Briefing: Alternative proteins – what's in it for farmers & land use?

Based on an AFN Network+ webinar, held 11.09.24

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About this briefing

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This briefing is based on a webinar discussion with Lydia Collas, Tom MacMillan and Stuart Roberts, given to the AFN Network+ community on the 11th September 2024. It is written and collated by Nina Pullman, food system writer for AFN, and edited by Jez Fredenburgh, knowledge exchange fellow for AFN. The transcript has been lightly edited to paraphrase in parts. You can also watch the webinar.

About the webinar topic:

Livestock production and alternative proteins are likely to sit side-by-side in the coming years, with alternative products taking greater market share than currently. But what might this mean for farmers? And how can we move the conversation forward productively and without negative polarisation in a way that benefits all?

Prof Tom MacMillan and colleagues from the Royal Agricultural University argue that we should be exploring this question around cultured meat (one type of alt. protein) more seriously, and that involving farmers as the industry develops could benefit everyone. In his recent report, he and colleagues argue that cultured meat may even present new income opportunities for some farmers, give ‘real meat’ a marketing edge, and that using agricultural by-products could make cultured meat cheaper and more sustainable.

Lydia Collas and colleagues at Green Alliance have mapped out how a ‘land dividend’, created from shifting towards more alternative proteins, could enable European farmers to sequester more carbon for the carbon market, create more space for nature, contribute towards greater national self-sufficiency, and expand agro-ecological farming. Read the Green Alliance report, and country profiles.

This webinar explores both reports and pushes the conversation beyond the often polarised debate around this topic.

About Lydia Collas:

Lydia Collas is Head of Natural Environment at Green Alliance, where she leads the organisation’s work on natural environment policy, exploring how best to adapt land use and management to meet food, climate and nature goals. She is interested in tackling the drivers of environmental degradation and nature loss, including routes to changing consumption preferences.

Lydia joined Green Alliance as a policy analyst in April 2022. Prior to joining, she completed a PhD in Conservation Science at the University of Cambridge, analysing the cost effectiveness of contrasting agricultural policy approaches to delivering ambitious biodiversity and climate mitigation outcomes.

About Tom MacMillan:

Professor Tom MacMillan is the Elizabeth Creak Chair in Rural Policy and Strategy at the Royal Agricultural University (RAU) in Cirencester.

Tom is a founding Director of the Centre for Effective Innovation in Agriculture, and a Deputy Director of The National Innovation Centre for Rural Enterprise (NICRE). He is an expert advisor to the Food, Farming & Countryside Commission and was one of the team supporting Henry Dimbleby to develop the National Food Strategy.

Formerly, Tom was Director of Innovation at the Soil Association, where he founded the Innovative Farmers network, and before that was Executive Director of the Food Ethics Council. He has served on various advisory groups and boards, including for the Cabinet Office Food Matters report, ScienceWise, BBSRC, Sustain and the Brighton & Hove Food Partnership.

About Stuart Roberts

Stuart farms 120 hectares of beef and arable in Hertfordshire in partnership with his wife. He was elected to the post of NFU Deputy President in February 2020 after serving two years as Vice President. After concluding his role with NFU, he now chairs the Liberal Democrats' newly formed Food and Farming Working Group.

Summary of key points

Actions needed on the emerging and growing alternative proteins market:

1. Work with farmers to understand the risks and opportunities to their businesses from alternative proteins and how policy could minimize the risks and maximize the opportunities.
2. Understand how alternative proteins can help reduce reliance on land overseas and ensure imports are disproportionately impacted.
3. Use policy to support farmers in expanding their agroecological and nature restoration businesses.
4. Explore potential synergies between cultured meat and farming through innovation projects, particularly on waste valorization
5. Help develop ESG criteria for investors in the cultured meat sector to ensure farmers are effectively included.

Green Alliance research looked at the potential to scale alternative proteins by 2050, the implications for land and opportunities for farmers. Key points from Lydia Collas:

Alternative proteins could free-up land used to feed livestock, enabling the UK to 'onshore' other foods and boost nature and carbon storage

- Land is used in different ways in the UK; food production, semi-wild habitats that help sequester carbon, and agroecological farming, which does a bit of both but generally can't be a net carbon sink. There will always be some trade offs in what we can do with land.
- The vast majority of farmland in the UK is used to produce livestock products, e.g. via arable or pasture land. The percentage of land used to grow food directly eaten by humans is very low.
- The report looked at three different alternative proteins; plant-based, cultivated meat, and fermentation-based. All three use less land than animal products, so the report also looked at how this additional free land could be used.
- Additional land could be used to bring production onshore that's currently overseas and increase self sufficiency. It could also be used to create carbon and nature-rich habitats with some grazing livestock. Finally, that land could expand agroecology or wildlife-friendly farming. The report assumed that farmers are key to delivering all of those.

Government intervention will impact the success of alternative proteins

- The success or failure of alternative proteins depends on the policy and regulatory environment. The report modelled both low and high intervention scenarios for government support:
- Low intervention could see alternative proteins displace about a sixth of meat and dairy by 2050, through plant-based products and some precision fermentation. In this scenario, cultivated meat doesn't reach a point where it's cost effective, or the regulatory environment doesn't allow it to become a big part of the marketplace.
- In the high intervention scenario, cultivated meat and precision fermentation become cost competitive. This would be primarily due to regulatory and policy decisions that help achieve price parity.
- At the moment, startups who are working on these products use lab-grade facilities where it's expensive to produce. There are few facilities where they can test at an intermediate scale before scaling up to commercial size. Supporting mid-size facilities is an example of where government could have impact.
- Processed products are likely to be where alternative proteins take off, for example in ready meals made with milk or egg proteins.

More land could be freed up for agro-ecology, but policy will be needed to avoid simply offshoring meat

- Currently 47% of the land that is used to grow food consumed in the UK, is in the UK. Under the low intervention scenario, there would be only small increases in food production and self sufficiency would stay largely the same as today.
- Under the high intervention scenario, 64% of land used to produce food could be within the UK. The UK could approximately quadruple the area of agroecological farmland under this scenario, because there would be more land freed-up.
- There is more work to do to understand how alternative proteins can help to reduce reliance on land overseas, but trade policy could help maintain some UK livestock production while reducing the amount of imported animal products.

The RAU looked at the implications of cultured meat for farmers in the UK using focus groups and case studies. Key points from Tom MacMillan:

Cultured meat innovation has begun to take off but remains expensive to scale

- Cultured meat is the process of growing animal cells without animals, by feeding cells with nutrients and growth factors in a bioreactor and processing the end result into something that looks like meat.
- The idea has been around a long time but has taken off in the last decade.
- Cultured meat 'nuggets' are available for sale in Singapore. Various other countries are now issuing marketing authorisations. The UK became the first to license a cultured meat pet food product.
- The new launches are primarily about impressing investors more than shifting product as it's still very expensive to make.
- There are uncertainties about how to scale up production, along with questions around who's going to buy it.

Farmers have concerns but also see some opportunities

- Farmers have questions over who benefits from cultured meat, and is it a disruptor or a doubling down of food industry industrialisation and corporate control.
- The opportunities farmers see range from growing or producing ingredients, either for the cell growth media or cells themselves; innovative supply chain relationships in terms of contracts or better terms; on-farm production particularly if they have energy or buildings available; a competitive edge for more 'natural' meat as opposed to cultured.

Polarising culture wars don't serve anyone, including farmers

- The concerns about the impact on farming could get blown up into a culture war. This would hinder cultured meat companies, dampen the appetite for alternative proteins more widely, and wouldn't serve farmers very well. Being in the conversation and shaping this technology is worth more than closing it down.
- To de-escalate the polarisation of cultured meat, companies could stop over-promising on cultured meat and stop oversimplifying farming. They could also look at ways of engaging with farmers for mutual benefit, such as through waste valorisation.

Key points from Stuart Roberts:

Division and binary positions aren't helpful or representative

- The debate about alternative proteins often forces people to take a position on being either a massive carnivore or a ruthless vegan. The reality is most people inhabit the place in between.

- Farmers already grow lots of different proteins in the form of peas and beans. Calling them ‘alternative proteins’ adds to that polarisation.

Land use is coming into sharper focus as societal values change

- The debate about land is not new but it's coming into sharper focus, because it is one of the only things that can solve some of the big problems for society.
- Farmers could be better at talking about how they are managing land in a way that reflects today's societal values, which aren’t just about food, but about energy, water and improving nature. If farmers talk in terms of all those, they will retain the social license to farm.

Supply chains could be better, or worse, with alternative proteins

- There is an opportunity to create better supply chains with farmers at the centre and a fairer distribution of power.
- New supply chains are also a threat and could lead to an even bigger power imbalance, around aspects such as intellectual property. This could put farmers in an even weaker position than traditional supply chains.
- There is a danger that the UK reduces livestock production without doing anything in terms of consumption. This would offshore supply to places where the environmental impact is greater.

Further key points from Q&A

Alternative proteins could widen the gap between who can afford ‘real’ versus processed food

- There is already a big gap in food accessibility, healthy eating habits and dietary outcomes. There is a risk that new alternative proteins, mostly destined for processed food, would exacerbate this gap in affordability and health outcomes.
- The value proposition and the market for these foods is still completely up in the air. So it could go the other way, and the price remains high.

Farmers could grow protein crops or sell livestock by-products

- Growth media for cultured meat is currently bought at huge expense from pharmaceutical suppliers. But it could be sourced agriculturally, including protein crops like lupins.
- A more unusual opportunity is looking at hoof and horn meal and blood as ingredients for cell growth media. This potentially changes the relationship between livestock farmers and the emerging cultured meat industry into a source of added value in supply chains.

Redefining what a ‘farmer’ means could help progress the conversation

- Farmers are not just responsible for delivering calories. Today's society has a plethora of needs, most of which can be delivered by farmers if they are adequately rewarded.
- The public has both a positive view of farming, seen in the popularity of TV shows like Clarkson’s Farm, but also has a tendency to blame farmers for society’s problems.
- Redefining what it means to be a farmer today could help both the public perception of the sector and create a more positive and progressive conversation around farming responsibilities and payments.

Webinar transcript

The webinar discussed recent reports looking at the implications for farmers of alternative meat and the potential for land use. Speakers also discussed the need to avoid polarisation and find common ground between farmers and alternative protein companies.

Speakers: Lydia Collas (LC), Tom MacMillan (T M), Stuart Roberts (SR), Jez Fredenburgh (JF).

The context around land use, the need to reduce emissions and how to engage farmers are all key aspects of the alternative protein debate

JF: So today's topic: realistically, livestock production and alternative proteins are likely to sit increasingly side by side in the coming years, with alternative proteins taking greater market share than currently. We'll be hearing from Lydia in a little bit about what that might look like and the implications of how that might play out in terms of land use and emissions and things.

But what we want to ask today is what this sort of shift in the market might mean for farmers? Are there potential opportunities? What are the implications for land use change, for carbon sequestration and emissions in general? And it would be great if we could all keep in mind three things when we're exploring this today. The first is just, very simply, the basic fact that emissions from our food system, particularly livestock, are going to have to come down, and alternative proteins may offer one tool for doing that.

The second is that even though that's the case, it's entirely understandable why many farmers may feel concerned about this likely shift, and I think it's important to acknowledge that. But thirdly, with both of those things in mind, it would be great if we could try to move the debate on today beyond what is often quite a polarised one, and try and move it on together. I'm hoping we can do that through the presentations, and then certainly in our Q&A afterwards.

So Lydia and Tom will present their recent research, and then Stuart will be giving his thoughts on what we've heard. We'll then have a 30 minute Q&A plus questions. So just to introduce Lydia properly: Lydia is head of natural environment at Green Alliance, where she leads the organisation's work on natural environment policy, exploring how best to adapt to land use and land management to meet food climate and nature goals. She's going to present a recent Green Alliance report for us called A New Land Dividend: The Opportunity of Alternatives Proteins in Europe.

Government intervention will define the ultimate size of the alternative protein market in the UK

LC: Thank you so much for inviting me to speak about this today. As Jez said, I am the head of natural environment at Green Alliance, which is a think tank that looks to influence the UK's environmental policies across the board in a positive direction. And I mainly work on our food, farming, land use and nature work. So I'm going to talk about a report that we published earlier this year, as Jez said, which looks at what is the potential scale that alternative proteins could reach between now and 2050 and what are the implications of that for how we use land, and what opportunities and risks does that create to farms on the land.

So as I'm sure everyone is very aware, we need land for loads of things, and we've already run out of it. In the UK, we use about as much land overseas as we do at home to grow the food that's eaten within our borders. And that's already using more than 70% of UK land to grow food. From an environmental perspective, we obviously need to expand carbon sequestering habitats like woodland and restore peatlands, and we've set commitments in this country to end nature's decline, which is already important to food security as well. And that does take space, but we don't want to offshore more of our production, because from a global perspective, that's not helpful to the terms of addressing climate change, either. So as well as the reasons why it's important to retain lots of food production in this country for security, for our rural communities because of the livelihoods that depend on it, etc, when we look at what land can be used for, there are hard trade offs that we face. We can't use the same land to deliver everything.

So land that is focused on producing food at high yields is generally delivering on that food production, but is not so good for nature, and certainly doesn't remove carbon from the atmosphere. On the other end of the spectrum, semi natural habitats, like woodlands, are great for taking carbon out of the atmosphere, supporting populations of wild species, but don't produce food.

And then in the middle, we've got agroecological, or wildlife-friendly farmland, which still produces food, maybe a bit less than when the whole landscape is dedicated to doing that. It's good for species that assist on farmed land, which is not everything, but also, although agroecological farming might have lower emissions, it generally can't be a net carbon sink, and we do need the land sector to be a carbon sink in order to get to net zero because of emissions that can't be abated elsewhere across the economy. So that's that.

We certainly do embrace the idea of multi functionality, but from that perspective there are some trade offs in terms of what land can do, and that's important when we're thinking about how to best use it. When we look at how land is currently used in the UK, the vast majority of farmland is just farmland used to produce livestock products. So you can see here that there's a lot of pasture, and then a lot of the arable as well is producing livestock feed. And the area that is growing food that's directly eaten by humans is a really low percentage.

And so this is all relevant when we're thinking about what alternative proteins mean for land use, which is what we did in this report. What I'm not showing here as well is the farmland that's used abroad for food that's eaten in the UK, of which livestock products also dominate. When we look at alternative proteins, they do need much less land than conventional livestock products. We looked at three different types of alternative proteins, those that are plant-based, those that are cultivated meat and fermentation-based products. And all of those are estimated to use much less land than livestock products.

So we took estimates of these relative land footprints in our assessment of what alternative proteins might mean for land use in the UK and in some other European countries as well. And we looked at if we do eat more alternative proteins, then that will free up some land, and what can that be used for? And we looked at three things. So the first was that land could be used to bring production onshore that's currently overseas and thereby increase our self-sufficiency and cut overseas land use. That land could be used to create carbon and nature-rich, semi natural habitats that maybe have some grazing livestock on them, but they're predominantly dedicated to delivering on those carbon and nature outcomes, and we looked at using that land to expand agroecology or wildlife-friendly farming.

We assumed that farmers are key to all of those. Farmers are the deliverers of all of those things, whether it's growing things that maybe in the past were grown overseas, lots of grain, for example, expanding their wildlife-friendly farming, which means you need a bitmore land in order to produce the same amount of food in that way and also creating those habitats.

So just to set up properly what we actually did: we looked at 10 countries, including the UK, and looked at the scope of alternative proteins to allow us to increase self sufficiency, to make space for wildlife-friendly farming and to make space for nature restoration. I'm not really going to talk about the full suite of countries, but just flashing up which are the ones that we looked at. In terms of how much meat and dairy we looked at being displaced by alternative proteins; no one knows, right? There's lots of uncertainty in terms of where the technology is going to go and also it really does depend on the policy and regulatory environment that is created as well. So governments have a role in determining which of these scenarios we might reach. To be illustrative, we did some really contrasting scenarios.

So the low intervention scenario looks at where alternative proteins displace about a sixth of meat and dairy by 2050 and that's predominantly through plant-based products and a bit of precision fermentation. And so that scenario is assuming that cultivated meat maybe doesn't reach a point where it's cost effective, or there isn't the regulatory environment that allows it to become a big part of the marketplace. We contrasted that with a high innovation scenario where all of those things I've just said don't happen, do happen.

And so in that scenario, we're looking at a much higher percentage change. It's worth saying that within that we came to that assessment by saying, what would the scale of change be if it was mostly processed products that were replaced by alternative proteins, which is likely where we're going to see change quicker. So where you're buying food that's got milk proteins or egg proteins in ready meals, for example, that might far more readily be switched on to an alternative protein than cuts of meat, which, even in this high innovation scenario, we're still imagining 90% of that comes from. Sorry, that thing's not quite right. I've just picked up the wrong figure. I think it's more like 80% of things like steak we're still imagining to come from livestock in that high innovation scenario. So really contrasting scenarios, and we looked at what that means for land use.

So the low intervention scenario could mean that an area the size of the UK across those10 countries, would no longer be needed for food production, and about an area the size of Ireland to be released from production overseas. The high innovation scenario is obviously a much larger scale of change, and that's reflected in this graph in terms of what that means in the UK. That's the area that we then looked at using to onshore production, to expand wildlife friendly farming and to expand nature and carbon sequestering habitat. So as I said before, we imagine farmers to be the ones doing all of those things, when we split this land equally between those three priorities, and then look at what that means at a country scale. This is what we found.

So in the UK, where currently 47% of the land that's used to grow food consumed in the UK is in the UK. So about half of that footprint is overseas. Today, the low intervention scenario, we found that in 2050 just some really small increases could be within the UK, and that's because of population changes, which is going to increase demand for food. So we'd stay about as self-sufficient as we currently are today. In terms of land use, the high innovation scenario would enable a much greater change and allow 64% of the food that is used to produce food consumed in the country is within our borders.

So you can see that high innovation scenario creating much more opportunity for change in terms of what it means for agroecological farmland. We found that there's space to approximately quadruple the area of agroecological farmland, and by 2050 while securing that increase in self sufficiency under the high innovation scenario. There's still space to increase it under the low intervention scenario. But again, it's a relatively smaller scale of change.

So there's a big, big opportunity there that's created through alternative proteins, releasing a bit of land to mean that we can farm over a slightly larger area in a more wildlife-friendly way. The third thing that we looked at, and this is across all 10 European countries, was in terms of making space for habitats, to stop nature being in decline. And we found that across those 10 countries, the land is there to meet the commitments that the EU set out in the nature restoration law, which is not actually specific to the UK, but we'd certainly meet our nature commitments in that high innovation scenario in the UK as well.

The thing that I haven't presented here, that we do also look at in the report, is in terms of net zero and carbon removal, we found that alternative proteins massively reduce the dependence that we'd have on engineered forms of greenhouse gas removal, which are likely to be very expensive. So that's beneficial from a perspective of how much is it going to cost the taxpayer to get to net zero and do look at the report if you want to look at that.

So I think the three things that I wanted to pull out in terms of where we want to go from here. I think it's important to work with farmers to understand the risks and opportunities to their businesses from alternative proteins and how policy could minimise the risks and maximise the opportunities. I think what this really shows is that there could be big changes in terms of what we need to use land for, and with the right policies that can allow farms to have more stable businesses because they expanded their income streams into environmental delivery, and that's giving them a better and more stable income.

The second thing is on trade policy. I think we want to understand how alternative proteins can help to reduce reliance on land overseas disproportionately. Let's keep the livestock production that we have at home and ensure that it's disproportionately imports that are impacted. And the third one is using policy to support farmers to expand their agroecological and nature restoration bits of their businesses.

The conversation around radically changing farming through alternative proteins so far hasn't included farmers

JF: Tom McMillan is the Elizabeth Creak chair in rural policy and strategy at the Rural Agricultural University in Cirencester, and a founding director of the Centre for Effective Innovation in Agriculture, and also Deputy Director of the National Innovation Centre for Rural Enterprise. He's also an expert advisor to the Food, Farming and Countryside Commission, and was Director of Innovation at the Soil Association.

TM: So I just want to share the highlights from a bit of work we've been doing over the past couple of years looking at the implications and one bit of this. So the implications of cultured meat for farmers in the UK, and from the starting point that Jez mentioned at the beginning, which is that every way anybody can think of plausibly to meet climate and nature goals relies on reducing emissions from livestock farming and alternative proteins seem to have a potential role to play within that. But we have deliberately kept ambivalent about the specific part that cultured meat would play within that. So we held open the possibility from the start, and still do, that it might be a big game changer, or it could be a damp squib. And so that's to set the scene for it.

What we focused on was that this proposition to radically change farming hasn't really involved farmers so far, and you can really see how that's happened, of course, but also how risky it is. So the potential for unintended consequences to be missed or to develop technologies that have an incredibly fragile social licence. So thanks to support from UKRI Transforming Food Systems Programme, we got together a team of scientists and social researchers with all sorts of different backgrounds, and a partnership that included culture, meat, businesses, farming networks as well, and also a plethora of different NGOs. We scraped and analysed what farmers were saying about this on social media.

We had focus groups of about 80 farmers right across the UK, lots of different farming systems, in different parts of the country. We then worked in detail with nine really different farms about how they would adapt their businesses to a world with cultured meat, and how they'd fare in those scenarios compared with business as usual. And then we also went in much more depth and modelled some innovation pathways for cultured meat that really deliberately sort out some potential synergies with farming.

So I'll come to all that in a minute, but very briefly: what is cultured meat? Basically growing animal cells without growing animals, so feeding them some nutrients and growth factors in some kind of bioreactor, harvesting massive cells that comes out the other end and turning that into something with a bit of processing that looks a little bit like some form of meat that we're used to. And lots of variations on that theme, but that's the gist of it, and it's a field that's moving really fast. So the idea has been around for a really long time, but it's really in the past decade or so that it's taken off, and it's now at a point where you can buy tiny amounts of it in nuggets, for example, in Singapore.

Various other countries are now issuing marketing authorisations, and just recently the UK has been the first of those for a cultured pet food product. In practice, a lot of those market firsts are about impressing investors more than shifting product at the moment, but it's still very expensive to make and to buy. Lots of uncertainties about how you'd scale up production, and also the question remains of who's going to buy it, and especially for a while, if it is more expensive, not only than meat, but also than many of the other alternative protein options.

Why look into farming, if the whole point of cellular agriculture in general, and culture meat like this, is to displace traditional farming? Why does farming matter? Well, partly because it's on the sharp end and farmers matter. And there's a kind of just transition reason to be looking at this, but also there are quite instrumental reasons, including for the companies involved in a sector.

So farmers will have insights into the real world impact of this that can help calibrate expectations. They can surface unintended consequences that might otherwise get missed there. And then there's this sort of broader issue around social licence for it, and people care about farmers rightly, and so it matters how, how they're affected by it. And that's playing out increasingly in terms of concerns within industry about the regulatory investment risk that might be particularly hinging on the expectations for farmers. So certainly impacts for farmers.

Farmers are concerned about corporate control of alternative proteins, but also see some business opportunities when considering their own specific farms

Since we started the project, cultured meat companies and investors have got a lot more interested in farming, and that's no surprise, perhaps given that we're in a small number of places where the technology is being banned. So in Italy and Florida, for example, that's being done in the name of traditional farming. So what we find overall through this work is both the potential for the issue to blow up, to get more polarised and politicised, but also how plausible it is to do things differently from that, to have more inclusive and progressive conversations about the technology that keep more different versions of it in play.

To get into some of the specifics onto, first of all, what farmers say about it and think about it right now, when you go and look at what's getting posted online. So we looked at the farming forum at X as well. There's a lot else on everybody's minds, particularly farmers' minds. Where there is much chat, it tends to be prompted by things in the media, ding dongs with George Monbiot, various other prompts. These are the kinds of views we find online. So scepticism and deep concern both about the products but also about the drivers. What's behind all this? What? When? What do farmers say when they have the chance to think about it a little bit more so when you get into conversation about it?

So in the focus groups, I mentioned much of the same. So a lot of that concern still, but also with the time to think it through and deliberate, more of a sense that it could complement farming as well as competing with it. So some could imagine selling sales like the top left here, some selling ingredients to it, or maybe it being at the other end of the market from their own. Or seeing it maybe as a threat for one part of their business, but an opportunity for another, so more ambivalence than there was online.

And then that trend, in a way, continues when you zoom in a step further, and we explored these issues in depth with nine farming families on their own farms, thinking really specifically about their businesses. So not about this in general, but what it would mean for them? And what we found when we zoomed in like that, was that it turns into a really pragmatic conversation. So the big questions are still there about where is this heading, who's in control, but this technology gets forwarded into discussions that are also about succession, that are about farm payments, about what to do with particular buildings they might have, how many people the farm supports as a business, but also how many people it feeds, and so forth.

So here's one example from a fresh produce grower, and you can see that business as usual 10 years' hence, compared with a scenario where cultured meat is a big thing. And the overall pattern was - you can see all these in the report we put out that Jez has put a link to in the chat - but the overall pattern was business as usual. It felt relatively rosy for some, but by no means for all of them. But how it felt said maybe more about their individual business circumstances than it did about the overall performance of the sector they were in.

The livestock companies, particularly the beef, sheep and pig farms, less the poultry, saw cultured meat maybe threatening jobs and production. But for others, it wasn't seen as the major threat, including, like, I say, for the poultry producers. And then for some, like this fresh produce grower actually, the future even looked marginally preferable in a scenario with cultured meat. So a real, mixed, mixed picture, but a pragmatic set of conversations. And the overall picture then from those different sources of insight into how farmers might engage with this was lots of concern among farmers, but they were mainly similar to the kinds of issues that have come up in conversations with other groups, so with members of the public and so on.

So this point that Lydia raised, we don't know what is yet. It's an uncertain proposition,what end of the market it comes in at, what it costs, all this sort of stuff that has massive implications for how it plays out and what it means for different farming businesses. So that all feels up in the air. A lot of scepticism about the sources of information about it, the independence and credibility of those sources of information, concern about whether the assumptions that were being made were realistic, including about practical things like supply chains and so on. So were unrealistic assumptions about a future possible production system being compared perhaps unduly favourably with real world data on the actual performance of livestock production?

Now, there is lots of discussion and lots in the report about unintended consequences, ranging from the big stuff to rural communities and health and ultra processed food and so onto really particular things like carcass balance. So to this point about selling lots of steaks, but not so much mince – well, when you're farming a whole animal, you don't necessarily have that choice. You've got to keep the carcass in balance and you can't just farm steaks. And then questions over who benefits, and is this really a disruptor, or is it actually more of the same? Is it a doubling down of food industry industrialisation and corporate control and so on? And you might expect a concern that this is less natural than what farmers are growing already.

Opportunities for farmers range from producing raw ingredients to a stronger competitive edge for 'natural' meat

So those are the concerns, but they are also interested in some of the opportunities, potentially for their own farms, and for some of them, seeing parallels where they already found opportunities from plant-based alternative proteins in their businesses, or seen other people they knew benefiting from that. So the main opportunities that came up were a big focus on waste valorisation, and we looked into that through some additional life cycle assessment and modelling work that we did. We look not only into into plant-based byproducts, but also into some animal byproducts, which is quite a novel thing to delve into on that front, and we can talk more about that in the conversation afterwards, if you like.

So it's interesting that there's also interest in just growing or producing ingredients, either raw materials for the cell growth media or cells themselves, or whatever it might be, but commercial opportunities for ingredient supply. They're interested in innovative supply chain relationships and starting afresh. So in a way, saying to this industry, look, you say you're a disruptor, behave disruptively, do something different, in terms of the contracts you have with us, those types of things you know. Put your money where your mouth is if you're wanting to do something afresh here.

There was an interest in on-farm production from a few of the folk involved, particularly when they had lots of energy available, renewable energy, and lots of buildings. And, you know, not naive about it. So where are the challenges? We did some analysis of that and found about 30% productivity penalty from producing a small scale compared to producing a big, centralised factory somewhere that, in a way, makes it seem possibly a surmountable area, something where it's maybe realistic to pursue on farm production at that kind of smaller scale.

And then for a lot of them, they weren't interested in getting involved in it, but they thought maybe it could sharpen their competitive edge. So if they're doing pasture-fed livestock or conservation grazing, or whatever some of those agroecological systems may be, actually, the more industrialised and less natural the alternatives look, maybe the better value they can get for their own products. So those are some of the opportunities people saw.

The concerns about the impact on farmers could blow up into a culture war unless we actively avoid polarisation

Just to end: our take on it was that the concerns about the impact on farming could get blown up into something of a culture war, like Lydia said. And not only would that hinder cultured meat companies, of course, and probably dampen the appetite for alternative proteins more widely, but also that kind of all or nothing approach, that kind of polarisation probably wouldn't serve farmers very well, either. There are bigger challenges and drivers facing their businesses and being in the conversation and shaping this technology is probably worth more than closing it down.

So we've suggested a few steps that could help sort of de-escalate it. So first was for the cultured meat industry and its advocates to start talking differently. So to stop over-promising and stop oversimplifying farming. The report includes some pointers on that that are really being taken up a little bit. It's great also to explore some of those potential synergies in practice through innovation projects with farmers, particularly on the waste valorisation. So we're helping a few folk being founded through this project pursue those areas of mutual interest. A few more farmers were interested, and we managed to link up with relevant researchers and companies in this space. So we're thinking of producing a little platform that helps do some of that matchmaking. And then finally, we've been helping some of the initiatives that are already in train to develop

ESG; so environmental, sustainable, social and government governance criteria, for investors to help make sure that the companies in the sector are including farmers effectively in that work.

Polarisation on meat and other proteins is unhelpful and unrepresentative – and so is the term 'alternative proteins' as farmers grow many proteins

JF: Thanks Tom, a whistle stop tour, but really interesting. I'm going to pass over to Stuart in a second, who's going to give his thoughts, and as a bit of an introduction: Stuart Roberts is a beef and arable farmer in Hertfordshire. He's formerly the NFU vice and deputy president, and before that, he had a long career at senior level in the meat processing sector. So he really knows a lot about this whole sector. He's also worked for Defra and the Food Standards Agency, and he recently stood as Lib Dem candidate, and has been at the forefront of rewriting the Lib Dem agricultural policy. I think everyone would be interested to know what are your thoughts as a beef and arable farmer yourself, but also knowing what you do, having spent a long time in the meat processing sector, but also speaking to lots of farmers around the country with your NFU hats on.

SR: I am very much going to approach this in a spirit of pragmatism, as a number of people who've heard me say before, my big hatred in the world at the moment is division and polarisation and seeing the world as this binary place where either you've got to be a massive carnivore, or you've got to be a ruthless vegan. You can't actually be anywhere in between those two places. The reality is, most of us do inhabit that place. And I suppose for me, first of all, I don't like the word alternative protein. I have grown non-meat proteins on my farm for the entire existence that I've been on my farm. They're called peas and beans, and they are perfectly acceptable protein sources for a human diet or for any other diet.

So I think the first thing to say is farmers grow lots of different proteins. Now I know that is slightly different when we get into some of Tom's cultured bit. And I think to some extent, just by calling them alternative proteins, we've added to that polarisation. I can do a fantastic sales pitch on UK livestock farming. I can talk about the fact it has a global carbon footprint 50% lower than the global average and all the rest of it. And that's not what I'm going to do, because people will have heard that time and again. What I do see, and I think Lydia really articulated this well, is we are faced with a world where we have a very finite resource, which is land. Unfortunately, they've stopped making it.

And the reality is that land is required for multiple uses, but I don't think there's anything new in that we've always used land for food, okay, but I was having a look at some records. I was involved the other day in a debate about whether we should be using land for energy or for food, right? And lots of people on this call will have been involved in this discussion around how we need to stop putting PV on land. We need to use land for food. We shouldn't be using it for energy. And the reality is, there's nothing new in this debate. One hundred years ago, a third of my farmland was being used for energy. Now the reality is, it wasn't PV, it wasn't wind farms, it was called oats, because if I didn't grow oats on a third of my farm, I couldn't have fed the horse that enabled me to then produce food on the other two thirds. So this land debate is not new, but I think it's coming into sharper focus, because again, as Lydia said, land is one of the only things that can solve some of the big problems for society.

When it comes to carbon sequestration, I get really excited in terms of my farm, because actually, I am in an industry that not only creates emissions, and I would say emissions for a part of human activity, in terms of preserving life, there will always be emissions from a food system, okay, and we need to accept that. But also, I have an ability to deal with those emissions. But also, as Lydia said, deal with those emissions for other sectors of the economy who have no ability to do it themselves. So I actually get very excited about the future. And you asked me to look at opportunities and benefits, the first one I want to pull out, and I had written very large on a piece of paper in front of me: supply chains. And it was really interesting that Tom pulled this. I was half hoping Tom wasn't going to mention supply chains, and then I could be really clever and say everyone's missed the word supply chains.

One of the big problems we've got in the food side of farming, if you like, is the fact that we have massively damaged and massively imbalanced supply chains. And I think actually, if we were to reinvent supply chains, whether that be for carbon, whether that be for nature, or whether that be for and I'll use the word alternative proteins, because that's what we're talking about on this call. But I've already made my point about that. Then actually we do have an opportunity to create supply chains in a very different way, supply chains where farmers can very much be at the heart of them.

If I look at many cereal supply chains, many fresh fruit and veg supply chains, and many livestock supply chains, there is a massive imbalance where I, the farmer, carry all the risks and most of the rewards are sat at the other ends of the supply chain. And I'm possibly just about given enough to scratch a living, so long as we then put some public support behind that, because otherwise I don't survive. So I think one of the first opportunities is, I do see a world where if we get that supply chain reinvented, we can address all the imbalances we've had in the past.

Alternative proteins could offer better supply chains, or they could deepen existing power imbalances

I also see that as a threat, because what I certainly see in some areas around some of the alternatives, and I think Tom was really interesting on this, is I think you could end up with an even bigger power imbalance when it comes to some of the technologies, some of the intellectual property around these things, that actually will put farmers in an even weaker position than they are with with traditional supply chains. So I think that's both an opportunity and a barrier.

 The other bit, and this wasn't touched on, particularly is we're talking about it in terms of farming, and that's absolutely right, and that's what this webinar is about. We're here to talk about the impacts, the relationships, the opportunities when it comes to farming. But actually, we do need to think about what is it the consumer wants? Because we quite often think of food as a maths equation. So we look at it in terms of calories, we look at it in terms of emissions, we certainly need to look more in terms of its impacts on water and on those other finite resources.

But actually, food is much more than that. Food is a cultural thing. Food can be a massive source for social good in communities, and I think that's something where those that are at the forefront of some of these technologies will need to have a think about that, because we don't just buy foods to satisfy our daily calorie intake. Our food choices relate to lots of different things about us. But I also think a number of companies are starting to think that they need to act in a different way and engage with farmers positively. I also think farmers need to engage positively on this.

And I think, you know, historically, and I've been at the forefront of this argument for, I don't know, a dozen years or more, when actually you're either a livestock farmer who doesn't see an alternative, or you're a ruthless NGO at the other end who sees no alternative other than getting rid of livestock off the planet. The reality is, there will always be a role for livestock. And I think Lydia is absolutely right on her trade point. Because I think there is a danger here where what we actually end up doing is we reduce livestock production here. We don't do anything in terms of consumption. We offshore to places elsewhere in the world, where actually the total emissions are greater than we produced here in the first place, and we take a massive economic hit.

We need to redefine what a farmer is to better reflect society's current values around food, environment and energy

I do think farmers need to engage in this, but we've also got to take society and consumers with us. And probably the last bit for me is you won't do this, I don't think through regulation and policy, the key will be about the economics. So, why was a third of my farm used to grow energy 100 years ago? It's because I couldn't make an economic output off the other two thirds without doing that and also it is about starting to think that there are win wins for everyone here. This isn't about a threat to farming.

The big thing we need to do is we need to actually redefine what a farmer is. So historically, and I've done it, the definition of a farmer is somebody who feeds an urbanised population that can't feed themselves. Well, actually, if you take all of the uses we have for land now, all of the needs we have for land, then actually we need to be much better at talking about us as land managers and delivering against all of those things, not just feeding ourselves. So look, there's a few thoughts, and as I say, I have been producing alternative proteins. And

I'm not sure whether I can say real proteins, but the reality is, I have been producing plant-based proteins and animal-based proteins on my farm for a very, very long time. And I, like many farmers, see myself as continuing to do that. It may be in a different balance. They may be different ingredients, they may use different things, but I certainly see it as a very mixed economy going forward.

Questions from the audience

JF: Can you say more about the innovative partnerships people are interested in for cultivated meat companies? What would farmers or others view as positively innovative or disruptive in this case?

TM: That bit of the conversation got as far as the worry that the drivers were pointing in the wrong direction on that front so you might have companies coming along saying they want to do things differently, and then what they're describing might feel, for example, like the vertically integrated arrangement you got with poultry, where effectively they're like we'll do this on farm, use your buildings and things. And it's great, but you've got very little autonomy. And even if the initial deal is on favourable terms, then actually that company gets bought, or the leadership changes. There's very little security in that arrangement persisting differently. So in terms of what the financial reward is, but also autonomy.

So it really is a bit like the wider conversations about a lot of these emerging technologies that you might have with citizen groups. A lot of it comes back to these questions of power and control and ownership. And you can't look to regulation to sort this out. There are those things which you again have worked on for yonks, in terms of how the market operates and what gives shape to our supply chains. And the rules of the game that really matter for these emerging sectors as well, particularly as in Lydia's contrasting innovation scenarios.

One of the big factors in those contrasting innovation scenarios is the regulatory environment and the public investment that goes into them. So they only work if they've got massive public backing in terms of fulfilling any of those expectations. And so we should be in quite a strong position, collectively, to set what the quid pro quo is to say, well, if investing, if we're giving a good regulatory environment for the technology, we also need to make sure that it's going to deliver, not only on potential resource efficiency, but on the much wider agenda that is important.

SR: For me, you look at what's the problem with current supply chains, where we have failures, and the reality is they're not fair, they're short term and there's a massive dose of secrecy and a lack of transparency. So the reality is, if you could create a new arrangement which was much more equitable between all the parties that was a much more long term relationship and that had a good degree of transparency in it, then I think actually you're probably two thirds of the way there to figuring out a new way of doing business.

JF: What does the high intervention scenario for alternative proteins involve? And in terms of regulation that would enable it to really get going as a market, what does that look like?

LC: Essentially, in that high innovation scenario, we assumed that cultivated meat and precision fermentation, particularly in relation to dairy and plant based products, become cost competitive with what they're trying to replace. And there are a load of regulatory and policy decisions that can contribute to how quickly price parity is reached. We're not there at the moment, cultivating meat is much more expensive than meat.

Precision fermentation is not really there yet either, but may come to be cheaper than dairy relatively quickly, but there are decisions that governments can make in terms of how much investment goes into their development, and at the moment, one of the challenges is that startups who are working on these products have access to high lab grade facilities where it's quite expensive to be producing their product, and there's not sort of the intermediate step of a facility where they could test them out at an intermediate scale to see how that works before going down the big step of really producing at high scale.

So that could be something that government could look to support. Essentially, that's the assumption that underlies it is that food manufacturers who are deciding what to put into a ready meal choose a different mince that's an alternative protein, rather than from a cow, because it's cost competitive.

JF: What might be the unintended consequences, particularly for low income groups who are eating a lot of Ultra Processed Food? Is there a danger that cultured meat ends up becoming something for low income groups, and we end up with even more of a two tiered meat system?

TM: We didn't particularly model that but it came up quite a bit in the conversations with farmers and wider discussions about cultured meat. So by social license, we meant public consent, so it's strong or weak, and then that affects the operating environment for regulators and so on as well, and for the companies directly. Whether it's progressive or not or and how it affects groups like farmers, those all play in to whether people feel something is okay or not okay in general. And I think it's really interesting, quite a lot of the conversations go in exactly that kind of arc.

They just said maybe this could complement reproduction, and you've got this contraction and convergence. And then this thing takes some space, a bit like in Midas models, and then you pretty much end up going, so then who's eating the cheap stuff, and who's eating the experiment? Until do you end up with a two tier food system? And as you say, then the next step is, we've got a steep gradient in food accessibility and health and eating habits and dietary outcomes at the moment already. So it's not a new thing, but the question is whether it's furthering exacerbation, and a further push in that direction. I think that is a real, real risk.

It's quite a hard one to mitigate for, but then also the value proposition and the market proposition for any of these things is also completely up in the air. So it might be that for a few years, this stuff's really expensive. One of the participants called it the golden nugget. So it looks like a chicken nugget but priced like gold. So it's a different thing from what we're used to. I think it's really hard to know how it would actually play out in practice on food security, affordability and food justice.

JF: What are the opportunities for livestock farmers to diversify into cultured meat?

TM: There's quite a lot more in the report, but we looked at things like cell line supply. The big questions are whether that would be worth much for anybody. So growth media, so the stuff that the cells get grown in is made of other things at the minute that's bought at huge expense from pharmaceutical suppliers. But it's made potentially from things you can source agriculturally. And then there are questions of whether that offers some relatively high value market opportunities for things that are rich in amino acids. So those include traditional protein crops, but also, but also byproducts and maybe also non traditional protein crops like lupins and so on as well, which have their own challenges, I gather.

And then on farm production as well. And so we did some modelling, just desk based stuff around all those and looked at the scale of some opportunities. But the one I'd like to flag, because it's quite unusual to look into it, is looking at hoof and horn meal and blood as byproducts into cell growth media. And the reason they're interesting is not only because there's been a lot of attention to them, but also because it potentially changes the relationship between livestock farmers and this emerging industry from one where it's possibly a source of added value in the supply chains. Although, whether they benefit from it or not is another question. It speaks exactly to that point that Lydia and Stuart both raised, which is, the future you are imagining this technology existing in is almost fictional where there is no livestock farming at all.

And so we're imagining everything needs to come from plant-based sources and so on. And this cultured meat is eaten by vegans or vegetarians. And the answer is, that's probably not in any way plausible for anytime soon. So maybe it's helpful to think about cultured meat being something that's more likely to be eaten by flexitarians, so having some animal input into it. It's maybe not the end of the world. And then there are synergies from traditional livestock production and supply chains and this emerging one that might have environmental advantages through waste valorisation and so forth. Looking at those technical questions also starts to build some of those bridges that, again, Stuart was talking about in terms of de-escalating the conversation, exploring the sort of messy middle ground of it, rather than assuming that people fall into opposing helps interest groups around this.

JF: How open do you think most farmers are to that idea of rethinking what a 'farmer' is?

SR: The reality is farmers have always been land managers. Land keepers. Call them whatever you like. So the starting point is, what is your limiting resource? Now, in most cases, and certainly in terms of this discussion, the land is the limiting resource. Okay? So we have always been land managers. Good farmers have always done their bit for nature. They've always done their bit keeping water clean. They've always done their bit for producing food, etc. I think actually it is just the tone within which the conversation takes place. So if I put my farmer hat on, all I see at the moment is people having a go at me, people telling me I am polluting the countryside, people telling me I have poor animal welfare standards, people telling me my emissions from my cattle are what is causing climate change, people telling me that, for some reason, I am also the villain, because we all eat highly processed food these days, and that's down to the food system of farmers.

What we need to do is to turn that conversation into a positive. So actually, we need to be way better as society in terms of seeing farmers as delivering those multiple benefits. There is massive room for improvement. If I look at simply the performance of cattle across the country, I could massively influence the greenhouse gas emissions from cattle if everyone was able to perform at the same growth rates as the very best. But what we don't do is we don't thank farmers enough. We don't praise farms enough. We don't recognise them as having the ability to deliver all of those things. We talk about them predominantly negatively as causing the problems, whereas actually what we've had out of today's discussion, I hope, is there is a role here for farmers to play, and I think that is down to academics. It's down to society, it's down to the media, it's down to farmers themselves, because actually, it's quite comfortable sometimes to just feel everyone's against you, and you just shrink into your own shell.

But it is society, and I think if you ask them specific questions about farmers, particularly if they've seen a recent episode of Clarkson's Farm or something similar, they have very high opinions of farming, but you then start to talk to them about the problems society faces, and it quite often comes back to farmers. And ultimately, farmers have also got to recognise we are here not just to deliver calories. We are here to deliver on society's needs. And today's society has a plethora of needs, most of which we can deliver, but we also need to be rewarded for that.

So I think it is just changing the narrative to one that recognises farmers, rewards farmers, praises farmers, or simply just acknowledges farmers have the keys to so many of the problems. Now, if farming doesn't change to see itself as addressing all of those things, then actually, ultimately we will. We have a license to farm the land. Okay, people allow us, society allows us to farm the land, and if we could be better at talking about how we're doing that in a way that reflects today's society's values, which isn't just about food, it isn't just about energy, isn't just about water, it isn't just about improving nature, it's about all of those things, then actually we will retain our license to farm the land, and that's absolutely right.

If we don't get better at being able to tell that narrative ourselves, ultimately, we may well lose our license to farm the land, and so therefore we've got to be better at talking positively about ourselves, but the world has got to be better at recognising farmers are able to deliver multiple benefits, not just produce food and see the world through the lens of food.

About the AFN Network+

The AFN Network+ (UKRI Agri-food for Net Zero Network+) is a unique network of 2,000+ academics, researchers, third sector organisations, policy makers, and agri-food industry professionals
from farmers to retailers.

Together, we are working to identify key research gaps that may be holding the UK food system back from transitioning towards a net zero UK by 2050, while also enhancing biodiversity and healthy ecosystems, nurturing livelihoods, supporting healthy consumer habits, and minimising the environmental impacts of overseas trade. Our findings will inform the next decade of research
investments in this area by UKRI (our funder and the UK research councils umbrella organisation).

Alongside our core research, we run in-person and online events, produce topical resources, and give out hundreds of thousands of pounds of funding a year.

The AFN Network+ is coordinated by the University of East Anglia, University of the West of England, University of York, and University of Leeds, and is a £5m, 3-year project funded by four research councils; the Biotechnology and Biological Sciences Research Council, Economic and Social Research Council, Engineering and Physical Sciences Research Council, and the Natural Environment Research Council.

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