



PRESERVE

# Customer perception for bio-based packaging products and upcycling options

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# WHY USE BIOBASED PLASTICS?

## **Reducing the dependency on fossil resources**

Crude oil or gas, the starting point of any conventional plastic, are limited resources that will only last for a few more decades and that are expected to become significantly more expensive. Most of these fossil resources are used to serve the energy demand of the world's population. Seeking alternative sources such as wind or solar power has been an important topic in the energy industry for a while. An early switch to renewable sources is equally important to the plastics industry. Even though only four percent of the global oil consumption is used to produce plastics, and a further four percent is used to generate the energy for plastics production, sufficient time is needed to develop the new technologies required to process renewable sources and prepare for the "post-oil era".

## **Annual grow back: Renewability is key**

Unlike conventional plastics, biobased plastics are derived from renewable resources. These resources are predominantly annual crops such as corn, cereals and sugar beets or perennial cultures such as cassava and sugar cane.

## **Reducing GHG emissions**

Powered by sunlight, plants absorb atmospheric carbon dioxide, the most abundant Greenhouse Gas (GHG) and transform it into biomass. This biomass becomes the starting point for the production of biobased plastics. Using renewable resources constitutes a temporary removal of Greenhouse Gases (basically CO<sub>2</sub>) from the atmosphere. This carbon fixation can be extended for a period of time if the material is recycled. In particular, recycling into durable products provides added value in this respect.

# WHY USE BIOBASED PLASTICS?

## **Creating renewable energy**

Incineration of biobased packaging at the end of life (when recycling is no longer possible) can also secure a net benefit for the environment. Biobased rigid packaging contains valuable energy that can be recovered in combined heat and power plants. The renewable share of the material releases the same amount of carbon dioxide as the plants had originally taken out of the atmosphere.

## **Increasing resource efficiency**

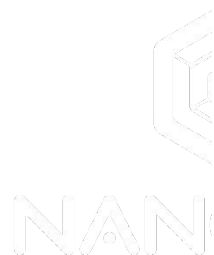
As they are made from renewable resources and fit for existing recycling streams, many biobased plastics such as biobased PE or partially biobased PET carry the potential to “close the loop” and consequently to increase resource efficiency. This potential can be best realised by establishing use cascades, meaning that renewable resources are firstly used to produce materials and products, prior to being used for energy recovery. Using renewable resources for bioplastic products, recycling these products several times and finally, at the end of their product life, incinerating them with energy recovery – this would be resource efficiency at its (current) best.



# PLASTICS AND BIOPLASTICS IN PACKAGING: MARKET AND APPLICATIONS

Type of packaging	Application	Material choice	Alternative material choice
Bottles	Carbonated Soft Drinks	PET	Bio-PET
Bottles, bricks	Still beverages	PET	Bio-PET, PLA
Bottles	Liquid dairy, personal care (shampoo, shower gel)	HDPE, PET	Bio-HDPE, Bio-PET
Cups	Semi-liquid dairy products (e.g. yoghurt)	PP, PS	PLA, Bio-PP
Closures	Beverages	PP	Bio-PP

Table: Examples of packaging types and corresponding bioplastic materials.



# TRANSITION TO BIOBASED PLASTICS - MORE BENEFITS ON THE WAY

## **Potential for further reducing environmental footprints**

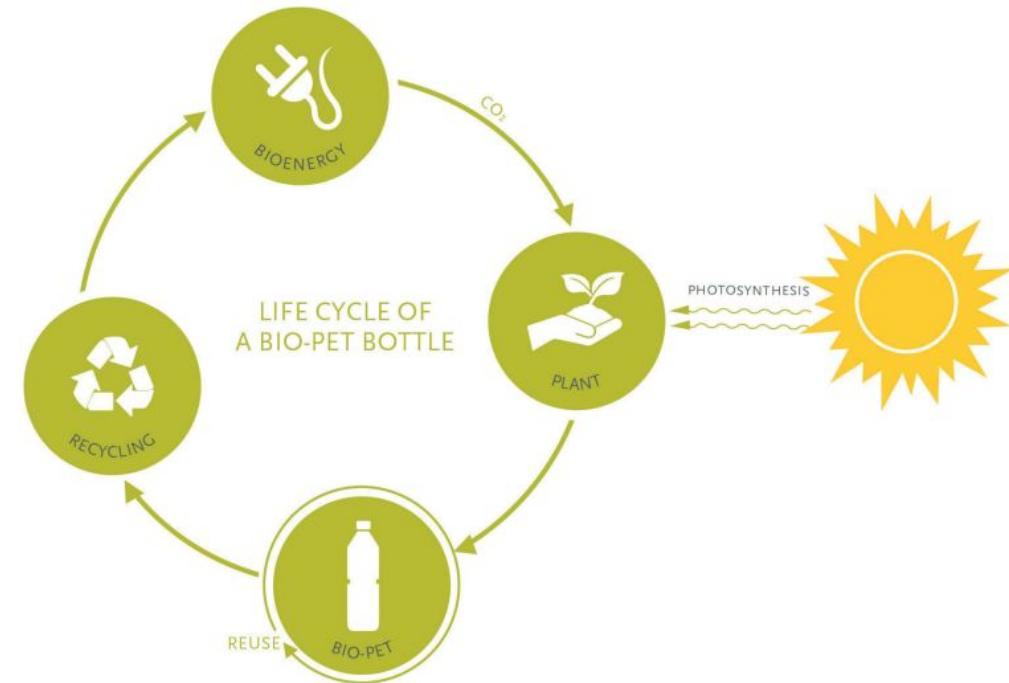
Biobased plastics still have ample unused potential that will be tapped in the near future. They are mostly produced in small scale or individual facilities, and transport, conversion, product design and final disposal are still being optimised. The implementation of innovative and more efficient processes is constantly improving the overall environmental performance.

## **Sustainability of feedstock**

Using renewable instead of fossil resources offers a set of environmental advantages. In order to maximise these advantages and to minimise environmental impact, good agricultural practice needs to be an integral part of packaging solutions made from renewable resources. Careful agricultural management is linked to e.g. soil management, fertiliser and pesticide use. Bad agricultural practice impacts such as land use change that result in e.g. deforestation of protected areas, loss of biodiversity or environmental damage must be avoided. And in addition, social criteria and human rights need to be taken into account. The implementation of good agricultural practices, including guidelines for social standards (health protection, etc.), is part of the sourcing strategy of many companies. This includes implementing a supplier's code of conduct or crop specific stakeholder initiatives and certifications such as the ISCC plus or Bonsucro. Certification is a beneficial tool to ensure the sustainable sourcing of biomass for all applications including biobased packaging. Furthermore, research is ongoing to optimise the conversion efficiencies of current feedstock and to consider alternative crops such as non food plant crops, cellulosic raw material or even bacterial conversion.

### Resource efficiency and use cascades

An efficient use of scarce and limited resources is one of the current top priorities of policy makers and administration throughout Europe. A large part of the renewable resources that are produced for non-food and non-feed purposes is destined for energy generation and fuelling cars in the form of bio-ethanol or biodiesel. Biobased plastics can contribute to achieving a more efficient use of renewable resources. In particular, rigid packaging applications are well suited for re-use and recycling. The resource efficiency is further enhanced if a product passes through one or more recycling loops of a material. In the case that a renewable resource is to be recovered, the energy contained in the material still can be used as fuel for steel ovens, cement kilns and combined heat and power plants. In this way a use cascade is achieved from feedstock to product to energy and the value of the renewable resource is utilised to the best possible degree.



## Implications of consumer confusion, unrealistic expectations, and the value-action gap on the use and disposal of bioplastics

	Consumer confusion	Unrealistic expectations	Value-action gap	Disposal/end of Life
Uptake/use phase	<ul style="list-style-type: none"> <li>Insufficient information is available, limiting informed decision making</li> <li>Confusion leading to a lack of confidence</li> <li>Lack of ability and knowledge to pass sustainability-related judgements</li> </ul>	<ul style="list-style-type: none"> <li>Mismatch between characteristic vs intended use</li> <li>Perceived level of sustainability does not always correspond with LCA results, uncertainty feeds perceived greenwash</li> <li>Exaggeration of positives and/or negatives</li> <li>Technical properties do not match conventional plastics</li> <li>Novelty and partly inferior technical properties limit applications</li> <li>Opportunistic companies may exploit green brand benefits</li> </ul>	<ul style="list-style-type: none"> <li>Poor availability</li> <li>Choice often determined by economic factors, leaving producers unsure about consumer preference</li> <li>Choice often determined in context of personal benefits, low willingness-to-pay, increased cynicism and skepticism</li> <li>Difficult to mobilize consumer demand, only “green consumers” make purchasing decisions based on environmental criteria</li> <li>Absence of incentives to mobilize sustainable behavior</li> </ul>	<ul style="list-style-type: none"> <li>Contamination of conventional recycling streams due to lack of clarity and understanding</li> <li>Consumers not clear where and how to discard of bioplastics</li> <li>Misleading design, signage or verbal cues can lead to mis-sorting within waste streams</li> <li>Inability to distinguish/separate materials unaware of difference between bioplastic</li> <li>Overcharged with multiple non-transparent labels and disposal instructions</li> <li>Rebound effects, lower recyclability, unsustainable feedstock leading to green wash and uncertainty</li> <li>Distrust in the current waste management systems due to lack of understanding</li> <li>Unaware of consequences of substituting trad. plastics</li> <li>Different terms may skew perceptions of suitability</li> <li>Rebound effects due to moral licensing is perceived to pay less attention to disposal phase</li> <li>Rebound effects of over-extensive production</li> <li>Requirement of new community configurations</li> <li>Take-back schemes require awareness/willingness</li> <li>Lack of access to waste separation bins in public</li> <li>Lack of understanding and/or inclination to sort waste</li> <li>Insensitivity/unresponsiveness to information and ineffective logos, with visual cues insufficient to change behavior</li> <li>Absence of responsibility/appropriate incentives to sort waste correctly</li> </ul>



Social life cycle assessment (S-LCA) is an evaluation tool used to evaluate potential positive or negative effects of a product in its whole life cycle in social aspect, including the process of raw material mining, production, distribution, application, reuse, maintenance, recycling, and final disposal.



## Targeted audience



**Info collection by online survey!!!**

## Goal of the S-LCA:

- Map areas of concerns from a social perspective with respect to the use of innovative packaging for food and cosmetics
- Get insights
- Gather the potential social benefits
- Map the level of risk attributed to the use of plastic packaging



## WORKERS QUESTIONNAIRE

1. To which industry do you belong?
  - Food
  - Cosmetics
  - Textile
  - Distribution
  - Logistics
  - Pharmaceutical
  - Plastic producer
  - Packaging design
  - Packaging production
  - Other
2. Which is your age range?
  - 18-26
  - 26-35
  - 35-50
  - 50-60
  - > 60
3. Please, indicate your average monthly wage (in Euro): \_\_\_\_\_
4. Please, indicate the number of hours in a normal working week:
  - < 30
  - 30-35
  - 35-40
  - > 40
5. Did you receive training in the field of security and safety in the workplace? If yes, how many hours were compulsory?
6. Rate from 1 to 10 the degree of safety of your work in a normal working day
7. Please, indicate existing preventive measures and protocols with regards to accidents and injuries that you are aware of
8. Please, indicate existing preventive measures and protocols with regards to chemical exposure that you are aware of
9. To which extent do you believe that an innovative packaging solution based upon renewable materials (bioplastics) would be applicable in your production? Rate 1-10
10. To which extent do you think it would be feasible to change the materials of your productive sector? Rate 1-10
11. Which are the main obstacles do you identify? (Rate 1-10 for each option, where 1 is the minimum and 10 is the maximum)
  - Excessive cost of the innovative material
  - Difficulties in the production process with the use of the innovative material
  - Technical barriers
  - EU and national regulations
  - Low marketing attractiveness
  - Little benefit in the short-term
  - Mind-set
  - Others

## CONSUMERS QUESTIONNAIRE

1. Sex:
  - Male
  - Female
2. Which is your range age?
  - 16-20
  - 20-30
  - 30-40
  - 40-50
  - 50-60
  - >60
3. What is your main activity?
  - Student
  - University student
  - Manufacturing worker
  - Freelance
  - Entrepreneur
  - Manager
  - Office employee
  - Unemployed
  - Retired
  - Other
4. What is your level of education?
  - First level diploma
  - High school diploma (maturità)
  - Bachelor degree
  - Master degree
  - Ph.D
  - Other
5. Rate from 1 to 10 your interest towards sustainable materials and environmental issues
6. Rate from 1 to 10 your attention towards the material labels present in packaging products
7. How would you rate your attention to the choice of a product depending on the packaging it is contained in? 1-10
8. How do you feel about the use of plastic packaging in everyday life?
  - No opinion
  - Not interested
  - Worried about the consequence on the environment
  - Very concerned, looking for possible alternative solutions
9. To which extent would you buy a cosmetic or a food product packed in a sustainable packaging material based on bioplastics, even if the cost of the final product would be higher than the traditional one? 1-10
10. To which extent are you concerned with the respect of the health and safety requirements by the new packaging material for food products? 1-10
11. To which extent are you concerned with the respect of the health and safety requirements by the new packaging material for cosmetics products? 1-10
12. Are you interested in the social benefits deriving by the use of innovative sustainable materials for packaging?
  - Not interested
  - Yes, I am interested, however the cost remains the main factor I consider
  - Yes, I am interested and I would accept a higher final price of the product using sustainable packaging
13. Would you be interested in knowing more about the material composition of plastic packaging, the recycling process and the environment consequence of plastic use?
  - Not interested
  - Yes, I am interested
  - Yes, I am interested and available to attend thematic workshops
  - Yes, I am interested in participating to thematic workshops and local events

## SOCIETY QUESTIONNAIRE

1. Sex:
  - Male
  - Female
2. Which is your age range?
  - 16-20
  - 20-30
  - 30-40
  - 40-50
  - 50-60
  - >60
3. What is your main activity?
  - Student
  - University student
  - Manufacturing worker
  - Freelance
  - Entrepreneur
  - Manager
  - Office employee
  - Unemployed
  - Retired
  - Other
4. What is your level of education?
  - First level diploma
  - High school diploma (maturità)
  - Bachelor degree
  - Master degree
  - Ph.D
  - Others
5. Rate from 1 to 10 your interest towards sustainable materials and environmental issues
6. Rate from 1 to 10 your attention towards the material labels present in packaging products
7. How would you rate your attention to the choice of a product depending on the packaging it is contained in? 1-10
8. How do you feel about the use of plastic packaging in everyday life?
  - No opinion
  - Not interested
  - Worried about the consequence on the environment
  - Very concerned, looking for possible alternative solutions
9. Are you aware of alternative solutions (like packaging based upon bioplastics or innovative material)? If yes, how did you find out?
10. To which extent are you concerned with the respect of the health and safety requirements by the new packaging material for food products? 1-10
11. To which extent are you concerned with the respect of the health and safety requirements by the new packaging material for cosmetics products? 1-10
12. Are you interested in the social benefits deriving by the use of innovative sustainable materials for packaging?
  - Not interested
  - Yes, I am interested, however the cost remains the main factor I consider
  - Yes, I am interested and I would accept a higher final price of the product using sustainable packaging
13. Would you be interested in knowing more about the material composition of plastic packaging, the recycling process and the environment consequence of plastic use?
  - Not interested
  - Yes, I am interested
  - Yes, I am interested and available to attend thematic workshops
  - Yes, I am interested in participating to thematic workshops and local events



## LOCAL COMMUNITY QUESTIONNAIRE

1. Sex:
  - Male
  - Female
2. Which is your age range?
  - 16-20
  - 20-30
  - 30-40
  - 40-50
  - 50-60
  - >60
3. What is your main activity?
  - Student
  - University student
  - Manufacturing worker
  - Freelance
  - Entrepreneur
  - Manager
  - Office employee
  - Unemployed
  - Retired
  - Other
4. What is your level of education?
  - First level diploma
  - High school diploma (*maturità*)
  - Bachelor degree
  - Master degree
  - Ph.D.
  - Others
5. To which association do you belong?
6. Is your ~~organisation~~ engaged/active in environmental, sustainability and recycling thematic? If yes, which are the main activities?
7. Rate from 1 to 10 your attention towards the material labels present in packaging products
8. How would you rate your attention to the choice of a product depending on the packaging it is contained in? 1-10
9. How do you feel about the use of plastic packaging in everyday life?
  - No opinion
  - Not interested
  - Worried about the consequence on the environment
  - Very concerned, looking for possible alternative solutions
10. Would you be interested in knowing more about the material composition of plastic packaging, the recycling process and the environment consequence of plastic use?
  - Not interested
  - Yes, I am interested
  - Yes, I am interested and available to attend thematic workshops
  - Yes, I am interested in participating to thematic workshops and local events



## VALUE CHAIN ACTORS QUESTIONNAIRE

### 1. To which area of the value chain do you belong?

- Biopolymer supplier
- Packaging material companies
- Packaging, products design
- Packaging converters
- Technological centre
- Technological cluster
- Association & Network
- Waste management company
- Distribution and logistics
- Chemical industry
- Food and drink industry
- Pharmaceutical industry
- Cosmetic industry
- Academia
- Other

2. To which extent do you believe that an innovative packaging solution based upon renewable materials (bioplastics) would be applicable in your area? Rate 1-10

3. Is your organisation engaged/active in environmental, sustainability and recycling thematic? If yes, which are the main activities?

4. Is the organisation/company where you belong engaged in research and innovation activities regarding alternative solutions to plastic packaging (like use of bioplastics or innovative material)?

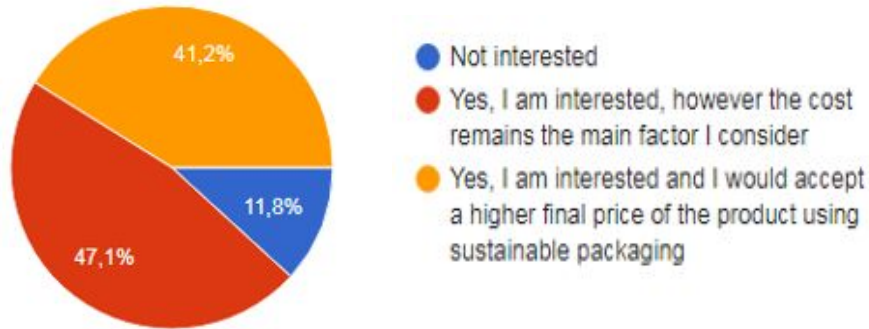
5. To which extent do you think it would be feasible to change the materials used in your productive sector? Rate 1-10

6. Which are the main obstacles do you identify? (Rate 1-10 for each option, where 1 is the minimum and 10 is the maximum)

- Excessive cost of the innovative material
- Difficulties in the production process with the use of the innovative material
- Technical barriers
- EU and national regulations
- Low marketing attractiveness
- Little benefit in the short-term
- Health and security concern
- Mind-set
- Other

## Social LCA assessment - examples

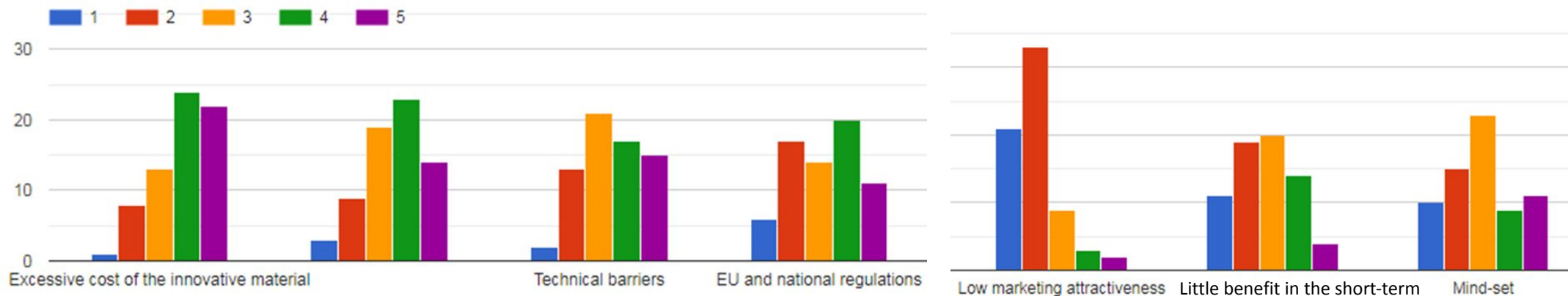
Are you interested in the social benefits deriving by the use of innovative sustainable materials for packaging?



To which extent do you believe it would be feasible to change the materials of your productive sector? Rate 1-10

- ✓ **Food industry:** average of 7,3
- ✓ **Packaging production:** average of 6,7
- ✓ **Plastic producer:** average of 6,7

Which are the main obstacles do you identify? (Rate 1-5 for each option, where 1 is the minimum and 5 is the maximum)



## Social LCA assessment

### *Preliminary feedbacks*

- ✓ Although the level of education affect the interest towards sustainability and innovative materials, the **cost** remains the main element considered
- ✓ Lot of interest in educational activities, i.e. thematic workshops and local events about **plastic packaging, environmental consequences, recycling process**
- ✓ For industry and actors of the value chain addressed the main obstacles in the application of the innovative sustainable materials are **difficulties in the production processes, excessive cost of the innovative material, EU and national regulations**





# Questions?

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Thank you

