



CONSUMER PERCEPTIONS OF DIFFERENT FEEDSTOCKS IN BIO- BASED PRODUCTS: A COMPARATIVE ANALYSIS

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CONTENT

1. INTRODUCTION

2. METHODOLOGY

3. RESULTS

4. PRACTICAL IMPLICATIONS

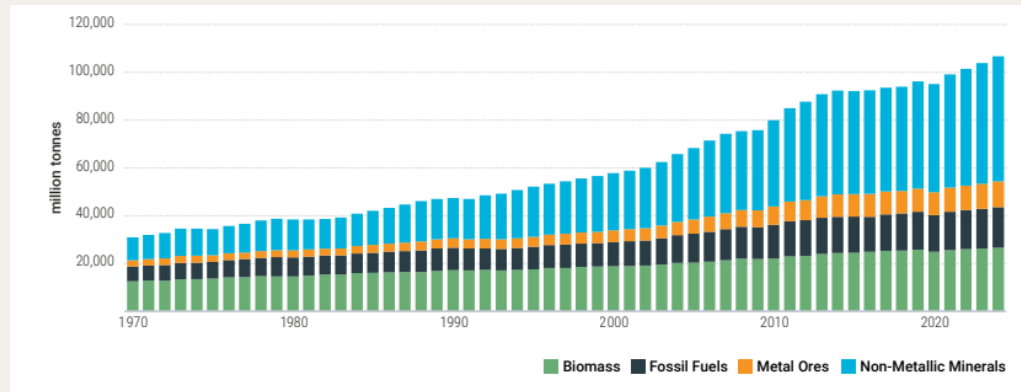
5. CONCLUSION

INTRODUCTION

Why Sustainable Transformation Is Urgent

- **Climate change ranks among the most pressing global challenges of our time.**
- **The need for sustainability has long been acknowledged** – already formalized in 1987 by the UN as “*meeting the needs of the present without compromising future generations.*”
- **The scientific consensus is unequivocal: climate change is human-induced, largely driven by growing resource consumption.**
- **Over 55% of global greenhouse gas emissions originate from resource extraction and processing.**
- **Human activity now exceeds the regenerative capacity of ecosystems, placing the planet in a state of unsustainability**

Global material extraction, four main material categories, 1970 – 2024, million tonnes.

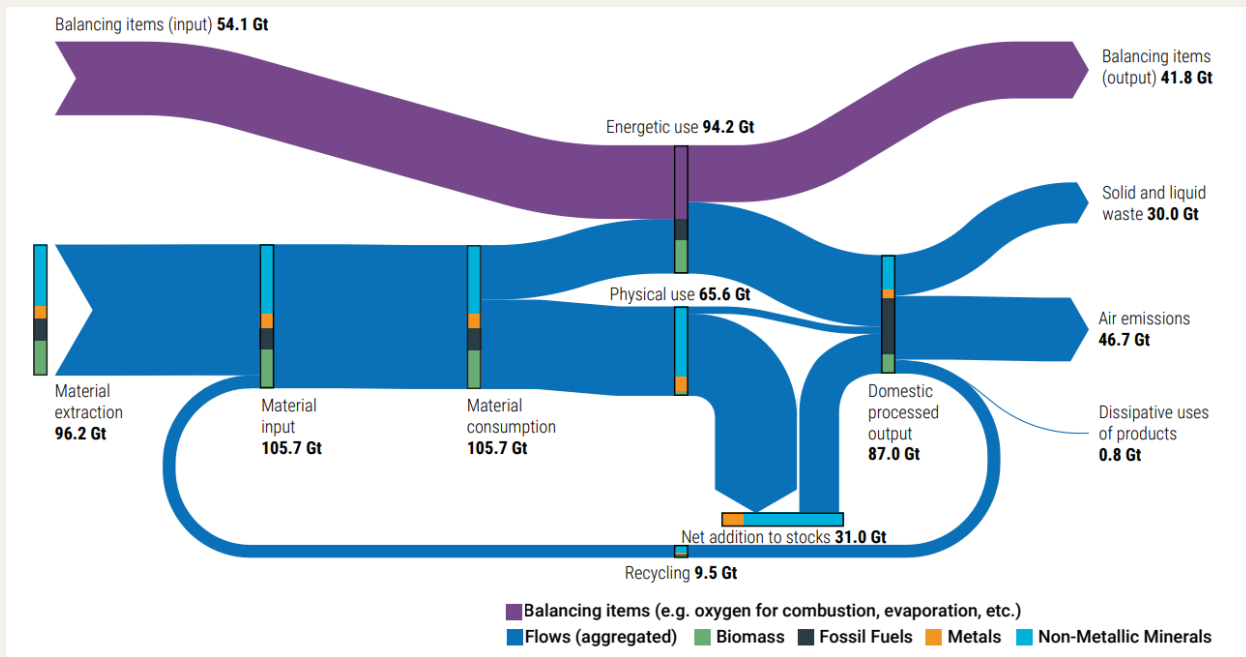


INTRODUCTION

Resource Consumption as a Core Driver of Climate Change

- Our economic system is based **on linear material use**, from extraction to short-term consumption to disposal.
- **Most materials exit the system as emissions, waste or dormant stock**, rather than being looped back into productive use.
- **Only a small fraction is retained or recycled**, while the majority contributes directly to **climate and environmental pressure**.

Global material flows, waste and emissions, 2019, billion tonnes.



FROM LINEAR TO REGENERATIVE SYSTEMS

Where Bio-Based Products Can Make a Difference

- To reduce emissions and resource pressure, **materials must become renewable, circular and low-impact.**
- **Bio-based products offer an alternative** — derived from regenerative biological feedstocks rather than finite fossil or mineral resources.
- Unlike conventional materials, they can integrate into natural cycles, allowing carbon storage, biodegradability or recycling.
- But their potential depends on one key factor — consumer acceptance.



METHODOLOGY

Free Association Task (N=2287)

Name the first four words, thoughts, or associations that come to mind
when you think of ...

Methodological Design:

- Participants were presented the terms **Algae**, **Collagen**, **Mushrooms**, and **Bio-based** and asked to share their first spontaneous associations for each concept
- These so-called free association enables the exploration of spontaneous mental connections and emotional evaluation underlying public perceptions of bio-based feedstocks and products
- For every association, participants indicated whether their emotional response was positive or negative, revealing underlying attitudes

METHODOLOGY

Inductive Coding (N=2287)

Procedure:

- Patterns and categories were derived directly from the raw data through an inductive approach
- Initial top codes were identified by analyzing the most frequently mentioned associations
- Existing top codes were refined and adjusted as they were applied to the remaining data
- Additional subcategories, or subcodes, were developed for each top code to capture more detailed information
- The final set of top codes included: **Environment**, **Innovation & Technology**, **Nutrition**, **Senses** and **Sustainability**

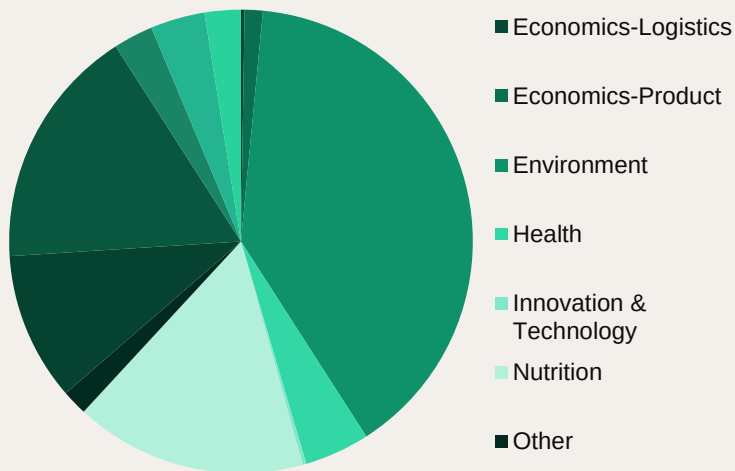
Top Code	Sub Code	Definition
Economics	Product	All associations related to a purchasable product, features of a product or product groups.
	Marketing	All associations related to the advertisement and commercialization of products.
	Logistics	All associations related to transport or logistical processes.
	Production	All associations related to production processes.
Health		All associations related to health-related effects.
Environment		All associations related to nature, specific locations or living beings.
Innovation & Technology		All associations related to technological or other novelties and innovations.
Nutrition		All associations related to food and beverages
Senses	Haptics	All associations related to the sense of touch.
	Optics	All associations related to visuals.
	Smell	All associations related to scents.
	Taste	All associations related to tastes.
Sustainability		All associations related to environmental impacts.

Results

RESULTS

Environmental and Sensory Dimensions Shape Public Perception of Algae

Free Association Task - Algae



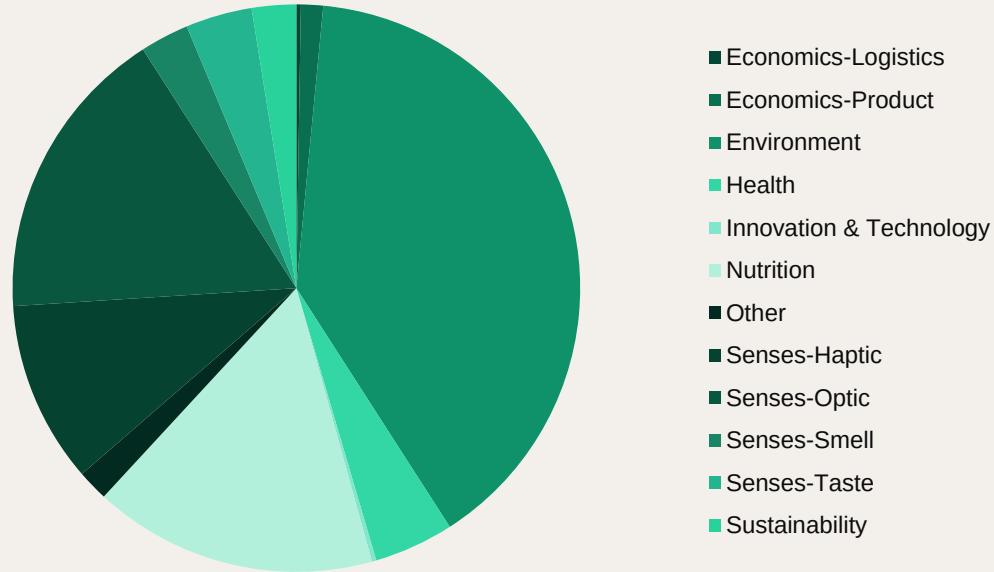
Key Findings:

- The most frequently occurring top codes were **Environment** (39%), **Senses** (34%) and **Nutrition** (16%)
- Associations were predominantly positive
- Environmental associations were primarily related to water
- Public connections to food and nature were generally favorable
- The Senses category includes both haptic and optic elements
- Positive optic associations were largely influenced by color perception
- Negative haptic associations were primarily driven by the unpleasant texture of algae

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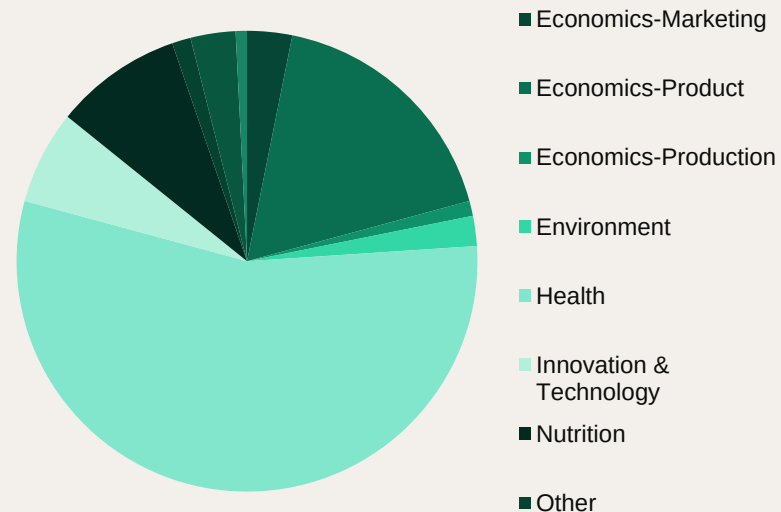
RESULTS

Perception of Collagen Shaped by Health, Beauty and Skepticism

Key findings:

- Most frequent top codes were **Health** (55%) and **Economics** (22%)
- Collagen was primarily associated with health, due to its use in beauty and anti-aging products
- Attitude towards collagen were generally positive, though some considered it as expensive and questioned its effectiveness
- Advertising was often perceived as exploiting contemporary beauty ideals
- Skepticism was expressed regarding the scientific research of collagen
- Collagen was strongly associated with the term supplement, reflecting its prominent role in the protein market

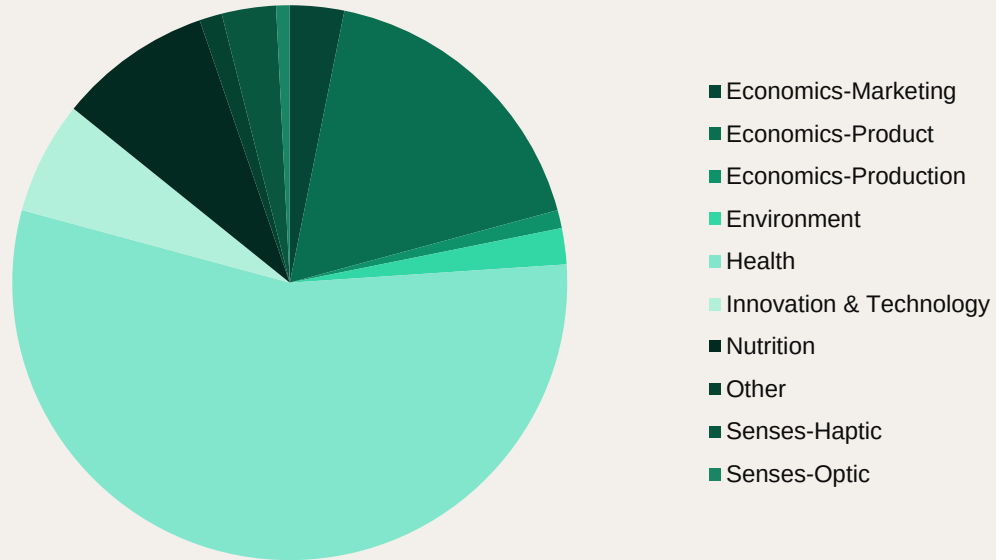
Free Association Task - Collagen



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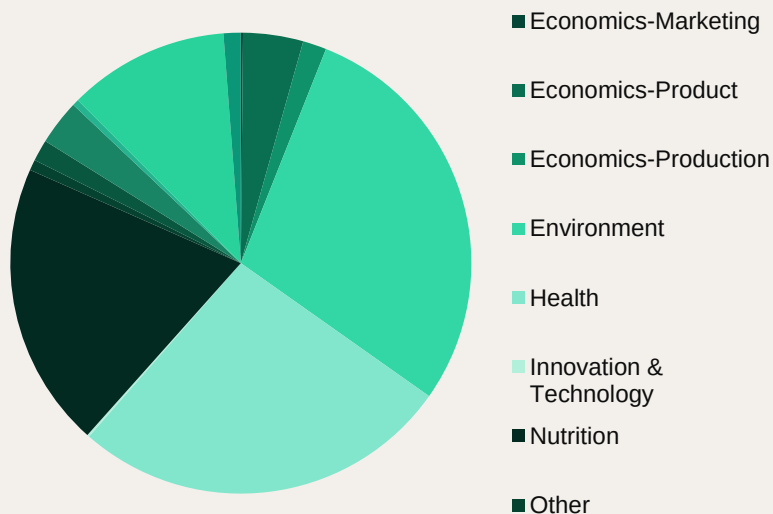
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Mushrooms seen as Natural and Versatile

Free Association Task - Mushroom



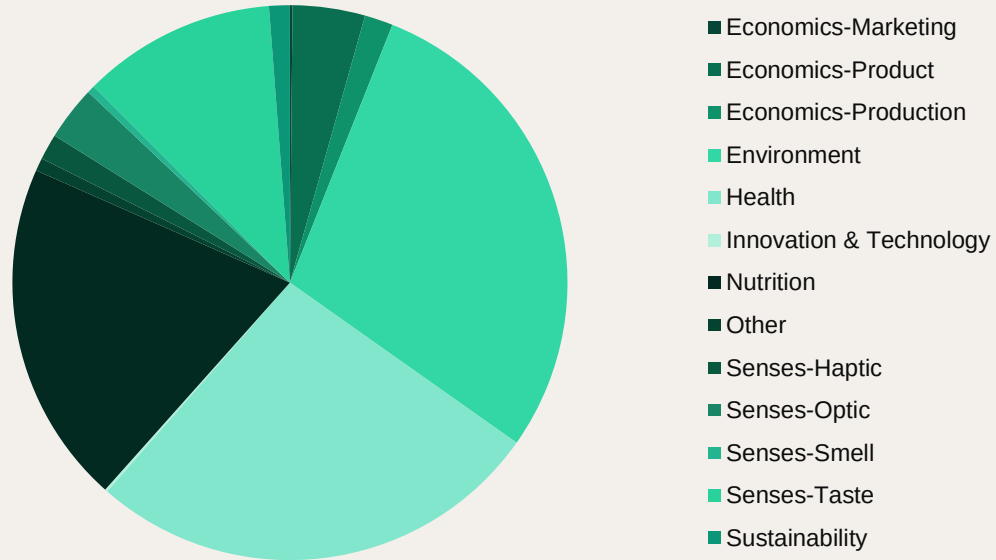
Key findings:

- The most frequently occurring top codes were **Environment** (29%), **Health** (27%) and **Nutrition** (20%)
- Mushrooms seen as a versatile product with multiple potential applications
- Viewed both as a psychedelic substance and a medical product, leading to mixed emotional responses
- Negative perceptions were linked to unhygienic or slimy texture
- Natural origin was viewed positively
- Associated with food and also as a meat substitute
- They were perceived as biodegradable, reinforcing their environmental relevance

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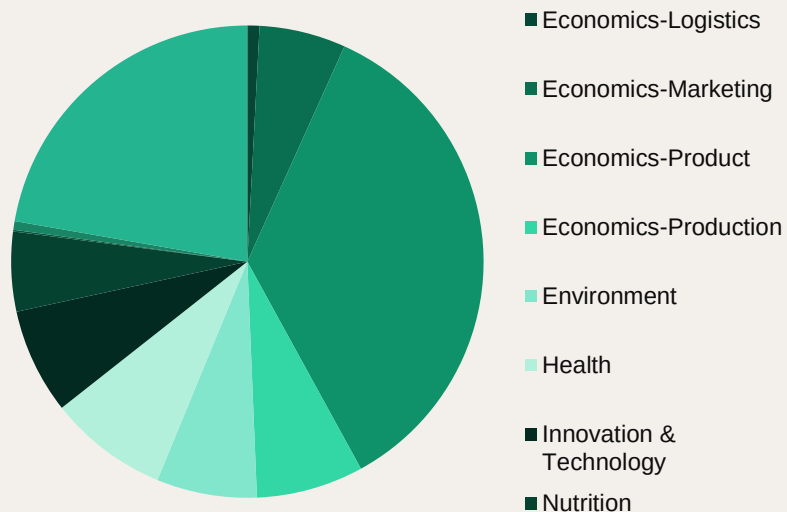
RESULTS

Technological Promise and Economic Ambiguity Shape Views on Bio-Based Products

Key Findings:

- Most frequent top codes were **Economics** (49%), **Health** (8%) and **Innovation and Technology** (7%)
- Bio-based products were strongly associated with high-quality bio-products
- Ambiguity persisted regarding their price and effectiveness
- They were generally perceived as environmentally friendly and chemical-free
- Sustainability aspects such as waste reduction and biodegradability were frequently mentioned
- Bio-based products were regarded as a technology of the future
- They were also viewed as research topic of interest

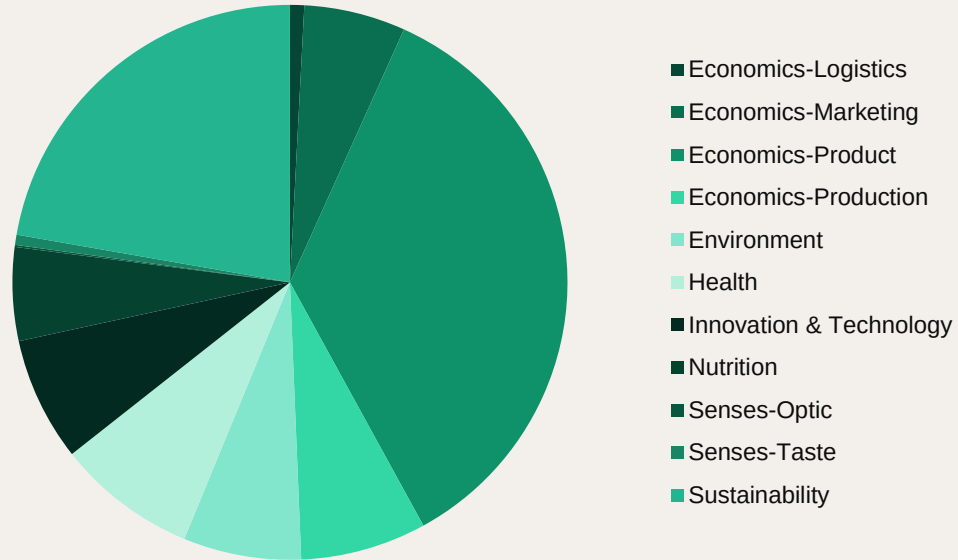
Free Association Task - Biobased



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PRACTICAL IMPLICATIONS

Translating Findings into Actionable Strategies

- **Bio-based products are strongly connected to sustainability and environmental impacts:** Consumers subconsciously associate the term “bio-based” with sustainability and assume positive environmental effects. Displaying the “bio-based” label prominently can reaffirm this perception.
- **Integrate Health Messaging Strategically:** Especially for collagen- and mushroom-based products, explicitly communicate health and wellness benefits to appeal to health-conscious consumers. Labeling products as “bio-based” can position them as healthier alternatives.
- **Address Price Sensitivity Proactively:** Provide transparent communication on value, use trial offers or discounts to lower the perceived risk of purchase.
- **Targeted marketing and education campaigns are needed** to reduce uncertainty and misconceptions about the meaning of “bio-based.” Clear communication about how products are made, why they are beneficial, and transparency about sourcing can improve trust.
- **Feedstock-specific strategies are important:** Algae-based products should highlight environmental benefits, collagen-based products should focus on health advantages, and mushroom-based products can combine sustainability and health messaging.

CONCLUSION

Bridging the Gap Between Bio-Based Innovation and Consumer Expectations

This project enhances the **understanding of consumer associations** with various bio-based feedstocks (algae, collagen, mushrooms). The results show that **sustainability, health, and natural ingredients are key associations**, while uncertainties about actual benefits and definitions remain. The study also highlights that the perception of bio-based products is influenced not only by environmental factors but also by **economic and sensory aspects**. Furthermore, the research **differentiates between consumer perceptions** of different bio-based feedstocks.

Sustainability as a Selling Point: Bio-based products are automatically linked with sustainability, which companies should leverage in their marketing strategies.

Health as a Marketing Strategy: Consumers perceive bio-based products as healthier and more natural, which is particularly relevant for the food and wellness sectors.

Improving Price Perception: Bio-based products are seen as expensive. Companies should not only keep prices competitive but also communicate the added value of these products.

Education and Transparency: There is confusion surrounding the term "bio-based." Clear and targeted educational campaigns are needed to clarify its meaning and benefits.

Thank your for your attention!

Please reach out for feedback and questions to:

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