Issue 18
September 30, 2024

NEWSLETTER

Smart & Net-Zero Project

Overview

The Smart Net-Zero (SNZ) project team under the Food and Fertilizer Technology Center (FFTC) for the Asian and Pacific Region regularly collects and shares information related to sustainable agrifood system and climate smart agriculture, including research, news, policy, data and event updates around the world on the project website.

When biowaste streams from the agrifood supply chains are properly managed and processed, it may be technically and economically viable to extract bioenergy, nutrients, and useful materials using appropriate bioconversion technologies. Substituting virgin materials with these secondary resources in the production of fertilizers, animal feed, or food may help decarbonize agri-food supply chain.

This issue highlights in research and policy concerning **decarbonization of agrifood supply chain through circular agriculture and bioeconomy.** It includes reviews of various technologies in biowaste valorization, application of life cycle analysis in technological evaluations, policies for promoting wide adaptation of innovative technologies and circular economic indicators.

Content

https://net.fftc.org.tw/smartnetzero www.fftc.org.tw

RESEARCH

01 THEME: GHG emission reduction

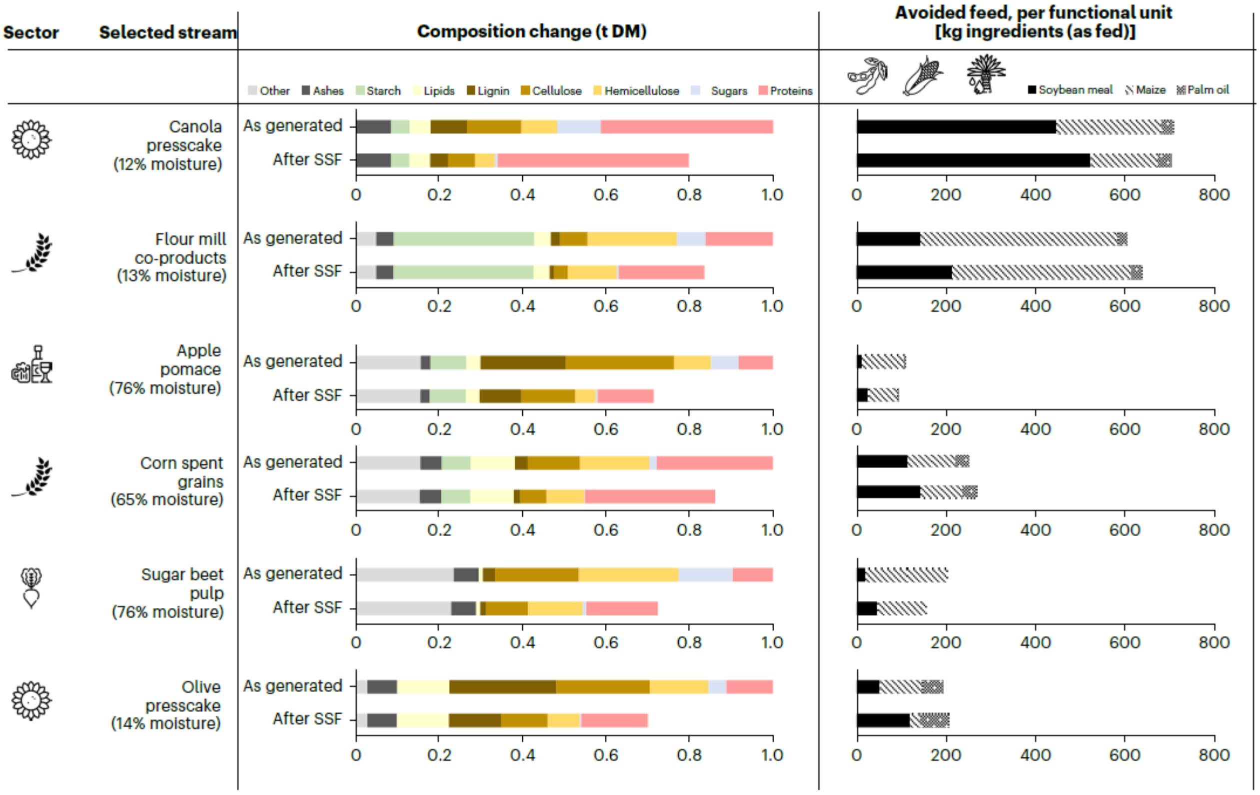
Upgrading agrifood co-products via solid fermentation yields environmental benefits under specific conditions only

September 23, 2022 | Nature Food | Source |

Introduction: Transforming agricultural waste into edible ingredients aims to reduce food system impacts, but these methods rely on new technologies and resources, with uncertain environmental benefits. A recent study by reseachers from France and Ecuador used life cycle analysis to evaluate the impacts of upgrading agrifood by-products through solid-state fermentation (SSF), as compared direct incorporation into livstock feed without SSF and anaeroic digestion (AD).

Key findings: While SSF can increase protein content in animal feed and reduce soybean meal use, it also brings environmental drawbacks, such as higher climate change and water depletion impacts. SSF tends to be better for environmental outcomes when used to upgrade food products rather than animal feed. The study found that SSF's benefits for climate change and other impacts are less than those of direct feeding methods, except for freshwater eutrophication. SSF's environmental performance varies depending on the type of co-product and how it's used. For instance, SSF upgrading to food products has shown up to ten times greater environmental benefits compared to conventional feed methods, mainly due to avoiding less sustainable ingredients like marginal wheat.

The analysis also highlighted that SSF is most beneficial when it replaces less sustainable food ingredients, while for feed markets, traditional methods may be more effective. Future evaluations should include broader waste-to-nutrition solutions and consider how emerging technologies can contribute to a more sustainable food system.



"Other" is composed mainly of pectin and non-starch polysaccharides

Figure | Effects of SSF on ingredients avoided by the incorporation of agrifood co-products into feed. For each stream, the biochemical composition 'as generated' was derived from the literature. The effects of SSF on each substrate's composition 'after SSF' were simulated on the basis of a simplified model combining fungal growth and mass balance. The food-grade white-rot fungus *Pleurotus ostreatus* was selected as the biological agent for its established ability to degrade lignocellulose and its nutritional safety13. The N used for fungal growth was considered to be supplied with ammonium sulfate. As detailed in the Supplementary Information, the model predicts rather optimistic performances when compared with current experimental data, but it can be seen as representative of future improvements. The compositions of both fermented and unfermented streams were then translated in terms of nutritional value (for livestock) based on the SFU proxy (Supplementary Information). The relative importance of proteins, carbohydrates and palm oil (modulated by the digestibility and fibre content) in the calculated SFU allowed us to derive equivalents in terms of avoided soybean meal, maize and palm oil for each stream (with and without SSF). These are the marginal supplies of feed proteins, energy and lipids, respectively (Supplementary Information). SSF modifies not only the relative distributions of macronutrients but also the digestibility and fibre content of biomass streams; therefore, their SFU net value after SSF differs from their SFU before SSF, and the relative contributions of proteins, lipids and carbohydrates to determine the SFU value are also modified. Because the functional unit is defined per wet weight of generated agrifood co-product stream, the initial moisture content strongly shapes the magnitude of avoided feed services.

02 THEME: GHG emission reduction

Materials, fuels, upgrading, economy, and life cycle assessment of the pyrolysis of algal and lignocellulosic biomass: a review

February 24, 2023 | Environmental Chemistry Letters | Source |

Introduction: Climate change drives the need for advanced, carbon-neutral methods to produce materials and fuels. Biomass pyrolysis, the process of heating organic material in the absence of oxygen, is a key focus in this area. This review by international consortium of researchers from UK, Japan, China, Taiwan, and Egypt examines the pyrolysis of algal and lignocellulosic biomass, highlighting product types, upgrading techniques, economic feasibility, and life cycle assessments.

Key findings

The key products from pyrolysis are bio-oil, syngas, and biochar. Upgrading methods include hot vapor filtration, solvent addition, and steam reforming. Economic evaluations show that pyrolysis can be profitable, with factors like feedstock type, temperature, and reaction time affecting product yields. Pyrolysis mechanisms involve breaking bonds and forming new compounds. Biochar can sequester carbon, potentially removing up to 2.75 gigatons of CO_2 annually.

Bio-oil is the primary product from cellulosic biomass, while lignin-rich biomass yields more biochar. Pyrolysis conditions like temperature, heating rate, and residence time crucially influence the product distribution. Higher temperatures increase syngas output but reduce biochar.

Recent life cycle assessments indicate that using waste as feedstock is environmentally beneficial compared to growing energy crops. Pyrolysis is effective for producing sustainable bio-oil and biochar, which can be further refined for advanced materials and chemical recovery.

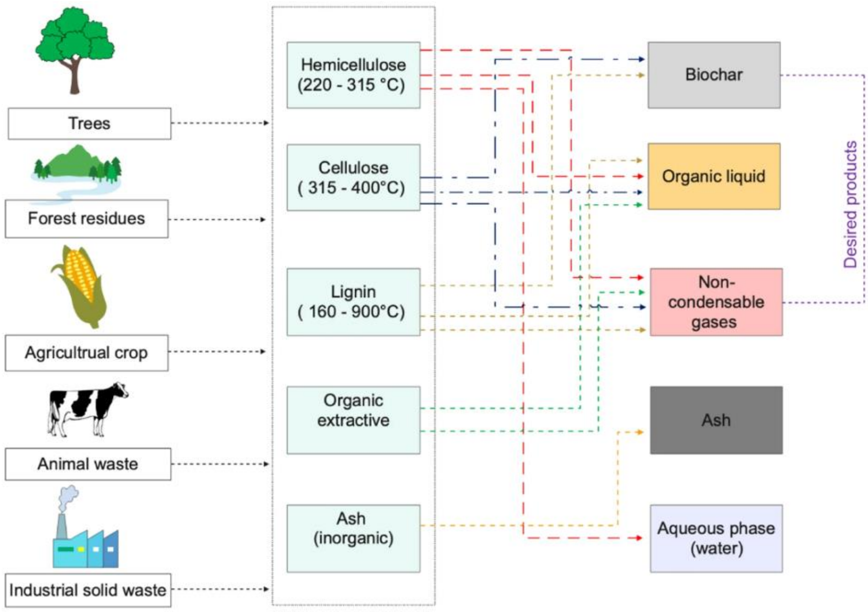


Figure | Lignocellulosic biomass degradation pathways. Lignocellulosic biomass degrades independently at a wide range of temperatures, producing target products, and byproducts. Therefore, selecting a particular biomass feedstock may have a meaningful impact on the final product yield.

03 THEME: GHG emission reduction

Unlocking the potential of biogas systems for energy production and climate solutions in rural communities

July 13, 2024 | Nature Communications | Source |

Introduction: The on-site conversion of organic waste into biogas can effectively address energy needs and climate change. Existing methods often fail to match biogas supply with demand, leading to inefficiencies. Researchers from China, the US, and UK present an improved community biogas production and distribution system (CBPD) that aims to solve these issues. By analyzing five existing systems, the study introduces mechanisms to adjust biogas flow rates and improve the consumption-to-production ratio. This approach ensures that rural energy needs are met while reducing carbon emissions.

Key findings: The proposed system could significantly reduce China's greenhouse gas emissions, contributing to the global 1.5°C climate goal. It also offers practical benefits, such as enhanced manure management and increased biogas use for cooking and agriculture. The study highlights the importance of regional adaptations and improved feedstock collection to optimize biogas production. Upgrading CBPDs in rural areas could reduce fossil fuel reliance and improve waste management. The study calls for further research on policy measures and technical improvements to ensure effective biogas supply and maximize climate benefits. Integrating CBPDs with other renewable energy sources could further enhance their efficiency and contribution to sustainable energy solutions.

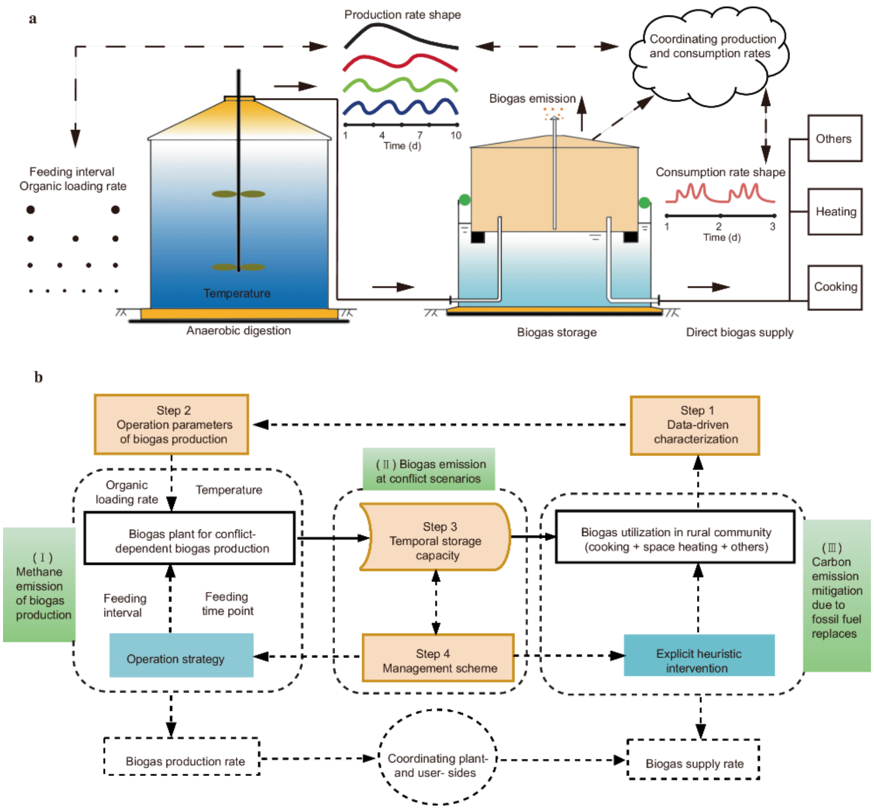


Figure | Upgraded community biogas production and distribution system (CBPD) design. a Schematic diagram of the biogas flow. Biogas losses occur when the temporal redundant biogas exceeds the storage capacity. b Framework to establish an upgraded CBPD for a demand-driven biogas supply. Data on the rural community's energy consumption is collected to estimate biogas consumption. The dynamically measured biogas supply rate is designed to equal the timely consumption/utilization rate in the community. Parts (I), (II) and (III) are sources of greenhouse gas emission or mitigation. Dotted arrows indicate information flow, and solid arrows indicate biogas flow.

04 THEME: GHG emission reduction

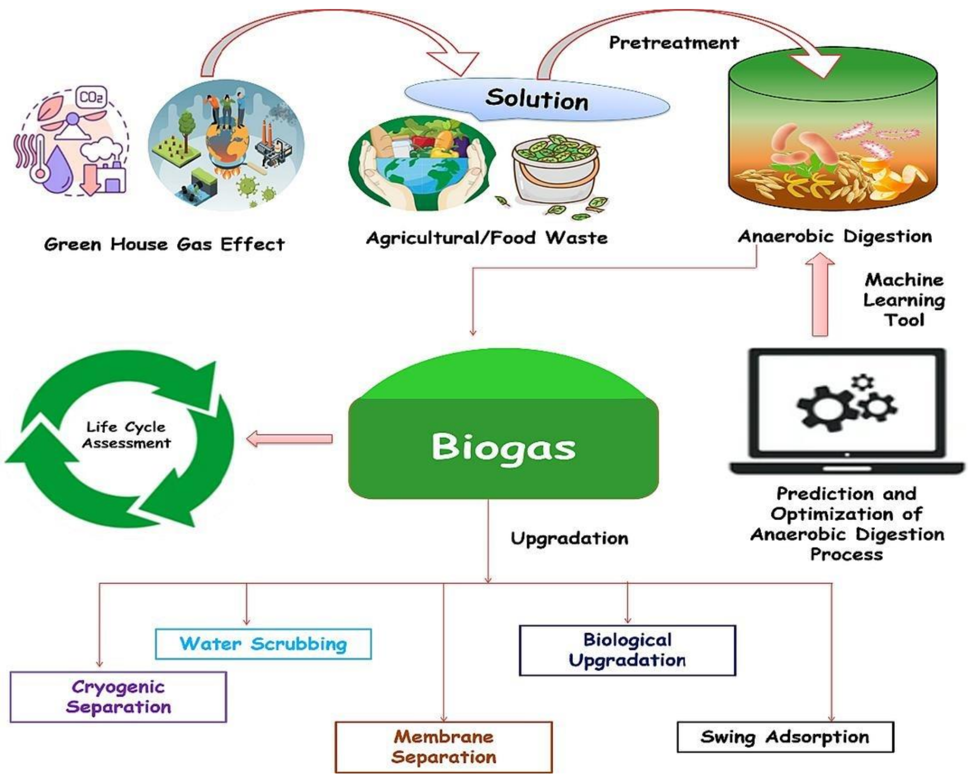
Insights into the recent advances of agro-industrial waste valorization for sustainable biogas production

December 1, 2023 | Bioresource Technology | Source |

Introduction: Recent years have seen a shift toward a circular economy that utilizes agro-industrial biomass waste to produce energy while reducing trash and greenhouse gas emissions. Biogas production from lignocellulosic biomass (LCB) is a promising alternative for generating clean, renewable fuels. Researchers from the National Kaohsiung University of Science and Technology conducts a review on recent advances.

Key findings: This process involves pretreatment, anaerobic digestion (AD), and upgrading biogas to biomethane. To optimize the biogas production process, machine learning (ML) tools are used for real-time monitoring, predicting, and improving process efficiency. Life cycle assessments (LCA) are essential in evaluating the environmental impacts of biogas production, such as greenhouse gas emissions. The transition to a circular economy in biogas production is supported by the use of agro-waste, which helps achieve sustainable energy goals like those outlined in the United Nations' Sustainable Development Goals (SDGs). However, there are challenges, including technical gaps, financial barriers, and regulatory issues, that need to be addressed. Effective policies, incentives, and technological advancements are crucial to overcoming these challenges and promoting the sustainable development of biogas systems.

Graphical Abstract:



05 THEME: Carbon sequestration ;GHG emission reduction

Biochar for agronomy, animal farming, anaerobic digestion, composting, water treatment, soil remediation, construction, energy storage, and carbon sequestration: a review

May 7, 2022 | Environmental Chemistry Letters | Source |

Introduction: Biochar, a recycled material created from organic waste, has diverse applications across various sectors due to its role in climate change mitigation and the circular economy. This review by an international consortium of researchers from Ireland, UK, Japan, Qatar, Egypt, and the US covers biochar's use in several key areas:

Key findings

- **Agronomy:** Biochar can enhance soil health and crop productivity when used as a fertilizer. It acts as a long-term carbon sink and can improve soil properties, though its effectiveness varies based on feedstock and preparation methods.
- **Animal Farming:** Adding biochar to animal feed can boost growth, improve gut health, and reduce methane emissions. It also has potential benefits as a litter additive and for managing wastewater.
- **Anaerobic Digestion:** Biochar can improve biogas production and digestion performance by adsorbing pollutants and enhancing microbial activity. However, more research is needed to optimize its use and understand its effects on large-scale systems.
- **Composting:** When mixed with compost, biochar can enhance microbial activity and reduce greenhouse gas emissions. It can also improve soil quality, though careful management is needed to avoid issues like heavy metal accumulation.
- **Environmental Remediation:** Biochar can remove pollutants from water and soil, contributing to sustainability goals. Its use must be carefully managed to avoid potential environmental risks associated with its production and disposal.
- **Construction and Energy Storage:** Biochar can be used in building materials and energy storage systems. It provides benefits like improved insulation and moisture control but requires careful processing to maximize its effectiveness and minimize environmental impact.

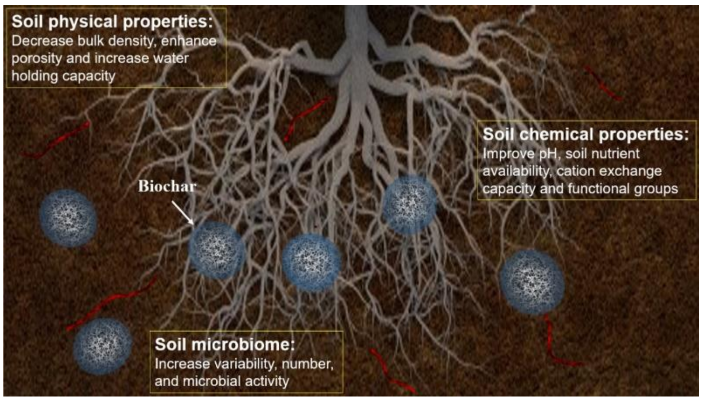


Figure | Biochar has a significant role in improving the chemical, physical, and microbiological properties of soil. Among the chemical properties of soil that can be improved are pH, nutrient availability, cation-exchange capacity and functional groups. Additionally, soil physical properties such as bulk density, porosity, and water holding capacity properties can be improved. Moreover, soil biological properties are enhanced by the addition of a significant amount of bioavailable nutrients, which improve the variety, number, and activity of soil microorganisms.

06 THEME: Carbon sequestration;GHG emission reduction; Policy incentives, financing, pricing

Carbon capture utilization and storage in review: Sociotechnical implications for a carbon reliant world

May 1, 2023 | Renewable and Sustainable Energy Reviews | Source |

Introduction: Decarbonizing industries like steelmaking, cement production, and chemicals is challenging due to the limited availability of low-carbon options. Carbon capture, utilization, and storage (CCUS) is a promising solution, helping reduce carbon emissions in these hard-to-decarbonize sectors. An international consortium of researchers from the US, Denmark, and Republic of Korea examines how CCUS can aid in industrial decarbonization by exploring technical, economic, and social factors.

Key findings:

The specific CCUS reviewed that are applicable to decarbonizing agrifood system include indirect air catpure (such as by photosynthesis), afforestation and forestry, blue carbon and ocean storage, algae culturing, bioenergy with carbon capture and storage. The specific utilizations reviewed that are applicable to agrifood sytems include production of fertilizers, biochar, and bioproducts. The key aspects highted in the review are as listed below.

- **Technical and Economic Factors:** CCUS involves capturing carbon emissions, transporting them, storing them safely, and utilizing them. Technologies such as direct air capture and various storage methods are discussed.
- **Policy and Regulation:** Effective policies are crucial for CCUS deployment. Key factors include stable regulations, early site identification, and research funding. Without these, CCUS adoption faces significant barriers.
- **International Cooperation:** Global efforts are uneven, and developed countries are encouraged to lead. Unilateral policies and international treaties are explored for their effectiveness in encouraging worldwide participation.
- **Challenges and Solutions:** The review identifies barriers such as high costs and the need for better regulatory frameworks. It suggests policies like grants, subsidies, and carbon pricing to support CCUS.

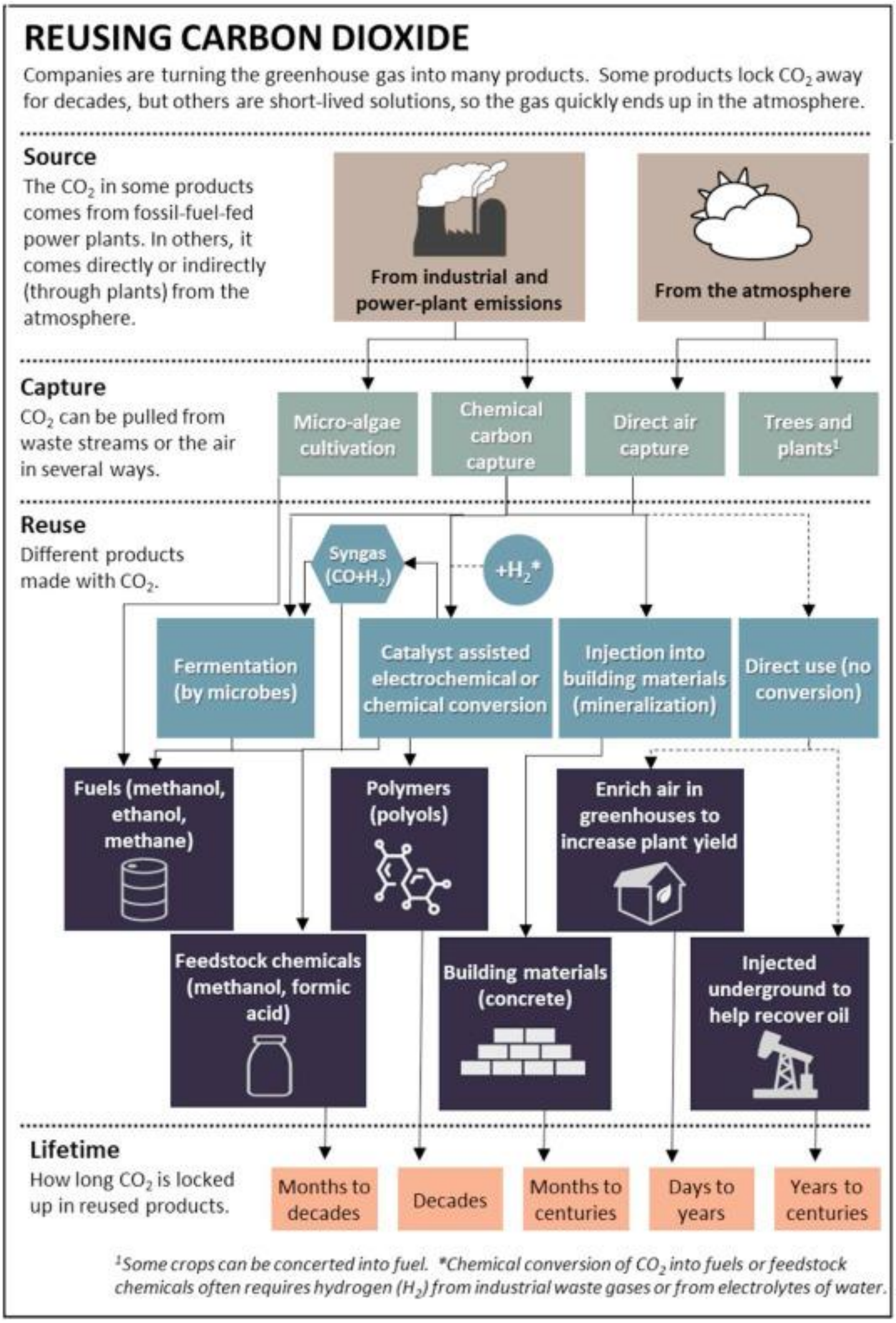


Figure | Conceptualizing carbon capture utilization and storage.

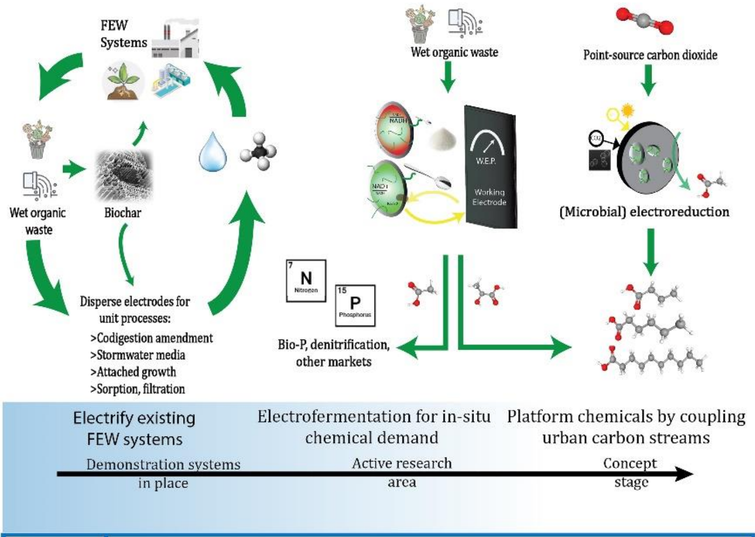
07 THEME: GHG emission reduction

Urban circular carbon economy through electrochemically influenced microbiomes

March 17, 2023 | One Earth | Source |

Introduction: Food waste and wastewater are significant sources of carbon emissions in cities, but they also hold potential for turning waste into valuable resources while reducing emissions. Traditional waste treatment often fails to realize this potential and can cause additional environmental issues. A new approach proposed by researchers based in Princeton University in the US involves using electrochemically engineered microbiomes to convert these waste streams into useful products, offering a more sustainable solution.

Key findings: This framework proposes integrating food and water waste through co-digestion and biofilm-based treatments, coupled with low-cost renewable electricity. By electrifying the microbiomes that process these wastes, we can enhance their efficiency and reduce greenhouse gas emissions. For instance, biochar, a byproduct of waste, can be used in various applications like stormwater management and wastewater treatment due to its high water retention and ability to support bioreactions. The framework also suggests that using electrochemical processes can help produce valuable chemicals from waste, such as organic acids, which are currently used in niche markets but have potential for broader applications. This approach not only reduces the carbon footprint of waste treatment but also creates economic opportunities by converting waste into high-value products.



Key pathways and microbes	Electrotrophic methanogens (e.g. *Methanosarcina* spp., *Methanothrix* spp.) Syntrophic fatty acid oxidizers (e.g. *Syntrophomonas* spp. , *Geobacter* spp.) Anode-respiring bacteria (e.g. *Geobacter* spp.)	Anodic fermenters (e.g. homofermentative LAB) Cathodic fermenters (*C. pasteurianum, L. plantarum*) Polyphosphate accumulating organisms (e.g. *Accumulibacter* spp.)	Acetogens (e.g. *Sporomusa* spp., *Clostridium* spp.) Reverse β-oxidizers (e.g. *Megasphaera* spp., *Caproicipro-ducens spp.*) "Clean systems" - enzymatic or whole-cell genetic engineering approaches for CO2-R
Outstanding questions	To what degree is DIET, versus other factors, responsible for biochar-induced performance enhancement in anaerobic digestion?	What heterotrophic processes could be made viable by cheap, tunable VFAs? Which microbes and associated waste streams are EF targets?	Can reducing power from electrodes and/or organic wet waste make CO2 to platform chemicals viable?

Figure | Technology roadmap for the application of electrochemically engineered microbiomes to enable an urban circular carbon economy.

08 THEME: GHG emission reduction

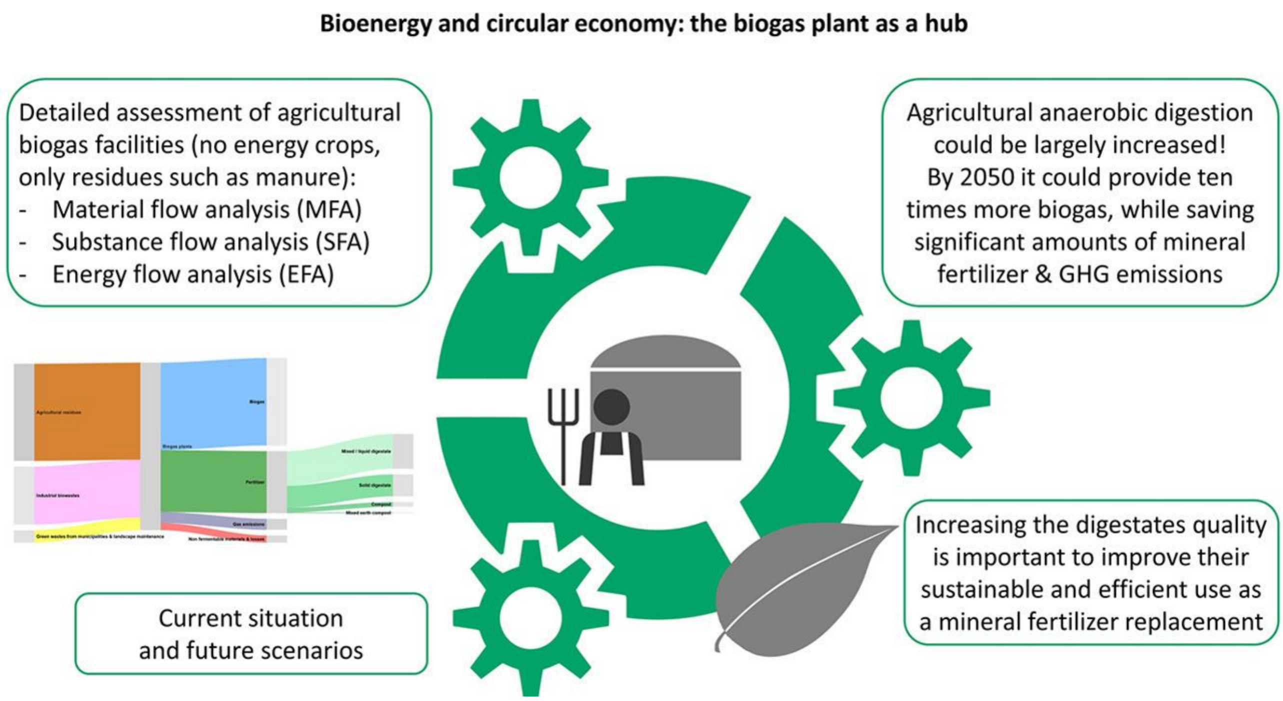
Agricultural biogas plants as a hub to foster circular economy and bioenergy: An assessment using substance and energy flow analysis

March 1, 2023 | Resources, Conservation and Recyling | Source |

Introduction: Currently, Swiss AD plants produce around 1,300 TJ of biogas annually, which could potentially be increased tenfold by 2050. This expansion could significantly reduce the need for mineral fertilizers and fossil fuels, lowering CO_2 emissions by 38 kt annually. The study by researchers from Switzerland focuses on optimizing the use of biomass in agricultural anaerobic digestion (AD) plants in Switzerland, aiming to enhance the circular economy and mitigate climate change.

Key findings: The study highlights that while 47% of the energy in input biomass is converted into biogas, the rest remains in solid and liquid residues. There is a need for better quality data to improve the accuracy of these measurements. The research indicates that agricultural digestates are valuable, providing essential nutrients and improving soil quality. However, their economic value is currently underutilized, partly due to market limitations and the preference for separate fertilizers. The study suggests that Switzerland needs to fully leverage its renewable energy potential, including biogas, to meet climate goals. Policymakers should enhance support for biogas plants and consider technological advancements to increase efficiency. Expanding this approach could also be beneficial if applied on a broader scale and integrated with other biomass uses. Overall, the study underscores the importance of advancing biogas technology to support sustainable agriculture and environmental management.

Graphical Abstract



Regionalized life-cycle monetization can support the transition to sustainable rural food waste management in China

September 18, 2023 | Nature Food | Source |

Introduction: Innovative recycling technologies are crucial for managing food waste, but their implementation often involves balancing various environmental, economic, and social factors. Monetization can help integrate these impacts and provide a comprehensive evaluation. In a study conducted by research team in Zhejiang province, China, a regionalized monetization model was used to assess ten common rural food waste recycling technologies.

Key findings: Compared to landfilling, technologies like biodrying and bioconversion are effective for waste management but require careful consideration of their broader impacts, such as higher initial costs or potential negative impacts on air quality. The monetization model used in this study allows for a detailed comparison of these trade-offs, showing that some technologies offer a good balance of environmental and economic benefits. The model developed can be applied to other sectors and regions to support decision-making towards more sustainable practices. This approach helps policymakers understand and manage the complex trade-offs involved in choosing the best waste recycling technologies.

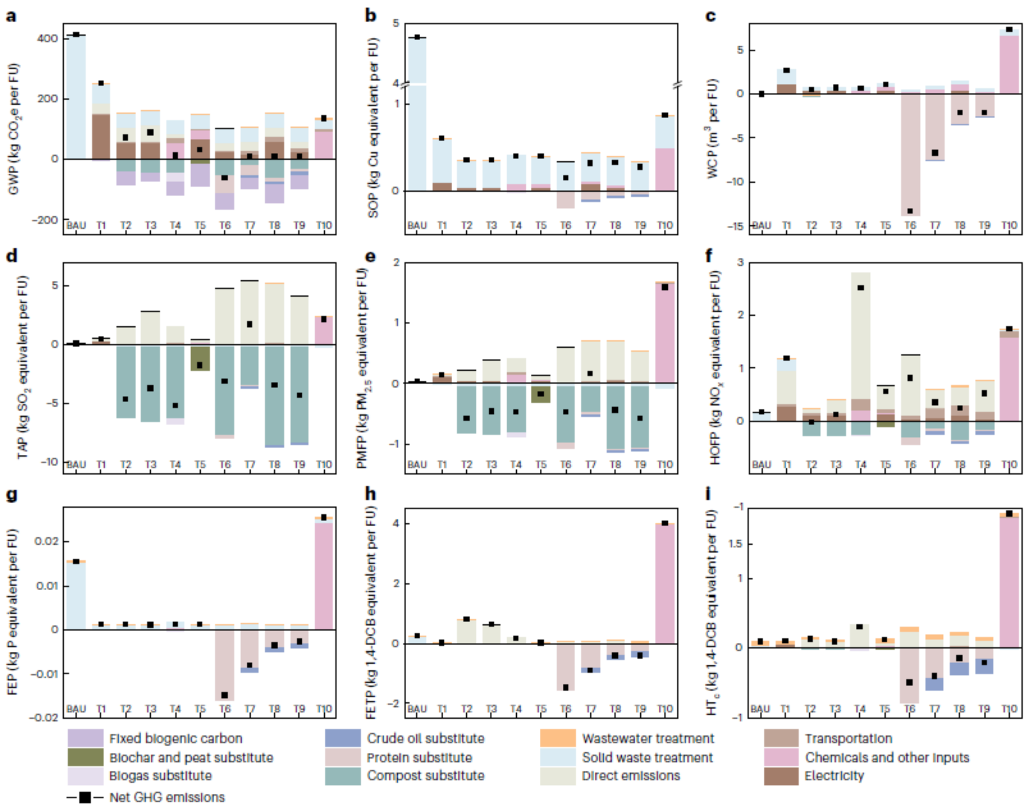


Figure | LCA results of ten rural food waste treatment technologies. a–i, BAU, business as usual (landfilling); T1, mechanical drying; T2, biodrying and maturity; T3, solar-assisted composting; T4, underground anaerobic digestion; T5, heat pyrolysis carbonization; T6, bioconversion for black soldier fly (BSF); T7, bioconversion for BSF and bio oil; T8, bioconversion for red head fly (RHF) and bio oil; T9, heat hydrolysis and bioconversion; T10, enzyme production.

10 THEME: GHG emission reduction

The potential of black soldier fly to recycle nitrogen from biowaste

December 1, 2023 | Current Opinion In Green And Sustainable Chemistry | Source |

Introduction: Insects, particularly the Black Soldier Fly (BSF), offer a promising solution for recycling nitrogen from biowaste. BSF larvae efficiently convert waste into protein-rich biomass and nutrient-rich residue, which can be used as animal feed and fertilizer. This process reduces waste, lessens the need for synthetic fertilizers, and provides an alternative protein source. Research team based in Thomas More University College in Belgium conducts a literature review on the efficiency of this nitrogen conversion, as well as managing emissions like ammonia (NH_3) and nitrous oxide (N_2O) for enhancing sustainability in waste management.

Key findings: Efficiency varies depending on the type of waste and its carbon-to-nitrogen (C/N) ratio. For example, mixing different waste types to balance the C/N ratio can improve nitrogen conversion efficiency. However, too much nitrogen or imbalanced ratios can reduce efficiency and larval growth. Additionally, during BSF treatment, nitrogen can be lost as gases like NH_3 and N_2O, which can negatively impact the environment. Studies reveal that emissions depend on factors like waste composition and moisture content. High moisture can increase NH_3 emissions, while a balanced C/N ratio can help reduce these losses.

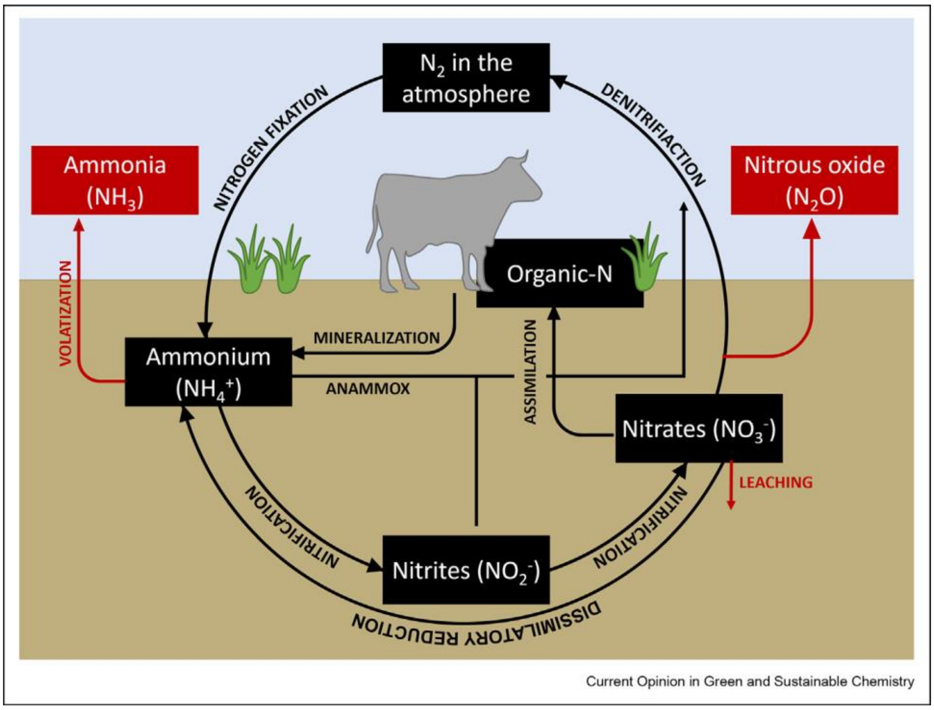


Figure | The nitrogen cycle. The nitrogen cycle comprises of several complex biological process that describes the transformation of nitrogen in various forms and its cycling through ecosystems. The major steps of the nitrogen cycle are as follows: Nitrogen fixation: dinitrogen gas (N_2) is fixed from the atmosphere into ammonium (NH_4+) or ammonia (NH_3) by nitrogen fixing bacteria. Nitrification: nitrification is an aerobic process that occurs by nitrifying bacteria in two steps: nitritation, the oxidation of ammonia to nitrite (NO_2-), and nitratation, oxidation of nitrite to nitrate (NO_3-). Dissimilatory reduction (DNRA): Dissimilatory reduction of nitrite to ammonium. This process is carried out by certain bacteria and fungi under anaerobic conditions. Anammox (anaerobic ammonia oxidation): ammonium and nitrite are converted into nitrogen gas under anaerobic conditions. Assimilation: Plants and microorganisms take up the nitrate and ammonia from the soil to use as building blocks for proteins, nucleic acids and other organic compounds. Mineralization: decomposers such as fungi and bacteria break down organic matter into simpler compounds, releasing ammonia back into the soil. Denitrifiaction: in this anaerobic process nitrate and nitrite are reduced to gaseous forms of nitrogen, principally nitrous oxide (N_2O) and nitrogen.

11 THEME: GHG emission reduction

Climate mitigation efficacy of anaerobic digestion in a decarbonising economy

January 10, 2022 | Journal of Cleaner Production | Source |

Introduction: Anaerobic digestion (AD) is a crucial technology at the intersection of waste management, energy production, and land use. An European research team based in University of Limerick in UK assesses the effectiveness of AD in reducing greenhouse gas (GHG) emissions within different decarbonization contexts using life cycle assessment.

Key findings: Results show that while AD can effectively manage residual food waste and manures, alternative strategies like food waste prevention, animal feed diversion, solar electricity generation, and afforestation offer more significant GHG reductions. As energy systems decarbonize, AD's role shifts from transport fuel to large-scale biogas combustion, especially with bioenergy carbon capture and storage (BECCS). However, maximizing GHG mitigation requires prioritizing waste prevention, renewable energy technologies, and nature-based solutions like afforestation. AD remains valuable, especially for residual waste management and short-term clean transport fuel, but should be part of a broader strategy for achieving climate neutrality.

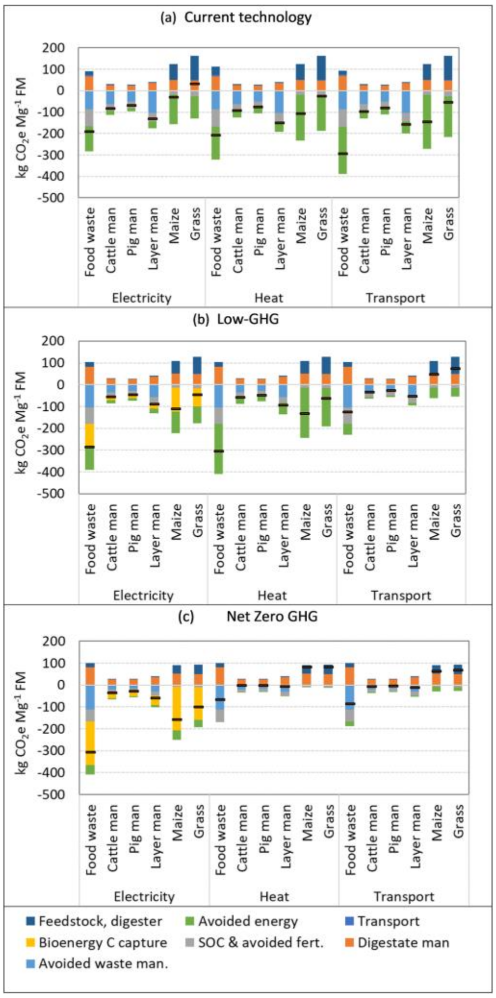


Figure | Global warming potential balance of anaerobic digestion of different feedstocks under different end uses of the biomethane (for electricity generation, heat production or as a transport fuel), and under different contexts –CURRENT technology (top), LOW-GHG (middle), net zero (NZ-) GHG (bottom). The net balance represents sum of emissions from incurred processes (e.g.transport of feedstock, fugitive and combustion emissions from digestion, emissions from digestate management) minus: (i) credits (avoided emissions) from avoided waste management, avoided synthetic fertiliser production and use, and avoided energy carriers; (ii) soil organic carbon storage (SOC) associated with digestate application; (iii) bioenergy carbon capture & storage. Carbon opportunity costs of land use are excluded here for crop feedstocks.

12 THEME: GHG emission reduction; MRV (measurement, reporting, verification)

Circular bioeconomy in carbon footprint components of nonthermal processing technologies towards sustainable food system: A Review

April 30, 2024 | Trends in Food Science & Technology | Source |

Introduction: A team of researchers from India, UK, and Belgium examines how nonthermal processing technologies and artificial intelligence (AI) can reduce the carbon footprint in food production, promoting sustainability.

Key findings: Traditional food processing often requires significant energy and water use, contributing to greenhouse gas emissions. However, emerging nonthermal technologies, such as high-pressure processing, pulsed electric fields, and cold plasma, offer alternatives that use less energy and water. These methods effectively inactivate harmful microorganisms and extend the shelf life of food while preserving its nutritional quality. AI technologies, including digital twins and electronic sensors, further optimize these processes by monitoring food quality and enhancing efficiency. By integrating AI with nonthermal techniques, food production can become more sustainable, minimizing environmental impact and aligning with global sustainability goals. By adopting these technologies, the industry can contribute to a circular bioeconomy, ensuring food safety while reducing resource consumption and emissions. This shift is crucial for meeting the growing demands of a sustainable and climate-resilient food system.

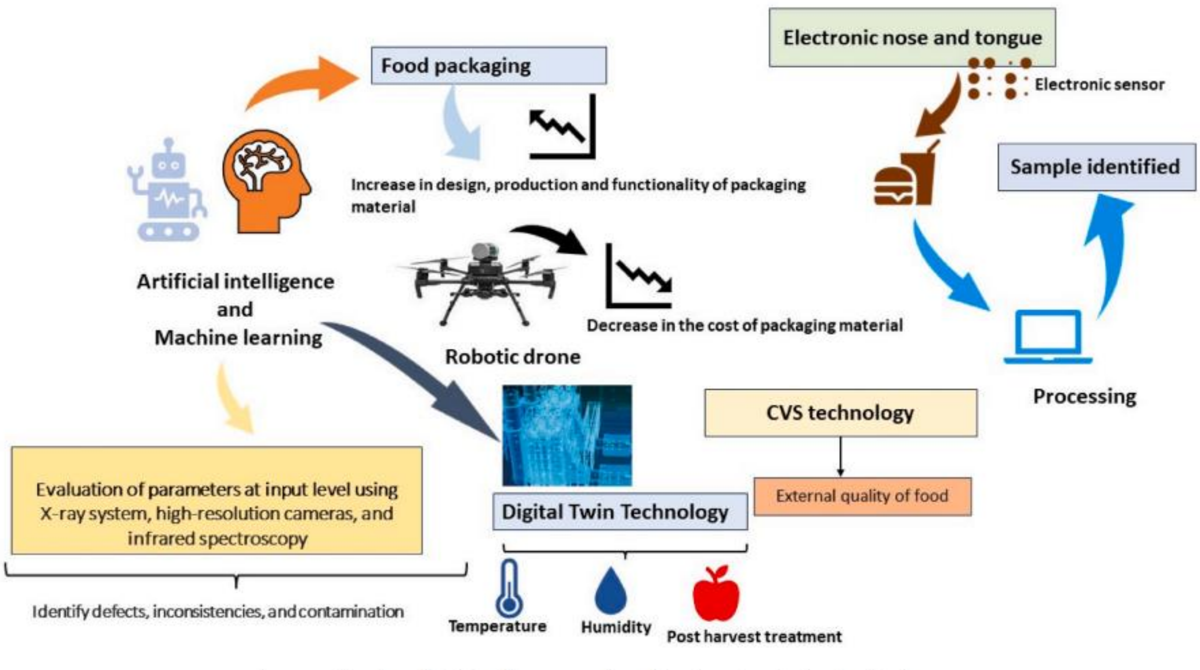


Figure | Role of artificial intelligence and Machine learning in the food industry.

NEWS

01 **THEME:** GHG emission reduction; MRV (measurement, reporting, verification); Policy incentives, financing, pricing

Changhua farmers develop sustainable agriculture processes in Taiwan, needs to align with international standards

June 08, 2024 | CNA, Taiwan |

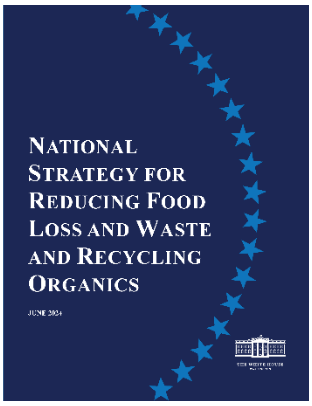
Changhua County, a major agricultural hub in Taiwan, is making strides in sustainability. Grape farmer Wu Wuming has adopted non-toxic cultivation methods to protect the land, despite lower and less stable yields. Meanwhile, coffee shop owner Zhang Zhimin in Changhua City is applying circular economy principles by turning coffee fruit skins into tea bags and using coffee grounds for mosquito coils and charcoal.

The county government is promoting agricultural environmental accounting to analyze and optimize environmental costs and benefits, aiming to achieve carbon reduction and zero-carbon goals. However, scholars like Huang Yaoming from Nanhua University emphasize the need for standardized procedures to accurately measure and achieve sustainability targets. Despite progress, standardization is crucial to align with international sustainability standards and enhance the effectiveness of these initiatives.

02 **THEME:** GHG emission reduction; Policy incentives, financing, pricing

Biden-Harris Administration announces National Strategy to Reduce Food Loss and Waste and Recycle Organics

June 12, 2024 | USDA |



On June 12, 2024, the U.S. Department of Agriculture (USDA), Environmental Protection Agency (EPA), Food and Drug Administration (FDA), and the White House unveiled a National Strategy to Reduce Food Loss and Waste and Increase Organic Recycling. This initiative, part of President Biden's comprehensive climate action plan, aims to cut food loss and waste by 50% by 2030, align with sustainable development goals, and foster a circular economy.

The strategy outlines four main objectives: preventing food loss, reducing food waste, increasing organic waste recycling, and supporting policies for these goals. Key actions include investing in consumer education, funding research on food loss prevention, and promoting public-private partnerships. The USDA plans to invest $2.5 million in testing consumer messages and $1.5 million in a new research center to address food waste.

The strategy is expected to reduce greenhouse gas emissions, save money for households and businesses, and support environmental justice. The EPA estimates that U.S. food waste contributes significantly to methane emissions, underscoring the need for this initiative. The strategy also builds on previous USDA efforts and includes renewed partnerships with industry leaders committed to reducing food waste.

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03 **THEME:** Carbon sequestration; GHG emission reduction; Policy incentives, financing, pricing

Cabinet approves BioE3 (Biotechnology for Economy, Environment and Employment) Policy for fostering high performance biomanufacturing

August 24, 2024 | PMINDIA.gov |

The Union Cabinet, led by Prime Minister Narendra Modi, has approved the 'BioE3 (Biotechnology for Economy, Environment and Employment) Policy,' spearheaded by the Department of Biotechnology. This policy focuses on advancing high-performance biomanufacturing through innovation-driven R&D and entrepreneurship. Key features include the establishment of Biomanufacturing & Bio-AI hubs and Biofoundries to support technology development and commercialization.

The BioE3 policy aims to promote regenerative bioeconomy models, enhance India's skilled workforce, and boost job creation. It aligns with government goals like achieving a 'Net Zero' carbon economy and supports 'Circular Bioeconomy' principles. The policy addresses crucial societal challenges such as climate change, food security, and health by fostering sustainable and circular practices.

The BioE3 Policy targets several strategic sectors, including high-value bio-based chemicals, smart proteins, precision biotherapeutics, climate-resilient agriculture, carbon capture, and marine and space research. By investing in biomanufacturing and integrating advanced biotechnologies, the policy seeks to drive green growth and establish a robust biomanufacturing ecosystem in India.

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04 **THEME:** GHG emission reduction; Policy incentives, financing, pricing

What is the bioeconomy and how can it drive sustainable development?

July 12, 2024 | World Economic Forum |

The bioeconomy harnesses renewable biological resources like plants, animals, and microorganisms to produce food, energy, and industrial goods, promoting sustainability and reducing dependence on fossil fuels. Technological advancements, such as gene editing, bioprocessing, and bioprinting, are driving innovation within this sector, enabling the development of sustainable solutions. Integrating these technologies with circular economy principles, which focus on minimizing waste and maximizing resource efficiency, is key to the bioeconomy's success.

Global initiatives demonstrate the bioeconomy's potential impact, from Brazil's ethanol production to Finland's bio-based packaging. As bio-based production expands, balancing growth with ecosystem conservation will be crucial. Investment in infrastructure, research, and cross-sector collaboration is essential to scale bioeconomic solutions, fostering long-term sustainability and economic growth. The bioeconomy offers a pathway to reconcile economic development with environmental stewardship, positioning it as a cornerstone of a resilient global economy.

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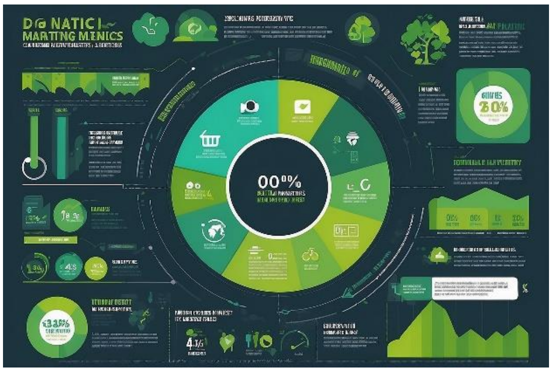
05 **THEME:** MRV (measurement, reporting, verification)

Index aims to quantify circularity in the bioeconomy

August 01, 2024 | Envirotec |



Researchers from the University of Illinois Urbana-Champaign have introduced a new tool called the Circularity Index (CI) to quantify circularity in bioeconomic systems. This index, detailed in their recent paper, measures circularity on a scale from 0 (completely linear) to 1 (completely circular), covering categories like take, make, distribute, use, dispose, recover, remake, and reuse.

The team applied the CI to two case studies: a corn-soybean farm in the U.S. and the entire U.S. food and agriculture system. They found that using manure instead of urea in the farm increased circularity (CI of 0.86 vs. 0.687). For the national system, the current CI is 0.179, but adopting the Environment-Enhancing Food Energy and Water System framework could boost it to 0.84 by improving waste recovery and recycling.

The CI offers a scalable method to evaluate and compare resource efficiency across various systems, from individual farms to global economies. It supports sustainability efforts and could aid in achieving UN Sustainable Development Goals by highlighting areas for improvement in circular economy practices.

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06 **THEME:** GHG emission reduction; Policy incentives, financing, pricing

Super-organism could help reduce greenhouse gas emissions: scientists

August 20, 2024 | Vietnamnet Global |

Azolla, a super-organism used in animal feed and organic fertilizer, is gaining attention for its potential to revolutionize agriculture and combat climate change. According to experts like Dr. Pham Gia Minh from Azovi, azolla absorbs CO_2 eight times more efficiently than green trees and reduces methane emissions from rice fields by 20-40%. Countries like China, India, and the Netherlands are already utilizing azolla on a large scale.

In Vietnam, azolla's potential is largely untapped, despite its rapid growth and benefits in organic farming. Farmers using azolla in rice cultivation can create low-emission, high-yield crops, opening opportunities for carbon credits. However, challenges such as pesticide overuse, yellow snails, and the lack of a clear policy on azolla's classification hinder its widespread adoption.

Experts urge the Vietnamese government to establish azolla cultivation policies and promote its use in sustainable agriculture, which could enhance the value of existing resources and support climate change mitigation efforts.

07 **THEME:** Carbon sequestration; GHG emission reduction; Policy incentives, financing, pricing

The Ministry of Agriculture and the Academia Sinica signed a carbon reduction research MOU (In Chinese)

July 11, 2024 | Agri-Harvest, Taiwan |

Taiwan's Ministry of Agriculture is committed to achieving net-zero emissions in agriculture by 2040, aiming to increase carbon sequestration by 10 million metric tons of CO_2 equivalent (CO_{2e}), offsetting over 6 million metric tons of annual carbon emissions. Acknowledging that current technologies alone cannot achieve net-zero, Minister Chen Junne-jih and Academia Sinica President Liao Junzhi signed a memorandum of cooperation on September 17 to deepen research on carbon reduction, resource recycling, and natural carbon sink monitoring.

The Ministry is seeking a budget of approximately NT$300 million for carbon reduction technology next year. The collaboration with Academia Sinica will focus on innovative research and practical applications, including studies on low-carbon rice cultivation, high-carbon sequestration plants, and offshore algae farming. The partnership aims to establish a comprehensive research ecosystem to support the net-zero goal.

08 **THEME:** Carbon sequestration; Policy incentives, financing, pricing

Regenerative agriculture is changing how we make wine — and combating climate change

August 16, 2024 | World Economic Forum |

The global wine industry, valued at over $300 billion, is increasingly influencing consumers and producers towards regenerative viticulture, a growing nature-positive strategy. Regenerative viticulture, which focuses on improving soil health and biodiversity, is rapidly gaining momentum despite its recent emergence in the 1980s. This approach, flexible and outcome-based, aims to reverse soil degradation and mitigate climate change impacts. Winegrowers are forming coalitions to share knowledge and promote these practices. Although initial costs may be higher, regenerative viticulture promises better yields and higher quality grapes, aligning with younger consumers' values of sustainability. The industry's efforts could serve as a model for broader agricultural transformation.

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09 **THEME:** GHG emission reduction; Policy incentives, financing, pricing

Biden-Harris Administration Announces $90 Million in Innovative Projects that Help Conserve Natural Resources and Address Climate Change as Part of Investing in America Agenda

July 18, 2024 | USDA |

U.S. Agriculture Secretary Tom Vilsack announced a $90 million investment in 53 Conservation Innovation Grants (CIG) projects aimed at advancing conservation practices on private lands. This funding, made possible by President Biden's Inflation Reduction Act, focuses on innovative solutions to reduce livestock methane emissions and support climate-smart agriculture. The grants include over $69.7 million for On-Farm Trials and $20.2 million for Classic projects. Two projects in Pennsylvania will improve nutrient management and deploy precision agriculture technologies. Since 2004, CIG has invested $541.9 million in 929 projects, with a focus on enhancing soil health and addressing climate challenges. The Inflation Reduction Act also supports additional conservation programs and climate-smart initiatives across the U.S.

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10 **THEME:** GHG emission reduction; Policy incentives, financing, pricing

Denmark will be first to impose CO_2 tax on farms, government says

June 25, 2024 | Reuters |

Denmark will become the first country to impose a tax on livestock carbon dioxide emissions starting in 2030, aiming to meet its 2030 goal of -reducing greenhouse gas emissions by 70% from 1990 levels. The new tax, agreed upon by the centrist government in a broad compromise with farmers, industry, and environmental groups, will start at 300 Danish crowns ($43.16) per ton of CO_2, increasing to 750 crowns by 2035. Farmers will receive a 60% income tax deduction, reducing the effective cost to 120 crowns initially, rising to 300 crowns by 2035. The tax is expected to raise the cost of minced beef by about 2 crowns per kilo. Despite initial concerns from farmers, the compromise is seen as a way to balance climate goals with maintaining agricultural operations. The proposal is anticipated to pass parliament, following a broad-based consensus.

POLICY

01 THEME: Carbon market; Circular Economy

Carbon Credit Methodology for Home Food Recycling

Gold Standard | Source | Download |

A new methodology, approved by the Gold Standard, enables the issuance of carbon credits for decentralized organic waste processing. Developed by Lomi in collaboration with Carbonomics, this methodology allows projects to earn Verified Emissions Reductions (VERs) by avoiding methane emissions from landfills and reducing transportation-related emissions.


Gold Standard for the Global Goals

METHODOLOGY

REDUCTION IN METHANE EMISSIONS FROM LANDFILLS THROUGH DECENTRALISED ORGANIC WASTE PROCESSING

SDG 13

Publication Date: **01.05.2024**
Version: **1.0**
Next Planned Update: **01.05.2027**

Key Points

- **Carbon Credit Generation:** The methodology supports decentralized, on-site processing of organic waste at households and commercial establishments. This reduces methane emissions by preventing waste from reaching landfills.
- **Emission Reduction Impact:** By processing waste locally, projects eliminate the need for transporting organic waste to centralized facilities, further lowering greenhouse gas (GHG) emissions.
- **Eligibility Criteria:** Projects must demonstrate additionality, ensuring that the activity is not legally mandated and that carbon finance is crucial for its implementation. Organic waste such as kitchen and vegetable waste is eligible for this methodology.
- **Global Applicability:** This methodology can be applied globally and supports activities of varying scales, from micro to large-scale projects.

Policy Implications: The adoption of this methodology can catalyze the reduction of landfill-related emissions, supporting global efforts to achieve Net-Zero targets. Policymakers should encourage decentralized waste processing initiatives by integrating them into waste management strategies, offering incentives for participation, and promoting the use of carbon credits to fund sustainable waste practices.

02 THEME: Circular Economy

Capturing the climate change mitigation benefits of circular economy and waste sector policies and measures

European Environment Agency | Source |

Circular economy and waste management practices significantly reduce greenhouse gas (GHG) emissions by decreasing the need for new primary materials and improving resource efficiency. Despite their potential, these actions are underrepresented in national climate policies and reporting, largely due to cross-sectoral challenges, such as in quantifying their impacts.

Key Messages

- **Underrepresentation in Policies:** Circular economy actions are often not fully integrated into climate policies. In Europe, only 6% of reported climate measures focus on circular economy, primarily related to waste.
- **Quantification Challenges:** The GHG reduction potential of circular economy measures is frequently underestimated due to difficulties in quantifying their impacts and their integration into existing reporting frameworks.
- **Waste Sector Contribution:** Although the waste sector contributes about 3% of total GHG emissions, better resource use can mitigate emissions in other sectors. Methane from landfills is a major issue, but emissions have decreased significantly due to improved waste management practices.

Recommendations

- **Increase Integration:** Improve the inclusion of circular economy actions in national climate mitigation reporting to better capture their potential benefits.
- **Enhance Quantification:** Develop robust models and methodologies to quantify the GHG reduction potential of circular economy measures accurately.
- **Policy Coordination:** Foster cross-sectoral collaboration to integrate circular economy measures into broader climate policies and reporting systems.
- **Legislative Support:** Analyze and propose additional legislative measures to support the implementation of circular economy practices.

Next Steps

- Raise awareness and improve coordination between circular economy and climate policy experts.
- Identify and integrate high-impact circular economy measures into national climate reporting.
- Monitor progress and adjust policies as needed.

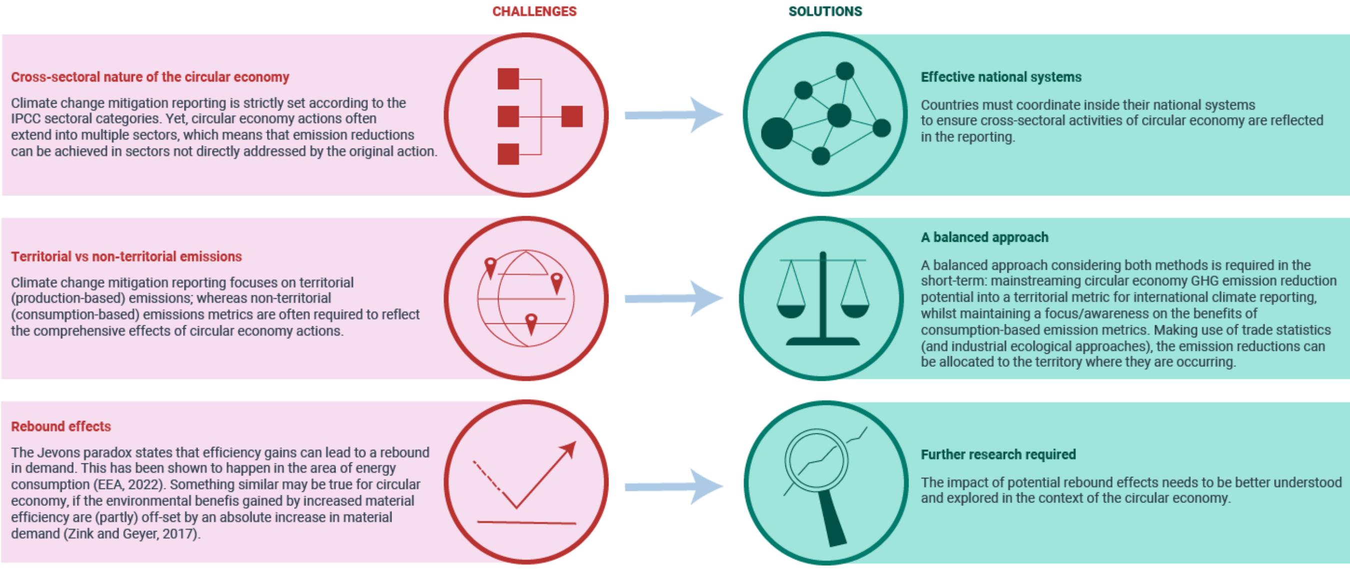
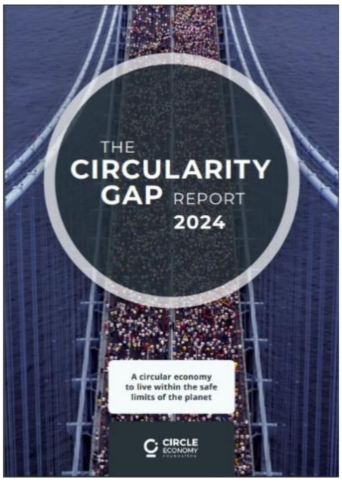


Figure | Challenges and solutions for integrating circular economy policies and climate policies

03 THEME: Circular Economy

The Circularity Gap Report

Circle Economy Foundation | Source | Download |



Despite the growing recognition of the circular economy, global circularity has declined, with the share of secondary materials dropping from 9.1% in 2018 to 7.2% in 2023. The global economy continues to extract and consume vast quantities of virgin materials, exacerbating environmental degradation and pushing six of the nine planetary boundaries beyond safe limits. Key global systems, like the food system, exert significant pressure on Earth's systems, contributing to the overshoot of six planetary boundaries. The food system, which employs 50% of the global workforce, is a major contributor to climate change, land use, freshwater loss, and biodiversity decline. Transformative circular solutions are essential to address these challenges while still fulfilling human needs.

Key Issues

- **Material Consumption:** The continued increase in material extraction threatens global sustainability. High-income nations, in particular, consume more than their fair share, exacerbating inequalities and environmental harm.
- **Circular Economy Solutions:** Although theoretical frameworks exist, translating these into actionable policies remains a challenge. Effective circular solutions could reduce material extraction by one-third and help reverse environmental damage.

Policy Recommendations

- **Level the Playing Field:** Implement policies that incentivize circular practices and penalize harmful activities. This includes adjusting fiscal policies to reflect true costs and promoting sustainable industrial processes.
- **Invest in Circular Skills:** Build a skilled workforce capable of driving the circular transition. This requires education, vocational training, and the creation of decent, meaningful jobs.
- **Global Collaboration:** Foster international cooperation to ensure that circular economy principles are adopted globally, with tailored approaches for different economic contexts. Urgent, coordinated action is needed to shift from linear to circular economies, ensuring a sustainable future within the planet's limits.

04 THEME: Circular Economy

Guidelines for Measuring Circular Economy (Part A: Conceptual Framework, Indicators and Measurement Framework)

UN Economic Commission for Europe | Source | Download |

The UNECE/OECD Guidelines for Measuring Circular Economy provide a comprehensive framework for defining and tracking circular economy (CE) progress. Part A outlines the CE concept, introduces a harmonized set of indicators, and discusses measurement considerations linked with the System of Environmental-Economic Accounting (SEEA). Part B, forthcoming, will offer practical guidance for implementing these indicators and fostering institutional collaboration.

Key Concepts

- **Circular Economy Definition:** An economy aimed at maximizing the value of materials by keeping them in use for as long as possible, minimizing resource input, and reducing waste and environmental impacts throughout the product lifecycle.
- **9R-Framework:** Focuses on closing, slowing, and narrowing resource loops.

Framework Structure

- **Material Life-cycle and Value Chain:** Covers material basis, circularity, and efficiency.
- **Interactions with the Environment:** Assesses resource depletion and environmental impacts.
- **Responses and Actions:** Includes support for circular design, waste management, innovation, and financial flows.
- **Socio-economic Opportunities:** Examines market developments, trade, skills, and inclusiveness.
- **Indicators:** The framework includes 19 core indicators, with categories such as material consumption, waste management, resource implications, and socio-economic impacts. It emphasizes policy relevance, analytical soundness, and measurability.

Recommendations

- Develop improved economic classifications and green taxonomies for better CE metrics.
- Create physical supply and use tables to measure material flows.
- Address gaps in indicator definitions and data quality.

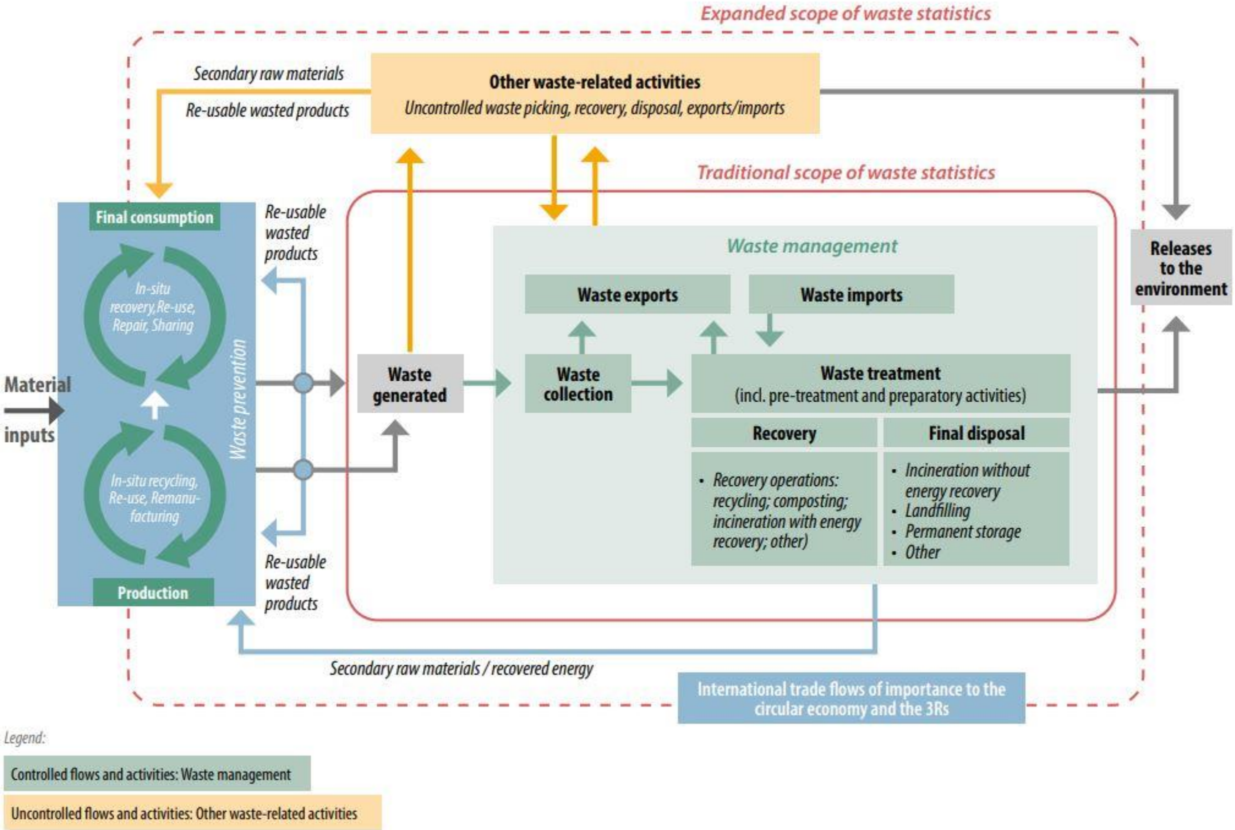
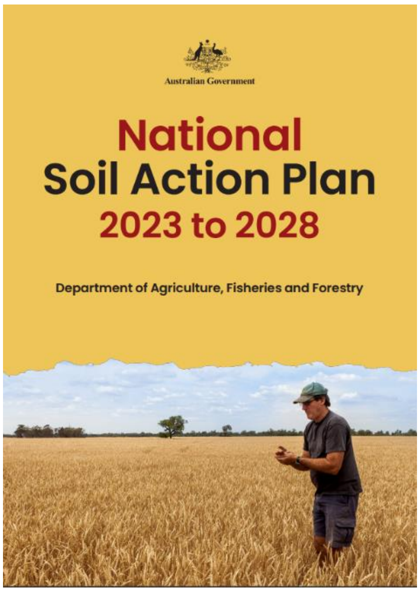


Figure │ CES Framework for Waste Statistics, embedded in a broader context

05 THEME: Climate smart agriculture; Nature-based solutions; Sustainable production

National Soil Action Plan 2023 to 2028 (Australia)

Australian Government | Source | Download |



Soil is fundamental for food production, environmental health, biodiversity, and climate resilience. Australia's National Soil Strategy 2021-2041, launched in May 2021, underscores the critical role of soil and outlines a comprehensive approach to its management and protection. The National Soil Action Plan 2023-2028 marks the first five-year phase of this strategy.

Key Objectives

- **Develop a National Framework:** Establish a unified system for measuring, monitoring, and reporting on soil health to guide management practices and investment.
- **Promote Holistic Policies:** Advocate for policies that recognize and protect soil's multifaceted roles across the environment, economy, and society.
- **Enhance Land Management Practices:** Accelerate the adoption of practices that safeguard and improve soil quality.
- **Build Soil Workforce:** Strengthen the skills and capabilities required to address current and future soil challenges.

Implementation: The Action Plan emphasizes collaboration among Australian governments, soil scientists, industry, and other stakeholders to address soil management challenges effectively. It aims to build foundational networks and systems to support the long-term vision of the National Soil Strategy.

Review and Future Directions: A review of the Action Plan's priorities will occur in 2027 to adapt and refine strategies based on emerging needs and developments. The plan is a dynamic document, evolving with new initiatives and activities to ensure continuous progress in soil management.

OPEN DATA

01 THEME: Agrifood system; Others

EUROSTAT Circular economy Database

European Commission | Source |

EUROPEAN STATISTICAL SYSTEM

To advance towards a circular economy, the European Commission adopted an action plan in 2020 as part of the European Green Deal. A revised monitoring framework was introduced in May 2023 to track progress, supported by Eurostat, which provides relevant data and indicators to assess the effectiveness of circular economy initiatives.

Eurostat monitors the circular economy's progress using a framework with 11 indicators across five key areas: production and consumption, waste management, secondary raw materials, competitiveness and innovation, and global sustainability. This data helps evaluate progress and effectiveness in transitioning to a circular economy.

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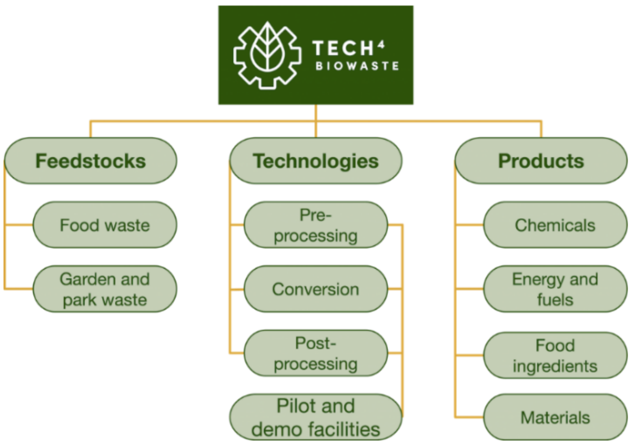
02 THEME: Agrifood system; Others

Tech4Biowaste database

Bio-based Industries Consortium | Source | Data |



The Tech4Biowaste project aims to support the circular economy in Europe by creating a comprehensive database of biowaste valorization technologies. Biowaste, such as food and garden waste, has significant potential to be transformed into valuable products like organic soil improvers, fertilizers, chemicals, and energy. The project, which started in April 2021, will develop a user-friendly database showcasing technologies with a Technology Readiness Level (TRL) of 4-9. This database will be continually updated, allowing technology providers to display new innovations and enabling users to compare and analyze different biowaste technologies. The project will involve stakeholders across the biowaste value chain to ensure the database's relevance and promote its widespread use, aiming for long-term growth and sustainability.

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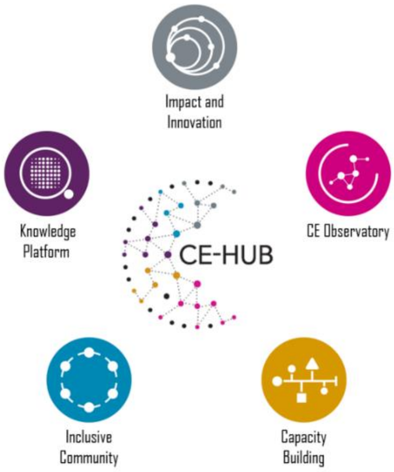
03 THEME: Others

UKRI National Interdisciplinary Circular Economy Research: Circular Economy-Hub

UKRI National Interdisciplinary Circular Economy Research | Source |

The National Interdisciplinary Circular Economy Research (NICER) Hub (CE-Hub) leads the NICER Programme, a four-year, £30 million UKRI-funded initiative aimed at creating a sustainable Circular Economy in the UK. The Hub collaborates with five research centers and engages academics, industry, policymakers, and communities to drive research and innovation.



The NICER Programme's goals are to enhance understanding and solutions for circular resource use, provide national leadership, and involve various stakeholders in the research process.

- **Knowledge Hub:** Offers access to the latest research and insights on Circular Economy practices, providing a resource center for policymakers and businesses. It features an easily navigable repository and highlights key academic findings.
- **CE Stories:** Showcases real-world examples of Circular Economy practices in action across the UK, demonstrating innovative approaches and success stories in the field.

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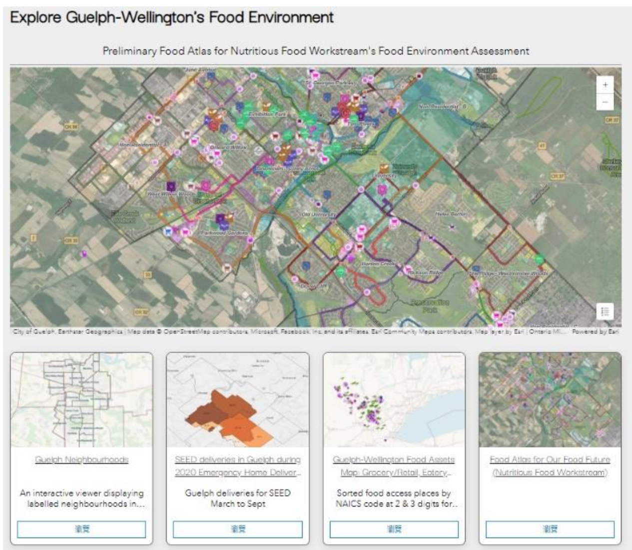
04 THEME: Agrifood system

Guelph-Wellington Civic Data Utility Project: Food Future Data Hub

Guelph Wellington | Source | Data |

The Guelph-Wellington Civic Data Utility aims to foster a circular food economy by facilitating data collaboration across the food supply chain. Spearheaded by Our Food Future and Alectra Utilities' Green Energy & Technology Centre, the initiative will launch the Our Food Future Data Hub to share and map food-related data from various collaborators. This project will explore use cases such as collaborative responses to COVID-19 challenges among restaurants, data sharing among farmers for local environmental insights, and adjustments in food relief services based on data.



Initial collaborators include the City of Guelph, the County of Wellington, Ontario's Ministry of Agriculture, Food and Rural Affairs, the University of Guelph, Wellington-Dufferin-Guelph Public Health, Towards Common Ground, and the Upper Grand District School Board. The project ensures privacy through distributed governance, where data owners control sharing and usage. An Advisory Committee of experts will oversee the project, ensuring adherence to principles of openness and transparency and setting performance metrics.

The Food Future Data Hub is an innovation platform where we will share data with our community, build maps, apps and other tools to tell stories, gain insights on our food ecosystem, and transform waste into a resource.

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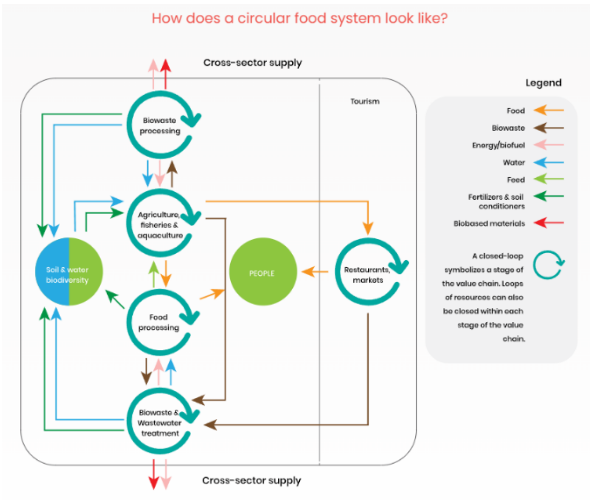
05 THEME: Agrifood system

Circular Economy HUB - Montenegro

Montenegro The Chamber of Economy | Source |

The Chamber of Economy of Montenegro is a key business association representing and supporting businesses in Montenegro. The Chamber of Economy of Montenegro has established the Circular Economy HUB to lead initiatives in circular economy practices. This HUB serves as a knowledge center for sharing experiences and accessing both domestic and international circular economy practices. It aims to promote efficient resource use, enhance economic sustainability, and support the transition from a linear to a circular economy.



Montenegro's transition is guided by the Sofia Declaration, which encourages Western Balkan countries to advance green economy policies. The Circular Economy HUB follows Montenegro's Roadmap for Circular Economy, focusing on key sectors for circular practices.

The HUB's mission is to build Montenegro's capacity for circular transition and promote systemic changes toward circular business models. Its goal is to integrate these models into priority areas through robust collaboration among institutions, businesses, and academia.

EVENT

01

Sixteenth meeting of the Conference of the Parties to the Convention on Biological Diversity (COP 16)

October 21 – November 1, 2024 | In-person | Cali, Colombia | Source |

The Conference will host the Sixteenth Conference of the Parties (COP 16) to the Convention on Biological Diversity, the Eleventh meeting of the Parties to the Cartagena Protocol on Biosafety, and the Fifth meeting of the Parties to the Nagoya Protocol on Access to Genetic Resources.

COP 16 will be the first biodiversity meeting since the Kunming-Montreal Global Biodiversity Framework was adopted at COP 15 in December 2022. The conference will review the implementation of this Framework, ensuring National Biodiversity Strategies and Action Plans align with it. Key tasks include developing a monitoring framework, advancing resource mobilization, and finalizing a mechanism for sharing benefits from digital sequence information on genetic resources. A high-level ministerial segment will also be included.

02

The 9th Asia Conference on Environment and Sustainable Development

November 9-11, 2024 | In-person | Osaka, Japan | Source |

ACESD 2024, sponsored by iNehc and IJESD, with technical support from leading Japanese institutions, will gather researchers, practitioners, and professionals to explore advancements in environmental and sustainable development. The conference will feature keynote speakers, case discussions, and opportunities for networking. Papers presented will be published in Springer's Environmental Science and Engineering series and indexed by major databases. Extended papers can be submitted to International Journal of Environmental Science and Development or Environment: Science and Policy for Sustainable Development. Key deadlines include paper submission by September 15, 2024, and registration by October 15, 2024. Attendees will benefit from engaging with experts, presenting their work, and exploring new research ideas.

03

The 4th International Conference on Electronic Information Technology and Smart Agriculture

December 6-8, 2024 | In-person | Singapore | Source |

The 4th ICEITSA conference will focus on electronic information technology and its applications in smart agriculture. This event aims to foster discussion and collaboration on innovations in agricultural sensors, AI, automation, and robotics. It provides a platform for researchers, industry experts, and government officials to share insights and advancements in precision agriculture and smart farms.

Key Topics:

- Electronic information technology
- Agricultural sensors and AI
- Remote sensing and big data
- Intelligent control and robotics
- Smart agriculture practices

04

International Soil and Water Forum 2024

December 9-11, 2024 | Hybrid | Bangkok, Thailand | Source |

The International Soil and Water Forum 2024, co-organized by the FAO and the Royal Thai Government, will be a pivotal event in advancing global efforts to combat soil degradation and water scarcity. It aims to create a high-level action plan for sustainable soil and water management, essential for food security and environmental health.

Objectives:

- Reinforce commitments to integrated land, soil, and water management.
- Promote technological, institutional, and social innovations.
- Address challenges and opportunities amid climate change.
- Identify research priorities and foster collaborations.
- Develop a joint action agenda.

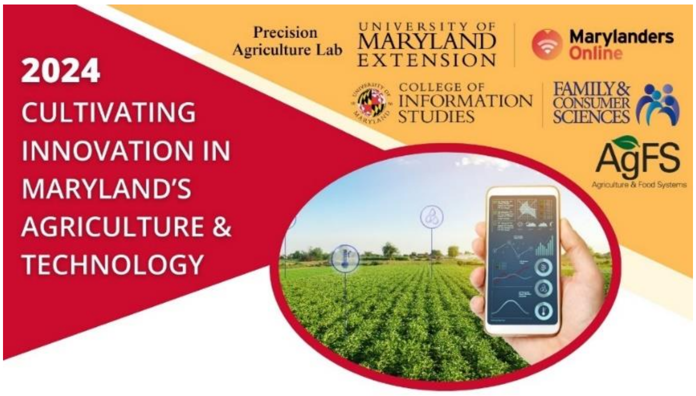
Main Themes:

- **Managing Water Scarcity:** Strategies for equitable water allocation and governance.
- Reversing Land Degradation: Approaches for land restoration and sustainable land management.
- Sustainable Soil Management: Techniques to prevent and manage soil degradation.
- Integrated Climate Resilient Management: Solutions for managing land, soil, and water in a changing climate.

05

The 2024 Cultivating Innovation in Maryland's Agriculture and Technology Conference

December 12, 2024 | In-person | Annapolis, USA | Source |



The University of Maryland Extension, in partnership with the Agriculture and Food Systems and Precision Agriculture Lab, presents the inaugural 2024 Cultivating Innovation in Maryland's Agriculture and Technology Conference. This one-day event will focus on leveraging cutting-edge technology to advance agricultural practices, enhancing yields, efficiency, and profitability.

Conference Highlights:

- Introduction to Technology: Understanding technology's role in modern agriculture.
- Uses and Applicability: Practical applications across farming sectors.
- Data Management & Analytics: Improving crop yields and efficiency through data.
- Resource Management: Utilizing drones, GIS, and other technologies.
- Current Implementations: Insights from early adopters.
- Future Outlook: Future innovations in agriculture technology.

06

The Oxford Real Farming Conference 2025

January 9-10, 2025 | Hybrid | Oxford, UK | Source |

The Oxford Real Farming Conference (ORFC) is a leading event for the real food and farming movement, bringing together farmers, growers, activists, policymakers, and researchers from around the world. Unlike the Oxford Farming Conference, ORFC focuses on alternative, progressive approaches to food systems. The conference covers topics such as agroecology, regenerative agriculture, organic farming, and indigenous practices.

Key Features:

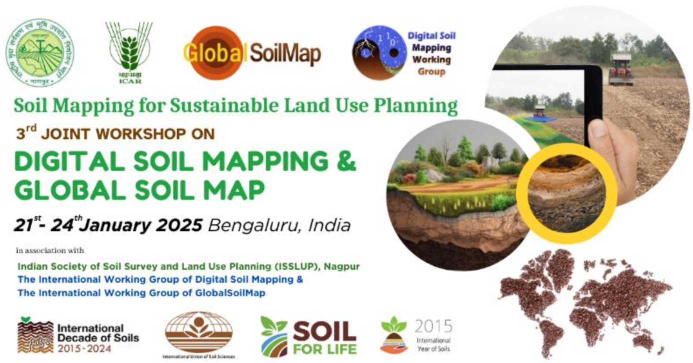
- Participant-Driven Program: Reflects a wide range of interests from soil microbiology to marketing, micro-dairies, mob grazing, and agroforestry.
- Diverse Sessions: Includes practical farming techniques and broader food system questions.
- Accessibility: Free online tickets for attendees from majority world countries.

07

The 3rd Joint Workshop of the IUSS Working Groups on Digital Soil Mapping (DSM) and GlobalSoilMap

January 21-24, 2025 | In-person | Bengaluru, India | Source |

This international conference, organized by the Digital Soil Mapping Working Group (DSMWG) and the GlobalSoilMap Working Group (GSM WG) of the International Union of Soil Science (IUSS), focuses on advancements in digital soil mapping and global soil data integration. The conference explores:



- Digital Soil Mapping (DSM): Innovations in mapping tools, data management, and integration techniques using geostatistics and machine learning.
- Digital Soil Assessment: Methods for applying DSM maps to land management.
- GlobalSoilMap Project: Updates on specifications, methodologies, and training for creating fine grids of soil properties.

Key Topics:

- Advances in DSM and soil mapping
- Data collection, processing, and integration
- Applied statistics and uncertainty estimation
- Soil organic carbon and degradation
- Soil functions, ecosystem services, and sustainable land use

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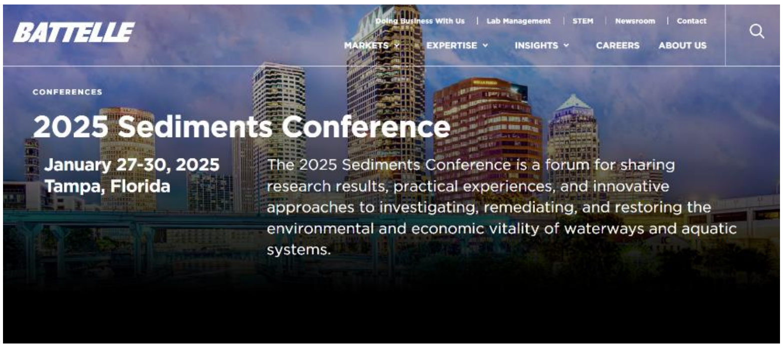
08

2025 Sediments Conference

January 27-30, 2025 | In-person | Tampa, USA | Source |

Hosted by Battelle, this premier international conference focuses on the investigation, remediation, and restoration of contaminated sediments in aquatic systems. The conference will cover state-of-the-science data collection, analysis, visualization, and innovative remedy design.



Key Topics:

- Emerging contaminants (e.g., PFAS)
- Beneficial use of contaminated sediments
- Climate change impacts on sediment management
- Advanced data analytics for decision-making
- Environmental justice in sediment projects

09

2025 10th International Conference on Chemical and Food Engineering

April 8-11, 2025 | In-person | Osaka, Japan | Source |

ICCFE 2025 will unite academics and industry experts in Chemical and Food Engineering to exchange innovative ideas and research. Chemical engineering integrates physical sciences, life sciences, applied mathematics, and economics to manage chemicals, materials, and energy. Food engineering combines microbiology, physical sciences, chemistry, and engineering to advance food production and processing.

Objectives:

- Foster research and development in Chemical and Food Engineering.
- Facilitate scientific information exchange among researchers, developers, engineers, students, and practitioners globally.
- Focus: The conference provides a platform for discussing advancements and experiences in Chemical and Food Engineering and related disciplines.

10

The 18th International Symposium on Soil and Plant Analysis (ISSPA)

June 9-13, 2025 | In-person | Durham, USA | Source |

Hosted by the North Carolina Department of Agriculture and Consumer Services and North Carolina State University, ISSPA 2025 marks the symposium's return to North America after a decade. Co-organized with the Australasian Soil and Plant Analysis Council, Agri-Laboratory Association of Southern Africa, and the UN FAO's Global Soil Partnership, the theme is "Advancing Agricultural Science for Global Sustainability."

Key Topics:

- Soil health and plant nutrition
- Carbon cycling and sequestration
- Water quality and resources
- Laboratory analysis methods and technologies
- Harmonized fertilizer recommendations
- Highlights:
- Pre-symposium workshop on laboratory instrumentation (June 9)
- Opening reception at Durham Hotel’s rooftop restaurant
- Full-day tour of NCDA&CS labs and research sites
- Closing banquet at Fair Barn, Pinehurst
- Optional post-symposium tour of coastal North Carolina.