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Political economy of protein transition: Battles of power, framings and narratives around a false wicked problem

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In this paper we revisit the current debate between red meat vs. alternative protein and explore the respective contribution that those two polarized discourses claim to make in relation to the new international agenda on transforming food systems toward a more sustainable future. To complete this, we combine classical political economy analysis focusing on the access and distribution of power and economic resources amongst different groups of actors, with a more sociological approach relying on discourses analysis. The first part of the paper highlights the relevance of adopting a political economy approach to explore the centrality of factors such as incumbent actors' powers and influence at both national and international levels. It also raises questions about the equitable redistribution of the dividends of the sector's rapid growth between the different groups of actors and in particular the marginalization of the smallholders. We then deconstruct some of the main narratives and counter-narratives that have emerged over the last two decades around the question of protein transition and show how those different narratives have been used as "discursive tools" by both the red meat and the alternative protein proponents to advance their own agendas and ignore others'. In doing so, we expose some of the unnecessary polarized or confrontational elements of the debate and suggest that the wicked nature of the problem as it appears at first sight may in fact be more the result of the framing used by particular actors, rather than the consequence of an irreconcilable tensions between diverging priorities.

KEYWORDS

food system transformation, political economy, protein transition, narrative analysis, discursive practices

Introduction—framing the problem

The term "protein transition" refers to the transition from a heavy red-meat consuming world to a more plant-based food system. The issue of transitioning away from red meat is a growing debate within the whole food system transformation literature, and a symbolic one (Purdy, 2020). In effect, along with sugar and salt, red meat (beef, pork, or lamb) is now often presented as an "unhealthy" food item when consumed in excess (Popkin, 2009; Vermeulen et al., 2020). In addition, the production and processing of animal-based proteins has also been recognized to be environmentally more harmful and resource intensive than plant-based sources (Herrero et al., 2016). The livestock sector is estimated to contribute 14.5% of our global GHG emissions (Gerber et al., 2013), and also, under some conditions, to increase land degradation, air and water pollution, and decline in biodiversity (Reynolds et al., 2010; Bellarby et al., 2013).

Yet, it is also well established that animal-based foods provide a concentrated source of vitamins and minerals (e.g., iron) that are particularly valuable to young children in low-income countries whose diet is otherwise generally poor (HLPE, 2017). Studies have demonstrated, for instance, large benefits from modest increases in meat in the diets of the poor in sub-Saharan Africa (Neumann et al., 2010). Conjointly, the livestock sector is also recognized to provide livelihoods to millions of smallholders (Steinfeld et al., 2006). Clearly, in some countries, *more* meat consumption, not less, would be beneficial to many.

The issue of protein transition seems therefore to involve conflicting and painful trade-offs between economic, ethical, societal and environmental objectives and priorities. As such it may look like a wicked problem. Not surprisingly, it has evolved over time in a heated argument between two coalitions of actors: on one side, the pro-livestock supporters who advocate for protecting the meat industry and its activities, and, on the other side, the pro-alternative-protein advocates who push for a replacement of red meat by other, more “sustainable” sources of protein.

The pro-livestock camp encompasses many different actors, including some academics and experts, but also—as expected—some of the largest transnational agri-food corporations (TNCs) such as JBS, Tyson Foods, Cargill and Smithfield—the world’s four largest meat-producing corporations. These TNCs have invested billions of dollars in the sector and have very strong financial interests to ensure that the increase in the consumption of animal-sourced protein (including red meat) as it has been taking place in the last 40 years across the globe, continues in the near future. To some extent, the pro-livestock camp also includes the millions of smaller actors whose livelihoods depend on livestock raising.

On the other side of the spectrum, an increasing number of international environmental or conservation organizations and global experts are now advocating for a drastic cut in the production and consumption of red meat. Applying the universal healthy reference diet advocated by the EAT-Lancet report would require, for instance, a more than 50% reduction in the global consumption of red meat—primarily by reducing excessive consumption in high-income countries (Willett et al., 2019). To substitute for red meat, alternative protein based systems¹ are being actively promoted in a growing number of countries, including Germany, South Korea, United Kingdom, or the Netherlands. In this last country for instance, several universities and think-tanks are heavily involved in the protein transition debate and are energetically pushing for the substitution to happen [e.g., NewForesight²; University of

Delft³; Utrecht University,⁴ Wageningen University,⁵ the Green Protein Alliance,⁶ and even the Dutch National Science Foundation (NWO)]⁷. As such, the Netherlands could be seen as a likely precursor of a future stance amongst (high-income) countries in the emergence of alternative protein based national food systems.

At the present time, the international debate between pro-livestock and pro-alternative protein approaches seems to be deadlocked: no general consensus on how to address this thorny problem and to navigate the necessary trade-offs between human health, nutrition, economic and environmental impacts seems to emerge. The divide is very apparent amongst many different groups, including academics and experts, development practitioners, but also even amongst members of the same governments. For illustration, in 2021 the discord became evident between the Consumption Minister and the Prime Minister of Spain. The former (Alberto Garzón), being “worried about the health of [Spanish] citizens and the health of our planet”, was forcefully advocating for a reduction of red meat consumption, while the Prime Minister (Pedro Sánchez), under pressure from the meat industry, openly opposed to the idea and the Ministry of Agriculture (Luis Planas) called Garzón’s campaign “unfortunate” and “unfair”—pointing out that the meat industry in Spain produces one-fifth of the country’s exports, worth 10 billion euros.⁸

Aware of these heated debates and acknowledging the pressing need to engage in a comprehensive transformation of our food systems (e.g., Béné et al., 2020; Webb et al., 2020), the objective of this paper is to revisit this debate and its apparent wicked nature from a political economy perspective. In light of the Spanish example above, one initial assumption is indeed that the concentration of a large share of the market power in the hands of a few national or international companies could influence or even limit the domestic policy space and the power of local and national governments. The fear is that some of the strong politico-economic dynamics that are already visible in the system at national or at global level (see e.g., Lundström, 2019) may contribute to “lock” this system further into its current trajectory and prevent or delay the structural transformation that is deemed necessary to achieve a long-term sustainability (Bernstein, 2016; IPES, 2017).

On the other hand, some would contend that reducing this debate to a traditional political-economy issue where power and status quo are in the hands of the most powerful players and framing it as a polarized debate between, on one side, the livestock proponents and, on the other side, the “alternative protein” (AP) proponents may, in itself, be part of the problem

1 Broadly defined, alternative protein refers to three types of products: (i) plant-based substitutes such as the ‘Impossible Burger’ or the egg substitutes made from algae-based powders, (ii) lab-grown meat/fish/dairy products and other novel manufactured high-protein foods, and (iii) insect-based protein products.

2 <https://www.newforesight.com/frontrunnersfeatured/going-beyond-meat-accelerating-the-green-protein-transition-in-the-netherlands/>

3 <https://www.biotechcampusdelft.com/news-and-events/news/the-protein-transition-in-the-netherlands-alternative-proteins-that-can-act-as-substitutes-for-traditional-animalbased-food/>

4 <https://www.uu.nl/en/events/protein-transition-towards-sustainable-plant-based-diets>

5 https://issuu.com/wageningenur/docs/ww2019_02_eng

6 <http://greenproteinalliance.nl/>

7 <https://www.nwo.nl/en/funding/our-funding-instruments/nwa/transition-to-a-sustainable-food-system/transition-to-a-sustainable-food-system.html>

8 <https://www.wsls.com/news/world/2021/07/08/debate-over-eating-meat-gets-heated-in-spanish-politics/>

-as this interpretation would undoubtedly reinforce, or at least contribute to, the perpetuation of this locked-in debate. The International Panel of Experts on Sustainable Food Systems (IPES) for instance, posits in their report on the Politics of protein: “At a critical juncture for food systems reform, the proliferation of competing claims in the “protein debate” is exacerbating tensions and creating further polarization—between animal welfare activists and livestock farmers; environmental and anti-poverty organizations; urban and rural populations; and between meat-eaters, vegetarians, and vegans” (IPES, 2022, p. 16, our emphasis).

Navigating between those two positions, the premise of this paper is that, when it comes to food and especially red meat, it is not just about the interests of the private sector (with power, connections and money) vs. considerations of public health or environmental conservation, even if (as we shall see below) those two are critical components of the same equation. Instead, as we intend to demonstrate in the rest of this paper, a more appropriate way to comprehend this problem is to adopt a more nuanced interpretation of the current discourses and narratives contributing to this apparent lock-in. We will argue in particular that unpacking carefully the different arguments, discourses, narrative and counter-narratives (Roe, 1994; Keller, 2020) adopted by the main actors, and critically analyzing the “framing” (van Hulst and Yanow, 2016) that these different actors (sometimes unconsciously but also often intentionally) use to define the problem, can be a first important step to disentangle, explain and hopefully ease some of the tensions that are currently observed and that are contributing to the polarized nature of the debate around protein transition.

When using the term “framing” in this paper, we refer to the concept initially developed by van Hulst and Yanow (2016) in relation to public policy and now more broadly used in social theory (Badie et al., 2011) to describe the interactive process by which decision-makers or actors build narratives to explain or justify decisions. More specifically, in the context of this paper, framing will be used to emphasize the politically constructed nature of the “stories” around protein transition.

Against this background the rest of the paper is organized as follows: first, we review some of the main elements which have led a growing number of scholars to argue that political economy is a relevant framework for the analysis of the protein transition and more globally of the food system transformation (Béné et al., 2020). Although only based on a succinct review, our intention is to demonstrate that this political economy approach is indeed legitimate when it comes to analyzing the meat transition as it helps demonstrate the centrality of elements such as powers and influence (of the incumbent actors) in explaining the current situation. In a second part, we complement this initial political economy ‘glance’ with an analysis focused on discourses—what could be called discursive political economy. The intention, in that second part, is to ‘deconstruct’ some of the narratives and counter-narratives that have been adopted by the different protagonists of the debate, and to reveal how those narratives -often carefully framed around a particular vision or interpretation of the problem- contribute actively -and sometimes intentionally—to the contested nature of the debate. As such, we argue, those polarized discourses are part of the problem.

Finally, although the constellation of actors involved on both sides of the debate is large and diversified—including experts and academics, policy-makers, civil society, as well as private sector (from small local artisanal enterprises or even start-ups to multi-billion dollar agri-food TNCs)—we propose to focus our attention mainly on the first of those groups, the experts and academics, because of the special responsibility that this group has in relation to the generation of knowledge, which puts them in a privileged and powerful position vis a vis the rest of society.

The old and new political economy of the protein transition

Central to the contemporary conceptualization of political economy is the question of power, considered in all its forms and expressions, spanning from politics and economics to finance, of course (Weingast and Wittman, 2008) but also, more subtly, to discursive practices, social norms, or discourses (Foucault, 1983; Krzyzanowski, 2020). Applying a political economy lens to a given sector (e.g., energy, health, etc.) can therefore help identify why and how particular status quo or practices persist despite a growing call for transitions. It also draws attention to the winners and losers of those practices.

In the past, political economy has been used in the context of food systems in general (e.g., Friedmann, 2005; Pritchard et al., 2016); and, today, it continues to be called upon to shine light on some of the current or emerging issues, especially around food system dynamics and systemic lock-ins, or the issue of inequality in power and decision making (e.g., IPES, 2015; Leach et al., 2020). IPES (2015, p. 5), for instance, remarks: “power imbalances, often stemming from economic inequalities, are a key factor in the way food systems operate”. The specific case of the meat industry does not seem to differ significantly from this general statement (Williams, 1999). In fact, many would even argue that the meat industry is one of the major agri-food sectors where this sense of power imbalance is the strongest (Winders and Ransom, 2019).

What do the facts tell us?

The value of global meat production had increased from about \$65 billion in 1961 to \$366 billion in 2014 (in constant 2004–2006 US\$)—an increase of more than 500% (FAO, 2019). This economic value, however, is not spread evenly among farmers, workers, and corporations, or even between countries. Rather, this massive increase in meat production has mainly benefitted big international corporations in the Global North and in some large industrializing countries (specifically, Brazil and China). A handful of those corporations (such as JBS in Brazil, WH Group in China, and Tyson in the US) have come to dominate the meat industry as it expanded over the past five decades. These TNCs do not simply control the production, but also the required inputs (upstream sector) and the processing of meat products (downstream activities). For instance, Cargill, headquartered in the US and one of the world’s leading grain traders, is also the second-largest animal feed manufacturer and the third-largest meat processor in the world.

Importantly, each of these TNCs has not just benefited from the worldwide exponential increase in meat demand; they also benefited from substantial help from their respective governments. In the US, for instance, Tyson received a diverse array of subsidies, among which the most important was aimed to reduce the costs of corn and soybeans used to feed livestock. [Starmer et al. \(2006\)](#) estimated that, between 1997 to 2005, through direct subsidies provided by various US Department of Agriculture's (USDA) programs, Tyson managed to save an estimated US\$288 million per year ([Starmer et al., 2006](#)), while Smithfield—another major agri-food firm involved in pork production and processing—saved the equivalent of US\$284 million per year for the same period ([Starmer and Wise, 2007](#)).

In China, the pork industry has also received massive support from both central and provincial governments ([Schneider, 2017](#)). For instance, in 2013 when the WH group acquired Smithfield—thus *de facto* becoming the world's largest pork processor—, the transaction was made possible thanks to a \$4 billion loan provided by the Bank of China as part of the wider Chinese central government strategy to boost the capacity of the national pork industry ([Howard, 2016](#)). When other aspects of production (including grants, subsidized loans, and tax breaks) are accounted for, the pork industry in China has been receiving an estimated US\$22 billion during the early 2010s, which would represent the equivalent of a US\$47 subsidy per pig ([The Economist, 2014](#)—reported in [Howard, 2016](#)).

A similar pattern is observed in Brazil. There, [Pigatto and Pigatto \(2015\)](#) described how JBS—which is now the world's largest meat processor of beef, pork and poultry—benefited from substantial financial supports through federal feed subsidies as well as very advantageous low-cost loans, in exchange for letting the Federal Government become a shareholder of JBS. These “arrangements” were part of Brazil's “national champions development strategy”, whereby the Brazilian government invested in some of the largest national firms, and particularly in the meat sector, because of their world-leading position in international trade.

[Howard \(2016\)](#) and [Schneider \(2017\)](#) provide detailed accounts of those various interferences of national/federal governments in the economics and finance of the “Big Meat” industry. They show how the financial interests and political agenda of those governments have become so entangled with those of the industry that it is now very difficult for those governments to reverse the tide and engage in the types of drastic policy changes that would be necessary to maintain the global food system within planetary boundaries ([Béné, 2022](#)).

The other side of the red meat equation

Another piece of the puzzle in this initial political economy analysis rests with the fate of other main actors, those millions of smallholders whose livelihoods depend for a great extent on raising livestock and who were expected to benefit from the so-called “Livestock revolution”.

The term Livestock Revolution was initially coined by Chris Delgado and his colleagues in a IFPRI discussion paper

([Delgado et al., 1999](#)), possibly with the intention to highlight some parallel with the Green Revolution and the poverty alleviation outcomes it delivered to rural/agrarian populations in Asia and Latin America during the 1960s and 1970s ([Raj, 2013](#)). By framing this Livestock Revolution as “the next food revolution” (the title of Delgado's paper), those authors were indeed referring to the assumption that this new “revolution” would generate economic opportunities for small-scale farmers in low- and middle-income countries (LMICs). The underlying argument was that although the bulk of the benefits may still be captured by the large agri-food companies through the wide-ranging vertical integration process that has characterized the sector in the last 20 years, the ‘rising tide’ would also benefit resource-poor smaller-scale farmers (see also [ILRI, 2002](#) or [Nin et al., 2007](#)). In theory, those smaller-scale farmers were expected to cash in some of the trickle-down benefits of the revolution ([Brown, 2003](#); [Global Livestock Advocacy for Development GLAD, 2018](#)) by getting access to previously unreachable global markets through their ‘partnership’ with the larger agri-food companies ([Waldron et al., 2003](#)).

What empirical data reveals, however, is that for the majority of the small-scale farmers living in LMICs, this livestock revolution did not materialize ([Dijkman, 2009](#); [Narrod et al., 2010](#); [Pica-Ciamarra and Otte, 2011](#)). Instead, the “red meat revolution” involved a process of vertical integration by which small actors became highly dependent on larger agri-food companies (see, e.g., [Khan and Bidabadi, 2004](#); [Gura, 2008](#)). Because this vertical integration also implied a rigid adoption of more capital-intensive technologies ([Nin et al., 2007](#)), smallholders were generally unable to afford the required technical upgrading, exposing them to risks of severe indebtedness ([von Kaufmann and Fitzhugh, 2005](#)). In the view of many, the vertical integration that was presented initially as the motor of the Livestock Revolution eventually disempowered and marginalized small-scale farmers as opposed to empowering them ([Dijkman, 2009](#); [Pica-Ciamarra and Otte, 2011](#)).

What about the alternative protein movement?

It would be wrong to assume that the concentration of power, resources and influence as described above only applies to the red meat industry. Although the perception we have of the alternative protein world is often one of myriad ‘smart’ disruptive start-ups wrestling to create a little space for their own original innovation, the reality is quite different. What emerges from the most recent analyses (see, e.g., [Clapp and Scrinis, 2017](#); [Mouat et al., 2019](#); [Howard et al., 2021](#)) is, on the contrary, a world where the research and development (R&D) of those alternative protein products is now essentially controlled by the same TNCs that have been leading the meat industry for the last three to four decades. In the last few years, Cargill, for instance, invested in the lab grown meat company Aleph Farms, joint ventured with the pea protein firm Puris, and later introduced its own plant-based meat substitute; JBS purchased Bio.Tech.Foods (a Spanish lab grown meat firm) in 2022 while investing another US\$100M in developing lab grown meat ([IPES, 2022](#)). Other major agri-food TNCs who invested in alternative protein include Nestle who acquired Sweet Earth in

2017, Unilever who acquired The Vegetarian Butcher in 2018, Kerry Group who acquired a majority stake in Ojah (a Dutch company specialized in the production of plant-based ingredients), or Hormel who acquired Skippy and Justin's, two peanut firms, in 2016 (Howard et al., 2021). Not to forget McDonald of course who ventured with Beyond Meat to develop their "McPlant" plant-based patty. In sum, nearly all the largest meat and dairy TNCs as well as some of the largest fast-food corporations have, in recent years, invested massively to acquire existing plant-based substitutes or to develop their own.⁹ The reason for these investments is obvious. The meat substitute market is expected to reach annual sales of US\$12 billion by 2025 and \$17 billion by 2027, with an annual growth rate of 15–18% projected from 2020 to 2025 (Meticulous Research, 2020). Europe is currently the largest market for these products with the popularity of meat analogs among consumers seeking protein alternatives and sustainable food particularly high in Germany, France, the Netherlands, the United Kingdom, Italy, and Sweden -even if Asia is currently estimated to be the fastest growing market (Mordor Intelligence, 2020, cited in Howard et al., 2021).

In sum the image of the small, smart and friendly start-ups striving to find a solution to the unsustainability of our food systems and to improve the health of the planet by developing less harmful and more environmentally or animal-friendly products needs to be replaced by the cold reality of a growing market, worth billions of dollars, being appropriated and now almost entirely controlled by some of the largest corporations of the global food system.

Overall, what this first part of the paper reveals is that the meat industry in both high- and lower-income countries, is rapidly changing, but perhaps more importantly, that those changes have been driven -and continue to be driven- by markets forces and powerful actors. As such this overview confirms the idea that a political economy lens is relevant to analyze not only the current structure but also the dynamics of the changes that have characterized the meat industry in the last two decades.

Protein transition: wicked problem or strawman argument?

Wicked problems are generally understood as issues or problems that are difficult or impossible to solve because of some element of dilemma and/or internal conflicting objectives. In planning and policy literature, the expression refers to debates that are socially and/or politically complicated because of incomplete, contradictory, and changing conditions (APSC, 2007). As (Head and Alford, 2015, p. 712) remark, for those reasons, "wicked problems seem incomprehensible and resistant to solution".

At first sight, the red meat transition does look like one of those wicked problems: as recalled in the introduction, red meat has now been recognized to be a major contributor of climate change as well as a main source of land and environmental degradation (Gerber et al., 2013; Willett et al., 2019; Ranganathan et al. 2016). In addition, when consumed in excess, red meat has also

been recognized to contribute to serious public health problems, including increased risks of stroke, type-2 diabetes, some forms of cancers and cardiovascular diseases (Etemadi et al., 2017; Zeraatkar et al., 2019). Yet, red meat and animal-source foods more generally provide a concentrated source of some of the critical vitamins and minerals necessary for young children's physical and cognitive development, as well as for pregnant and lactating women, and more generally people suffering from undernutrition (Mozaffarian, 2016; HLPE, 2017). Therefore, many experts insist of the need to boost animal-source foods consumption in regions where diets are otherwise poor, such in sub-Saharan Africa and some parts of South Asia (Gibson, 2011). In addition, livestock contributes to the food and nutrition security of millions of poor smallholders in those same countries, directly through the consumption of their own animals and indirectly from the incomes that they derive from raising and selling those animals.

Framed as such, the tension between two conflicting objectives; on one hand, the need to drastically reduce global production and consumption of red meat to remain within planetary boundaries and to address the red meat health crisis, and, on the other hand, the necessity to increase and facilitate the consumption of animal-source food in some particular parts of the world or for some particular groups, could be seen as the root of an irreconcilable dilemma between two incompatible priorities, making it look like a wicked problem.

The (deceptive/fallacious?) wicked nature of the problem

We argue however that part of this apparent wicked problem is simply the result of a 'battle' of narratives and counter-narratives in which the pro-meat on one side and pro-alternative protein on the other, quarrel with each other, creating a confrontational discursive battlefield where the strategy is not to describe reality as it is (i.e., complex, nuanced and often ambivalent), but rather to present the problem in such a way that one's view/interpretation would be embraced by the largest number, even if achieving this implies deploying deceptive or fallacious arguments. In some other cases, the arguments may be valid but the way the problem is 'framed' is partial or biased, preventing the emergence of the full and comprehensive picture. As such, we argue, those narratives contribute to create or to reinforce the wickedness element of the debate, as opposed to address it.

Narratives and counter-narratives

Understood in a relatively 'generic' manner, a narrative can be seen as a storyline (Roe, 1994) used to explain or interpret reality as we observe it. Decision-makers, stakeholders or even researchers and experts adopt such storylines to define what a given problem is (and what it is not) and identify the solution they see appropriate or necessary to address that problem (Yanow, 1996; Drysek, 1997). Narratives can therefore become discursive 'tools' used to justify or impose specific policies, official positions, or even research agendas.

⁹ Other major influential investors including multi-billionaires such as Richard Branson or Bill Gates who advocate for lab-grown 100% synthetic beef substituting for animal-based protein (Temple, 2021).

Applied to the question of the (un)sustainability of our food systems, narrative analysis has already shown to be useful in revealing how different views and interpretations prevail amongst experts about the nature of the “sustainability crisis”, and consequently about the types of solutions that are needed to fix the problem (Béné et al., 2019). In the present case, we propose to use more specific examples to illustrate how such narrative analysis can help unpack the stories behind the protein transition and debunk some of the contested elements of the problem.

Let us first briefly illustrate how important the *framing* of a problem -or of a solution- is for its perception and potential acceptability by the general public. In a recent analysis, Bryant and Dillard (2019) explored the level of consumers’ acceptance for what is called “cultured meat” (i.e., meat grown *in-vitro* in laboratory). For this, they proposed to present this new product using three alternative narratives: (i) “societal benefits”, (ii) “high tech”, and (iii) “same meat”. The first narrative, advocating for societal benefits, presents cultured meat as “clean meat [that] has many benefits for society like reducing harm to the environment and helping animals”; the second narrative (“high tech”) presents cultured meat as “clean meat (...) made using highly advanced technology in a state of the art laboratory”; and the third narrative (“same meat”) presents cultured meat as “clean meat [that] tastes like conventional meat, is increasingly affordable and can be healthier to eat” (Bryant and Dillard, 2019, p. 3). Bryant and Dillard then show that when introduced to the general public (in their case, a group of US adults), the level of acceptance of the product depends highly on the initial framing used. In particular, the “high tech” narrative received significantly less support and was less likely to be widely accepted, compared to the two other narratives,¹⁰ even though the product it was advocating for was exactly the same.

Interestingly, livestock proponents also use this apparent skepticism about the “high-tech” narrative as part of their strategy to fight the rise of alternative protein (AP). A series of counter-narratives were developed recently by those livestock proponents with the aim to contest the different narratives that AP supporters have developed. In a very insightful analysis, Sexton et al. (2019) dissect several of these counter-narratives. The first is the “Frankenfood” counter-narrative, which builds on the consumers’ hesitance regarding the technoscientific methods used to produce these alternative products, spreads doubt about the technological capabilities of the new AP companies to produce competitive and quality products. In parallel, another powerful counter-narrative emphasizes the “ultra-processed” nature of alternative meat. This second counter-narrative builds on the apparent contradiction between, on one hand, the claims made by AP proponents that alternative proteins are more environment-friendly than conventional meat production and, on the other hand, the fact that those alternative meats are in reality ultra-processed food- which is, everything but “natural”.

At the end, both the narratives put forward by AP advocates and the counter-narratives developed by the livestock proponents create a very polarized landscape between two divergent interpretations about what “qualifies” as meat and what

a better or healthier protein-food system should look like. As concluded by Sexton et al. (2019), this narrative-counter-narrative battle feeds from a combination of individual and collective societal concerns or fears regarding the welfare of people, animals and the planet, both in the present day and in the future, as well as elements related to the cultural, social and ethical values associated with animal-based foods. To some extent, they both draw from the same initial collection of values and concerns; yet, end up proposing completely opposed ‘solutions’.

As we shall see below, these debates also touch upon the interaction between ontology and epistemology and the role that science, knowledge and expertise play in creating, maintaining or in some cases exacerbating those contested narratives through what would be considered discursive practices. The term “discursive practices”—understood here in a Foucauldian sense (Foucault, 1983)—refers to practices of knowledge construction and assertion and intend to describe how specific knowledges (“discourses”) operate and what discursive outcomes they eventually aim to achieve. Put simply, discursive practices are the *practices of discourses* (Bacchi and Bonham, 2014, p. 173) and their analysis can be very instructive.

Discursive practices around protein transition

In this section we review examples of discursive practices used by scientists, experts or private sector actors as part of their effort to influence the red meat vs. alternative protein debate. Those examples are listed in Table 1 and discussed in greater detail below.

A first discursive strategy, used almost universally, consists in constructing the core of a given argument around the strengths and advantages of its specific content -and to forget or omit the limitations and negative elements or trade-offs that it may also imply. To a large extent, this corresponds to the conventional way the literature understands the concept of frame:

“Frames highlight certain aspects of a situation and obscure others, in order to define problems, diagnose causes, make moral judgments and suggest remedies (...). As such, frames determine what the actors (...) will consider relevant or important and how the definition of competing problems lead to normative prescriptions for action” (Béné et al., 2021, p. 989).

In the context of the AP debate, a first example of this discursive strategy is when experts (correctly and rightly) point at the multiple health benefits that moderate consumption of (red) meat can bring, especially to people at risk of micro-nutrient deficiencies, but at the same time downplay, or neglect to mention, the negative consequence of consuming too much meat. Adesogan and his colleagues, for instance, made the point that:

“Compared to plant foods, ASF [Animal Sourced Foods] supply greater quantities of higher quality protein and more bioavailable vitamin A, vitamin D3, iron, iodine, zinc, calcium, folic acid and key essential fatty acids. (...) In addition, ASF are the only natural source of vitamin B12, the deficiency of which

10 The “same meat” framing was shown to be conducive to the most positive attitudes amongst those adults (Bryant and Dillard, 2019, p. 6).

TABLE 1 Example of practices found in various discourses in relation to the debate on protein transition.

Discursive practices	Examples amongst	
	Livestock proponents	Alternative protein proponents
Systematic omission of the 'negative' element of an argument—only the strengths and advantages are presented, omitting the other (more problematic) aspects of the proposed 'solutions'	Adesogan et al. (2020), when they omit the health and environmental impact of red meat production/consumption	Patrick Brown, CEO of "Impossible Foods" when he omits the lower-than-expected environmental gains of alternative protein solutions
Use of incorrect or incomplete data or information	Livestock Global Alliance [LGA] (2016), when they claim that livestock contributes 40% of the agricultural GDP in developing countries	Willett et al. (2019), when they claim that healthier diet would lead to a reduction of 11 million premature deaths, conflating correlations with causality
Use of fallacious <i>argumentum ad hominem</i> —trying to win an argument by challenging one's opponent's knowledge or questioning their (scientific) integrity	R. Petre, Executive Director of the "Global Roundtable for Sustainable Beef", when he denigrates the FAO "Livestock's Long Shadow" for ignoring or deliberately minimizing the contribution of the livestock sector	Goodland and Anhang (2009), when they criticize the same FAO <i>Livestock's Long Shadow</i> report for being inaccurate and biased in favor of the livestock sector

is associated with developmental disorders, anemia, poorer cognitive function, and lower motor development" (Adesogan et al., 2020, p. 2).

They then concluded:

"To this end, increasing access to and consumption of moderate amounts of ASF should simultaneously be a global priority for people in areas where undernutrition remains a persistent problem, particularly for infants and women of childbearing age." (Adesogan et al., 2020, p. 3—their emphasis).

All the information provided by those authors is correct and they offered several references to back-up their statements. What they omit to mention, however, is that excessive consumption of red meat has also been documented to increase the risks of serious health complications -see our succinct summary above—and that those diet-related health problems are responsible for more deaths than any other risk factor in the world (Afshin et al., 2019). They also omit the many environmental impacts associated with the red meat industry. Instead, they made the following two statements:

"Animal source food production contributes meaningfully to goals for a sustainable food system by converting millions of tons of agro-industrial by-products that cannot be consumed by humans into livestock feeds, concomitantly reducing waste and environmental pollution and increasing human-consumable food" (Adesogan et al., 2020, p. 4—our emphasis).

"Sustainable intensification of livestock production, which involves improved resource use efficiency with environmental stewardship can foster a reduction of greenhouse gas emissions" (Adesogan et al., 2020, p. 4—our emphasis).

The authors did not provide references, however, for any of those statements. In essence, what we observe here is a first vivid example of discursive practices, performed by scientists.

On the other side of the debate, plant-based meat proxies and meat alternatives from various animal and novel sources (e.g., insects, cultured meat, algae) are often presented by AP supporters as a promising industry that has attracted multibillion-dollar investments over the last decade and is said to offer "plausible

and desirable futures" (Bai et al., 2016; Tziva et al., 2019). According to this literature, environmental, human health and animal welfare concerns are the main factors that have driven the development of those different meat alternatives. As part of this discourse, those AP products are presented as the solution to "the inefficiencies of the meat production (...) [and] the negative impacts from the consumption of meat on human health and the environment" (He et al., 2020, p. 2639). Overall, the main narrative is one where red meat is to be replaced by something cleaner, healthier, and more environmentally friendly, in one word, something "better"; and the role of technological innovation in this sustainable and healthy transition is often viewed as instrumental (Herrero et al., 2020). For instance, the trademark of DSM, one of the lead actors in this vibrant alternative meat industry, is "Bright science, brighter living".¹¹ Likewise, Patrick Brown, CEO of 'Impossible Foods' founded in 2011, is keen to contrast "meat today [that] is basically made using pre-historic technology"¹² with the molecular engineering technique that his company uses to create plant-based burgers.

In sum, in order to boost consumer demand and secure investments, AP proponents offer a series of "promises" that are framed to feed the imagination of the consumers (Stephens, 2013). What these different narratives don't mention, however, is that the potential sustainability gains of those disruptive and high-tech options may turn out to be much lower than expected or claimed (van der Weele et al., 2019). While comparing the technical feasibility and production costs of different alternatives, several recent studies concluded that even though those alternative solutions may be technically feasible, their potential environmental gains are more limited than their advocates claim (see, e.g., Tuomisto and Teixeira de Mattos, 2011; Alexander et al., 2017; van der Weele et al., 2019). Part of the reason for this limited gain is the extensive processing that they generally require and the high energy consumption and subsequent losses during the transformation from raw material into final products.

Omitting part of the reality is thus a strategy frequently adopted by parties on both side in this debate. This is not, however, the only

¹¹ https://www.dsm.com/food-specialties/en_US/markets/savory/plant-based-meat-alternatives.html

¹² Quoted in 'Our Meatless Future: How The \$2.7T Global Meat Market Gets Disrupted'. (Aug. 2021) <https://www.cbinsights.com/research/future-of-meat-industrial-farming/>.

strategy adopted as part of those discursive practices. Another way to try and slant the discussion is to build (part) of the narrative on incorrect information. For instance, it is often (correctly) argued that raising livestock is a critical part of the livelihoods of many poor people, most of whom live in low or even middle-income countries. As part of this narrative, the figure of 40% of agriculture GDP being tied to the livestock sector is frequently quoted. For instance, the Livestock Global Alliance state:

Livestock is the fastest growing agricultural sub-sector today, making up five of the six highest value commodities in the world and 40 percent of agricultural Gross Domestic Product (GDP) in developing nations (Livestock Global Alliance [LGA], 2016, p. 1—our emphasis).

Beyond the fact that the world's fastest growing agriculture subsector is not livestock as claimed here, but aquaculture (which is often included in the wider livestock sector) (HLPE, 2014; Béné et al., 2015), we draw the attention of the readers to the “in developing nations” at the end of the LGA's statement. The problem is that this statement is incorrect. Salmon (2016) clarifies this point:

“Globally, 40% is a figure regularly quoted as being the contribution that livestock makes to total agricultural production, in terms of gross domestic product (GDP). [This] 40% figure appears to originate from calculations made by Steinfeld and co-authors in the “Livestock's Long Shadow” publication (Steinfeld et al., 2006). (...) A recalculation for years 2005 to 2014 (...) demonstrated that although there has been variation in livestock's contribution to agricultural GDP, the global average remains around 40%. (...) However, the global figure obscures significant variations by region. Notably, LMICs have a substantially lower proportion of total agricultural GDP coming from livestock” (Salmon, 2016, p. 1—our emphasis).

In effect, for LMICs, the contribution of livestock to GDP is between 20 and 25%, not 40%—see figure in Salmon 2016 based on updated FAOSTAT and World Bank data. So, deliberate omission or honest oversight from the LGA? Difficult to know. The point is that all those who continue to refer to that 40% figure (see, e.g., Adesogan et al., 2020; World Bank, 2022) contribute to create—or to maintain—a false image about the importance of livestock in the economy of LMICs—at least when measured in terms of GDP. A more appropriate indicator would probably be the number of households whose livelihood and/or food security is partially dependent on livestock—see Salmon et al. (2020)'s more recent paper on this issue.

Similarly, proponents of AP also appear to be tempted to use false or biased statements in their attempt to influence the discussion. For instance, Solar Foods who developed a bacteria-based protein powder (called Solein) claimed that it is “100 times more efficient in converting energy to calories than animals” (Solar Foods, 2021). Yet, as pointed by IPES (2022), there does not appear to be any publicly available data to substantiate this claim.

What also emerges from the literature is the voluntarily amalgam between simple statistical correlation and causality, as a way to build or support specific narratives. In our case, while many scientifically rigorous studies which found statistical

associations between consumption of red meat and high prevalence of cardiovascular and other non-communicable diseases (NCDs) were generally relatively careful not to overinterpret their results, subsequent scientific analyses which build on those initial findings may have been less rigorous and ended up making some questionable causality inferences. One of the most recent examples of this is the EAT Lancet report which relied on the confirmed association between high consumption of red meat and NCDs to claim that “Dietary changes from current diets to healthy diets are likely to substantially benefit human health, averting about 10.8–11.6 million deaths per year” (Willett et al., 2019, p. 448—our emphasis). While there is little doubt that the adoption of healthier diets -and in particular the reduction of red meat consumption by those who overconsume it- would lead to a reduction in the number of premature deaths, the statement made by the EAT Lancet report (and the figure behind it) is built on that fuzzy amalgam between association and causality.

Another strategy widely used to try to influence a debate is to make the opponents look biased or untrustworthy, by challenging their knowledge or even questioning their (scientific) integrity. In the linguistic literature this is what is called a fallacious *argumentum ad hominem*, that is, a rhetorical strategy where one side would challenge the agenda, motive, or some other attributes or features of the other side rather than contesting the substance of the argument itself (Tindale, 2007). One example of this strategy can be found in Goodland and Anhang (2009) where those two authors criticize the FAO report *Livestock's Long Shadow* (Steinfeld et al., 2006) as being too lenient with the meat industry and in particular too conservative in their estimate of the impact of livestock on climate change. In their 10-page paper, Goodland and Anhang use the terms “undercounting/ting”; “underestimated”; “understate”; “overlooked”; “imprecision”; “did not account for” or “flawed/wrong” 22 times, essentially to delegitimize Steinfeld and his colleagues' work and to argue that “these [pieces of evidence] are obvious but underestimated, some are simply overlooked, and some are emissions sources that are already counted but have been assigned to the wrong sectors (Goodland and Anhang, 2009, p. 11). Ironically, Steinfeld's *Livestock's Long Shadow* report has also been heavily criticized by experts from the other side (the livestock proponents), but this time for being too disparaging of the sector. Adesogan et al. (2020), for instance, refer to “narrow interpretation”, “negative perceptions”, and “overestimation of the environmental footprint”. Subsequently, TNCs and individual private sector actors in support of the livestock industry also adopted this *argumentum* strategy by actively denigrating the AP narrative and anyone who seemed too critical of the livestock sector. R. Petre, Executive Director of the “Global Roundtable for Sustainable Beef” declared for instance:

“While we have long recognized the challenges that face the livestock sector, these seem to be amplified in the echo chamber of modern media, while many very significant contributions livestock make to livelihoods and food production systems are either ignored or deliberately minimized.”¹³

¹³ <https://wa.grsbeef.org/resources/EmailTemplates/Archives%20Connect/2018/071718/index.html>

Others go even one step further and are not afraid of comparing discourses supporting vegetarianism and veganism with “colonialist thinking” biased toward a “Euro-centric perspective”.¹⁴

Returning to the *Livestock's Long Shadow* report and the instrumentalization of its conclusions, it is worth noting that the Steinfeld report is now recognized to have played a pivotal role in raising the awareness of the general public about the link between livestock, climate change and environmental degradation (Salmon et al., 2020). In the Netherlands for instance, the publication of the report was used by several political parties and societal organizations to justify their own positions regarding the unsustainability of meat production. Coupled with the introduction of the political “Party for the Animals” and the release of the documentary “Meat the Truth” in 2007 (NGPF, 2019), meat production and consumption has become a highly debated issue in the Netherlands (Tziva et al., 2019).

In sum, what we see emerging are assemblages of contentious and divergent constructions of the same reality, interpreted and (more importantly) communicated, in the form of deeply entrenched and polarizing discourses by different actors with specific agendas. Analyzed from a wider perspective, those examples are powerful illustrations of how research and researchers can fail to provide the right support to untangle a societal debate and instead contribute to, or get caught up in, what we refer as the “politicization of science” (Béné, 2022)¹⁵. In this politicization process, contests are thus not just about the role of technology, markets or the state—as a more conventional political economy analysis would suggest (e.g., Khan and Bidabadi, 2004; Bernstein, 2016; De Schutter, 2019)—but also about the construction of the knowledge underpinning them (Parkhurst, 2017; Leach et al., 2020). In this sense, the science that is invoked to legitimize (or delegitimize) calls for the protein transition is also an arena of political contestation. It does not provide neutral value-free guidance as to what is to be done, how, and by whom. Instead, it contributes—and this is the main argument of this paper—to the current polarization of the debate.

Conclusion

There is little doubt that a form of political contestation has emerged in the current scientific and societal debates about protein transition and the role of livestock in building a new, sustainable, food system (Kanerva, 2021). This observation should not come as a surprise. As Parkhurst (2017) and many other sociologists before him reminded us, social norms, ideologies,

personal agendas and power relations can be central elements in the creation of knowledge (e.g., Longhurst, 1989), leading Krieger to consider scientific data not just as a neutral instrument supporting decision-making but as a “social product” (Krieger, 1992, p. 413) used to influence and shape how problems are perceived.

In this paper we revisit the current debate between red meat vs. alternative protein and explore the respective contribution that those two polarized visions claim to make in relation to the new international discourse on transforming food systems toward a more sustainable future (Caron et al., 2018; Webb et al., 2020).

The starting point of the discussion was the apparent wicked nature of the problem between, on one hand, the need to drastically reduce the global production and consumption of red and processed meat (Popkin, 2009; Ranganathan et al., 2016; Willett et al., 2019), and on the other hand, the need to boost the level of protein in the diets of particular populations at risk of undernutrition (Neumann et al., 2010; HLPE, 2017), as well as protect the livelihoods of the millions of livestock-raising households in LMICs.

We started the analysis by highlighting why adopting a political economy approach is relevant in relation to the meat industry, especially to analyze not only the concentration of power in the hands of the “Big Meat” sector but also the role that the governments of specific countries have played to contributing to this highly inequal system. In parallel we recall that a substantial number of analyses challenges the claim that the Livestock Revolution has been an effective pathway out of poverty for smallholders (Narrod et al., 2010; Pica-Ciamarra and Otte, 2011). Pushing this first conclusion one step further, it means that the argument that a reduction of the global production and consumption of red meat may harm poor smallholders is a false argument since those smallholders are not benefitting from the red meat revolution in its current form. Instead, what we saw is that the rapid growth of the sector led to further vertical concentration of power and resources in the hands of fewer actors (essentially a dozen TNCs operating from the global North but also Brazil and China) and that this process of concentration was facilitated by the close economic and financial ties that those TNCs have developed with the governments of those countries (Howard, 2016; Lundström, 2019).

To some extent, those findings are not completely new, nor surprising. They confirm in the specific case of the red meat industry what has been observed more globally for the whole food system, that is, the extremely high level of concentration of power, influence and resource in the hands of a very limited number of actors, mainly a handful of TNCs (Khan and Bidabadi, 2004; Bernstein, 2016; Howard, 2016; Clapp, 2021; Béné, 2022). What is perhaps more surprising—and certainly new—is that those powerful actors are also the ones who are now in full control of the AP sector, having co-opted or bought one by one all the AP start-ups which emerged in the last 10 years. In sum, the dream of some to see the Big Meat industry being challenged and the current status quo being disrupted by those new-comers has died even before the protein transition was completed.

14 Sarah Taber, reported in <https://qz.com/1311884/is-promoting-vegetarianism-a-form-of-colonialism/>.

15 Politicisation of science denotes the process by which specific pieces of evidence or academic works are cherry-picked—or on the contrary ignored or hidden—as a way to advance particular agendas, ideologies or ideas (Parkhurst, 2017).

In the second part of the paper, we complemented this initial political economy assessment with some element of critical discourse analysis (Weiss and Wodak, 2003; Keller, 2020). For this, we deconstructed some of the main narratives and counter-narratives that have emerged over the last two decades around the question of protein transition and showed how those different narratives have been used as “discursive tools” to advance particular agendas and ignore others. In doing so, we exposed some of the unnecessary polarized or confrontational elements of the debate, which suggests that the wicked nature of the problem as it appears at first sight may in fact be more the result of the framing used by particular actors, rather than the consequence of an irreconcilable tensions between diverging priorities. In other words, the wickedness of the debate may not be rooted in the nature of the problem itself, but rather in the scientific, technical and societal framings used to present it.

The second major conclusion of this work is therefore that it should be possible to reconcile the agendas of the two sides of the meat story. In fact, there is no technical impossibility to *simultaneously* reduce the consumption (and production) of red meat directed at consumers in high and middle-income countries, while at the same time boosting protein consumption among the socio-demographic groups and populations for which more protein in their diet would be beneficial. The polarized nature of the debate between the livestock proponents and the alternative protein proponents is therefore the result of a strawman argument that prevent the system from transitioning toward more sustainability, and benefits only those who have strong financial, economic, or professional interests in maintaining the system in its current lock-in. It is up to the rest of us to make this change happening.

Data availability statement

The original contributions presented in the study are included in the article. Further inquiries can be directed to the corresponding author.

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Author contributions

CB contributed to conception and design of the study and wrote the first draft of the manuscript. CB and ML wrote all sections of the manuscript and contributed to manuscript revision, reading, and approval of the submitted version. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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