BioReCer

Biological Resources Certifications Schemes

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Socio-Economic Analysis to adapt the new certification schemes

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The Socio-Economic analysis was based on a Three-step methodology with 3 different tools

1. **Delphi Survey** -> **Collecting feedback from industries and consumers about new requirements that can be adopted to improve and adapt the actual certification schemes.**

2. **AHP Analysis** -> **Obtaining expert prioritization of the requirements, combining their point of view with the consumers' and industries' opinions.**

3. **Online Experiment** -> **Assessing the validity of the certification schemes in fostering the acceptance of bioproducts. We proposed an experimental design to elicit consumers' willingness to pay for specific products that are strictly related with the BioReCer case studies.**

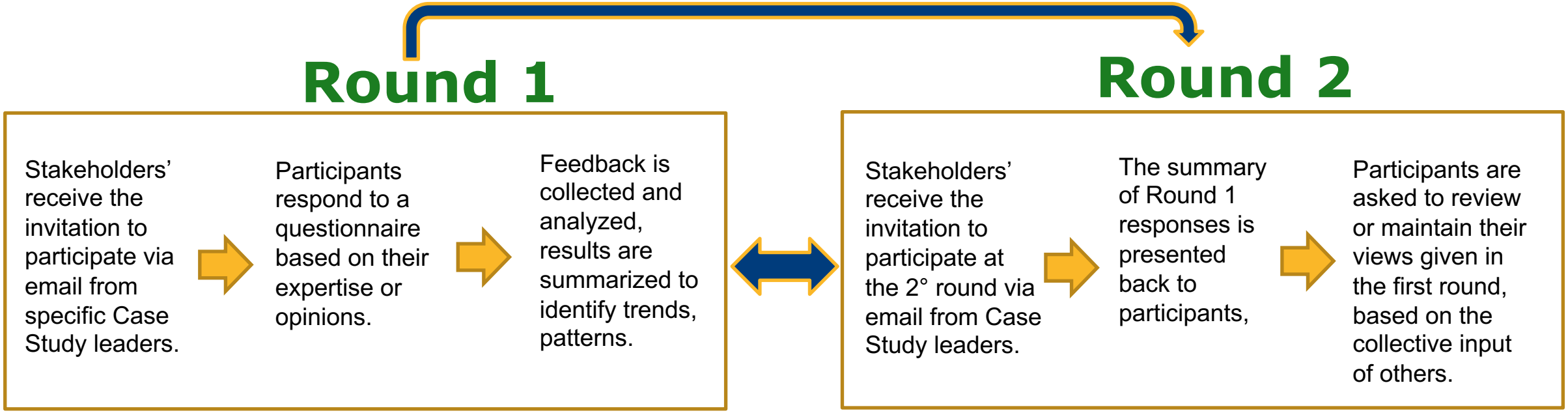
1) Delphi survey: Importance of including 7 new requirements

List of 7 requirements:

1. Requirement 1: "**The company measures its carbon emissions and has established a reduction plan**"
2. Requirement 2: "**The company promotes the use of materials with bio-base origin**"
3. Requirement 3: "**The company allocates resources to research and develop circular economy strategies within its value chain»**
4. Requirement 4: "**The company achieves goals of reduction or substitution of resources**"
5. Requirement 5: "**The company can demonstrate that its products have comparable characteristics and quality as its conventional counter part**"
6. Requirement 6: "**The company has defined strategies to promote a system thinking of processes and the analysis of material loops**"
7. Requirement 7: "**The company has programmed training activities for workers in order to tackle with the specifies of circular technologies and/or strategies**"

"Please rate on a scale from 1 (not at all) to 10 (a great deal) how much you think it is important to include the following requirement in the existing certification schemes:"

The Delphi Survey consisted of two rounds:



We delivered the questionnaires (translated in national language) to both stakeholders representing industries (4 for each country) and to a group of consumers (10 for each country) in 4 countries.

Results from both rounds show a consensus for including Requirement Q1

	Consumers	Industries
	Q1	Q1
	Q1	Q1
	Q1	Q1
	Q1	Q1

Q1: The company measures its carbon emissions and has established a reduction plan.

2) AHP Analysis: validating the results according to the experts' assessment

The Analytic Hierarchy Process (AHP) is a quantitative tool useful to identify a list of priorities through pairwise comparisons.

Two main phases were conducted:

1. **Selection of expert participants** (industry representatives, CS leaders, members of academic community)
2. **Definition of criteria and alternatives to be compared from 1 (equally preferred) to 9 (extremely preferred)**

AHP criteria and alternatives

List of criteria

Criteria	Type	Example
C1	Reputation	Boosts corporate public image (reputation) and brand value
C2	Competitive advantage	Provides a competitive advantage over companies who are not compliant with this specific requirement
C3	Investment	Attracts investment from capital providers (investors) with a higher commitment to sustainability
C4	Safety and quality	Improves the quality and the safety of products offered, ensuring consumer protection
C5	Responsible innovation	Promotes responsible innovation and new products and processes development
C6	Efficiency	Promotes more efficient use of resources
C7	Saving	Leads to long-term cost savings for the industry and, hence, has the potential to reduce prices for consumers

List of alternatives

Alternatives	Type	Example
A1	Requirement 1	The company measures its carbon emissions and has established a reduction plan.
A2	Requirement 2	The company promotes the use of materials with bio-based origin.
A3	Requirement 3	The company allocates resources to research and develop circular economy strategies within its value chain.
A4	Requirement 4	The company achieves goals of reduction or substitution of resources.
A5	Requirement 5	The company can demonstrate that its products have comparable characteristics and quality as its conventional counter part.
A6	Requirement 6	The company has defined strategies to promote a system thinking of processes and the analysis of material loops.
A7	Requirement 7	The company has programmed training activities for workers in order to tackle the specifics of circular technologies and/or strategies.

Example of AHP excel sheet

	C1	C2	C3	C4	C5	C6	C7
C1	1	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
C2		1	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
C3			1	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
C4				1	#DIV/0!	#DIV/0!	#DIV/0!
C5					1	#DIV/0!	#DIV/0!
C6						1	#DIV/0!
C7							1
Total	1	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

	C1	C2	C3	C4	C5	C6	C7	Total	Average
C1	1.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
C2	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
C3	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
C4	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
C5	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
C6	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
C7	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Total	1.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

Amax	CI	CR
#DIV/0!	#DIV/0!	#DIV/0!

CRITERIA	
C1	**Reputation:** Boosts corporate public image (reputation) and brand value
C2	**Competitive Advantage:** Provides a competitive advantage over companies who are not compliant with this specific requirement
C3	**Investment:** Attracts investment from capital providers (investors) with a higher commitment to sustainability
C4	**Safety and quality:** Improves the quality and the safety of products offered, ensuring consumer protection.
C5	**Responsible innovation:** Promotes responsible innovation and new products and processes development
C6	**Efficiency:** Promotes more efficient use of resources
C7	**Savings:** Leads to long-term cost savings for the industry and, hence, has the potential to reduce prices for consumers

INSTRUCTION
You solely need to fill the yellow cells with numbers. Put a number between 1 and 9 according to whether you believe criteria in the row are more relevant that the criteria in the column. On the contrary, if you believe that criteria in the columns are more relevant than those in the rows, writhe the number corresponding to 1/NR.
For example: if you believe that C4 is "strongly preferred" to C3, you will write the value 5 in the cell E5. If, on the contrary, you evaluate that C3 is "strongly preferred" to C4, you report the value 0,20 (= 1/5) in the cell E5.
Recall to check that CR is less or (at least) equal to 0.1

	A1	A2	A3	A4	A5	A6	A7
C1	3	4	3	4	5	3	3
C2	7	7	7	7	8	6	5
C3	7	7	7	8	5	6	5
C4	3	8	8	6	6	3	3
C5	7	7	8	8	7	5	5
C6	8	7	7	8	5	5	3
C7	3	3	3	5	6	6	5

INSTRUCTION
Fill in only yellow cells. In this case you are asked to express, on a scale from 1 (minimum value) to 9 (maximum value) how much important is each criterion for any alternative proposed.

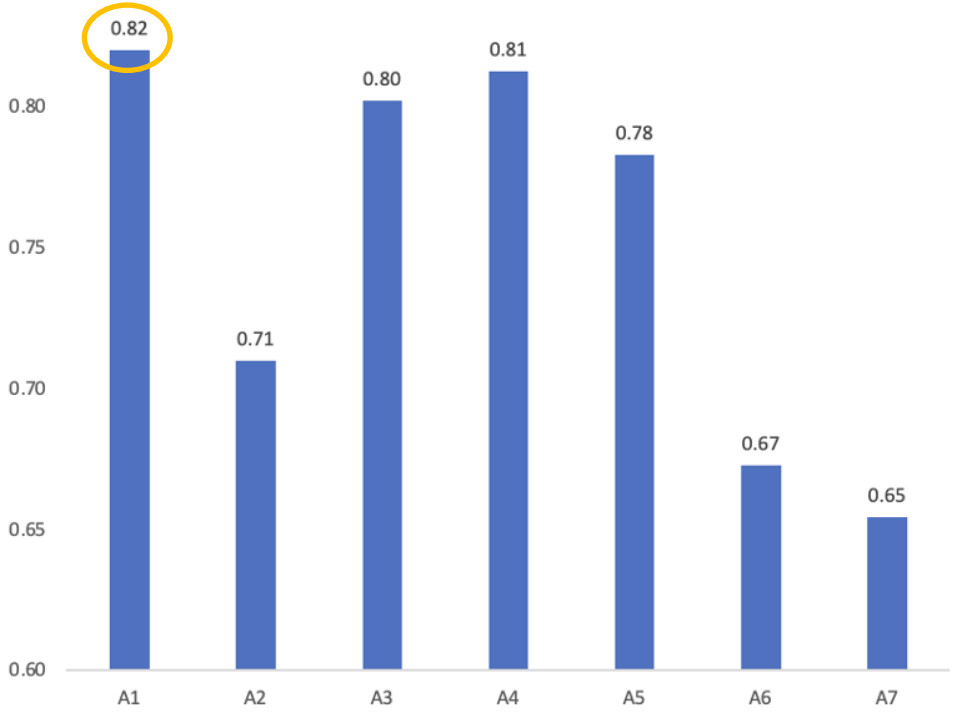
CRITERIA	
C1	Reputation
C2	Comparative Advantage
C3	Investment
C4	Safety and quality
C5	Responsible innovation
C6	Efficiency
C7	Savings

ALTERNATIVES - CS4	
A1	**Requirement 1**: The company measures its carbon emissions and has established a reduction plan
A2	**Requirement 2:** The company promotes the use of materials with bio-base origin
A3	**Requirement 3**: The company allocates resources to research and develop circular economy strategies within its value chain
A4	**Requirement 4**: The company achieves goals of reduction or substitution of resources
A5	**Requirement 5**: The company can demonstrate that its products have comparable characteristics and quality as its conventional counter part
A6	**Requirement 6**: The company has defined strategies to promote a system thinking of processes and the analysis of material loops
A7	**Requirement 7**: The company has programmed training activities for workers in order to tackle with the specifies of circular technologies and/or strategies

AHP main results: experts agree on the salience of including Requirement n.1

Ranking of alternatives

Each bar represents an alternative and the y-axis measures the average values.

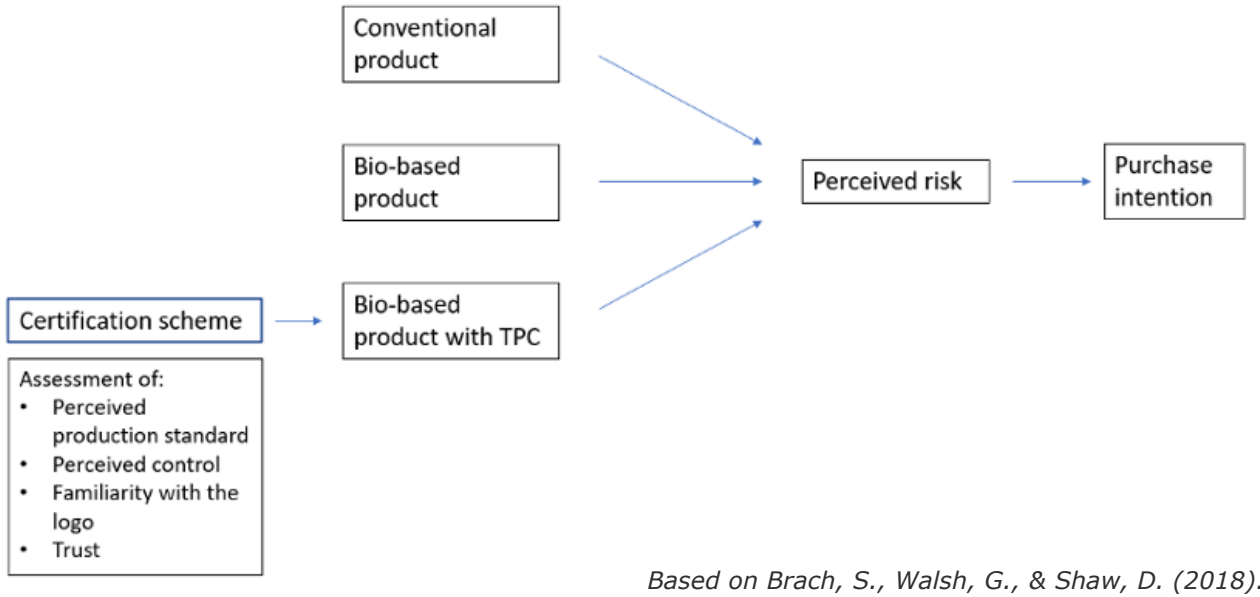


Q1: The company measures its carbon emissions and has established a reduction plan.

3) Online Experiment

The aim of this experiment is to elicit consumers' Purchase Intention (PI) on three different products (selected in accordance with the CSs leaders and based on the potential use of the byproducts for each CS).

Theoretical framework



Based on Brach, S., Walsh, G., & Shaw, D. (2018). Sustainable consumption and third-party certification labels: Consumers' perceptions and reactions. European Management Journal, 36(2), 254-265.

The experimental design

We proposed a **3x3x2 design**

3 products

3 versions
of the same product

2 certification schemes
(ISCC PLUS and RSB)

The 3 products

Shampoo for CS1 (Spain)

Fertilizer for CS2 and CS3 (Italy and Greece)

Cosmetic cream (e.g., face cream) for CS4 (Sweden)

These products were selected in accordance to the CSs leaders and based on the potential use of the byproducts for each CS.

The 3 versions of the product

For each product, we asked respondents to declare the price they are willing to pay (WTP) considering the following 3 versions:

- **the conventional product** (i.e., produced with chemicals);
- **the bioproduct** (i.e., produced by recycling organic or industrial waste materials);
- **certified bioproduct** (i.e., bioproduct with a certificate).

Example of 3 versions of the cream (ISCC+ treatment)

The 2 certification schemes

ISCC PLUS is a voluntary certification scheme designed to validate sustainability characteristics of alternative feedstocks such as waste and residues, renewable energy-derived feedstock, but also sustainably grown agricultural raw materials and forest biomass.
Each producer interested in getting a certification scheme needs to fulfill some obligations that are called requirements.

We provide you a list of some of the **requirements** that need to be fulfilled to get ISCC PLUS certifications:
- *The company has proposed strategies to protect water, soil and air quality and prevent negative impacts.*
- *The company shall have evaluations about the state of the biodiversity within the area and a plan to maintain and improve biodiversity.*
- *The company characterizes the introduced genetically modified species.*
- *The company ensures gender equality.*
- *The company applies the waste hierarchy to reduce and valosed its waste.*
- *The company has an energy efficiency plan in place.*
- *The company identifies and quantifies of the use of chemicals and hazardous substances.*
- *The company has established measures to track the disposal of by-products and waste.*

ISCC
International Sustainability & Carbon Certification

This logo on the product signals that the company meets all the requirements and that it proved evidence of compliance with the requirements by sending all the documents to the Certification Body.

RSB is a voluntary certification scheme designed to validate sustainability characteristics of alternative feedstocks such as waste and residues, renewable energy-derived feedstock, but also sustainably grown agricultural raw materials and forest biomass.
Each producer interested in getting a certification scheme needs to fulfill some obligations that are called requirements.

We provide you a list of some of the **requirements** that need to be fulfilled to get RSB certifications:
- The company protect water, soil, and air quality.
- The company must check if it operates in a protected area.
- The company checks noise and odour levels to make sure they meet legal limits.
- The company studies the genetically modified species it introduces.
- The company has a plan to improve energy efficiency.
- The company checks if steps have been taken to ensure food security in biomass production.
- The company has complete records of property rights (when applicable).
- The company has a Health and Safety plan in place.

RSB
CERTIFIED

This logo on the product signals that the company meets all the requirements and that it proved evidence of compliance with the requirements by sending all the documents to the Certification Body.

Example of WTP for Shampoo

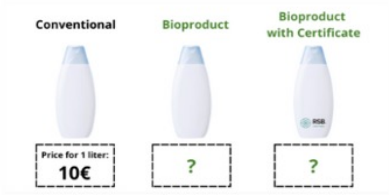
Example of the information provided to participants for ISCC PLUS (left) and RSB certificate (right)

Imagine you are about to buy a shampoo and you can choose among the following alternatives:

- **Conventional** shampoo (i.e., produced with chemicals).
- **Bioproduct** (i.e., produced by recycling organic or industrial waste materials.
- **Bioproduct with certificate** (as the previous option with the RSB certificate).

A summary is shown in the following image:

Assume that the price of 1 liter of conventional shampoo is 10€.



Please indicate for each of the alternatives, how much you are willing to pay for 1 liter of shampoo (insert your answer in numbers).

Bioproduct Shampoo

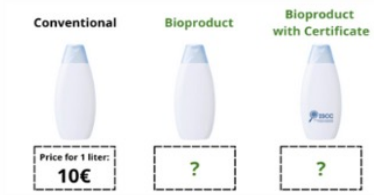
Bioproduct with RSB certificate Shampoo

Imagine you are about to buy a shampoo and you can choose among the following alternatives:

- **Conventional** shampoo (i.e., produced with chemicals).
- **Bioproduct** (i.e., produced by recycling organic or industrial waste materials.
- **Bioproduct with certificate** (as the previous option with the ISCC PLUS certificate).

A summary is shown in the following image:

Assume that the price of 1 liter of conventional shampoo is 10€.



Please indicate for each of the alternatives, how much you are willing to pay for 1 liter of shampoo (insert your answer in numbers).

Bioproduct Shampoo

Bioproduct with RSB certificate Shampoo

The experimental design

Groups of participants (n.400)

		Certification Scheme	
		ISCC PLUS	**RSB**
Products	**Shampoo**	Study 1 50 participant Spain	Study 2 50 participant Spain
	Cosmetic cream	Study 3 50 participant Sweden	Study 4 50 participant Sweden
	Fertilizer (1)	Study 5 50 participant Italy	Study 6 50 participant Italy
	Fertilizer (2)	Study 7 50 participant Greece	Study 8 50 participant Greece

- N = 400 participants, 100 for each country.
- Recruitment through the Prolific platform, selecting a subject pool composed by the working age population (18-65 years old) for each of the four case studies.
- The experiment took place in March 2025.

Higher WTP for bioproducts relative to conventional benchmarks, the presence of certification signaled by the logo resulted in a further increase in WTP (no difference between RSB and ISCC PLUS)

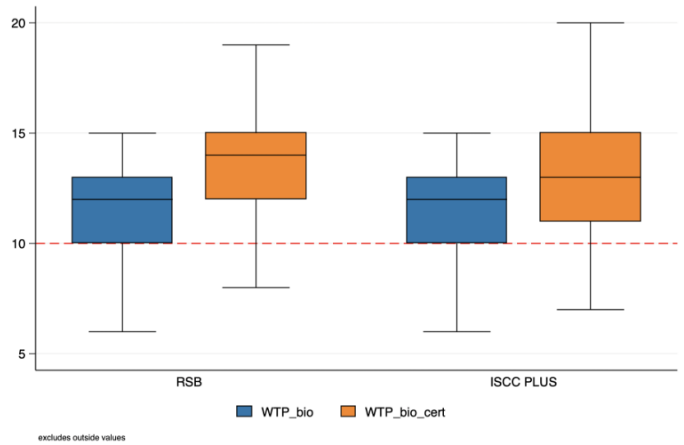


Figure 22: WTP for cosmetic bioproduct (blue box) and bioproduct with certificate (orange box) across RSB and ISCC PLUS certificates, respectively on the left and on the right. The red line represents the reference price of the conventional product.

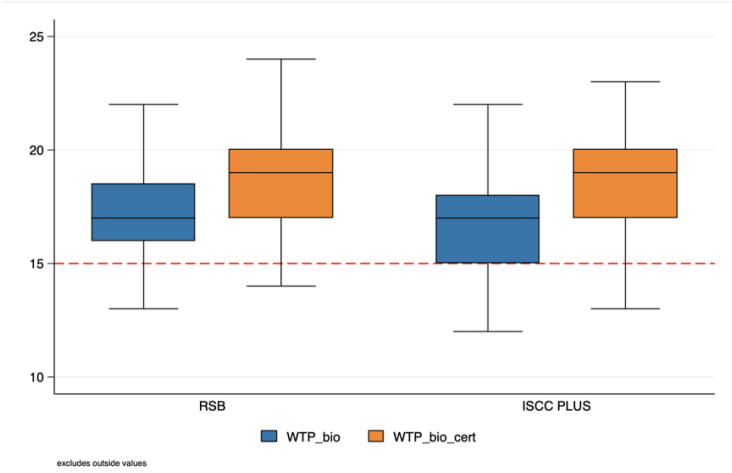


Figure 23: WTP for fertilizer bioproduct (blue box) and bioproduct with certificate (orange box) across RSB and ISCC certificates, respectively on the left and on the right. The red line represents the reference price of the conventional product.

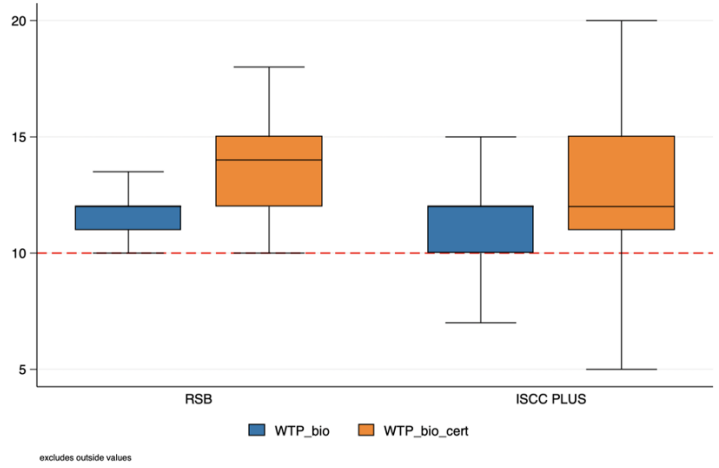


Figure 24: WTP for shampoo bioproduct (blue box) and bioproduct with certificate (orange box) across RSB and ISCC certificates, respectively on the left and on the right. The red line represents the reference price of the conventional product.

The presence of certification signaled by the logo resulted in a lower perceived environmental and health risk

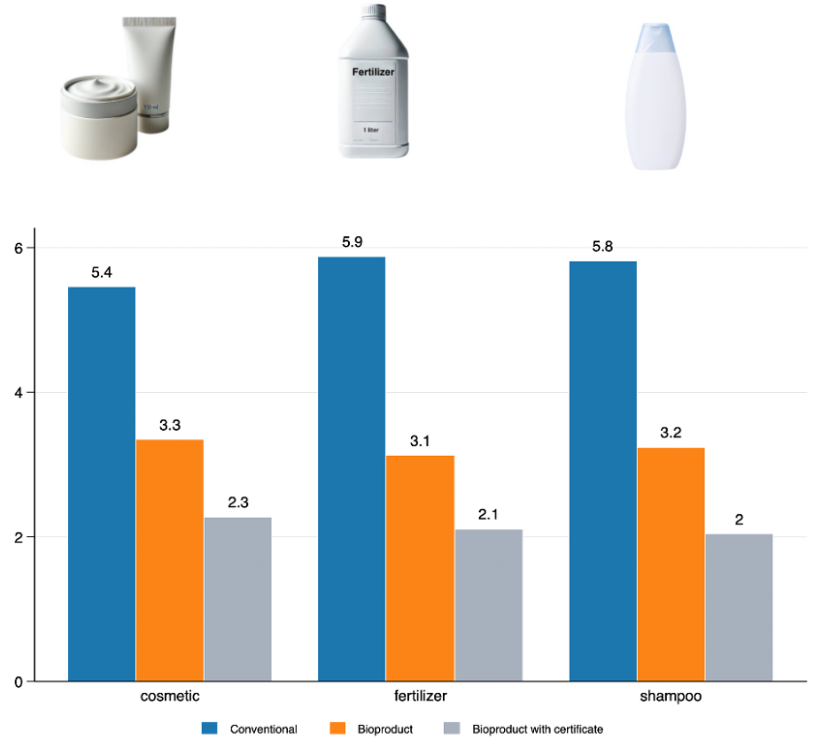


Figure 30: Environmental risk
Average values are reported on the individual evaluation on a value scale ranging from 1 (strongly agree) to 7 (strongly disagree)

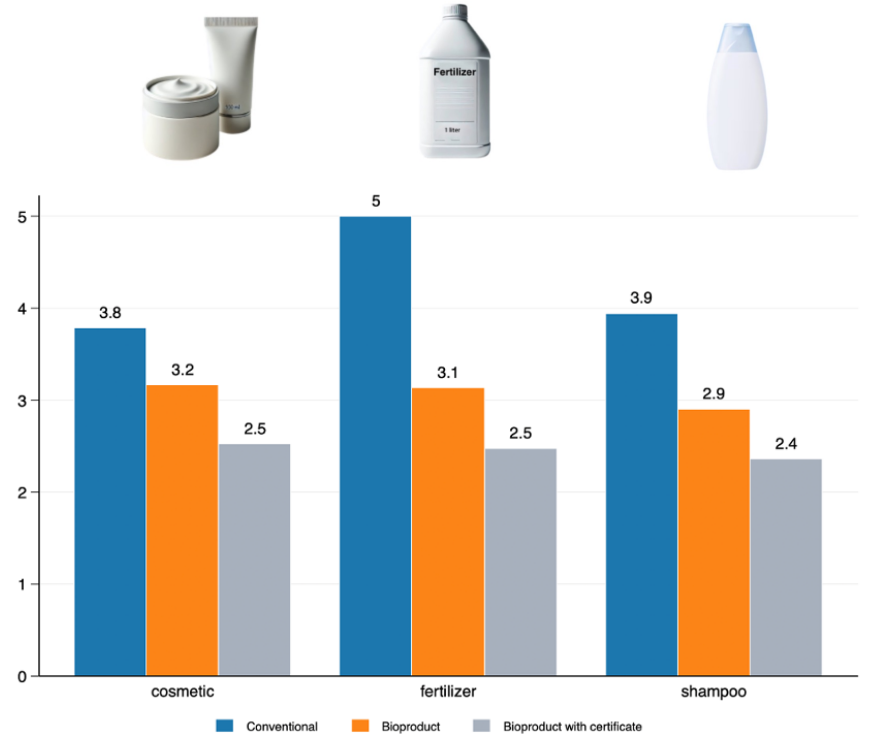


Figure 29: Health risk
Average values are reported on the individual evaluation on a value scale ranging from 1 (strongly agree) to 7 (strongly disagree)

Concluding remarks

- According to the **Delphi survey and AHP** analysis methodologies, consumers, industries and experts converged to **include the same key requirement (Q1): "*The company measures its carbon emissions and has established a reduction plan.*"**

- **Insights from the economic experiment** with consumers **show that the presence certification(**(ISCC PLUS and RSB) **increases consumer trust, purchase intention and WTP, due to the reduced perceived environmental and health risks, across** 3 alternative versions of 3 different products.

These evidences can **help the integration of the BioReCer impact and traceability assessment framework into existing certification schemes**, and offer practical insights for future research, particularly on **how certification can shape consumer acceptance and, as a consequence, foster sustainable innovation.**

BioReCer

Biological Resources Certifications Schemes

Thank you for your attention!

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