

LIVING WITH THE TROUBLE: MAPPING SUSTAINABLE FOOD FUTURES - PROF. DAMIAN MAYE'S INAUGURAL LECTURE

Thank you, Steven, for the very kind introduction. Welcome everyone to tonight's lecture and thank you all very much for coming. Uhm, I was asked a few months ago to provide a title for tonight's lecture and I adopted two strategies. The first one was to come up with a title that was quite vague so I could work out what I was actually going to say, nearer the time. But the second strategy, which is the profound one, was that I reflected on my research career to date and also the research that I want to do on Agrifood sustainability in the future. And one of the things that struck me in terms of a common theme, if you like, was that a lot of my work has been around some aspect of food and farming crisis. So, for example, my PhD research with Brian Ilbery was about short food supply chains in the context of the foot and mouth outbreak. The work that I've done recently with Garth Entecote and colleagues is around how farmers live with the ongoing trouble of bovine tuberculosis. The work that I've done with James Kerwin and colleagues is situated in a context of global food and nutrition security, and how both global and local networks can help to solve those problems. And more recently, the work that I've been doing, which has looked at, basically, dairy farmers getting pretty rubbish milk prices, is situated in a context of increasing global market volatility. But having reflected on that, I also was reflecting on the current period, and it struck me that arguably were in one of the most troublesome periods for food and farming, particularly if you're a livestock farmer, hence the image of the cow.

So, in your mind you might be thinking what troubles is he talking about? The first two troubles that I had in mind were, of course, Brexit, which provides a geopolitical trouble, not to mention the mess that is contemporary politics. But to me Brexit is a distraction. The most significant trouble is, of course, climate change. And more recently, we have seen a public debate and a series of protests, which are trying to basically force politics to do something. To act. To get beyond the horror show that is our contemporary politics. But when we talk about food and farming troubles, it's actually both more diverse and more complex than just Brexit and climate change.

So again, some examples. And Steven has mentioned the book *Geographies of Food*, which

it feels like I've been writing it for about 20 years, but in fact we've been writing it for about four or five years, and in that period a great deal has happened. We've nearly finished this book. It will be done at the end of this month, but we sent it out, it was reviewed and one of the reviewers suggested that it was quite gloomy in places. And we said, well, yeah, yes it is gloomy, but that reflects the nature of Agrifood sustainability and the troubles that are facing global food supply chains. So, for example, we know that at the moment eight hundred and fifteen million people are currently undernourished in a system that's producing more food than we've ever produced before. We have growing food poverty. We have a rise in food banks in some of the most prosperous countries in the world. As Steven mentioned, we throw away thirty percent of the food that we produce globally. And on top of that, a lot of the food that we produce is of a very poor nutritional quality. Hence related problems with obesity. And it gets worse, because of course we then on top of that, we have increased recognition that the way that we produce, make, sell, eat and waste food is damaging the earth's natural processes, both in terms of climate change but more broadly as well.

And then to add another layer of gloom, what we also know is that food and food systems are embedded with other systems, for example, a financial system, our economic system, our health system. So what I want to suggest, as a kind of entry point, it's that we're talking about a nexus of troubles, combination of factors, both in relation to environment, to health and finance. So, finally, slowly but surely, we have a recognition that food is now in what's called the Anthropocene. And I want to suggest that the word trouble is helpful. The word trouble is interesting because it comes from a thirteenth century French verb, which means to stir up, to make cloudy, or to disturb. And I think you might agree, you might disagree, but things like the IPCC report, the latest biodiversity and ecosystems report and The Lancet report are all in their own ways, disruptive, in important ways, I would argue. Finally, this realization that climate threatens our existential status on this planet. And so, slowly but surely, we're connecting Agri food scholarship to what's termed the Anthropocene, this first geological epoch that is shaped by human activity and not

natural system processes.

So, the challenge I've set myself is, how then do we live with the trouble? And I take my, uh, inspiration, if you like, from the tremendous Donna Haraway's wonderful book, where she argues that actually, when you look at the politics of the Anthropocene, it's very often pessimistic. And she argues that when we talk about futurism or the future, we shouldn't really be overly despairing, but at the same time we shouldn't be overly hopeful. What we really need to do is to foster paths, transformative paths in the present. So, with that in mind, what I want to do, if Isaac will allow me, is to use my research that I've been doing for the past ten years or so in the Institute to develop four pathways, or principles or themes to hopefully allow us to live with the trouble and to also inform a future Agrifood research agenda.

So it's a lecture then, that is primarily about ideas and principles rather than lots and lots of data. And I've identified four themes, and if you're eagle eyed, you'll have noticed that they all begin with the letter E. So the first one is Agrifood epistemology. The second one is Agrifood ethics, the third one is Agrifood economies, and the fourth one is what I'm calling Agrifood experimentation.

So let's begin with the first and probably the most horrible word of all, epistemology. So when you do your masters or PhD, you come across this word and it tends to scare some students. They get very, very confused by it. But if you're a researcher, it's absolutely essential because what it's about, is it's about the theory of knowledge. It's about how we know what we know about the world, both now and in the future. And the critical thing that I want to argue is that very often particular knowledge systems tend to dominate our discussion about the future.

So, to demonstrate that, rather than giving you a really boring lecture on what epistemology is all about, I thought I would look at the meat debate and look at the ways that the meat debate is being framed, in terms of food futures. And what I want to suggest is that there are basically three key framing's. And the first framing is what I've called a plant based food future. So I'm drawing very heavily here on a really important report that was published very recently by the Eat Lancet Commission, and a series of related publications, particularly the one that was published in Nature last year, I think, about environmental limits. Now, I've had the joy of reading this report in a lot of detail. But for the purposes of tonight's lecture, I'll just give you the highlights. The first important thing about this report is that it adopts two interesting frameworks around this idea of nexus. So it's combining, essentially, a nutritional perspective, using the idea of sustainable diet, with this idea of planetary boundaries which comes from Earth system sciences. So what is this report and the related publications arguing? Well, in terms of a healthy diet, it's arguing that we need to radically change our diet in terms of global Agrifood. It's arguing that we need to basically shift from a meat orientated diet to a plant

orientated diet. It's proposing what is sometimes referred to as a flexitarian diet, a semi-vegetarian diet if you like. The critical thing to note is that it's calling for a reduction in meat consumption, particularly red meat consumption. But it's a global reference diet, so it's not saying that we apply this everywhere the same. It's contextually different but you use it as a global reference diet.

The second element which is critical, is in terms of the production side. And this is where the concept of planetary boundaries comes in. So there are nine planetary boundaries, which were developed by a group of Earth system scientists recently, and in The Lancet document they look at six that are linked to the food system. And what they're arguing is that we need to identify, for each of these boundaries, a set of global targets, targets that we must not go beyond. So it is, in effect, a set of planetary boundaries for food production. And how to get there? They argue that we need to do various things. We need to shift our diet, we need to reduce food losses and waste, and we need to improve our food production processes. And the methodology that they propose is what's called sustainable intensification. So this is about producing food, potentially producing more food, but in ways that are sensitive in terms of the resource that's used. So some of it's techno-innovation, but actually some of it's also Agroecology. And the keyword is this idea of what's called land sparing. So you don't, you try and reduce the amount of land that you use. Thanks for that, Isaac. He knows more about this than I do.

Right, so. The second framing is what I'm calling an Agroecological food future. And it very much sits in opposition to the plant one that I've just outlined. So what we see in the Agroecological food future are particularly grass fed orientated livestock farmers and groups like the Sustainable Food Trust, and the Pasture Fed Livestock Association, who are contesting the science and the recommendations of Eat Lancet. For example, they say that we should not reduce beef and lamb, but we should be targeting poultry because poultry is in competition with humans for grain. They point out that if you look at the geography of the UK, a high percentage of our farmland is only suitable for growing grass. In other words, we should be promoting grass and grazing, and reintroducing it in all arable crop rotations.

So, bearing that all in mind, I thought it might be nice to have a map, and my colleague Rob Berry was very kind to produce a range of maps on this topic for me. And I thought I'd show you just the land cover one. And Rob has very diligently there, mapped all the different land cover types. But for the purposes of this lecture, focus on the green relative to the brown. So the green stuff is the grass. The brown stuff, it's a little bit of horticulture, but horticulture is tiny, so it's mainly arable. And what we see is an almost classic geography of a West versus East in terms of food production. An arable East and a pastoral West. So immediately you start to say to yourselves, what are the implications of a transition whereby they don't have livestock in rural landscapes. What replaces that? Is it conservation? Aforestation? Is it horticulture? It depends on the quality of the soil,

of course. Is it urbanization? So, it raises a whole range of interesting and potentially very challenging questions if you're from the farming sector.

And to take it a stage further, this is a study that's been produced by colleagues in Iddri in Paris, and what they do is they construct what they call an Agroecological Europe for 2050. And in this key diagram in their report, which is again very long, but the key things in this report are as follows. First of all, they agree with Eat Lancet about certain things. The fact that we have a series of challenges facing European agriculture around natural resources and Biodiversity. They agree that we need to change our diets in terms of having a diet that's less rich in animal products. However, what they propose is an Agroecological transition, which involves a phasing out of pesticides in organic fertilizers and the deployment of extensive grasslands and landscape infrastructure. In other words, they are promoting ruminant livestock and questioning the use of, and arguing for, a reduction in pigs and poultry. So we see an immediate clash then, and an immediate difference in these two scenarios of the future. But then to make it even more interesting, I hope you find it interesting anyway, if you don't, I guess you wouldn't be here.

So the third one is about the lab based food future because on top of all of this, we also have the emergence of a debate about the future of protein. And so what we find are the emergence of new products, of plant based proteins, of edible insects and of what's called cellular agriculture. This is cell science, growing animals in the laboratory or in vitro outside animal bodies. There's very, there's some examples. Actually what's quite interesting, a lot of these products are not on the market yet. But what they do is they promise a future that's better. But there is one called the impossible burger. I don't know if Gareth is here, but I think he's eaten one. Fair play to him. So, we can talk to Gareth later on about that. There's other burgers as well. There's one called the Beyond Burger that just went on the Stock Exchange very recently. So the key insight from this paper which has come out in Environment and Planning A is the way in which these technologies use what are called promissory narratives. In other words, they create a promise, a utopian future based on the technologies. Many of them are still locked away in Silicon Valley. And what they show in their paper, is the way in which we get a clash of narratives between, on the one hand, the alternative protein guys who are promoting things like healthier bodies and feeding the world, against a counter narrative from the livestock industry. Both big farming and small farming on the livestock side. What they argue in the paper, which is really interesting, is that actually some of this stuff has a history. So there's a set of flash points that always pop up when we have these debates about the future. So a classic debate between real versus fake, between clean versus dirty, between tradition and progress.

So, to avoid running out of time, what does that story of meat tell us about food futures? Well, the

first thing I would suggest is that we can see how particular food futures are imagined. And I would argue that if you look across the narrative, it reflects a broader set of battles that we find now between Agrifood production futures. A battle between a technocentric approach, which is advocating through technology, precision agriculture, aligned also with debates around things like the smart city, against an eco-centric approach which is about ecological sustainability, agroforestry and multifunctionality of farming. So, they have associated and new geographies of food and indeed different knowledge claims associated with them. And to continue that critique, what I want to suggest now that we live in this horrid world of what's called post truth politics, is that a productive way to be thinking about the future of food? And my thoughts are basically that the meat debate is highly polarized. But the other thing that's slightly irritating about it is that it's dominated by science. You don't have enough social science to inform some of this stuff. So, if we look, for example, at the sustainable diet concept. We know that that's a hugely contested concept, both in a cultural and a social, and indeed a contextual frame. We can even go back into the writings of sociology to get some insights around the way that things like meat create distinction in class. Science also, as Melanie Dupuis argued recently, suggests that we know the solutions, that they've got the answers to these problems. But actually we don't know about the future, and it's much more uncertain than it appears. So there is indeed a consensus about the need to act. But I would argue, in line with a really nice line in Tara Garnett's discussion paper on sustainable diet, these issues are arguably more about values than they are about science. And so what we need to be doing is trying to create shared values, understanding social practices and doing this communication of science in ways that are less normative, less top down. So that's that first rant over.

Into the second one, which is about ethics. So, in my ethical theme, I want to build on that critique of epistemology in the context of a broader idea of ethics. And it's linked also, of course, to meat. And I want to introduce you, to begin with, to an idea which we developed in a project that we finished very recently, James and I, with Dan as well, on global and local food chain assessments. So, this was a project from the European Commission where they wanted us to basically tell them when global was good, and local was bad. And we were like, okay, but it's actually a bit more complicated than that. So, what we did was we proposed something called post normal science. And you're probably thinking, what the hell is post normal science? Well, it's interesting because it's about complexity. It's about uncertainty. It's about the fact that we very often have incomplete data. And, crucially, it argues that a reliance on scientific knowledge alone from the top down is no longer appropriate. We need, in other words, to democratize knowledge. We need to recognize a multiplicity of perspectives and values. And that's what we tried to do in this project by looking at the perceptions of food chain performance in twelve countries. Ten of them were in Europe. We also had Senegal and Peru. And as you can see

from the slide, we were looking at the debate across a series of what's called spheres. So, these are basically arenas of communication, the public sphere, the market sphere, the science sphere and the policy sphere, and mapping that across five dimensions. Now, there's a range of really interesting papers that have come from this project. Tremendous papers, they are. You have to go and read them all. But the key output from all of this stuff, was this rather marvelous table or matrix, which James and I probably spent far too long working on. But what it tries to do is to synthesize that detailed analysis that we've done across those twelve countries. And we came up with twenty-four attributes or characteristics that are associated with the performance of global and local food chains. And the key thing that I want to talk about tonight is the dimension right at the end, the ethical dimension. Because one of our key reflections on this work was that arguably, ethics should be the thing that underpins everything around food, and probably what we should have done, if we were a bit wiser, was had ethics kind of running at the bottom of the diagram.

So, what I want to argue is that it's very important, and based on that reflection we've been doing a bunch of research since this, since these papers to try and develop a kind of ethics and Agrifood governance perspective. And again, I want to give you an example to show why I think ethics is a very powerful way to think about sustainable food futures. And the example that I want to give is from another remarkable paper which is just being published in *Agriculture and Human Values*, and it's all about single use coffee cups. And what we argue, and again, you may be familiar with some of this stuff, in the sense that plastic is now something that we are beginning to debate in the public sphere. We know it's a very versatile product, but at the same time it's made from fossil fuels and it's a really difficult, I won't swear, but it's very difficult to get rid of it. So, at the same time, we've had an enormous rise in the coffee cup industry. And so, as a consequence, food and drink is a key contributor to the plastics problem, both in terms of single use plastic bottles but also take away coffee cups. Apparently we use more than seven million everyday in the UK and only one in four hundred is being recycled. And what the, the, the kind of entry point for our case study was this idea, the consumers assume that they're recyclable, but actually they're not because of the plastic that's in the inner part of the cup to stop you burning your hand. But what's happened over a period of time, is a process of what we've called problematization, and this was initiated by Hugh Fearnley-Whittingstall, and more recently, well actually before that, by foundations like the Ellen MacArthur Foundation, which are promoting this idea of circular economy, of trying to get us to be less wasteful, basically.

But the key moment in problematization of the issue came with the Blue Planet two program, which in Episode four, which was aired in November 2017, highlighted how plastics were creating huge problems for our environment, And so you had David Attenborough explaining how a female pilot whale was next to a lifeless calf, and the calf had died because the mother's milk had

been contaminated by microplastics. And what we can see from these Google trends figures is the way in which that then initiated a public interest. So, you can see the spikes both for recycling plastic and also for recycling coffee cups. And so what we do in this marvelous paper that again you'll all have to read, is we look at how that then relates to what we call responsabilisation. So, what's the relationship? It's not completely linear, but the first thing to say is we do have something called a producer responsibility scheme, but it's basically not very good. So, in the recent environment plan, they're looking to radically change it. And there was an important report which came out in January 2018 from the Environmental Audit Committee, which made a series of recommendations around coffee cups, including things like introducing what they call a twenty-five pence 'latte levy'. And the other thing that we do in the paper is we look at examples that are emerging both in terms of industry and more generally. And you can see the way that particularly retail coffee cup chains are responding, for example, Starbucks, reducing, basically introducing incentives to try and responsabilise our consumer behavior.

That's an interesting case study, but what we've been thinking about more generally is what that means more broadly in this idea of Agrifood governance. And so, in the paper we create a model that tries to look at the relationship between the outcomes of the food system, and particularly what happens when knowledge is created that problematises our social norms and how we behave, and what that then means in terms of the relationship with responsabilisation. How people have a food chain, how government reacts, and does that lead to changing government arrangements. And the idea that we suggest is that we need to think about what Iris Young refers to as a distributed responsibility. So, in other words, we mustn't promote kind of micro consumer actions to deal with these very complicated problems. It's a combination of individual and collective responsabilisation.

I'm halfway, Isaacs interjected on several moments, which is funny, but I shall continue into the third theme or the third rant, mini rant about Agrifood. And so, this is what I'm calling Agrifood economies. And one of the reflections, and it's not really a rant is, if you look across particularly Agrifood studies in the past ten years or so, we spent most of our energy documenting alternative food networks and more recently urban food networks. And that work is very helpful, very progressive and very welcome. But what we've ended up doing is forgetting about mainstream agricultural commodity networks. And why is that significant? Well, if you look at mainstream agricultural commodity networks, there's been some really significant changes in the last 10 years and the most significant change of all is a shift to what I would term a market orientated agricultural policy. So, we have the emergence of things like, what's termed a contractual economy. There was a report produced by a group called the Agricultural Markets Task Force, who were recognising that as state intervention pulls back, what this is doing is creating more instability for farmers. It's exposing

them to price volatility and to potentially what's termed information asymmetry, where retailers have most of the information. So, there's an argument to look at a new set of arrangements, contracts, cooperatives, futures, insurance schemes and so forth. We can see this in reforms of both the Common Agricultural Policy, and if we ever get there, a Post Brexit Agricultural Policy. And we've just had an announcement of an Unfair Trading Practices Directive by the European Commission.

So, in a project that has literally just finished, with the acronym SUFISA, all these horizon projects have really brilliant acronyms, and this one is called SUFISA, and it's about sustainable agriculture for sustainable. It's about sustainable agriculture and fishing, fisheries, actually. But our kind of entry point, looking at that broader change, is to argue that we need to think about and better understand the range of institutional arrangements that are now forming in Agrifood commodity markets. And so basically in this diagram what it's showing, is that policies there, but it's, it's kind of out there a bit. And what we should really be looking at are either forms of horizontal coordination, so these are cooperatives, producer organisations and so forth, and also vertical coordination, so relationships between individual farmers and processors or retailers, and how they work in combination with policy incentives, which might be about climate change, animal welfare, et cetera. What we've done is we've looked at the emergence of institutional arrangements for milk in the UK, focusing in particular on Somerset and Devon as our case study. And what we've found is that essentially you have these two types of arrangement. You have what are called collective organizational arrangements. So, some of these are not new things, like cooperatives, but we have new arrangements emerging like Dairy Crest Direct organization, or even the Free Range Network, which is promoting a kind of grass fed based form of dairy. But increasingly there's a shift towards individual sales. So the classic example is your supermarket aligned contracts, which constitute about ten percent of dairy sales. Probably more significant are the shift towards private forms of arrangement between either farmers and processors, or farmers and milk buyers. And looking at how they operate, it's quite interesting because one of the things that's happening is that contracts are having an increasing role in managing the way that both farms and retailers relate to one another. And there's instruments like A & B pricing, which are trying to control or send signals to farmers about how much milk they should produce. So, you have an A price and a B price, or even an A price, a B price and a C price, which might turn into a dance at some point, but not now.

So, the other key reflection that I've had on this stuff is the amount of information that farmers give to some of these processors to get their contracts. They probably know what they've had for breakfast this morning, let alone how many cows they've got. And that, arguably, is a new form of information asymmetry. The other thing which is really interesting, I would argue, is that we

can look at patterns of restructuring. So, in this diagram you see very clearly the relationship between the number of dairy producers, which has gone like that, and the average herd size, which has gone like that. So, despite the debate that I just had, we can see clear patterns of intensification or what we might term a kind of eoproductivist form of agriculture. And to extend that rant even further, 'cause I'm in rant mode now, I think we need to be very aware that capitalism, if you like, or capital, is quite a tricky operator and it will find ways to adapt to new environmental conditions. And so, although I won't go into the detail of it, I think there are two other key trends to note. So, alongside Contractualization, we've got this key issue of financialization of agricultural commodity markets, both in terms of financial speculation but also in thinking in terms of things like stranded assets. So, as we move to a post carbon economy, finances invested in agriculture doesn't suddenly pull back on what the implications.

The other key trend is digitalization. So, there's a great deal of excitement and probably rightly so, around things like big data, both as a resource and a strategic asset for farms and for agricultural commodity sectors. We've got wonderful things like these intelligent tractors that can drive on their own. But at the same time, do they lock farmers in to particular arrangements and who, who owns the farm, who has these relationships? So, these are questions that I think we need to be kind of a little bit cynical about or challenging as critical social scientists. And to take that even a stage further, I would argue that there's some really interesting debates happening in economics more generally. So, this is the idea of what's called doughnut economics, which is a book which has been produced by Kate Raworth. And in that book, she basically suggests that we need to completely move away from our obsession with growth, gross national product, gross domestic product, and that we need to move into the safe space of the donut. So interestingly, the ecological ceiling is the planetary boundaries that I talked about at the start, and the social bit is our sustainable development goals. So, this to me is both challenging but potentially transformative.

So, can we move towards the donut in food system thinking? Well, I would argue that we really ought to. How? By making a greater place for ethics. Not just a procedural ethics, but a kind of moral philosophy of ethics in terms of justice, and rights, and equity and public. We can look at the power of governance and the emergence of particularly these really interesting, more holistic system-based ideas that are now emerging. So, Canada, for example, has just announced a National Food Policy. We're having a debate about one in this country. There will be a European Common Food Policy potentially. And we have things like our Food Policy Councils, and they're proposing a mixture of methods, design, technology and social ecology.

So, the fourth theme is what I'm calling experimentation. And I'm not going to be talking about the DNA version of the helix, but I want to talk about the helix from a social perspective. So,

this is work that's in the pipeline if you like. So, it's two projects. The first is a project with Martin Phillips and Keith Halfacree, which is going to be looking at rural transformations in the UK and Japan. And the second project which I'll talk more about is a Horizon 2020 project, which is led by Han Wiskerke at Wageningen, but involves colleagues also from Aberystwyth, and Dan Keech and Matt Reed as well in the CCRI. And why do we need to think about experimentation. Well, actually, if you look at the climate change literature, there is quite an interesting debate about the power of experiments. So there's a new book coming out, for instance, called Green Ovation by a lady called Joan Fitzgerald, and it shows the power of experimentation in terms of its ability to vision futures and to involve different actors. And that's essentially what we're trying to do in the Robust project. So, we're applying what's called a living lab approach, which is about co-innovation. So, it's about academics working with practice partners rather than just academics on their own. The idea is to improve rural urban linkages and governance, and our partner, because we're working in Gloucestershire, is the County Council. And we've got three specific themes; food, ecosystem services and new business models.

Now you may be thinking I want to know what living labs are or you might be thinking I don't care. But anyway, this is what they are. This is a living lab in, in terms of definitions at least. The key point is that they're geographically embedded, so they're often in city, or in our case in the county. And the crucial thing is to engage in a participatory process of what's called co-innovation. So, this is this is what I mean by the quadruple helix. So traditionally it's been academia, or maybe academia, industry and government. But increasingly now there's a call to also engage civil society. And indeed they've added another layer in terms of the environment. And so, what we're doing in the project, we've got a series of stages that we're working through, which we've developed for the Robust project. We've just completed our envisioning stage where you create a shared vision. And we're moving into the really exciting stuff, which is experimentation and experiencing those experiments, and critically reflecting on them, because monitoring is a key part of the co-innovation process.

So, to kind of ground that a little bit in about two minutes, well, maybe three. We'll see. We are basically operating what I would call a

Gloucestershire 'food lab'. So, we are working, as I already said, with both the County Council, but as our work moves into the next phases, we're also connecting with, for example, the work that's been led by colleagues at the RAU around a new food strategy for the county. And we're connecting to other policy links in terms of, there's something called a Gloucestershire 2050 vision which the University was involved with, and is still ongoing. There is of course the local industrial strategy, the twenty-five year environment plan and so forth. So, it's co-innovation, but as a reviewer said to me the other week in Brussels, "yeah, but what are you actually doing"? So, I thought, yeah, a good point. Well, what we're actually doing is creating fairly tangible outcomes. So, to give you some examples, we're going to be doing some experimental work, looking at the Council's school food contracts. So, can we respond to the challenge of sustainable diet? Can we create criteria that do what's called a more balanced assessment of those who applied for the contract. And crucially, also we want to experiment with new business models, which are circular, which are smart, which are public, and which will also involve payment through ecosystem services. And so, this is my plea because the key part of a lab is to kind of animate it. So, if you're interested, if you know a business that might be interested, drop me an e-mail, because we're in the process of trying to get businesses involved who might be up for some of this experimental stuff over the next year.


So, to conclude before you all fall asleep. In tonight's lecture I've covered quite a lot of ground and I've hopefully introduced you to the highlights of some of the projects that we've been working on in the Institute. Hopefully you will agree that food is a defining issue for twenty-first century society, both in terms of our landscape and environment. Hopefully you can see this idea of what we've argued as this notion of what we call fractured consensus. So, there's agreement that we need to make some radical changes, but disagreement about how we do it. Techno-science is clearly very important and it's certainly not the enemy, but at the same time we need to be more transparent about the uncertainties attached to some of these knowledge claims. And so, with that in mind, I've proposed four paths/principles around notions of epistemology, around notions of ethics, around notions of economy, and around notions of experimentation. We have, I hope you will agree, much work still to do.

Thank you very much.

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