UK Consumers' Willingness to Pay for Eco-Friendly, Renewable Energy-Powered Agri-Food Systems

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ABSTRACT

Integrating anaerobic digestors (AD) and recirculating aquaculture systems (RAS) for sourcing King Prawns (KP) in UK agriculture is a promising farm diversification approach based on circular economy principles. RAS powered by AD renewable energy can boost farm Net Margins by up to 56% and 38% for arable and dairy farms, respectively, while promoting waste recycling and nutrient efficiency. KP is a healthy and mostly imported seafood, but there are concerns regarding environmental degradation and unsustainable practices abroad (e.g., mangrove deforestation). In addition, there is a lack of understanding of consumer preferences regarding UK-grown KP. We investigate the willingness to pay (WTP) for UK-sourced KP under standard and environmentally friendly systems integrating AD. We collected 282 responses on, among others, consumer demographics, purchasing preferences, and origin. We apply Weber's law to build price increments for our WTP analysis. The results illustrate a higher WTP for UK-grown prawns under both systems and the likelihood of switching to a 'UK option'. Under standard practices, 27.3% of respondents were willing to pay an additional £0.51–£1.05, considering a £5 baseline price (approx. the retail price for a 150 g unit). Regarding 'environmentally friendly practices', 26.87% were willing to pay £0.51–£1.05, and 19.38% would pay £1.05–£1.60. When considering a switch from usual prawns purchases to the UK option, 45.18% were somewhat likely under both production scenarios. Still, the highly likely group doubled to 29.82% for a system powered by AD energy, highlighting strong consumer preference for sustainability. The principles of a circular economy and domestic production positively influence consumer choice. The WTP findings suggest a premium market price for agri-food businesses while supporting the integration of RAS and AD. This potential transformation opens avenues for innovative practices that satisfy the demand for healthy diets and support the transition towards more sustainable food systems

1. Introduction

This research project aims to investigate consumer behaviours, preferences, and attitudes toward purchasing king prawns, with a particular focus on UK-grown and environmentally friendly options. The study addresses a critical research problem: understanding the factors influencing consumer WTP for sustainably sourced king prawn products. While previous studies indicate that consumers generally prefer seafood associated with higher quality, freshness, and sustainability (Mustapa et al., 2025), there remains a gap in understanding how these attributes interact with demographic factors, cultural influences, and eco-certification labels in shaping consumer demand (Meyer et al., 2025). Therefore, this project seeks to explore the determinants of consumer WTP for king prawns, examining the relative importance of product quality, environmental certifications, and demographic characteristics such as income, age, and education. Additionally, the research aims to assess how cultural influences, and culinary traditions affect consumer preferences for sustainably sourced king prawns in the UK. Specifically, the objectives of the study include: (1) identifying key product attributes that consumers consider when purchasing prawns; (2) assessing the impact of sustainability certifications on consumer WTP; (3) examining demographic and cultural factors influencing consumer choices; and (4) evaluating the extent to which consumer education on sustainability affects purchasing decisions. By addressing these objectives, the research intends to contribute valuable insights into the growing trend of environmentally conscious consumption and provide recommendations for marketing strategies and policy interventions that promote sustainable prawn production and consumption.

This paper presents a detailed analysis of the King Prawn Survey, focusing on consumer behaviours, preferences, and attitudes toward purchasing prawns, particularly UK-grown and environmentally friendly options. The study is based on a set of categorical questions that capture shopping frequencies, the importance of various product attributes, willingness to pay, and the demographic characteristics of the respondents.

Research on willingness to pay (WTP) for shrimp and prawn-related products globally, particularly in Europe, indicates that several determinants significantly influence consumer preferences and pricing. The quality of the product is predominant, as consumers often associate higher quality with better taste and health benefits, which in turn increases their WTP. Studies have shown that consumers are willing to pay a premium for seafood that is perceived as fresh and of high quality, often linked to sustainability practices in fishing and aquaculture (Cantillo et al., 2021; Smetana et al., 2022). Furthermore, the presence of sustainability certifications, such as those from the Marine Stewardship Council (MSC), enhances consumer confidence and willingness to

pay, as these labels signal responsible sourcing and environmental stewardship (Bonanomi et al., 2017; Vitale et al., 2020).

Sustainability certifications play a crucial role in shaping consumer attitudes towards seafood products. Research indicates that eco-labels inform consumers about the environmental impact of their purchases and serve as a marketing tool that can significantly influence WTP (Asche et al., 2015; Vitale et al., 2017). For instance, consumers in various European countries have demonstrated a higher WTP for seafood products that carry eco-labels, reflecting a growing trend towards environmentally conscious consumption (Malcorps et al., 2021; Vitale et al., 2017). This trend is further supported by findings that highlight the importance of consumer education regarding sustainability issues, which can lead to increased support for eco-labelled products (McClenachan et al., 2016; Tlusty, 2012).

Demographic variables also significantly influence WTP for shrimp and prawn products. Factors such as income level, age, and education have been shown to correlate with consumer preferences for sustainable seafood (Cantillo et al., 2021; Smetana et al., 2022). Higher-income consumers tend to exhibit a greater willingness to pay for eco-labelled products, as they are often more aware of the environmental issues associated with seafood consumption (Xu et al., 2012). Additionally, younger consumers and those with higher education levels are more likely to prioritise sustainability in their purchasing decisions, indicating a shift in consumer behaviour towards more responsible consumption patterns (Almeida et al., 2015; Neale et al., 2012).

Cultural influences and culinary traditions further complicate the landscape of consumer preferences for shrimp and prawn products. Different European countries exhibit varying degrees of emphasis on sustainability and quality, often influenced by local culinary practices and traditions (Cantillo et al., 2021; Malcorps et al., 2021). For example, in some cultures, traditional recipes and cooking methods may dictate the types of preferred seafood, which can affect WTP. This cultural context is essential for understanding the complexities of consumer behaviour in the seafood market, as it highlights the interplay between intrinsic product attributes and external factors such as marketing and policy initiatives (Torquati et al., 2018).

Overall, the analysis of WTP for shrimp and prawn products underscores the multifaceted nature of consumer behaviour in the seafood market. Both intrinsic product attributes, such as quality and health benefits, and external factors, including sustainability certifications and demographic influences, play critical roles in shaping consumer preferences and pricing strategies. As consumers become increasingly aware of the environmental impacts of their food choices, the demand for sustainably sourced seafood is likely to grow, necessitating further research into the dynamics of consumer behaviour in this sector (Barclay & Miller, 2018; Cranfield et al., 2010).

2. Data and Methods

2.1. Survey structure and data collection

The survey utilised in this study (see the complete questionnaire in Supplementary Materials, (6) section was designed to investigate consumer attitudes toward UK-grown prawns, focusing on willingness to pay for products with varying levels of environmental sustainability. The survey, structured into multiple sections, captured demographic information, shopping behaviours, the importance of product attributes, and self-perceived environmental consciousness. Key questions aimed to assess the frequency of grocery shopping, seafood purchasing habits, and the significance of factors such as price, country of origin, and farming methods in purchasing decisions. Furthermore, respondents were asked about their willingness to pay a premium for prawns produced using standard and environmentally friendly practices. The survey also included Likert scale items to gauge environmental attitudes and behaviours. We use Qualtrics to format and distribute the survey.

Data collection was conducted during May and June 2024. The survey was promoted through the social media channels of the University of Reading and the University of Exeter. Many responses were gathered during the University of Reading's Community Festival in May 2024. Out of 282 total responses, 255 were retained after pre-processing, ensuring the validity of the dataset for subsequent analysis.

In terms of data analysis, we conducted a descriptive and regression analysis. Our descriptive offer insights across each question. Our regression-based techniques explore the factors influencing respondents' willingness to pay for UK-grown prawns. The independent variables in the regression model included demographic factors such as age, gender, education, income, and employment status, alongside self-perception measures of environmental consciousness. The analysis aims to identify the key drivers behind consumer willingness to pay a premium for environmentally sustainable seafood, as detailed below.

2.2. Modelling and estimation approach

To evaluate the influence of sociodemographic factors and environmental attitudes on consumers' willingness to pay for UK-farmed king prawns, we employed an Ordinal Logistic Regression (OLR) model. This model is appropriate given that the dependent variables, representing willingness to pay, are ordinal in nature (i.e., they are categorical variables with a meaningful order). OLR allows us to capture the nuanced preferences of consumers regarding their WTP based on multiple influencing factors as past studies (Cheung et al., 2022; Mauracher et al., 2019; Palmieri et al., 2021).

We focus on two main dependent variables:

i) Willingness to pay for king prawns produced under standard practices (WTP_{Stand}): This variable is ordinal and coded into categories based on the range of additional amounts respondents are willing to pay.

ii) Willingness to pay for king prawns produced under environmentally friendly practices (WTP_{Env}): This variable is similarly ordinal and coded based on the willingness to pay for environmentally friendly practices.

The independent variables include gender, age range, employment status, education, household income, environmental consciousness (representing the respondent's self-perception as environmentally conscious), and behaviour (indicating the extent to which respondents engage in environmentally friendly behaviours). The OLR is specified as follows:

$$logit\big(P(Y \leq j)\big) = \alpha_j - (\beta_1 Age + \beta_2 Emp + \beta_3 Gender + \beta_4 Educ + \beta_5 Income + \beta_6 EnvConscious + \beta_7 EnvBehaviour \quad (1)$$

where Y represents the dependent variable (WTP_{Stand}, WTP_{Env}), j indexes the ordered categories of the dependent variable, and α is the threshold parameter for the j-th category. The βThe coefficients are estimated using Maximum Likelihood Estimation (MLE). The model estimates the log-odds of being in a higher willingness-to-pay category relative to the reference category for each predictor versus being in any lower category.

3. Results

3.1. Descriptive analysis

3.1.1. Demographic profiles and environmental consciousness of respondents

Table 1 outlines the demographic characteristics of the survey respondents, including age, employment status, gender, education level, income, and the presence of children in the household. The survey captured a broad range of ages, with a concentration of 38.7% in the 35-54 age groups, representing middle-aged adults likely to have established buying habits. Regarding gender, most of the sample was responded by female individuals (47.3%) and related to education and employment status; the most represented categories are individuals holding post-graduate credentials and full-time workers, respectively. Since most respondents hold higher education degrees and are employed full-time, the sample would reflect a consumer

base that may be more informed and discerning in purchasing decisions with stable income and consistent purchasing power. The presence of children in the household is, on average, 0.73. Children's presence may influence purchasing decisions, particularly regarding nutritional content and family-friendly products.

Table 1. Respondents' demographics and socio-economic features (53 no responses)

Demographics and socio-economic variables	n	%
Age range		
18-24 years old	24	8.54
25-34 years old	46	16.37
35-44 years old	50	17.79
45-54 years old	61	21.00
55-64 years old	36	12.81
65+ years old	12	4.27
Gender		
Female	134	47.33
Male	88	31.32
Non-binary / third gender	3	1.07
Prefer not to say	4	1.42
Education		
Post-graduate degree and above	142	50.53
College or university	64	22.78
Higher or secondary or further education (A-le...	13	4.63
Secondary school up to 16 years	6	2.14
Up to primary education	4	1.42
Employment status		
Working full-time	132	46.98
Working part-time	42	14.95
Student	37	13.17
Retired	11	3.91
A homemaker or stay-at-home parent	4	1.42

Other	3	1.07
Income range		
Less than£10,000 per year	10	2.49
Between£10,000 and£20,000 per year	19	6.76
Between£20,001 and£30,000 per year	25	8.90
Between£30,001 and£40,000 per year	30	10.68
Between£40,001 and£50,000 per year	37	13.17
Between£50,001 and£60,000 per year	29	10.32
Between£60,001 and£70,000 per year	16	5.69
Between£70,001 and£80,000 per year	11	3.91
More than£80,000 per year	52	18.51
Number of children		
Mean = 0.73		
St dev=1.23		
min= 0		
max=12		

Note: Percentages estimated on the total of valid responses. Approx 53 no responses in the sample.

We also asked about individuals' self-perceptions regarding the environment. Table 2 presents the results for the questions "I think of myself as an environmentally conscious person" and "I am the type of person who engages in environmentally friendly behaviours". Our results reveal a strong inclination among the respondents towards environmental awareness and action. To illustrate, a significant majority, 51.95%, of participants somewhat agree with identifying themselves as environmentally conscious, with an additional 36.80% strongly agreeing. This indicates that nearly 90% of respondents perceive themselves as aware of environmental issues. Similarly, when asked about engaging in environmentally friendly behaviours, 55.41% somewhat agree, and 31.60% strongly agree, suggesting that over 87% of respondents actively participate in environmentally responsible actions. The consistency between these two responses underscores a high level of environmental consciousness and corresponding behaviour among the participants, which could influence their preferences and willingness to pay for sustainably produced goods. Only a tiny fraction of respondents disagreed with these statements, with less than 7% either somewhat or strongly disagreeing, indicating that environmentally unfriendly attitudes are rare in this sample.

Table 2. Environment self-perception

I think of myself as a:	environmentally conscious person		a person who engages in environmentally friendly behaviours	
	n	%	n	%
Strongly disagree	7	3.03	8	3.46
Somewhat disagree	7	3.03	6	2.60
Neither agree nor disagree	12	5.19	16	6.93
Somewhat agree	120	51.95	128	55.41
Strongly agree	85	36.80	73	31.60
No response	51		51	

Note: Percentages estimated on the total of valid responses

3.1.2. Understanding consumer shopping patterns

This section analyses respondents' shopping habits, including how often they shop for groceries, seafood, and prawns. Table 3 shows that most respondents (42.5%) reported grocery shopping “once a week”, indicating that most consumers follow a consistent weekly shopping routine. Seafood is purchased weekly only by 28.6% of respondents, while 20.3% declare a 2-3 times per month routine, suggesting a less frequent pattern than groceries. Regarding prawns, they are bought even less frequently, with the majority (55.4%) indicating they purchase prawns “Monthly” (17.5%) or “less often than monthly” (37.8%). This suggests prawns are seen as a luxury or speciality item, consumed on specific occasions rather than regularly. Also, 19.5% of the sample declared newer buying prawns.

Table 3. Consumer shopping patterns

Frequency	Grocery shopping		Buying seafood		Buying prawns	
	n	%	n	%	n	%
Daily	3	1.17	0	0.00	0	0.39
5-6 times per week	5	1.95	0	0.00	0	0.00
3-4 times per week	45	17.58	5	1.96	0	0.00
Twice a week	60	23.44	14	5.49	3	1.17
Once a week	109	42.58	73	28.63	15	5.86
2-3 times per month	24	9.38	52	20.39	45	17.58
Monthly	4	1.56	45	17.65	45	17.58
Less often than monthly	4	1.56	46	18.04	97	37.89
Never	2	0.78	20	7.84	50	19.53
No response	26		27		27	
Total	282		282		282	

Note: Percentages estimated on the total of valid responses

3.1.3. Key attributes influencing prawn purchasing decisions

This section explores the factors consumers consider important when buying prawns, including expiration date, nutritional information, appearance, brand name, country of origin, price, and farming methods. Table 4 summarises these insights as follows:

- The “expiration date” is considered "Very and Extremely important" by a substantial majority of respondents (72.5%), indicating that freshness and food safety are top priorities.

- While still important, “nutritional content” is less critical than the expiration date, with a 39.4% portion of respondents finding it “very and extremely important”.

- The “appearance” of prawns is highly valued, with 63.3% of respondents considering it a key factor in their purchasing decision.

- The “brand name” shows lower importance, with most respondents (46%) considering it 2not at all important”.

- “Country of origin” shows mixed importance, with the majority of responses for categories from Slightly to Very important.

- The “price” is a critical consideration, and similar to the appearance attribute, most respondents indicate it as a very and extremely important factor (59.7%), highlighting the need for competitive pricing.

- There is considerable concern for “farming and processing methods” approved by respondents, with many respondents (55.2%) considering this very and extremely important, reflecting a growing consumer awareness of utilised farming/processing.

Table 4. Attributes importance when buying prawns

Attributes		Not at all important	Slightly important	Neither / Nor important	Very important	Extremely important	No response	Total
Expiration day	n	5	29	28	84	80	56	282
	%	2.21	12.83	12.39	37.17	35.40		
Nutritional content	n	42	36	60	69	21	54	282
	%	18.42	15.79	26.32	30.26	9.21		
Appearance	n	6	35	43	93	52	53	282
	%	2.62	15.28	18.78	40.61	22.71		
Brand name	n	105	36	66	15	6	54	282
	%	46.05	15.79	28.95	6.58	2.63		
Country of origin	n	29	50	61	63	27	52	282
	%	12.61	21.74	26.52	27.39	11.74		
Price	n	5	45	43	98	40	51	282
	%	2.16	19.48	18.61	42.42	17.32		
Approved farming/processing methods	n	18	33	52	73	54	52	282
	%	7.83	14.35	22.61	31.74	23.48		

Note: Percentages estimated on the total of valid responses

3.2. Willingness to pay

3.2.1. Descriptive results

This section examines how much more consumers are willing to pay for UK-farmed prawns under standard and environment-friendly practices and their likelihood of replacing usual prawn purchases with 100% UK-produced and more sustainable ones. Table 5 shows results for willingness to pay more for UK-farmed and processed king prawns under both standard and environmentally friendly practices, highlighting consumers' preferences towards sustainable food production. Considering prawns produced under standard practices, 27.31% of respondents were willing to pay an additional £0.51 to £1.05, making it the most common response. This was followed by 20.26% willing to pay an extra £0.01 to £0.50, while 18.50% of respondents were unwilling to pay more than the base price £5. In contrast, when the prawns were processed under environmentally friendly practices, a slightly lower % of respondents, 26.87%, were willing to pay an additional £0.51 to £1.05, similar to the standard practice's scenario. However, the willingness to pay increased notably for higher price increments, with 19.38% of respondents willing to pay £1.051 to £1.60 more and 15.42% willing to pay £1.61 to £2.30 more. Only 10.57% of respondents were unwilling to pay any extra for environmentally friendly practices, which is lower than the 18.50% for standard practices. This indicates a stronger consumer preference and greater willingness to pay a premium for prawns that are produced using environmentally sustainable methods.

Table 5. Willingness to pay

Willingness to pay	Standard practices		Environmental practices	
	n	%	n	%
0£	42	18.50	24	10.57
0.01 - 0.5£ (1 - 50 pence)	46	20.26	31	13.66
0.51 - 1.05£	62	27.31	61	26.87
1.051 - 1.60£	34	14.98	44	19.38
1.61 - 2.30£	12	5.29	35	15.42
2.31 - 3.00£	12	5.29	11	4.85
3.01 - 3.80£	9	3.96	10	4.41
3.80£ or more	10	4.41	11	4.85
No response	55		55	

Note: Percentages estimated on the total of valid responses

We also explore consumers' likelihood of replacing their usual prawn purchases with King Prawn-branded products that are 100% UK-farmed. In this regard, Table 6 shows that when considering prawns processed under standard practices, 45.37% of respondents indicated they are somewhat likely to make the switch, with an additional 14.54% being extremely likely to do so. However, 21.15% of respondents were neutral, neither likely nor unlikely to replace their usual prawns with the UK-farmed option, and 18.95% expressed some reluctance, being either somewhat or extremely unlikely to make the switch. In contrast, when the prawns are processed using environmentally friendly practices, the likelihood of switching increases significantly. The percentage of respondents somewhat likely to switch remains nearly identical at 45.18%. However, the proportion of those extremely likely to switch jumps to 29.82%, more than double the figure for standard practices. The number of respondents who are extremely unlikely or somewhat unlikely to switch decreases to a combined 11.85%, indicating a stronger overall preference for prawns produced under environmentally friendly practices. These results suggest that ecologically sustainable production methods could be a critical factor in influencing consumer behaviour towards purchasing UK-farmed prawns.

Table 6. Likelihood of replacing their usual prawn purchases with prawns that are 100% UK-farmed

Likelihood of replacing usual prawn purchases with prawn 100% farmed in the UK under:	Standard practices		Environmental practices	
	n	%	n	%
Extremely unlikely	14	6.17	10	4.39
Somewhat unlikely	29	12.78	17	7.46
Neither likely nor unlikely	48	21.15	30	13.16
Somewhat likely	103	45.37	103	45.18
Extremely likely	33	14.54	68	29.82
No response	55		54	

Note: Percentages estimated on the total of valid responses

3.2.2. Drivers of willingness to pay

Model 1: Willingness to Pay for UK produced King Prawns with Standard Practices

An ordinal logistic regression model was used to examine the relationship between willingness to pay for standard environmental products and several predictors, including environmental consciousness, environmental behaviour, income, gender, education, and age. Among the polynomial contrasts of environmental consciousness, the cubic contrast (Q8_environmentConciuos.C) emerged as a statistically significant predictor (t = 2.305), suggesting a non-linear relationship: individuals with certain patterns of environmental consciousness were more likely to fall into higher willingness-to-pay categories. Environmental behaviour (Q9_environmentBehaviour.C) showed a marginally significant negative cubic effect (t = -1.695), indicating that some behavioural patterns might be associated with lower willingness to pay, although this result was not statistically conclusive. Demographic variables such as income, gender, and education did not show significant associations with willingness to pay. However, age was a strong predictor: individuals aged 25–34, 45–54, and 55+ were significantly less likely to be in higher willingness-to-pay categories compared to the reference group (likely 18–24), with t-values of -3.137, -2.372, and -2.004, respectively. The model had a residual deviance of 273.04 and an AIC of 323.04. These values suggest a reasonable model fit, though further diagnostics may be warranted. A total of 31 observations were excluded due to missing data.

Table 7. Model 1 (Standard Environmental Practices) Predictor estimates

Predictor	*Estimate*	*Std. Error*	*t value*	*p-Value*
Q8_environmentConciuos.L	0.6671	1.406	0.474	0.635
Q8_environmentConciuos.Q	-1.1839	1.221	-0.970	0.332
Q8_environmentConciuos.C	**1.8368**	**0.797**	**2.305**	**0.021**
Q8_environmentConciuos^4	-1.1541	0.770	-1.499	0.134
Q9_environmentBehaviour.L	-1.0085	1.227	-0.822	0.411
Q9_environmentBehaviour.Q	1.0913	1.068	1.021	0.307
Q9_environmentBehaviour.C	**-1.9117**	**1.128**	**-1.695**	**0.09**
Q9_environmentBehaviour^4	0.8020	0.843	0.951	0.342
incomeGroupMiddle income	0.1548	0.510	0.304	0.761
incomeGroupHigh income	0.5008	0.546	0.918	0.359
D3_genderMale	-0.0969	0.392	-0.247	0.805
educGroupMedium education	-0.1995	0.682	-0.293	0.77
educGroupHigh education	0.0945	0.673	0.140	0.888
D1_ageRange25-34 years old	**-2.1419**	**0.683**	**-3.137**	**0.002**
D1_ageRange35-44 years old	**-0.7613**	**0.658**	**-1.157**	**0.247**
D1_ageRange45-54 years old	**-1.6119**	**0.679**	**-2.372**	**0.018**
D1_ageRange55+ years old	**-1.3303**	**0.664**	**-2.004**	**0.045**

Table 8. Model 1. Intercepts

Threshold	*Estimate*	*Std. Error*	*t value*	*p-value*
0£|0.01£ - 0.5£ (1-50 pence)	-1.911	0.857	-2.230	0.026
0.01£ - 0.5£ (1-50 pence)|0.51 - 1.05£	**-1.911**	**0.857**	**-2.230**	**0.026**
0.51 - 1.05£|1.051 - 1.60£	0.068	0.834	0.081	0.935
1.051 - 1.60£|1.61 - 1.60£	**1.737**	**0.860**	**2.021**	**0.043**
1.61 - 1.60£|1.61-2.30£	**1.737**	**0.860**	**2.021**	**0.043**
1.61-2.30£|2.31-3.00£	**1.737**	**0.860**	**2.021**	**0.043**
2.31-3.00£|3.01£-3.80£	**1.737**	**0.860**	**2.021**	**0.043**
3.01£-3.80£|3.80£ or more	**1.737**	**0.860**	**2.021**	**0.043**

The intercepts from the ordinal logistic regression model represent the thresholds between adjacent categories of willingness to pay. The first two thresholds, distinguishing the lowest payment categories (up to £0.50), were statistically significant, indicating clear separation between these lower levels. In contrast, the threshold between £0.51–£1.05 and £1.051–£1.60 was not significant, suggesting less distinction between these middle categories. All higher thresholds, from £1.60 upwards, were estimated at the same value and were statistically significant, reflecting consistent and meaningful separation among the higher willingness-to-pay categories. These results suggest that the model effectively differentiates between the lowest and highest levels of willingness to pay, while the middle categories may exhibit more overlap.

Model 2: Willingness to Pay for UK produced King Prawns under Sustainable Environmental Practices

A second ordinal logistic regression model was fitted to assess individuals' willingness to pay for UK produced King Prawns under sustainable environmental practices, using the same set of predictors as the previous model: environmental consciousness, environmental behaviour, income, gender, age and education. The linear trend of environmental behaviour (Q9_environmentBehaviour.L) was a statistically significant positive predictor (t = 1.981), indicating that individuals who reported more frequent pro-environmental behaviours—such as recycling, conserving energy, or reducing waste—were more likely to express higher willingness to take further action for environmental causes. High income also emerged as a significant predictor (t = 2.044), suggesting that individuals in the highest income bracket were more likely to report greater willingness to act, potentially due to increased financial flexibility or access to resources that facilitate environmentally responsible actions. The linear trend of environmental consciousness (Q8_environmentConciuos.L) showed a marginally significant negative effect (t = -1.904), which may indicate that individuals who strongly identify as environmentally conscious do not always translate that awareness into a higher willingness to act—possibly due to skepticism about the effectiveness of individual actions or perceived barriers. A fourth-degree polynomial term for environmental behaviour (Q9_environmentBehaviour^4) also showed a marginal effect (t = 1.720), suggesting the presence of a non-linear relationship—for example, that willingness to act may increase at both low and high levels of behavioural engagement, but plateau or dip at moderate levels. Other predictors, including middle income, male gender, and medium or high education levels, were not significantly associated with willingness to act. This suggests that demographic factors such as income (except at the highest level), gender, and education may play a limited role in shaping environmental action when controlling for attitudes and behaviours. Several higher-order polynomial contrasts for both environmental consciousness and behaviour had wide confidence intervals and lacked statistical significance, indicating that more complex patterns in these variables were not strongly supported by the data. The model yielded a residual deviance of 204.35 and an AIC of 246.35, identical to the first model, with 31 observations excluded due to missing data.

Table 9. Model 2 (Standard Environmental Practices) Predictor estimates

Predictor	*Estimate*	*Std. Error*	*t value*	*p-value*
Q8_environmentConciuos.L	**-3.14233**	**1.6504**	**-1.9040**	**0.057**
Q8_environmentConciuos.Q	1.32135	1.2541	1.0536	0.292
Q8_environmentConciuos.C	1.24298	0.9659	1.2868	0.198
Q8_environmentConciuos^4	-1.39626	0.9760	-1.4306	0.153
Q9_environmentBehaviour.L	**2.86147**	**1.4445**	**1.9810**	**0.048**
Q9_environmentBehaviour.Q	-0.57526	1.0988	-0.5236	0.601
Q9_environmentBehaviour.C	-0.95785	1.2279	-0.7801	0.435
Q9_environmentBehaviour^4	**1.64135**	**0.9542**	**1.7201**	**0.085**
incomeGroupMiddle income	0.09557	0.5433	0.1759	0.86
incomeGroupHigh income	**1.22096**	**0.5973**	**2.0443**	**0.041**
D3_genderMale	-0.08411	0.4416	-0.1905	0.849
educGroupMedium education	0.80880	0.9361	0.8640	0.388
educGroupHigh education	0.41527	0.8734	0.4755	0.634

Table 10. Model 1. Intercepts

Threshold	*Estimate*	*Std. Error*	*t value*	*p-value*
0£|0.01£ - 0.5£ (1-50 pence)	-0.7704	0.8729	-0.8825	0.377
0.01£ - 0.5£ (1-50 pence)|0.51 - 1.05£	-0.7704	0.8729	-0.8825	0.377
0.51 - 1.05£|1.051 - 1.60£	1.0467	0.8941	1.1706	0.242
1.051 - 1.60£|1.61 - 1.60£	**3.4118**	**0.9659**	**3.5323**	**0.0**
1.61 - 1.60£|1.61-2.30£	**3.4118**	**0.9659**	**3.5323**	**0.0**
1.61-2.30£|2.31-3.00£	**3.4118**	**0.9659**	**3.5323**	**0.0**
2.31-3.00£|3.01£-3.80£	**3.4118**	**0.9659**	**3.5323**	**0.0**
3.01£-3.80£|3.80£ or more	**3.4118**	**0.9659**	**3.5323**	**0.0**

The intercepts from the ordinal logistic regression model represent the thresholds between adjacent categories of willingness to act. The first three thresholds, which separate the lower and middle categories (up to approximately £1.60), were not statistically significant, indicating limited distinction between these levels of willingness. In contrast, all thresholds from £1.60 upwards were statistically significant ($p < 0.001$) and shared the same estimated value (3.412), suggesting strong and consistent separation between the higher categories. This pattern indicates that the model is particularly effective at distinguishing individuals with greater willingness to act, while the lower and middle categories show more overlap in predicted probabilities.

4. Discussion & Conclusion

The insights from the King Prawn Survey highlight key consumer preferences and behaviours, particularly regarding sustainability, price sensitivity, and the importance of product origin. These findings provide valuable guidance for targeting marketing strategies, product positioning, and the development of prawn products that align with consumer values and expectations. By focusing on these critical factors, businesses can better cater to the demands of the UK market, particularly in the growing segment of environmentally conscious consumers.

This study explored the factors influencing individuals' willingness to pay for King Prawns produced in the UK under standard and sustainable environmental practices, using ordinal logistic regression models respectively. The results offer insights into the psychological and socioeconomic drivers of pro-environmental behaviour, with implications for policy design and environmental marketing strategies.

A key observation lies in the interpretation of the model's intercepts, which define the thresholds between adjacent categories of willingness to pay. The first three thresholds—spanning the lower to middle categories (up to approximately £1.60)—were not statistically significant. This suggests that individuals within these lower levels of willingness to pay are not easily distinguishable based on the predictors included in the model. The overlap in predicted probabilities across these categories may reflect a general ambivalence or lack of differentiation in moderate levels of environmental engagement.

In contrast, all thresholds from £1.60 and above were statistically significant ($p < 0.001$) and shared a consistent estimated value. This uniformity and significance indicate that the model is particularly effective at distinguishing individuals who exhibit higher levels of willingness to pay. The clear separation among these upper categories suggests that once individuals surpass a certain threshold of motivation or capacity—whether due to behavioural, attitudinal, or socioeconomic factors—they are more consistently identifiable in terms of their readiness to engage in environmental action.

Environmental Behaviour as a Key Driver

Across both models, environmental behaviour emerged as a consistent and significant predictor. In the second model, the linear trend of environmental behaviour was strongly associated with increased willingness to act, with a notably high odds ratio. This suggests that individuals who already engage in environmentally friendly behaviours are more likely to support further environmental initiatives, either through action or financial contribution. This finding aligns with behavioural consistency theories, which posit that past behaviour is a strong predictor of future actions.

Income Effects and Economic Considerations

High income was a significant predictor in the second model (willingness to act), but not in the first model (willingness to pay for standard products). This discrepancy may reflect a difference in perceived value or urgency between general environmental products and more direct environmental actions. It also suggests that while financial capacity may enable action, it does not necessarily translate into consumer choices unless the environmental benefit is clearly communicated or perceived as impactful.

Complex Role of Environmental Consciousness

Environmental consciousness showed a more nuanced effect. While a cubic contrast was significant in the first model, the linear trend was only marginally significant in the second. This indicates a non-linear relationship, where moderate levels of consciousness may not be sufficient to drive behaviour, or where overly abstract environmental concerns may not translate into concrete action. These findings highlight the importance of targeted messaging that connects environmental values with specific, actionable outcomes.

Non-Significant Predictors: Gender and Education

Neither gender nor education level significantly predicted willingness in either model. This suggests that pro-environmental attitudes and behaviours may be more universally distributed across demographic groups than previously assumed. Alternatively, it may reflect the limitations of the sample size or the need for more nuanced measures of these variables.

Model Fit and Limitations

Both models demonstrated similar fit statistics (Residual Deviance = 204.35, AIC = 246.35), with 31 observations excluded due to missing data. While the models provide valuable insights, the relatively small sample size and the complexity of the polynomial contrasts may limit generalizability. Future research could benefit from larger, more diverse samples and the inclusion of additional psychological or contextual variables.

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6. Supplementary Material

University of Reading

The UK Sustainable King Prawn Project

Survey of King Prawn Consumption in the UK

· The survey will be entirely anonymous, i.e. we will not request your name, contact details or any personal information which could be used to identify you;

· Participation in this study is entirely voluntary, and you are free to skip questions or leave the survey at any time without having to give a reason.

· By agreeing to take part in this survey, you consent to your anonymised answers being used in publications arising from the UK Sustainable King Prawn Project, such as technical reports, academic publications and conference presentations.

· If you have questions about this study, or you would like a summary of the survey results, please contact: Dr Yiorgos Gadanakis, Associate Professor, School of Agriculture, Policy and Development, University of Reading, email: g.gadanakis@reading.ac.uk.

This research project has been reviewed according to the procedures specified by the University Research Ethics Committee and has been given a favourable ethical opinion for conduct.

TO ACCESS THE SURVEY, PRESS ' --> '.

Consumer behaviour on seafood

In your household, how often do you go for grocery shopping?

- ○ Never
- ○ Less often than monthly
- ○ Monthly
- ○ 2-3 times per month
- ○ Once a week
- ○ Twice a week
- ○ 3-4 times per week
- ○ 5-6 times per week
- ○ Daily

How often do you buy seafood?

- ○ Never
- ○ Less often than monthly
- ○ Monthly
- ○ 2-3 times per month
- ○ Once a week
- ○ Twice a week
- ○ 3-4 times per week
- ○ 5-6 times per week
- ○ Daily

How often do you buy prawns?

- ○ Never
- ○ Less often than monthly
- ○ Monthly
- ○ 2-3 times per month
- ○ Once a week
- ○ Twice a week
- ○ 3-4 times per week
- ○ 5-6 times per week
- ○ Daily

When buying prawns during your typical supermarket trip, how important do you consider the following?

	Not at all important	Slightly important	Neither/Nor important	Very important	Extremely important
Expiration day	○	○	○	○	○
Brand name	○	○	○	○	○
The product has used farming/processing methods that I approve of	○	○	○	○	○
The price	○	○	○	○	○
Nutritional information	○	○	○	○	○
Country of origin	○	○	○	○	○
Appearance	○	○	○	○	○

Willingness to pay

Soon, you will be asked whether you are willing to pay for a 150g package of cooked King Prawn, conventionally produced or following sustainable production practices. Before answering, please think carefully about the consequences on your disposable income when paying an increase since that would decrease your available budget. Please keep in mind the above when answering the questions below.

Suppose now that a typical imported 150g package of cooked, King Prawn-branded food can be found in your favourite supermarket at an average cost of £5 (five pounds).

How **much more** would you be willing to pay for the same 150g package of cooked, King Prawn-branded food if it was 100% UK-farmed and processed under standard practices (e.g. conventional energy or electricity sources)?

- 0 £
- 0.01 - 0.5 £ (1 - 50 pence)
- 0.51 - 1.05 £
- 1.051 - 1.60 £
- 1.61 - 2.30 £
- 2.31 - 3.00 £
- 3.01 - 3.80 £
- 3.80 £ or more

Suppose now that a typical imported 150g package of cooked, King Prawn-branded food can be found in your favourite store at an average cost of £5 (five pounds).

How **much more** would you be willing to pay for the same 150g package of cooked, King Prawn-branded food if it was 100% UK-farmed and processed under environmental friendly practices (e.g. energy from circular economy systems like Anaerobic Digestor located at arable and dairy farms across the UK)?

- 0 £
- 0.01 - 0.5 £ (1 - 50 pence)
- 0.51 - 1.05 £
- 1.051 - 1.60 £
- 1.61 - 2.30 £
- 2.31 - 3.00 £
- 3.01 - 3.80 £
- 3.80 £ or more

How likely are you to replace your usual cooked prawn choice with a King Prawn-branded food if it was 100% UK-farmed and processed under standard practices as stated above?

- ○ Extremely unlikely
- ○ Somewhat unlikely
- ○ Neither likely nor unlikely
- ○ Somewhat likely
- ○ Extremely likely

How likely are you to replace your usual cooked prawn choice with a King Prawn-branded food if it was 100% UK-farmed and processed under environmental friendly practices as those illustrated above?

- ○ Extremely unlikely
- ○ Somewhat unlikely
- ○ Neither likely nor unlikely
- ○ Somewhat likely
- ○ Extremely likely

Which reasons best describe your choices to pay or not to pay for the food described above? [**Tick all that apply**]

- [ ] Environmentally friendly products are important to me
- [ ] I am on a limited budget
- [ ] I think it is our responsibility to protect environment
- [ ] I do not think that environmentally friendly products based on prawns would be effective for tackling climate change
- [ ] I do not think that I should be responsible for bearing an extra cost of an environmentally friendly prawn product
- [ ] I want to contribute to a good cause
- [ ] I think the current market of prawn products is adequate to tackle climate change
- [ ] I don't believe that the hypothetical scenario you presented can reflect real market conditions
- [ ] Others, such as the government and industry, should be responsible for bearing the extra cost of an environmentally friendly product based on prawns

I think of myself as environmentally-conscious person

- ○ Strongly disagree
- ○ Somewhat disagree
- ○ Neither agree nor disagree
- ○ Somewhat agree
- ○ Strongly agree

I am the type of person who engages in environmentally-friendly behaviours

- ○ Strongly disagree
- ○ Somewhat disagree
- ○ Neither agree nor disagree
- ○ Somewhat agree
- ○ Strongly agree

Demographics

How old are you?

- ○ Under 18
- ○ 18-24 years old
- ○ 25-34 years old
- ○ 35-44 years old
- ○ 45-54 years old
- ○ 55-64 years old
- ○ 65+ years old

What best describes your employment status over the last three months?

- ○ Working full-time
- ○ Working part-time
- ○ Unemployed and looking for work
- ○ A homemaker or stay-at-home parent
- ○ Student
- ○ Retired
- ○ Other

How do you describe yourself?

- ○ Male
- ○ Female
- ○ Non-binary / third gender
- ○ _____ Prefer to self-describe
- ○ Prefer not to say

How many children under 18 live with you?

What is the highest level of education that you have completed?

- Up to primary education
- Secondary school up to 16 years
- Higher or secondary or further education (A-levels, BTEC, etc.)
- College or university
- Post-graduate degree and above

In which of the following income brackets does the gross annual income (before any deductions) of your household fall?

When estimating the annual income of your household, please count all wages, pensions and other incomes that come in BEFORE taxes and other deductions.

- Less than £10,000 per year
- Between £10,000 and £20,000 per year
- Between £20,001 and £30,000 per year
- Between £30,001 and £40,000 per year
- Between £40,001 and £50,000 per year
- Between £50,001 and £60,000 per year
- Between £60,001 and £70,000 per year
- Between £70,001 and £80,000 per year
- More than £80,000 per year