



**BIOTEXFUTURE**

# **CONSUMER PERCEPTIONS OF BIOBASED PRODUCTS**

ANALYSIS OF EMPIRICAL EVIDENCE

REPORT NO. 1 – FEBRUARY 2021

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The **goal** of this study is to summarize findings of empirical research on consumer perceptions of biobased products

# **ABOUT THIS RESEARCH**

# ABOUT THIS RESEARCH

THIS STUDY SUMMARIZES FINDINGS FROM EMPIRICAL RESEARCH

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## Research context

- This research is part of the 'adidas workstream' within TransitionLab, a project within BIOTEXFUTURE.
- BIOTEXFUTURE is a 5-year, cross-industry R&D program, funded by the Federal Ministry of Education and Research (BMBF), focusing on transforming the textile industry from petrol- to biobased (>20 partners).
- BIOTEXFUTURE is jointly led by RWTH Aachen University and adidas.

## Goal

The goal of this research is to **summarize findings of empirical research on consumer perceptions of biobased products.**

## What does 'biobased' mean?

Biobased materials are 'wholly or partly derived from biomass, such as plants, trees or animals (the biomass can have undergone physical, chemical or biological treatment)\*'. Materials derived from fossil sources are excluded.\*\* Biobased materials are not necessarily biodegradable.

Sources: \*[European Commission](#).

\*\*Biofabricate & Fashion for Good 2020 (Understanding "bio" material innovations: a primer for the fashion industry)

## Methodology

- **Method:** Literature review
- **Sample:** 16 scientific studies published 2015 – 2020:
  - 11 journal articles
  - 3 working/white papers
  - 1 dissertation
  - 1 conference proc. article
- **Search terms:** 'Biobased' AND 'Consumer' (incl. synonyms)
- **Search focus:** Empirical studies that meet scientific quality standards
- **Procedure:** Each article was briefly scanned for its key take-aways, mainly in the sections: abstract, discussion, and managerial implications. In order to create this report's executive summary, a qualitative content analysis of all key takeaways was conducted (explorative development of categories).

## Limitations & future research opportunities

- Although this study provides preliminary insights into consumer acceptance of biobased products, further research is needed to adequately support the shift toward a sustainable future from a consumer perspective.
- This study applies a pragmatic research approach regarding the complexity of the term "biobased". Future research should further contribute to the conceptual clarity of "biobased". The differences in perspective between technological experts and non-experts (e.g. consumers) should be taken into account.
- This study does not focus on investigating the influence of country-specific differences on the perception of biobased products. However, it can be noted that most of the included studies conducted data collection in Europe. Future studies should also analyze possible cultural differences more closely.

# ABOUT THIS RESEARCH

THIS STUDY FOCUSES ON BIOPLASTICS – EXCLUDING NATURAL MATERIALS

## MAIN FOCUS

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### Biobased products made from synthetic polymers

Examples: Bio PET, Bio PTT, Bio PA, PHA, algae-based polymers etc.

## OUT OF SCOPE

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### Biobased products made from natural materials

Examples: Cotton, cashmere, silk, wool, wood etc.

## SCOPE AND INTERPRETATION

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This literature review used the terms 'biobased' and 'consumer' (incl. synonyms) to arrive at the studies analyzing consumer perceptions of biobased products.

However, due to the current semantics of the term 'biobased', the search results mostly yielded publications addressing **biobased synthetic polymer materials**, also known as 'bioplastics'.

With a small exception of studies that included a few non-plastic biobased materials (e.g. bamboo, silk, mycelium), the findings of this research provide insights to the consumer perception of **bioplastics**. Therefore, the findings should not be extrapolated to biobased materials overall as these also include natural materials such as cotton, cashmere, wool, wood, etc.

# **EXECUTIVE SUMMARY**

- 1** Most consumers don't know what 'biobased' means. Many consumers even have a false understanding of biobased products.
- 2** Consumers are generally open for biobased products.
- 3** Reactions to biobased products range from positive to negative emotions (e.g. surprise vs. disgust).
- 4** Biobased products won't be accepted without considering 'end-of-life'.
- 5** Consumers prefer biobased products containing a high percentage of biobased material.

### Please note:

The research presented here analyzes current consumer perceptions and preferences, but these are also subject to constant change based on external influences of various kinds. This must be considered when interpreting the results.

## CONSUMER PERCEPTIONS

### Familiarity with biobased products

- **Most consumers are unfamiliar with ‘biobased’ as a concept.** In Germany, for example, less than 10% are sure they know exactly what bioplastics are.
- Many consumers have a **false understanding of bioplastics** (e.g. "All bioplastics are compostable" and "The raw materials for bioplastics must come from organic farming").

### Attitudes towards biobased products

- Consumers have a **basic interest** for biobased products.
- For biobased products, consumers have **positive associations linked to the environment**.
- However, consumers have **questions**, they feel **uncertain**, and they have **mixed feelings**.
- Confronting consumers with biobased product examples can trigger **both positive (e.g. surprise) and negative (e.g. disgust) emotions**.

## CONSUMER PREFERENCES

### End-of-life

- Consumers are most **discouraged from supporting bioplastics when they learn that bioplastics do not biodegrade**.
- Consumers request information about recyclability and biodegradability.

### Land use (biobased vs. food)

- **Ethical concerns** about the **use of agricultural land** to produce raw materials for biobased products are raised primarily by **German** (vs. French & US) **consumers**.

### Proportion of biobased material

- **Consumers prefer** biobased products containing a **high percentage of biobased plastic**.
- In an experiment, only brands with attributes that were 100% biobased consistently resulted in enhanced purchase intentions.
- **Introducing partially biobased attributes (e.g. 30%) does not always result in a better evaluation of the brand** compared to brands that do not contain any biobased attributes.

### ‘Biobased’ vs. other product attributes

- The biobased element of products is perceived as only a small additional positive aspect; first it is important that one’s personal benefits are fulfilled by the product.

### Origin of raw material

- German consumers prefer **the use of raw materials cultivated in Germany**.
- Consumers who are interested in biobased products have more positive expectations but also **stricter requirements regarding the cultivation of raw materials**.



# **DETAILED RESULTS**

**ONE PAGE PER STUDY**

# 0 – SCIENTIFIC INSIGHTS

THIS STUDY ...

On each slide the subtitle gives a brief introduction to the study.

## SOURCE

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**Title:** xxx  
**Year:** 20XX  
**Outlet:** xxx  
**Author(s):** xxx  
**Method:** xxx  
**Comment:** xxx

Here you can find some general information about the study.

## NICE TO KNOW

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- XXX

If applicable, useful additional information is presented here.

## KEY TAKE-AWAYS

- XXX

This is the most important section.

# 1 – SCIENTIFIC INSIGHTS

THIS STUDY EXAMINES CONSUMER REACTIONS TO PRODUCTS MADE FROM FOOD WASTE

## SOURCE

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**Title:** From trash to treasure: The impact of consumer perception of bio-waste products in closed-loop supply chains

**Year:** 2019

**Outlet:** Journal of Cleaner Production

**Author(s):** Scientists from Italy & USA

**Method:** Empirical – quantitative

**Comment:** High-end journal (Impact factor = 7.1)

## NICE TO KNOW

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- A new type of polyhydroxyalkanoates (PHA) have been very recently developed to convert food waste into a biodegradable multifunctional raw material to help solving the plastic waste problem.
- This study aimed at addressing the role of involvement, personal values and demographics on the intention to purchase biobased products recovered from urban food waste.
- The 'green self-identity' scale can be found in [Barbarossa et al. \(2017\)](#).

## KEY TAKE-AWAYS

- **Product involvement does not affect purchase intention for biobased products.** This encourages the production of a broad spectrum of this new generation of biobased green products, encompassing both high- and low-involvement products.
- **Green self-identity** positively affects willingness-to-pay and purchase intentions of biobased products.
- **Perceptions of and reactions to biobased products are not affected by gender but are affected by age and past purchases.** Specifically, older consumers display higher willingness-to-pay, and those who already purchased eco-products had higher intentions to purchase and switch to biobased products, regardless of the number of times they purchased eco-products in the past.

## 2 – SCIENTIFIC INSIGHTS

THIS STUDY EXPLORES PEOPLE'S PERCEPTIONS REGARDING THE CONCEPT OF 'BIOBASED' IN GENERAL AND SPECIFIC BIOBASED PRODUCTS

### SOURCE

**Title:** Consumer perception of biobased products — An exploratory study in 5 European countries

**Year:** 2016

**Outlet:** NJAS – Wageningen Journal of Life Sciences

**Author(s):** Scientists from The Netherlands & Germany

**Method:** Empirical – qualitative

**Comment:** Journal of the Royal Netherlands Society for Agricultural Sciences (KLV) – Impact factor = 1.6

### NICE TO KNOW

- **Example of neg. reaction to “biobased”:** “It doesn't tell me exactly what it is about. Perhaps it started out as something good, then it has taken a turn. Somehow, I have the feeling that it is a trap.”
- **Example of a pos. reaction:** “Naturalness, that you have something on your body that is natural and that has not been produced chemically but that has been made of plants. That gives you a good feeling and soothes your conscience.”
- **Example of reaction to a biobased shopping bag:** “I think that it is a very thin shopping bag. I usually use a shopping bag several times. I'm not sure that this shopping bag can stand up to that. I think that it will break faster than an ordinary shopping bag.”
- “I think biological plastic is a contradiction in itself. I just don't believe it. You would have to explain in detail why it is biological plastic.”
- “I would think that it would be healthier for your body when you use natural products on your body. It should but I don't know if that's true”

### KEY TAKE-AWAYS

- Consumers are unfamiliar with 'biobased' as a concept.
- A large group of consumers indicates having questions, feeling uncertain, and having mixed feelings regarding biobased processes and products.
- Associations with 'biobased' as a concept and as a product can be positive or negative, or both at the same time. This idea highlights the complexity and uncertainty of consumer perception of the concept of 'biobased'.
- Consumer perception of biobased products seems to be dependent on the concept and its entire context.
- Being 'biobased' can be regarded as an additional value, while other aspects (e.g., convenience, looks and price) are more important and must be fulfilled before participants are willing to choose these specific biobased products.
- Personal benefits are most relevant for the perception of 'biobased'. Yet, the environmental friendliness and healthiness of biobased products do relate to personal benefits, such as feeling good, or personal motives, such as having a sustainable and healthy lifestyle.

### 3 – SCIENTIFIC INSIGHTS

ARE CONSUMERS WILLING TO PAY MORE FOR BIOPOLYMER PRODUCTS THAN FOR PLASTIC PRODUCTS MADE FROM FOSSIL FUEL?

#### SOURCE

**Title:** Consumers' Willingness to Pay for Durable Biobased Plastic Products: Findings from an Experimental Auction

**Year:** 2016

**Outlet:** Dissertation

**Author(s):** PhD candidate from Technical University of Munich

**Method:** Empirical – quantitative

#### NICE TO KNOW

- This study applied a well-tested and established method to the new and emerging field of biomass use for the production of consumer goods. In summary, participants of the auction experiment offered significantly higher prices for a biopolymer product than for a conventional, fossil-based plastic product.

#### KEY TAKE-AWAYS

- Consumers have a basic interest for biopolymer products and see them as a slightly positive development, but a lot of effort is needed to raise awareness for and acceptance of such products.
- Durable biopolymers might not match consumers' expectations of a sustainable product as they add to environmental pollution and landfills just like conventional plastics if they are not recycled or burned for energy use.
- Consumers might also expect from a biomass-based plastic product that it is biodegradable.
- Consumers tend to believe that "bioplastic" means biodegradable/compostable.
- Consumers do not only lack information about what biopolymers are, but sometimes the information they thought to have was also misleading.

## 4 – SCIENTIFIC INSIGHTS

THIS REPORT PRESENTS A STUDY OF SOCIETAL PERCEPTIONS AND ATTITUDES TOWARDS THE BIOECONOMY IN GERMANY

### SOURCE

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**Title:** Bioökonomie aus Sicht der Bevölkerung

**Year:** 2019

**Outlet:** Working Paper as part of the BMBF-funded research project "Bioökonomie 2050"

**Author(s):** Thünen-Institut für Marktanalyse

**Method:** Empirical – qualitative & quantitative

### NICE TO KNOW

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- German sample

### KEY TAKE-AWAYS

- The heterogeneity in the preferences and attitudes of citizens must be taken into account when it comes to raising awareness about biobased economic activity among the population.
- Consumers consider their own knowledge about the bio-economy as a whole as too little to form a well-founded opinion on this topic. It is therefore important to conduct information campaigns and seek dialogue with the public in order to gain support for a biobased future. The heterogeneity of citizens in terms of their individual environmental behavior as well as in terms of preferences and dislikes of different technologies and processes requires adapted communication strategies and content.
- When converting to a biobased economy, a part of the population fears that prices (e.g. for electricity) could rise.
- A reduction in consumption is perceived as almost more important than a mere exchange of raw material sources. A large part of consumers believe that there is a lot of potential for savings in everyday consumption that does not mean a reduction in the standard of living.

# 5 – SCIENTIFIC INSIGHTS

THIS REPORT EXAMINES CONSUMER ACCEPTANCE OF BIOBASED PRODUCTS

## SOURCE

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**Title:** Acceptance factors for bio-based products and related information systems

**Year:** 2015

**Outlet:** White paper, funded by EU (part of the project “Open Bio: Opening biobased markets via standards, labelling and procurement)

**Author(s):** Scientists from TU Berlin

**Method:** Empirical – qualitative & quantitative

## NICE TO KNOW

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- This report also includes sections on the acceptance of biobased products in the business-to-business market as well as in public procurement (not covered in this page’s key take-aways).

## KEY TAKE-AWAYS

- There is a high degree of unfamiliarity with biobased concept and biobased products among consumers.
- Consumers have positive associations linked to the environment such as “naturalness” and “environmentally friendly” but also “health-related”.
- There are also mixed and negative feelings due to the lack of knowledge and arising questions about biobased concept and products.
- The biobased element of products is perceived as only a small additional positive aspect. First it is important that one’s personal benefits are fulfilled by the product.
- Consumers request information about recyclability and biodegradability.
- When biobased products are marketed as green it is important to have a coherent product concept in which all production process phases are sustainable on the social, environmental and economic dimension.

## 6 – SCIENTIFIC INSIGHTS

THIS STUDY ANALYZES EMOTIONAL RESPONSES OF CONSUMERS WHEN PROMPTED WITH PRODUCTS MADE OF SUSTAINABLE MATERIALS

### SOURCE

**Title:** 'Is this wallet made of real leaves?': A Study of Sustainable Materials' Emotional Experiences

**Year:** 2018

**Outlet:** Proceedings of NordDesign 2018, Linköping, Sweden

**Author(s):** Two scientists from the Imperial College London

**Method:** Empirical – qualitative

### NICE TO KNOW

- Ten study participants were prompted with ten products made of **sustainable materials, including recycled plastics, leaves, mycelium mushroom, bamboo fiber, agricultural plant fiber.**
- Fun fact: One of the stimuli was a running shoe made of ocean plastic (adidas logo removed).
- Participants were asked to report their emotional responses towards the stimuli and describe the reasons for the emotions triggered by the stimuli.
- This study has found that the stimuli evoked 163 emotions consisting of 114 positive emotions and 49 negative emotions.

### KEY TAKE-AWAYS

- When consumers are prompted with products made from sustainable materials, it can trigger both positive and negative emotions.
- 'Surprise' and 'disgust' are the dominant positive and negative emotions.
- The research indicates that there is no specific rigid formula to guarantee the success of particular sustainable materials. But there are definitely some aspects in which the emotional experiences of the materials can be altered by designers.



## 7 – SCIENTIFIC INSIGHTS

THIS STUDY EXAMINES PERCEPTIONS OF BIOECONOMY THROUGH A POLICY MAKER LENS

### SOURCE

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**Title:** Understanding Perceptions of the Bioeconomy in Austria – An Explorative Case Study

**Year:** 2018

**Outlet:** Sustainability

**Author(s):** Scientists from Austria & Germany

**Method:** Empirical – qualitative & quantitative

### NICE TO KNOW

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- N.a.

### KEY TAKE-AWAYS

- Perceptions of term ‘bioeconomy’ are strongly related to consumers’ expectations regarding its – not only environmental – performance and can vary significantly between different societal groups and hence consumer segments as a result of psychographic and societal group (socio-demographic characteristics).
- Highly educated, young adults like students are open for discussions on bioeconomy.
- In contrast, other consumer groups (e.g. ‘employees’ and ‘farmers’) are observed to be overshadowed by personal fears and concerns about the risks associated with change.

## 8 – SCIENTIFIC INSIGHTS

THIS STUDY FOCUSES ON PARENTS AND THEIR PREFERENCES FOR SAND TOYS MADE FROM BIOBASED PLASTICS

### SOURCE

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**Title:** Biogenic product alternatives for children: Consumer preferences for a set of sand toys made of bio-based plastic

**Year:** 2017

**Outlet:** Sustainable Production and Consumption

**Author(s):** Scientists from Germany

**Method:** Empirical – quantitative

**Comment:** Journal Impact Factor = 3.8

### NICE TO KNOW

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- Respondents: 521 members of an online panel in Germany, who have children aged two to eight years.
- The number of pieces in the set of sand toys, the origin of raw biomass materials, the additives contained, price and three ecologically relevant product attributes were included in the choice experiment.

### KEY TAKE-AWAYS

- When dealing with conscious consumers, such as parents when buying toys for their children, consumers clearly preferred products with environmentally friendly cultivated raw materials.
- Conscious consumers do not accept biomass imports from outside of Europe.
- Four consumer segments could be identified: eco-sensitive, price-sensitive, origin-sensitive and those who prefer conventional plastics.
- **Eco-sensitive consumers accept higher prices but require high ecological standards.**

## 9 – SCIENTIFIC INSIGHTS

THIS STUDY EXAMINES CONSUMER PREFERENCES FOR OUTDOOR SPORTING EQUIPMENT MADE OF BIOBASED PLASTICS

### SOURCE

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**Title:** Consumer preferences for outdoor sporting equipment made of bio-based plastics: Results of a choice-based-conjoint experiment in Germany

**Year:** 2018

**Outlet:** Journal of Cleaner Production

**Author(s):** Scientists from Germany

**Method:** Empirical – quantitative

**Comment:** High-end journal (Impact factor = 7.1)

### NICE TO KNOW

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- Research object of this study is outdoor sporting equipment: A biobased plastic drink bottle for bicycles and a running shoe with a biobased sole.
- Survey data is from 2014.

### KEY TAKE-AWAYS

- German consumers support the use of biobased plastic.
- The origin of raw materials is of major importance: Consumers clearly prefer locally cultivated raw materials.
- German consumers have a clear preference for the use of raw materials cultivated in Germany.
- Consumers prefer biobased products containing a high percentage of biobased plastic, products associated with a large reduction of CO<sub>2</sub>-emissions and products not involving the use of plastic softeners.
- High price premiums limit interest in biobased sporting equipment.

# 10 – SCIENTIFIC INSIGHTS

THIS STUDY EXAMINES AUSTRALIAN CONSUMERS AND THEIR PERCEPTION OF BIOPASTICS

## SOURCE

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**Title:** Public attitudes towards bioplastics – knowledge, perception and end-of-life management

**Year:** 2019

**Outlet:** Resources, Conservation & Recycling

**Author(s):** Scientists from Australia

**Method:** Empirical – quantitative

**Comment:** High-end journal (Impact factor = 8.1)

## NICE TO KNOW

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- Australian sample

## KEY TAKE-AWAYS

- Consumer knowledge of bioplastics is low, but perception, particularly of biodegradable plastics, is positive.
- Biodegradable plastics are perceived as better for the environment than 'normal plastics' and 'easily recyclable' plastics.
- 58% are unsure whether biodegradable plastics can have negative environmental impacts.
- 68% say they would like to see more of the plastic items they use be biodegradable.

# 11 – SCIENTIFIC INSIGHTS

THIS STUDY PROVIDES AN IMPORTANCE RANKING OF BIOBASED PRODUCT ATTRIBUTES

## SOURCE

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**Title:** Indicators of Consumers' Preferences for Bio-Based Apparel: A German Case Study with a Functional Rain Jacket Made of Bioplastic

**Year:** 2020

**Outlet:** Sustainability

**Author(s):** Scientists from Germany (incl. Technical University of Munich)

**Method:** Empirical – quantitative

## NICE TO KNOW

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- German sample
- Choice based conjoint analysis

## KEY TAKE-AWAYS

- Strong predictors of consumer preferences for biobased apparel are prior product experience, green consumer values, and attitudes towards bioplastics.
- Increasing the awareness of bioplastics is important in order to promote biobased apparel.
- Importance ranking of biobased product attributes
  1. Price (Rel. importance = 45%)
  2. Product certificate (e.g. labeling and information, 19%)
  3. Percentage of bioplastic in fabric (14%)
  4. Origin of resource (14%)
  5. Biogenic resource (8%)

## 12 – SCIENTIFIC INSIGHTS

THIS STUDY SHOWS THAT CONSUMERS HAVE INCORRECT IDEAS ABOUT BIOPLASTICS (E.G. . "ALL BIOPLASTICS ARE COMPOSTABLE“)

### SOURCE

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**Title:** Bevölkerungsrepräsentative Online-Befragung in Deutschland zu Biokunststoffen

**Year:** 2017

**Outlet:** Working paper as part of the BMBF-funded research project "Neue Wege, Strategien, Geschäfts- und Kommunikationsmodelle für Biokunststoffe als Baustein einer Nachhaltigen Wirtschaft"

**Author(s):** Scientists from Germany

**Method:** Empirical – quantitative

### NICE TO KNOW

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- German sample (representative)

### KEY TAKE-AWAYS

- There is generally a rather low awareness of bioplastics (<10% are sure they know exactly what bioplastics are)
- Consumers have incorrect ideas about bioplastics (e.g. "All bioplastics are compostable" and "The raw materials for bioplastics must come from organic farming").
- Consumers are most discouraged from supporting bioplastics when they learn that bioplastics do not degrade in an environmentally friendly way per se or in a short time under normal environmental conditions.
- Overall, the respondents show a tendency to look for products made of bioplastics when purchasing in the future (in contrast to products made of petroleum-based plastics). The rather cautious consumption intention reflects the overall assessment of bioplastics, which ranges on average between "both positive and negative" and "rather positive".

## 13 – SCIENTIFIC INSIGHTS

THIS STUDY SHOWS THAT CONSUMERS FOCUS PREDOMINANTLY ON END-OF-LIFE ATTRIBUTES OF PACKAGING

### SOURCE

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**Title:** Consumer attitudes towards biobased packaging – A cross-cultural comparative study

**Year:** 2018

**Outlet:** Journal of Cleaner Production

**Author(s):** Scientists from Germany

**Method:** Empirical – quantitative

**Comment:** High-end journal (Impact factor = 7.1)

### NICE TO KNOW

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- 3-country study: Germany, France, USA

### KEY TAKE-AWAYS

- Consumers prioritize recyclability and biodegradability over renewable origin.
- Consumers focus predominantly on end-of-life attributes of packaging.
- The fact that biomethane is biobased counts little in consumer ratings if the product is not also biodegradable.
- Cultures differ in how they weigh the relative value of recyclability, reusability and biodegradability: German consumers favour reusability; French and US favour recyclability.
- Ethical concerns about the use of agricultural land to produce biogas substrates are raised primarily by German consumers.
- Consumers concern themselves less with renewable origins, and almost not at all with activities relating to production, transport and retail use.
- There are discrepancies between consumer perceptions and results from LCA studies on the environmental impact of different packaging options.

# 14 – SCIENTIFIC INSIGHTS

THIS STUDY FINDS THAT CONSUMERS LACK KNOWLEDGE ABOUT BIOBASED PACKAGING MATERIALS

## SOURCE

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**Title:** Consumers' response to environmentally-friendly food packaging – A systematic review

**Year:** 2020

**Outlet:** Journal of Cleaner Production

**Author(s):** Scientists from Germany and Denmark

**Method:** Empirical – qualitative

**Comment:** High-end journal (Impact factor = 7.1)

## NICE TO KNOW

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- The paper is based on a systematic synthesis of 46 scientific journal articles on consumer studies related to environmentally-friendly packaging.

## KEY TAKE-AWAYS

- Consumers lack knowledge about biobased packaging materials.
- Consumers need guidance in recognizing environmentally-friendly packaging.
- Many of the studies reviewed provide evidence that other product attributes such as price and product quality are more important to consumers than environmentally-friendly packaging. Nevertheless, some studies recorded a significantly **higher willingness on the part of consumers to buy and pay for environmentally-friendly packaging** and products with reduced packaging compared to products with standard packaging, signaling an overall positive attitude.



## 15 – SCIENTIFIC INSIGHTS

THIS STUDY EXAMINES THE IMPACT OF 100% VS. PARTIALLY BIOBASED PRODUCTS ON CONSUMERS' BRAND PERCEPTIONS

### SOURCE

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**Title:** Can biobased attributes upgrade a brand? How partial and full use of biobased materials affects the purchase intention of brands

**Year:** 2017

**Outlet:** Journal of Cleaner Production

**Author(s):** Scientists from the Netherlands

**Method:** Empirical – quantitative

**Comment:** High-end journal (Impact factor = 7.1)

### NICE TO KNOW

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- Two experimental studies in six European countries on biobased products were used to test whether consumers responded differently to brands that use materials that are fully biobased (i.e., 100% biobased) compared to brands that use materials that are partially biobased (30%).
- Control condition: 0% biobased.
- The results hold true for multiple products, brands and countries.

### KEY TAKE-AWAYS

- Introducing biobased product attributes may help enhance the value of brands.
- However, only brands with attributes that were 100% biobased consistently result in enhanced purchase intentions.
- Introducing partially biobased attributes does not always result in a better evaluation of the brand compared to brands that do not contain any biobased attributes.
- Brands need to ensure that their biobased products are communicated clear and accessible to consumers who are not knowledgeable.

## 16 – SCIENTIFIC INSIGHTS

THIS STUDY SHOWS THAT ECO-CONSCIOUS CONSUMERS PREFER A HIGH BIOBASED PLASTIC CONTENT AND HAVE GENERALLY STRICTER REQUIREMENTS

### SOURCE

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**Title:** Segmentation of interested and less interested consumers in sports equipment made of biobased plastic

**Year:** 2018

**Outlet:** Sustainable Production and Consumption

**Author(s):** Scientists from Germany

**Method:** Empirical – quantitative

**Comment:** Journal Impact Factor = 3.8

### NICE TO KNOW

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- In this study, consumer groups who are interested in biobased sports equipment were differentiated from those who are less or not interested.

### KEY TAKE-AWAYS

- Consumers with interest in biobased sports equipment prefer a high biobased plastic content, a large reduction in potential CO<sub>2</sub>-emissions and the use of regionally grown raw materials.
- Consumers who are interested in biobased products have more positive expectations but also stricter requirements regarding the cultivation of raw materials.
- The sporting equipment industry may be a promising industry for the replacement of conventional plastic with biobased plastic because there seems to be a sufficient proportion of consumers who are interested in such products.

Bahrudin, F. I., & Aurisicchio, M. (2018). 'Is this wallet made of real leaves?': A Study of Sustainable Materials' Emotional Experiences. *DS 91: Proceedings of NordDesign 2018, Linköping, Sweden, 14th-17th August 2018*.

Blesin, J. M., Klein, F., Emberger-Klein, A., Scherer, C., Menrad, K., & Möhring, W. (2017). Bevölkerungsrepräsentative Online-Befragung in Deutschland zu Biokunststoffen. *Arbeitsbericht Oktober*.

Dilkes-Hoffman, L., Ashworth, P., Laycock, B., Pratt, S., & Lant, P. (2019). Public attitudes towards bioplastics—knowledge, perception and end-of-life management. *Resources, Conservation and Recycling*, 151, 104479.

Hempel, C., Will, S., & Zander, K. (2019). *Bioökonomie aus Sicht der Bevölkerung* (No. 115). Thünen Working Paper.

Herbes, C., Beuthner, C., & Ramme, I. (2018). Consumer attitudes towards biobased packaging – A cross-cultural comparative study. *Journal of Cleaner Production*, 194, 203-218.

Kainz, U. (2016). *Consumers' willingness to pay for durable biobased plastic products: Findings from an experimental auction* (Doctoral dissertation, Technische Universität München).

Ketelsen, M., Janssen, M., & Hamm, U. (2020). Consumers' response to environmentally-friendly food packaging—a systematic review. *Journal of Cleaner Production*, 254, 120123.

Klein, F. F., Emberger-Klein, A., & Menrad, K. (2020). Indicators of Consumers' Preferences for Bio-Based Apparel: A German Case Study with a Functional Rain Jacket Made of Bioplastic. *Sustainability*, 12(2), 675.

Meeusen, M., Peuckert, J., & Quitzow, R. (2015). Acceptance factors for bio-based products and related information systems. *Open-BIO: Opening bio-based markets via standards, labelling and procurement* (Work Package 9: Social Acceptance).

Reinders, M. J., Onwezen, M. C., & Meeusen, M. J. (2017). Can bio-based attributes upgrade a brand? How partial and full use of bio-based materials affects the purchase intention of brands. *Journal of Cleaner Production*, 162, 1169-1179.

Russo, I., Confente, I., Scarpi, D., & Hazen, B. T. (2019). From trash to treasure: The impact of consumer perception of bio-waste products in closed-loop supply chains. *Journal of Cleaner Production*, 218, 966-974.

Scherer, C., Emberger-Klein, A., & Menrad, K. (2017). Biogenic product alternatives for children: Consumer preferences for a set of sand toys made of bio-based plastic. *Sustainable Production and Consumption*, 10, 1-14.

Scherer, C., Emberger-Klein, A., & Menrad, K. (2018). Consumer preferences for outdoor sporting equipment made of bio-based plastics: Results of a choice-based-conjoint experiment in Germany. *Journal of Cleaner Production*, 203, 1085-1094.

Scherer, C., Emberger-Klein, A., & Menrad, K. (2018). Segmentation of interested and less interested consumers in sports equipment made of bio-based plastic. *Sustainable Production and Consumption*, 14, 53-65.

Sijtsema, S. J., Onwezen, M. C., Reinders, M. J., Dagevos, H., Partanen, A., & Meeusen, M. (2016). Consumer perception of bio-based products – An exploratory study in 5 European countries. *NJAS-Wageningen Journal of Life Sciences*, 77, 61-69.

Stern, T., Ploll, U., Spies, R., Schwarzbauer, P., Hesser, F., & Ranacher, L. (2018). Understanding perceptions of the bioeconomy in Austria – An explorative case study. *Sustainability*, 10(11), 4142.

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