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Consumers' Willingness to Pay a Premium for Climate-Friendly Food Production: The Role of Production Method Information and Social Norms

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ABSTRACT

This study examines whether information about production methods and social norms can increase consumers' willingness to pay (WTP) a price premium for food produced using climate-friendly farming methods. A randomized survey experiment was conducted with 1568 respondents across Denmark, Lithuania, and Spain, who were assigned to one of four experimental groups: a control group, a group receiving information on food production methods that can reduce climate impact, a group exposed to social norm messaging, and a group receiving combined interventions. Results show that while a substantial share of consumers expressed a positive WTP for climate-friendly produced carrots and beef, the proportion declined rapidly as the premium increased. Moderate premiums were acceptable to many respondents but only about 10% were willing to pay a premium above 10%. The average WTP for carrots was 5% in the control group and increased by about 16% under the combined information and social norm intervention, indicating that the two strategies together modestly enhance premium acceptance. Very similar patterns were observed for beef. The effects of the treatments differed across demographic groups: respondents aged 41 or below were more responsive to social norms, while respondents above 41 reacted more to production method information. Overall, the findings suggest that leveraging production information with social-norm message can modestly promote climate-friendly produced food choices and offer useful guidance for designing tailored communication strategies.

JEL Classification: D12, Q01, Q13, Q18

1 | Introduction

1.1 | Background and Motivation

Climate-smart agriculture (CSA) includes diverse farming practices and technologies (Amadu et al. 2020; Hussain et al. 2022) that aim to enhance sustainable agricultural productivity and adaptation to changing climatic conditions while mitigating climate impacts (Lipper et al. 2018). Within the domain of CSA, precision agriculture (PA) technologies could play a crucial role in increasing food production in a more sustainable way while also contributing to reductions in greenhouse gas (GHG) emissions (Takács-György and Takács 2022). These technologies contribute to climate-friendly food production and mitigate agricultural GHG emissions by increasing productivity, improving quality, and reducing fertilizer, agrochemical, and water use (Balafoutis et al. 2017). In addition, livestock management practices, such as replacing imported soybean meal (linked to land use change) with locally grown legumes (Rauw et al. 2023) and better manure handling, contribute to reducing methane emissions (Köninger et al. 2021), can also offer viable mitigation

strategies since livestock remains a significant source of GHG emissions (European Environmental Agency 2024). Furthermore, integrating renewable energy sources, such as solar power and biogas, into both crop and livestock systems provides an additional pathway to reduce emissions (Majeed et al. 2023). However, the large-scale adoption of these climate-friendly production practices ultimately depends on whether they are supported by market demand and consumer acceptance (Guetschow et al. 2021; Schnack et al. 2024).

A transition towards climate-friendly food systems, therefore, requires contributions of actors across the entire food system (Kenny et al. 2023; Schulze et al. 2024; Scherer and Verburg 2017). While supply-side efforts to enhance the adoption of sustainable practices are crucial (S.M. Pedersen et al. 2024), demand-side interventions are equally important. In this regard, consumers' WTP for food produced sustainably enables producers to adopt these practices through market signals (Hernandez-Aguilera et al. 2018; Jacques et al. 2025; Ploll et al. 2023). Without corresponding changes in consumer behavior, the overall effectiveness of supply-side measures may be limited (Lohmann et al. 2024). If consumers are willing to pay for climate-friendly produced food (Predieri et al. 2023), this can provide perceived demand-side incentives for farmers to invest in CSA technologies (S.M. Pedersen et al. 2024). Thus, aligning producer incentives with consumer preferences is a way forward for the transition to more climate-friendly food systems (Gemtou et al. 2025; Lohmann et al. 2024; Scherer and Verburg 2017).

In Europe, food companies are increasingly integrating sustainability attributes into their products in response to consumer demand and changing regulatory landscapes (Nes et al. 2024). Moreover, consumers often pay a higher price for organic products compared to conventional products (Boufous et al. 2023; Gastaldello et al. 2025). Producing food through CSA practices can reduce GHG emissions and thereby lower climate impacts, which is an important aspect of sustainability (Predieri et al. 2023; Said et al. 2025). However, CSA production often entails higher production costs and lower profits in the short run for farmers (Galgo et al. 2025; S.M. Pedersen et al. 2024). Empirical studies indicate that climate-friendly production practices often involve higher production costs, and that consumer price premiums may help offset these costs, thereby supporting adoption under specific market conditions (Li et al. 2016; Nian et al. 2023; Predieri et al. 2023).

A wide range of policy tools and market-based interventions can encourage consumers to choose sustainably produced food, including regulation, taxes, subsidies, certification schemes, and changes in product availability (Ammann et al. 2023; Bujold et al. 2020; Ran et al. 2022; White et al. 2019). Prior evidence shows that when such contributions are communicated effectively, consumers are willing to pay extra to support products with lower climate impacts (Fuller and Grebitus 2023; Grashuis 2021; Ploll et al. 2023; Staples et al. 2020; Yang and Renwick 2019a). Conversely, insufficient understanding of sustainable food production can reduce WTP and undermine adoption efforts (Pedersen et al. 2024; Van Bussel et al. 2022). In this regard, demand-side levers that enhance consumers' WTP are necessary (Jacobs et al. 2018; Pagliacci et al. 2020; Scherer and Verburg 2017).

One such lever is information provision (Jürkenbeck 2023; Ran et al. 2022; Stöckigt et al. 2018). Enhancing sustainability knowledge of available food products has been found to motivate a shift towards purchasing sustainably produced food (Schrader and Lawless 2004; Van Bussel et al. 2022). Empirical evidence shows that increasing consumers' awareness of food production plays an important enabling role in sustainably produced food choices by shaping beliefs and attitudes toward sustainability attributes (Dihr et al. 2021; Gustafson 2015; Ran et al. 2022; Scozzafava et al. 2021), highlighting the importance of information provision. Different studies suggest that targeted and credible information about food production methods and their climate benefits can increase trust in sustainability claims and raise WTP towards more sustainably produced foods (Ammann et al. 2023; Dihr et al. 2021; Feucht and Zander 2017; Rihn and Yue 2016). Nevertheless, food purchasing decisions are complex (Stöckigt et al. 2018) and information alone may not be sufficient. In this context, social influence has also been shown to play an important role in shaping pro-environmental consumption patterns (White et al. 2019), yet social dimensions of sustainability remain less examined than environmental impact (Piracci et al. 2024). Social-norm-based messages that highlight changing consumption patterns and social approval have been found to encourage purchases of sustainably produced food (Carrión-Yaguana et al. 2020; Salmivaara et al. 2021).

Building on evidence that both information provision and social-norm messaging can influence pro-environmental behavior independently, combining them may yield more substantial effects (Alt et al. 2024; Carrión-Yaguana et al. 2020). Fuller and Grebitus (2023) highlighted that communicating multiple sustainability-related attributes enhances consumers' willingness to pay for them, even though it remains an underinvestigated research domain (Hao et al. 2024). While previous studies have examined either the provision of information on climate-friendly food or the influence of social norms on willingness to pay a premium (e.g., Feucht and Zander 2017; Gravert and Kurz 2021; Li et al. 2016; Schmidt 2020), the interactive effects of these approaches have received limited attention. This study contributes to filling this gap by employing an experimental framework that integrates production-method information and social-norm text messaging within a willingness-to-pay framework, allowing us to assess whether normative cues amplify consumers' valuation of climate-friendly food beyond information provision alone. Using a randomized survey experiment, the paper compares information provision, social-norm messaging, and their combination, thereby isolating the added value of social norms in shaping consumers' willingness to pay. By doing so, the study provides evidence on when and for whom combined information–norm communication strategies outperform information-only approaches, contributing to the literature on demand-side instruments for promoting climate-friendly food systems, particularly within the CSA and EU context, where sustainable consumption remains a focus area (Van Bussel et al. 2022).

1.2 | Conceptual Framework and Hypothesis

This study builds on existing behavioral theories to explain why consumers may be willing to pay a premium for food produced

using CSA practices and how information about climate-friendly food production methods and social-norm nudge influence consumers' WTP for climate-friendly produced food. In particular, the Value-Belief- Norm (VBN) (Stern 2000) and the Norm-Activation Model (NAM) (Schwartz 1977) provide the foundation for why CSA production may generate higher WTP. The Knowledge-Attitude-Behavior (KAB) (Schrader and Lawless 2004) and Social Influence Theory (SIT) (Lim 2022; Wu and Yu 2025) are used to explain how information provision (as a cognitive mechanism) and social-norm messaging (as a normative mechanism) influence the consumer WTP.

The VBN and NAM suggest that individuals' pro-environmental behavior is driven by personal values, awareness of environmental consequences, and internalized moral norms, which activate motivations to act in environmentally responsible ways (Stern 2000; Schwartz 1977). Consumers who value environmental benefits may believe that climate friendly production reduces climate impacts, leading to a moral obligation to support such production (Chen et al. 2025; Iweala et al. 2022). NAM further explains how these moral norms translate into behavior when individuals recognize the environmental consequences of their choices and feel a sense of personal responsibility (Han et al. 2025). As a result, purchasing food produced using CSA practices can generate moral satisfaction and reinforce consumers' sense of environmental responsibility, thereby contributing to their overall utility (Iweala et al. 2022; Pedersen et al. 2024; Traoré et al. 2023).

Food produced using climate-friendly production methods embodies environmental and ethical credence attributes (Harwatt et al. 2024; Ishaq et al. 2023; Shabir et al. 2023a). These attributes cannot be directly verified by consumers at the point of purchase (Aminravan et al. 2025; Fuller and Grebitus 2023; Grunert et al. 2024; Piracci et al. 2023; Yang and Renwick 2019a). As a result, consumers' willingness to pay a premium for climate-friendly produced food reflects an increase in their reservation price driven by changes in utility associated with these credence attributes (Ishaq et al. 2024; Yang and Renwick 2019a; Zhou et al. 2025). Food products produced using climate-friendly production methods are commonly perceived as contributing to lower climate impacts relative to conventional methods (Keesstra et al. 2024; Li et al. 2016; Singh and Singh 2017). The utility derived from such products primarily stems from perceived intrinsic benefits, including environmental concern (Galgo et al. 2025; Ishaq et al. 2024; Pedersen et al. 2024; Traoré et al. 2023). In addition, consumers' utility from climate-friendly produced food products is derived from ethical and pro-social benefits, including moral satisfaction and the perceived contribution to climate mitigation (Buil and Mata 2024; Jürkenbeck 2023; Predieri et al. 2023; Schrobback et al. 2023). Although price, convenience, taste, and health attributes typically dominate food choices, perceptions of sustainability attributes can also play an important role (Piracci et al. 2023; Van Bussel et al. 2022).

Because the environmental and ethical benefits of climate-friendly food production are not directly observable, consumer valuation depends on external signals that reduce information asymmetry and shape beliefs about how food is produced (Ammann et al. 2023; Ishaq et al. 2023; Li et al. 2016; Traoré et al. 2023). For CSA credence attributes to be recognized and rewarded by consumers, salient and credible information is therefore required (Traoré et al. 2023; Van Bussel et al. 2022; Yang and Renwick 2019a). Information provision about sustainable production methods can serve as a cognitive mechanism by reducing uncertainty and enhancing the perceived credibility of climate-friendly claims (Ammann et al. 2023; Dihr et al. 2021; Grunert et al. 2024). However, food purchasing decisions are complex, and information alone may not be sufficient to induce behavioral change (White et al. 2019; Wu and Yu 2025). Social-norm cues provide an additional normative mechanism by signaling that climate-friendly consumption is socially endorsed and increasingly common (Stöckigt et al. 2018; Thøgersen 2023). Together, information provision and social-norm messaging can activate and reinforce the valuation pathway described above by strengthening intrinsic benefits and increasing consumers' utility from choosing climate-friendly produced food. (Bujold et al. 2020; Alt et al. 2024). Drawing on the above theories, this study tests the effects of CSA-related information, social norms, and their combination on consumers' willingness to pay for climate-friendly produced food.

1.2.1 | Provision of Information on Food Production Methods

Lack of environmental knowledge may hinder individuals' engagement in pro-environmental behavior (Anderson 2003; Van Valkengoed et al. 2022). According to the KAB framework, providing targeted information can reduce knowledge gaps and shape attitudes that lead to behavioral change (Dhir et al. 2021; Schrader and Lawless 2004). Information about CSA production processes may influence WTP through several mechanisms. First, it reduces information asymmetry by clarifying how CSA practices reduce climate impacts, thereby increasing trust in and the perceived credibility of sustainability claims (Menozzi et al. 2023; Chen et al. 2016; Fuller et al. 2022). Second, information can highlight farmers' efforts to reduce climate impacts, activating pro-social and ethical motivations to support environmentally responsible producers and signaling ethical value that consumers may reward with higher prices (Hao et al. 2022; Jacobs et al. 2018; Ploll et al. 2023; Ran et al. 2022) When consumers understand how climate-friendly food production contributes to climate mitigation, they are more likely to reward these attributes through price premiums (Amorim et al. 2025; Chen et al. 2018; Hartmann et al. 2021; Lanfranchi et al.2019; Stöckigt et al. 2018). Thus, communicating the benefits of climate-friendly food production relative to conventional methods can increase consumers' preferences for sustainable produced food choices (Drichoutis 2005; Huang et al. 2025; Thøgersen 2021). Therefore, we expect:

H1. *Providing CSA production information increases respondents' willingness to pay for climate-friendly produced food compared to the control group.*

1.2.2 | Social Norm Messaging

Purchasing decisions for sustainably produced food often involve higher prices and complex (Lehner et al. 2016; Stöckigt et al. 2018). The decisions are often influenced by external factors, particularly social norm influence (White et al. 2019). According to Social Influence Theory, individuals adjust their behavior to align with perceived social expectations and norms (Lim 2022; Wu and Yu 2025). Social-norm-based nudges by

signaling that sustainably produced food consumption is socially desirable and increasingly common (McDonald and Crandall 2015; Thøgersen 2023). In the context of sustainable consumption, dynamic social norms that emphasize changing behavior (e.g., an increasing number of consumers choosing climate-friendly produced food) can be especially effective in motivating pro-environmental choices (Lee and Liu 2023; Salmivaara et al. 2021; Sparkman and Walton 2017). Empirical evidence suggests that such norm-based messages can positively influence consumers' willingness to pay for sustainably produced food products (Dannenberg et al. 2024; Elgaaied-Gambier et al. 2018; Lopez-Sintas et al. 2024). When consumers perceive that others are increasingly willing to pay a premium for climate-friendly food, this perception provides normative validation and signals social approval for doing so themselves (Cialdini and Jacobson 2021; Emberger-Klein et al. 2021). Social-norm messaging may increase the intrinsic benefits of purchasing climate-friendly food by generating social approval and moral reinforcement, thereby increasing consumers' willingness to pay (Pollicino et al. 2025; Salmivaara et al. 2021). Accordingly, we hypothesize:

H2. *Exposure to dynamic social-norm messaging increases respondents' willingness to pay for climate-friendly produced food compared to the control group.*

1.2.3 | Joint Effects of Information and Social-Norm Messaging

The inclusion of both information provision and social-norm messaging is motivated by mixed evidence regarding the effectiveness of single behavioral interventions in promoting sustainable consumption (Alt et al. 2024; Bujold et al. 2020; Paul Fesenfeld et al. 2023; Van Der Linden 2015; Zheng et al. 2023). While information and social norms often co-exist in a real-world communication context, their individual and joint effects on consumers' valuation of climate-friendly food are rarely disentangled experimentally. Information provision primarily operates through a cognitive pathway by reducing uncertainty and enhancing beliefs about the environmental and ethical attributes of food production methods (Kaczorowska et al. 2019). Social norms, in contrast, operate through a normative pathway by shaping perceptions of what is socially appropriate or increasingly common (Sparkman and Walton 2017). When combined, these mechanisms may reinforce each other: information can provide justification for higher prices, while social norms can enhance intrinsic utility by signaling social approval and shared values.

Evidence suggests that combining cognitive and normative mechanisms can strengthen pro-environmental behavior relative to relying on either mechanism alone (Bujold et al. 2020; Zheng et al. 2023). Information provision alone does not always lead to behavioral change (Katare et al. 2023), particularly when social influences are at play (Van Valkengoed et al. 2022; White et al. 2019). Conversely, social-norm nudging alone may be ineffective if individuals lack baseline knowledge (Van Valkengoed et al. 2022), for instance, about the food they consume and how production methods contribute to reducing climate impacts. By simultaneously addressing cognitive and normative barriers, combined communication strategies may generate stronger increases in consumers' utility and reservation price. By jointly enhancing intrinsic benefits and reinforcing social approval, the combined provision of production-method information and social-norm cues is therefore expected to increase consumers' utility and, in turn, raise their reservation price for climate-friendly produced food. Therefore, we expect:

H3. *Combining CSA food production method information with dynamic social norms increases WTP premiums more than either single treatment or the control condition.*

2 | Methodology

2.1 | Data Collection

For this survey experiment, Norstat (www.norstat.co), an international market research company, handled data collection from its consumer panel. Participants (age 18-64) were recruited from Denmark, Lithuania, and Spain. As indicated in Table 1, participants were randomly allocated to one of the four experimental groups: CSA information (T1), social norms (T2), a combination of both (T3), or a control group. Within each country, respondents were randomized 1:1:1:1 to each experimental group using the survey platform's stratified randomization by age group, gender, education, and household size. The ethical approval for this experiment was obtained from the University of Copenhagen's ethics committee (Reference Number: 504-0483/24-5000). Prior to the final data collection, a pilot test was conducted in January 2024 with 25 respondents from BEATLES project partners, representing diverse consumer groups across three European countries. The questionnaire was drafted in English at the beginning and subsequently revised based on feedback from the pilot test. Finally, it was translated into the respective local languages by native-speaking project partners from the three countries.

A power calculation was conducted to estimate the minimum required sample size. Using the pwr.anova test function in R (package pwr) (Stephane 2020) and assuming a small effect size ($f = 0.10$, equivalent to Cohen's $d \approx 0.2$), a significance level of $\alpha = 0.05$, and a power of 0.90. It indicated that a minimum of 355 samples per group (for a total of 1420 across the four groups) would be sufficient to detect meaningful effects. Although the nature of our primary outcome variable is discrete and interval censored (rather than continuous), we planned to assess group differences using a non-parametric Kruskal–Wallis test. However, for power analysis, we conducted a one-way ANOVA. We recruited approximately 390 participants per group, totaling 1568 participants, exceeding the minimum sample size to ensure sufficient power even in the event of

TABLE 1 | Participant allocation across experimental groups and countries.

	Experimental groups			
Country	**Control**	**T1**	**T2**	**T3**
Denmark	101	101	103	99
Spain	133	133	133	133
Lithuania	158	159	158	157
Total	392	393	394	389

potential data exclusions (Ploll et al. 2023) and to provide adequate power for heterogeneity tests.

2.2 | Description of Data and Experimental Design

2.2.1 | *Description of the Outcome Variable*

To empirically test H1–H3 proposed in Subsection 1.2, we implemented a randomized between-subjects survey experiment designed to estimate the effect of providing CSA information and social norm messages on consumers' WTP extra[1] for climate-friendly produced food. The initial design included general food categories (meat and vegetables), but based on pilot test feedback, we focused on two specific products (carrots and beef). This choice is motivated by evidence-based environmental impact differences between plant-based and animal-based foods (Notarnicola et al. 2017; Takacs et al. 2022). For example, beef-based meals generate up to 14 times more greenhouse gas emissions than vegetable-based alternatives (Takacs et al. 2022). Thus, including both carrots and beef, therefore, allows us to test whether consumers reward CSA practices across products with markedly different climate footprints.

For the market scenario, following Yu et al. (2014), participants were presented with two versions of each product: a conventional produced product[2] (hereafter, standard product) and a climate-friendly alternative produced using CSA practices. The survey explicitly stated that the two versions were identical in all other aspects, with the only distinction being that the climate-friendly option had a lower climate impact due to the production methods used. WTP was measured as the maximum percentage premium respondents were willing to pay for carrots and beef produced using climate-friendly production methods relative to the reference market price of standard products. Using percentage-based WTP, with the standard food product price as the reference unit, accounts for country-specific price-level variations, thereby enabling comparability across nations (Yang and Renwick 2019a). Providing participants with a reference price also reduces the cognitive difficulty of forming value judgments for new or unfamiliar product attributes (Nian et al. 2023). The reference prices were obtained from local BEATLES project partners for each country. The obtained reference prices for 1 kg of carrots were €2.00 in Denmark, €0.90 in Spain, and €0.79 in Lithuania, while for 0.5 kg of minced beef, they were €6.60 in Denmark, €4.90 in Spain, and €3.30 in Lithuania.

Although stated-preference methods typically yield slightly higher WTP estimates than in revealed-preference methods (Yu et al. 2014), this study used a contingent valuation (CV) method, as it reduces cognitive burden, offers flexibility in responses, and is easy for respondents to understand (Basen et al. 2025). We specifically employed a payment-card version of the CV method due to its widely convenient approach in stated-preference WTP assessment research (Nian et al. 2023; Yang and Renwick 2019a) and because the approach also combines advantages of both dichotomous-choice and open-ended approaches (Yu et al. 2014). This approach also allows respondents to choose from a range of researcher-defined price levels, thereby reducing cognitive burden and improving accuracy compared to open-ended questions or dichotomous-choice formats (Van Der Pol et al. 2024; Xu et al. 2011). The percentage-based WTP extra was presented for climate-friendly produced food compared to conventionally produced food, ranging from 0% to more than 50%. In this study, smaller increments were used at the lower end of the scale, reflecting evidence that consumers are more responsive to smaller price changes than to large premiums (Denver et al. 2023). Additional response options were included: "I do not know" to account for uncertain WTP responses and "I never buy these products" to accommodate uncertainty and reduce response bias among non-consumers (Logar and Van Den Bergh 2012). To elicit consumers' valuation of food produced using climate-friendly agricultural practices, respondents were first presented with a standardized shopping scenario. All respondents received the following statement:

The shopping situation: *"Suppose that you are shopping for an everyday meal. Suppose the supermarkets also sell new versions with a much lower climate footprint than standard products. These are labeled 'Produced climate-friendly'. The two versions of the products are the same in all other aspects."*

This ensured a realistic market context in which climate-friendly products are identifiable through a basic label (Kühne et al. 2023). Providing this minimal information in the control group prevents respondents from assuming that the two products are identical and therefore avoids artificially suppressing baseline WTP. Thus, it allows us to assess whether additional food production method information or social norms messaging shift valuation beyond the existence of a climate-friendly label. After shopping-scenario presentation, each of the three treatment groups received respective information about the interventions. Before stating their WTP premium, all experimental groups received a realism reminder ("Be realistic") that included a brief cheap-talk script and a budget-constraint reminder to reduce hypothetical overstatement, following Cummings and Taylor (1999). The text read as follows:

Be realistic: "*Please note that people often overestimate their willingness to pay in surveys. Consider your answers carefully and respond as if shopping in a supermarket. Remember: If you spend more money on food, you have less to spend on other things.*"

The valuation task in this study is one-shot and not incentive compatible. Although incentive-compatible mechanisms can strengthen the alignment between stated and revealed preferences (Lloyd-Smith and Adamowicz 2018), their implementation was not considered feasible in the present study due to its multi-country design, large sample size, and focus on everyday food products purchased in diverse retail contexts. Instead, the study follows established best practices in stated-preference research by incorporating realistic reference prices, a detailed shopping scenario, and a cheap-talk script with a budget constraint reminder to encourage respondents to reveal their preferences as accurately as possible (Yu et al. 2014).

2.2.2 | *Treatments*

After viewing the common shopping scenario, the randomly assigned respondents received their corresponding questionnaire scripts. Participants in the CSA information treatment have received targeted information about climate-friendly

production methods (CSA info). Although the concept CSA guided the design of the information treatment, the term "CSA" was not explicitly used in the questionnaire. Importantly, the information treatment relied on illustrative examples of climate-friendly production process practices to enhance respondent comprehension, rather than on a single explicitly defined CSA technology.

For carrot, the information highlighted how precision technology can reduce inputs such as fertilizers, pesticides, and water, resulting in a lower climate impact (Balafoutis et al. 2017; Shabir et al. 2023b). Although livestock, particularly beef, is often associated with a high environmental footprint, use of CSA practices allow the producers to reduce emissions through targeted interventions (Llonch et al. 2017). Thus, for beef the information emphasized how interventions such as replacement of soybean meal with locally grown legume-based feed (De Visser et al. 2014; Rauw et al. 2023) and improving manure management techniques (Erekalo et al. 2024; Petersen et al. 2013) can significantly reduce greenhouse gas emissions. For both products, we also noted that role of renewable energy sources in food production that can replace fossil fuels as energy sources and thereby contribute to climate-friendly farming (Jürkenbeck and Schulze 2024; Majeed et al. 2023; Shabir et al. 2023b). Presenting this information about food production methods increases consumer knowledge about sustainable agricultural methods and could encourage more environmentally responsible purchasing decisions (Chen et al. 2018). Thus, the information presented to respondents was:

For Carrots: "*Farmers can produce crops, vegetables, and fruit that are more climate-friendly by investing in precision technologies that can reduce the use of chemical fertilizers, pesticides, and irrigation water. These practices lead to a lower impact on the climate*."

For Beef: "*Farmers can produce meat and dairy products in a more climate-friendly way by optimizing feed (such as using legumes instead of imported soy) and by improving manure handling. These practices lead to a lower impact on the climate". "For all types of farming, using renewable energy is part of climate-friendly production and contributes to reducing climate impact*."

Participants in the second treatment (social norm messaging) received information highlighting changes in purchasing trends among peers. The underlying assumption was that highlighting behavioral change (rather than static norms) would strengthen the perceived social pressure to adopt sustainable food behaviors. Previous research has demonstrated that dynamic norm messaging, which highlights behavioral change rather than static norms, can more effectively promote sustainable behavior (Sparkman and Walton 2017, 2019). Since food produced using CSA methods typically costs more, which may make people hesitant to pay extra, this intervention could help determine whether leveraging social norms can encourage consumers to shift their willingness to purchase more climate-friendly produced food. Thus, the second treatment focused on providing a dynamic social norm message (SocialN), which was formulated as follows:

More and more people think about the impact of climate change on their food, and many have changed their consumption behavior toward more climate-friendly food products. Many people also state that they are willing to pay a higher price for food produced using climate-friendly agricultural practices.

The third treatment assigned participants received information, including both the CSA production information and the social norm message. This condition was designed to test the synergistic effect of the above two treatments on enhancing consumers' demand for climate-friendly produced food in their purchasing decisions. Finally, the respondents in the control group were presented only with market scenario without additional information linked to the three treatments. Importantly, the market scenario presented to all respondents includes a generic "climate-friendly" label to ensure a realistic market context. However, such labels typically provide limited insight into how climate benefits are generated. Detailed information about CSA production methods can therefore generate additional utility beyond generic climate-footprint cues by increasing perceived credibility, understanding of farmer effort, and perceived effectiveness of the production process.

2.2.3 | Behavioral and Socio-Demographic Control Variables

We included pre- and post-experiment questions to capture relevant socio-demographic and behavioral characteristics that may influence consumers' food purchasing decisions (see the questionnaire in the Supporting Materials). Based on findings from previous studies, the behavioral control variables included how frequently consumers purchase organic vegetables (Bursan et al. 2022), consumer perceptions of the climate impact of food production (Li and Kallas 2021), attitudes toward low-impact food consumption (Van Bussel et al. 2022), personal responsibility for climate change (White et al. 2019; Yue et al. 2020), and trust in climate-friendly labels (Canova et al. 2020; Nocella et al. 2014; Thorsøe et al. 2016). In addition, we controlled for the importance respondents attach to general food product characteristics such as price, environmental impact, health attributes (Ammann et al. 2024; Jacobs et al. 2018), and animal welfare (Denver et al. 2023), as these factors typically influence food purchasing decisions. Finally, socio-economic characteristics and country differences were included to account for heterogeneity in food consumption behavior (Mota-Gutierrez et al. 2024).

2.3 | Data Analysis

The empirical analysis focused on testing the effects of each treatment on respondents WTP a premium for food produced using climate-friendly methods, using both non-parametric and parametric methods to ensure robustness. WTP extra was measured as a choice of responses: 0%, 1–2% extra, 3–5% extra, 6–10% extra, 11–20% extra, 21–30% extra, 31–50% extra, and more than 50% extra[3] for carrots and beef. To illustrate the estimated average WTP for the extra, we applied the interval midpoint approach, assigning each response to its corresponding midpoint (e.g., 3–5% coded as 4%), following the method outlined by Xu et al. (2011). Based on these values, we further calculated the percentage change in average WTP extra across treatments relative to the control group to assess the magnitude of intervention effects. Given the discrete and interval-censored nature of the WTP extra responses in our study, it is not

appropriate to treat this variable as continuous (Aweke 2025). Hence, to assess overall differences in WTP across experimental groups, we applied the non-parametric Kruskal–Wallis test, which provides insights into ranked medians across the multiple groups (Leon 1998). To identify which specific group-level differences, we followed up with Dunn's post hoc pairwise comparisons, as the Kruskal–Wallis test does not indicate which experimental groups differ significantly (Dinno 2015).

For parametric analysis, we employed an interval regression model to estimate the effect of the treatment on the outcome variable, as the WTP extra categories used in the payment card were an interval boundary, with true WTP lying between the boundaries. Since each respondent evaluated two different product-specific information stimuli, we estimated separate interval regression models for carrots and beef. For each product $p \in \{\text{carrots, beef}\}$, we estimate Model 1 as follows:

$$WTP^{*}_{ip} = \beta_0 + \beta_1 CSAInfo_i + \beta_2 SocialN_i + \beta_3 Combined_i + \alpha_j + \epsilon_{ij},$$

where:

- WTP^{*}_{ip}: It is a latent variable that indicates the true willingness to pay extra.
- $CSAInfo_i$: Indicator variable for CSAInfo group (1 if the treatment is CSAInfo, 0 otherwise)
- $SocialN_i$: Indicator variable for SocialN group (1 if the treatment is SocialN, 0 otherwise)
- $Combined_i$: Indicator variable for combined group (1 if the treatment is Combined, 0 otherwise)
- α_j: Categorical variable for capturing unobserved heterogeneity among countries, where j = Denmark, Spain, Lithuania
- ϵ_{ij}: Variance of the error term, where the variance can differ across groups and countries

We then extend with (a) behavioral controls and (b) sociodemographics in Models 2–3 analogously. Thus, we estimate model 2 as:

$$WTP^{*}_{ip} = \beta_0 + \beta_1 CSAInfo_i + \beta_2 SocialN_i + \beta_3 Combined_i + \beta_i X'_i + \alpha_j + \epsilon_{ij},$$

where X'_i: Vector of behavioral control variables

Model 3 further extended Model 2 by incorporating sociodemographic variables to assess whether their inclusion affects treatment, coefficient stability, and significance levels.

Assuming no boundaries for WTP extra, an ordered probit model can yield results comparable to interval regression (Yang et al. 2013). Therefore, a heteroscedastic ordered probit model was employed as a robustness check to account for differences in error variance across observations (Litchfield et al. 2012; Shear and Reardon 2021). While heteroscedastic ordered probit coefficients indicate direction and significance, they are less intuitive to interpret in discrete WTP categories. For clear interpretation, we estimated marginal effects to quantify how each treatment changed the probability of selecting a given WTP premium interval (Aguilar and Vlosky 2007; Nickkar et al. 2024). To further assess validity, we examined the correlation between the stated WTP extra and consumers' self-reported intention to pay for CSA solutions. This serves as an additional reliability check in the absence of real purchase data. Finally, because responsiveness to interventions may vary across demographic segments (Gracia et al. 2012; Jordi et al. 2025; Lopez-Sintas et al. 2024), we conducted heterogeneity analyses by age category and country subsamples to examine whether treatment effects varied across demographic segments and national contexts.

3 | Results

3.1 | Distribution of Respondents and Non-Parametric Testing for WTP Extra By Experimental Group

Before proceeding with further analysis, we conducted a randomization check, which confirmed that key characteristics, such as age, gender, education, household size, and purchasing behavior, were evenly distributed across the treatment groups. Balance tests indicated that randomization across experimental groups was achieved, as the statistical tests were nonsignificant (see Table S1). Overall, 64% and 62.5% of respondents expressed their positive willingness to pay a premium for carrots and beef produced using climate-friendly farming practices, respectively (see Figures S1 and S2). From the stated willingness, it is evident that the consumers have lower willingness as the price premium increases. For instance, only 12.5% of respondents in our sample were WTP at least 11% more for CSA-based food production, while around 28% of respondents were WTP at least 6% more. When it comes to experimental groups, of our sample respondents, around 41% of the control group were unwilling to pay extra for either product. However, the combined intervention group had a lower proportion of respondents (36% for carrots and 33% for beef) for the stated 0% WTP extra (see Figure S3). While over 60% of respondents across all experimental groups were WTP at least 1% extra, less than 15% were WTP 11% or more, even respondents in the combined treatment group. The average WTP[4] for climate-friendly produced carrots in Table 2 increased from 4.73% in the control group to 5.55% in the combined intervention. For instance, the combined treatment increases average WTP by 0.86 percentage points for carrots and 0.94 percentage points for beef relative to the control, corresponding to 17% and 16% increases over the control means (Table 2). The country-disaggregated average WTP extra shows that sampled consumers in Denmark had the highest average WTP for products, while those in Lithuania consistently had the lowest (see Table S2).

The non-parametric Kruskal–Wallis test indicated a statistically significant difference in WTP premiums across experimental groups for climate-friendly produced carrots (Table 3). Dunn's pairwise comparison tests provide indicative evidence that providing CSA-related information alone is associated with higher WTP premiums for carrots relative to the control group. Importantly, the information treatment presented a bundle of CSA practices rather than isolating specific technologies, suggesting that respondents responded to the overall climate-

TABLE 2 | Average WTP extra and percentage change relative to the control group.

Group	Carrot WTP extra (%)	% Change (Carrot)	Beef TP extra (%)	% Change (Beef)
Control	4.73	—	4.81	—
CSA Info	5.28	11.64%	5.37	11.41%
Social Norm	4.97	5.08%	4.82	0.21%
Combined	5.55	17.34%	5.59	15.97%

Note: Percentage change is calculated relative to the control group using the formula: *Percentage Change = (Mean treatment − Mean control)/Mean control × 100.*

TABLE 3 | Kruskal–Wallis overall and Dunn's pairwise comparison tests.

Comparison	Carrot *z-statistic*	Beef *z-statistic*
CSA Info versus Control	−1.96*	−1.209
SocialN versus Control	−1.151	−0.359
Combined versus Control	−2.58***	−2.179**
SocialN versus CSA info	0.685	0.313
Combined versus CSA info	−0.345	−0.483
Combined vs SocialN	−1.028	−0.796
Kruskal–Wallis *p*-value	0.0494	0.089

Note: ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$, *z-statistics represent the standardized difference in Dunn's test as the standardized difference in average rank sums between two groups, Dunn z-statistics are reported with the sign indicating the direction of mean rank differences (negative when the treatment shows higher ranks than control, given our group ordering).*

friendly production concept rather than to individual CSA methods. For climate-friendly produced beef, providing CSA-related information alone did not result in a statistically significant difference in WTP premiums compared to the control group. Similarly, the dynamic social-norm intervention did not significantly affect WTP premiums for either carrots or beef when implemented in isolation. In contrast, combining CSA-related information with dynamic social-norm messaging resulted in statistically significant differences relative to the control group for both climate-friendly carrots and beef. Pairwise comparisons across treatment groups did not reveal statistically significant differences between carrots and beef (Table 3).

3.2 | Determinants of WTP Extra for Climate-Friendly Produced Food

Table 4 presents the results of the interval regression analysis across three models. The results show that providing information about CSA-based food production methods significantly increased the WTP a premium for carrots. However, for beef, CSA information alone did not significantly increase WTP. Notably, the combined intervention showed a higher and more consistent effect on the WTP across all models. The results imply that, on average, sampled consumers who received both CSA information and social norm messaging about consumption behavior change were willing to pay 0.86 and 0.94 percentage points more, respectively, for climate-friendly produced carrots and beef than those in the control group. Pairwise post-estimation tests indicate no statistically significant differences between the individual interventions; however, the combined intervention consistently outperformed the control group. However, the combined comparison with CSA information for beef was only marginally significant at the 10% level.

Beyond the effects of the treatment, several control factors were significantly associated with WTP for climate-friendly produced food. The frequency within which organic food is purchased is strongly correlated with higher WTP for both carrots and beef, supporting the idea that respondents who already engage in sustainable purchasing habits are more willing to support climate-friendly produced food options. Furthermore, the perceived climate impact of food production is positively and significantly associated with WTP for climate-friendly produced carrots and beef, indicating that stronger recognition of the climate impacts of food production is associated with higher WTP. Consumers' trust in climate-friendly labels has a positive and significant correlation with consumers' WTP, highlighting that consumers' credibility of the label claim drives willingness to pay a premium, with consumers who have greater trust in these label claims more likely to choose mid- to high WTP extra categories. Similarly, perceived personal responsibility for climate change was positively correlated with WTP. Among general food characteristics, environmental concern has a positive relationship with WTP for both products, highlighting that consumers who weigh environmental concerns in their purchasing pay more for climate-friendly production. In contrast, price concern in food choice has a negative, significant relationship with WTP extra for both products, indicating that price salience remains a significant barrier to paying a premium.

The socio-demographic variables included in Model 3 indicate that age is negatively associated with WTP extra (Table 4), suggesting that younger consumers are more willing to pay extra for these products. The level of education had a consistently positive and significant effect: respondents with vocational or tertiary education reported higher WTP than those with lower levels of education. Gender and household size were not statistically significant. The final control variable, country, shows that Spanish and Lithuanian respondents reported

TABLE 4 | Interval regression results on determinants of WTP premium for climate-friendly produced food.

	Climate-friendly produced carrot			Climate-friendly produced beef		
Variables	**Model 1**	**Model 2**	**Model 3**	**Model 1**	**Model 2**	**Model 3**
Treatments	Coeff (Std. Err)	Coeff (Std. Err)	Coeff (Std. Err)	Coeff (Std. Err)	Coeff (Std. Err)	Coeff (Std. Err)
CSA information	0.711*** (0.294)	0.690*** (0.270)	0.612** (0.268)	0.427 (0.303)	0.399 (0.285)	0.328 (0.283)
Dynamic social norms	0.553 (0.294)	0.547 (0.279)	0.513 (0.298)	0.397 (0.302)	0.437 (0.285)	0.360 (0.283)
Combined	0.857*** (0.296)	0.877*** (0.272)	0.846*** (0.269)	0.941** (0.302)	0.871** (0.284)	0.859** (0.282)
Control attitudinal factors						
Frequency of buying organic food		0.555*** (0.105)	0.514*** (0.104)		0.644*** (0.111)	0.592*** (0.111)
Perceived climate impact of food production		0.579*** (0.107)	0.570*** (0.106)		0.425*** (0.113)	0.392*** (0.112)
Consumes a low-impact diet		0.020 (0.112)	0.002 (0.111)		0.00043 (0.115)	−0.00016 (0.114)
Perceived concern about global climate change		0.158 (0.114)	0.150 (0.113)		0.207 (0.120)	0.199 (0.119)
Feeling of personal responsibility		0.447*** (0.083)	0.436*** (0.082)		0.066 (0.087)	0.058 (0.087)
Trust in climate-friendly labels		0.340*** (0.089)	0.321*** (0.089)		0.434*** (0.094)	0.407*** (0.094)
The importance of general food choice characteristics						
Environmental concern		0.227** (0.113)	0.256** (0.112)		0.267* (0.127)	0.286* (0.127)
Price concern		−0.652*** (0.12)	−0.657*** (0.117)		−0.626*** (0.124)	−0.634*** (0.123)
Health concern		0.189* (0.108)	0.163 (0.108)		0.122 (0.113)	0.0935 (0.114)
Animal welfare concern					0.147 (0.107)	0.180 (0.107)
Socio-demographic variables and country dummy						
Age (continuous)			−0.023*** (0.008)			−0.025** (0.009)
Gender (Female)			−0.100 (0.193)			−0.360 (0.205)
Household size (continuous)			0.180* (0.094)			0.089 (0.100)
Education: Up to A-Levels			0.775** (0.315)			0.175 (0.326)
Education: Vocational			1.066*** (0.277)			0.701* (0.288)
Education: Bachelor's/Postgraduate			1.432*** (0.343)			1.382*** (0.360)
Countries (ES)	−0.298 (0.273)	−0.429 (0.272)	−0.206 (0.291)		0.164 (0.285)	0.514 (0.307)
Countries (LT)	−1.023*** (0.266)	−0.244 (0.262)	−0.226 (0.261)		0.220 (0.279)	0.276 (0.278)
Constant	3.204*** (0.276)	1.848** (0.762)	1.974** (0.904)	2.812*** (0.282)	1.424 (0.811)	0.886 (0.965)
Observations	1482	1482	1482	1406	1406	1406

Note: Robust standard errors in parentheses, ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$, Combined = CSA information + dynamic social-norm message. Model 1 focuses solely on treatments, Model 2 focuses on treatments and attitudinal factors, while Model 3 includes socio-demographic variables in addition to those in Model 2. 86 respondents (5.48%) and 162 respondents (10.3%) were excluded from the regression analysis because they answered "I do not know" or "I never buy this product" for climate-friendly produced carrots and beef, respectively. Combined is the CSA information with social normsBase categories: DK is the base category for countries, and the primary school and below is the base category for education.

higher WTP for climate-friendly beef than Danish respondents (the reference category), as reflected by positive, statistically significant coefficients in both models. In contrast, for carrots, the effects were smaller and less consistent, with no clear pattern across the groups.

3.3 | Results of Robustness Check and Heterogeneity Analysis

The results from the heterogeneous ordered probit regression, conducted as a robustness check, are consistent with our main findings in terms of significance level (see Tables S3 and S4). The predicted marginal effects (reflecting the change in the probability of selecting a given WTP category due to the treatment relative to the control group) indicate that the CSA information and social-norm interventions primarily affected respondents at lower WTP thresholds. In contrast, the combined intervention exhibited relatively larger and more consistent effects across most WTP categories, particularly for carrots (see Tables S5 and S6). As illustrated in Figure S4, the combined intervention was associated with a notable increase in the probability of selecting moderate and higher WTP categories. For example, the likelihood of being willing to pay a 6–10% premium increased by 3.1 percentage points for carrots and 2.6 percentage points for beef. Similarly, the probability of selecting the 11–20% premium category rose by 2.6 percentage points for carrots and 2.0 percentage points for beef.

To explore heterogeneity in treatment responses, respondents were grouped into two age categories (≤ 41 years and > 41 years) based on the sample median age (see Tables S7 and S8). The results suggest that treatment effects vary across age groups. Among younger respondents, the combined intervention was associated with higher WTP for both carrots and beef, while the individual interventions showed weaker or insignificant effects. Among respondents aged 41 or older, both the CSA information and the combined intervention were associated with higher WTP for carrots, whereas for beef, only the combined intervention showed a significant association. Finally, country-specific interval regressions were estimated to explore whether treatment effects differed across national contexts (see Tables S10 and S11). Overall, the combined intervention displayed a consistent positive association with WTP across countries and products. In contrast, the effects of CSA information and social-norm messaging varied across countries. For instance, CSA information was positively associated with WTP for climate-friendly beef only in the Danish sample, while no significant effects were observed for beef in Spain or Lithuania, nor for carrots across the three countries. The social-norm intervention alone did not exhibit significant effects across products or countries.

4 | Discussion

The results show a moderate, positive WTP for carrots and beef produced using climate-friendly methods. This is consistent with prior evidence on WTP for sustainability attributes (Ali et al. 2021; Feucht and Zander 2018; Fuller and Grebitus 2023). Consistent with earlier studies, the proportion of consumers' WTP declines as premium levels increase (Ishaq et al. 2023; Li and Kallas 2021; Yang and Renwick 2019a), indicating that consumers have lower WTP when premiums exceed 10%, reinforcing that modest increases are more acceptable to consumers.

Overall, the intervention effects across experimental groups suggest shifts in preferences, though these shifts were highly product-specific. CSA information treatment significantly increased the WTP a premium for carrots but did not lead to a similar increase for beef. This asymmetry is unlikely to reflect differences in the scientific validity of the practices but might be due to consumers perception and interpretation. This can be understood through the cognitive mechanisms described by the KDM and KAB framework, where the proposed information could change behavior when it increases knowledge in a form that is intuitive and easy to integrate into prior beliefs (Anderson 2003; Schrader and Lawless 2004; Van Valkengoed et al. 2022). In our experiment, the CSA information for carrots with reductions in input use seems easily understood and associated with environmental improvement. Because these cues are familiar and align with consumers' pre-existing beliefs about vegetable production, they likely enhanced perceived credibility and reduced uncertainty, thereby increasing WTP (Hao et al. 2022; Hu et al. 2024). In contrast, the CSA information for beef emphasized on feed optimization and improved manure handling. Although scientifically sound, these practices are rather technical and may be difficult for consumers to link to environmental improvement. In addition, consumers might hold a strong prior belief that "beef consumption is not good for the climate," which may generate skepticism toward claims—even if it can be produced in a substantially more climate-friendly way (Ishaq et al. 2024). Consequently, the CSA information for beef may have been insufficient to shift attitudes, consistent with evidence that information affects behavior only when it is salient, easily understood, and clearly connected to product attributes (Emberger-Klein and Menrad 2018; Schmidt 2020).

Dynamic social-norm messaging alone did not significantly affect WTP for either product. This may be linked to the presented norm message, which may have had low salience, meaning that respondents did not perceive it as relevant enough to shift their behavior (De Groot et al. 2021; Patel et al. 2024). In line with the SIT framework, normative cues exert influence only when individuals perceive them as salient, credible, or personally relevant (Jia et al. 2024). It may also be related to the fact that many consumers already hold strong pre-existing personal norms and values related to climate-friendly produced food choices. In our sample, respondents reported relatively strong personal responsibility for climate change, which is a central component of the NAM. When personal norms are already activated, additional normative cues tend to have limited influence because individuals rely primarily on their internal moral standards rather than social expectations (De Groot et al. 2021; Patel et al. 2024). However, we cannot conclude that social norms interventions are ineffective, numerous studies document their potential for shifting pro-environmental behavior (Farrow et al. 2017; Salmivaara et al. 2021; Sparkman and Walton 2017). Instead, our findings suggest that the norm message used for this experiment may not have been sufficiently targeted to overcome strong pre-existing personal norms. As prior research shows, normative messages are most

effective when highly salient, personalized, or delivered to segments particularly responsive to social comparison (Lede et al. 2019; Pristl et al. 2021). The mixed effects of information and social norms observed in this study are consistent with prior literature showing heterogeneous and context-dependent impacts of behavioral nudges, underscoring the importance of distinguishing between generic sustainability cues and detailed production-process information.

The combination of production-method information and normative messages produced the most consistent and robust effects, increasing WTP for both carrots and beef. This demonstrates that combining both approaches can more effectively enhance consumers' WTP than either approach alone, likely due to synergies between cognitive and normative pathways. From an economic perspective, this alignment of cognitive understanding and normative reinforcement increases consumers' utility from climate-friendly produced food, thereby shifting their reservation price upward and resulting in higher willingness to pay. In this treatment, providing production-method information reduces uncertainty and enhances the perceived credibility of CSA practices, reflecting a cognitive pathway emphasized in information-processing and attitude-formation theories (Alt et al. 2024; Batkoska and Koseska 2012; Bujold et al. 2020). At the same time, dynamic social norms signal that climate-friendly purchasing is socially desirable, reinforcing perceptions of appropriate behavior (Cialdini and Jacobson 2021) and strengthening moral obligations to act sustainably, consistent with NAM (Schwartz 1977). Evidence suggests that combining cognitive and normative pathways can generate synergistic effects, resulting in stronger and more sustained pro-environmental behavior (Bujold et al. 2020; Cialdini and Jacobson 2021; Liobikienė et al. 2016).

The stronger effects observed for the combined condition indicate that consumers respond not merely to additional information, but to the alignment of cognitive understanding and normative reinforcement. While social-norm messages may already signal that climate-friendly consumption is desirable, their effectiveness appears enhanced when consumers also receive clear and credible information about production methods. Our findings, therefore, underscore the value of communication strategies that integrate credible production information with social-norm reinforcement to shift consumer preferences toward climate-friendly food options. By combining informational awareness with behavioral reinforcement, such strategies can more effectively influence WTP than either approach alone, consistent with evidence from prior studies on pro-environmental behavior and sustainable food choice (Deloyde et al. 2022; Feucht and Zander 2018; Ploll et al. 2023). This aligns with broader research showing that consumers are willing to pay premiums for sustainability attributes when these purchases generate moral satisfaction and reflect a pro-environmental identity (Fuller and Grebitus 2023; Gracia et al. 2012; Grunert et al. 2024; Yang and Renwick 2019a).

The analysis of individual characteristics (age) further highlights that responsiveness to interventions is heterogeneous. Younger consumers appear more responsive to social norms, while older consumers respond more strongly to production-method information. The combined treatment increased WTP across both age groups. These findings are consistent with prior studies showing that younger consumers are more influenced by social norms (Ahmed et al. 2021; Gracia et al. 2012), while older consumers rely on detailed, credible information (Castellini et al. 2025; Lanfranchi et al. 2019). Notably, the combined treatment produced significant increases in WTP across both age groups, reinforcing evidence that integrative behavioral interventions can transcend demographic differences and generate broader behavioral change (Zheng et al. 2023).

The influence of control variables further supports existing empirical evidence. Frequent organic food purchases are positively associated with WTP for both carrots and beef produced using climate-friendly methods, consistent with findings that consumers with established sustainable purchasing habits are more willing to support such attributes (Feucht and Zander 2018; Ishaq et al. 2023). Perceptions of the climate impact of food production and a sense of personal responsibility for climate change also play an important role in shaping WTP, reflecting the relevance of environmental values in sustainable produced food choice (Aweke 2025; Yu et al. 2014). Trust in climate-friendly labels was strongly associated with WTP for both products, reinforcing evidence that label credibility is central to consumer acceptance of sustainability claims (Boufous et al. 2023; Moser 2016; Staples et al. 2020). In contrast, price concern remains a significant barrier: more price-sensitive consumers are less willing to pay premiums for climate-friendly food, a finding that aligns with prior reviews of sustainable food consumption (Van Bussel et al. 2022).

5 | Limitations and Further Research Needs

Although these findings offer valuable insights, the following limitations should be considered. First, although carrots and beef were included as representatives of vegetables and meat, the results should not be generalized to other food categories, as consumer preferences may vary across food types. Additionally, all respondents, including those in the control group, were presented with the availability of two versions of the food products: a standard version and a new version labeled "Produced climate-friendly." This label was included to provide a realistic shopping context by reflecting how such products are typically displayed at the point of purchase. However, exposure to this label in the control group may have attenuated incremental treatment effects.

Second, as with all stated-preference studies, the valuation task was hypothetical. Although a cheap talk script and realistic price references were included in the shopping scenarios to minimize the hypothetical bias commonly associated with stated WTP measures, it is essential to acknowledge that this does not eliminate the potential gap between intention and actual purchase behavior, which remains a limitation (Sun and Morwitz 2010). Nevertheless, over 70% of respondents who indicated a positive WTP extra (≥1%) reported being either "somewhat certain" or "very certain" about their responses (see Figure S4). In addition, the strong positive correlation between stated willingness to pay and consumers' intentions to pay extra for CSA solutions (Table S9) suggests consistency between preferences and intentions. In line with the Theory of Planned Behavior (Ajzen 1991), consumers reporting higher willingness to pay would therefore be expected to exhibit a higher likelihood of purchasing climate-friendly food in real-life purchasing situations. Future research

could further strengthen external validity by employing field experiments or real-purchase market settings.

Finally, the country-specific analyses should be interpreted with caution, as the heterogeneity results are correlational rather than causal. Moreover, the information intervention did not distinguish between specific CSA technologies or quantify their environmental performance. Instead, general climate-friendly production principles were presented with illustrative examples to enhance respondent comprehension and reflect how sustainability attributes are typically communicated at the point of purchase. Future studies could build on this work by comparing clearly defined CSA technologies and linking consumer responses to verified environmental indicators.

6 | Conclusion and Practical Implications

This study examined the roles of production method information and social norm interventions in consumers' WTP for food produced more climate-friendly. While a substantial share of respondents expressed a positive WTP for climate-friendly food, the acceptable price premiums were generally moderate. Across Denmark, Spain, and Lithuania, between 23% and 32% of respondents were willing to pay more than a 5% premium for food produced using climate-friendly methods. Providing information on climate-friendly production methods increased consumers' WTP for carrots. Combining production-method information with dynamic social-norm messaging produced modest but consistent effects relative to single interventions and the control group. For example, the combined intervention increased average WTP by approximately 16–17% compared to the control group. Although these effects are moderate in magnitude, the results demonstrate that informational and normative interventions can enhance consumers' valuation of climate-friendly food production.

The findings reinforce the view that communicating the ethical and environmental benefits of certain food production methods, such as CSA, can increase consumers' perceived moral utility and their willingness to pay a premium. Climate-friendly labels and certification schemes may therefore be more effective when they integrate both credible production-method information and social-norm framing, thereby activating personal norms and reinforcing intrinsic motivations for pro-environmental consumption. From a practical perspective, policymakers, food companies, and certification bodies should consider pairing technical information about production practices with norm-based messages, rather than relying on either strategy in isolation. The observed heterogeneity in treatment effects across age groups provides additional practical insight. Younger consumers were more responsive to social-norm messaging, whereas older consumers responded more strongly to information about production methods. This suggests that communication strategies for climate-friendly food products may benefit from considering demographic differences in responsiveness when designing information and messaging approaches.

Author Contributions

Kassa Tarekegn Erekalo: conceptualization, investigation, writing – original draft, methodology, validation, visualization, writing – review and editing, software, formal analysis, data curation. **Tove Christensen:** conceptualization, investigation, funding acquisition, writing – original draft, methodology, validation, writing – review & editing, project administration, supervision. **Sigrid Denver:** conceptualization, investigation, funding acquisition, writing – original draft, methodology, validation, writing – review & editing, project administration, supervision. **Marilena Gemtou:** conceptualization, funding acquisition, validation, writing – review & editing, project administration, methodology, investigation. **Spyros Fountas:** conceptualization, investigation, funding acquisition, methodology, validation, writing – review & editing, project administration. **Søren Marcus Pedersen:** conceptualization, investigation, funding acquisition, writing – original draft, methodology, validation, writing – review & editing, project administration, supervision, resources.

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Ethics Statement

This research involved human participants in the form of survey responses. Ethical approval for the study was obtained from the University of Copenhagen's ethics committee under reference number: 504-0483/24-5000. All participants provided informed consent prior to their participation.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data used for this study will be made available from the corresponding author upon request.

Endnotes

[1] In this study, WTP refers specifically to the percentage premium respondents are willing to pay for climate-friendly produced food, relative to the standard product price.

[2] Food produced using conventional farming practices and technology.

[3] Due to a lower response for the higher levels, we merged the WTP 21–30%, 31–50%, and more than 50% extra and referred to this as WTP extra "> 20%"

[4] For the "> 50%" category, for descriptive midpoints we use 60% (robustness with 75% yields unchanged conclusions).

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Supporting Information

Additional supporting information can be found online in the Supporting Information section.
Supporting Materials for consumer WTP_Rev1.