Brown Revolution 2.0

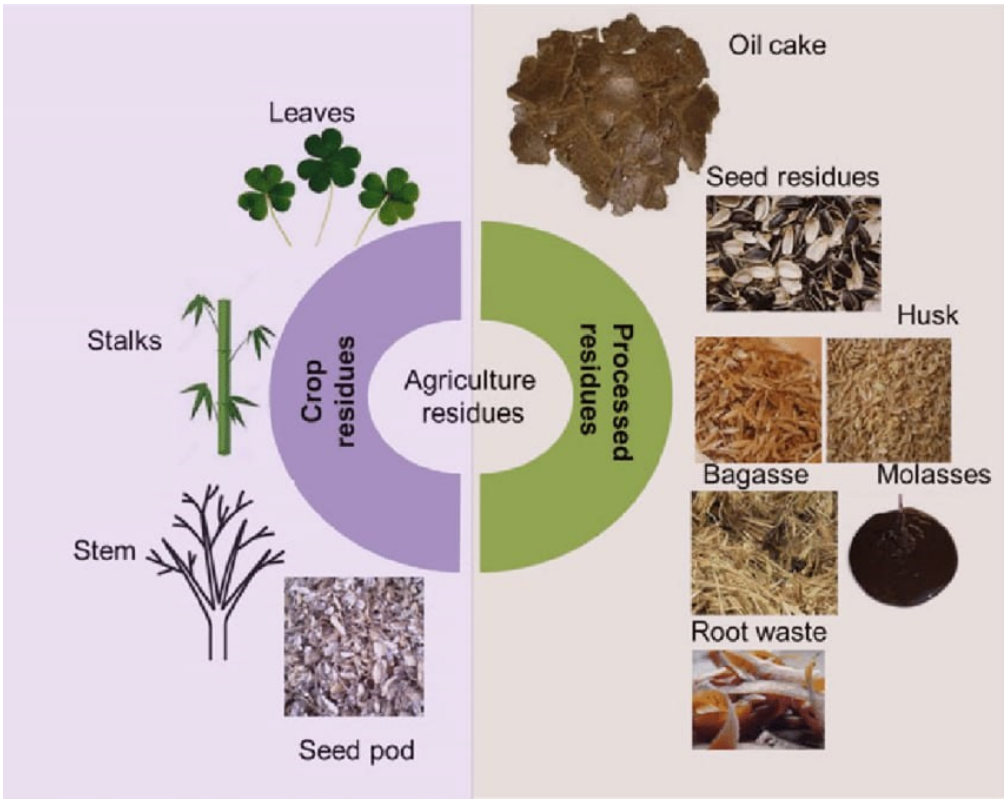
Mains: *GS III – Environment pollution and degradation*

Why in News?

Recently, India is looking up to address the challenges of increased burning of agricultural residues through Brown revolution 2.0

What are agricultural residues?

- **Meaning** – It refer to the leftover plant matter, like stalks, leaves, and husks that remain after crops are harvested.
- **Types**



- **Production** – Over 350-500 million tonnes generated annually.
- **Issues** – Most agro-waste is either burned or left to decompose inappropriately.
- This results in severe air pollution, greenhouse gas emissions, and the persistent depletion of organic carbon in the soil.

Brown Revolution
• **First Brown revolution** – For promoting *leather and coffee in tribal areas of Visakhapatnam.* • **Initiated by** – *Hiralal Chaudhary.* • **Brown Revolution 2.0** – It seeks to *restore soil health of India by processing agricultural residues.* • **Aim** – To secure the long-term *food productivity, creating rural livelihoods, and bolstering India's climate commitments* as the most populous nation. • **Residues included** - Field crops – Rice, wheat, maize, cotton, and sugar cane - Horticulture – Vegetables, fruits, flowers, and tubers - Oil seeds, and plantation crops – coconut, areca nut, oil palm, tea and coffee • Returning their organic content to farmland, sustainable agriculture can be restored.

What is the need for brown revolution 2.0?

- **Lack of focus** – Existing *policies often ignored the foundational role that organic waste recycling plays in soil health restoration* and food security.
- **Declining soil fertility** – The fertility of India's soils has been in decline for decades, in large parts.
- **Reducing rural income** – The depletion of organic carbon in the soil *negatively impacts rural incomes and alienates rural communities from value addition.*
- **Effects on industries** – The industrial use of agro-wastes will be unsustainable, as feedstock volume and quality both decline.
- **Reducing organic matters in soil** – Large proportion of Indian farmland now *lies below the critical thresholds* of soil organic matter needed for sustainable productivity.
- **Increasing agro wastes** - India produces approximately *350-990 million tonnes of crop residues* and agro-waste every year.
- In many districts, the organic fraction of this waste, largely from *fruits, vegetables, and staples, exceeds 40%,* and in certain horticultural regions, may reach 70%.
- **Lack of recycling** – *Less than 20%* of this biomass is currently recycled in a scientific and productive manner, while the majority is openly burned.
- **Unmanageable wastes** – Plantation crop wastes are another group as they are highly recalcitrant and accumulate over a long period of time posing both environmental and health hazard.
- **Increase in severe air pollution** – The routine burning of crop residues, particularly in North India, results in massive emissions of fine *particulate matter (PM2.5), noxious gases, and greenhouse gases such as methane and nitrous oxide*.

  Every tonne of paddy straw burned *is estimated to release 3 kilograms of particulate matter, 60 kilograms of carbon monoxide, and 1,460 kilograms of carbon dioxide, along with less yet significant quantities of ash and sulphur dioxide.*

- **Environmental pollution** – Water bodies suffer from eutrophication when run-off from waste dumps *leads to excessive nutrient loads.*

- The rural health faces risks from both *air and water contamination*.
- **Widening disparities** – The impacts of soil infertility echo across the economy and amplify rural-urban disparities.
- **Need for region specificity** – The ICAR and NAAS, in both policy papers and demonstration projects, have highlighted the need for region-specific agro-waste recycling.

ICAR, *or the Indian Council of Agricultural Research, is the apex body for coordinating, guiding, and managing research and education in agriculture across the country.*

NAAS, *or the National Academy of Agricultural Sciences, is a learned society focused on advancing scientific knowledge and innovation in agriculture and related fields*

What are the benefits of Brown Revolution 2.0?

- **Improves soil fertility** – It promises to *restore soil structure and fertility, enhance water and nutrient retention.*
- Increases resilience – It improves long-term yields and *resilience to both drought and flooding.*
- **Socio-economic advantages** – It will create *millions of new rural jobs in* logistics, production, technology, and service roles.
- It will strengthen farmer and cooperative incomes, and reduce reliance on expensive fertilizers.
- **Environmental benefits** – The shift will be able *to reduce greenhouse gas emissions* and air pollution.
- It will improve water quality and biodiversity, and strengthen India's claims for climate-linked rewards.
- **Technological benefits** – The process will become a flagship for data-driven, technology-enabled sustainability.
- **Ensures transparency** – Data-driven approaches *also enable transparent monitoring for carbon credit schemes.*
- **Empowers farmers** – It ensure that products meet quality standards, and empower farmers with timely feedback and recommendations.
- **Alignment with national priority** – Brown Revolution 2.0 is strategically aligned with national agricultural priorities.

What are the policy measures can be taken?

- **Strategic framework** – Brown Revolution 2.0 may include a mandate and corresponding funding for cooperative-based agro-waste collection and processing clusters in every agricultural district.
- **Providing incentives** – It must offer economic incentives similar to a minimum support price for collected and processed biomass.
- **Subsidized processing centres** – Decentralised composting and bio-char units ought

to be subsidised, and their management integrated into KVK and extension programmes.

- **Ban on burning** – The prohibition of open burning and haphazard disposal should be strictly enforced.
- **Financial support** – Logistical and financial support to be provided to ensure that viable alternatives are available.
- **Preparation of registry** – A national organic carbon credit registry to be prepared.
- It recognises and rewards the sequestration of carbon in soils, harnessing both domestic and international climate finance.
- **Use of latest Technology** – Rapid in-vessel composting, optimised vermicomposting, and modular biochar units facilitate wide adoption and high-quality amendments.
- **Adoption of AI** – The integration of artificial intelligence and IoT-based platforms allows real-time tracking of soil health, optimisation of compost production, and predictive logistics for biomass flows.
- **Linking with schemes** – The recycling of agro-waste should be closely linked to the ***Soil Health Card*** scheme.
- It empowers farmers with data and feedback both on the status of their soils and the value of recycled amendments, supplemented by targeted outreach.
- **Investing in R&D** – Research and demonstration efforts must be continuous, regionally varied, and closely tied to the needs of local farmers.
- **Developing human resources** – Human capital must be cultivated with a special focus on women, youth, and self-help groups.

Brown Revolution 2.0 – Following the Amul Model
• **Amul model** – Amul federated village-level milk producers into a vertically integrated, member-owned profit-sharing enterprise. - It enabled both local participation and economies of scale. • A similar model can be established for *agro-waste recycling.* • **Local recycling cooperatives** – It will handle the collection, scientific processing, and marketing of compost, vermicomposting, and biochar. • It returns much of this output directly to the soils of their communities while also creating tradeable surplus. • **Technical support** – It could be provided by institutions such as ICAR, SAUs, and Krishi Vigyan Kendras (KVKs), with capacity-building for rural entrepreneurs embedded throughout. • **Other facilities** – Pooled logistics, shared finance mechanisms, quality control, and traceability will be managed in the cooperative federated structure.

What lies ahead?

- National leadership could prioritise and scale this movement, and set a global example in combining scientific sustainability with social inclusion.

Reference

The Hindu| Brown Revolution 2.0

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