CONVENING: Biochar for crop residue management & climate resilience in Punjab

KEY TAKEAWAYS

APRIL 9, 2025 |
CHANDIGARH

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CRIA CARBON REMOVAL INDIA ALLIANCE | GDI

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Table of Contents

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Executive Summary

The convening was attended by over 60 stakeholders, including biochar developers, financial institutions, CSR representatives, civil society organizations, farmer groups, and government officials.

The session began with opening remarks from senior government officials, who set the context and outlined expectations from key players in the biochar ecosystem. This was followed by three focused panel discussions on policy imperatives, research and knowledge needs, and financing requirements. The workshop concluded with a role and responsibilities mapping exercise, during which key interventions were identified and stakeholders were aligned across various focus areas.

Objectives of the convening

- Facilitating Multi-Stakeholder Dialogue – Creating a common platform for biochar ecosystem players including technology providers, project developers, government officials, and researchers to share insights and coordinate efforts to promote biochar in Punjab.
- Promoting Research & Knowledge Enhancement – Collaboration with scientific institutions to advance biochar technology, and the development of certification and labelling standards.
- Policy Advocacy & Institutional Support – Engaging policymakers to drive regulatory support and integration into national sustainability programs.
- Driving Adoption & Farmer Engagement – Addressing key challenges, including awareness, financial incentives, and application methods.

The Plenary Session

The plenary session featured addresses by senior government leaders who shared their perspectives on biochar and expressed strong interest in supporting the development of a robust biochar ecosystem in Punjab.

Ajit Balaji Joshi, Secretary, Rural Development and Panchayats, Government of Punjab

- Emphasized the concept of completing the carbon cycle by returning carbon to the soil, thereby enabling the generation of carbon credits.
- Stressed the importance of balancing environmental priorities with the state's economic growth objectives, and highlighted the need to enable a circular economy in Punjab.
- Highlighted the readiness of government agencies to integrate biochar solutions into the crop residue management action plan to eliminate stubble burning.

M.P. Singh, Director, Punjab Energy Development Agency (PEDA)

- Highlighted diverse applications of biochar and gasification technologies in both industrial and rural contexts especially in the domain of energy production from Biochar gasification.
- Expressed PEDA's willingness to develop a framework for supporting Biochar projects and urged industry players to explore the possibility of establishing long-term buyback arrangements for syngas or bio-oil produced from Biochar processes.
- Highlighted the need to explore pricing options for Biochar based on thermal content (GCV) to promote market development.
- Referred to current government incentives for biofuel initiatives, such as stamp duty and electricity duty waivers and the possibility of extending the benefits to Biochar units as well.

G. S. Majithia, Member Secretary, Punjab Pollution Control Board (PPCB)

- Underlined the need for clear emission norms, siting guidelines, and environmental clearances for setting up biochar plants.
- Reiterated the board's commitment to supporting entrepreneurs while ensuring compliance with environmental standards.
- Encouraged early engagement with PPCB to streamline approval processes and avoid regulatory delays.
- Emphasized the importance of aligning biochar operations with the broader environmental objectives of the state, particularly in relation to air quality and crop residue management.

Biochar Developers Showcases

The discussion was moderated by Asitava Sen (Co-Founder and CEO, Carbon Removal India Alliance (CRIA)). Present at the discussion were Tanmay Telang (Takachar), Kul Kauwid Rora (Circonomy), Palak Nanjani (ASQI), Piyush Sharma (Varhad), Lt. Col. Monish Ahuja (Biochar Ind. Pvt. Ltd), Souvik Dhar (Sajeevan and ISAP), and Hasan Chaithanya (Tapovanam).

To start, CRIA emphasized that biochar production, by converting biomass into a stable carbon form that can be stored in soil for long durations, serves as a crucial approach to locking carbon away for centuries or even millennia. Asitava Sen, highlighted India's potential to become a global leader in the durable carbon removal industry, with biochar playing a significant role in achieving this. The need for recognizing Biochar as an "Industry" was emphasized. This presentation also highlighted the co-benefits of biochar, such as improved soil health, increased crop yields, and reduced air pollution, further strengthening the case for its role in crop residue management in Punjab.

Key Insights

1. **Diverse biochar production methods cater to different scales and contexts**. For instance, ASQI and Circonomy utilise low-cost, manually operated Kon-Tiki kilns suitable for small-scale operations in rural areas. Takachar's model relies on selling low-cost, decentralized biomass-to-biochar pyrolysis equipment. The Sajeevan-ISAP project also uses an innovative flame curtain pyrolysis which is suitable for decentralized small-scale operations. In contrast, BiocharIND (PRESPL & APChemi) and Tapovanam Biochar employ industrial, high-technology pyrolysis plants for larger-scale production.

2. **Biochar production effectively utilises a range of biomass inputs ranging from agricultural waste to invasive species, thereby mitigating environmental issues.** The Sajeevan-ISAP project specifically uses the invasive Prosopis juliflora as feedstock, having processed over 60,000 tons. Similarly, ASQI converts crop residues like cotton stalk and maize stover, which were previously burnt in fields, into biochar. Varhad blends biochar from woody biomass with compost from paddy straw, avoiding the burning of 60,000 MT of agri-residue.

3

Accurate carbon credit validation relies heavily on Digital Monitoring, Reporting, and Verification (dMRV). Circonomy has developed a digital platform with end-to-end traceability and is creating a user-friendly dMRV app. Takachar provides simple and intuitive dMRV services suitable for less-literate workforces in low-internet areas. BiocharIND highlighted its fully automated and digitized plant for precise carbon footprint calculations and plans to register on Puro.Earth.

4

Early results for biochar application in agriculture is encouraging, and more research on co-benefits should be undertaken. ASQI anticipated a 20% combined improvement in farmer income through residue sales, yield enhancement, and reduced input costs. BiocharIND projects a 10 to 30% boost in crop yield from their biochar. Varhad's Gramkalyan Biochaar++ trials showed significant yield increases and reduced water requirements in various crops. This is corroborated by numerous international academic studies undertaken such as this study.

5

Biochar initiatives contribute to the creation of jobs and improved livelihoods in rural communities. Circonomy estimated 10-12 jobs per production site. ASQI's Khargone plant has already created over 30 local jobs, with upcoming sites expected to generate 50-60 jobs each. Takachar reports having engaged with 15,000 farmers and added $800,000 to rural livelihoods.

6

Biochar offers a durable solution for carbon dioxide removal while offering multiple agricultural co-benefits. Different biochar technologies offer potential for CDR over a long-time duration and creation of quality carbon credits. For instance, The Kon-Tiki technology provides ~80% carbon permanence for 1000+ years and has already removed ~2600 tCO_2e. ASQI's operations have resulted in 1800 tCO_2e removed. BiocharIND anticipates generating ~25,500 tCO_2e of carbon credits per annum from their first plant. Takachar has already removed 11,000 tonnes of CO_2e.

Policy Imperatives and Pathways for large scale adoption of Biochar in Punjab

The discussion was moderated by Ankit Jain (Co-Founder, GDi Partners) and panelists included Shoikat Roy (Member, Punjab Development Commission), Gurharminder Singh (Joint Director, DECC), Sampriti Baruah (Head of Sustainable Agriculture, Food-Land-Water Program, WRI) & Aparna Sharma (Head, Low Carbon Economy- Carbon Markets & CBAM, CEEW). The discussion highlighted -

Key Needs and Gaps

- The current over-reliance on voluntary carbon markets by the biochar industry was noted, with a call to develop more stable revenue models, including commercial sales and agriculture-based use cases.
- There is a pressing need to standardize the quality of biochar and invest in building a robust body of scientific evidence that validates its agronomic and environmental benefits.
- Institutions such as ICAR, KVKs, and agricultural universities were urged to lead trials, generate localized evidence, and incorporate findings into the package of practices for farmers.
- Demand-side development was emphasized as a priority, with a need to support experimentation, field validation, and market creation for biochar across different agricultural settings.

Government Readiness and Enabling Role

- The government is considering measures such as formal recognition of biochar, development of quality standards, and the introduction of targeted subsidies to boost adoption.
- There is an openness to exploring the creation of a transparent market mechanism or digital platform for biomass pricing and transactions to support fair and efficient supply chains.
- The Punjab Development Commission showed readiness to act as a potential anchor to facilitate convergence between departments, universities, private sector players, and civil society to drive coordinated biochar pilot initiatives and scientific validation of the soil co-benefits.
- Suggestions were made to establish a dedicated facilitation desk or cell at the subnational level to help navigate and leverage emerging opportunities in the carbon market space, specifically tailored to biochar.

Cultivating Trust for Scale through Research and Knowledge

The discussion was moderated by Aaran Patel (Executive Director of Climate, Nand & Jeet Khemka Foundation) and panelists included Dr. Manpreet Singh Mavi (Senior Soil Chemist, PAU), Navjot Kaur (Asst. Professor, Plaksha University), Gyan Rai (Project Lead, TNC), Tanmay Telang (Head, Business Development, Takachar), and Suhas Dixit (CEO, APChemi). The discussion highlighted –

Key Research Requirements

- Conduct scientific studies to determine optimal biochar dosages for different crops and soil types across Punjab's agro-climatic zones.
- Initiate long-term research on the impact of biochar on soil carbon sequestration, soil health, and crop productivity.
- Develop robust quality control frameworks, including data sheets specifying parameters such as particle size, bulk density, porosity, and carbon percentage.
- Study and document the agronomic benefits and limitations of different biochar products, enabling farmers to make informed decisions.
- Support trials and field experiments in collaboration with research institutions and organizations like The Nature Conservancy (TNC).

Readiness and Collaborative Efforts

- Punjab Agricultural University invited biochar stakeholders to collaborate on research examining the impact of biochar on soil properties and crop yields, and emphasized the need to develop research literature tailored to Indian agro-climatic conditions.
- Participants outlined the potential of building regional consortia to explore biochar pilots. For instance, the Nabha Foundation and TNC already have pilots underway in the Patiala and Mansa districts of Punjab. Through a consortium of civil society organizations, biochar developers, farmer producer organizations, and academic institutions, these efforts could be accelerated.
- Biochar developers expressed willingness to adopt global standards, including exploring the implementation of European Biochar Certification protocols for biochar products in India.
- Academia and industry showed intent to collaborate on solving technical challenges and accelerating commercialization of biochar innovations.
- Participants emphasized the importance of building trust through meaningful partnerships with civil society organizations and farmer groups to promote adoption at the grassroots level.

Role of Public, Private and Philanthropic Finance in Scaling Biochar

The discussion was moderated by Asitava Sen (Co-Founder & CEO, CRIA) and panelists included Pritpal Singh (Executive Director, PSCST), Aakash Shah (Partner, Peak Sustainability Ventures), Md. Asghar Ali (Head of Social Investments - North, ITC), and Srajesh Gupta (Founder and Lead, C-GEM). The discussion highlighted –

Key Financial Gaps

- There is a need for innovative financial instruments that can de-risk investments in biochar, especially at scale.
- The absence of credit history, scale and lack of standardized valuation methods for biochar projects make them less attractive to banks.
- Early-stage technology developers face significant barriers in accessing capital due to limited track records. The need for dedicated funding to support innovation and pilot demonstration was widely recognized.
- The ecosystem currently lacks financing structures suited for community-driven or non-bankable projects. Options such as the WWF-managed Dutch Fund for Climate and Development were cited as potential models for channeling catalytic capital.
- While CSR funds present an opportunity, there is limited alignment between corporate giving and long-term ecosystem-building and scaling for biochar.

Readiness and Emerging Initiatives

- While reaffirming PSCST's commitment to collaboratively work towards research and finance that can underpin biochar's success as a crop residue management method, Pritpal Singh traced PSCST's journey in paddy straw briquetting and the learnings 'biochar' can derive thereof. He emphasized the need for end-use clarity, as well as that of the right kind of policy incentives that are required for biochar to take off. He also mentioned the Tech Fair and Technology Transfer MOUs are two potential avenues for collaboration with PSCST.
- ITC Group shared its work on the Climate Smart Village (CSV) Initiative. CSV works towards making villages climate smart by promoting weather smart, water smart, seed/breed smart, carbon/nutrient smart and institutional/ market smart practices. The programme's biochar initiative focuses on using different biomass in different areas to produce biochar with the help of local communities. Md. Asghar Ali talked about the importance of such a decentralized approach in the usage and financing of biochar, and the need for the development of low-cost, replicable models in this regard.

- Peak Sustainability Ventures emphasized the need for risk-mitigation mechanisms and highlighted opportunities for government and philanthropic actors to provide guarantees that unlock commercial finance. Aakash Shah differentiated between the financial opportunities that might be available for small projects vis-à-vis large projects, and the role that different players can play in building a vibrant biochar ecosystem.
- C-GEM Foundation empowers farmer communities to access carbon markets benefits. Srajesh Gupta highlighted the importance of ensuring that the farmer is at the centre of innovations in biochar production, as well as financing through carbon markets.
- Panelists expressed openness to exploring innovative financing pathways, including sustainable funds and philanthropic capital, to support early-stage players and scale operations.

Strategic outcomes from Role mapping & Taskforce formation exercise

The exercise outlined five key personas i.e. research support, strategy support, institutional partnerships, implementation support, and financial support. All of these are essential for advancing the biochar ecosystem.
Participants were presented with initiatives across four focus areas: supply-side, demand-side, policy reforms, and market development. They were asked to position their organizations against each initiative under the identified personas based on their roles and capabilities.
Based on participant inputs, several key initiatives were prioritized for immediate execution. This exercise will lay the groundwork for establishing a dedicated task force and fostering coordinated, collaborative efforts moving forward.

Supply-side Initiatives

- Conducting research experiments to measure the effectiveness of Biochar.
- Biochar Product Development (e.g. Fortified Biochar fertilizers, application specific Biochar combinations).

Demand-side Initiatives

- Enhancing farmer trust and confidence in biochar application.
- Increasing Biochar demand as soil amendment material.

Policy Reforms

- Defining regulations and guidelines for Biochar Industry.
- Inclusion of Biochar manufacturing units under Crop Residue Management (CRM) Scheme.
- Inclusion of Biochar-based products under GOBARDHAN scheme to provide MDA.

Market Development Initiatives

- IEC campaign strategy for the promotion of Biochar Products.
- Training of Farmers and PACs regarding the usage of Biochar.

Annexure 1: List of Attendees

Speakers and Panelists:

- Aakash Shah: Partner, Peak Sustainability Ventures
- Aaran Patel: Executive Director, Climate, Nand & Jeet Khemka Foundation
- Ajit Balaji Joshi: Secretary, Department of Rural Development and Panchayats
- Ankit Jain: Co-Founder, GDi Partners
- Asitava Sen: Co-Founder & CEO, Carbon Removal India Alliance (CRIA)
- Dr. Aparna Sharma: Programme Lead, Centre for Energy, Environment & Water
- Dr. Manpreet Singh Mavi: Senior Soil Chemist, Punjab Agricultural University
- Dr. Navjot Kaur: Asst. Professor, Plaksha University
- Dr. Sampriti Baruah: Head, Sustainable Agriculture, Land-Water Program, World Resources Institute
- Gurharminder Singh: Joint Director, Directorate of Environment & Climate Change, Government of Punjab
- Gurinder Singh Majithia: Member Secretary, Punjab Pollution Control Board
- Gyan Rai: Project Lead, The Nature Conservancy
- Hasan Chaithanya: Founder, Tapovanam
- Kuldeep Kaur Rora: Co-Founder & COO, Circonomy
- Lt. Col. Monish Ahuja: Chairman, BiocharIND
- M.P. Singh: Director, Punjab Energy Development Agency
- Md. Asghar Ali: Head of Social Investments, North, ITC
- Palak Nanjani: Co-Founder & COO, ASQI
- Piyush Sharma: Head, Strategy & Business Development, Varhad
- Pritpal Singh: Executive Director, Punjab State Council for Science and Technology
- Shoikat Roy: Member, Punjab Development Commission
- Souvik Dhar: Program Manager, ISAP India Foundation & Sajeevan Life
- Srajesh Gupta: Founder and Lead, Centre for Grower-centric Eco-value Mechanisms
- Suhas Dixit: CEO, ApChemi
- Tanmay Telang: Head of Business Development, Takachar

Paricipants:

- Aakriti Kapoor: Portfolio Manager, Clean Air Fund
- Arunjit Singh Sidhu: Advisor, Invest Punjab
- Astha Gupta: Senior Manager, Climate, Children's Investment Fund Foundation
- Ayushman Saboo: Consultant, Council on Energy, Environment and Water (CEEW)
- Bhavya Dhall: Consultant, GDi Partners
- Christi Kesh: Research Analyst, Council on Energy, Environment and Water (CEEW)
- Chhaya Bhanti: Founder & CEO, Vertiver
- Divya Bawa: Program Associate, India Climate Collaborative
- Dr. Shashank Tamaskar: Associate Professor, Plaksha
- Faiza Khalil: Consultant, Council on Energy, Environment and Water (CEEW)
- Gurtar Singh: Agriculture Co-Ordinator, ASAR
- Jitendra Yadav: Technical Advisor, GIZ
- Karthik Ram: Head of India Portfolio, Clean Air Fund
- Kashmeera Patel: Research Associate, Sustainable Futures Collaborative
- Kshitij Urs: Executive Director, India Biochar and Bioresources Network
- Kurinji Kemanth: Programme Lead, Council on Energy, Environment and Water (CEEW)
- Lt Cdr Anish Kumar (Retd): Zonal Head – NZ, PRESPL
- Murli Dhar: Director, Sustainable Agriculture Programme, WWF- India
- Navin Horo: Country Project Lead, GIZ
- Navjot Singh Sarao: Consultant, Council on Energy, Environment and Water (CEEW)
- Ninad Rajput: Consultant, GDi Partners
- Nivedita Ravindranath: Programme Coordinator, Consortium for Agroecological Transformations
- Palwinder Singh: Senior Agriculture Co-Ordinator, ASAR
- Pawan Kumar: Principal Lead, Agriculture Development, SM Sehgal Foundation
- Rajnish Virdi: Associate Consultant, GDi Partners
- Rajveer Singh Brar: Agronomist, The Nature Conservancy
- Rohit Malviya: Biochar Plant Operations, ASQI
- Sanat Vora: Head of Partnerships, Climitra
- Sukhwinder Singh Grewal: Associate VP, PRESPL
- Shubhra Singh: Executive Director, Nabha Foundation
- Sonam Meena: Environment Research Analyst, Tapovanam
- Swagata Dey: Policy Specialist, CSTEP
- Umendra Dutt: Executive Director, Kheti Virasat Mission
- Vaishnavi Chandrashekhar: Associate, Program Partnerships, Villgro
- Yogini Oke: Communications Manager, Carbon Removal India Alliance (CRIA)

Thank you

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