



**FEASTS**

Fostering European Cellular Agriculture  
for Sustainable Transition Solutions

# Drivers and barriers of consumer acceptance and engagement strategy

## Deliverable 4.1

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## Executive summary

This deliverable is prepared as part of Task 4.3, *Consumer Perceptions and Drivers of Acceptance*, within the FEASTS project. The task consists of three phases, with this report covering findings from the first phase—an online survey conducted in Denmark, France, and Germany. The survey aimed to assess consumer perceptions, awareness, and willingness to adopt cultured meat (CM) and cultured seafood (CSF) products. Additionally, we present results from a **preference-based segmentation analysis**, which will inform the next phases of the task. These insights highlight key factors influencing consumer acceptance and the challenges associated with market adoption.

### Key findings

The survey results indicate that approximately **1 out of 3 consumers are aware of CM and CSF**. However, there are **notable regional differences**. Germany and France exhibit higher awareness levels than Denmark, where familiarity is lower. Despite recognizing the potential sustainability benefits, consumers remain skeptical about the nutritional value, taste, and naturalness of CM/CSF. Price is consistently identified as the biggest barrier against adoption, as cultured products are widely perceived as expensive.

From an ethical perspective, **CM and CSF are generally viewed from neutral to positive**, with higher agreement being achieved for their **environmental benefits and implications for animal welfare**. However, **concerns about their impact on farmers and traditional food systems** remain prevalent, especially in France where agriculture holds a significant cultural and economic role. While Germany appears more open to CM and CSF, France and Denmark display greater hesitation, with religious and cultural reservations influencing their willingness to adopt alternative proteins.

Regarding consumer **willingness to consume, purchase, and pay a premium** for CM and CSF, the findings show **moderate to low** scores in all three countries. Germany emerges as the most receptive market, where consumers show a slightly greater willingness to pay a premium, particularly for CSF. In contrast, France demonstrates the most resistance with many consumers showing a strong preference for traditional foods over innovative alternatives.

While the willingness to try is low, a larger proportion of consumers are willing to substitute a small percent (25% to 50%), of the existing meat or seafood intake with CM or CSF respectively. This result leaves room to options like hybrid products as more promising ways of incorporating CM and CSF into people's diets. Consumers in **Germany and Denmark show higher willingness for substitution**, while French consumers show less, with a significant portion rejecting the idea of substitution.

**Taste and texture** emerge as the **most critical drivers of consumer preferences** for CM and CSF, followed by safety and environmental impact. Although concerns about naturalness persist, they are secondary to sensory attributes.

## Preference-Based Segmentation

From the results obtained on consumer preferences, a segmentation was performed resulting in four distinct segments: **Taste-driven (35.2%)**, **Sustainability-Oriented (29.3%)**, **Safety-Conscious (20.2%)**, **Naturalness-Oriented (15.3%)**. **Taste-Driven** is the biggest segment and consists of consumers who are primarily motivated by taste and texture, especially at the expense of environmental impact. **Sustainability-Oriented** is the second biggest segment and consists of individuals who prioritize environmental impact while showing the least importance on naturalness, and taste and texture. The **Safety-Conscious** segment prioritizes food safety and considers nutritional value as the least important. Finally, **Naturalness-Oriented (15.3%)** is the smallest segment that prioritizes naturalness and shows the least importance on the environmental impact.

The segments show significant differences in their perceptions and beliefs about cultured meat and seafood. In a nutshell, the segment that is more favorable toward cultured meat and seafood is the **Sustainability-Oriented**. On the other hand, **Naturalness-Oriented** has the most resistance, scoring lower across most questions related to beliefs and perceptions about cultured meat and seafood. This is the segment that also is less willing to adopt such a product. What is also interesting is that the **Sustainability-Oriented** are those who are less neophobic about food-related technologies, whereas the **Naturalness-Oriented** are those who are more neophobic. In a similar fashion, the segment that is more attached to meat or seafood is the **Taste-Driven** followed by the **Naturalness-Oriented**, whereas the **Sustainability-Oriented** segment is the one that is least attached.

## Recommendations

Increasing consumer awareness about CM and CSF is paramount for their future adoption. Consumers still lack awareness (2 out of 3 are not aware of the term “cultured meat/seafood”) and thus **communication efforts aiming at increasing their awareness are necessary**. Communication should target to emphasize on benefits of CM/CSF emphasizing their nutritional value and sustainability credentials. However, this also requires **addressing misconceptions**. The general belief that CM/CSF is not natural imposes a potential barrier that requires further attention. It should also be noted that **consumers have not yet developed certain attitudes** toward CM/CSF (as shown from the scores that are close to the average of the scales), which indicates that what is communicated will be influential for future adoption.

Since CM and CSF are widely **viewed as ethical** due to their sustainability and animal welfare benefits, leveraging these attributes in **marketing communication** is also of importance. However, considering the differences observed across countries, messaging may need to be tailored. In Germany, where sustainability is a strong driver, marketing efforts could emphasize environmental benefits. In France, where traditional food systems are deeply ingrained, messaging could acknowledge cultural values and highlight how CM and CSF can coexist with traditional food practices rather than replace them entirely.

**Hybrid products present an opportunity** to introduce CM and CSF gradually, increasing consumer familiarity and acceptance. This is further supported by the higher percentage of consumers who are willing to substitute meat or seafood with either CM or CSF. This result is also shown in other novel products (e.g., plant-based proteins), where consumers are less resistant to the adoption of hybrid products. Thus, **product concept development** may benefit from focusing on hybrid formulations, specifically those containing 25% to 50% cultured content that seem to be an acceptance entry point.

Finally, the preference-based segmentation provides a tool that can support **market development**. The results indicate that those driven by sustainability are trading it off with naturalness and even taste. This segment is rather big (29.3%). Those driven by taste are the biggest segment (35.2%) and thus for this segment a tailored approach is needed to ensure that CM/CSF products can meet their taste expectations. On the other hand, those driven by naturalness form the smallest segment (15.3%) and are those with the most resistance to novelty (as shown by the highest scores in food technology neophobia). This segment may be the laggards in the process of adoption of CM/CSF. Therefore, for the initial phase of introduction, the most important segments are those driven by sustainability and taste, who will be the first movers when CM/CSF are marketed.

# Introduction

Cultured meat and seafood are emerging as viable alternatives to conventional animal-based protein sources, aiming to address critical concerns related to environmental sustainability, animal welfare, and food security. As these products near commercialization, understanding consumer acceptance becomes essential for their market success. In the FEASTS project, consumer acceptance is one of the key objectives set within Task 4.3.

Prior research suggests that consumer attitudes toward these novel foods are shaped by multiple factors, including health perceptions, cultural beliefs, and the framing of information. Perceptions of health and safety play a significant role in consumer acceptance of cultured meat and seafood. Studies indicate that consumers often associate these products with health benefits, such as a lower risk of zoonotic diseases and antibiotic resistance (Chen et al., 2023). However, skepticism persists, particularly due to unfamiliar production methods and the perceived "unnaturalness" of cultured foods (Hwang et al., 2020; Rombach et al., 2022). For example, comparative analyses reveal that food neophobia—an aversion to unfamiliar foods—can hinder willingness to try cultured meat, leading to negative perceptions that overshadow potential benefits (Hwang et al., 2020; Rombach et al., 2022).

Cultural and religious factors also significantly shape consumer attitudes. Research highlights that acceptance varies across regions, particularly in societies with strong dietary traditions (Guo & Wiwattanadate, 2023; Fujiwara & Tachikawa, 2024). In Muslim-majority countries, for instance, acceptance is closely linked to halal certification and religious considerations (Guo & Wiwattanadate, 2023). Additionally, demographic factors such as age, urbanization, and political ideology correlate with acceptance levels, with younger and more urban consumers generally showing greater openness to cultured foods (Lewisch & Riefler, 2023; Bryant et al., 2020).

Effective communication strategies are crucial for improving consumer acceptance. The terminology used to describe cultured meat and seafood significantly influences perceptions. Studies suggest that terms like "clean meat" evoke more positive reactions than more technical labels such as "cultured" or "cell-based" (Bryant & Dillard, 2019; Bryant & Barnett, 2020). Moreover, providing clear and accessible information about the production process and potential benefits can mitigate distrust and increase consumer willingness to try these products (Palmieri et al., 2020; Franceković et al., 2021).

In conclusion, while interest in cultured meat and seafood is growing, consumer acceptance remains complex, shaped by health concerns, cultural beliefs, framing of communication, and the fact that it is still at the early stages of product development. Addressing these factors through targeted education and marketing efforts will be essential for successfully integrating these innovative food sources into mainstream diets.

## Objectives

The present study aimed to explore consumer perceptions and acceptance of cultured meat and seafood products in the three countries targeted by the FEASTS project: Denmark, France, and Germany. Based on a meta-review (see Appendix 2), we identified key areas for investigation, including awareness, perceptions, ethical considerations, willingness to try and purchase, and preferences. These elements were captured in an online survey that was conducted in these three countries.

The results reported offer insights that can guide stakeholders in effectively positioning cultured products in the marketplace. Additionally, this study serves as a foundation for the next phase of the project, which involves a series of Living Lab sessions with citizens. The segmentation analysis provides valuable insights to guide this process.

# Methodology

## Data collection

The survey was conducted online in three European countries: Denmark, France, and Germany. The target population consisted of individuals aged 18 and older, with main quotas imposed for gender and age to ensure demographic balance within each country sample. Sampling and recruitment were carried out by a professional market research agency (Norstat Danmark A/S), which was also responsible for compensating participants who completed the survey. The final sample was designed to be broadly representative of the general population in each country in terms of age and gender, although no post-collection weighting was applied to further adjust for representativeness. Data collection took place between October 24 and November 8, 2024. The study received ethical approval from the Research Ethics Committee at Aarhus University (Approval No. BSS-2024-143-S2).

## Survey Design

The survey was programmed in Qualtrics and translated into Danish, German, and French. To ensure that all respondents could comfortably read the instructions and view the infographic on cultured meat and seafood prepared for the survey, participation was restricted to respondents using a personal computer (desktop or laptop). Mobile phones and tablets were excluded to avoid potential readability and display issues.

The survey was structured around two products—cultured meat and cultured seafood—with respondents randomly assigned to one of the two. The survey was divided into the following sections: Awareness/Knowledge, Perceptions, Ethics & Religion, Preferences, Willingness to Pay and Eat, Perceptions of Hybrid Cultured Meat/Seafood, Beliefs, Covariates (Meat Attachment Scale and Food Technology Neophobia Scale), Socio-demographics, and Feedback. The survey questions (see Appendix) included 5- and 7-point Likert scales, multiple-choice, and open-ended formats. The preferences section was implemented using the best-worst scaling technique (Louviere et al., 2015).

## Data analysis

Upon completion of data collection, the data were downloaded, cleaned (with metadata deleted except for country identification), and pseudonymized by generating an anonymous ID. The final sample size of the survey was 2.937. The survey included a timing question related to cultured meat and seafood information, and respondents who spent less than five seconds on the page

*Table 1 Survey sample retention and screening rates*

| Country      | Initial sample | Retained sample | Speeders   | % Speeders | Passed attention check | Failed attention check | % Failed attention check |
|--------------|----------------|-----------------|------------|------------|------------------------|------------------------|--------------------------|
| Denmark      | 911            | 847             | 64         | 7          | 777                    | 70                     | 8                        |
| France       | 1,033          | 860             | 173        | 17         | 767                    | 93                     | 11                       |
| Germany      | 993            | 901             | 92         | 9          | 777                    | 124                    | 14                       |
| <b>Total</b> | <b>2,937</b>   | <b>2,608</b>    | <b>329</b> | <b>11</b>  | <b>2,321</b>           | <b>287</b>             | <b>11</b>                |

were screened out due to speed. As a result, 11% of respondents were excluded. This percentage was significantly higher in France, where 17% of respondents were screened out for speeding. In addition, one attention check was included in the covariates section, specifically in the Meat Attachment Scale, where respondents were required to select “Agree”. As a result of the attention check, 11% of respondents were removed due to incorrectly choosing the guided response. The final working sample across all countries was 2,321. Finally, since respondents were randomly assigned to one of two groups, meat or seafood, the two sub-surveys were combined into a single dataset, and a product code was created (1 = meat; 2 = seafood).

Table 1 summarizes the retention and screening rates. The final sample consisted of 2,321 participants, with the following distribution: 777 from Denmark, 767 from France, and 777 from Germany.

# Results

## Sample Background Overview

### Demographics

The sociodemographic characteristics of the sample are summarized in Table 2. The data include participants from Denmark, France, and Germany, providing insights into gender distribution, average age, and levels of educational attainment across these countries. The following analysis highlights key findings.

The sample consists of 2,321 participants, with a relatively balanced gender distribution of 46.6% men and 53.0% women. The average age of the participants is 50.8 years. In terms of education, the largest proportions have either a technical qualification (24.8%), an undergraduate degree (26.3%), or a graduate degree or higher (23.0%). Participants with high school education account for 23.0%, and those with only primary education are a small minority (2.9%).

Broken down by country, the Danish sample (N=777) has an average age of 49.5 years and is 47.5% male and 52.0% female. The level of education shows that 31.9% have an undergraduate degree, 29.2% have a technical qualification and 20.1% have a graduate degree or higher. High school and primary education account for 14.0% and 4.8% respectively. In France (N=767), the average age is slightly higher at 51.6 years, with a gender distribution of 46.3% men and 53.3% women. Remarkably, 26.6% of the French sample have a graduate degree or higher, while 24.3% have a high school education, 23.9% have a bachelor's degree, and 21.1% have a technical degree. Only 2.0% have a primary education.

Lastly, Germany (N=777) also shows a balanced gender distribution, with 46.1% men and 53.8% women, and an average age of 51.3 years. In terms of educational attainment, 30.8% have completed upper secondary education, the highest of the three countries. This is followed by

*Table 2 Sociodemographic characteristics of the sample*

| Demographics (%)          | Total | Denmark | France | Germany |
|---------------------------|-------|---------|--------|---------|
| <b>Gender</b>             |       |         |        |         |
| Male                      | 46.6  | 47.5    | 46.3   | 46.1    |
| Female                    | 53.0  | 52.0    | 51.6   | 51.3    |
| <b>Age (mean)</b>         | 50.8  | 49.5    | 51.6   | 51.3    |
| <b>Education</b>          |       |         |        |         |
| Primary School            | 2.9   | 4.8     | 2.0    | 2.1     |
| High School               | 23.0  | 14.0    | 24.3   | 30.8    |
| Technical Qualification   | 24.8  | 29.2    | 21.1   | 23.9    |
| Undergraduate degree      | 26.3  | 31.9    | 23.9   | 20.8    |
| Graduate degree or higher | 23.0  | 20.1    | 26.6   | 22.4    |

23.9% with a technical qualification, 22.4% with a graduate degree or higher, and 20.8% with a bachelor's degree. Only 2.1% of the German sample have completed primary education.

Overall, the countries are representative of the total sample, with similar patterns of gender and age distribution. However, the differences in educational attainment between the three countries may reflect differences in national education systems, as well as differences in social norms and cultural expectations regarding education.

## Dietary Habits

As part of the socio-demographic section of the survey, respondents were asked about their dietary habits, including meat and seafood consumption, the frequency of consumption, and their overall dietary preferences. The data corresponding to these questions are presented in Table 3. For clarity, the definitions of dietary preferences were provided within the survey and are available in Appendix A1.

Regarding meat consumption, most of the respondents (93.6%) were meat eaters, while 6.4% said they did not eat meat. The frequency of consumption also varied: 5.7% said they never ate meat, while 9.8% ate meat less than once a week, 26.1% ate meat 1-2 times a week, 31.3% ate meat 3-4 times a week, and 27.1% ate meat 5 times or more a week. In terms of seafood consumption, 17.0% of respondents said they did not eat seafood, while 83.0% said they did. In terms of frequency of consumption, 21.1% of respondents never ate seafood, 44.7% ate seafood less than once a week, 29.1% ate it 1-2 times a week, 4.1% ate it 3-4 times a week and 0.9% ate seafood 5 times or more a week.

Looking at the total sample, 62.9% of respondents identified as meat eaters, with other dietary preferences distributed as follows 29.2% identified as flexitarian, 2.5% as pollotarian, and 1.7% as pescatarian. Smaller proportions were identified as lacto-ovo-vegetarians (2.5%), lacto-vegetarians (0.3%), ovo-vegetarians (0.1%), and vegans (0.8%).

Denmark reported the highest percentage of meat eaters at 97.0%, compared to 90.0% in Germany. Similarly, Denmark reported the highest percentage of seafood eaters as well (97.0%), whereas in Germany only 72.3% reported eating seafood.

Table 3 Total sample and country dietary habits

| Dietary Habits                            | Total | Denmark | France | Germany |
|-------------------------------------------|-------|---------|--------|---------|
| <b>Meat eaters</b>                        | 93.6  | 97.0    | 93.7   | 90.0    |
| <b>Frequency of meat consumption</b>      |       |         |        |         |
| <i>Never</i>                              | 5.7   | 2.5     | 4.6    | 10.0    |
| <i>Less than once a week</i>              | 9.8   | 4.3     | 10.0   | 15.2    |
| <i>1-2 times per week</i>                 | 26.1  | 19.0    | 25.8   | 33.3    |
| <i>3-4 times per week</i>                 | 31.3  | 29.1    | 35.5   | 29.1    |
| <i>Five times per week</i>                | 27.1  | 45.1    | 24.1   | 12.4    |
| <b>Seafood eaters</b>                     | 83.0  | 92.3    | 83.7   | 72.3    |
| <b>Frequencies of seafood consumption</b> |       |         |        |         |
| <i>Never</i>                              | 21.1  | 7.1     | 16.3   | 27.7    |
| <i>Less than once a week</i>              | 44.7  | 41.3    | 53.4   | 40.0    |
| <i>1-2 times per week</i>                 | 29.1  | 44.4    | 17.1   | 25.1    |
| <i>3-4 times per week</i>                 | 4.1   | 6.3     | 1.4    | 4.5     |
| <i>Five times per week</i>                | 0.9   | 1.9     | 0.6    | 0.3     |
| <b>Type of diet</b>                       |       |         |        |         |
| <i>Meat eaters</i>                        | 62.9  | 75.9    | 64.1   | 48.8    |
| <i>Flexitarians</i>                       | 29.2  | 18.5    | 29.7   | 39.4    |
| <i>Pollotarian</i>                        | 2.5   | 3.0     | 2.0    | 2.4     |
| <i>Pescatarian</i>                        | 1.7   | 1.0     | 1.6    | 2.6     |
| <i>Lacto-ovo-vegetarian</i>               | 2.5   | 1.3     | 1.6    | 4.5     |
| <i>Lacto-vegetarian</i>                   | 0.3   | 0.3     | 0.3    | 0.4     |
| <i>Ovo-vegetarian</i>                     | 0.1   | 0.0     | 0.1    | 0.3     |
| <i>Vegan</i>                              | 0.8   | 0.0     | 0.7    | 1.7     |

Conversely, Germany had a higher proportion of flexitarians (39.4%) compared to France (29.7%) and Denmark (18.5%). These differences suggest that dietary patterns in terms of meat and seafood, and preferences for more plant-based or flexible diets, differ significantly between countries, with Denmark leaning more towards conventional meat and seafood consumption and Germany showing a higher percentage of flexitarians.

## Meat Attachment Scale

### Section Summary

- French consumers show the highest meat attachment, Danes the strongest seafood affinity, and Germans the lowest dependence on both
- France scores highest for entitlement, while hedonism is strong across all countries, peaking for meat in France and seafood in Denmark
- All dimensions show good reliability ( $\alpha > 0.60$ ), except Affinity in Denmark for both meat ( $\alpha = 0.636$ ) and seafood ( $\alpha = 0.631$ ).

The shortened **Meat Attachment Scale (MAS)** (Kuhn et al., 2023) was used to assess individuals' attachment to meat and seafood. The scale is a psychological tool designed to measure individuals' attachment to meat consumption. We adapted the scale items to address seafood.

Overall, the scale assesses the psychological barriers to reducing meat consumption, providing insights into why individuals may resist plant-based diets. It is useful for understanding consumer attitudes toward meat and designing strategies to promote dietary shifts.

The scale consists of four dimensions:

- a) **Entitlement** – Reflects the belief that humans have a natural or moral right to consume meat. It is associated with justifications for eating meat based on tradition, necessity, or dominance over animals.
- b) **Hedonism** – Captures the enjoyment and pleasure derived from eating meat. Individuals high in this dimension strongly associate meat consumption with taste, satisfaction, and indulgence.
- c) **Affinity** – Represents a deep emotional or cultural attachment to meat. This dimension reflects how much individuals view meat as an integral part of their identity, family traditions, or personal history.
- d) **Dependence** – Refers to the perceived difficulty of reducing or eliminating meat from one's diet. It measures the extent to which individuals feel they rely on meat for satiety, nutrition, or habit.

Table 4 reports internal consistency and means for the scale dimensions. Internal consistency was assessed using Cronbach's alpha, and all dimensions demonstrated acceptable to high reliability ( $\alpha > 0.70$ ), except for Affinity in Denmark for both meat ( $\alpha = 0.636$ ) and seafood ( $\alpha = 0.631$ ), which fell below the threshold.

Descriptive analysis revealed variations in meat and seafood attachment across the three countries.

- Entitlement scores were highest in France for both meat ( $M = 4.99$ ) and seafood ( $M = 4.92$ ), indicating stronger beliefs in the necessity of these foods compared to Denmark and Germany. Germany reported the lowest entitlement to seafood ( $M = 3.96$ ).
- Hedonism was relatively high across all countries, with France scoring highest for meat ( $M = 5.00$ ) and Denmark for seafood ( $M = 4.99$ ).
- Affinity was generally higher for seafood than meat, with Denmark reporting the highest attachment to seafood ( $M = 5.77$ ).
- Dependence scores were consistently lower than other dimensions, with Germany showing the lowest dependence on seafood ( $M = 3.28$ ), suggesting greater flexibility in reducing seafood consumption.

The findings indicate cross-cultural differences in meat and seafood attachment, that further highlight variations in consumer openness to meat and seafood reduction strategies across

Table 4 Internal consistency and means for each dimension from Meat Attachment Scale

|                         | Cultured Meat |        |         | Cultured Seafood |        |         |
|-------------------------|---------------|--------|---------|------------------|--------|---------|
|                         | Denmark       | France | Germany | Denmark          | France | Germany |
| <b>Cronbach's Alpha</b> |               |        |         |                  |        |         |
| <i>Entitlement</i>      | 0.829         | 0.874  | 0.869   | 0.794            | 0.833  | 0.864   |
| <i>Hedonism</i>         | 0.904         | 0.935  | 0.938   | 0.853            | 0.877  | 0.915   |
| <i>Affinity</i>         | 0.636         | 0.772  | 0.820   | 0.631            | 0.677  | 0.762   |
| <i>Dependence</i>       | 0.902         | 0.922  | 0.938   | 0.881            | 0.875  | 0.866   |
| <b>Means</b>            |               |        |         |                  |        |         |
| <i>Entitlement</i>      | 4.17          | 4.99   | 4.21    | 4.50             | 4.92   | 3.96    |
| <i>Hedonism</i>         | 4.80          | 5.00   | 4.49    | 4.99             | 4.86   | 4.23    |
| <i>Affinity</i>         | 5.49          | 5.11   | 5.10    | 5.77             | 5.28   | 5.13    |
| <i>Dependence</i>       | 4.07          | 4.39   | 3.97    | 3.98             | 3.63   | 3.28    |

markets. Specifically, French consumers display the highest attachment to meat, Danish consumers exhibit a stronger affinity for seafood, and German consumers report lower dependence on both food types.

## Food Technology Neophobia

### Section Summary

- The FTNS demonstrated strong internal consistency across all countries ( $\alpha = 0.849\text{--}0.881$ ).
- French consumers showed the highest food technology neophobia ( $M = 4.83$ ), while Danes ( $M = 4.18$ ) and Germans ( $M = 4.25$ ) were more open to novel food technologies.
- Lower food technology neophobia in Denmark and Germany suggests greater acceptance of food technology advancements.

The Food Technology Neophobia Scale (FTNS) (Cox & Evans, 2008) was used to assess consumer reluctance toward novel food technologies. The scale measures individuals' reluctance or resistance toward novel food technologies. It assesses how people perceive and react to food innovations, particularly in terms of safety, ethics, and naturalness.

The scale demonstrated high internal reliability, with Cronbach's alpha values ranging from 0.849 (Denmark) to 0.881 (Germany), indicating strong internal consistency across all three countries. Descriptive statistics revealed variations in food technology neophobia across the three countries. French respondents exhibited the highest level of food technology neophobia ( $M = 4.83$ ), while Danish ( $M = 4.18$ ) and German participants ( $M = 4.25$ ) reported comparatively lower resistance to novel food technologies. The findings suggest cross-cultural differences in attitudes toward novel food technologies. French consumers exhibit the highest level of food technology neophobia, indicating stronger resistance to food innovations, while Danish and German

consumers report lower levels of food technology neophobia, potentially reflecting a greater openness to food technology advancements.

## Consumer Awareness and Perceptions

### Awareness and knowledge

#### Section Summary

- Awareness of CM (30.6%) and CSF (36.6%) was generally low across all respondents
- More respondents were familiar with CSF than CM, particularly in France (44.4%) and Germany (45.3%).
- Danish respondents showed the lowest awareness of both CM (27.1%) and CSF (20.6%).

Table 5 Cultured meat and seafood knowledge per countries

| Awareness (%)       | Total | Denmark | France | Germany |
|---------------------|-------|---------|--------|---------|
| Knowledge about CM  | 30.6  | 27.1    | 30.4   | 34.3    |
| Knowledge about CSF | 36.6  | 20.6    | 44.4   | 45.3    |

Respondents' prior awareness of Cultured Meat (CM) and Cultured Seafood (CSF) products was generally low across the sample at 30.6% and 36.6% respectively, with higher awareness of cultured seafood compared to cultured meat, as also shown in Table 5.

To ensure that all respondents possessed a shared understanding, the following definition, localized to the relevant language, was provided at the commencement of the survey, accompanied by an infographic illustrating the production process (see Appendix 1):

*"Cultured [meat/seafood] refers to a diverse range of new food products made possible by innovative production methods that use animal cells grown in cell culture conditions rather than whole animals. Some products may resemble traditional foods, e.g., chicken fillets, pork sausages, salmon, fish fillets, etc., while others may expand consumer choice to exotic species or entirely novel food experiences."*

**It is important to note that the higher awareness obtained for cultured seafood compared to cultured meat is most likely attributed to bias introduced from participants confusing CSF with "farmed/cultivated seafood". Despite this bias, all participants were introduced to the correct definition before answering the other items of the survey.**

In Denmark, 27.1% of respondents were aware of cultured meat, compared to 30.4% in France and 34.3% in Germany, which had the highest awareness of the three countries

While, for cultured seafood, only 20.6% of Danish respondents were aware, compared to 44.4% in France and 45.3% in Germany, reflecting much higher awareness in these two countries. This

shows a significantly higher familiarity with cultured seafood in France and Germany compared to Denmark.

## Perceptions

### Section Summary

- Perceptions of CM and cultured CSF are fairly similar across countries.
- Sustainability is the most positively perceived parameter, with Germany and Denmark perceiving the products as more sustainable, while France holds a more neutral stance.
- All countries perceived cultured products as expensive, with Denmark showing slightly better affordability perceptions. Naturalness received the lowest scores overall (2.2–3.1), reflecting consumer skepticism.

Consumer perceptions of cultured meat and seafood products were assessed across six parameters: sustainability, nutritional value, healthiness, safety, taste, cost, and naturalness. Table 6 summarizes the results per country and product.

Denmark and Germany showed more positive perceptions of both cultured meat and cultured seafood, particularly in terms of sustainability, with average scores of around 5. In contrast, France was more neutral, with scores of 3.9 for CM and 4.1 for CSF. In terms of nutritional value, perceptions were generally neutral in all three countries. Denmark scored highest for CM (4.5), while Germany led for CSF (4.8), reflecting slightly more favorable views.

Perceptions of safety were fairly consistent for CM, with Denmark scoring highest (4.2), followed by Germany (3.9) and France (3.7). For CSF, Germany again had the highest safety rating (4.5), followed closely by Denmark (4.3), while France had the lowest (3.9). Healthiness was perceived as neutral across the board, with average ratings around 4.0, although CM was perceived as slightly less healthy than CSF.

Taste perception was significantly higher for CSF compared to CM. Germany gave the highest rating for CSF (4.5), while Denmark and France rated it lower. France, in particular, rated the taste of cultured products less favorably overall. Affordability was a concern for consumers across all countries, as both CM and CSF were viewed as somewhat expensive. However, Denmark considered the products to be slightly less expensive than Germany and France. Naturalness

*Table 6 Average perceptions of Cultured Meat and Seafood by country*

| Perceptions (mean) | Cultured Meat |        |         | Cultured Seafood |        |         |
|--------------------|---------------|--------|---------|------------------|--------|---------|
|                    | Denmark       | France | Germany | Denmark          | France | Germany |
| Sustainability     | 5.1           | 3.9    | 4.9     | 5.0              | 4.1    | 5.1     |
| Nutrition          | 4.5           | 4.0    | 4.3     | 4.7              | 4.3    | 4.8     |
| Healthiness        | 4.0           | 4.0    | 3.8     | 4.4              | 4.1    | 4.4     |
| Safety             | 4.2           | 3.7    | 3.9     | 4.3              | 3.9    | 4.5     |
| Taste              | 3.8           | 3.5    | 4.0     | 4.1              | 3.9    | 4.5     |
| Affordability      | 3.5           | 3.1    | 3.2     | 3.7              | 3.4    | 3.5     |
| Naturalness        | 2.2           | 2.2    | 2.6     | 2.3              | 2.5    | 3.1     |

*Note: Measurement is 7-point bipolar*

received the lowest scores in all countries, indicating significant skepticism. Denmark rated naturalness lowest for both CM (2.2) and CSF (2.3), while Germany and France gave slightly higher scores, ranging from 2.6 to 3.1. This suggests among all countries consumers do not associate these products with naturalness.

Overall, Denmark and Germany had more positive perceptions, particularly for sustainability, but these perceptions were offset by concerns about high costs and low naturalness. In contrast, France had more neutral and slightly less positive views on most parameters, suggesting a more cautious or skeptical attitude towards these products.

Perceived similarity to conventional products

Section Summary

- French consumers perceived the greatest difference between cultured and conventional products, while Germans had a more optimistic view.
- CSF was seen as slightly more similar to conventional seafood than CM, but both were generally viewed as different.

Table 7. Perceived similarity of CM and CSF to conventional meat and seafood (mean values)

| Perceived similarity of CM and CSF to conventional meat and seafood | Denmark | France | Germany |
|---------------------------------------------------------------------|---------|--------|---------|
| Cultured Meat                                                       | 4.09    | 4.57   | 3.56    |
| Cultured Seafood                                                    | 4.08    | 4.02   | 3.27    |

Note: Measurement is 6-point bipolar scale: 1 = "Very Similar," 6 = "Very Different"

Consumers were asked to rate the degree of overall similarity between cultured products and their conventional counterparts (Table 7). Overall, respondents in all three countries viewed both cultured meat and cultured seafood as more different than similar to conventional products. French consumers expressed the greatest perceived difference for both product types, with average scores of 4.57 for cultured meat and 4.02 for cultured seafood. Denmark followed closely with scores of 4.09 and 4.08, respectively. However, German consumers were more optimistic, with a slightly more positive view, with average scores of 3.56 for cultured meat and 3.27 for cultured seafood. While cultured seafood was generally perceived as slightly more like its conventional counterpart, the perception still tended towards being "slightly different" in all countries.

# Ethics

## Section Summary

- Cultured seafood is perceived slightly better than cultured meat, but both are seen as beneficial for animal welfare, food security, and the environment.
- Affordability is a key concern in all countries, while skepticism about nature and farmer impact is highest among French consumers.
- Germany consistently rates both cultured meat and seafood the most favorably.

Ethical perceptions of cultured meat and seafood were assessed using a 7-point Likert scale. The results, summarized in Table 8 show a mixture of support and concern, reflecting the different attitudes towards these products in the three countries.

In terms of animal welfare, both cultured meat and seafood were generally perceived positively. German respondents showed the highest agreement with the welfare benefits of cultured meat (4.7), followed by Denmark and France with slightly lower scores (4.3 and 4.2 respectively). Similarly, cultured seafood was rated most favorably in Germany (5.0), with Denmark (4.5) and France (4.0) showing slightly less enthusiasm.

Respondents also recognized the potential of cultured products to address global food security. Ratings for cultured meat were consistent across countries, averaging 4.3, with Germany showing slightly higher optimism (4.4). For cultured seafood, responses were similarly positive, with Germany leading the way (4.6) and Denmark and France close behind at 4.5 and 4.3 respectively.

Affordability emerged as a key ethical priority. Respondents in all three countries strongly agreed that cultured meat and seafood should be available to everyone at a reasonable price. Germany

*Table 8. Ethical perceptions on CM and CSF (mean values)*

| Statements                                           | Cultured Meat |        |         | Cultured Seafood |        |         |
|------------------------------------------------------|---------------|--------|---------|------------------|--------|---------|
|                                                      | Denmark       | France | Germany | Denmark          | France | Germany |
| Improve animal welfare                               | 4.3           | 4.2    | 4.7     | 4.5              | 4.0    | 5.0     |
| Solve world famine problems                          | 4.3           | 4.3    | 4.4     | 4.5              | 4.3    | 4.6     |
| Should be available for everybody at a low price     | 4.8           | 4.5    | 4.9     | 4.8              | 4.9    | 5.3     |
| Are disrespectful to nature                          | 3.8           | 4.3    | 3.6     | 3.8              | 4.3    | 3.3     |
| Its production will have negative impacts on farmers | 4.9           | 5.2    | 4.9     | 4.1              | 4.8    | 4.1     |
| Will have a positive environmental impact            | 4.9           | 4.2    | 4.6     | 4.7              | 4.2    | 4.7     |

Note: Measurement is 7-point bipolar scale: 1 = "Strongly disagree" 7 = "Strongly agree"

rated this aspect highest for both products (4.9 for meat, 5.3 for seafood), followed by Denmark (4.8 for both) and France (4.5 for meat, 4.9 for seafood).

Opinions on whether cultured products respect nature were more divided. Cultured meat was more skeptical in France, with a score of 4.3, compared to Germany and Denmark, with scores of 3.6 and 3.8 respectively. A similar trend was observed for cultured seafood, with France again expressing more concern (4.3), Germany less (3.3), and Denmark in the middle (3.8).

Concerns about the impact on farmers were notable. The perception that cultured meat production could have a negative impact on farmers was most pronounced in France (5.2), followed by Denmark and Germany, which both rated this concern equally (4.9). For cultured seafood, French respondents were again the most concerned (4.8), while Denmark and Germany gave identical, slightly lower ratings (4.1).

Lastly, the environmental impact of cultured products was viewed favorably in all countries. Cultured meat was rated positively for its potential to reduce resource use and emissions, with Denmark giving the highest score (4.9), followed by Germany (4.6) and France (4.2). Cultured seafood received similarly strong support, with Germany and Denmark leading the way (4.7 and 4.8 respectively) and France scoring slightly lower (4.2).

In summary, the ethical evaluation of cultured meat and seafood in Denmark, France, and Germany shows significant agreement on its potential to improve animal welfare, food security, and the environment. However, concerns about affordability, respect for nature, and the impact on farmers remain prominent, with notable differences between countries. These findings highlight the need for targeted communication and policymaking to address regional concerns and ensure broad acceptance of the products.

## Religiosity

### Section Summary

- Most respondents in Denmark, France, and Germany do not consider themselves religious.
- Among religious consumers, most remain uncertain about the ethical preference of CM and CSF, though CSF generally receives more favorable moral views, especially in Germany.

This section examines the religiosity of respondents across the three countries and explores whether religious consumers perceive CM and CSF as more ethically and morally acceptable compared to conventional products. The findings reveal varied levels of religious identification and ethical preferences towards these alternative food options, as described in Table 9.

Most respondents in all three countries, do not consider themselves to be religious. Specifically, France has the highest percentage of people identifying themselves as having no religion, at 58%, followed by Denmark (55%) and Germany (53.7%). The distribution of religious identification is similar across countries, with most people identifying as slightly religious, followed by moderately

Table 9. Religious identification and ethical preferences for CM & CSF across countries (percentages)

| Religious Identification                        | Denmark | France | Germany |
|-------------------------------------------------|---------|--------|---------|
| <b>Religious People</b>                         | 45.0    | 42.0   | 46.3    |
| <b>CM Ethical Preference (all respondents)</b>  |         |        |         |
| Yes                                             | 18.3    | 17.0   | 30.6    |
| Maybe                                           | 49.1    | 42.1   | 37.3    |
| No                                              | 32.6    | 40.9   | 32.1    |
| <b>CSF Ethical Preference (all respondents)</b> |         |        |         |
| Yes                                             | 22.0    | 18.3   | 38.1    |
| Maybe                                           | 45.0    | 45.8   | 39.7    |
| No                                              | 33.1    | 36.0   | 22.1    |

religious, and only a small minority identifying as very religious. The lowest proportions of those identifying as very religious are found in Denmark (2.2%), France (4.7%) and Germany (4.8%).

All respondents were then asked whether they consider CM and CSF to be ethically and morally preferable to conventional options, regardless of their religious identification.

Regarding cultured meat, responses varied from country to country. In Denmark, 18.3% of respondents considered cultured meat ethically preferable, 49.1% were unsure (maybe), and 32.6% said no. France was more skeptical, with 17% saying yes, 42.1% saying maybe, and 40.9% saying no. Germany had the highest percentage of respondents who viewed cultured meat as ethically preferable, with 30.6% saying yes, 37.3% saying maybe, and 32.1% saying no.

For cultured seafood, the patterns were similar, but with more favorable views overall. In Denmark, 22% considered it ethically preferable, 45% were unsure, and 33.1% said no. In France, 18.3% said yes, 45.8% said maybe, and 36% said no. Germany showed the highest levels of support, with 38.1% considering it ethically preferable, 39.7% saying maybe, and 22.1% saying no.

Overall, cultured seafood was viewed more favorably than cultured meat in all countries, with a higher percentage of respondents considering seafood to be ethically preferable.

# Willingness to Consume and Purchase

## Section Summary

- **Willingness to Try:** German consumers show the highest willingness to try cultured meat and seafood, while the French are the least willing. Cultured seafood is slightly more accepted than cultured meat across all countries.
- **Willingness to Buy:** Consumers generally remain neutral, with responses falling in the "maybe" range. German consumers are the most open to purchasing, while the French are slightly more hesitant.
- **Willingness to Pay More:** Consumers are largely unwilling to pay premium price, especially for cultured meat. Cultured seafood has slightly higher acceptance, particularly in France and Germany.
- **Willingness to Substitute:** A significant share of consumers, especially in France, are unwilling to substitute conventional meat and seafood. However, moderate substitution (10-30%) is common, and Germany shows the highest willingness for complete substitution.

## Willingness to try

Overall, consumer willingness to eat cultured meat (CM) and cultured seafood (CSF) products is relatively low to neutral across all three countries, with no substantial differences between the two products. German consumers show the highest willingness to try both CM (32.3%) and CSF (43.7%), followed by Denmark (29.8% for CM, 37.3% for CSF). French consumers exhibit the lowest willingness, with only 23.6% for CM and 30.3% for CSF (Table 10). While CSF is generally viewed slightly more favorably than CM, the variation remains minimal.

*Table 10. Mean willingness to try cultured meat and seafood*

| Willingness to try CM and CSF products | Cultured Meat |        |         | Cultured Seafood |        |         |
|----------------------------------------|---------------|--------|---------|------------------|--------|---------|
|                                        | Denmark       | France | Germany | Denmark          | France | Germany |
| <b>Yes</b>                             | 29.8          | 23.6   | 32.3    | 37.3             | 30.3   | 43.7    |
| <b>Maybe</b>                           | 27.8          | 18.2   | 32.1    | 21.2             | 21.3   | 22.7    |
| <b>No</b>                              | 42.4          | 58.2   | 35.6    | 41.5             | 48.3   | 33.6    |

Note: Measurement is 5-point bipolar scale (1 = Extremely Unlikely, 5 = Extremely Likely) collapsed into: No (1-2), Maybe (3), Yes (4-5)

## Willingness to buy

Consumers' willingness to buy CM and CSF products, presented in Table 11 varies slightly across countries, with a significant share of respondents expressing uncertainty rather than a clear preference. In all three countries, CSF tends to be slightly more accepted than CM, particularly in Germany.

In Denmark, consumer attitudes are neutral, with 16.3% willing to buy CM, 54.1% unsure, and 29.6% unwilling. CSF sees slightly higher acceptance, with 19.8% willing to purchase, 54.2%

Table 11. Willingness to buy cultured meat and seafood (percentages)

| Willingness to buy (%) | Cultured Meat |        |         | Cultured Seafood |        |         |
|------------------------|---------------|--------|---------|------------------|--------|---------|
|                        | Denmark       | France | Germany | Denmark          | France | Germany |
| <b>Yes</b>             | 16.3          | 22.1   | 30.8    | 19.8             | 28.1   | 37.3    |
| <b>Maybe</b>           | 54.1          | 30.9   | 42.0    | 54.2             | 34.8   | 36.8    |
| <b>No</b>              | 29.6          | 47.0   | 27.4    | 25.9             | 37.1   | 25.9    |

uncertain, and 25.9% unwilling. French consumers appear more hesitant. Only 22.1% express willingness to buy CM, while 30.9% are undecided, and 47.0% are unwilling. CSF is somewhat better received, with 28.1% willing to buy, 34.8% uncertain, and 37.1% unwilling. Germany shows the highest acceptance of both products. For CM, 30.8% of consumers are willing to buy, 42.0% remain uncertain, and 27.4% are unwilling. CSF is the most accepted, with 37.3% willing to purchase, 36.8% uncertain, and only 25.9% unwilling. Overall, while consumer openness varies by country, the trend suggests a slightly greater acceptance of cultured seafood over cultured meat, particularly in Germany.

### Willingness to pay more

When looking at willingness to pay more the motivation of consumers is generally low across all three countries, particularly for CM products. As presented in Table 12, the majority of respondents are unwilling to pay more, with rejection rates exceeding 65% in all cases. For CM, willingness to pay more is especially low, with only 4.0% of Danish consumers, 6.6% of French consumers, and 4.5% of German consumers expressing willingness, while the vast majority are unwilling. CSF sees slightly higher acceptance but remains limited, with willingness to pay more not exceeding 9% in any country. France (6.7%) and Germany (8.8%) show slightly greater openness, while Denmark remains the least receptive. Overall, while CSF is marginally better

Table 12. Mean willingness to buy cultured meat and seafood.

| Willingness to pay more (%) | Cultured Meat |        |         | Cultured Seafood |        |         |
|-----------------------------|---------------|--------|---------|------------------|--------|---------|
|                             | Denmark       | France | Germany | Denmark          | France | Germany |
| <b>Yes</b>                  | 4.0           | 6.6    | 4.5     | 1.6              | 6.7    | 8.8     |
| <b>Maybe</b>                | 18.5          | 14.1   | 29.6    | 26.2             | 22.8   | 30.1    |
| <b>No</b>                   | 77.4          | 79.3   | 65.9    | 72.2             | 70.5   | 61.1    |

accepted than CM, consumers across all three countries are largely unwilling to pay a premium for either product.

### Willingness to Substitute

Respondents were also asked to indicate what percentage of their current meat and seafood consumption they would be willing to substitute with cultured alternatives. The results that are

Table 13. Percentage of meat and seafood replacement with cultured alternatives across countries

| % existing intake of meat/<br>seafood would you be<br>willing to substitute | Cultured Meat |        |         | Cultured Seafood |        |         |
|-----------------------------------------------------------------------------|---------------|--------|---------|------------------|--------|---------|
|                                                                             | Denmark       | France | Germany | Denmark          | France | Germany |
| 0                                                                           | 25.3          | 42.6   | 13.5    | 22.2             | 32.0   | 21.3    |
| 10                                                                          | 19.0          | 18.7   | 16.7    | 18.3             | 24.7   | 14.7    |
| 20                                                                          | 13.5          | 9.5    | 12.7    | 10.8             | 12.1   | 9.9     |
| 30                                                                          | 8.3           | 5.1    | 7.0     | 9.5              | 7.0    | 10.9    |
| 40                                                                          | 4.0           | 2.4    | 5.2     | 6.6              | 5.9    | 4.3     |
| 50                                                                          | 9.0           | 8.0    | 9.2     | 14.0             | 7.3    | 9.1     |
| 60                                                                          | 4.5           | 4.6    | 4.5     | 4.0              | 4.8    | 6.1     |
| 70                                                                          | 3.8           | 1.7    | 2.5     | 5.3              | 2.0    | 6.7     |
| 80                                                                          | 5.0           | 2.4    | 5.2     | 2.9              | 1.1    | 6.9     |
| 90                                                                          | 1.8           | 1.2    | 4.0     | 1.1              | 0.8    | 1.3     |
| 100                                                                         | 5.8           | 3.6    | 8.5     | 5.3              | 2.2    | 8.8     |

presented in Table 13 show varying degrees of acceptance across Denmark, France, and Germany.

For cultured meat, a significant portion of respondents in all three countries were unwilling to substitute any of their meat consumption, with France showing the highest resistance (42.6%), followed by Denmark (25.3%) and Germany (24.6%). Willingness to substitute smaller portions (10-30%) was relatively common across all three countries, but higher substitution levels (50% and above) were less frequently chosen. Notably, Germany had the highest share of respondents willing to substitute 100% of their meat intake (8.5%), compared to Denmark (5.8%) and France (3.6%). Focusing on cultured seafood, a similar trend emerged, with the highest resistance in France (32.0%), followed by Denmark (22.2%) and Germany (21.3%).

Moderate substitution levels (10-40%) were again the most common choices. Interestingly, Denmark had a relatively high share of respondents willing to substitute 50% of their seafood intake (14.0%), while Germany had the highest percentage of respondents open to fully replacing their seafood consumption with cultured alternatives (8.8%).

Overall, while resistance remains, a substantial portion of respondents across all three countries are open to at least partially integrating cultured meat and seafood into their diets.

# Consumer perception of hybrid products

## Section Summary

- **Support for Hybrid Products:** Denmark and Germany show higher support for hybrid seafood than hybrid meat, while France has the lowest support for both.
- **Willingness to Eat Hybrid Products:** Consumers in Denmark and Germany are neutral to slightly negative, while France reports the lowest willingness to eat hybrid products.
- **Willingness to Buy Hybrid Products:** France has the highest rejection rate, while Germany shows the most openness to hybrid seafood. Denmark and Germany remain uncertain but less opposed than France.
- **Willingness to Pay More:** Most consumers are unwilling to pay extra, with France showing the strongest resistance. Willingness to pay more remains below 7% across all countries.
- **Willingness to Replace Conventional Meat/Seafood:** Most consumers prefer minimal replacement of conventional products. France is the most resistant, while Denmark and Germany show more openness to partial substitution.
- **Ideal Percentage of Cultured Ingredients in Hybrids:** 25% or 50% cultured content is the most accepted across all countries. France prefers no cultured ingredients, while Germany is the most open to higher percentages.

## Support for hybrid products

Consumers were asked about their support towards hybrid products that combine conventional and cultured meat or seafood (Table 14). Denmark had the highest support for hybrid seafood (3.67), followed by Germany (3.84), while France had the lowest support in both categories.

Table 14. Mean support for hybrid products with cultured meat and seafood across countries

| Support the creation of hybrid products | Denmark | France | Germany |
|-----------------------------------------|---------|--------|---------|
| Hybrid products with Cultured Meat      | 3.51    | 2.65   | 3.38    |
| Hybrid products with Cultured Seafood   | 3.67    | 2.97   | 3.84    |

Note: Measurement is 7-point liked scale: 1 = “Extremely disagree”, 7 = “Extremely agree”

## Willingness to try hybrid products

Looking at the likelihood of eating hybrid products with cultured meat or seafood, Germany and Denmark showed similar levels of acceptance, though still negative to neutral, while France reported the lowest, with scores of 1.99 for meat and 2.30 for seafood (Table 15).

Table 15. Mean willingness to eat hybrid products across countries

| Willingness to eat hybrid products    | Denmark | France | Germany |
|---------------------------------------|---------|--------|---------|
| Hybrid products with Cultured Meat    | 2.52    | 1.99   | 2.53    |
| Hybrid products with Cultured Seafood | 2.63    | 2.30   | 2.70    |

Note: Measurement is 5-point bipolar scale: 1 = "Extremely Unlikely," 5 = "Extremely Likely"

## Willingness to buy hybrid products

When asked about purchasing hybrid meat products (Table 16), France had the highest percentage of respondents saying "no" (63.0%), indicating a strong reluctance, while Denmark (45.9%) and Germany (40.3%) leaned more toward the "maybe" response, suggesting some uncertainty but not outright rejection. In contrast, consumer willingness to buy hybrid seafood was somewhat more positive, with Germany showing the highest percentage of "yes" responses (26.7%), while France again had the lowest (18.0%). This indicates that while consumers remain cautious overall, they seem slightly more open to the idea of purchasing hybrid meat products than hybrid seafood, except for Denmark, where willingness to purchase both types of hybrid products was similar.

Table 16. Percentage willingness to buy hybrid products across countries

| Willingness to buy hybrid products (%) | Cultured Meat |        |         | Cultured Seafood |        |         |
|----------------------------------------|---------------|--------|---------|------------------|--------|---------|
|                                        | Denmark       | France | Germany | Denmark          | France | Germany |
| Yes                                    | 12.5          | 13.6   | 17.4    | 13.5             | 18.0   | 26.7    |
| Maybe                                  | 45.9          | 23.4   | 40.3    | 46.6             | 29.5   | 34.9    |
| No                                     | 41.6          | 63.0   | 42.3    | 39.9             | 52.5   | 38.4    |

## Willingness to pay more for hybrid products

Most respondents were not prepared to pay more for hybrid meat or seafood Table 17. France had the highest resistance (81.3% for meat and 77.0% for seafood), followed by Denmark and Germany. The percentage of respondents willing to pay more remained below 7% in all cases, indicating a low level of consumer willingness to accept a higher price for both products.

Table 17. Percentage willingness to pay more for hybrid products across countries

| Willingness to pay more for hybrid products (%) | Cultured Meat |        |         | Cultured Seafood |        |         |
|-------------------------------------------------|---------------|--------|---------|------------------|--------|---------|
|                                                 | Denmark       | France | Germany | Denmark          | France | Germany |
| Yes                                             | 2.0           | 4.6    | 4.0     | 1.9              | 6.2    | 6.9     |
| Maybe                                           | 19.3          | 14.1   | 21.4    | 25.7             | 16.9   | 29.3    |
| No                                              | 78.7          | 81.3   | 74.6    | 72.5             | 77.0   | 63.7    |

## Willingness to replace conventional meat and seafood with hybrids

When it comes to consumers' willingness to replace existing meat or seafood consumption with hybrid products (Table 18), French consumers show the strongest resistance. Specifically, 52.8% are unwilling to replace any of their meat intake, while 44.9% reject hybrid seafood. In comparison, Denmark (34.3% for meat, 29.6% for seafood) and Germany (37.6% for meat, 30.9% for seafood) show a more balanced distribution of responses, indicating a greater openness to at least partial substitution.

Across all countries and product types, most consumers are only willing to replace a small portion of their diet with hybrid alternatives. The 10% replacement level was the most popular choice after 0%, with 19.3% of Danes, 20.2% of French, and 17.2% of Germans choosing it for meat, with similar trends for seafood. The willingness to replace more than 30% of conventional products drops significantly, reinforcing the idea of hybrid products as a complement rather than a complete substitute.

A small percentage of consumers are willing to replace 50% or more of their meat or seafood intake. In Denmark, 3.3% would fully substitute meat and 2.4% would fully substitute seafood. In Germany, 2.0% would completely replace meat and 3.7% would completely replace seafood. France shows the lowest commitment to large-scale substitution, with only 1.0% for meat and 0.8% for seafood.

The data suggests that while Denmark and Germany are more open to hybrid products, most consumers still prefer minimal levels of replacement. Full adoption seems unlikely in the near future, as consumers tend to prefer gradual change rather than immediate, large-scale substitution.

*Table 18. Percentage of meat and seafood replacement with hybrid alternatives across countries*

| % of Existing Intake of Meat/Seafood Willing to Replace | Cultured Meat |        |         | Cultured Seafood |        |         |
|---------------------------------------------------------|---------------|--------|---------|------------------|--------|---------|
|                                                         | Denmark       | France | Germany | Denmark          | France | Germany |
| 0                                                       | 34.3          | 52.8   | 37.6    | 29.6             | 44.9   | 30.9    |
| 10                                                      | 19.3          | 20.2   | 17.2    | 21.4             | 22.2   | 16.8    |
| 20                                                      | 13.0          | 5.8    | 10.9    | 11.1             | 9.6    | 9.6     |
| 30                                                      | 9.5           | 4.6    | 5.2     | 9.0              | 4.5    | 7.5     |
| 40                                                      | 7.0           | 5.6    | 7.5     | 5.6              | 4.2    | 4.8     |
| 50                                                      | 7.0           | 5.6    | 7.5     | 10.8             | 6.5    | 8.8     |
| 60                                                      | 3.0           | 3.4    | 6.0     | 4.2              | 2.2    | 5.9     |
| 70                                                      | 4.0           | 1.7    | 3.0     | 3.4              | 2.2    | 6.4     |
| 80                                                      | 1.8           | 1.7    | 3.5     | 1.9              | 1.7    | 4.0     |
| 90                                                      | 1.3           | 0.7    | 0.7     | 0.5              | 1.1    | 1.6     |
| 100                                                     | 3.3           | 1.0    | 2.0     | 2.4              | 0.8    | 3.7     |

## Consumer Preferences for the Ideal Percentage of Cultured Ingredients in Hybrid Meat and Seafood Products

In terms of the ideal percentage of cultured ingredients that consumers are willing to accept in hybrid products, varying levels of openness were observed across countries, with some common trends emerging for both cultured meat and cultured seafood (Table 19).

As seen with the willingness to substitute conventional meat and seafood, most consumers in all three countries are not very open to completely replacing conventional products with hybrid or cultured alternatives. French consumers showed the strongest resistance to cultured ingredients in both meat and seafood. More than half of French respondents preferred products with no cultured ingredients at all, and only a small minority accepted products with higher percentages, particularly for cultured meat. This reflects a clear reluctance to incorporate cultured ingredients into their diets.

On the other hand, German consumers were the most receptive to hybrid products overall and showed higher acceptance of cultured ingredients. In fact, a significant proportion of German respondents were comfortable with products containing 25% or 50% cultured ingredients, and some were even willing to accept 75% or fully cultured products. For cultured seafood, Germany again showed the highest acceptance, with a significant proportion supporting 50% or more cultured content.

Danish consumers showed a more moderate level of acceptance. Most Danish respondents favored products with 25% or 50% cultured ingredients for both meat and seafood. However, acceptance of higher percentages dropped significantly, although Danes appeared to be slightly more open to hybrid seafood than hybrid meat.

In summary, while there is a general openness to hybrid products, most consumers in all three countries prefer products with relatively low levels of cultured ingredients. The 25% or 50% cultured options were the most popular across all consumers, suggesting hybrid products as a complement to conventional foods rather than a complete replacement. France stands out for its strong resistance to hybrid meats, while Denmark and Germany show greater flexibility,

*Table 19. Ideal percentages distribution of CM and CSF in hybrid products by country*

| Ideal percentage of CM/CSF in hybrid products | Cultured Meat |        |         | Cultured Seafood |        |         |
|-----------------------------------------------|---------------|--------|---------|------------------|--------|---------|
|                                               | Denmark       | France | Germany | Denmark          | France | Germany |
| 0                                             | 34.8          | 51.6   | 31.6    | 33.3             | 47.8   | 23.7    |
| 25                                            | 24.6          | 24.3   | 24.4    | 28.6             | 25.6   | 21.1    |
| 50                                            | 22.1          | 9.2    | 18.7    | 24.3             | 15.2   | 26.9    |
| 75                                            | 8.0           | 7.3    | 12.9    | 6.3              | 7.0    | 17.1    |
| 90                                            | 2.5           | 1.7    | 2.7     | 3.2              | 2.2    | 5.1     |
| 100                                           | 8.0           | 5.8    | 9.7     | 4.2              | 2.2    | 6.1     |

particularly for seafood. However, even in these countries, full acceptance of hybrid products with high levels of cultured ingredients is still a long way off.

## Preferences

### Section Summary

- Taste and texture dominate preferences for both CM and CSF across all countries.
- Safety is a secondary concern, more so for France than Denmark and Germany.
- Environmental Impact is slightly more relevant for seafood than meat, especially in Denmark and Germany.
- Nutritional value and Naturalness are generally the least important factors, with Naturalness ranking the lowest in all cases, particularly in Denmark.

The results of the Best-Worst Scaling survey on consumer preferences for CM and CSF across Denmark, France, and Germany highlight clear trends in attribute importance (Table 20).

For cultured meat, taste and texture emerge as the most important factors in all three countries, with the highest mean scores in Denmark (1.1), France (0.6), and Germany (0.8). This suggests that consumers prioritize the sensory experience above all other attributes. Safety is also considered relevant, even if to a lesser degree, with slightly positive mean values across the board (Denmark: 0.2, France: 0.4, Germany: 0.2). In contrast, environmental impact is viewed with more neutrality, with Denmark showing a small positive preference (0.1), while France (-0.3) and Germany (-0.1) lean slightly negative. This indicates that while sustainability is not disregarded, it does not play a decisive role in consumer choices. Nutritional value ranks lower in importance, with negative mean values in all three countries (Denmark: -0.2, France: -0.6, Germany: -0.5), suggesting that consumers do not see it as a major factor in their purchasing decisions. Naturalness emerges as the least important attribute, especially in Denmark (-1.1), but also in France (-0.2) and Germany (-0.4), indicating concerns over perceived artificiality towards the acceptance of the product, as shown in Figure 1.

*Table 20. Mean of preference drivers' distributions for Cm and CF by country*

| Preference drivers   | Cultured Meat |        |         | Cultured Seafood |        |         |
|----------------------|---------------|--------|---------|------------------|--------|---------|
|                      | Denmark       | France | Germany | Denmark          | France | Germany |
| Environmental impact | 0.1           | -0.3   | -0.1    | 0.3              | -0.3   | 0.6     |
| Nutritional value    | -0.2          | -0.6   | -0.5    | 0.1              | -0.9   | -0.7    |
| Taste and texture    | 1.1           | 0.6    | 0.8     | 1.0              | 0.4    | 0.7     |
| Safety               | 0.2           | 0.4    | 0.2     | -0.3             | 0.4    | 0.0     |
| Naturalness          | -1.1          | -0.2   | -0.4    | -1.2             | 0.4    | -0.5    |

*Note: Measurement is Best-Worst Scale (-4 = least important, 4 =most important)*

A similar pattern is observed for cultured seafood, where taste and texture remain the most important attributes across all three countries (Denmark: 1.0, France: 0.4, Germany: 0.7). However, unlike with meat, environmental impact is perceived as slightly more relevant, particularly in Germany (0.6), whereas in France, it remains slightly negative (-0.3). This suggests that sustainability concerns may play a slightly larger role in the acceptance of cultured seafood compared to cultured meat. The importance of safety varies, with French consumers (0.4) valuing it more than those in Denmark (-0.3) and Germany (0.0), where it is viewed as neutral or slightly negative. Nutritional value, much like in the case of cultured meat, is not a major driver of preference, with France (-0.9) and Germany (-0.7) showing low scores, while Denmark (0.1) remains neutral. Naturalness, once again, is the least important attribute, particularly in Denmark (-1.2) and Germany (-0.5), though in France (0.4), it is viewed more positively compared to cultured meat, as also illustrated in Figure 2.

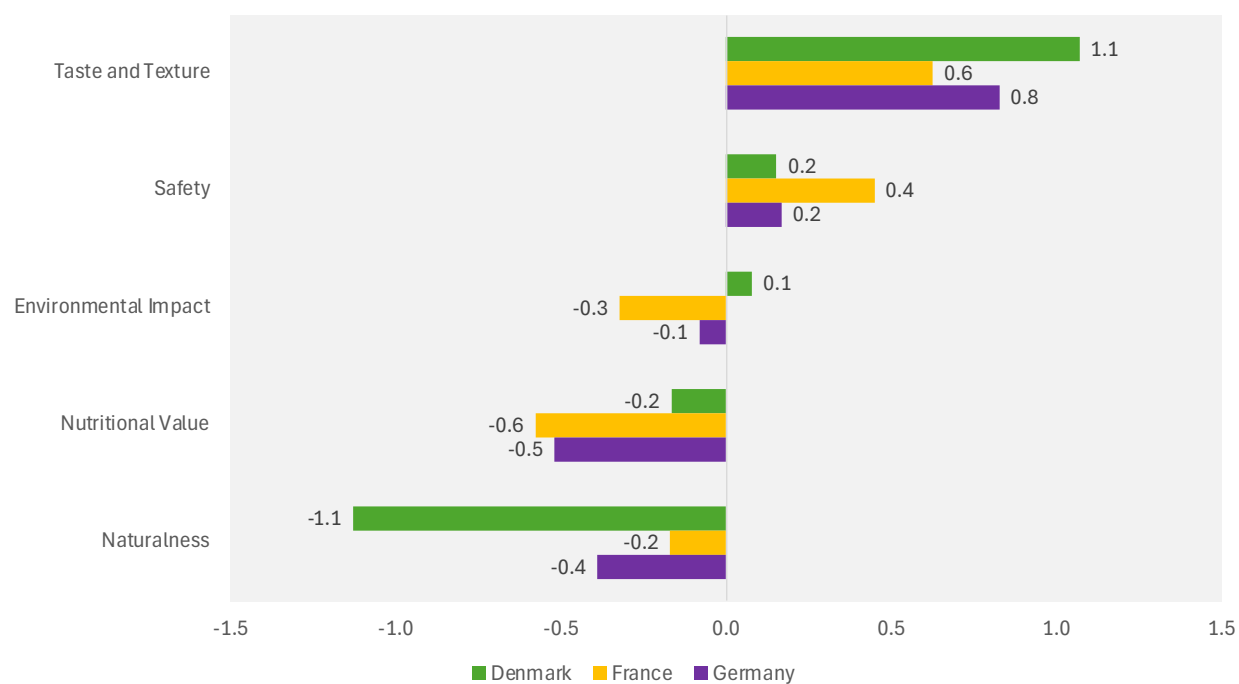


Figure 1 Driver of preference for cultured meat

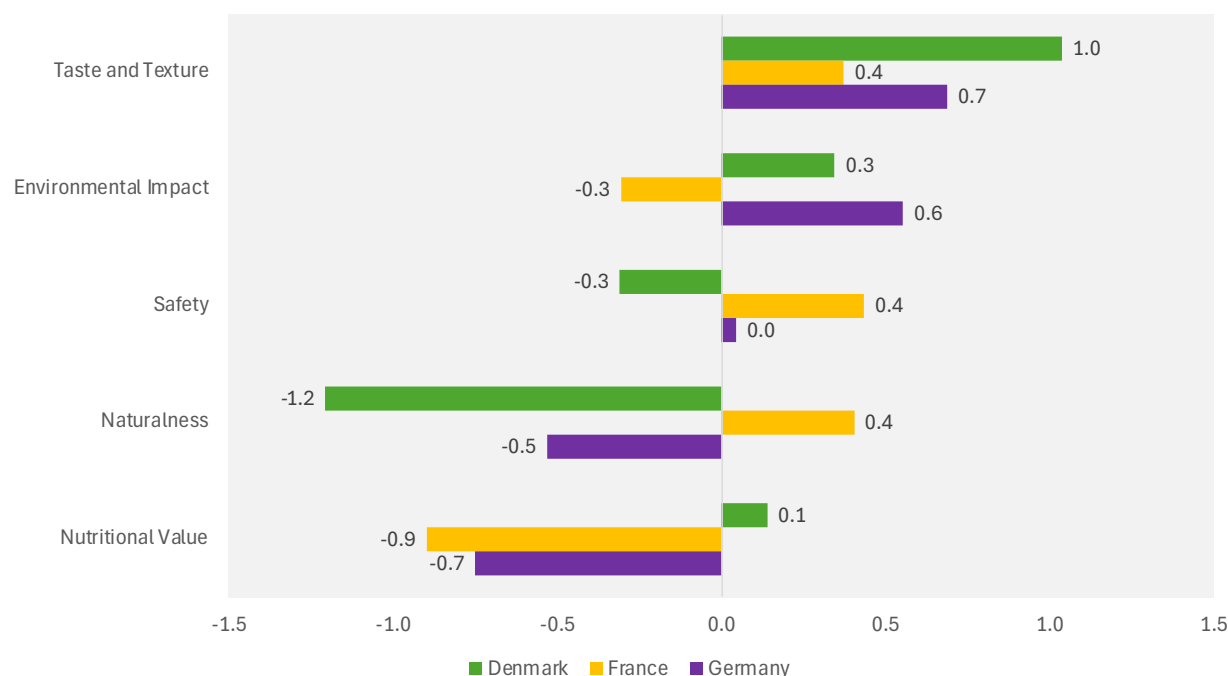


Figure 2 Driver of presences for cultured seafood

Overall, the findings suggest that taste and texture are the primary factors influencing consumer acceptance of both cultured meat and seafood. While safety and environmental concerns are relevant, they remain secondary considerations, with sustainability playing a slightly more important role in seafood than in meat. Nutritional value and naturalness are generally the least important attributes, with naturalness ranking particularly low in Denmark and Germany. These insights indicate that for the successful adoption of cultured meat and seafood, companies should focus on delivering products that closely match the sensory experience of conventional alternatives, as this will be the most critical factor in consumer acceptance.

## Preference-based Segmentation

### Derived Segments

#### Section Summary

- **Naturalness-Oriented (15.3%):** Prefers naturalness but is not concerned about sustainability or safety.
- **Sustainability-Oriented (29.3%):** Prioritizes environmental impact but does not care much about naturalness or taste.
- **Safety-Conscious (20.2%):** Values food safety but is less interested in taste, nutritional value, and sustainability.
- **Taste-Driven (35.2%):** Focuses on taste and texture while deprioritizing all other attributes.

A hierarchical cluster analysis was first conducted to determine the optimal number of clusters, using a dendrogram for visual inspection. The clustering was performed using the centroid method, which merges clusters based on their mean values. The dendrogram indicated that a four-cluster solution was most appropriate. To refine this segmentation, the cluster means from the hierarchical solution were extracted and used as initial cluster centers in a subsequent K-means cluster analysis. This approach optimized the cluster assignments, resulting in a final solution of four distinct clusters.

The segmentation was conducted based on consumer preferences across both product categories, without distinguishing between cultured meat and cultured seafood. The analysis did not reveal significant differences in preferences between the two product types, indicating that the same underlying preference patterns apply to both. As a result, a unified segmentation solution was developed, identifying four distinct consumer segments. These segments, which are presented in Figure 3, capture the main variations in consumer preferences for cultured products.

### **Segment 1: Naturalness-Oriented (15.3%)**

This group places a strong emphasis on naturalness, as indicated by the highest positive score (3.0). They prefer products that are perceived as minimally processed, free from artificial ingredients, and closer to conventional food. However, they don't prioritize environmental impact (-1.2), suggesting that sustainability concerns do not strongly influence their purchasing decisions. Taste and texture (-0.6), nutritional value (-0.7) and safety (-0.5) are seen as relatively neutral factors.

### **Segment 2: Sustainability-Oriented (29.3%)**

Consumers in this cluster highly prioritize environmental impact (3.2), making sustainability the key driver in their decision-making. They are likely to choose cultured meat for its potential to reduce land and water use, as well as lower greenhouse gas emissions. However, they score nutritional value (-1.6) negatively, meaning they are less concerned about whether the product is highly processed or artificial. They also do not prioritize taste and texture (-0.1) and safety (-0.5), indicating that these aspects are secondary to their sustainability concerns.

### **Segment 3: Safety-Conscious (20.1%)**

This segment places safety (3.4) as the most important factor, meaning they prioritize whether the product is safe for consumption, free from risks, and meets high food safety standards. However, they have a strong negative preference for nutritional value (-1.4) and do not place significant importance on naturalness (-0.9) or taste and texture (-0.1). Environmental impact (-1.0) is also not a major consideration, suggesting that this group is primarily focused on food safety and hygiene rather than sustainability or sensory attributes.

#### Segment 4: Taste-Driven (35.2%)

Consumers in this cluster prioritize taste and texture (3.1) above all else, meaning that they want their cultured meat to closely mimic the sensory experience of conventional counterparts. They down-prioritize all other attributes: environmental impact (-1.4), safety (-0.8), naturalness (-0.9), and nutritional value (0.0), indicating that they are less concerned with health, sustainability, or how processed the product appears. Their purchasing decisions are largely driven by whether the product tastes and feels good.

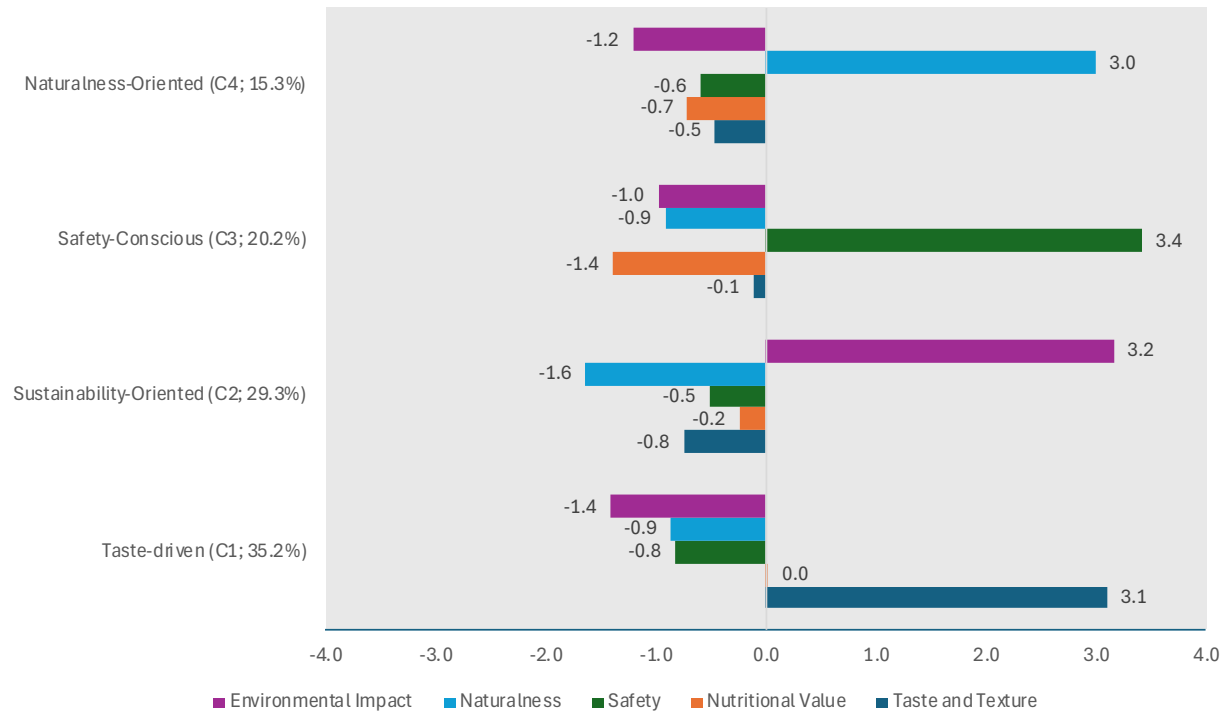


Figure 3 Preference-based segmentation

## Differences Across Segments

The following section describes differences across segment for questions of interest that helps understand better their profile. ***We should note that questions were framed per product (meat/seafood) for each participant that was either filled out the survey for meat or seafood.*** Given that the segment solution is provided for both subsamples those questions have been pooled. For example, when referring to difference in frequency of consumption, the results refer to either seafood or meat. ***This choice was made to ease the presentation of the findings, especially since in these questions there were no plausible differences between products.***

### Difference per country and product

The distribution of consumer segments across countries is illustrated in Figure 4. In Denmark, the Taste-driven segment represents the largest group (40.8%), followed by the Sustainability-oriented segment (31.3%). This suggests that Danish consumers place a strong emphasis on sensory qualities, while environmental considerations also play a notable role. In France, the distribution is more evenly spread across segments, with the Taste-driven segment being the largest (31.2%), but with a relatively higher proportion of Safety-conscious (25.2%) and Naturalness-oriented (19.2%) consumers compared to the other countries. This indicates that French consumers show greater concern for product safety and naturalness when evaluating cultured products. In Germany, Taste-driven (33.5%) and Sustainability-oriented (31.9%) segments are almost equally represented, reflecting a dual focus on taste and environmental responsibility. Across all three countries, the Naturalness-oriented segment is the smallest, though its presence is most pronounced in France.

Figure 5 shows that the distribution of the two products, cultured meat and cultured seafood, across the clusters is very similar, with no significant differences between them. For instance, the Taste-driven segment accounts for 34.9% of cultured meat consumers and 35.4% of cultured seafood consumers, while the Sustainability-Oriented segment represents 29.1% and 29.4%,

*Table 21 Difference in consumer segment differences per country and product*

| Difference per:  | Naturalness-Oriented | Sustainability-Oriented | Safety-Conscious | Taste-Driven |
|------------------|----------------------|-------------------------|------------------|--------------|
| <b>Country</b>   |                      |                         |                  |              |
| Denmark          | 10.7                 | 31.3                    | 17.2             | 40.8         |
| Germany          | 16.2                 | 31.3                    | 18.4             | 33.5         |
| France           | 19.2                 | 24.5                    | 25.2             | 31.2         |
| <b>Product</b>   |                      |                         |                  |              |
| Cultured meat    | 14.4                 | 29.1                    | 21.6             | 34.9         |
| Cultured seafood | 16.4                 | 29.4                    | 18.8             | 35.4         |

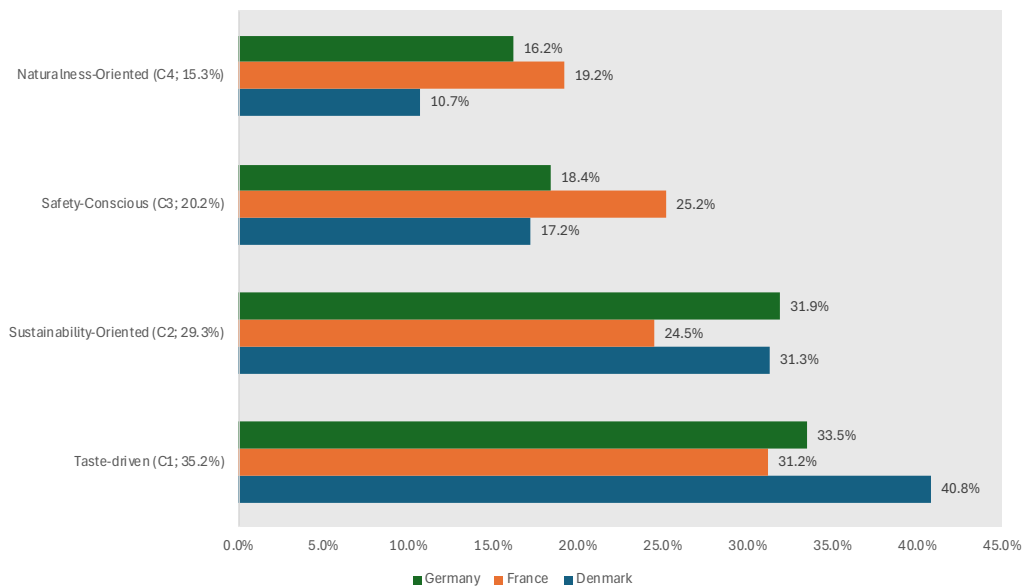


Figure 4 Distribution of consumer clusters across countries

respectively. These percentages are presented in Table 21, further illustrating that both products are evenly spread across segments. This confirms that there is no need to separate the analysis by product, as the segmentation works consistently for both cultured meat and seafood.

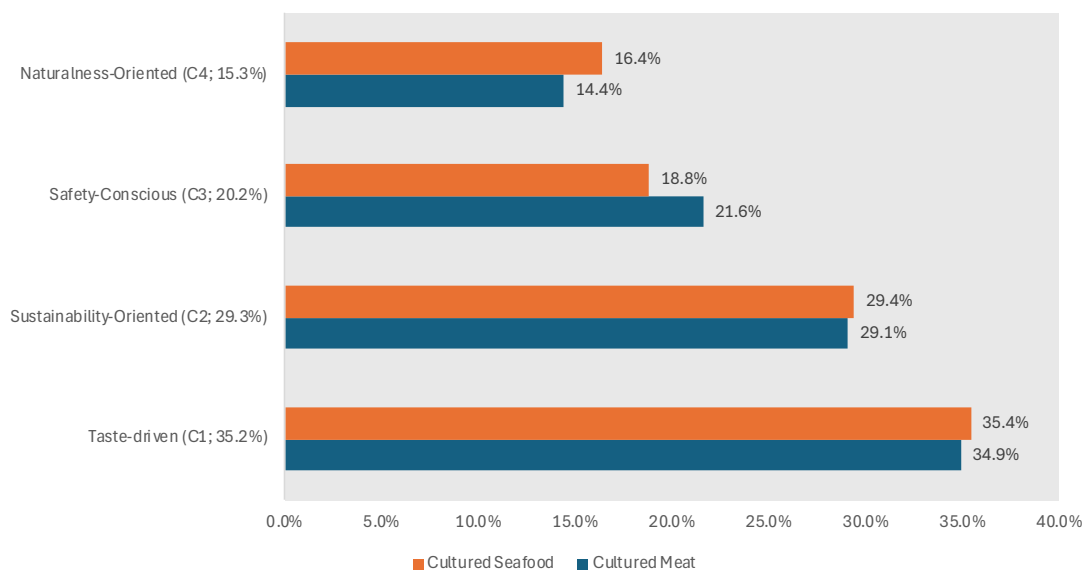


Figure 5 Consumer segment distribution for products

## Demographics

### Section Summary

- The Naturalness-Oriented is predominantly female, well-educated, and focused on natural food products, with a significant portion of its members based in France.
- The Sustainability-Oriented is also predominantly female, highly educated, and prioritizes sustainability in their food choices, with the highest representation in Germany and Denmark.
- The Safety-Conscious exhibits a more balanced gender distribution and includes a variety of educational backgrounds, particularly technical qualifications, with strong representation across Denmark, Germany, and France.
- The Taste-Driven is slightly male dominated, with a wide range of educational levels, and is primarily motivated by taste preferences. This cluster is most prominent in Denmark.

For gender, as presented in Table 22, the Naturalness-Oriented cluster remains predominantly female, with 57.9% of its members being women, compared to 42.1% men. This suggests that those who prioritize naturalness in their food choices tend to be more female-oriented. This gender distribution is statistically significant, with  $p$ -value = 0.045, indicating that gender plays a notable role in segment membership.

Education-wise, this cluster includes a significant proportion of highly educated individuals: 26.7% have completed high school, 25.0% hold a technical qualification, and 21.1% have a graduate degree. This reflects a well-educated consumer base that is likely to make informed decisions based on natural food attributes. The relationship between education level and cluster membership is statistically significant ( $p$ -value = 0.036), underscoring the importance of education in shaping preferences for natural foods.

The Sustainability-Oriented cluster is also slightly female-dominated, with 54.9% females and 44.5% males, showing a strong inclination toward sustainable food choices. This cluster is the most highly educated, with 29.7% of its members having a bachelor's degree and 24.0% having a

Table 22. Demographic distribution by consumer segments

| Demographics (%)             | Naturalness-Oriented | Sustainability-Oriented | Safety-Conscious   | Taste-Driven      |
|------------------------------|----------------------|-------------------------|--------------------|-------------------|
| <b>Gender</b>                |                      |                         |                    |                   |
| Male                         | 42.1                 | 44.5                    | 44.9               | 51.3              |
| Female                       | 57.9                 | 54.9                    | 54.9               | 48.3              |
| <b>Age (mean)</b>            | 51.5 <sup>a</sup>    | 49.7 <sup>a</sup>       | 49.5 <sup>ab</sup> | 52.2 <sup>b</sup> |
| <b>Education</b>             |                      |                         |                    |                   |
| Primary School               | 2.0                  | 2.7                     | 3.8                | 3.1               |
| High School                  | 25.3                 | 20.0                    | 27.0               | 22.2              |
| Technical Qualification      | 25.0                 | 23.6                    | 21.1               | 27.8              |
| Undergraduate degree         | 26.7                 | 29.7                    | 23.8               | 24.6              |
| Graduate degree or posterior | 21.1                 | 24.0                    | 24.3               | 22.3              |

graduate degree, indicating that sustainability-conscious consumers tend to be well-educated and informed about the environmental impact of their food choices.

The Safety-Conscious cluster has a more gender-balanced distribution, with 48.0% male and 52.0% female, indicating that food safety concerns resonate equally with both genders. Regarding education, this group has a more diverse profile: 27.8% have a technical qualification, and 24.3% have a graduate degree. This suggests that safety-conscious consumers may be more practical in their approach to food choices, with some having a more technical or professional background in food safety.

Lastly, the Taste-Driven cluster is slightly more male-dominated, with 51.3% men and 48.3% women, suggesting that taste preferences in meat consumption are more likely to appeal to men. This cluster has a balanced educational profile: 24.6% have an undergraduate degree and 22.3% have a graduate degree.

## Dietary Habits

### Section Summary

- The Naturalness-Oriented is primarily composed of meat eaters (89%), with a moderate consumption frequency and a notable portion (28%) following a flexitarian diet.
- The Sustainability-Oriented shows a more moderate approach to meat, with 38% identifying as flexitarians and a smaller group following a vegan diet (2.1%).
- In the Safety-Conscious, meat consumption remains high (87.9%), but many individuals still adopt a flexitarian approach (31.3%), balancing their diet with plant-based foods.
- The Taste-Driven is the most meat-focused, with 91.2% of meat eaters, consuming meat frequently, but still showing a small portion of flexitarians (19.5%).

Meat consumption plays a central role in all four clusters, but the frequency and dietary choices vary according to the values that drive each group, as shown in Table 23.

The Naturalness-Oriented cluster is predominantly made up of meat and seafood eaters (89.0%), whose frequency of consumption indicates a preference for moderate consumption of meat and seafood. A significant proportion of individuals in this cluster also identify as flexitarians (28.1%), suggesting an openness to occasionally reducing their intake of meat and seafood while maintaining a traditional animal-based diet. In addition, 13.8% of this group consume meat and seafood five or more times per week, indicating a preference for more frequent consumption compared to other clusters.

The Sustainability-Oriented cluster consists of 85.4% meat and seafood eaters. However, this group tends to consume meat and seafood less frequently, with 31.7% eating them 1-2 times per week and 26.7% eating them 3-4 times per week. Sustainability-minded individuals are more likely to reduce their consumption, with 38.0% adopting a flexitarian diet. A smaller portion of the group (2.1%) follow a vegan diet, reflecting their commitment to reducing animal products

for environmental reasons. The dietary habits of this group suggest a balance between sustainability and moderate meat and seafood consumption.

The Safety-Conscious group is composed mainly of meat and seafood eaters (87.9%). Their consumption frequency is also moderate, with 32.4% eating meat and seafood 3-4 times per week and 15.1% eating them 5 or more times per week. A significant proportion of this group (30.5%) follow a flexitarian diet, suggesting that food safety concerns coexist with an openness to incorporating plant-based foods into their diets. The combination of safety concerns and flexibility in their consumption of meat and seafood reflects a more cautious approach to food choices.

Finally, the Taste-Driven cluster stands out as the largest group of meat and seafood eaters, with 91.2% identifying as such. Most in this group consume meat and seafood frequently, with 35.9% eating them 3-4 times per week and 19.2% eating them 5 or more times per week. These individuals are primarily motivated by the taste of meat and seafood, which is reflected in their high consumption rates. Despite this, 19.5% of the cluster follow a flexitarian diet, indicating that taste remains the primary motivator, but there is still openness to incorporating plant-based options. A chi-square test reveals a significant difference in dietary habits among the clusters ( $p$ -value < 0.001), indicating that preferences and consumption patterns vary significantly across the different groups.

*Table 23. Dietary habits distribution by consumer segments*

| Dietary habits (%)                 | Naturalness-Oriented | Sustainability-Oriented | Safety-Conscious | Taste-Driven |
|------------------------------------|----------------------|-------------------------|------------------|--------------|
| <b>Meat / seafood eaters</b>       | 89.0                 | 85.4                    | 87.9             | 91.2         |
| <b>Frequency of consumption</b>    |                      |                         |                  |              |
| <i>Never</i>                       | 14.0                 | 15.0                    | 14.3             | 10.3         |
| <i>Less than once a week</i>       | 28.1                 | 28.0                    | 25.5             | 25.1         |
| <i>1-2 times per week</i>          | 26.7                 | 31.7                    | 25.1             | 35.9         |
| <i>3-4 times per week</i>          | 17.4                 | 16.2                    | 20.0             | 19.5         |
| <i>Five times or more per week</i> | 13.8                 | 9.1                     | 15.1             | 19.2         |
| <b>Type of diet</b>                |                      |                         |                  |              |
| <i>Meat eaters</i>                 | 62.4                 | 47.4                    | 62.8             | 76.2         |
| <i>Flexitarian</i>                 | 32.0                 | 38.0                    | 31.3             | 19.5         |
| <i>Pollotarian</i>                 | 2.8                  | 3.7                     | 1.7              | 1.7          |
| <i>Pescatarian</i>                 | 0.6                  | 3.4                     | 1.9              | 0.7          |
| <i>Lacto-ovo vegetarian</i>        | 1.1                  | 4.6                     | 1.7              | 1.7          |
| <i>Lacto- vegetarian</i>           | 0.6                  | 0.7                     | 0.0              | 0.0          |
| <i>Ovo-vegetarian</i>              | 0.3                  | 0.1                     | 0.2              | 0.0          |
| <i>Vegan</i>                       | 0.3                  | 2.1                     | 0.4              | 0.1          |

## Awareness

Table 24. Percentage of awareness on by cluster segmentation

| Awareness on CM (%)               | Naturalness-Oriented | Sustainability-Oriented | Safety-Conscious | Taste Driven |
|-----------------------------------|----------------------|-------------------------|------------------|--------------|
| Knowledge about cultured products | 31.5                 | 37.1                    | 35.1             | 30.4         |

When it comes to awareness of cultured meat, the four consumer segments show some differences in their level of knowledge (Table 24). While no cluster demonstrates particularly high awareness, the Sustainability-Oriented and Safety-Conscious groups show slightly higher familiarity compared to the Naturalness-Oriented and Taste-Driven segments.

In the Naturalness-Oriented cluster, only 31.5% of respondents indicate that they have some knowledge of cultured meat, meaning that nearly 70% are unfamiliar with the concept. Similarly, the Taste-Driven segment shows the lowest awareness level, with just 30.4% having knowledge of cultured meat. On the other hand, the Sustainability-Oriented and Safety-Conscious segments display slightly higher awareness. Among the Sustainability-Oriented, 37.1% report knowledge of cultured meat, while 35.1% of the Safety-Conscious segment is familiar with it. This indicates that consumers in these two clusters are marginally more exposed to or interested in cultured meat, which may be linked to their stronger interest in sustainability issues or food safety concerns. A Pearson Chi-Square test reveals a significant difference in awareness of cultured meat among the clusters ( $p$ -value = 0.033), suggesting that consumer awareness varies significantly across the groups. Overall, the data highlights that awareness of cultured meat remains relatively low across all consumer segments, with no single group showing widespread familiarity.

## Perceptions

Perceptions of cultured products vary significantly across the four consumer segments, with each group holding distinct views that reflect their values and priorities regarding health, safety, nutrition, sustainability, taste, and naturalness. These differences are shown in Table 25, which highlights statistically significant variations in perceptions across the segments.

Table 25. Distribution of mean values of perception by CM clusters

| Perceptions (mean) | Naturalness-Oriented | Sustainability-Oriented | Safety-Conscious  | Taste-Driven      | F     | p-value |
|--------------------|----------------------|-------------------------|-------------------|-------------------|-------|---------|
| Sustainability     | 4.0 <sup>a</sup>     | 5.0 <sup>b</sup>        | 4.6 <sup>c</sup>  | 4.8 <sup>d</sup>  | 32.6  | <.001   |
| Nutrition          | 3.8 <sup>a</sup>     | 4.6 <sup>b</sup>        | 4.4 <sup>bc</sup> | 4.1 <sup>c</sup>  | 24.4  | <.001   |
| Healthiness        | 3.5 <sup>a</sup>     | 4.4 <sup>b</sup>        | 3.8 <sup>c</sup>  | 4.2 <sup>d</sup>  | 32.24 | <.001   |
| Safety             | 3.3 <sup>a</sup>     | 4.4 <sup>b</sup>        | 3.7 <sup>c</sup>  | 4.3 <sup>c</sup>  | 42.9  | <.001   |
| Taste              | 3.5 <sup>a</sup>     | 4.3 <sup>b</sup>        | 3.9 <sup>c</sup>  | 3.9 <sup>c</sup>  | 21.3  | <.001   |
| Affordability      | 3.3 <sup>a</sup>     | 3.5 <sup>b</sup>        | 3.2 <sup>a</sup>  | 3.4 <sup>ab</sup> | 2.7   | 0.042   |
| Naturalness        | 2.0 <sup>a</sup>     | 2.8 <sup>b</sup>        | 2.7 <sup>c</sup>  | 2.5 <sup>d</sup>  | 19.4  | <.001   |

Note: Measurement is 7-point bipolar

In general, the Naturalness-Oriented tends to view cultured products most negatively across several attributes. This group rates cultured products as the least sustainable (mean = 4.0) and the least nutritious (mean = 3.8) compared to other segments. They also perceive it as the least healthy (mean = 3.5) and the least safe (mean = 3.3), indicating strong concerns about the technology itself and its potential impact on human health and safety. This group also expresses the greatest skepticism about taste (mean = 3.5) and rates cultured products as the most unnatural (mean = 2.0). These perceptions align with their preference for natural and minimally processed foods.

In contrast, the Sustainability-Oriented, by contrast, holds the most favorable view of cultured products. They rate it highest in terms of sustainability (mean = 5.05) and nutrition (mean = 4.60), reflecting their belief that cultured products offer an innovative and environmentally responsible alternative to conventional meat. They also see it as the healthiest (mean = 4.4) and safest (mean = 4.4) option. While they rate the naturalness of cultured products relatively low (mean = 2.8), this attribute is likely less important for them compared to its perceived environmental and nutritional benefits. This group also has the most positive expectations regarding taste (mean = 4.3) and views cultured products as moderately affordable (mean = 3.5)

The Safety-Conscious holds moderately positive perceptions of cultured products. They rate it as relatively safe (mean = 3.7) and nutritious (mean = 4.4), though they are not as enthusiastic as the Sustainability-Oriented segment. Their perception of sustainability (mean = 4.6) is also positive but lower than that of the Sustainability-Oriented group. Regarding taste (mean = 3.9), they are somewhat neutral, indicating limited confidence in the sensory appeal of cultured products. This group also rates the naturalness of cultured products slightly higher than the Naturalness-Oriented group (mean = 2.7), suggesting a somewhat greater openness to technological innovation in food production.

Finally, the Taste-Driven, unsurprisingly, prioritizes taste in its assessment of cultured products. Their taste score (mean = 3.9) is higher than that of the Naturalness-Oriented group but lower than the Sustainability-Oriented segment. They perceive cultured products as relatively healthy (mean = 4.2) and safe (mean = 4.3), but not to the same extent as the Sustainability-Oriented group. Their perception of sustainability (mean = 4.8) is positive but secondary to their focus on sensory attributes. Regarding naturalness, they are somewhat skeptical (mean = 2.5), but less so than the Naturalness-Oriented group.

Overall, the Sustainability-Oriented stands out as the most supportive of cultured products, seeing it as a sustainable, healthy, nutritious, safe, and reasonably tasty option. On the opposite end, the Naturalness-Oriented remains highly skeptical, perceiving cultured products as unnatural, unhealthy, unsafe, and unsustainable. The Safety-Conscious and the Taste-Driven occupy middle ground, with the Safety-Conscious segment emphasizing safety and nutrition, and the Taste-Driven group placing greater importance on sensory appeal. These findings highlight

how consumer perceptions of cultured products are closely tied to the core values of each segment, illustrating the importance of tailoring communication strategies to align with the unique concerns and priorities of each group.

## Religiosity & Ethics

Religiosity levels vary across the four consumer segments (Table 26), with the naturalness-oriented and safety-conscious groups showing higher levels of religious identification compared to the sustainability-oriented and taste-driven segments. Among the naturalness-oriented, nearly half (48.6%) identify as religious, followed by 24.7% who consider themselves slightly religious. Similarly, 48.3% of the safety-conscious segment identifies as religious, with an additional 29.4% describing themselves as slightly religious. In contrast, the sustainability-oriented and taste-driven segments show lower levels of religiosity, with 43.3% and 41.4% identifying as religious, respectively.

Religious respondents across all segments were also asked whether they perceive cultured products as morally and ethically preferable to conventional products. Responses reveal considerable differences between segments. Among the naturalness-oriented, 52.0% of religious consumers view cultured products as more ethical than conventional ones. By contrast, only 22.2% of religious respondents within the sustainability-oriented segment share this view, with a large proportion (42.3%) expressing uncertainty ("maybe"). The safety-conscious and taste-driven religious consumers show moderate support, with 33.2% in both segments considering cultured products to be ethically preferable, while almost half (45.5% and 45.2%, respectively) remain undecided.

This indicates that ethical acceptance of cultured products among religious individuals is not solely driven by their religiosity. Instead, it reflects a combination of religious beliefs, and the broader value system tied to each consumer segment, such as concerns for naturalness, safety, or taste preferences.

*Table 26 Religious identification by cluster segmentation*

| Religious Identification (%)                                                                 | Naturalness-Oriented | Sustainability-Oriented | Safety-Conscious | Taste-Driven |
|----------------------------------------------------------------------------------------------|----------------------|-------------------------|------------------|--------------|
| <b>Religious</b>                                                                             | 48.6                 | 43.3                    | 48.3             | 41.4         |
| Slightly religious                                                                           | 24.7                 | 23.9                    | 29.4             | 23.0         |
| Moderately religious                                                                         | 19.9                 | 16.2                    | 13.2             | 15.1         |
| Very religious                                                                               | 3.9                  | 3.2                     | 5.7              | 3.3          |
| <b>Do you find cultured product morally and ethical preferable to conventional products?</b> |                      |                         |                  |              |
| Yes                                                                                          | 52.0                 | 22.2                    | 33.2             | 33.2         |
| Maybe                                                                                        | 36.8                 | 42.3                    | 45.5             | 45.2         |
| No                                                                                           | 19.9                 | 16.2                    | 13.2             | 15.1         |

Table 28 Willingness to buy cultured products by cluster (percentages)

| Willingness to buy (%) | Naturalness-Oriented | Sustainability-Oriented | Safety-Conscious | Taste-Driven |
|------------------------|----------------------|-------------------------|------------------|--------------|
| Yes                    | 11.2                 | 35.5                    | 22.1             | 25.6         |
| Maybe                  | 32.9                 | 42.6                    | 42.6             | 45.7         |
| No                     | 55.9                 | 21.9                    | 35.3             | 28.7         |

## Willingness to try, buy, and pay more

Table 27 shows the willingness to try cultured meat across different consumer clusters, with overall moderate levels of acceptance. As expected, the Sustainability-Oriented group shows the highest interest, with 46.0% willing to try and 31.8% unlikely. This reflects their positive views on sustainability and innovation. The Naturalness-Oriented group, on the other hand, is the least willing, with 64.9% unlikely to try and only 16.6% expressing interest, likely due to concerns about the unnatural production methods. The Safety-Conscious and Taste-Driven groups fall in between, with the former showing moderate interest (27.2% willing, 47.6% unlikely) due to health and safety concerns, while the latter shows 31.9% willingness, likely driven by taste preferences, though both groups still show a relatively high level of reluctance. A chi-square test indicates that the differences in willingness to try cultured meat among the clusters are statistically significant ( $p < 0.001$ ).

Table 27 Willingness to try cultured products by cluster (percentages)

| Willingness to try (mean) | Naturalness-Oriented | Sustainability-Oriented | Safety-Conscious | Taste-Driven |
|---------------------------|----------------------|-------------------------|------------------|--------------|
| Yes                       | 16.6                 | 46.0                    | 27.2             | 31.9         |
| Maybe                     | 18.5                 | 22.2                    | 20.2             | 27.1         |
| No                        | 64.9                 | 31.8                    | 47.6             | 41.0         |

Note: Measurement is 5-point bipolar scale (1 = Extremely Unlikely, 5 = Extremely Likely) collapsed into: No (1-2), Maybe (3), Yes (4-5)

## Willingness to buy

Consumer willingness to buy varies significantly across different preference groups, as shown in Table 28. Similar to their willingness to try, the Sustainability-Oriented group demonstrates the highest willingness to buy cultured products, with 35.5% responding positively, reflecting their strong support for sustainability. In contrast, the Naturalness-Oriented group is the most resistant, with 55.9% unwilling to purchase. The Safety-Conscious and Taste-Driven groups show more neutral attitudes, with a large portion undecided, 42.6% and 45.7%, respectively indicating moderate interest but also some hesitation. A chi-square test confirms that the differences in willingness to buy among the clusters are statistically significant ( $p < 0.001$ ).

## Willingness to pay

Consumer willingness to pay a premium follows a similar trend to willingness to buy but with a significant overall decline Table 30. The Sustainability-Oriented is the most willing to pay more, with 9.8% saying "Yes," while the other clusters show minimal willingness, just 3.1% for Naturalness-Oriented and 2.7% for Taste-Driven. A majority across all segments, especially Naturalness-Oriented (84.9%) and Safety-Conscious (80.5%), are unwilling to pay extra. This trend mirrors the willingness to buy results, suggesting that price sensitivity remains a key challenge despite varying levels of interest in cultured. This trend mirrors the country-level analysis, where willingness to pay a premium price also drops significantly, suggesting price sensitivity remains a major barrier despite interest in the product. As for willingness to try and buy, a chi-square test indicates that the differences in willingness to pay among the clusters are statistically significant ( $p < 0.001$ ).

*Table 30 Willingness to pay more for cultured products by clusters (percentages)*

| Willingness to pay more (%) | Naturalness-Oriented | Sustainability-Oriented | Safety-Conscious | Taste-Driven |
|-----------------------------|----------------------|-------------------------|------------------|--------------|
| Yes                         | 4.2                  | 9.6                     | 3.6              | 3.3          |
| Maybe                       | 13.5                 | 34.9                    | 18.9             | 20.8         |
| No                          | 82.3                 | 55.5                    | 77.4             | 75.9         |

## Food Technology Neophobia

The level of food neophobia varies significantly across the identified consumer segments, as shown in Table 29, and depicted in Figure 6. The Naturalness-Oriented has the highest mean score on the Food Neophobia Scale (mean = 5.0), indicating a relatively strong reluctance to try novel foods such as cultured products. In contrast, the Sustainability-Oriented reports the lowest level of food neophobia (mean = 4.1), suggesting that consumers in this group are more open to innovation in food production. The Safety-Conscious (mean = 4.5) and Taste-Driven (mean = 4.4) fall in between, showing moderate levels of neophobia. The differences between segments are statistically significant ( $F = 69.41$ ,  $p < .001$ ), indicating that food technology neophobia plays a significant role in characterizing each segment.

*Table 29 Mean Food Technology Neophobia scores across consumer segments*

| Food Technology Neophobia Scale (mean) | Naturalness-Oriented | Sustainability-Oriented | Safety-Conscious | Taste-Driven     | F     | p-value |
|----------------------------------------|----------------------|-------------------------|------------------|------------------|-------|---------|
| Degree of Food Technology Neophobia    | 5.0 <sup>a</sup>     | 4.1 <sup>b</sup>        | 4.5 <sup>c</sup> | 4.4 <sup>d</sup> | 69.41 | <.001   |

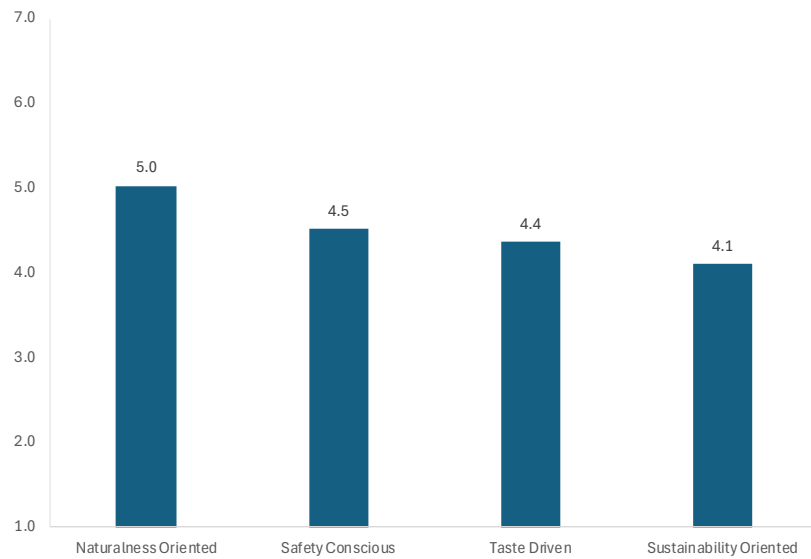


Figure 6 Differences across segments in scores of food technology neophobia

## Meat Attachment Scale

Table 31 presents results across segments for each dimension of the Meat Attachment Scale and Figure 7 depicts these differences. The Taste-Driven scores high across all dimensions. In contrast, the Sustainability-Oriented scored the lowest across Affinity, Entitlement, and Dependence dimensions. The Naturalness-Oriented are those scoring the lowest in the Hedonism dimension. The differences between segments are all statistically significant ( $p < .001$ ), indicating that meat attachment scale plays a significant role in characterizing each segment.

Table 31 Mean Meat Attachment Scale scores across consumer segments

| MAS Dimensions | Naturalness-Oriented | Sustainability-Oriented | Safety-Conscious | Taste-Driven     | F     | p-value |
|----------------|----------------------|-------------------------|------------------|------------------|-------|---------|
| Entitlement    | 4.8 <sup>a</sup>     | 3.8 <sup>b</sup>        | 4.5 <sup>c</sup> | 4.8 <sup>a</sup> | 58.86 | <.001   |
| Hedonism       | 4.3 <sup>a,b</sup>   | 4.9 <sup>c</sup>        | 4.7 <sup>b</sup> | 5.1 <sup>a</sup> | 31.49 | <.001   |
| Affinity       | 5.4 <sup>a</sup>     | 4.8 <sup>b</sup>        | 5.3 <sup>a</sup> | 5.7 <sup>c</sup> | 56.00 | <.001   |
| Dependence     | 4.1 <sup>a</sup>     | 3.4 <sup>b</sup>        | 3.6 <sup>c</sup> | 4.3 <sup>a</sup> | 39.23 | <.001   |

## Discussion

The results provide valuable insights that inform the broader discussion on consumer acceptance of cultured meat and seafood. Below, we discuss the key findings and implications for market adoption and product development for CM and CSF.

### Awareness and knowledge

The survey results indicate that overall consumer awareness of cultured products remains relatively low, suggesting that these innovations are not widely known and accepted. However, there is a slight lead in awareness for cultured meat compared to cultured seafood, suggesting a growing but still nascent awareness in certain markets. Looking at differences between countries, France and Germany show significantly higher awareness of both CM and CSF than Denmark, likely due to more proactive media coverage and public discourse on sustainable seafood. In contrast, Denmark shows a lower degree of awareness of both CM and CSF, possibly due to a stronger attachment to traditional food systems, especially for meat production, and a slower acceptance of sustainable food innovations. Regarding the differences between CM and CSF, CSF shows higher overall awareness, while CM remains less familiar to consumers, reinforcing the need for targeted awareness campaigns. These findings highlight the importance of tailored communication strategies to increase consumer knowledge and acceptance, especially in countries with lower awareness levels such as Denmark.

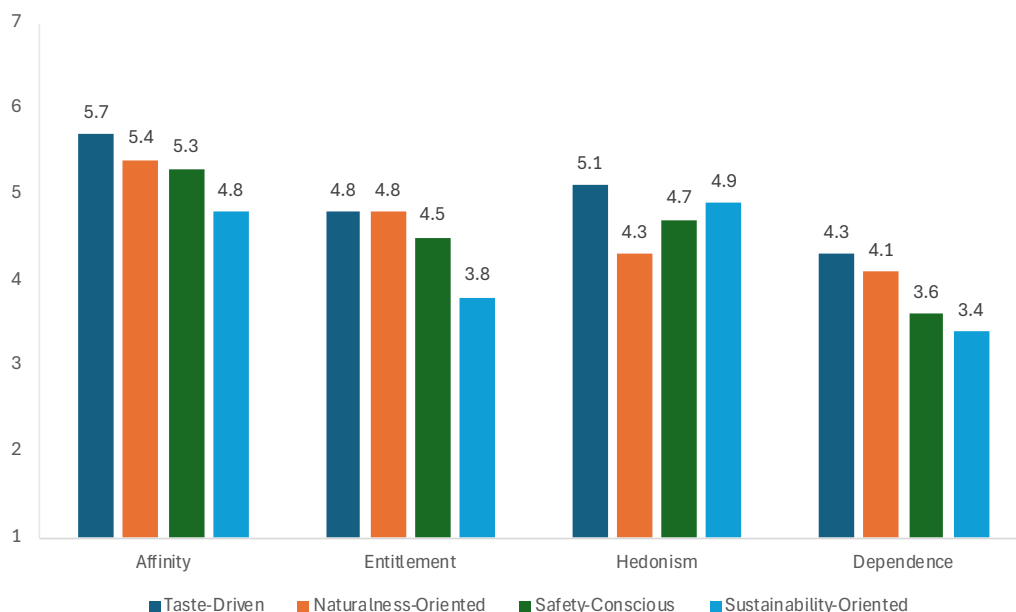


Figure 7 Differences across segments for each dimension of Meat Attachment Scale

## Perceptions

Consumers have acknowledged the potential benefits of cultured products, however, skepticism remains a significant barrier to acceptance. While consumers generally perceive these products as sustainable, they still hold ambivalent opinions regarding their nutritional value, healthiness, and safety. Moreover, concerns about taste, affordability, and naturalness continue to shape consumer attitudes, limiting mainstream appeal. Most notably, cost emerged as a key concern across all countries, with consumers perceiving both cultured meat and cultured seafood as expensive. This highlights a critical obstacle to widespread adoption, as price sensitivity poses a significant challenge for the future of cultured foods. In addition to affordability, skepticism about the naturalness of lab-grown food remains strong, a perception likely driven by unfamiliarity with these products and the association of lab-based technologies with artificial or processed food. Across countries, Denmark and Germany exhibit more positive perceptions, likely influenced by stronger public discourse on sustainability and food technology. France, on the other hand, exhibits a neutral stance on sustainability, suggesting a less engaged but not necessarily negative outlook on cultured products. A comparison of perceptions of CM and CSF reveals that they are viewed quite similarly, with CSF receiving a slightly more positive perception, likely due to a higher degree of familiarity compared to CM. This trend may be influenced by cultural and dietary factors, as meat holds a more prominent role in traditional diets and is consumed more frequently across the surveyed countries. Additionally, the relatively higher skepticism toward CM may stem from general knowledge and assumptions, which often emphasize the artificiality of the product, reinforcing consumer concerns about its naturalness.

In terms of perceived similarity to conventional products, cultured products are still seen as quite different, reinforcing the perception of them as "unnatural" or not direct substitutes. Perceptions vary between countries: German consumers tend to view cultured products as more similar to conventional options, while French consumers perceive a greater difference. Danish consumers fall in between, leaning more toward the French view. When comparing CM and CSF, both are viewed similarly, though cultured seafood is seen as slightly more similar to its conventional counterpart. This minimal distinction suggests that both product types face similar challenges in overcoming consumer skepticism about their naturalness and in being perceived as familiar and comparable alternatives. The findings highlight that while most consumers perceive cultured products still quite different from their counterparts but as somewhat sustainable, there is still a need for greater communication and dissemination of information about the technology. Concerns about naturalness require more targeted educational efforts to enhance consumer understanding and acceptance. Additionally, the issue of price needs to be addressed, not only through scaling up production but also by exploring hybrid products as a potential solution to improve affordability and accessibility.

## Ethical Considerations & Religiosity

Ethical considerations and religiosity surrounding cultured meat and seafood are closely aligned with consumer perceptions in different countries. Ethically, cultured products are generally viewed positively for their potential to improve animal welfare, food security, and environmental sustainability, reflecting the broader perceptions of sustainability discussed earlier. In addition, there is a common belief among consumers that these products should be available at a lower price, reflecting affordability concerns related to the technology. Across countries, cultured products are viewed ethically positively in both Germany and Denmark, while France shows a higher level of skepticism, particularly regarding their impact on nature and farmers. French consumers, known for their strong attachment to traditional food culture and a well-established agricultural sector, express concern that this technology could negatively affect farmers' incomes and livelihoods. When comparing cultured meat and seafood, perceptions do not differ significantly, as both products are viewed similarly from an ethical perspective.

Religiosity plays a role in shaping attitudes towards cultured products, although most respondents identify as non-religious. Among religious individuals, ethical preferences for CM and CSF vary across countries. In Germany, a higher percentage of religious respondents consider cultured meat to be ethically preferable, possibly reflecting a greater openness to innovative and sustainable alternatives. In contrast, religious respondents in France and Denmark tend to be more uncertain or skeptical about the ethical implications of CM and CSF. This hesitation is in line with broader cultural trends in these countries, where there is a stronger attachment to traditional food practices and a more cautious approach to new technologies.

Overall, the ethical debate surrounding cultured meat and seafood reflects broader consumer perceptions, particularly regarding the naturalness of these products and their affordability. While the environmental and animal welfare benefits of CM and CSF are widely recognized, concerns about their perceived unnaturalness and potential impact on farming remain significant barriers to wider acceptance. These ethical debates are further shaped by religious and cultural values, which influence how different countries perceive the ethical implications of these innovative food alternatives.

## Willingness to Consume, Purchase, Pay More, and Substitute

The willingness to consume cultured products appears to be relatively neutral among consumers in all countries. While there is a moderate willingness to try these products, there is a significant drop in disposition to purchase them regularly and, even more so, to pay a premium. This trend highlights a key barrier to market adoption as price sensitivity remains a major concern in all countries, reinforcing the need for competitive pricing strategies to drive consumer adoption.

Looking at country-specific differences, German consumers show the highest openness to CM and CSF, suggesting that Germany could serve as an early adopter market for cultured products.

This higher acceptance may reflect greater environmental awareness and higher acceptance of sustainable innovations. In contrast, Denmark and France show greater reluctance, likely due to their deep-rooted meat and agricultural industries and traditional food cultures. French consumers in particular are the most skeptical, with a lower willingness to try, buy, or replace conventional products with cultured alternatives. This resistance is consistent with the French preference for natural and locally produced foods, suggesting that targeted educational campaigns may be necessary to change perceptions.

When comparing acceptance across product categories, CSF is consistently perceived as slightly more acceptable than CM. Consumers show a slightly higher willingness to try and buy cultured seafood, most notably among German consumers, who also show a greater willingness to pay a premium for CSF compared to CM. This suggests that price sensitivity is somewhat lower for cultured seafood, possibly because seafood is often perceived as more sustainable and healthier than meat.

Regarding substituting conventional products, overall willingness remains limited, mirroring the trends seen in trying and buying cultured products. Germany again shows the highest level of acceptance, with a small percentage of consumers willing to fully replace meat and seafood with their cultured counterparts. France is the most resistant, with a significant proportion of consumers unwilling to replace any part of their conventional meat and seafood consumption. Moderate levels of substitution (10-40%) are the most common across all countries, suggesting that while consumers may be open to incorporating cultured products into their diets, full substitution is unlikely in the near term.

Overall, while there is some consumer interest in cultured meat and seafood, significant barriers remain, particularly around pricing and cultural resistance. Germany stands out as the most promising market for early adoption, while France presents the greatest challenges due to its traditional food culture and agricultural ties. Cultured seafood appears to have a slight advantage over cultured meat, particularly in Germany, where consumers are more willing to pay a premium.

### Support for hybrid products

Consumer attitudes towards hybrid products vary from country to country but are still very similar to those for cultured products. Support for these products is highest in Denmark and Germany, particularly for hybrid seafood, while France has the lowest acceptance in both categories. However, despite relatively higher support in Denmark and Germany, actual willingness to eat and buy hybrid products remains low to neutral in all three countries, with France consistently showing the least enthusiasm. As with cultured products, the willingness to buy hybrid products reinforces this trend. While Germany and Denmark show some openness, particularly towards hybrid seafood, French consumers show strong reluctance. However, when

it comes to paying a premium for hybrid products, resistance is widespread in all three countries, regardless of initial interest. This suggests that while there may be curiosity or openness to hybrid options, price sensitivity remains a significant barrier to wider consumer adoption.

When it comes to replacing conventional meat and seafood with hybrid alternatives, most consumers in all three countries prefer minimal substitution. Once again, France is the most resistant, with more than half unwilling to replace any of their meat consumption with hybrid products. In contrast, Denmark and Germany are slightly more open to partial substitution, but large-scale substitution remains unlikely. The data suggests that hybrid products are perceived primarily as a complement to conventional meat and seafood, rather than a replacement. Similarly, when considering the ideal proportion of cultured ingredients in hybrid products, consumers in all three countries tend to prefer lower percentages, with 25% and 50% being the most acceptable. This preference highlights an important consideration for product development, as gradual consumer exposure to hybrid options can help build familiarity and acceptance over time. Overall, consumer attitudes do not differ significantly between hybrid meat and seafood products, but as seen with cultured products, hybrid seafood tends to receive slightly higher acceptance than hybrid meat.

## Preferences

The results of the Best-Worst Scaling survey provide valuable insights into the key attributes that drive consumer preferences for cultured products across countries. By asking respondents to rank the importance of different attributes, the study reveals what factors would most strongly influence their decision to choose cultured products over conventional alternatives. The findings indicate that taste and texture are the primary determinants of consumer acceptance, while safety, environmental impact, and nutritional value play secondary roles. Naturalness, often being a concern in discussions around food technology, emerges as the least driving factor in shaping consumer preferences. The importance of taste and texture as primary drivers highlights that if these attributes do not meet expectations, other benefits like sustainability or nutrition are unlikely to compensate. Environmental concerns resonate more in Germany, particularly for CSF, whereas French consumers show a negative perception of sustainability claims, indicating they do not see it as a compelling reason to choose cultured products. Safety perceptions also vary: French consumers prioritize it more than Danes and Germans, underlining a higher level of skepticism for the technology, as seen previously and meaning companies must emphasize regulatory assurances in France. While environmental impact is not a decisive factor, it is slightly more relevant for CSF, particularly in Germany. Nutritional value remains unimportant, reinforcing that consumers do not view cultured products as notably healthier. Naturalness is the least important driver factor overall, especially in Denmark and Germany.

The drivers for purchase do not differ significantly across products, as taste and texture dominate for both categories. However, environmental concerns weigh more heavily for CSF, particularly

in Germany, suggesting that sustainability messaging may be more effective for promoting seafood alternatives than meat. Safety is a more significant factor for CM than CSF in Denmark, implying greater trust in seafood-related innovations. While naturalness is generally unimportant, it is slightly more accepted for CSF in France, indicating potential openness to hybrid or minimally processed products. This suggests that cultured seafood alternatives, particularly those that are hybrid or minimally processed, may be perceived as more acceptable than entirely cultured meat options.

## Cluster Segmentation

The distribution of consumer segments varies across countries, reflecting differences in cultural and culinary traditions. Danish consumers place the strongest emphasis on taste, while environmental sustainability also plays a prominent role. In contrast, French consumers display a more balanced distribution across all four segments, with relatively higher concern for naturalness and safety. In Germany, taste and sustainability emerge as equally important, highlighting a dual focus on sensory appeal and environmental responsibility.

Interestingly, no significant differences were observed in segment distribution between cultured meat and cultured seafood, indicating that consumer segmentation is driven more by overarching values and motivations than by product type. This consistency simplifies targeted marketing and communication strategies, allowing companies to address each segment's core values without needing to significantly differentiate between product categories.

The analysis of these consumer clusters reveals distinct motivations and preferences that shape their eating habits and attitudes toward food innovation. Each cluster — Naturalness-Oriented, Sustainability-Oriented, Safety-Conscious, and Taste-Driven — differs in terms of demographics, dietary behaviors, awareness levels, perceptions, willingness to purchase and try cultured products, and food technology neophobia.

The Naturalness-Oriented segment is the smallest cluster in all three countries, with the largest presence in France. This cluster is predominantly female (57.9%) and relatively older, with an average age of 51.5 years. Education levels are generally high, with a significant proportion holding a bachelor's or postgraduate degree. These consumers show a strong preference for natural foods and a cautious approach to new technologies such as cultured meat and seafood. This is reflected in their low awareness of cultured products, with only 31.5% reporting familiarity.

Dietary habits within this group reveal a balanced approach, with many identifying as flexitarians (28.1%), indicating an openness to occasionally reducing meat consumption. However, frequent consumption of meat and seafood is still present, with 13.8% consuming these products five or more times per week. This suggests that while naturalness is important, traditional eating patterns remain firmly in place. Overall, the Naturalness-Oriented cluster reflects a group that

values transparency, simplicity and minimal processing in their food choices, which may be a significant barrier to the acceptance of cultured products.

This reluctance is further underscored by the Food Technology Neophobia findings, where the Naturalness-Oriented segment has the highest level of food technology neophobia (mean score = 5.02). This indicates a strong reluctance to try new foods, including cultured products. Combined with their strong preference for "natural" foods and relatively low awareness of cultured products, this highlights the importance of framing cultured products in a way that emphasizes their naturalness or alignment with traditional food values - for example, by focusing on clean labels, minimal additives, and transparent production processes.

In addition, religiosity plays a role in this cluster, with nearly half (48.6%) identifying as religious, a higher proportion than in other segments. Interestingly, despite their general aversion to novel foods, a remarkable 52% of religious respondents within this segment view cultured products as more ethical than conventional ones. This suggests that moral and ethical narratives, especially around animal welfare and environmental stewardship, could resonate with this group - although acceptance will likely depend on aligning these messages with their naturalness-oriented values.

The Sustainability-Oriented segment is one of the most prominent, particularly in Denmark and Germany, where environmental concerns strongly influence food choices. This cluster also tends to be female (54.9%) and is the most highly educated, with 29.7% having a bachelor's degree and 24.0% having a graduate degree. These consumers are more aware of cultured products than the other clusters, with 37.1% reporting familiarity.

Dietary patterns within this segment show a clear commitment to reducing meat consumption, with a strong presence of flexitarians (38.0%) and the highest proportion of vegans (2.1%) of any cluster. Despite this, 85.4% still consume meat and seafood, albeit at a lower frequency. This cluster's emphasis on environmental sustainability aligns well with the potential benefits of cultured meat and seafood, such as reduced land use and lower greenhouse gas emissions. Thus, sustainability-oriented consumers may be among the most receptive to these innovations if they are effectively positioned as environmentally friendly alternatives.

This openness is also reflected in the Food Technology Neophobia scores, where this segment reports the lowest level of food technology neophobia (mean score = 4.10), indicating a greater willingness to explore new foods and technologies. Their relatively lower level of religiosity (43.3% identify as religious) further suggests that ethical or moral concerns stemming from religious traditions play a lesser role in shaping their views on cultured products. However, it is worth noting that only 22.2% of religious respondents within this group consider cultured products to be morally preferable to conventional products, suggesting that for sustainability-oriented religious consumers, ethical acceptance is not automatic and may require further communication about the broader societal benefits of these products.

The Safety-Conscious group, which is particularly prominent in France, has a relatively balanced gender distribution (44.9% male, 54.9% female) and a diverse educational background, with a strong presence of individuals with technical qualifications (27.0%). This cluster places a high value on food safety, which influences their cautious approach to novel foods such as cultured products. Awareness of cultured meat is relatively high within this group (35.1%), second only to the sustainability-focused segment.

Dietary habits within the Safety-Conscious cluster show that while most (87.9%) consume meat and seafood, they tend to maintain moderate consumption levels, with many following a flexitarian diet (31.3%). This group's emphasis on safety suggests that clear and transparent communication about the production process, safety standards and regulatory oversight will be critical to fostering acceptance of cultured products. Their relatively high level of awareness suggests that they are already engaged with information on the topic, making them an important target for educational campaigns.

The Food Technology Neophobia score for this segment (mean = 4.52) falls in the middle range, indicating a moderate level of caution towards novel foods. This is consistent with their focus on safety - they are not outright rejectionists, but they do demand clear evidence of safety and quality. In terms of religiosity, 48.3% identify as religious, and 33.2% of these religious respondents consider cultured products to be ethically preferable to conventional products. This mixed attitude suggests that while ethical narratives may appeal to some within this segment, robust assurances of safety and quality will likely be the deciding factor in their acceptance.

The Taste-Driven segment is the largest in all three countries, especially in Denmark, where it represents 40.8% of consumers. This segment is slightly more male (51.3% male) and tends to be slightly older (average age 52.2 years). Education levels are well balanced, with many having technical qualifications (27.8%) or a bachelor's degree (24.6%). Taste-Driven consumers have the lowest awareness of cultured meat (30.4%), indicating limited exposure or interest in this innovation to date.

This segment has the highest percentage of meat and seafood eaters (91.2%) and also has the most frequent consumption patterns, with 35.9% eating meat 3-4 times per week and 19.2% eating meat 5 or more times per week. For this group, sensory qualities such as taste, texture and overall eating experience are paramount. Therefore, for cultured meats and seafood to appeal to this segment, products must match or exceed conventional products in sensory appeal. While sustainability or safety claims may be of secondary importance, it is the hedonic experience that will ultimately determine acceptance.

In terms of food technology neophobia, the Taste-Driven segment has a moderate score (mean = 4.36), indicating neither strong openness nor strong aversion to novel foods. Their level of religiosity is the lowest (41.4% identify as religious), and only 33.2% of these religious

respondents consider cultured products to be ethically preferable. This suggests that ethical arguments alone may not resonate strongly with this group. Instead, communication strategies should prioritize the sensory and culinary potential of cultured products, positioning them as indulgent, high-quality alternatives capable of delivering superior taste experiences.

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# Appendix

## A1. Survey Template

| Title                                                                          | Statement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CONSENT</b>                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>CONS</b>                                                                    | <p><b><i>Consent to process personal data:</i></b></p> <p>In this study, we will ask you to participate in a survey presenting you with information about cultured meat and seafood. Afterwards, you will be asked about your attitudes towards cultured meat and seafood. Lastly, you will be asked about your background (e.g. age, gender, etc.). We would like to inform you that your input to this survey will remain anonymous. By agreeing to participate you give your consent to have your relevant personal data collected and processed by Aarhus University in Denmark. The research is conducted within the frames of the Horizon Europe project FEASTS (<a href="http://www.feasts-innovation.eu">www.feasts-innovation.eu</a>) and funded by the European Commission.</p> <p>By selecting “I Consent”, I confirm to have read and accepted the terms of the below privacy statement on personal data protection on how Aarhus University ensures the confidentiality of your responses (<a href="#">click here to read it</a>). Besides, I confirm that:</p> <p>A. My participation is voluntary, and I may withdraw my consent at any stage during the survey without stating a reason. I can withdraw my consent by closing the survey, since impartial/incomplete responses will not be registered, will be erased, and not kept for any reason.</p> <p>B. By providing my consent, I do not waive any legal rights or release Aarhus University or its agents from liability for negligence.</p> <p>C. I consent to my responses being analyzed in aggregate for research purposes at Aarhus University.</p> <p>❖ I Consent</p> <p>❖ I DO NOT Consent</p> |
| <b>Randomization</b>                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <<Participants will be randomized to cultured [MEAT] or [SEAFOOD] conditions>> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Awareness / Knowledge</b>                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>AWARE</b><br>Verbeke, Sans & Van Loo (2015)                                 | <p>In the following questions we are interested in understanding your knowledge regarding cultured meat/seafood.</p> <p>Please note that the survey includes screeners and attention checks to ensure timely and thoughtful responses. We recommend taking your time to read and answer each question carefully, as proceeding too quickly may result in being screened out of the survey.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

*Have you heard anything before today about cultured [meat/seafood]?*

- Yes, and I know what it means.
- Yes, but I do not know what it means.
- No, I have never heard about it.

<<If YES, respondents should answer the question below and then see the provided definition and image>>

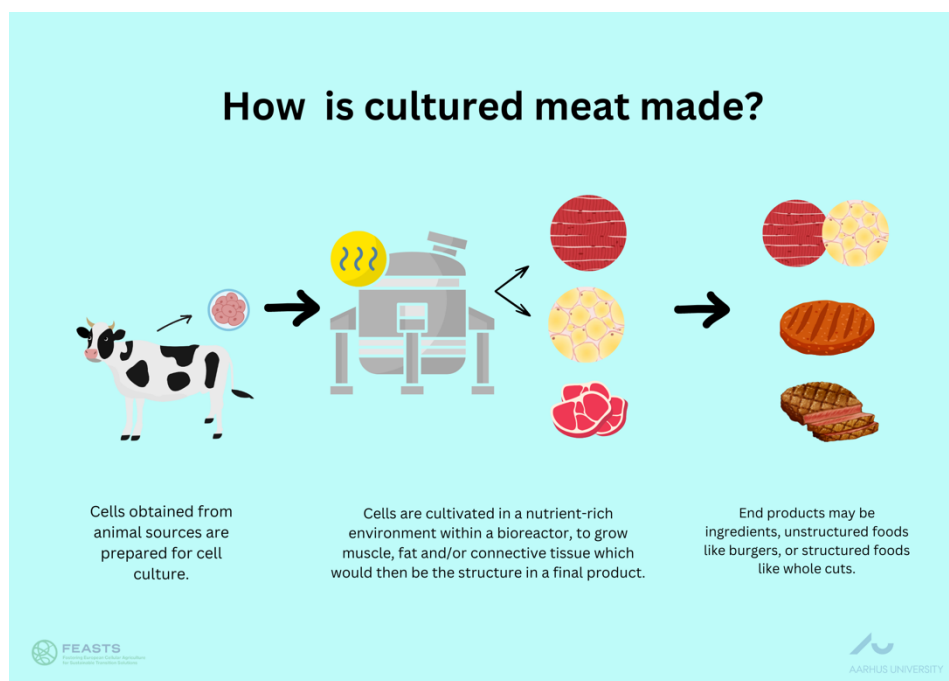
*What do you believe cultured [meat/seafood] is?*

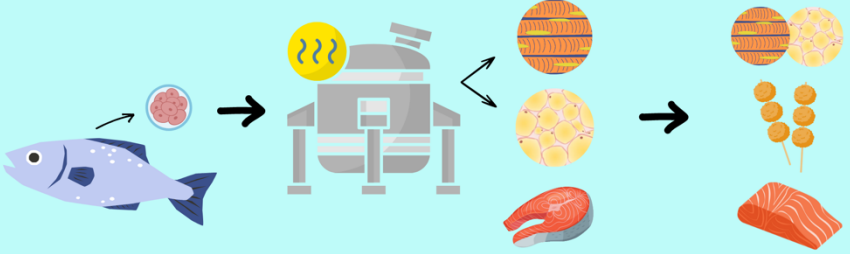
- Open ended answer

Please read the definition on what cultured [meat/seafood] is:

Cultured [meat/seafood] refer to a diverse range of new food products made possible by innovative production methods that use animal cells grown in cell culture conditions rather than whole animals. Some products may be like traditional foods e.g. chicken fillets, pork sausages [salmon, fish fillets], etc. while others may expand consumer choice to exotic species or entirely novel food experiences.

Cultured [meat/seafood] production process:



|                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                        | <h2 style="text-align: center;">How is cultured seafood made?</h2>  <p>Cells obtained from animal sources are prepared for cell culture.</p> <p>Cells are cultivated in a nutrient-rich environment within a bioreactor, to grow muscle, fat and/or connective tissue which would then be the structure in a final product.</p> <p>End products may be ingredients, unstructured foods like fish fillets, or structured foods like whole cuts.</p> <p><b>FEASTS</b><br/>Fostering European Cellular Agriculture for Sustainable Transition Solutions</p> <p>AARHUS UNIVERSITY</p>                                                                                                                                                     |
| <b>Perception, Ethics &amp; Religion</b>                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <p><b>PERC</b><br/>Verbeke, Sans &amp; Van Loo (2015); Mancini &amp; Antonioli (2022); Wilks &amp; Phillips (2017)</p>                                                                                 | <p>Below, you will find a series of statements related to your perception of what cultured meat will be. For each statement, please indicate where your opinion falls on the scale between two opposing options.</p> <p>Cultured [meat/seafood] will be...</p> <ol style="list-style-type: none"> <li>1. Unhealthy/healthy</li> <li>2. Unsafe to consume/safe to consume</li> <li>3. Not nutritive/nutritive</li> <li>4. Unsustainable/sustainable</li> <li>5. Tastes bad/tastes good</li> <li>6. expensive/inexpensive</li> <li>7. Unnatural/natural</li> </ol> <p>7-point bipolar</p>                                                                                                                                                                                                                                 |
| <p><b>ETHICS</b><br/>Mancini &amp; Antonioli (2022); Lonkila &amp; Kaljonen (2022) ; Kouarfaté &amp; Durif (2023); Tomiyama et al. (2020); Wilks &amp; Philips (2017); Croney &amp; Swanson (2023)</p> | <p>Please indicate your agreement with the following statements regarding cultured [meat/seafood]:</p> <p>Statements:</p> <ol style="list-style-type: none"> <li>1. Cultured [meat/seafood] improve animal welfare.</li> <li>2. Cultured [meat/seafood] will be able to solve world famine problems.</li> <li>3. Cultured [meat/seafood] should be available for everybody at a low price.</li> <li>4. Cultured [meat/seafood] is disrespectful to nature.</li> <li>5. The production of cultured [meat/seafood] will have negative impacts on [farmers/aquafarmers].</li> <li>6. Cultured [meat/seafood] will have a positive environmental impact (e.g. reduced land and water use, fewer greenhouse gases emissions).</li> </ol> <p>Scale:</p> <ul style="list-style-type: none"> <li>• Strongly disagree</li> </ul> |

|                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                         | <ul style="list-style-type: none"> <li>• Disagree</li> <li>• Somewhat disagree</li> <li>• Neither agree nor disagree</li> <li>• Somewhat agree</li> <li>• Agree</li> <li>• Strongly agree</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>ETHICSII</b><br>Items 1-4 are based on literature by Croney & Swanson (2023). Items 5-12 are from Rothgerber (2013) Meat Eating Justification Scale. | <p>Please indicate your agreement with the following statements regarding the ethics of consuming cultured [meat/seafood]:</p> <p>Statements:</p> <ol style="list-style-type: none"> <li>1. Natural resource scarcity will limit or eliminate meat production in the future.</li> <li>2. The current meat production system is good for the environment.</li> <li>3. In countries with high food security, eating [meat/seafood] is not ethically justified.</li> <li>4. Technological innovation is important for the [meat/seafood] production system.</li> <li>5. Animals do not really suffer when being raised and killed for [meat/seafood].</li> <li>6. It's acceptable to eat certain animals because they're bred for that purpose.</li> <li>7. When I look at [meat/seafood], I try hard not to connect it with an animal.</li> <li>8. Animals do not feel pain the same way humans do.</li> <li>9. We need the protein we can only get in [meat/seafood] for healthy development.</li> <li>10. Ultimately, animals are here to serve our needs.</li> <li>11. When I eat [meat/seafood], I try not to think about the life of the animal I am eating.</li> <li>12. We need [meat/seafood] for a healthy diet.</li> </ol> <ul style="list-style-type: none"> <li>• Strongly disagree – Strongly agree</li> </ul> <p>Scale: 7-point bipolar</p> |
| <b>RELIGION</b><br>Bryantt (2020)                                                                                                                       | <p>To what level do you consider yourself to be religious?</p> <ul style="list-style-type: none"> <li>• Not religious</li> <li>• Slightly religious</li> <li>• Moderately religious</li> <li>• Very religious</li> </ul> <p>Do you consider cultured meat/seafood to be an ethically and morally preferable option to conventional meat?</p> <ul style="list-style-type: none"> <li>• No</li> <li>• Maybe</li> <li>• Yes</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Best-Worst Scaling</b>                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>B/W Scale</b>                                                                                                                                        | <p>In the following section we are interested in understanding what would drive your preference for cultured [meat/seafood]. We would like you to first imagine that cultured [meat/seafood] is commercially available. Then consider the following drivers:</p> <p>Attributes to be tested:</p> <ol style="list-style-type: none"> <li>1. EI: <b>Environmental impact</b> (e.g. reduced land and water use, fewer greenhouse gas emissions)</li> <li>2. NV: <b>Nutritional value</b> (e.g. good protein source that is low on fat)</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

3. TT: **Taste and texture** (e.g. the product tastes and feels good)
4. SA: **Safety** (e.g. safe for consumption)
5. NA: **Naturalness** (e.g. the product does not contain preservatives or artificial colorings)

In the following set of questions, we would like to answer which of the following attributes do you think would influence your decision to eat cultured [meat/seafood]? Choose one product attribute that would influence your decision to eat cultured [meat/seafood] the **most** and one the **least**.

===//===

\*Attributes have been combined using a Balanced Incomplete Block Design\*

BIBD:

|   | V1 | V2 | V3 | V4 |
|---|----|----|----|----|
| 1 | EI | NV | TT | SA |
| 2 | EI | NV | SA | NA |
| 3 | EI | TT | SA | NA |
| 4 | NV | TT | SA | NA |
| 5 | EI | NV | TT | NA |

===//===

BW1:

| Least important          | Attributes           | Most Important           |
|--------------------------|----------------------|--------------------------|
| <input type="checkbox"/> | Environmental impact | <input type="checkbox"/> |
| <input type="checkbox"/> | Nutritional value    | <input type="checkbox"/> |
| <input type="checkbox"/> | Taste and texture    | <input type="checkbox"/> |
| <input type="checkbox"/> | Safety               | <input type="checkbox"/> |

BW2:

| Least important          | Attributes           | Most Important           |
|--------------------------|----------------------|--------------------------|
| <input type="checkbox"/> | Environmental impact | <input type="checkbox"/> |
| <input type="checkbox"/> | Nutritional value    | <input type="checkbox"/> |
| <input type="checkbox"/> | Safety               | <input type="checkbox"/> |
| <input type="checkbox"/> | Naturalness          | <input type="checkbox"/> |

BW3:

| Least important          | Attributes           | Most Important           |
|--------------------------|----------------------|--------------------------|
| <input type="checkbox"/> | Environmental impact | <input type="checkbox"/> |
| <input type="checkbox"/> | Taste and texture    | <input type="checkbox"/> |

|                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                      |                          |
|------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|--------------------------|
|                                                                                          | <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Safety               | <input type="checkbox"/> |
|                                                                                          | <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Naturalness          | <input type="checkbox"/> |
|                                                                                          | BW4:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                      |                          |
|                                                                                          | <b>Least important</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Attributes</b>    | <b>Most Important</b>    |
|                                                                                          | <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Nutritional value    | <input type="checkbox"/> |
|                                                                                          | <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Taste and texture    | <input type="checkbox"/> |
|                                                                                          | <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Safety               | <input type="checkbox"/> |
|                                                                                          | <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Naturalness          | <input type="checkbox"/> |
|                                                                                          | BW5:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                      |                          |
|                                                                                          | <b>Least important</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Attributes</b>    | <b>Most Important</b>    |
|                                                                                          | <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Environmental impact | <input type="checkbox"/> |
|                                                                                          | <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Nutritional value    | <input type="checkbox"/> |
|                                                                                          | <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Taste and texture    | <input type="checkbox"/> |
|                                                                                          | <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Naturalness          | <input type="checkbox"/> |
|                                                                                          | <b>Willingness</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                      |                          |
| <b>WILLEAT</b><br>(WILLEAT_M)                                                            | <i>If available, how likely would you be willing to eat cultured [meat/seafood]?</i> <ul style="list-style-type: none"> <li>Extremely unlikely/Extremely likely</li> </ul> Scale: 5-point bipolar.                                                                                                                                                                                                                                                                                                                                                 |                      |                          |
| <b>WILLPAY</b><br>(WILLPAY_M)<br>Wilks & Phillips (2017); Verbeke, Sans & Van Loo (2015) | <i>If available, would you be willing to buy cultured [meat/seafood]?</i> <ul style="list-style-type: none"> <li>No</li> <li>Maybe</li> <li>Yes</li> </ul><br><i>If available, would you be willing to pay more for cultured [meat/seafood]?</i> <ul style="list-style-type: none"> <li>No</li> <li>Maybe</li> <li>Yes</li> </ul>                                                                                                                                                                                                                  |                      |                          |
| <b>REPLACE</b>                                                                           | What percentage of your existing intake of meat/seafood would you be willing to replace with cultured [meat/seafood]? <ul style="list-style-type: none"> <li>Slider Answer Option 0/10/20/30% range</li> </ul>                                                                                                                                                                                                                                                                                                                                     |                      |                          |
| <b>Hybrids</b>                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                      |                          |
| <b>HYBRIDS</b>                                                                           | <p>In the following section we are interested in understanding your opinion regarding cultured [meat/seafood] hybrids. Hybrid products are a combination of conventional [meat/seafood] and cultured [meat/seafood].</p> <p>Would you support the creation of hybrid products with cultured meat/seafood as one of the ingredients?</p> <ul style="list-style-type: none"> <li>7-point disagree/agree</li> </ul> <p>If available, how likely would you be willing to eat hybrid products with cultured meat/seafood as one of the ingredients?</p> |                      |                          |

|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                   | <ul style="list-style-type: none"> <li>Extremely unlikely to eat / extremely likely to eat</li> </ul> <p>Scale: 5-point bipolar.</p> <p>If available, would you be willing to buy hybrid products with cultured meat/seafood as one of the ingredients?</p> <ul style="list-style-type: none"> <li>No</li> <li>Maybe</li> <li>Yes</li> </ul> <p>If available, would you be willing to pay more for hybrid products with cultured meat/seafood as one of the ingredients?</p> <ul style="list-style-type: none"> <li>No</li> <li>Maybe</li> <li>Yes</li> </ul> <p>What percentage of your existing intake of meat would you be willing to replace with hybrid products with cultured meat as one of the ingredients?</p> <ul style="list-style-type: none"> <li>Slider option: 0-100%- increments by 10</li> </ul> <p>If you were to consume a hybrid product with cultured meat/seafood as one of the ingredients, what do you think the ideal percentage of cultured meat/seafood should be?</p> <ul style="list-style-type: none"> <li>0% (no culture meat/seafood)</li> <li>25%</li> <li>50%</li> <li>75%</li> <li>90%</li> <li>100%</li> </ul> |
| <b>Beliefs</b>                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>BELIEF</b><br>Scale adapted by Street et al. (2008) perceived similarity scale | Do you think cultured [meat/seafood] will be similar to conventional [meat/seafood]? <ul style="list-style-type: none"> <li>Very similar</li> <li>Moderately similar</li> <li>Slightly similar</li> <li>Slightly different</li> <li>Moderately different</li> <li>Very different</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Covariates</b>                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Meat attachment scale (MAS)</b><br>Graça, Calheiros & Oliveira (2015)          | Please indicate your agreement with the following statements regarding [meat/seafood]: <p>Statements:</p> <ol style="list-style-type: none"> <li>To eat [meat/seafood] is one of the good pleasures in life.</li> <li>[Meat/seafood] is irreplaceable in my diet.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

|                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Shortened version: Kuhn et al. (2023)</p>                                                                   | <ol style="list-style-type: none"> <li>3. According to our position in the food chain, we have the right to eat [meat/seafood].</li> <li>4. I love meals with [meat/seafood].</li> <li>5. To eat [meat/seafood] is disrespectful towards life and the environment. (r)</li> <li>6. To eat [meat/seafood] is an unquestionable right of every person.</li> <li>7. I am a big fan of [meat/seafood].</li> <li>8. If I could not eat [meat/seafood], I would feel weak.</li> <li>9. To ensure quality responses, please select “Agree” for this statement.</li> <li>10. If I was forced to stop eating [meat/seafood], I would feel sad.</li> <li>11. [Meat/Seafood] reminds me of diseases. (r)</li> <li>12. By eating [meat/seafood], I am reminded of the death and suffering of animals. (r)</li> <li>13. Eating [meat/seafood] is a natural and undisputable practice.</li> <li>14. I do not picture myself without eating [meat/seafood] regularly.</li> <li>15. I would feel fine with a meatless diet [with a diet without seafood]. (r)</li> <li>16. A good [steak/fish fillet] is without comparison.</li> </ol> <p>Scale:</p> <ul style="list-style-type: none"> <li>• Strongly disagree</li> <li>• Disagree</li> <li>• Somewhat disagree</li> <li>• Neither agree nor disagree</li> <li>• Somewhat agree</li> <li>• Agree</li> <li>• Strongly agree</li> </ul> |
| <p><b>Food Technology Neophobia Scale (FTNS)</b><br/>Shortened version, adapted by Cox &amp; Evans (2008).</p> | <p>Please indicate your agreement with the following statements by the box beside the appropriate number on the scale. When responding we ask you to think about new food technologies in general rather than one specific technology.</p> <p>Statements:</p> <ol style="list-style-type: none"> <li>1. There are plenty of tasty foods around, so we do not need to use food technology to produce more.</li> <li>2. The benefits of new technologies are often grossly overstated.</li> <li>3. New food technologies decrease the natural quality of food.</li> <li>4. Society should not depend heavily on technologies to solve its food problems.</li> <li>5. New food technologies may have long term negative environmental effects.</li> <li>6. It can be risky to switch to new technologies too quickly.</li> <li>7. New products produced using new technologies can help people have a balanced diet. (r)</li> <li>8. New food technologies give people more control over their food choice. (r)</li> <li>9. The media usually provides a balanced and unbiased view of new food technologies. (r)</li> </ol> <p>Scale:</p> <ul style="list-style-type: none"> <li>• Strongly disagree</li> <li>• Disagree</li> <li>• Somewhat disagree</li> <li>• Neither agree nor disagree</li> <li>• Somewhat agree</li> </ul>                                          |

|                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                            | <ul style="list-style-type: none"> <li>• Agree</li> <li>• Strongly agree</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Socio-demographics / Background</b>     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>AGE</b><br>Wilks & Phillips<br>(2017)   | How old are you?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>GENDER</b>                              | What is your gender? <ul style="list-style-type: none"> <li>• Man</li> <li>• Woman</li> <li>• Non-binary</li> <li>• Other</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>EDU</b>                                 | What is your level of education? <ul style="list-style-type: none"> <li>• Primary school</li> <li>• High school</li> <li>• Technical qualification</li> <li>• Undergraduate degree</li> <li>• Postgraduate degree</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>PB</b>                                  | Do you eat [meat/seafood]? <ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>DH</b><br>De Backer &<br>Hudders (2014) | Which of the following diets do you best adhere to? <ul style="list-style-type: none"> <li>• Meat eating (i.e. eating (red) meat, fish and chicken)</li> <li>• Flexitarian (i.e. consciously reducing meat intake, but eating meat now and then)</li> <li>• Pollotarian (i.e. eating no red meat, but eating fish, chicken and other poultry)</li> <li>• Pescatarian (i.e. eating no red meat or chicken, but eating fish and shellfish)</li> <li>• Lacto-ovo vegetarian (i.e. eating no meat or fish, but eating eggs and dairy produce)</li> <li>• Lacto-vegetarian (i.e. eating no meat, fish or eggs, but eating dairy produce)</li> <li>• Ovo-vegetarian (i.e. eating no meat, fish or dairy produce, but eating eggs)</li> <li>• Vegan (i.e. eating no meat and using no products of animal origin).</li> </ul> |
| <b>FREQUENCY</b><br>Hoek et al.<br>(2011)  | On average, how often have you consumed [meat/seafood] in the past four weeks? <ul style="list-style-type: none"> <li>• Never</li> <li>• Less than once a week</li> <li>• 1-2 times per week</li> <li>• 3-4 times per week</li> <li>• Five times or more per week</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Thoughts</b>                            | Do you have any thoughts or any suggestions about the survey and/or cultured [meat/seafood], that you would like to share?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

## A.2 Literature Review (Milestones 2.1)

### FEASTS

The goal of this milestone is to identify key drivers and barriers to consumer acceptance of cultured meat and seafood and explore potential solutions through a systematic meta-review. Following the PRISMA framework, a structured search across multiple databases used predefined search criteria related to consumer perception, barriers, and drivers. This document also maps potential consumer groups and provides a country-by-country analysis to identify research gaps and overlooked consumer segments. Limitations such as lack of relevant reviews regarding consumer behavior towards cultured seafood have been identified alongside a publication bias where most research is concentrated on Western countries.

### Methods

A meta-review (systematic review of reviews; Hennesy et al., 2019), integrating empirical evidence from existing systematic, scoping, realist, narrative, rapid and umbrella reviews was conducted. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al., 2021) were applied and extracted from Covidence.

### Search strategy, inclusion and exclusion criteria

A systematic search of four databases (Scopus, Web of Science, Google Scholar, Cochrane) was conducted. The selected databases are either multidisciplinary or address economic and business, agricultural, medical sciences and social sciences fields. The search was carried out applying a series of keywords that referred to: (1) alternative protein indicators (e.g. cultured meat and cultured seafood); (2) indicators of consumer choices or categories of individual level determinants; and (3) the terms referring to review as a research method. Examples of keywords include: (1) cultured meat, cultured seafood, cultivated meat, cultivated seafood, cellular aquaculture, cellular agriculture, lab-grown meat, lab-grown seafood; (2) consumer behavior, consumer perception, consumer adoption, consumer acceptance; (3) systematic literature review; scoping literature review, narrative literature review.

In the case of this meta-review, the chosen strategy was to use a search string where multiple terms that represented the investigated factors were applied. Basic Boolean operators AND, OR and a search limitation to only reviews was established. Individual search strings for both cultured meat and cultured seafood were prepared. The feasibility of the strings was pretested across the databases before the search was initiated. The decision to use a broad search string increased the number of identified entries, thus leading to the inclusion of more relevant reviews during the first stages of the screening process. Both search strings yielded n=2425 results obtained through all four databases. In the case of cultured meat, the results per database are as follows: Scopus (n=15), Web of Science (n=806), Google Scholar (n=824), Cochrane (n=17). The results per database for cultured seafood are as follows: Scopus (n=13), Web of Science (n=730), Google Scholar (n=3), Cochrane (n=17). For both cultured meat and cultured seafood, the Cochrane database delivered irrelevant results for the purpose of this review. Additionally, in the Web of

Science database, results were further refined in the Web of Science Categories to ensure only relevant results appeared due to the overwhelming number of initial search results.

All papers were initially identified by their abstract, which were later screened to elicit potentially relevant studies. Next, a full-text screening of articles was performed to determine their match with the inclusion criteria. Overall, the search process and evaluation of all reviews resulted in the inclusion of 27 reviews.

The following inclusion criteria was applied: (1) qualitative and/or quantitative reviews of original research providing empirical evidence of consumer perception of cultured meat and cultured seafood; (2) abstract and whole publication only in English. The following exclusion criteria was applied: (1) original studies (i.e. research that did not aim at providing a review, but rather focused on reporting new results of an original study); (2) gray literature (e.g. dissertations, conference materials, book chapters); (3) reviews that did not aim to provide empirical evidence on consumer perception of cultured meat and cultured seafood; (4) reviews of theoretical models.

### Data extraction and coding

To address the review's objectives, the following data was extracted: the characteristics of reviews included, type of cultured product (e.g. meat or seafood), drivers and barriers of consumer acceptance or rejection of cultured meat and cultured seafood and recommendations to increase consumer acceptance of cultured meat and seafood.

Reviews were coded as referring to:

- Alternative proteins: For this review we focused on two innovative alternative proteins, cultured meat (CM) and cultured seafood (CSF).
- Cultured meat and seafood drivers and barriers such as environmental sustainability, animal welfare, price, naturalness, food neophobia, sensory appeal, distrust, religion, among others were included to understand consumer perception of mentioned products.
- Factors influencing cultured meat and seafood acceptance/rejection such as culture, socio-demographics, meat attachment, behavioral factors (e.g. risk-taking behavior), geographic location (e.g. urban or rural living).
- Suggestions to improve consumer acceptance such as product information, marketing strategies, regulatory approval, improved taste and texture, communication strategies oriented towards benefits, affordability and accessibility
- Potential consumers who are prone to support the production and consumption of cultured meat and seafood.

### Data analysis and synthesis

For this review, we will be conducting a thematic analysis of the data presented in the reviews. This method analyses qualitative data that entails searching across a data set to identify, analyze and report repeated patterns. A thematic analysis describes and interprets data by selecting codes and constructing themes (Kiger and Varpio 2020). A set of repeated themes across reviews will be identified and analyzed to map determinants of consumer behavior of cultured meat and seafood.

Furthermore, reviews will be categorized as either offering preliminary support or strong support. A review is classified as providing preliminary support if multiple sources discuss the drivers, barriers, and influencing factors, but the evidence remains moderate. On the other hand, if a substantial number of sources consistently demonstrate a strong association between these factors and consumer perception, the review is classified as providing strong support.

## Limitations

The dataset reveals that reviews that focus on consumer acceptance of cultured meat is mostly concentrated in Western countries, with the USA (22 studies) leading, followed by the UK (16), Australia (14), Netherlands (13), Italy (13), and China (12). Other countries, such as Germany, Belgium, New Zealand, India, Spain, Brazil, Finland, Switzerland, Canada, Portugal, and France, show moderate research activity, which suggests a growing interest in alternative proteins. On the contrary, several regions, particularly Africa, South Asia, and parts of Latin America, have limited representation, with only one or two studies conducted in countries like Colombia, Iran, Turkey, Ethiopia, Nigeria, and Thailand. The underrepresentation of African and Southeast Asian nations highlights existing research gaps, as these regions may be considered potential markets for cultured meat and seafood. Overall, research efforts are concentrated in Europe and North America, with some growing interest in Asia-Pacific and Latin America, while Africa remains largely overlooked. Addressing these gaps through further research could provide valuable insights into consumer acceptance in diverse global markets.

The purpose of this meta-review was to identify the drivers and barriers to consumer acceptance of cultured meat and seafood. However, during the review process across the four consulted databases, no relevant reviews on consumer perception of cultured seafood were found. This highlights the need for increased research in this area and the generation of primary data, which could serve as the foundation for future reviews or meta-reviews on the topic.

## Cultured meat drivers

| Type of driver              | Authors                                                                                                                                                                                                                                                                              |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Animal welfare</b>       | Hefferon et al. (2023); Bryant and Barnett (2018); Lewisch & Riefler (2023); Mancini & Antonioli (2022); Jairath, et al. (2021); Kantono, et al. (2022); Lonkila & Kaljonen (2022); Pakseresht, et al. (2021); Kouarfaté & Durif (2023); Siddiqui et al. (2022b); Tso et al. (2020); |
| <b>Health benefits</b>      | Bryant and Barnett (2018); Hefferon et al. (2023); Hartmann & Siegrist (2017); Jairath, et al. (2021); Kantono, et al. (2022); Pakseresht, et al. (2021); Onwezen, et al. (2020); Kouarfaté & Durif (2023); To et al. (2024); Ye et al. (2022); Siddiqui et al. (2022b)              |
| <b>Environmental impact</b> | Hefferon et al. (2023); Bryant and Barnett (2018); Mancini & Antonioli (2022); Fernandes, et al. (2022); Jairath, et al. (2021); Kantono, et al. (2022); Pakseresht, et al. (2021); Kouarfaté & Durif (2023); Siddiqui et al. (2022a & b); To et al. (2024) (both                    |

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|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                   | Driver and Barrier); Tomiyama et al. (2020) (both Driver and Barrier Fernandes et al (2022)); Tso et al. (2020)                                                                                          |
| <b>Familiarity/Knowledge</b>      | Bryant and Barnett (2018); Carneiro et al. (2022); Mancini & Antonioli (2022); Hartmann & Siegrist (2017); Pakseresht, et al. (2021); Onwezen, et al. (2020); Kouarfaté & Durif (2023); To et al. (2024) |
| <b>Non-technical descriptions</b> | Bryant and Barnett (2018); Tomiyama et al. (2020); Tso et al. (2020)                                                                                                                                     |
| <b>Low-cost expectation</b>       | Bryant and Barnett (2018); Lonkila & Kaljonen (2022); Pakseresht, et al. (2021); Hefferon et al. (2023)                                                                                                  |
| <b>Food security</b>              | Lewisch & Riefler (2023); Bryant and Barnett (2018); Mancini & Antonioli (2022); Jairath, et al. (2021); Kantono, et al. (2022); Siddiqui et al. (2022b)                                                 |
| <b>Socio-demographics</b>         | Hefferon et al. (2023); Hartmann & Siegrist (2017); Kantono, et al. (2022); Siddiqui et al. (2022b); Pakseresht et al. (2021)                                                                            |
| <b>Media coverage</b>             | Hefferon et al. (2023)                                                                                                                                                                                   |
| <b>Religion</b>                   | Lewisch & Riefler (2023); Jairath, et al. (2021); Kantono, et al. (2022); Kouarfaté & Durif (2023); Tomiyama et al. (2020); Ye et al. (2022); Fernandes et al. (2022)                                    |
| <b>Social norms</b>               | Onwezen, et al. (2020) (both D and B)                                                                                                                                                                    |
| <b>Regulations</b>                | Mancini & Antonioli (2022); Kouarfaté & Durif (2023); Siddiqui et al. (2022c)                                                                                                                            |
| <b>Morality</b>                   | Kouarfaté & Durif (2023)                                                                                                                                                                                 |

## Cultured meat barriers

| Type of driver              | Authors                                                                                                                                                                                                                                                                              |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Animal welfare</b>       | Hefferon et al. (2023); Bryant and Barnett (2018); Lewisch & Riefler (2023); Mancini & Antonioli (2022); Jairath, et al. (2021); Kantono, et al. (2022); Lonkila & Kaljonen (2022); Pakseresht, et al. (2021); Kouarfaté & Durif (2023); Siddiqui et al. (2022b); Tso et al. (2020); |
| <b>Health benefits</b>      | Bryant and Barnett (2018); Hefferon et al. (2023); Hartmann & Siegrist (2017); Jairath, et al. (2021); Kantono, et al. (2022); Pakseresht, et al. (2021); Onwezen, et al. (2020); Kouarfaté & Durif (2023); To et al. (2024); Ye et al. (2022); Siddiqui et al. (2022b)              |
| <b>Environmental impact</b> | Hefferon et al. (2023); Bryant and Barnett (2018); Mancini & Antonioli (2022); Fernandes, et al. (2022); Jairath, et al. (2021); Kantono, et al. (2022); Pakseresht, et al. (2021); Kouarfaté & Durif (2023); Siddiqui et al. (2022a & b); To et al. (2024) (both                    |

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|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                   | Driver and Barrier); Tomiyama et al. (2020) (both Driver and Barrier Fernandes et al (2022)); Tso et al. (2020)                                                                                          |
| <b>Familiarity/Knowledge</b>      | Bryant and Barnett (2018); Carneiro et al. (2022); Mancini & Antonioli (2022); Hartmann & Siegrist (2017); Pakseresht, et al. (2021); Onwezen, et al. (2020); Kouarfaté & Durif (2023); To et al. (2024) |
| <b>Non-technical descriptions</b> | Bryant and Barnett (2018); Tomiyama et al. (2020); Tso et al. (2020)                                                                                                                                     |
| <b>Low-cost expectation</b>       | Bryant and Barnett (2018); Lonkila & Kaljonen (2022); Pakseresht, et al. (2021); Hefferon et al. (2023)                                                                                                  |
| <b>Food security</b>              | Lewis & Riefler (2023); Bryant and Barnett (2018); Mancini & Antonioli (2022); Jairath, et al. (2021); Kantono, et al. (2022); Siddiqui et al. (2022b)                                                   |
| <b>Socio-demographics</b>         | Hefferon et al. (2023); Hartmann & Siegrist (2017); Kantono, et al. (2022); Siddiqui et al. (2022b); Pakseresht et al. (2021)                                                                            |
| <b>Media coverage</b>             | Hefferon et al. (2023)                                                                                                                                                                                   |
| <b>Religion</b>                   | Lewis & Riefler (2023); Jairath, et al. (2021); Kantono, et al. (2022); Kouarfaté & Durif (2023); Tomiyama et al. (2020); Ye et al. (2022); Fernandes et al. (2022)                                      |
| <b>Social norms</b>               | Onwezen, et al. (2020) (both D and B)                                                                                                                                                                    |
| <b>Regulations</b>                | Mancini & Antonioli (2022); Kouarfaté & Durif (2023); Siddiqui et al. (2022c)                                                                                                                            |
| <b>Morality</b>                   | Kouarfaté & Durif (2023)                                                                                                                                                                                 |

**Providing strong support**

**Providing preliminary support**

## Suggestions

| <b>Suggestion</b>                                     | <b>Authors</b>                                                                                                                                                                                        |
|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Labeling                                              | Siegrist & Hartmann (2020); Lewis & Riefler (2023); Siddiqui et al., (2022a & c)                                                                                                                      |
| Highlight benefits and animal welfare through framing | Hefferon, et al. (2023); Mancini & Antonioli; Lonkila & Kaljonen (2022); Onwezen, et al. (2020); Siddiqui et al., (2022a & c); Hartmann & Siegrist (2017); Pakseresht et al. (2021); To et al. (2024) |
| Nomenclature (steer away from technical terms)        | Tomiyama et al. (2020); Bryant & Barnett (2018); Tso et al. (2020); Pakseresht et al. (2021); Hefferon et al. (2023)                                                                                  |
| Provision of Information                              | Pakseresht et al. (2021); Onwezen et al. (2020); Siddiqui et al. (2022a & c); Tomiyama et al. (2020); Tso et al. (2020); Ye et al. (2022); Carneiro et al. (2022)                                     |
| Protect traditional farmers (through policy)          | Lewis & Riefler (2023); Jairath et al. (2021); Tomiyama et al. (2020)                                                                                                                                 |

|                                                                                                                             |                                                                                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Consider country-specific drivers and barriers                                                                              | Lewisch & Riefler; Siddiqui et al. (2022c)                                                                                                          |
| Media coverage                                                                                                              | Fernandes et al. (2022); Siddiqui et al. (2022b & c); Ye et al. (2022)                                                                              |
| Regulation (to increase trust) (of technology and marketing)                                                                | Bryant & Barnett (2018); Fernandes et al. (2022); Jairath et al. (2021); Kantono et al. (2022); Siddiqui et al. (2022a & c); Tomiyama et al. (2020) |
| Communication                                                                                                               | Mancini & Antonioli (2022); Fernandes et al. (2022); Tomiyama et al. (2020)                                                                         |
| Nudging strategies                                                                                                          | Hartmann & Siegrist (2017); Tomiyama et al. (2020)                                                                                                  |
| Avoiding naturalness and focus on similarities with conventional meat                                                       | Lonkila & Kaljonen (2022)                                                                                                                           |
| Focus on social benefits, altruism and environment instead of the technology                                                | Lonkila & Kaljonen (2022)                                                                                                                           |
| Promotion of trust in social actors and the food system to combat food neophobia                                            | Pakseresht et al. (2021)                                                                                                                            |
| Technology improvement and information about unnatural process of conventional meat to tackle disgust and unnaturalness     | Siddiqui et al. (2022a); Tomiyama et al. (2020)                                                                                                     |
| Balance between safety, regulation and market entrance (to not make the lives of those introducing a product too difficult) | Siddiqui et al. (2022a)                                                                                                                             |
| Use green in packaging to highlight environmental benefits                                                                  | Siddiqui et al. (2022a)                                                                                                                             |
| Promote positive human-animal relationship                                                                                  | Siddiqui et al. (2022b)                                                                                                                             |
| Lean into the perception that cultured meat can end world hunger                                                            | Siddiqui et al. (2022c)                                                                                                                             |
| Research and data should be available through marketing channels                                                            | Siddiqui et al. (2022c); Tomiyama et al. (2020)                                                                                                     |
| Tackle disgust caused by the feeling of violating social norms with familiarity                                             | Siddiqui et al. (2022c)                                                                                                                             |

|                                                                                                                                                          |                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| Use images that focus on similarities with conventional meat and not on the production process                                                           | Siddiqui et al. (2022c)             |
| A proposal to reduce meat rather than replace it is seen as a more manageable dietary goal for consumers                                                 | Ye et al. (2022); Tso et al. (2020) |
| Long-term studies to measure cultured meat acceptance over time                                                                                          | Siddiqui et al. (2022c)             |
| Food companies need to be transparent about quality and provenance of ingredients and about nutritional quality and sustainability of production methods | Tso et al. (2020)                   |
| Household socio-economic dynamics (i.e. meal prepping, meal planning) could significantly influence consumer behavior                                    | Tsvakirai et al. (2023)             |
| Holistic analysis to understand cultured meat market can improve consumer behavior                                                                       | Tsvakirai et al. (2023)             |

## Consumers

| Potential consumers                                                                | Review Authors                                                                                                    |
|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| Flexitarians                                                                       | Hefferon et al. (2023)                                                                                            |
| High meat-eating countries                                                         | Lewisch & Riefler (2023)                                                                                          |
| High meat consumption individuals (less likely, but also display high willingness) | Kantono et al. (2022); Pakseresht, et al. (2021); Onwezen et al. (2020); Siddiqui et al. (2022a & b & c)          |
| Pescatarians                                                                       | Kantono et al. (2022)                                                                                             |
| Vegetarians and Vegans                                                             | Kantono et al. (2022); Lonkila & Kaljonen; Pakseresht, et al. (2021); Siddiqui et al. (2022b)                     |
| United States' consumers                                                           | Kantono et al. (2022)                                                                                             |
| China and India                                                                    | Kantono et al. (2022); Siddiqui et al. (2022c)                                                                    |
| Liberal, young, educated men living in urban areas                                 | Pakseresht et al. (2021); Onwezen et al. (2020); Ye et al. (2022); Siddiqui et al. (2022c); Kantono et al. (2022) |

|                                                                                                                                                                                   |                                                                            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| Women are reticent to try cultured meat, but open to other alternative proteins (e.g. plant-based proteins)                                                                       | Pakseresht et al. (2021); Siddiqui et al. (2022b & c)                      |
| Lower willingness to eat among Malaysians and Chinese compared to Indonesians, Thai and Vietnamese                                                                                | Siddiqui et al. (2022b)                                                    |
| German consumers are more open to cultured meat than French                                                                                                                       | Siddiqui et al. (2022b)                                                    |
| Acceptance is higher among agricultural and meat workers                                                                                                                          | Siddiqui et al. (2022b)                                                    |
| Italian consumers                                                                                                                                                                 | Siddiqui et al. (2022b)                                                    |
| Consumers with high meat attachment are more open to CM                                                                                                                           | Siddiqui et al. (2022b)                                                    |
| Gen Z is unwilling to accept cultured meat                                                                                                                                        | Siddiqui et al. (2022b)                                                    |
| Consumers 65+                                                                                                                                                                     | Siddiqui et al. (2022c); Bryant and Barnett (2020)                         |
| In New Zealand and India there is a higher consumption of cultured meat among those with higher income. In the USA, there is a higher consumption among those with lower incomes. | Siddiqui et al. (2022c); Tsvakirai et al. (2023); Lewisch & Riefler (2023) |
| Mexico, Spain, England, Dominican Republic, Brazil and South Africa                                                                                                               | Tsvakirai et al. (2023); Bryant and Barnett (2020)                         |

## Reviews' country distribution



literature AND review OR rapid AND review OR realist AND review OR evidence-based AND review OR umbrella AND review ) AND ( LIMIT-TO ( DOCTYPE , "re" ) ) (13 results)

## Web of Science

ALL=("cultured meat" OR "lab-grown meat" OR "cell-based meat" OR "cultivated meat" OR "lab-cultivated meat" OR "in-vitro meat" OR "cell-cultivated meat" AND "consumer behavi\*r" OR "consumer perception" OR "consumer acceptance" OR "consumer adoption" OR "consumer attitudes" OR "consumer motives" OR "consumer knowledge" OR "consumer awareness" AND "systematic literature review" OR "scoping literature review" OR "narrative literature review" OR "rapid review" OR "realist review" OR "evidence-based review" OR "umbrella review") (806 results)

ALL=("cultured seafood" OR "lab-grown seafood" OR "cell-based seafood" OR " cell-cultured seafood" OR "cellular aquaculture" AND "consumer behavi\*r" OR "consumer perception" OR "consumer acceptance" OR "consumer adoption" OR "consumer attitudes" OR "consumer motives" OR "consumer knowledge" OR "consumer awareness" AND "systematic literature review" OR "scoping literature review" OR "narrative literature review" OR "rapid review" OR "realist review " OR "evidence-based review" OR "umbrella review") (730 results)

## Google Scholar

"cultured meat" OR "lab-grown meat" OR "cell-based meat" OR "cultivated meat" OR "lab-cultivated meat" OR "in-vitro meat" OR "cell-cultivated meat" AND "consumer behavior\*r" OR "consumer perception" OR "consumer acceptance" OR "consumer adoption" OR "consumer attitudes" OR "consumer motives" OR "consumer knowledge" OR "consumer awareness" AND "systematic literature review" OR "scoping literature review" OR "narrative literature review" OR "rapid review" OR "realist review" OR "evidence-based review" OR "umbrella review"  
Limited to review articles. (824 results, after filtering for review articles)

"cultured seafood" OR "lab-grown seafood" OR "cell-based seafood" OR " cell-cultured seafood" OR "cellular aquaculture" AND "consumer behavio\*r" OR "consumer perception" OR "consumer acceptance" OR "consumer adoption" OR "consumer attitudes" OR "consumer motives" OR "consumer knowledge" OR "consumer awareness" AND "systematic literature review" OR "scoping literature review" OR "narrative literature review" OR "rapid review" OR "realist review " OR "evidence-based review" OR "umbrella review" (3 results)

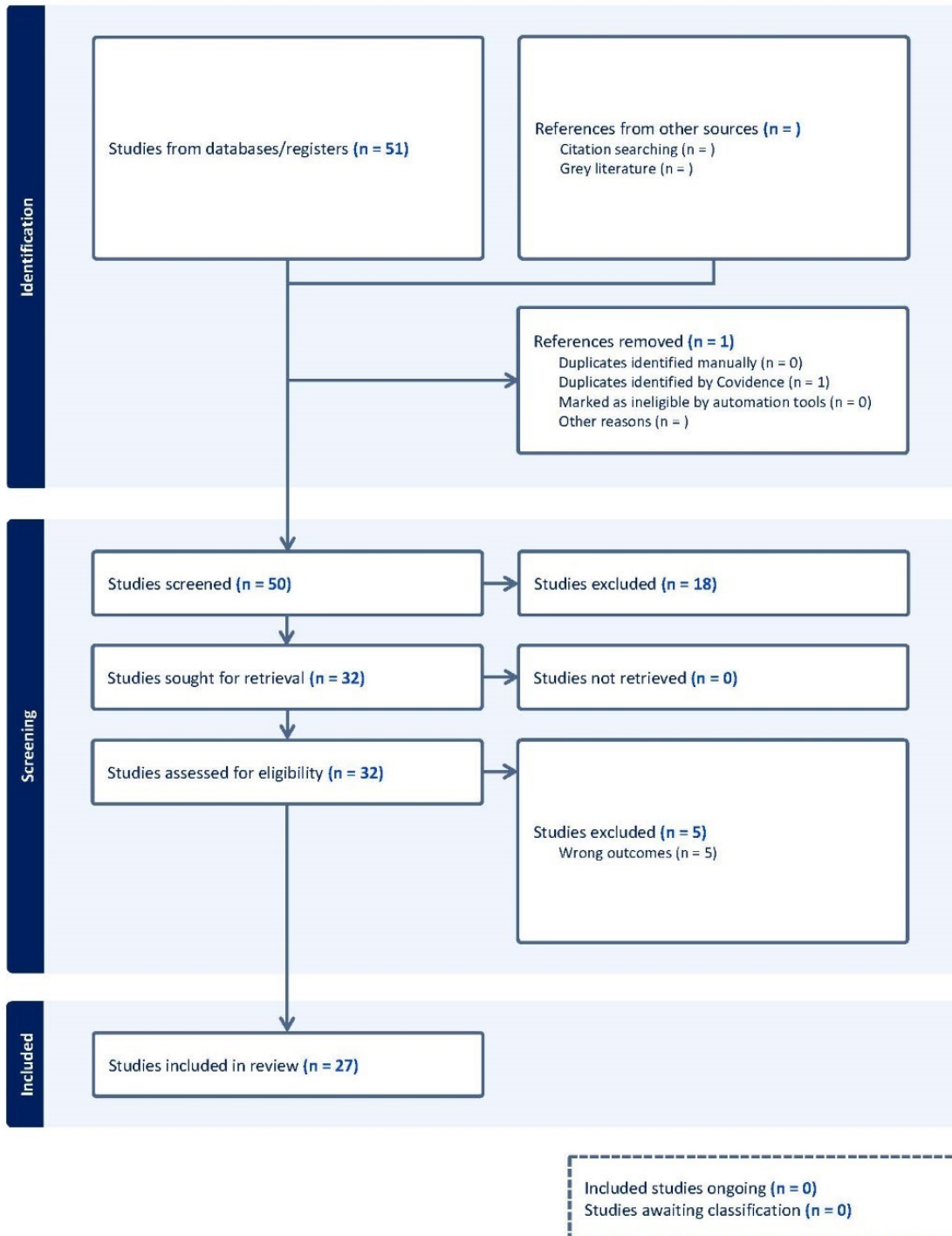
## Cochrane

"cultured meat" OR "lab-grown meat" OR "cell-based meat" OR "cultivated meat" OR "lab-cultivated meat" OR "in-vitro meat" OR "cell-cultivated meat" AND consumer NEXT behavior\*r OR "consumer perception" OR "consumer acceptance" OR "consumer adoption" OR "consumer attitudes" OR "consumer motives" OR "consumer knowledge" OR "consumer awareness" AND "systematic literature review" OR "scoping literature review" OR "narrative literature review" OR "rapid review" OR "realist review" OR "evidence-based review" OR "umbrella review" (17 irrelevant results)

"cultured seafood" OR "lab-grown seafood" OR "cell-based seafood" OR " cell-cultured seafood" OR "cellular aquaculture" AND consumer NEXT behavior OR "consumer perception" OR "consumer acceptance" OR "consumer adoption" OR "consumer attitudes" OR "consumer motives" OR "consumer knowledge" OR "consumer awareness" AND "systematic literature review" OR "scoping literature review" OR "narrative literature review" OR "rapid review" OR "realist review " OR "evidence-based review" OR "umbrella review" (17 irrelevant results)

## PRISMA

## A meta-review on consumer perception regarding cultured meat and seafood products



29th January 2025

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