	AI Model Used
Sentinel-2	Forest cover monitoring	CNN
UAV Hyperspectral	Disease detection	CNN
LiDAR	Biomass estimation	Random Forest
IoT Sensors	Soil & climate monitoring	LSTM

3. Bridging the Gap: AI and Remote Sensing

The AI-Powered Canopy is built upon the synergy between multi-source remote sensing data and advanced machine learning algorithms. Remote sensing platforms provide continuous, large-scale observation of forest landscapes (Cohen & Goward, 2004).

3.1 Data Sources

Modern precision forestry integrates diverse datasets:

- Satellite imagery (Sentinel, Landsat) for monitoring vegetation cover and forest degradation **(Hansen *et al.*, 2013)**.
- Drone-based hyperspectral imaging for detecting subtle physiological stress signals **(Zhang *et al.*, 2019)**.
- LiDAR scanning for capturing 3D forest structure and biomass estimation ***(Lefsky et al., 2002).***
- IoT sensors for measuring temperature, humidity, and soil moisture in real-time **(Hart & Martinez,2006)**.

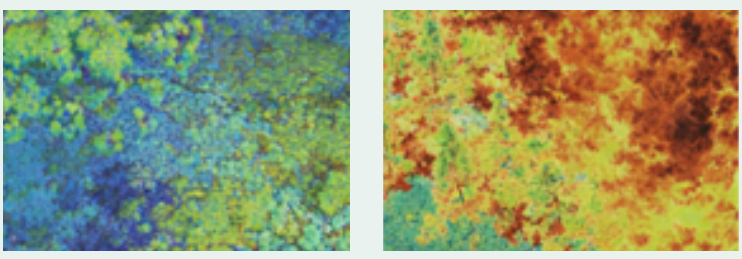
The integration of these technologies generates massive datasets, requiring AI for effective interpretation.

3.2 AI and Deep Learning Models

AI models, particularly deep learning, have demonstrated strong performance in analyzing complex forest data **(LeCun *et al.*, 2015)**. Convolutional Neural Networks (CNNs) are widely applied for tree species classification and disease detection from aerial imagery **(Minařík & Langhammer, 2016)**. Similarly, Long Short-Term Memory (LSTM) networks are used for predicting forest growth trends and wildfire occurrence based on temporal patterns **(Zhu *et al.*, 2017)**.

Figure 2. Multi-source data acquisition in AI-powered canopy monitoring

3.1 Data Sources



Healthy Diseased

4. Key Applications of the AI-Powered Canopy

4.1 Early Disease and Pest Detection

One of the most significant applications of AI-powered canopy monitoring is the early detection of forest diseases. Hyperspectral sensors can capture changes in chlorophyll content and leaf reflectance before symptoms become visible **(Asner & Martin, 2008)**. AI algorithms identify spectral anomalies linked to pest infestation, enabling rapid response **(Pontius *et al.*, 2008)**.

4.2 Wildfire Risk Prediction

Wildfires are increasing globally due to climate-driven drought and rising temperatures (Bowman *et al.*, 2009). AI models can integrate vegetation dryness indices, weather conditions, and historical fire data to generate predictive wildfire risk maps (Jain *et al.*, 2020). Such tools allow forest agencies to allocate resources more effectively.

4.3 Timber Yield and Inventory Prediction

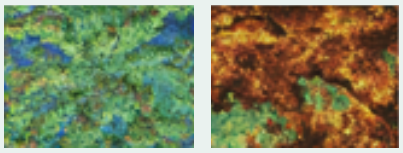
Accurate timber yield estimation is essential for sustainable forest management. LiDAR-derived 3D models provide detailed measurements of tree height, crown structure, and stand density **(Popescu *et al.*, 2011)**. AI-based inventory systems improve yield forecasting and reduce uncertainty in timber supply chains **(White *et al.*, 2016)**.

4.4 Carbon Stock and Ecosystem Services

Forests play a central role in climate mitigation through carbon sequestration **(Pan *et al.*, 2011)**. AI-driven biomass quantification enhances transparency in carbon credit markets by providing verifiable carbon stock assessments **(Gibbs *et al.*, 2007)**. This ensures accountability in climate finance initiatives.

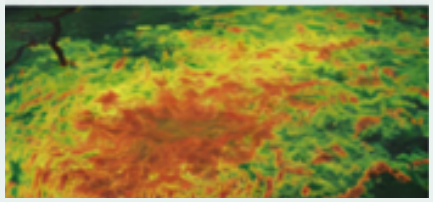
Figure 3. Spectral anoomidy dot-cactatices and shrece urte hyperspectral imagery.

4.1 Early Disease and Pest Detection



Healthy Diseased

4.2 Wildfire Risk Prediction



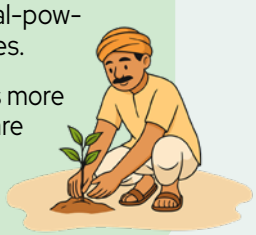
5. Challenges and Future Directions

Despite its transformative potential, the AI-Powered Canopy faces challenges. Data standardization remains a major obstacle, as remote sensing datasets vary across regions and platforms **(Wulder *et al.*, 2012)**. Computational costs and limited access to high-performance infrastructure may restrict adoption in developing countries **(Gartner & Reif, 2021)**.

Future advancements such as edge computing, which enables real-time processing at sensor level, will reduce dependency on cloud systems **(Shi *et al.*, 2016)**. Additionally, digital twin forests, virtual replicas of ecosystems, offer new opportunities for simulating forest dynamics and testing management strategies **(Liu *et al.*, 2021)**.

Agri Facts

- India supplies nearly 80% of global guar gum used in food and oil drilling industries.
- Iceland grows vegetables using geothermal-powered greenhouses.
- Bamboo absorbs more carbon per hectare than many tree species.



6. Conclusion

The AI-Powered Canopy represents a revolutionary step toward intelligent and sustainable forest management. By integrating AI, remote sensing, and IoT technologies, it enables early disease detection, wildfire prediction, accurate yield estimation, and carbon stock monitoring. Although challenges persist, emerging innovations such as digital twins and edge AI promise to further enhance ecosystem stewardship. AI-powered forestry will be essential in safeguarding global forests against future environmental threats.

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CHALLENGES OF THE FARMER AS A CONSUMER

Prof. Narasimha Nakshathri Karkada is a seasoned agriculture and horticulture specialist with over four decades of experience in agricultural extension, cooperative development, and agri supply chain management. He has worked closely with the National Dairy Development Board during the era of Dr. Verghese Kurien and played a pioneering role in developing farmer-led vegetable marketing models through SAFAL Growers Associations.

His corporate leadership spans organizations such as Global Green Company, Aditya Birla Retail, and Metro Cash & Carry India, where he contributed to building fresh produce supply chains and farmer-market integration. Prof. Nakshathri is also an advisor, mentor, and consultant supporting agri-entrepreneurship, food processing, and producer organizations across India.

Prof. Narasimha Nakshathri Karkada

President- Akhil Bhartiya Grahak Panchayat, Karnataka Prant
Mentor - Agro& Food Processing Experts Committee, BCIC, Bengaluru
Advisory Board Member -Sahaja Samruddha Organic Producers Company, Bengaluru
Former Pro -Vice Chancellor ,BESTI, AP
Former National Head Fresh Food Division - Metro Cash & Carry India Pvt Ltd. Bengaluru,
Former Head Backward Linkages -Safal Fruit & Vegetables Auction Maraket , Bengaluru
Former Sr. Manager , Agri Division, Global Green Company Ltd., Bengaluru

When we speak about farmers, we often describe them as producers – providers of food, guardians of the land, and contributors to national food security. Rarely do we pause to recognize a simple but uncomfortable truth: the farmer is also a consumer, and in many ways, a highly vulnerable one.

Through 45+ years of interaction with farming communities across regions, I have observed a paradox that should deeply concern every conscious citizen and consumer organization. The very hands that grow food for the nation often struggle to access safe, nutritious, and dignified consumption for their own families. This contradiction lies at the heart of many systemic failures in our agricultural and market structures.

The Farmer's Income Paradox

A farmer produces value, yet often lacks purchasing power. Income from farming is seasonal, uncertain, and highly dependent on weather, market fluctuations, and input costs. While consumers expect stable prices and quality produce, farmers face unpredictable earnings that make even basic household consumption a challenge.

As consumers, farmers must purchase essentials such as cooking oil, pulses, vegetables, healthcare services, education, clothing, and household goods – often at retail prices similar to urban consumers, but with far lower income stability. This mismatch forces farmers to compromise on quality, nutrition, and long-term well-being.

Food Producers Consuming Inferior Food

One of the most painful realities is that many farmers do not consume the same quality of food they grow or sell. Financial pressure often compels them to sell their best produce and retain lower-grade or leftover stock for household use. In some cases, farmers purchase cheaper, lower-quality food from the market because their own crops are grown for sale, not for self-consumption.

This results in nutritional deficiencies, poor health outcomes, and increased medical expenses – further weakening the farmer's economic position. When the producer of food is unable to consume good food, it is not merely an individual problem; it is a structural failure.

Farmers as Consumers of Agricultural Inputs

Farmers are major consumers of seeds, fertilizers, pesticides, machinery, and advisory services. Unfortunately, this input market is one of the most opaque and exploitative. Misinformation, aggressive marketing, and lack of independent guidance often lead farmers to purchase unnecessary or harmful inputs at high costs.

As consumers in this market, farmers rarely enjoy the protections that urban consumers expect. Quality assurance is weak, accountability is limited, and grievance redressal mechanisms are often inaccessible. When crops fail due to faulty inputs, the farmer bears the entire loss.

Healthcare and Education: Hidden Consumer Burdens

Health and education are critical consumption needs for farming families. Yet rural healthcare remains inadequate and expensive. Preventable illnesses, often linked to chemical exposure and poor nutrition, result in high out-of-pocket expenses. For many farmers, a single medical emergency can erase years of savings.

Similarly, education costs continue to rise, forcing farmers to choose between investing in their children's future and sustaining their farming operations. As consumers of these essential services, farmers face limited choices and high vulnerability.

Market Structures That Ignore Farmer-Consumers

The existing market ecosystem treats farmers primarily as suppliers, not as participants in consumption-driven economic planning. Consumer protection policies, pricing mechanisms, and quality standards are rarely designed with farmers' consumption realities in mind.

While urban consumers benefit from choice, information, and competition, farmers often operate in monopolistic or poorly regulated markets – whether buying inputs or selling produce. This imbalance deepens inequality and erodes trust in the system.

Psychological and Social Costs

Beyond economics, the farmer as a consumer carries a heavy psychological burden. Continuous financial stress, social expectations, and uncertainty about the future affect mental health and family stability. Consumption decisions that urban consumers make casually – such as medical treatment, nutritious food, or education – become sources of anxiety for farming households.

This silent pressure contributes to social distress, migration, and loss of confidence in agriculture as a dignified livelihood.

Re-framing the Farmer as a Protected Consumer

If we are serious about strengthening agriculture and food systems, we must begin by recognizing farmers as consumers deserving of protection, transparency, and fairness. Consumer movements like ABGP have a vital role to play in expanding the definition of consumer welfare to include farmers explicitly.

Policies must ensure fair input pricing, reliable advisory systems, accessible healthcare, and education support for farming families. Market reforms should aim to reduce exploitation and restore dignity to the farmer's role as both producer and consumer.

Building Ethical Consumer–Farmer Linkages

A sustainable solution lies in closer consumer–farmer relationships built on trust and mutual respect. When consumers understand the realities faced by farmers, and when farmers receive fair value and consistent demand, the system becomes more humane and resilient.

Ethical market models that emphasize transparency, long-term partnerships, and shared responsibility demonstrate that such balance is possible. These models remind us that consumption is not just an economic act, but a moral one.

Conclusion

The farmer's challenges as a consumer are not isolated issues; they reflect the health of our entire food and economic system. A society that fails its farmers as consumers ultimately fails itself.

Recognizing, respecting, and protecting farmers in their role as consumers is essential for true food security, social stability, and national well-being. As a consumer organization committed to fairness and ethics, ABGP must continue to bring this perspective into public discourse and policy advocacy.

Only when the farmer can consume with dignity will the nation truly prosper.

Agri Facts

- Honey bees communicate through movement patterns.
- Agricultural insurance supports risk management.

RETHINKING INDIA'S AGRI-FOOD GLOBAL VALUE CHAIN STRATEGY IN A RAPIDLY TRANSITIONING WORLD

Prof. Vidya Vemireddy is a faculty member at the Centre for Management in Agriculture (CMA), Indian Institute of Management Ahmedabad, India, with expertise in agricultural policy, food systems, climate resilience, and gender in agriculture. Her work focuses on strengthening agri-food systems through research, policy analysis, and stakeholder engagement.

She has contributed extensively to research and advisory work on climate-smart agriculture, market linkages, and inclusive development, with a strong emphasis on gender-responsive approaches in agriculture. Prof. Vemireddy's work significantly examines the impact of women's empowerment on household and intra-household nutrition, highlighting the role of gender equity in improving food systems and community well-being. She collaborates with national and international organizations, bridging academic research with practical, field-level insights to support sustainable and equitable agricultural development.

Prof. Vidya Vemireddy

Faculty, Centre for Management in Agriculture (CMA)
Indian Institute of Management Ahmedabad (IIMA), India
Expert in Agricultural Policy, Food Systems & Gender in Agriculture

India's role in global agricultural value chains has expanded steadily, but on what terms? As supply chains become more risk-aware and efficiency-driven, the question is no longer simply about participation, but about positioning: how should a country balance global integration with

the imperatives of domestic food and nutritional security? At the heart of this lies the structure of agricultural value chains themselves. Far from being neutral conduits between producers and consumers, these chains shape how risks are distributed, how value is captured, and ultimately, how food security is experienced within a country.

In mid2023-, when India restricted non-basmati rice exports, the move sent ripples across global markets. Prices surged in parts of Africa and Southeast Asia, and familiar criticisms of protectionism, unpredictability, and policy overreach resurfaced. Yet, beneath the noise, the episode revealed something more fundamental: global agricultural value chains are no longer governed by the logic of seamless interdependence. They are being recalibrated for a world where disruption is the norm, not the exception.

India's decision was not an outlier. Between 2020 and 2024, over 30 countries imposed some form of food export restriction, according to the World Bank tracker. What is emerging is not deglobalisation, but a strategic rebalancing where resilience increasingly shapes trade behaviour.

The End of "Friction-less" Food Chains

For nearly three decades, global agri-food systems operated under the implicit assumption that trade flows would remain largely uninterrupted. This allowed value chains to stretch geographically. Soybeans from Brazil fed livestock in China; Ukrainian wheat supplied North Africa; fertilisers sourced from a handful of countries supported production across continents.

This model delivered efficiency but at the cost of concentration risk.

According to World Bank food security updates (24–2022), over %70 of global wheat exports are concentrated among a few countries. Similarly, fertiliser markets are heavily dependent on a limited number of suppliers. When disruptions occur, whether due to conflict, sanctions, or climate shocks, the ripple effects are immediate and global.

What is changing now is not trade per se, but its architecture. Countries and firms are building

redundancy into supply chains: diversifying sourcing geographies, investing in domestic buffers, and shortening certain value chain segments. McKinsey's report on supply chain resilience notes that companies are increasingly

willing to trade off short-term efficiency for long-term stability, particularly in critical sectors like food.

In agriculture, this translates into a hybrid model: global networks layered with regional and domestic safeguards.

India's Paradox: Surplus Producer, Nutritional Deficit

India's position within this evolving system is paradoxical. It is among the world's largest producers of rice, wheat, milk, and pulses, and a major exporter of several commodities. Yet, it continues to grapple with nutritional challenges at scale.

This paradox is not merely about income or access. It is structurally rooted in the composition of production and the configuration of value chains.

Public policy has historically prioritised staple grain production, supported by minimum support

prices (MSP), procurement, and distribution through the Public Distribution System (PDS). This architecture has been remarkably successful in ensuring caloric security. India's buffer stocks have often exceeded normative requirements, enabling it to act as a stabilising force in domestic markets.

However, as multiple studies, including those referenced in food systems resilience literature, emphasise, resilience cannot be measured solely in terms of grain availability. It must account for dietary diversity, supply chain flexibility, and the system's ability to absorb shocks without compromising nutritional outcomes.

India's production systems remain skewed toward cereals, particularly rice and wheat. Meanwhile, demand-side shifts driven by urbanisation and rising incomes are increasing the consumption of proteins, fruits, vegetables, and processed foods. This mismatch creates both economic inefficiencies and nutritional gaps.

The policy push toward millets, pulses, and oilseeds aims to correct this imbalance. But production incentives alone are insufficient. Without corresponding investments in value chains processing, storage, branding, and market development, diversification will remain limited.

The Quiet Bottleneck: Midstream Value Chains

Much of the discourse on Indian agriculture oscillates between farm-level productivity and consumer-level affordability. The "missing middle" is the value chain that connects the two.

It is here that inefficiencies accumulate.

Post-harvest losses in fruits and vegetables are estimated at –15 %25, largely due to inadequate storage and logistics. Cold chain penetration remains low relative to production volumes. Processing levels for perishable commodities are significantly below global benchmarks.

India's agri-sector consistently highlights this midstream gap as a key constraint on value

realisation. Farmers capture a limited share of final consumer prices, while consumers often face high price volatility. The value chain, instead of smoothing these outcomes, amplifies inefficiencies.

This has implications beyond domestic markets. Global value chains increasingly demand consistency of quality, volume, and standards. Fragmented aggregation and weak logistics make it difficult for Indian producers to reliably participate in high-value export segments.

This is where the importance of value addition in rural production clusters becomes evident. When processing, grading, and packaging are located closer to the farm gate, it not only reduces logistical friction and wastage but also enables farmers to capture a greater share of the final value. In effect, value addition at the local level can transform agricultural supply chains from mere channels of movement into engines of income generation.

Farm → Local Aggregation → Rural Processing → Integrated Logistics → Market/Export
↑ (FPOs, platforms) ↑ (Food parks, SMEs)

→ Value addition near farm gate
→ Higher farmer income
→ Better quality, traceability
→ Reduced wastage and volatility

Firms as Architects of Modern Value Chains

If value chains are being rewired, firms are doing much of the rewiring.

Across global agriculture, large companies are no longer just traders or processors; they are increasingly shaping how production itself is organised. Firms like Cargill and ADM now operate deeply embedded sourcing systems, working directly with farmers, deploying digital traceability tools, and enforcing sustainability standards across geographies. Nestlé, for instance, has begun mapping its supply chains down to farm-level sourcing in several commodities, pushing compliance requirements upstream rather than managing them at the point of export.

What this means in practice is simple: price is no longer enough to secure market access. Standards on traceability, emissions, and sourcing practices are becoming entry conditions.

For India, the implications of this shift are already visible. Between 2022 and 2024, several Indian agricultural exports, particularly spice and rice consignments, were flagged in EU markets for pesticide residues and contamination, reflecting the difficulty of enforcing consistent standards across fragmented supply chains. These are not isolated incidents; they reflect the difficulty of enforcing consistent standards across fragmented supply chains. At the same time, when India imposed restrictions on non-basmati rice exports in 2023, global buyers quickly diversified toward Vietnam and Thailand, not necessarily because they were cheaper, but because they offered greater policy predictability and supply chain reliability.

India does have counterexamples. In basmati rice, companies like LT Foods and KRBL Limited have built integrated systems that link farm procurement with branding and export markets. Similarly, in marine exports, compliance with strict traceability norms has enabled Indian firms to retain access to high-value markets despite tightening regulations.

But these successes remain sector-specific.

A large part of India's agricultural economy still operates through dispersed procurement systems, where quality varies, and traceability is limited. In contrast, countries like Brazil have built tightly integrated soybean and meat value chains, while Vietnam has aligned its coffee exports with global certification systems in less than two decades.

Efforts to bridge this gap are visible but uneven. Farmer-Producer Organisations (FPOs) are attempting to aggregate smallholders, while platforms like Ninjacart and DeHaat are building more direct farm-to-market linkages. Public-private partnerships in agri-tech are also beginning to reduce inefficiencies in logistics and aggregation. Yet the underlying challenge remains coordination.

Global value chains are increasingly rewarding the ability to deliver consistency at scale. For India, the focus needs to be shifted towards value creation and that comes from structural changes in the organisations. Until value chains can reliably aggregate, standardise, and certify output, much of India's agricultural strength will remain locked in lower-value segments.

Climate Risk as a Value Chain Disruptor

Climate change is often discussed in terms of yields, but its impact on value chains is equally significant.

Extreme weather events disrupt logistics networks, damage storage infrastructure, and create sudden mismatches between supply and demand. Temperature increases affect not just output but also crop quality, altering protein content, shelf life, and processing characteristics.

Climate variability interacts with food systems across multiple dimensions, amplifying both production and distribution risks.

Water stress adds another layer of complexity. Crops that are

environmentally unsustainable today become economically unviable tomorrow, as seen in water-intensive rice cultivation in Punjab and Haryana, or sugarcane in Maharashtra, where groundwater depletion and rising input costs are already eroding long-term viability.

These are the regions that form the backbone of grain procurement in India. This raises fundamental questions about the sustainability of existing value chains.

Global buyers are increasingly sensitive to these issues. Sustainability is no longer a reputational concern; it is a supply chain requirement. Carbon footprints, water usage, and land practices are being factored into sourcing decisions.

The Nutrition–Sustainability Convergence

An important shift underway is the convergence of nutritional and environmental objectives.

Traditional policy frameworks treated these as separate domains: agriculture for production, health systems for nutrition, and environmental policy for sustainability. This separation is increasingly untenable.

Diversified diets rich in pulses, coarse grains, fruits, and vegetables are both nutritionally superior and environmentally less intensive. Conversely, production systems overly reliant on water-intensive cereals impose ecological costs while limiting dietary diversity.

India's millet strategy is emblematic of this convergence. Millets require less water, are more resilient to climate variability, and offer

higher nutritional value. However, integrating them into mainstream consumption requires more than production incentives. It requires reconfiguration of value chains, processing technologies, branding, retail integration, and consumer awareness.

The same applies to pulses and oilseeds, where India remains dependent on imports despite being a major producer.

Trade Policy: Between Credibility and Control

India's engagement with global agricultural markets is often characterised by a tension between domestic stabilisation and international credibility.

Export restrictions, particularly on staples such as rice and wheat, have been used to manage domestic price volatility. While effective in the short term, such measures can create uncertainty for global buyers and affect India's reputation as a reliable supplier.

From a value chain perspective, predictability matters. Firms investing in processing and export infrastructure require stable policy environments. Frequent shifts in trade policy can discourage long-term investments and limit integration into global supply chains.

At the same time, the political economy of food in India cannot be ignored. Ensuring affordability for a large population is a legitimate policy objective.

The challenge, therefore, is not to eliminate intervention, but to design it more strategically using targeted instruments that minimise disruption to value chains while achieving domestic goals.

Digital Infrastructure as a Force Multiplier

One of India's distinctive advantages lies in its digital public infrastructure.

Platforms such as e-NAM, combined with emerging agri-stack initiatives, have the potential to transform value chains by improving transparency, enabling

traceability, and facilitating access to markets and credit.

McKinsey and World Bank analyses highlight the role of data in enhancing supply chain resilience through better demand forecasting, risk management, and coordination.

In agriculture, this could translate into more efficient aggregation, reduced wastage, and improved alignment between production and consumption.

However, technology is not a substitute for physical infrastructure. Investments in storage, logistics, and processing must complement digital platforms.

Finding a New Equilibrium, If There's Any!

The future of agricultural value chains will not be defined by a return to the past, and departure from globalisation should not be the option. Instead, it will be characterised by layered systems, global networks supported by regional and domestic resilience.

For India, the strategic question is how to position itself within this emerging architecture.

A purely inward-looking approach would limit opportunities for value creation and technological upgrading. An overly open approach would expose domestic systems to external shocks.

The answer lies in calibrated integration.

This involves strengthening domestic value chains, particularly the midstream, while selectively deepening global linkages in sectors where India has or can build a competitive advantage. It requires aligning production systems with nutritional and environmental goals. It demands policy stability that encourages private investment while retaining the ability to respond to shocks.

Above all, it requires a shift in perspective.

Agriculture can no longer be viewed solely as a sector of subsistence or even of production. It must be understood as a complex system of value chains where resilience, sustainability, and competitiveness are deeply intertwined.

In this reconfigured food economy, resilience is not the opposite of efficiency. It is its evolution.

India's ability to recognise and act on this distinction will determine not only its food security outcomes but also its role in shaping the future of global agriculture.

Agri Facts

- Ethiopia is considered the birthplace of coffee, where wild coffee plants still grow naturally.
- Japan grows square watermelons mainly for easier transport and storage.
- Australia produces some of the world's highest-quality merino wool due to selective sheep breeding.

KHETIVALAH DIALOGUES: NURTURING A GLOBAL AGRICULTURAL CONVERSATION

Agriculture today is shaped by interconnected challenges. Climate variability, sustainability concerns, food systems, technological changes, rural livelihoods, and market transitions, which are influencing farming communities across regions. These realities highlight an important truth: agricultural progress depends not only on innovation, but also on dialogue.

KhetiValah Dialogues emerged from the belief that agriculture improves when knowledge is shared openly across geographies, disciplines, and experiences. What began as a dialogue initiative has gradually developed into a multilingual platform connecting farmers, researchers, institutions, policymakers, entrepreneurs, and development practitioners.

Rather than functioning as a collection of isolated sessions, KhetiValah Dialogues has evolved into a continuing ecosystem of agricultural conversations.

A Vision Built on Shared Learning

KhetiValah Dialogues was created to make agricultural conversations more accessible, inclusive, and connected. Its purpose is to connect grassroots realities with global understanding and innovations by creating spaces where local experiences meet research, policy, innovation, and practice.

Agriculture is not only about productivity or technology. It is also about ecosystems, livelihoods, communities, health, education, and resilience. The platform recognizes this broader context and encourages dialogue that reflects agriculture as an interconnected system.

A Multilingual Agricultural Platform

One of the defining strengths of KhetiValah Dialogues is its multilingual structure. Agricultural knowledge often becomes more meaningful when discussed in familiar languages and regional contexts. To support this, the initiative operates through multiple dialogue series across Indian regional languages and international editions.

Regional dialogues include Telugu, Tamil, Hindi, Marathi, Assamese, Gujarati, Bengali, Kannada, Odia, Rajasthani, and Meghalaya-focused sessions. International interactions include Filipino, Sinhala, Bangla, and Malay dialogue initiatives.

The platform also hosts thematic series such as UrbanKrishi, focused on urban farming, TattvaVedika exploring artificial intelligence in agriculture, and NaariShakthi Samvad highlighting women's participation in agriculture.

Together, these editions create a network where local perspectives contribute to a broader agricultural narrative.

KV Dialogue Global Series

At the center of this ecosystem is the KV Dialogue Global Series, the English-language global edition of KhetiValah Dialogues.

Conducted every Friday as a one-hour virtual session, the Global Series brings together speakers and participants from different countries to discuss sustainability, agricultural innovation, rural development, climate resilience, and emerging trends.

Unlike one-time webinars, the Global Series is built on continuity. Discussions evolve over time, allowing participants to revisit themes and engage with perspectives from different regions.

Contributors have represented countries including India, Nepal, Netherlands, Belgium, Egypt, Philippines, Bangladesh, Sri Lanka, and other emerging regions.

As the platform approaches its 50th session, the Global Series reflects a sustained effort to create meaningful agricultural exchange.

Moderators Guiding the Dialogue

The first 49 sessions of the KV Dialogue Global Series have been guided by moderators who contribute academic, institutional, and development perspectives.

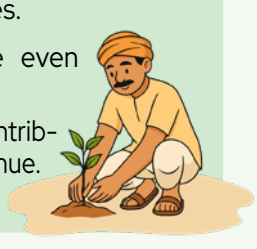
Dr. Flt. Lt. AT Kishore (Retd), Director at DDPA Bengaluru and Senior Consultant, contributes on interdisciplinary leadership and strategic thinking.

Dr. Dhananjay S. Gaikwad, Assistant Professor and Researcher, brings academic depth and research-oriented discussion.

Shri Vinayak Seshadri Regional Chairman of One World Peace Maker Foundation (OWPMF), USA, contributes broader social and developmental perspectives.

Agri Facts

- Sericulture supports rural women-led economies in many Asian countries.
- Cassava remains productive even under poor soil fertility.
- New Zealand's dairy sector contributes significantly to export revenue.



Together, these moderators help to maintain continuity and encourage balanced participation.

Speakers across Regions and Disciplines

KhetiValah Dialogues has welcomed speakers from research institutions, universities, sustainability networks, agricultural communities, and development organizations.

Recent contributors include **Prof. Narasimha Nakshathri** from India, whose work spans food systems and agricultural value chains.

Dr. Shree Govind Shah from Nepal contributes expertise in ecology and environmental planning.

Mr. Filip Van Noort of Wageningen University and Research shares perspectives on crop systems and innovation, From Netherlands.

Dr. Assem Abdel Hamid Moussa from Egypt contributes interdisciplinary insights connecting leadership, technology, and systems thinking.

Dr. Nidhi Nagabhatla, Senior Fellow at the United Nations University of Belgium, brings expertise in climate resilience and environmental policy.

Agri Facts

- Urban farming is expanding rapidly in vertical indoor systems.
- Many medicinal plants originated from traditional agricultural knowledge.
- Soil microorganisms influence crop nutrient availability.

These contributors represent the broader diversity of voices that continue to shape agricultural conversations across the platform.

Advisors and Institutional Direction

The initiative is supported by advisors who contribute strategic insight and long-term perspective.

Dr. N. Sudhakar, former Director of the ICAR Zonal Project Directorate at CRIDA Campus, Hyderabad, contributes decades of agricultural research and extension experience.

Shri C.S.R. Murthy, former Chief General Manager at NABARD, brings expertise in rural development, watershed programs, Farmer Producer Organizations, and climate-related initiatives.

Their guidance strengthens the platform's connection with agricultural research, institutional systems, and development practice.

Knowledge Partnerships

KhetiValah Dialogues continues to grow through partnerships with institutions that support agricultural learning, research, and collaboration.

The **ICAR Agricultural Technology Application Research Institute (ATARI), Zone X,** located at CRIDA Campus in Hyderabad, strengthens connections with agricultural extension and outreach.

Mariano Marcos State University (MMSU), Philippines contribute academic engagement and international participation.

Isabela State University (ISU), Philippines, contribute academic engagement and international participation.

The **Centre on Integrated Rural Development for Asia and the Pacific (CIRDAP), Bangladesh,** supports broader discussions related to rural transformation and regional cooperation.

GIRAS – Global Initiative for Regenerative Agriculture & Soil Resilience contributes perspectives on soil systems, regenerative agriculture, and sustainability.

These partnerships help strengthen dialogue through institutional participation and shared expertise.

Conversations across Borders

One of the distinctive features of KhetiValah Dialogues is its ability to connect agricultural contexts from different parts of the world.

Themes explored through the platform include climate-smart agriculture, biodiversity, water management, regenerative farming, digital agriculture, entrepreneurship, women in agriculture, and rural livelihoods.

The value of these discussions lies in their timeliness, analysis and exchange.

A researcher may present scientific insights, while a farmer shares practical adaptation strategies. Institutions contribute policy perspectives, while sustainability professionals highlight environmental considerations.

This intersection creates conversations that are both grounded and globally relevant.

Impact through Continuity

KhetiValah Dialogues has completed more than 225 sessions across language editions and thematic series, engaging over 250 speakers and generating more than 100,000 digital views.

However, the platform's impact is defined less by numbers and more by continuity.

Participants return regularly. Discussions continue beyond sessions. Institutions remain connected through recurring engagement.

The platform creates opportunities for researchers, universities, farmers, and development professionals to interact within a shared learning environment.

By encouraging sustained conversation, KhetiValah Dialogues contributes to agricultural awareness, cross-border understanding, and collaborative learning.

A Growing Global Community

As the KV Dialogue Global Series approaches its 50th session, the initiative continues to invite participation from researchers, institutions, progressive farmers, policymakers, students, and sustainability professionals.

Its strength lies in collective wisdom and contribution. Moderators create structure. Speakers contribute expertise. Advisors provide direction. Knowledge partners strengthen credibility. Participants create continuity.

Together, these elements form an evolving agricultural dialogue ecosystem.

In a world where agriculture faces increasingly shared challenges, meaningful conversation remains one of the most valuable tools for building understanding and collaboration.

KhetiValah Dialogues continues to connect communities, countries, and agricultural knowledge through the conversations that evolve and grow over time.

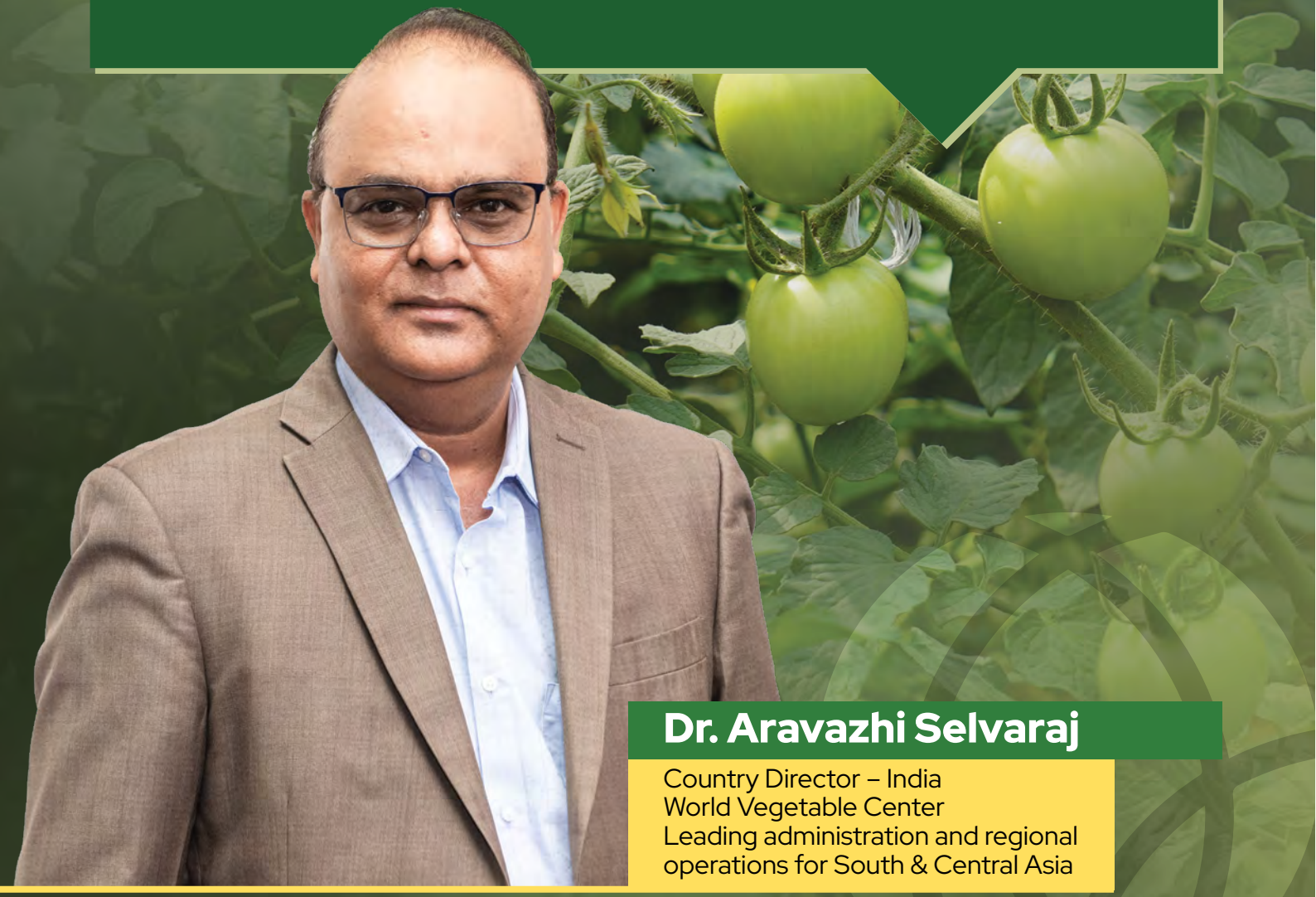
World Vegetable Center

Lakshman K., Founder & Chairman (Haladhari Group) of KhetiValah, in an exclusive cover story interview with **Dr.Aravazhi Selvaraj**, India Country Director, World Vegetable Center.

Dr. Aravazhi Selvaraj is a distinguished agribusiness leader with over two decades of experience spanning both public and private sector organizations. Throughout his career, he has executed institutional and corporate agribusiness projects, working across areas such as start-up financing, project and program planning and management, innovative technology funding, and the development of sustainable agribusiness models for farmer producer organizations. He has also contributed to macro and micro level projects for farming communities in commodity value chains.

He currently serves as India Country Director at the World Vegetable Center, overseeing the overall administration and management of the South and Central Asia Regional Office.

He holds a Doctorate of Business Administration from the Swiss School of Business and Management, and is a recipient of the Distinguished Alumnus Award from the Faculty of Agriculture, Annamalai University. His research interests span food science, sustainable agriculture, nutrition interventions, and agribusiness innovation.



Dr. Aravazhi Selvaraj

Country Director – India
World Vegetable Center
Leading administration and regional operations for South & Central Asia

WORLD VEGETABLE CENTER

Responses from **Dr.Aravazhi Selvaraj**, India Country Director, World Vegetable Center

The World Vegetable Center (WorldVeg), founded in 1971, is the foremost international non-profit institute for vegetable research and development. Its mission is to advance science to boost vegetable production and consumption globally. As the custodian of global vegetable biodiversity and breeder of vegetable crops, the organization drives both the demand and supply of vegetables, while strengthening the conditions - policies, markets, and capacities - for diverse and sustainable food systems. WorldVeg has headquarters in Taiwan, with regional centers in Benin, India, Mali, Tanzania, and Thailand, and country offices across Africa, Asia and Latin America.

Q1. The Role of Vegetables in Future Food Systems

Vegetables are not merely a dietary complement – they are foundational to any meaningful vision of sustainable, resilient food systems. Over the coming decade, vegetables must shift from the margins of food policy to the very centre of it. They are our most powerful tool against hidden hunger: the micronutrient deficiencies that silently undermine the health of billions, particularly women of reproductive age and children under five in Africa and Asia. At WorldVeg, we have long articulated that a food system without dietary diversity is a food system built on a fragile foundation. Globally, per capita vegetable consumption in many of our target regions – including India, where it stands at roughly 86 grams per day against the FAO-recommended 200 grams – reflects how far we still have to go.

The next decade demands an integrated approach: breeding vegetables that are heat-tolerant, disease-resistant, and nutritionally dense; embedding vegetables into cereal-dominated farming systems as rotation and intercrop options; and changing consumer behaviour through nutrition education and market development. Vegetables also offer a uniquely rapid return on investment for smallholders – short growing cycles, high value per hectare, and suitability for home gardens and peri-urban agriculture make them an engine of income and nutrition simultaneously. As food systems adapt to climate change, demographic shifts, and urbanisation, vegetables – with their diversity, adaptability, and nutritional density – must be at the heart of every national food strategy.

Q2. Strengthening Smallholder Livelihoodsthrough Vegetable Farming

Smallholder farmers – the majority of whom are women – are not just food producers; they are the backbone of food security across Asia and Africa. Vegetable-based farming offers them a tangible pathway to economic upliftment and climate resilience, but only when supported by the right varieties, agronomic knowledge, and market access.

WorldVeg's approach in South and Central Asia illustrates this vividly. Our work has enabled over 1.2 million mungbean farmers across India, Bangladesh, Pakistan, and Myanmar to access improved germplasm developed through the International Mungbean Improvement Network (IMIN). In Assam, India, tomato cultivation using minimum tillage in rice fallows – a WorldVeg-piloted innovation – generated additional household incomes of INR 7,000 to INR 24,000 per growing season. When vegetables are integrated into rice-based cropping systems, productivity of vegetable crops increases by 200–350% compared to traditional practices. Beyond yield, this diversification rebuilds soil health, reduces climate risk through crop rotation, and provides nutritional security for families who consume what they grow.

To truly strengthen smallholder livelihoods, the vegetable sector needs investments in three areas: improved stress-resilient varieties adapted to local agroecologies; affordable and accessible inputs including quality seeds; and stronger value chain linkages connecting farmers to fair markets. WorldVeg's work with state governments in India – including Odisha, Assam, and Telangana – demonstrates that when research, extension, and market systems work together, the results for smallholder families are transformative.

Q3. Global Impact of the World Vegetable Center

Since our founding in 1971, WorldVeg has built an impact record that spans continents, crops, and communities. A few milestones stand out as markers of our contribution to global food and nutrition security.

Our International Vegetable Genebank at our headquarters in Shan-

hua, Taiwan – recently modernised with upgraded temperature and humidity control systems, a 2.5-fold increase in storage capacity, and improved seed distribution infrastructure – is the world's largest public vegetable germplasm repository, currently conserving over 75,000 seed accessions of 330 vegetable species from 155 countries. Over the past five decades, we have distributed more than 700,000 seed samples to researchers, breeders, and farmers across more than 200 countries and territories, leading to hundreds of new varieties.

In India alone, a major review found that 14% of all hybrid tomato seeds and 13% of all hybrid chili seeds sold commercially contain WorldVeg germplasm – with our contributions even more pronounced in the public sector, where 38% of tomato hybrids and 72% of chili hybrids incorporate our material. WorldVeg's mungbean improvement work has resulted in improved varieties being planted on 82% of the mungbean area in India. In October 2024, WorldVeg signed a landmark Memorandum of Association with the Indian Council of Agricultural Research (ICAR) to deepen collaboration on vegetable research, disease management, and sustainable farming practices. Globally, WorldVeg's VeggieMon disease monitoring system now tracks nearly 10,000 pathogens across 62 countries – a powerful tool for protecting vegetable production worldwide.

Q4. Elevating Vegetables in Agricultural Policy and Investment

Despite their unambiguous importance for nutrition and farm diversification, vegetables remain underrepresented in national agricultural budgets, research allocations, and policy frameworks – a structural imbalance that urgently needs correcting.

The policy shifts needed are several. First, national food security frameworks must expand beyond caloric sufficiency to explicitly include dietary diversity and micronutrient adequacy – metrics for which vegetables are indispensable. Second, agricultural investment in national research systems must prioritise horticulture with the same vigour applied to staple cereals. Public breeding programs for vegetables, disease surveillance networks, and farmer advisory systems for vegetable production are all chronically underfunded relative to their impact potential. Third, value chain development – cold storage, transportation, market linkages, and food safety standards – must be treated as public infrastructure investments, not afterthoughts.

At the international level, we need greater integration of vegetables into climate finance instruments. Vegetable-based diversified farming systems build climate resilience, reduce greenhouse gas emissions from more intensive livestock and monoculture systems, and support biodiversity. These services deserve recognition and funding. WorldVeg advocates strongly for vegetables to be explicitly named in national food policies, in CGIAR

and One CGIAR research priorities, and in the SDG monitoring frameworks – particularly those tracking progress on SDG 2 (Zero Hunger), SDG 3 (Good Health and Well-Being), and SDG 12 (Responsible Consumption and Production).

Q5. South and Central Asia's Role in Vegetable Innovation

South and Central Asia – with India at its centre – represents one of the most important theatres for vegetable innovation in the world. India is the second-largest vegetable-producing nation globally, harvesting approximately 209 million metric tonnes annually across 11.24 million hectares. The country's diverse agroclimatic zones, vast smallholder farming community, and growing urban consumer base create both the need and the opportunity for transformative vegetable innovation.

WorldVeg's South and Central Asia office, established in 2006 on the ICRISAT campus in Hyderabad, Telangana, sits at the heart of this opportunity. Our work across the region spans mungbean genetic improvement through IMIN; virus-resistant okra varieties developed and tested under field conditions; heat-tolerant tomato genotypes for climate adaptation; and diversification of rice-based farming systems with vegetables and legumes in Assam, Odisha, and beyond. The ICAR-WorldVeg Memorandum of Association signed in 2024 has further deepened collaboration with national institutes including IIHR and IIVR on projects spanning bacterial wilt management in tomato, genome-wide association mapping for heat tolerance, and rootstock screening for grafting technologies.

The region's contribution to sustainable vegetable value chains will grow further through investment in local seed systems, strengthened public-private partnerships, and regional knowledge exchange. India's position as both a major producer and a significant source of scientific talent makes it a vital hub for vegetable innovation that can serve the entire Global South.

Q6. Innovation and Emerging Technologies in Vegetable Agriculture

The technological revolution in agriculture is reshaping what is possible for vegetable farmers – and WorldVeg is at the forefront of integrating these tools into research and practice. Our approach, embodied in the Open Science Center model that we launched at our Taiwan headquarters, emphasises that innovation must be open, collaborative, and accessible.

Artificial intelligence and digital advisory systems are already demonstrating transformative potential. WorldVeg's VeggieMon platform uses AIoT technology to monitor and track nearly 10,000 vegetable pathogens across 62 countries in near real-time, enabling plant pathologists and breeders to identify emerging threats, map disease distribution, and inform proactive crop protection strategies. In September 2025, WorldVeg hosted an APEC event in Tainan where we demonstrated the power of combining AIoT, biologicals, and Integrated Crop Management for sustainable pest and disease control. Our plant pathologists are now actively building a global early-warning system for vegetable diseases – one that could save millions of smallholder farmers from catastrophic crop losses.

In breeding, high-throughput phenotyping – where cameras document plant growth continuously to generate data for breeders – is accelerating the development of heat-tolerant, disease-resistant, and high-yielding varieties at a pace previously unimaginable. Genome-Wide Association Mapping (GWAS) is enabling precision identification of stress-tolerance genes in tomato, mungbean, and other priority crops. The WorldVeg-Biologicals

Consortium, launched in November 2025, brings together public and private partners to accelerate the development and adoption of biopesticides and biostimulants as environmentally friendly alternatives to synthetic agrochemicals. Taken together, these innovations hold the promise of delivering safer, more productive, and more sustainable vegetable systems to farmers worldwide.

Q7. Partnerships and the Role of Startups in Agricultural Transformation

No single institution – however well-resourced or scientifically accomplished – can transform a food system alone. Partnerships are not merely desirable at WorldVeg; they are structurally embedded in how we work. Our model positions WorldVeg as a knowledge hub and public goods generator, while relying on a diverse ecosystem of partners for delivery, scaling, and market development.

Our partnership portfolio is deliberately broad. With national agricultural research systems such as ICAR in India, BARI in Bangladesh, and NARC in Nepal, we co-develop improved varieties and agronomic practices adapted to local conditions. With development organisations including ACIAR, GIZ, USAID, the Asian Development Bank, and the World Bank, we design and implement projects that reach

smallholder farmers at scale. The Asia-Pacific Seed Alliance-WorldVeg Seed Breeding Consortium and the Africa Vegetable Breeding Consortium (AVBC) create structured channels for WorldVeg's improved germplasm to flow into private seed company pipelines – reaching farmers faster than public systems alone can achieve.

Startups have an increasingly important role to play. Agri-tech startups specialising in precision advisory services, market linkage platforms, cold chain logistics, and digital extension can carry WorldVeg's research outputs to the last mile – where smallholder farmers actually live and work. WorldVeg actively seeks to build bridges with the startup ecosystem through our Open Science model, creating shared data platforms, open access to germplasm databases, and collaborative field trial protocols that allow emerging companies to build on our scientific foundations. We believe the next wave of vegetable system transformation will emerge precisely at the intersection of our long-term research capacity and the speed and creativity of agricultural startups.

Q8. Leadership Journey and Vision

The World Vegetable Center's leadership has been shaped by a deep conviction that science, when directed toward the right problems and guided by a genuine commitment to equity, can change lives at scale. For many of us, the journey began with a recognition that the world's most vulnerable people – smallholder farmers, women, and children in low-income countries – were not the primary beneficiaries of the first Green Revolution, which focused overwhelmingly on staple cereals. Vegetables, with their nutritional density and economic potential, offered a path to address this inequity.

What continues to motivate our leadership, day after day, is the evidence of impact that comes back from the field: a farmer in Assam generating income she had never previously had from tomatoes grown in a rice fallow; a child in Kenya with greater dietary diversity because a new variety of traditional African leafy vegetable is now available and affordable; a researcher in Bangladesh developing a mung-

bean variety resistant to Yellow Mosaic Disease that will protect harvests for thousands of smallholders. These stories are not abstractions – they are the lived reality of WorldVeg's work. Our vision is of a world where no one suffers from hidden hunger, where smallholder farmers have the tools and knowledge to build resilient livelihoods, and where vegetable diversity is treasured as the biological and cultural heritage it truly is. We are motivated, above all, by the knowledge that our work matters – and that there is still so much more to do.

Q9. Message to the Next Generation of Agricultural Innovators

To the next generation of farmers, researchers, entrepreneurs, and innovators: the challenge before you is profound, but so is the opportunity. You are entering a field at a moment of genuine transformation – when digital technologies, genomic tools, agroecological insights, and global connectivity are converging in ways that make it possible to achieve in a decade what once took a generation.

Our message to you is threefold. First, stay close to the farmer. The most brilliant research means nothing if it does not reach the people who grow our food. Design your innovations for the last mile – for the woman smallholder farming 0.5 hectares in Telangana or Tanzania – and you will have designed something truly transformative. Second, embrace collaboration without ego. The problems we face – climate change, biodiversity loss, micronutrient deficiency, market failure – are too large and too complex for any one discipline, institution, or country to solve alone. Build partnerships across boundaries of sector, geography, and knowledge system, including with indigenous farmers whose wisdom about local crops and ecosystems is irreplaceable. Third, be bold about public goods. Not every innovation needs to be a commercial product. Some of the most important contributions you can make – open-access germplasm databases, freely shared agronomic knowledge, community seed banks – are public goods that serve humanity without a price tag. These, too, are forms of innovation.

The World Vegetable Center's own 54-year history demonstrates that sustained, mission-driven work on behalf of the world's most vulnerable people does make a difference. We invite you to join us – and to surpass us.

Agri Facts

- The Netherlands exports more agricultural products per hectare than almost any country due to greenhouse technology and logistics efficiency.

With Respect and Gratitude

It has been a privilege to engage with **Dr. Aravazhi Selvaraj**, India Country Director, World Vegetable Center, for this insightful interaction on advancing sustainable agriculture and resilient food systems across South & Central Asia.

We sincerely thank **Mr. Neil Palmer**, Lead – Strategic Communications, for his kind support in facilitating this interview and for his continued contribution to strengthening the global agri-ecosystem.

At KhetiValah Global Agri Magazine (e-magazine), we remain grateful for this opportunity to share such valuable perspectives with our readership.

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NET ZERO STARTS IN THE SOIL: WHY AGRICULTURE CAN'T STAY AT THE MARGINS

Ms.Nazwa W.B. Salim

MEng (Sustainable Infrastructure), MBA (HRM), PBP®, LEED® Green Associate™

In the Sylhet region of Bangladesh, farmers who have worked the same floodplains for generations are watching the rhythm of their land collapse. Monsoons that once arrived with predictable grace now come as walls of water, destroying crops, washing away topsoil, and erasing months of labour in a single afternoon. The 2022 floods submerged nearly a third of the country, displacing millions and devastating the rice and vegetable crops that sustain rural livelihoods.

In Maharashtra's Vidarbha, India's cotton belt, farmers face a different crisis: erratic rainfall followed by prolonged dry spells. Wells run dry before the season ends, and repeated crop failures have deepened a long-standing agrarian crisis. Further east, in Odisha's deltaic regions, coastal farmers are losing arable land to saltwater intrusion as rising seas and stronger cyclones render once-productive fields unfit for cultivation.

Across the Sahel, drought stretches across seasons, turning fertile land into dust.

These are not isolated disruptions. They signal a systemic shift, one that places agriculture at the centre of the climate crisis and farmers at the frontline of both the problem and the solution.

When the Ground Fails, Everything Follows

Food production is rarely framed as a human rights issue, but it should.

When crops fail, the consequences extend far beyond the field. Food insecurity translates into malnutrition, reduced school attendance, and deepening poverty—intersecting directly with **SDG 2 (Zero Hunger), SDG3 (Good Health & Well-being), SDG 4 (Quality Education), and SDG 10 (Reduced Inequalities).**

Agriculture is not just another sector; it underpins human systems and sustains livelihoods across the Global South.

This is where the concept of a **food basin** becomes critical. A food basin refers to the geographic region that produces and supplies food for a population. When climate shocks disrupt these regions, through floods, droughts, or soil degradation, the impacts cascade across entire food systems.

Climate change is actively reshaping that foundation. The IPCC estimates that a 2°C increase in global temperatures could reduce maize yields in Sub-Saharan Africa by up to 20%. In Southern and Eastern Africa, where maize provides up to 50% of daily caloric intake, declines of 5–20% are expected at 2°C warming, with some projections reaching up to 30% by 2050.

In India, even a 1°C rise is associated with a 0.5–1.5% decline in wheat and maize yields, while a 2°C increase could reduce rain-fed rice yields by 5–12%. In systems so dependent on climate-sensitive crops, even modest declines translate into significant systemic food insecurity.

Extreme weather compounds the challenge. In 2022, floods in Nigeria submerged over 600,000 hectares of farmland. That same year, India experienced both severe flooding in the Northeast and drought in the Northwest, illustrating the volatility farmers must now navigate through.

These events are no longer anomalies. They are becoming the norm.

The Invisible Emitter

Agriculture sits at the centre of a difficult paradox: it is both a victim of climate change and a significant contributor to it.

Global food systems account for roughly one-third of total greenhouse gas emissions (FAO, 2021). Emissions stem from deforestation, methane from livestock and rice cultivation, and nitrous oxide from synthetic fertilizers, an especially potent gas with a warming potential nearly

300 times that of CO_2 (IPCC).

In countries like India, where agriculture employs over 40% of the workforce, this creates a tension between livelihoods and emissions reduction.

Yet agriculture remains underrepresented in climate strategies. In many Nationally Determined Contributions (NDCs), it is treated primarily as an adaptation issue rather than a mitigation opportunity.

This framing must change.

Regenerative practices like agroforestry, conservation tillage, improved nutrient management, and the System of Rice Intensification (SRI), offer dual benefits. They enhance resilience while reducing emissions. Healthy soils act as carbon sinks, positioning agriculture as a climate solution rather than simply a challenge.

Soil Is Not Dirt, It's a Critical Infrastructure

One of the most overlooked dimensions of modern agriculture is soil health.

Soil is not just a medium for crops, it is one of the planet's most powerful climate assets. It is the second-largest carbon sink after the oceans, storing an estimated **2,500 billion metric tons of carbon.** When managed well, healthy soils can absorb more carbon than they emit.

However, decades of intensive farming, excessive tillage, and chemical inputs have degraded soil systems globally. The FAO estimates that one-third of the world's soils are already degraded. In India's agricultural heartlands, declining soil organic matter and rising salinity are increasingly evident.

This creates a vicious cycle: degraded soils require more chemical inputs, further accelerating decline.

Regenerative practices offer a way forward. Increasing soil organic carbon through composting, reduced tillage, and agroecology restores fertility while reducing dependence on synthetic inputs. Carbon-rich soils are more resilient, retaining water during droughts and maintaining structure during floods.

The mitigation potential is significant. Agricultural soils could sequester over a billion additional tons of carbon annually, with some estimates suggesting up

to **five gigatonnes of CO_2 per year by 2050.**

India's Zero Budget Natural Farming (ZBNF) in Andhra Pradesh demonstrates that this transition is already underway, reducing costs, improving soil quality, and strengthening long-term productivity.

This is not a return to the past. It is a scientifically grounded transition toward resilient agriculture, and a climate strategy hiding in plain sight.

The Equity Imperative: Investing in Those Who Feed Us

Any serious transformation of agriculture must center equity.

Over 70% of the world's food-insecure population lives in the Global South, with smallholder farmers, and many of them are women, bearing the greatest burden. In India, more than 80% of farmers are small or marginal landholders.

Climate-smart agriculture must prioritize these communities. This includes access to drought-resistant crops, efficient irrigation, agroforestry, renewable-energy-powered solutions, and traditional ecological knowledge.

Climate finance must shift. Too often, funding flows toward large-scale infrastructure, while smallholder farmers remain underfunded.

Emerging platforms connecting farmers with investors, such as Niveshak, can help bridge this gap by aligning capital with re-

silience, productivity, and long-term sustainability.

Food sovereignty and climate justice are inseparable, and so are their impact and opportunity.

Start From the Ground

The net-zero transition cannot succeed without transforming agriculture.

Food systems must sit at the core of climate policy, not as an afterthought, but as a central pillar. Governments must reflect agriculture's mitigation potential in their NDCs. The private sector must address supply chain emissions and invest in regenerative sourcing. Finance must flow toward local resilience.

For countries like India, where agriculture sustains hundreds of millions, this is an urgent economic, environmental, and social priority.

What happens to a floodplain in Bangladesh or a drought-stricken farm in Maharashtra is part of a shared global system; one that demands collective action.

Net zero does not begin in boardrooms or policy frameworks.

It begins in the soil; and in the resilience of the food basins that sustain us.

The question is not whether agriculture belongs at the centre of climate action.

The question is whether we are ready to invest in making it so.

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Agri Facts

- The global flower auction system in the Netherlands handles millions of stems daily.
- Chile exports fresh fruit during the Northern Hemisphere winter.

CIRDAP

CIRDAP - KHETIVALAH KNOWLEDGE FORUM ON RURAL DEVELOPMENT FOR ASIA PACIFIC

RURAL HEARTBEAT
INVESTING IN PEOPLE AND PLANET: THE TRUE PATH TO RURAL PROSPERITY

Dear Partners,

In the heart of our villages—from the fields of India to the hills of Fiji—true change begins not with policies or projects alone, but with people. Hence, the message is loud: changing practices gives short wins; investing in people builds futures.

Look at our women in Self-Help Groups—over One Hundred Million strong under National Rural Livelihood Mission, India. They don't just learn banking or farming tricks; they gain voice, confidence, leadership. Grameen Bank's mothers in Bangladesh pass on not just loans, but courage across generations. India-Kerala's health workers teach communities to own their wellness—no checklists, just trust and shared care. These are not just programs—they are sparks of agency. When we move from training to lifelong learning, from service delivery to real power, rural hearts beat stronger. Cooperatives in Nepal and Sri Lanka show it too: farmers who once followed orders now steer their own markets, own their seeds, shape their tomorrows. Thanks to the vibrant groups.

And the planet? It's no side story. Climate hits our farms hardest, floods swallow fields, droughts crack soil, cyclones wipe out harvests. Yet every solar pump lighting a Bangladeshi hamlet, every mangrove wall guarding coastal homes, every patch of natural farming brings back balance. These aren't burdens; they create jobs—youth wiring mini-grids, women weaving eco-fabrics for global shelves. Clean energy cuts bills, boosts health, frees us from oil imports. Regenerative fields heal land, lower debt, and feed families better. Disaster readiness? Little money spent on village alerts saves many in rebuild communities bounce back faster, prouder.

Prosperity isn't chasing quick gains. It's regeneration: soil healed, risks lowered, communities leading. Think of eco- textiles from South Asia—fair wages, clean dyes, premium prices. Or community solar lighting schools at night, powering phones, opening doors to online learning. These aren't dreams; they're happening now, quietly turning vulnerability into strength.

So, let's ask: are we still counting attendance sheets? Or are we building leaders? Are we patching floods, or planting mangroves? The rural heartbeat thrives when people feel seen, when land feels cared for.

Let us invest wisely—together— on people and planet for Rural Empowerment.

With Warm Wishes

Dr. P. Chandra Shekara
Director General, CIRDAP

CIRDAP

DG, CIRDAP DELIVERED KEY NOTE ADDRESS AT NATIONAL CONFERENCE ON EMPOWERING RURAL COMMUNITIES THROUGH INVESTING ON PLANET, PEOPLE AND PROSPERITY IN HYDERABAD, INDIA

HE. Dr. P. Chandra Shekara, Director General of Centre on Integrated Rural Development for Asia and the Pacific (CIRDAP), delivered the keynote address at the National Conference on "Transforming Rural Livelihood Landscape in India: Empowering Rural Communities through Investing in People, Planet and Prosperity (3Ps)" held on 19 February 2026 at ICAR–National Academy of Agricultural Research Management (NAARM), Hyderabad. The conference was organized by the Institute of Livelihood Research and Training (ILRT) and the Participatory Rural Development Initiatives Society (PRDIS).

In his address, Dr. Shekara highlighted the Asia-Pacific region's dual reality as a global growth engine and one of the most climate-vulnerable regions. He emphasized that development choices today must be structural, not incremental, given the challenges posed by climate instability, demographic transitions, technological disruption, and fiscal constraints.

Focusing on the 3Ps framework, he underscored that true investment in people goes beyond changing practices to building human capability, agency, and resilience. Citing examples from South Asia, he noted that cooperatives, self-help groups, and community-driven initiatives demonstrate how empowering people leads to sustainable prosperity.

On the planet dimension, he described climate action as an economic imperative rather than an environmental cost. Investments in renewable energy, climate-resilient infrastructure, ecosystem restoration, and eco-friendly enterprises, he noted, generate jobs, enhance energy security, and protect livelihoods.

Addressing prosperity, the DG called for aligning investments with long-term value through green MSMEs, clean energy, natural farming, and disaster risk management. He stressed that shifting from extraction to regeneration and from risk accumulation to risk reduction is essential for resilient and inclusive rural transformation.

The keynote reaffirmed CIRDAP's commitment to advancing integrated development strategies that place people, planet, and prosperity at the center of rural transformation in the Asia-Pacific region.

CIRDAP

STRATEGIC SYNERGY: FAO SPECIAL REPRESENTATIVE OF DG VISITS CIRDAP HEADQUARTE

CIRDAP warmly welcomed Dr. Daniel Gustafson, Special Representative of the Director General of the Food and Agriculture Organization of the United Nations (FAO), Rome, to its Headquarters at Chameli House on 22 February 2026. The visit reinforced the strong partnership and shared commitment to advancing sustainable rural development in the Asia Pacific region.

During the visit, Dr. Gustafson had a courtesy meeting with H.E. Dr. P. Chandra Shekara, Director General of CIRDAP. Discussions focused on enhancing collaboration and exploring new opportunities to address emerging rural development challenges through joint initiatives.

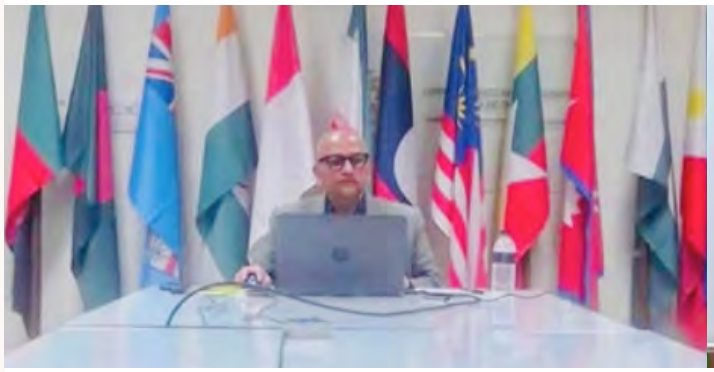
He met with key staff members and received a comprehensive briefing from the Director Research on CIRDAP's ongoing programmes and research initiatives. His valuable insights highlighted shared priorities and potential synergies toward building a resilient and sustainable future for rural communities in the region.

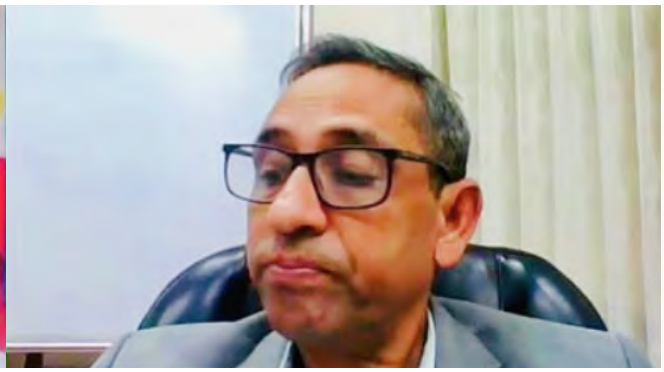
He visited the CIRDAP Library and the International Conference Centre and appreciated the organization's efforts in promoting knowledge exchange and regional dialogue. Dr. Gustafson also signed the World Rural Development Day poster in support of global rural advocacy and officially launched CIRDAP's new publication on Integrated Rural Development and South South Learnings. The publication presents key insights from forty thematic webinars covering critical areas including food security, climate resilience, inclusive gender equality, digital transformation, entrepreneurship, health systems and disaster preparedness.

CIRDAP

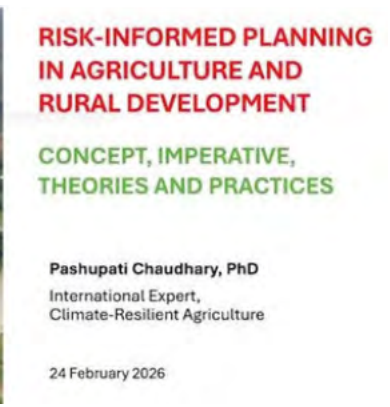
BUILDING RESILIENT AGRI-FOOD SYSTEMS IN ASIA AND THE PACIFIC: CIRDAP'S INTERNATIONAL ONLINE TRAINING PROGRAM

On 24 February 2026, CIRDAP launched a Three-day International Online Training program on Climate Risks and Risk-sensitive Planning for Sustainable and Resilient Agri-Food Systems in Asia and the Pacific. More than 400 participants representing 20 countries are taking part in the program. Policymakers, Researchers, Academicians, and Development Practitioners are actively engaging in the sessions, fostering knowledge exchange, shared experiences, and best practices in Climate Risk Management.

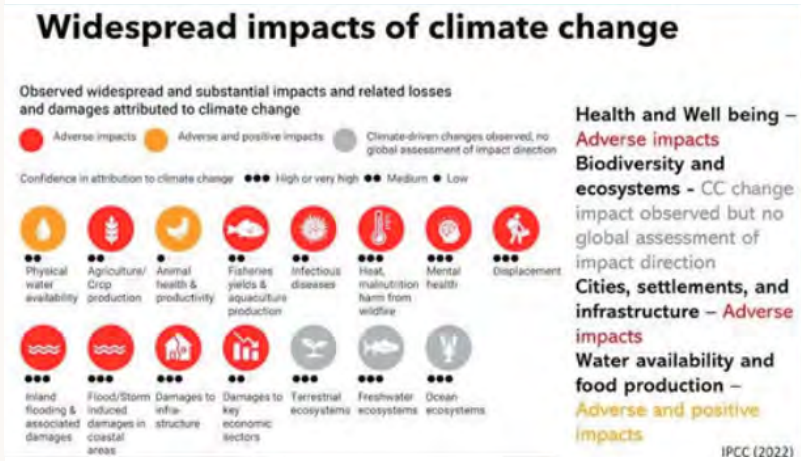




In the inaugural address, H.E. Dr. P. Chandra Shekara, Director-General of CIRDAP emphasized that the Asia-Pacific Region faces mounting Climate-related hazards that threaten Agriculture, Rural livelihoods, and Food Security.



Dr. Shekara underscored the importance of promoting Cooperatives, FPOs by mainstreaming Climate Risk Management, strengthening capacities of stake holders to build Sustainable and Resilient rural economies. The program is jointly designed and coordinated by Dr. Uttam Babu Shrestha, International Climate Change Expert, and Dr. Ganga Dutta Acharya, Director (Research), CIRDAP.



CIRDAP

ASIA-PACIFIC INNOVATORS YOUR RURAL INNOVATIONS DESERVE GLOBAL RECOGNITION!

- Are you part of a transformative rural initiative in the Asia-Pacific?
- Has your innovation uplifted a village, empowered a community, or sparked sustainable change in rural areas?
- Do you know of a rural innovation that has uplifted a village, empowered a community, or sparked transformative change in rural lives?

Calling the innovative solutions in Rural Development from all Changemakers from Asia and the Pacific Countries!

CIRDAP and **REEDS** proudly present the **International Rural Development Innovation Challenge 2026** a platform to showcase rural innovations from across the Asia-Pacific region. This is your chance to amplify local impact on a global stage.

Challenge Overview

- The challenge seeks impactful innovations addressing rural issues like poverty, inequality, climate change, and limited access to services.
- Participants can include community leaders, NGOs, startups, and individuals from CIRDAP member countries.
- The initiative aims to recognize and reward outstanding innovations that can transform rural livelihoods.

Awards & Recognition:

- Top 5 Innovations: USD 500 + Certificate
- Next 10 Impactful Ideas: Certificate of Appreciation
- Featured in a Book + Invitation to an International Conference

Application Process:

- Proposals (up to 5 pages) can be submitted in any language, including high-resolution photos and evidence of impact.
- Include impact evidence, visuals and video byte on proposed innovation
- Please find the brochure containing the details for submitting proposals.

https://cirdap.org/CIRDAP-International-Rural-Development-Innovation-Challenge-2026-brochure

Share your innovation at Email: communication_officer@cirdap.org
WhatsApp: +880 1741 589228

Last Date of Submission: 31st May 2026

Let›s celebrate rural wisdom - **One Innovation. Endless Change. Countless Smiles**

CIRDAP

CIRDAP AND KHETI VALAH SIGN MEMORANDUM OF UNDERSTANDING TO STRENGTHEN KNOWLEDGE- DRIVEN RURAL DEVELOPMENT

The Centre on Integrated Rural Development for Asia and the Pacific (CIRDAP) and Haladhari's KhetiValah Foundation & Haladhari Communications Private Limited (KhetiValah) signed a Memorandum of Understanding (MoU) on 23 February 2026, marking an important step toward strengthening cooperation in agriculture, integrated rural development, and knowledge dissemination across the Asia-Pacific region.

The MoU aims to promote collaborative programmes, capacity building, policy dialogue, and the exchange of best practices through platforms such as KhetiValah Global Agri Magazine and KhetiValah Dialogues (AgriTalks). Through this partnership, both institutions will work together on training programmes, workshops, webinars, dialogue sessions, and joint publications to support sustainable agriculture, rural livelihoods, and evidence-based development policies in CIRDAP Member Countries.

The MoU was signed on behalf of CIRDAP by Mr. FAM Zakirul Huq, Head of Administration, and on behalf of KhetiValah by Mr. Lakshman K, Founder & CEO. The signing ceremony was honoured by the presence of His Excellency Dr. P. Chandra Shekara, Director General of CIRDAP, along with representatives from both organisations. This collaboration reflects CIRDAP's continued commitment to fostering regional and global knowledge partnerships that contribute to inclusive, sustainable, and integrated rural development.

CIRDAP KNOWLEDGE SERIES 52 WEBINAR ON STRENGTHENING LAST MILE DELIVERY THROUGH AGRI ENTREPRENEURSHIP

CIRDAP successfully hosted Knowledge Series Webinar 52, titled "Strengthening the Last Mile Delivery Ecosystem through Agri Entrepreneurship Models in Villages of Asia and Africa" on 16 February 2026.

The session delved into how local entrepreneurs are becoming the vital link in the "last mile" delivery ecosystem, ensuring that essential agricultural services, technology, and market access reach even the most remote areas. By fostering these grassroots business models, we aren't just improving farming efficiency; we are revitalizing entire village economies.

Key Highlights from the Session

- Bridging the Gap: Agri-entrepreneurs act as essential intermediaries who bring innovation and logistics to the farm gate.
- Empowering Communities: Moving from subsistence farming to business-orientedmodels creates sustainable livelihoods for rural youth and women.
- Policy & Practice: Insights from the International Finance Corporation (IFC) showcased practical field experiences that can be scaled across CIRDAP Member Countries.

The featured speaker, Mr Rahul Arun Tidake, Consultant at the Global Agri Entrepreneurship Academy of the International Finance Corporation IFC, shared practical models, field experiences, and policy relevant insights drawn from diverse country contexts.

The session was chaired by H E Dr. P Chandra Shekara, Director General of CIRDAP and participation from experts and representatives of CIRDAP Member Countries, making it an engaging and insightful discussion.

CIRDAP continues to promote knowledge exchange and innovative approaches to advance rural development across the region.

CIRDAP

POLICY BRIEF OF GENDER- RESPONSIVE BUDGETING IN NEPAL'S LOCAL GOVERNMENT

The Centre on Integrated Rural Development for Asia and the Pacific (CIRDAP), in partnership with Nepal's Local Development Training Academy (LDTA), implemented a capacity development initiative to strengthen elected representatives and officials in Gender-Responsive Budgeting (GRB). The project helped align local planning and budgets with the Gender-Responsive Budgeting Guideline, 2025, which ensures gender equality is incorporated into planning, budgeting, and program implementation.

Participants

- 117 participants from:
  - Modi Rural Municipality
  - Sunwal Municipality
  - Gramthan Rural Municipality
- Included: Mayors/Chairpersons, Deputy Mayors/Vice-Chairpersons, Chief Administrative Officers, Ward Chairpersons, Executive Members, Section Chiefs, and technical staff.
- Ensured cross-institutional engagement between political and administrative wings.

Key Outcomes

Knowledge Gains:

- Average learning improvement: 4.19 points (pre- vs post-test)
- Sunwal Municipality achieved highest evaluation: 85.23%

Institutional Engagement:

Strong participation from both political and administrative wings
Strengthened ownership of GRB processes

Challenges

- Limited technical capacity to implement GRB independently
- Non-mandatory compliance leads to inconsistent application
- GRB coding and classification system is complex

Lessons Learned

- Simplification is key: Guidelines must be practical and user-friendly
- Incentives matter: Linking GRB compliance to performance improves adherence
- Multi-sectoral inclusion: NGO and private sector budgets should be gradually included

Policy Recommendations

1. Revise GRB guidelines to be simplified and practical
2. Institutionalize GRB in the annual budget cycle
3. Link GRB compliance to performance assessments and federal grants
4. Establish Local GRB Implementation Committees
5. Expand GRB coverage to NGO-funded programs and private sector initiatives

Conclusion

Targeted capacity development enhances local readiness for GRB implementation. Sustainable institutionalization requires policy reinforcement, simplified tools, and incentive-based compliance. Strengthening GRB at the local level is a vital step toward gender equality, inclusive governance, and equitable development in Nepal.

CIRDAP

IRD MODEL SERIES 18
DRIVING RURAL INNOVATION THROUGH THE BENAZIR INCOME SUPPORT PROGRAMME OF PAKISTAN

The Benazir Income Support Programme (BISP), launched in 2008, is Pakistan's largest social protection initiative and a transformative example of rural innovation. Established to provide financial assistance to the most vulnerable populations, particularly women, BISP has evolved from a basic cash assistance scheme into a technology driven and data informed social protection system that supports rural resilience and inclusive growth.

One of the most significant innovations introduced by BISP is its scientific targeting system. Through a Poverty Scorecard based on a Proxy Means Test approved by the World Bank, beneficiary identification became evidence based rather than politically influenced. In partnership with the National Database and Registration Authority, BISP developed the National Socio Economic Registry, a comprehensive database created through nationwide door to door surveys. This BISP registry enables accurate identification of deserving households, particularly in remote rural areas. The introduction of biometric verification for payments further strengthened transparency and reduced fraud, demonstrating how digital innovation can enhance rural governance.

Financial inclusion is another pillar of BISP›s rural innovation. Through the Kafaalat program, quarterly cash transfers are delivered directly to women from low income households. This direct transfer system not only reduces poverty but also enhances women›s participation in household decision making. By placing financial resources in the hands of women, BISP contributes to social transformation rural communities where women traditionally have limited economic authority.

BISP has also expanded its focus from income support to human capital development. The Benazir Taleemi Wazaif program encourages school enrollment and attendance, especially for girls, by providing additional financial incentives to families. This initiative addresses educational disparities and promotes long term rural development. Similarly, the Nashonuma program supports pregnant and lactating mothers and young children by providing financial assistance and nutrition awareness. By investing in education and health, BISP strengthens the foundation for sustainable rural progress.

With a nationwide administrative network covering all provinces, BISP ensures outreach even in remote villages. Continuous improvements in digital systems, data management, and service delivery reflect the government›s commitment to transparency and efficiency.

The Benazir Income Support Programme represents a powerful model of rural innovation. By integrating financial inclusion, digital systems, women›s empowerment, and human capital investment, BISP moves beyond traditional welfare approaches. It not only provides immediate relief to vulnerable families but also builds long term resilience and opportunity in rural Pakistan.

Agri Facts

- Morocco is among the world's largest exporters of citrus fruits.

GIRAS

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FROM AGRICULTURE TO AGRICULTURAL DEVELOPMENT: RETHINKING SYSTEMS, INSTITUTIONS, AND RURAL TRANSFORMATION

Chandan Kumar Panda

Agribusiness professional-Master's degree (M.Sc.)

Chandan Kumar Panda is an agribusiness professional holding a Master's degree (M.Sc.) in Agriculture, with field experience in rural development and farmer institution building. He currently serves as District Executive at a National development centre, Harsha Trust in Gajapati district of Odisha, where he works towards the promotion of organic farming through Farmer Producer Organizations (FPOs). He works closely with FPOs to promote integrated, community-driven agribusiness models. He is a pioneer in introducing maize double cross hybrid seed production in South Odisha in collaboration with a private seed company. His areas of interest include farmer empowerment, institutional strengthening, women-led rural India livelihoods, and sustainable agricultural development

Introduction

Agriculture continues to play a pivotal role in the socio-economic fabric of countries like India, where a significant proportion of the population depends on farming for livelihood.

Despite its importance, the sector remains characterized by small and marginal landholdings, fragmented supply chains, limited access to institutional support, and volatile market conditions.

While agricultural production has increased over the years, the translation of this growth into sustainable farmer income and rural prosperity remains a challenge. This highlights a critical gap between the existence of the agriculture sector and the realization of true agricultural development.

At the core of this transformation lies a fundamental requirement–a shift in mindset. **Development in any sector begins with a developmental mindset.** In agriculture, this mindset must be built on collaboration, cooperation, and coordination among all stakeholders, especially farmers. Without this shift, even the best policies and technologies fail to deliver long-term impact.

Bridging this gap requires institutional mechanisms that empower farmers collectively, enhance their bargaining power, and integrate them into value-driven agribusiness systems. In this context, Farmer Producer Organizations (FPOs) have emerged as a transformative force and undeniably the backbone of agricultural development.

The Need for Collective Institutional Structure

In developing economies, individual farmers often operate at a disadvantage due to their small scale of production and limited access to resources. They face multiple constraints, including:

Inadequate access to quality inputs
Limited awareness of government schemes
Lack of technical knowledge and training
Weak market linkages and price fluctuations

Operating individually, farmers struggle to overcome these challenges. However, when organized into FPOs, they gain the ability to aggregate resources, share knowledge, and access opportunities collectively.

FPOs function as institutional platforms that bridge the gap between farmers and markets, ensuring that the benefits of agricultural growth are distributed more equitably and efficiently.

I–S–T–I–M Framework: Strengthening the Role of FPOs

To effectively transform agriculture into a development-oriented sector, FPOs can be strengthened through **a five-pillar approach known as I–S–T–I–M. This framework not only enhances service delivery but also restores the self-esteem** and confidence of farmers.

The five pillars include:
I – Inputs: Ensuring timely access to quality seeds, fertilizers, and essential agricultural inputs

S – Subsidy/Schemes: Facilitating access to government programs and institutional support T – Training: Providing continuous capacity building and skill development

I – Institutional Strengthening: Building strong, accountable, and efficient FPO structures

M – Marketing: Enabling collective marketing, value addition, and better price realization

This framework operates on the principle of delivering services at the right time, right price, and right place, which is essential for improving farm-level decision-making and minimizing risk.

By integrating these five pillars, FPOs transform agriculture from a fragmented livelihood activity into a structured pathway for economic and social development.

Agri Facts

- Pollination contributes to one-third of global food production.
- Turkey is among the largest hazelnut producers.
- Climate-smart seeds improve resilience.

Beyond Dependency: FPOs as Engines of Self-Reliance

A critical aspect of agricultural transformation is reducing excessive dependency on external support systems. While governments play a vital role in providing policies, subsidies, and schemes, and private organizations contribute through improved seeds and crop protection technologies but cooperation can bring the real transformation. In simpler government supports , private innovates , but cooperation empowers.

FPOs represent this shift from dependency to self-reliance through collective strength. By working together, farmers can achieve outcomes that are otherwise difficult individually– such as bulk procurement of inputs, shared learning, risk reduction, and stronger market negotiation.

Cooperation among farmers enables:

Better price realization through aggregation

Shared access to knowledge and innovation

Reduced cost of inputs through collective purchasing

Stronger voice in policy and market systems

Thus, FPOs stand as a practical example of how cooperation can achieve what isolated efforts cannot, making them central to sustainable agricultural development.

FPOs as Catalysts for Market Access and Value Addition

One of the most significant contributions of FPOs lies in improving farmers' access to markets.

Through aggregation of produce, FPOs strengthen farmers' bargaining power and enable them to negotiate better prices.

Moreover, FPOs promote value addition activities such as grading, processing, and packaging. This shift allows farmers to move beyond primary production and participate in higher-value segments of the agricultural value chain.

Such interventions not only increase farmer income but also enhance the overall efficiency and competitiveness of the agricultural sector.

Women are emerging leaders of rural economy

FPOs play a critical role in fostering inclusive and equitable development, particularly by empowering women in rural areas. In many agricultural communities, men migrate in search of employment, while women remain engaged in farming and household management.

This positions women as emerging leaders of the rural economy, although their contributions often remain under-recognized in patriarchal social structures.

FPOs provide women with opportunities to:

Participate in organized economic activities

Access training, credit, and institutional support

Take part in leadership and d ecision-making.

Recognizing and strengthening women's role within FPOs is essential for achieving sustainable agricultural development. Policy frameworks must evolve to formally acknowledge women as primary stakeholders and ensure their active inclusion in institutional structures.

Purpose-Driven Transformation for Generational Growth

Sustainable agricultural development requires not just incremental change but purpose- driven trans formation. This is the time for a shift that is intentional, inclusive, and long-term in vision.

Transformation must go beyond systems and outputs–it must reshape the very foundation of rural development:

Transformation of information into empowerment

Transformation of groups into institutions

Transformation of efforts into dignity

Transformation of labourers into leaders

FPOs serve as the ideal platform to enable this transformation by aligning community participation with economic opportunity and institutional strength.

Such a purpose-driven approach ensures that development leads to generational growth, where the benefits extend beyond immediate income to long-term resilience, knowledge, and socio-economic advancement of rural communities.

Global Relevance of the FPO Model

The FPO model is not limited to India; it holds significant relevance for developing regions across Asia and Africa. The challenges faced by smallholder farmers–fragmentation, lack of access, and weak market linkages–are common across these regions.

By adopting the FPO approach, countries can:

* Strengthen agricultural institutions
* Enhance productivity and income levels
* Promote rural entrepreneurship
* Achieve sustainable and inclusive growth

The adaptability and scalability of FPOs make them a powerful instrument for global agricultural transformation.

Conclusion

Farmer Producer Organizations represent a paradigm shift in agricultural development. They move beyond isolated interventions and provide a holistic institutional framework that integrates production, services, and markets.

By fostering the right mindset of collaboration, reducing dependency, and enabling purpose- driven transformation, FPOs effectively bridge the gap between agriculture and agricultural development.

In countries like India, FPOs are not merely supportive structures–they are the foundation and backbone of sustainable agricultural transformation.

Agri Facts

- China leads global garlic production.
- Quinoa was once called the "mother grain" by ancient Andean civilizations.
- Biochar improves soil carbon storage.

KhetiValah's

KhetiSwags

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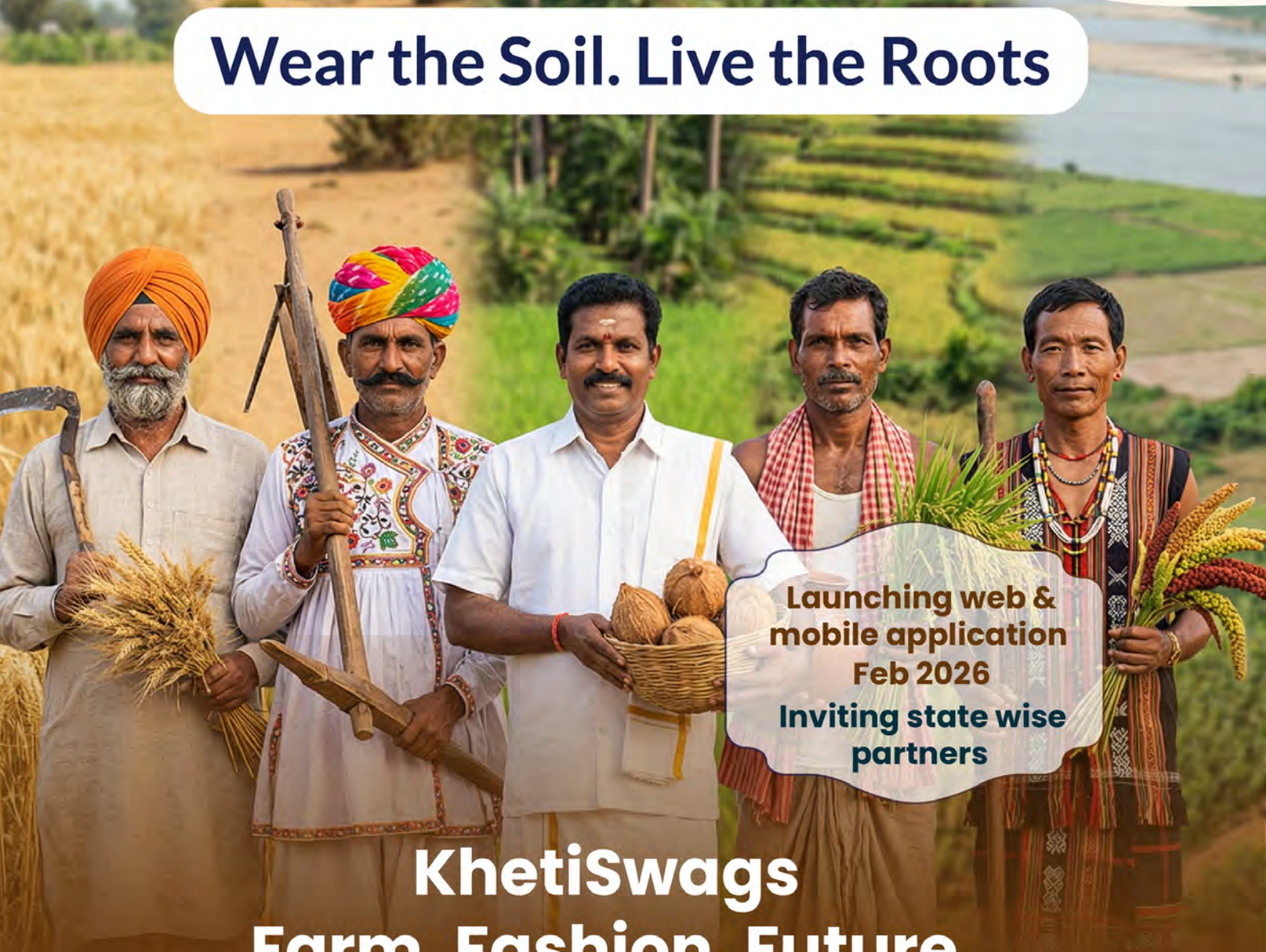

Launching web & mobile application Feb 2026

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#Khetiswags #Khetivalah

The Innovation Behind Articulated **TRACTORS**

Alex Cotterill
MA graduate from University of Nottingham
Freelance Agricultural Journalist
Contributor, Farm Machinery Journal, Farmers Guardian, Classic Tractor, & NFU.
Agricultural Heritage & Farm Machinery Specialist

Alex Cotterill is a freelance agricultural journalist with a strong background in farming heritage and agricultural reporting. With roots in a family farming tradition, he contributes to leading publications including Farm Machinery Journal, Farmers Guardian, Classic Tractor, NFU, and KhetiValah Global Agri Magazine.

His expertise covers modern and vintage farm machinery, livestock systems, arable farming, and the relationship between agricultural research and industry practice. Alex also has a keen interest in international agricultural heritage, particularly across countries such as Germany, Japan, and Russia.

Why Articulated Tractors were Introduced

Whether it is a classic 2000s machine such as the John Deere 7530 Premium or John Deere 6930, a modern Fendt 728 Vario, or the latest generation of the Case IH Magnum, conventional tractors remain the machines most closely associated with agriculture in the public imagination. Yet their articulated counterparts, though far less numerous, are often the most visually striking machines in the field. With their distinctive central pivot and immense pulling power, articulated tractors, be it both wheeled and tracked, represent a very different approach to agricultural engineering.

This raises an interesting question: why were these machines developed in the first place, and how have they evolved from the early articulated tractors of the mid-twentieth century to today's immense machines such as the Case IH Quadtrac 715?

As farms expanded and implements became increasingly larger and heavier, manufacturers faced a major engineering challenge. Farmers needed tractors capable of delivering far greater traction and power while also reducing soil compaction and maintaining field efficiency. The search for a machine that could pull the largest cultivators and seed drills without damaging soil structure ultimately led engineers to a radical solution: the articulated tractor.

Kirovets K700A

Some of the most notable articulated tractors of the twentieth century were produced in the former USSR by the St Petersburg-based manufacturer Kirovets. Among the most recognisable models were the K700A and the more powerful K701, which were manufactured from 1975 to 2002. With an output of around 235 hp and a fuel capacity of approximately 640 litres, the K700A quickly established itself as a key machine for heavy tillage operations across the Soviet Union. Its successor, the K701, offered even greater performance, producing around 300 hp and later reaching outputs of up to 330 hp from its large 22.3-litre V12 engine.

These articulated machines were developed in response to the urgent need for high-productivity, heavy-duty mechanisation on the vast state and collective farms of the Soviet agricultural system. Capable of handling demanding ploughing and cultivation work, the Kirovets tractors were also valued for their versatility. Their relatively high road speeds allowed them to transport grain, timber and other loads, while their robust construction and large tyres made them well suited to operating in the harsh winter conditions common across much of Russia. The K700A and K701 could also be fitted with dual wheels to further increase traction and stability. Because of their substantial weight - often exceeding 12 tonnes - these tractors were frequently used on silage clamps, where their mass and even weight distribution made them effective for compacting forage when operating with levellers or rollers.

For smaller farms within the Soviet Union, particularly in regions such as Ukraine and Belarus, slightly smaller articulated machines were also produced. A notable example was the KhTZ T-150K, manufactured in the Ukrainian city of Kharkiv. Although less powerful than the Kirovets tractors, the T-150K provided a more accessible articulated option and was widely used across the Soviet agricultural landscape. Many examples were later exported and could even be found operating in countries such as the United States and Canada.

T-150K

The KhTZ T-150K was powered by a six-cylinder turbo-diesel engine with a maximum output of around 165 hp. It featured a four-speed gearbox combined with both a reduction gearbox and a range gearbox, giving the tractor the flexibility required for heavy field work. Marketed for export under the name Belarus 1500, the T-150K developed a reputation for being simple to maintain, rugged in construction and generally reliable. Moreover, the Soviet Ukrainian tractor offered up to 80 percent greater productivity than many earlier machines used on Soviet farms. Later variants were also fitted with dual wheels and low-pressure tyres, increasing the contact area with the soil and helping to reduce compaction while maintaining traction.

However, the Soviet Union was not alone in developing powerful articulated tractors during this period. Manufacturers in Western Europe and North America were also exploring similar designs. Models such as the Ford FW-30 and the Steiger ST-225 became well known examples of Western articulated tractors, while companies including Massey Ferguson and Fiat also produced notable machines that balanced power with improved efficiency and operator comfort.

MF 1200

Introduced in the United Kingdom in 1972, the Massey Ferguson 1200 represented an important step forward in articulated tractor design. Producing around 105 hp from a 5.8-litre six-cylinder Perkins A6.354 engine, the MF 1200 placed greater emphasis on operational efficiency and driver comfort rather than simply maximising raw power. Its centre-pivot articulation allowed the tractor to maintain four-wheel traction across uneven terrain, while a near 50:50 weight distribution improved stability when operating heavy implements. The model was also notable for being one of the first British-built tractors to feature an integrated Q-cab.

Inspired by the larger articulated tractors developed in North America and the Soviet Union, the Italian manufacturer Fiat introduced the Fiat 44-28 in 1979 as part of a marketing agreement with the Canadian manufacturer, Versatile. Delivering approximately 280 hp from a 14-litre six-cylinder Cummins NT855 turbocharged engine, the 44-28 was designed for demanding large-scale field operations. Equipped with a 12-speed manual

transmission and weighing around 12,470 kg, it was a substantial machine that proved particularly well suited to the vast agricultural landscapes of North America.

Fiat 44-28

Then to Now

As the examples above demonstrate, both the Soviet Union and Western manufacturers produced some iconic articulated tractors during the twentieth century. From powerful machines such as the Kirovets K-701, Kirovets K-700A and Fiat 44-28, to slightly smaller yet highly capable models such as the KhTZ T-150K and Massey Ferguson 1200, these machines laid the foundations for modern high-horsepower articulated tractors.

In the twenty-first century, however, technological innovation within the articulated tractor market has largely been driven by manufacturers such as Case IH, John Deere and Claas. While other manufacturers continue to produce impressive articulated machines – including the Kirovets K-744R, the Rostselmash 2400 and the New Holland T9 – it is Case IH, John Deere and Claas that have played a particularly significant role in shaping the modern articulated tractor market.

A major pioneer in both the tracked and articulated tractor markets is Case IH. Its signature Quadtrac has become one of the most recognisable high-horsepower tractors in modern agriculture. Combining immense pulling power with improved traction and reduced ground pressure, the Quadtrac design has proven particularly well suited to large-scale arable farming where efficiency, productivity and soil protection are key priorities. Case IH first introduced the Quadtrac concept in 1996 with the launch of the Steiger Quadtrac. Unlike conventional articulated tractors fitted with four large wheels, the Quadtrac utilised four independent rubber tracks, significantly increasing the tractor's ground contact area and improving traction while helping to minimise soil compaction.

Although now superseded by the recently introduced Case IH Quadtrac 715 and 785, the Case IH Quadtrac 470 remains one of the most notable machines within the Quadtrac range. Featuring the brand's distinctive four-track design, the 470 incorporated advanced technology such as the AFS Connect system, which helped operators maximise traction and fuel efficiency while simultaneously reducing soil compaction and ground pressure. Each track unit on the Quadtrac 470 is also capable of pivoting by up to ten degrees in both directions. This allows the tractor to follow field contours more closely, reducing soil disturbance and preventing berming during tight turns when operating heavy implements. The system significantly improves stability and traction, particularly when working on uneven terrain. Another important feature was the Positive Drive system, which uses specially designed lugs that interlock with the drive wheel to ensure continuous power transfer to the tracks. This design helps prevent slippage and maintains consistent traction, even in wet or challenging field conditions. The tractor was equipped with the AFS Pro 1200 display for advanced machine monitoring and control, while its 12.9-litre Tier 4 Final engine delivered up to 520 hp. As a result, the Quadtrac 470 represented a major step forward in high-horsepower tractor engineering and remains a popular machine among large-scale arable farmers today, such as the famous YouTuber, Olly Harrison.

The latest development in the Quadtrac range is the 715 and its even more powerful counterpart, the 785. While both machines share the same engine platform, the 785 has been engineered to handle the additional demands associated with its increased horsepower. This allows operators to pull larger implements, operate at higher working speeds and achieve greater field productivity during demanding cultivation and drilling operations.

Case IH Quadtrac 470 and the Case IH Quadtrac 715 at LAMMA 2024

The Steiger 785 Quadtrac represents the most powerful tractor currently offered by Case IH. Delivering maximum outputs of up to 853 hp, the tractor is designed specifically for large-scale farming systems where extreme pulling power and reliability are essential. Hydraulic capacity is also significant, with flow rates of up to 428 litres per minute available across multiple re-

mote valves. The machine can lift up to 10,092 kg at the rear linkage, while features such as the Smart Torque 2.0 hydraulic system and centre-pull drawbar help optimise traction and weight distribution. The Quadtrac's articulated steering system and Tri-Point oscillation allow the tractor to maintain consistent ground contact, while the four-track undercarriage spreads the machine's weight across a footprint of up to 5.9 m². This helps minimise soil compaction while maintaining traction, even when working with extremely large implements.

John Deere 9RX 830

While Case IH has refined the four-track concept to an exceptional level, its green and yellow rivals are close competitors. The John Deere 9RX 830 represents one of the most powerful articulated tractors produced by John Deere. With maximum engine outputs of up to 913 hp from the JD18 engine platform, the 9RX 830 is designed to convert immense engine power into effective drawbar performance.

The tractor combines the JD18 engine with the e21 PowerShift transmission and redesigned track undercarriages to deliver strong pulling capability under demanding field conditions. Precision agriculture technology also plays a major role in the 9RX platform. Integrated systems such as the StarFire receiver, the G5Plus CommandCenter display and JDLink connectivity enable farmers to manage guidance, machine performance and data analysis directly from the cab.

Claas Xerion 12.650 Terra Trac

In Europe, the German manufacturer Claas has also developed high-horsepower tractors capable of competing with the largest machines from North America. Its flagship model, the Claas Xerion 12.650 Terra Trac, demonstrates the company's approach to combining power with innovative engineering. Known for its distinctive rotating cab design, the Xerion allows operators to rotate the entire cab by 180 degrees, providing excellent visibility for tasks such as silage compaction or reverse-mounted equipment. The Xerion 12.650 Terra Trac produces up to 653 hp from a 15.6-litre engine supplied by Mercedes-Benz and incorporates advanced digital systems such as the CEMIS 1200 terminal and GPS PILOT steering. The model was recognised as Tractor of the Year 2024 following its debut at the Agritechnica 2023 in Hanover. With long service intervals and an efficient drivetrain design, the Xerion range highlights the continued development of high-horsepower tractors in modern agriculture.

In conclusion, while many conventional tractors now achieve impressive horsepower figures - such as the Fendt 1050 Vario, Fendt 939 Vario, the John Deere 8R and the New Holland T8.435 SmartTrax - articulated tractors continue to play a crucial role on large-scale farms. Their combination of immense traction, advanced technology, reliability and reduced soil compaction explains why they remain in high demand among large arable operations and agricultural contractors around the world.

Photo Credits:

1. Kirovets K700A – Agriland (website)
2. T-150K – Wikipedia (website)
3. MF 1200 – Farmers Guardian (magazine's website)
4. Fiat 44.28 – Alex Cotterill (own photo)
5. Case IH Quadtrac 470 – Olly Blogs Agricontract Farmer (You Tube thumbnail)
6. Case IH Quadtrac 715 – Alex Cotterill (own photo)
7. John Deere 9RX 830 – John Deere (website)
8. Claas Xerion 12.650 Terra Trac – Claas (website

Photos by:
Alex Cotterill, magazines and manufacturers

Agri Facts

- Aquaculture is the fastest-growing food production sector globally.
- France remains one of the world's largest wine grape producers.
- Saffron is among the world's most expensive agricultural commodities.
- Beekeeping supports biodiversity beyond honey production.

PUTTING SOIL FIRST: RETHINKING THE FUTURE OF INDIAN AGRICULTURE

SOILFIRST :INDIA'S QUIET AGRICULTURAL REVOLUTION

A quiet shift is underway–from feeding crops to restoring soil life

SRIBIO
A Microbiome Company

For decades ,Indian agriculture has relied on a familiar formula: improved seeds ,chemical fertilizers ,crop protection products, and irrigation .This approach helped the country achieve food security and support millions of livelihoods .But today ,a growing number of farmers and scientists are asking a critical question:

Is the current model sustainable in the long run?

Across regions ,there is increasing evidence that the productivity gains of the past are slowing. Input costs are rising ,while soils are showing signs of fatigue. In many fields ,yields have plateaued despite higher fertilizer use .The underlying issue ,experts suggest ,lies not in what is added to the soil ,but in what has been lost from it.

The Emerging Soil Challenge

Soil degradation is increasingly being recognized as a major constraint to agricultural productivity .According to various field studies and agronomic assessments ,several trends are becoming common across Indian farmlands:

- Declining levels of soil organic carbon
- Reduction in microbial diversity and activity
- Lower efficiency in nutrient uptake

- Weakening soil structure and water-holding capacity
- Increased incidence of soil-borne pests and diseases

While these changes may not always be visible immediately, their cumulative effect is significant .Crops become more dependent on external inputs ,and the system as a whole becomes less resilient to climatic stress.

In response, farmers often increase fertilizer doses or pesticide applications. However, this can create a cycle of dependency, without addressing the root cause of the problem.

A Shift Toward Soil Biology

In recent years ,there has been growing interest in an alternative approach—one that focuses on restoring the biological health of soils .Soil scientists emphasize that soil is not merely a physical medium for plant growth, but a living ecosystem .Billions of microorganisms—including bacteria ,fungi ,and actinomycetes—play a crucial role in nutrient cycling ,disease suppression, and root development.

When this biological system is disrupted ,soil function declines.

To address this ,researchers and practitioners are exploring methods to rebuild soil microbiology. These include:

- Application of beneficial mi crobial formulations
- Promotion of mycorrhizal as sociations
- Use of organic matter and carbon inputs
- Improved management of the rhizosphere (root zone)
- Adoption of soil biological testing alongside conventional nutrient analysis

Some agronomists describe this process as a form of" soil biological restoration "or" microbial retrofitting ",aimed at gradually converting degraded soils into more self-sustaining systems.

From Research to Field Practice

What is notable is that these ideas are no longer confined to laboratories or pilot projects .In several states ,farmer groups, agri-entrepreneurs ,and extension teams have begun implementing soil-focused practices at scale.

Village-level meetings, demonstration plots, and peer learning models are helping to translate scientific concepts into practical field applications.

In many cases, farmers are being encouraged to observe changes in soil structure, root development, and crop response over multiple seasons.

This participatory approach is gradually building awareness that soil health is not a one-time intervention ,but a continuous process of management and regeneration.

Early Outcomes and Observations

Field experiences from different regions suggest encouraging trends where soil-focused practices have been adopted consistently:

- Improvements in crop vigor and root growth
- Better water retention, particularly under dry conditions
- Reduction in certain soil-

borne disease incidences

- Gradual increase in yields over multiple cropping cycles

In crops such as paddy and potato ,some farmers have reported yield improvements ranging from 20% to ,40% although results vary depending on soil condition ,climate ,and management practices.

Importantly ,these gains are often accompanied by improved input efficiency—meaning that the same or lower quantities of fertilizers can deliver better results when soil biology is active.

Linking Soil Health to Climate and Sustainability

The renewed focus on soil health also aligns with broader environmental concerns.

Soils rich in organic carbon act as an important carbon sink ,helping to mitigate climate change. Enhancing soil biology can accelerate the process of carbon sequestration ,while also improving soil structure and water retention—key factors in climate resilience.

As a result ,soil regeneration is increasingly being discussed not only as an agronomic issue ,but also as part of climate-smart agriculture.

This has implications for policy ,investment ,and future agricultural models ,including the potential integration of carbon credit systems and sustainability-linked incentives for farmers.

Implications for Food Systems

The conversation around soil health is also extending beyond production to food quality.

There is growing consumer interest in food that is not only safe but also nutritionally rich and sustainably produced .This has led to increased attention on the link between soil health and food quality.

While more research is needed to quantify these relationships fully ,the underlying idea is gaining acceptance:

Healthier soils are likely to produce healthier crops.

Looking Ahead

India's agricultural future will depend on how effectively it balances productivity with sustainability. While chemical inputs and modern technologies will continue to play a role ,there is a clear need to integrate them with ecological and biological approaches.

Restoring soil health is not a quick fix .It requires time ,consistent practices ,and a shift in mindset—from short-term input management to long-term system stewardship.

However ,the growing interest in soil-centered agriculture suggests that such a shift may already be underway.

Conclusion

The challenges facing Indian agriculture are complex ,but the solutions may be closer than they appear—embedded within the soil itself.

As farmers ,researchers ,and policymakers explore new pathways ,one principle is becoming increasingly clear:

Sustainable agriculture begins with healthy soil

Agri Facts

- Precision irrigation can reduce agricultural water use by up to one-third.
- Rice paddies can store carbon when managed through alternate wetting systems.

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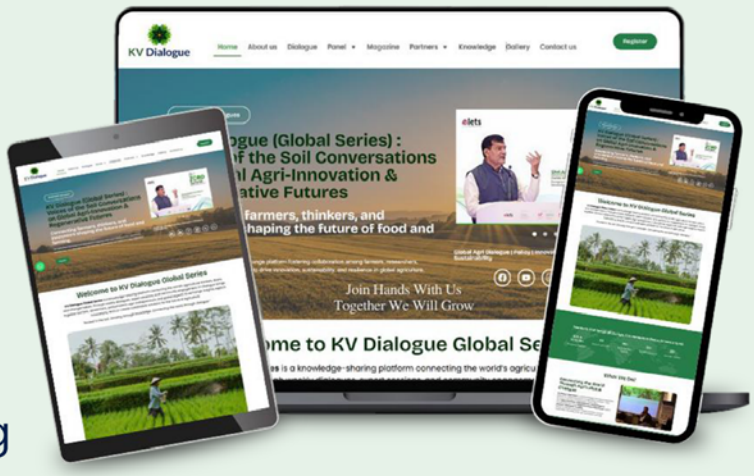
www.kvdialogue.in



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Tamil	கவே உரையாடல் – KV Uraiyadal (Tamil)	Wednesday
Hindi (National)	खेती संवाद – KhetiSamvad (Hindi)	Monday
Uttar Pradesh	खेती संवाद – KhetiSamvadUP (Hindi)	Wednesday
Madhya Pradesh	खेती संवाद – KhetiSamvadMP (Hindi)	Friday
Marath	शेती संवाद – ShetiSamvad (Marathi)	Tuesday
Assamese	খতেি সিংলাপ – KhetiSanglap (Assamese)	Tuesday
Gujarati	ખેતીનો સંવાદ – KhetinoSamvad (Gujarati)	Wednesday
Bengali	খতি সংলাপ – KhetiSanlapa (Bengali)	Saturday
Rajasthani	खेता री बातां – Kheta Ri Bataan (Rajasthani)	Thursday
Kannada	ಖೇತೀವಾಲ ಸಂವಾದ – KhetiValahSamvada (Kannada)	Thursday
Odia	ଚାଷୀ ସଂଳାପ – ChasiSanglapa (Odia)	Tuesday
Meghalaya	KhetiKobor (Meghalaya)	Monday
Other countries		
Philippines	KV Diyalogo (Filipino)	Every Wednesday
Sri Lanka	කථිකා කිරීම – KarthikaKireema (Sinhala)	Every Wednesday
Other Verticals		
UrbanKrishi	Urban Gardening & Farming	Every Friday
TattvaVedika	Artificial Intelligence Dialogues	Thursday
NaariShakthi Samvad	Women Empowerment Dialogues	Saturday

GLOBAL AGRICULTURE INVESTMENT OUTLOOK

Part 2 – Asia and Africa: Shaping Agricultural Investment Priorities

Field Focus: Following the global overview in Part 1, this edition examines how Asia and Africa are directing public agricultural investments to strengthen food security, support farmers, and build climate resilience.

Contrasting Investment Pathways Across Asia and Africa

Agriculture continues to be a critical sector across Asia and Africa, not only for food production but also for employment and economic stability. Governments in both regions allocate significant public resources to agriculture, though priorities differ based on demographic, climatic, and economic conditions.

In Asia, where population density is high and food demand continues to grow, agricultural investment is largely focused on productivity, irrigation, and input support. In contrast, Africa's investment approach is more centered on smallholder development, rural infrastructure, and climate resilience.

Scaling Production Systems in Asia's High-Demand Economies

Across Asia, agricultural investment strategies emphasize large-scale production and food security. Governments support farmers through subsidies on fertilizers, seeds, and irrigation systems, ensuring stable production of staple crops.

Irrigation infrastructure remains a major focus area, particularly in regions with uneven rainfall. Investments in mechanization and digital agriculture are also increasing, helping improve efficiency and reduce labour constraints.

In addition, procurement systems and price support mechanisms are being strengthened to ensure income stability and maintain national food reserves.

Strengthening Rural Livelihood Systems across Africa

In Africa, agriculture is largely driven by smallholder farmers, making rural development a central focus of public investment. Governments and development partners are investing in extension services, irrigation systems, and access to inputs.

Climate resilience is a defining priority. Investments in drought-resistant crops, water management, and soil conservation are becoming increasingly important as weather variability intensifies.

Programs often integrate capacity building, training, and financial inclusion to improve long-term productivity and rural stability.

Agri Facts

- Apple diversity includes thousands of varieties.
- Carbon markets increasingly include agriculture.

Table: Agricultural Investment Priorities – Asia vs Africa

Region	Key Focus Areas	Strategic Approach
Asia	Input subsidies, irrigation, mechanization, price support	Productivity and food security
Africa	Smallholder support, irrigation, climate resilience, rural infrastructure	Livelihoods and sustainability

Table: Comparative overview of agricultural investment priorities across regions.???

Emerging Convergence in Climate and Digital Investments

Several common trends are emerging across Asia and Africa. Climate adaptation is becoming a central investment priority, with increasing focus on water management and sustainable farming systems.

Digital tools such as weather advisory services, satellite monitoring, and farm-level data platforms are gaining importance. Public-private partnerships are also expanding, particularly in agri-technology and value chain development.

Governments are increasingly focusing on improving market access and strengthening supply chains to support farmers and agribusinesses.

Infographic : "Agricultural Investment Focus Areas in Asia and Africa"

Visual Elements:

- Asia: Irrigation, subsidies, mechanization, procurement
- Africa: Smallholders, resilience, infrastructure, training

Regional Priorities Shaping the Next Phase of Global Agriculture

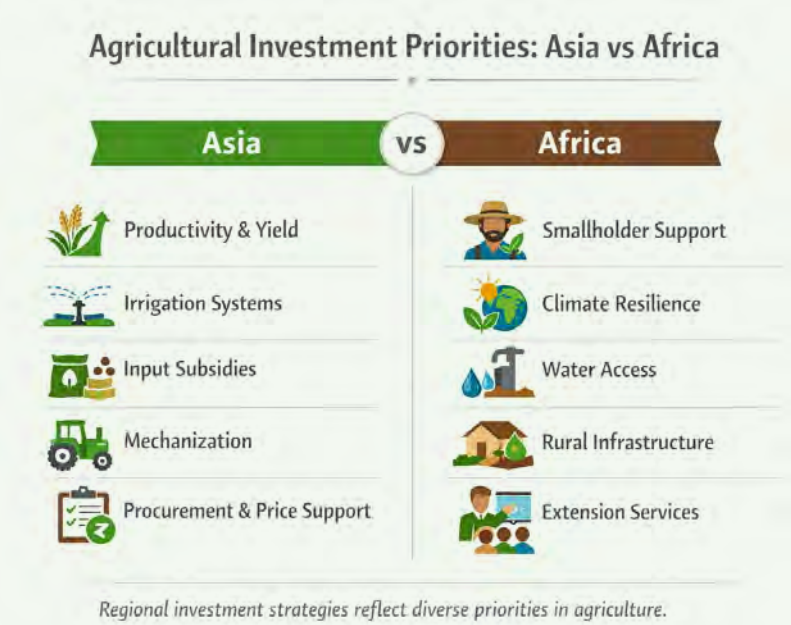
As global agriculture evolves, Asia and Africa will continue to play a central role in shaping food security and rural development. Their investment strategies reflect both immediate production needs and long-term sustainability goals.

While Asia focuses on scale and efficiency, Africa emphasizes resilience and inclusivity. Together, these pathways highlight how different regions are responding to shared global challenges.

Part 3 will explore agricultural investment patterns across Europe and the Americas.

Sources & References Sources:

Food and Agriculture Organization; World Bank; Organisation for Economic Co-operation and Development; International Food Policy Research Institute; United Nations reports; national agricultural policy documents.



Regional investment strategies reflect diverse priorities in agriculture.

Agri Facts

- Almond production depends heavily on migratory bee pollination.
- Peru preserves more than 3,000 potato varieties in mountain farming systems.

APRIL 2026 – GLOBAL AGRI DEVELOPMENTS

CLIMATE ADAPTATION FUNDING EXPANDS ACROSS AGRICULTURE

P.C-Climate-resilient farming programs are helping producers adapt to changing weather conditions.

Field Focus:

Public investment in climate-resilient agriculture is expanding as governments and institutions respond to rising weather uncertainty and long-term food security concerns.

Across many regions, agricultural funding is increasingly directed towards adaptation rather than recovery. Governments are supporting drought management, improved irrigation systems, climate-resilient seeds, and farm advisory services that help producers respond to changing weather patterns.

Climate-smart agriculture programs now focus on improving soil health, water-use efficiency, and crop diversification. These measures help to reduce vulnerability while improving productivity under variable climatic conditions.

International development institutions are also strengthening partnerships that support sustainable farming practices and farmer training. Many initiatives encourage practical adaptation strategies that can be implemented at local level, particularly in areas affected by rainfall variability and extreme temperatures.

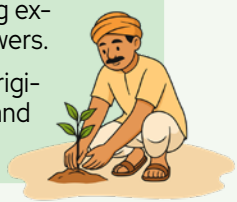
Rather than reacting only after disasters occur, many agricultural systems are shifting toward proactive planning. Climate adaptation is increasingly viewed as a long-term investment that protects both productivity and rural livelihoods.

As climate pressures continue to influence agriculture, investment in resilience is becoming a core part of agricultural policy. These efforts are helping to strengthen food systems while reducing production risks.

Source: *Food and Agriculture Organization (FAO), World Bank, United Nations climate adaptation reports.*

Agri Facts

- Greenhouses can increase yield per square meter several times.
- Kenya is a leading exporter of cut flowers.
- The cacao tree originated in Central and South America.



INTELLIGENCE CONTINUES TO RESHAPE FARMING SYSTEMS

P.C-AI-powered tools are improving crop monitoring and farm-level decision-making.

Field Focus:

Artificial Intelligence is increasingly supporting agricultural decision-making as digital tools become more accessible to farmers and agribusinesses.

AI-based technologies are now used for crop monitoring, pest identification, irrigation scheduling, and weather forecasting. These systems help farmers make informed decisions by converting field-level data into practical recommendations.

Smart farming platforms collect information from sensors, satellite imagery, and mobile applications to improve efficiency across agricultural operations. This can support better timing of planting, nutrient application, and crop protection.

Research institutions and agri-tech companies are also developing AI-powered advisory systems that strengthen extension services. These platforms can improve access to information, especially in regions where traditional advisory support is limited.

The use of AI is helping to reduce operational costs while improving resource use efficiency. In some farming systems, digital monitoring also supports better yield forecasting and risk management.

As internet access and mobile connectivity improve, AI adoption is expected to expand further. Technology-driven farming is increasingly becoming part of modern agriculture, supporting productivity, sustainability, and better farm planning.

Source: *World Economic Forum, agricultural innovation reports, digital farming research institutions.*

Agri Facts

- Rice terraces reduce erosion in mountainous farming regions.
- Ancient Mesopotamia practiced organized irrigation.
- Regenerative farming improves microbial activity in soils.

WATER MANAGEMENT GAINS GLOBAL ATTENTION IN AGRICULTURE

P.C-Efficient irrigation and water planning are becoming central to sustainable agriculture.

Field Focus:

Water management is becoming a major priority as agriculture faces increasing pressure from drought, groundwater decline, and irregular rainfall.

Governments and agricultural institutions are promoting efficient irrigation systems, improved storage methods, and farm-level water planning to strengthen long-term sustainability. Many regions are also encouraging practices that improve water conservation and reduce unnecessary losses.

Farmers are increasingly adopting drip irrigation, mulching, rainwater harvesting, and crop planning based on water availability. These methods help to improve soil moisture retention while reducing pressure on freshwater resources.

Research organizations continue to emphasize integrated water management approaches that combine productivity with conservation. Better planning can improve water-use efficiency while helping farmers to adapt to changing climatic conditions.

Water budgeting is also receiving greater attention as a practical tool that aligns crop demand with available resources. By improving how water is allocated across seasons, farmers can reduce risk and improve farm stability.

As climate-sensitive agriculture becomes more important, water management is shifting from a supporting activity to a core farming strategy.

Source: *International Water Management Institute (IWMI), Food and Agriculture Organization (FAO), water governance reports.*

REGENERATIVE AGRICULTURE EXPANDS BEYOND NICHE FARMING

P.C-Soil-focused practices are helping expand regenerative agriculture across farming systems.

Field Focus:

Regenerative agriculture is gaining wider recognition as farmers and institutions look for practices that improve soil health and long-term productivity.

The approach focuses on restoring natural systems through reduced soil disturbance, crop diversity, organic matter improvement, and better ecosystem management. Practices such as cover cropping, compost application, and crop rotation are increasingly promoted.

Across several countries, regenerative farming methods are becoming part of sustainability programs and supply chain initiatives. Many organizations believe these practices can improve soil structure, enhance biodiversity, and support long-term resilience.

Farmers adopting regenerative systems often aim to reduce dependence on external inputs while improving nutrient cycling and water retention. Healthy soils are increasingly viewed as a foundation for sustainable production.

Interest in regenerative agriculture is growing among researchers, policymakers, and agribusinesses. As awareness increases, these methods are moving beyond small-scale trials and becoming part of larger agricultural discussions.

The broader appeal of regenerative agriculture lies in its ability to combine productivity with environmental stewardship.

Source: *Food and Agriculture Organization (FAO), sustainability research networks, agricultural policy studies.*

Agri Facts

- Soil carbon plays a role in climate regulation.
- India is the world's largest spice producer.
- Goat farming is increasing in dryland economies.

LIVESTOCK SYSTEMS MOVE TOWARD SUSTAINABLE PRODUCTION

P.C-Livestock systems are integrating sustainability and animal health innovations.

Field Focus:

Livestock systems are gradually evolving as producers focus on improving sustainability, animal health, and resource efficiency.

New approaches in dairy, poultry, and meat production aim to improve feed quality, waste management, and environmental performance. Farmers are increasingly exploring precision livestock systems that monitor health and productivity.

Better nutrition and disease management are helping to improve animal performance while reducing production risks. Digital monitoring tools are also becoming more common, supporting better decision-making at farm level.

Research institutions are examining ways to reduce emissions linked to livestock production while maintaining efficiency. Improved feed formulations and manure management systems are part of these efforts.

Governments and industry groups are supporting programs that strengthen animal health services, improve breeding systems, and encourage responsible production practices.

As global demand for animal protein continues to rise, sustainable livestock systems are becoming increasingly important. Balancing productivity with environmental responsibility remains a key objective for the sector.

Source: *World Organisation for Animal Health (WOAH), livestock research institutions, agricultural sustainability reports.*

Agri Facts

- Wheat protein levels vary depending on climate.
- Tea plants can remain productive for decades.
- Brazil dominates soybean exports.
- Agroforestry improves biodiversity and farm resilience.

RURAL AGRI-ENTERPRENEURSHIP CONTINUES TO EXPAND

P.C-Rural entrepreneurship is creating new opportunities across agriculture and allied sectors.

Field Focus:

Agricultural entrepreneurship is creating new opportunities across rural economies as farming increasingly connects with innovation and value addition.

Young entrepreneurs, producer groups, and agri-startups are building business models that support processing, farm services, digital agriculture, and direct market access. These enterprises are helping to strengthen local economies while generating employment.

Many rural businesses now focus on value-added products, logistics, advisory services, and agri-input distribution. Technology platforms are also helping farmers to access buyers and improve market visibility. Institutions supporting entrepreneurship are increasingly investing in skill development, incubation programs, and financial access. These efforts encourage rural youth to explore agriculture as a business opportunity rather than as only a traditional livelihood option.

Entrepreneurship is becoming an important part of agricultural transformation. By connecting farming with innovation and enterprise development, rural economies can diversify beyond production alone.

As agriculture evolves, entrepreneurial ecosystems are helping to create stronger value chains and improving long-term resilience.

Photo Caption:
Source: International Fund for Agricultural Development (IFAD), rural development reports, agricultural innovation studies.

Agri Facts

- Controlled-environment agriculture reduces weather dependency.
- Aquaponics combines fish farming with plant cultivation.
- Millet cultivation requires less water than rice.

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Your Voice Matters: Readers Feedback & Suggestions

At KhetiValah Global Agri Magazine, we believe that meaningful agricultural knowledge evolves through dialogue, shared experiences, and community participation.

In this regard we value the thoughts and perspectives of our readers, including farmers, researchers, students, institutions, agri-entrepreneurs, policymakers, and development professionals.

Your feedback would helps us to continuously improve the quality, relevance, and impact of our magazine.

We invite you to share:

- Feedback on articles, design, and magazine sections
- Suggestions for future topics and special editions
- Agricultural innovations, success stories, and field experiences
- Research highlights and institutional initiatives
- Ideas that support sustainable agriculture and rural development

Your voice matters in shaping a stronger knowledge platform for the global agricultural community.

Share Your Feedback & Suggestions
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MECHANICAL DATA & LAYOUTS

Page	Width x Height (Inches)	Layouts
Magazine Size	8.5 X 11	
Full Page (Trimmed size)	8.5 X 11	
Full Page (Bleed size)	8.7362 X 11.2362	
Double Page (Trimmed size)	17 X 11	
Double Page (Bleed size)	17.2362 X 11.2362	
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Address:
Haladhari Technologies Pvt. Ltd.
Bangalore | Hyderabad | INDIA.

Phone:
+91 9030302139

Email:
askus@khetivalah.in

Web:
www.khetivalah.com