DANNY LENNON: Hannah, thank you so much for joining me on the podcast.

HANNAH RITCHIE: It's my pleasure, thank you very much for having me.

DANNY LENNON: I've got so many questions that I want to ask you about, but maybe a good starting point to give some listeners some context to you, what is it that you do, what is a bit about your work, and then also some of the things you tend to write on about as well.

HANNAH RITCHIE: So I'm Dr. Hannah Ritchie, so I'm a researcher, now based at the University of Oxford, but my background is really focused on, I guess, you call environmental sustainability, and that kind of initially spanned from really broad issues, so climate change, water use, land use, biodiversity, and then that kind of research led into what I focused my PhD on, which was looking at, I guess, very broadly, how we can possibly feed the world, so in the future possibly 10, 11 billion people, but without the kind of large environmental empires that we see today. So is it possible to feed such a large population well, and not just talking about feeding, but nourishing, so making sure they all have good high-quality diets, but doing that in a way that's environmentally sustainable, so that was the kind of focus of that research. And then right at the end of [inaudible 00:06:45] Oxford is I worked for a website publication called Our World in Data, and a lot of what we do is less focused on doing the original

research, so doing academic papers, although I've done a lot of them in the past, but now looking at more of bridging the gap between what is the data and how do we communicate that clearly to the general public, to journalists, to policymakers, because, I mean, there's a lot of really good research out there, but it's often communicated very poorly or it could be done much better, so that's kind of where the focus of my work lies now.

DANNY LENNON: And of course we're going to center a lot of this discussion on the impact of our diet and those choices potentially, but to take a step back from that to set some context, even when we're talking about the issue of climate change, if people look at this from the soundbites that are in political discourse, at least to me, I've seen two extremes that both are probably not exactly correct, on one hand you have their outright denial of climate change and then on the other you have this hyper pessimistic view that the world is going to be gone in 10 years from now. So as with most things, I guess, there's probably somewhere in between those that that we actually are, so in relation to climate change, what state are we actually in, what is the situation of the world related to that?

HANNAH RITCHIE: So I think it's important to be clear in these discussions that it's undeniable that humans are changing the climate, so just to take that kind of whole denial argument out of the way, like it's very clear the scientific consensus is that this is happening, the global temperatures are rising, and it's because humans are emitting CO2 and greenhouse gases, so that's undeniable. In terms of where we are, in terms of where we are heading, how drastic these consequences should be, so I agree that often a lot of the, at least the public kind of exposure to this is now become like very, very dramatic, worst kind of cataclysmic stuff, where we're looking at more than 5 degrees of warming, we're all going to die, the extinction of the human race, and I think that's very much overblown and is not really in line with what the science says. So internationally, we've set this target that we will try to limit temperatures to two degrees of warming, and that's the targets that we're going for. Now, we're off track on that, so if you look at what we kind of, governments have currently agreed and what

we may be on track for, we're looking at around 50 degrees of warming which is obviously much more than our target and we really need to bring that down, but it's not looking at these five, six, or seven degree scenarios that we often see. So I think the impacts can be very severe, if we don't reduce our emissions, and I want to make that clear, but we're not looking at extinction of the human race. I think even for the, especially for the west, so basically rich countries, I think the consequences may actually be much less than we expect, but for poorer countries the impacts could be very large. So we do need to reduce our emissions but I don't think we're looking at these really dramatic scenarios that often play out in the media.

DANNY LENNON: Right. So if we turn to diet, one of the big things that has been part of this broader discussion I've been having as we were late to the ethics of what we choose to eat, a lot of what gets brought up in the discussion is the environmental impact that we have, how what we eat may impact the climate and some other things we've discussed, and there's this kind of tagline sound bite of, well, one thing that you could do or maybe the best thing you can do is to eat a vegan diet, and within that I see several different reasons that people give for that claim, the first would probably be around the greenhouse gas emissions themselves from livestock – so how much of an issue is that and can you maybe put that in some contexts for us?

HANNAH RITCHIE: Yeah, so if we look at food production in total, so globally food production that accounts for around a quarter of global greenhouse gas emissions, and I think often when that statement comes up – obviously that's big, but it's a quarter and there's 75% that's not food – I think often the argument that comes up there is, oh well, why would you focus on diet, we should surely focus on the other 75% first. I've never actually seen a credible person argue that you shouldn't do both, I've never seen anyone argue that you should only focus on diet and not focus on energy and the other 75%. So that's one point to make. I think the other point is that when we look in the future, the 75% mainly comes from energy production, from burning fossil fuels, and we know actually, we know we have solutions to that. We know we can switch to

renewable energy or nuclear energy, so we have a path we know, that if we really commit to it, we can do that. For diets and food production, it's very different, we don't actually have a lot of solutions at disposal at the moment, apart from dietary change, very small ones, but we can't stop eating food, we can't stop cows emitting methane, we can't stop putting fertilizers on our soils. So I think there's a segment that we actually don't really know how to tackle yet without major shifts in diet. So I think that's an important point to make in terms of a personal impact, that's 75% from energy and fossil fuels, it's possibly something that you can't do a lot about. I mean, we need governments to invest in renewable energy systems, etc., but that dietary component, that you have full control over what it is that you eat, I think that's important in terms of our choices.

DANNY LENNON: Right, and so I think that's a really good point to clarify for people, there's a distinction between what is maybe the ideal things that we as a society can do versus what an individual can do that it seems that most of these issues that would have the biggest impact would be those top-down things that need to come from governmental change and so on, as opposed to putting the onus on what we choose to do at least relatively.

HANNAH RITCHIE: Yeah, so in terms of, so if you take your energy at home, for example, okay, you can – there are choices you can make, you can use less energy at home, you can not take the car and cycle instead, those are all choices, but ultimately if you plug – if you turn on your heating, if you plug your TV or laptop and you're kind of at the disposal of what the energy system is in your country, I mean that determines the footprint of that energy, and okay you can for there's this aspects such as that that you can have potentially some influence on. But from a very personal carbon footprint point of view, what you eat is probably the biggest choice that you can make, you can have control over.

DANNY LENNON: Sure. So with that then the question that someone might come up is in relation to our own individual carbon footprint, what is the scope of how much we could change that with personal changes around diet

and that obviously begs the question what is that ideal change in terms of a carbon footprint, and then how much of an impact would that have on a personal level?

HANNAH RITCHIE: So the carbon footprint of your diet probably accounts for around a third of your total emissions in the West that you'd be responsible for. If the levels of reduction that you could achieve there, so if you went from a kind of standard Western diet, so this is not excessive meat consumption but a reasonable amount of meat and dairy consumption, animal products, and you switch to a vegan diet, you've probably cut it by 50 to 60% of the – so it's a big reduction. And if you think of diet in terms of what could be the change that would make the biggest difference, it's true that eating a vegan diet has the lowest environmental impact, like that's true, and that's what the data says. Whether there's a much bigger to be debate there on whether that's feasible for people, whether promoting that as an approach actually puts people off or people are willing to make that change, I think it's important to make clear that although that's the biggest change it can make, there are smaller changes that maybe are more manageable for people, and more people will buy into, it could have a bigger impact. So I'm always a little bit on the fence as to whether actually promoting that message is useful or whether it completely puts a lot of people off that may otherwise make changes which could make a big difference.

DANNY LENNON: Right. So yeah, rather than view it as a binary thing of you either have to be 100% vegan or not, it can be there's a whole spectrum of things, and where is comfortable for someone to be on that is going to have some degree of benefit. So with regard to food choices, is there any type of hierarchy in terms of those various different animal products that would have the biggest impact, is there some that contribute more than others in terms of different animal foods?

HANNAH RITCHIE: Yeah, there's a really, really broad spectrum, I mean, this is why it's important to know that there are choices you can make of us not going completely cold turkey on meat and dairy completely, that could have a big difference. So if you look at the hierarchy in terms of environmental impacts, in this case CO_2

emissions, but it tends to be very consistent when you look at other environmental metrics as well, so beef is top of the list in terms of highest impact, it has a really high impact, one because cow's methane, with large amounts of methane which is a really strong greenhouse gas, but also they just need so much feed and so much land that there's, I mean, the biggest driver of deforestation globally is producing animal feed or grazing land for cattle and cows. So that's really the biggest impact. Next you have lamb and mutton which also uses a lot of land. And then actually there's a big gap between those two and then pork and poultry or chicken. So pork and chicken tend to have much, much lower impact than beef and lamb and dairy to some extent as well. So you have like quite a big gap between what we call ruminants or cattle, cow products or beef, lamb and dairy, and there's a big gap to pork and poultry and eggs. So if you look at it in terms of what is a change that I can make, that's not going completely vegan, by far the biggest one is cutting beef and lamb and reducing dairy intake, it makes a massive difference.

DANNY LENNON: I think you kind of had touched on it as well that there's other metrics outside of just greenhouse gas emission. In one of the ones I've heard brought up is around the land use, so we have a certain amount of land that's being used for livestock right now, and not only would it shift more of that for crop production, but more so there's a conversation around essentially real wilding that land is the term I've heard of being able to restore it back to a more natural state for lack of a better term, and how that might have then have knock-on benefits for the environment. What is the conversation around land use that we currently have for livestock and how would shifting more of the population towards, let's say, a plant-based diet, impact not only that land use but would that actually have a knock-on impact environmentally?

HANNAH RITCHIE: So yeah, I think the land use question is majorly underestimated. I think people don't understand the magnitude of just how much land we actually use for livestock production. So I did a graphic of visualization of what, if you grouped all of the land use for livestock together, like how much space would that take up, and it actually takes up the full continent of

the Americas, so all of North America, so Alaska, Canada, the US, all of Central America, and all of South America. So literally that whole continent in magnitude is what is used for livestock production. So obviously there's major benefits there to freeing that out for nature, whether it's just restoring it back to natural habitats or whether it's actually deforesting. When you look at the cropland, the cropland that we use for human food is actually much, much smaller, and I think one of the major misconceptions that people have, when I put this argument forward, a lot of the rebuttal is, well, we need to use that land for livestock because it's not suitable to grow crops on which at face value is a reasonable argument, if you need to produce food and you can't grow crops, then yeah, sure, we should use it for grass and for grazing land. I think what people misunderstand is the amount of food that we actually, crops that we grow and then feed to animals, so half of global cereal production, only half of it is eaten by humans, around 40% is fed to animals. So what happens if everyone went vegan, we would actually need less cropland in total, because all of that crops that we're feeding to animals we could feed to humans instead. So the argument that we need to use that land for livestock otherwise we wouldn't be able to grow our food is wrong, because we would actually need less land.

DANNY LENNON: Yeah, that's a really interesting one because I became aware of some of this looking at it from an ethical perspective, because there's sometimes a pushback when people say, well, look if we had everyone go vegan, then producing crops isn't a zero kill situation, animals get displaced from habitats, animals are killed during crop production, etc., etc. And that is true, but like you say, there's a significant proportion of those crops that are being produced simply for animal feed, and so the net effect at the end is not necessarily as linear as some people might suggest.

HANNAH RITCHIE: Yeah, if you look in the US, for example, in the US only 10% of the crops they produce, and there are massive agricultural powerhouse, only 10% actually gets fed to humans in the end.

DANNY LENNON: One of the things that gets brought up Hannah that I've seen is the impact of either producing animal or

plant foods is around the water use, say per unit of food that's used. And then we can also look beyond that, just more generally the resources that are used per unit of food production, number one, is there differences between again those different types of foods, and I'm guessing, based on what you've already said around say beef production versus others, there is some degree of difference between different animal products; and then also how can we contextualize the difference between how much food we can produce from plants rather than animal produce if we're talking about that efficiency of water use or other resources that might be used in their production, if that makes sense?

HANNAH RITCHIE: Yes, so it's a good question. So the, as I said earlier, one of the reasons that the beef has such high environmental impacts is because the amount of resources that need to go in to feed it, and on a previous podcast I kind of tried to explain it in terms of the nutrition space what you may think of as like BMR. So to produce one unit of beef or meat takes really large inputs of feed, and that's simply because it's a massive animal. So to make a cow gain weight, you need to feed it a lot compared to a chicken, because it has a much higher of BMR. And basically what that works out as is, so if you wanted to produce one kilo of beef, you're looking at input, so if it can be 25 to 30 kilos of cereal crops, so basically you've got, you feed it 25 to 30 kilos and you only get one kilo of beef back. So basically what you would call the protein or calorie conversion there, you're losing 95% of it, which is obviously a really terrible conversion. When you look at say chicken as a comparison, you're probably looking to get one kilo back, you're probably looking at around 3 kilos of input. so much, much more efficient to produce chicken or pork versus beef or lamb; and then, I guess, if you were to think of it in terms of the plant-based alternative, you're just looking at the kilo of cereal that you could have consumed on its own, kind of the one for one. So a really massive differences in the resource efficiency there, and that really translates into water use. So again, I think a big misunderstanding is how much water is used globally for food and agriculture, so you're looking at 70% of the water we use globally is used for food. So many people think the biggest

impact they can make on water stress or water scarcity is by having shorter showers or turning off the tap when they're brushing their teeth, but naturally in most countries that's a really small percentage of total water use, and by far again the biggest impact you can have is by choosing what you eat. So basically, every agricultural input needs water, if you're looking at beef and you have that really per conversion of 25 to 30 kilos of cereal to produce one kilo of meat, then again you're looking up that sort of difference in terms of how much water it would take to produce that. So you're really, between beef and either poultry or also chicken or plant-based protein actually looking at orders of magnitude. So it can be 20-30 possibly even more times difference between them.

DANNY LENNON: In terms of the efficiency and the resources used, is there differences even within, let's say, if we took a beef production and compared the intensive farming and we see an industrial factory farm produce beef versus, let's say, more ethical grass-fed, free to roam, pasture produced beef, is there differences there in the efficiency?

HANNAH RITCHIE: Yeah, there's massive differences. And I think it's a valid point that people bring up, but I think, again, it can be slightly overplayed. So when I make this point a lot of people will say, okay, but you're looking at, let's say, a global average – like in the UK, farming is much more productive and we have much better farming practices than elsewhere in the world, so my beef that I get from down the road is much more efficient. And that's true to a certain extent, there are really large regional differences, but it's still true that if you look globally that, the lowest impact or the best beef in the world is usually still worse for the environment than the worst chicken or the worst crop plant based solution. So I think there's massive differences, but I don't think it changes much but it can make some difference.

DANNY LENNON: That kind of leads me onto one question that would be related to people who would be, talk about the concept, I suppose, of being an ethical omnivore, that they are going to eat animal products but trying to do that in the most ethical way possible, and this in itself is a whole debate as well. But just the idea that we

want animals raised in a cruelty-free way, minimized amount of suffering, have local food production as opposed to these large-scale factory farms where the conditions maybe aren't so good, but one aspect of that is the aspect of getting locally produced meat and this also tends to crop up in the climate environment discussion as well, and at least I've seen it repeated several times that one aspect of diet is not just plants versus animals but also where you are getting them from. How much of a consideration is the origin of where we get that food and if it's the locally produced food versus not locally produced, how much of an impact does it actually have?

HANNAH RITCHIE: I think there's actually two really important points to make here, the first looking at the kind of ethical omnivore debate, I mean, there's a very inconvenient truth that actually the most environmentally sustainable way to produce meat is often worse for the animal. So there's the kind of, I guess, double-edged sword that when you look at conditions where you'd see the animal welfare is high, so they have lots of land to roam around on or chickens are not packed in cages, that takes up more land, it takes up more resources, they're burning more energy which, when you want to produce meat, it's actually quite inconvenient, because that's kind of wasted energy, it sounds terrible, but it is wasted energy because it's not producing the product that you want. So they actually tend to have a higher environmental footprint when they have better conditions. I guess the lowest impact is really high industrial farming, chickens crammed in cages, fed antibiotics so they grow much quicker, so I think there's actually a trade-off there that's quite inconvenient from a kind of ethical animal welfare and environmental point of view. So I think that's one point to make. And the question on, I guess, food miles and local food, so I actually published something on this recently which went kind of viral and got a lot of feedback from – the argument for local food is definitely overplayed, I think people have the perception that probably one of the biggest impacts they can have is to eat local, and we hear that a lot, eat local to reduce your carbon footprint and often it's just a really quite insignificant part of the footprint of your diet. So globally transport from food, and this is international transport accounts for

around 5 or 6% of total emissions which is very, very small when compared to the massive differences that you can make by choosing different products. So if you look at the carbon footprint of beef, for example, transport – even if you transported it from, so the UK, from UK to New Zealand – transported it from New Zealand to the UK, the transport emissions in that are less than a percent, like half a percent of the emissions of the beef. So all of the emissions from the beef basically come from its production, not from where it's coming from. So if you think the local producer buying it locally really reduces your footprint, that's incorrect unfortunately, because it makes almost no difference where that comes from. And I think that's also an argument that I hear a lot, from kind of a criticism of vegans that, okay, you are not eating meat, but you're importing, shipping all these avocados from South America and that must have a massive footprint. But unless they're being flown in, which most foods are not flown, they come by sea, by boat, the footprint is still very, very small. So my advice is always more focused on what you eat rather than where it comes from, and it's a much, much bigger difference.

DANNY LENNON: Right, yeah, and that's actually one of the things that I saw in one of your articles that discuss that how small the number is of actually food that's produced maybe on the other side of the world that comes via a plane that, it's at such a small percentage that most of the food, no matter the origin, probably doesn't have as big a footprint as we would guess, unless like you say, it's flown in so that was a really interesting point for me to see for sure. If you were to leave people with some of the most important things when it comes to this discussion of how our dietary choices can impact the environment and climate, what are some of the most important things to be clear on either misconceptions to clear up or just the most important takeaway messages from this whole thing that you'd like to leave people with?

HANNAH RITCHIE: A couple of the key points I'd make is, one, your diet can make a big difference. So again, if you want to reduce your environmental impact, focusing on what you eat is a really good option. You make these choices, I don't know, three, four, how many times

you eat a day, and you have full control over that, unlike other aspects that you may have less control over. So it can have a big impact. I think a lot of this stuff we see in the media or promoted as to how we reduce this impact is overblown and doesn't really have a massive impact, so the local thing doesn't have a massive impact. I think there's a big emphasis on packaging, doesn't have a massive impact and actually it's sometimes really important in reducing waste. In terms of, so yeah, I'd say, focus on what you eat is the primary thing. And to be clear, I'm not actually – maybe I come across in this conversation as being a vegan, and I'm very anti-beef, I'm not a vegan or anti-beef. I as much as pescetarian, so I eat fish, but try to cut out meat. And one of the reasons I do that is because the marginal gains that it would take for me to go from the diet I am eating now are very small amounts of animal products to completely vegan, in terms of environmental footprint, would be quite small, like I think I've already got a reasonably low footprint. And I feel like my quality of life and diet is maybe slightly better with that small amount of animal products in it, so I chose to eat that way. And another point is that I think I maybe can have a larger impact in that way rather than being completely weakened. I think if I'm trying to convince others that it can reduce their footprint by cutting out a significant amount of beef and dairy or cutting them a reasonable amount of meat, they may not need to go fully vegan and more people may buy into that. So it's maybe well that people may see my diet, see, okay, she has a reasonably low carbon diet, she doesn't need to go fully vegan to achieve that, maybe that is also achievable for me. If you want to go fully vegan, that's great, and you will have a slightly lower impact, but I want to make clear that you can make a massive difference without going that fully vegan way.

DANNY LENNON: Yeah, and that's such an important message for people to hear because sometimes I think the off-putting idea is that it's sometimes painted as an all-or-nothing proposition that you need to go vegan for these reasons which are all valid and good, but that anything less than that is not good enough, and so that kind of turns people away as opposed to the message that you've outlined of there are several steps here that you can get like 99% of the way there in a lot

of cases, at least in terms of our environmental impact, and it doesn't have to be an all-or-nothing. So I think that's really useful for people to hear. Hannah, I'm sure there's people that want to find more of your work that you've published online, so can you remind people where they can find some of your work and also if they can track you down on social media or anything like that, where's the best places for them to try and find your work?

HANNAH RITCHIE: Yes, I think most of my work is published, we have this web publication Our World in Data. So if you just Google Our World in Data, it will come up, and that's where most of my work is published. And then if you want to, I'm not really Instagram active, I'm one of a followers rather than producer of content, but I'm very active on Twitter, and it's _hannahritchie, you can follow me there.

DANNY LENNON: Perfect, and for everyone listening, I will link up to all of that in the show notes to the episode. And so with that Hannah, thank you so much for coming on the podcast, it's been great to talk to you and clarify so much for this and your work has been actually extremely useful and informative for me, so I appreciate you taking the time out to do this.

HANNAH RITCHIE: Yeah, that's great, thank you very much for having me.