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TOWARDS SUSTAINABLE CONSUMPTION: QUANTITATIVE INSIGHTS INTO CONSUMER BEHAVIOUR ON CIRCULAR FOOD PRODUCTS

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Abstract:

The concept of Circular Food Products, focusing on sustainability and waste minimization throughout the production and consumption cycle, has garnered significant attention recently. This research aims to provide empirical insights into factors influencing consumer behaviour regarding sustainability in the food industry. Using quantitative analysis techniques such as the questionnaire to measure attitudes, preferences and behaviours among consumers, and employing structural modeling for the collected data, the study yields important findings that advance knowledge in sustainable food consumption. These findings promote environmentally friendly and socially responsible practices within the food industry and among consumers. One key finding is the low level of consumer awareness about circular food products and their benefits. Perceptions varied, with some viewing these products as innovative and eco-friendly, while others considered them inferior to conventional products. This suggests the need for effective marketing campaigns to shape consumer awareness and perception of circular food products. Additionally, the research highlighted varying levels of awareness regarding the environmental impact of food production and consumption, with some consumers demonstrating strong concern for sustainability. These insights underscore the importance of targeted marketing and education to enhance consumer understanding and acceptance of circular food products, ultimately supporting the shift towards more sustainable consumption patterns.

Key words: sustainability concerns; consumer behaviour; circular economy; Circular Food Product; structural equation modelling.

1. Introduction

Change is a global trend that affects all aspects of life, including consumption patterns (Whitmarsh et al., 2021) and behaviours (Teixeira et al., 2021; Yilmaz, 2023). It manifests itself in diverse ways, such as in terms of intensity, pace and scale, at micro, meso, and macroeconomic levels.

Sustainable consumption represents a paradigm shift in consumer behaviour, emphasising the quality and longevity of products over the quantity consumed (Hojnik et al., 2019; Antonides, 2017). This approach seeks to meet consumer needs without compromising the integrity of natural resources and environmental well being. By adopting a sustainable model of consumption, it serves as a cornerstone of the circular economy (Lang et al., 2023), a paradigm shift in resource management that seeks to minimise waste and maximise resource utilisation.

The research topic is highly relevant, focusing on the intersection of consumer behaviour and sustainable consumption. According to researchers, the integration of consumer behaviour with sustainable consumption is feasible (Moschis, 2020), but it necessitates a shift from the common perception of "less" which is frequently linked to sacrifice and restrictions. Instead, a more optimistic and empowering approach is essential. This approach should leverage technology to transform and improve consumer lifestyles while reducing environmental impact (Spangenberg & Lorek, 2019).

One of the greatest challenges the world is facing is building a better food system, capable of sustaining and ensuring food products for a population in continuous development. At the same time, the increasing pressure on sustainability puts a great strain on environment and social dimensions (Fassio & Chirilli, 2023) the food industry finding itself in the situation of needing to develop circular food systems, meaning different means moving towards a food system that builds natural capital, allows nature to thrive and prevents food waste. In these conditions, the transition towards circularity emerges as a necessity of the contemporary economic reality that must be applied at all levels, with the aim of achieving sustainable development. At microeconomic level the transition to a circular economy requires the adoption of greener production and ecological design (Quintás et al. 2018), while at macroeconomic level the transition to a circular economy indicates the quality of consumption models that has an influence on environmental impacts (Van Bussel et al. 2022).

In some studies (Konuk, 2019; Ateş, 2021; Teng & Wang, 2015) the prominence of food and the perceived environmental benefits of these circular food products have been recognized as positive predictors of purchase willingness. Do Canto et al. (2021) classify circular food behaviours into linear, transitioning, and circular categories, with circular behaviours driven by long term sustainability goals and high consumer engagement. Fogarassy et al. (2020) identify segments within the Hungarian food market that are more inclined to participate in circular systems, particularly highly educated, conscious, and affluent young consumers. De Bernardi et al. (2023) underscore the importance of consumer behaviour in the transition to circular food systems, highlighting the need for further research in this domain.

Once analysing the specialised literature and observing that there are multiple elements that constitute factors that influence consumer behavior, our research goal is to identify the factors influencing consumer behaviours regarding sustainability in the food industry and moreover exploring the correlations between the identified factors.

To achieve this goal Structural Equation Modelling (SEM) is applied on quantitative questionnaire in order to examine consumer behaviours related to sustainability in the food industry. The main contributions of this article are outlined as follows: it stands out as one of the few scientific studies to examine the relationship between consumer behaviour and the consumption of circular food products, focusing on the influencing factors. These insights have the potential to impact a wide range of stakeholders, including food producers, manufacturers, retailers, governments, policymakers, investors, and consumers. Additionally, the article introduces the concept of Circular Food Product, combining organic and green food, and analyses the variables affecting consumer behaviour towards it.

2. Literature review and the perspectives offered by authors on the concepts

2.1. Introducing the concept of Circular Food Products

Recent food production systems emphasize food security and resource conservation through organic and green food products. Organic foods are grown without synthetic chemicals, genetically modified organisms (GMOs), or irradiation, focusing on soil health, biodiversity and sustainability. Green food products employ eco-friendly practices across the supply chain including consumption (Woo & Kim, 2019; Kamalanon, et al., 2022). To support the transition to circularity, this paper introduces the concept of Circular Food Product (CFP), which aims to create a closed-loop system that minimizes waste and maximizes resource efficiency throughout the entire food supply chain.

The proposed definition of the concept highlight the significance of the behavioural premises of modern food consumers and explicitly broadens the objectives and strategies of companies in the food industry. A focus on social and environmental aspects will minimize the environmental impact throughout the product's lifecycle, from production and consumption to disposal.

The following notations have been used:

CFP - the concept of Circular Food Products;

P - the identified sufficiency predicates;

M - the sufficiency predicates, where: $M = \{P_1, P_2, \dots, P_n\}$, n - natural number.

The following logical sufficiency predicates are considered for the concept of CFP:

P1. It is a concept that can be used and evaluated at food industry level;

P2. It is the output of a circular food system;

P3. It is in direct dependence with all the components of the food supply chain including production, processing, packaging, distribution, consumption and recycling;

P4. It responds to the sustainable and responsible behaviour of the modern consumer;

P5. It reflects the requirements and expectations of sustainable and responsible consumption behaviour;

P6. Generate food industry resilience to thrive in the long term, taking into account the limited nature of resources.

Consequently, CFP can be defined as the outputs of a circular food system, directly dependent on all components of the food supply chain, including production, processing, packaging, distribution, consumption, and recycling. These products respond to the sustainable and responsible behaviour of the modern consumer, who supports a circular food system. Their characteristics reflect the requirements and expectations of sustainable and responsible consumption behaviour, ultimately enhancing the food industry's resilience and long term viability.

From a formal point of view the following logical expression of CFP can be written:

$M(CFP) = \{P1, P2, P3, P4, P5, P6\}$, where $M(CFP)$ is the crowd of sufficiency predicates of CFP.

An integrated approach that provides a comprehensive understanding, which includes enablers, such as legal framework, innovation, digitalization, but also barriers (cultural, regulatory, economic and technical), regarding how to create CFP and the impact on the three dimensions of sustainability, that meet the requirements and expectations of the modern consumer (which determine its behaviour towards the consumption of circular food products) is emphasised in Figure 1.

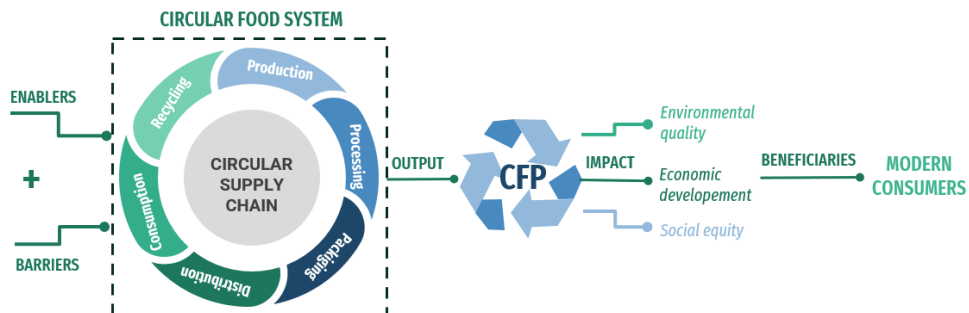


Figure 1. An integrated approach of CFP concept

Source: authors' conceptualisation

2.2. Factors influencing the behaviour towards Circular Food Products

Understanding consumer awareness and perception of CFP is crucial for addressing food industry challenges. Awareness involves knowledge of circularity principles like waste reduction, while perception relates to the value and benefits of CFP. In theoretical studies, the feasibility of involving consumers in closed loop models aligned to the circular economy is examined (Borrello, 2017).

Cattaneo et al., (2019) highlighted the role of education and information in shaping positive attitudes towards food by products. However, Sousa et al. (2021) and Sijtsema et al. (2019) noted a lack of clear understanding and low awareness of the circular economy concept among consumers, suggesting a need for greater promotion and dissemination of information. These findings collectively suggest that increasing consumer awareness and understanding of CFP can positively impact their consumption behaviour. Historically,

humans understood resource moderation, but modern efforts must focus on educating consumers about the circular economy to enhance acceptance and drive circular food consumption.

Acknowledgment of the critical role knowledge plays in promoting the adoption of circular food systems leads this research to explore the complex interplay between subjective norms and consumption characteristics which shape behaviour. Subjective norms, representing individuals' perceptions of others' expectations, significantly influence behaviour (Manning, 2011). This influence is particularly evident in online communities, where factors such as opinion leadership, self presentation, and enjoyment drive content contribution (Teichmann et al., 2015). However, the relationship between subjective norms and behaviour can be complex, as it is influenced by factors such as social motivation and interpersonalness. Furthermore, the interaction of consumption characteristics, such as product enjoyment and importance, can moderate the relationship between norms and behaviour (Lee et al., 2009). Lastly, do Canto (2021) categorised circular food behaviours as part of a systemic circular economy view, emphasising the importance of communication and consumer education.

Health motivation is another significant factor in consumer behaviour due to the growing interest in healthy eating patterns in society (Profeta et al., 2021). Health consciousness is the main determinant for the rising preference on organic food (Rehman et al., 2023). The multifaceted concept of health encompasses diverse scientific perspectives, as health is perceived through nutritional aspects, such as functional foods and non-GMO choices, and food safety considerations (Petrescu et al., 2019). Health consciousness and past experiences positively impact attitudes and repurchase intent for organic grains, while trust and willingness to pay also play key roles (Thanki et al., 2022).

Consumer perceptions of food quality, influenced by factors like geographical origin and scientific knowledge, are crucial in purchasing decisions, impacting health and the environment (Petrescu et al., 2019; Sadilek, 2019). Ghvanidze et al. (2016) underscored the significance of perceived consumer effectiveness in influencing the use of food product information, particularly in relation to environmental and ethical concerns. These findings collectively suggest that addressing the awareness and perception of consumers regarding CFP' quality and health concerns is crucial in shaping their consumption behaviour.

Scientific studies have consistently shown a positive correlation between sustainability awareness and proenvironmental behaviour (Cogut et al., 2019). This relationship is further influenced by individual attitudes and perceptions, with strong proenvironmental attitudes being associated with sustainable consumption (Wang, 2017).

Consumer food waste issue is significant, especially in developed countries (Aschemann-Witzel et al., 2015). Sustainable food packaging, such as recyclable or reusable options, can help reduce this waste and protect the environment (Guillard et al., 2018). Attitudes towards eco-friendly living, pollution, shopping habits, and leftover reuse routines influence consumer behaviour (Stancu et al., 2016). Choosing CFP and sustainable packaging supports sustainability and environmental protection, driving the shift towards circular food consumption.

In recent years, there has been an increasing awareness and concern about sustainability issues related to food production and consumption (Anaissi et al., 2024). Consumers are now more conscious of the environmental impact of their food choices (Wijekoon & Sabri, 2021) and are actively seeking out CFP that align with their sustainability values. Recent research conducted by Mancini et al. (2017) identified a potential interest in sustainable behaviour but highlighted a lack of knowledge on how to achieve sustainability. Basha et al., (2023) reported a positive consumer stance towards transitioning to a circular economy, aligning with the principles of the Green Economy and Sustainable Development Goals. Consumers who prioritize sustainability prefer CFP over conventional options. They prioritize local and seasonal products, recyclable packaging, low-fat foods, traceability and origin. They invest in researching companies' sustainability practices, including packaging, waste management, and carbon footprint reduction (Mancini et al., 2017). These consumers also value nutrition, closely examining labels for sustainable and nutritious options. Economic, social, and environmental factors shape their behaviour, reflecting a commitment to personal health and planetary well-being.

There are also concerns about the influence of marketing strategies on consumer choices and highlights of the need for interventions to promote healthier food choices (Mendes et al., 2021). Despite acknowledged limitations, consumer trust in the standards and controls surrounding organic production methods, evidenced by willingness to pay premium prices, significantly influences their intention and actual purchase of these foods (Aker et al., 2023). Food standards, regulations, and governments and organisations involvement to promote accessibility of CFP are also powerful drivers in conducting sustainable consumer behaviour. There is an even more complex approach regarding consumer response to laws, rules, regulations, and recommendations that Stewart & Scammon (2016) highlights in their investigations, suggesting that it may take many forms: advocacy, support, compliance, adherence, rejection, compensation, or rebellion.

There are also other drivers that can influence consumer behaviour such as rewards, discounts, gifts and other extrinsic incentives that can increase desired behaviours and positive habits towards certain categories of products (White et al., 2019). Promoting monetary incentives such as rebates tiered pricing and discounts are important tools to encourage people to adopt and promote sustainable consumption behaviours (Wilhite & Ling, 1995).

Building upon the insights presented above on the multifaceted nature of consumer behaviour and its influence on sustainable consumption, this research will delve deeper by leveraging structural model analysis in order to identify the key factors that influence consumer engagement with circular food options.

3. Research methodology

3.1. Materials and Methods

The questionnaire method has been used in order to study specific behaviour towards CFP among consumers by gathering information from a sample of individuals. The information collected was processed by using a robust and widely acclaimed methodology tool, which is IBM SPSS AMOS 20, serving as a pivotal component in the framework of our

scientific inquiry utilising questionnaires as a quantitative research tool. Developed to facilitate Structural Equation Modelling (SEM), the hypotheses of this study were investigated by assessing the connections and dependencies among variables, shedding light on the underlying structures that shape this research conceptual framework model.

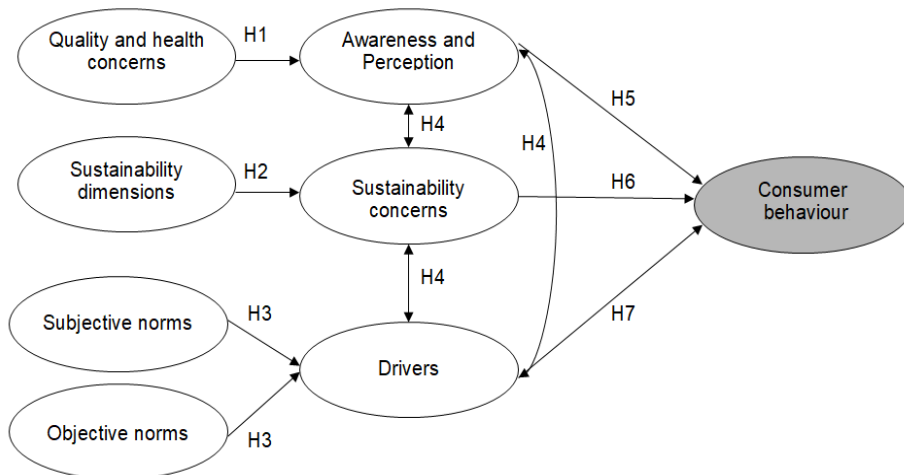


Figure 2. Conceptual framework model proposed for this research

Source: authors' conceptualisation

The relationships between constructs are modelled into a theoretical framework represented by the schematic diagram that suggests the hypotheses of interest to be tested, presented in Figure 2.

H1: Quality and health concerns are important aspects that positively influence awareness and perception of the consumer behaviour regarding CFP.

H2: Approaches addressing the economic, social, and environmental dimensions of sustainable development are crucial factors strongly influencing Sustainability Concerns.

H3 - When addressing motivation consumption factors as Drivers, subjective norms tend to be more influencing than objective factors.

H4 - Awareness and Perception, Sustainability Concerns and Drivers are directly linked and positively influence each other.

H5 - Awareness and Perception of the consumers regarding CFP has a positive impact on their behaviour.

H6 Sustainability Concerns of the consumers positively influence the consumer behaviour towards CFP.

H7. Drivers that conduct consumer preferences regarding CFP have a positive impact on their behaviour.

Through the application of IBM SPSS AMOS 20, we strive to enhance the precision and depth of our analysis, contributing to a more comprehensive understanding of the phenomena under investigation.

3.2. Questionnaire development and sampling

The structure of the questionnaire was designed to collect data considering the three-factor model proposed for this study, comprising measurement scale from 1 (Completely disagree) to 5 (Completely agree) for the entire variables on the conceptual model. The questionnaire also included investigations on the participants' socio-demographics which were very valuable for sample characterisation. The questionnaire was created using Google Forms, in Romanian language and distributed via chat communication channels (WhatsApp groups and e-mail).

The structure of the conceptual framework that stood as background for the questions in the questionnaire included 26 measurable variables (observed variables) that were divided into three constructs (latent or unobserved variables) as shown in Table 1.

Table 1. Structure of the variables considered in the conceptual framework model

Unobserved variables	Observed variables	Abbreviations
Awareness and Perception	Concern of seeking information about CFP	AP1
	Willing to pay extra for CFP	AP2
	Willingness to buy and consume CFP	AP3
	Willingness to discuss about pros and cons of CFP with family and friends	AP4
	Concern to promote the consumption of CFP	AP5
	Level of accessibility to information regarding CFP	AP6
	Level of understanding the circular economy in the food context	AP7
	Perception of CFP quality	AP8
	Perception of CFP safety for health.	AP9
Sustainability Concerns	Higher levels of price for CFP are justified due to their lower environmental impact	SC1
	Prioritising purchase of environmentally friendly food products	SC2
	Preoccupation for food waste while shopping	SC3
	CFP offer sustainability benefits	SC4
	Opting for CFP a means to support environmental protection and sustainability	SC5
	Opting to purchasing food items with recyclable or reusable packaging	SC6
	Social responsibility importance to contribute to sustainability through consumption choices	SC7
	Circular Food industry and promotion of its products contribute to new job creation	SC8
Drivers	Influence of education on understanding CFP	D1
	Importance of health concerns in shaping consumer food choices	D2
	Willingness to purchase CFP if they are readily available in consumer vicinity	D3
	Governments and organisations involvement to promote accessibility of CFP	D4
	Personal beliefs influence the choice to consume CFP	D5
	Previous satisfaction given by consumption of CFP	D6
	Influence of price in consumer decision to purchase CFP	D7
	Influence of discounts or bonuses on consumer propensity to purchase CFP	D8
	Past experience and positive feedback strongly impact decisions on consuming CFP	D9

Source: authors' work.

For the sampling method the simple random sampling was used in order to gather a random selection from the potential consumers without imposing any kind of restrictions. The data was collected throughout November - December 2023 and a number of 230 respondents agreed to send their answers, but only 229 were validated and processed due to missing data. The sample included individuals from different counties from Romania and their socio-demographics backgrounds are presented in Table 2.

Table 2. Socio-demographics background of the sample

Demographics	Category	No.	%
Gender	<i>female</i>	145	63.32%
	<i>male</i>	84	36.68%
Age (years)	<i>18-24</i>	97	42.36%
	<i>25-34</i>	48	20.96%
	<i>35-44</i>	38	16.59%
	<i>45-54</i>	23	10.04%
	<i>55-64</i>	18	7.86%
	<i>more than 65</i>	5	2.18%
Education	<i>Secondary school</i>	1	0.44%
	<i>High school</i>	73	31.88%
	<i>Bachelore degree</i>	80	34.93%
	<i>Master degree</i>	58	25.33%
	<i>Doctoral degree</i>	17	7.42%
Area	<i>Urban</i>	162	70.74%
	<i>Rural</i>	67	29.26%
Household monthly income (eur)	<i>under 200</i>	53	23.14%
	<i>200 - 400</i>	13	5.68%
	<i>400 - 600</i>	24	10.48%
	<i>600 - 800</i>	26	11.35%
	<i>800 - 1000</i>	31	13.54%
	<i>more than 1000</i>	82	35.81%

Created with Datawrapper

Source: authors' work.

The sample under analysis consisted of 145 females representing 63.32% and 84 men representing 36.68%. Regarding age, the majority of the respondents were in the age group: 18-24 representing 42.36 % of the total sample, followed by 20.96% for age group: 25-34, 16.59% for age group: 35-44, 10.04% for age group 45-54, 7.86% for age group 55-64, and only 2.18% for individuals over 65 years old. Education was also an important variable in considering the socio-demographics aspects of the sample, and after processing the questionnaires the information provided showed high levels of education for the majority of the respondents, 67.68% of them having higher education qualifications (34.93% with bachelor degree, 25.33% with master degree and 7.42% with doctoral

degree), 31.88% graduated highschool and only 0.44% graduated secondary school. Access and availability, awareness and education were considered when approaching the area of provenience of the sample, and the information provided showed that the majority were coming from the urban sector, meaning 70.74% of the respondents and only 29.26% represented the rural sector. Income levels can play a significant role in consumers' behaviour, making consumption choices more affordable for residents compared to rural areas where incomes might be lower, and from the data collected a consistent part of the sample, 35.81%, has a monthly income over 1000 euros, 13.54% have an income between 800-1000 euros, 11.35% have an income between 600-800 euros, 10.48 % have an income between 400-600 euros, 5.68% have an income between 200-400 euros, while respondents who have less than 200 euros represent 23.14%.

3.3. Model Framework

The purpose of this research was to test a model to understand whether the unobserved variables Awareness and Perception, Sustainability Concerns and Drivers influence the Consumers' Behaviour toward CFP. The mentioned constructs were introduced after a detailed literature review that focused on demonstrated theories testing consumer behaviour such as "The theory of reasoned action" (Hagger, 2019; Hale et al., 2002; Yzer, 2012), "The theory of planned behaviour" (Adabre et al., 2023; Hardeman et al., 2002, Kaiser et al., 2005; Sobaih et al., 2023); "The Value-Norm-Belief Theory" (Hardeman et al., 2002; Williams et al., 2021) and "The Attitude-Behaviour-Context Theory" (Dhir et al., 2021). The conceptualization of the latent variables in this proposed model considered the most relevant aspects that focus on the relationship between behavioural intentions and attitudes, subjective norms, level of knowledge and understanding of the new concept of CFP and main factors of consumption motivation that were introduced in the model as drivers.

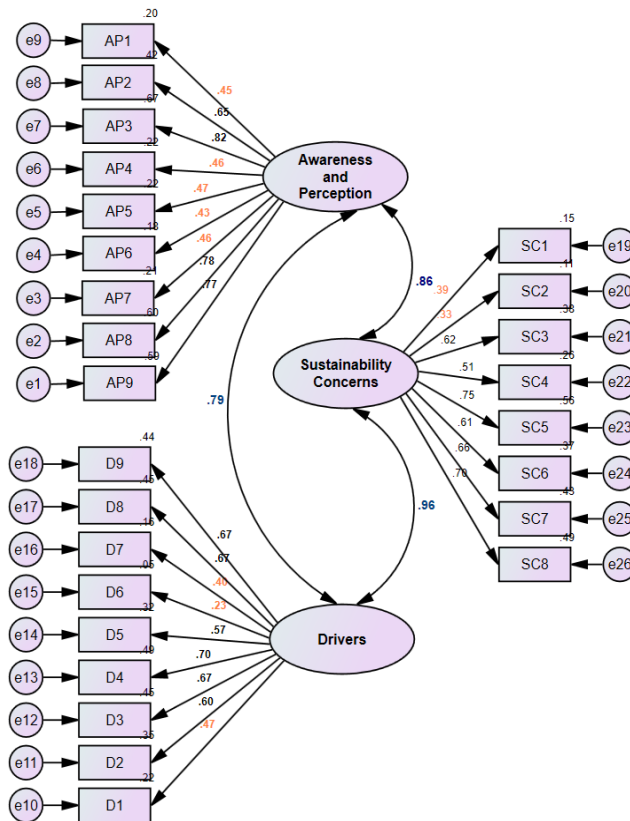


Figure 3. The conceptual framework of the research model

Source: authors' work in IBM SPSS AMOS 20

Confirmatory Factor Analysis (CFA) was computed using AMOS to test the measurement models and the obtained outputs for the proposed model suggest significant improvements by eliminating the observed variables that registered low factor loadings (<.50) within the constructs, referring to: AP1, AP4, AP5, AP6, AP7, SC1, SC2, D1, D6, D7.

Furthermore, model measurements were conducted to establish covariance and correlation estimations between the constructs. Analysing the output path diagram, model fit was assessed to enhance the model fit indices. In this direction, adjustments were made by examining the modification indices, succeeding to establish meaningful associations between variables not initially part of the hypothesized model. This process led to the refinement of the theoretical framework showed in Figure 4.

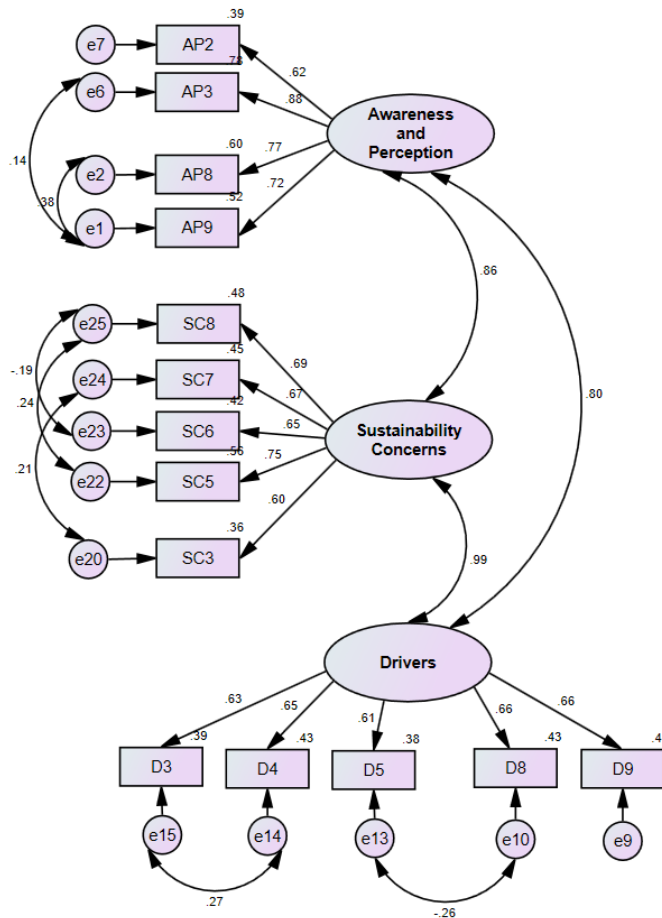


Figure 4. The framework for Model Fit Estimation

Source: authors' work in IBM SPSS AMOS 20

4. Results

Sensitivity analyses to the development of a more robust model fit have been conducted by assessing standardised residual covariance matrix of the observed variables, removing the values greater than 2. After all the steps that could have been implied in assessing model fit were performed, the new framework of the proposed model is captured in Figure 4.

For the construct measuring Awareness and Perception (AP), the remaining measurable variables are represented by Consumers' willingness to pay extra for CFP (AP2), interest to buy and consume these products (AP3) and consumer perception regarding the quality (AP8) and the safety concerns on health (AP9). When correlating awareness to the willingness of paying and consuming CFP means that consumers are aware of the benefits of these products as long as they have a positive perception regarding CFP quality and the health benefits. Beyond mere willingness to pay extra, willingness to buy and consume CFP involves actual purchase behaviour and consumption patterns. According to the information collected from the questionnaires consumers expect

CFP to be of superior quality to conventional alternatives. Assurance of safety for health is essential to building and maintaining consumer confidence in CFP, influencing their awareness and perception positively.

If we also consider the covariance indicator between AP and Sustainability Concerns (SC), it can be stated that consumers may express interest in sustainable options, as their actual buying and consumption behaviour demonstrate a deeper commitment to sustainability. If consumers perceive CFP as contributing positively to environmental sustainability, they may be more inclined to pay extra for them, which reflects their valuation of sustainability and environmental responsibility.

Sustainability concerns play a central role in shaping consumer awareness and perception towards CFP by highlighting the environmental (environmental protection and sustainability - SC5), social (Social responsibility - SC7, contribution to new job creation - SC8), and economic (food waste - SC3, recyclable or reusable packaging - SC6) benefits of transitioning to more sustainable food systems. As data processed showed, as consumers become increasingly informed and conscious of these issues, they are more likely to seek out and support CFP that align with their values and contribute to a more sustainable future.

Referring to the Drivers construct (D), the results obtained indicate that the most significant factors motivating consumer behaviour towards Circular Food Products (CFP) are influenced by a combination of factors. These include economic considerations such as availability (D3), price, and incentives (D8), as well as external influences like government and organizational involvement (D4), and personal values and beliefs (D5, D9).

Considering the covariances for the model provided, it is also important to underline that to some extent Awareness and Perception towards CFP are also influenced by various drivers, including price, discounts or bonuses, government and organisational involvement in promoting and ensuring accessibility to these products, and personal beliefs. Positive experiences with high quality CFP enhance consumer perceptions and contribute to increased awareness through positive reviews and recommendations.

The strongest connection observed among the underlying concepts seemed to be between Sustainability Concerns and Drivers, showing a consistently direct and positive relationship between them.

4.1. Results for Model Fit Statistics

The model fit measures were used to assess the overall goodness of the model fit (CMIN/df, GFI, CFI, TLI, NFI, SRMS and RMSEA) and all values were within their respective common acceptance levels as shown in Table 3.

Table 3. Model Fit Measurements

Model fit	Fit Indices	Recommended Value	Obtained Value
Absolute Fit	<i>Chi -Square (p-Value)</i>	Insignificant	.000
	<i>RMSEA</i>	< .08	.059
	<i>GFI</i>	> .90	.931
Parsimonious Fit	<i>CMIN/df</i>	<3	1.805
Incremental Fit	<i>CFI</i>	> .90	.964
	<i>TLI</i>	> .90	.951
	<i>NFI</i>	> .90	.924
	<i>SRMR</i>	< .08	.043

Source: authors' work.

4.2. Results for Construct Reliability and Validity

Construct Reliability was assessed using Composite Reliability (CR) by evaluating the extent to which a variable or a set of variables is consistent in what it intends to measure. The obtained values ranged from .780 to .841, above the .70 benchmark (Bentler, 1990) as presented in Table 4, confirming that construct reliability was established for each construct in the study. By using Average Variance Extracted (AVE) information about how much of the indicator's variance can be explained by the latent unobserved variance was provided (Gefen et al., 2000).

Table 4. Factor Loadings, Reliability and Convergent Validity

Items	Loadings	Composite Reliability	AVE
Awareness and Perception		.841	.570
AP2	.622		
AP3	.881		
AP8	.773		
AP9	.720		
Sustainability Concerns		.804	.452
SC3	.597		
SC5	.748		
SC6	.647		
SC7	.668		
SC8	.693		
Drivers		.780	.415
D3	.627		
D4	.654		
D5	.615		
D8	.659		
D9	.665		

Source: authors' work.

According to Hair Jr. et al. (2014) if the construct reliability is established for each of the constructs of a model, convergent validity (AVE) is valid even if it is slightly less than 0.50. Based on this knowledge and the obtained values of CR, ranging from .780 to .841 convergent validity has been accepted.

In order to support the robustness of the proposed model, discriminant validity or divergent validity was also addressed in order to validate the degree to which the

measures that should not be very highly correlated with each other are actually distinct (Collier, 2020). Discriminant validity in the study was assessed using Heterotrait - Monotrait (HTMT) Ratio, in order to examine the correlations of indicators across constructs (heterotrait) to the correlations of indicators within a construct (monotrait), by using the implied correlations matrix presented in Table.5.

Table 5. Implied correlations Matrix

	SC8	SC7	SC6	SC5	SC3	D3	D4	D5	D8	D9	AP2	AP3	AP8	AP9
SC8														
SC7	.463													
SC6	.346	.432												
SC5	.631	.499	.483											
SC3	.414	.526	.386	.446										
D3	.431	.416	.402	.465	.371									
D4	.450	.433	.419	.485	.387	.571								
D5	.422	.407	.394	.456	.364	.386	.402							
D8	.453	.436	.422	.488	.390	.413	.431	.251						
D9	.457	.440	.426	.493	.393	.417	.435	.409	.438					
AP2	.369	.356	.344	.398	.318	.311	.325	.305	.327	.330				
AP3	.523	.504	.488	.564	.450	.441	.460	.432	.463	.467	.548			
AP8	.459	.442	.428	.495	.395	.387	.404	.380	.407	.410	.481	.681		
AP9	.427	.412	.399	.461	.368	.360	.376	.353	.378	.382	.448	.680	.725	

Source: authors' work

HTMT Ratio is a multitrait-multimethod matrix that requires a value below .90 in order to establish discriminant validity between two reflective constructs. Hence, in our study all ratios were less than the required limit of .90 (Henseler et al., 2015), discriminant validity has been established, as shown in Table 6.

Table 6. HTMT Ratio Matrix

	Sustainability Concerns	Drivers	Awareness and Perception
Sustainability Concerns	-		
Drivers	.897	-	
Awareness and Perception	.820	.775	-

Source: authors' work.

Consumer behaviour towards CFP was incorporated into the Structural Equation Modelling framework in AMOS to provide a comprehensive understanding of the factors influencing it. By utilising three latent constructs - Awareness and Perception, Sustainability Concerns, and Drivers - the model aims to capture the multifaceted nature of consumer behaviour. Awareness and Perception delve into how consumers perceive and comprehend sustainability related issues, while Sustainability Concerns encapsulate their level of concern regarding environmental, economic and social aspects.

Meanwhile, Drivers examine the motivational factors influencing consumer behaviour in sustainable practices. The integration of the consumer behaviour into the SEM framework, this research achieved a comprehensive analysis, enabling an exploration of the intricate relationships between these latent variables and gaining insights into the complex mechanisms guiding consumer actions in the realm of sustainability (Figure 5). Consumer behaviour towards CFP was assimilated into the Structural Equation

Modeling framework in AMOS to offer a thorough understanding of the factors influencing it (the three latent constructs). This involved introducing consumer behaviour as a new construct in the structural model and repeating the model assessment regarding the covariances between constructs.

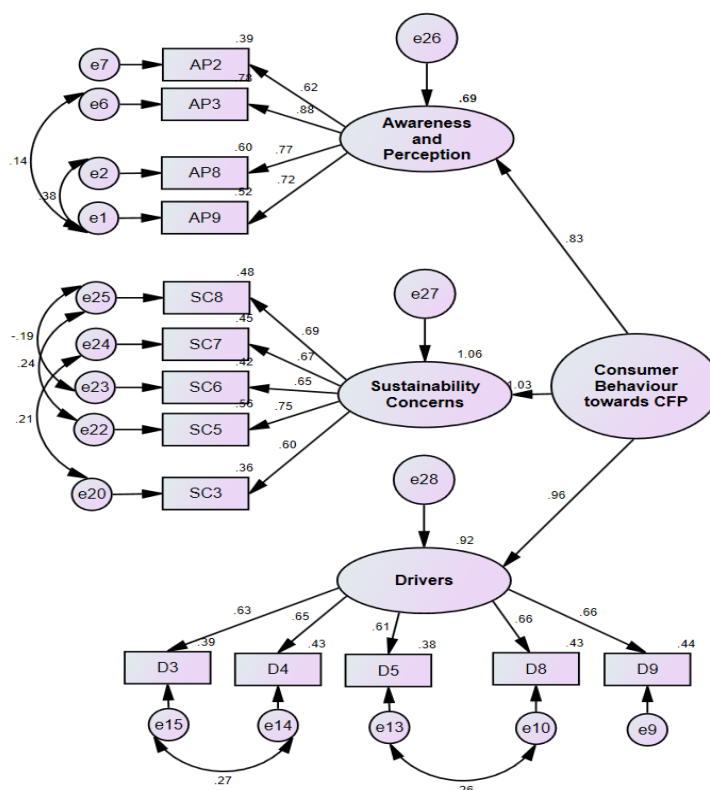


Figure 5. Structural model of the representative factors influencing Consumer Behaviour towards CFP

Source: authors' work in IBM SPSS AMOS 20

After assessing the correlations between the constructs, the findings show that there is a strong and positive correlation between all the analysed constructs, confirming the good fit of the structural model.

5. Discussion

From the start of the research, as reflected in the hypotheses and literature review, it has been assumed that attitudes toward circular economy products are closely connected to sustainability and its various aspects. The complex analysis that has been conducted was extremely important in order to validate the research hypotheses, as shown in Table 7.

Table 7. Hypotheses results

Research Hypotheses	Hypothesised Effects	Standardised Regression Weight	p-Value	Conclusion
H1	AP8 ← Awareness and Perception	.773	< .001	supported
	AP9 ← Awareness and Perception	.720	< .001	
H2	SC3 ← Sustainability Concerns	.587	< .001	supported
	SC5 ← Sustainability Concerns	.748	< .001	
	SC8 ← Sustainability Concerns	.693	< .001	
H3	D3 ← Drivers	.627	< .001	not fully supported 3 out of the 5 validated variables considered objective norms
	D4 ← Drivers	.654	< .001	
	D8 ← Drivers	.659	< .001	
H4	Awareness and Perception ↔ Sustainability Concerns	Correlations Estimates .856	< .001	supported
	Drivers ↔ Sustainability Concerns		< .001	
	Awareness and Perception ↔ Drivers		< .001	
H5	Consumer behaviour ← Awareness and Perception	.830	< .001	supported
H6	Consumer behaviour ← Sustainability Concerns	1.031	< .001	supported
H7	Consumer behaviour ← Drivers	.961	< .001	supported

Source: authors' work.

As can be seen from the values obtained after processing the application of the tests to establish the correlation and convergence coefficients of the observable and unobservable variables considered in the structural model, the hypotheses that were the basis of this research were mostly confirmed. An important aspect supported by the outputs obtained after performing the analysis in AMOS, disclose that every variable of the research framework is significantly and highly correlated with each other. After conducting statistical analysis, the p-value obtained (< .001) suggests that the observed results are unlikely to have occurred by chance alone, concluding that there is sufficient evidence to support a significant relationship.

5. Conclusions

In this paper, we leverage the analytical prowess of IBM SPSS AMOS 20 to elucidate the intricate relationships within our study, thereby enhancing the depth and rigour of our research findings. The covariances between selected constructs in the proposed statistical model indicated the extent to which these constructs vary together. In other words, it measured the degree to which changes in one construct are associated with changes in another construct. The positive covariance that was obtained suggests that each pair of two latent variables tend to vary in the same direction, which provides insights into the underlying structure of the model.

In regard to the proposed model for analysing consumer behaviour towards Circular Food Products (CFP), the correlation coefficients between the variables examined, and the model fit tests conducted, confirmed the good fit of our structural model.

More precisely, Awareness and Perception of the consumers were strongly related to quality (AP8) and health (AP9) aspects supporting their decisions to buy and consume CFPs (AP3) and their willingness to pay extra (AP2) considering the benefits of these products.

When addressing Sustainability Concerns, all the three dimensions of sustainability (economic - social - environment) were present in the consumers' concerns, as they showed preoccupation with food waste while shopping (SC3) and opting for CFPs to support environmental protection (SC5), being aware of the potential of Circular Food industry and how supporting the consumption of its products can contribute to new job creation (SC8). The environmental dimension was the most representative among the concerns for aspects related to sustainability as questionnaire respondents confirmed their willingness to purchase food items with recyclable or reusable packaging (SC7) as they consider social responsibility (SC7) of great importance in contributing to sustainability through consumption choices.

Consumer choices for CFPs are influenced by the availability of CFPs nearby (D3), government and nongovernmental organisations efforts to promote them (D4) and incentives like discounts (D8). Price sensitivity plays a key role, as CFPs often cost more due to sustainable production. Discounts and bonuses can make CFPs more appealing to price-conscious consumers. Government policies and NGO involvement, such as subsidies, regulations and awareness campaigns, enhance CFP accessibility and increase consumer awareness and acceptance.

Subjective norms were also identified as strong drivers in conducting consumers behaviour. Consumers' personal beliefs and values (D5) and past experience and positive feedback strongly impact decisions on consuming CFPs (D9). Some consumers prioritise environmental sustainability and are therefore more inclined to choose circular food options that minimise waste and reduce carbon footprints. Others may be motivated by health concerns and perceive CFPs as healthier alternatives due to their often fresher and more natural characteristics. Additionally, consumers who value supporting local economies may be more inclined to purchase CFPs sourced from nearby producers. These personal beliefs shape consumer awareness and perception by guiding their preferences and choices.

The construct with the higher standardised regression weight, meaning with the strongest covariance regarding consumer behaviour, was obtained for Drivers. The finding suggests that the factors encompassed within the Drivers construct play a great role in shaping consumer behaviour towards CFPs. This result can be explained by the necessity of regulation and interventions or marketing strategies targeting these drivers on promoting the adoption of CFPs. Understanding what drives consumer behaviour allows for more targeted and effective interventions, such as marketing campaigns, policy initiatives, or societal trends, that could amplify the influence of certain drivers on consumer behaviour.

When these aspects are taken into account, further research can explore the development of specific marketing strategies and policy regulations aimed at raising awareness and fostering responsibility among consumers regarding the benefits and opportunities associated with consuming Circular Food Products (CFPs) on both personal and social levels. This research could adopt a holistic approach to the dimensions of sustainability as reported on consumer behaviour. Another future direction of research can target the new concept introduced in this work, which defines the CFP from the perspective of the principles promoted by the circular economy (reduce, reuse, recycle), which can significantly contribute to the development of innovative food products that respond to concerns regarding sustainable economic development and the development of a sustainable food industry.

Despite the relevant findings and the contributions related to current and future research directions, the present research study faces several limitations that warrant acknowledgment. Firstly, the study's generalizability may be constrained by its sample size and composition, potentially limiting the broader applicability of its findings to other demographic groups or geographical regions. Secondly, the reliance on self-reported data introduces the possibility of response bias or social desirability bias, where participants may provide answers they perceive as socially acceptable rather than reflecting their true attitudes and behaviours. Additionally, the complexity of consumer behaviour, especially in relation to such a novelty concept as CFP, may not be fully captured by the research's chosen methodology, potentially overlooking nuanced factors or motivations driving consumer choices. Moreover, external variables, such as cultural influences or economic factors, which could significantly impact consumer behaviour, may not have been adequately accounted for in the analysis. Finally, the dynamic nature of consumer preferences and attitudes towards sustainability may render the study's findings time sensitive, requiring continuous reassessment and validation over time. Addressing these limitations through robust methodological approaches and comprehensive data collection strategies will be essential for advancing our understanding of consumer behaviour in the context of CFP.

7. References

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