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India Carbon Summit 2026

30th July 2026 | India International Centre, New Delhi

Building India's Carbon Economy Through Biochar and NBS

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A Carbon Summit Keynote Paper by Greenstar Fertilizers Limited

BIOCHAR: The Silver Bullet for India's Carbon Economy

Transforming Agricultural Residues into Carbon Assets, Soil Health Solutions and Climate-Resilient Farming Systems

India stands at a critical intersection where climate change mitigation strategies must be seamlessly synchronized with sustainable agricultural development. Declining soil organic carbon, crop-residue burning, land degradation, and climate variability threaten the long-term resilience of agricultural systems and food security. Biochar, a stable, carbon-rich material produced through the pyrolysis of biomass under oxygen-limited conditions has emerged as a promising nature-based solution that addresses these interconnected challenges.

By utilizing diverse agricultural residues such as paddy straw, sugarcane trash, and coconut biomass, the production of biochar transforms problematic, low-value waste streams into highly stable ecological resources. It's stable carbon structure enables long-term carbon sequestration while improving soil physical, chemical, and biological properties. Biochar enhances soil structure, water-holding capacity, nutrient retention, microbial activity, and fertilizer-use efficiency, contributing to higher crop productivity and greater resilience to climate stress.

Beyond its agronomic benefits, biochar is increasingly recognized as a durable carbon removal technology. Replacing open-field residue burning with pyrolysis reduces greenhouse gas emissions, stores carbon in soils, and creates opportunities for carbon credit generation, providing an additional income stream for farmers. These attributes support India's transition toward a circular, climate-smart, and low-carbon agricultural economy.

Global experiences from Brazil, Kenya, and Thailand demonstrate the successful integration of biochar into diverse farming systems through research, policy support, and farmer participation. With abundant biomass resources, a strong agricultural research network, and a vast farming community, India is well positioned to establish a robust biochar ecosystem. Strategic investments in research, quality standards, supportive policies, and Farmer Producer Organization (FPO)-led enterprises can transform agricultural residues into carbon assets, improving soil health, enhancing farmer livelihoods, and strengthening India's leadership in the emerging global carbon economy.

Conclusion

Biochar represents a transformative pathway for advancing sustainable agriculture, climate mitigation, and rural prosperity. By converting agricultural residues into durable carbon assets, it strengthens soil health, enhances farm resilience, and supports carbon markets. Strategic policy support, scientific innovation, and stakeholder collaboration will be pivotal in realizing India's biochar-driven carbon economy.

Key References

IPCC (2019, 2022); FAO; International Biochar Initiative (IBI); Lehmann & Joseph (2015); Woolf et al. (2010); ICAR publications; Peer-reviewed research in Biochar, Global Change Biology Bioenergy, and Science of the Total Environment.

About India Carbon Summit

As global industrial growth and rising energy demand intensify, the urgency for climate action and effective carbon management has become a critical economic and environmental priority.

Against this backdrop, the Indian Chamber of Food and Agriculture (ICFA) convened the India Carbon Summit 2026 on 30 July 2026 at the India International Centre, New Delhi. The Summit provided a strategic platform to deliberate on building India's carbon economy, scaling climate-smart agricultural practices, advancing nature-based solutions, and integrating smallholder farmers into emerging carbon markets, in alignment with India's commitment to achieving Net Zero emissions by 2070.

Objectives of the Carbon Summit

- Policy Dialogue: Shape India's evolving carbon market frameworks and regulatory policies.
- Market Development: Establish credible, transparent carbon markets aligned with global standards.
- Nature-Based Solutions: Leverage sustainable agriculture, forestry, agroforestry, and other nature-based approaches for carbon sequestration and climate resilience.
- Farmer Integration: Facilitate the participation of smallholders and rural communities in carbon markets through aggregation models, FPOs, and other inclusive mechanisms.
- Climate Finance: Mobilize investment and innovative financial instruments for high-impact climate and carbon projects.
- Knowledge Exchange: Facilitate the exchange of knowledge, technologies, experiences, and global best practices among key stakeholders.



Inaugural Session :

The inaugural session set a grounded, realistic, and farmer-centric tone for the Summit, focusing on the intersection of climate realities on the ground, carbon markets, and the broader global carbon economy.



In his Welcome Address, ***Mr Sanjay Sethi, Executive Director and CEO, Indian Chamber of Food and Agriculture*** highlighted the growing imperative to reduce emissions across sectors and the need to translate India's climate ambitions into practical, scalable and measurable action. He noted that while multiple pathways are being explored to reduce emissions, carbon markets and emerging approaches such as carbon removal offer a ray of hope, particularly in creating new avenues for climate action and rural participation.

He underscored the importance of technology, finance and credible measurement systems in enabling these opportunities to move from potential to implementation, while emphasizing the need for collective action among policymakers, industry, researchers, financial institutions and other stakeholders to build a credible and inclusive carbon economy.

Dr. Tarun Shridhar, Director General, Indian Chamber of Food and Agriculture set a grounded and farmer-centric tone for the Summit, emphasizing that agriculture, livestock and fisheries are simultaneously contributors to and victims of climate change.

He stressed that India's carbon market architecture must bridge the gap between global carbon accounting and ground-level agrarian realities. Highlighting the equity challenge, he noted that women undertake over 80% of cattle and buffalo-related work in some estimates, yet accounted for only 4% of participants in one study of carbon-farming projects; notably, 99% of participating farmers in that study had received no monetary benefit at the time.

He further pointed out that individual carbon-project registration can cost ₹2–5 lakh, making aggregation essential for India's predominantly smallholder farming systems. He cautioned that while aggregation through FPOs and other collective structures can reduce costs, it must be accompanied by transparent contracts and equitable revenue-sharing mechanisms.

Dr. Shridhar also highlighted blue carbon as an important untapped opportunity for India, noting



that India has traded only around 11 million tonnes of CO_2 equivalent from blue carbon in recent years, despite its extensive mangrove coastline. He called for carbon-market models that are scientifically credible, economically viable, inclusive, and firmly rooted in the realities of Indian agriculture and rural livelihoods.

Mr. Takayuki Hagiwara, FAO Representative in India emphasized that building an effective carbon economy requires strong government intervention, noting that carbon markets are significantly shaped by policy frameworks rather than conventional supply-and-demand dynamics.



Highlighting India's urban-rural income disparities, he stressed that carbon finance must translate into direct and tangible economic benefits for smallholder farmers, rather than remaining an abstract environmental policy instrument.

To balance climate mitigation with food security, Mr. Hagiwara highlighted low-methane agricultural practices such as Direct Seeded Rice (DSR) and Alternate Wetting and Drying (AWD), alongside supporting technological innovations. He also referred to FAO's collaboration with NABARD on carbon finance and cautioned that voluntary buyer demand may remain limited in the absence of appropriate policy and regulatory incentives.

He concluded by urging India to leverage its scientific and policy leadership to help shape more equitable and inclusive global carbon standards, particularly for developing countries.

Dr. A.K. Nayak, Deputy Director General (Natural Resource Management), ICAR

highlighted India's commendable progress in national climate mitigation, emphasizing that the country has successfully reduced the greenhouse gas emissions intensity of its GDP by approximately 36% compared with 2005 levels. This achievement positions India as one of the top performers among G20 nations. He noted that despite India's position as an agrarian powerhouse, its per capita agricultural emissions remain comparatively low, reflecting the resource efficiency inherent in several Indian farming systems.

However, to ensure fair and accurate global carbon accounting, Dr. Nayak emphasized the need for India to develop and adopt country-specific emission factors rather than relying predominantly on generalized default IPCC values.

Focusing on agricultural decarbonisation, Dr. Nayak explained that while rice cultivation is a primary source of emissions, extensive experimental trials by ICAR demonstrate that adopting climate-smart agricultural interventions can dramatically curb these outputs. Key measures such as Alternate Wetting and Drying (AWD), conservation agriculture, solarization, agroforestry, diversified cropping systems, and improved soil organic carbon management can contribute to emissions reduction while enhancing farm productivity and potentially generating carbon credits.



He further highlighted the strategic opportunity to diversify a portion of rice acreage towards less emission-intensive crops, while ensuring that national food security objectives remain protected.

Padma Shri Dr. P.L. Gautam, Former Chairman, PPV&FR Authority & National Biodiversity Authority, traced the evolution of global negotiations on biodiversity, desertification, and climate change, highlighting the growing importance of carbon markets as a mechanism for advancing global sustainability.



He emphasized that India's emerging carbon economy must be anchored in three foundational pillars: sound science, transparent markets, and reliable data systems. He further stressed the importance of safeguarding India's national priorities during international climate negotiations and ensuring that emerging carbon market frameworks provide fair and equitable opportunities for developing countries.

Dr. Gautam advocated for a broader vision extending beyond carbon credit trading towards a low-carbon, nature-positive economy, where economic growth is aligned with ecosystem restoration and resource conservation.

He highlighted India's rich biodiversity and scientific capabilities as key strengths for developing nature-based climate solutions. To realize this potential by 2047, he called for stronger multi-stakeholder partnerships among governments, research institutions, and rural communities to transform agricultural residues into economic resources and degraded landscapes into productive carbon sinks.

Dr. Maria Valentina Lasorella, Expert – Council for Agricultural Research and Economics, Embassy of Italy, characterized the global transition toward a low-carbon economy as one of the defining challenges of our time, emphasizing that successful climate action requires bridging the gap between scientific research and practical application on the ground. She commended India's proactive leadership in aligning economic growth with climate targets, noting that the rollout of the Indian Carbon Credit Trading Scheme (CCTS) represents a critical milestone in establishing market-based incentives for industrial decarbonization.

Dr. Lasorella underscored that no country can achieve a sustainable transformation in isolation and called for stronger international collaboration, knowledge exchange, and technology transfer. Drawing on Italy's experience in biogas and



bioenergy, she highlighted the potential for collaborative initiatives leveraging India's extensive biomass resources.

She concluded by reaffirming Italy's commitment to working with India to co-create resilient, low-carbon agricultural and industrial pathways by leveraging international experience, technology, and policy expertise.

Launch of Policy Report: "Framework for Carbon Market to Lay the Path of Decarbonisation"



Mr. Mohanji Saxena, Former Managing Director, Ayurvet Limited, shared his remarks on the policy report, "Framework for Carbon Market to Lay the Path of Decarbonisation," highlighting the importance of creating an enabling policy ecosystem to support India's transition towards a low-carbon economy. He emphasized the need for clear regulatory guidelines, appropriate market incentives, and supportive policy frameworks to encourage the adoption of sustainable practices across agriculture and allied sectors.

he report presents a comprehensive framework for strengthening India's agricultural carbon market, with a focus on farmer participation, India-specific carbon methodologies, transparent benefit-sharing mechanisms, digital MRV, priority carbon project pilots, blended finance, and convergence with existing government schemes. It particularly emphasizes the need to ensure that small and marginal farmers are not excluded from emerging carbon market opportunities and that carbon finance contributes to climate resilience, sustainable agriculture, and rural livelihoods.

Following the remarks, the policy report was formally launched by the distinguished members of the Inaugural Session, marking an important milestone in ICFA's efforts to contribute to the evolving policy discourse on India's carbon economy and agricultural decarbonisation.



Panel Discussion

Session 1: Building India's Carbon Market: Architecture, Climate Finance & Carbon Investments

Panelists:

1. **Mr. Sanjay Sethi,** Executive Director & CEO, Indian Chamber of Food and Agriculture (Moderator)
2. **Ms. Shubhi Goel,** Founder, Parijata Earth Foundation
3. **Mr. Abhimanyu Gaurav,** Co-founder, NetZero.ai
4. **Mr. Bishwa Ranjan Roy,** Chief Revenue Officer – Climate Finance, Grow Indigo
5. **Mr. Kranav Sharma,** Technical Manager – Industry Innovation, Verra



Mr. Sanjay Sethi steered the discussion towards the practical challenges of establishing a credible carbon market ecosystem in India. He emphasized that while India possesses significant potential in agricultural carbon markets, long-term success will depend on trust, transparency, technological innovation, robust monitoring, and scientific integrity.



Raising questions around India's readiness, credit validation, and the adequacy of monitoring systems, Mr. Sethi highlighted the challenges associated with monitoring practices such as AWD in rice cultivation at scale. He noted that without technology-driven monitoring systems capable of reducing dependence

on manual reporting, Indian carbon credits could face credibility challenges in international markets. He also highlighted the financial lag faced by farmers, with carbon revenues potentially taking two to three years to materialize.

Ms. Shubhi Goel emphasized that carbon markets are not new to India, given the country's longstanding participation in mechanisms such as the Clean Development Mechanism (CDM) and voluntary carbon markets. She noted that the key challenge today is restoring and strengthening the credibility and value of Indian carbon credits.



She advocated alignment with international integrity frameworks such as Article 6 of the Paris Agreement, ICVCM, and VCMI, alongside the adoption of digital MRV and blockchain-based systems for improved traceability. Highlighting the high upfront costs associated with project registration and technology deployment, she called for the integration of carbon finance with instruments such as green bonds, sustainability-linked loans, and concessional finance to bridge the financing gap for smallholders.

Mr. Abhimanyu Gaurav focused on the role of digital innovation in de-risking and streamlining carbon markets. He explained how digital MRV, AI-based analytics, remote sensing, and automated data collection can reduce monitoring costs while improving transparency.

He described carbon finance as an important viability-gap financing mechanism for farmers adopting sustainable practices and explained how NetZero.ai seeks to lower entry barriers by deferring certain technology costs until carbon credits are



monetized.

However, Mr. Gaurav cautioned that digital technologies alone cannot address all market challenges and must complement strong institutional governance, ethical implementation, and meaningful field-level engagement.

Mr. Bishwa Ranjan Roy addressed the scientific integrity of agricultural carbon credits, highlighting Grow Indigo's application of Verra's VM0042 methodology across rice and wheat systems. He



noted the company's initiatives in Punjab and Haryana and highlighted the importance of rigorous standards, independent validation, and environmental integrity in sustaining carbon revenue flows to farming communities.

Acknowledging that domestic demand remains limited, Mr. Roy explained that Grow Indigo connects Indian smallholders with international buyers, emphasizing that high-quality project development and credible third-party validation are essential to maintaining investor and buyer confidence.

Mr. Kranav Sharma provided an assessment of implementation challenges in India, identifying gaps in rigor and execution delays as important barriers to market credibility. He explained Verra's approach to incorporating Core Carbon Principles (CCP) into updated methodologies and highlighted the potential of satellite monitoring and digital MRV to reduce manual reporting biases in agricultural projects.

Mr. Sharma reaffirmed Verra's commitment to working with Indian regulators, researchers, and market participants to strengthen domestic frameworks using internationally benchmarked methodologies.



Audience Intervention

Mr. Ashwin Shailja, Manager - Standard Development & Innovation at Gold Standard, intervened from the audience to share perspectives on the credibility and evolution of carbon markets. He emphasized that market credibility depends on continuous methodology refinement, robust verification, and transparent processes, rather than reliance on a single standard.



He explained how global accounting frameworks manage inherent uncertainties through defined and standardized error margins. Highlighting the use of remote sensing and objective satellite data, he encouraged Indian stakeholders to move from conceptual discussions towards practical, scalable field implementation informed by established global best practices.

Panel Discussion

Session 2: Nature-Based Climate Solutions

Panelists:

1. **Mr. Navin Horo,** Project Lead, GIZ (Moderator)
2. **Shri Rajit Punhani, IAS**, Chief Executive Officer, FSSAI
3. **Dr. Nutan Kaushik,** Director General, Amity Food & Agriculture Foundation
4. **Dr. Ezhil Subbian,** CEO, String Bio
5. **Ms. Archana Pai,** Founder & Director, CostMos Pvt. Ltd.



Mr. Navin Horo opened the session by highlighting the Indo-German partnership on sustainable agriculture as an important component of the broader Green and Sustainable Development Partnership between India and Germany.



He emphasized that while India successfully achieved food security through the Green Revolution, the next frontier is to make agricultural systems more environmentally sustainable without compromising productivity or smallholder incomes.

He stressed that farmers must remain at the centre of India's transition towards a low-carbon agricultural economy and outlined three foundational principles: sustainable agriculture should provide supplementary income opportunities, with carbon markets functioning as an additional incentive rather than the sole driver; climate-smart practices must

safeguard productivity; and the transition should adopt a systems-based approach integrating ecological sustainability, economic viability, and social equity.

The discussion also explored the challenges of scaling nature-based solutions beyond pilot projects, leveraging consumer demand for sustainable food, enabling price premiums through certification and traceability, commercializing technologies such as biochar and biologicals, and strengthening cross-sectoral collaboration.

Shri Rajit Punhani, IAS challenged the perception that Indian consumers are exclusively price-sensitive, noting growing willingness among consumers to pay premiums for products perceived as healthy, organic, and sustainably produced, provided such claims are supported by credible evidence.



He suggested that district- or region-level certification models could provide a practical and scalable approach to strengthening traceability and verification. He further emphasized the importance of public awareness campaigns to help consumers understand the value of sustainably produced food.

He concluded by stressing that sustainable consumption must evolve into an interconnected ecosystem supported by credible certification, transparent supply chains, consumer awareness, and effective regulatory oversight.

Dr. Nutan Kaushik highlighted the contribution of nature-based solutions, particularly conservation agriculture, to climate mitigation and resilience. She identified soil carbon as an important indicator of agricultural climate resilience and linked soil health with the One Health framework.



Drawing on international experience, including Argentina's adoption of conservation agriculture, she identified key barriers in India, including limited farmer awareness, insufficient field demonstrations, inadequate policy support, and a lack of direct financial incentives.

She also advocated for documenting India's indigenous agricultural practices and developing measurable indicators that can enable traditional knowledge to be appropriately integrated into formal sustainability and carbon market frameworks.

Dr. Ezhil Subbian presented String Bio's proprietary biotechnology platform for capturing methane and



converting it into high-value biological products, thereby transforming a potent greenhouse gas into a productive resource.

She highlighted the company's carbon project and emphasized that farmer adoption ultimately depends on economic viability and tangible value creation, rather than environmental messaging alone. She also highlighted ongoing research and validation partnerships with institutions including ICAR–Indian Institute of Rice Research, ICAR–IARI, and the International Rice Research Institute (IRRI).

Ms. Archana Pai advocated for a shift in the national narrative around farmers, emphasizing their role as



providers of environmental services rather than merely beneficiaries of climate programmes.

She highlighted the significant volume of agricultural biomass generated annually in India and the challenges associated with its unmanaged surplus. She presented biochar as a potential solution that simultaneously addresses agricultural residue management and soil restoration.

She recommended integrating biochar into existing government initiatives, including the National Mission on Natural Farming and the Soil Health Card Programme, while linking soil organic carbon monitoring with biochar application to strengthen climate impact measurement and farmer incentives.

Special Presentation by Sponsor:

Biochar – The Silver Bullet for India's Carbon Economy

Mr. S. Narayanan, Director - Marketing, GreenStar Fertilizers Limited delivered a special presentation on "Biochar: The Silver Bullet for India's Carbon Economy," highlighting biochar's potential to address soil degradation, crop residue management, water stress, and climate change while creating additional income opportunities for farmers.

He explained how agricultural residues can be converted into stable carbon through pyrolysis and applied to soils to improve soil health, nutrient retention, water-holding capacity, and long-term carbon sequestration. The presentation also highlighted decentralized biochar production, FPO-led value chains, and the integration of biochar with carbon markets.

Mr. Narayanan proposed a Five-Pillar National Biochar Mission encompassing research and innovation, farmer adoption, policy integration, rural enterprise development, and carbon finance, positioning biochar as a promising circular-economy solution linking agricultural productivity, climate action, and rural livelihoods.



Panel Discussion

Session 3: Carbon Markets and Farmers

Panelists:

1. **Mr. Rajasekhar Reddy Salipela,** India Lead – Carbon Program, UPL (Moderator)
2. **Mr. Surendra Pal,** Head – Farm & Technical Services, Elbrow India Pvt. Ltd.
3. **Mr. Deepak Pareek,** Founder, HnyB
4. **Ms. Ankita Garg,** Co-founder & COO, Varaha



Mr. Rajasekhar Reddy Salipela steered the discussion towards the practical realities of leveraging carbon markets to advance farmer-led climate action.



He emphasized that the long-term viability of agricultural carbon programmes depends on commercially robust models that generate clear and measurable economic value for primary producers.

The session examined the realities of voluntary carbon markets, monetization pathways beyond conventional carbon credits, commercial opportunities for premium-priced sustainable commodities, and supply-chain readiness.

Mr. Surendra Pal underscored that sustainability initiatives can achieve scale only when they directly improve farmers' return on investment. Drawing on field experience, he noted that farmers are more likely to adopt sustainable interventions when they



result in lower input costs, higher yields, improved profitability, and price premiums.

He shared field-level observations indicating yield improvements of 7–10% alongside reductions in chemical fertilizer, pesticide, and water use. He emphasized that sustained behavioural change requires continuous handholding, trust-building, and localized field demonstrations, rather than one-time training interventions.

Mr. Deepak Pareek identified the shortage of patient capital as a major bottleneck facing sustainability initiatives. He challenged the assumption that smallholders are primarily motivated by carbon credits, noting that farmers generally prioritize immediate risk management, quality inputs, and reliable market returns.



He called for simplified, farmer-centric models that reduce administrative and data-collection burdens and argued that premium pricing for sustainably produced food can serve as a stronger commercial driver than carbon credits alone.

Ms. Ankita Garg shared Varaha's experience in implementing carbon programmes across India, Nepal, and Bangladesh through regenerative agriculture, agroforestry, and related climate pathways. She emphasized that local partnerships, community consultations, and Farmer Producer Organizations (FPOs) are foundational to designing practical and scalable interventions.

To reduce barriers to participation, she highlighted the importance of simplifying MRV processes and utilizing upfront project financing, grants, and



advance funding mechanisms to support farmers before carbon credits are monetized.

She concluded that technology-enabled monitoring, accessible data infrastructure, and collaborative partnerships will be essential to scaling carbon finance across South Asia.

Audience Intervention

Mr Vijayabalan Anbalagan, CEO & Founder, Transun Energy Systems sought clarity on the procedure for farmers who have installed solar pumps to access carbon credits.

The panelists explained that the emission reductions resulting from the solarisation of agricultural pumps need to be systematically monitored and quantified through an appropriate monitoring mechanism.

The discussion highlighted the importance of robust monitoring, reliable data, and verification mechanisms in enabling farmers to convert the environmental benefits of solar pump adoption into tangible carbon-credit opportunities.



Panel Discussion

Session 4: Future of India's Carbon Economy

Panelists:

1. **Ms. Shuchi Malhotra,** Lead Advisor – Carbon Pricing, Environmental Defense Fund (Moderator)
2. **Mr. Vimal Kumar,** Co-founder, Finovista
3. **Mr. Tanuj Kapta,** Senior Engagement Manager, cKinetics
4. **Mr. Anil Pareek,** Corporate Strategic Advisor, Terra Agro Biotech Pvt. Ltd.
5. **Dr. Vikas Dugesar,** National Consultant, International Rice Research Institute (IRRI) – South Asia Regional Centre



Ms. Shuchi Malhotra highlighted the dual role of farmers as both among the populations most vulnerable to climate change and important potential contributors to climate mitigation.



She noted that while climate-smart agriculture, carbon markets, sustainable finance, and digital technologies have been discussed extensively, the immediate priority is to translate these concepts into practical, financially viable, and scalable solutions and policy recommendations.

The discussion explored investment readiness, farmer incentives, buyer confidence, technology adoption, and equitable revenue distribution. Ms.

Malhotra concluded that India's carbon economy can succeed only when smallholders receive meaningful economic returns and climate-smart practices become viable long-term livelihood strategies.

Mr. Tanuj Kapta highlighted the urgency of climate action using global carbon concentration and emissions trends, emphasizing agriculture's potential contribution to carbon removal.

He identified biochar and integrated carbon removal solutions as promising interventions, particularly because of their potential to combine long-term carbon sequestration with improved soil health, agricultural productivity, and rural livelihoods.

Mr. Kapta emphasized that carbon projects become more commercially attractive when they deliver strong environmental and social co-benefits. He also noted that international carbon buyers are increasingly attentive to projects demonstrating high levels of social and environmental integrity and called for transparent revenue-sharing mechanisms to strengthen investor confidence.



Mr. Anil Pareek shared Terra Agro Biotech's experience as an early adopter of biochar in organic fertilizer blends and highlighted the establishment of a large-scale industrial biochar facility in Rajasthan.



He advocated for regenerative agriculture supported by climate-smart inputs as an important foundation for India's future carbon economy, emphasizing that healthy soils are fundamental to agricultural resilience and long-term productivity.

He also stressed the importance of farmer participation in feedstock collection and field application and highlighted the growing market potential for sustainably produced commodities.

Mr. Vimal Kumar emphasized that the success of climate initiatives ultimately depends on establishing the underlying economic viability of agriculture, with carbon finance serving as a supporting financial mechanism rather than the primary objective.

Drawing on experience in clean cooking and rural finance, he highlighted the potential of blended finance, subsidies, concessional capital, and carbon revenues to reduce technology adoption barriers and



lower upfront costs.

He called for policymakers to introduce risk-sharing mechanisms, targeted policy incentives, and appropriate financial instruments to encourage sustained private investment in the carbon economy.

Dr. Vikas Dugesar emphasized that timely and reliable information is among the most valuable interventions for strengthening smallholder climate resilience.



He highlighted how localized weather advisories and optimized sowing windows can reduce input costs, improve productivity, and mitigate climate risks.

Discussing advances in MRV, Dr. Dugesar highlighted the transformative potential of remote sensing, IoT sensors, artificial intelligence, machine learning, and geospatial technologies for large-scale and automated carbon monitoring.

He concluded that widespread farmer adoption will require localized awareness, trust, field-level demonstrations, and targeted financial incentives, particularly for smallholders with limited capacity to absorb financial risks.

Recommendations

- ✓ **Ensure Equitable Benefit Sharing for Farmers :** Establish transparent and mandatory revenue-sharing mechanisms to ensure that a substantial share of carbon revenues reaches farmers and rural communities, supported by standardized and transparent FPO agreements.
- ✓ **Strengthen India's Carbon Market Architecture and Integrity :** Develop a robust, transparent, and science-based carbon market framework with clear regulatory guidelines, credible methodologies, independent validation, and alignment with international carbon market integrity standards.
- ✓ **Develop India-Specific Emission Factors and MRV Systems :** Promote the development of country-specific emission factors and strengthen Measurement, Reporting and Verification (MRV) systems through remote sensing, satellite data, IoT, AI, and digital technologies to improve the accuracy, scalability, and credibility of carbon projects.
- ✓ **Reduce Entry Barriers for Smallholder Farmers :** Develop simplified, farmer-centric carbon project models that reduce registration, documentation, monitoring, and compliance burdens, while providing upfront financing, grants, or advance payments to farmers before carbon revenues are realized.
- ✓ **Mobilize Innovative Climate Finance and Patient Capital :** Leverage blended finance, concessional capital, green bonds, sustainability-linked finance, and other innovative financial instruments to de-risk climate investments and address the shortage of patient capital for agricultural and rural climate projects.
- ✓ **Scale Nature-Based and Regenerative Solutions :** Promote climate-smart and regenerative agriculture, agroforestry, conservation agriculture, soil carbon enhancement, and other nature-based solutions through field demonstrations, policy incentives, scientific validation, and scalable implementation models.
- ✓ **Recognize Farmers as Providers of Environmental Services** : Reframe farmers not merely as beneficiaries of climate programmes but as providers of environmental and ecosystem services, creating appropriate economic incentives for carbon sequestration, biodiversity conservation, soil restoration, and sustainable resource management.
- ✓ **Promote Biochar and Agricultural Biomass as Climate and Economic Opportunities** : Integrate biochar and agricultural residue management into relevant government programmes while strengthening the measurement of soil organic carbon and exploring opportunities to generate both environmental benefits and additional income for farmers.
- ✓ **Strengthen Data Infrastructure and Digital Public Goods :** Develop centralized and accessible databases covering land records, soil health, satellite imagery, weather, and agricultural data to reduce project development costs, improve MRV, and enable more efficient scaling of carbon projects.
- ✓ **Build Stronger Multi-Stakeholder and International Partnerships :** Strengthen collaboration among governments, research institutions, financial institutions, carbon market participants, technology providers, farmer organizations, development agencies, and international partners to co-create scalable, credible, and inclusive climate solutions for India and other developing countries.

Glimpses of Cotton Seminar















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