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Opportunities and Challenges of Cultivated Meat in the European Union's Regulatory Landscape:
A Stakeholder Analysis

Simone Pinster
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Simone Pinster

Supervisor: Inga Winkler

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Opportunities and Challenges of Cultivated Meat in the European Union's Regulatory Landscape:
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Simone Pinster
Law and Governance Group, Wageningen University, The Netherlands

Abstract

Animal agriculture significantly contributes to greenhouse gas emissions globally. While the demand for meat continues to rise, the pressure to shift to a more sustainable and resilient food system is increasing. Novel technologies emerged to address these issues. One of these technologies is cellular agriculture. My thesis focused on the opportunities and challenges of cultivated meat in the EU's regulatory landscape. The main objective of this thesis was to analyse how stakeholders' perspectives are reflected in the regulatory landscape. The research used literature, legal doctrinal analysis, and empirical research to conduct the stakeholder analysis. Semi-structured interviews were conducted with stakeholders in the cultivated meat industry, consultants, advocacy groups, academics and studied through a thematic analysis. The analysis identified how the regulatory landscape is shaped by misleading narratives, stakeholders' interests and power dynamics, political resistance, strategic framing and the EU's stance towards GMOs.

The polarisation and politicisation of cultivated meat should be overcome by facilitating interdisciplinary collaboration between all food system actors, fostering transparency in decision making, educating consumers based on evidence-based information, and implementing experimental regulatory frameworks. This research contributes to understanding how stakeholder interests shape the regulatory landscape and influence the future of cultivated meat in the EU.

Key words: cultivated meat, stakeholder analysis, European Union, Novel Food Regulation

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List of Abbreviations

AgriFish	Agriculture and Fisheries
CAP	Common Agricultural Policy
DE	Germany
EC	European Commission
EFSA	European Food Safety Authority
EP	European Parliament
EU	European Union
CAN	Cellular Agriculture Nederland
F2F	Farm-to-Fork Strategy
FEASTS	Fostering European Cellular Agriculture for Sustainable Transition Solutions
FBO	Food Business Operator
FBS	Foetal Bovine Serum
FR	France
GFI	Good Food Institute
GFLR	General Food Law Regulation
GMO	Genetically Modified Organisms
GMR	Regulation on Genetically Modified Food and Feed
LCA	Life-Cycle Assessment
LVVN	Ministry of Agriculture, Fisheries, Food Security and Nature
NL	The Netherlands
PAFF	Standing Committee of Plants, Animals, Food, and Feed
SDG	Sustainable Development Goals
SFA	Singapore Food Agency
TFEU	Treaty on the Functioning of the European Union
TRIS	Technical Regulations Information System
UK	United Kingdom
US	United States

1. Introduction

1.1 Background

One of the most significant global issues of the twenty-first century is climate change, which is mainly caused by human activities such as the combustion of fossil fuels, deforestation, and industrial agriculture. Animal agriculture is among the contributors, as it is estimated to be responsible for 14.5% of greenhouse gas emissions worldwide.[1] Additionally, the demand for animal protein in Europe has risen in the last fifty years, further intensifying the environmental burden.[2] Beyond climate change, there is a growing global awareness of environmental sustainability and food security, which could accelerate the transition into more sustainable food systems. This transition is evident with the establishment of international commitments, such as the Sustainable Development Goals (SDGs), which aim to ensure food security, and the European Green Deal, which emphasises environmental sustainability.[3] As a result, the animal agriculture industry must simultaneously meet the growing protein demand and pursue a sustainable green transformation aligned with international agreements. Policy measures, consumer education and shifts in dietary habits are measures to reduce this demand. Innovation could additionally play an essential role in transitioning to a more sustainable and resilient food system.

One of these emerging innovations is cellular agriculture, which produces animal-based products from cell cultures rather than directly from animals.[4] These animal-based products are called cultivated meat or fish. This differs from precision fermentation technology, where microorganisms, yeasts, or fungi function as 'cell factories' to produce specific targeted compounds.[5] The production of cultivated meat is a novel technology. These products are similar in composition and sensory attributes to animal-based meat. Therefore, cultivated meat can reduce reliance on animal agriculture

[1] Food and Agriculture of the United States (FAO), 'Livestock Solutions for Climate Change' (2017) <https://www.fao.org/family-farming/detail/en/c/1634679/>.
[2] Céline Bonnet and others, 'Viewpoint: Regulating Meat Consumption to Improve Health, the Environment and Animal Welfare' (December 2020) 97 Food Policy 101847 <https://doi.org/10.1016/j.foodpol.2020.101847>.
[3] United Nations, 'Sustainable Development Goals' <https://sdgs.un.org/goals>; European Commission, 'The European Green Deal' (11 December 2019) <https://ec.europa.eu/commission/presscorner/detail/en/ip_19_6691>.
[4] ProVeg International, 'What Is Cellular Agriculture?' (25 August 2020) <https://proveg.org/news/what-is-cellular-agriculture/>.
[5] Vanessa Assaro-Aluis, 'The Science of Fermentation' (The Good Food Institute, 17 January 2023) <https://gfi.org/science/the-science-of-fermentation/>.

without compromising on the sensory characteristics of animal products.[6] Besides cultivated meat, it has been labelled as cell-cultured, clean, and lab-grown meat.[7]

Research describes the adoption of cultivated meat as the 'second domestication' because it could dramatically transform animal agriculture.[8] Cultivated meat could ensure food security, improve animal welfare, and contribute to combating climate change. For instance, certain cultivated meat products will require 90.0% less land use and 96.0% less water compared with animal-counter products.[9] This shift would contribute to achieving the European Green Deal, which aims to make Europe the first climate-neutral continent in 2050.[10] The Farm to Fork Strategy (F2F Strategy) of the European Commission (EC) of 2019-2024 is a component of the European Green Deal, which aims to make food systems fair, healthy, and environmentally friendly.[11] One of the objectives was to promote sustainable food consumption and to facilitate the transition to a sustainable, healthier diet. Cultivated meat could be part of a sustainable and nutritious diet. As a follow-up to the F2F Strategy, the EC of 2024-2029 established The Vision for Food and Agriculture. Herein, the EC emphasised strategic autonomy, sustainability, and resilience in food and agriculture by having dialogues with stakeholders to address the challenges and establish tailor-made policy measures.[12]

However, cultivated meat faces challenges. Stakeholders have raised food safety concerns, as the technology is novel and therefore associated with unknown safety risks.[13] Furthermore, high production costs and technological complexity may limit

[6] ibid.
[7] Marlana Malerich and Christopher Bryant, 'Nomenclature of Cell-Cultivated Meat & Seafood Products' (13 January 2023) 6 Npj Science of Food <https://www.nature.com/articles/s41538-022-00172-0>.
[8] Lesley Hughes, 'The Second Domestication of Dairy and Beef', Routledge eBooks (2024) <https://doi.org/10.4324/9781003280316-20>.
[9] Marilia M Knychala and others, 'Precision Fermentation as an Alternative to Animal Protein, a Review' (14 June 2024) 10 Fermentation 315 <https://www.mdpi.com/2311-5637/10/6/315>.
[10] European Commission, 'The European Green Deal' (n 3).
[11] European Commission, 'A Farm to Fork Strategy for a Fair, Healthy and Environmentally Friendly Food System', COM (2020) 381 final, 20 May 2020.
[12] European Commission, 'Vision for Agriculture Food' (Agriculture and Rural Development, 19 February 2025) <https://agriculture.ec.europa.eu/vision-agriculture-food_en>.
[13] European Food Safety Authority, 'The Safety of Cell Culture-Derived Food – Ready for Scientific Evaluation' (10 May 2023) <https://www.efsa.europa.eu/en/news/safety-cell-culture-derived-food-ready-scientific-evaluation>.

accessibility, which could increase the price of the product.[14] Moreover, the energy usage of production is predicted to be high without the usage of renewable energy.[15] Finally, consumer acceptance may be low, particularly in regions with established culinary traditions and cultural preferences that favour conventional foods.[16] At the same time, regulatory tools must accommodate the market entry of cultivated meat.

In conclusion, cultivated meat presents a promising solution for a more sustainable food system. However, regulatory, technological and societal issues should be addressed to guarantee its sustainability alongside traditional agriculture

1.2 Problem Statement

Cultivated meat could be a promising product to accelerate the transition to a more sustainable food system. However, the development and market adoption of cultivated meat face economic, social, and technological challenges. To understand these challenges, it is crucial to consider the interests and motivations of a diverse range of stakeholders involved (e.g., authorities, the food industry, farmers, research institutions, civil society organisations, and consumers). When it comes to cultivated meat, these stakeholders pursue different interests and have complex interrelationships. For example, the EC must balance innovation, food safety, sustainability, and the interests of national governments. These vested interests and tensions of stakeholders manifest in initiatives such as the announced ban on the production of cultivated meat by Italy and the approved pre-market tasting in the Netherlands.[17] These diverging views shape the regulatory framework. While current literature has focused on the technology behind cultivated meat and its environmental benefits, there is a limited understanding of how stakeholder dynamics impact the EU's

[14] NR Jahir and others, 'Cultured Meat in Cellular Agriculture: Advantages, Applications and Challenges' (June 2023) 53 Food Bioscience 102614 <https://www.sciencedirect.com/science/article/pii/S2212429223002651>.
[15] ibid.
[16] ibid.
[17] Augustus Bambridge-Sutton, 'The Future of Italy's Cultivated Meat Ban' (FoodNavigator, 22 February 2024) <https://www.foodnavigator.com/Article/2024/02/22/Italy-s-cultivated-meat-ban-postponed>.; Rijksoverheid, 'Code of Practice for Safely Conducting Tastings of Cultivated Foods Prior to EU Approval' (5 July 2023) https://www.rijksoverheid.nl/documenten/rapporten/2023/07/05/bijlage-cop-safely-conducting-tastings-cultivated-foods-prior-to-eu-approval accessed 27 January 2025.

regulatory landscape, and thus the development and market adoption of cultivated meat.[18]

Therefore, first, the key stakeholders are identified and the various contexts that impact cultivated meat and the regulatory framework for cultivated meat are investigated to understand the status quo of cultivated meat. The Regulation (EU) 2015/2283 on Novel Food and Regulation (EC) 1829/2003 on Genetically Modified Food and Feed are the regulations that are relevant to cultivated meat.[19] These regulations ensure the market approval of novel foods and food products that contain genetically modified organisms (GMOs), guaranteeing that the products are safe for consumption and adequately labelled.

The precautionary principle plays a crucial role in decision-making in the EU. It ensures that when there is scientific uncertainty and the stakes are high, regulators implement precautionary risk measures to protect human and animal health and life, and the environment.[20] However, this principle could potentially slow innovation in cultivated meat.[21] An example illustrates this concern regarding GMOs. When GMOs were introduced, the EU raised concerns about the safety and ethics of GMO products in an early stage of technology development.[22] This hindered further GMO innovation in the EU.[23] This is a significant example because GMOs are a recurring theme in cultivated meat debates, as it could be produced with genetic engineering techniques.[24] Therefore,

[18] Farzana Choudhary and others, 'Understanding Crucial Factors in Cultured Meat Production: A Comprehensive SWOT Analysis' (2024) 4 Applied Food Research 100474 <https://doi.org/10.1016/j.afres.2024.100474>.

[19] Regulation (EU) 2015/2283 of the European Parliament and of the Council of 25 November 2015 on Novel Foods, Amending Regulation (EU) No 1169/2011 of the European Parliament and of the Council and Repealing Regulation (EC) No 258/97 of the European Parliament and of the Council and Commission Regulation (EC) No 1852/2001 [2015]; Regulation (EC) No 1829/2003 of the European Parliament and of the Council of 22 September 2003 on Genetically Modified Food and Feed [2003].

[20] European Parliament, 'The Precautionary Principle: Definitions, Applications and Governance' (9 December 2015) <https://www.europarl.europa.eu/thinktank/en/document/EPRS_IDA(2015)573876>.

[21] Caroline Orset, 'Innovation and the Precautionary Principle' (2 October 2014) 23 Economics of Innovation and New Technology 780 <https://doi.org/10.1080/10438599.2014.907667>.

[22] Menozzi Davide and others, 'A Stakeholder Engagement Approach for Identifying Future Research Directions in the Evaluation of Current and Emerging Applications of GMOs' (31 May 2017) AgEcon Search <https://doi.org/10.22004/ag.econ.276286>.

[23] ibid.

[24] J Mohorčich and Jacy Reese, 'Cell-Cultured Meat: Lessons from GMO Adoption and Resistance' (1 December 2019) 143 Appetite 104408 <https://www.sciencedirect.com/science/article/pii/S0195666319304829>.

cultivated meat may face comparable regulatory challenges, potentially impeding its development and market introduction in the EU.

Cultivated meat falls under GMO Regulation if traces of GMO DNA are present in the final cultivated meat product. Otherwise, the cultivated meat product is regulated under the Novel Food Regulation. Food companies are less willing to invest in GMO products, as the EU regulatory process imposes stringent requirements.[25] Another concern relates to consumer acceptance of cultivated meat as it has not yet entered the EU market. A consumer study in Germany revealed that consumers have a negative perception of GMOs.[26] As a result, Member States hesitate to adopt novel food technologies, especially when they associate them with genetic modification.[27]

Against this background, a stakeholder analysis considers how the influence and position of stakeholders shape the EU's regulatory landscape of cultivated meat. These interests and positions must be understood within the political climate and cultural dynamics of the EU and its Member States. This analysis clarifies the EU regulatory landscape for cultivated meat and identifies opportunities and obstacles for development and market adoption.

1.3 Primary Objective and Research Questions

The primary objective is to investigate stakeholder positions on cultivated meat and their influence on the regulatory framework.

This results in the main research question: "Who are the primary stakeholders in developing and adopting cultivated meat in the European Union, and how do their interests and perceptions shape the regulatory landscape?"

[25] Lonneke Poort and Willem-Jan Kortleven, 'GMO Regulation in Crisis – The Experimental Potential of Regulation (EU) 2020/1043 on COVID-19 in Addressing Both a Crisis and a Pandemic' (September 2021) Law And Method <https://www.bjutijdschriften.nl/tijdschrift/lawandmethod/2021/09/lawandmethod-D-21-00008>.

[26] Sarah Kühl and others, 'Beyond the Cow: Consumer Perceptions and Information Impact on Acceptance of Precision Fermentation-Produced Cheese in Germany' (December 2024) 10 Future Foods 100411 <https://www.sciencedirect.com/science/article/pii/S2666833524001175>.

[27] Julie Babinard and Timothy Josling, 'The Stakeholders and the Struggle for Public Opinion, Regulatory Control and Market Development', Elsevier eBooks (2001) <https://doi.org/10.1016/b978-012515422-2/50011-4>.

To answer the main question, several sub-questions are composed:

1.1 What are the current regulatory frameworks that govern cultivated meat in the EU?
1.2 How do these regulatory frameworks impact cultivated meat development and market adoption?
1.3 Who are primary stakeholders in the cultivated meat sector, and how do their interests and interrelationships influence the regulatory frameworks and ultimately the development and adoption of cultivated meat?

1.4 Methodology

The methodology outlines the methods used, including literature, doctrinal legal, and empirical research. To perform a stakeholder analysis, interviews with stakeholders were conducted. The combination of methods provided a robust and nuanced understanding of the opportunities and challenges for cultivated meat within the EU regulatory landscape.

The literature research examined the status of cultivated meat within consumer preferences and historical, technological, ethical, and environmental contexts. The aim was to develop a holistic understanding of its position in the EU food system and identify challenges and opportunities. The research scope was based on the contexts related to cultivated meat and the EU legal framework. EUR-Lex, EU policy documents, and national initiatives were analysed to assess how the regulatory frameworks impact cultivated meat development and market adoption. Secondary sources, including news articles and position papers, were used to identify stakeholders and evaluate their perspectives. News articles were selected based on relevance to cultivated meat, regulation, political debates and industry developments. Position papers from advocacy organisations were reviewed to understand the narratives of the stakeholders. The recurring themes in literature, position papers and news articles were used for the thematic analysis.

The empirical component of the research involved semi-structured interviews with stakeholders who are involved with regulatory affairs in the field of cultivated meat. Interviewees included representatives from cultivated meat companies, lobbying groups, research institutes, and consultants specialising in alternative proteins. To

select participants with expertise in regulatory affairs, purposive sampling was used, while snowball sampling expanded the pool through interviewee recommendations. A total of twelve interviews were conducted, including representatives from three cultivated meat companies, four organisations advocating for animal welfare and alternative proteins, two research institutes, and three consultants. The objective was to achieve data saturation, which occurs when no new themes emerge.[28] For the participating stakeholders, data saturation was achieved as no new themes were occurring.

Interviews were conducted via MS Teams or in person between early November and early January, lasting 30 to 60 minutes each. An interview guide (Appendix 8.2) provided structure and allowed for follow-up questions. The interview questions were created based on the regulatory framework and the conflicts raised in literature and news articles, for instance, the ban in Italy and Hungary, the public consultation process of the European Food Safety Authority (EFSA), and the interference of GMOs and cultivated meat. All interviews were audio-recorded, transcribed, and securely stored in a personal database. Two interviews were conducted in Dutch and, later translated into English.

Data analysis involved both deductive and inductive coding. Themes, such as the role of GMOs in cultivated meat development and political resistance, were identified based on the literature. Other themes from the interview data were identified inductively, such as references to other jurisdictions and interdisciplinary collaboration. A codebook was developed in Excel, and ATLAS.ti 25 software was used for coding the transcriptions. To ensure participant privacy, interviewees asked the interviewer to review their quotations before publication and remain anonymous if desired. Anonymous quotations were categorised by stakeholder type and date, while others were attributed to individuals, organisations, or companies. Themes were identified based on their recurrence across the literature, position papers, and interview data. The themes identified in the literature are, for example, the influence of GMOs on cultivated meat development, regulatory challenges, misleading narratives, and the coexistence between traditional farming and cellular agriculture. The interview data validated these

[28] Monique Hennink and Bonnie N Kaiser, 'Sample Sizes for Saturation in Qualitative Research: A Systematic Review of Empirical Tests' (January 2021) 292 Social Science & Medicine 114523 <https://www.sciencedirect.com/science/article/pii/S0277953621008558>.

themes. Another method used to identify themes was analysing the conflict points and policy recommendations that stakeholders mentioned, such as the conflict between fostering innovation and safeguarding regulation.

1.5 Limitations

The research revealed several limitations. The methodological limitation is the lack of diversity among the stakeholders interviewed and the bias towards proponents of cultivated meat. The stakeholders were all involved in fostering the development of cultivated meat. To get a comprehensive understanding of the challenges and opportunities, it is essential to interview individuals or associations who might be affected adversely by the market adoption of cultivated meat. Multiple individuals were contacted, however, due to their non-responsiveness, insufficient expertise in regulatory matters or lack of a position on cultivated meat as an organisation, it was impossible to include their perspectives in the empirical research. However, position papers and news articles provided insights into their perspectives and influence on the regulatory landscape.

Furthermore, stakeholder bias may have influenced the research outcome as interviewees shared their experiences and perspectives based on their position in the cultivated meat sector. The sample composition may have further biased toward particular perspectives. For future research, interviewing all stakeholders would be relevant as it will result in a more holistic overview of perspectives and positions towards cultivated meat and their opportunities and challenges in such a regulatory landscape.

1.6 Structure

The first chapter identifies the relevant stakeholders and examines the status quo of cultivated meat. It includes how cultivated meat could contribute to a sustainable food system. The following chapter covers the regulatory framework of cultivated meat. In the first part of the third chapter, the policy initiatives at the EU level and political influences on the EU regulatory processes are analysed in relation to their stance towards cultivated meat and stakeholder influences. The second part of the third chapter includes the policy initiatives that are taken by national governments. The latter chapter presents the findings based on the interviews by conducting a thematic analysis. The concluding chapter ends with a conclusion and recommendations.

2. Stakeholder Landscape and Current Developments in Cultivated Meat: A Literature Review

The chapter on the stakeholder landscape and current developments in cultivated meat identifies the key stakeholders and examines the status quo of cultivated meat developments in the EU. It provides a critical overview of stakeholder roles and their interests, perceptions, and interactions regarding cultivated meat. A literature review explores the environments in which cultivated meat is positioned.

2.1 Stakeholder Identification

A stakeholder identification identifies and describes the stakeholders based on their function and role in the cultivated meat sector.[29]

2.1.1 Authorisation bodies

The authorisation bodies are responsible for the approval of novel foods. The authorisation bodies include the EFSA, the EC, and the Standing Committee on Plants, Animals, Food, and Feed (PAFF). The PAFF Committee comprises experts from Member States with diverse interests, including economic concerns and divergent stakeholder perspectives. Their arguments will be based not only on EFSA's risk assessment but also on other legitimate factors, such as consumer acceptance and economic concerns.[30] This could influence the approval of the current novel food applications of cultivated meat.

2.1.2 Other relevant EU bodies

The other relevant EU bodies are the European Parliament (EP) and the Council of the European Union. They are responsible for passing legislation based on the proposals of the EC. The EP represents the citizens of the EU, and the Council of the EU consists of the government ministers from each Member State, depending on the policy area being debated.[31]

The EP and the Council of the EU are not directly involved with the novel food authorisation procedure. However, their legislative decisions could influence the broader regulatory landscape for cultivated meat. The outcomes of policy debates could shape

[29] R Brugha, 'Stakeholder Analysis: A Review' (September 2000) 15 Health Policy and Planning 239 <https://pubmed.ncbi.nlm.nih.gov/11012397/>.
[30] Interview with a consultant (Wageningen, 18 November 2024)
[31] Article 14 of the Consolidated Version of the Treaty on European Union [2012] OJ C326/13.

the direction of how cultivated meat will be governed in the future. For instance, the EP and Council of the EU were responsible for adopting the current NFR and repealing Regulation (EC) No 258/97 in 2015 to increase the efficiency of the overall authorisation process.[32]

2.1.3 Cultivated meat industry

The cultivated meat industry consists of start-ups and SMEs. Examples of companies that specialise in cultivated meat are Mosa Meat (NL), Meatable (NL), Gourmey (FR), and BLUU Seafood (DE). Gourmey was the first company to apply for EU market approval in July 2024.[33]

The cultivated meat industry emphasises the importance of reaching policy initiatives related to climate goals, such as the F2F Strategy.[34] They also stated that cellular agriculture could foster a sustainable and resilient food system. Regarding the regulatory framework, the cellular agriculture sector wants to contribute to making it fit for purpose. It aims to share feedback on the EFSA guidelines and improve communication between consumers, policymakers, and regulators about the benefits of cultivated products.[35]

Due to the promising characteristics of cultivated meat as a possible solution for climate issues, a competitive environment is created where cultivated meat companies are racing to market their products.[36] This could compromise safety, sustainability, and ethical considerations. Additionally, the competitive environment results in the protection of intellectual property rights and less cooperation between the companies, which could result in the privatisation of cultivated meat technology and could hinder the overall success of cultivated meat in the long term.[37]

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[32] Regulation (EU) 2015/2283 (n 19).
[33] EIT Food, 'GOURMEY Files the First EU Novel Food Submission for Cultured Meat' (29 July 2024) <https://www.eitfood.eu/news/gourmey-files-the-first-eu-novel-food-submission-for-cultured-meat>.
[34] Valeria Teloni, 'Safety and Regulatory Aspects of Cell Cultured Foods: Insights from the Industry' (Presentation, 20 June 2023) <https://www.efsa.europa.eu/sites/default/files/2023-06/4.%20Valeria%20TELONI.pdf>.
[35] ibid.
[36] Dwayne Holmes and others, 'Cultured Meat Needs a Race to Mission Not a Race to Market' (18 October 2022) 3 Nature Food 785 <https://www.nature.com/articles/s43016-022-00586-9.pdf?utm_source=sciencedirect_contenthosting&getft_integrator=sciencedirect_contenthosting>.
[37] ibid.

2.1.4 Advocacy groups

Various advocacy groups in the EU lobby in the field of cellular agriculture. Their positions vary according to the different objectives of the lobbyist groups. In the EU, lobbyist groups advocating for animal agriculture received 1200 times more funding from the livestock farming sector than those advocating for the plant-based industry.[38] The agricultural sector is a large sector, which could be attributed to the considerable influence of the meat industry on the EU decision-making process. Lobbying is a legal instrument in the EU. However, as a step to make it fair and transparent, the transparency register was established in 2011.[39] Here, lobbyist groups can register themselves if they seek to influence EU decision-making. This section is divided into paragraphs on groups advocating for animal agriculture, animal welfare, plant-based society, and cellular agriculture.

i. Animal agricultural advocacy groups

Certain animal agricultural associations are critical and cautious about cultivated meat.[40] They are driven by food safety concerns and the socioeconomic impacts of cultivated meat on animal agriculture. For example, the animal agricultural associations Copa Cogeca and Farm Europe represent the interests of farmers and agri-food businesses. They advocate for a sustainable and competitive agricultural sector while ensuring food security.[41] The larger animal agriculture associations lobby for their interests in agricultural policies through their connections in DG AGRI, the AgriFish Council, and the Agricultural Committee of the EC.[42] They have a critical attitude towards cultivated meat, arguing that questions remain unanswered by the cultivated meat industry. Examples of such questions include the environmental and societal

[38] Simona Vallone and Eric F Lambin, 'Public Policies and Vested Interests Preserve the Animal Farming Status Quo at the Expense of Animal Product Analogs' (15 September 2023) 6 One Earth 1213 <https://www.cell.com/one-earth/fulltext/S2590-3322(23)00347-0>.; Damian Carrington, ''Gigantic' Power of Meat Industry Blocking Green Alternatives, Study Finds' (The Guardian, 18 August 2023) <https://www.theguardian.com/environment/2023/aug/18/gigantic-power-of-meat-industry-blocking-green-alternatives-study-finds>.

[39] European Union, 'Transparency Register' (10 April 2024) <https://transparency-register.europa.eu/index_en>.

[40] European Food Safety Authority, 'EFSA Scientific Colloquium 27: Cell Culture-derived Foods and Food Ingredients' (11 March 2024) <https://www.efsa.europa.eu/en/supporting/pub/en-8664>.

[41] Susannah Savage and Thin Lei Win, 'The Truth behind Europe's Most Powerful Farmers Lobby' (Politico, 29 June 2023) <https://www.politico.eu/article/copa-cogeca-farmering-lobby-europe/>.

[42] ibid.

impacts, the role of GMOs, the calculation of energy use of production, the risk of monopolisation of large cultivated meat corporations, the position of farmers in the cultivated sector, and the assessment of consumer acceptance.[43]

ii. Animal welfare advocacy groups

Animal welfare advocacy groups aim to foster the interests and position of animals in society by advocating for improved legislation, standards, and enforcement. Cultivated meat could be one of the promising solutions for achieving a transition to a sustainable food system, as it could significantly reduce the number of animals that are farmed and put an end to animal suffering.[44] Many animal welfare groups believe that the production of cultivated meat should be made available for small-scale farmers and prevent the monopolisation of large companies.

GAIA, an animal welfare group, has issued a scientific report on the environmental impact of cultivated meat in collaboration with the Good Food Institute (GFI) and cultivated meat companies.[45] The report concluded that cultivated meat could reduce the environmental impact by about 93% compared to beef, by 53% compared to pork and by 29% compared to poultry. A consultant of GAIA stated: *"If you want to do good for the environment, then you should eat as much plant-based food as possible. If you still want to eat meat, it is best to eat cultivated meat made with green energy: good for the animals and the environment."*[46] Another research project of GAIA in collaboration with RESPECTfarms is on the feasibility of producing cultivated meat on conventional European farms and how farmers could be included in this collaboration.[47]

iii. Plant-based advocacy groups

Advocacy groups in the alternative protein and plant-based sector include ProVeg International and the Good Food Institute (GFI). These non-governmental organisations promote plant-based diets and the position of alternative proteins, including cultivated

[43] Farm Europe, 'Food Is Coming from Farmers, Not from Labs' (24 October 2024) <https://www.farm-europe.eu/news/food-is-coming-from-farmers-not-from-labs/>.
[44] GAIA, 'Kweekvlees' (1 February 2025) <https://www.kweekvlees.be/>.
[45] GAIA, 'GAIA Launches Worldwide Scientific First: Environmental Impact Study on Cultivated Meat' (9 March 2021) <https://www.gaia.be/en/news/gaia-launches-worldwide-scientific-first-environmental-impact-study-cultivated-meat>.
[46] ibid.
[47] GAIA, 'RESPECTfarms Bereidt de Toekomst van de Landbouw Voor' (8 February 2023) <https://www.gaia.be/nl/nieuws/respectfarms-bereidt-de-toekomst-van-de-landbouw-voor>.

meat. Their approach includes assisting the sustainable transition by creating awareness, investing in scientific research, advocating for public funding, and encouraging stakeholder engagement.[48] They view cultivated meat as a possible solution for improving animal welfare, reducing the reliance on animal agriculture, and tackling climate change.[49]

iv. Cellular agricultural advocacy groups

Cellular agricultural associations, like Cellular Agriculture Europe, aim to foster development in cellular agriculture and transform the agriculture sector through alternative proteins and more sustainable practices.[50] They advocate for a harmonised regulatory environment that could be reached by collaboration between policymakers, academia, regulators, and EFSA and the exchange of data between companies and stakeholders. They also provide consumer education about the benefits of cellular agriculture. Another cellular agricultural organisation is RESPECTfarms. They are focused on transitioning livestock farming into cultivated-producing practices in the Netherlands by supporting farmers with a business model that entails decentralised, domestic production of cultivated meat.[51] Farmers are responsible for keeping the livestock and producing the cultivated meat in bioreactors on their land instead of selling the animals' cells to larger cultivated meat companies.[52]

2.1.5 Research institutes

Certain research institutes explore the potential of cultivated meat. For example, the collaboration between Maastricht University, Delft University of Technology, and Wageningen University & Research (NL) established projects that tackle the technological challenges of cultivated meat production and developed courses that focus

[48] Heather Mount, 'What Is Cultivated Meat?' (The Good Food Institute, 20 November 2024) <https://gfi.org/cultivated/>.
[49] Elliot Swartz, 'The Science of Cultivated Meat' (The Good Food Institute, 5 July 2023) <https://gfi.org/science/the-science-of-cultivated-meat/>.; ProVeg International, 'The Latest Developments in Cellular Agriculture' (4 March 2024) <https://proveg.org/cellular-agriculture/>.
[50] Cellular Agriculture Europe, 'About Us' (3 September 2024) <https://www.cellularagriculture.eu/about-us/>.
[51] RESPECTFarms, 'Home' <https://www.respectfarms.com/>.
[52] Etske Bijl, 'Next-Gen Businesses Produce Meat without Animals and Fish without a Catch' WUR (11 December 2024) <https://www.wur.nl/en/newsarticle/next-gen-businesses-produce-meat-without-animals-and-fish-without-a-catch.htm>.

on cellular agriculture.[53] In addition to universities, New Harvest is an independent research institute focusing on cellular agriculture. They aim to establish a robust foundation for developing cultivated products by supporting open-access research projects, collaborating with various stakeholders, and educating on cellular agriculture.[54]

2.1.6 Alternative Protein Consultancy

Various consultancy companies support stakeholders in the alternative protein industry. These companies specialise in the regulatory framework of cultivated proteins and could assist policymakers and cultivated meat companies, for example.

2.1.7 Consumers

Consumers are key stakeholders in determining whether cultivated meat will gain market acceptance. Understanding the perspectives of consumers is crucial to assessing market viability and acceptance.

Consumer perceptions are based on perceived physical attributes compared to other types of products, like conventional meat or different plant-based products, as cultivated meat products are not on the market in the EU.[55] A study investigated the perception of Southern European consumers towards cultivated meat. Consistent themes were reviewed that shaped their views. These included concerns regarding cultural heritage, safety, and the impact on traditional farming.[56] These concerns could influence consumer attitudes and could impact the regulatory direction of cultivated meat.

[53] R.H. Wijffels, 'Wageningen to Provide Cellular Agriculture Education and Research' (23 October 2024) <https://www.wur.nl/en/newsarticle/wageningen-to-provide-cellular-agriculture-education-and-research.htm>.
[54] New Harvest, 'What We Do' (7 July 2021) <https://new-harvest.org/what-we-do/>.
[55] Barbara Borusiak, Diana Bogueva and Dora Marinova, 'Consumer Perception of Cultivated Meat', Consumer Perceptions and Food (24 October 2024) <https://doi.org/10.1007/978-981-97-7870-6_14>.
[56] Jingjing Liu and others, 'Perception of Cultured 'Meat' by Italian, Portuguese, and Spanish Consumers' (20 June 2023) 10 Frontiers in Nutrition <https://www.frontiersin.org/journals/nutrition/articles/10.3389/fnut.2023.1043618/full>.

2.2 Status Quo of Cultivated Meat

This section describes the status quo of cultivated meat, considering its historical, technological, ethical, and environmental contexts and the challenges and opportunities it faces. The objective of assessing the status quo is to get a comprehensive understanding of its position in the EU food system and evaluate its potential role in a sustainable and resilient food system. It highlights the promising yet complex environment in which cultivated meat is emerging.

2.2.1 Historical Context

The integration of meat as part of diets goes back to around 11.000 years ago when the first cattle were domesticated.[57] From then onwards, animal agriculture has been developing rapidly, especially after 1950, as urbanisation and development resulted in a shift in diet. Diets moved from a diet based on the availability of locally produced ingredients to a diet with more convenient and fast foods made from ingredients farther from home. In addition, incomes increased, which boosted the demand for livestock products.[58] Now, it is expected that worldwide, the demand for meat will almost double by 2050.[59] This expected increase raises concerns on its environmental, ethical, and economic implications. This is where cultivated meat comes into play as it could be a potential solution to achieve this demand more sustainably. However, reducing the overall meat demand is also a critical consideration, which policy measures and consumer awareness could foster.[60]

In 1931, Winston Churchill already foresaw the future of cultivated meat in his essay 'Fifty Years Hence', stating: *"We shall escape the absurdity of growing a whole chicken to consume just the breast or wing by cultivating these parts separately in an*

[57] Albano Beja-Pereira and others, 'The Origin of European Cattle: Evidence from Modern and Ancient DNA' (11 May 2006) 103 Proceedings of the National Academy of Sciences 8113 <https://pmc.ncbi.nlm.nih.gov/articles/PMC1472438/>.

58 Food and Agriculture of the United States (FAO), 'Livestock's Long Shadow' (2006) <https://www.fao.org/4/a0701e/a0701e00.htm>.

[59] Food and Agriculture of the United States (FAO), 'How to Feed the World in 2050' (June 2009) <https://www.fao.org/fileadmin/templates/wsfs/docs/expert_paper/How_to_Feed_the_World_in_2050.pdf>.

[60] Christopher Bryant and others, 'A Review of Policy Levers to Reduce Meat Production and Consumption' (2024) Appetite 107684 <https://www.sciencedirect.com/science/article/pii/S0195666324004872?casa_token=ZCYOCla3MhkAAAAA:14o8jFW6K2N5OJy1rdISQeIWX8jHj0IPHMnm_LgvUCMoB2kvLjtGJQonC39_e2Ox2LoIniTjoYU#sec5>.

appropriate medium."[61] This quote is from his essay reflecting on the rapid advancements in science and technology following World War I, where he speculated about the future considering the ethical concerns, such as animal welfare and the role of human intervention in nature.

Fast forward to 2013, when the world's first cultivated burger was unveiled at Maastricht University. This burger had a price of around 325.000 dollars, and the production took two years.[62] Over the last decade, there has been an increase in companies specialising in cultivated meat. In 2022, the Singapore Food Agency (SFA) approved the first cultivated meat product for market adoption in Singapore. The US followed with the regulatory approval of a cultivated meat product in 2023.[63] In the EU, the first application for market approval of a cultivated meat product was submitted by a French company called Gourmey in July 2024, followed by a second application by the company Mosa Meat in January 2025.[64]

2.2.2 Technological Context

The technological context gives insight into the production process and its technological challenges. Cultivated meat production is based on tissue engineering, which can be divided into four steps: biopsy, cell isolation, cell expansion, and cell differentiation on scaffolds, also seen in Figure 1.[65]

[61] New Harvest, 'A Reflection of New Harvest's Achievements: Bringing Winston Churchill's Prediction to Life' (4 October 2021) https://new-harvest.org/winston-churchill-prediction/ accessed 27 January 2025.
[62] Henry Fountain, 'Engineering the $325,000 in Vitro Burger' (The New York Times, 12 May 2013) <https://www.nytimes.com/2013/05/14/science/engineering-the-325000-in-vitro-burger.html>.
[63] Elliot Swartz (n 49).
[64] New Food, 'Gourmey Seeks Cultivated Foods Approval in Five Key Markets' (30 July 2024) https://www.newfoodmagazine.com/news/241834/gourmey-cultivated-foods-approval/; Alessandro Ford, 'Dutch Pioneer Files EU's Second Lab-Grown Meat Application' (Politico, 22 January 2025) <https://www.politico.eu/article/eu-mosa-meat-european-union-ceo-dutch-food-company-price/>.
[65] Shlomit David and others, 'Co-Culture Approaches for Cultivated Meat Production' (Nature, 12 June 2023) 1 Nature Reviews Bioengineering 817 <https://www.nature.com/articles/s44222-023-00077-x>.

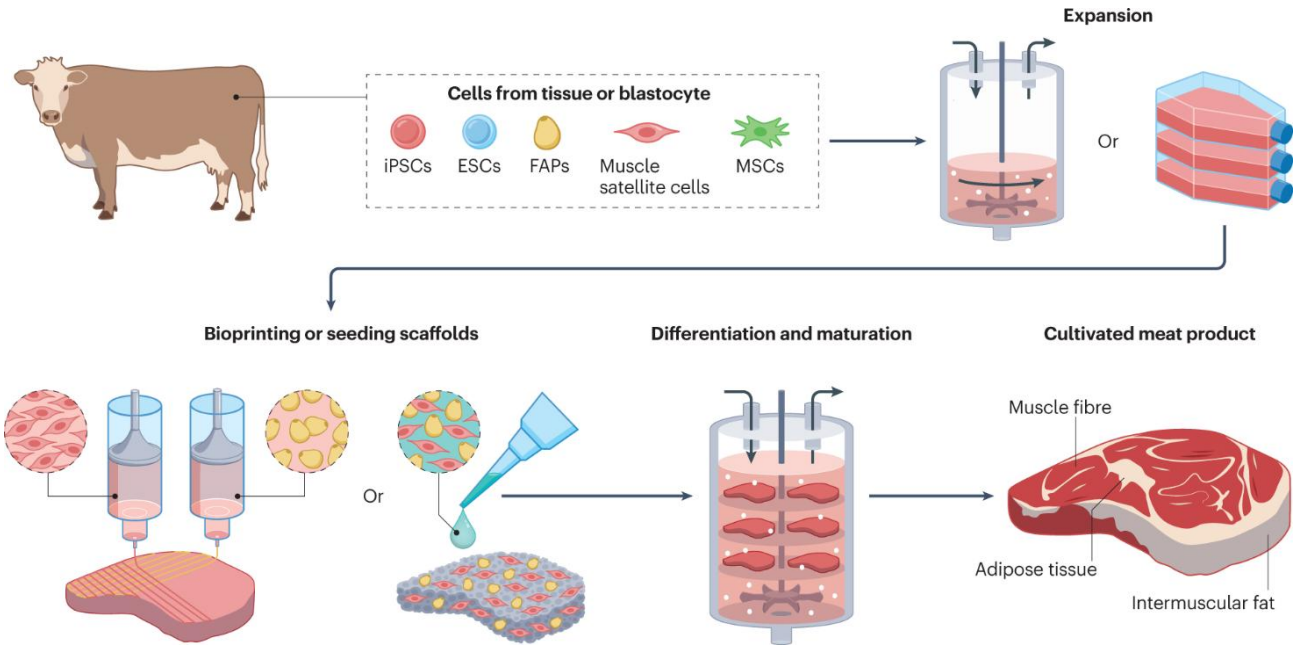

Figure 1: Simplified illustration of the production of cultivated meat.[66]

First, during a biopsy, stem cells are taken from the animal donor. These cells are extracted, as they can develop into other specialised types, like muscle or fat cells.[67] The stem cells are placed into bioreactors that are large tanks containing a growth medium. The growth medium includes essential nutrients for cell proliferation. The type of growth medium will decide how the stem cells will differentiate into the muscle, connective tissue, or fat cells. After the expansion stage, the scaffolding stage will begin. This entails the separation and building of the desired meat product. The function of a scaffold can be described as an edible material that fosters the arrangement of the cells into the desired product. It also serves as an intermediary of the nutrients and encourages further cell differentiation.[68] The production is performed under a strictly controlled environment to ensure that the growing conditions are identical to natural conditions in terms of temperature, pH, pressure dissolved oxygen, dissolved ammonia, dissolved carbon dioxide, glucose, cell density, and cell viability.[69]

[66] ibid.
[67] Mark J Post and others, 'Scientific, Sustainability and Regulatory Challenges of Cultured Meat' (16 July 2020) 1 Nature Food 403 <https://www.nature.com/articles/s43016-020-0112-z>.
[68] ibid.
[69] Dnyandeo Pawar and others, 'Current and Future Technologies for Monitoring Cultured Meat: A Review' (November 2023) 173 Food Research International 113464 <https://www.sciencedirect.com/science/article/pii/S0963996923010128?via%3Dihub>.

Producing cultivated meat presents several technological challenges. One challenge is that developing the cells in bioreactors consumes much energy. The advancement of bioreactors may soon reduce energy consumption.[70] Other solutions are the recycling of waste streams and the use of renewable energy.

Another challenge is related to upscaling production. Cultivated meat is now only produced on a small scale. However, cultivated meat is only economically feasible if the production is upscaled.[71] Various complex challenges related to engineering, price, and sustainability are involved in upscaling production.[72] These technological challenges should be addressed to foster the development and market adoption of cultivated meat.

2.2.3 Ethical Context and Consumer Preferences

Ethical considerations, including animal welfare, food equity, and food sovereignty, are evaluated to identify concerns about the production of cultivated meat. Furthermore, consumer preferences, including naturalness and techno-scepticism, are investigated.

i. Animal welfare

Animal welfare is a motivator for the development of cultivated meat. Animal welfare has been an important topic in the EU, which is reflected in the outcome of a survey about European attitudes towards animal welfare: "*83% of the Europeans believe that the welfare of farmed animals should be better protected in their country than it is now*".[73] Cultivated meat has a market advantage as no or very limited animal suffering or killing is necessary for the production. It is important to consider that animals are indeed used to obtain stem cells via biopsy. The biopsy is performed under local anaesthesia to minimise pain and reduce stress.[74] Furthermore, only a limited number of animals is required.

[70] Jiaqi Cai and others, 'Industrialization Progress and Challenges of Cultivated Meat' (15 July 2023) 4 Journal of Future Foods 119 <https://www.sciencedirect.com/science/article/pii/S2772566923000472>.
[71] Maria Clara Manzoki and others, 'Scaling-Up of Cultivated Meat Production Process', Cultivated meat (6 June 2024) <https://doi.org/10.1007/978-3-031-55968-6_12>.
[72] ibid.
[73] European Commission, 'Animal Welfare' <https://food.ec.europa.eu/animals/animal-welfare_en>.
[74] Lea Melzener and others, 'Cultured Beef: From Small Biopsy to Substantial Quantity' (27 July 2020) 101 Journal of the Science of Food and Agriculture 7 <https://pmc.ncbi.nlm.nih.gov/articles/PMC7689697/>.

The issue regarding animal welfare is related to the growth medium. The growth medium is often derived from animal sources, like foetal calf serum (FBS). This causes ethical concerns. Some companies are focusing on developing plant-based growth media, which shows a promising substitute for the animal-based growth medium.

In the case of animal welfare, cultivated meat would attract meat consumers who are uncomfortable with the slaughtering of animals but are not willing to change their dietary preferences for animal products. In that sense, cultivated meat will not substitute all conventional animal products but be a complementary product.[75]

ii. Food security and food sovereignty

Food security and food sovereignty have been debated intensively globally due to the current war in Ukraine and the COVID-19 pandemic, which both impacted the global agri-food trade.[76] Food security is defined as *"The state when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life".*[77] Food sovereignty is a more contested concept, as it is interpreted differently depending on the stakeholder.

Food sovereignty is defined by the Nyéléni Forum as "*The right of people to define their own food, agriculture, livestock, and fisheries systems and policies."*[78] This social movement is driven by the focus on protecting the domestic market and trade policies that promote the right to food for smallholders and peasants, often in opposition to large agri-businesses. In contrast, the EU emphasises food sovereignty to ensure food security. They aim for organic and domestic food production instead of relying on imports to make the food system more resilient.[79] Conversely to the social movement, the EU does not oppose large agri-businesses.

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[75] ibid.
[76] Tarja Laaninen, 'Russia's War on Ukraine: EU Food Policy Implications' (April 2022) PE 729.368 <https://www.europarl.europa.eu/RegData/etudes/ATAG/2022/729368/EPRS_ATA(2022)729368_EN.pdf>.
[77] World Food Summit and World Bank, 'Policy Brief' (FAO, 2006) <https://www.fao.org/fileadmin/templates/faoitaly/documents/pdf/pdf_Food_Security_Cocept_Note.pdf>.
[78] Nyeleni Europe, 'Food Sovereignty' <https://nyeleni-eca.net/food-sovereignty>.
[79] European Commission, 'EU Protein Strategy', COM (2023) 123 final https://www.europarl.europa.eu/RegData/etudes/BRIE/2023/751426/EPRS_BRI(2023)751426_EN.pdf accessed 27 January 2025.

The demand for animal agricultural products in Europe has been rising.[80] In a theoretical sense, cultivated meat could meet the rising demand for animal protein as it is not reliant on location or import. Therefore, it could, for example, be produced locally and thus be identifiable by consumers as a domestic product. However, it is still unsure what the position of cultivated meat will be in a practical sense, as it is not on the EU market yet.

iii. Reduction of meat consumption

The reduction of (red) meat consumption is an action point of the F2F Strategy.[81] The consumption of large quantities of meat is not recommended because it has been linked to adverse health impacts.[82] The technologies behind cultivated meat are flexible and dynamic.[83] Therefore, the negative health attributes of conventional meat could, for example, be omitted in cultivated meat without compromising on the taste. It is essential to assess whether a cultured meat product is associated with the same adverse health effects as conventional meat while also providing similar or even superior nutritional value.[84] Thus, it should be investigated if cultivated meat is an adequate solution for a more sustainable and healthier food system.[85]

iv. Naturalness and techno-scepticism

The introduction of GMO products in the EU is an example of how certain food innovations are perceived by consumers as unnatural. Cultivated meat is in vitro produced. Therefore, consumers could associate cultivated meat with the 'yuck' factor.[86] The yuck factor is a feeling of disgust that could result in the rejection of cultivated meat in practice. Consumer education and transparent communication by governments and the cultivated meat industry are essential to building trust in cultivated meat and

[80] Martin Krøyer Rasmussen and others, "Critical Review of Cultivated Meat from a Nordic Perspective" (February 2024) 144 Trends in Food Science & Technology 104336 <https://www.sciencedirect.com/science/article/pii/S0924224424000128?via%3Dihub>.
[81] European Commission, 'A Farm to Fork Strategy' (n 11).
[82] Jeanine M Genkinger and Anita Koushik, 'Meat Consumption and Cancer Risk' (11 December 2007) 4 PLoS Medicine e345 <https://pmc.ncbi.nlm.nih.gov/articles/PMC2121650/>.
[83] Pei Ying Lim, Ratima Suntornnond and Deepak Choudhury, 'The Nutritional Paradigm of Cultivated Meat: Bridging Science and Sustainability' (February 2025) 156 Trends in Food Science & Technology 104838 <https://www.sciencedirect.com/science/article/pii/S0924224424005144#sec6>.
[84] ibid.
[85] Marlana Malerich and Christopher Bryant (n 7).
[86] Martin Krøyer Rasmussen and others (n 80).

thus preventing techno-scepticism. Examples of transparent communication are clear labelling, branding, and food certification.[87]

v. Conclusion

This section explores the ethical considerations and consumer preferences shaping the opportunities and challenges for cultivated meat. Cultivated meat highlights the potential to address issues such as animal suffering and food security. However, challenges exist regarding consumer perceptions of cultivated meat. Consumer acceptance can be fostered by investing in education and ensuring transparency in the risk assessment. The following part discusses the environmental context, as cultivated meat companies promote cultivated meat as a sustainable alternative to conventional meat.

2.2.4 Environmental Context

The environmental benefits of cultivated meat are a main aspect used for marketing by the cultivated protein sector. The global food system is one of the largest contributors to climate change, loss of biodiversity due to deforestation, and the overuse of fertilisers and pesticides. The production of animal-based products, such as eggs, dairy, and meat, has the highest environmental impact compared with other food products. The current state of industrial animal agriculture is based on a high production rate with high efficiency, which results in greenhouse gases, excessive loads of manure, antibiotic resistance, deforestation, and decreased animal welfare.[88] Thus, changing the food system is essential to combat these challenges. Cultivated meat could be a solution to reduce the environmental impact of animal agriculture.

Several Life-Cycle Assessments (LCA) have been established to investigate the environmental impact of cultivated meat.[89] However, cultivated meat is still not produced on an industrial level. Therefore, the environmental impacts are calculated

[87] ibid.
[88] Shanna McCormack, 'Climate Change and Animal Agriculture: Federal Actions Protect the Biggest Contributors from the Disasters They Cause' (2021) 51 JSTOR 745 <https://www.jstor.org/stable/48628532>.
[89] Pelle Sinke and others, 'Ex-ante Life Cycle Assessment of Commercial-scale Cultivated Meat Production in 2030' (2023) <https://link.springer.com/content/pdf/10.1007/s11367-022-02128-8.pdf>.; Mohammad El Wali and others, 'Life Cycle Assessment of Culture Media with Alternative Compositions for Cultured Meat Production' (2024) 29 The International Journal of Life Cycle Assessment 2077 <https://link.springer.com/article/10.1007/s11367-024-02350-6>.

via scientific models based on the current research and state of technology. In the following paragraphs, the carbon footprint, land use, and water use of cultivated meat production are explained and compared to conventional meat production.

i. Carbon footprint

The carbon footprint of animal products is based on the use of fertiliser, animal digestion, and manure storage. In contrast, the carbon footprint of cultivated meat is caused by the energy usage of the facility to condition the optimal growth environment.[90] The carbon footprint of cultivated meat is estimated to be lower than that of animal products if renewable energy sources are used.[91] If fossil fuels are used in the cultivated meat production, CO_2 will be emitted. CO_2 accumulates longer in the atmosphere than CH_4 emitted from livestock.[92] Therefore, the emission of cultivated meat could have a larger impact on climate change in the long term as CO_2 accumulates more than CH_4.[93] Thus, renewable energy sources can significantly influence its environmental impact, highlighting the importance of sustainable practices in food production.

ii. Land use

At present, livestock feed production uses one-third of the land on earth. 67% of deforestation is related to livestock production.[94] Cultivated meat will require less land use as it eliminates the need for intensive livestock farming and feed cultivation. The amount of land that is needed to grow the nutrients for the growth of cultivated cells is estimated to be low. In the case of conventional crops, such as wheat, corn, and soy, the growth medium will depend on the efficiency of cultivated meat production. This is defined by the size of the raw material input that can be converted to one kilogram of cultivated meat.[95] So, the production of cultivated meat will result in less land use compared to conventional animal agriculture.

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[90] What is Cultivated Meat, 'Environment' <https://www.whatiscultivatedmeat.com/environment#:~:text=Including%20the%20rest%20of%20the,equivalents%20per%20kilogram%20of%20meat accessed> 27 January 2025.
[91] Da Young Lee and others, 'Environmental Impact of Meat Protein Substitutes: A Mini-Review' (1 January 2025) 45 Food Science of Animal Resources 62 <https://pmc.ncbi.nlm.nih.gov/articles/PMC11743834/>.
[92] ibid.
[93] ibid.
[94] Hanna L Tuomisto and Toni Ryynänen, 'Environmental Impacts of Cultivated Meat', (6 June 2024) <https://doi.org/10.1007/978-3-031-55968-6_14>.
[95] A.T. Kearney, 'How Cultured Meat and Meat Alternatives Will Disrupt the Agricultural and Food Industry' <https://eionet.kormany.hu/download/2/89/92000/Meat_alternatives.pdf>.

iii. Water use

Animal agriculture is responsible for 30% of the use of water resources.[96] The water use of cultivated meat is still uncertain. It depends on the type of culture medium, production processes, the energy source used, options for recycling water, and whether fresh or seawater is utilised for cooling.[97] The water use for conventional meat is high, as the production of feed is also included in the calculation.[98] Cultivated meat production is a closed-loop production. Therefore, the emission of wastewater is reduced compared with conventional meat production.[99] In conclusion, cultivated meat production offers a more sustainable option to traditional meat agriculture by minimising wastewater emissions and possibly lowering overall water consumption. However, water usage is still uncertain and reliant on a variety of factors.

iv. Conclusion

In conclusion, the environmental context highlights the potential of cultivated meat as a more sustainable alternative to conventional animal agriculture. However, further research is needed to confirm the lower environmental impact of cultivated meat compared with other protein sources. The environmental impact is dependent on the type of energy source used and advancements in production efficiency. Overall, cultivated meat is presenting a promising innovation to address environmental challenges.

2.3 Conclusion

This chapter identifies the key stakeholders and explores the status quo of cultivated meat in historical, technological, ethical, and environmental contexts. This provides a comprehensive understanding of its current role and potential in addressing the EU food system issues, such as reducing the environmental impact, enhancing food security, and improving animal welfare. In the next chapter, the focus shifts to the regulatory framework of cultivated meat, examining the relevant regulations and policy documents.

[96] Sergiy Smetana and others, 'Meat Substitutes: Resource Demands and Environmental Footprints' (March 2022) 190 Resources Conservation and Recycling 106831 <https://www.sciencedirect.com/science/article/pii/S0921344922006632>.
[97] Hanna L Tuomisto and Toni Ryynänen (n 94).
[98] Arjen Y Hoekstra, 'The Hidden Water Resource Use behind Meat and Dairy' (2012) 2 Animal Frontiers 3 <https://academic.oup.com/af/article/2/2/3/4638610?login=false>.
[99] Hanna L Tuomisto and Toni Ryynänen (n 94).

3. The Regulatory Framework of Cultivated Meat

3.1 Introduction

The relevant regulations that govern cultivated meat are Regulation (EC) No 178/2002 on General Food Law (GFLR), and more specifically Regulation (EU) 2015/2283 on Novel Food (NFR) and Regulation (EC) No 1829/2003 on Genetically Modified Food and Feed (GMR). There exists no specific legal framework for cultivated meat or cellular agriculture.

3.2 Relevant Regulations

3.2.1 General Food Law

Regulation (EC) No 178/2002 is the foundation for general food law in the EU.[100] It is referred to as the General Food Law (GFLR) and provides the foundation for consumer protection and the effective functioning of the internal market. The GFLR was established after several food outbreaks, including the BSE food crisis.[101] It aims to "*ensure a high level of protection of human life and consumers' interests related to food while ensuring the effective functioning of the internal market*."[102] Therefore, general principles, requirements, and procedures for all stages of food and feed production and distribution are established to aim for this level of safety. The GFLR is the base for other food regulations.

An important principle of the GFLR is the precautionary principle. As Article 7 GFLR states, the precautionary principle will be applied when there is a possibility of harmful effects on health in addition to scientific uncertainty.[103] Therefore, risk management measures will be taken to ensure a high level of human protection. The risk measures should be non-discriminatory and proportionate.[104] Therefore, risk measures should not unfairly burden new food technologies, such as cultivated meat, compared to conventional products, like meat. Measures should align with the risks, ensuring that

[100] Regulation (EC) 178/2002 of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety (2002) OJ L31/1.
[101] European Parliament, 'The EU's General Food Law Regulation: An Introduction to the Founding Principles and the Fitness Check' (25 January 2017) <https://www.europarl.europa.eu/thinktank/en/document/EPRS_IDA(2017)595906>.
[102] European Commission, 'General Food Law' (Food Safety) <https://food.ec.europa.eu/horizontal-topics/general-food-law_en>.
[103] Article 7 of Regulation (EC) 178/2002 (n 100).
[104] ibid.

innovation is not hindered by excessive or unnecessary regulatory barriers.[105] Through these measures, the precautionary principle ensures that potential risks are managed while ensuring that innovative technologies, like cultivated meat, are treated fairly and proportionately within the regulatory framework.

3.2.2 Novel Food Regulation

Regulation (EU) 2015/2283 was established for the regulation of novel foods.[106] It will be referred to as NFR. It was originally established in 1997 and updated in 2018. In Article 3 (2)(a) NFR, the definition of novel foods with the relevant category is stated as follows:

"'Novel food' means any food that was not used for human consumption to a significant degree within the Union before 15 May 1997, irrespective of the dates of accession of Member States to the Union, and that falls under at least one of the following categories:

- *(vi) Food consisting of, isolated from, or produced from cell culture or tissue culture derived from animals, plants, micro-organisms, fungi, or algae"*[107]

Cultivated meat falls under category vi of Article 3(2)(a) NFR and thus is a novel food.[108] Article 7 of NFR states that a novel food must be safe for consumption, not misleading to consumers, and must not replace another food in a way that would be nutritionally disadvantageous to the consumer.[109] Thus, cultivated meat should be equally or more nutritious than conventional meat to allow market authorisation.

Before market entry, the novel food needs to undergo pre-market authorisation, where it will be evaluated by EFSA.[110] In case a novel food is approved, it will be included in the Union list. This list is maintained by the EC and includes all novel foods that have been assessed with regard to their safety and approved for market adoption within the EU.[111] The specific conditions of use, labelling requirements, and specifications of the novel food that must be included in the Union List are stated in Article 10 of NFR.[112] If

[105] Kristel De Smedt and Ellen Vos, "The Application of the Precautionary Principle in the EU," (2022) <https://link.springer.com/chapter/10.1007/978-3-030-91597-1_8#Sec11>.
[106] Regulation (EU) 2015/2283 (n 19).
[107] Article 3(2)(a) of Regulation (EU) 2015/2283 (n 19).
[108] ibid.
[109] Article 7 of Regulation (EU) 2015/2283 (n 19).
[110] Article 10 of Regulation (EU) 2015/2283 (n 19).
[111] ibid.
[112] ibid.

a cultivated product is included in the Union List, it will serve as an example for other food business operators (FBOs) to comply with regulatory standards. This inclusion will simplify the process of introducing similar novel food products to the market unless the EC granted data protection to the novel food.[113]

i. The application procedure for novel foods

The application procedure for novel foods is elaborated in more detail to understand the regulatory process, including its implications for cultivated meat. An overview of the procedure gives insight into how stakeholders navigate the authorisation pathways in the EU.

The EC, EFSA, and the PAFF Committee are responsible for novel food authorisation. They ensure that novel foods, such as cultivated meat, undergo rigorous safety assessments and regulatory scrutiny before receiving market authorisation in the EU.

The first step is for the FBO to submit an application to the EC. In this application, the FBO proves that its product falls under the NFR and thus constitutes a novel food. After verification, the authorisation process for the novel food product will begin.[114] The applicant needs to submit a substantive assessment to the EC. The EC will inform the Member States about the application, and a summary of the application will be published. EFSA performs a risk assessment to investigate if the novel food product imposes a health risk based on the dossiers provided by the applicant.[115] According to Article 11 (1) NFR, EFSA should give a scientific opinion within nine months after the product is verified as a novel food.[116] However, Article 11 (4) NFR states that if EFSA requires more scientific data from the applicant, the nine months can be extended, which is called a clockstop.[117] This application procedure is time-consuming and costly for cultivated meat companies, as they are often startups and small- to medium-sized

[113] Article 26 of Regulation (EU) 2015/2283 (n 19).; D Lanzoni and others, 'Cultured Meat in the European Union: Legislative Context and Food Safety Issues' (2024) 8 Current Research in Food Science 100722 <https://doi.org/10.1016/j.crfs.2024.100722>.
[114] European Food Safety Authority, 'Novel Food and Traditional Food Applications' (27 November 2023) <https://www.efsa.europa.eu/en/applications/novel-food-traditional-food>.
[115] Article 22 of Regulation (EC) 178/2002 (n 100).
[116] Article 11 (1) of Regulation (EU) 2015/2283 (n 19).
[117] Article 11 (4) of Regulation (EU) 2015/2283 (n 19).

enterprises (SMEs) with limited financial capabilities.[118] In Article 11 (2) NFR, the requirements that EFSA needs to consider when formulating a scientific opinion are stated:

- *"(a) the safety of the novel food concerned is comparable to the conventional food category already placed on the market within the Union.*
- *(b) the composition of the novel food and its usage conditions do not pose a safety risk to human health in the Union.*
- *(c) a novel food intended to replace another food should not differ in a way that it is nutritionally disadvantageous for the consumer."*[119]

After the publication of EFSA's scientific opinion, the EC is given a timeframe of seven months to submit a draft implementing act to the PAFF Committee. This committee comprises representatives of each Member State that are the risk managers during the authorisation procedure. The decision-making process requires a qualified majority, which mandates that 55% of Member States vote in favour, representing at least 65% of the EU population.[120] If the PAFF Committee decides on a negative opinion or no opinion, the application dossier is transferred to the Appeal Committee. This committee is composed of representatives of the EU Member States, who will discuss the application dossier of the novel food further.[121] If the Appeal Committee decides on a negative opinion, the EC shall reject the authorisation of the novel food.[122]

The NFR is an essential regulation for novel food products like cultivated meat. The market authorisation by the various authority bodies, including the rigorous safety assessment procedure. While this will guarantee safety, transparency, and compliance with the requirements, stakeholders in the cultivated meat industry, whom I interviewed, also raised challenges in the authorisation process, including the lengthy timeline, uncertainty, innovation, transparency, and EFSA guidance.[123] These factors

[118] Food Fermentation Europe, 'Precision Fermentation: Practices, Challenges and Suggestions for the Novel Food Framework' (18 October 2023) <https://www.efsa.europa.eu/sites/default/files/2023-11/4-food-fermentation-europe-presentation.pdf>.
[119] Article 11 (2) of Regulation (EU) 2015/2283 (n 19).
[120] Karin Verzijden, 'Nomenclature for Cultivated Meat across Europe' (Food Health Legal, October 2022) <https://foodhealthlegal.eu/?p=1189>.
[121] European Commission, 'Appeal Committees' (Food Safety) <https://food.ec.europa.eu/horizontal-topics/committees/appeal-committees_en>.
[122] Karin Verzijden (n 120).
[123] Interview with a consultant (Wageningen, 18 December 2024); Interview with a cultivated meat company (Wageningen, 11 December 2024); Interview with a research institute

may influence the market adoption of cultivated meat, especially for start-ups and SMEs with limited resources. Therefore, EFSA has taken steps to refine its risk assessment process for novel foods and provide clearer guidance for applicants by organising a scientific colloquium, a public consultation with stakeholders, and updating the guidelines for novel food applications.

ii. EFSA Scientific Colloquium

In May 2023, EFSA organised a colloquium to gain insights from experts, organisations, and companies about cell culture-derived foods and food ingredients. The colloquium aimed to identify the different sectors in the agrifood system relevant to cultivated foods, investigate the existing technologies and concepts, and examine the methodological and safety aspects and their impact on EFSA's risk assessment.[124]

The outcome of the colloquium included the assessment of safety and technological issues. It stated that there is a need for collaboration between EFSA and the stakeholders, as well as more collaboration between the industry actors themselves.[125] The regulatory framework for cultivated products was also discussed, and the conclusion was that the NFR is fit for the purpose of evaluating the safety of cultivated products. The technological developments in the cultivated meat industry are growing rapidly. The methodologies used by EFSA to evaluate cultivated products should be up to date.[126] In response, EFSA initiated the updating of the guidelines for novel food authorisation.

iii. Updated guidelines for novel food authorisation

As a follow-up to the scientific colloquium, EFSA updated its guidelines to assist applicants in their novel food authorisation process. These guidelines were updated in

(Wageningen, 7 January 2025); Interview with a consultant (Wageningen, 18 November 2024); Interview with Seth Roberts, Senior Policy Maker, GFI Europe (Wageningen, 8 January 2025); Interview with a consultant (Wageningen, 6 November 2024); Interview with Julia Martin, Cellular Agriculture Lead, ProVeg International (Wageningen, 11 November 2024)

[124] European Food Safety Authority, 'EFSA Scientific Colloquium 27: Cell Culture-derived Foods and Food Ingredients' (n 40).

[125] ibid.

[126] ibid.

September 2024 as there was an increase in applications for novel foods, and will take effect in February 2025.[127]

The guidelines were established after a public consultation, where stakeholders gave 700 comments of feedback to EFSA regarding the risk assessment process.[128] Most comments are anonymous, and thus not linked to a specific stakeholder group. The comments include references to other jurisdictions on how to assess the safety of cultivated meat and the inclusion of the requirements needed for cultivated products. Furthermore, EFSA should provide specific examples of studies that are needed to assess the genotoxicity of cultivated meat. One comment referred to the need for research on the impact of cultivated meat on the human microbial gut. A stakeholder stated that the evaluation of cultivated meat should fall under the safety criteria of new pharmaceutical products, and that a comprehensive impact assessment should be performed considering the issues regarding cultivated meat and include consumer views. The latter was not included in the updated guidelines.

These updated guidelines provide additional scientific and administrative guidance to ensure that applicants can deliver all necessary scientific information about the product. They also provide further guidance for new novel foods, such as cultivated meat. This will lead to longer preparation times for companies to establish a complete dossier, but it will reduce the likelihood of delays and accelerate the market entry of novel foods.[129] In cases where a novel food contains GMO residues, it falls under the scope of GMO regulation rather than the NFR. The following subchapter covers this regulation.

3.2.3 Genetically Modified Food and Feed Regulation

Regulation (EC) No 1829/2003 governs genetically modified food and feed in the EU.[130] It is referred to as GMR. The regulation focuses on the authorisation and supervision of genetically modified food and feed. It also specifies the labelling requirements. GMR aims to protect human life and health, to protect animal life and health, and to protect

[127] European Food Safety Authority, 'Guidance on the Scientific Requirements for an Application for Authorisation of a Novel Food in the Context of Regulation (EU) 2015/2283' (30 September 2024) <https://www.efsa.europa.eu/en/efsajournal/pub/8961>.
[128] European Food Safety Authority, 'Public Consultation on Novel Food Guidance' (19 April 2024).
[129] Clare Daley, 'EU Novel Food Applications: Major Changes in 2025' (31 January 2025) <https://www.hooleybrown.com/blog-post/eu-novel-food-applications-major-changes-in-2025>.
[130] Regulation (EC) No 1829/2003 (n 19).

environmental and consumer interests. It applies to products where GMOs are used in food or feed, food and feed that contains GMOs, or food and feed that is made or contains ingredients made using GMOs. Cultivated meat can be produced by genetically modified cells, as this could result in higher production efficiency and/or could influence the nutritional attributes.[131] This process, known as cell line engineering, involves adding, modifying, or eliminating DNA to create long-lasting alterations. The regulatory framework of a certain jurisdiction will influence the extent of the genetic engineering process and what type of modifications are allowed. Most companies in the EU are not using GM techniques.

The authorisation procedure for GMO products is similar to the authorisation of the NFR.[132] The procedure starts with the company submitting an application to the competent authority of its Member State. Then, the Member State forwards the application to EFSA, which gives a scientific opinion. EFSA informs the Member State, the EC, and the applicant of its scientific opinion. The PAFF Committee votes on the draft implementing act of the EC based on the qualified majority. The EC determines the final opinion, which could result in a positive opinion, a negative opinion, or no opinion. In case of a positive opinion, the EC will adopt the draft implementing act.[133]

In conclusion, the GMR framework is established for the approval and monitoring of genetically modified food and feed. This will ensure environmental protection and food safety while imposing stringent regulatory requirements on cultivated meat products containing GMOs.

3.3 Conclusion

This chapter on the regulatory framework of cultivated meat discusses the relevant regulations. It highlights the need to balance innovation, safety, and stakeholder interests in the regulatory framework governing cultivated meat. Cultivated meat is a novel food product, which could fall under either the NFR or GMR.

The interests and perspectives of stakeholders shape this regulatory landscape. The EC, EFSA and PAFF Committee are responsible for authorising cultivated meat. They are

[131] Elliott Swartz (n 49).
[132] Karin Verzijden and Jasmin Buijs, 'Meat 3.0 — How Cultured Meat Is Making Its Way to the Market' (2020) <https://effl.lexxion.eu/article/EFFL/2020/2/4>.
[133] ibid.

driven by ensuring the highest safety standards while attempting to facilitate innovation.

Cultivated meat companies are affected by this stringent authorisation procedure as it poses multiple challenges. In response to stakeholder concerns, EFSA organised a scientific colloquium and updated its guidelines for novel food authorisation, aiming to provide clearer regulatory pathways. Stakeholders, including cultivated meat companies, advocacy groups and research institutes, played a role in shaping these updated guidelines of EFSA. In the following chapter, the relevant policy initiatives for cultivated meat are discussed.

4. Policy and Political Developments Shaping Cultivated Meat Policy

This chapter examines the regulatory and political developments that shape the regulatory landscape. While the NFR and GMR are the foundation for the authorisation of cultivated meat, policy initiatives on EU level, political influence on EU regulatory processes, and policy initiatives on national level demonstrate how cultivated meat is positioned in the EU and national policy and political environment. These processes reflect the broader tensions on innovation, safety, economic interests, and cultural traditions that shape the regulatory direction of cultivated meat.

4.1 Policy Initiatives on EU Level

This section discusses the various policy initiatives in the EU. It provides a comprehensive overview of the current position of cultivated meat.

4.1.1 Sustainability Transformation in the EU Food System

The sustainability transformation in the EU food system is a shift toward an environmentally responsible, economically viable, and socially equitable food production and consumption. Policy initiatives, such as the F2F Strategy of the former EC (2019-2024), which is part of the European Green Deal, and the Vision for Agriculture and Food of the current EC are examples of drivers of this shift.[134]

The F2F Strategy does not specifically touch upon cultivated meat as part of a sustainable and resilient food system. It should be investigated what the role of an innovative product such as cultivated meat could contribute to the objectives of the F2F Strategy. A research project under the F2F Strategy is the 'Fostering European cellular Agriculture for Sustainable Transition Solutions' (FEASTS) project, which is focused on cultivated meat.[135] However, the research project is still ongoing, and thus, no publications have been completed so far. The FEASTS research aims to deliver a supporting tool for informed policymaking, and decision-making. They will perform impact assessments on the economic and societal effects of cultivated meat and seafood and their sustainability, ethics, nutritional value, and health effects. This will help to

[134] European Commission, 'A Farm to Fork Strategy' (n 11).
[135] EIT Food, 'FEASTS - an EU Horizon Funded Project to Create Knowledge Base about Cultured Meat Its and Place in the Food System' (29 January 2024) <https://www.eitfood.eu/news/feasts-has-been-launched-a-research-project-on-cultured-meat-and-seafood-explores-the-future-of-protein>.

understand the position of cultivated products in the EU food system and could help to shape policy recommendations by collaborating with all stakeholders.[136]
Another policy initiative of the EC is the Vision for Agriculture and Food, which is published in February 2025. Herein, the EC emphasised the importance of fostering innovation in the food system while balancing social, ethical, economic, environmental, and cultural considerations.[137] Cultivated meat is an innovation which could contribute to sustainability goals, food security, and technological competitiveness in the EU. However, the EC also noted how novel technologies are sometimes perceived as a threat to traditions and cultures of the EU. Therefore, the EC aims for an enhanced dialogue to ensure that these technologies are assessed on their impacts and accessible to all stakeholders in the food system.

In conclusion, neither the F2F Strategy nor the Vision for Agriculture and Food explicitly mention the position of cultivated meat in a sustainable and resilient food system. However, the FEASTS project, which falls under the F2F Strategy and the EC's awareness of how innovative food products are perceived as a threat, shows that the EC is evaluating the position of cultivated meat in the EU. The following section discusses other policy initiatives, focusing on the EU Protein Strategy and national initiatives.

4.1.2 EU Protein Strategy

The EU Protein Strategy was established in July 2023. The aim is to reduce dependency on protein imports and to diversify the available proteins for food and feed.[138] The environment and climate are threatened for reasons such as importing soybeans for animal feed from Brazil, Argentina and the United States (US), which is linked to deforestation.[139] These issues show the importance of domestically produced plant-based proteins as part of the human diet.[140] The objectives of the EU Protein Strategy are to increase the domestic production of plant-based proteins, foster the development of alternative plant-based proteins and promote protein efficiency and circularity.

[136] ibid.
[137] European Commission, 'The Vison for Agriculture and Food' (n 12).
[138] European Commission, 'EU Protein Strategy' (n 79).
[139] ibid.
[140] ibid.

The EU Protein Strategy is shaped by stakeholders' positions, such as EU institutions, research institutes, and advocacy groups in animal agriculture, animal welfare and alternative proteins.[141] Advocacy groups in alternative proteins argue in a position paper that alternative proteins, including cultivated meat, could have an important role in the protein diversification shift.[142] Conversely, lobbyist groups advocating for animal agriculture are concerned about the impact of alternative proteins on the agricultural sector, rural economics, and price.[143]

The EU Protein Strategy indicates that the rise in consumption of plant-based meat alternatives and cultivated meat is expected to be limited. Additionally, the potential for the development and market adoption of cultivated meat in the EU is considered low due to concerns about affordability, consumer acceptance, and the energy-intensive nature of its production.[144] These concerns show that the EC acknowledges cultivated meat as a possible alternative but views it as a niche product and not a major component of the food system. The more cautious approach of the EC towards cultivated meat could influence the amount of governmental funding and regulatory support.

In conclusion, the EU Protein Strategy highlights how stakeholders' perspectives can shape a policy document. The strategy aims to rely on domestic, sustainable alternatives instead of imported proteins. However, the EC views cultivated meat as an unsuitable solution in the broader sense due to its limited market potential. This cautious stance is aligned with the position of animal agricultural lobbyist groups. Conversely, organisations lobbying for alternative proteins argue about the potential of cultivated meat. The EU Protein Strategy illustrates how the interests of certain stakeholders shape a policy initiative. Market adoption may be slowed by this cautious policy framing of cultivated meat since it may affect public and governmental acceptance.

[141] ibid.
[142] GFI EUROPE, 'Establishing European Leadership in Protein Diversification' <https://gfieurope.org/wp-content/uploads/2023/07/Final-_-GFIE-Position-Paper-Protein-Strategy_Jul-23.pdf>.
[143] Copa Cogeca, 'Reflection Paper on Lab-Grown Protein Products' (2025) <https://copa-cogeca.eu/Flexpage/DownloadFile/?id=13552416>.
[144] European Commission, 'EU Protein Strategy' (n 79).

4.2 Political Influence on EU Regulatory Processes

4.2.1 Political Debates on Cultivated Meat

The ongoing debates between political parties with differing interests demonstrate the complexity of the current political climate. Therefore, shifting political power can influence the direction of cultivated meat in the EU. Tension points in cultivated meat between national and EU-level interests, such as national priorities on cultural heritage, innovation, or sustainability, could lead to debates within the Council. One example is a note brought forward by various delegates of the Member States during the Agriculture and Fisheries (AgriFish) Council committee discussion. Council committee discussions are held to discuss matters in a specific field. For example, the AgriFish Council discusses legislation related to the topics of food production, rural development, and the management of fisheries.[145]

On 23 January 2024, the AgriFish Council held a committee discussion in Brussels. One key discussion point was the 'Strategic Dialogue on the Future of Agriculture in the European Union'. This dialogue aimed to depolarise the debates regarding the green transition and agriculture and to foster support for farmers. During the 'Any other businesses', the delegates of the Member States of Italy, Austria, and France, presented a note (n. 5469/24) to the Council of the EU with support from the delegates of the Czech Republic, Cyprus, Greece, Hungary, Luxembourg, Lithuania, Malta, Romania, and Slovakia.[146] The subject of the note is: '*The CAP's role in safeguarding high-quality and primary farm-based food production'.*

The delegates raised concerns regarding cultivated food, which should be answered before proceeding with the market authorisation of cultivated meat.[147] They argued that these concerns should be included in the updated EFSA guidelines on the scientific requirements for an application for authorisation of a novel food in the context of

[145] Council of the European Union, 'Agriculture and Fisheries Council Configuration' (Consilium) <https://www.consilium.europa.eu/en/council-eu/configurations/agrifish/>.
[146] Council of the European Union, 'The CAP's Role on Safeguarding High-Quality and Primary Farm-Based Food Production' (22 January 2024) <https://data.consilium.europa.eu/doc/document/ST-5469-2024-REV-1/en/pdf>.
[147] Flora Southey, 'Is Cultivated Meat a Threat to Farming? EU Countries Clash over Cellular Agriculture's Future' (FoodNavigator, 25 January 2024) <https://www.foodnavigator.com/Article/2024/01/25/Cultivated-meat-debate-ramps-up-at-AgriFish/>.

Regulation (EU) 2015/2283.[148]

The delegates stated that cultivated food poses a threat to agricultural primary practices and traditional food practices. Therefore, they raised several questions about ethics, economics, sustainability issues, social and public health concerns, transparency issues, and legal aspects. The delegates stated that *"It is essential to have a transparent, science-based, and comprehensive approach to assessing the development of cultivated meat production, which does not constitute a sustainable alternative to primary farm-based production."*[149]

Furthermore, they called for measures to prevent greenwashing in cultivated meat products. Therefore, the EC should ensure that independent and accurate science-based information is shared. If cultivated meat products do not demonstrate clear benefits, the delegates suggest that the EC should not consider supporting the development of the cultivated sector in the EU.

The next point of the delegates concerned transparency. They advised the EC to launch a public consultation on cultivated meat. Furthermore, EU regulations should include prohibiting 'meaty' terms for cultivated meat products. This also aligned with the following point, which is that cultivated meat should never be promoted as conventional meat products to avoid misconception.

The last part concerns the impact assessment on EU strategic autonomy and food sovereignty. Herein, the risk of monopolisation in the cultivated meat industry was considered, which could result in crisis-prone dependencies in the food system and more pressure on small farmers. Therefore, the delegates asked the EC to perform an impact assessment on cultivated meat and take action to prevent the monopolisation of the cultivated meat industry. In January 2024, the FEASTS project was launched to perform an impact assessment and thus evaluate the impact of cultivated meat on the EU food system.[150]

In October 2024, after the publication of the updated guidelines by EFSA, the delegates,

[148] Regulation (EU) 2015/2283 (n 19).
[149] Council of the European Union, 'The CAP's Role on Safeguarding High-Quality and Primary Farm-Based Food Production' (n 146).
[150] EIT Food (n 135).

including 17 agricultural ministers from Austria, Bulgaria, Croatia, Cyprus, France, Greece, Hungary, Italy, Lithuania, Luxembourg, Poland, Portugal, Slovakia, Spain, Czechia, Malta and Romania, along with animal agricultural advocacy groups, sent a letter to the Acting Executive Director of EFSA, Bernand Url.[151] In the letter, they expressed their concerns mentioned in the note regarding 'The role of the CAP in safeguarding primary and high-quality food production of agricultural origin' were not reflected in the updated guidelines.[152] They criticised EFSA for not considering the EU Protein Strategy in the updated guidelines, which stated that the NFR is not fit for purpose of evaluating the risk of cultivated foods. The updated guidelines still do not adequately assess the risks associated with cultivated foods. Additionally, the feedback that the delegates raised in the public consultation for the updated guidelines were not considered in the final version of the updated guidelines. They argued that EFSA should implement this advice. During the period of implementation, the authorisation of cultivated products should be stopped, as it falls under the precautionary principle.

Following the letter from the delegates to EFSA, the debate extended beyond governmental actors. One of these non-governmental stakeholders is the alternative protein lobbyist group GFI, which evaluated the key claims mentioned in the note.[153] They identified false claims about cultivated meat in the note. The first claim relates to the environmental benefits of cultivated meat versus conventional meat. The note states that cultivated meat did not have additional environmental benefits compared to beef. GFI noted that this statement is based on a non-peer-reviewed article and that peer-reviewed articles state that cultivated meat has lower emissions if produced with renewable energy. The following claim is related to ethical concerns. In the note, FBS was referred to as a growth medium for cultivated meat production. The use of FBS raises ethical concerns, such as animal welfare. However, most cultivated meat companies are not using FBS as a growth medium due to its ethical considerations, inefficiency, and excessive costs on a larger production scale.[154]

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[151] Cesare Baldrighi and others, 'Co-Signed Letter to EFSA on the Approval of Cell-Based Food' (21 October 2024) <https://www.agra.fr/agra-presse/sites/agra-presse/files/2024-10/24_10_21_courrier_cosigne_fnb_a_efsa_-_agrement_des_cell-based_food.pdf>.
[152] ibid.
[153] Alex Holst, 'Misinformation about Cultivated Meat Brought to EU Council Meeting' (GFI Europe, 31 January 2024) <https://gfieurope.org/blog/misinformation-about-cultivated-meat-brought-to-eu-council-meeting/>.
[154] Elliot Swartz, 'Cultivated Meat Cell Culture Media' (GFI, 4 October 2024) <https://gfi.org/science/the-science-of-cultivated-meat/deep-dive-cultivated-meat-cell-culture-media/>.; Mohammad El Wali and others (n 89).

The last part of the GFI article refers to how research projects of the EU Horizon Programme and governmental investments in cellular agriculture are essential for the development and market adoption of cultivated meat, which is in contrast with certain statements made by certain agricultural ministers regarding the concerns on the environmental benefits, ethical considerations, and economic impacts of cultivated meat. Furthermore, GFI emphasised the need for certainty for innovative companies in the EU. Otherwise, companies will move their innovations to countries outside the EU. In conclusion, GFI advised to ensure that the EU will not fall behind in developing sustainable and innovative foods, the EU should prevent weakening the EU's regulatory framework and misinformation. Political resistance and how regulations could facilitate innovation emerged as themes for further analysis.

The following sections discuss policy initiatives on a national level. This gives insight into the political climate of certain national governments and their perspectives on cultivated meat.

4.3 Policy Initiatives on a National Level

Various Member States established national initiatives to foster or restrict the development of cultivated meat. These initiatives are elaborated to identify which stakeholders are behind them and how their perspectives and motivations have influenced the regulatory landscape.

4.3.1 Pre-Market Tastings of Cultivated Foods in the Netherlands

The Netherlands is a pioneer in cellular agriculture within the EU, featuring two established cultivated meat companies: Meatable and Mosa Meat.[155] The Dutch government views their cultivated products as promising due to their environmental and economic potential. Therefore, they have increased the public funding for cellular agriculture to foster a cellular agriculture ecosystem.[156] In response, Cellular Agriculture Netherlands (CAN) has been established and is responsible for fostering cellular agriculture in the Netherlands. This includes promoting research projects and education, attracting cellular companies and investors, and scaling up existing businesses.[157]

[155] Rijksoverheid, 'Code of Practice for Safely Conducting Tastings of Cultivated Foods Prior to EU Approval' (n 17).
[156] ibid.
[157] ibid.

One of the initiatives is the approval of pre-market tastings of cultivated foods by the Ministry of Agriculture, Fisheries, Food Security and Nature (LNNV). The Netherlands is the first EU country to approve cultivated meat tastings, which are conducted under strict and controlled conditions. To date, two tasting sessions have been conducted in the Netherlands.[158]

In conclusion, the pre-tasting approval in the Netherlands reflects its positive approach towards cultivated meat and demonstrates how a government could foster the growth of the cultivated meat industry. The positive stance of the Dutch government towards cultivated meat could influence EU discussions on cultivated meat and set an example for other governments. In the following part, an example of a national approach to restricting the development of cultivated meat is given.

4.3.2 The Bans by Italy and Hungary

The Technical Regulations Information System (TRIS) was established to foster the free movement of goods in the EU and ensure the functioning of the internal market.[159] The TRIS notification procedure facilitates information exchange between the EC and Member States to prevent trade barriers. In case of the establishment of new technical draft rules related to industrially manufactured products and agricultural products, the Member State should notify the TRIS procedure before adopting it into national law. The EC, along with other countries and relevant stakeholders, has three months to respond to the draft rules and assess whether it may pose a potential trade barrier and if it aligns with EU law.[160]

Italy and Hungary attempted to use national bans to restrict the production and market adoption of cultivated meat. These cases illustrate how the TRIS procedure functions as a regulatory checkpoint to balance national priorities within EU market integration and legal consistency. The bans demonstrate how stakeholders shaped the regulatory landscape of cultivated meat.

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[158] Carlota Ellenberg, 'Mosa Meat Hosts First Official EU Cultivated Beef Tasting, Experts Rave It "Really Tasted Like' (Cultivated X, 2 August 2024) <https://cultivated-x.com/meat/mosa-meat-hosts-first-official-eu-cultivated-beef-tasting/>.

[159] European Commission, 'Notifications in the Field of Technical Regulations (TRIS) and Services (IMI)' <https://single-market-scoreboard.ec.europa.eu/enforcement-tools/notifications_en.>.

[160] ibid.

i. Italy's ban on cultivated meat

In July 2023, the Minister of Agriculture, Food Sovereignty and Forestry and the Minister of Health of Italy notified a draft law through the TRIS procedure on *"the prohibition on the production and marketing of food and feed consisting of, isolated from, or produced from cell cultures or tissues derived from vertebrate animals, as well as the prohibition on the designation of processed products containing vegetable proteins as meat."*[161] Thus, the draft law prohibits the production and distribution of cultivated products.

In Article 2 of the draft law, the precautionary principle was used to justify prohibiting the production and distribution of cultivated products to safeguard health and cultural heritage interests. In case of violation of Article 2 of the draft law, the FBO is penalised a maximum of 60.000 euros. The Italian agricultural association Coldiretti lobbied for this ban, arguing that cultivated meat would threaten traditional farming and cultural heritage.[162]

The Italian Parliament had already passed the bill before the TRIS procedure was finished, effectively circumventing EU scrutiny.[163] Therefore, the EC was obligated to withdraw the procedure. The production and marketing of cultivated meat products are now prohibited in Italy.[164] However, the future is uncertain as there is still no market approval for cultivated meat in the EU. It will become evident when the first submission for a cultivated meat product by the company Gourmey has gone through the pre-market authorisation and been approved via NFR how Italy will comply with European regulations.

ii. Hungary's ban on cultivated meat

[161] European Commission, 'Provisions on the Prohibition of the Production and Marketing of Food and Feed Consisting of, Isolated from or Produced from Cell Cultures or Tissues Derived from Vertebrate Animals And on the Prohibition of the Designation as Meat...' (27 July 2023) <https://technical-regulation-information-system.ec.europa.eu/en/notification/24242>.
[162] Coldiretti Giovani Impresa, 'Consumi: le 5 bugie della carne Frankenstein' (18 November 2021) <https://giovanimpresa.coldiretti.it/notizie/attualita/pub/consumi-le-5-bugie-della-carne-frankenstein/>.
[163] Legge 1 dicembre 2023, n. 172, G.U. 1 dicembre 2023, n. 281 (Italy) https://www.gazzettaufficiale.it/do/atto/vediLavoriPreparatori?atto.dataPubblicazioneGazzetta=2023-12-01&atto.codiceRedazionale=23G00188 accessed 5 February 2025.
[164] Federica Milioto and Gregory Barton, 'Italy Bans Lab-Grown Meat, Violating EU Procedure' (3 May 2024) <https://www.osborneclarke.com/insights/italy-bans-lab-grown-meat-violating-eu-procedure>.

Apart from Italy, the Hungarian government placed cultivated meat on their political agenda, stating that cultivated meat should be strictly regulated in its production and distribution. Cultivated meat products have been extensively rejected in Hungary, according to the president and agricultural minister of Hungary.[165] However, it is unclear which specific stakeholder groups are rejecting cultivated meat, given that it is not yet on the market in Hungary.

In response to concerns related to cultivated meat, the Hungarian government established a draft act *"prohibiting the production and placing on the market of laboratory-grown meat"*.[166] The foundation of this prohibition is based on the benefits of traditional farming on agriculture and rural living conditions, and how other technologies and production methods, such as cellular agriculture, endanger this. The Hungarian government argued that the presumed adverse effects regarding the health effects of cultivated meat and the endangered position of traditional agriculture in the domestic economy are enough to justify a ban. This ban would result in prohibiting cultivated products to ensure animal and human health and the protection of the environment.

The EC argued that the draft law is unnecessary based on the authorisation procedure under the NFR. The risk assessment of EFSA ensures that the novel food is safe to consume and will not pose a threat if it enters the market. The draft law is also unjustified as it will pre-empt the harmonised risk assessment.[167]

Member States were invited to provide comments on the draft law. Sweden stated that the proposed ban cannot be justified as it is not based on scientific evidence.[168] They stressed that if cultivated meat is approved via the NFR in the EU and thus enters the market, the national ban on cultivated meat will result in an obstacle to free trade

[165] Ministerie van Landbouw, Natuur en Voedselkwaliteit, 'Hungarian Presidency: Cultured Meat, Food Waste, Animal Welfare on the Agenda' (16 February 2024) <https://www.agroberichtenbuitenland.nl/actueel/nieuws/2024/02/16/hungary-presidency-cultured-meat>.
[166] European Commission, 'Draft Act Prohibiting the Production and Placing on the Market of Laboratory-Grown Meat' (July 2024) <https://technical-regulation-information-system.ec.europa.eu/en/notification/26066>.
[167] European Commission, 'Notification Detail | TRIS' (European Commission, 9 October 2024) <https://technical-regulation-information-system.ec.europa.eu/en/notification/26066>.
[168] Sweden, 'Notification Detail | TRIS' (European Commission, 17 October 2024) <https://technical-regulation-information-system.ec.europa.eu/en/notification/26066>.

movements and hinder innovative developments in the EU. However, to date, no cultivated meat product has been approved as a novel food and entered the market. Thus, it is unnecessary to impose a ban on such products on a national level if it is not even allowed on the market under European law.

The Netherlands referred to the growing protein demand in the EU, which places more importance on the alternative protein industry and the market adoption of cultivated products in other jurisdictions outside the EU. This emphasises the need to keep up and compete with markets outside the EU.[169]

Non-governmental stakeholders were also invited to react to the draft law of Hungary. The research institute New Harvest, which focuses on cellular agriculture, stated that Hungarian arguments lack a thorough impact assessment, rendering the ban unjustified.[170] Therefore, the ban based on the presumed threat to human health is unjustified. Eurogroup for Animals added that the rigorous safety assessment by EFSA protects human life and health, thus ensuring the highest safety standards for novel foods.[171] GFI highlighted that the introduction of cultivated meat would result in the creation of additional businesses for farmers, as it would be complementary to animal agriculture. Therefore, it is important to foster developments in cellular agriculture as a government to protect traditional agriculture and to make it future proof.[172]

In conclusion, the arguments of the EC, Member States and other stakeholders highlight that the foundations for implementing the draft law are unjustifiable, unnecessary, and not proportionate under EU law. Therefore, the EC has given Hungary till January 2025 to react to the issues raised. If Hungary proceeds with the draft law without considering the objections or does not comply with the obligations mentioned by the EC, the EC may initiate an infringement procedure under Article 258 TFEU.[173] This entails that if

[169] The Netherlands, 'Notification Detail | TRIS' (European Commission, 11 October 2024) <https://technical-regulation-information-system.ec.europa.eu/en/notification/26066>.
[170] Dwayne Holmes, 'Response to Hungarian draft act to ban cultivated meat' (11 October 2024) <https://technical-regulation-information-system.ec.europa.eu/en/notification/26066>.
[171] Eurogroup for Animals, 'Eurogroup for Animals' response to TRIS Notification 2024/0394/HU' (18 July 2024) <https://technical-regulation-information-system.ec.europa.eu/en/notification/26066>.
[172] GFI Europe, 'GFI Europe observations on TRIS notification 2024/0394/HU - 'Draft act prohibiting the production and placing on the market of laboratory-grown meat' (2 September 2024) <https://technical-regulation-information-system.ec.europa.eu/en/notification/26066>.
[173] Article 258 of the Consolidated Version of the Treaty on the Functioning of the European Union [2016] OJ C202/47.

Hungary fails to meet an obligation under EU law, it could result in legal proceedings in the European Court of Justice.[174]

4.4 Conclusion

Policy initiatives on the EU level to facilitate sustainability transformation in the EU food system did not explicitly mention cultivated meat. However, the F2F Strategy resulted in a research project about the impacts of cultivated meat on the EU food system, and the recently published 'Vision for Agriculture and Food' acknowledged how food innovation is seen as a threat to traditional farming practices, which emphasise the need for enhanced dialogue between all stakeholders.

The EU Protein Strategy illustrates how organisations advocating for alternative proteins and research institutes are attempting to shape policy debates by providing evidence-based assessments on the impact of cultivated meat on the EU food system. Conversely, animal agricultural groups are more hesitant to adopt cultivated meat in the EU food system. This hesitant approach resulted in omitting cultivated meat in the Strategy as a potential alternative. Additionally, the Strategy highlighted the challenges of cultivated meat. This could impact the extent of support for the cultivated meat industry from the EU as it does not fully recognise its market potential.

National policy initiatives demonstrate the diverging climate in the EU regarding cultivated meat. The Netherlands established the first pre-market tastings of cultivated products. The national initiative of the Dutch government demonstrates how targeted policies on cultivated meat could foster development in innovation, bridge gaps in the regulatory framework, and accelerate the market authorisation process. Conversely, the bans in Italy and Hungary illustrate how lobbying activities driven by the protection of traditions could lead to restrictive policies that challenge the principles of the EU's single market.

Thus, the regulatory landscape reflects the priorities among governments, industry players, consumers and agricultural stakeholders. This could affect the extent to which cultivated meat will be adopted in the EU food system.

[174] ibid.

5. Thematic Analysis

The thematic analysis explores the themes highlighted by the literature and the interview data. Its outcome shows how stakeholder conflicts and perspectives shape the regulatory landscape.

5.1 Stakeholder Influence on the Regulatory Landscape

Stakeholders influence decision-making and shaping regulatory frameworks by using advocacy techniques. Animal agricultural, plant-based, and cellular agricultural lobbyist groups are lobbying to align EU policies with their interests. These influences are expressed in different ways, depending on the economic, environmental, and social priorities of the stakeholders involved. Seth Roberts of the GFI described the influences on the regulatory framework as, *"It is important to point out that regulation and the regulatory landscape are not just about concrete legislation and rules. It is more like an ecosystem where various actors are influenced by political statements and shaped by informal practices and ways of working"*.[175]

An example of such an ecosystem is when a favourable political climate around cultivated meat attracts investors, smooths engagement with regulators, and fosters national initiatives for cultivated meat.[176] Currently, national initiatives that promote cultivated meat development coexist alongside increasing political resistance towards cultivated meat in the EU, such as the bans.

Advocacy groups favouring the cultivated meat industry describe animal agricultural advocacy groups as vocal.[177] For decades, animal agricultural advocacy groups have lobbied for policies that protect the livestock sector. Their objectives include ensuring food security and protecting the position of farmers.[178] Moreover, national governments such as France, Italy, Hungary, and Austria have significant economic interests in the agricultural sector.[179] Therefore, they have sought to establish a significant influence in the EU's policy-making. Julia Martin (Cellular Agriculture Lead of ProVeg International)

[175] Interview with Seth Roberts, Senior Policy Maker, GFI Europe (Wageningen, 8 January 2025).
[176] Interview with a cultivated meat company (Wageningen, 11 December 2024).
[177] Interview with Julia Martin, Cellular Agriculture Lead, ProVeg International (Wageningen, 11 November 2024); Interview with Camilla Björkbom, Food Policy Project Manager, Eurogroup for Animals (Wageningen, 2 December 2024).
[178] Copa Cogeca, 'Our objectives' <https://copa-cogeca.eu/about-copa>.
[179] Interview with a consultant (Wageningen, 18 November 2024).

described the impact of the lobbyist activities of the animal agricultural organisations as:

"*So, the meat industry has lobbied very heavily on regulatory makers in the EU to make it to the point where we are now. Now we have, you know, hundreds and hundreds of farmers, thousands and thousands of farms, millions, and millions of animals. And these products are heavily polluting ….. It is also a lesson to be learnt right on how lobbying is always representing the interests of a few".*[180]

The animal agricultural lobbyist group Copa Cogeca argued that their efforts are essential to prevent disruptive economies that could arise from cultivated meat and to ensure the viability of traditional farming.[181] This concern is also mentioned in literature[182]

Lobbyist groups in the cultivated meat industry, plant-based sector, and animal welfare organisations advocate for the development and market adoption of cultivated meat. Animal welfare organisations provided evidence-based information to the EP in the format of a book on cultivated meat to inform them about the opportunities of cultivated meat.[183]

In conclusion, the regulatory landscape is not only shaped by scientific evaluations but also by political debates and stakeholder influences with different interests and powers. Stakeholder power dynamics will be an important factor in determining how food innovation develops in the EU as discussions surrounding cultivated meat evolve.

5.2 Misleading Narratives and Strategic Framing

Misleading narratives and strategic framing are important themes as they have influenced the position of cultivated meat in the EU. In the early stage of development, cultivated meat companies framed cultivated meat as the ultimate solution to reduce

[180] Interview with Julia Martin, Cellular Agriculture Lead, ProVeg International (Wageningen, 11 November 2024).
[181] Copa Cogeca (n 143).
[182] Bruno Dutra Da Silva and Carlos Adam Conte-Junior, "Perspectives on Cultured Meat in Countries with Economies Dependent on Animal Production: A Review of Potential Challenges and Opportunities" (July 2024) 149 Trends in Food Science & Technology 104551 <https://www.sciencedirect.com/science/article/pii/S0924224424002279#sec4>.
[183] Interview with Camilla Björkbom, Food Policy Project Manager, Eurogroup for Animals (Wageningen, 2 December 2024); Interview with an animal welfare organisation (Wageningen, 17 December 2024).

the environmental impact of the agricultural sector and to ensure food security.[184] This narrative attracted investors but amplified opposition from lobbyist groups in the livestock sector, policymakers and consumer groups. Political groups leveraged this tension to justify bans on cultivated meat based on the protection of cultural heritage.[185] Two researchers argued that traditional foods are used as symbols in right-wing political rhetoric, reflecting a nostalgic vision of national identity.[186] Novel technologies, such as cultivated meat, contrast these national ideals as they are focused on innovation and sustainability. By framing cultivated meat as a cultural threat, political groups reinforce nationalist ideologies, potentially slowing its adoption in the European market.[187]

As a result, cultivated meat became a polarising topic in EU debates. The animal agricultural sector continued to push concerns about its risks, with Cellular Agriculture Lead of ProVeg International stating: *"Due to the uncertainties of cultivated meat, citizens and even policymakers are constantly bombarded with all of this information from the animal industry saying all kinds of negative things that are not necessarily based in evidence or not at all based in evidence".*[188]

These narratives contribute to the polarisation and politicisation of the cultivated meat debate in the EU. Advocacy groups that favour cultivated meat are shifting this narrative to a more inclusive approach in which cultivated meat is promoted as an alternative to conventional meat. This polarisation of cultivated meat in debates should be overcome to ensure market adoption of cultivated meat in the EU.

5.3 Vested Interests of Farmers and the Agricultural Sector

The interests of advocacy groups lobbying for farmers and the agricultural sector are based on protecting traditional farming practices. The framed threat to traditional farming by the cultivated meat industry resulted in opposition from the agricultural sector.

[184] Michael Goodman and others, 'Analysis of the Narrative Grammars of Cultured Meat in UK Food and Farming Media' (2024]) The International Journal of Sociology of Agriculture and Food <https://doi.org/10.48416/ijsaf.v30i2.684>.
[185] Interview with a research institute (Wageningen, 7 January 2025).
[186] Guido Bellenghi and Luca Knuth, 'Food Culture and the Far-Right' (13 October 2023) Verfassungsblog <https://verfassungsblog.de/food-culture-and-the-far-right/>.
[187] ibid.
[188] Interview with Julia Martin, Cellular Agriculture Lead, ProVeg International (Wageningen, 11 November 2024).

In November 2021, the Italian animal agricultural organisation Coldiretti published a statement on the perceived lies around cultivated meat, accusing multinationals of spreading misinformation about its environmental benefits and cruelty-free production.[189] Coldiretti argued that traditional farming, with its nutritional, environmental, and social relevance, faces a threat from cultivated meat. Coldiretti and right-wing political groups argued that the prohibition of cultivated meat is essential to preserve cultural heritage and traditional farming and prevent the monopolisation of the cultivated meat industry by large corporations.[190]

Furthermore, the animal agricultural lobbyist groups Farm Europe and Eat Europe argued that the cultivated meat industry spreads misleading narratives that misrepresent the livestock sector and influence policy decisions.[191] They argued that claims of the cultivated meat industry often lack an evidence-based approach or comprehensive impact assessment. This includes claims that only consider the environmental impact of livestock on climate change without considering the environmental impact of cultivated meat.

The animal agricultural sector, including farmers, aims to have the opportunity to respond to statements made by the cultivated meat sector regarding the environmental impact of the livestock industry. Some farmers experience the introduction of novel foods, including cultivated meat, as a threat to traditional farming.[192] Therefore, animal agricultural lobby groups advocate for a holistic approach in discussions about cultivated meat products, considering not just environmental and ethical factors but also the competitiveness of the EU's agri-food sector.[193]

The coexistence of traditional and cellular agriculture remains a widely debated topic, as the impact of cultivated meat on traditional farming requires further investigation.[194] Farmers play a crucial role in this debate, as they are invaluable actors in the food

[189] Coldiretti Giovani Impresa, 'Consumi: le 5 bugie della carne Frankenstein' (18 November 2021) <https://giovanimpresa.coldiretti.it/notizie/attualita/pub/consumi-le-5-bugie-della-carne-frankenstein/>.
[190] ibid.; Angela Giuffrida, 'Italian Plan to Ban Lab-Grown Food Criticised as Misguided' (The Guardian, 29 March 2023) <https://www.theguardian.com/world/2023/mar/29/italian-plan-to-ban-lab-grown-food-criticised-as-misguided>.
[191] Farm Europe (n 43).
[192] Interview with animal welfare organisation (Wageningen, 17 December 2024).
[193] Farm Europe (n 43).
[194] Interview with a consultant (Wageningen, 18 November 2024).

system. Policymakers must consider farmers' concerns regarding corporate dominance, as small-scale farmers might struggle to access cellular technology.[195]

Animal welfare advocacy groups, who oppose industrial livestock farming, support the development of cultivated meat as a way to diversify food production and integrate it into agroecological farming. They argue that cultivated meat should be accessible to small-scale farmers rather than being monopolised by large corporations. On these points, their position aligns with that of animal agricultural associations and nationalist and right-wing political parties, which fear that job security of farmers, cattle breeders, and supply chain operators will be threatened and argue that cultivated cannot replace animal-based food.[196] However, animal welfare groups do not reject cultivated meat and view cultivated meat as a potential solution to reduce industrial farming, while maintaining the livelihood of small-scale farmers. The cultivated meat industry shifted its narrative on substituting animal agriculture to be another alternative on the market. A cultivated meat company described it as:

"*They just need to see that we are there to coexist, not to steal anybody's market presence or something,* and another cultivated meat company stated, *"What I do not want is for cultivated meat to simply replace traditional agricultural meat. Any replacement should come naturally from consumer choice, not from us forcing it out of the market"*.[197]

While there is resistance towards cultivated meat from the agricultural sector, certain stakeholders from the cultivated meat industry, the agricultural sector, and animal welfare organisations gathered to discuss cultivated meat's impact on traditional farming. An animal welfare advocacy group stated that cultivated meat companies align more closely with small-scale farmers than large agribusinesses as most cultivated meat companies are startups or SMEs. The organisation RESPECTfarms explores the opportunities for farmers to access and implement the technology.[198] Farmers and cattle breeders are necessary to produce cultivated meat as they deliver the raw materials

[195] Interview with Camilla Björkbom, Food Policy Project Manager, Eurogroup for Animals (Wageningen, 2 December 2024).
[196] Alessandro Ford, 'This Burger Could Kill the EU' (Politico, 22 July 2024) <https://www.politico.eu/article/lab-grown-meat-burger-kill-europe/>.; ibid.
[197] Interview with a cultivated meat company (Wageningen, 18 November 2024); Interview with a cultivated meat company (Wageningen, 11 December 2024).
[198] Interview with an animal welfare organisation (Wageningen, 17 December 2024); RESPECTfarms, 'RESPECTfarms Kicks off Feasibility Research' (24 January 2024) <https://www.respectfarms.com/blog/respectfarms-kicks-off-feasibility-research>.

and donate animal cells. Collaboration between cultivated meat companies and farmers could also promote biodiversity restoration, as grazing animals contribute to ecological balance while providing biopsies for cultivated meat production.[199] An animal welfare advocacy group recommended a decentralised food system to prevent corporate dominance by large food industry players.[200]

Now, the cultivated meat industry is still in the development phase. As a result, the transition to cultivated meat will take time and is unlikely to happen for many years. This extensive timeline provides opportunities to adapt traditional farming practices and integrate cultivated meat into the existing food system.[201]

5.4 Scapegoating of Cultivated Meat

Debates around cultivated meat are not only driven by safety and regulatory concerns. Animal agricultural lobbyist groups have also framed cultivated meat as a threat to push forward political agendas on food sovereignty, traditional agriculture, and national heritage.[202] An example of a political agenda is how farmers' protests and the framing of cultivated meat serve as distractions from broader agricultural issues.

Farmers' protests have been rising in the EU due to low wages, the administrative and bureaucratic inefficiency within the Common Agricultural Policy, and lack of guidance on transitioning to sustainable farming from the EU.[203] Small-scale farmers cannot compete with large agribusinesses that benefit economies of scale and incentives; thus, they are under financial pressure.[204] Larger agribusinesses tend to be favoured by these subsidies, which contributes to inequality in the industry.[205] As a result, larger

[199] Interview with Camilla Björkbom, Food Policy Project Manager, Eurogroup for Animals (Wageningen, 2 December 2024).
[200] Interview with an animal welfare organisation (Wageningen, 17 December 2024).
[201] ibid.
[202] Council of the European Union, 'The CAP's Role on Safeguarding High-Quality and Primary Farm-Based Food Production' (n 146).
[203] Simone De La Feld, 'Farmers' Protests Exploited to Spread Fake News about EU Climate Policy: Study Nails European Far Right' (Eunews, 6 June 2024) <https://www.eunews.it/en/2024/06/03/farmers-protests-exploited-to-spread-fake-news-about-eu-climate-policy-study-nails-european-far-right/>.
[204] Alfonso Giuliani and Hervé Baron, 'The CAP (Common Agricultural Policy): A Short History of Crises and Major Transformations of European Agriculture' (2023) 54(1) Forum for Social Economics 68 <https://doi.org/10.1080/07360932.2023.2259618>.
[205] ibid.

agribusinesses undercut smaller farmers by consolidating their market strength.[206] These challenges caused farmers' protests calling for enhanced government support.
A consultant observed that agricultural lobbyists have used cultivated meat as a scapegoat to frame emerging technologies, such as cultivated meat, as a threat to traditional farming rather than focusing on the economic pressure created by corporate dominance in conventional farming.[207] Seth Roberts of the GFI noted:

"Some of this stems from concessions made by governments concerned about broader issues, like the challenges faced by farmers and agricultural communities. Recent farmers' protests highlight the growing struggles in these sectors. Banning cultivated meat, for example, might be seen as an easy political move—something symbolic to appease these groups. It does not affect the existing voter base, and since cultivated meat is not widely available yet, the public does not pay much attention. So, it feels like a low-cost concession to farmers, even though, in my view, it does not address the challenges that rural communities are facing."[208]

This political framing is also mentioned in another news article, stating that far-right-wing parties have exploited farmers' protests to spread misinformation, including claims about cultivated products, and undermine climate action to gain public support in the next elections.[209] The claims of these far-right-wing parties stated that the EU promotes the consumption of cultivated meat, which is unjustified as cultivated meat is not on the EU market.[210]

The farmer's protest in Brussels on 1 February 2024 resulted in the exclusion of cultivated meat in the EU's climate strategy of 2040, and cultivated meat will not be included in the EU's policy plans.[211] European Commissioner of Agriculture Janusz

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[206] Simone De La Feld (n 203).
[207] Xianxiang Zhu, 'Corporate Concentration of Power in the Global Food System: Dynamics, Strategies and Implications,' Advances in Social Science, Education and Humanities Research/Advances in social science, education and humanities research (November 2024) <https://www.researchgate.net/publication/385429883_Corporate_Concentration_of_Power_in_the_Global_Food_System_Dynamics_Strategies_and_Implications>. ; Zach Boren, 'How a Livestock Industry Lobbying Campaign Is Turning Europe against Lab-Grown Meat' (Unearthed, 31 October 2024) <https://unearthed.greenpeace.org/2024/07/30/cultivated-backlash-livestock-industry-lobbying-europe-lab-grown-meat/>.
[208] Interview with Seth Roberts, Senior Policy Maker, GFI Europe (Wageningen, 8 January 2025).
[209] Simone De La Feld (n 203).
[210] ibid.
[211] Bartosz Brzeziński and Karl Mathiesen, 'EU Dumped Lab Meats from Climate Plans on Farm Chief's Demand' (Politico, 12 February 2024) <https://www.politico.eu/article/eu-lab-meat-climate-plan-agriculture-commissioner-janusz-wojciechowski/>; Interview with Camilla Björkbom, Food Policy Project Manager, Eurogroup for Animals (Wageningen, 2 December 2024); Zach Boren (n 207).

Wojciechowski supported this decision, advocating for the interests of traditional livestock farmers. He argued that the agricultural sector should be exempted from climate targets. Thus, the support for the alternative protein sector was omitted in the final climate strategy.[212] These events demonstrate the power of political parties and agriculture lobbyist groups and how they influence policymaking in the EU.

5.5 The GMO Conundrum and Regulatory Parallel

Stakeholders in the cultivated meat sector have debated the role of GMOs in the market adoption of cultivated meat, as there is a resemblance between the two products. Startups initially developed cultivated meat and GM food products.[213] The startups of GM food products were marketing their products as a solution for achieving food security and a sustainable food system, similar to the narrative shared by the cultivated meat industry.[214] GM food products and cultivated meat face similar challenges related to safety concerns and the unnatural character perceived by consumers.[215]

The EU has a hesitant and stringent approach towards adopting GMO products based on the precautionary principle.[216] This approach results in most cultivated meat companies avoiding GMOs or GM techniques if they aim to market in the EU. Cellular Agriculture Lead of ProVeg International described the EU's regulatory stance on GMOs as confusing, calling it a "GMO limbo" with overly complex and restrictive regulations.[217] Consequently, EU companies developing cultivated meat with GM techniques are focused on markets outside the EU, as these markets are more accessible for GMO food products. Stakeholders in the cultivated meat industry suggested that the EU should reconsider its stance on GMOs, as it is the most restrictive in the world.[218]

Another reason for the stringent approach of the EU towards GMO products is partly attributed to governance issues during the introduction of GMOs.[219] Debates focused on

[212] European Commission, 'Europe's 2040 climate target and path to climate neutrality by 2050 building a sustainable, just and prosperous society' COM [2024] 63 final (6 February 2024).
[213] J Mohorčich and Jacy Reese (n 24).
[214] ibid.
[215] ibid.
[216] ibid.
[217] Interview with Julia Martin, Cellular Agriculture Lead, ProVeg International (Wageningen, 11 November 2024).
[218] Interview with a research institute (Wageningen, 7 January 2025); Interview with a cultivated meat company (Wageningen, 18 November 2024).
[219] J Mohorčich and Jacy Reese (n 24).

the risk and public acceptability rather than evaluating its potential as an innovation.[220] This cautious framing of GMO food products shaped long-term regulatory attitudes and consumer scepticism towards food innovations, which can be seen at the stringent framework for GMO food products in the EU compared with other jurisdictions.[221] Like GMOs, the future market adoption of cultivated meat will depend not only on scientific assessments of EFSA but also on how organisations and policymakers frame the product. The proposed bans of Italy and Hungary have already demonstrated this. Political actors in Italy and Hungary use food regulations, such as the NFR, to position themselves on issues related to national identity, tradition, and sovereignty. These bans frame cultivated meat as a threat, influencing consumer acceptance when cultivated meat enters the market.

Another parallel between GMO and cultivated meat is the fear of corporate dominance. In the past, a few large corporations exploited gene technology, which resulted in a loss of power for organic farmers.[222] Cultivated meat companies have attracted investments from large (meat) corporations, such as Tyson Foods, JBS, and Cargill.[223] These investments result in a fear of corporate control, as it creates a fear that the power will end up with a few large corporations, and small companies, including small-scale farmers, will lose their jobs.[224]

In conclusion, there is a parallel between the market adoption of GMOs and cultivated meat as they experience similar challenges in framing and fear of monopolisation. The risk framing of GMOs resulted in a cautious regulatory approach. Political parties, animal agricultural groups and national governments framed cultivated meat as a threat to the traditional heritage and the EU food system, which could impact the market adoption of cultivated meat and consumer acceptance.

5.6 The US and Singapore: An Example for the EU

Stakeholders in the cultivated meat industry referred to other jurisdictions as an example for the EU. However, they emphasised the importance of maintaining the EU's

[220] ibid
[221] ibid.
[222] Interview with Julia Martin, Cellular Agriculture Lead, ProVeg International (Wageningen, 11 November 2024).
[223] Euromeat News, 'Tyson Foods Announces Investment in Clean Meat' (30 January 2018) <https://euromeatnews.com/Article-Tyson-Foods-announces-investment-in-clean-meat/697>.
[224] J Mohorčich and Jacy Reese (n 24).

high safety standards.[225] The cultivated meat industry described Singapore and the US as frontrunners in the development of the regulatory framework for cultivated meat.[226] The positive attributes of the Singaporean regulatory framework are the opportunities for collaborative exchange between regulators and companies.[227]

The regulatory approvals for cultivated meat in other jurisdictions have influenced regulators in the EU by putting indirect pressure on EU regulators.[228] Therefore, regulators set up various initiatives to foster the development and market adoption of cultivated meat. For example, EFSA organised a scientific colloquium for cultivated foods and updated guidelines that included criteria for cultivated products. Furthermore, EU regulators are discussing with regulators from Singapore and the US on how to improve guidance.[229] The EU regulators are receptive to the requests of the cultivated meat industry, as other markets outside the EU are actively working to facilitate the development and market adoption of cultivated meat.

A consultant stated that more collaboration between regulators from different jurisdictions will appear in the future. Details about how this collaboration will unfold and the role of the EU will become evident in the future. A consultant provided an example to illustrate this collaboration:

"If you have received approval in one jurisdiction and wish to apply in another jurisdiction that also has a regulatory framework for novel foods, the two jurisdictions will collaborate, with your consent as a company, regarding the documentation you submitted. This collaboration is intended to speed up the approval process."[230]

In conclusion, the open approach towards cultivated meat in jurisdictions like Singapore and the US could set an example for the EU in facilitating a streamlined regulatory process, supporting the market adoption of cultivated meat, and fostering innovation.

5.7 Overcoming Polarisation and Policy Recommendations

Cultivated meat has been a polarising topic in EU debates. This section elaborates on the policy recommendations and how this polarisation can be overcome to facilitate the

[225] Interview with a cultivated meat company (Wageningen, 18 November 2024).
[226] Interview with a consultant (Wageningen, 18 November 2024).
[227] ibid.
[228] Interview with a consultant (Wageningen, 6 November 2024).
[229] Interview with a cultivated meat company (Wageningen, 11 December 2024).
[230] Interview with a consultant (Wageningen, 6 November 2024).

development and market adoption of cultivated meat in the EU. While stakeholders in academia, consultancy, and animal welfare advocacy groups viewed cultivated meat as one of the solutions that could foster a sustainable food system in the EU, they emphasised that it should not be the sole solution.[231] A consultant noted: *"It is a solution or part of the solutions that we can implement to solve the state of our unsustainable food system. But it should not be put forward as the only one. And I think from a societal point of view, just depriving people of choice is not the best way to achieve change"*.[232]

The interviews have revealed policy recommendations that foster the development and market adoption of cultivated meat. These recommendations include interdisciplinary collaboration, transparency, sandboxes, and information campaigns.

i. Interdisciplinary collaboration

Interdisciplinary collaboration between all actors of the food system is essential to facilitate the development and market adoption of cultivated meat. For example, the collaboration between regulators and companies could result in a high-quality dossier, which would minimise delay in the risk assessment. A cultivated meat company described the collaboration between cultivated meat companies as minimal due to the competitive environment of startups and SMEs.[233] However, GFI and New Harvest promote open-access research to accelerate the development of cultivated meat. Open-access research could ensure that the technology is accessible to smaller actors in the system, like farmers. Additionally, open-access research fosters trust in cultivated meat products.

The collaboration between the food industry and the cultivated sector led to increased investments from large food companies in the cultivated sector.[234] The meat industry has also been investing in the cultivated meat industry. As Cellular Agriculture Lead of ProVeg International stated: *"I would be personally excited to see meat producers take the lead in diversification by investing in and adopting novel technologies that ensure their businesses remain sustainable for the future. For instance, we are pleased to see*

[231] Interview with a consultant (Wageningen, 6 November 2024); Interview with prof. dr. Jonathan Verschuuren, Researcher International and European Environmental Law, Tilburg University (Wageningen, 11 November 2024); Interview with Camilla Björkbom, Food Policy Project Manager, Eurogroup for Animals (Wageningen, 2 December 2024).
[232] Interview with a consultant (Wageningen, 6 November 2024).
[233] Interview with a cultivated meat company (Wageningen, 18 November 2024).
[234] Interview with Seth Roberts, Senior Policy Maker, GFI Europe (Wageningen, 8 January 2025).

Tyson investing in new biotech foods in Spain, specifically a cultivated meat company".[235] Cultivated meat companies are dependent on investments to upscale their production. However, these investments raise concerns about monopolisation of the industry. Therefore, governments could implement policies that foster fair competition, such as funding for small actors, open-access research initiatives and clear regulatory pathways. For example, governments could guide farmers and cattle breeders to transform their businesses to become suppliers of animal cells and raw materials for cultivated meat production. Furthermore, cultivated meat companies should ensure that smaller actors are included in developing cultivated meat.

In conclusion, interdisciplinary collaboration among all stakeholders, including small actors like startups and farmers, will ensure fair competition and foster innovation and development in the cultivated meat industry.

ii. Transparency in decision making

Policymakers must ensure that regulatory frameworks prioritise public interests, such as safety, sustainability, and ethical considerations, rather than favouring industry interests. Cellular Agriculture Lead of ProVeg International argued against excessive industrial involvement in policymaking, which could contribute to regulatory frameworks that favour corporate profit over societal benefit, emphasised by an example: "*If we get industry involved too heavily with our policymakers, it is not always in the best interest of consumers, and we need to keep industry separated from policymakers".*[236] The EU and governments should maintain the integrity of policymaking by fostering transparency, facilitating public consultations, and including all stakeholders in policy discussions. This approach could increase consumer confidence in cultivated meat and encourage fair competition among stakeholders.

The risk management phase of the first novel food authorisation for cultivated meat will demonstrate whether the PAFF Committee will base their opinions on the draft implementing act on consumer protection, as guided by the EFSA scientific opinion, rather than on political considerations.

[235] Interview with Julia Martin, Cellular Agriculture Lead, ProVeg International (Wageningen, 11 November 2024).
[236] ibid.

iii. Sandboxes as a pathway to innovation

Regulatory sandboxes provide a promising tool to balance innovation and regulation. An example of a regulatory sandbox is the one in the UK. Stakeholders, such as Cellular Agriculture Lead of ProVeg International and a research institute, view regulatory sandboxes as a promising tool to foster the development and market adoption of cultivated meat. As a research institute explained: *"Sandboxing allows for little areas, or test markets, where you can achieve what the companies are interested in while also gaining information for the regulator. To me, it is a win-win, and it does not affect the consumer"*.[237]

The UK government is the first country in Europe to propose the development of a regulatory sandbox for cultivated meat.[238] The Food Safety Agencies of the UK and Scotland will give guidance to companies on how to comply with the regulatory framework to enter the market.

A regulatory sandbox can be described as a trial period for producers to evaluate their products in a real environment with flexible regulatory requirements.[239] This allows companies to experiment with their product while guaranteeing consumer protection. Close collaboration between the industry, scientists, and regulators helps to identify and address compliance issues. Regulatory sandboxes enable the regulator to understand the technology behind the novel food better. This will result in a more efficient authorisation process and thus could accelerate market adoption of the novel food.

Upcoming EU policy developments could influence the introduction of sandboxes. The EC is expected to introduce the Biotechnology Act in late 2025 under the Danish Council Presidency, which may result in introducing regulatory sandboxes in the EU.[240] As Seth Roberts of the GFI highlighted: *"If the Biotechnology Act does something big around*

[237] Interview with a research institute (Wageningen, 7 January 2024).
[238] Augustus Bambridge-Sutton, 'Cultivated Meat Regulatory Sandbox Announced by UK Govt' (FoodNavigator, 8 October 2024) <https://www.foodnavigator.com/Article/2024/10/08/Cultivated-meat-regulatory-sandbox-announced-by-UK-Govt/> accessed 27 January 2025.
[239] Publications Office of the European Union, 'Regulatory Sandboxes : Policy Report Drafted by WG5's Regulatory Sandboxes Task Force' (2023) <https://op.europa.eu/en/publication-detail/-/publication/d74556a2-4ba0-11ee-9220-01aa75ed71a1/language-en>.
[240] Interview with Seth Roberts, Senior Policy Maker, GFI Europe (Wageningen, 8 January 2025); European Commission, 'The Vision for Agriculture and Food' (n 12).

sandboxes, it could be a massive boon to the sector. It could drive forward innovative ways to regulate and foster closer cooperation between regulators, companies, and academics".[241]

In conclusion, the introduction of sandboxes in the EU could support innovation while ensuring robust risk assessments. This may foster a more dynamic and collaborative governance in the cultivated meat industry. The UK sandbox is a promising initiative for the development of cultivated meat and could set an example for the EU.

iv. Consumer education

Consumer education is an important factor in fostering consumer acceptance of cultivated meat. The narratives shared in the media and debates influence consumer attitudes. A consultant described this phenomenon as if the technology is not well explained, like what happened with GMOs, cultivated meat could follow a similar path regarding consumer acceptance.[242] The consultant also noted that consumer acceptance depends on how consumer education is performed, and what kind of name is given to the label.[243] An example of consumer education is campaigns on why the food system needs to be changed to a more sustainable and resilient system, what alternative proteins are and how they could contribute to this system without compromising on taste or even dietary habits.[244] The education should consider why cultivated meat is as necessary as conventional meat already exists. Educating consumers and addressing their concerns using an evidence-based approach could foster consumer acceptance.

[241] ibid.
[242] Interview with a consultant (Wageningen, 6 November 2024).
[243] ibid.
[244] ibid.

5.8 Discussion

The themes in the analysis highlight the complex system in which cultivated meat is positioned. Stakeholders in the cultivated meat industry, along with organisations focused on animal welfare, plant-based diets, and alternative proteins, are actively promoting the adoption of cultivated meat in the EU market. In contrast, national governments, like Italy, France, Austria, Hungary, and animal agriculture organisations, have taken a more cautious approach towards market entry. The development and future market adoption of cultivated meat depends not only on the risk assessment conducted by authorisation bodies but also on political concerns. These concerns include the protection of cultural heritage, traditional farming practices, and consumer acceptance.

The stakeholder influence on the regulatory landscape illustrates how stakeholders, with different interests and powers, influence the direction of political debates and regulatory decisions through lobbyist activities. Due to their decades-long presence in the EU political landscape, large animal agriculture lobbying groups developed a significant impact on EU and national decision-making. This influence can be demonstrated by how the agricultural group Coldiretti initiated the ban on cultivated meat in Italy. Conversely, the cultivated meat industry has been created in the last decade. Advocacy groups supporting alternative proteins, animal welfare, and sustainability have also incorporated cultivated meat into their lobbying strategies, emphasising its potential benefits.

The cultivated meat industry is mainly composed of startups and SMEs. In the early stage of development, they were dependent on private investments. Therefore, they were marketing their product as a substitution for traditional farming to attract investors. This narrative resulted in opposition from lobbyist groups in animal agriculture and political actors. These groups used this narrative to demonstrate how novel food technologies, like cultivated meat, threaten cultural heritage and traditional farming. Additionally, cultivated meat has been used as a scapegoat in political debates to distract from the underlying issues of small-scale farmers in the EU. The polarisation and politicisation of cultivated meat resulted in the omission of cultivated meat as a potential in the EU policy climate documents. This demonstrates how the interests of stakeholders from far-right wing groups and large animal agricultural groups are reflected in the regulatory landscape.

This cautious approach of the EU to cultivated meat mirrors the challenges faced when GMOs were introduced in the EU. The risk framing of GMOs resulted in scepticism from consumers and a more stringent regulatory framework. The next GMO chapter should be prevented as food innovations should be evaluated based on their potential rather than the perceived risks. Policy measures must address the polarisation and misinformation surrounding cultivated meat, relying on evidence-based research. These measures include fostering interdisciplinary collaboration, ensuring transparency in decision-making, educating consumers, and implementing experimental regulatory frameworks like sandboxes.

6 Epilogue

6.1 Conclusion

This thesis explored how stakeholders' interests and perspectives shaped the EU regulatory landscape of cultivated meat. The findings highlighted a policy environment where scientific advancements in cellular agriculture intersect with political resistance, misleading narratives and concerns regarding food innovations.

The analysis demonstrated that stakeholders shape the regulatory direction of cultivated meat. The cultivated meat industry highlights the environmental and food security benefits of cultivated meat. In contrast, agricultural advocacy groups emphasise cultural and economic concerns to limit the adoption of cultivated meat, as its market introduction could disrupt traditional farming practices. The national bans in Italy and Hungary illustrate how the perspectives of animal agricultural groups shape the regulatory landscape. The EU's cautious stance is reflected in the EU Protein Strategy as it suggests that cultivated meat will be a niche innovation rather than a transformative food innovation. This position could limit funding opportunities and slow down regulatory advancements.

At the national level, the approved pre-market tastings in the Netherlands show that certain Member States are evaluating the potential of cultivated meat through governmental funding, which fosters the development and market adoption of cultivated meat.

Although, no cultivated meat products have received approval through the novel food authorisation process, the EFSA held a scientific colloquium to gather insights from stakeholders about cultivated meat. Following this event, EFSA updated its guidelines to streamline the regulatory process for companies seeking novel food approval. These guidelines include additional requirements specific to cultivated products. Besides the regulatory challenges in the authorisation procedure, these initiatives demonstrate that EFSA is willing to accommodate the requests of the cultivated meat industry.

Looking ahead, cultivated meat is a polarising topic in the EU debates, which should be overcome by enhanced dialogue between all actors of the food system and consumer education to address misinformation. A collaborative and transparent regulatory approach that incorporates the perspectives of small-scale farmers, cultivated meat

companies, and policymakers could ensure that cellular agriculture can coexist with traditional farming. Ultimately, the future of cultivated meat will depend on how policymakers balance innovation with cultural and economic concerns.

6.2 Recommendations

Recommendations for future studies are based on the analysis. Future research should investigate the long-term impact of national initiatives on the cultivated meat market adoption and development in the EU, as no cultivated meat product has been approved yet. Furthermore, in an interview, it was noted that stakeholders in the cultivated meat industry expressed interest in research on collaborative governance models, such as sandboxes and other experimental regulatory frameworks. They are particularly interested in how these models could encourage innovation in cellular agriculture.[245]

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iii. Empirical research

Camilla Björkbom, Food Policy Project Manager, Eurogroup for Animals, 'Interview' (Wageningen, 2 December 2024).

Hans Vloet, Regulatory Expert within the cultivated sector, 'Interview' (Wageningen, 12 November 2024).

Julia Martin, Cellular Agriculture Lead, ProVeg International, 'Interview' (Wageningen, 11 November 2024).

Jonathan Verschuuren, Researcher International and European Environmental Law, Tilburg University, 'Interview' (Wageningen, 11 November 2024).

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Consultant, ‘Interview’ (Wageningen, 18 December 2024).

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8 Appendix

8.1 Acknowledgement of AI

In this thesis, I have used AI as a supportive tool. For instance, I used Grammarly to refine sentences and check grammar, and all improved sentences were rewritten. I also used ChatGPT for brainstorming, as a sparring partner for feedback, and for additional grammar checks. AI, as a supportive tool, has encouraged me to reflect more critically on my research.

8.2 Interview Guide

Introduction (ca 5 min)

The interviewer will introduce themselves before the interview begins. The purpose of the interview and the rationale for selecting the interviewee will then be addressed. The interview will be semi-structured and last approximately 40 minutes. A voice recording of the interview will be made, which will then be transcribed and analysed. The recording will be only used for research purposes. Informed consent is obtained before the interview occurs.

- Are there any questions or concerns before we start the interview?

Questions (ca 30 min)

a) Company-focused

General questions (5 min)

1. Could you elaborate on the company and its vision shortly?
2. How would you describe the product and its technology?
3. What is the stage of development of the product/technology?

Questions regarding the regulatory environment (20 min)

1. How would you describe the regulatory framework for cultivated proteins in the EU?
2. What do you think about how the regulatory framework addresses the development and market adoption of cultivated proteins?
   ➔ Are the current regulations clear and comprehensive?
   ➔ If not, which area(s) seem ambiguous or confusing?

3. How adaptable would you describe the regulatory framework in response to advancements in cultivated protein technology?
4. To what extent were you involved in the consultation process for the Novel Food Regulation? How have you sought to influence the regulation? To what extent do you consider your efforts successful?
5. What are the regulatory challenges that you encounter within the EU regulatory framework?
6. To what extent does the regulatory framework address the existing challenges in the cultivated protein sector?
7. What amendments need to be made to the current regulatory framework from your perspective?
   ➔ Are there examples from other countries that the EU should learn from?
8. How do you foresee the regulatory landscape evolving over the next few years?

<u>Questions regarding the feasibility of the protein transition (5 min)</u>

9. What is your perspective on the feasibility of cultivated proteins as part of the alternative protein transition?
   ➔ What are the factors that influence the feasibility of cultivated proteins as part of a sustainable food system in the broader sense?
10. What are the main hurdles in the alternative protein sector?
    ➔ How can these hurdles be addressed?

b) Organisational-focused

<u>General questions (5 min)</u>

1. Could you describe shortly the organisation and its vision within the alternative protein sector?

<u>Questions regarding the regulatory environment (20 min)</u>

2. How would you describe the regulatory framework for cultivated proteins in the EU?
   ➔ What are the key regulations and policy documents?
3. Are there specific areas where you feel that opportunities and challenges for cultivated proteins are underrepresented in the regulatory framework?

4. What amendments need to be made to the current regulatory framework from your perspective?
   ➔ What would be the impact of these amendments?
   ➔ Are there examples from other countries that the EU should learn from?
5. To what extent were you involved in the consultation process for the Novel Food Regulation? How have you sought to influence the regulation? To what extent do you consider your efforts successful?
6. Could you share examples that illustrate how the regulatory landscape has been influenced by the position of certain stakeholders?
7. How do you foresee the regulatory landscape evolving over the next few years?

<u>Questions regarding the feasibility of the protein transition (5 min)</u>

8. What is your perspective on the feasibility of cultivated proteins as part of the alternative protein transition?
   ➔ What are the factors that influence the feasibility of cultivated proteins in the broader sense?
9. What are the main hurdles in the alternative protein sector?
   ➔ How can these hurdles be addressed?

<u>Closing (ca 5 min)</u>

Is there anything else that I have not touched upon that is relevant or insightful from your perspective relating to the regulatory landscape of cultivated proteins?

- Provide a summary of the interview
- Additional remarks and questions?
- Appreciation for the participation