From Food Waste to Sustainable Fashion: The Reaction of the Consumer to a New Circular Economy Perspective

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Abstract

The paper aims to analyze the circular economy and, in particular, the possibilities to reuse food waste to create innovation in the fashion industry. According to the UN's Food and Agriculture Organization, approximately one-third of all the food produced in the world becomes waste. The reduction of waste in the agri-food industry is one important goal. Finding innovative ways to use food waste for productive use, improves, on one side, sustainable development and, on the other side, creates new business models. The generation of waste can take place in every phase of the value chain, such as production, processing, distribution, food services, and finally domestic consumption. At the same time, also the fashion industry is affording the problem of pollution. It's the second-largest polluter in the world, just after the oil industry. To mitigate this problem the fashion industry is developing new solutions to change the image of a polluting industry to a regenerative industry. A circular business model can give a new life and a new value to what was previously considered a mere waste and cost, contributing to the reduction of waste generation. To understand the reaction of the consumer, a survey with fifteen questions was conducted and we had 266 participants. The questions are divided into three categories. The first category of questions is age-related (such as age, nationality, work, etc.)- The second category is based on purchasing behavior and on consumer habits. The last part of the survey is more focused on the re-use of food waste in the fashion sector. We analyzed the consumer awareness of the existence of the problems of the reduction of waste and we understood that there is still a long way to go to raise awareness and inform the final consumer. The over 55s are more focused on environmental problems at the time of a purchase than Generation Z, however, generation Z is declared to be the age group most informed about the existence of fabrics that reuse food waste. These data go against the trend.

Keywords

Circular economy; food; fashion industry; sustainability; waste.

Introduction: Food and Fashion, the connection

The food and fashion industries look so different, but they are very connected (Ritch, 2015). It's enough to think about *Made in Italy* to understand that they represent two excellences in the world. Both industries are involved in sustainability and they are implementing projects and concrete actions to start a transformation in their production and consumption models (Binotto & Payne, 2017). Reducing the waste generated by their processes is becoming a priority.

Using different food waste from different stages of food production can find new life in clothing. On the one hand, technology plays a fundamental role and, on the other, the increased interest in finding eco-sustainable materials (Shirvanimoghaddam, 2020). Todeschini et al. (2017) argue that fashion is a resource-intensive sector in which opportunities to reduce environmental impact and innovate business models abound (Pollifroni, 2012). In particular, models that have sustainability as a distinctive feature, especially in terms of a value proposition. Niinimäki (2017) also states that building a circular economy system requires a new level of system and radical innovations.

Great brands, both fast fashion, and high fashion have turned to start-ups and companies that produce innovative fabrics based on food waste, such as citrus fruits or from the wine chain promoting the circular economy (Gazzola et al., 2020a). From the cultivation of the banana plant in the Philippines and through a natural ecosystem that makes it possible not to use chemical treatments in the plant, a robust and ecosustainable fabric was born. Other examples are start-ups that have used waste from pineapple, apples, coffee, and even milk. An American company has created a natural fiber made with the same substance used to make mushrooms or the British project Bio-Trimmings where accessories from domestic food waste are created.

In the Netherlands, through the collaboration of various actors, a project was born to give new life to all the waste coming from chewing gum finished on the street, which every year reaches almost 1.5 million kg and has a period between 20 and 25 years to complete the biodegradation process. Thanks to the intuition of a young student who created a polymer made of recycled chewing gum for use in industrial training processes. In addition, a special container has been created where you can throw away your used chewing gum, which has been installed in the streets of the city. This waste is given new life by becoming the sole for sneakers. To produce 4 pairs of shoes you need 1 kg of gum. Or again in Mexico, they have managed to create a vegetable skin from the prickly pear leaf.

In this framework the paper analyses the circular economy and, in particular, the possibilities to reuse food waste to create innovation in the fashion industry. In the first part, the literature review on waste in food is developed. The second part is devoted to the quantitative analysis. The results of a survey with 266 participants are analyzed with the statistical descriptive method.

Literature review: the impact of food waste and the unsustainable fashion

Our current food production is certainly neither democratic nor sustainable. Increasingly longer, complex, and conformed globalized food chains have cut connections between ecological units that made food production the outcome of a healthy relationship with nature. Our economy lives by overshooting our planetary (Rockstrom et al., 2009), and social (Raworth, 2017) boundaries adopting a predatory and unrestrained approach that is wasting our shared home. But what is food waste? According to United Nations Environment Programme (2021), Food is defined as any substance, whether processed, semi-processed, or raw, that is intended for human consumption. "Food" includes a drink and any substance that has been used in the manufacture, preparation, or treatment of food. Therefore, food waste includes both: • "edible parts": i.e., the parts of food that were intended for human consumption, and

• "inedible parts": components associated with food, that are not intended to be consumed by humans."

Actually, the food industry produces an unsustainable amount of waste and all this leads to strong repercussions also on an environmental, economic as well as ethical level. (Rezaei & Liu, 2017). The production of food losses and waste is still too high, and this year the pandemic has certainly aggravated the situation rather than contributing to its improvement. The waste of food implies a cost (Nahman & de Lange, 2013).

"Food loss" and "food waste" are sometimes used as synonyms, but the meaning is different. "Food loss" normally is connected with the food lost in earlier stages of production such as harvest, storage, and transportation. "Food waste" is in relation to items that are fit for human consumption but thrown away, often at supermarkets or by consumers. The researches of FAO show, high-income countries discard food for 670 million tonnes and low-income countries for 630 million tonnes. The quantities are similar, but there is a major difference in where and how that loss occurs (FAO, 2011).

About one-third of the food produced globally is wasted in the food chain. This is a burden for the environment and an inefficiency of the total food system. Analyzing food waste is a priority on the global political agenda to guarantee food security (Corrado et al., 2019). The report of United Nations Environment Program 2021. estimates that food waste from households, retail establishments, and the foodservice industry totals 931 million tonnes each year. Nearly 570 million tonnes of this waste occurs at the household level. The report also reveals that the global average of 74 kg per capita of food wasted each year is remarkably similar from lower-middle-income to high-income countries, suggesting that most countries have room to improve.

According to the Ellen McArthur Foundation, inefficiencies in production and processing contribute 1.1 billion tonnes of waste per year. Food waste accounts for 40% of the total waste produced annually (MacArthut, 2013). A significant part of the food for food consumption is wasted throughout the supply chain, of which 32% of the global food supply is lost by weight, while 24% of the total worldwide food supply is

lost by energy content (calories) (FAO, 2011). In fact, nearly one-third of the food produced is not consumed and the increase of production to satisfy the global needs has created paradoxes; food is more caloric, but less nutritious and while 820 million people still suffer from hunger, 2.5 billion people are overweight or obese (FAO et al., 2019). In 2017, nearly 29 million people died from food excesses all over the world, while the deaths caused by undernourishment are quickly reaching 36 million (WHO, 2017). Another paradox reveals itself when we realize that, every year, we throw away food for an overall value of nearly 1,700 billion dollars, while nearly 267 billion dollars per vear could eliminate hunger in the world by 2030. It is an investment corresponding to 0.3% of world GDP (FAO, IFAD, and WFP, 2015) a reasonable amount if we think that the global food industry involves over one million people (FAO, 2017) and makes up for 10% of the total GDP equal to nearly 8 trillion dollars (van Nieuwkoop, 2019). Therefore, to stop these paradoxes and assure a future to 10 billion people who will live on Earth in 2050 (Population Reference Bureau, 2020), we must intervene and build a new narrative (Fassio, 2021) focusing on the overall well-being of people and the planet, recognizing their interdependence.

The causes of the environmental and economic impacts concern every single phase of the food chain, from production to final consumption, as it is necessary to take into account not only the actual food waste but also the use of resources such as land, air, and energy. As we will see, the issue is not only about the quantity that is produced, but also about how resources are exploited and how the product is distributed and then consumed (Garcia-Herrero et al., 2018). Although over the last few years we have seen an increase of initiatives and projects aimed at combating food waste, it does not indicate a strong improvement and continues to be an emergency that must be faced. Only this year, due to the pandemic and related travel restrictions and transport difficulties, there has been an increase in both food losses and food waste, reaching the 8% cause of greenhouse gas emissions (FAO,2020).

The food system is, in fact, responsible for nearly a quarter of the global greenhouse gas emissions (IPCC, 2014); the exploitation of the natural system for food purposes is one of the main causes of habitat destruction and global warming change (Grooten & Almond, 2018); agriculture is the first sector for the water use, reaching 70% of the global consumption (FAO, 2014) and, thanks to these three modes of action, it contributes to overpassing 4 out of 9 thresholds determining Earth limits (Rockstrom et al., 2019).

Stimulating the reduction of waste in the food chain for a company means being able to increase its efficiency along the value chain as well as having reduced costs both for the company itself and for consumers. It could also lead to limiting competition on water and land resources in middle-income countries, making them usable in other ways. At the European level in 2010, only 40% of the waste produced is given new life, the rest is taken to landfill and then burned (Eurostat, 2010). In 2018 in the European Union, 38.5 % of waste was landfilled and 37.9 % were recycled. 5.2 tonnes of waste were generated per EU inhabitant in 2018 (Eurostat, 2018)

The European Commission has taken several actions to contribute to a transaction towards greater waste efficiency (European Commission, 2020). Among the actions

are: Encouraging the trade of secondary and recycled materials with the inclusion of tax reliefs; Setting again what are the goals that the EU had set itself in terms of recycling to transform itself into an economy built on reuse and reuse. Other actions concern the inclusion of a minimum percentage of second-hand substances, with also criteria of recyclability and through the use of the financing deriving from the EU budget give precedence to the years at the top of the waste pyramid, specified by the waste framework directive. Optimization in waste regulation brings considerable advantages such as more efficient use of resources, increased employment through the expansion of markets, and, of course, reduced impacts on our planet (Ruiz, Ramón & Domingo, 2020).

The current geopolitical challenge of our food system is that of revolutionizing its production model starting from correct management of natural capital connected to the economic and cultural one, respecting planetary boundaries, and offering at the same time a fair space to civil society (Fassio, 2019). The complexity of the food system requires an interdisciplinary perspective defining the characteristics of a regenerative economic paradigm. We must embrace wholeheartedly the ambition to reconnect our economy to ecosystem balance sustaining life on our planet which humankind is devouring with incredible voracity. In other words, it means starting from avoiding compromising the relationship with the best provider (Nature) of raw material known to humankind (Lovins, Lovins, & Hawkeyes, 1999), moving from a linear economy based on apparent abundance and accessibility to a tailor-made economy fairly distributed, borne out of affective intelligence. To tackle this emergency, our food system must once again give the right importance to relational goods, acting locally but with a global perspective shared by all. Starting from food, developing an economic paradigm shift towards circularity means refocusing on communities, quality of connections, and substance of behaviors (Petrini, 2016).

The fashion industry is one of the sectors with the highest environmental impact globally, mainly due to the evolution of "fast fashion" (Mishra & Malhotra, 2020). This business model has a high fashion design reproduced at a very low price, using often poor and unsustainable materials, for mass production (Ki, Chong, & Ha-Brookshire, 2020). The expansion of this sector has meant that the fashion industry is now responsible for multiple damages not only environmental (Moorhouse & Moorhouse, 2017) but also social: in fact, such low prices are to the disadvantage of textile workers in developing countries, who, in addition to disproportionate working hours and conditions compared to normally acceptable standards, minimum contributions are paid (Machado et al., 2019). Since 1996, the amount of clothes that are bought in the European Union per person has increased by 40%, precisely because of fast fashion which has caused a sharp drop in prices. This has led to a reduced perception of their value and as a result, if Europeans use around 26 kilograms of textiles each year, around 11 kilograms are thrown away and 86% of these end up in landfills or are burned (European Parliament, 2020).

Producing the conventional fabrics that we find in stores requires a very high amount of water: in 2015 alone the textile sector globally used about 79 billion cubic meters of water. To understand the extent of this data, it is sufficient to consider that 266 billion cubic meters of water are required for the total water needs of the European Union

economy (European Parliament, 2020). Just to produce a cotton t-shirt you have to use the amount of water necessary to give a person a drink for almost four years, that is 2,700 liters, while for a pair of jeans about 3,800 liters are needed. In addition, the water that is used for these items of clothing is contaminated during production and often returns to the local water system and also contaminates the surrounding area: 20% of water pollution in the world is caused by the textile industry. Polyester is responsible for 35% of the microplastics in the oceans that are released after purchase during home washes: a single washing machine loaded with polyester items can release up to 700,000 microplastic fibers. As for greenhouse gas emissions, the textile sector causes 10% of global emissions (Chinasamy, 2019).

More and more companies are joining the so-called revolution of materials, in which they want to focus on strong research on innovative methods of creating fabrics without causing negative effects on the environment (Brydges, 2021). According to a survey by McKinsey, 45% of the companies that participated want to integrate these fabrics (Amed et al., 2020).

Methodology

The quantitative part is based on the description, in detail, of the sample. To show the results the instrument of descriptive statistics was used. This technique is useful to describe the basic characteristics of the collected data (Fisher & Marshall, 2009). It is useful because it provides summary statistics and is used with graphical analysis, it constitutes the initial starting point for any quantitative data analysis (Cox, 1978).

A questionnaire was conducted to analyze the consumer's point of view, perception, and propensity towards the use of food waste for the fashion industry in the framework of the circular economy. Qualtrics software was used to carry out the survey. The survey was disseminated mainly through digital tools such as e-mail and Whastapp in November 2020. A total of 266 responses were collected, but only the questionnaires with all the complete answers will be taken into account, 48 questionnaires will be excluded, therefore. The data were collected during the same month. In the whole of the answers, there will be multiple-choice answers where it was possible to indicate only one choice. Others in which it is necessary to enter an evaluation according to a scale of preference indicated, which ranged from a minimum of 1 to a maximum of 5.

The total number of questions was fifteen from Q1 to Q15. The first category of questions is age-related (such as age, nationality, work, etc.), moving on to a second category based on purchasing behavior and consumer habits, and finally, more focused questions are submitted on the re-use of food waste in the fashion sector. The single questions are analyzed and described, for certain questions a methodology of crossed fields will be used, thus inserting one or more variables to be able to analyze in more detail the single aspects and to be able to analyze which are the characteristics of the consumer that most influence certain habits and behaviors. Finally, following the results obtained from the processing of the data of this research, a benchmarking will be carried out with the data reported above on other studies carried out, to verify whether there are points in common or not between the different reports.

The research questions are the following: RQ1: Are the consumer ready to buy environmentally friendly clothing? RQ2: What kind of consumers (gender, age) will buy garments made from food waste?

The characteristics of the sample

A cross-analysis has been done, inserting the age and gender variations to specifically understand the typo of the consumers.

Q.1 Gender

The first group of questions is about the personal data: 64.2% belong to the female gender, while the remaining 35.8% are represented by the male gender (Fig. 1). The results are in line with the research of Brough et al. (2016). Also, Gazzola et al. (2020b) highlighted the existence of a relationship between sustainability and femininity from a psychological point of view.



Q.2 Age

The age brackets have been divided into 4 categories:

- the under 25 years the Generation Z, characterized by being born in a period of economic crisis and high technological innovation. It is the next generation to enter the world of work, and it will be characterized by changing its methodology, both from the point of view of the method and as a consumer (Gazzola et al., 2020b);

- The Millenials or Generation Y, represent the highest number of people currently working, and are often called the "first digital natives", they manage to be smart with all kinds of technology;

- the 40-55-year-old, Generation X, occupy 33% of employment and are the pioneers of technological change (Gazzola et al., 2020b);

- the Baby Boomers over 55, those who have witnessed the demographic increase, the economic recovery, and the subsequent economic boom.

From the samples collected (Fig.2), the largest share is represented by the over 55s, while the under 25s, Generation Z represents the smallest percentage.



Q.3 Nationality



The survey was disseminated in Italy and a large percentage are Italians (Fig.3).

Q.4 Occupation

The question has been divided into 8 different categories including employees, self-employed, entrepreneurs and traders, trainees, students, retired people, and "other". Fig. 4 shows, that the employed workers are 30%, followed by self-employed workers who represent 27.65% of the totality of the samples.





Q.5 Annual income

The question provided multiple-choice answers with 7 different price ranges. From the graph below (Fig.5), it can be noticed that the highest percentage (30.37%) is represented by consumers with an income between $10.000 \in$ and $24.999 \in$.



The sustainable buyer

Q.6 How often do you read the labels inside the garments?

After analyzing more personal data, we now consider the second group of questions relating to consumer habits (Gazzola et al., 2018). With this question, we want to understand how careful and accustomed the samples are to reading the labels inserted in the garments. From the results it emerges that the media of the answers collected is identified with a score of 3.34, indicating that on average the samples are quite accustomed to reading the labels that are reported to the entire garment. In Fig. 6 a cross-analysis has been conducted, inserting the age and gender variations to specifically understand which are the consumers who are more used to reading the labels.

The majority of the samples that have declared never to read the labels are men, while as far as age is concerned, they are represented by samples under 25 years of age. On the contrary, those who declare to always read the labels are the samples over 55 years of age, and women are almost twice as likely to read the labels as men.

Answer		Q1: Gender			Q2: Age						
	Male	Female	Total	< di 25	25 - 39	40 - 55	> di 55	Total			
1=Never	7,6%	5,8%	6,4%	12,1%	9,0%	7,5%	1,3%	6,4%			
2	41,8%	15,1%	24,8%	36,4%	35,8%	12,5%	16,7%	24,8%			
3	20,3%	23,0%	22,0%	39,4%	19,4%	27,5%	14,1%	22,0%			
4	13,9%	26,6%	22,0%	6,1%	19,4%	27,5%	28,2%	22,0%			
5=Always	16,5%	29,5%	24,8%	6,1%	16,4%	25,0%	39,7%	24,8%			

Figure 6. Cross analysis with inclusion of age and gender variables (own re-elaboration)

Q.7 How often do you buy clothes?

In this question there are 5 different choices of purchase: every week, every fortnight, once a month, every 3/4 months, and finally every 6/12 months. From the samples analyzed (Fig. 7), it emerges that less than 2% of the samples purchase clothing every week.



Q.8 How relevant is the environmental aspect to you when buying a garment?

Only twelve of the 218 samples examined state that the environmental aspect is of little relevance during the purchasing phase, and on the opposite side of the evaluation grid, there are only 29 samples that state that this aspect is very relevant to them.



If we consider the value 3 (Fig. 8), which has the highest response rate, we can see a similarity between women and men. In the same way, if we analyze the age variable combined (Fig. 9) with the answer indicating the value 3, therefore at half of the two variables, there is an equal distribution among the different age groups, while if we go

to examine the higher value, we can find a clear prevalence of the over 55s on the importance of the consequences that the purchases have on the environmental impact. On different opinions are Dabija, Bejan, and Dinu (2019). They argue that members of Generation Z, unlike their parents and older brothers, belonging to Generation X and/or Millennials, have totally different behavior, being greener, sustainability-oriented, and tech-savvy,

Answer	Q1: Gender			Q2: Age						
	Male	Female	Total	< di 25	25 - 39	40 - 55	> di 55	Total		
1=little	7,6%	4,3%	5,5%	15,2%	4,5%	0,0%	5,1%	5,5%		
2	29,1%	25,2%	26,6%	39,4%	37,3%	22,5%	14,1%	26,6%		
3	34,2%	31,7%	32,6%	21,2%	35,8%	35,0%	33,3%	32,6%		
4	21,5%	22,3%	22,0%	24,2%	19,4%	25,0%	21,8%	22,0%		
5=very	7,6%	16,5%	13,3%	0,0%	3,0%	17,5%	25,6%	13,3%		

Figure 9. Cross analysis with inclusion of age and gender variables (own re-elaboration)

Q.9 Would you be more inclined to buy environmentally friendly clothing?

The question aims to analyze whether and to what extent the consumer would be more willing to buy a particular item of clothing, knowing that it has been made using a production process with low environmental impact and non-polluting materials that respect our planet. From the data collected (Fig.10), it can be seen that as many as 90 samples declared that they are hypothetically very inclined to buy a garment that is committed to safeguarding our planet, while only 7 samples were found to be unwilling to buy this type of consumption habit.



Figure 10. Propensity to purchasing respecting the environment (own re-elaboration)

Concerning the gender in Fig. 11, taking the answer with the highest value, we can notice a majority of the female gender. As far as age is concerned, analyzing the

answers related to the highest value, we find the over 55 age group with the highest percentage followed by the under 25 samples.

Answer		Q1:Gender			Q2: Age						
	Male	Female	Total		< di 25	25 - 39	40 - 55	> di 55	Total		
1= Little	5,1%	2,2%	3,2%	[3,0%	3,0%	2,5%	3,8%	3,2%		
2	3,8%	5,8%	5,0%		3,0%	7,5%	5,0%	3,8%	5,0%		
3	21,5%	17,3%	18,8%		36,4%	22,4%	7,5%	14,1%	18,8%		
4	38,0%	28,1%	31,7%		18,2%	29,9%	47,5%	30,8%	31,7%		
5= Very	31,6%	46,8%	41,3%		39,4%	37,3%	37,5%	47,4%	41,3%		

Figure 11. Cross analysis with inclusion of age and gender variables (own re-elaboration)

Q. 10 Do you know the eco-friendly fashion world?

The average of the answers results to have a value of 2. 53, which means that most of the samples have a scarce/moderate knowledge of this world. 71 respondents responded that they have very limited knowledge of the sustainable fashion world, and only 17 consumers surveyed have a high awareness of its existence (Fig.12).



Figure 12. Knowledge about the world of sustainable fashion (own re-elaboration)

The propensity of the buyer to textiles made from waste produced by the agro-food chain

Q.11 Do you know of the existence of fabrics made from the food industry?

The following questions want to explain if consumers are aware of textiles made from waste produced by the agro-food chain. 67 samples indicated a value of knowledge equal to 2, corresponding therefore to a reduced knowledge of this, while only 17 have a full awareness of it. In Fig. 13, considering the answers containing the value n. 2, it is

possible to notice a preponderance of the female gender compared to the male gender and among those who have scarce knowledge of this world.

Answer	Q1: Gender			Q2: Age						
	Male	Female	Total	< di 25	25 - 39	40 - 55	> di 55	Total		
1= Little	21,8%	29,5%	26,7%	18,2%	24,2%	27,5%	32,1%	26,7%		
2	28,2%	32,4%	30,9%	24,2%	37,9%	37,5%	24,4%	30,9%		
3	29,5%	14,4%	19,8%	30,3%	13,6%	10,0%	25,6%	19,8%		
4	12,8%	15,8%	14,7%	15,2%	12,1%	17,5%	15,4%	14,7%		
5=Very	7,7%	7,9%	7,8%	12,1%	12,1%	7,5%	2,6%	7,8%		

Figure 13. Cross analysis with inclusion of age and gender variables (own re-elaboration)

Q.12 Would you buy garments created with materials from the recycling of citrus fruits?

The aim was to investigate whether consumers would be inclined to buy textiles from the waste products of certain foods. The foods are oranges, grapes, and milk. The first question is about the use of citrus fruits. The data show that 91% of consumers replied that they would buy these types of fabrics and only 8% said that they would not buy garments made with waste citrus fruits. In Fig.14 if we consider who answered yes, the female gender prevails a little over the male gender, while as far as the age variable is concerned, a fair distribution between the different groups can be observed. Compared to the samples that gave a negative answer, it is found that males are almost double the females, while Generation X is in a slight majority compared to the others.

Answer	Q1: Gender				Q2: Age						
	Male	Female	Total	< di 2	5 25 - 39	40 - 55	> di 55	Total			
Si	88,6%	93,5%	91,7%	90,99	6 93,9%	90,0%	91,0%	91,7%			
No	11,4%	6,5%	8,3%	9,1%	6,1%	10,0%	9,0%	8,3%			



Q.13 Would you buy garments created with materials from the recycling of grapes?

The percentage remains unchanged compared to the previous question, in fact, even here it can be noted that 91% of the sample responded positively, while 8% of them are not inclined to purchase garments produced with materials that use grape waste.

Q.14 Would you buy garments created with materials from milk recycling?

Unlike the two previous answers, this one found some difference in the percentage of affirmative and negative answers. In fact, from the data processing, it appears that 14% (previously 8% in both cases) stated that they would not be prepared to buy clothes made from materials derived from the reuse of milk waste, while 84% answered in the affirmative. From the cross-analysis, concerning the affirmative

answer, there is a slightly higher percentage of the female sex than the male sex, while concerning the age variable, the respondents that are more inclined to purchase materials from milk waste are those aged between 25 and 39 years. If instead the answer "no" is analyzed, the male gender is less predisposed than the male gender. (Fig.15).

Answer	Q1: Gender				Q2: Age						
	Male	Female	Total	Ι	< di 25	25 - 39	40 - 55	> di 55	Total		
Yes	81,0%	87,8%	85,3%	ſ	81,8%	91,0%	82,5%	83,3%	85,3%		
No	19,0%	12,2%	14,7%		18,2%	9,0%	17,5%	16,7%	14,7%		

Figure 15. Cross analysis with inclusion of age and gender variables (own re-elaboration)

Q. 15 Would you be willing to pay a premium price?

The last question in this survey is aimed at understanding whether consumers would be willing to pay a premium price for a product obtained from the reuse of food waste, with a low environmental impact and, above all, with a focus on safeguarding our planet. The data analyzed showed that as many as 41% of consumers surveyed would not be willing to pay a higher price for these products (Fig.16). As can be seen from the data below, as far as the affirmative answer is concerned, the female sex is more likely to pay a higher price than the male sex, while if we consider the age variable, who is more willing to pay a higher price is the age group between 40 and 55.

Answer		Q1: Gender			Q2: Age						
	Male	Female	Total		< di 25	25 - 39	40 - 55	> di 55	Total		
Yes	51,9%	62,6%	58,7%		45,5%	52,2%	72,5%	62,8%	58,7%		
No	48,1%	37,4%	41,3%		54,5%	47,8%	27,5%	37,2%	41,3%		



Conclusions

To answer the RQ1: "Are the consumer ready to buy environmentally friendly clothing?", we analyzed the consumer and we understood that there is still a long way to go to raise awareness and inform the final consumer. Concerning the RQ2: "What kind of consumers (gender, age) will buy garments made by food waste?", it is interesting to note that the samples questioned in this survey go a little against the mainstream from what could be expected and from the analysis of the literature. In fact, from the processing of the data of this survey, we can see a focus on environmental problems at the time of purchase more in the over 55s and on the contrary, who is less attentive is Generation Z. The latter, however, declared to be the age group most informed about the existence of fabrics that reuse food waste. These data go a bit against the trend if we remember that several studies mentioned above showed that Generation Z and Millennials were the most attentive to these aspects.

To conclude, we can say that surely if the same survey had been administered a few years ago we would not have had the same results. Consumer behavior is changing, but consumers need to be informed and this must be done first of all by providing them with the necessary tools, and secondly, a more targeted intervention by institutions, companies, or the brands themselves is needed to effectively communicate the issues and related problems, but above all, as we consumers can help our planet through our actions and good consumer habits. On the one hand, companies must include the circular economy in the strategy, on the other, consumers must be careful and prepared. It is therefore important to know the perceptions of consumers regarding their behavior and sustainability (Hu et al., 2019).

In conclusion, empathy, listening, debating, reciprocity, and circularity are the values that we must adopt to get out of this destabilizing crisis, both for us and the context in which we live. The agri-food industry, as well as the textile industry, can amply contribute to the development of this paradigm and new opportunities can come from involving all the steps and players of the food and dress system, from production to distribution as far as consumption and final disposal. Regardless of the company's size, it is paramount to adopt a systemic-circular approach (Meadows, 2009) to meet new needs. A modus operandi based on interconnection and taking advantage of the potential offered by connecting different situations with the desire to optimize resources and processes, sharing objectives, improving employment, competitiveness, innovation, market positioning, creation of social-economic value. Our consumer society is based on permanent dissatisfaction, on promises that must be constantly broken to generate new ones: without the ongoing frustration of desires, consumer demand could run dry and markets lose momentum. It is against this scenario that we must create a new meeting point between cultures, which through action and information can share the responsibility for sustainable development. A round table in which both businesses and consumers must take part, to create benchmarks and solutions based on science that can really support this necessary economic paradigm transition towards a circular economy. The objective is to identify common interests starting from an increasingly complex understanding of players, to generate proposals going beyond our well-established habits, which are the worst hindrance to experimenting with new development models.

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