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Willingness to switch to cultured meat: insights from UAE Muslim consumers

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Abstract

Purpose – The purpose of this paper, which is focused on a Muslim consumer sample's willingness to switch from natural to cultured meat, is threefold: (1) To investigate the internal environmental locus of control (INELOC) "types" as antecedents on perceived benefits; (2) To examine the impact of perceived benefits on Muslim consumers' willingness to switch (MCWS) to cultured meat; and (3) To explore perceived benefits as a mediator between INELOC (green consumers, environmental activists, environmental advocates and recyclers) and MCWS to cultured meat.

Design/methodology/approach – The study collected survey responses from 241 Emirati consumers from the United Arab Emirates (UAE) and analysed them using the partial least squares method and structural equation modelling.

Findings – The authors found that three INELOC "types" – (i.e. environmental activists, environmental advocates and recyclers) – personal responsibility factors predict perceived benefits. The results also showed that perceived benefits positively influence MCWS to cultured meat. Finally, perceived benefits mediate between three INELOC "types" – (i.e. environmental activists, environmental advocates and recyclers) – and MCWS to cultured meat.

Research limitations/implications – The study provides theoretical insights on how INELOC influences MCWS to cultured meat in the UAE. Furthermore, the study offers important implications for meat alternative companies in their marketing strategies in shaping Muslim consumers' decision to switch and consume

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cultured meat, as well as for policymakers in designing parameters for importation, consumption and creation of cultured meat products in the country. Further, it has implications for exporters of halal meat and for food security in the UAE and other drylands.

Originality/value – Using INELOC and Stimulus-Organism-Response theories, to the best of the authors' knowledge, this study is the first attempt to empirically investigate Muslim consumers' willingness to transition to cultured meat in the UAE. Moreover, this study serves as an early attempt to evaluate perceived benefits as a moderator between INELOC and MCWS to cultured meat.

Keywords Cultured meat, Muslim consumers, Perceived benefits, INELOC, Stimulus-organism-response theory

Paper type Research paper

1. Introduction

Global environmental changes like urbanisation, climate change, greenhouse gas emissions and ozone layer depletion endanger food security worldwide. These issues ultimately lead to global warming and the death of crops and even wild animals. This threat is a concern shared by many both inside, and outside, the scientific community (UNESCO). The rise in meat consumption, driven by global population increases and per capita earning growth (Chatti and Majeed, 2024), further aggravates food security concerns. The Daily Guardian (2024) reported that 956 million people worldwide will face food insecurity by 2028. In response to these concerns, scientists worldwide are trying to find solutions to mitigate the issues. Introducing cultured meat as a meat alternative has been identified as one potential solution. Laestadius (2015) expounded that cultured meat offers a possible solution to world hunger and food insecurity. Thus far, only three countries worldwide have produced cultured meat: Singapore, the USA and Israel (Holland, 2024). As cultured meat has yet to be commercialised on a large scale, measures of consumer acceptance of it as a meat substitute are still in the early stages. Li *et al.* (2024) noted that understanding consumers' acceptance of cultured meat as a meat substitute is important before it can reach a wide consumer base. Thus, this study on cultured meat is warranted as it is important to future world food security.

Existing literature on cultured meat has explored diverse areas, including risk-benefit trade-offs (Gómez-Luciano *et al.*, 2019), perception of healthiness (Dupont and Fiebelkorn, 2020), spokespersons such as social media influencers (Leite *et al.*, 2024) and vegetarians (Lanz *et al.*, 2025), personal factors such as gender (Mancini and Antonioli, 2019) and age (Zhang *et al.*, 2020), intercultural differences such as those in Germany and France (Bryant *et al.*, 2020), the UK, Spain, Brazil and the Dominican Republic (Gómez-Luciano *et al.*, 2019), Singapore and the USA (Chong *et al.*, 2022) and consumer acceptance (Muiruri and Rickertsen, 2024). Scholars have also examined environmental concerns (Circus and Robison, 2019; Dupont and Fiebelkorn, 2020; Castellani *et al.*, 2025), price (Zhang *et al.*, 2020; Arora *et al.*, 2020), name framings (Li *et al.*, 2024), sensory expectations (e.g. taste and appearance) (Gómez-Luciano *et al.*, 2019), emotions such as fear of the unknown (Gómez-Luciano *et al.*, 2019), fear of unfamiliar technology (Gómez-Luciano *et al.*, 2019) and plant-based alternatives (Arora *et al.*, 2020). It can be deduced that cultured meat research focuses on the external and internal stimuli that trigger consumers' acceptance of cultured meat. Within the risk-benefits perception factor, several studies have examined perceived benefits of consuming cultured meat as opposed to conventional meat, as well as its potential environmental benefits. For example, Bryant and Barnett (2018) highlighted that one of the key perceived benefits of cultured meat is the avoidance of animal suffering and (even) slaughter. In terms of environmental impact, perceived benefits such as reduced greenhouse gas emissions, lower water consumption and decreased land used have been identified as contributing factors to the acceptance of perceived benefits (Shaw and Iomaire, 2019; Weinrich *et al.*, 2020). However, these studies primarily

demonstrate the direct relationship between the perceived benefits and cultured meat acceptance or willingness to switch to cultured meat (Rolland *et al.*, 2020). Nevertheless, the role of perceived benefits as a mediating variable has not been sufficiently investigated, particularly in the case of groups with specific requirements for meat processing, such as Muslims. Understanding perceived benefits as a mediator is important, as it may reveal underlying psychological mechanisms that influence Muslim consumers' attitudes towards the willingness to switch to cultured meat.

Thus far, research on cultured meat largely focuses on the undifferentiated population. For instance, the general populations of the countries where the studies were conducted are the UK, Spain, Brazil and Dominican Republic (Gómez-Luciano *et al.*, 2019), Germany (Dupont and Fiebelkorn, 2020), Germany and France (Bryant *et al.*, 2020), Italy (Castellani *et al.*, 2025), China (Zhang *et al.*, 2020) and India (Arora *et al.*, 2020). These nations have varying numbers of ethnic and religious identities, and the populations have not been stratified along any lines in these studies. Notwithstanding, consumer willingness to switch to cultured meat among Muslim populations remains relatively undiscovered (Boereboom *et al.*, 2022). Aligning with Boereboom *et al.* (2022), Halmi and Khalli (2025) emphasised that future research on cultured meat should focus on Muslim consumers to better understand their level of acceptance. This is particularly an issue as it relates to Muslim consumers understanding of the halal status of cultured meat. According to Statista Research Department (2024a), Muslims constitute 25.8% of the world population. In addition, Muslim consumers' spending on halal food was US$1.26tn in 2021 and is estimated to increase to US$1.67tn by 2025 (Statista Research Department, 2024b); US$870.4bn was spent on Halal meat in 2023, and it is expected to increase to US$1,654.8bn by 2032 (Straits Research, 2024). Given the huge Muslim population worldwide (2 billion) (World Population Review, 2024) and the subsequent market for halal food, research on cultured meat amongst the Muslim community is significant as it delves into present attitudes and prospects regarding accepting cultured meat. In the same way, as noted above, previous studies on cultured meat skewed towards predominantly non-Muslim countries such as Germany, France, Spain, Brazil, the UK, China and India. Accordingly, there is a clear need for research on cultured meat among Muslim populations, especially those who are net importers of halal meat products and face food insecurity as a result of extreme arid climates, such as in the United Arab Emirates (UAE).

Previous research on consumer willingness to switch to cultured meat has employed a range of theoretical frameworks, including integration of value-belief-norm theory with theory of planned behaviour (Engel *et al.*, 2024), social representative theory (Hamlin *et al.*, 2022), the push-pull-mooring model (Chen, 2025), the extended theory of planned behaviour (Dupont *et al.*, 2022) and a combination of the focus theory of normative conduct and social identity theory (Lewisch and Riefler, 2023). To the best of the authors' knowledge, no empirical study to date has examined the combined application of internal environmental locus of control (INELOC) and stimulus-organism-response (SOR) theories in understanding Muslim consumers' willingness to switch (MCWS) to cultured meat.

Drawing on INELOC and SOR theories, the study aims to develop a suitable model to investigate the willingness of the Muslim population in the UAE to switch to cultured meat. To uncover the primary determinants of Muslim consumers' willingness to switch (MCWS) to cultured meat, this study is built upon three key research questions (*RQs*):

RQ1. What are the factors that influence MSWS to cultured meat?

RQ2. Do the perceived benefits influence MSWS to cultured meat?

RQ3. Do the perceived benefits mediate the relationship between INELOC and MSWS to cultured meat?

Our study offers notable contributions to the literature and meat-alternative industry in the following ways: First, the current research combines insights from INELOC and SOR theory to propose a model to advance an understanding of predictors in MCWS to cultured meat. By integrating these theories into cultured meat research, we contribute to the wider domain of sustainable consumption. Understanding how Muslim consumers view their responsibility towards environmental outcomes impacts public health, environmental policy and global food security. Second, to our knowledge, there is a paucity of literature examining MCWS to cultured meat. Recent literature by Mohd Kashim *et al.* (2023) discussed six principles of the Halal status of cultured meat; however, there is no empirical result. Hence, the present study offers a novel investigation into the unexplored aspect of cultured meat, i.e. Muslim consumers. Finally, this study is one of the few which explores the mediating role of perceived benefits in meat alternatives. Including perceived benefits as an intermediary variable in the study provides a deeper understanding of the causal relationship, which may lead to more effective interventions (e.g., campaigns) and policies (e.g., regulatory framework support). From a managerial standpoint, our findings are highly significant. Managers can leverage the findings from the study to develop marketing campaigns to target relevant segments of Muslim consumers, while contributing to national spend on imports and reducing the environmental impact of consuming animal proteins overall.

2. Context

The UAE has a local population totalling around 12% of the resident population and consisting of Arab Muslim origin. The remainder of the population are expatriates from around the world, dominated by South Asia (Indian 38%, Bangladeshi 9.5%, Pakistani 9.4%), Egyptian (10%), Philipino (6%) and others (12+%) (CIA, 2020). A notable feature of this population makeup is the extreme domination of expatriates in terms of numbers compared to the local population, and that the "ex-pat effect" causes an overall skew towards male residents (at a ratio of 7:3).

Our study was conducted with respondents from the local population, typically Sunni Muslim residents of different age groups and genders, representing the ruling population of the country. The country has several features that affect its relationship to food. One is that the country's Gross Domestic Product per capita is nearly US$50,000, so local people can afford to eat what they desire to a large extent; another is that there is such a range of nationalities present that the markets have a very wide range of food choices available. Similarly, the region is one of the dryest places on earth and suffers from the limitations in food production common to drylands. Consequently, the vast majority of food consumed and sold in the country is imported. There is limited water, tap water is widely considered undrinkable and household water is desalinated water from the sea. As such, the local population has little daily familiarity with natural habitats with more access to water, and so there is less (random) vegetation and plant growth; of the "desert hardy" plants in the country, it remains a skill to keep them alive; animals have little access to "wet" natural/organic foods such as grass and suffer disproportionately to colic and other potentially fatal digestive conditions.

Islam, which the local population subscribes to, promotes the care and preservation of the natural environment and encourages Muslims to consider it as part of their faith (Zafar, 2024). As such, many projects within the country are underway to address the many concerns of food insecurity for the country, and the region, as the earth heats ever further. In terms of

socio-cultural context, the local population is considered "collectivist" (Triandis *et al.*, 1990), and they are organised into tribes, usually associated with particular areas (or emirates) in the country. The UAE is, in fact, an amalgamation of seven separate emirates, each originally delineated under a separate ruler, which were joined together in 1971, forming the nation as we know it today.

3. Literature review and hypotheses development

3.1 Underpinning theories

3.1.1 Internal environment locus of control. Locus of control refers to an individual's belief in their capabilities to control the events occurring and can be classified into internal and external *locus* of control (Rotter, 1966). Internal *locus* of control denotes one's perception of their ability to control their future and belief that the outcome is based on their input (Cleveland *et al.*, 2012). Following from this, Cleveland *et al.* (2012) conceptualised INELOC as a concept that encapsulates people's complex beliefs regarding their accountability for, and capacity to, influence environmental consequences. Consumers are now more aware and concerned about their actions' environmental impact, and INELOC is the most important psychological driver of ecological behaviour (Hwang *et al.*, 2020). In other words, the more consumers are concerned about the environment, the more likely they are to partake in pro-environmental behaviour. Studies such as Yang and Weber (2019) and Cleveland *et al.* (2012), have demonstrated that consumers with INELOC positively affect their pro-environmental behaviours. Cleveland *et al.* (2012), emphasise categorising consumers by psychographics based on INELOC into "types" – green consumers, environmental activists, environmental advocates and recyclers. Green consumers quietly perform small but significant actions for sustainable development driven by personal ethics and confidence in their ability to make a difference (Moisander and Pesonen, 2002). Environmental activists work to actively improve environmental quality through financial support, protesting and voluntary work (Dono *et al.*, 2010). Environmental advocates are involved in less public environmental movements with lower commitment, such as convincing friends to join into pro-environmental activities (Larson *et al.*, 2015). Recyclers have a simple, affordable commitment to the environment, regularly engaging in daily or weekly recycling activities (Iyer and Kashyap, 2007). Overall, this multi-dimensional INELOC framework offers high validity and predictive power in an ecological context (Cleveland *et al.*, 2012), as psychological segmentation assists in clarifying how individual dispositions towards the environment influences consumption behaviour (Hwang *et al.*, 2020).

3.1.2 Stimulus-organism-response theory. SOR theory was developed by Mehrabian and Russell (1974), in which stimuli are the external environment that alters an individual's internal organism, which then formulates their behavioural response. According to Grădinaru *et al.* (2022), these stimuli impact an individual's psychological state, forming their particular behavioural reactions. In other words, this model allows research to explain the factors that facilitate the decision-making process. Recently, research has utilised the SOR theory in sustainable and environmental research, such as exploring sustainable cosmetic brand purchases, which examine triple bottom line as the stimuli (Grădinaru *et al.*, 2022), and organic food purchase which examines marketing communication sources and organic food values as the stimuli (Sultan *et al.*, 2021). This research demonstrates that SOR theory is a strong theoretical framework for predicting sustainable behaviour, as evidenced by the abovementioned studies.

Altogether, this study will integrate the INELOC theory with the SOR framework using the four segments of INELOC (green consumers, activists, advocates and recyclers) as the

stimulus in the SOR model to explain their impact on an individual's organism, which (in this study) are perceived benefits, which in turn leads to the response of that individual, which in this study is consumers' willingness to switch to cultured meat. By analysing how each INELOC segment impacts the organism's perception of benefits and subsequent willingness to switch to cultured meat, this study aims to elucidate the relationship between different internal control perceptions and their responses. This integration will yield a thorough knowledge of how various loci of control influence cognitive and behavioural outcomes, providing valuable insights into the mechanisms underlying these processes.

3.2 The effect of internal environment locus of control on perceived benefits

Recent literature, such as Magsayo (2021), predominantly investigates the role of *locus* of control in moderating the relationship between different values – functional, social and epistemic – and behavioural intention. Additionally, Magsayo (2023) explores how the internal *locus* of control moderates the relationship between perceived functional benefits and behavioural intention. These studies suggest that consumers with a high *locus* of control are more likely to perceive higher benefits or value from behaviour, as their *locus* of control inherently elevates their perception of these benefits. This finding is further supported by Ahadzadeh *et al.* (2021), who found a positive relationship between high internal health *locus* of control and performance expectancy towards mobile health adoption, and by Hsia (2016), who discovered a positive impact of *locus* of control on the perceived usefulness of educational technologies. Similarly, when Muslim consumers have a high INELOC, they are likely to relate more to perceived benefits. A pertinent example by Hwang *et al.* (2020) found that INELOC significantly affects the image of an edible insect restaurant, indicating that individuals with higher confidence in their capacity to influence environmental outcomes have a more favourable perception of the restaurant. Building on this finding, it can be expected that individuals with high INELOC may perceive greater advantages from switching to cultured meat. Consequently, based on the findings gathered from the recent studies above, this research hypothesises that:

H1a. "Green consumer" status positively affects perceived benefits.

H1b. "Activist" status positively affects perceived benefits.

H1c. "Advocate" status positively affects perceived benefits.

H1d. "Recycler" status positively affects perceived benefits.

3.3 The effect of perceived benefits on Muslim consumers' willingness to switch to cultured meat

A study by Loh *et al.* (2021) found that perceived security and privacy positively impact consumers' switching intention to mobile payments. Similarly, perceived benefits – such as health and sustainability – also play a crucial role in switching to cultured meat. Just as perceptions of security and privacy drive consumers to switch to mobile payments, perceiving benefits such as health and sustainability in cultured meat positively impacts consumer willingness to make the switch. Another relevant finding by Raddatz *et al.* (2023) found that the perceived benefit of blockchain positively impacts the intention to switch to blockchain. Additionally, Lin *et al.* (2021) identified that service quality positively impacts the switching intention of users from physical courses to online learning platforms. Furthermore, Confente *et al.* (2020) found that perceived value positively influences consumers' intention to switch to products obtained from organic waste. These

studies demonstrate that when consumers perceive significant benefits from a particular action or object – in this case, switching to cultured meat – they exhibit a stronger intention to make the switch. In addition, Arli *et al.* (2025) discovered that religious appeals enhanced perceived environmental benefits, which led to an increase in the acceptance of cultured meat among Muslim. This supports the relationship between perceived benefits and willingness to switch among Muslim consumers. Meanwhile, Hanifasari *et al.* (2024) found that perceived benefits such as halal certification, and alignment with religious values significantly enhance Muslim consumers' intention to purchase. This shows that when consumers perceive cultured meat to offer similar benefits and reassurances, they will be more willing to switch to cultured meat. Hamdan *et al.* (2021) also further support this by demonstrating that Muslim consumers have higher purchase intention towards cultured meat if it meet their religious values ethics – which involve perceived benefits both religious and ecological – may enhance their willingness to switch. Also, Kouarfaté and Durif (2023) discovered that perceived benefits significantly influenced the conative attitude component regarding cultured meat acceptance, which supports the relationship between perceived benefit and willingness to consumer cultured meat. Likewise, this is also supported by Sherwani *et al.* (2018), as it is found that intention to consume halal meat is significantly related to positive factors such as perceived control, moral obligation, trust and availability which reflect perceived benefits of consuming halal meat. Therefore, based on the findings above, this study hypothesises that:

H2. Perceived benefits positively affect MCWS to cultured meat.

3.4 Mediation effect of perceived benefits

The literature indicates that an internal *locus* of control positively impacts switching intention. For example, a study by Palau-Saumell *et al.* (2021) shows that an internal *locus* of control positively affects the intention to switch to locally produced food. Similarly, Sharma *et al.* (2020) demonstrate that an environmental *locus* of control positively impacts consumers' behavioural intentions, such as green purchasing intention. These studies show that *locus* of control impacts various behavioural intentions. Despite the strong correlation between INELOC and different behaviours, Cleveland *et al.* (2012) state that people do not consistently exhibit pro-environmental behaviour. In light of this, studies such as Joo *et al.* (2023) have found that a mediator-like attitude can positively influence the relationship between INELOC and behavioural intention, such as dining at indoor smart farm restaurants.

Additionally, Hwang and Choi (2021) found that attitude mediates the relationship between INELOC and the intention to use environmentally friendly airlines. Furthermore, perceived benefit-related constructs, such as perceived hedonic value and perceived utilitarian value, serve as powerful mediators between various constructs and behavioural intentions. For instance, these constructs are significant in contexts like mobile banking adoption (Jebarajakirthy and Shankar, 2021) and web rooming intention (Shankar and Jain, 2021). Additionally, Chen and Aklikokou (2020), discovered that perceived benefits, such as perceived usefulness and ease of use, mediate the relationship between various factors and the intention to use. Zollo *et al.* (2020), also found that social integrative benefits are robust mediators.

It is also important to note that Hamdan *et al.* (2021) highlight that Muslim consumer acceptance of cultured meat depends on how they perceived the benefits, including halal compliance, environmental sustainability and health safety. This indicates that even if an individual possesses high INELOC, they still rely on whether the clear benefits match their values, which shows that perceived benefits help translate internal beliefs into behavioural

intentions supporting their function as a key mediating factor. Also, Boereboom *et al.* (2022), discovered that British Muslims, priotise environmental responsibility showing a great sense of internal control and demonstrated that perceived benefits like sustainability greatly affected their willingness to adopt cultured meat. This shows that INELOC leads to higher perceived benefits, which in turn increases the willingness to switch, supporting perceived benefits as a mediator. On a side note, Ho *et al.* (2024) discovered that halal-conscious Muslims focused more on media messages that prioritised the benefits of cultured meat, which influenced their attitudes and intentions. This mirrors how consumers with high INELOC seek and act on beneficial information supporting the role of perceived benefits as a mediator between INELOC and switching intention. Considering these findings, it is plausible that other factors, such as perceived benefits, influence the relationship between INELOC and switching intention, rather than it being a direct path. In summary, perceived benefits have the potential to be a powerful mediator in understanding and predicting consumer behavioural intentions. Therefore, this study hypotheses that:

H3a. Perceived benefits mediate the relationship between green consumers and MCWS to cultured meat.

H3b. Perceived benefits mediate the relationship between activists and MCWS to cultured meat.

H3c. Perceived benefits mediate the relationship between advocates and MCWS to cultured meat.

H3d. Perceived benefits mediate the relationship between recyclers and MCWS to cultured meat.

The conceptual framework can be found in Figure 1 below.

4. Methodology

As the study aims to identify what could drive MCWS to cultured meat based on the INELOC theory with the SOR framework, an inductive approach using quantitative data is deemed appropriate. In this case, a self-administered questionnaire survey is chosen to test the framework. This survey was conducted in the UAE to assess consumer willingness to switch to cultured meat. Considering the large population of Muslim consumers in the UAE and its position as the most innovative country in the Arab Muslim world (WIPO, 2022), this is a suitable research context to examine the willingness of Muslim consumers.

4.1 Instrument design

The survey instrument was developed based on prior literature, and some elements were adapted for the research context. The scales used to measure the primary constructs were acquired from prior research. A seven-point Likert scale ranged from 1 (“strongly disagree”) to 5 (“strongly agree”) was used. The dimensions of the INELOC (green consumers, environmental activists, environmental advocates and recyclers) were taken from Hwang *et al.* (2020). Three items were used to measure green consumers, which develop from personal ethics and confidence to positively impact sustainable development by using pro-environmental products or services and rejecting environmentally unfriendly firms. Environmental activists, measured by five items, are related to commitment to public measures to enhance the environmental quality of a policy/system and impact the broader population. Environmental advocates were each measured by four items focused on the engagement in environmental movements that are less public and require lower

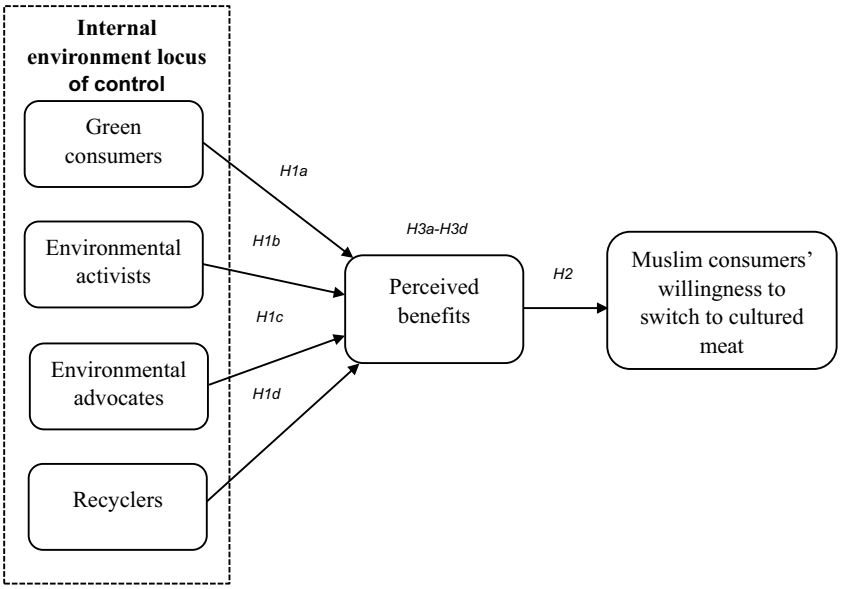

Figure 1. Conceptual framework
Source: Authors' own work

commitment. The last construct in the INELOC, recyclers, refers to people's routine recycling behaviour, measured by three items. Perceived benefits were adapted from Cheah *et al.* (2020) and include four items that assess the level to which an individual believes executing a particular action may bring about a certain level of interest. The original items were on "*reducing meat consumption*" but were adapted to "*switching from conventional meat to cultured meat*". The willingness to switch to cultured meat was evaluated using three items adapted from Wang *et al.* (2020). While the original items were "*willingness to switch to green transportation from private cars*", the measures have been thoroughly validated and tested for assessing environmental and sustainable practices, making them suitable to be adapted to "s*witch from conventional meat to cultured meat*" in this study. Finally, the study framework also included four control variables: gender (1 = male), age (in years), education level (1 = certificate or lower, 2 = diploma/foundation/A level, 3 = Bachelor's degree, 4 = postgraduate degree) and monthly income level (in AED; 1 US$ = 3.67 AED). Prior works (e.g. Tobler *et al.*, 2011; Aguirre Sánchez *et al.*, 2021) have shown that some control variables are related to food consumption behaviour, but not all are directly concerned with our hypotheses.

Since this is an emerging topic and has not been examined in the Muslim world, a pilot study of 50 participants was conducted to ensure that the survey questions were easy to understand and appropriate. After reflecting on their comments, minor edits were made to the questionnaire.

4.2 Sampling

Four trained research assistants ran the survey for about three months. They conveniently approached 400 adults using their social networks and referrals through their family

members. As cultured meat is a new and unfamiliar item to the general population, the research associates first explained what cultured meat is and then extended the invitation to participate. A total of 124 invitations were declined. Thus, 276 questionnaires were collected. However, 35 questionnaires were incomplete. Hence, the analysis was based on the survey data collected from 241 participants, giving an overall response rate of 60%. Several procedures were adopted to safeguard participants' rights during data collection. To ensure anonymity, participants were not obliged to reveal their names when completing the survey. Furthermore, the invitation statement indicated the full confidentiality of participants' responses, and their participation was voluntary. The participant information sheet given to the survey participants also underlined that the study would only analyse aggregate responses rather than individual data.

Due to the nature of the self-administered survey, it is essential to ensure that non-response bias is not present in the study data. We followed the recommendation of Armstrong and Overton (1977) that non-response bias is not a concern if late respondents have comparative responses with non-respondents. Using a procedure similar to that used in prior work (Ng and Sia, 2023), an independent group *t*-test was executed. The values for the focal constructs across early (first 120 respondents) and late respondents (last 120 respondents) were compared using IBM SPSS (version 29.0). No significant ($p > 0.05$) variance in the mean values of either subgroup was confirmed, proving that non-response bias was not a significant point in this study. In cross-sectional studies like this, we adhered to the suggestions of Podsakoff *et al.* (2003) to examine this bias using Harman's one-factor (Harman, 1976). The exploratory factor analysis with all 22 items was extracted into six factors (i.e. green consumers, environmental activists, environmental advocates, recyclers, perceived benefits and willingness to switch). The highest proportion of variance explained by a single factor was 36.75%, which is far below 50%. Hence, this data set has a low likelihood of common method bias.

4.3 Data analysis

Smart PLS 4.0 structural equation modelling (PLS-SEM) is a well-developed and vigorous second-generation SEM technique used to confirm the measurement model and evaluate the hypothesised relationships in the structural model. This variance-based approach was selected to examine complicated multivariable relationships concurrently while accounting for measurement errors (Hair *et al.*, 2017). It has been applied in empirical investigations in this research domain (Castellani *et al.*, 2025; Shin *et al.*, 2024).

5. Results

A total of 241 responses were used to test the hypothesised model. Table 1 presents the profiles of the respondents and their characteristics.

We first examined the measurement model by assessing its reliability and convergent and discriminant validity following the procedure recommended by Hair *et al.* (2017). Composite reliability (CR) is used as a reliability index alpha with a proposed threshold of 0.8 (Chin and Gopal, 1995). Cronbach's α is often utilised to assess internal consistency reliability, with the suggested threshold at 0.7 or higher (Nunnally, 1978). As shown in Table 2, Cronbach's α coefficients ranged from 0.744 to 0.880 in this study. All CR values are above 0.70, ranging from 0.837 to 0.926. As such, the scales demonstrated satisfactory internal consistency. Next, convergent validity is assessed in two means. Initially, the items were evaluated to see whether there was a significant association with the related constructs by checking the significance of the item loadings. Subsequently, we determined if each construct's average variance extracted (AVE) values were higher than the suggested limit of

Table 1. Profiles of respondents

Characteristics	Frequency	%
Gender		
Male	59	24.5
Female	182	75.5
Age		
18–24	162	67.2
25–34	48	19.9
35–44	23	9.6
35–44	6	2.5
55 and above	2	0.8
Education level		
Certificate or lower	13	5.4
Diploma/foundation/A-level	32	13.3
Bachelor's degree	139	57.7
Postgraduate degree	57	23.6
Household monthly income		
Less than AED 5,000	62	25.7
AED 5,000–10,000	37	15.4
AED 10,001–20,000	45	18.7
AED 20,001–50,000	61	25.3
Above AED 50,000	36	14.9

Note(s): Measurement model
Source(s): Authors' own work

0.5 (Chin, 2010). All item loading except EAD4 (0.633) exceeds the threshold of 0.7 required in item loading. However, the item is retained to ensure the content validity of the construct (Hair *et al.*, 2017). The AVE indices for all constructs were above the threshold of 0.5, ranging from 0.564 to 0.807. These outcomes denote that the instruments demonstrated adequate convergent validity.

The heterotrait-monotrait (HTMT) ratio and the Fornell–Larcker criterion were used to evaluate the discriminant validity of the constructs. As shown in Table 3, all the HTMT values were below the critical level of 0.9, indicating that discriminant validity was proven (Henseler *et al.*, 2015). The Fornell–Larcker criterion outcome exhibited that the square roots of all the AVE values were higher than the estimated correlation between the constructs. These results met all the conditions required to decide the reliability and validity of the measurement model. To address multicollinearity, the recommendation of Wilden *et al.* (2013) was followed, and variance inflation factors (VIFs) were utilised. The VIFs ranged from 1.348 to 2.699, well below the cut-off value, i.e. 5 (Hair *et al.*, 2010), indicating multicollinearity did not significantly impact the PLS estimation.

5.1 Structural model

We used a bootstrapping procedure with a resampling rate of 5,000 to test the hypotheses by gathering the standardised coefficients (β), *t*-values and p values (Dijkstra and Henseler, 2015). Bootstrapping produced 5,000 resamples and corrected the biases within 95% confidence intervals. A close to 47% explanatory power on willingness to switch to cultured meat was found in the proposed structural model, corresponding with earlier findings in food

Table 2. Standardised factor loadings, AVE and CR

Factors (Cronbach's α)	Indicators	Outer loadings	CR	AVE	Mean	SD
Green consumers	GC1. The sooner consumers start buying greener products, the sooner companies will transform to respond to their demands	0.818	0.889	0.727	4.803	1.508
$\alpha = 0.812$	GC2. The more I buy "green" products, the more I help persuade companies to become friendlier to the environment	0.873				
	GC3. By buying greener products, I can make a difference in helping the environment	0.867				
Environmental activists $\alpha = 0.866$	EAC1. Any donation to environmental groups helps it attain its goals	0.746	0.903	0.651	4.775	1.397
	EAC2. The efforts deployed by environmental groups result in many ecological challenges	0.843				
	EAC3. By donating to pro-environmental groups, I can help make a positive difference in the state of the environment	0.807				
	EAC4. By giving money to environmental groups, I help increase their probability of success	0.805				
	EAC5. Pro-environmental groups make a difference in fighting local environmental issues	0.831				
Environmental advocates $\alpha = 0.744$	EAD1. I can convince a friend to change his/her conservation habits	0.770	0.837	0.564	4.153	1.310
	EAD2. I can convince some of my friends to take action regarding environmental challenges	0.808				
	EAD3. If willing, people can generally influence their friends' transportation habits	0.780				
	EAD4. To some degree, I can influence my friends'/colleagues' choice between carpooling, taking the bus or driving their car to work	0.633				
Recyclers $\alpha = 0.874$	RE1. By recycling, I am helping to reduce pollution	0.886	0.921	0.794	5.366	1.562
	RE2. By recycling, I am doing my part to help the state of the environment	0.882				
	RE3. By recycling, I am saving valuable natural resources	0.905				

(*continued*)

Table 2. Continued

Factors (Cronbach's α)	Indicators	Outer loadings	CR	AVE	Mean	SD
Perceived benefits $\alpha = 0.815$	PB1. I believe switching from conventional meat to cultured meat could help me decrease saturated fat intake in my diet, as the nutritional content of cultured meat can be controlled in the medium of production	0.760	0.878	0.644	4.063	1.407
	PB2. Switching from conventional meat to cultured meat could help greenhouse gas emissions	0.764				
	PB3. I believe switching from conventional meat to cultured meat is safer as cultured meat is produced in an environment fully controlled by the producer	0.853				
	PB4. I believe switching from conventional meat to cultured meat could reduce food-borne illness	0.830				
Willingness to switch $\alpha = 0.880$	WS1: I am willing to switch from conventional meat to cultured meat	0.902	0.926	0.807	3.679	1.714
	WS2: I will switch from conventional meat to cultured meat	0.900				
	WS3: I will likely switch from conventional meat to cultured meat as it is more environmentally friendly	0.892				

Source(s): Authors' own work

Table 3. Measurement model. Discriminant validity

	Heterotrait-monotrait ratio (HTMT)										Fornell–Larcker Criterion									
	Age	EDU	GEN	INC	GC	EAC	EAD	RE	PB	WS	Age	EDU	GEN	INC	GC	EAC	EAD	RE	PB	WS
Age											*1.000*									
EDU	0.163										0.163	*1.000*								
GEN	0.182	0.009									−0.182	−0.009	*1.000*							
INC	0.172	0.101	0.155								0.172	0.101	−0.155	*1.000*						
GC	0.098	0.092	0.085	0.019							0.089	0.071	−0.074	0.018	*0.853*					
EAC	0.067	0.083	0.060	0.053	0.857						0.056	0.076	−0.025	0.003	0.715	*0.807*				
EAD	0.163	0.073	0.183	0.117	0.540	0.618					0.139	−0.007	−0.152	−0.076	0.432	0.500	*0.751*			
RE	0.058	0.006	0.060	0.045	0.729	0.707	0.453				0.048	−0.000	−0.058	0.038	0.613	0.619	0.366	*0.891*		
PB	0.049	0.114	0.062	0.041	0.446	0.585	0.454	0.271			0.003	0.101	−0.037	−0.037	0.362	0.493	0.363	0.234	*0.803*	
WS	0.057	0.090	0.070	0.106	0.239	0.321	0.469	0.091	0.804		0.026	0.084	−0.065	−0.099	0.204	0.285	0.378	0.068	0.685	*0.898*

Note(s): EDU = education level; GEN = gender; INC = income level; GC = green consumers; EAC = environmental activists; EAD = environmental advocates; PB = perceived benefits; RE = recyclers; WS = willingness to switch
Source(s): Authors' own work

behaviour (Nguyen and Dang, 2022) (see Figure 2). The standardised root mean square residual (SRMR = 0.066) was below the threshold of 0.08, indicating the model fit the data (Henseler *et al.*, 2014). We also used blindfolding with the cross-validated redundancy approach to examine the Q-squared value for predictive relevance. To confirm the predictors of each outcome have reasonable power and relevance, Q-squared values (PB = 0.24; WS = 0.12) were calculated, showing they are greater than the threshold value of 0 (Henseler *et al.*, 2009). The R-squared values also proved this predictive relevance (PB = 0.27; WS = 0.47). Empirical findings of the direct effects show that environmental activists, environmental advocates and recyclers significantly and positively influenced perceived benefits (β = 0.458, $p < 0.001$; β = 0.162, $p < 0.05$; β = 0.142, $p < 0.05$, respectively). However, the relationship between green consumers and perceived benefits is insignificant (β = 0.042, $p > 0.05$). Therefore, *H1a* was rejected, but *H1b*, *H1c* and *H1c* were supported. The significant relationship between perceived benefits and willingness to switch to cultured meat was also confirmed (β = 0.678, $p < 0.001$), supporting *H2* (Table 3).

The outcomes of the indirect effects showed that through perceived benefits, environmental activists (β = 0.322, $p < 0.001$), environmental advocates (β = 0.111, $p < 0.05$) and recyclers (β = 0.010, $p < 0.05$) significantly influenced willingness to switch to cultured meat, therefore supporting the mediating role of perceived benefits. To assess if perceived benefits were a full or partial mediator, we further investigated the direct effect of the dimensions of INELOC on willingness to switch to cultured meat. We found significant positive relationships between environmental activists (β = 0.239, $p < 0.05$) and environmental advocates (β = 0.325, $p < 0.001$) on willingness to switch to cultured meat, but recyclers (β = 0.192, $p > 0.05$) produced no significant result. The explanatory power of willingness to switch to cultured meat was slightly low at 18%. As both the direct and indirect effects were significant in environmental activists and advocates, these suggest that perceived benefits partially mediate their relationship with willingness to switch to cultured meat. However, the perceived benefit is a full mediator in the relationship between recyclers

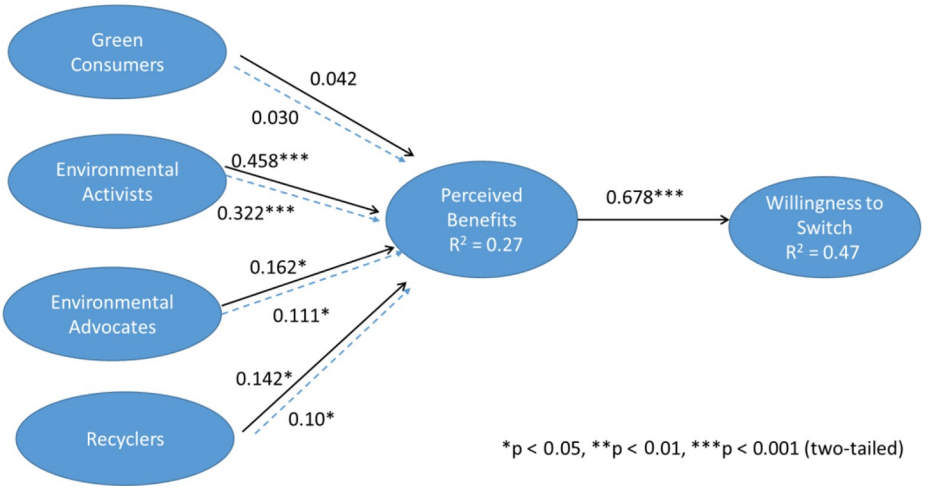

Figure 2. Results of the research mode
Source: Authors' own work

and willingness to switch to cultured meat because the effect of recyclers on willingness to switch became significant when perceived benefits were included.

Concerning the control variables (age, gender, education and income level), none significantly impacted perceived benefits or willingness to switch to cultured meat, as shown in Table 4. The results suggest that personal characteristics do not influence their motivation to consume cultured meat.

6. Discussion

Given that the socio-cultural context of our sample – purposely chosen as they are the settled, native population and can be expected to remain in the UAE regardless of what the future might hold (and as the same cannot be said for ex-pats) – that they are collective and tribal and so adhere to established patterns in the literature, such as in and out-group consideration (Tajfel and Fraser, 1978) – typical of historically tribal societies -, high power distance social structures (Hofstede, 1984) and strong reputational/social capital considerations, our results can be understood as having extensive potential for the population. Not only are the local people those who formulate and enact the government policies and laws surrounding imported foods, halal certification and societal framing, but they also adhere to Islam as a framework and so consider their nation's obligations in those terms. As such, and as mentioned earlier, caring for the environment is an obligation for Muslims; self-sufficiency and independence in terms of food have been promoted in all the Vision documents for the country and was established as a priority by the founding ruler, Sheikh Zayed, in 1971. Similarly, considerations of the status of meat products as halal (or not) are carefully monitored by governmental agencies in the country.

Perhaps the biggest concern for a Muslim population considering cultured meat is if the meat can be classified as halal (or lawful). At the time of our data collection, several developments in this regard made our results even more insightful. Earlier this year, the Fatwa Committee of Singapore ruled that the consumption of cultured meat can be considered halal as long as the meat comes from a halal animal source and every ingredient in the composition is halal (Majlis Ugama Islam Singapura, 2024). This development follows a ruling from Saudi Arabia which also noted that the animal from which the cell was harvested must be slaughtered in compliance with halal rules and is now part of the general discussion around such consumption – particularly for food-insecure regions such as the Gulf area (Issawy, 2024), of which meat imports make up 11% of total (80%) food and beverage imports (Federal Competitiveness and Statistics Centre, 2021).

With the ruling that cultured meat is permissible for Muslims to eat, we can see the potential for this product to expand in Muslim societies to meet consumers' environmental needs and offset the import costs and unsustainability of importing long-term in food-insecure regions like the drylands.

Our data shows that green consumers – a group motivated by personal ethics and idealism that involves boycotting and using pro-environmental products – are not directly convinced of the benefits of cultured meat consumption, nor are they leveraged towards willingness to switch. This finding is interesting but may be rooted in the individualistic environmental positioning of the green consumers, vis-á-vis the environmental activists and advocates – who are more collectively organised and similarly more convinced of the benefits of cultured meat consumption and, therefore, more willing to switch. This distinction could also explain the lack of significance in the statistical result for recyclers, the arguably most passive classification in our model when considering willingness to switch. However, this result was also significant when perceived benefits were included. Recyclers, by their acts of simple recycling, may also be more community motivated in terms of performing simple acts

Table 4. Hypotheses assessment

Hypotheses	Standardised coefficient (β)	T-statistics (t-value)	Standard errors	95% Confidence interval	Decision
Direct effects					
Green consumers → perceived benefits	0.042	0.556	0.079	[−0.086, 0.172]	Not supported
Environmental activist → perceived benefits	0.458***	5.519	0.085	[0.320, 0.598]	Supported
Environmental advocates → perceived benefits	0.162*	2.277	0.071	[0.055, 0.291]	Supported
Recyclers → perceived benefits	0.142*	2.020	0.070	[−0.251, −0.018]	Supported
Perceived benefits → willingness to switch	0.678***	19.461	0.035	[0.627, 0.743]	Supported
Indirect effects					
Green consumers → perceived benefits willingness to switch	0.030	0.554	0.054	[−0.060, 0.118]	Not supported
Environmental activists → perceived benefits → willingness to switch	0.322***	5.268	0.061	[0.217, 0.417]	Supported
Environmental advocates → perceived benefits → willingness to switch	0.111*	2.194	0.051	[0.037, 0.215]	Supported
Recyclers → perceived benefits → willingness to switch	0.10*	1.960	0.050	[−0.175, −0.012]	Supported
Control variables					
Age → perceived benefits	−0.055	0.814			
Gender → perceived benefits	−0.040	0.271			
Education → perceived benefits	0.075	1.344			
Income level → perceived benefits	0.022	0.386			
Age → willingness to switch	0.027	0.391			
Gender → willingness to switch	−0.114	0.943			
Education → willingness to switch	0.019	0.346			
Income level → willingness to switch	−0.088	1.745			

Note(s): Critical t-values ***3.29 ($p < 0.001$); **2.58 ($p < 0.01$); * 1.96 ($p < 0.05$)
Source(s): Authors' own work

personally, or on behalf of their families, which impact day-to-day environmental concerns. Recycling may be individual, but it is also one of legacy – preserving the earth for future generations as a consideration in collective societies. Onel and Mukherjee (2017), found that altruistic motivations were not dominant in a study on recycling workers in the individualistic society of the USA.

7. Implications

Our results suggest that clear communication on the halal status of cultured meat would enhance the uptake of the switch in Muslim communities. Perhaps acceptance would be even more quickly and successfully achieved because the society is collective, and as such, the pro-social impact of environmental behaviours would be more pronounced. Similarly, if the ability to achieve other pro-environmental tasks were supported (such as the provision of convenient recycling stations), the opportunity to leverage the personal characteristics inherent in some environmental actions (in our study, green consumers and recyclers) would be enhanced by encouraging people to feel their ability to perform the task was enhanced (Geiger *et al.*, 2019).

For the UAE, a severely food insecure dryland, the ability to domestically produce halal cultured meat in-country would save money on imports as well as other resources surrounding the raising of meat. It would have s significant negative effect on countries who vigorously export halal meat to the UAE (and other Muslim countries), particularly New Zealand, Australia and Brazil. This impact would be felt right along the halal meat supply chain from farmers to shippers to storers to retail sellers. Obviously, the uptake of cultured meat would reduce negative environmental impacts, which are so fragile in this region.

Wider implications, across the Muslim world, would be better access to animal proteins for the food deprived, once production was sufficient to reduce price. This would allow another level of independence to the region and shore up issues of food insecurity, at least on the animal proteins front.

8. Limitations and future research

Future research could delve into this topic by comparing the interest and proposed uptake of plant-based meats/proteins with similar populations facing extreme food insecurity in the future due to climate and climate changes. Similarly, eating cultured meat may be less acceptable when farming is commonplace, or communities are more self-sufficient and/or less wealthy. Even amongst Muslim populations, with their shared culture based on their understanding of Islam, there may be interesting differences in the way cultured meat as a market offering or as a pro-environmental choice is perceived. One limitation of this study is that it is confined to one population – albeit a key population in terms of culture and food insecurity. Further studies could investigate the phenomenon raised here in detail, such as through in-depth interviews and/or focus groups, to reinforce the concepts and design future studies which could be applied in other/wider Muslim/dryland contexts. An expansion of the study could be to take the views of market actors who are from countries which can/do grow food successfully – are their views of cultured meat impacted by their familiarity with farming and exposure to non-drylands? Are the views of UAE nationals comparable to those of other Gulf nationals, many of whom are at a significant minority in their countries, and what effect would this have on overall market demand in the country overall? The region is very complex in terms of markets, but studies on this (and related) food alternatives for a significant dryland and both timely and necessary, and can give hints to how best to serve Muslim markets in general in terms of access and nutritional benefits to animal proteins.

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Ethics statement
Ethical approval for the study was obtained from the academic ethics committee (Approval number: ERSC_2024_4376).

Data availability
The datasets analysed in the study are available from the corresponding author upon reasonable request.

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