

In the name of protein

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[Standfirst]

The framing of global food challenges as a matter of producing enough protein deserves critical assessment. We argue that powerful actors in the food system are responding to this apparent protein shortage in a way that deflects from the critical environmental and social challenges associated with conventional livestock production.

[Main]

Public concern about conventional livestock production on land and in water has reached a fever pitch. Increased anxieties around animal welfare have certainly played into this turn, just like the increasing recognition of the enormous ecological footprint of animal agriculture - which contributes to a sizable percent of anthropogenic greenhouse (GHG) emissions, fresh water usage, extensive land allocation for feed production, and the undermining of antibiotic efficacy through overuse.

Often citing the Food and Agricultural Organization of the United Nations' (FAO) widely circulated projection that world meat production will more than double in the first half of the 21st century,¹ a set of highly powerful actors is recasting this rising tide of public concern over conventional livestock production as a crisis of protein. A report from the World Economic Forum (WEF) epitomizes this shift while simultaneously setting a future agenda: "How can we produce enough protein to feed 10 billion people?"²

Given the consequences of how food problems are framed and solved, this slippage from a concern with animal production to a crisis around protein warrants critical assessment. After all, the issues that underpin concern with meat (food insecurity, animal welfare, climate change, environmental sustainability) could be addressed in any number of ways, at a range of different scales, and by diverse public and private actors. Constructing the problem of planetary food production as one of insufficient protein, however, provides a different moral valence than a critique of livestock, allowing global shapers to frame the solution as the production of an ever-expanding variety of proteins.

This shift in register from food to protein harkens back to earlier periods when protein was the subject of global debate and discussion. Between the 1950s and early 1970s nutritional concerns over the so-called 'protein gap' prompted multilateral agencies and non-governmental organizations (NGOs) to lead out and mobilize with the private sector to address what was regarded as a critical *shortage* of protein for Third world countries. Indeed, the "lack of protein was understood to be the defining feature of the third world food problem."³

Efforts to ameliorate this shortage were predicated on an understanding of protein as heroic, which indeed serves as an important point of continuity between the protein gap of the 1950s and the crisis being narrated today. Protein has historically been, and remains, widely accepted as a crucial macronutrient for human health and a building block for human life whose desirability is both built on and transcends its material properties. Today, protein's goodness

also aligns with the embrace of high protein diets among western elites responding to nutritional advice and dietary trends (e.g., Atkins, Keto) that have all but vilified other macronutrients (fats and carbohydrates). Protein's status as an unquestioned good bestows a halo on those who pursue it and that which is done in its name, raising the question of what exactly *is* being done in the name of the current protein crisis.

In this instance, the construction of a protein crisis has primarily attracted a rush of private investment, speculative finance, innovation, and product development - all promising to avert a future catastrophe. It has brought together those who want to entirely do away with animal agriculture and those who continue to contribute to livestock's problematics. The switch from 'meat' as a potentially scarce and encumbered bad, to 'protein' as an unassailable good, is crucial in rendering this particular convergence of actors and interventions possible.

A range of market responses

The influx of private actors and investment dollars into new forms of protein coincides with a veritable invitation from the WEF. Working closely with the United Nations and other groups to facilitate public-private cooperation, the WEF boasts a membership of hundreds of global companies and aims to coordinate efforts to address the 'grand challenges' of the current moment. With the problems associated with animal agriculture now at the fore, and heeding calls of projected global food shortages, they have called for a diverse 'portfolio of protein solutions' – a '21st Century Protein' – that will meet the challenges associated with climate change, consumption demand, livelihoods, and health.⁴ Their call has been a galvanizing force, motivating a suite of actors to find ways of re-engineering production, particularly through innovations in alternative proteins and animal feeds.

One highly visible set of responses has come from the innovation startups in Silicon Valley and elsewhere. Setting their sights on the conventional livestock industry as ripe for 'disruption,' such sectors have nearly singularly narrowed in on protein as a problem they can (and must) solve in order to have the impact that attracts the venture capital investors that fund them. To this end, they are developing an extraordinary array of products derived from plants (such as peas and soy), fungi, animal cells (i.e. cellular or lab grown meat etc.), insects, and even more novel sources to supplant and augment traditional animal proteins. This so-called alternative protein sector has seen enormous investments. According to a recent report by the Good Food Institute, the sector secured \$3.1 billion of funding in 2020, "a figure three times higher than 2019 and nearly five times higher than 2018."⁵

Another important response to the protein crisis seems to have taken the WEF's idea of a 'protein portfolio' a bit more literally by establishing investment platforms aimed at rewarding livestock producers that can demonstrate improvements across environmental, social and governance criteria. A prominent example is the UK-based investment company Coller, which established a protein producer index in 2018 to assess 60 of the world's largest protein producers on their performance related to greenhouse gas emissions, water use, waste and animal welfare.⁶ The aim of the index is twofold – informing private equity and institutional investors on the particular risks incurred by investing in conventional meat production, and highlighting the upside opportunities available through companies prepared to transform existing production methods and diversify into a broader set of protein products.

In a related development, some companies are innovating around existing livestock operations, hoping to improve their sustainability optics and maintain their positioning as viable assets in sustainable protein portfolios. Given that the production and transportation of feed represents up

to 45% of the greenhouse gas emissions associated with the production of both terrestrial and aquatic animal protein, the development of new, ostensibly more sustainable, feeds and additives has been a particular target of innovation. Where some seek to alleviate animal welfare problems that have deleterious knock-on effects (such as increased use of antibiotics and the development of superbugs) or reduce methane production), many of these innovations in animal feed seek to leverage the research and development pouring into proteins derived from plants, insects, single cell algae and fermentation. These developments are being explored across livestock production systems but are perhaps most advanced in aquaculture where, on the basis of sustainable feed, farmed fish are set to become the 'the world's most efficient protein generator.'⁷

In addition to efforts at addressing the sustainability of animal-based protein production, many established agri-food Trans-National Corporations (TNCs) have taken the protein crisis as an opportunity to rebrand to expand their brands beyond conventional livestock. Pivoting towards a refreshed identity as 'protein companies' rather than meat brands, they are also positioning themselves as sustainable and prepared to meet future demands. Take, for example, Perdue Farms whose vision is "to be the most trusted name in premium protein,"⁸ or Tyson's recent trademarking as "the Protein Company," or Canadian Maple Leaf Foods, which claims its "purpose and vision" is "to be the most sustainable protein company on earth."⁹ This has coincided with significant investment to support the development of alternative protein products. Tyson, for example, was an early investor in Beyond Meat, Memphis Meats (now called Upside Foods)¹⁰ and 12 alternative protein companies through their venture capital arm.¹¹ Tyson's investments have been mirrored by several of the other traditional agri-food giants including Cargill and Perdue, which have also established their own venture capital divisions.¹² These companies are also developing new plant-based protein products in-house as a means to transform their extant product lines into diversified protein portfolios. Tyson's alternative protein is already on the market under the 'Raised and Rooted'¹³ label, while Perdue is working on a plant-based chicken alternative.¹⁴ Expanding beyond the United States, Archer Daniels Midland's strategy has partnered with the large Brazilian meat processor Marfrig Global Foods to produce plant-based burgers for the Brazilian market.¹⁵

Public sector funding and research agendas appear to be following the lead of these private sector responses to the protein crisis. National science agencies across the globe are funding projects under the protein umbrella – from 'Future Protein Missions' ¹⁶ in Australia and a 'Protein Supercluster' ¹⁷ in Canada to the EU's 'pathways for action' on alternative proteins¹⁸ and recent series of high-profile awards in the US.¹⁹ Indeed, in China alternative proteins have made their debut in the nation's most recent five-year plan.²⁰ This work is also crossing borders with Canada and the US collaborating to establish the Canadian Prairies and U.S. Upper Midwest/Great Plains region as a 'Protein Highway' under the well-rehearsed "9 billion by 2040" refrain.²¹ In this light, state support for diversifying national protein portfolios reads as an alignment with, rather than a counterbalance to, private interests.

Occlusions

These examples across the food sector provide a taste of what is being done in the name of protein by governments and research institutions, investors, incumbent livestock producers *qua* protein companies, and by companies involved in the research and development of alternative proteins for both humans and animals. While it is certainly possible that some of these options will have lower environmental impacts than conventional livestock production, a response that is nearly exclusively led by private sector interests, which have reframed the problem in a way that matches the solutions they can provide, is concerning.

It is worth bearing in mind that this private sector leadership is part of a broad and well-recognized arc towards the perceived efficiency and agility of market-driven approaches. Food crises, specifically, have heretofore been the provenance of a range of public, private and non-governmental actors. The protein gap of the immediate post-war period, for example, was coordinated through various branches of the United Nations, including the FAO and World Health Organization. While companies were involved in efforts to find protein supplements that could be distributed as a way of addressing malnutrition, they were directed by public institutions and governments rather than operating on their own initiative. Thus, though many of the solutions generated – like single-cell proteins or concentrated high-protein flours – were not dissimilar from today's technologically driven alternative proteins, a broader set of accountability mechanisms played an important role in shaping their development.²² In contrast, today's efforts to increase the size, content and sustainability of 'protein portfolios' are almost exclusively guided by the market's demands for dividends and return on investment - and high-value exits.

Certainly, the expansion of portfolios is likely to continue well-established trends of financialization and consolidation of the food sector, adding to already voiced concerns with control, stifling of competition, and predatory pricing – what Howard and colleagues have called “a convergence toward monopoly under the umbrella of protein.”²³ In addition, this striking shift in register from meat to protein as the fulcrum upon which these emergent strategies rest has enabled a powerful set of occlusions embedded in the very solutions themselves. Which is to say that the emphasis on protein portfolios in both the financial sense and as a menu of alternative protein options burnishes the image of companies whose activities elsewhere are the very object of public critique.

Indeed, the highly publicized work of Collier's protein index or TNC's development of improved feeds and non-animal proteins obfuscates that many of these companies continue to be heavily vested in conventional livestock production. Similarly, the flood of public funding into corridors of plant-based protein production and new biotech projects, belies continued support for conventional sectors as in the case for Australia's meat exports. In hedging bets, spreading out risks, and otherwise expanding into new sectors, such efforts effectively inoculate their bottom line against market recalibrations or crisis conditions. Moreover, they crowd out other possibilities such as more intensive regulation of livestock sectors, subsidies for the de-intensification of livestock, or, for that matter, efforts to address huge inequities in access to nutritious food.

Even the high velocity growth of many alternative protein startups – those which often explicitly aim to disrupt meat production – does not necessarily challenge conventional meat production. Not only is this growth taking place simultaneously with increases in meat intake overall, but also in their efforts to meet venture capital's demands and garner funding, some of these companies are aligning with those who remain entrenched in conventional livestock production. Here, the effective mainstreaming of the emergent alternative protein sector bears remarkable parallels to the trajectories of the organic food market. Once a social movement posed in contrast to industrial agriculture, ultimately organic farming interests elected to eschew oppositional approaches, such as pursuing regulatory change to restrict certain practices industry-wide, and steered instead toward developing markets for organically produced products. This move allowed many organics producing companies to be subsumed by, and sit side by side, their conventional counterparts. Rather than posing an existential threat to 'meat', it appears that alternative proteins may be following a similar trajectory of coexistence.

In short, private sector actors have characterized a protein crisis in such a way that their investment appears as the solution. This has at once absorbed and occluded the motivating concern with meat and industrial livestock production, instead offering a proliferation of alternative proteins and putting lipstick on the veritable pig of conventional livestock. Because their work revolves around the heroic nutrient protein, these investments perform virtuousness. But is more protein really the answer to what ails us? Are there roads not being taken because the map has been drawn by those who already know where they want to go? Other possibilities for framing the problem are an essential first step for careful consideration of what else might be done.

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Competing interests

The authors declare no competing interests.