




Social Research: How People Receive Information Related to Sustainability/Circular Economy, Their Perception, and Purchase Options: A Survey Based on the Island of Lemnos [†]

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Abstract: Agro-industrial waste biotechnology refers to applications of biotechnological processes and techniques to convert agricultural/agro-industrial waste into valuable products. The food and agricultural industries generate significant amounts of waste during processing and production, including by-products from crops, fruits, vegetables, and other agricultural products. By using biotechnological techniques such as fermentation, enzymatic conversion, and microbial processes, it is possible to convert these waste materials into various useful products. But how do people receive this information (and others generated from this field of science) in their daily lives? This study aims to cover this topic and provide an approach to how it ultimately relates to people's purchasing options. A total of 120 people (37.5% men, 62.5% women) from six different parts of Greece (34.2% from Lemnos) took part in this survey. The key result of the survey was that 85.0% of respondents responded positively to their awareness of sustainability/circular economy. In addition, 64.6% of participants answered negatively when asked (whether they thought the information they received from the media and public bodies on the topic of sustainability/circular economy was sufficient for them. Some 36.7% of participants responded that they would be willing to pay 20% more to purchase a product that itself (or a component of it) is produced through biotechnological applications, and 46.7% responded that they would be happy to pay more, but that cost coverage is important.

Keywords: agro-industrial; biotechnology; applications; survey



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1. Introduction

The circular economy is a concept and economic system that aims to minimize the waste generated and maximize the value of resources by promoting the continuous circulation of products, materials, and resources in a closed loop [1]. Unlike the traditional linear economy, where goods are produced, used, and then disposed of as waste, the circular economy aims to create a sustainable, regenerative system [2]. Circular economy, bioeconomy and food waste biotechnology are interrelated concepts related to sustainable resource management and aim to reduce waste in the food industry [3]. Depending on their interests, background, and access to information, people engage with scientific research in different ways. This includes the scientific community, the media, online platforms/blogs, educational institutions, government/policy makers, NGOs and interest groups, business/industry applications, citizen science, peer review/replication, policy consultations, and public feedback [4]. This survey was carried out using the Google Forms tool because it is easily accessible and free.

2. Methods

This study was developed using a structured numerical process (Table 1) to examine the extent to which people perceive and interact with information related to the circular economy and biotechnological applications in the agro-industrial waste management sector, and to examine their associated potential purchasing preferences. A total of 120 participants took part in this study (37.5% men, 62.5% women). The 120 participants came from the following regions: 34.2% Lesvos (all from Lemnos) 15.0% Athens, 21.7% Thessaloniki, 7.5% Thessaly, 4.2% Peloponnese, 6.7% Heperus, and 10.8% from the rest of Europe. The questionnaire was split into section A and B (Part 1, Part 2a, Part 2b).

Table 1. Structure of the questionnaire.

Examining the public's familiarity with the conceptual meaning of sustainable development	
Section A	
Questions	<p>Sustainable development/green development, bioeconomy</p> <p>1/3 of the food produced worldwide is turned into waste</p> <p>Food waste is a source of pollution for the environment (CO₂, destruction of the sea, lakes/rivers, soil, atmosphere, bad/toxic smells, etc.)</p> <p>Can food waste be used to produce new products with high added value?</p> <p>The EU has created frameworks within which practical changes/compliances are envisaged for a greener society. These changes are considered necessary because the intensive destruction of the environment has and will have devastating effects on the environment</p>
Possible answers	Yes, No, Else
Section B	
Part 1: Investigating the degree of interaction with the placement that was given to the participants	
Question:	<p>The information on the circular economy/bioeconomy/green development as far as I can find it from the media is sufficient for me</p> <p>I get a lot of information about the circular economy/bioeconomy/green development from public bodies such as municipalities, schools, universities, organizations, and any public institutions that can provide it to me</p> <p>I believe that the application of frameworks to promote circular economy/sustainable economy/green development is a key issue in our society, and requires immediate implementation</p> <p>I believe that I am not most directly involved in the practical implementation of circular economy/bioeconomy/green development policies</p> <p>I believe that the practical applications of circular economy/bioeconomy/green development come with negative impacts such as speculation, misinformation, expediency, etc.</p>
Possible answers	Totally disagree, Disagree, Neither agree nor disagree, Agree, Totally agree
Part 2a: Qualitative and quantitative study of citizen satisfaction and changes in various consumer parameters	
Questions	Would you be willing to pay more to acquire a product (of the order of <20–30%, 30–50%, 50–80%, 80>%), than another of the same category, which is (or a component thereof) produced within the framework of the circular economy?
Possible Answers	Yes, No, I would like to but I have to consider the cost
Part 2b: Note your opinion on a scale of 1–10, with 1 being the least agreement and 10 being the most agreement	
Questions	<p>I would buy a food that itself or some of its ingredients come from biotechnological production processes</p> <p>I support the consumption of products or food ingredients using biotechnology methods and would buy a product to do so</p> <p>I believe that the products or food ingredients produced via biotechnological methods of processing food waste are of inferior quality (in terms of nutrients, taste, aroma, etc.)</p> <p>If I knew that a leisure facility (e.g., restaurant or hotel) contained one or more ingredients produced by bioengineering food waste in one or more of the dishes they offer, I would choose to eat there</p> <p>Manufacturing products or food ingredients using biotechnological methods is relatively new and scares me</p> <p>I consider biotechnological applications in the field of food waste to be necessary for people and society, and think that they will have applications in everyday life in the future</p>
Possible Answers	Disagree to Agree (1–10)

3. Result

Results of the participants' answers are shown in Table 2 and Figures 1–7.

Table 2. Results of the participants' answers.

Statement	Yes (%)	No (%)	Else (%)
Sustainable development/green development, bioeconomy	87.6	11.2	1.1
1/3 of the food produced worldwide is turned into waste	74.2	25.8	0.0
Food waste is a source of pollution for the environment (CO ₂ , destruction of the sea, lakes/rivers, soil, atmosphere, bad/toxic smells, etc.)	88.8	11.2	0.0
Can food waste be used to produce new products with high added value?	84.3	15.7	0.0
The EU has created frameworks within which practical changes/compliances are envisaged for a greener society. These changes are considered necessary because the intensive destruction of the environment has and will have devastating effects on the environment	89.9	10.1	0.0

Statement	Totally disagree (%)	Disagree (%)	Neither agree or disagree (%)	Agree (%)	Totally agree (%)
The information on the circular economy/bioeconomy/green development as far as I can find it from the media is sufficient for me	18.0	48.3	22.5	9.0	2.2
I get a lot of information about the circular economy/bioeconomy/green development from public bodies such as municipalities, schools, universities, organizations, and any public institutions that can provide it to me	11.2	51.7	24.7	12.4	0.0
I believe that the application of frameworks to promote circular economy/sustainable economy/green development is a key issue in our society, and requires immediate implementation	28.1	6.7	7.9	55.1	28.1
I believe that I am not most directly involved in the practical implementation of circular economy/bioeconomy/green development policies	9.0	22.5	37.1	23.6	7.9
I believe that practical applications of circular economy/bioeconomy/green development come with negative impacts such as speculation, misinformation, expediency, etc.	4.5	32.6	38.2	20.2	20.2

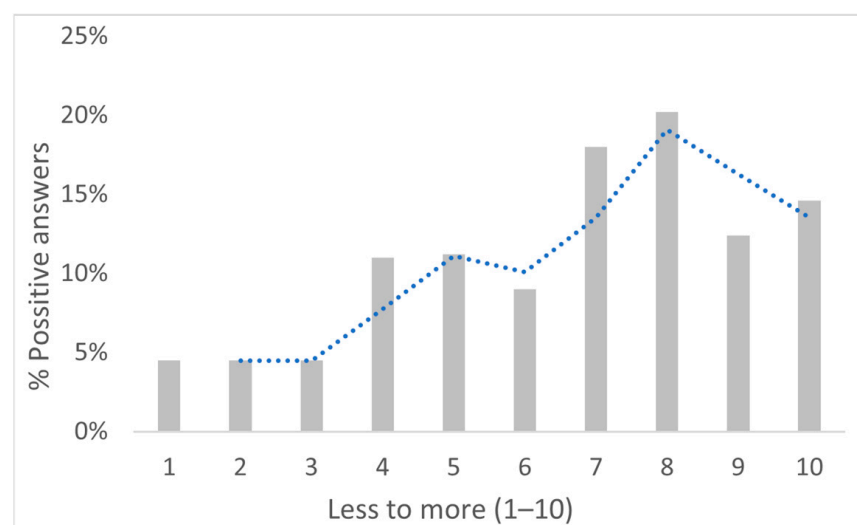


Figure 1. I would buy a food that itself or some of its ingredients come from biotechnological production processes.

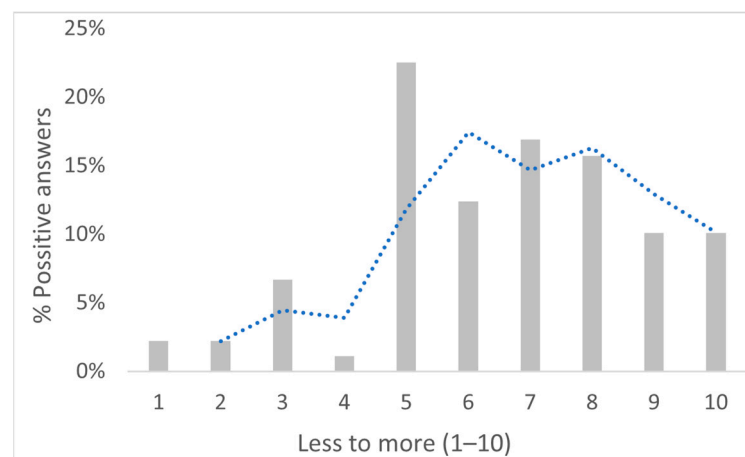


Figure 2. I support the consumption of products or food ingredients using biotechnology methods and would buy a product to do so.

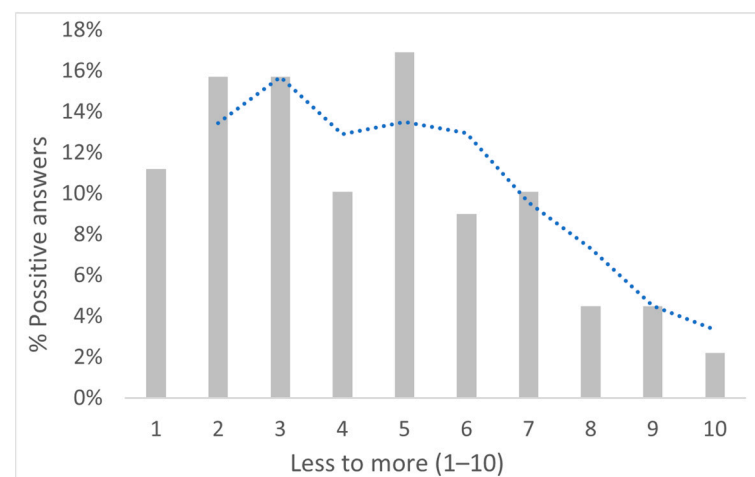


Figure 3. I believe that the products or food ingredients produced by biotechnological methods of processing food waste are of inferior quality (in terms of nutrients, taste, aroma, etc.).

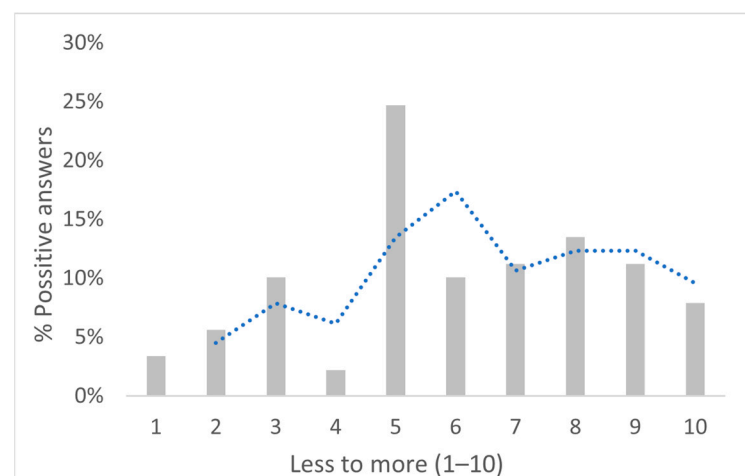


Figure 4. If I knew that a healthcare facility (e.g., restaurant or hotel) contained one or more ingredients produced by bioengineering food waste in one or more of the dishes they offer, I would choose to eat there.

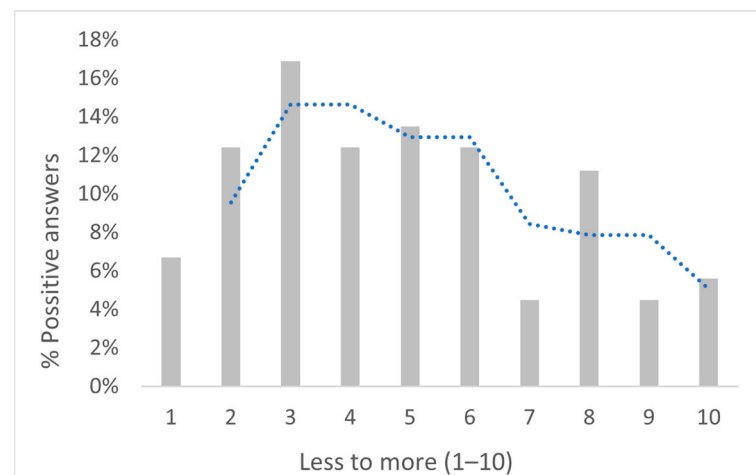


Figure 5. Manufacturing products or food ingredients using biotechnological methods is relatively new and scares me.

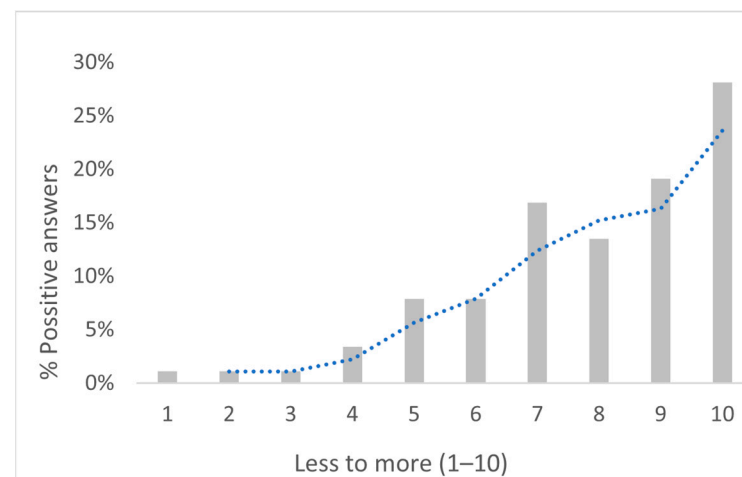


Figure 6. I consider biotechnological applications in the field of food waste to be necessary for people and society and see an application in everyday life in the future.

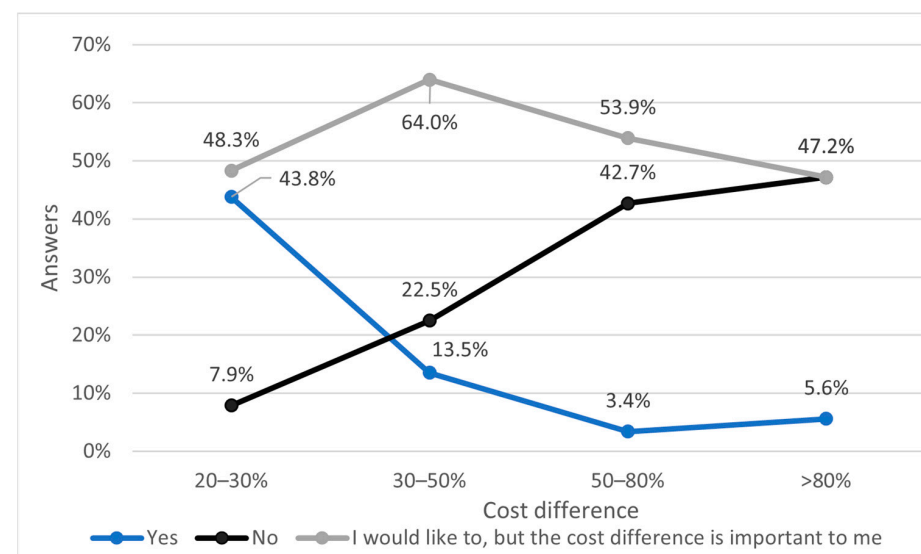


Figure 7. Would you be willing to pay more to purchase a product than another product in the same category that (or part of it) is manufactured as part of the circular economy?

4. Discussion and Conclusions

The answers produced quite interesting results. Most participants answered questions about their awareness of circular economy and bioeconomy positively (on average, 84.96%) (Table 2). Furthermore, results showed that participants (on average, 50%) did not think that the information they receive from local authorities (such as schools, media, etc.) is sufficient (Table 2). Some 55.1% of participants agree that the shift towards sustainability is crucial for our society and must be implemented immediately (Table 2). Figures 1–6 show the results of the questions which was included in section B (Table 1). Finally, 43.8% (the highest score) of participants would be willing to pay 20–30% more to purchase a product that is entirely (or partly) produced within the circular economy than another product in the same category; an average of 53.4% of them would like to pay more, but cutting costs is important to them (Figure 7). In conclusion, this study shows that most participants are aware of biotechnological applications for sustainability, etc., and would like to know more about these applications.

Supplementary Materials: The presentation materials can be downloaded at: <https://www.mdpi.com/article/10.3390/Foods2023-15030/s1>.

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Data Availability Statement: Data was obtained from each participant and are available upon request from <https://docs.google.com/forms/u/0/> with the permission of each participant.

Conflicts of Interest: The authors declare no conflict of interest.

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