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Consumer Preferences for Gene-Edited Foods: A Review of the Literature and Discussion of Industry and Policy Implications

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ABSTRACT

Gene editing (GE), a revolutionary genetic engineering technology that makes targeted modifications to plant and animal genomes, offers the potential to address key challenges in food security, nutrition, safety, health, agricultural productivity, and sustainability, yet consumer demand for GE foods remains uncertain and complex. This study reviews (1) the factors affecting consumer preferences for GE foods and (2) studies on consumer acceptance of GE foods that feature comparisons to genetically modified (GM) foods. The present manuscript also discusses implications for industry and policymakers and identifies areas where additional research would further promote the acceptance of GE technology. A total of 74 consumer studies were identified, reviewed, and discussed. The results indicate that many factors drive consumer preferences for GE foods, mainly sensory attributes, nutritional content, price, risk perception, trust in institutions, consumer socio-demographics, and available knowledge and information about GE technology. Furthermore, we found that consumers generally prefer GE foods over GM foods, but this preference varies depending on specific products and contexts. These findings provide useful insights for science, industry, and policymakers aiming to develop, commercialise, and regulate GE foods. Finally, several future research avenues are outlined and discussed.

JEL Classification: Q13, Q16, Q18, L66

1 | Introduction

Gene editing (GE) represents a ground-breaking advancement in genetic engineering, with techniques such as CRISPR-Cas9 enabling targeted modifications to genomes to create desirable new traits (FAO 2023).[1] Unlike genetic modification (GM), which typically involves inserting foreign DNA, GE can modify organisms without necessarily introducing external genetic material (Bullock et al. 2021; McGuire et al. 2020). This distinction gives GE an important advantage over GM in food production, as the public often perceives the latter as risky and unnatural due to concerns over food safety (Lusk et al. 2018).[2]

Since the introduction of CRISPR-Cas9 (Ran et al. 2013), GE technologies have been widely adopted for various crop and animal applications, opening the door to numerous potential innovations (Khalil 2020). The technology offers vast potential benefits in agriculture and food production. For instance, researchers have employed GE to develop crops that support food security (Georges and Ray 2017), extend shelf life (Lassoued et al. 2019), and enhance the nutritional value of food products (Nagamine and Ezura 2022). These advancements have led to the development of new foods and ingredients created through GE microorganisms (Pan and Barrangou 2020), while also increasing agricultural productivity and efficiency through

disease-resistant crops, improved agronomic performance, better animal welfare standards (Kilders and Caputo 2021), and other benefits. Examples of GE foods include allergen-free milk (Sun et al. 2018), dehorned cattle for welfare-friendly beef and milk production (Carlson et al. 2016), camelina enriched with omega-3 and -6 fatty acids (Kawall 2021), and tomatoes with higher gamma-aminobutyric acid levels to aid blood pressure control (Sanatech Seed 2021).

Despite these promising applications, consumer acceptance of GE foods remains a complex matter influenced by perceptions of risk, knowledge gaps, and regulatory challenges (Caputo et al. 2020; Idris et al. 2023). Over the past few years, numerous studies have explored consumer acceptance, attitudes, preferences, and willingness to pay (WTP) for GE foods across diverse populations and contexts. These studies present mixed results, often shaped by factors such as product type, kind of information provided, regional differences, and consumer awareness (Marette et al. 2021; Paudel, Kolady, Just, and Ishaq 2023; Paudel, Kolady, Just, and Van der Sluis 2023). For instance, while some research shows that consumers equate GE and GM foods due to limited understanding (Farid et al. 2020), other studies indicate a positive consumer valuation of GE products (Macall et al. 2023; Gatica et al. 2019), particularly when consumers receive information on their benefits (Kilders and Caputo 2021). Acceptance also varies across countries and depending on whether products are derived from plants or animals (Marette et al. 2021; Meerza et al. 2024).

These complexities warrant a review study to identify how consumer preferences for, acceptance of, and attitudes towards GE foods have evolved and how they compare to those for GM foods (Caputo et al. 2025). Previous reviews have addressed GM foods (Costa-Font et al. 2008; Lusk et al. 2005), but the landscape for GE foods remains underexplored, although recent articles provide partial insights. Beghin and Gustafson (2021) review consumer attitudes towards GE plant foods, and Woźniak-Gientka et al. (2022) offer a global perspective on consumer perceptions of GE plant products. In addition, Strobbe et al. (2023) examine acceptance factors, such as perception, price, and knowledge, whereas Henderson et al. (2024) describe sociocultural influences on GE food preferences. None of these studies systematically address consumer preferences, attitudes, and WTP for GE foods, the factors affecting these preferences, how they differ from those for GM foods, or how they vary across diverse contexts, matters relevant to guiding policy and assessing the market potential of new GE food products.

This study reviews (1) the factors affecting consumer preferences for GE foods and (2) studies on consumer acceptance of GE foods that feature comparisons to genetically modified (GM) foods. It also discusses implications for industry and policymakers and identifies areas where additional research could further support the acceptance of these technologies. The review process yielded two main studies. Study 1 applies Mojet's model (Köster 2009) to categorise the factors influencing consumer preferences for GE foods, a framework used successfully in recent reviews to analyse drivers of food choices (e.g., Asioli, Aschemann-Witzel, et al. 2017). Study 2 narrows the focus to articles comparing GE and GM foods, evaluating consumer preferences and acceptance to determine whether GE is more widely accepted than GM.

This article is structured as follows. First, the methodology used in the review is described and an overview is given of the selected studies. Second, we present the results of Study 1 and Study 2. Finally, we discuss the results, offer implications for industry and policymakers, and suggest future research avenues.

2 | Methodology

The review was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol (Shamseer et al. 2015). A literature search was conducted in five online catalogues: AgEcon, AGRIS, EconPapers, Scopus, and Web of Science. The following keywords or keyword combinations were sought in the title, abstract, and keyword fields: 'public', OR 'consumer' AND 'food', OR 'plant', OR 'crop', OR 'animal', AND 'gene edit*' OR 'gene', OR 'crisper', AND 'willing*', OR 'preference*', OR 'attitude*' OR 'opinion' OR 'accept' OR 'choice' OR 'behavi*' OR 'perception'. The review was restricted to English-language, peer-reviewed empirical articles examining consumer acceptance, attitudes, behaviour, choice, opinions, perceptions, preferences, and willingness to buy (WTB) and WTP for GE foods that were published in academic journals over the 11 years (2013–2024) since the significant advancement and use of CRISPR-Cas9 GE techniques in agriculture and food (Cong et al. 2013).

Figure 1 shows the PRISMA flow diagram used in the study's screening. The results from the five databases (AgEcon [$n=1$], AGRIS [$n=5$], EconPapers [$n=2$], Scopus [$n=272$] and Web of Science [$n=481$]) yielded a total of 761 articles. These were then combined for title and abstract screening using the Rayyan software tool, web version (Ouzzani et al. 2016), which detects and deletes duplicates. Rayyan has been broadly used by researchers for reviews in various fields, such as health, transportation, and food-related areas (Abreu et al. 2023). After obtaining the complete dataset of published articles, we removed duplicates ($n=247$) from the dataset based on a 90% text similarity rate. Next, articles irrelevant to the review aims, not in English, or outside the 2013–2024 period were excluded ($n=402$). We subsequently implemented a two-step screening procedure. First, articles were screened based on their titles, abstracts, and core study topic, resulting in the exclusion of 22 articles that were not relevant to the aims of the review. Second, 90 articles underwent full-text review. Of these, 16 were excluded owing to irrelevance to the aims of the review, resulting in a final selection of 74 articles. The full list of articles included in this review is presented in Table A1 in Appendix S1.

Figure 2 illustrates the number of articles on consumer preferences for GE foods published each year from 2013 to 2024. Notably, the number of published articles has increased over the past 6 years, with a notable rise in the past four, whereas only one article was found between 2013 and 2018.

Table 1 provides an overview of the selected studies' descriptive statistics. The majority of the studies were conducted primarily in North America and Europe, with less research carried out in

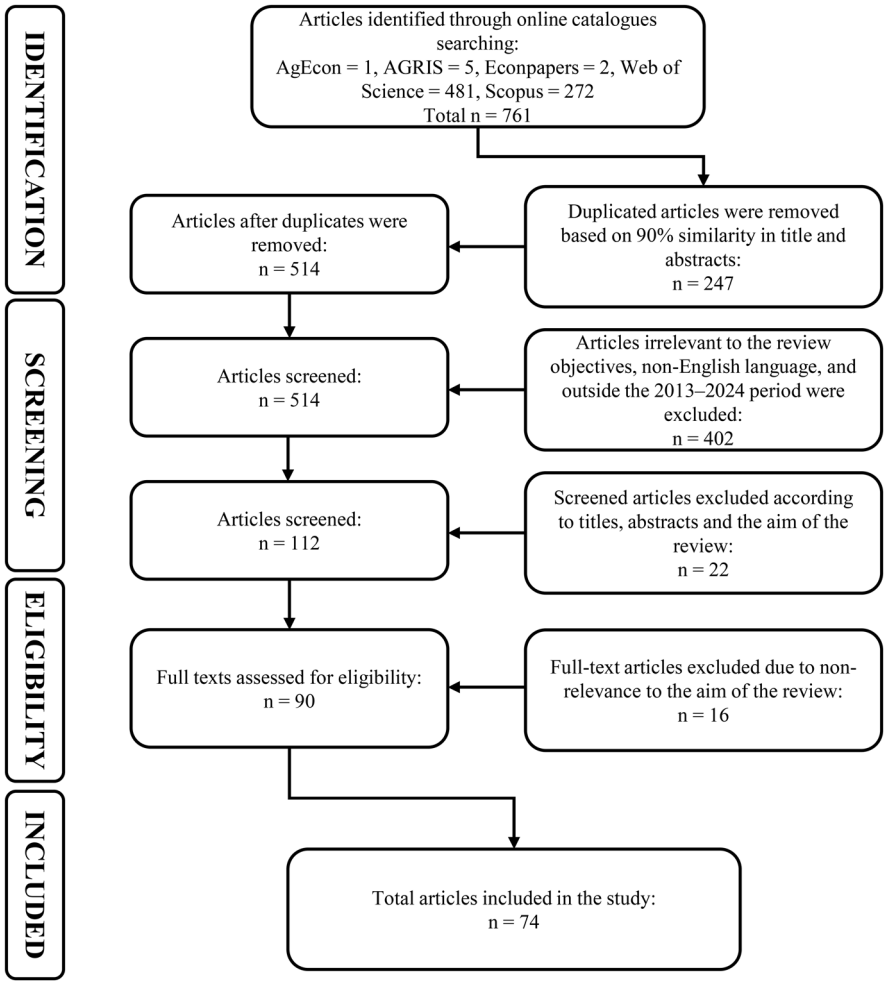

FIGURE 1 | PRISMA flow diagram of the screening process.

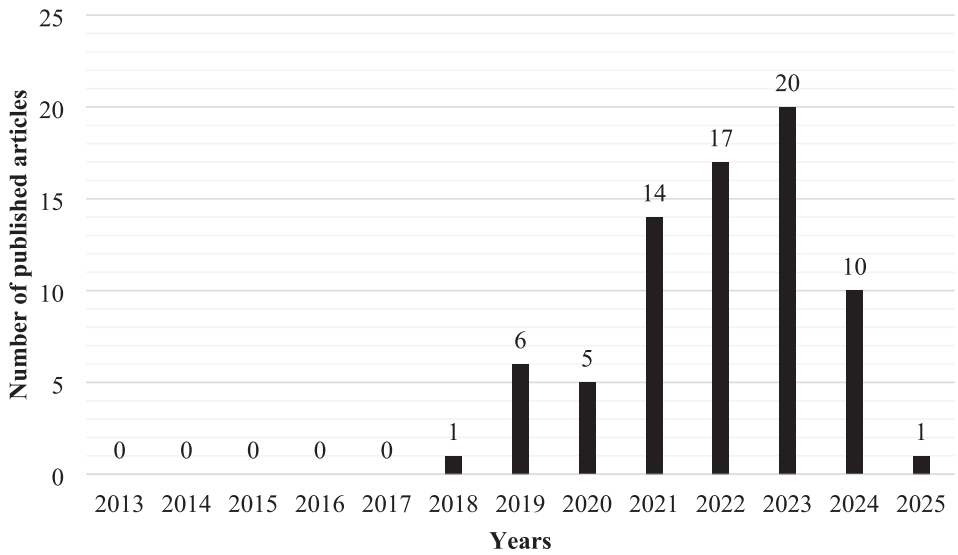

FIGURE 2 | Number of published articles investigating consumer preferences for gene-edited foods as of 31 December 2024 (an article published at the end of 2024 but appearing in a 2025 publication is included).

the Asia-Pacific region and South America. Most studies have investigated GE plants, whereas fewer have focused on GE animals. Moreover, the research has explored a wide range of GE foods, focusing mainly on meat, cereals, legumes, dairy, fruits, vegetables, juice, alcoholic beverages, and seafood. The vast majority of studies employed quantitative research methods (mainly choice experiments), with fewer using qualitative or mixed-methods approaches to explore consumer preferences for GE foods.

TABLE 1 | Descriptive statistics of the selected studies.

Characteristics	Category	Subcategory	N° articles
Countries investigated	North America	United States	34
		Canada	13
	Europe	Italy	5
		Germany	4
		France	3
		Spain	1
		Sweden	1
		United Kingdom	1
	Asia	Japan	5
		China	4
		Vietnam	2
		India	1
		South Korea	1
	Pacific	Australia	4
	South America	Brazil	2
		Chile	1
Product category investigated	Plant		31
	Plant and animal		17
	Animal		12
	Not specified		12
Food products investigated	Meat	Beef	8
		Pork	6
		Chicken	2
	Cereals and legumes	Rice	6
		Wheat	6
		Corn	2
		Soybean	2
	Dairy products	Milk	10
	Fruit	Apple	8
		Blueberry	1
		Orange	1
	Vegetables	Potato	6
		Tomato	5
		Lettuce	1
	Juice	Orange juice	4
	Alcoholic beverages	Wine	1
	Seafood	Salmon	1

(Continues)

TABLE 1 | (Continued)

Characteristics	Category	Subcategory	N° articles
Research methodology	Quantitative	Choice experiment	28
		Generic questionnaire	27
		Social media analysis	2
		Experimental auction	2
		Vignette experiment	1
	Mixed methods	Generic questionnaire with both close-ended and open-ended questions	6
		Vignette experiment with both close-ended and open-ended questions	1
	Qualitative	Focus group	5
		Generic questionnaire with open-ended questions	2

3 | Results

3.1 | Study 1: Consumer Preferences for Gene-Edited Foods and Their Determining Factors

Study 1 examines the factors influencing consumer preferences for GE foods, organised according to Mojet's model (Köster 2009). Figure 3 displays the essential factors and sub-factors in Mojet's model that affect consumer preferences for GE foods. These include intrinsic and extrinsic product characteristics as well as psychological, sociocultural, situational, and biological factors. It is important to note that the boundaries between different sub-factors may sometimes overlap. Specific details for each factor are discussed in subsections 3.1.1 through 3.1.6.

3.1.1 | Intrinsic Product Characteristics

The review identified key intrinsic product characteristics, such as sensory and nutritional attributes, that affect consumer preferences for GE foods. Sensory attributes related to GE, including flavour, fragrance, taste, and appearance, significantly influence consumer preferences, yet results across studies remain inconclusive.

Flavour preferences vary by region. In the United States, consumers are willing to pay a premium price for GE pork without boar taint (Ufer et al. 2022), whereas Brazilian consumers did not identify the boar taint trait in GE pigs as a key factor affecting their preference for GE pork products (Yunes et al. 2019). Fragrance and taste appeal to specific demographics; for instance, female Vietnamese consumers show a preference for GE rice with improved fragrance (Hao et al. 2024). U.S. consumers rate the sensory attributes (e.g., sweetness, crispness) of GE and conventional grapes similarly, with no significant difference in WTP between the two production methods (Uddin et al. 2023). Lastly, studies reveal ambivalent preferences for appearance traits; while many U.S. and French consumers prefer non-browning apples only if they are not produced by GE, others favour them even when GE technology is used (Marette et al. 2021; Paudel, Kolady, Just, and Ishaq 2023; Paudel, Kolady, Just, and Van der Sluis 2023).

Regarding nutritional attributes, key traits influencing consumer preferences for GE foods include nutrient content, oleic acid content, phytonutrient levels, omega-3 content, and sugar content. Nutrient content has been shown to increase consumer willingness to consume (WTC) and pay in various regions. In Costa Rica, consumers demonstrate a higher WTC for GE rice and beans with enhanced nutrients (Macall et al. 2023). Similarly, U.S. consumers who perceive nutritional benefits in GE foods are more willing to eat them (Paudel, Kolady, Just, and Ishaq 2023; Paudel, Kolady, Just, and Van der Sluis 2023; Lindberg et al. 2023), and Japanese consumers show greater acceptance and higher WTC for GE foods that can solve nutritional problems (Shigi and Seo 2023). Specific nutrient components also play a role in consumer preferences. In the United States, consumers are willing to pay a premium price for GE soybeans with a higher oleic acid content (Paudel, Kolady, Just, and Ishaq 2023; Paudel, Kolady, Just, and Van der Sluis 2023), but they are less inclined to pay more for GE grapes with enhanced phytonutrients (Uddin et al. 2023). A segment of UK consumers is willing to pay a premium price for GE chicken with enhanced omega-3 content (Martin-Collado et al. 2022), whereas U.S. consumers are willing to pay a premium price for GE cranberry products with reduced sugar content, especially if they retain the intense flavour associated with conventional cranberries (Bearth et al. 2024).

3.1.2 | Extrinsic Product Characteristics

The studies identify several key extrinsic product characteristics that influence consumer preferences for GE foods, including price, risk perception, food safety claims, health benefits, environmental benefits, labelling, traceability, origin, naturalness, and product type. Multiple studies found a preference for GE foods that are priced lower than conventional options,[3] with affordability being a recurrent factor across regions and product types, as highlighted by Ding et al. (2023), Caputo et al. (2025) and Marette et al. (2021).

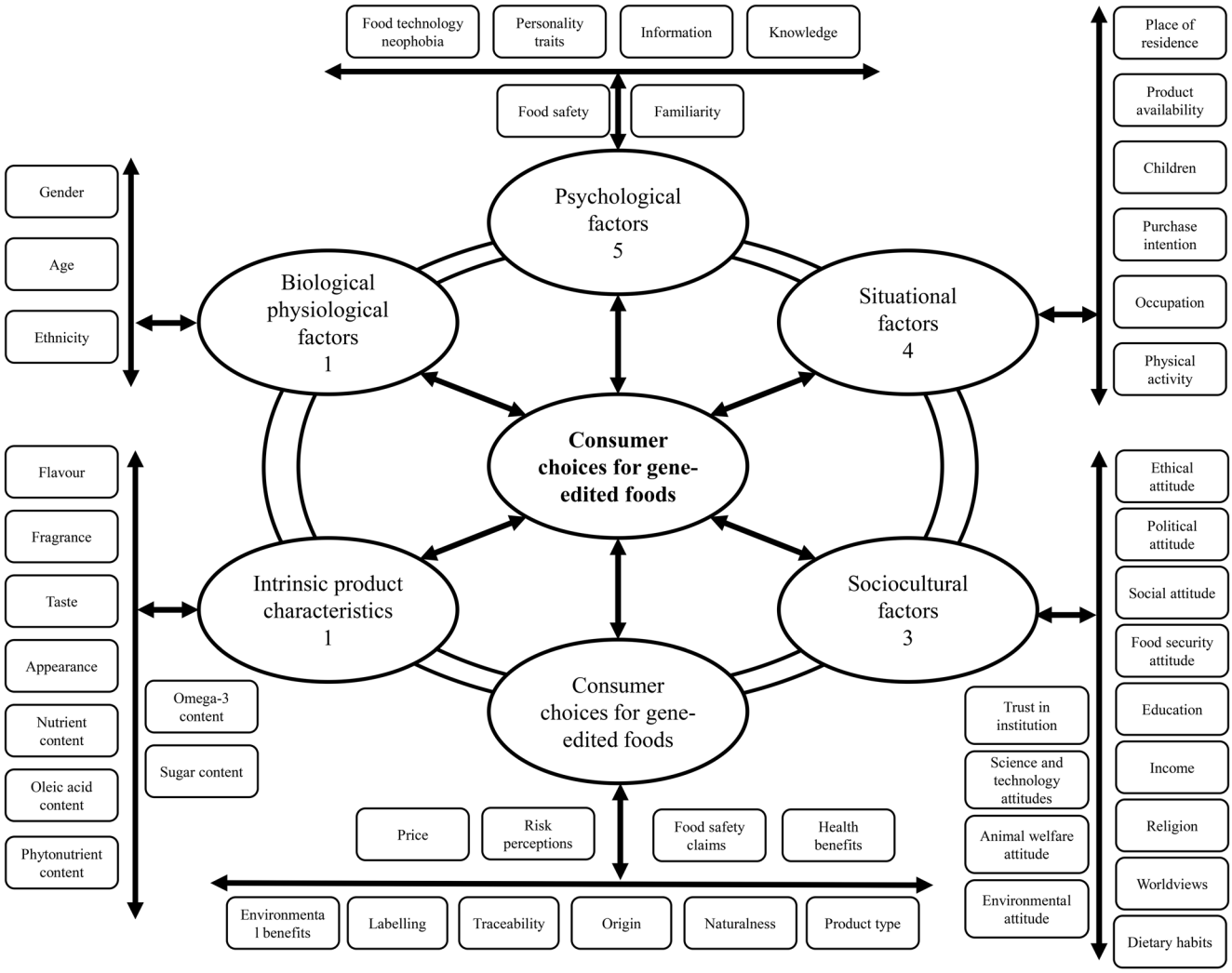

FIGURE 3 | Essential factors and sub-factors that drive consumer preferences for gene-edited foods (adapted from Mojet's model).

Risk perception also shapes consumer choices for GE foods. Indeed, many studies have found that the perceived greater risks of GE technology reduce WTC and WTP for GE foods (Cummings and Peters 2023; Lindberg et al. 2023).[4] Acceptance and WTP for GE foods are further influenced by food safety claims, but this varies across countries, product types, and GE traits (Bearth et al. 2022; Ortega et al. 2022). For instance, UK and Swiss consumers are more willing to accept GE tomatoes that promise an extended shelf-life (Bearth et al. 2022); in China, by contrast, reduced cadmium contamination in GE rice does not affect consumer WTP, whereas consumers prefer pork that is resistant to African swine fever as a GE food product in comparison to GE rice (Ortega et al. 2022).

Health benefit claims generally enhance consumer perceptions of GE foods as well as their WTP for these products (Macall et al. 2023). For instance, Krasovskaia et al. (2024) found that U.S. consumers favour GE food with health benefit claims, such as GE potatoes with low acrylamide and GE apples with high vitamin C content.

Multiple studies report that consumers would prefer and accept GE foods that claim to offer environmental benefits (e.g., Krasovskaia et al. 2024; Martin-Collado et al. 2022). For instance, Kilders and Ali (2024) report that consumers have a higher WTP for GE milk from cows with reduced methane emissions when informed of this environmental benefit.

Labelling information is critical, as studies show that proponents of GE labelling are less likely to consume unlabelled GE foods than consumers who do not demand such labelling (Lindberg et al. 2023). There are ambiguous findings on the effect of labelling on consumer WTP for GE foods. Indeed, while GE labels reduce U.S. consumers' WTP for GE foods according to Krasovskaia et al. (2024), Marette et al. (2021) claim that such labelling had no effect on consumer WTP in either France or the United States. Interestingly, Caputo et al. (2025) found that consumer WTP for GE lettuce varied depending on the type of labelling, with bioengineered labels garnering the highest WTP compared to other labels, such as Quick Response (QR) codes and textual descriptions on the product.

Consumers also demand traceability information for GE foods (Mandolesi et al. 2022; Ortega et al. 2022). For instance, Ortega et al. (2022) note an increased WTP among Chinese consumers when GE rice and pork included traceability information. Perceived naturalness and product origin also play significant roles in consumer preferences for GE foods, with acceptance

rising when GE technologies are perceived as more natural (e.g., Bearth et al. 2024; Uddin et al. 2023). Furthermore, several studies reveal that consumers often favour local or regional GE products (e.g., Edenbrandt and Lagerkvist 2024; Orivri et al. 2024). Son and Lim (2021), for example, found that Korean consumers prefer domestically produced GE foods over foreign ones. Finally, product type influences consumer acceptance for GE foods, with U.S. consumers, for example, being more receptive to GE soybeans than to GE apples (Paudel, Kolady, Just, and Ishaq 2023; Paudel, Kolady, Just, and Van der Sluis 2023).

3.1.3 | Sociocultural Factors

The review's outcomes identify many key sociocultural factors influencing consumer preferences for GE foods, such as trust in institutions, attitudes towards science and technology, animal welfare, the environment, ethics, politics, society, food security concerns, education, income, religion, worldviews, dietary habits, and past consumption habits.

Trust in institutions is the most frequently cited factor influencing consumers (Uddin et al. 2023). For instance, Bearth et al. (2024) found that U.S. and Swiss consumers with a stronger trust in governments and scientists exhibit greater acceptance of GE foods than those who do not trust them. Similarly, Muringai et al. (2020) report that Canadian consumers have a greater WTP for government-produced GE potatoes than those from biotech firms (i.e., J.R. Simplot and Monsanto). Furthermore, multiple studies report consumers' concerns about GE technology ownership and their distrust of biotech institutions.[5]

Consumer attitudes towards science and technology, particularly biotechnology, influence behaviour towards GE foods. Many studies show that consumers with positive attitudes towards science and technology generally exhibit greater acceptance of and WTP for GE foods than those with negative attitudes.[6] For example, UK consumers with favourable views on science and GE technology are willing to pay a premium or the same price for GE chicken that provides benefits not found in conventional chicken (Martin-Collado et al. 2022).

Similarly, attitudes towards animal welfare play a complex and controversial role in shaping consumer preferences for GE animal products. While some studies indicate that consumers support GE technologies that promote animal health and welfare (e.g., Kilders and Caputo 2021; Lund et al. 2023), others describe ethical concerns regarding certain GE applications (Ryan and Weary 2023). For instance, consumers' perception that GE technologies benefit animal welfare positively influences their preference for animal-derived GE foods (Yunes et al. 2019; Martin-Collado et al. 2022). Contrastingly, Ryan and Weary (2023) report that U.S. and Canadian consumers are more likely to reject GE technologies that involve blind chickens or insentient animals if they perceive them as violating the dignity of animal life.

Environmental attitudes have also been found to affect consumer preferences for GE foods. Some studies indicate that perceived environmental benefits increase GE food acceptance (Nawaz et al. 2023; Shew et al. 2018), but consumer perspectives can be ambivalent, combining scepticism and optimism regarding GE's environmental impact (Baum et al. 2023). For instance, consumers with stronger environmental concerns may recognise the potential environmental benefits of GE technology in food but struggle to decide whether the technology should be accepted (Nawaz and Satterfield 2022). Some studies, however, find that stronger environmental concerns are associated with lower GE acceptance among consumers in the UK, Belgium, and the Netherlands (Ferrari et al. 2021; Nawaz et al. 2023).

Social and political views as well as ethical attitudes likewise influence perceptions of GE foods. Specifically, consumers who perceive greater social benefits of GE foods are more likely to purchase them (Baum et al. 2023), whereas consumers with strong ethical concerns may exhibit negative attitudes towards GE technology (Mandolesi et al. 2022; Ryan and Weary 2023). Regarding political views, McFadden, Anderton, et al. (2021) and McFadden, Rumble, et al. (2021) found that Republicans in the United States are more likely than Democrats to equate GE plants and conventional plants, whereas McConnachie et al. (2019) and Lindberg et al. (2023) contend that U.S. liberals are more willing to consume GE food and less inclined to support GE food labelling than moderates and conservatives. Furthermore, researchers highlight consumer attitudes towards food security as a driver of consumer preferences for GE food (Macall et al. 2023; Pruitt et al. 2021). For example, Macall et al. (2023) found that Costa Rican consumers favour GE technology for improving agricultural productivity. In addition, Pruitt et al. (2021) report that young U.S. college students believe that GE food is crucial to feeding a growing population.

Perceptions of and preferences for GE food also vary by consumer education and income levels. Many studies indicate that more highly educated consumers across countries generally promote positive views and acceptance of GE foods (e.g., Cummings and Peters 2023; Ferrari et al. 2021),[7] yet multiple studies have found no effect of education level on acceptance or WTP for GE foods (e.g., Bearth et al. 2022).[8] Income is an influential factor affecting consumer preferences for GE food, but the findings are ambiguous, albeit many studies report that higher-income consumers are more likely to prefer GE foods than low-income people.[9] For instance, some studies have found that high-income U.S. consumers are more likely to have positive or neutral perceptions and a stronger WTP for GE foods (Cummings and Peters 2023; Lindberg et al. 2023), whereas other research has observed that lower-income consumers show greater acceptance (Paudel, Kolady, Just, and Ishaq 2023; Paudel, Kolady, Just, and Van der Sluis 2023; Shew et al. 2018; Yunes et al. 2021).

Religion also shapes consumer acceptance of GE foods, but the research outcomes are ambiguous. Religion often negatively influences acceptance in some studies (Busch et al. 2022; Cummings and Peters 2023), but other studies report no significant effect of religion in Brazil (Yunes et al. 2019) or China (Gao et al. 2024). Worldview also affects consumer preferences for GE foods (Yang and Hobbs 2020b). For instance, techno-centric U.S. consumers have more positive perceptions of GE foods due to their benefits (Baum et al. 2023), and those who hold hierarchical, individualist views[10] are more likely to perceive GE insects and animals as safe than those holding egalitarian, communitarian views (McFadden,

Anderton, et al. 2021; McFadden, Rumble, et al. 2021).[11] Moreover, dietary habits and past consumption habits affect consumer preferences for GE foods. Consumers familiar with GM foods generally show stronger WTC and WTP for GE foods (Shew et al. 2018), whereas those who do not eat meat tend to be less supportive of GE animals (Ryan and Weary 2023). Moreover, while Bearth et al. (2024) found no impact of organic consumer preferences on GE acceptance, Lund et al. (2023) report that Danish consumers who preferred organic milk were less likely to accept GE milk.

3.1.4 | Situational Factors

Among the situational factors potentially influencing consumer behaviour towards GE foods are place of residence, product availability, presence of children, occupation, and physical activity. Studies reveal notable differences between urban and rural consumers, with the former showing greater acceptance of GE foods than the latter (e.g., Ding et al. 2023; Koralesky et al. 2023; Martin-Collado et al. 2022). Product availability also affects WTC and preference for GE foods, as some consumers would be more accepting of GE foods if they were locally available (Bearth et al. 2024; Gatica et al. 2019; Ryan and Weary 2023). Moreover, households with children have a lower WTP for GE milk and apples than childless households (e.g., Kilders and Ali 2024; Uddin et al. 2023). Occupation, however, does not impact consumer GE food preferences (Kato-Nitta et al. 2019; Martin-Collado et al. 2022). Similarly, physical activity does not influence GE food choices among U.S. college students (Pruitt et al. 2021).

3.1.5 | Psychological Factors

The studies identify several key psychological factors influencing consumer preferences for GE foods, including information, knowledge, food technology neophobia, food safety concerns, familiarity, and personality traits. Information about GE has been one of the more investigated factors affecting consumer preferences for GE foods. Indeed, many studies show that information on GE technology can significantly influence consumer attitudes and preferences for GE foods, generally increasing WTP, acceptance, and positive perceptions (e.g., Borrello et al. 2021; Farid et al. 2020).[12] However, the effects vary by region and context (Marette et al. 2023); for example, U.S. consumers had more negative perceptions of GE when informed about its role in combating citrus greening (McFadden, Anderton, et al. 2021; McFadden, Rumble, et al. 2021). Moreover, in the study of Yunes et al. (2019), providing GE information about the absence of boar taint trait did not increase Brazilian consumers' acceptance of GE pork. Information's impact on consumer preferences for GE foods is also affected by how that information is given to consumers (Kato-Nitta et al. 2023). For example, research has found that infographics are more effective than videos or text in increasing consumer WTP for GE orange juice (Hu et al. 2022), and personal narratives can reduce negative perceptions more effectively than scientific explanations (Yang and Hobbs 2020c). Other studies, however, report no effect of information type; for instance, the length or tone (positive/negative) of information had no impact on WTP for GE foods in some cases (e.g., Borrello et al. 2021; Marette et al. 2021). Orivri et al. (2024) used a different approach, however, framing the information as either gain (benefits of GE) or loss (disadvantages of not using GE), and found that presenting consumers with gain-framed information significantly increased their preferences and WTP, especially when compared to loss-framed information.

Knowledge also shapes consumer attitudes and preferences for GE foods. Many studies report that higher levels of GE knowledge and of scientific knowledge generally result in more positive attitudes,[13] higher WTP, and greater acceptance of GE foods (Borrello et al. 2021). For instance, consumers with greater knowledge of GE technology are more likely to accept GE foods (Lindberg et al. 2023), and those with strong scientific knowledge or background are likely to exhibit higher WTP and acceptance of GE pork (Ufer et al. 2022). Studies also indicate that the type of knowledge matters; greater subjective knowledge of GE increases acceptance of GE foods, whereas more objective knowledge may negatively impact acceptance (Meerza et al. 2024).

Factors such as food technology neophobia (Baum et al. 2023; Giacalone and Jaeger 2023; Parrella et al. 2024) and concerns about food safety (Bearth et al. 2022; McFadden, Anderton, et al. 2021; McFadden, Rumble, et al. 2021; Son and Lim 2021; Stofer et al. 2023; Uddin et al. 2023) may also dampen consumer acceptance of GE foods. Familiarity with GE foods plays a role, although the findings are mixed. Some studies indicate it increases acceptance (Nawaz and Satterfield 2022), whereas others find no effect (Williams et al. 2021; Yang and Hobbs 2020b). Furthermore, personality traits such as openness to innovation are associated with greater acceptance of new food technologies, including GE (Marette et al. 2021; Paudel, Kolady, Just, and Ishaq 2023; Paudel, Kolady, Just, and Van der Sluis 2023; Orivri et al. 2024).

3.1.6 | Biological and Physiological Factors

Biological and physiological factors, such as gender, age, and ethnicity, contribute to shaping consumer preferences and attitudes towards GE foods. Gender is a particularly significant factor, with many studies indicating that females are generally less likely than males to accept or prefer GE foods (Lindberg et al. 2023; Meerza et al. 2024; Williams et al. 2021). McConnachie et al. (2019) found that U.S. females are less likely to prefer GE milk and beef products than males, while Cummings and Peters (2023) report that females are more likely to demand labelling for GE foods. However, not all studies agree, as some research suggests that gender does not significantly influence consumer preferences for GE foods (Bearth et al. 2022; Ding et al. 2023; Ferrari et al. 2021; Ryan and Weary 2023; Gao et al. 2024).

Age also affects attitudes towards GE foods. Younger consumers generally express more positive views and willingness to try GE foods than older consumers, according to Shew et al. (2018), yet other findings suggest the opposite. For example, Hendricks et al. (2022) report that older Australian consumers expressed slightly more confidence in GE cattle than younger consumers. Other studies, including that of Bearth et al. (2022), found no significant age-related differences in preferences for GE foods.

Ethnicity has been less frequently studied but also shows variation in acceptance. Studies by Cummings and Peters (2023) and Meerza et al. (2024) found that White U.S. consumers are more

accepting of GE foods than other ethnic groups, including Black and Asian consumers.

3.2 | Study 2: Consumer Preferences for Gene-Edited and Genetically Modified Foods

In Study 2, we reviewed 25 of the 74 articles analysed in Study 1 as well as a research report that compares consumer preferences for GE and GM foods. In addition, Caputo et al. (2020) consumer acceptance report from FMI is also included.

Consumers generally show a stronger WTP for GE foods than for GM foods. Studies across regions, including those by Caputo et al. (2025) and others,[14] consistently report that consumers are willing to pay a greater premium for GE foods than for their GM counterparts (e.g., Marette et al. 2021; Shew et al. 2018; Paudel, Kolady, Just, and Ishaq 2023; Paudel, Kolady, Just, and Van der Sluis 2023). For instance, Marette et al. (2021) found that U.S. and French consumers were willing to pay a higher premium for GE apples than for GM apples and that U.S. consumers were willing to pay more than their French counterparts. However, the magnitude of WTP varies by product type and regional context. For example, French consumers generally prefer lower prices for GM apples than U.S. consumers (Marette et al. 2021). Moreover, Paudel, Kolady, Just, and Ishaq (2023) and Paudel, Kolady, Just, and Van der Sluis (2023) observe that U.S. consumers showed a greater WTP for GE soybean oil than for GM soybean oil but exhibited no significant difference in WTP between GE and GM apples. Although consumers clearly prefer GE over GM foods, that does not always translate into a price premium. For instance, Shew et al. (2018) note that while consumers favour GE rice over GM rice, their preference does not necessarily inspire a greater WTP for GE rice.

The general higher premium price paid for GE over GM foods can be attributed to several factors, including more favourable attitudes and greater acceptance of GE technology compared to GM. Across many regions, consumers tend to view GE foods more positively than GM foods because they perceive the former to be more precise and less invasive than the latter. This trend is reflected in studies by Bašinskienė and Šeinauskienė (2021), Bearth et al. (2022) and others.[15] For instance, studies by Nales and Fischer (2023) and Bearth et al. (2022) suggest that consumers perceive GE as less intrusive, engendering more positive views of GE than of GM technology. However, some consumers remain sceptical about GE foods, questioning their necessity and expressing concerns over these products' potential to perpetuate problematic agricultural practices (Nawaz et al. 2023). This scepticism often focuses on the availability of alternatives and the social impact of GE technology rather than on transgenic concerns, which are more commonly associated with GM.

Much of this scepticism may stem from poor familiarity and limited awareness of GE technology. Consumer awareness of GE varies widely by region, shaping attitudes towards these products. In Lithuania, for instance, lower awareness of GE compared to GM foods correlates with slightly more favourable attitudes and a greater WTB for GE products (Bašinskienė and Šeinauskienė 2021). Yang and Hobbs (2020c, 1289) describe a 'window of acceptance' for GE, a situation in which positive communication is especially effective because resistance to GE is generally milder than resistance to GM. However, inadequate familiarity with GE foods sometimes leads consumers to conflate GE with GM as seen in the United States, potentially introducing biases against GE foods (McFadden, Anderton, et al. 2021; McFadden, Rumble, et al. 2021).

Information delivery also plays a role in shaping consumer perceptions and acceptance of GE and GM foods. Caputo et al. (2025) report that consumers are more willing to receive information about these technologies directly rather than seeking it independently. This tendency is more pronounced among older consumers, whereas younger consumers are more proactive information seekers. Notably, younger consumers, who tend to actively seek information, have shown stronger WTP for GE foods than for GM foods. Furthermore, Lynas et al. (2023) highlight that traditional and social media often portray GE technology in agriculture more favourably than GM technology, a factor that may contribute to the public's increasing acceptance of GE foods compared to GM foods.

3.3 | Discussion and Conclusions

This review offers several useful insights regarding consumer preferences for GE foods, particularly in comparison to GM foods, and provides a foundation for understanding the dynamics shaping their acceptance. These results can, in turn, inform strategies and policies for producers, marketers, and policy makers. First, consumer research on GE foods is rapidly growing and relatively recent, emerging around 2018 following the advent of CRISPR-Cas9 technology (Verma et al. 2023). Most studies focus on high-income countries, especially the United States, and on staple products such as milk, beef, apples, and soybeans. These products are frequently chosen due to their established history with GM technology (Raman 2017), enabling researchers and producers to optimise them through GE technologies while reducing the costs and risks associated with developing new products (Bullock et al. 2021). This highlights potential new opportunities for diversification, as scientists and producers could explore GE applications in less traditional, high-value niche products to cater to emerging consumer segments. These efforts should also be supported by policy makers through funding for research and development (R&D) activities.

Second, as consumer preferences for GE foods are shaped by a combination of different intrinsic and extrinsic product characteristics, it is important that producers align these product attributes with consumer expectations and needs when developing and marketing such new foods. To achieve this, producers and marketers should invest in R&D and marketing research to support clear and targeted communication of the intrinsic attributes—especially nutritional enhancements or sensory improvements—as well as the extrinsic benefits (e.g., health and environmental) of GE foods in a tangible way, while also reassuring consumers about their safety. Industry and policy makers should collaborate to promote educational campaigns and develop product claims that effectively communicate the benefits of GE foods to consumers, thereby helping to build consumer trust in these products. Third, psychological and socio-cultural factors, mainly linked to risk perception, limited knowledge, trust

in institutions, technophobia, and ethical issues, also play a critical role (Gaskell et al. 1999), especially in Europe, in affecting consumer choices for GE foods. Producers and marketers should provide clear and effective information to consumers about GE technology, its safety, and ethical aspects, also with the aim of increasing familiarity with GE foods, which in turn can enhance their acceptance. Also, educating consumers about GE technology might lead them to seek out additional information themselves (Caputo et al. 2025). Furthermore, promoting collaboration with scientists and regulatory bodies to establish clear labelling and certification standards, akin to organic certifications, could build consumer trust and differentiate GE foods from GM.

Fourth, in terms of situational factors, we found that urban consumers without children tend to prefer GE foods more than rural consumers and households with children. Thus, producers and marketers of GE foods should initially focus their communication and marketing efforts on urban consumers and those without children, who are more likely to be early adopters. Fifth, biological and physiological factors play a central role in household food purchasing (Flagg et al. 2014). Marketing and educational efforts should therefore consider tailoring messages for GE foods according to specific socio-demographic characteristics, such as age and gender, emphasising attributes such as safety, health benefits, and sustainability to bridge the acceptance gap as also suggested in recent industry reports (Caputo et al. 2020). Specifically, marketing communication strategies should target younger, male, and highly educated consumers, who are the early adopters of GE foods. Furthermore, as consumers tend to prefer GE foods produced domestically, policymakers should consider supporting domestic GE producers through R&D funding.

Lastly, while consumers generally perceive GE foods as more natural and safer than GM foods, this preference does not necessarily translate into a WTP a premium price for GE foods compared to GM. In this regard, producers and marketers should clearly inform consumers about the differences between GE and GM foods and consider developing distinct labelling schemes that clearly differentiate between the two.

This review touches on several matters that require further investigation. First, more consumer research should be conducted in developing countries, given that GE benefits can address important food security, food safety, and nutritional issues in those countries. Second, more qualitative research is needed to inform a deeper exploration of the interrelations among consumer expectations, opinions, perceptions, concerns, and preferences regarding GE foods. Third, further research should investigate at greater depth the formation of consumer preferences, for example, by using implicit measures such as neuroscience tools to capture more information on consumer behaviour. Fourth, research should determine how different informational messages, contexts, and information channels can strengthen consumer trust in GE technology. Fifth, future studies should further investigate consumers' WTP for GE foods by conducting incentive-compatible experiments (e.g., experimental auctions and real-choice experiments) combined with sensory evaluations (Asioli, Varela, et al. 2017) to increase the external validity of our findings and align it more closely with real consumer shopping behaviour. Finally, researchers should investigate the consumer behavioural factors driving decision-making processes for GE food products. For example, future research should explore whether the inclusion of various psychological factors (e.g., risk preferences and time preferences) in economic models of consumer demand could improve those models' predictive power and thus the understanding of consumer decision-making processes regarding GE foods.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that supports the findings of this study is available in Supporting Information of this article.

Endnotes

[1] CRISPR-Cas9: clustered regularly interspaced short palindromic repeats and CRISPR-associated protein 9.

[2] This article abbreviates both *gene editing* and *gene edited* as *GE* and abbreviates *genetically modified* and *genetic modification* as *GM*.

[3] Also see Borrello et al. (2021), Britton and Tonsor (2019), Ding et al. (2023), Edenbrandt and Lagerkvist (2024), Gatica et al. (2019), Götz et al. (2022), Hu et al. (2022), Jones and Brown (2023), Kilders and Ali (2024), Kilders and Caputo (2021), Ma et al. (2024), Macall et al. (2023), Marangon et al. (2021), Marette et al. (2023, 2021), Martin-Collado et al. (2022), McFadden, Anderton, et al. (2021), McFadden, Rumble, et al. (2021), Muringai et al. (2020), Ortega et al. (2022), Shew et al. (2018), Son and Lim (2021), Uddin et al. (2023), Yang and Hobbs (2020a, 2020c), Orivri et al. (2024), Caputo et al. (2025).

[4] Also see Baum et al. (2023), Bearth et al. (2022), Busch et al. (2022), Cummings and Peters (2023), Ding et al. (2023), Farid et al. (2020), Gatica et al. (2019), Hao et al. (2024), Koralesky et al. (2023), Lindberg et al. (2023), Macall et al. (2023), Mandolesi et al. (2022), McConnachie et al. (2019), Ryan and Weary (2023), Shew et al. (2018), Williams et al. (2021), Meerza et al. (2024), Parrella et al. (2024), Orivri et al. (2024).

[5] Also see Bearth et al. (2022, 2024), Farid et al. (2020), Hendricks et al. (2022), Koralesky et al. (2023), Lindberg et al. (2023), Mandolesi et al. (2022), Nawaz et al. (2023), Shigi and Seo (2023), Yunes et al. (2021).

[6] Also see Bearth et al. (2022), Britton and Tonsor (2019), Cummings and Peters (2023), Farid et al. (2020), Hao et al. (2024), Lindberg et al. (2023), Martin-Collado et al. (2022), Muringai et al. (2020), Son and Lim (2021), Ufer et al. (2022), Yang and Hobbs (2020b), Gao et al. (2024).

[7] Also see Cummings and Peters (2023), Ferrari et al. (2021), Giacalone and Jaeger (2023), Koralesky et al. (2023), Lindberg et al. (2023), McFadden, Anderton, et al. (2021) and McFadden, Rumble, et al. (2021), Nguyen et al. (2022), Paudel, Kolady, Just, and Ishaq (2023), Paudel, Kolady, Just, and Van der Sluis (2023), Tadich and Escobar-Aguirre (2022), Yunes et al. (2021).

[8] Also see Bearth et al. (2022), Borrello et al. (2021), Kato-Nitta et al. (2019), Martin-Collado et al. (2022), Yang and Hobbs (2020b), Yunes et al. (2019), Gao et al. (2024).

[9] Also see Cummings and Peters (2023), Lindberg et al. (2023), McFadden, Anderton, et al. (2021), McFadden, Rumble, et al. (2021), Paudel, Kolady, Just, and Ishaq (2023), Paudel, Kolady, Just, and Van der Sluis (2023), Shew et al. (2018), Yang and Hobbs (2020b), Yunes et al. (2021), Gao et al. (2024).

[10] Hierarchical individualist views emphasise traditional social structures, individual autonomy and fixed societal roles based on institutions such as family, religion or government.

[11] Egalitarian communitarians prioritise social equality, cooperation and collective responsibility, advocating for reduced hierarchy and fair distribution of power and resources.

[12] Also see Borrello et al. (2021), Farid et al. (2020), Gatica et al. (2019), Hao et al. (2024), Hu et al. (2022), Kato-Nitta et al. (2021), Kato-Nitta et al. (2019), Mandolesi et al. (2022), Marette et al. (2023), Marette et al. (2021), Martin-Collado et al. (2022), McFadden, Anderton, et al. (2021), McFadden, Rumble, et al. (2021), Nguyen et al. (2022), Paudel, Kolady, Just, and Ishaq (2023), Paudel, Kolady, Just, and Van der Sluis (2023), Shew et al. (2018), Stofer et al. (2023), Tadich and Escobar-Aguirre (2022), Yang and Hobbs (2020c), Orivri et al. (2024), Caputo et al. (2025).

[13] Also see Borrello et al. (2021), Busch et al. (2022), Cummings and Peters (2023), Ding et al. (2023), Ferrari et al. (2021), Kato-Nitta et al. (2021, 2023), Lindberg et al. (2023), Ma et al. (2024), McConnachie et al. (2019), Nales and Fischer (2023), Paudel, Kolady, Just, and Ishaq (2023), Paudel, Kolady, Just, and Van der Sluis (2023), Shigi and Seo (2023), Son and Lim (2021), Stofer et al. (2023), Uddin et al. (2023), Ufer et al. (2022), Meerza et al. (2024), Parrella et al. (2024), Orivri et al. (2024), Caputo et al. (2025).

[14] Also see Hao et al. (2024), Hu et al. (2022), Kilders and Ali (2024), Marette et al. (2021), Muringai et al. (2020), Paudel, Kolady, Just, and Ishaq (2023), Paudel, Kolady, Just, and Van der Sluis (2023), Pruitt et al. (2021), Shew et al. (2018), Yang and Hobbs (2020c), Meerza et al. (2024).

[15] Also see Kato-Nitta et al. (2019), Lynas et al. (2023), McFadden, Anderton, et al. (2021), McFadden, Rumble, et al. (2021), Nales and Fischer (2023), Nawaz et al. (2023), Nguyen et al. (2022), Ortega et al. (2022), Son and Lim (2021), Stofer et al. (2023), Vasquez et al. (2022), Yang and Hobbs (2020c).

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Supporting Information

Additional supporting information can be found online in the Supporting Information section. **Appendix S1:** jage70008-sup-0001-Supinfo01.docx.