Financing Agriculture Waste Management

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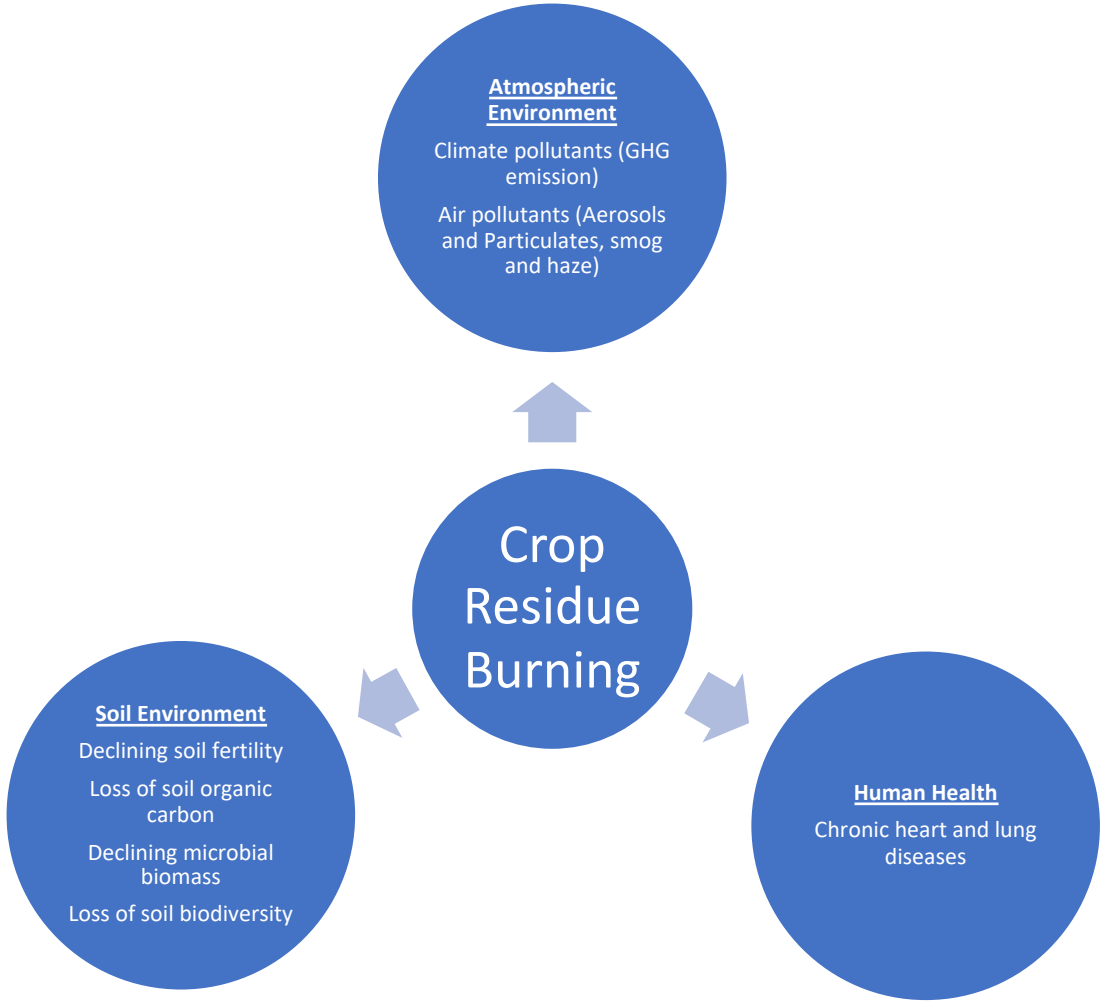
Impact of Crop Residue Burning



20% of crop residue generated in 2017-18 in India was burned

Multiple impacts also mean opportunity for multiple co-benefits

Drivers of Crop Residue Burning

Net increase in agriculture residue (Intensive agriculture)

Increased income (remittance)

Labor Shortage

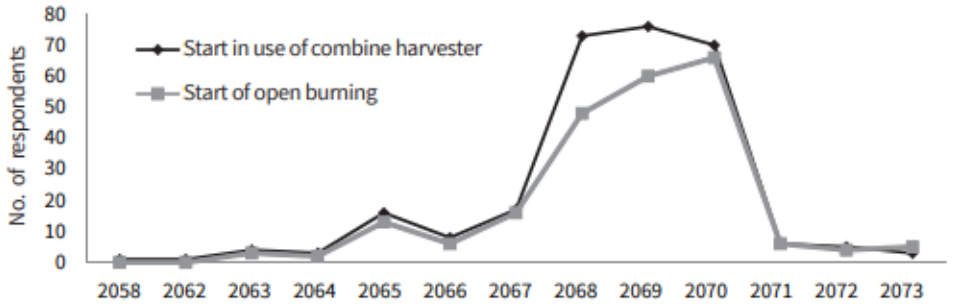
- Mechanization

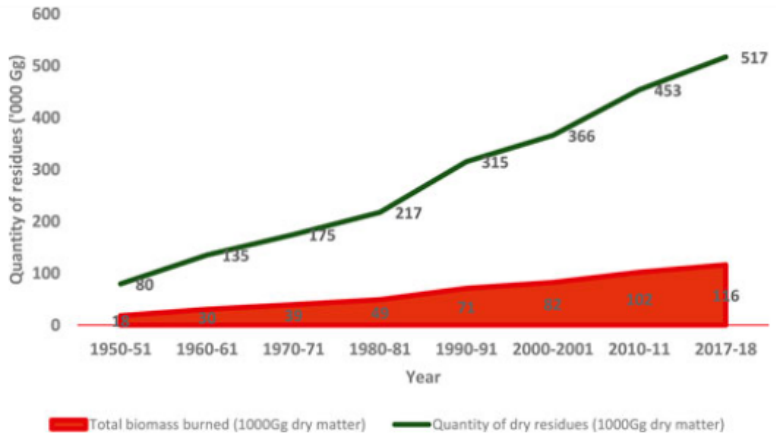
Lack of market for straw (Graduation in energy pyramid, less livestock/ alternate feed)

Tight harvesting schedule

- Post-harvest straw and stubble in fields

Open agriculture burning





Example of current incentives for appropriate mechanization

Policy

- Banning of open burning
- Mandate attachment of super straw management system to combine harvester

Practice

- Promotion of Mechanization for **In-situ** management of Crop Residue in the states of **Punjab, Haryana, UP, and Delhi** (Fund and subsidy) (approx. **US$ 330 million** 2018-2022)
- Straw mulching (by Happy Seeder)
- **Ex-situ**: Baling and transporting straw (limited feasibility)

Savings per ha:
1600 kg C, 4-7 kg P, 60-100 kg K, 4-6 kg S;
Equivalent to US$ 20-30 per ha for plant nutrients (after 3-4 years)
25% less water
20 kg per ha less urea

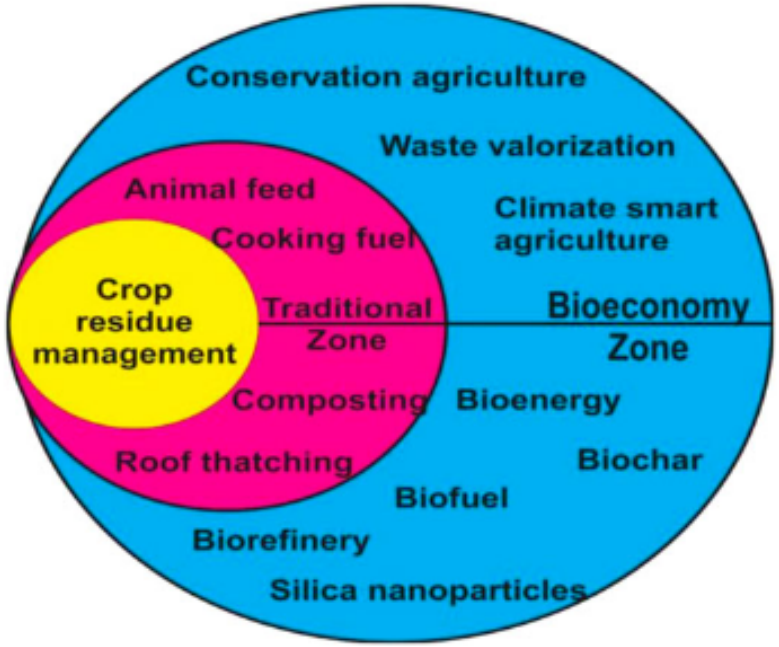
Improved Yield:
2.7% higher wheat yield

Reduce burning:
19% less than 2018,
31% less than 2017
52% less than 2016

Downside:
Increased fuel use and related carbon footprint

Conundrum: Increased use of fossil fuel to mitigate biomass burning?

Transforming agriculture waste management practices



Shift from the traditional approach to agriculture bio-economy and circular economy

Smart agriculture practices
- Conservation farming

Waster bioeconomy
- Waste to energy (displace coal and fossil fuels)

Reduce open burning
Decarbonization of agriculture
Improve Livelihoods

Financing the transformation

Conditional cash transfer

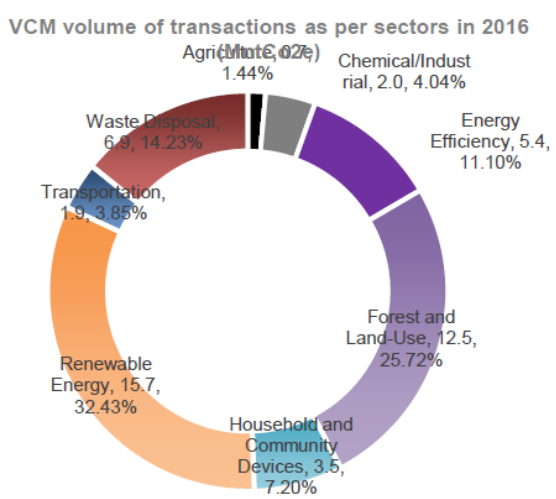
- Payment for Ecosystem Services(PES) to Reduce Crop Residue Burning
- Study in India indicate partial upfront cash transfer is a cost-effective way to improve air quality

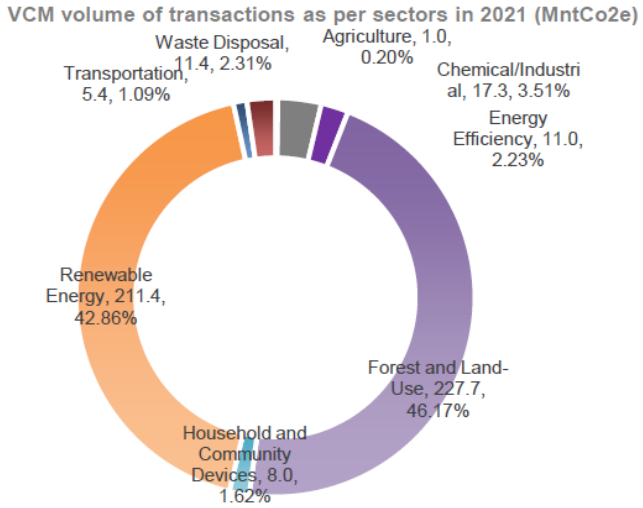
Carbon market: Storing carbon in agriculture soil

- Soils—mostly, agricultural ones—could sequester over a billion additional tons of carbon each year
  - Practice includes perennial crops, cover crops, no or less tilling

Voluntary carbon market

Comparison of global VCM volume of transactions as per sectors in 2016 and 2021 (in MntCo2e)



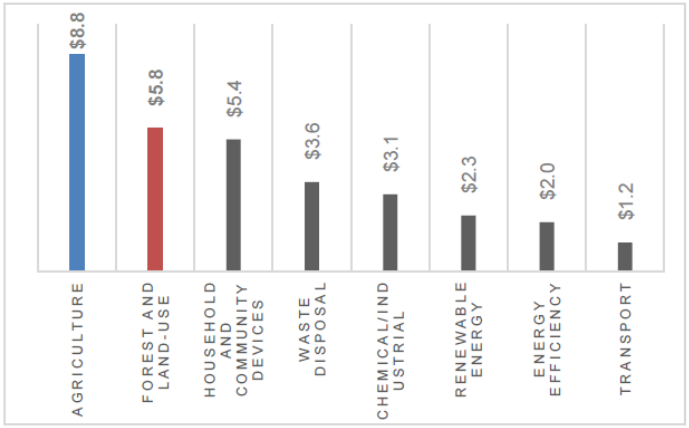


Source: Ecosystem Marketplace Database

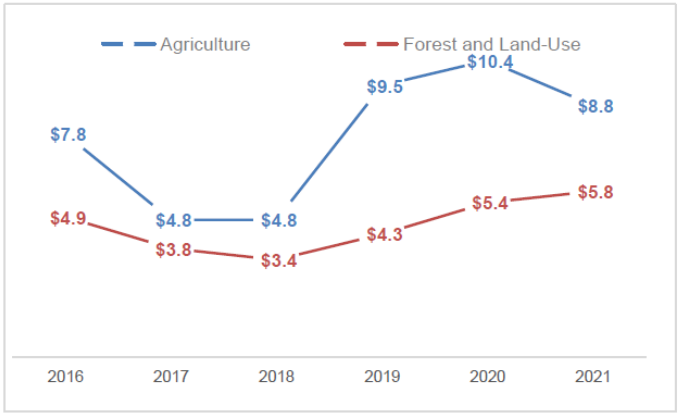
- Growing trend by corporates to purchase carbon offsets from nature-based solution (NBS) projects
  - Forest and land use have witnessed the highest increase in global market volume by 18 times from 2016
  - Demand for carbon offsets is expected to increase five to ten-fold over the next decade
  - Carbon offset prices rise to $20-50/tCO2e by 2030

Demand for NBS credits

Avg. price of VCM projects across sectors in 2021 ($/tCo2e)



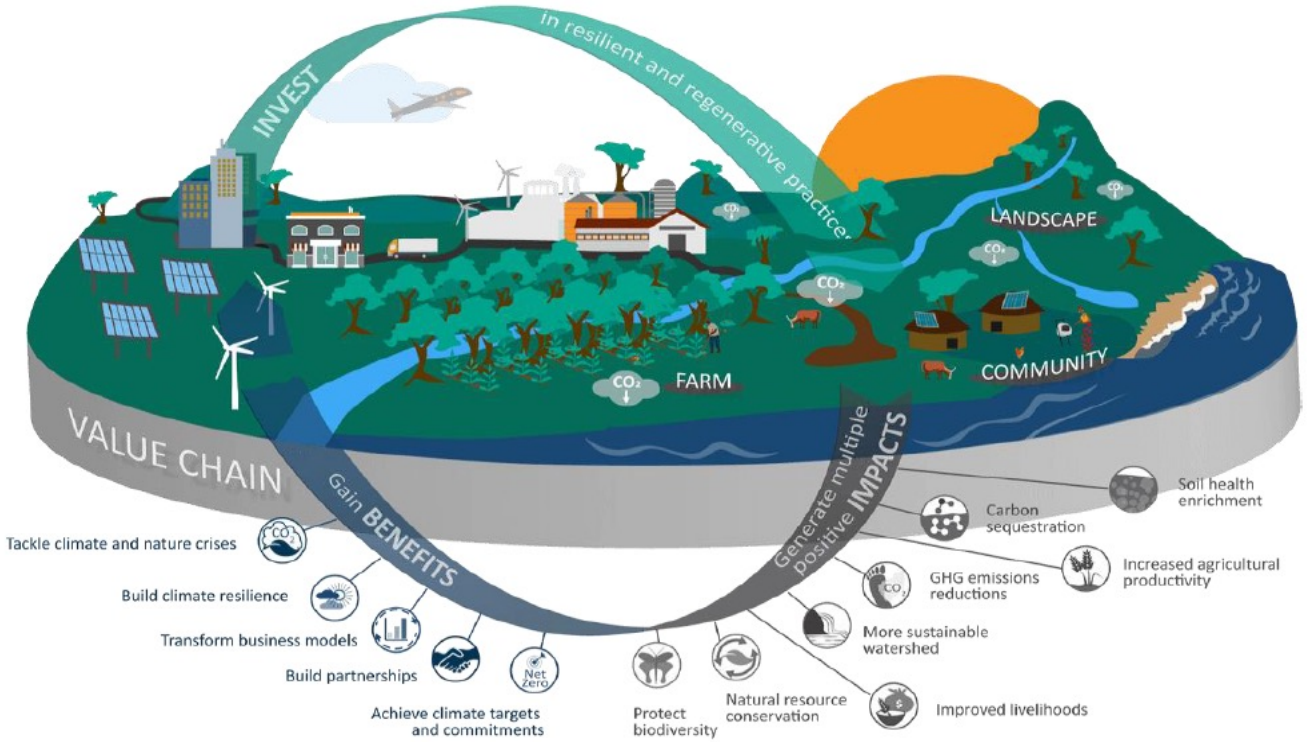
Price trend of NBS project b/w 2016-2021($/tCo2e)



Source: Ecosystem Market Database

- **Examples of large global players leveraging NBS credits to offset emissions:**
- **Microsoft** purchased 1.3 Mn tons of credits in 2021 to achieve its goal to become carbon negative by 2030. Of the total, 1.1 Mn tons were linked to forestry projects.
- **Shell** aims to use NBS projects to offset emissions of ~120 Mn tons a year by 2030
- **Nestle** plans to offset some of its emissions through high-quality carbon removal projects to become net zero by 2050

Carbon Insetting



Carbon insetting approach adapted from the International Platform for Insetting

Carbon standards in the VCM and Inder

VCM Standards:

- The main VCM standards with the highest share of volume of carbon offsets transacted in 2021:
  - Verified Carbon Standard (VCS)
  - Gold Standard (GS)
  - Climate Action Reserve (CAR),
  - American Carbon Registry (ACR), and
  - Plan Vivo.

- In 2021, more than 90% of the total carbon offsets transacted in the market were under the VCS standard, followed by GS
- Plan Vivo had the highest price of ~$11/tCo2e in 2021 as the standard only focuses on NBS projects which provide co-benefits in addition to the carbon benefit.

Intermediaries

Indigoag: A platform that measures and generates carbon credits, for adding cover crops, reducing tillage, and other practices that help benefit soil health.

Defire: A Thai startup fighting crop residue burning and air pollution with green financing. Employs remote sensing technology, drones, IoT, and machine learning algorithms to detect and monitor fires at scale and speed. Partnered with Southpole, to assess whether Defire's projects in Thailand are eligible to participate in the international voluntary carbon market.

Types of crop management projects that can be registered under independent international carbon crediting mechanisms

Crop Management	
Plant management	Improved crop varieties, crop rotation, use of cover crops, perennial cropping systems
Nutrient management	Reduction of chemical inputs to increase yield and residue input
Tillage management	Practices for tillage intensity reduction and residue retention
Water management	Drainage management to reduce emissions and reduce nitrogen runoff leaching
Rice cultivation management	System of rice intensification for rice cultivation
Biochar application	Soil amendment to increase biomass productivity, and sequester carbon
Organic soils-restoration	Soil carbon restoration on peatlands; and avoided net soil carbon emissions using improved land management
Degraded soils-restoration	Land reclamation (afforestation, soil fertility management, water conservation soil nutrients enhancement, improved fallow)

Key interventions required for application of existing carbon platform to agriculture sector

Key areas of intervention	Interventions
Improve sustainability/ permanence	**Socio-economical:** Provide a payment structure that incentivizes smallholders to commit for long term Bundle climate and ecosystem services impacts to ensure permanence **Technical:** Address ground Reversal Risks utilizing Soil data Increase Buffer Pool percentage to Account for Risks
Conservatively standardize additionality	Set conservative and standardized baselines
Address the MRV Challenges	Establish Interdisciplinary Science, Policy, and Technology Forums Scale Cost Effective Soil Sampling Technologies Develop an Open Soil and Forestry Data Repository
Address fair benefit distribution and equity	Improve land rights and tenure documentation Use direct payments to farmers
Incentivize high-quality credits	Mandate that buyers disclose their carbon accounting of carbon credit purchases Higher price of carbon credit, due to co-benefit, positive impact on women farmers, social impacts etc.

Thank you for your attention!

For more information, please email

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