

## Environment and Sustainable Production Processes

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The VII International Symposium on Science, Health and Territory, held at the University of Planalto Catarinense (Lages/SC), reinforced the importance of aligning economic development and environmental preservation. Axis III – Environment and Sustainable Production Processes highlighted circular economy, clean technologies and sustainable management of natural resources as central themes, pointing to the need to rethink production chains to minimize impacts and meet global environmental demands.

The circular economy, also known as the “cradle-to-cradle” approach, proposes replacing the linear “extract, produce, consume and discard” model with a closed cycle that extends the useful life of products and reintegrates waste into the production chain. This logic reduces dependence on new resources and prevents unnecessary environmental degradation (BRASIL, 2025). Extending the use of materials contributes to ‘reducing habitat disturbance and curbing biodiversity loss’ (Cifuentes-Faura, 2021). This perspective was addressed in the symposium presentations, highlighting how crisis situations and environmental challenges can stimulate innovative solutions for food reuse and energy generation (Geissdoerfer *et al.*, 2017).

Clean technologies are essential for minimizing pollution and conserving ecosystems, promoting energy efficiency and sustainability (Arena, 2012). Waste-to-energy initiatives in the food industry demonstrate how waste can be converted into renewable energy, reducing environmental liabilities and strengthening the energy transition (Soni *et al.*, 2025).

Innovation in production processes was represented by examples such as precision agriculture and integrated water resource management. These practices reduce fertilizer use, conserve water and increase agricultural efficiency (Gebbers; Adamchuk, 2010). Data from Embrapa show that producers who applied fertilizers at variable rates significantly reduced their consumption of inputs, contributing to less pollution of water sources (Embrapa, 2020). Agroforestry systems and smart irrigation complement this approach, increasing the resilience of production chains in the face of climate change.

Environmental governance and public policies were identified as essential elements for internalizing environmental costs and encouraging sustainable practices. The Organization for Economic Co-operation and Development (OECD, 2021) highlights that effective economic instruments and regulations are necessary to stimulate clean production and ecosystem conservation. Integration between government, the private

sector and civil society was reiterated as a condition for balancing economic growth and environmental preservation. (Ostrom, 2009).

The symposium discussions showed that productive sustainability requires a systemic vision and interdisciplinary cooperation. The cradle-to-cradle concept argues that there should be no waste, but rather nutrients for other production processes. (Braungart; McDonough, 2009). The speakers presented laboratory analyses and public policy studies that reinforce the need for multiple perspectives to address climate change, biodiversity loss, and pollution.

The contributions presented at the event and compiled in this editorial reinforce that the integration of technological innovation, robust policies, and socio-environmental awareness will enable economic progress and the health of the planet to be reconciled. The path to regenerative production systems involves the practical application of concepts such as the circular economy, clean technologies, environmental governance, and the efficient use of natural resources, topics that were highlighted at the symposium as urgent for a sustainable future.

### Declaration regarding the use of artificial intelligence

The authors confirm that did not use artificial intelligence tools to prepare texts nor to create images or any other element of this manuscript.

### CRediT author statement

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