Report | Sept 2026

TABLE

More, different, stop:

The stories we tell about protein

Tara Garnett
Tamsin Blaxter

UNIVERSITY OF OXFORD

SUGGESTED CITATION

Garnett, T., Blaxter, T., (2026). More, different, stop: The stories we tell about protein. TABLE Reports. TABLE, University of Oxford.

WRITTEN BY

Tara Garnett & Tamsin Blaxter

ACKNOWLEDGEMENTS

Many thanks to Ruth Mattock for her useful comments, to Rachel Headings for copy editing and to Jackie Turner for formatting and design.

COVER PHOTO BY

Le Tia on Unsplash

TABLE helps people navigate the evidence, values and visions shaping global debates about the future of sustainable food systems. Both scientific evidence and our personal biases play roles in these crucial conversations: TABLE provides clarity on where, how and why we disagree in order to support inclusive dialogue and drive much-needed action. Originally founded as a collaboration between the University of Oxford, the Swedish University of Agricultural Sciences (SLU) and Wageningen University & Research (WUR), the TABLE network has since expanded to include la Universidad de los Andes (Colombia) and la Universidad Nacional Autónoma de México.

For more information:
www.tabledebates.org/about

Table of contents

Protein is having its (latest) moment in the sun	4
How much protein do current recommendations say we need?	7
Protein and its discontents	10
Nitrogen in a nutshell	10
One nutrient: three narratives	14
Alignments and divergences	28
Beyond protein	29

You can use the upwards arrow at the bottom of each page to return to the table of contents at any time.

Protein is having its (latest) moment in the sun

Protein – as problem, aspiration, solution, obsession – is everywhere.

In our everyday lives, thanks to the efforts of marketeers, retailers and social media influencers, we're urged to make sure that we get 'enough' protein, whether this is to meet our fitness goals, to lose weight or to combat ageing. So powerful has this nutritional idea become that the word 'protein' often features more prominently on the product label than the containing food itself. What do we need? Not yoghurt, or ice cream, or a snack bar, but *protein*. In fact, protein has become a word so ubiquitous in public discourse that articles about its ubiquity – which tend to start with an opener a bit like this one – are also everywhere.

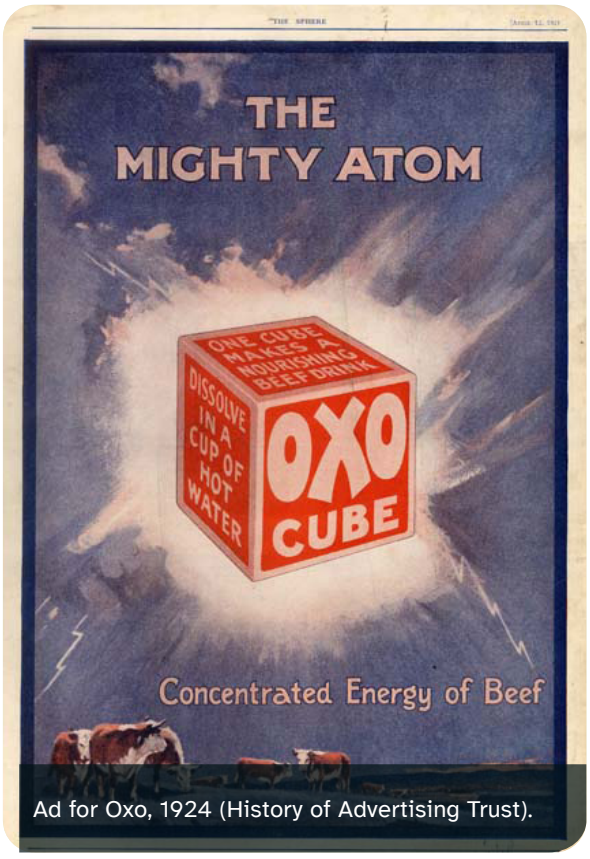
Within the more delimited world of professional thought and action on food systems here too protein dominates the conversation. The focus in this world is on what to do about it, and the language tends to be of protein *future*s, protein *transition*s, protein *alternative*s. Topics rise and fall in prominence, but right now within this community, protein has become a kind of shorthand for a whole range of other social, economic, ethical, environmental concerns that people talk about when they talk about the food system, and as such, the stories these different stakeholders tell about protein – how important it is in our diets, what kinds of protein are good or bad and how we should be producing and distributing it – tend to mirror and reinforce the familiar tribal groupings that delineate contemporary food system debates.

It's worth noting, of course, that these 'professional' discussions don't exist in isolation from the lay, since food system researchers, policymakers and activists are also people who shop, see adverts, worry about their health or their looks, and think about what to eat for dinner. What they focus on in their professional lives will to some extent be influenced by the wider public discourse of the world they live in. Of course what might also be the case is that, as with much else in people's lives, there are contradictions between their professional stances on the protein issue and their individual anxieties and behaviours, which they may or may not choose to dwell upon.

In short, protein is having its moment, and that moment is complicated, as this essay aims to describe and explore. Before doing so, however, it's worth saying that our fascination with this nutrient isn't new. As our TABLE report, Primed for power: a short cultural history of protein and its accompanying essay Where does protein get its power? explain, since its 'discovery' as a nutrient in 1838, protein has risen and fallen in the public and professional consciousness several times, and while all nutrients are special, some nutrients seem to be – or are seen to be – more special than others. This is perhaps reflected in the very name 'protein', derived as it is from the Greek for 'best', 'supremacy' and 'first place'. While the early scientific idea that protein was the ultimate, and indeed the only nutrient we actually really need, was quite quickly knocked down, a general sense of its all-encompassing goodness and importance continued over the years.

These perceived attributes gained strength from the fact that protein quickly became conflated with meat and animal products more generally. This is perhaps understandable, since meat is indeed a rich source of protein. But as reinforcing factors, meat was already a high-status food because of its associations both with wealth and with vigour and strength – and *therefore* masculinity – and these associations became increasingly fused with notions of Britishness or European-ness (given high meat intakes in this part of the world) and *therefore* mastery and *therefore* superiority: Europeans eat a lot of meat, Europeans are conquering the world, meat is high in protein, protein is the supreme nutrient – ergo these things are all connected.

This combination of associations influenced the setting of very high recommendations for protein intakes from the 1850s through to the turn of the twentieth century. These recommendations were to be found both in the scientific literature and – the two are obviously connected – also the earliest institutional ideas about what British citizens or subsets thereof, such as the military, should be eating (see Figure 1). However, as research into human nutritional requirements continued and evolved and as evidence emerged that protein, while important, wasn't the nutritional be-all and end-all it was originally supposed to be, the recommendations for intakes began to fall, and they more or less continued falling over the course of the twentieth century, through to where they have settled today.



Ad for Oxo, 1924 (History of Advertising Trust).

Notwithstanding this decline, the 1950s through to the 1970s saw another surge of interest in protein, with the spotlight this time falling on the British colonies and ex-colonies in sub-Saharan Africa. Medics and other Westerners working in these regions had observed a condition among children and some adults, characterised by muscle wasting, swollen pot-bellies, dry skin, reddish hair and extreme tiredness; this constellation of symptoms came to be called 'kwashiorkor'. While the initial diagnosis was that this might be due to multiple kinds of nutritional deficiency, over time medical attention narrowed down to a single-minded focus on protein. These children, it was argued, lacked *protein*, and this lack could only be remedied by the feeding of large quantities of protein-containing milk, which available foods, including breast milk, could alone not supply, and which therefore had to be delivered in the form of imported products like milk powder and condensed milk.

Over the years, the kwashiorkor = protein-deficiency hypothesis gained a huge amount of traction and it took several decades before it was recognised that the problem was more complex than a matter of protein insufficiency alone. Multiple factors were at play, and even today there isn't a clear consensus as to its causes. Other possible explanations include one or more of the following: a basic lack of food energy, specific amino acid deficiencies, oxidative stress, aspergillus/aflatoxin exposure, intestinal damage from repeated parasitic infections, as well as various forms of micronutrient deficiency, a consequence of the fact that people's diets were composed almost entirely of a single starchy staple, such as maize.

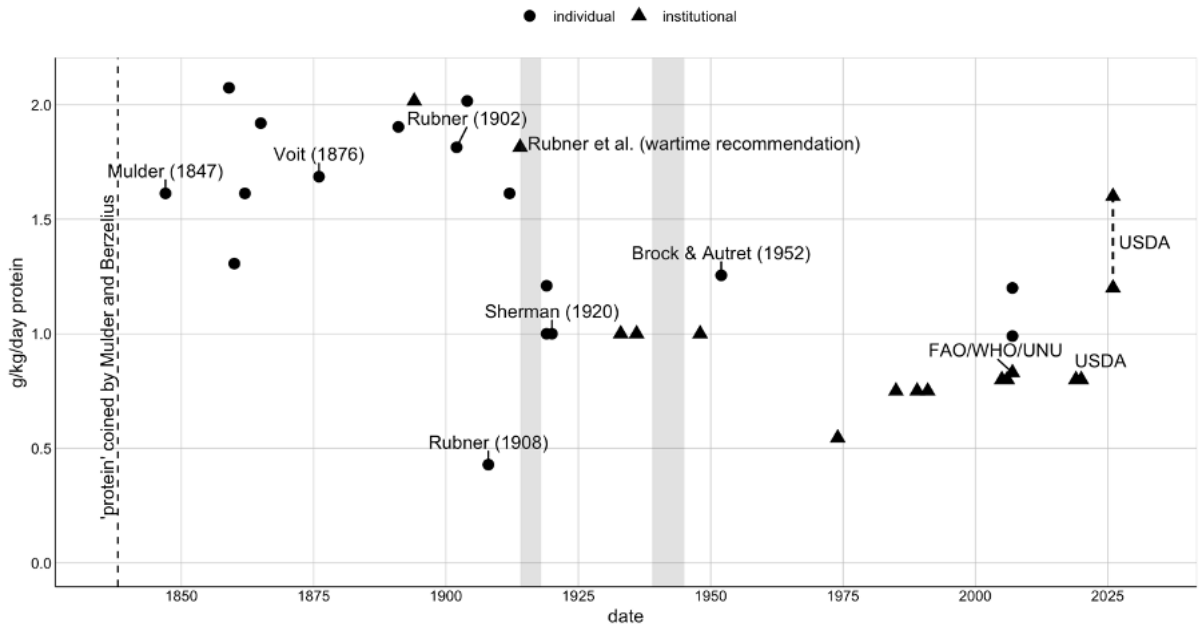
The question that perhaps should have been asked is: why were people subsisting on a single food source and in these conditions? Observers note that the overwhelming focus on nutrients *per se* at the time overshadowed explanations for this condition that considered the social, economic or political causes of the problem and that would therefore have centred on poverty and its causes. These very crucially included colonialism and the decisions being made, or that had been made, by the colonial administration.

More broadly, and concurrent with this focus on kwashiorkor was a growing anxiety that, with rapidly growing populations especially in the Global South, it might not be possible to produce enough food to feed the world, and in particular to produce enough *protein* to meet our growing global needs. These anxieties had wider consequences for technological developments in agriculture but they also

sparked a huge amount of interest and investment into the development of novel, non-traditional forms of protein, from meals and flours made of fish through to substances based on petroleum derivatives. While most of these innovations never really saw the light of commercial day, a few of them, Quorn and TVP in particular, are still going strong and are widely available for sale.

So to summarise, we've been here before. Our fascination with protein isn't new, and it seems to go in waves. The first wave was in the latter part of the nineteenth century through to the turn of the twentieth. The second was a surge from the 1950s through to the 1970s, the era of the Population Bomb[1], Limits to Growth[2] and Diet for a Small Planet[3]; right now we seem to be riding the crest of wave number three. The recommendations set at the turn of the twentieth century, and the general medical consensus that there are more important nutrients to worry about than protein, are starting to be reconsidered and critiqued. As for those 1970s preoccupations with producing *enough* – of food in general and protein in particular – well, they are of course very live today, even if the discussions take somewhat different forms and reflect a wider set of anxieties.

Figure 1: Trends in protein intake recommendations over time



Source: adapted from Blaxter T., and Garnett T. (2022). Primed for power: a short cultural history of protein. TABLE.

1 Erlich P. (1968). The Population Bomb. Ballantine Books, New York.

2 Meadows DH, Meadows DL, Randers J and Behrens WW III. (1972). The Limits to Growth; A Report for the Club of Rome's Project on the Predicament of Mankind. Universe Books, New York.

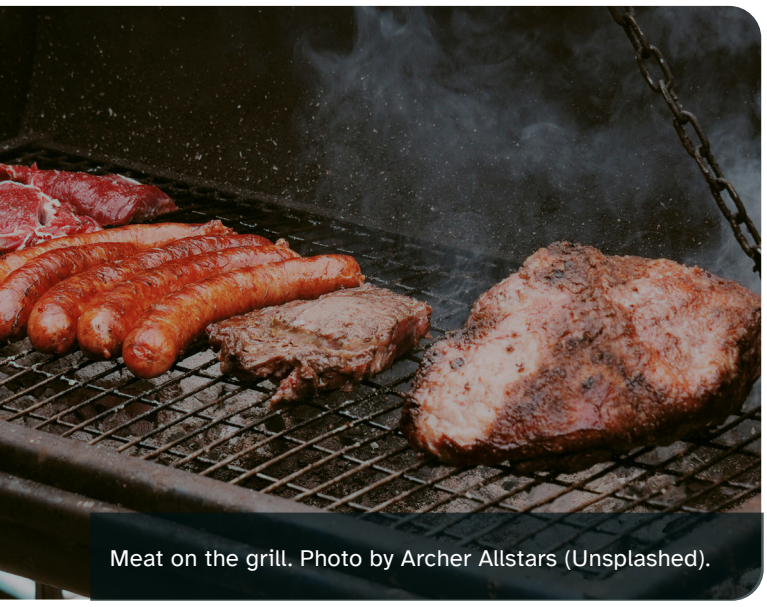
3 Lappé FM. (1971). Diet for a Small Planet. Ballantine Books, New York.

Those are the recommendations, but what about actual intakes?

Knowing what and how much of any kind of food or nutrient people actually eat – as opposed to what and how much people buy and might then waste or which will be shared in differing proportions within the household, or else what is available on the market for purchase – is a notoriously tricky undertaking. You have to actually ask people to keep a record of what they're eating and we tend to be very unreliable diarists. Underreporting is the main concern here – people either forget or don't want to admit to what or how much they are eating.

To take the UK as an example, the UK's National Diet and Nutrition Survey estimates people's intakes based on food diaries which people keep for a period of time (up to four days in total). The survey finds that the average 18–64-year-old adult woman in the UK eats about 1,450 calories daily and the average man about 1,800 calories. Both figures include calorie intakes from alcohol. Clearly, since these are far fewer calories than are needed to maintain a healthy bodyweight, and since in any case two-thirds of the British public is either overweight or obese, these numbers cannot be accurate.[9] Those same data sets indicate that on average women and men in that same age category eat about 60.2 and 80.6 grams of protein daily, respectively, which in turn works out at about 16.5% of total energy intake for women and 18% for men (using those same calorie intakes). If the average weight of a British woman and man is 73 kilograms and 86.2 kilograms respectively[10], then it appears that women are getting exactly the recommended amount of protein, while men are getting a little over, at 0.93 g/kg bodyweight. Given underreporting, actual intakes are likely to be considerably higher. That said, we don't know if the underreporting of protein-containing foods is as high as the underreporting of foods like biscuits, chocolate and crisps that might contain less protein and more energy.

Notwithstanding these uncertainties, it is probably safe to assume that on average people in the UK (and in other affluent countries) consume not only enough protein to meet the WHO safe intakes but also the higher intakes recommended by some new studies. There will nevertheless be population subgroups who may not be getting quite enough and these include the elderly (whose numbers are growing as a proportion of the overall population)[11] and potentially people who are very physically active – although that said, since their energy requirements also go up so too will their protein intakes as a natural consequence of their eating more.[12]



Meat on the grill. Photo by Archer Allstars (Unsplashed).

Zooming out beyond the UK and the affluent West, it becomes even harder to obtain accurate protein (or any) intake data. Figures on protein *supply*, as opposed to intake, are more readily available, however, even if still unreliable. What those data show, and as this figure from Our World in Data illustrates (on the following page), is that there is a massive disparity in how much protein is available

9 National Diet and Nutrition Survey (NDNS), 2019–2023.

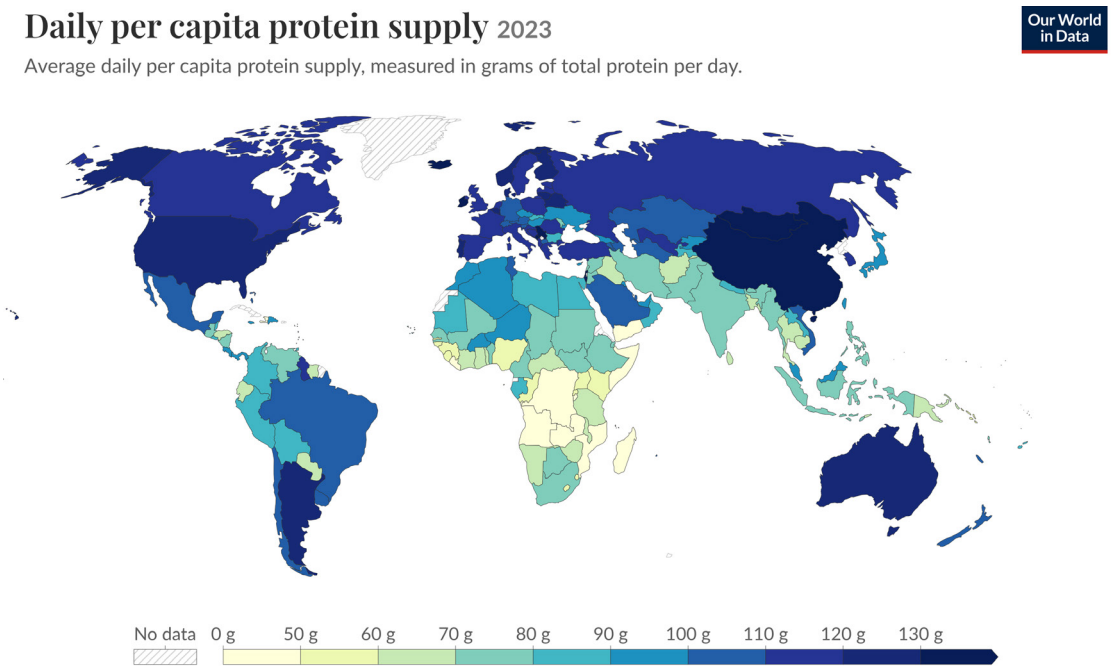
10 NHS Digital. (2024). Health Survey for England 2024: Adults' overweight and obesity. https://digital.nhs.uk/data-and-information/publications/statistical/health-survey-for-england/2024/adults-overweight-and-obesity.

11 Morgan PT, Witard OC, Højfeldt G, Church DD and Breen L. (2025). Dietary protein recommendations to support healthy muscle ageing in the 21st century and beyond: considerations and future directions. Proceedings of the Nutrition Society. 84(3), 245–258.

12 Campbell B, Kreider RB, Ziegenfuss T et al. (2007). International Society of Sports Nutrition position stand: protein and exercise. Journal of the International Society of Sports Nutrition. 4,8. https://doi.org/10.1186/1550-2783-4-8.

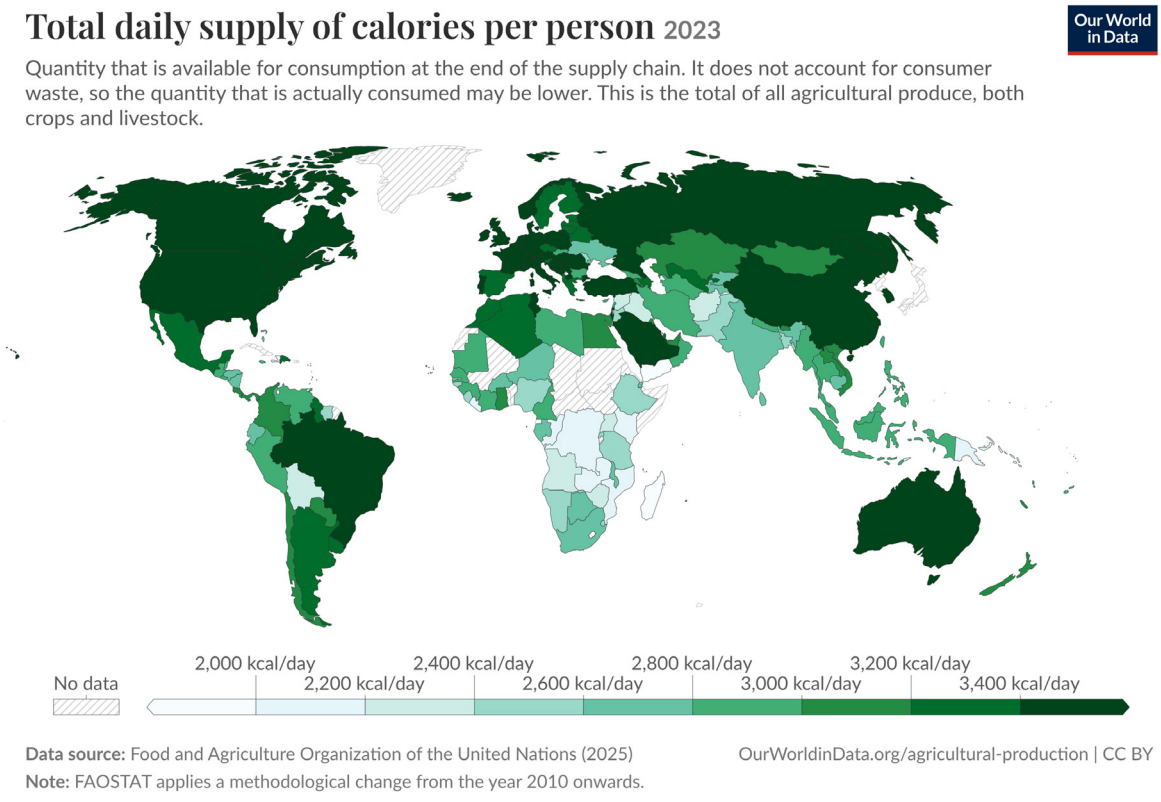
for people to eat in any given country. In some parts of the world – most notably in much of sub-Saharan Africa – intakes are almost certainly inadequate.

Figure 2: Daily per capita protein supply across the world (2023).



However, as Figure 3, also from Our World in Data shows, this is also true of overall energy supply. Micronutrient availability data will show a similar story. Again, arguably, the problem here is not protein deficiency specifically, but food insecurity across all four of its dimensions: the inadequacy of food's availability, accessibility, utilisability, and stability over time.

Figure 3: Daily per capita calorie supply across the world (2023).



Protein and its discontents

We are now, nevertheless, in a period where even in countries where it is abundantly available and consumed, protein is attracting renewed attention from the nutrition community, in addition to its promotion by the food industry and media influencers. It is relevant to mention that meat and dairy-related industries are important funders of protein-related research. Since research questions and the capacity to conduct research are shaped by the financial, institutional and social environment, it is possible that this funding has an influence on the work that is produced and its findings. While it is important not to discredit any individual research finding simply on grounds of its funding source, there does seem to be a need for further work to understand the relationship between the source of research funds, the questions asked (or not asked) about protein and the conclusions that are drawn. For now, the point here is simply that the resurgence in protein's prominence we're seeing today is due to a complex set of factors, and commercial influences may be one of them.

To those concerned about the food system's environmental impacts, this resurgence matters, because protein is an environmentally expensive nutrient to produce. This is for two reasons.

First, environmental impacts arise because of protein's basic nitrogen-containing structure. For plants to make the amino acids which constitute the building blocks of protein (plants which we either eat directly, or feed to the animals which we then eat or milk), a nitrogen-containing source is needed. The higher the protein content, the more nitrogen is needed. For example, wheat grown for bread-making in the UK requires more fertiliser than wheat grown for animal feed, since its higher gluten content – gluten is a protein – is what creates the structure for the dough.

Nitrogen can come from mineral or organic sources, and both come with environmental costs. Protein is about 16% nitrogen by weight.

Nitrogen in a nutshell

Nitrogen (N) plays a dual role in the agri-food system: it's an essential nutrient for all life forms, yet also an environmental pollutant, causing a range of environmental and health impacts. N pollution has increased to unsustainable levels.

The introduction of synthetic N fertiliser during the 20th century revolutionised the entire food system because it removed the natural constraint of N scarcity.

There is no such thing as a perfectly circular N supply. Losses of N to the environment inevitably arise as N is transformed, for example, in soil processes, during manure storage and as a result of fertiliser applications.

Livestock production is responsible for a large majority of agricultural N emissions.

There is broad political agreement that global N emissions should be reduced by about 50%.

Source: Einarsson R. (2024). Nitrogen in the food system. TABLE Explainer. TABLE, University of Oxford, Swedish University of Agricultural Sciences and Wageningen University and Research.

Taking mineral sources first, the synthesis of ammonia via the Haber-Bosch process is a highly energy-intensive undertaking, and the process is usually fuelled by fossil energy sources. It's been estimated that mineral fertiliser production accounts for about 2% of global energy use.[13]

As for organic sources, these can come from biological nitrogen fixation by leguminous plants, or from manure. Biological nitrogen fixation has the advantage of requiring no fossil energy inputs, other than those associated with mechanised farming. However, land and sometimes other inputs are still needed to grow the crops, raising potential conflicts with other land-use requirements which in turn can trigger environmental and social consequences. What's more, while beans and pulses are highly nutritious, being rich in protein, fibre and other nutrients, the varieties that are grown to produce food for humans (grain legumes) tend to put most of their growing effort and nitrogen into producing pods that we harvest and therefore take out of the system. While grain legume production does to some extent boost the yield of subsequent crops (and their introduction into the cropping rotation also helps break pest and disease cycles[14]), there is less nitrogen available in the soil for any subsequent crops to use than when inedible legumes are grown specifically to enhance soil fertility. These legume green manures and cover crops require the allocation of land and labour and so they are typically used only on large farms.[15]

Animals that eat leguminous fodders (and indeed any other form of feed) will utilise some of the protein they ingest to keep themselves alive, gain muscle, produce milk and so forth; they will excrete the rest in the form of urine and dung. This manure has the advantage of providing the next generation of crops with a highly bioavailable form of nitrogen. The manure itself is also rich in organic matter and it can therefore improve soil quality. It's important to note, however, that manure does not introduce new nitrogen into the system, and some of the nitrogen the animals ingest will not be returned to the soil, because it will be removed from the system in the form of milk or meat. What's more, in the wrong place, quantity or weather, nitrogen in the manure can leach out of soils and create a whole set of now very well documented environmental problems.

Whatever the nitrogen source – mineral or organic – the nitrogen cycle is very 'leaky'. Some 20–50% of nitrogen used in crop production is lost to the environment. Depending on soil, weather and climatic conditions, this 'lost' nitrogen goes through various chemical processes, and can end up as nitrates or ammonia (polluting soils, waterways and air) or the potent greenhouse gas nitrous oxide. As noted, adding an animal to the nitrogen cycle (the animals eat the plants which rely on the nitrogen) adds an extra layer of leakiness and therefore environmental harm to the system.

More significantly still, though, the second reason that protein matters environmentally is because of its physical link to and metonymic associations with meat and milk. As described above, protein has long been seen as synonymous with animal products themselves and the connection today is as strong as ever; a connection that some might say has actually been reinforced by the use of the term 'protein alternatives,'[16] since in claiming to serve as an 'alternative,' the animalianness of the 'real' thing itself is strengthened.

It's now well recognised that animal agriculture makes a significant contribution to greenhouse gas emissions, and is also a major driver of land use change, deforestation and biodiversity loss, and a cause of soil degradation, soil and water pollution.[17] But while these problems are well documented,

---

13 International Energy Agency (2021). Ammonia Technology Roadmap: Towards more sustainable nitrogen fertiliser production. International Energy Agency.

14 Giller KE. (2026). Agroecology's Allure and Tech Temptations: Why Neither Alone Will Drive Change in Africa. Clim-Eat: Wageningen, the Netherlands.

15 Giller KE. (2001). Nitrogen Fixation in Tropical Cropping Systems. CAB International, Wallingford.

16 Rees J, Blaxter T and Garnett T. (2025). Alternative proteins and better food futures: moving beyond the binaries. TABLE Reports. TABLE, University of Oxford.

17 Godfray HCJ et al. (2018). Meat consumption, health and the environment. Science, 361, eaam5324 https://doi.org/10.1126/science.aam5324.

there is also kickback in some quarters, with their counter-arguments usually consisting of a combination of the following: the environmental problems don't apply or are not caused by every system or every context, there are also active environmental benefits which a switch to more plant-based agricultural systems would destroy, the negatives are either exaggerated or can be managed, or the social and economic benefits outweigh any costs.[18]

While environmental issues loom large they are, however, just one strand in a much more complex and entangled bundle of politically, economically and culturally themed contestations about meat and animal farming, as the figure below shows. Protein by association inevitably gets caught up in these entanglements, despite the fact that meat ≠ protein – it's important to remember that foods of plant origin also contain protein and in fact, they supply, on average, around 60% of all protein consumed globally, or 40% of the protein we consume in the UK.[19]

Our ideas about nature, land and farming are another major component of this bundle. Debates about protein/meat reflect a spectrum of views (aesthetic, economic and otherwise) about what landscapes should look like, what sorts of biodiversity we value (instrumentally, morally, aesthetically), how farming should *be* in order to create the landscapes and biodiversity we want – and what role farmed animals do or don't play in all this. Are the animals we rear destroyers of biodiversity or their custodians? Is the nature that's been shaped by animal farming the nature we value and indeed consider to be 'natural' or are true value and nature only to be found in landscapes absent of humans? Our views on the moral status of animals and especially on whether it is acceptable, necessary and even inherent to our natures to exploit them for our use – and if so then how we should care for them – will also layer onto and inform these discussions.

Figure 4: Protein-animal entanglements

Source: Authors

18 Leroy F, Beal T, Dunshea F et al. (2026). Carbon tunnel vision and sustainable meat production in the West: A disproportionate focus on dietary greenhouse gas emissions? Food Science of Animal Resources, 46, 69.

19 Our World in Data (2025). Daily protein supply from animal- and plant-based foods. Based on FAO data. https://ourworldindata.org/grapher/daily-protein-supply-from-animal-and-plant-based-foods and https://ourworldindata.org/grapher/daily-protein-supply-from-animal-and-plant-based-foods?country=~GBR accessed 7 September 2026

Then there are the debates relating to our health. Answers to the question "how much, and what kind of protein do we need?" form part of a wider package of questions about what we mean by 'good' nutrition. Stakeholders will make different connections between individual nutrients (including protein), foods, diets and health; the connections they make may be shaped by their disciplinary background (physiology, epidemiology, cardiology), by their focus of concern either as regards population (children, athletes) or geography (Western Europe, sub-Saharan Africa); and by whether they think it relevant to factor other considerations into their analysis, such as the environment. They may also have different counterfactuals in mind, even if only subconsciously: if we do / don't do X then Y (they assume) would be the situation and this would be worse / better than X. Connectedly, they may differ in their disposition to focus upon what *is* versus what could *be*.

With all these variables differently arranged in people's heads, it's not surprising that different conclusions are drawn. Some stakeholders will place more emphasis on the quantity and composition of the nutrients we need, including protein; others may be less focused on this kind of detail and more concerned with the broad dietary patterns they want us to adopt or to move away from. These differing scales of resolution may also shape and be shaped by whether their concerns are with the *excesses* of consumption – the fact that too many calories or too much of a 'bad' nutrient like saturated fat can lead to problems such as obesity or heart disease; or whether their concern is with the *insufficiencies* of intake, because of the health consequences that these lead to – osteoporosis, iron deficiency anaemia and the like. Our need for protein and/or protein-rich foods (that will also contain other nutrients, good and bad) will be seen in light of these differing emphases.

Adding to the mix will be different attitudes to processing, and here we enter into the 'ultra-processed' foods debate,[20,21] which itself interfaces with the polarised discourse around 'alternative proteins',[22] since many alternatives have been substantially processed in order to resemble meat in their taste, look or texture. For some stakeholders, this doesn't matter – for them, these alternatives are not only lower in environmental impacts but healthier too because they are generally lower in fat and calories, and, thanks to fortification, equivalent to or richer in certain micronutrients than the processed meats they substitute for. For others, these alternatives are just fake foods, embodiments of everything that's wrong with our modern industrial food system and no substitute at all for the naturally nutritionally dense foods – like carcass meat, milk, yoghurt, cheese and eggs – that they are intended to replace.

Freshly caught shrimp. Photo by Engin Akyurt (Unsplashed).

All these differing perspectives are themselves marbled through with ideas about culture and tradition – there will be different feelings about what cultures and traditions 'count', how old practices have to be in order to do so, and how mutable they are or are allowed to be, as times and circumstances change. These differing attitudes will in turn inform our definitions of what we hold to be good foods, good landscapes, and a good way of farming.

20 Fraanje, W. and Garnett, T. (2019). What is ultra-processed food? And why do people disagree about its utility as a concept? Foodsource: Building Blocks. Food Climate Research Network, University of Oxford

21 van Hensbergen, H. (2024). Nature Knows Best? Naturalness in the UltraProcessed Foods Debate. TABLE Explainer. TABLE, University of Oxford, Swedish University of Agricultural Sciences and Wageningen University and Research. https://www.doi.org/10.56661/f76228c7

22 Rees J, Blaxter T and Garnett T. (2025). Alternative proteins and better food futures: moving beyond the binaries. TABLE Reports. TABLE, University of Oxford.

Whatever our views on tradition, they will also be shaped by who we think we are or ought to be as individuals, as members of a community or as citizens of a nation, and these of course also tap into more personal-but-also-political ideas of selfhood, including as to gender and sexuality.

None of this is new, as the earlier discussion about protein, meat, race, class, masculinity and national identity has shown. Food has always been a marker of identity, and therefore of distinction and exclusion. That said, while many of the themes and connections, such as those between meat and masculinity, are very long-standing, the specifics of time and place as well as evolving knowledge – about the nutrients that constitute our foods and about the environment – give them new flavours, mesh onto new concerns, and afford new opportunities for conflict and division.

Finally, the glue that binds, are questions about power. Our discussions about protein and animals are tethered to our beliefs about what kinds of power there are out there in the world – moral, financial, political, narrative and more – and about how this power should and could be redistributed and redirected, by whom and for what ends.

One nutrient: three narratives

Nourishment, identity, sex, power, planetary boundaries, ethics, aesthetics: it's all quite a burden to load onto a biochemical structure.

But load we do, and what happens is that different people select and configure the evidence in different ways, based on their particular combinations of interests, ideologies, dispositions and assumptions. From these configurings emerge different stories about this molecule, about our need for protein, how it connects to (represents, exacerbates or solves) wider problems and concerns and how we should align or balance priorities when conflicts occur.

There are perhaps three versions of the protein story that are told out there. Each one has its own set of champions and aficionados; each one can find justifications for their claims in the peer-reviewed scientific literature, at least for most of the assertions being made. Sometimes, the very same article can be used to argue for two different stories, since much lies in the interpretation of findings. While it's true that the devil can cite scripture for his purpose, the fact that there is evidence to be found in support of the different stories being told means that it's not entirely straightforward (or honest) to dismiss an argument just because one doesn't agree with it.

It's also striking, although unsurprising that, as touched upon earlier, when you hear these stories, you know they're not really new. They're really just nutrient-themed retellings of the pre-existing narratives that have been circulating for so long in food system discussions[23,24] – they're the West Side Story update to Romeo and Juliet, so to speak. The same arguments play out, which tend to centre on differing ideas about the 'true' nature of human motivations, on the 'real' forces that shape them, and on the desirability or feasibility of redirecting them; on how we relate, or should relate to nature and the non-human world; and about who or what should be making the decisions about any of this. Sometimes 'traditional' positions invert themselves, but the fault lines are more or less plain to everyone for everyone to see, and, unfortunately whatever the topic, people tend to align themselves in familiar ways.

23 Garnett T. (2013). Food sustainability: problems, perspectives and solutions. Proceedings of the Nutrition Society, 72, 29–39.

24 Garnett T. (2014). Three perspectives on sustainable food security: efficiency, demand restraint, food system transformation. What role for life cycle assessment? Journal of Cleaner Production. 73, 10–18.

So, on to the stories themselves. The first one goes like this:

Story one: We need more protein!

Protein is an essential nutrient and most current official guideline recommendations do not reflect the best and latest evidence about its function in the body and our need for it. We need to eat more protein.

Higher protein intakes are important for two reasons. The first is that protein is essential for building and maintaining muscle. Maintaining muscle function is extra important for an ageing population, and now also for the growing number of people on weight loss medications, who lose muscle mass along with their fat. Second, higher-protein diets can make it easier to maintain or lose weight, partly because protein is a highly satiating nutrient (you feel fuller for longer) and partly because it has a high thermic effect, meaning we use more energy to digest protein than with other macronutrients. Protein's contributions in both these respects make it particularly important for menopausal and postmenopausal women: since their bodies have stopped producing oestrogen, the risk of falls and subsequent bone fractures increases and for this reason it's all the more important that they maintain their muscle mass and their all-round strength.[25,26,27]

So, we need more protein than the recommendations currently suggest, and animal products are an excellent source of that protein. Meat, milk, eggs and fish contain the full complement of essential amino acids, in the right balance and in more bioavailable forms than plants do. Put another way, to meet our requirements for protein entirely via plant sources, we'd need to eat considerably more protein than the recommendations suggest, in order to account for their reduced digestibility and their lower abundance of limiting amino acids.[28]

Animal products don't just contain protein though; they're nutrient-dense in general, offering a whole bundle of vital micronutrients such as iron, zinc, iodine, calcium, B vitamins and vitamin A. These are often in short supply in people's diets, in rich countries as well as in poor.[29,30]

The purported nutritional downsides of meat are based on flawed or limited research – the evidence linking unprocessed red meat to poor health outcomes is in fact weak and of poor quality.[31,32] Meat eating, provided it's of the right kind, and in the context of an overall healthy diet, is fully compatible

---

25 Morgan PT, Witard OC, Højfeldt G, Church DD and, Breen L. (2025). Dietary protein recommendations to support healthy muscle ageing in the 21st century and beyond: considerations and future directions. Proceedings of the Nutrition Society. 84(3), 245--258.

26 Moon J and Koh G. (2020). Clinical Evidence and Mechanisms of High-Protein Diet-Induced Weight Loss. Journal of Obesity and Metabolic Syndrome. 29(3), 166-173.

27 Silva TR and Spritzer PM. (2017). Skeletal muscle mass is associated with higher dietary protein intake and lower body fat in postmenopausal women: a cross-sectional study. Menopause. 24(5), 502-509.

28 Moughan PJ, Fulgoni VL and Wolfe RR. (2024). The Importance of Dietary Protein Quality in Mid- to High-Income Countries, The Journal of Nutrition, 154, 3, 804-814

29 Darnton-Hill I. (2019). Public Health Aspects in the Prevention and Control of Vitamin Deficiencies, Current Developments in Nutrition, 3(9).

30 Derbyshire E. (2018). Micronutrient Intakes of British Adults Across Mid-Life: A Secondary Analysis of the UK National Diet and Nutrition Survey. Frontiers in Nutrition. 5, 55.

31 Johnston BC, Zeraatkar D, Han MA et al. (2019). Unprocessed Red Meat and Processed Meat Consumption: Dietary Guideline Recommendations From the Nutritional Recommendations (NutriRECS) Consortium. Annals of Internal Medicine. 171(10), 756-764. https://doi.org/10.7326/M19-1621.

32 Kavanaugh M, Rodgers D, Rodriguez N and Leroy F. (2025). Considering the nutritional benefits and health implications of red meat in the era of meatless initiatives. Frontiers in Nutrition. 12, 1525011. https://doi.org/10.3389/fnut.2025.1525011.

with good health.[33] In the case of dairy products, there's a growing body of research[34,35] that links dairy, including full-fat versions, with positive health outcomes. As for alternative proteins, these are highly processed products whose on-paper nutritional profile is, unlike animal products, reliant on fortification rather than naturally present; ultimately they benefit no one except for the corporates and Silicon Valley types who push them.

Vegans, or those who eat very few animal products, are more likely to be deficient not just in protein but in a range of vital micronutrients too, including omega-3 fatty acids, vitamins B12, D and A, iodine, iron, zinc and calcium.[36,37,38] Deficiencies can lead to hugely damaging conditions such as night blindness, anaemia and osteoporosis[39], and when it comes to the latter, evidence suggests that vegetarians and vegans are more prone to bone fractures than omnivores.[40,41] The fact that supplementation is essential in vegan diets (vitamin B12 at minimum) shows that these diets are inherently inadequate.

There are psychological consequences too; vegans are more likely to be depressed than omnivores[42] and to suffer from eating disorders (or disordered eating more generally),[43,44] perhaps because these diets are deficient in vital nutrients that are essential for brain health[45] or perhaps because veganism provides them with a culturally acceptable cover for eliminating entire food groups from their diets.

As for environmental considerations, livestock farming has certainly caused environmental damage, but all agricultural production causes problems – think about the fertiliser- and pesticide-intensive monocultures that are the defining features of current arable production. Animal farming has been unjustly maligned. Better animal management – via better feeds, better manure management, better animal husbandry and so forth – can improve production efficiencies, so reducing environmental

---

33 Fontes T., Lopes S., Cebola M. et al. (2025). The influence of vegetarian and omnivorous diet quality on metabolic profiles and cardiovascular risk. Scientific Reports, 15, 35776.

34 Akyil S, Winkler S, Meyer D et al. (2026). Association between dairy intake and multiple health outcomes: a scoping review of systematic reviews and meta-analyses. European Journal of Clinical Nutrition. 80(1), 16-27. https://doi.org/10.1038/s41430-025-01639-5.

35 Astrup A, Geiker NRW and Magkos F. (2019). Effects of Full-Fat and Fermented Dairy Products on Cardiometabolic Disease: Food Is More Than the Sum of Its Parts. Advances in Nutrition, 10(5).

36 Bath SC. (2025) Plant-based diets for sustainability and health – but are we ignoring vital micronutrients? Proceedings of the Nutrition Society, 84(3), 216–224.

37 Bali A and Naik R. (2023). The Impact of a Vegan Diet on Many Aspects of Health: The Overlooked Side of Veganism. Cureus, 15(2).

38 Bakaloudi DR, Halloran A, Rippin HL et al. (2021). Intake and adequacy of the vegan diet. A systematic review of the evidence. Clinical Nutrition, 40(5).

39 Neufingerl N and Eilander A. (2021). Nutrient Intake and Status in Adults Consuming Plant-Based Diets Compared to Meat-Eaters: A Systematic Review. Nutrients. https://doi.org/10.3390/nu14010029.

40 Tong TYN, Appleby PN, Armstrong MEG et al. (2020). Vegetarian and vegan diets and risks of total and site-specific fractures: results from the prospective EPIC-Oxford study. BMC Med. 18(1), 353.

41 Ballarin RS, Lazzarin T, Minicucci MF et al. (2025). Vegetarian and Vegan Diets and the Risk of Hip Fracture in Adults: A Systematic Review and Meta-analysis, Nutrition Reviews, nuaf241

42 Saintila J, Carranza-Cubas SP, Serpa-Barrientos A et al. (2024). Depression, Anxiety, Emotional Eating, and Body Mass Index among Self-Reported Vegetarians and Non-Vegetarians: A Cross-Sectional Study in Peruvian Adults. Nutrients, 16, 1663. https://doi.org/10.3390/nu16111663.

43 Salvia MG, Onteeru M, Lipson SK and Quatromoni PA. (2015). Adopting vegetarian and vegan eating patterns: Associations with disordered eating behaviors among young adult college students. Eating Behaviors, 57, 101967.

44 Sergentanis TN, Chelmi ME, Liampas A et al. (2020). Vegetarian Diets and Eating Disorders in Adolescents and Young Adults: A Systematic Review. Children, 8(1), 12. https://doi.org/10.3390/children8010012.

45 Clemente-Suárez VJ, Redondo-Flórez L, Martín-Rodríguez A et al. (2025). Impact of Vegan and Vegetarian Diets on Neurological Health: A Critical Review. Nutrients, 17(5), 884.

impacts per unit of product produced and decoupling demand from impact.[46] Moreover, it's possible not just to manage the downsides of animal farming, but for livestock farming to actually be actively environmentally beneficial. Well-managed grazing systems not only help store carbon in soils – and keeping carbon in the ground is vital – but in some settings can even sequester it.[47] Arable soils contain much less carbon, because they're regularly ploughed. Moreover, not all animal agriculture is associated with deforestation – think of mixed British and European livestock systems – and as for biodiversity, grazing lands and pastures are much more hospitable to wildlife than arid croplands. Without animal agriculture, our much-loved British and European landscapes, with their unique biodiversity, landscapes that have been shaped by livestock over thousands of years, would no longer exist. The same goes for pastoralism in sub-Saharan Africa, and for the other vast rangelands on this animal-shaped planet.[48]

An additional important benefit of livestock farming is that animal manure contributes to the recycling of nutrients in the system and enhances soil organic matter, leading to healthy soils. Without this manure we'd be even more dependent on energy-intensive mineral fertilisers and our soil quality would further decline. The buildup of pests and diseases in cropping systems can also be broken by including animals in the rotations, thereby reducing pesticide requirements.[49] Finally, while animal agriculture is indeed a source of greenhouse gas emissions, the importance of methane, one of the contributing gases, is very overstated. Methane's impacts are powerful but short-lived; CH_4 degrades within a few years into biogenic CO_2, which is taken up by plants again. In any case, the methane from farmed ruminants needs to be seen in relation to the baseline level of emissions from wild herbivores that would be there in the absence of farmed cattle and sheep – ruminant farming adds little or nothing into the atmosphere that wouldn't otherwise be there.[50] Moreover, with developments such as methane inhibitors, this is a problem that can be solved.[51]

One final point to make about meat's environmental profile is this. Most life-cycle assessments which compare the greenhouse gas footprint of meat with plant-based alternatives on a per gram of protein basis conclude that plants perform better than animal products – per gram of protein delivered their carbon footprint is lower. However, these studies fail to take account of plant protein's lower digestibility and less favourable amino acid profile. Once these are accounted for, the gap between plants and animals reduces very considerably.[52] Add in the caveats about methane, as well as ongoing improvements in production efficiency and the possible benefit of soil carbon sequestration, and the hierarchies might even be reversed.

Over and above the beneficial health and many positive environmental credentials of meat eating and livestock farming, are the livelihood, economic and cultural benefits they generate. There are about a billion livestock farmers globally and their numbers include some of the world's poorest peoples.

---

46 Leroy, F., Beal, T., Dunshea, F. et al. (2026). Carbon tunnel vision and sustainable meat production in the West: A disproportionate focus on dietary greenhouse gas emissions?. Food Science of Animal Resources, 46, 69. (2026)

47 Leroy, F., Beal, T., Dunshea, F. et al. (2026). Carbon tunnel vision and sustainable meat production in the West: A disproportionate focus on dietary greenhouse gas emissions?. Food Science of Animal Resources, 46, 69. (2026)

48 Briske DD, Cromsigt J, Davies J et al. (2026). Pastoralism can mitigate biodiversity loss on global rangelands. BioScience, 76(1), 78-89. https://doi.org/10.1093/biosci/biaf158.

49 Al-Musawi ZK, Vona V, and Kulmány IM. (2025). Utilizing Different Crop Rotation Systems for Agricultural and Environmental Sustainability: A Review. Agronomy, 15(8), 1966.

50 Manzano P and White SR. (2019). Intensifying pastoralism may not reduce greenhouse gas emissions: wildlife-dominated landscape scenarios as a baseline in life cycle analysis. Climate Research, 77(2), 91-97.

51 Leroy, F., Beal, T., Dunshea, F. et al. (2026). Carbon tunnel vision and sustainable meat production in the West: A disproportionate focus on dietary greenhouse gas emissions?. Food Science of Animal Resources, 46, 69. (2026).

52 Moughan PJ. (2021). Population protein intakes and food sustainability indices: The metrics matter. Global Food Security, 29, 100548.

sources in fact offer better protection.[55]

It's worth reiterating the point made earlier that most of the British population and the Global North already consume more protein than the minimum safe level of intake, and in some cases more than the amounts tested in these studies, so in a sense these findings are less relevant to some people.

A broader point to make is that the 'more' narrative doesn't actually get to grips with the question of "more protein than what?" Put another way, "what would a deficiency look like?" It's still not clear how suboptimality would or does manifest itself in the context of all the other factors that influence our physical health – from how much exercise we take, to what else we eat, to the quality of our relationships. Given these variables, it's not exactly clear how to mark the divides between deficiency, adequacy and optimality.

While advocates of the "we need more protein" narrative would certainly not claim that more protein is 'the' or 'the only' answer, the overwhelming attention paid to this nutrient (for which they do bear some responsibility) ends up distracting us, in potentially damaging ways, from all these other influences on our health. We discuss this in more detail later.

Even more important, however, the 'more' story pays insufficient attention to issues around planetary boundaries and equity. If more is optimal, the logical next question to ask is: who gets to be optimal? Optimal for *whom* and at what *cost*? The risk here is that the concerns of the already reasonably well-nourished Global North divert resources – of time, narrative energy, research effort, money and implementation – from the more serious needs of citizens in the Global South.

Crucially, what if we can't all be optimal? What happens if we can't afford, environmentally speaking, for everyone to have access to an optimally proteinaceous diet abundant in the 'perfect' animalian protein and its associated micronutrients that advocates of the 'more protein' position would urge us to consume? The evidence suggests that we can't.

One obvious potential answer, which is so often forgotten because of the elision between animal products and protein, is that 'more protein' could potentially be delivered via plant-based sources. It's striking that, because of the conflation between protein and animal products, one rarely comes across a 'more' narrative from those who argue for a transition away from livestock production, except in relation to the specific needs of certain groups such as vegan athletes,[56] or in the marketing efforts of companies selling vegan protein powder or shakes (like Huel). While any increase in protein production to match increased protein recommendations brings with it its own environmental consequences – and as noted, protein is more environmentally expensive to produce than carbohydrate – those consequences are likely to be less severe than those associated with an increase in animal products.

Huel products. Photo by Ethan Mackenzie Akyurt (CC BY-SA 4.0).

Finally, the 'more' camp's arguments that we can address our livestock-related problems through various targeted measures (as summarised above) display somewhat contradictory thinking. Often the assertion is made that greater 'efficiencies' via, for

55 Montiel-Rojas D, Nilsson A, Santoro A et al. (2020). Fighting Sarcopenia in Ageing European Adults: The Importance of the Amount and Source of Dietary Proteins. Nutrients, 12(12), 3601.

56 Vegan Runners. (undated). Nutrition frequently asked questions. https://www.veganrunners.org.uk/nutrition-frequently-asked-questions/ (accessed 19 August 2026).

example, combinations of breeding, management and technological innovation can (partly) decouple production from impact, while at the same time and sometimes in the same sentence positive claims are also made about agroecological or regenerative practices. These last approaches tend to be founded on a rejection of those same efficiency-oriented approaches and in any case only 'work', environmentally speaking, in the context of actions to moderate demand for meat and dairy products and to ensure equitable distribution of those products.[57,58] Otherwise, additional land would need to be used for livestock production with all the environmental damage that that entails and/or only those who can afford what will inevitably be more expensive meat will get to eat it. So one is left with the alternative solution – which is happening anyway – a reliance on increases in industrial animal production, whose environmental, ethical and societal harms are well documented.[59]

So one ignores either environmental or equity imperatives; quite likely one ends up ignoring both.

Story two: We need different protein (and we don't need more)!

The second story goes like this:

There are so many problems with the 'more protein' narrative that it's hard to know where to start.

But perhaps we should begin with the most damaging problem of all, which is psychological: the fact that 'more protein' is simplistically equated in the public and political consciousness with 'more meat, milk and eggs,' based on the misconception that protein can only be found in animal products or else that plant sources are inferior.

Both these mistaken views are reinforced by the messaging of a very well-resourced, very powerful meat and dairy industry and by researchers with strong industry connections.[60,61]

To start with planetary concerns: a vast body of evidence shows that animal agriculture is a major driver of many kinds of environmental damage – it's the source of 15% of global greenhouse gas emissions and the main driver of deforestation and other forms of land use change worldwide, with all the biodiversity loss that that habitat destruction entails.[62,63,64] Effluents from animal farming also cause soil and air pollution, and contaminate waterways creating dead zones in rivers, lakes and seas. From a planetary boundaries viewpoint, study after study shows that we simply cannot afford to eat animal foods in the quantities and the forms that we currently do in the Global North – and global consumption trends are currently heading in this dangerous direction. We urgently need to cut back on animal farming and associated meat and dairy consumption. On-farm technological and managerial improvements aren't going to solve our problems: worse, they may entrench damaging

57 Muller A, Schader C, El-Hage Scialabba N et al. (2017). Strategies for feeding the world more sustainably with organic agriculture. Nature Communications, 8, 1290.

58 Röös E et al. (2022). Agroecological practices in combination with healthy diets can help meet EU food system policy targets. Science of The Total Environment, 847, 157612.

59 Bryant C, Aiking H, Alessandrini R et al. (2024). The Dublin Declaration fails to recognize the need to reduce industrial animal agriculture. Nature Food, 5, 799–801. https://doi.org/10.1038/s43016-024-01054-2.

60 Kenny T, Sievert K, Duffy C et al. (2026). Unpacking industry influence in academia and public policy: a case study of the Dublin Declaration of Scientists. Agriculture and Human Values, 43, 54.

61 Teimouri N, Sievert K, Hannah A, et al. (2026). Is Meat Industry Affiliation Associated With Study Conclusion in Nutrition Research? A Meta-Research Review, Obesity Reviews, e70153.

62 Poore J and Nemecek T. (2018). Reducing food's environmental impacts through producers and consumers. Science, 360, 987-992.

63 FAO. (2013). Tackling Climate Change through Livestock. Food and Agriculture Organisation.

64 Rockström J, Thilsted SH, Willett WC et al. (2025). The EAT-Lancet Commission on healthy, sustainable, and just food systems. The Lancet. 406(10512), 1625-1700.

production and consumption patterns or even worsen them via the Jevons paradox[65]. If we are to reduce food-related emissions, halt and reverse biodiversity decline and free up land that can be returned to nature, then eating less meat and fewer dairy products is just a non-negotiable.[66,67] While 'agroecological' or 'regenerative' farming practices that integrate livestock into cropping systems may offer some advantages over industrial ones, these benefits will only materialise if we constrain demand – otherwise even more land will need to be cleared to deliver the volume of output that current trends imply.[68]

As to the impacts on our health, there's damage here too: people who eat diets high in red and processed meats are more likely to suffer from heart disease, diabetes, and several kinds of cancers, and they're also likely to be overweight or obese – obesity engenders many physical and mental health consequences far beyond its contribution to these diseases.[69] What's more, expert opinion debunks the "we need meat" myth, showing that far from being inadequate, well-planned vegetarian and vegan diets can be healthy, yield multiple health benefits, and are suited to all life stages.[70,71]

Moving from physical to mental health, the claimed association between vegetarian and vegan diets and depression is unfounded. Depression has multiple causes, we don't know the causality between mental state and diet choice (where there is a choice), and evidence suggests that the diet-connection is to do with the quality of the diet rather than whether it's plant-based or not;[72] in fact some research suggests that plant-based diets may actually be protective against depression.[73] When it comes to eating disorders, the relationship has been oversimplified[74] by those with an axe to grind.

Regarding protein more specifically, contrary to popular perceptions, all plants and therefore all plant-based foods contain not just proteins, but indeed all the amino acids, albeit in varying proportions. This includes everyday staples like bread. To obtain the full complement of essential amino acids in sufficient quantities, plant sources of protein need to be eaten in combination with one another, but this isn't difficult and in any case occurs naturally and intuitively in most culinary traditions – think rice and peas, dhal and chapattis, beans on toast, beans and tortillas. Claims around specific amino acid deficiencies substantially overstate things.[75] Plant proteins in combination perform just as well as

---

65 TABLE. 'Jevons Paradox'. TABLE glossary entry. TABLE, University of Oxford. https://www.tabledebates.org/index%2Ephp/glossary?name=10.

66 Clark MA et al. (2020). Global food system emissions could preclude achieving the 1.5° and 2°C climate change targets. Science, 370(6517), 705-708.

67 Willett W et al. (2019). Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. The Lancet, 6736, 3–49

68 Waite R, Zoints J and Cho C. (2024). Toward 'Better' Meat? Aligning meat sourcing strategies with corporate climate and sustainability goals. World Resources Institute, Washington, D.C.

69 Key TJ, Papier K and Tong TYN. (2022). Plant-based diets and long-term health: findings from the EPIC-Oxford study. Proceedings of the Nutrition Society. 81(2), 190-198. https://doi.org/10.1017/S0029665121003748.

70 Melina V, Craig W and Levin S. (2016) American Dietetic Association: Position of the American Dietetic Association: Vegetarian diets. Journal of the American Dietary Association. 116(12), 1970-1980.

71 WHO Regional Office for Europe. (2021). Plant-based diets and their impact on health, sustainability and the environment: a review of the evidence. WHO European Office for the Prevention and Control of Noncommunicable Diseases, Copenhagen.

72 Walsh H, Lee M and Best T. (2023). The Association between Vegan, Vegetarian, and Omnivore Diet Quality and Depressive Symptoms in Adults: A Cross-Sectional Study. International Journal of Environmental Research and Public Health. 20(4), 3258. https://doi.org/10.3390/ijerph20043258.

73 Zhang B, Li M and Li X. (2026). Plant-based diets, especially healthy ones, are negatively associated with depression: a cross-sectional study. BMC Public Health, 26, 17.

74 McLean CP, Kulkarni J and Sharp G. (2022). Disordered eating and the meat-avoidance spectrum: a systematic review and clinical implications. Eating and Weight Disorders, 27, 2347–2375. https://doi.org/10.1007/s40519-022-01428-0.

75 Mariotti F and Gardner CD. (2019). Dietary Protein and Amino Acids in Vegetarian Diets-A Review. Nutrients, 11(11), 2661.

To these forms of damage should be added infectious diseases. Sixty percent of emerging human infectious diseases are animal-borne. The majority (71.8%) originate from wildlife,[83] but here too animal agriculture is implicated. The connection is as follows: habitat loss brings humans, livestock and wildlife into closer contact with one another;[84] the main cause of habitat loss is agriculturally induced land-use change and the main reason for that land-use change is to create space for livestock rearing and animal feed production.[85] So in driving land-use change, animal farming is creating the conditions for future epidemics to start.

Livestock production also contributes to the urgent and growing issue of antimicrobial resistance. Around 73% of antibiotics used worldwide are for farm animals, and while the relationship between its use in animal agriculture and human resistance is complex, a majority of studies investigating the connection show there to be a positive relationship. In other words, antibiotic use in animal agriculture leads to increasing resistance in humans.[86] While everyone is at risk, this is particularly true of people who work in confined animal production systems; these workers are also exposed to multiple forms of respiratory disease.[87]

Further down the production chain (and a neglected area of concern), slaughterhouse work is one of the most physically dangerous occupations in the world. Over and above the physical health effects, abattoir workers also suffer from very high levels of post-traumatic stress disorder, depression and anxiety. This in turn can trigger a cascade of maladaptive coping strategies, such as substance use and violence, particularly sexual violence,[88] meaning that the health consequences ripple outwards.

To the suffering experienced by workers in the animal agriculture sector should be added the voiceless misery of the farm animals themselves. Over eighty billion land animals are reared and slaughtered annually,[89] alongside an untold number of aquatic animals. Most of these animals will have been reared in confined and inhumane conditions, before undergoing traumatic deaths.

As to solutions, there has been a lot of negative kickback to 'alternative proteins,' on the grounds that these are 'ultra-processed' 'frankenfoods'. This is a narrative that's been created and pushed by meat and livestock groups who have a vested interest in the status quo[90] – the irony is that many of the products they market to us, like sausages, ham, nuggets and burgers to name but a few, are themselves 'ultra-processed.' Expert opinion suggests that the NOVA classification system which underpins the 'ultra-processed' category may be too baggy to be useful, because it lumps foods that are associated with positive health outcomes (like commercial wholemeal bread) together with foods

---

83 Rahman MT, Sobur MA, Islam MS et al. (2020). Zoonotic Diseases: Etiology, Impact, and Control. Microorganisms, 8(9):1405. https://doi.org/10.3390/microorganisms8091405.

84 Mahon MB, Sack A, Aleuy OA et al. (2024). A meta-analysis on global change drivers and the risk of infectious disease. Nature, 629, 830–836. https://doi.org/10.1038/s41586-024-07380-6.

85 Singh C and Persson UM. (2026). Global patterns of commodity-driven deforestation and associated carbon emissions. Nature Food, 7, 138–151.

86 O'Neill J. (2015). Antimicrobials in agriculture and the environment: Reducing unnecessary use and waste: The review on antimicrobial resistance. Available at: http://amrreview.org/sites/default/files/Antimicrobials%20in%20agriculture%20and%20the%20environment%20-%20Reducing%20unnecessary%20use%20and%20waste.pdf.

87 May S, Romberger DJ and Poole JA. (2012). Respiratory health effects of large animal farming environments. Journal of Toxicology and Environmental Health, Part B, 15(8), 524-41. https://doi.org/10.1080/10937404.2012.744288.

88 Slade J and Alleyne E. (2023). The Psychological Impact of Slaughterhouse Employment: A Systematic Literature Review. Trauma, Violence and Abuse. 24(2), 429-440. https://doi.org/10.1177/15248380211030243.

89 Our World in Data. (2026). How many animals get slaughtered every day? Based on FAO data. https://ourworldindata.org/how-many-animals-get-slaughtered-every-day (accessed 18 August 2026).

90 Boren Z. (2024). How a livestock industry lobbying campaign is turning Europe against lab-grown meat. Unearthed. https://unearthed.greenpeace.org/2024/07/30/cultivated-backlash-livestock-industry-lobbying-europe-lab-grown-meat/ (accessed 21 August 2026).

that are bad for us (like sweets and chocolates).[91,92] Research generally shows that processed plant-based meat substitutes are often healthier than the (also heavily processed) meat products they substitute for.[93]

Overall the ultra-processed messaging, when weaponised in this way, distorts the issues. Our problems are urgent – and rather than dismissing these newer technologies we should be seeking to develop as wide a range of solutions as possible. These innovations offer the hope that we can reduce both environmental impacts and the suffering of billions of sentient creatures, and might also serve as a kind of dietary stepping stone away from our current meat-heavy diets.[94]

Finally, the whole protein agenda and the positioning of meat as 'perfect' protein is developing an increasingly toxic edge. For sure, meat eating has always been associated with notions of masculinity, virility and nationalism, but all these are being turbocharged now by the far right,[95] and it's young men in particular who are both victims and perpetrators here.[96]

The 'different protein' story's strongest, most solid arguments are, in our view, the environmental ones. As we noted earlier, protein is environmentally expensive, and animal protein is especially so. The weight of evidence shows that current trends in the sheer quantity of anticipated production – whatever the farming system that delivers it – are damaging. As our reflections on the 'more protein' story underlined, current trends are simply not compatible with our climate and other environmental goals. And if they're not compatible with these goals, then they're fundamentally and biophysically not compatible with human health goals.

Environmentally and existentially speaking, 'different' protein is essential, whether we like it or not.

The same is true of the animal ethics arguments for 'different protein.' One may argue about whether the rearing of animals for human consumption is morally justifiable,[97,98] but it's hard to justify the scale and intensity of animal suffering today.[99]

As to this story's weaknesses, tellers of the 'different protein' story can sometimes be guilty of 'bundled thinking,' that is, the tendency to align a whole load of 'bads' (as one sees them) on one side and a whole load of 'goods' (likewise) on the other. Once convinced by the claim that "animal agriculture is bad for the environment", it becomes tempting not to examine the claims that "we already eat too much protein" and "meat and dairy are bad for our health" too deeply – but when it comes to nutrition the evidence does seem to be rather more equivocal.

---

91 O'Connor LE, Herrick KA and Papier K. (2024). Handle with care: challenges associated with ultra-processed foods research. International Journal of Epidemiology. 53(5), dyae106. https://doi.org/10.1093/ije/dyae106.

92 Kahleova H, Himmelfarb J, and Barnard ND. (2026). Not all ultra-processed foods are created equal: a review. BMJ Nutrition, Prevention and Health, e001358. https://doi.org/10.1136/bmjnph-2025-001358.

93 Nájera Espinosa S, Hadida G, Reuzé A, Lindberg L, Green R and Scheelbeek P. (2026). Plant-based analogues to meat and dairy for sustainable food systems. Proceedings of the Nutrition Society, 1-12. https://doi.org/10.1017/S0029665126102237.

94 Rees J, Blaxter T and Garnett T. (2025). Alternative proteins and better food futures: moving beyond the binaries. TABLE Reports. TABLE, University of Oxford.

95 Ionnaidou M, Harlow G, Patel M, Leach S, Hodson G and Dhont K (2026). Why the right resists veg(etari)anism: Ideological commitment to consuming animal products, Food Quality and Preference, 136, 105769.

96 Hubbub. (2025). High Steaks. Hubbub.

97 Croney C and Swanson J. (2023). Is meat eating morally defensible? Contemporary ethical considerations. Animal Frontiers, 13(2), 61–67.

98 TABLE. (2024). Rethinking animals in food and agriculture: welfare, rights and the future of food. TABLE event, 10 September 2024. https://www.youtube.com/watch?v=2hSVR7ZHHA4.

99 Blaxter T, Åsbjer E and Fraanje W. (2024). Animal welfare and ethics in food and agriculture. TABLE, Oxford, UK; Uppsala, Sweden; Wageningen, the Netherlands.

The “different protein” story as written does not recommend a purely plant-based diet; nevertheless, the adequacy of such a diet often gets entangled in debates around protein. Purely plant-based diets are associated with lower risks of diseases such as heart disease, type 2 diabetes and certain types of cancer but, as consumed in real life (rather than in their ideal theoretical versions) they are also often associated with micronutrient deficiencies and a raised risk of osteoporosis; the latter in particular is of growing concern as our global population ages. From a theoretical standpoint, a vegan who maintains an appropriate, not too low bodyweight – because vegans tend to have lower BMIs than omnivores and a low BMI is itself a risk factor for osteoporosis – who consumes sufficient plant sources of protein and calcium (a sufficiency that takes account of differing bioavailabilities), who supplements with vitamins B12 and D, and who does regular weight-bearing exercise[100] may not have a higher risk of bone fractures than their omnivorous counterpart. In real life however, this amounts to a pretty demanding set of practices, which is infeasible for many people. More effort is needed as a vegan to achieve the same bone-related results, so to speak, and vegans, like everyone else, have other things to be getting on with in their lives than worrying about every mouthful that they eat.

All that said, it’s important that we (as well as everyone else) avoid falling into the trap of binary thinking: most advocates of the ‘different protein’ argument are not arguing for veganism per se but for a shift towards diets richer in fruits, vegetables, legumes, wholegrains and so forth and, for high consumers, lower in animal products. Diets that are skewed in this direction offer many nutritional advantages and are associated with better health outcomes than those that are either purely vegan or high in animal products.

A second weakness of the ‘different protein’ narrative is that it can underplay the deep-rooted, cross-cultural value that people around the world place on animal products. Statements are not uncommonly made by the ‘different protein’ advocates that traditional diets around the world are primarily plant-based. This is true enough, but potentially a little glib because it ignores the reality that these dietary patterns are a function of poverty (and at some times of year religious injunctions) rather than inclination. While the idea that meat eating is somehow inherent to us – a defining marker and feature of our humanness[101,102] – is a matter of ongoing debate, what is clear is that when people are able to and can afford to eat animal products, they generally do and have always done so.

As such, the strong historical and cultural ties that we humans have to livestock keeping cannot be easily untied. All this said, the “meat’s in our culture” or “meat eating’s natural” types of arguments are not answers in themselves. They can be historically misinformed insofar as they essentialise and atemporalise values or practices that are never that solid or that permanent, and that have themselves been responses to the specifics of circumstance, rather than features of our being. And of course in confusing is with ought they can be ethically questionable – the same arguments can be used to justify racism, misogyny, animal exploitation and other forms of abuse. Nevertheless, we are where we are, culturally speaking, and the many positive values that people around the world associate with livestock keeping and meat eating do need to be engaged with properly and with respect.

Finally, there is the livestock sector’s economic importance to consider. This is a matter of powerful vested interests, but that’s not all it is. There are also the ‘vested’ interests of those lacking in power, who may have no easy alternatives to livestock farming, and for whom the economic and the cultural are also very closely entwined. There is talk and recognition of the need for just transitions within the ‘different’ community, but what this looks like is as yet unclear.

---

100 Kassam S. (2026). Plant-based diets and bone health: Bone health needs special consideration on a plant-based diet. Plant-Based Health Professionals. https://plantbasedhealthprofessionals.com/plant-based-diets-and-bone-health (accessed 19 August 2026).

101 Zink K and Lieberman D. (2016). Impact of meat and Lower Palaeolithic food processing techniques on chewing in humans. Nature, 531, 500–503.

102 Barr WA, Pobiner B, Rowan J, Du A, and Faith J.T (2022). No sustained increase in zooarchaeological evidence for carnivory after the appearance of Homo erectus. Proceedings of the Natural Academy of Sciences, 119(5), e2115540119.

On to story three.

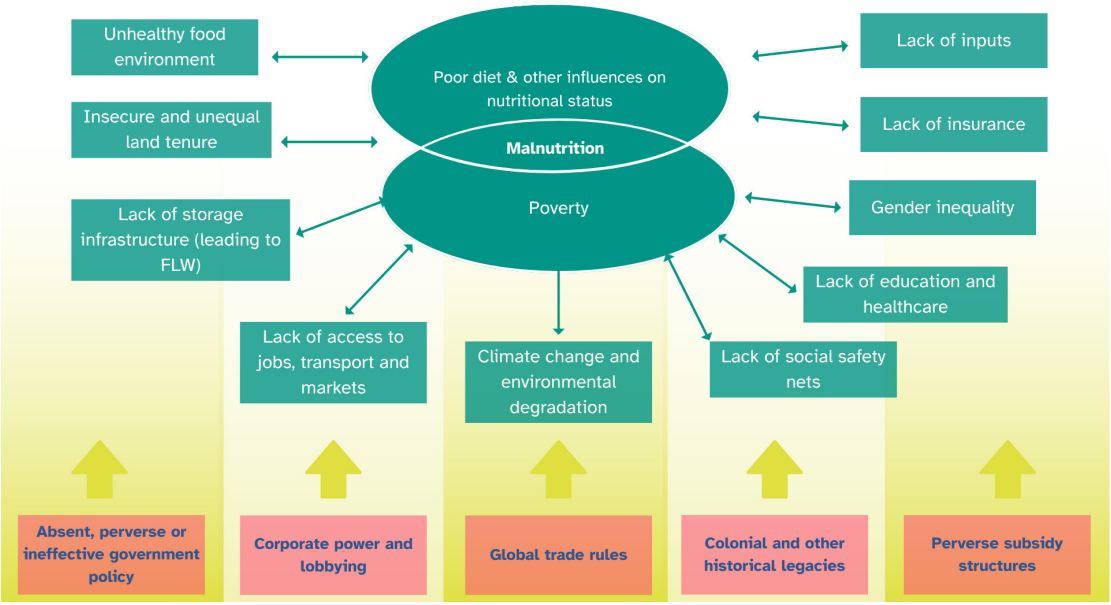
Story three: We need to stop obsessing about protein!

The focus on protein is misplaced and reductive.

We need to stop playing nutrient dot-to-dot and attend instead to the socio-economic, environmental and physical determinants of nutritional health. Obviously what you eat is important, but the big and critical question to ask is this: what shapes what enters into and gets utilised by your body?

As Figure 5 shows, people's nutritional status arises from a whole complex of interacting factors. These include their income status, levels of educational attainment, housing conditions, the presence or absence of adequate water and sanitation, gender and class relations, the laws of the land – and how and whether they're enforced – what physical and economic access to markets they have, the historical legacies communities have inherited, and much, much more.[103,104] The question of protein – and diets in general – has to be seen in relation to all these other factors.

Figure 5: A few of the many influences on poor nutritional status



Source: Authors

Protein deficiencies around the world are fairly rare, even in much of the Global South, although notable exceptions can be found in sub-Saharan Africa and in South Asia, where poverty levels in many countries are very high and hunger remains widespread. That said, if we have to focus on nutrients, then let's focus on the *micro* ones, because deficiencies of many kinds are a concern here, certainly in Africa and South Asia but also across the world and even in the affluent North. The prevalence of these deficiencies is also on the rise.[105]

Animal products are rich in micronutrients as well as protein. As such, it's important that they become

103 UNICEF. (2021). Conceptual Framework on Maternal and Child Nutrition.

104 Büttner N, Heemann M, De Neve J et al. (2023). Economic Growth and Childhood Malnutrition in Low- and Middle-Income Countries. JAMA Network Open, 6(11), e2342654. https://doi.org/10.1001/jamanetworkopen.2023.42654.

105 Han X, Ding S, Lu J and Li Y. (2022). Global, regional, and national burdens of common micronutrient deficiencies from 1990 to 2019: A secondary trend analysis based on the Global Burden of Disease 2019 study. EClinicalMedicine. 44, 101299.

more accessible and affordable in countries where they are rarely consumed or eaten only in small quantities. They're not the only source, though, and the role of animal products per se needs to be seen in a wider dietary context.

That context is that many people in the Global South – and especially in the very poorest countries – subsist on diets that are overwhelmingly carbohydrate-based, be these the carbohydrates we traditionally associate with poverty, such as maize, or else their more contemporary forms, like instant noodles or cheap white bread. The diets of the poor don't just lack animal products; they lack many other nutritious foods too, particularly vegetables (leafy greens and orange-fleshed vegetables are particularly important), fruits, nuts, pulses and legumes. The issue here is *diversity*, or rather its lack. Poor people lack sufficient food and nutrient diversity across the board.

Beyond the nutrients they contain, livestock have a range of other influences on people's health status, because they play multiple roles in shaping and reflecting people's underlying socio-economic circumstances. This means that the relationship between livestock and people's nutritional as well as broader health outcomes is complex.[106]

As regards positive influences, livestock keeping has the advantage of enhancing a household's economic resilience, because it can act as a form of portable banking and insurance service. Crop production is a seasonally limited activity and if you're poor, you tend to have to buy high and sell cheap. With animals, on the other hand, you can sell on an as-needed basis, perhaps when times are tough or for an emergency need (a new roof, or to pay for healthcare), and you can buy them in again when times are better.

Keeping animals can of course in principle increase a household's access to meat, milk or eggs, and these are indeed nutrient-rich foods. It's important to note though that the distribution of these foods isn't always evenly allocated within a household, and those who need them most – children and women – may in fact be the least likely to get to eat them. Additionally, just because you keep animals doesn't mean that you actually end up eating more animal products – you might sell them instead, and then use the money earned for something else. That something else might have positive consequences for health (medicine, say, or education) but it might not – for example if you buy less healthy food or alcohol. Importantly, livestock keeping brings with it the risk of disease – and the potential nutritional benefits of having greater access to animal source foods can be undermined by the infectious diseases the animals carry, which can exacerbate pre-existing poor gut health and malnutrition, particularly in young children. The lack of policy support for managing the endemic diseases that chronically affect poor livestock keepers means that they have to endure the financial burdens that result, which keeps them trapped in poverty.[107,108]

In short, if we have to talk about nutrients we should be talking about *micronutrients*, and any discussion about people's nutritional status needs to be seen in a much wider environmental and economic context. When it comes to livestock, keeping animals and eating animal products can add diversity both to people's livelihoods and to their diets, but there are also downsides. Context and diversity are everything. We should be aiming for more *diversified* farming systems, diets and income generation strategies; and the details of what this looks like and how it comes about depends on *context*.

---

106 Flax VL, Ouma EA, Baltenweck I et al. (2023). Pathways from livestock to improved human nutrition: lessons learned in East Africa. Food Security, 15, 1293–1312. https://doi.org/10.1007/s12571-023-01382-4.

107 Grace D, Lindahl J, Wanyoike F, Bett B, Randolph T, and Rich KM. (2017). Poor livestock keepers: ecosystem-poverty-health interactions. Philosophical Transactions of the Royal Society of London, Part B, Biological Sciences, 372(1725), 20160166.

108 Chen D, Mechlowitz K, Li X, Schaefer N, Havelaar AH and McKune SL (2021) Benefits and Risks of Smallholder Livestock Production on Child Nutrition in Low- and Middle-Income Countries. Frontiers in Nutrition, 8, 751686. https://doi.org/10.3389/fnut.2021.751686.

One very major strength of the 'stop talking about' narrative lies in the way it zooms out beyond nutrients, foods and diets to consider the socio-economic context which shapes what people do or don't get to eat and what their bodies are able to utilise. Its second is that it underlines the point that one size does not fit all, and that the specific circumstances are key.

That second strength is also a limitation though, in that context specificity risks leading to a fudge. Context is vital, but at the same time, we need to reckon with the reality that all these unique contexts add up to *something* – we need to know the sum total of what they collectively add up to, and we need to understand the environmental and other implications that ensue. Context is everything, but in some instances it can lead to an attitude of exceptionalism. Every situation is unique and special, but it may be that they collectively constitute a production and consumption reality that leads to hugely damaging environmental impacts.

Furthermore, contexts don't just stay the same. Interventions happen both despite and because of needs. Take, for example, the efforts of development banks, aid agencies and NGOs to support local smallholder livestock production via better, more nutritious feedstuffs, more productive breeds, better veterinary care, improved market access, marketing support, supply chain integration and so on. Collectively these efforts generally lead to intensification, and if successful, to a certain level of scaling up. They can also yield economic, health or other benefits. But at what point do scaled-up, intensified 'improved' smallholder systems segue into something bigger and more commercial? At what point do outsiders come in and configure them into industrialised production systems, systems that (over and above their environmental harms) don't actually serve the needs of the smallholders themselves? When, in other words, does Animal Farm become the last line of Animal Farm?[109]

Alignments and divergences

These, broadly speaking, are the three main stories about protein that get told by stakeholders in the food systems world. They are not, of course, entirely distinct. For example, one finds some similarities between the 'more' and the 'stop' stories in what they say about livestock across its nutritional, cultural and economic dimensions. There are also alignments between the 'different' and the 'stop' stories when it comes to the importance of dietary diversity, or as regards the non-nutritional harms arising from livestock keeping.

There is notably one major point of cross-story agreement: all three stories either implicitly or explicitly foreground the importance of micronutrient adequacy. The 'more' story bolsters its arguments for more animalian protein by underlining the micronutrient richness of meat, milk and eggs. The 'different' narrative, by decentring protein as 'the' nutrient of concern, and emphasising more plant-forward eating based around fruits, vegetables, legumes, nuts and wholegrains, is implicitly arguing for dietary diversification, with micronutrient diversity a benefit that follows. The 'stop' story is the one that perhaps talks most explicitly about the need to address micronutrient deficiencies.

As regards environmental concerns, no narrative discounts (at least overtly) the importance of planetary boundaries. However, they offer very different accounts of how their stories (or rather their consequences) are compatible with those boundaries. The 'different' argument is the one that perhaps addresses the issues most explicitly and with the greatest emphasis – the reality of those boundaries is paramount, and we are to sit within them by changing our consumption practices. Achieving this goal is the focus of considerable NGO attention and effort, but the challenge of altering current trends is evidently immense. The 'more' argument adopts a twin-track approach – the first is to offer technological and managerial innovations as an answer (despite evidence suggesting that an absolute decoupling of production from emissions is not on the cards, and despite the fact that there may be

109 Orwell G. (1945). "The creatures outside looked from pig to man, and from man to pig, and from pig to man again; but already it was impossible to say which was which." Animal Farm. Secker and Warburg, London.

trade-offs within environmental concerns, and negative consequences for animal welfare); the second is to prioritise other goals (economic, nutritional, cultural), thereby underplaying the importance of keeping within those limits. As for the 'stop' argument, it's hard to know what a series of place-based, context-specific interventions end up adding up to in the end.

The three different stories also take very different approaches to questions of equity and justice. The 'more' argument, as we discussed in our critique, tends to be very preoccupied with optimising already very protein-abundant diets in the Global North while matters of North-South equity tend, by comparison, to be neglected apart from the odd mention of pastoralism in sub Saharan Africa. In so far as they are addressed it's via economic arguments – that is, the argument that livestock production provides livelihoods and keeps people in employment. The 'different' argument emphasises the need for fair-share healthy diets within the limits of planetary boundaries, and in that sense it does indeed foreground matters of equity. However, the impacts on the livelihoods of those working in the livestock sector (from farming, through processing onwards) need further examination, and the 'how' of what a just transition might look like and how it might be achieved are as yet unclear. The 'stop' story is the one that is most explicitly centred on the needs of the poor today, but less considered are those of future generations who will be affected by the environmental consequences of the farming and food provisioning decisions made today. Finally, there is the important question of cross-species equity – the implications of those different stories for the animals we currently rear for slaughter. Only the 'different' story really thinks about these.

Beyond protein

Ultimately, the question of how much protein we need prompts in our minds a much bigger question, which the "we need to stop obsessing about protein" story begins to ask, but which perhaps we could and should be asking in a more deliberate and overt way. The big question that interests us is this:

"What is health?"

It's a question that the World Health Organisation (WHO) has also, naturally enough, asked. Helpfully, it has also supplied an answer, and it has embedded it in its constitution.[110] Health, for the WHO, "is a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity."

This is an impressive but pretty daunting definition. If this is health, then which of us is healthy? Some of us might have been lucky enough to experience fleeting moments in that blissful state, but even for the most fortunate, it will be for moments only.

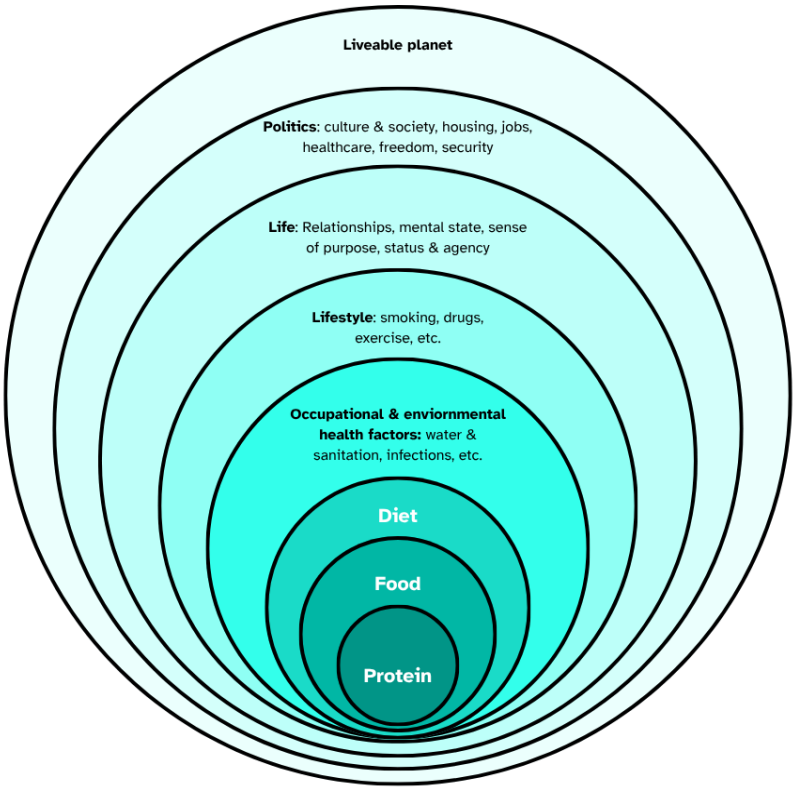
The point, of course, is to be all-encompassing, to offer a platonic ideal; it's the WHO's job to set the bar high. And while we will always be living in the failing, grubby world, the act of asking this question is useful, because it can prompt us – by 'us' we mean those of us who are working on food systems and on trying to make them 'better' – to think more broadly about what we are trying to achieve (what are the ultimate goals?), about connections or interactions we might be missing, and to see our work in the context of everything else that others are thinking about and working on, thereby challenging us to ask if we have our priorities right.

To illustrate all this, Figure 6 sets out some ways in which the various influences on our health could be seen to nest into one another. A nested diagram is arguably an overly simple way of looking at things because it suggests a neatness of causality that doesn't obtain in real life, but then again, all diagrams oversimplify. Another point to note is that this is not a food systems diagram. If it were, it would have to include things like 'farming systems' – and if these were included they would go

110 World Health Organisation. (undated). Constitution. https://www.who.int/about/governance/constitution (accessed 9 July 2026).

somewhere in the outermost ring of the diagram, because they influence the state, or otherwise, of planetary liveability.

Figure 6: A way of looking at the influences on health



Source: Authors

Protein, simply because it's the focus of this essay and of so much discussion in the food systems community, sits in the innermost circle. One could of course add in or substitute other nutrients too (micronutrients perhaps) or even other topics of focus, which might not even be food related.

All three narratives would broadly concede that we eat *food*, not protein (although products like Huel and This is Food might blur some boundaries here). They all also agree that it's the overall composition of the diet – over the day, and over the weeks, months and years – that's important. For many people working in food systems, these three circles make up the comfort zone of discussions.

Beyond these three, and depending on their particular interests and disciplinary or sectoral backgrounds, stakeholders will also extend the focus to include one or more of the other circles. For example, individuals and organisations primarily concerned with health might extend their consideration to the fifth circle out, in which diet and its impacts are thought about in the context of other so-called lifestyle factors – exercise, legal and illegal drugs, sleep – all which have important chronic and immediate effects on a person's wellbeing.

Some might go a step further, jumping outwards to the seventh circle, which is about the social, economic and political determinants of health. These include things like the presence or absence of social security nets, employment status and working conditions, housing, physical, economic or cultural access to healthcare, and the extent to which a society's governance arrangements allow one to function with a degree of agency. More extreme but obviously very major influences on health will be factors such as war, environmental disasters, migration and displacement.

Researchers and practitioners concerned with environmental sustainability might alternatively jump

from the first three circles to the outermost one, linking nutrients-foods-diets to the biophysical underpinnings (climate, biodiversity, nutrient cycles and so forth) that make life on Earth possible. Less discussed within the food systems community, but the focus of much work by the international development community and the collection of institutions known as the Consultative Group on International Agricultural Research, are the issues that fall within the fourth circle, where the influences on health include water, sanitation, disease and occupational hazards. These are sometimes considered in tandem with circle seven, the political and economic influences on health. Perhaps least discussed of all by organisations or institutions working in the food systems field are the 'life' part of our influences on health, which are sandwiched between, and of course massively affected by, the other circles – these are the psychological, spiritual and relational factors that affect our health, many of which will intersect, one way or another, with food.

In summary, organisations working within the food systems field tend to pick and mix from these categories. Protein is configured differently and assumes greater or lesser importance depending on which circles they foreground or ignore.

In the grand scheme of all these influences, it's tempting to say that protein is not very important. That would be technically inaccurate since it's a building block of life, but it would also be an overstatement since protein, whether one likes it or not, also serves as a proxy for meat and livestock and for all the major issues bound up in our discussions about them.

We can at least say, however, that the current focus on protein is also myopic. It may be time for actors within the food systems community to zoom out, reach beyond their comfort zones to consider some of the other vital influences on health, and to work more in collaboration with non food-oriented actors and organisations who place their efforts in the other circles.

Find out more

TABLE helps people navigate the evidence, values and visions that shape important debates about the future of food. Learn more at our website.

Sign up to our newsletter

Once a month, TABLE sends out our newsletter FODDER which includes summaries of journal papers, reports, books and other resources. We also send updates to our community about upcoming events and recent publications. Subscribe here.