



# ***CLIMATE CHANGE AND BIODIVERSITY***

*HOW CAN WE MITIGATE THE ENVIRONMENTAL IMPACTS OF PRODUCING PROTEIN-RICH FOODS, AND HOW MIGHT GLOBAL ENVIRONMENTAL CHANGE SHAPE THEIR PRODUCTION IN TURN?*

*[TRANSCRIPT FROM THE FIFTH SESSION OF THE FUTURE OF PROTEIN CONFERENCE]*

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**Ryan Katz-Rosene** [00:00:00] Producing protein rich foods and how might we how might global environmental change, in turn, shape the production of these foods. OK. So I'm just gonna quickly introduce our our panelists today and then let them do their talks. Again if you're just joining us we have the format is we have each presenter giving a 10 minute quick talk and then that is maximizing time for dialogue and exchange thereafter. So first up we will have Jeremy Pittman who is an assistant Professor with the School of Planning at the University of Waterloo. Just give a little wave there. Then after Jeremy we'll have Gabrielle Bastien, who's the both founder and executive director of Regeneration Canada. Hi Gabrielle. Then we'll hear from Kathleen Kevany, associate Professor of Food Systems at Dalhousie University, and we'll close up with Eric Darier, ecological campaigner for Greenpeace. And my name is Ryan Katz-Rosene and I'm an assistant Professor here at the School of Political Studies at the University of Ottawa. So, without further ado, I think I will turn it over to Jeremy to begin. Thanks.

**Jeremy Pittman** [00:01:18] Awesome thanks Ryan. As Ryan was saying I'm Jeremy Pittman. I'm a assistant Professor, School of Planning, University of Waterloo. Just start about a year ago. Yeah maybe before I begin I'd just like to thank Ryan and Shannon for organizing this. It's been excellent. One thing I really like is it's it's not an echo chamber. There's really diverse opinions in the room. It's been really nice to kind of hear these and discuss these over the over the last couple of days. So I study a broad range of things. I have a broad range of interests. I do some work in sort of the marine ocean space, looking at sort of coastal systems, coastal marine systems, small scale fisheries and whatnot in the Caribbean South America. So that's one part of my work. But what I'm gonna speak to you today a little bit more is sort of focused on how do we do agriculture and biodiversity together on landscapes. And for this work I draw on a lot of examples and experience in Saskatchewan. I grew up on a farm in Saskatchewan and you know it's just a place where I really like to think about some of these issues. There's a lot of you know a lot of how we how we're going to do this a lot of how we're going to transition between different proteins, that type of thing, will happen in these landscapes. So yeah so I'll kind of use Saskatchewan as a touchstone throughout my my work to sort of give ground some of these ideas. So Ryan asked us to talk about how can we mitigate the environmental impacts of protein production as well as how might environmental change climate change kind of shape the production of proteins. And so yeah I've been reflecting about that over the last couple of days a lot and you know thinking about some of

discussion here as well. One thing that I've really been reflecting on is like you know how did we do this when I was growing up because we were just kind of flipping between proteins and all that kind of stuff. I was really I was really kind of curious like thinking about how do we get to lentils eventually. How did that how did that kind of transition happen? So you know in the 80s I lived on a I grew up on a wheat farm, mostly wheat a little bit of oilseeds. We used to we used to actually actually grow canary seed a little bit for, you know, people keeping canneries in New York City and stuff, and you know it was a bit of a cash crop for us but also it provided something to work into the rotation. If you grow wheat every year it's not good. So we worked sort of oilseeds into the rotation, a little bit of a cash crop, that type of thing to kind of keep keep the keep the farm businesses operating. One thing that was a little bit different for us compared to our peers and our neighbours was we actually raise hogs as well. We had a really small scale hog operation, Duroc and Yorkshire, kind of running around our farm, really small scale but it provided sort of again like an extra source of income for us. The eighties on the prairies were super dry. The wheat crops weren't doing so well, the farm on agriculture wasn't doing so well. It was sort of this period where you know having these sort of these these ultra actually using some of these, at the time for our area, kind of an alternative protein at that time. I know it's pork, it's very mainstream, but in terms of the production in our area it was actually one way that we were able to kind of get through some of these things you know. Early 90s rolled around, a bunch different forces. On the hog side there was kind of a bigger flip in the industry towards more industrialised operations kind of coming in at the same time as changes regulations, that type of thing. We were kind of pushed out of the out of the hog business, essentially. It wasn't wasn't viable anymore. That was kind of like you know concurrent with kind of broadly in the industry coming through the 80s the family farmers weren't doing so well. It was really dry, as I mentioned before, but you know you have these other economic factors are sort of increasing our vulnerability to these things. Land prices were ,really high as well as interest rates were really high. So you know coming through that there's a lot of economic pressure on the family farm operations. The way that the system responded and we've heard a lot the last couple days around sort of the role of extension and you know back then we actually had a lot more extension there was a lot more going on. And one thing that they really pushed a lot was diversification, which is you know it's happened it's been pushed forever, but there's one thing that they really pushed a lot back then. And you know as a kid kind of going through this I remember it almost seemed like the sky was the limit in terms of what you could diversify to. So you know you used to go to these farm progress shows and there'd be like emu and ostrich there and elk and all these different like it was really, to us, like really strange types of animals that they were trying to get us to grow. You know the way that those those types of those types of systems kind of went, if you got in at the ground floor and you were able to sell the breeding stock you might have made it. You made it maybe did OK. But the people that were actually trying to do it as more of a livelihood actually went broke. There was no market for these things. Nobody wants to eat ostrich, really you know it was just kind of a almost doomed to fail but it was one thing that was happening in the industry at the time. Coming out of that though, there were a few options that that stuck. And one of those options was lentils. It was something you know as a as a as a wheat farmer we could grow lentils without new equipment. We had to learn how to use that equipment a little bit differently. You know when we when we started growing lentils we plugged the combines a lot, all those kind of things it was a bit of a challenge, but at least within sort of the way that our system worked we could switch to lentils fairly easily. There was a good strong market in India and other parts of the world that would buy these lentils from us. So economically and sort of logistically on the operations it made sense and it kind of saved a lot of family farms, to be honest. I don't know if I don't know if our family farm would be around if it wasn't for lentils. We sort of switched switched to lentils pretty pretty hard. And again it was something we could work into our rotation. So you know you typically, where we were doing a lot of like cereals or oilseeds before, you work in a pulse into that rotation and it's sort of you know potentially helps build your soils, that type of thing. It's probably a baby step maybe towards regenerative agriculture in this context, you know, a small step, but you know kind of thinking about just just why that happened and where some of the roots of that came from. Some of the work I'm doing now. So, since we've seen this sort of this onslaught of lentils on the prairies, one thing kind of thinking about the biodiversity element a little bit more so if you drive around rural Saskatchewan now you'll start to notice you'll see like in the lentil fields there's a lot more pronghorn, a lot more pronghorn antelope kind of locating there. You know it seems like you know lentils are influencing these landscapes in ways that maybe support a little bit biodiversity in this context. I've been doing some interviews with some of the some people in our area that kind of know what it was like before. As settlers we started breaking the prairie and thinking about what sort of animals were there before. And a lot of them were saying that you know as as sort of as a lot of the settlers were coming the animals you saw there were a lot of moose and pronghorn. That that's sort of the mix of what you saw there. As more and more prairie got broke, that kind of switched to being white tail deer and mule deer. I didn't see moose a lot growing up there was hardly any there. But, you know, in sort of the mid 90s moose started coming back. Pronghorn were always kind of around. But they used to kind of hang out more in the hills where there's bigger patches of grass. But now, with sort of the lentils across these lands, he had just seen a lot more pronghorn that are that are that are sort of like selecting it. We think for food. Lentils are really good food for humans but they also are potentially a really good food source for a lot of different animals so we think that that's why that's happening. You know to be honest, though, we're not totally sure. That's one thing. I'm actually working on a project right now with Saskatchewan Ministry of Environment where we're trying to actually test some of these hypotheses about the role of lentils in these ecosystems as a food source. But you know, kind of anecdotally, it is something that seems like there might be something there. Kind of shifting up a little bit though. So when you think about biodiversity and agricultural production in this landscape, you know, this transition to lentils is still part of a bigger you know this really huge land use change that's happening for the last hundred, hundred and fifty years, where we've really broken a lot of prairie and really transform this ecosystem to something very different. These

landscapes are completely different to what they were when settlers first stepped out there. And so you know, when you're thinking about how you might move this forward one thing that lentils will never replace is native grass, in terms of their role for biodiversity and that type of thing. You know when I mentioned that lentils are good for potentially some of these species that aren't necessarily at risk, things like pronghorn and moose and that type of thing, but when you start thinking about species at risk you need to start thinking about native grassland ecosystems and how you can restore them. And that kind of shifts you know into into the realm into a completely different production system which is the ranching out there. A lot of the remaining species at risk habitat is actually found on ranches. That's and that's not because the ranch is necessarily having an impact. It can if it's done improperly. But part of it is because those are the area those are the kind of last areas where a lot of these species at risk can actually survive. So it's a bit you know I know I know cows have been kind of beat up a little bit over the last couple days. But in this in this sort of landscape they can play a potentially important role in conserving biodiversity. And you know thinking about the future I think there's some really you know we need to start rethinking how these landscapes are configured. Right now it's kind of, as I mentioned, there's like grass over there crops over here. That's not necessarily the best for biodiversity, it's more about how do you start to like maybe make fields a bit smaller or something like that. How do you start adding in prairie strips so that this kind of the separation between the native grass and and you kind of your crop land agriculture isn't so isn't so abrupt and distinct. There's some work, I was chatting with with a few people here, actually, there's some work coming out of Carleton by [...] that suggests that from a connectivity and ecosystem standpoint those types of landscapes can actually be really beneficial. Even though they're fragmented, they can still be somewhat healthy. So you know thinking about how that might work in this landscape will be important and part of that, for at least the short term, really involves thinking about how we can raise cattle on these on these landscapes. It's something that time is up so I'll finish up here quickly but it's something that can be can play a really important role. You could do the same thing with bison. People have tried. Again it comes down to markets a little bit and there's not always a market for bison meat, that type of thing, but you know just thinking about a ruminant on these landscapes in addition to lentils, in addition to cereals, I think would be important for the future, for biodiversity in particular. Anyways, thank you.

**Ryan Katz-Rosene** [00:12:12] So next up we'll have Gabrielle Bastien.

**Gabrielle Bastien** [00:12:15] [...] I'll wait a tiny bit because the PowerPoint is important for what I'll say. Great. Perfect. Well thank you so much Ryan for the invitation. And thanks everybody for your contributions so far. It's really been a pleasure hearing a variety of perspectives on the topic. So I'd like to start by actually reframing the question that was asked of us on this panel because I think we urgently need to move away from trying to reduce our detrimental impact, move away from doing less harm. So instead of asking how we can reduce our detrimental impact on the environment from protein production, I am interested in thinking about how we can actually use protein production to improve the health of our lands and to have a net positive impact on our environment. So in trying to answer that question I will focus on soil because soil health is the basis of environmental health. So we're on the climate change and biodiversity panel and so soils play a really important role in regulating our climate through soil carbon sequestration. They purify our air and healthy soils supports a biodiverse ecosystem as well. On top of that, a healthy soil provides countless ecosystem services that we take for granted every day, like filtering our water, holding water to regulate floods and droughts as well. But for far too long we've only looked at what was aboveground and we've isolated it from the rest of the system and designed our agricultural systems in relation to what we thought the plant needed. So we killed everything around it, tilled the ground before planting, and fed it with concentrated amounts of fertilizers. Well in doing that, we forgot that our agricultural systems are actually ecosystems with multiple different parts, many different beneficial interconnections between these parts, and it's not only the aboveground ecosystem that's important. In fact, it's the basis of that ecosystem is the below ground biodiversity that's in the soil. So the bacteria, the protozoa, the nematodes, the fungi. When they're happy, that's when the whole rest of the ecosystem can thrive. So we should have thought about how to how to feed them aside from instead of how to feed the plants. So that was paradigm shift number one. Now paradigm shift number two. Although many of you probably know about this. But for those who don't soils are also the largest terrestrial carbon sink. So they hold two to three times as much carbon than the atmosphere and unfortunately, In large part due to industrial agricultural practices, but also deforestation and other human impacts, we've degraded a lot of our soils worldwide and that's caused the loss of soil carbon to the atmosphere. So a study actually came out last year saying that, since the beginnings of agriculture, we've lost a hundred and thirty three billion tons of soil carbon which had largely been emitted to the atmosphere and contributed to climate change. Now the current CO2 levels in the atmosphere are 407 ppm and what we need to try to do is to get back to the only levels that we know are safe. So pre-industrial levels of 260 ppm. So that means that we need to sequester about 300 billion tons of carbon. And I've included a photo of photosynthesis here to remind us all that, still to this day, plants are the best known cheapest way to sequester carbon since they take CO2 from the atmosphere, turn it into glucose, and put it in their biomass or they actually channel a lot of that those carbon compounds into the ground to feed the soil microbiome. So this is what regenerative agriculture seeks to do. Regenerative agriculture promotes practices that seek to regenerate soil health and build soil carbon. It also has a strong ethics and welfare focus, but I want to mention now that not all organic farming is actually regenerative. A lot of organic agriculture is done with intensive tilling which is counter regenerative practices. So a few examples here of regenerative practices and a lot of them relate to protein production in different ways. I won't go in depth for all of them but in a nutshell what we're trying to do here is to enable the condition the conditions in which the soil microorganisms thrive. So step number one is not turning their

habitat upside down, so not tilling. Soil cover is also very important. We can think of soil cover as a protective layer, such as our skin, so it keeps the humid and lower temperature conditions that soil micro organisms like. Prioritizing perennials is also very beneficial for soils. Perennials stay in the ground year after year, they grow deeper roots, and that's beneficial. In a similar way agro forestry, so integrating tree crops in agricultural systems, is very good, again for those deep deeper roots and on that note actually, growing nut trees, integrating nut trees and agricultural systems, is a really good way to supply for protein needs. Enhancing the soil biologically through compost and compostee is very beneficial too so, compost is not only carbon but it's nutrients and it's actually life that you're putting in the soil. And last but not least, integrating livestock in strategic ways in our agricultural systems really helps soil microorganisms thrive and is beneficial for soil carbon sequestration. And because this event is focused on protein production, and since I consider this being the largest opportunity we have to turn a degenerative industry into a highly beneficial one that can improve the health of our landscapes and sequester carbon, I'll focus the rest of the talk on regenerative grazing of ruminants through a method called holistic management. So holistic management was developed by someone named Allan Savory who's an ecologist from Zimbabwe. So the whole concept of holistic management. Well first of all I need to say it's an elaborate planning process that determines how to move cattle on land in order to optimize the recovery time of grasses, optimize soil regeneration, and according to that land, specific conditions, the climatic conditions, as well as the land owners specific goals. It's an adaptive methodology so it's an elaborate planning process that acknowledges that the plan will change along the way, according to the specific conditions of that season. And the whole concept is about mimicking nature so back when we had large herds of ruminants roaming on lands and that were staying in a concentrated manner and constantly moving because of predator pressure. So now that we no longer have those large herds of ruminants or the predator pressure well we need to do with what we have and we have large herds of cattle that we can manage according to what we know now. So this is to illustrate how deep topsoil can go in grasslands ecosystems due to very deep roots systems of grasses. So topsoil can go as deep as 10 to 12 feet and that that whole layer sequesters high amounts of carbon. And we need ruminants because we ruminants can digest cellulose and grasses. So in order for grasslands to be as productive as can be, they actually need the help of ruminants. Just quickly here for you to know a few synonyms, ish, because there are nuances here, but when people talk about holistic planned grazing, adaptive multi-padded grazing, and mob grazing, they're highly similar methods. What is not the same as holistic management is simply rotational grazing. That does not mean the same. Obviously continuous grazing, so just leaving cattle on pasture, does not yield the same results at all and can lead to overgrazing. I'm mentioning this here because there has been some science done about holistic management specifically but there's also been some reviews that include other methodologies that are very different from holistic management. So it's important to keep that in mind when we analyze the science that's out there. So this is to illustrate also that we can actually regenerate land that was previously barren through this method. So when we're thinking about land use for the future and thinking about the fact that there's currently one third of our land that's degraded, well we can make the most of that land by doing what has been done at the left of the fence, holistic management, and actually improve ecosystem services, improve water holding capacity, grow vegetation on that land, and yield yields of meat from the livestock as well. So this photo was taken in South Africa. Thank you Seth for the photo. Very quickly here I don't know how long I have left. One minute. So perhaps we can talk more about methane in the discussion part. But this is just to say that obviously methane is a huge issue in concentrated animal feeding operation. The way that livestock is raised currently, you know probably in 99 percent of America, is a huge issue for methane. However I went to a talk by soil scientist Christine Jones a few years ago who was saying that when cattle are on pasture there's actually bacteria in the soil that feed on methane, methanotrophic bacteria, and when there's a lot of methane well they they reproduce and actually degrade a large part of that methane. So she was claiming that methane should not be an issue when cattle are in pasture. And she was supporting this fact by this iscore data. Here on this graph the methane is the green line and we can see the line going very high up in recent years. And historically methane levels were much much lower, although, there was a much higher number of total ruminants on the planet with bison, antelopes. So I'm not an expert on the topic but this does seem to support this the fact that it should not be an issue on pasture. And just to say also so some of the some of the best results in the science to this day about soil carbon sequestration with these methods have been you know by scientist Richard Teague as well as Mac Muller, some of them have gotten up to three tons of carbon per acre per year of sequestration by these methods. So it's a really big opportunity to to improve the health of our lands. So just quickly because I know when my time's up I didn't talk very much about Regeneration Canada and what we do. So a large part of our mission is to help raise awareness and gain public engagement for how important soil regeneration is. So we're trying to educate the general public about this. If you're interested in learning more I would urge you to go to our website. It's a good tool to try to speak about this to people who don't know about this topic at all. We're also trying to build a network gathering everybody around this topic so you can learn more about it on our website as well. And we'll have our next living soil symposium in Montreal from March 28th to 31st at the [...] in the old port so feel free to keep in touch and I'll be happy to answer any questions. Thank you.

**Ryan Katz-Rosene** [00:24:47] Next up we have Kathleen Kevany.

**Kathleen Kevany** [00:24:59] Do like others and get my timing here. OK. So good morning. Today I'm going to invite you to think with me about climate change being the social justice, health, and environmental issue of our time. And if the answer was easy we'd be there. We wouldn't even need to be in this room. We'd be done. We'd be doing other things. It's gorgeous out today but today we have climate change pressing upon us and it's a critical state. We have

got to take action. So when I do work with my students or talks about the necessity to examine our food systems I love this piece that comes from the food FAO and other colleagues who've been working on this. This is 2012. You could examine all of it and thank you for the good work Ryan of bringing together such a disparate collection of voices and ideas and passions because we really need systems thinking to get at this. So today I'm just going to talk about the pedal that's looking at environment of course but all of them need to be factored into our equation. It does no good, friends, to leave a dragon out of your calculations if you live near one, and I daresay we do. Friends who have done research in this field know that the report from 20 2006 and many other reports since livestock's long shadow, I would challenge some of our findings and our friends in the field who are doing much more of this, would remind us that we have got to mitigate and not just address in a gentle way but reverse. And I applaud the effort to be regenerative and we have the opportunity to do that. So just this week or last week we had our colleague Bruce Lister remind us that we're seeing great biodiversity loss in Puerto Rico. You may have heard that he had 40 years vantage point 40 years ago he was there now it's decimated the populations that he studied. He was I mean it's shocking. And we heard it yesterday, biodiversity loss, how critical this is. I think Jodi made mention yesterday of the IPC report just last week as well. We have got to change things around and fortunately we can because we have all of you brilliant people who can do things differently together. But we have to examine the reality. We have got to look at the dragon. And well I'm just going to look at some of the elements of agriculture as we've designed and it need not be the way it is, in large scale, we can change it around the world. So we have by 2025 we're going to have people stressed, needing water, and yet it's mismanaged and misused around the world and the footprint is unconscionable. Water wars are coming should we not be more prudent. And this is an issue of social justice as well. Of course we need land for grazing. We need to do some of the regenerative practices that colleagues are talking about. But you can't ignore the figures. We can't ignore the consequences of this footprint. And of course we're talking about protein. So where are our opportunities? Lucky for all of us, plants are full of proteins, and are all the foods we can create innovative ways to use a diversity of foods much more logically and strategically. Sadly deforestation is a critical element of our systems and the figures are telling. We take down for us at levels that you can't even imagine that it would be sensible to do and yet we continue to do so. We are clearing more land that's being used for not just grazing, but for feed, which of course is inefficient and the conversion rate, again, makes us question whether that's a legitimate or moral use of resources on the planet. Not to mention the beauty of the greenhouse gas sequestering and the opportunities to use the field and the trees but also the other life in those. What else do we lose when we have deforestation? That's a call out to you. Biodiversity. That's it. We are losing a lot of life when we practice these methods. I don't need to educate this audience but others might not know that confinement could be the other C in cafos but concentrated feedlots are creating conditions that we didn't hear a lot about it yesterday in the health panel, but certainly zoonotic diseases are growing around the world and again these issues are global. We have an issue of social justice that people who have less opportunity have greater exposure to zoonotic diseases and it's now the number one of the number 10 causes of death for people who have less favorable conditions. We also didn't hear about antibiotic resistance that is contributing and growing these kind of conditions. And then there's the other pretty picture. Anybody want to live near here? Anybody live near one of these? Humans are pretty heroic, but we do not create excrement to this level and these tailing ponds in these conditions are creating tremendous unification around delicate essential bodies of water and it's not, again, the privileged people who see this or smell it or have to even taste it. We see racism in our food system and people who are less advantaged and less vocal are subject to live near these. We must not fail to understand that element either. So we heard a bit about the greenhouse gas emissions. We have wonderful research, of course there's more than we have time to cover, but the three critical ones we're talking about: carbon dioxide, methane, and nitrous oxide. We could argue about the figures. This is IPC from 2007. We have many more up to date. It's the same kind of outcome, whether we argue whether it's transportation or animal agriculture, I think we can agree. Climate change is happening. It's driven by human effort and it's largely animal agriculture. We can also get at some of the other lifestyle things that were made mention of yesterday, like not flying, those things. Certainly we should be doing all that we can to mitigate harm and to turn this around, but fortunately we can. In examining some of the research that was happening during a time when industry was very effective and over stating its positive benefit to the marketplace and understating the science, Judge Sirkin came to the conclusion that, all too often in the choice between the physical health of consumers and financial well-being of business, concealment is chosen over disclosure, sales over safety, and money over morality. You might recognize this back in the date of these this is not even that far out. This is related to tobacco. Seven thousand articles it took before the Surgeon General made a public association between lung cancer and the use of tobacco. We have got to also appreciate, and we didn't hear a lot of it yesterday but, I would challenge a lot of what our colleague said about health implications from animal. We have a lot of findings that show opportunities for other, better outcomes, through other methods, which I'll get to. So we have the opportunity to extend our discourse together. What kind of society do we want to create? I love that the ethics asked us that and that Andrew says I don't want to live in a world where we aren't moral together, that we're not asking each other those deep and important questions. And we have to examine our previously unpenetrable questions. So for every action there is an equal and opposite government program. I love this picture because it reminds us that I like to say agricultural policy is health policy. It is environmental policy. It is social policy. It is economic policy. The question is, Is it good policy? What do you think. How are we doing? I don't think we're stacking up very good. Our agriculture policy is creating tremendous adverse impacts and here in Canada I think many folks had mentioned it yesterday. I think Paul was talking about the fact that we're coming out with our food policy in Canada. First time ever. One, do we care? And two, who's going to notice, and is it going to change? And hopefully it's going to inform our practice, but it needs coherence. Sadly, at the same time, we have the Minister of

Agriculture emphasizing the export of high value items like beef and lobster and other things that have all these other consequences that are understated when we look through an economic lens alone. So to my dear friend says think about it. If we can live well without causing unnecessary harm, but better than that, raising the standard together, why wouldn't we? So you might know the name James Cameron. He knows a few things about what's going on in the world. He's invested in the biggest pea protein facility in organic pea protein in Saskatchewan. France has invested in Manitoba. He's also come out in coming out with a film talking about the strength of people who are plant based athletes. Not only do you perform better, you recuperate well and there's that thing like you don't need much Viagra. Just saying. so we have challenges before us. We have to feed more people. We have to address climate change. We can't not do both those things. We also have to prevent harm and regenerate prospects and be innovative together. And as Hugo said yesterday we have to create greater stability, security, and increase our respect for our interconnectedness. So who's heard of this? Project Draw Down. Yay. More of you please take time to go to this website. Paul Hocking, from natural capitalism, lots of ideas. These are the best scientists in the world who have come up with strategies that are proving already, not only to mitigate, reverse climate change. And the top 10 for their value for climate change reversal. Here they are. Refrigeration, modification, we already have the Montreal Protocol. That could be enhanced. Wind turbines on land. Number three and number four: food. Reduce food waste. Number four, plant based. We got to do it and the beauty is it can turn the ship around. So I invite you to join with me in the journey of this wonderful group that we are developing across the world, particularly a group in North America at the moment, who are plant rich living because we're interested in far more than diet. It's about all these lifestyle choices. So thank you very much. Look forward to you joining with me.

**Eric Darier** [00:36:37] My name is Eric. Eric Darier. I work for Greenpeace. I work for Greenpeace International. I'm not. I used to work for Greenpeace in Canada years ago. So my comments come from that perspective. Now the beauty of coming at the end of a conference and at the end of a panel you have at least the advantage of what people have said before. So I had talk but I think there's been already I think there's a consensus around the need to to act because of climate change, because of biodiversity. So I'm not going to actually repeat it. What I'm going to do instead is actually keep the PowerPoint presentation that was originally planned and I will make some general comments. So it's gonna be a bit schizophrenic but if you don't like what I'm saying can we get pretty pictures and I think you'll be fine. Just a bit of context, first, maybe on one minute on the context. Greenpeace published a report early earlier this year which basically summarizes or looks at that three sets of recent scientific data on on both climate change, on biodiversity, and on ELF issues and all the evidence shows that we have to act. I think there's has been a consensus here. We are demanding a reduction of meat consumptions and dairy by 50 percent based on the current consumption level. All right. So that means if you think of projections in 2050 it's more than just offing the consumption. We can go into details later. It's quite substantial. The the important thing is both, because I work for Greenpeace we have also you know sets of ecological farming principles. One of the slides will show you this report. You can check it as well. And one of them [...] there is a role for animal farming if we want to talk about fertilising on the farm and in that respect. So there's also part of a reduction of the other side of it. The reduction is about whatever meat is is could be consume has to be what we call better meat. And I've heard already some of the some of the possible possible of that. So I'll I'll stop there onto that. We can go back and when it is a different questions we can do it during the panel. What I've heard, I think and this is my if you want about my eight aspects or eight comments on this, what I've heard so far is that it is very important to avoid single bullet solutions. I think we have to think of systemic solutions. I think that's really really the key elements there. Secondly I think this issue of information deficit. We think oh if we add and we are also guilty at Greenpeace I don't [...] we think that if we have the best science things will change, people will get aware of it, policy makers and things will act. Well it doesn't. Unfortunately you know we can regret it but it's this situation. So we have also to understand who have the powerful economic interest beyond beyond both situation. So let's not think that, and I'm not aware of it but, more data will necessary lead to action. [...] Thirdly keep it simple. Let's not reinvent the wheel. I know you know. I think there is a lot of focus on technology technological fix solutions, but I think we should also be aware that there are social innovations as well. So let's also focus on this because it's easier maybe to raise capital for social technological innovations rather than actual social innovation, for example, which are probably a key element. Fourthly, yes there's a climate climate change crisis. But there's also another crisis which is a serious shrinking of a democratic space, not only south of the border. I work globally I can tell you in Philippines, India, maybe soon in unfortunately in Brazil, Turkey and ever less it goes on and on. All right. So we have to be also aware of that aspect because it has a huge impact on the kind of solutions and to whom we're talking to. To whom we want to change. So I think we have to be to be really aware of that. I've heard also lots of emphasis on we have to tell individuals individual consumers to act. Well yes but you know there's only 24 hours a day. You know we can't be on constantly become Ph.D and experts on every field. So we putting a lot of burden of the individual consumers. But people are not only consumers. People are parents, citizens, you know. So we have also to change the way we frame this. It doesn't mean we don't have an individual responsibility, moral responsibility, ethical responsibility to act. But we have to make sure that we also don't forget that dimension of this. Where am I time wise? Right. Okay. That's fine. So what's happening? I think so. [...] a gloomy part. A bit more let's say, what do we do? You know. [...] What do we do? First of all, although we can be very depressing in terms of situations you know talk about the big words [...] capitalism, destruction of environment, you know we can be very very gloomy but at the same time we should not overrate that side either and I give you a good example and I think it was said in this conference yesterday. Let's not forget that 70 percent of a food eaten in the world is actually produced by small [...] farmers. I mean it's a miracle that after 60 years of industrial agriculture and chemical agriculture, and largely driven by commodities, there is still some like a billion small farmers managing

to feed the world. They are threatened by climate change by lots of issues. But it shows resilience. And when I look at the so that's the first thing you should not overstate the what's facing us as well. And also recognize that there's lots of things happening. In our food movement, when you think of it, is actually combination of small farmers in the South, it's the rise of the foodies. I mean there's an interest on around foods in there. There's issue of urban agriculture. There's food justice. There's a huge cluster and I think this conference, in a sense, has tried to bring some of those main actors. So I think we have to also see the strength in social change that could be built from this this food movement. And we have to make sure, and that's probably a contribution of this conference as well and others, to make sure it's fair and make the linkages between those different actors. Three minutes. Okay. So for Greenpeace, and I'm going to show you a little video. It's just at the end of a session it's probably a good thing. Just context, first. It's why we decided to do on this meat issue and on food generally, as a starter, it's not the end of it, is actually to address cities. As you know the world population is more and more living in cities. It's also a subnational level of government that has not been totally corporate captured yet. So there is a space, its level of government closer to people where you can still mobilize people into having a direct impact. So we decided to focus on cities, and there's a movement out there, the C40 and Climate Change. You got [...] pact on food issues, [...] which is more on sustainability. So I think there's a room, and we think there's a room, for actually getting more active and citizen mobilizing people. And then the younger people, as well, I think because of the urgency of climate change, because of what's happening politically, I think there's a new generation that is happening. So I'll stop there. It's a short video. It's cute. Was going to say it's cute little video which explains and you'll probably see some elements of what I've said in that video. So let's go.

**Ryan Katz-Rosene** [00:47:32] So thank you very much to all of our panelists and thanks for the cute video at the end there. I think what we'll do is we'll we'll start off by allowing the panelists if they have any reflections that they'd like to state before we move to the audience. If there's anything that that kind of came up during some of the other presentations that you'd like to touch on feel free. It looks like Kathleen you have something to say.

**Kathleen Kevany** [00:48:01] I'm happy to add because I love the ideas that are percolating here and I have to share with my colleagues that I've been changed in the thinking that I've enjoyed really very much this diverse perspective so I think the work that people are doing and using animals more responsibly is necessary. And certainly the drawdown gives all of those suggestions that you had. They're all in the top 80 actions that are already happening. So we just we need to do these things more logically and strategically and certainly far less. Certainly reducing meat. I think some would go so far as the wild as I do and be plant strong. But I think we have a lot of strategies together.

**Ryan Katz-Rosene** [00:48:41] Did any of the other panelists want to just have any reflections before we turn out to the audience?

**Gabrielle Bastien** [00:48:52] Yes well I just want to point out that yes I think we all agree about the fact that we need less industrial meat. You know the the way that the vast majority of the the way that the vast majority of the meat around the world is raised is highly detrimental to the environment. So I think we all agree on that. And then I think we can use. Yes. You know cattle strategically and other types of animals as well in systems to actually really regenerate or land. I'm not really well versed in terms of you know the global numbers of you know how much land we would have to you know what how does that translate into our actual meat consumption. Are we eating too much of it at this stage? I've heard a lot about the fact that we are eating too much about it yet, in other discussions yesterday from Diana Rogers, namely, we heard that we're not actually eating that much meat, we're producing a lot of it, but the end result to what we're eating is not necessarily that much per capita. So yeah I'm not necessarily an expert on that but I do I do know that there is a huge opportunity to yes regenerate degraded degraded land. And yes which current production to to do better.

**Ryan Katz-Rosene** [00:50:08] Jeremy or Eric anything to add? OK. No shortage of comments and questions. Maybe what we'll do is take two questions at a time and and if you want to direct your question to a specific panelist or to the panel at large maybe you can indicate that and do us a favor and tell us who you are before you ask your question. So we'll start with Carl and then back there.

**Audience Member #1** [00:50:34] Thank you Carl Tatum and Soil4Climate. I have a question for Eric. You mentioned that Greenpeace is interested in in cutting in half the livestock population, and I'm wondering what is Greenpeace's, now that we've heard how important grazing is for healing land, getting carbon out of the air and so forth, how does Greenpeace propose to pull down or draw down the 300 billion tons of carbon in the atmosphere in a timeframe consistent with the preservation of civilization without regenerative grazing?

**Ryan Katz-Rosene** [00:51:07] Thank you. And Shannon there's a question at the back.

**Audience Member #2** [00:51:15] Hello my name is [...] totally an outsider, so my questions will be like lay people's questions. But yesterday Jodi raised the IPCC report that we have 12 years. A couple of days after that report we had another report, at least in the UK, I don't know whether it was heard in Canada, but I'm just wondering whether we are not using the actual numbers we should be using. That report said we need to be reducing our meat consumption by 90 percent, not 50 percent. And I'm suspecting that we are using the 50 percent not to scare off the people. So

this is just a comment. The later report say 90 percent. But I just have a very quick question to the second speaker. I'm a lay gardener and I'm told no dig, add your compost, everything that you said to regenerate the earth but I'm also told I shouldn't be walking on the soil at all if I want it to be regenerating and I'm hoping that I'm lighter than a cattle, let alone their whole herd. So how does it go together? The idea is that you can just let loose a herd of cattle and still be able to regenerate the soil. Thank you.

**Ryan Katz-Rosene** [00:52:26] OK so I'll turn to the panel now and see if we have some answers. So starting with Eric.

**Eric Darier** [00:52:35] Yeah some of. Okay the first question on the 50 percent reduction. Right. I think it was just to. First of all it was to acknowledge that getting out of fossil energy, only, would not be sufficient to address climate change. Right. So it was to address the issue of meat consumption. I mean if we don't do anything on the current scenarios by 2050 agriculture will represent more than half of the CO2 emissions and about 64 percent of all that is animal is animal, basically is livestock, or meat consumption. So we have to deal with it. The reason over 50 percent right, it's important to understand that there are [...] we are a global organization. We have to be aware that there are a lot of pastoralists in the world [...]. So we are not saying up to people to become vegan or vegetarians. Although we should thank vegetarian and vegans to do their contribution there. Right. I think we have to be aware. And then in the ecological farming principle one of them is about fertilisers. Right. So if we want to get out of oil based fertilizers we have to also think of the role of animals on farms are fertilising but also on other aspects of of agriculture and the kind of ecological farming. I think that was that. Yeah I think on the issue of carbon. Yeah I think it's we have to to to address it but we have to be aware as well that you know as was said we should be aware not putting too much on single solutions. All right. I know carbon sequestration is a is one of them has been [...]. What we know and we can maybe have a conversation beyond this this meeting is also to understand that carbon in soil is not necessary stable over time. All right. So I think we have to be also aware of it. There are so many factors basically in this. And then there's the politics of it. We know in international negotiations there's a lot of pressure also to put a price to carbon in soil. Right. So there's a lot of mechanisms there and we have to be very cautious and I think lot's of countries and lots of are not going down that route because if you start putting a carbon price in soil you can just imagine which big company will be very keen to offer solutions to farmers. Some farmers, not the small farmers in the South who do it. So I think there's also a political dimension of this. But regardless of this technical point I just want to really say that ecological farming, organic farming, regeneration agriculture, all work together to a more holistic approach to it. And if we manage to put the carbon in the soil, fantastic as well. But let's also look at the broader issue as well. So that would be my my my support. But we can carry on of course.

**Audience Member #1** [00:55:46] But to answer my question specifically, how does Greenpeace propose that we remove 300 billion tonnes of carbon from the atmosphere? Thank you.

**Eric Darier** [00:55:55] I think again I think it's. I mean I can't go into the figures right now. I mean I can give it to you. I work on food issues, not on climate issues per say, but I can give you and put in contact with some of our some of our experts on this. Yeah I mean [...].

**Ryan Katz-Rosene** [00:56:16] Gabrielle.

**Gabrielle Bastien** [00:56:17] Yes. Yes so to answer your question about walking on your garden and how does it make sense for a cattle to roam on land. You know I would guess it's really a context matter so you know say your garden it's a it's a market garden, its annual plants, so you know it wouldn't be recommended to have cattle walk on your market garden either. But on grassland, was that not your question? Sorry what? I can't hear.

**Audience Member #2** [00:56:47] It's also perennials.

**Gabrielle Bastien** [00:56:51] Okay. So what are you what are you growing specifically? Right but on a grassland you know it's it's perennial grasses that have been like we can walk on grasslands and it's not really a problem. And even if you have a herd of cattle that are there for a very limited period of time it causes a short intense disturbance, but then the whole concept of holistic management is to leave enough recovery time so the cattle don't come back to this plot until you know sometimes months later, depending on the conditions, and that's how it was done in nature previously and that's a way to regenerate soil very effectively so you know they graze the grasses, there is sometimes a little bit of root die off, but then the the plant is prompted to grow back very quickly and it has a lot of recovery time. The trampling also stimulates you know it stimulates the composting process by putting some of the grasses back into the ground, favoring some mixing, there's some mixing with the manure as well. So it's different than it might be in your garden whether you grow perennials or not. That's my understanding of it at least.

**Ryan Katz-Rosene** [00:58:10] Jeremy did you want to add on that. I think that.

**Jeremy Pittman** [00:58:12] Yeah I would just say that I would support all that. It's the way that these systems evolve there was kind of large ruminants walking on them and like you're saying they can actually play a role in helping cycle some of nutrients down to the soil as well. Kind of like really targeted, Intense disturbance, but then not for a long time too. So I would just echo what Gabrielle is saying.

**Ryan Katz-Rosene** [00:58:34] OK we're going go to the front two questions. Oh yep. OK.

**Audience Member #3** [00:58:39] Oh hi. So most of us who are proponents of animal agriculture are admitting that you know industrial scale animal agriculture is not the solution and more regenerative. But I'm not hearing a lot about industrial scale plant production and how damaging that is. And one of the worst things for climate and for carbon emissions is actually tiling. Much much worse than than the numbers that are attributed to animal agriculture. And I had a couple of points about some of the methodologies used for the land and the water numbers. So the land numbers it's really hard to see land for cattle versus land for lentils when we know that more cattle are grazing a land that can't be cropped, that most of our agricultural land cannot be cropped. And so to compare lentils on land that can be cropped when we couldn't be cropping the land that that cattle can be grazing on it's it's unfair. Similarly with the water numbers a lot the exaggerated water numbers that I saw up there are based on green water, not blue water. So green water, as I'm sure you know, is rainfall that would have fallen on pasture whether or not the cattle were there, whether or not the cattle eat that blade of grass that the water fell on. Rice emits more methane than cattle, and I'm not seeing anyone arguing for rice free Fridays and the livestock long shadow numbers of 18 percent have been retracted. The EPA's more recent numbers are 2 percent from livestock and there have been models looking at what would happen if we eliminated all livestock production from our food system. Nutrient deficiencies include B12, calcium, iron, zinc, long chain fatty acids like EPA and DHA, and vitamins A and D. There are very serious health consequences of B12 deficiency including permanent brain damage. There have been deaths in babies from this and there are countries looking at making it illegal to feed babies a vegan diet. And there are a lot of genetic reasons why some people might do better on a plant based diet, but almost half of the population cannot convert beta carotene to vitamin A. So you've got right there almost half the population would be deficient. So there's a lot of health consequences from only a plant based diet. Humans are omnivores and I think that we need to be looking at plant based agriculture as critically as everyone's looking at animal based agriculture.

**Ryan Katz-Rosene** [01:01:32] OK thanks Diana. I think we'll I think Donald you had your hand up before and then the next round we'll go to Kate.

**Audience Member #4** [01:01:40] Thanks Scott. I also wanted to add some complications to sort of all sides of the debate, plant versus animal agriculture and different sorts of animal agriculture. But I wanted to ask or just complicate the scenario or the situation of the considerations with regard to the water footprint first. It's an unfortunate fact for proponents of extensive animal agriculture that the water footprint of extensively raised ruminants is even higher than the water footprint of industrial confinement ruminants. The reason for that is that the feed conversion of confined ruminants is so much higher especially when there are pharmaceutical inputs. And so the feed conversion is so much greater in comparison to grazing. However, adding to what Diana talked about, my understanding, and I've looked I've traced back through the references that philosophers cite about water footprints, is exactly what Diane was saying that it's mostly green water that makes up the water footprint that's commonly cited and that is the amount of water that is evaporated from the soil and transpired from the crops that are grown for the animals or the forage that is grown for the animals to graze. If you compare the water footprint of the crops or the forage that's grazed to a more natural habitat, whether it's a grass habitat or whether it's a forest habitat, they're comparable. So the net loss of water from grazing ruminants is about zero in comparison to a more natural habitat. Second, with regard to the greenhouse gas emissions, to complicate this dialogue as well, most of the greenhouse gas emissions figures, as I understand them, come from an assumption of the current mix of agricultural practices and assumes the conventional agricultural model mostly, and of course therefore ignores the salutary effect of the sort of regenerative processes that we've been talking about to sequester carbon in the soil. And again I want to, in connection with greenhouse gas emissions, question our focus on food. If you consider the greenhouse gas emissions associated with one round trip flight in one year from Chicago to London. Compare that to lamb is sort of the worst methane emitter that there is. And compare the greenhouse gas emissions from a round trip flight once per year that I mentioned in comparison to eating two extra quarter pound lamb burgers per year. It's about the same. So that seems to be if the greenhouse gas emissions associated with two extra lamb burgers per day on top of one's normal diet is a good reason not to do that. We really ought to question our common practices especially for academics. Totally within the realm of normal to take to travel on that in that in that way.

**Ryan Katz-Rosene** [01:05:01] And maybe I'll. OK [...] I was going to build on that but I'll hold off. Yep. Go ahead Kathleen. Oh. We'll start sorry we'll start with Kathleen.

**Kathleen Kevany** [01:05:16] You're raising some really good points and I think we have the opportunity to look at data that we might not want to and that is Project Draw Down. These are the most recent findings and I challenge a lot of what you're suggesting is insufficient because we want a particular outcome. We're not inclined to really hear all of what we need to hear. So Project Draw Down is one of the best tools we have. No one has come up with a solution yet. That's why Paul Hawking can say this is the most comprehensive strategy ever because we don't have one. We have a lot of problems but we don't have solutions. So in that 80 examples that are already proven they've done very cautious and conservative calculations of outcomes. So you're quite right that there's opportunities to be thinking about this differently and looking at non industrial scale. But we don't have that yet widely distributed. We have 70 percent of our world producing 70 percent of our small holders, thankfully, feeding us lovingly and we can do more

of that. So we have opportunity to really change the economic model. We have to look at neoliberalism. We have to look at world stability. These are not simple issues about food and I think you're quite right Donald. It shouldn't just be about food. It should be big picture thinking. Project Draw Down will show to you, as Gabrielle was saying too, all of those styles that you're suggesting. Regenerative? Absolutely. Agro forestry? Yes. All of those strategies are in there. They're just not giving you the bang for the buck on the top 10. They're gonna give you other benefits, for sure, but they're not in the top 10 for reversing green house gases. That's really what we're after. We're not just mitigating. We're after improving conditions. So I'll just leave it there. But there is and this is Yeah I really challenge you to go and look at the best writers, the researchers who are current in this examining that.

**Ryan Katz-Rosene** [01:07:10] Eric, do you wanna?

**Eric Darier** [01:07:10] Yeah I think I just want to to echo I think on the issue of impact of course of of plant base. With. Everything has an ecological impact. I mean it. I think you're correct. So it's not an issue of of getting rid of meat or reducing meat consumption by 50 percent only. It's also to change the system around it. All right. So it's why in my very quick presentation it was the seven principles of eco ecological farming. I didn't go into details but some of it it's like food sovereignty, diversity on the farm, diversity on the landscape, rural development as well. Right. So I think we have to look at it from that perspective as well. I think it's important to approach it from a systemic perspective. And on the issue of you know we need meat for diets or for nutrition aspect. I think we have big issues as well it's a bigger issue which is inequalities in the world. All right. So it's about all about food justice. So I agree some people might and again we can argue because I think we're all [...] we could conceive that some people might need more meat because of nutritious needs. Maybe. And I'm [...] an that one because I think we can we can go on debating. But the issue is why most people don't have access to that. So it's about food. Access to food. So [...] justice has also to be put on on on the table. And then on the issue of impact of food and meat on climate change, I think the figures are the figures are very wide because it depends how you calculate them. All right. I think the lowest one is 14 percent direct emission, but if you include land use changes like deforestation and so forth, which is necessary to feed animals, you go to 40, 42 and if you include the food system it could go higher. So I think it's pretty big chunk that we need to address if we're going to have a chance to address climate change and biodiversity and feeding people. So I think there's a wide consensus. I don't think there is no consensus on this. I think that yeah.

**Ryan Katz-Rosene** [01:09:37] Do you guys want to add in?

**Gabrielle Bastien** [01:09:40] Um well just in relation to Kathleen's comment when you said that in the top 10 there was no regenerative agriculture solution there actually is. So number nine is silver pasture in Project Draw Down. So the pasture is basically mixing, grazing of livestock with agro forestry in between trees basically. So they have very high carbon sequestration rates that are yeah that are listed in carbon drawdown in sorry in Project Draw Down. I do want to mention here that Project Draw Down includes managed grazing. That's the way they call it. And again I am no expert on the issue, I haven't looked deeply into their data, but I think there might be, again, as I mentioned in my presentation, there is science that's specifically looking at the holistic plant grazing methodology that's yielded really amazing results in soil carbon sequestration. I'm suspecting that because Project Draw Down is not calling it holistic management or holistic plant grazing they're looking at a broader range of grazing methods. Managed grazing is still listed in there. The numbers aren't ridiculously amazing but it is listed as a as a great solution too.

**Ryan Katz-Rosene** [01:10:59] I'm going to use my my I know there's a lot of comments but I am going to use my my moderator's privilege to touch quickly on figures and messaging because that seems to be an issue here. And I think the reason why I want to mention this is as we can tell, from people who are who are involved in some capacity with with forms of animal agriculture, that there is a real frustration, especially amongst regenerative farmers who are who who I have some experience and connection with with people, as I mentioned my wife is one of them, and I recognize that there was a slide that's commonly, you had Eric, that purports that emissions from the transport sector are essentially equivalent to the livestock sector. And the problem that I think what what that does is that that message drives a lot of regenerative farmers a little crazy because it's an unfair comparison. And I understand why that why organizations like Greenpeace have that very simple clear messaging because it's it's a much easier for the public to digest the message like that. But it's unfair, and it's unfair for the following reason. Basically, that that figure of 14.5 percent is an FAO calculated figure that looks at the entire sector of the livestock supply chain. A significant chunk of it is deforestation, which I think we can all agree is a terrible thing. Nobody should be cutting down trees in this in this world. But the transport figures are essentially just tailpipe emissions. And so if you if you're going to if you're going to list 14.5 percent, which is which is the sort of scientific gold standard, FAO based figures, it you're talking about an entire supply chain including even post-production and transport of sort of ironically transport. And so you need you would then need to compare the entire supply chain of the transport sector so you have to look at things like the production the building of airports and runways and highways and so on and so forth. So it's an unfair comparison and it drives the people who are using livestock in a regenerative capacity kind of nuts. So I just wanted to sort of express that and you could tell there is a bit of frustration for people who are trying to do that. So I wanted to put that out there. Kate and then Scott.

**Miscellaneous** [01:13:40] We have five.

**Ryan Katz-Rosene** [01:13:43] And then I feel free to address my case.

**Audience Member #5** [01:13:47] So I have one piece of information add to the grazing walking on the soil part. Actually the co-evolution is so cool when you look at cloven hooved animals, such as cattle and small ruminants. And when you juxtaposition them against, as example, the release of feral horses into the foothills, horses destroy ecosystems. The way in which they consume grasses is they they shear and pull and if you look at their teeth you can tell this. Cattle in contrast, they wrap their tongues around to to to pull and they do less damage to the existing native grasses. So that's the one thing, the way in which they consume it is better, and then the cloven hooves create less damage than hooves or feet so when we look at those animals in particular. There's my little little ad. My next my question is completely different. We talk about reducing meat and you're talking to all of us and I've already heard repeatedly that Canadians are decreasing their meat consumption and we're low. And then I look at the stats that I see, regarding who is increasing meat consumption, and it's developing countries who have been predominantly on plant based diets and now are becoming more affluent and want meat. Is it me or are we the wrong people to be talking about reduction of meat? And what we should really be doing is talking about developed talking to developed countries about using that wealth more wisely because the only reason that we keep producing meat for export, which is another kind of layer in this question, because it's about our GDP so it totally no I think our economist isn't here, but we're producing meat for the growing developing demand for meat. Not for us. How are we changing this narrative? We we're going to make a little we you shrink Canadian's consumption. Tiny tiny tiny dent. You shrink developing, big dent. Help me rationalize that.

**Ryan Katz-Rosene** [01:16:03] Scott.

**Audience Member #6** [01:16:08] Two things. So first to riff a bit more on the need to nuance and maybe be cautious about small is beautiful romanticism and the figure of 80 percent of global food production being produced by smallholders. I don't pretend to be an expert in this area, but I do know that a new publication came out in global food security this year, which purports to be the most comprehensive of its kind, and revised that figure significantly downwards to about 35 percent. So I think you know I'm not saying that's the last word but maybe we need to rethink that figure. The second is for anybody interested in the soil carbon sequestration in rangelands, so the panel and anyone in the audience. So I mean I support ruminants in extensive grazing systems and things like that, for the agro ecological and biodiversity reasons, on the climate bit though I mean there it's a saturation curve for carbon sequestration, right? So there's going to be a point where it tapers off and depending on the stocking rate and the level of methane emissions it could eventually become a net carbon source. I've heard that concern raised in the literature, I've never seen a satisfactory answer to it but I don't pretend to have looked into it systematically so I'd love to hear anybody else's thoughts on that. And like I said it depends on a lot of things, the feed, stocking rates, etcetera. Thanks.

**Ryan Katz-Rosene** [01:17:31] Eric.

**Eric Darier** [01:17:35] Yeah I think the issue of the climate change and the accounting mechanisms. Cause I think it's also how you present figures of CO2 emissions. And I think for historical reasons the international community looked more at the source right so it's about about fossil energy fossil energy and so forth. So it depends. It's why there's controversy. Not a controversy. It's because it depends on how you look at the data. So you don't want to do a double counting you know because that's some of the issues you raised there. But the 14 percent figure. You know it's also to it's a way to also send a message that we should not ignore the issue around meat consumption and food. Cause we it's something which you know we have to also you know tell that message as well. Cause so far I mean things are changing fast. The last three four years I think it there's a momentum now. I think it's also too a way to illustrate what it is. So I think that will be bad. I don't think it's um I mean we'll have to talk a bit more about why farmers might and I can see why because it's you know it's the core business. If it's the meat and you feel really under attack.

**Ryan Katz-Rosene** [01:18:54] Well because it's a comparison to the transport system which is entirely based on fossil fuels and methane and or sorry carbon dioxide emissions from fossil fuels and even methane, fossil methane, is very different than bio-genic methane which is produced by livestock. And so that nuance can't possibly be translated in a simple message. And again I understand why why there is a motivation to to to produce a simple message, because it's easier for people to digest, o pun intended, but but it's problematic because it lacks that context, lacks that nuance, and you know one of the foremost climate scientist Michael Mann, who, he doesn't eat meat for personal reasons, but he says really the climate prop from a climate point of view it's fossil fuels. We need to tackle fossil fuels and so.

**Eric Darier** [01:19:47] No I totally agree. I'm from Greenpeace and I mean most of our campaign effort is on getting out of oil so I'm totally with you on this. But because of the urgency, and there was a question of the urgency, of dealing with climate change it's also about tackling the others. And I think it's why we have to stop it. I know it's we tried to reduce things. We say okay let's go to the first challenge because we can't overwhelm people, it's too depressing, and all this. But I think especially on the issue of meat reduction it's something which is at the same time very easy. I mean it's not something we don't have to reinvent the energy system. It's something we can do quickly. I mean quickly. Theoretically. I'm saying I'm not saying it's easy and the psychology and the way people actually

behave. But it is quite easy even if it seems now maybe something really difficult to do for cultural reasons. So that's the first question of his answer. Well yeah maybe I'm not answering all the questions. North south. Yes. North south. Yes even if consumption of meat has gone down in the north, I mean, look at the figures. Yes it's gone down but I mean, help me, some people have figures here. I mean is it 90 kilos of meat in Canada? A bit more in the US? Still even if it's going down. What is it? Anyway. I mean okay let's not go to the figures but let's say it's a fair amount. I'm aware of a Chinese figure which is going up and it's probably about 40 or 45 or whatever it is. Right. So. So we have to be aware of that. So the challenge is indeed in the expanding market in the south. But let's think it's the same thing with climate change you know. I mean if you look at from a south perspective it's a very you know. OK. The north has been eating meat, it's a symbol of wealth. And now you're telling us we can't eat meat. Again it's why the justice aspect of it has to be really really talked about. And then the if you want a moral or ethical aspect from our perspective, if we in a rich country where we still eat a large quantity of meat we don't show the example what chance do we have? What chance do we have? I mean that's bad for every one of us. And just to put another twist because I didn't answer the full questions on why 50 percent and I would just want to go back to this I just want to give you it because I deal with India. And just to show other things as you know there's an internationalist government in place. It was you know on papers a good way against meat eating meat all right. Of course we know it's totally our fault because we quite export a lot of meat in the Middle East. Right. Right. So I think it's also that double edge. But the issue of meat eating in India, for example, is now being instrumentalized by internationalist government to do Muslim bashing. So we have really to be aware of that dynamics as well and not looking at only from the north perspective because it's quite dangerous situation currently. So the situation is that now young people in urban settings wants to show let's say disagreement with the current government, you know, is actually saying oh I'm allowed to eat meat as kind of an active resistance. It's how it's twisted. So I'm only giving these illustrations to show the complexity of the cultural-political context in different context. Anyway I'll stop there but I think it's to give a bit more.

**Ryan Katz-Rosene** [01:23:46] And because we only have about less than 20 minutes left I'm going to ask the panelists and questions to be short and specific.

**Gabrielle Bastien** [01:23:55] I'm gonna answer the more simple question of the carbon sequestration rates, the issue about saturation, and your question about would it become a net methane or carbon source. So one thing that's important to keep in mind when we think about carbon sequestration is the depth and that's a really complicated question because for a very long time you know we've looked at shallower depths but we know that in grasslands you know the roots go very very deep. And so you know supposedly it could potentially keep sequestering carbon at a meter deep or even more. And so we haven't looked at all those intricacies of how deep the carbon sequestration happens. So potentially you know at shallower depths it you know it does plateau after a while. But many scientists have supposed that you know at lower depths it keeps building topsoil and building soil carbon. And actually I'm saying that they have supposed but maybe the science is further than I think I. Again I'm not an expert on this I know what the questions are and the both sides of the arguments but I'm not sure where the science is at this point. About I'm glad you raised the methane question because I wanted to add something about what I said in my presentation. What I presented about Christine Jones and you know her raising the bacteria that degrade methane in the soil and because by the way methane in cows it's their burps it's not so you know when they're when they're grazing it's actually going directed in the soil. I don't think there is a scientific consensus at this point about, you know, methane all being degraded through this process or or I'm not even sure about the proportion. So yes potentially there's still a proportion that's not degraded and that's being emitted. But I want to raise that there was a recent study by Paige Stanley in 2013 that looked into, you know, even with the methane emissions, even if we consider all the methane emissions from these cows, well the carbon sequestration rates that they yielded from their study are from doing holistic plant grazing way more than offset, you know, those methane emissions. So it was still a net positive impact in terms of greenhouse gas emissions.

**Miscellaneous** [01:26:26] I would just say I think we need to think more about [...] when we make those comparisons. So even with the deeper soil that that's something that you might hear. But is that changing or is it just buying more [...] and I don't know the answer.

**Ryan Katz-Rosene** [01:26:43] OK.

**Gabrielle Bastien** [01:26:44] Just simply through pure logic like when you look at grasses, you know, they're not going to keep building biomass forever and keep you know so but they're still performing photosynthesis on a daily basis right. So those carbon compounds that they're producing they are channeling it in the soil to feed the soil microbiomes so that that carbon is going somewhere. They're not stopping to do photosynthesis and they're not growing to be tropical trees. So my logic tells me that it keeps sequestering carbon. But I'm not sure.

**Ryan Katz-Rosene** [01:27:19] Kathleen or Jeremy, anything to add?

**Jeremy Pittman** [01:27:21] I'd just add maybe quickly to that. I would just yeah echo it. There's a lot of uncertainties around different elements of it but does still seem to be a good idea. You know? On the timing thing one thing that's that's we think about a place like the prairies where the climate's really variable on those photosynthesis rates, year

to year, or even month to month, they can be really different. So it's just that that timing issue is one thing that I think we do need to think about a little bit more. But again there's no consensus on how it works. You know it's kind of it's a tricky thing right and it's as we started doing these things and monitoring how they progress I think we'll learn a lot about them, you know. But that's probably the next step.

**Kathleen Kevany** [01:27:58] I'll leave time for [...]

**Miscellaneous** [01:27:59] OK. We have an order of five right now so we'll see if we can get through. So we'll go here, here, the back, and then Jody, and then Seth had his hand up and then we'll see if. You're good? OK. So we'll see how many we can cover.

**Audience Member #7** [01:28:16] Hi Goretty Dias. One of the most fun things about working with food is that it's so complex. And Kathleen mentioned the system approach to things and what I'm finding is probably we all have a bit of the truth or science but we're not putting it all together and the problem is like we probably need a few hours now to see OK. You know this. You know this. Is there any contradiction? But I think there's probably more agreement, than disagreement, around regenerative agriculture and animal systems. But we also have to there's a couple of things we need to clarify. We keep talking about meat as if it's protein. And protein, I said there's twice the protein not twice the meat that we need. And I said that in Canada we consume twice the protein because it also comes from milk and other sources. Yeah I mean it comes from all kinds of sources. When we talk about the amount of protein and not all of it's of course the same digestibility. And we also keep thinking about this or that. And it's reduction and sequestration, right? Seventy five percent of greenhouse gases are coming from fossil fuels and it's but the question of livestock and meat is more. It's not just about climate change. There are other aspects of animal agriculture that are negative if done wrong. And I said yesterday that the reason we can't support current livestock numbers and meat consumption is because of the way we're doing it. We're not doing it well. But we're also not doing plant agriculture well. So we need regenerative plant agriculture. It's not going to have to be mono cropping. We have to change the whole system. We said we need regenerative agriculture. I think we all agree with that. Right. So the other thing and I don't wanna talk too much. I said there are a billion cattle in the world. They're not all meat animals. So that 15 percent of greenhouse gas is not just coming from meat, it's milk, and half of that number of cattle is in India, Brazil, and China. So it's really more complex and nuanced than we're talking about so I just wanted to sort of say you know we probably have more agreement than disagreement and I do have a question at the end of this all. What is the potential of mixed cropping and other things, like we haven't touched on that, for protein because we're talking about we need mixed systems, we need livestock systems, in certain situations, but I think if we went to a very clear you know OK if we're talking about grassland regeneration there's only so many animals still like we can't keep the same amount of beef with that. I don't think, for example. But so we do have to look for other sources of protein and to do it right if we don't want to be feeding grains to other animals like chickens and pigs and whatever else. So what is the potential there? Does anybody have any thoughts on that?

**Ryan Katz-Rosene** [01:31:41] And Brent?

**Audience Member #8** [01:31:42] Sorry yeah Goretty said what I wanted to say. I just wanted.

**Ryan Katz-Rosene** [01:31:46] You can pass.

**Audience Member #8** [01:31:47] Yeah I think that that we're comparing apples and oranges. So the plant pro plant people are saying eating a plant based diet is better than industrial meat and the meat people are saying eating regenerative meat is better than industrial plants. So my question is [...] Yeah. So my question is how can we change the dialogue to to from these poles to people should eat good meat, people should eat good vegetable protein. And I think because also people are usually more motivated by a positive message: you should do X rather than you should not do Y.

**Ryan Katz-Rosene** [01:32:25] Right. Quick quick comments from the panel.

**Jeremy Pittman** [01:32:35] Can I speak to that can I speak to that one quickly just about the crop mixing? That's that's an interesting thing. Yeah and like I'm kind of torn in terms of how you might approach it like you look at a landscape and then you think about having this mix of crop across the landscape but you're still in one place it's just one crop but it's you know that type of thing? Versus like I mentioned we started growing lentils some people actually you can inter crop it with wheat you know and you know the combines we use can can sit them out differently and all that kind of stuff like the technology's there it's been there for a long time. I don't know like some people did that. I don't know why they stopped exactly. You know. There is this one really prolific ag extension guy Kevin Hirsch who used to do that and you know like basically everybody listen to him for everything else except for that. So I don't know why but.

**Miscellaneous** [01:33:19] [...] You've got Manashaw out of south east Saskatchewan. She's only been able to get eight thousand dollars over five years for her inter crop flax chickpea experiment which reduces herbicide use and basically the only chemical filter using is that the the front end fertilizer. But the hegemony in agriculture is we do

things this way. The box is so tight that you look at a yield drag of any kind, if i've got to modify my equipment, the assumption is that farmers aren't going to do it. We've trained them to be our little minions in this way. They're not [...].

**Kathleen Kevany** [01:33:57] These are all great comments and great questions so I'm just gonna touch on a few together I think. And in terms of the percentage of the world that's producing in small operations it's relative, isn't it? It's a percentage relative to the global market and it's the penetration of the agro industrial complex. And so we can see that we heard yesterday that you know they're going into places they weren't, before, modifying earlier systems so I think in reference to your point Brent that we certainly could be talking and I think also Kate you're saying who are we putting this message out for? It is a global message. It isn't just for this audience. We're not just talking about this moment in time. We're talking about we need strategies and we need really creative ones and we have to change some of what we're doing around us, certainly our personal investment in the industrial system, how many of us spend money at the farmer's market, where are we getting our own food. And of course if you're producing it yourself all the better and if you're doing it regeneratively, blessings, you know? Those strategies are all essential but collectively we're not necessarily the random sample here we are an informed population. We have got to get the message to others who are not practicing this we're helping the Weston family I love them too but they don't need our money. Sobey's and Irving, all of them, you know, we have got to be wiser as that's one panel that we're missing is a political or [...] because I think you're right. There's opportunities and [...] saying we had over in great agreement but we've got to get past the sticky points. We've got to make some changes.

**Gabrielle Bastien** [01:35:37] To answer your question Brent you know you were concerned we were comparing apples to oranges. You know I think I think we know enough by now we've heard enough in this conference to hear that you know meat is the best protein on per calorie ratio. And we heard also that having a diet that's higher in protein you know reduced mortality rates reduced I think cardiovascular diseases. You know I think that we should have a mixed diet that includes regenerative meat and regenerative vegetables. Now the the the quantities and you know there's a lot of cultural aspects in our diet and I think some people will eat more meat, some people less. But I think you know regardless of of you know with the global situation might be you know do we have enough land to do this or that if we switch to regenerative grazing already and you know there will be much less land used for growing grain for cattle that's already going to be an improvement. Anything that we know enough now to start the switch and shift our diets and we shouldn't wait to see how it translates on a global level because we know already that this is way more positive than both for our diet and for environmental matters. So.

**Ryan Katz-Rosene** [01:37:04] I think we we may have time for one or two more comments from the audience.

**Audience Member #9** [01:37:10] Just take two quick comments. Wow that was loud. Thanks thanks for that. So I'm going to hold it here. Thanks for that session. It was really good. Two things that have come up are really important so Donald's comments about academics are really important. To be fair to those of us who are not full professors, the reason why we do conferences is this is part of the metric for promotion. So full so full professors in this room shut the hell up about it and do something in your departments about academic metrics because you're responsible for the shit. So stop that. Second second thing that Donald brought up yesterday was pronatalism no kidding that's toxic and when bioethics I do human biomedical ethics no no kidding pronatalism is toxic. And so we do need to engage that. But justice came up in this session and I think it's really important to keep reiterating this. There are structural problems here about choices being made in the global south that they have no control over and we need to recognize that [...] who is a really important feminist philosopher talks about the invisible foot. We need to actually recognize that certain rational choices are rational and they're not in people's best interests and that invisible foot keeps them down. And we need to recognize that and we need to stop being so disingenuous about this. We don't get to actually ask the global south not to do what we did to build our economies. And one of the things that's deeply disingenuous and I really worry about it when it comes up in this room and discussion is we talk about this as if we can actually talk to the global south about not doing what we did. What we did gave us what we have here and there's people in this world that don't have it and want it and reasonably want the opportunities that we have. We need to have a more like uncomfortable conversation about what we did to this planet to get where we were and how we can redistribute our wealth so they don't have to. Let's not talk about what they shouldn't be doing given what we did. Let's start talking about how we can redistribute what we earned by poor misconduct or bad misconduct in a way that's that provides them the opportunities to actually live as we take for granted and wouldn't want to give up and stop talking about them making bad choices. There's structural problems here, there's justice problems here. Again two rules: don't be an asshole and leave the planet in better shape than we found it. Don't be an asshole about folks that want to have better opportunities and are stuck in a world that we helped create through misconduct. We need to talk about redistribution here as well when we're talking about choices.

**Ryan Katz-Rosene** [01:39:46] Thanks. I think we have time for one more comment or question. I think so you'll get the last one. But judging from the way the interest I think we'll probably have a lot of conversations in the hallway there after and I just while we're while Paul is setting things up I want to comment on something Kathleen mentioned. We one of the intentions with this conference is to seek the next phase of the project is the outreach component. And in terms of the policy dimensions we're going to try and get some some funding to do to get some students to synthesize some of the discussion that's occurred over these this day and a half and maybe we'll use the

IPCC sort of method for for for each point whether there's consensus on a particular issue or you know lack of consensus on various issues but that may be one way of addressing the some of the tensions and points of disagreement that we have.

**Audience Member #10** [01:40:46] So thanks and pressure on me for the last comment. And this is just actually going back to the previous comment and to Kate and this certainly is the question is yes there is obviously the challenges that are coming out of Beck and we know where are we versus what is happening in the emerging nations. What I would urge is that I think that what is incumbent on us and our responsibility is that we have to come up help with the solution because ultimately Canada has one of the most trusted and in the future as we face climate change increasingly the world will look for us for one of the most trusted food supply chains. And I think there is that responsibility and I think with it we have the responsibility to assist the world in terms of solutions and I come back to what I've been very intimately involved in and it's sustainable seafood. And what is interesting around sustainable seafood is in fact that countries like China are actually looking to us as part of helping to come up with their own solutions. So if we can come up with an appropriate solution or show leadership it will find its way elsewhere in the world. So that's my last comment thank you.

**Ryan Katz-Rosene** [01:42:00] On that note I think where we are right on time to take a break. Feel free to acost our for panelists in the hallway but let them have a chance to you know take a take a little break and get some snack. Thank you guys very very much. Join me in thanking our panelists. And we will. We will return at ten thirty five.

[END]