Creating Multidisciplinary-Stakeholder Alliances To Innovate Circular Bioeconomy Systems

Circular Bioeconomy Systems Institute
Advancing Multidisciplinary Innovations for a Sustainable Bioeconomy

Presented at the
Circular Bioeconomy Systems Workshops
March – June, 2024

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Our inspiration

“I believe that the great Creator has put ores and oil on this Earth to give us a breathing spell… as we exhaust them, we must be prepared to fall back on our farms (biological materials produced on land, in water, or elsewhere) which are God’s true storehouse. We can learn to synthesize materials for every human need from things that grow.”

- George Washington Carver, Circa 1930
Agri-Food Systems

- Increase productivity, food security, and resiliency…
- Develop economic opportunities …
- Decarbonize economic activities, reduce GHG emissions…
- Regenerate natural systems, soil health, water resources…
- Eliminate or greatly reduce wastes and losses…
- Eliminate/significantly reduce environmental degradation…
- Replace fossil carbon sources with biomass carbon sources…

Challenges

- Driven by research & innovations in life sciences, engineering, biotechnology, computational & information sciences (NASEM, 2020)
  - Quadrupled supply of food and fiber since 1930
  - 22% of the US economy
  - Over 28% of the US workforce
  - Reduced world famine and poverty to the lowest recorded levels

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Partial List of activities and partnering disciplines and stakeholders

**ACTIVITIES, 2019-2024**

2019 NASEM Board on Ag & Natural Resources

2020 ASABE Roundtable

2021 National Academy of Engineering (~1,000 attended)
2021 Multidisciplinary-Stakeholder Focus Group

2021-23 Circular Bioeconomy Systems Task Force

2021-23 Numerous webinars and presentations
2022 ASABE AIM Workshop (100 participants)
2023 ASABE - CBS Day Keynote & Concurrent Sessions

2023 – Circular Bioeconomy Systems Institute (CBSI)

2024 – CBSI Workshops, CBS Day and more

**PROFESSIONAL SOCIETIES, AGENCIES AND FOUNDATIONS**

- Society of Food Engineers
- American Society of Dairy Science
- Institute of Biological Engineering
- American Society of Civil Engineers
- Soil and Water Conservation Society
- American Institute of Chemical Engineers
- American Society of Horticultural Sciences
- European Society of Agricultural Engineers
- American Society of Ecological Engineering
- Agricultural and Applied Economics Association
- Tri-Societies (Crop Science, Soil Science and Agronomy)
- American Society of Agricultural and Biological Engineers
- USDA-USAID
- NSF - National Science Foundation
- NAE - National Academy of Engineering Webinar
- NIST - National Institute of Standards and Technology
- BANR - Board of Agriculture and Natural Resources of the NASEM
- Schmidt Futures
- ASABE Foundation
- World Wildlife Fund
- Solutions from the Land
- Field to Market Webinar
- Foundation for Food & Agriculture Research

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GOALS

- Promote Innovations
- Develop Multidisciplinary Culture
- Communicate CBSI information
- Grow ASABE-CBSI membership

CBSI Leadership Team
Chair, Chair-Elect, Vice-Chair, and Past Chair

Executive Committee (ExCom)
Officers of all Standing Working Teams and Committees

Multidisciplinary Standing Working Teams
Chair, Chair-Elect, Vice-Chair, and Past Chair

Innovate Systems
Develop Metrics and Standards
Organize Meeting
Publicize and Promote

Appoint and dissolve committees as needed

CBSI Membership
ASABE Members
Affiliate Members
Circular Bioeconomy Systems

**Vision:** A healthy planet driven by vibrant, sustainable circular bioeconomy systems producing plentiful food, feed, forest products, and renewable resources

**Principles of Circularity**

- Increase use efficiency
- Design out waste and pollution
- Keep products and materials in use
- Regenerate natural systems
- Provide economic benefits

*A circular bioeconomy* is one in which the values of bioproducts, materials and resources are maintained in the economy for as long as possible by cascading use of biomass from biological resources and producing minimal wastes using a systems approach for economic development.

**Moving from a Fossil-based Industrial Age toward a Bioeconomy-based Sustainable age.**

For Presentation at the Circular Bioeconomy Systems Workshops

March - June 2024
From Linear to Circular

Animation provided by Prof. Sauleh Siddiqui, American University; PI of NSF project RECIPES

Multiscale RECIPES for Sustainable Food Systems
NSF Grant 2115405

Animation by Liz Sisk Illustration

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Creating Multidisciplinary-Stakeholder Alliances To Innovate Circular Bioeconomy Systems
Nature’s ecosystems and human’s food-agriculture and socio-economic systems are interwoven and layered together to create complex systems of systems in which resources interact spatially and temporally and continuously cycle.

We need multidisciplinary systems approaches, and create an alliance of professional societies!
TRANSITION
from
Linear to Circular
will require a
transition
of mindsets and habits
inculcated from
education
and
lived experiences;
these are the
fountains of
innovations

LINEAR
A System
Connected
Complicated

CIRCULAR
Systems of Systems
Interwoven
Complex

Disciplinary
Control
Singular

Transdisciplinary
Collaborative/Adaptive
Integrated

Ecology OR Commerce
Take
Waste

Ecology AND Commerce
Reciprocate
Byproducts

Tyranny of the OR
End

Creativity of AND
Endless

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To address the following challenges

- Decarbonize economic activities, reduce GHG...
- Regenerate natural systems, soil health, and water resources...
- Produce near zero waste...
- Eliminate/significantly reduce environmental degradation...
- Replace fossil carbon sources with biomass...
- Increase food security and reliance...
- Increase productivity and economic benefits

“as much as 60 percent of the physical inputs to the global economy could, in principle, be produced biologically.”
## Workshop Dates and Locations**

<table>
<thead>
<tr>
<th>Constituent System Boundaries</th>
<th>Dates</th>
<th>Place</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Res. &amp; the Environ. Systems</td>
<td>27-29 March</td>
<td>Chicago</td>
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<tr>
<td>Farm Production Systems</td>
<td>1-2 April</td>
<td>Chicago</td>
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<tr>
<td>Socio-Economic System across Value-chains</td>
<td>4-6 April</td>
<td>Chicago</td>
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<tr>
<td>Controlled Environmental Agri Systems</td>
<td>17-19 April</td>
<td>Biosphere II, AZ</td>
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<tr>
<td>Food Processing Systems</td>
<td>23-24 April</td>
<td>Chicago</td>
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<tr>
<td>Animal &amp; Dairy Systems</td>
<td>23-24 April</td>
<td>Chicago</td>
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<tr>
<td>Urban Agricultural Systems</td>
<td>8-10 May</td>
<td>Sarasota, FL</td>
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<tr>
<td>Young Professionals, Edu, and Training</td>
<td>14 &amp; 16 May</td>
<td>Via Zoom</td>
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<tr>
<td>Capstone Workshop</td>
<td>17-18 June</td>
<td>Minneapolis</td>
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- **Report outcomes at professional Meetings**                         | Summer/Fall      | TBD            |
- **Planning a CBS Summit**                                            | Fall             | TBD            |
- **CBS Summit for Building an Alliance**                              | Spring-Fall 2025 | TBD            |

** Dr. P.V. Vara Prasad, Distinguished Professor and Director of the Feed the Future Innovation Lab on Sustainable Intensification Innovation Lab (SIIL) at Kansas State University has provided $500,000 to fund the workshops.
Workshop Objectives and Outcomes

- **Objectives**: To envision and develop an action plan for applying principles of circularity to transition constituent systems for advancing sustainable circular bioeconomy systems.

- **Impacts**: Assess the degree to which circularity would be achieved in the envisioned constituent systems. That is, provide an estimate of achieved increased resource use efficiencies, reduced waste and pollution, increased regeneration of natural systems, and increased socio-economic benefits, tradeoffs, and well-being.

- **Barriers**: Assess ecological, technical, economical and social barriers to be overcome for achieving the objectives.

- **Outcomes**: Recommend actions needed to achieve the envisioned circularity. Analyze need for new knowledge and innovations to identify multidisciplinary stakeholders.
Workshop Outcomes – A List of Actions

A. Identify major societal challenge(s) toward achieving circularity
B. Identify knowledge, techniques and skills needed for system-level innovations
C. Identify connections to:
   i. Young Professionals & Education
   ii. Metrics, Methods and Standards
   iii. Developing countries/regions
D. Provide recommendations for building a professional society alliance
E. Provide rationale for a CBS Summit organized by multiple professional societies.
F. Outline content for publications and messaging documents
CBS Day 2024 Afternoon Session
Anaheim, CA (July 28, 2024)

GOALS and OUTCOMES of the CBS WORKSHOPS (10 min. each)

1. **Farm Production Systems** – P.V. Vara Prasad, Ignacio A. Ciampitti, Bruno Basso, Charlie Messina
2. **Animal and Dairy Systems** – Lara Moody
3. **Natural Resources and Environmental Systems** – Ximing Cai, Adel Shirmohammadi and Gretchen Sassenrath
4. **Controlled Environmental Agricultural Systems** – K.C. Ting and Adel Shirmohammadi
6. **Urban Agricultural Systems** – Charlie Messina, Stephanie …
7. **Socio-Economic Systems** – Gal Hochman, Madhu Khanna, and David Zilberman
8. **Young Professionals** – David Jones and Sharvari Raut
Our inspiration

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Thank you!

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