IBF Working Group on Microbiomes

Policy Brief – October 2026

Context

The transition to a circular bioeconomy is a strategic response to climate change, biodiversity loss, and the need for resilient food and health systems. While the bioeconomy has traditionally focused on macroscopic biomass, a new frontier to innovation lies in the microbial world. Microbiomes, the complex communities of microorganisms inhabiting soils, oceans, plants, animals, and humans, are the fundamental processors of nutrients, energy, and carbon. They are the "invisible engine" of primary production, climate stability, and industrial circularity.

To unlock this potential, the International Bioeconomy Forum (IBF) Working Group on Microbiomes proposes to adopt a multi-sectoral approach centered on the **Holobiont** (the host-microbiome unit) and **One Health** (the interconnection between environmental and human health). Microbial solutions offer a path toward chemical-free agriculture, resilient forestry, and the conversion of industrial side-streams into high-value bio-products. However, because microorganisms and their digital signatures are transboundary, no single nation can master this bioeconomy in isolation. The microbiome raises unique opportunities but also complexities for global governance, pushing the boundaries of how we share data and benefits in an AI-driven digital economy.

Purpose

This policy paper provides a strategic basis for strengthening the contribution of microbiomes to a competitive, sustainable, and circular bioeconomy at the international level. It supports major global processes including the G20 Bioeconomy Initiative, the Global Bioeconomy Summit, or the implementation of the CBD's and BBNJ Multilateral Mechanisms. This policy paper aims to inform high-level discussions by identifying priority areas for research, innovation, and collaborative frameworks that can unlock the full potential of microbial resources. It translates high-level principles into actionable directions for the IBF WG on Microbiomes, highlighting key innovation bottlenecks (Digital Sequence Information (DSI) governance, capacity building and technology transfer, biomanufacturing scale-up…) that must be addressed to ensure microbiome-based development remains efficient, science-based, and equitable.

In this context, the following areas need to be addressed and are proposed to be the priorities for the IBF WG Microbiome:

- **Advance the "Holobiont" approach in primary production**, moving from single-strain research to managing complex microbial functional synergies in agriculture and forestry, with possible workstreams such as joint R&I calls on microbial solutions for soil carbon and crop health, microbial biorefineries, joint regulatory sandboxes to harmonize safety requirements for live microbial products.
- **Enhance innovation in circularity and biorefineries**, accelerating the use of microbial blueprints to transform lignin, plastics, and agricultural waste into bio-based chemicals and materials.
- **Safeguard planetary health and climate resilience**, reinforcing the role of terrestrial and marine microbiomes in carbon sequestration and ecosystem restoration.
- **Promote policy coherence in DSI governance**, bridging the gap between open science and equitable benefit-sharing through "compliance-by-design" technical solutions, with possible workstreams on DSI interoperability, metadata Standards, AI applications and valorization of complex datasets.

- **Strengthen global infrastructure and monitoring systems**, including standardized metadata (MIxS), AI-enabled functional forecasting, and shared bio-foundries, with possible workstreams on shared infrastructure for rapid prototyping and scaling of microbial solutions, capacity exchange and technology transfer to ensure equitable participation of the Global South in the digital bioeconomy.

Expected outcomes:

- **A synthesis** of the microbiome's contribution to international circular bioeconomy debates, informing international discussions at the G20, GIB, and FAO.
- **Clear research recommendations** to enhance innovation, efficiency, and sustainability across the environmental, agricultural, and industrial microbial sectors.
- **Technical blueprints for governance** that provide legal certainty for innovators while supporting the stewards of global biological heritage.

Delivered to date:

- **Peer-reviewed publication (June 2026)**: The paper ("*The digital bioeconomy: microbiomes as a stress test for global digital sequence information governance*") examines how the multi-layered complexity of microbiomes where host, microbial, and environmental data intersect as an integrated unit, exposes major regulatory friction points and "double taxation" risks in international Digital Sequence Information (DSI) governance frameworks (such as the CBD's Multilateral Mechanism and the Nagoya Protocol).
- **Global Bioeconomy Summit workshop (October 2026)**: This workshop focuses on establishing trusted digital infrastructure and unified regulatory pathways to eliminate compliance gaps, such as untracked Digital Sequence Information (DSI) usage, and streamline global bioeconomy value chains from raw biological data to market-ready biobased innovations.

Target audience

Policy makers, R&I funding agencies, industrial biotechnology leaders, and international partners engaged in sustainable resource management and One Health transitions.

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