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Green Marketing in the Restaurant Industry: A Focus on Upcycled Food

Amine Benslimane[1]*, Abdelhadi Benghalem [2]

[1] University of Oran 2 Mohamed Ben Ahmed, Algeria, benslimane.amine@univ-oran2.dz

[2] Oran Graduate School of Economics, Algeria, abdelhadi.benghalem@gmail.com

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Abstract: The 2021 Food Waste Index report published by the United Nations Environment Programme revealed that over 931 million tons of food are wasted globally each year, with a portion of this waste originating from the restaurant industry. In response to this challenge, there has been growing interest in employing food upcycling as a viable solution. Food upcycling involves repurposing and highlighting ingredients that would otherwise be wasted, ensuring transparent supply chains, and thereby contributing positively to environmental conservation efforts. This paper aims to analyse Algerian citizens' behaviour regarding this type of food. To achieve this goal, we conducted quantitative research based on structural equation modelling. The results shed significant light on attitudes, environmental concerns, descriptive social norms, and the perceived green value of Algerian citizens toward upcycled food. These findings pave the way for the implementation of effective green marketing strategies within catering establishments.

Keywords: green marketing, upcycled food, attitude, environmental concerns, descriptive social norms, the perceived green value, restaurant industry.

*** Corresponding Author**

1. Introduction:

The 21st century presents humanity with a grand challenge: ensuring food security for a growing global population on a planet that is becoming warmer and more crowded (Sakaguchi et al., 2018). This challenge encompasses a range of interconnected issues that require innovative solutions and collaborative efforts from various sectors. One of the primary challenges is the sheer magnitude of the global population, which is expected to reach nearly 10 billion by 2050. This

population growth, coupled with changing dietary preferences and consumption patterns, places immense pressure on food production systems. Agricultural practices must evolve to meet the increasing demand for food while minimizing environmental impact.

According to the UNEP Food Waste Index Report 2021, a staggering amount of more than 931 million tonnes of food is wasted annually (Amato et al., 2021). This highlights a significant global challenge in food sustainability and resource utilization. Such wastage not only impacts the environment through increased greenhouse gas emissions and land use but also represents a missed opportunity for addressing food insecurity and hunger.

The 2023 edition of the State of Food Security and Nutrition in the World report highlighted a concerning trend in global hunger. The report revealed that between 691 and 783 million people experienced hunger in 2022, marking a significant increase of 122 million people compared to the numbers reported in 2019 (United Nations Food, 2023). This rise in hunger levels underscores the urgent need for comprehensive and sustainable strategies to address food insecurity and malnutrition on a global scale. It also reflects the complex interplay of factors such as economic challenges, conflicts, climate change impacts, and social inequalities that contribute to food insecurity worldwide.

The current state of our food system is predominantly linear, characterized by significant inefficiencies and wastage throughout the entire food supply chain (United Nations Environment Programme, 2021). At each stage, from production to consumption, food is lost or wasted, contributing to substantial environmental impacts. According to studies, approximately 8–10% of global greenhouse gas emissions can be attributed to food loss and waste (United Nations Environment Programme, 2021). This inefficiency in the food system has multiple negative consequences. It not only leads to economic losses for producers and consumers but also contributes to environmental degradation and climate change. Food loss and waste generate greenhouse gas emissions, such as methane and carbon dioxide, during decomposition in landfills. Moreover, the resources used in producing the wasted food, such as water, land, energy, and labour, are essentially squandered.

Food waste is a critical issue that has far-reaching implications for both the environment and public health (Spratt et al., 2021). When food is wasted, it not only represents a loss of valuable resources but also contributes to environmental degradation. One of the key impacts of food waste on the environment is its contribution to greenhouse gas emissions.

When food waste is disposed of in landfills, it undergoes anaerobic decomposition, releasing methane, a potent greenhouse gas that contributes to global warming. This process not only adds to the overall carbon footprint but also exacerbates climate change. Additionally, the inefficient breakdown of food waste in landfills leads to the release of other harmful substances into the environment, further impacting air and water quality.

The environmental consequences of food waste extend beyond landfills. The resources used in food production, such as water, energy, and land, are also wasted when food is discarded unnecessarily. This inefficient use of resources intensifies pressure on ecosystems and exacerbates issues like water scarcity and deforestation. Furthermore, food waste has indirect effects on public health. Wasted food represents lost opportunities to provide nutrition to those in need, contributing to food insecurity and malnutrition in communities. Additionally, the resources invested in producing wasted food could have been utilized more effectively to address food access and affordability challenges.

According to the 2021 Food Waste Index Report, one of the major contributors to food waste is the restaurant industry (United Nations Environment Programme, 2021). In the restaurant service sector, food waste often stems from various factors. These include issues like improper storage methods leading to spoilage, residues from food preparation due to mishandling or over-preparation, leftover food on plates from overly generous portions, challenges in accurately predicting customer numbers, forgotten or spoiled items, insufficient awareness about food waste and its economic/environmental impacts due to poor data, and struggles in accommodating diverse dietary preferences of clients (Ofei & Mikkelsen, 2011). In response to the challenge of food waste in the restaurant industry, there has been a notable increase in the exploration of food upcycling as sustainable solution and green marketing strategy.

Food upcycling involves transforming food leftovers or by-products into new, usable items, thereby reducing waste and promoting environmental responsibility. This growing interest reflects a broader shift towards innovative and eco-friendly practices in the food sector, as businesses and consumers alike recognize the importance of minimizing waste and maximizing resource efficiency. Embracing food upcycling not only addresses the immediate issue of food waste but also aligns with broader goals of sustainability and responsible consumption, making it a promising avenue for businesses seeking to operate more ethically and efficiently. Upcycled foods are prepared with “ingredients that otherwise would not have gone

to human consumption, which are procured and produced using verifiable supply chains, and have a positive impact on the environment"(Upcycled Food Definition Task Force, 2020).

Generally, when we talk about upcycled food products, we refer to items made from ingredients that would otherwise have been discarded, such as food by-products or items not suitable for regular sale in the market (Spratt et al., 2021). These ingredients are often perfectly edible and nutritious but may not meet the conventional standards for commercial sale, leading to their potential wastage. By upcycling these ingredients, food producers can create new, value-added products that not only reduce waste but also offer consumers innovative and sustainable options. This approach not only addresses food waste but also encourages a more circular and resource-efficient food system, aligning with broader sustainability goals in the food industry.

Aschemann-Witzel et al. (2023) have identified two distinct types of upcycled foods that play crucial roles in resource preservation. The first type, termed 'alternative use', involves utilizing edible foods that would otherwise be discarded as waste. By upcycling these foods, resources invested in their production are preserved, reducing overall waste and promoting sustainability. On the other hand, 'novel use' upcycled foods involve using ingredients that are not conventionally viewed as edible or are not commonly used in food production. This approach expands the available food resource base by transforming non-traditional ingredients into consumable products, contributing to food diversity and potentially reducing pressure on conventional food sources.

Implementing upcycled food initiatives as green marketing strategy in the restaurant industry can play a vital role in reducing this wastage by creatively transforming surplus or imperfect food into delicious and nutritious dishes, thus contributing to a more sustainable food system. Green Marketing is "the holistic management process responsible for identifying, anticipating and satisfying the needs of customers and society, in a profitable and sustainable way" (Peattie, 2001, p. 141). It is often associated with efforts to mitigate adverse environmental and social effects caused by current products and production methods. It also involves promoting products and services that are less harmful to the environment and society (Peattie, 2001, p. 129). These two definitions shed light on green marketing as a comprehensive approach to managing customer and societal needs profitably and sustainably. It encompasses efforts to minimize negative environmental and social impacts associated with current products and production methods while

promoting environmentally friendly products and services. When we evoke waste reduction challenge and upcycled food, we can see define marketing as the holistic marketing concept wherein the production, marketing consumption and disposal of products and services happen in a manner that is less detrimental to the environment with growing awareness about the implications of global warming, nonbiodegradable solid waste, harmful impact of pollutants etc. (Mishra & Sharma, n.d., p. 35).

Thorsen et al. (2024) highlight that upcycled foods play a significant role in supporting both the environmental and economic aspects of sustainable development. By reducing greenhouse gas emissions and enhancing the financial viability of businesses adopting food upcycling practices, these foods contribute to a more sustainable food system. Furthermore, Nogueira et al. (2021) have demonstrated that upcycling fresh foods can lead to improved dietary habits and better health outcomes, particularly for low-income families. This aligns with global goals focused on poverty reduction (SDG 1) and health improvement (SDG 3). Additionally, promoting healthy eating habits and reducing disparities in access to nutritious foods through upcycled foods contributes to the broader objective of achieving social sustainability (SDG 10).

The UFA's mission emphasizes the positive effects of upcycled foods on both the environment and society. By focusing on reducing food waste, the association contributes to mitigating climate change, as reducing food waste is identified as the third most effective solution to combatting climate change. This approach aligns with broader sustainability goals and highlights the significant impact that upcycled foods can have on environmental preservation and societal well-being (Spratt et al., 2021).

The Food Recovery Hierarchy underscores the importance of minimizing food waste by addressing its root causes, such as reducing the production of surplus food (United States Environmental Protection Agency, 2017). This aligns with the concept of upcycled food as a green marketing initiative, as it emphasizes transforming food waste into valuable products, thus reducing waste at the production stage and promoting sustainability throughout the food supply chain.

In Algeria, upcycled foods have been a common practice in households for several years, where food items are creatively reused to minimize waste. However, the use of upcycled foods in restaurants and food services remains largely undocumented and unofficial. Through our investigation, we discovered that some food services in Algeria employ upcycled foods without openly disclosing this practice to

customers. This lack of transparency indicates that the formal adoption or acknowledgment of upcycled foods in Algeria, particularly within the restaurant industry, is either limited or non-existent, based on our findings.

Considering the significance of upcycled foods as a green marketing strategy in restaurants and their positive influence on sustainable development pillars, alongside their limited recognition in Algeria, which represents an overlooked opportunity, we have opted to examine Algerian consumer behaviour towards these foods. Analysing consumer behaviour allows for the development of effective marketing strategies and provides a roadmap for food service establishments to integrate upcycled foods into their offerings.

The objective of the current paper is to analyse Algerian consumer behaviour towards upcycled foods as a green marketing strategy in restaurants. This analysis aims to understand the current perception and acceptance of upcycled foods among Algerian consumers and to identify opportunities and challenges for integrating these foods into the offerings of food service establishments. Additionally, the paper aims to develop effective marketing strategies based on consumer insights to promote the adoption of upcycled foods in Algeria and contribute to sustainable development goals.

2. The conceptual model:

To investigate Algerian consumer behaviour towards upcycled foods as a green marketing strategy in restaurants, we developed a conceptual model integrating relevant variables namely, perceived green value, descriptive social norms, attitude toward upcycled food, environmental concern, and behavioural intention to purchase upcycled food.

The intention to purchase upcycled food (BI):

The behavioural intention in this study reflects the willingness to buy upcycled food, to spend effort willing to acquire this type of food. The behavioural intention could be described as "...instructions that people give themselves to behave in a certain way." (Triandis, 1980, p.203). Swan & Trawick (1981) defined this factor as the anticipation, attempt, or willingness to perform a behaviour. Icek Ajzen, who focused extensively on individuals' behavioural intentions and highlighted this factor in his well-known theories, the Theory of Reasoned Action (Fishbein & Ajzen, 1975) and the Theory of Planned Behaviour (Ajzen, 1991), emphasizes that intentions capture the motivational factors influencing behaviour. They show how willing people are to try and how much effort they expect to exert to adopt the

behaviour. Icek Ajzen believed that intentions are important because they show what motivates people to act in a certain way. For example, if someone intends to start eating healthier, it means they are motivated to improve their diet. The strength of this intention also reflects how much they're willing to try to make this change happen and how much effort they're ready to put into adopting healthier eating habits. So, intentions not only show what people want to do but also how much they're committed to making it happen.

The attitude towards upcycled food (ATD):

The theory of planned behaviour as well as reasoned action suggest that behavioural intention is predicted by attitudes (Ajzen & Fishbein, 1980; Albarracín et al., 2005). In this context, Ajzen (1991) Suggested that an individual's positive attitude strengthens their behavioural intention, and the more favourable the attitude towards a given behaviour, the more likely the individual is to adopt it. In other words, when someone has a positive attitude, it makes him more likely to want to do something. And if they really like a certain behaviour, they're more likely to start doing it. Attitude is defined as the degree to which a person has a favourable or unfavourable evaluation or appreciation of the behaviour in question (Ajzen, 1991, p.188). It also refers to the psychological emotions and positive or negative evaluations that occur when an individual engages in certain behaviours (Eagly & Chaiken, 1993). In the marketing context, Kotler & Keller (2011) suggested that attitude plays a role in shaping people's minds and influences whether they like or dislike something. It implies that attitudes, emotions, and evaluations are interconnected and can influence how individuals perceive and respond to various objects or situations.

Perceived Green value (PGV):

Woo & Kim (2019) suggested that there is a significant link between attitude and the dimensions of perceived green value namely, functional value, conditional value, social value, and emotional value. The perceived green value refers to how consumers evaluate the overall benefit of a product or service in terms of what they receive versus what they give, considering their environmental preferences, expectations for sustainability, and green priorities (Chen & Chang, 2012, p. 505). It encompasses the consumer's assessment of the environmental impact, sustainability features, and alignment with their ecological values, influencing their perception of the product's worth and desirability. Perceived green value goes beyond just the monetary cost of a product or service. It includes how consumers view the environmental impact of their choices and how well those choices align

with their personal values and beliefs about sustainability. This means that consumers consider not only the immediate benefits of a product but also its long-term effects on the environment and society. For example, a consumer might be willing to pay more for a product that is sustainably sourced and has minimal environmental impact, even if it costs more upfront, because they believe it contributes positively to the planet and aligns with their values. This perception of value can greatly influence consumer behaviour and purchasing decisions, driving demand for eco-friendly products and services.

Environmental concerns (EC):

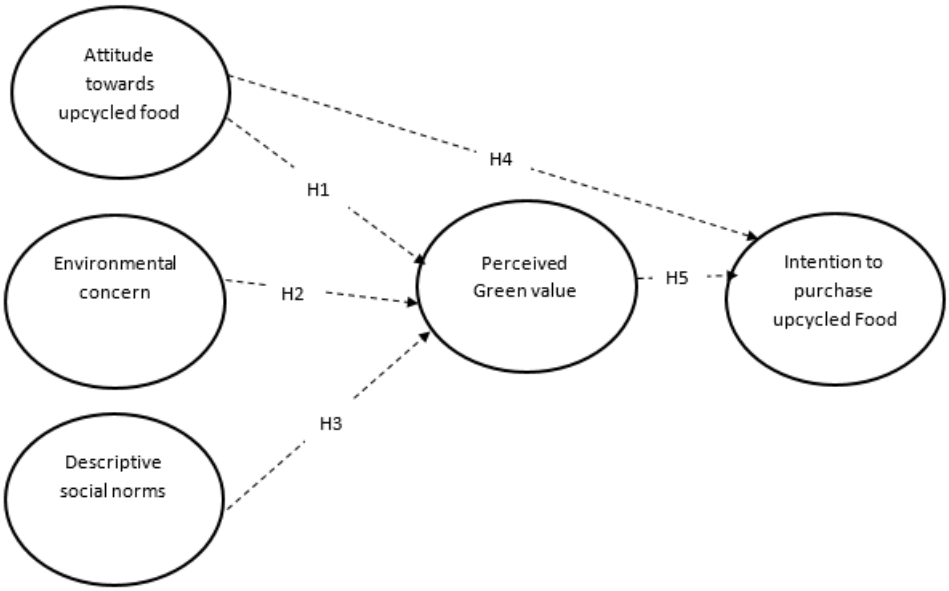
Adetola et al. (2021) found a significant and direct relationship between perceived environmental concern and perceived consumption value to perform in a green use context. Perceived environmental concerns refer to an individual's subjective assessment and awareness of environmental issues, such as pollution, climate change, resource depletion, and biodiversity loss. It includes the level of importance and urgency that individuals attribute to these environmental challenges based on their beliefs, values, and personal experiences. Dunlap & Jones (2002) the level of awareness individuals has regarding environmental issues and their active support for initiatives aimed at resolving them.

These facts emphasize the strong correlation between individuals' awareness of environmental concerns and their appreciation for green practices' value. This awareness reflects personal beliefs and values, underscoring the importance of active engagement and support for environmental initiatives in promoting sustainability.

Descriptive social norms (DSN):

Social norms are guidelines and standards that group members understand and use to direct or limit social behaviour, without the need for legal enforcement (Cialdini & Trost, 1998, p. 152). There are two types of social norms namely, injunctive norms and descriptive norms. Injunctive norms refer to societal approval, reflecting what is generally endorsed by the majority, while descriptive norms focus on observed behaviours, illustrating what people commonly practice. In other words, descriptive norms refer to the perceived behaviours or actions that individuals believe are common or typical within a particular social group or context. For example, perception that most people in a community recycle regularly. This perception influences individuals to align their behaviour with what they believe is the typical or expected action within their social group.

Figure 1: The conceptual model



Analysing descriptive social norms is essential for grasping how people view and understand behaviours in their social circles. This examination provides marketers with valuable insights into the factors shaping people's choices, especially in fields like green marketing. This understanding aids in crafting more impactful strategies that resonate with prevalent beliefs and actions, fostering positive societal shifts and promoting sustainable behaviours.

Based on the discussion above, we developed in figure 1 the research conceptual model, illustrating the following hypotheses:

H_1: Attitude towards upcycled food has a significant and positive effect on perceived green value.

H_2: Environmental concern has a significant and positive effect on perceived green value.

H_3: Descriptive social norms have a significant and positive effect on perceived green value.

H_4: Attitude towards upcycled food has a significant and positive effect on behavioural intention.

H_5: Perceived green value has a significant and positive effect on behavioural intention.

3. Methods:

Sampling and data collection:

To test our theoretical model, we conducted quantitative research employing a survey questionnaire and structural equation modelling. All items in the questionnaire were sourced from existing literature.

Perceived green value, descriptive social norms, attitude toward upcycled food, environmental concern, and behavioural intention to purchase upcycled food were assessed using a 5-point Likert scale ranging from 0 (totally disagree) to 5 (totally agree). The questionnaire was designed and administered using Google Forms. We employed a non-probabilistic conventional sampling method, as our target population was the entire Algerian population, making a probabilistic method impractical.

Data collection took place from December 30th, 2023, to April 4th, 2024, yielding a total of 238 responses, with females comprising slightly more than half (55%) of the sample. The vast majority of respondents (97.5%) reported having attained a university-level education. Socio-demographic characteristics of the sample are summarized in Table 1.

The majority of respondents were single (82%) student (57,6%) and aged between 18 and 35 (83.2%). The survey questionnaire covered all regions of Algeria, 42 provinces with the most represented being: Algiers, the capital (16.4%), Oran (14.3%), Skikda (10.5%), Setif (5.5%), Borj Baji Mokhtar (5%), Telemcen (4.6%), Constantine (4.6%), and Ouargla (3.8%).

Measurement:

The empirical study was conducted through Structural Equation Modelling (SEM) using Amos Version 23 software via a two-step approach recommended by Anderson & Gerbing (1988). In this regard, Confirmatory Factor Analysis (CFA) was first executed to empirically validate the measurement model with the proposed constructs and measurement items. At this initial phase, Cronbach's alpha test, Average Variance Extracted (AVE), and Composite Reliability (CR) were also computed to assess internal consistency and construct validity. The second step involved developing a structural model with latent variables, to verify the robustness of the proposed conceptual model and inspect all hypothetical links. In these two phases, various fit indices were evaluated, including Standardized Root Mean Square Residual (SRMR), Chi-Square statistic (X^2), Normalized Chi-Square statistic (X^2/df), Root Mean Square Error of Approximation (RMSEA), Incremental

Fit Index (IFI), Tucker-Lewis Index (TLI), Comparative Fit Index (CFI), and Goodness-of-Fit Index (GFI).

Table (1) Sample characteristics (n=238)

Sociodemographic variables		**Frequency**	**(%)**
Gender	Male	107	45
	Female	131	55
Age	18 to 35 years old	198	83,2
	36 to 65 years old	40	16,8
Education	University level	232	97,5
	Secondary level	4	1,7
	Middle school level	2	,8
Marital status	Married	42	17,6
	Single	196	82,4
Employment status	Employee	33	13,9
	Employer	12	5,0
	Student	137	57,6
	Student and employed	38	16,0
	Unemployed	17	7,1
	Retired	1	,4
Provinces	Algiers	39	16,4
	Oran	34	14,3
	Skikda	25	10,5
	Setif	13	5,5
	Bordj Badji Mokhtar	12	5,0
	Constantine	11	4,6
	Tlemcen	11	4,6
	Ouargla	9	3,8

Source: SPSS outputs

Table (2): Likert interpretation

Echelle de Likert	**Mean interval**	**Difference**	**Interpretation**
1	1,00 - 1,80	0,80	**Totally disagree**
2	1,81 - 2,60	0,79	**Disagree**
3	2,61 - 3,40	0,79	**Neutral**
4	3,41 - 4,20	0,79	**Agree**
5	4,21 – 5,00	0,79	**Totally agree**

Source : (Pimentel, 2010)

Table (2) illustrates the interpretation of the Likert scale concerning each average interval for all variables. We used this method to interpret the opinions of our sample regarding upcycled food.

4. Results:

Descriptive statistics:

In addition to investigating Algerian attitudes towards upcycled food, their descriptive social norms, environmental concerns, perceived green value, and behavioural intentions, we analysed then in Table 3 their price sensitivity towards upcycled food, past behaviours, and familiarity with this type of cuisine. Our findings revealed that 95% of respondents are sensitive to the pricing of upcycled food in the restaurant industry. When asked whether they believe the price of upcycled foods should be lower than that of other dishes if customers are informed that they are recycled, 95% responded affirmatively.

Regarding past behaviour and familiarity with upcycled food, only 6% of respondents confirmed that they have previously tried this type of dish, while 25% indicated that they have heard about it.

Table (3) Price sensitivity, past behaviour, and familiarity with upcycled food

	Items	**Yes**	**No**
Price sensitivity	**The restaurant informs customers that these are upcycled foods. Do you think their price should be lower than the price of other foods?**	95%	5%
Past behaviour	**Have you ever eaten upcycled food as a customer in a restaurant?**	6%	96%
Familiarity	**Have you ever heard of upcycled food?**	75%	25%

Source: SPSS outputs

Despite the lack of familiarity among our sample regarding upcycled food, our questionnaire aimed to elucidate the concept in Arabic by providing various explanations and examples like this statement: “In short, upcycled foods refer to the reuse of clean, edible food that has not been consumed, to prepare new meals. These foods are presented to new customers instead of being discarded, thus avoiding waste. Upcycled foods also include dishes made from partially damaged but still edible ingredients, such as wilted vegetables.” We included these clarifications to ensure the comprehension of our questions, especially those measuring attitude, environmental concerns, descriptive social norms, perceived green value, and intention to purchase upcycled food.

In terms of the main variables in our research, participants expressed a favourable view of upcycled food. They agreed that introducing upcycled food in the restaurant industry is a good idea and an important action. Additionally, they believed that buying this type of food is beneficial, a wise decision, and will evoke positive feelings. The interpretations of the Likert scale can be found in Table (4).

Respondents also voiced concerns about the negative impacts resulting from human activities such as excessive consumption and waste. They expressed apprehension regarding the fragility of the environmental balance and emphasized the importance of preserving it to prevent catastrophic consequences. However, their perception regarding the green value of upcycled food and descriptive social norms was neutral. Finally, respondents expressed a favourable intention to purchase upcycled food. They showed a positive willingness to buy this type of cuisine when it's available and expressed their intention to actively seek out upcycled food and purchase it once it becomes available.

Through the questionnaire we conducted, we aimed to identify the factors that could motivate potential consumers to purchase upcycled food. Our findings revealed that 49.6% of respondents would consider buying it to contribute to waste reduction efforts, 10.9% for environmental preservation, 9.2% for a new culinary experience, and 7.6% due to its lower price compared to other meals. It's noteworthy that 19.3% of respondents expressed that they would never try this type of cuisine.

Confirmatory factor analysis:

The factor analysis showed problems with unidimensionality and convergent validity, so we had to remove certain items that were causing these issues. The eliminated items are: ATD5, EC1, PGV1, PGV4, PGV5.

After removing these items, we can see that unidimensionality is achieved, as the factor loadings for all factors exceeded the benchmark of 0.5 (J. F. Hair et al., 2006).

Factor loadings, average variance extracted, and composite reliability are presented in table (5). The values of composite reliability (CR) ranging from 0.76 to 0.87 are above 0.70 (Fornell & Larcker, 1981), indicating that composite reliability is achieved.

Table 4: Likert interpretation for descriptives statistics

Variables	**Mean**	**Std Dev**	**Likert interpretation**
Attitude towards upcycled food	3,58	,89	Agree
Environmental concerns	4,16	,49	Agree
Descriptive social norms	3,16	,99	Neutral
Perceived green value	3,25	,63	Neutral
Behavioural intention	3,42	1,18	Agree

Source: SPSS outputs

Similarly, Cronbach's α values ranging from 0.626 to 0.952 are above 0.60 (Nunnally & Bernstein, 1994), indicating that internal consistency is achieved.

Table 5: Reliability and consistency

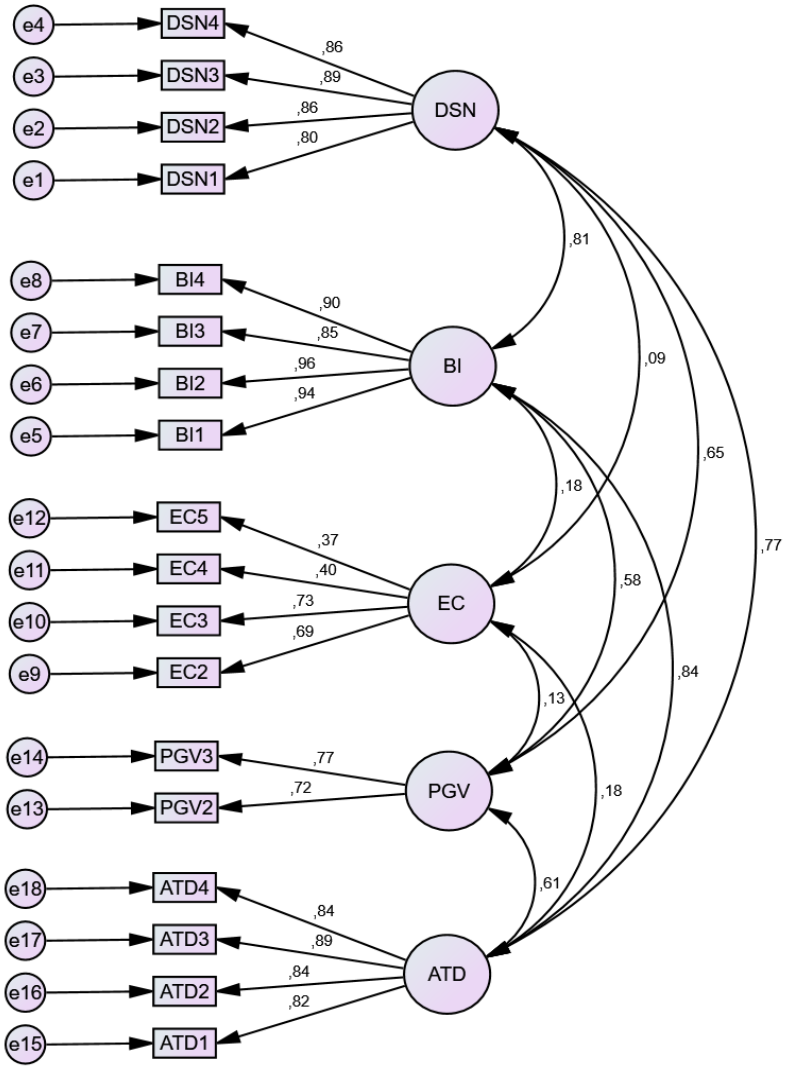
Items	Factor loadings	AVE	Composite Reliability (CR)	α
ATD1	,810	,61	,86	,910
ATD2	,837			
ATD3	,739			
ATD4	,744			
DSN1	,811	,62	,87	,910
DSN2	,832			
DSN3	,738			
DSN4	,771			
EC2	,763	,47	,78	,626
EC3	,784			
EC4	,582			
EC5	,580			
PGV2	,779	,61	,76	,713
PGV3	,780			
BI1	,707	,49	,79	,952
BI2	,682			
BI3	,739			
BI4	,659			

Source: SPSS outputs

However, convergent validity is achieved only for three factors: attitude, descriptive social norms, and perceived green value, which recorded significant AVE values above 0.50 (J. Hair et al., 2014).

Figure (2) shows the first version of the measurement model, as after running this model on Amos, we obtained low values for model fit. Therefore, we decided to improve the CFA model by incorporating recommended covariances from Amos via modification indices. Once the covariances were added, we obtained the following results:

Figure 2: The measurement model without modification indices



X^2/df=3,128 **GFI= ,847**
SRMR = ,0522 **IFI= ,920**
RMSEA= ,095 **TLI= ,901**
CFI= ,920

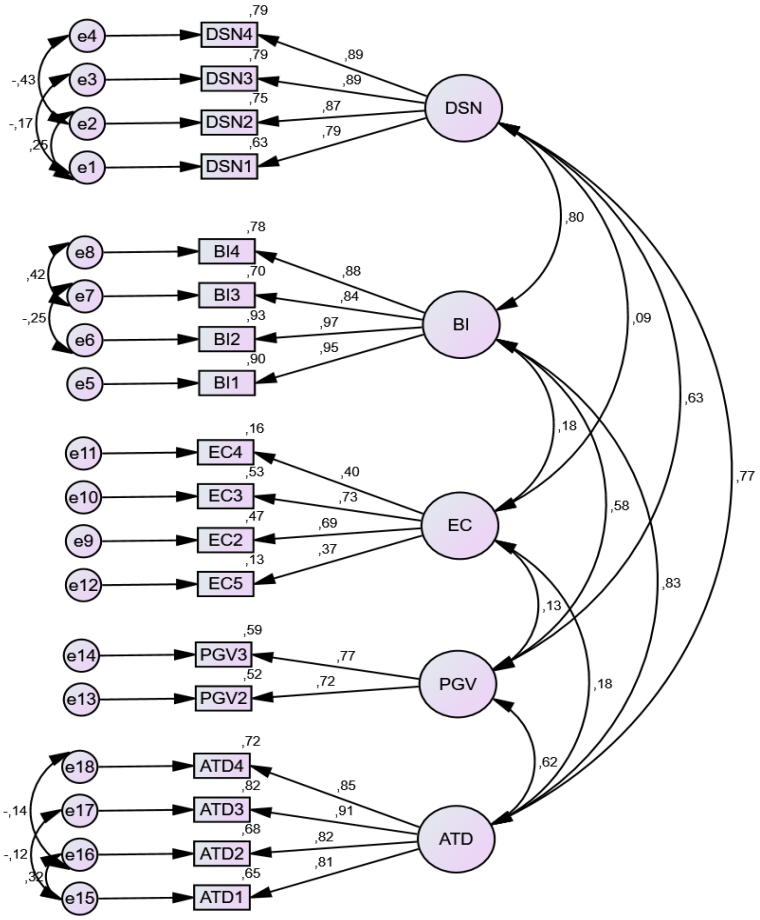
DSN: descriptive social norms, BI: behavioural intention, EC: environmental concerns, PGV: perceived green value, ATD: attitude towards upcycled food.

Source: Amos outputs

The normalized chi-square statistic (X^2/df) indicated a value of 2.198, which is below 3, demonstrating very good fit (Bearden et al., 1982). The root mean square error of approximation (RMSEA) recorded a value of 0.071, close to the ideal value of 0.06, also indicating a good fit (Hu & Bentler, 1999).

The measurement model and fit indicators are illustrated in Figure (3). The standardized root mean square residual (SRMR) indicated excellent fit, with an SRMR value of 0.0492, significantly below 0.08 (Byrne, 2013). The Goodness of fit index, Incremental Fit Index, Tucker-Lewis Index, and Comparative Fit Index, recorded values of (GFI=0.894, IFI=0.958, TLI=0.945, CFI=0.958), indicating good fit (Bentler, 1990; J. F. Hair et al., 2010).

Figure 3: The improved measurement model



X^2/df=2,198 **GFI= ,894**
SRMR = ,0492 **IFI= ,958**
RMSEA= ,071 **TLI= ,945**
CFI= ,958

DSN: descriptive social norms, BI: behavioural intention, EC: environmental concerns, PGV: perceived green value, ATD: attitude towards upcycled food.

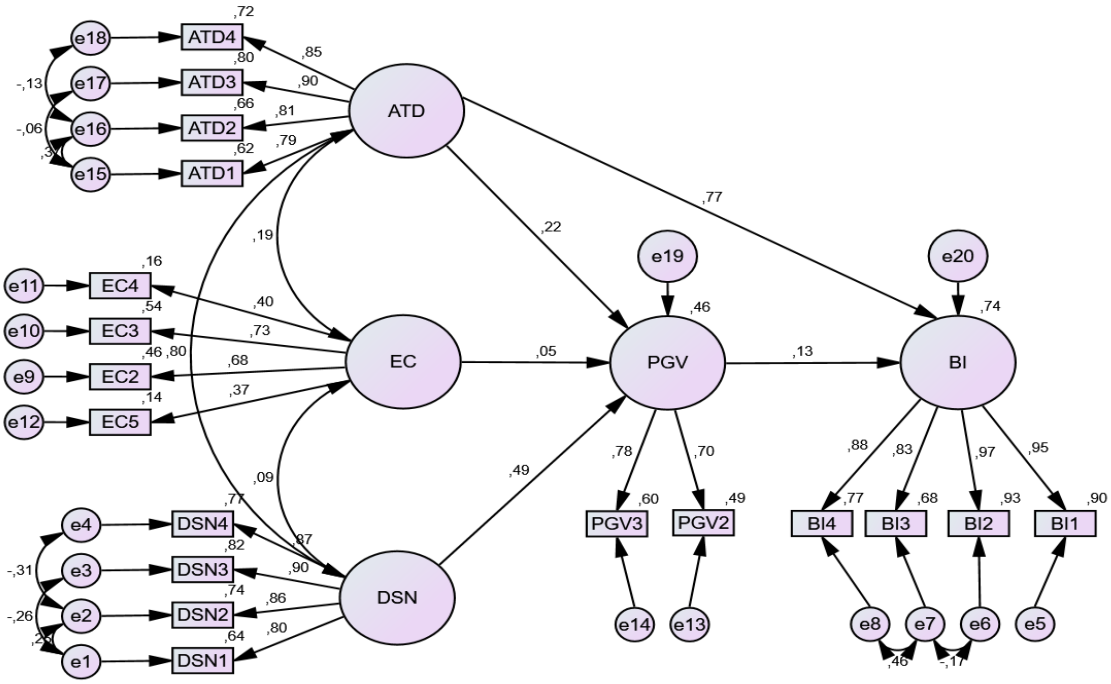
Source: Amos outputs

The Structural model:

The model was estimated using maximum likelihood estimation, when executed Amos suggested covariances among independent variables, namely attitude, environmental concerns, and descriptive social norms. Once the recommended covariances were implemented, we obtained the following results:

The model's probability level indicated a value of (.000), meaning that the model data is significant at the 0.05 level (Bollen & Long, 1993).The structural model is presented in figure (4). The normalized Chi-square statistic (X^2/df) showed a value of 2.398, which is below 3, reflecting a very good fit (Bearden et al., 1982). The standardized root mean square residual (SRMR) recorded a value of 0.0582, which is below 0.08, indicating a good fit (Byrne, 2013). However, the root mean square error of approximation (RMSEA) registered a value of 0.077 although slightly higher than the ideal threshold of 0.06 (Hu & Bentler, 1999) still within an acceptable range, suggesting a reasonably good fit

Figure 4: The structural model



X²/df=2,398	**GFI= ,887**
SRMR = ,0582	**IFI= ,950**
RMSEA= ,077	**TLI= ,935**
	CFI= ,950

Source: Amos outputs

Finally, All fit indices recorded values significantly above 0.90 (IFI=0.950, TLI=0.935, CFI=0.950), reflecting a very good fit of the structural model (Bentler, 1990), except for the goodness-of-fit index (GFI=0.887), which indicated a poor fit. Based on these fit indices, we can conclude that the model is well-suited for proceeding to the next stage of analysis, namely, testing the significance of the hypothetical pathway.

The path analysis:

Significance tests assist in understanding the connection between independent and dependent factors. As outlined by Lann (1959), when the t-value exceeds 1.96 and the p-value is below 0.05, the relationship is statistically significant. This implies that the exogenous variable truly influences the endogenous ones. Moreover, when the (β) values are positive, it indicates a positive correlation between the two factors, and conversely.

Table (6) Estimates of structural parameters

Hypotheses	Standardized regression weight (β)	t value	P-value	Conclusion
H1: ATD →PGV	,216	1,649	,099	Rejected
H2: EC →PGV	,046	,583	,560	Rejected
H3: DSN→PGV	,488	3,653	***	Supported
H4: ATD→BI	,773	10,569	***	Supported
H5: PGV→BI	,135	2,059	,040	Supported

*** Significant at level p 0.001 (two-tailed)
*** p <0,001

Source: Amos outputs

Table (6) shows the standardized regression weights (β), t-values, and p-values for various hypothetical relationships. The connection between attitude towards upcycled food and perceived green value turned out to be non-significant (β=0.216; t=1.649; p-value=0.099), rejecting hypothesis H1. Similarly, the impact of environmental concerns on perceived green value also proved statistically non-significant (β=0.046; t=0.583; p-value=0.560), rejecting hypothesis H2.

However, the relationship between descriptive social norms and perceived green value emerged as significant and positive (β=0.488; t=3.653; p-value<0.001), supporting hypothesis H3, indicating that descriptive social norms are indeed positively associated with perceived green value. The conclusions regarding the hypotheses are summarized in Table (). The results from investigating the path significance also indicated that attitude towards upcycled food has a significant, strong, and positive impact on upcycled food purchase intention (β=0.773; t=10.569; p-value<0.001), confirming hypothesis H4.

The relationship between perceived green value and upcycled food purchase intention proved significant and positive (β=0.135; t=2.059; p-value=0.040), supporting hypothesis H5, meaning that perceived green value is indeed positively associated with behavioural intention.

5. Discussion:

The aim of this study was to examine how Algerian consumers respond to upcycled foods as part of restaurants' green marketing strategies. To achieve this, we constructed a structural equation model to evaluate behavioural intentions, attitudes, perceived green value, environmental concerns, and descriptive social norms. The measurement and structural models developed in this study demonstrated strong consistency, reliability, and a good fit for predicting the intention to buy upcycled food.

The path analysis conducted in the empirical study revealed insightful findings. Particularly, descriptive social norms were found to have a significant and positive influence on the perceived value of upcycled food in terms of its environmental benefits, which reflect what people commonly do, play a crucial role in shaping how individuals perceive the value of upcycled food. The significant and positive impact indicates that when people observe others engaging in behaviours that support upcycled food consumption, they are more likely to view it favourably. This underscores the impact of social influence on consumer perceptions and highlights

the potential effectiveness of leveraging descriptive norms in promoting sustainable food choices.

In line with the planned behaviour theory and related studies, our findings demonstrated a strong and significant connection between individuals' positive attitudes towards upcycled food and their intention to purchase this type of food. This indicates that when people hold favourable views about upcycled food—such as seeing it as environmentally friendly, innovative, or socially responsible—they are more likely to express a genuine interest in buying it. This relationship is crucial in the context of sustainable consumption, highlighting the pivotal role of attitudes in driving consumer choices towards more eco-friendly options. It suggests that efforts to promote upcycled food should focus not only on its environmental benefits but also on shaping positive perceptions and attitudes among consumers to encourage widespread adoption and support for sustainable food practices.

Our study also revealed a notable and positive influence of perceived green value on the intention to purchase upcycled food. This implies that when individuals perceive upcycled food as having strong environmental benefits, such as waste reduction or sustainability, they are more inclined to consider buying it. This finding underscores the importance of highlighting the environmental advantages of upcycled food in marketing and promotional efforts. By emphasizing its green value, businesses can potentially increase consumer interest and support for sustainable food options like upcycled products.

The empirical study, which included a sample of 238 Algerian individuals, revealed a positive trend in attitudes towards upcycled food as well as a favourable intention to purchase this type of food. Specifically, 49.6% of respondents were inclined to buy upcycled food to support waste reduction efforts, 10.9% for environmental preservation, 9.2% for a new culinary experience, and 7.6% due to its lower price compared to other meals. This suggests a promising outlook for the acceptance and adoption of upcycled food products within the Algerian population. Understanding this favourable attitude and intention among consumers can guide businesses and policymakers in developing targeted strategies to promote upcycled food and encourage sustainable consumption practices in Algeria. Our findings regarding the motives for purchasing upcycled food among Algerian consumers reveal several key insights. The significant percentage (49.6%) inclined to buy upcycled food to support waste reduction efforts reflects a growing awareness and concern for environmental sustainability within the population. This aligns with global trends where consumers are increasingly seeking products that align with their

environmental values. The motivations related to environmental preservation (10.9%) and the desire for a new culinary experience (9.2%) indicate a diverse range of reasons driving interest in upcycled food. This suggests that promoting upcycled food not only as a sustainable choice but also as an innovative culinary option could appeal to different consumer segments. Additionally, the lower price compared to other meals (7.6%) emerged as a motivator for some consumers. This highlights the potential economic appeal of upcycled food, especially in regions where cost considerations play a significant role in purchasing decisions. However, it's notable that 19.3% of respondents expressed a reluctance to try upcycled food. This hesitation could stem from various factors, such as unfamiliarity with the concept, concerns about taste or quality, or simply a preference for traditional foods. Understanding these barriers is essential for addressing consumer hesitations and increasing acceptance of upcycled food. Marketers and policymakers can use this insight to develop targeted educational campaigns, improve product messaging, and address misconceptions to broaden acceptance and adoption of upcycled food among Algerian consumers.

The concept of upcycled food, which aims to reuse surplus or imperfect ingredients into valuable culinary creations, presents an opportunity to address both food waste and food insecurity. By incorporating upcycled food practices in the restaurant industry, stakeholders can contribute to a more equitable and sustainable food system, ensuring that nutritious meals are accessible to a greater number of people. Utilizing upcycled ingredients and creating food products from what would otherwise be wasted elevates the value of food and brings tangible benefits to both the environment and society (Spratt et al., 2021). By repurposing ingredients that would typically be discarded, such as food by-products or surplus items, upcycling minimizes waste and reduces the environmental impact associated with food production and disposal. Additionally, these upcycled products often offer nutritional benefits and innovative flavours, contributing to a more diverse and sustainable food landscape. From a societal perspective, upcycling food fosters awareness about food waste issues and encourages responsible consumption practices. It also creates economic opportunities by tapping into new markets for sustainable food products. Overall, the practice of upcycling food not only maximizes the use of resources but also promotes a more resilient and environmentally conscious food system.

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