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भाकृअनुप–भारतीय मृदा विज्ञान संस्थान
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Application No. 350-4/IISS/RTI/2026

Dated 05/05/2026

To,

Dr. Rajeshwari Sinha
Centre for Science and Environment
Core 6A, 4th Floor, India Habitat Centre
Lodhi Road, New Delhi – 110003

Sub.: Reply to information under RTI Act 2005- reg.

Dear Madam,

Please find enclosed herewith the information (five pages) in reference to your RTI application No. 350-04/IISS/RTI/2026 dated 27/04/2026 (registration no. IIOSS/R/T/26/00002 dated 27/04/2026) transferred by ICAR Hqrs (Reference Number ICARH/R/T/26/00088 dated 27/04/2026) recieved online.

Kindly acknowledge the receipt of this reply letter along with enclosures.

Further it is informed that the Appellate Authority is Director, ICAR-IISS, Bhopal and his telephone no. is 0755-2730946.

Yours sincerely,

Encl: Information containing five pages

(R. Elanchezhian)
PS & Nodal Officer RTI cum-CPIO (Scientific)

RTI Reply

1. What is current focus of Department on biochar- No information available
2. What are the different initiatives being taken by department (under various/schemes/projects) on promoting biochar use in agriculture- No information available
3. What are challenges and opportunities that the government sees in promoting biochar, wrt improving soil health, among other benefits

Challenges

High initial costs of producing biochar

Setting up of pyrolysis units and ensuring consistent production quality can be expensive.

Standardization and quality control issues

Biochar quality varies depending on feedstock and production method.

Low-cost scalable technology and supply chain constraints

Collecting biomass, transporting it, and producing biochar at scale (low cost) remains logistically challenging, especially in fragmented farming systems.

Opportunity

Improved soil health and productivity

Biochar enhances soil structure and increases water retention capacity of degraded or coarse textured soils.It also improves pH of acid soils.

Climate change mitigation

Carbon locked in biochar is recalcitrant in nature and persists for very long periods, supporting climate change mitigation.

Waste to wealth potential

Agricultural residues (like stubble) can be converted into biochar instead of being burned.

4. Are there any national policies, guidelines, standards, or manuals related to biochar at the central of ministry level. If so, please mention or provide links or copies- Information attached
5. What is the plan of the department wrt biochar and its promoting among farmers- No information available

Policy Brief

Roadmap for Biochar Use in India

ICAR-Indian Institute of Soil Science

Nabibagh, Berasia Road, Bhopal-462038 (M.P.)

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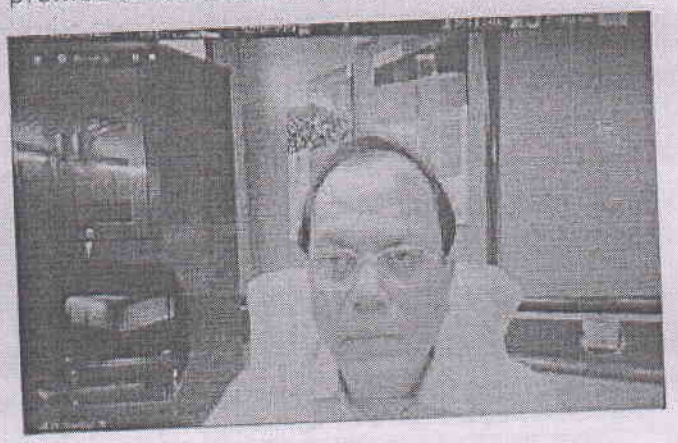
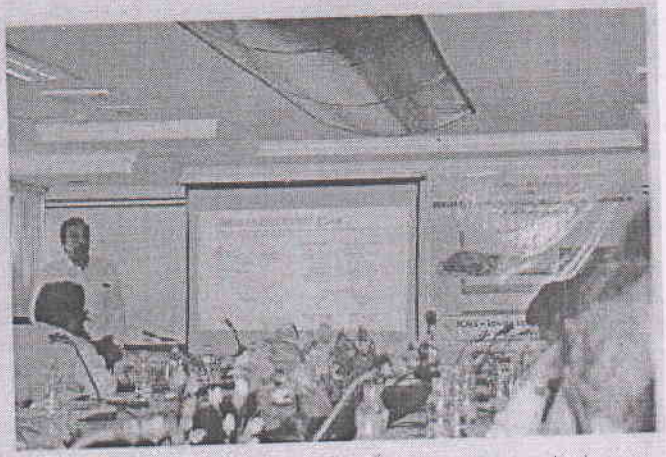
CONTEXT

The term 'biochar' denotes black carbon formed by the pyrolysis of biomass i.e. by heating biomass under oxygen-free or stress environment so that it does not completely combust. Charcoal is a good example of biochar produced from woody biomass. However, the term 'biochar' is much broader in perspective than the definition being used and it encompasses black carbon produced from any biomass stock. Biochar can be used to hypothetically sequester carbon on centurial or even millennial time scales. In the natural carbon cycle, plant matter decomposes rapidly after the plant dies, which emits CO_2; the overall natural cycle is carbon neutral. Conversion of biomass carbon to biochar carbon leads to sequestration of about 50% of the initial carbon compared to the low amounts retained after burning (3%) and biological decomposition (< 10–20% after 5–10 years), therefore yielding more stable soil carbon than burning or direct land application of biomass. Instead of allowing the plant matter to decompose, pyrolysis can be used to sequester some of the carbon in a much more stable form. Biochar thus removes circulating CO_2 from the atmosphere and stores it in virtually permanent soil carbon pools, making it a carbon-negative process. The use of biochar as soil amendments is proposed as panacea for mitigating man induced climate change along with improving soil productivity.

Because of several advantages associated with biochar, it is being used as amendment across the countries. It prevents loss of nutrients from soil through leaching and release to plants slowly as per their need, thus reducing the need for fertilizers, which ultimately results in savings on their manufacturing, transport and application costs, especially for nitrogenous fertilizers. Significant changes in soil quality, including increase in pH, organic carbon and exchangeable cations as well as reduction in tensile strength were observed at higher rates of biochar application. Reduction in tensile strength and increase in field capacity of hard-setting soil were the most significant findings. Biochar has the potential to increase conventional agricultural productivity and mitigate GHG emissions from agricultural soils. This has led to renewed interest of agricultural researchers to produce biochar from bio-residues and its use as a soil amendment.

Farmers especially in northern India are facing problems of rice residue management and in view of the shortage of time and labour availability, practice of residue burning is rampant for clearing the fields. According to an estimate, about 686 million tonnes of agro-residues are produced every year, of which 234 million tons are surplus. These residues are either partially utilized or un-utilized due to various constraints and approximately 16% of total crop residues were burnt.Biochar is one of the viable options to get rid of the excessive biomass. The cereal crops (rice, wheat, maize, millets) contribute 70%, while rice crop alone contributes 34% to the crop residues.Although many countries have prioritized the use of biochar in agricultural systems, studies on biochar production and its utilization as a soil amendment are at a nascent stage in India.Biochar being a carbon negative material, may be promoted for use in agriculture for soil health





improvement and climate change mitigation provided its efficacy in different soil types and cropping system is established.

Brainstorming Session and Webinar on Biochar

In past two decades, worldwide extensive research on biochar has been conducted to assess its suitability for enhancing soil health, carbon sequestration and mitigation of GHGs. Despite all these, the adoption of biochar in agriculture is insignificant, but with science based evidence on multiple benefits in addressing growing complexity of challenges and to deliver to several sustainable development goals, use of biochar has emerged as one of the major frontiers of future agriculture. However, scaling biochar based management practices in diversity of farm technologies under different agro-ecosystem is a challenging task. Keeping that in view, ICAR-Indian Institute of Soil Science, Bhopal organized a brainstorming session (27.09.2019) and national webinar (19.06.2020) on 'Biochar: Potential Availability, Usefulness and Limitations for Use in Agriculture'to review the status of biochar research in India and workout future road map of biochar use in agriculture.

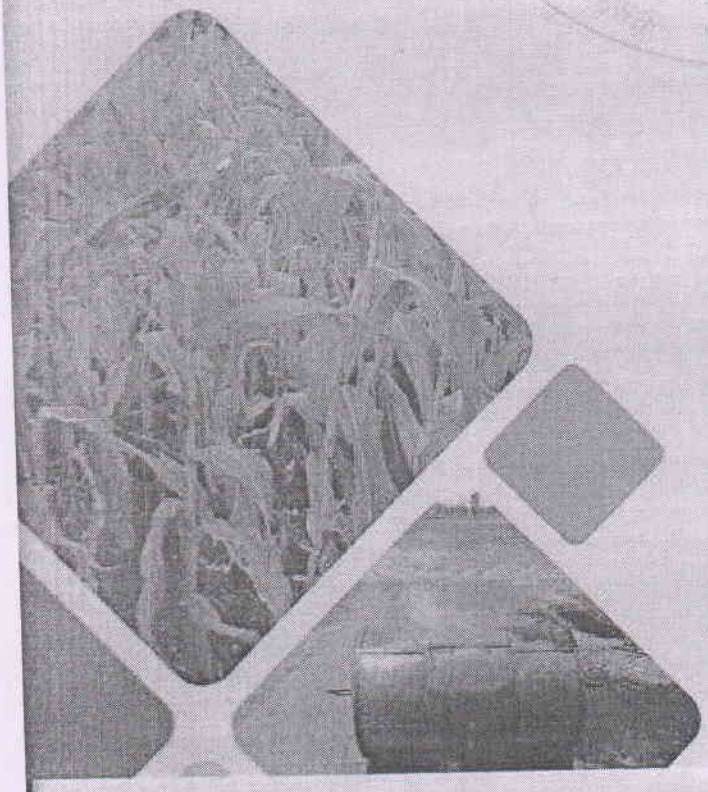
Roadmap

- Biochar being a carbon negative material, qualify as an amendment for soil health improvement and climate change mitigation. It also offers solutions to residue burning problem. Besides, biochar production and burial removes carbon dioxide directly from the atmosphere through photosynthesis, leading to an actual reduction in atmospheric carbon dioxide levels. Thus biochar should be added to the climate change toolkit of renewables, energy saving, and carbon capture and storage.
- Good quality biochar manufactured safely and efficiently starts with good equipment design. The biochar produced should provide measurable benefits, whether environmental, economic, or social and should be fit for purpose. Hence, development of standard pyrolytic condition and protocol for biochar production, and establishment of Indian biochar standard should be ascertained.
- An integrated technology process model should be developed to efficiently convert the agro residue into clean solid and gaseous energy sources and organic biochar farm fertilizer. Therefore, Micro, Small and Medium Enterprises (MSME) may be involved in production of biochar and should be linked with government schemes such as start-up programme, Swachh Bharat Mission and Soil Health Card mission.
- Technologies producing biochar are designed and optimized to produce biochar ahead of volatile compounds. The common processes include slow

and fast pyrolysis, and the most successful approach for high-yield biochar production is via slow pyrolysis, which produces biochar yield between 25 and 35%. Therefore, scale appropriate biochar production technology and technological innovation to reduce biochar production cost should be developed.

- Farm wastes that are non-competing, non-palatable to animals and other surplus biomass may efficiently be used as sustainable feedstock for making biochar.
- Meta-analysis of data on biochar research has shown that biochar use in soil leads to favorable changes especially in acid and degraded lands. Therefore, it may be promoted in niche areas for more beneficial effects. Hence, potential hotspots for use of biochar as soil amendment need to be identified.
- The fundamental mechanisms by which biochar could provide beneficial functions to the soil and the wider function of the agro-ecosystem are poorly described in terms of providing the predictive capacity that is required. There is need for long-term studies on biochar for better understanding its properties, rate of application, efficacy, ecosystem services and usefulness in agriculture. Further, investigation on biochar for ecosystem benefits and improvement in environmental and economic aspects need to be accurately assessed and monetized.
- Biochar application to soil has many environmental benefits however its adoption has been slow. Aligning the environmental benefits with commercial motivations to drive more widespread implementation is needed. Well-designed policy can play an important role in establishing roadmaps in achieving wide scale benefits of biochar. Therefore, policy formulation for implementation of biochar in government schemes must be worked out.
- Determination of toxicity levels is a first step in the risk management of biochar use. Biochar application to soil also be assessed with respect to human health hazards due to presence of some poly-aromatic hydrocarbons. These toxic compounds pose a threat to human health. The advantages of technologies must be considered in relation to the associated health risks.

Citation
Lakaria BL, Jha P, Biswas AK, Patra AK and Chaudhari SK (2021) Roadmap for Biochar Use in India. Policy Brief, ICAR-IISS, Bhopal. 4p.



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