

Modelling Strategies to Reduce the Cost of Capital for Cultivated Meat

Introduction and Background

The global food system is responsible for around a third of greenhouse gas (GHG) emissions of which “the largest contribution came from agriculture and land use/land-use change activities” (Crippa et al., 2021, p. 1). Comparing different approaches of reducing emissions in this sector shows that plant-rich diets have big potential (Clark et al., 2020, p. 2). Alternative Proteins, making meat from plants, could be one promising option of reducing environmental impact while avoiding people’s resistance to dietary shifts (Macdiarmid et al., 2016). One way of doing this would be by cultivating meat, though current price is not competitive with animal meat. A techno-economic analysis (TEA) has shown that besides the cell culture medium, cost of capital (CoC) is the second big driver of cost of goods sold (COGS) (Vergeer et al., 2021, p. 4). Cultured meat brings unique challenges for financing. Production facilities would require equipment that is not commoditized and sometimes has never been built on the necessary scale which drives costs as there are no economies of scale (Humbird, 2020, p. ii; Vergeer et al., 2021, pp. 31–32). At the same time the production processes are unproven in industrial settings which adds uncertainty to expected revenue streams (Shah et al., 2024, p. 25).

Objective, Methods, and Roadmap

The TEA includes scenarios with different investment criteria which demonstrates a significant reduction in COGS by extending the recuperation of investment from four years to the lifetime of the facility. The researchers offer ideas but do not take a closer look at how this change in CoC can be achieved. (Vergeer et al., 2021, p. 18)

My goal with this thesis would be to analyse specific financing strategies to identify ways of achieving these cost reductions. To compare different approaches, I want to build on the existing research and expand the models to include more nuanced factors than payback time to differentiate between capital sources. This would allow me to model structures that include government and philanthropic funding.

The research process could look like this:

1. Literature review to understand the needs of the cultivated meat industry and possible investors, get an overview of the technological landscape, and extract parameters for the model.
2. Building a base model based on findings from 1) using Python. Validate it by comparing its results to existing TEAs.
3. Develop financial structure scenarios and implementing them in the model.
4. Interpret findings and extract recommendations for companies and investors.

This project would align well with combining my background in environmental sciences and strong motivation of working on climate solutions with the skills I will acquire during my master's in Management, Technology, and Economics.

Prior Work

Besides the already mentioned TEA (Vergeer et al., 2021) and some similar reports like Humbird (2020), there is limited research on this specific problem. The Good Food Institute has released a report about the financing bottleneck of alternative proteins, which they base on interviews with industry insiders (Shah et al., 2024). This thesis could be a quantitative counterpart to this report.

Further Reading

Global Food System's Climate Impact:

- *Food systems are responsible for a third of global anthropogenic GHG emissions* (Crippa et al., 2021): Estimating the climate impact of food systems taking into account the whole value chain.
- *Global food system emissions could preclude achieving the 1.5° and 2°C climate change targets* (Clark et al., 2020): Big picture view at different possibilities of reducing global food emissions.

2024 State of the Industry: Cultivated meat, seafood, and ingredients (Good Food Institute, 2025): General overview of where the cultured meat industry is at. Also highlights financing challenges.

Techno-Economic Analyses:

- *TEA of cultivated meat* (Vergeer et al., 2021): Report commissioned by GFI. They also published their analysis of the findings combined with a life cycle assessment (Macdiarmid et al., 2016).
- *Scale-Up Economics for Cultured Meat* (Humbird, 2020): Also not very focused on the financing aspect.
- *Preliminary Techno-Economic Assessment of Animal Cell-Based Meat* (Risner et al., 2021): Confirms high CAPEX but does not go into CoC considerations.

Funding the Build (Shah et al., 2024): GFI report based on interviews with industry insiders looking at possibilities for alternative proteins to get funding to scale.

Blended Finance (an idea for capital structures which include the "strategic use of development finance for the mobilisation of additional finance towards sustainable development" (OECD Environment Directorate, 2022, p. 8))

- *OECD Blended Finance Guidance for Clean Energy* (OECD Environment Directorate, 2022): Looks specifically at Clean Energy, a technology that has succeeded in scaling.
- *State of Blended Finance Climate Edition* (Convergence Blended Finance, 2024)

References

- Clark, M. A., Domingo, N. G. G., Colgan, K., Thakrar, S. K., Tilman, D., Lynch, J., Azevedo, I. L., & Hill, J. D. (2020). Global food system emissions could preclude achieving the 1.5° and 2°C climate change targets. *Science*, 370(6517), 705–708. <https://doi.org/10.1126/science.aba7357>
- Convergence Blended Finance. (2024). *The State of Blended Finance 2024. Convergence Report*.
- Crippa, M., Solazzo, E., Guizzardi, D., Monforti-Ferrario, F., Tubiello, F. N., & Leip, A. (2021). Food systems are responsible for a third of global anthropogenic GHG emissions. *Nature Food*, 2(3), 198–209. <https://doi.org/10.1038/s43016-021-00225-9>
- Good Food Institute. (2025). *2024 State of the Industry: Cultivated meat, seafood, and ingredients*. <https://gfi.org/resource/cultivated-meat-seafood-and-ingredients-state-of-the-industry/>
- Humbird, D. (2020). *Scale-Up Economics for Cultured Meat: Techno-Economic Analysis and Due Diligence*. <https://doi.org/10.17605/OSF.IO/AJSU9>
- Macdiarmid, J. I., Douglas, F., & Campbell, J. (2016). Eating like there's no tomorrow: Public awareness of the environmental impact of food and reluctance to eat less meat as part of a sustainable diet. *Appetite*, 96, 487–493. <https://doi.org/10.1016/j.appet.2015.10.011>
- OECD Environment Directorate. (2022). *OECD blended finance guidance for clean energy* (OECD Environment Policy Papers No. 31; OECD Environment Policy Papers, Vol. 31). <https://doi.org/10.1787/596e2436-en>
- Risner, D., Li, F., Fell, J. S., Pace, S. A., Siegel, J. B., Tagkopoulos, I., & Spang, E. S. (2021). Preliminary Techno-Economic Assessment of Animal Cell-Based Meat. *Foods*, 10(1), 3. <https://doi.org/10.3390/foods10010003>
- Shah, L., Clark, L., & Murray, S. (2024). *Funding the build* (p. 43). <https://gfi.org/resource/funding-the-build/>
- Vergeer, R., Sinke, P., & Odegard, I. (2021). *TEA of cultivated meat*. <https://cedelft.eu/publications/tea-of-cultivated-meat/>