



INNOVATION AND INVESTMENT IN THE AGRI-FOOD SECTOR

HOW CAN INNOVATION AND INVESTMENT IN AGRI-FOOD HELP TACKLE ENVIRONMENTAL PROBLEMS ASSOCIATED WITH THE PRODUCTION AND DISTRIBUTION OF PROTEIN FOODS, WHILE HELPING SUSTAINABLE PRODUCTION MODELS SCALE-UP?

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

Kelly Bronson [00:00:09] Okay great. So. Hello everyone. My name is Kelly Bronson. I'm a Canada Research Chair in Science and Society here at the University of Ottawa. I'm housed actually in two places, even though that seems existentially confusing, in the Soc-Anthro School, here, and also at a research institute called the Institute for Science, Society, and Policy. And I'm a sociologist of technology, interested in agricultural technologies and also energy systems, but really for the past two years I've been preoccupied with emergent innovations in agriculture in digital innovations. So in big data and machine intelligence. So this panel is very exciting for me. Our panel is I guess the question that was given the panelists is: how can innovation and investment in agrifood help tackle environmental problems associated with the production and distribution of protein foods while helping sustainable production models scale up? Somewhat like Gabrielle, I'm interested in a slightly different question which is: can innovation and investment, or perhaps I'm interested to hear from the panelists perhaps in discussion, what constitutes innovation according to them? Social innovation. Is it just emergent technologies, etc.? So I perhaps we'll leave that for the discussion. There's been a change, that I'm supposed to alert you to, in the program. So instead of Joanne Booth, and now I've lost the little piece of paper, instead of Joanne Booth we have Andrea Johnston from ISED who's going to be speaking in her place. And Andrea is going to go first, followed by Seth Itzkan, who's president of Planet-TECH, as it says in your program. Jarrod Goldin, who's an insect farmer, who was here yesterday, we heard him comment, and Sarah Martin, an assistant professor with the Department of Political Science at Memorial in Newfoundland. Without further ado I will welcome Andrea to the podium.

Andrea Johnston [00:02:19] So yes I'm not a former senator and I'll bring a perspective that's a little different than

Joanne may have brought. But I'll talk to you from a Government perspective of how we're supporting protein in terms of a tech play, a global R&D investment, attraction, and where we feel that, of all the economic sectors in Canada, we are doubling down in agriculture and particularly in plant protein. So in budget 2017 and is from a Government perspective everything comes out big news comes out in different budgets. The Government announced six economic strategy tables, one in digital, one in events and manufacturing, health and bio sciences, clean technology, resources of the future, and the sixth one was agriculture. And that means that of those those are the six sectors where they feel they're going to be the economic growth engines for this country and their challenges was to recognize that with Canada's aging population and the competitiveness and productivity challenges we need to rethink how these six economic sectors can unlock growth. Without that, our cherished kind of social security systems are going to be have significant challenges in terms of sustainability in the coming decades. So that was their their challenge. So this is an industry these are industry led. It was chaired by Murad al-Katib who is the CEO of AGT which is a pulse company in Regina but a global company and he was surrounded by 20 agrifood companies as well as three or four producers and he also had a producer Advisory Council to support him. If you're interested, all of the economic strategy table reports are on the ISED, innovation, science, economic development website. So there's lots to do. And this is really about a call to action for Canada's competitiveness and innovation challenges. Their vision is by 2025 Canada will be one of the top five competitors in the agrifood sector, recognized as the most trusted, competitive, and reliable supplier of safe, sustainable, high quality agri food products, and an innovator in value added products to feed the dynamic global consumer. We will have a leading digital and technology based supply chain, and stand out as the world's favorite protein provider. And in so that's their vision and in within their vision they have a target of eighty five billion exports by 2025 and a domestic sales target of one hundred and forty billion. However, the table felt that in order to achieve this vision, what they needed was an agile regulatory system that supports innovation, provides certain needs to Government, and protects the health and safety of Canadians; a business climate that supports the scaling up of Canadian companies and makes us the top country in which to invest; a smart interconnected transportation system that is free of bottlenecks; a broadband and I.T. infrastructure accessible in all communities and by all businesses; a labor force that meets the range of skills and experiences required to achieve sector growth targets; and, access to global and domestic markets, where goods are traded more freely. So right now Government is in this pre budget period. So every department's putting what they call their Budget Ask to the Minister of Finance. They're taking what the six economic sectors have developed, they're kind of thinking which one can we implement, which ones we want to move forward, put some funds in, and expect to see some announcements on November 21st when the Government announce its economic fiscal update. And in the budget later on in the New Year because these tables have kind of definitely built a roadmap. But I think what is interesting is the discussion there about the favored protein provider. A lot of discussion about do we focus on protein and if we're going to double down in agriculture we have to even double down a bit further and focus on protein. So that was one area. The other area that's quite interesting is the protein highway. This was the brainchild of a former governor general, David Johnston, and his idea was well we have similar landmass with our Midwestern prairie and Midwest American Midwest counterparts. We have similar climate. We we grow similar proteins. It's that system of pulses for nitrogen fixing then go on to canola as another round and then go into spring wheat and we kind of rotate that and there's a lot more we can do in terms of research scientists enable to enable sustainable production, work on crop breeding, look at the research infrastructure and have industry more integrated because really that kind of Canada US highway is incredibly tight and there's a lot that they can do there. So that's pretty exciting as well in terms of the work that they're doing and they've completed a I believe they completed an asset mapping of research infrastructure between the two countries. So that's something to keep an eye on as well and the one area that I'm particularly involved in right now, and fairly excited, is Canada announced five super clusters. And we've the Government of Canada is putting an investment of nine hundred and fifty million dollars. And this is, again, where the Government of Canada feels we need to double down and focus and target our investments. So we're targeting our investments in digital, events, manufacturing, artificial intelligence, oceans, and protein. We had 50 applications and we drilled down to five. And that again shows you the the commitment of the Government to support research scientists and industry in their in their moving forward in terms of developing the the the crop breeding, the sustainable production, the export capacity because this is this is like 13. It's a 13 billion global market. And Canada has the right opportunities. We've got the global reach, we've got very strong science, we need to continue to build the value added capacity in Canada. What we don't want to do is to grow pulses, export it, and then get them processed value added opportunities in other countries. So this cluster and, as you know as I mentioned the other ones, these are those are pretty big areas as well. So the fact that the Government is focusing on agriculture protein, particularly plant protein, it is a very exciting area. Their their goals, and we're just in the last stages of negotiating the contribution agreements with the five super clusters, and it's different because it's about building an ecosystem it's not just Government giving money to industry and then determining the projects we're putting a lot of effort that there's a spillover effect. So we want to ensure that there's emphasis on talent and jobs. And so a lot of the discussion for the protein super cluster has been bringing the universities, bringing the colleges together to see how we can ensure we have the talent to to undertake these bold objectives. We want inclusiveness. The Government is committed to inclusive innovation. So were looking at opportunities to bring Indigenous women-owned businesses into these clusters. And the Government is also committed to clean growth. So there is an expectation that these broad projects enable more sustainable production. So it is exciting. In the end of the five years, when we the Government funds will move on to other areas, we expect to have an economic impact of 4.5 billion, with this protein super cluster, and the creation of more than 4500 jobs. And again, so it just I gave you three examples of where, from a Government perspective, there's a

lot of attention on protein. I know throughout the last couple of days you would have spoken about the global opportunities, the opportunities in Canada, how we can ensure we do it in a more sustainable way. But there certainly is a lot of interest from the Government of Canada's perspective, both from Agriculture and Agri-Food Canada, where I spent a decade, and then also in Innovation, Science, and Economic Development, that this is a key area where we want to focus our innovation investments, focus them in areas where we do have global market opportunities, and bring the best talent to Canada enable us to succeed. Thank you.

Kelly Bronson [00:12:01] Great. So now we'll hear from Seth Itzkan.

Miscellaneous [00:12:09] [...]

Seth Itzkan [00:12:25] Hello everyone. Good morning. It's a honor to be here today with with with you all at this prestigious event. It's, really from my heart, it's it's very special and thank you. I want to open with an apology, actually, for perhaps getting a little too animated yesterday. We've determined I just didn't have access to the Canadian CBD oil and hopefully we will rectify that. Also this is the first time, for me, to be at a conference with two philosophers and again it may have seemed that the esteemed professor, Andrew Denton and I, were perhaps getting locking horns with each other but I can assure you we are now best of friends and we have a fondness in Greek tragedies and we were wondering which Greek tragedy best expressed our situation. We decided it was not Oedipus. But but of course perhaps Ulysses and you know we all have our hero's journey, right? And that's that's what we're trying to do. We're trying to be heroes in the world and in some of us have different opinions about how to do that. So I actually let me start the timer here. I actually a couple minutes. OK. So obviously I'm defending the, well first, just to be clear so I'm representing Soil4Climate today. I have a private consultancy called Planet-TECH, but I'm here as Soil4Climate and my colleague Karl Tatum is in the front row and so obviously, from yesterday and from our comments, you know that that we are in support of of animal agriculture done right as a climate solution and we believe there needs to be quite frankly much more of it. So our disagreement is on the messaging around less meat. We would say, of course, less industrial meat, of course, but also less industrial soy and less industrial, you know, forms of agriculture in general. And for us we say the proof is in the soil. Like either the soil is getting better or it's not. And the carbon market. So again the whole investment side of this is going to be in carbon markets, or that's one of the ways, and the proof is going to be in the pudding, literally. The methodologies which are improving soil carbon are going to be the ones that are going to be rewarded and, quite frankly, it's going to be regenerative grazing on most of the earth. And there's going to need to be a lot more cows, managed properly, to restore most of the planet. And that's also where the greatest carbon drawdown is going to be from. And again, with all the respect that I could muster for my good colleagues from Greenpeace and elsewhere, I understand where you're coming from, historically, but that's not the correct narrative to bring into the future. The correct narrative to bring into the future is that we have to restore soil. Most of the world's soil is in semi arid, non temperate environments, and it needs ruminants and it needs lots of them and they need to be managed properly. Okay. That's the thesis. It's hard to see, but the land on the left is obviously the restored land. The land on the right is desertification and you would look at this and you think this is a fantasy. It's not. This is reality. I've been to this fence. I call this the paradigm fence, and I just ask you, which side of the paradigm are you on? Okay. Sometimes I open with this slide I say which side gets more rain? Which side produces more food? Which side is more hopeful? And the the zinger is, which side is four times as many livestock? Hello? The slide on the left. And how do you think they're managed? Regeneratively. And and when I go to Zimbabwe, where I've been multiple times now with Allan Savory and those crew, they're already close to five times the amount of livestock that they had when they inherited the property, and Allan Savory recently said we probably need to double that. So we're completely missing the understanding of the role of ruminants in regenerative ecology. We're just we're just in a totally different space. So I invite you to literally step across that fence into the paradigm of the regenerative future in which livestock are absolutely essential. Now, that I've been so serious, I kind of want to be a little more fun. So I'm just going to zip through these slides and there's a whole bunch here. And you know what, I gave a TEDx talk. You can find it and all these slides are there and you can see Allan's TEDx talk. But it is kind of not not the best visuals here. This is called the two tree site. Bare for decades. Okay. Now they increased the livestock by fivefold and they managed properly, and now look. The land is coming back. That's me. And I say don't tell me it doesn't work because I'm standing in the efficacy. All right. And when you've stood in the efficacy, I'm sorry you just take these things personally. You can't hear the message that it doesn't work when you've stood in the proof of it. OK. So I just want to get on to something more fun. The whole thing about water is confusing, because when you restore soil you get more water. That's how you replenish the water table. So we need people to talk about we want a broad view. Yes exactly. OK. I just want to get through this quickly because there's all this data is out there, all these papers are out there in terms of what the draw down can be. I'm saying, basically, between 25 and 60 tons per hectare and when you do this globally the amount of grazing lands it's available 88 to 210 gigatons, or about 41 to 99 parts per million, draw down through regenerative grazing on depleted land. Tara Garnett didn't like that and she called me out on it specifically. I'll be happy to debate her about this anytime anywhere. If people know her and you want to set it up. Please let me know. But now I want to get to the a little bit of a fun. Okay. So this is just a picture of how we think about the future. This was a real cover of The New Scientist magazine. This is how they ended the last millennium, 1999. They said the next 100 years and all this doomsday stuff. This is the actual cover from their magazine and pictures of how everything is gonna be so horrible but geoengineering will rescue. And I was just so upset I took out my copy of Photoshop and I just remade the magazine. Okay. But I so, you know, how we think about the future is important. And so thank you. So this is okay. Now I want to get to the fun part. Okay, because

we're at the Alex Trebek forum I thought I thought we would just quickly, you know, for a little bit of fun, play an episode of Future of Sustainable Protein. And this I wrote the questions and the answers and I'm the moderator so you need it you need to answer it the way you think I would answer it, not necessarily the way it might be true. OK. But but I. Everything I say I, you know, say scientific scrutiny will will prove it out. OK. The answer. The future of protein. Let's do do two teams. Let's say the left side and the right side. Left side. What's the question? That's good but that's not the answer I'm looking for. The future of protein. Yes. Yes. What is regeneratively produced meat? Very good. Yes we get the ding. Next one. The answer: the place where most atmospheric carbon will be sequestered. What's the question? Yes. Very good group here. The answer: a method of management to assure livestock get to the right place, at the right time, for the right reason. What's the question? Yes. Very good group here. Holistic plant grazing. Answer: synthetic. Ooh I make it. I don't know. A synthetic fake meat product that purports to be the future of protein but isn't. OK. Well that's good enough. It's what is beyond meat. And then the last one, the answer: this financial instrument, abbreviated CRC, and created through open source block chain technology by new companies such as Nori, oh I'm sorry, that should be Nori, is central to carbon markets. What's the question? The last Jeopardy question is always the toughest. Consider this double jeopardy. Doo doo doo doo doo doo doo doo doo doo. Abbreviated CRC, that's the give away. Come on you could take out your smartphone and look it up. All right. Okay what is a carbon removal certificate? And and because this is the forum on an investment. Please look up Nori, N O R I, and look up block chain technology and carbon remover certificates. And they wanted wanted to be very careful to use the term certificate versus credit. There's nuances in the differences of language there. So our proposition, also, is that the carbon markets, and using technology and companies like this, will be part of the investment strategy for drawdown and that regenerative grazing will actually be one of the cash cows, if you will. Thank you very much.

Kelly Bronson [00:22:52] Thank you Seth. Okay so now we have Dr. Jarrod Goldin, president and co-founder of EntomoFarms, who apologizes. Do you want to tell them? He has to leave right after because he's running to catch a plane.

Jarrod Goldin [00:23:07] Yeah I was. Again thank you for the organizers and Ryan and Shannon. It's been a fantastic couple days and it's been lovely meeting everybody and I appreciate the passion and the love and everybody's commitment to, I think summed up very well, to not be an asshole and leave the world in a better place than we found it. Maybe the most important thing I am gonna take home and certainly underscores the way I try to live my life. So before we get started I think a kind of framework or context I want to offer about this whole edible insect business, paradigm, new protein, is really to look at it, maybe and in an analogous way, to the way in which we've learned that working out in the old traditional way isn't the best way to maximize strength or fitness or cardiovascular health. That doing things more dynamically, or in different ways, may improve, you know, your efforts when you're going to the gym. So I think the question, first, is can edible insects play a role in improving people's health and health outcomes? Is it a food that can act medicinally? Can the fiber be of benefit to the gut biome? Can the protein be absorbable? How much more absorbable, or if at all, compared to meat? What about the other macronutrients and micronutrients? So studies are already showing that in certain situations, like with iron and magnesium, manganese, copper, and zinc, that the concentration of these minerals was much higher in the crickets than meat, but more importantly, it was far more bio available. So already there's anecdotal evidence to suggest that edible insects are really, really, healthy, and that their nutritional value is excellent and there may be clinical benefit. An observational study found, in communities where they eat a lot of edible insects, there was very low incidence of autoimmune diseases. So there's universities in Israel that are now looking at whether that there's a positive correlation there and those are some of the reasons. So that's kind of the framework. It's not to disrupt the meat industry, per say. It's not, like we've discussed earlier on, and you know that these are contrast. It's either this choice or that choice. It's not binary. If edible insects are healthy for you the same way water is, maybe you want to drink more water and maybe you want to eat more insects. You can still eat steak, you can still eat fish, you can still eat chicken, no problem. You know? All this is is an opportunity to give people another choice about food, that may be healthy, that most of us in the West have largely dismissed for all the wrong reasons over the last few generations. So. So that's the context here. Given that this panel is really around investment, I'm gonna try kind of share our journey of you know over the last four years of how we started, the money we raised, who our investors are, and kind of where we've landed today. So EntomoFarms was founded by myself and my two brothers, Darren and Ryan. They had been farming insects for about 10 years for the reptile business, for people snakes, and bearded dragons, and stuff like that, and the bait industry, and they had they have a wonderful company that's been successful doing that. I was always envious and wanted to join them in business. We're one of those weird, tight, close families. And I was just looking for that opportunity. My background is in chiropractic. I've been in health care. Witnessed the association between what people eat and how healthy they are, especially with respect to musculoskeletal health. And they were having much too much fun without me. So when the United Nations and the Food and Agriculture Organization put out that paper, that was referenced in another slide yesterday, titled Edible Insects: Future Prospects for Food and Feed Security, and around the same time a gentleman was on Shark Tank pitching a protein bar made with this stuff called cricket powder, and my brothers had already been kind of looking into it a little bit and did some studies with Guelph and I called them up and I said this is this is it. The three, they used to be three ducks, now they're three crickets, they're in a row. This is our chance. Let's see if we can convince an investor to make a small investment and let's start North America's first human grade edible insect farm. And let's see if the United Nations you know if that fire can really underscore an opportunity to get us started. And that's what we did. So we started with 5000 square feet. Now we've heard a lot, over and over again, that edible insects are eaten in 80 percent of the world, billions of

people eat them every day, and they are a complete protein, they have all essential amino acids. Again, when comparing cricket powder to a steak they're twice as high in protein. Meats about 30 percent, crickets are about 60 percent. So maybe crickets are the most efficient source of protein and it's not red meat. We have to look at digestibility studies and that kind of thing along the way. But the exciting part for us, and I can tell you for our investors, is not necessarily the protein piece, because as we've learned, most North Americans get enough protein, albeit perhaps it's not the most sustainable source of protein, and again that's not the emphasis of the argument. But, what we are is fiber deficient, and it may be that the [...] and [...] fibers in edible insects are the best source of fiber for the human gut biome. How interesting would that be? And a lot of the root vegetables, that had far superior fibers than the vegetables we have today, we don't farm anymore, and yuca root is a good example of that. So they have a you know a complete nutrition profile. I think the iron and B12 and fiber are perhaps the most exciting elements of their nutritional value. They use less resources than than meat and other livestock. How much less? We've got lots of work to do to figure that out. I don't even think that we understand the grey, the blue, and the green water associated with meat farming and insect farming I'm sure it's less. Is it 10 percent less or ten thousand percent less? I'm not sure. But if we look at average numbers that are out there and what we've learned today, if a family of four chose to get their protein from insects instead of red meat one day a week for a year, so in the morning they put some cricket powder in a muffin and in the afternoon they sprinkled some crickets on a pizza and in the evening maybe they made a chili with some cricket powder, that family would save about 650000 liters of water a year. So if you begin to extrapolate that and that's all all forms of water and that's again just using the average numbers that are out there from the WHO and maybe maybe they're not exact but I think they're a framework to start with. So we are being inundated with researchers all over the world, master's students, Ph.D students wanting to study all elements of this. One of the most exciting pieces is, the HNRCA, at Tufts University, brought academia, industry, and the Government together and we put out a white paper, that's in the Journal of Nutrition, that underscores a framework for how should what is the pathway to research look like for this category and let's get some collaboration going and accelerate accelerate the research. That's my brother Darren and he's holding up what's called a cricket condo, so we grow these insects in retrofit chicken barns. We have now almost 80 thousand square feet of retrofit chicken barns. And then we have a processing facility, which isn't a processing facility, because processing means you add or you remove something from the food. We don't. We we rinse them, we dehydrate them, and we grind them. So I don't know what word in English to use for our process, because it's not processing of anything. It's a whole food that's unprocessed, which you look at the ingredients and it just says cricket powder. So how many packages in a grocery store have one ingredient on their list? Milling. So it's a milling facility. Great. Thank you. Two things I can take home. So that's what the chicken barn looks like now. In each barn there's about 35 million crickets, so we have over 100 million head of cricket. Maybe we're the biggest farm in the world. I'm not sure. Our livestock's pretty small but but that's okay. Here's what it looks like inside. So these are the cricket condos. The one on the south side are much more expensive than the ones on the north side. They're closer to the lake. And they're essentially free range. They hang out, they hide, they eat, and they drink. There's no stress. They live their full life cycle, which is about six weeks, so they would die in a couple of days if we didn't cull them anyway. The basic grains for now and a water trough and that's it. And you would know if they're happy and you would know if they're stressed out. If you walk in there and there's very little movement they're happy. If they're stressed, they're jumping all over the place. And it's only the male crickets that are mating that chirp. And my brother always says, you know, one chirping cricket in your house can drive you crazy but thousands of them up north sounds like a symphony. So here we're really a business to business business. I think we would love to model the sun ray Sunmade raisin business where everybody's bought a pack of the red sun made raisins in a grocery store. But what you don't know is they're really a wholesaler, and every raisin and every muffin and bread probably comes from Sunmade. So we want to supply our powder and crickets all over the world, but we also would love to sell our powder and our roasted crickets as an ingredient in grocery stores. But we may not want to compete with our customers who are making consumer packaged goods, like these chips that you can find in some Loblaws. These were three women from, I'm not sure which university in the Northeast U.S., but they're now in San Francisco. This is the second business that Mark Cuban invested in that is an insect-based business and these chips are delicious and they're made with vegetables and cricket powder, so you can send your kid to school with a bag of these chips and they probably have the healthiest lunch on the playground. Paul had some of these slides up yesterday, and thanks for that shot out there Paul, and this is what to a future aisle may look like in a grocery store, where you may have this sustainable protein aisle or something like that from a marketing perspective and what we've learned is if you just have a bar or you just have a bag of powder on a shelf it doesn't sell well. But when you have pasta and pasta sauce and chips and crackers and everything, the perception is the category is normalized, legitimized, and people I think see oh I'll buy that for my kids and that for my wife and I'm gonna take these home. That's what the President's Choice is the 5th most trusted brand in Canada. We launch with President's Choice in the spring. It's been extremely successful. They're rolling it out into 800 Shoppers Drug Mart. So we tested the thesis that there is pent up demand from the low house consumer, a lifestyle of health and sustainability. That demographic is not specific to anybody. There's seniors who care and there's young people who care. So it's so awesome to have Loblaws normalize the category and give us that platform. The second is that we've got an investment from a large Canadian food company called Maple Leaf food. They took a minority stake in our business. I believe that their passion and their desire to innovate is sincere. Everything they've worked with us on and done with us so far has demonstrated that. And we're really excited. This was a huge ad that Loblaw put on a subway station downtown. It's cool to see/ you can see the size of it with the with the women next to it. This is one of our customers from Montreal. Amazing product. Gorgeous packaging. Absolutely delicious. These are healthy protein bars. They're fruit based. They're cold pressed. Same thing with the crackers. Awesome with some

hummus. So you can begin to see where the CPG piece of this will go. Thank you very much. And again I really appreciate everybody's point of view and perspective and passion. And all the best to all of you and thank you Ryan and thank you Shannon.

Kelly Bronson [00:36:08] Great. So last up we have also Dr. Sarah Martin, assistant professor with the Department of Political Science at Memorial University.

Sarah Martin [00:36:28] Good morning everyone. I'm really pleased to be here. Thanks to Shannon and Ryan for bringing us all together. I'm really appreciative. I'm very very humbled to be here today. I also want to thank all the people that have fed us and cleaned up after us today and yesterday, all the folks who work here that support us in the work that we're doing. And in addition, thanks to all the folks who provided the food that have nourished us over the last couple of days. The title of my presentation today is the future of the The Future of Protein: The and market not the or market. I specialize in the global political economy of food and agriculture and I specialize in finance, looking at agricultural finance. The question we were asked to reflect on this morning was how can innovation and investment in agrifood help tackle environmental problems associated with the production and distribution of protein foods while helping sustainable production models scale up. So here's my argument. The future of protein will be shaped by those who are investing and betting on protein markets today. Spoiler alert, it is primarily the same large agrifood corporations that dominate industrial agriculture today. Unless we change. In the last couple of days we've had a lot of focus on production debates about different models of animal agriculture, cricket agriculture, and so on, and we've talked a lot about changing the habits of consumers, but we haven't touched much about what Jennifer Clap would call the middle. What is shaping the choice for farmers, different kinds of production models, different kinds of being ways of being on the land, and what's shaping the choice of us consumers at the other end. So I want to talk a bit about the middle. To understand my argument I want to talk briefly about how agriculture and investment have long interacted and the special challenges of agricultural finance. I will then discuss who is investing in alternative meat products, or alternative proteins, let's say, and what makes these markets especially valuable to those investors. Finally, I want to suggest that the characteristics that make these markets valuable are the very characteristics that create barriers to more socially and environmentally just food systems by crowding out alternatives. So I want to talk a bit about agricultural finance. As many of you know, for a variety of reasons, agriculture is risky. We have drought, we have volatile commodity markets, we have diseases for animals and so on, diseases for plants, and because of this risk, private capital has generally been very reluctant to invest in agriculture. As a result, for most of the 20th century, Governments in the global north, and to a certain degree in the global south, especially around independence movements, have created policies institutions that support farmers and at the same time reign in excessive speculation in food and agricultural markets. State regulations have also been in place to assure competition, that is to restrict monopolies and oligopolies from controlling agrifood markets. And why have these models been in place? Why of these regulations and policies been in place? Because during the 20th century farmers were a strong political force, especially in the early part of the 20th century, and they pushed for these changes. But in the last number of decades or so supports for farmers have shifted, and in many cases, been eroded, and financial regulations have been relaxed and we've seen an uptick in corporate concentration especially in agrifood. The same kind of corporate concentration that we saw in the late 19th century that these regulations were put in place to constrain. Now these changes, relaxation and regulation around finance, relaxation around competition controls, have implications for innovation and investment in agriculture. As state support has pulled back, private investment continues to be reluctant because of these risks. But what if there are ways to limit these risks for private investment? Limit market risks by, let's say, controlling aspects of the agricultural market, such as the market for protein. This is already happening with global corporate consolidation. In the agricultural input sector, for example, in the last year we've seen the recent merger or actually acquisition by the German company Bear of the U.S. based Monsanto. We've seen continued consolidation in the meat sector. These I'm talking global meat sector. The Chinese corporation Shineway bought the largest U.S. pork producer, Smithfields, a couple of years ago. So we see large corporations operating in the middle. OK so let's see. So who are the key investors today? I'm going to use two examples from the US, two agrifood corporations who are investing in alternative meats, specifically Tyson and Cargill. I want to start with Tyson. It's a 39 billion dollar meat and processed meat company. Tom Hayes, the CEO of Tyson, has recently discussed how his company is going to be focused on sustainable proteins and cleaner foods. And he's led the change at Tyson from a meat producer and processor to a protein producer and processor. And this is the shift a shift in the company to invest in cultured meats, plant based alternatives. So these have included Future Meat Technologies, Memphis Meats, both cultured meats, and Beyond Meats the plant beyond meat. The second example is Cargill. Although Maple Leaf is also claiming to be the most sustainable protein company as well so we see that change in Maple Leaf as well. Cargill CEO, David MacLellan, in a recent interview, extolled the value of alternative proteins, from pea powder to cellular meat. And like Tyson, Cargill also bought a stake in Memphis Meats. So according to him the future for Cargill is in the lab. It's with alternative proteins and with more efficient animal agriculture. As many of you know Cargill is the largest privately held corporation in the United States. We're not too sure exactly how big it is because it is privately held. So we have companies, whether Tyson or Cargill, turning their companies towards protein and seemingly away from animal agriculture, seemingly away from animal industrial agriculture. So what do these investments look like in the context of these corporations? Tyson's executive vice president of corporate strategy and chief sustainability officer stated when we think about investments like this we're thinking about an and model not an or model. In fact, the investments in alternative proteins pale in relations to these corporations business models. Cargill, as I mentioned, there are no clear figures because they're privately

held, but they recently stated that they've invested nearly 600 million dollars in conventional protein. That's industrial animal protein. In other words capnos and other industrial models that we have been critiqued over the last couple of days, and Tyson has started a venture capital fund that is investing in sustainable technology investment. Around one hundred and fifty million dollars in these alternative proteins. But this fund of one hundred and fifty million dollars is not just alternative proteins, but it's also other kinds of sustainable tech. So the amount of money that they've invested in sustainable technology, including alternative proteins, is less than half the cost of a recent poultry plant that they're building and pales in comparison to their other investments in industrial animal agriculture. So why is why the interest? So first of all, I just want to sort of summarize, is that although these companies are turning towards alternative proteins, their actual investments in alternative proteins are very minor compared to the the majority the vast majority of their work. So why the interest in the sector, albeit limited, as I I stated, if this agricultural sector is risky? The key is how to scale up these alternative proteins and I'm gonna be looking at some of the issues around cellular meat and why they're investing particularly in this model. No technology is neutral and I would argue that technology, whether agro ecology or regenerative agriculture or lab grown meat, requires regulatory supports, it requires resources, and it requires institutions. Why this interest in lab grown meats? The key is vertical integration or market control. The Good Food Institute, it's a nonprofit that works with scientists and investors and entrepreneurs around plant-based food and also the cultured meats that we're talking out talking about, maps out six elements that are required for cultured meat. Cell lines, cell culture media, scaffolding and structuring, bio reactors, and supply, and distribution. These are the steps that are required to get cultured meat to the market. What's important about mapping out these steps is that these are the critical technologies that are required but they serve as lucrative intellectual property licensing opportunities. In other words, IP, intellectual property, is foundational to the supply chain and IP will become the quote unquote guiding factor of company's future focus and key to securing the vertical integration of supply chains. Technology is not inherently good or bad, but it does arrive with a framework. It is not launched alone. In this case, intellectual property rights are critical. And this goes back to an earlier point. Agriculture. It can be a challenge to make money because of the risk. Much of the risk can be alleviated if you control the market. One way to do that is through intellectual property rights. Control of supply chains is really the ultimate aim of intellectual property to cell based meat startups. And they'll, in interviews though absolutely say this, this is what they're after. The venture capital is in there to get the intellectual property rights in order to gain purchase in the markets. So I just want to summarize a bit here. While the alternative protein market is growing, it is small. It's very small. And it is expected to have little or no impact on traditional pork, meat, or poultry demand. It is business as usual with industrial meat. If we are looking for socially and environmentally just food system we have to look at who is sitting and operating in the middle between farmers and consumers. In turn, we can look past in turn we can look to the past for how to reassert fair competition and access, and we need to look towards the future and the multiple ways that people around the world sustain themselves through many different food systems, and we need to reembed the marketplace within environmental and social constraints rather than market constraints. Thank you very much.

Kelly Bronson [00:49:37] OK. That was just great. It reminded me, the panel, of that expression to a worm in horseradish, the world is horseradish. I'm a sociologist of technology and innovation and I thought the panel would be about innovation and it was, but everyone seemed to grab on to investment in innovation. So that was interesting to me. I was going to do maybe a brief summary of all the each of the panelists to facilitate discussion but I think in the interest of time, we've gone a bit over, I will just invite the panelists to respond to one another. Is there any conversation that we want to have among ourselves before turning it to the audience? Yeah Seth.

Seth Itzkan [00:50:18] I'll just say that it's just delightful to hear all the different ideas. I love the cricket idea and I had some crickets last night in that meringue, that people that were here last night. It was a little crunchy but it was OK, right? And then. So that's like the good news. The sort of the bad news is like what the last speaker just said about the IP in the sort of the fake meat movement. That's a problem. I don't know quite what the solution is but I acknowledge that that's a problem.

Kelly Bronson [00:51:01] I wonder if. Do you want to elaborate a tiny bit Seth and say for whom is that a problem or what's the problem.

Seth Itzkan [00:51:09] I mean, as you heard, I mean we we stand against the fake meat movement. You know, we want real meat that's the animals are on the ground restoring the soil and I want to see much more of that and I'm disturbed by the narrative that fake meat is a solution to anything. It's not. It's it's a disaster in every regard, except, apparently, for the people who have the IP and who are convincing other people that this is a good thing to invest in. So you've got your Leonardo DiCaprio's, you've got your Bill Gates' running around the world saying oh look at us we're investing in beyond meat. To me to me it's a disaster. It's hard to like keep calm when I see this going on because that's just that's just ramming our life support system. Just head on into into disaster. So it's all the wrong messaging. It's all the wrong forms of production. It's all the wrong forms of of investing. And you're right it's because of IP and I don't I don't know how to get around that. I don't know how to solve that problem except to measure the soil carbon. It's always just gonna come back to the soil. Show me the data of the soil getting better and the soil will always be getting better with regeneratively produced meat. It will always be getting worse with wheat gluten based products, which is industrial wheat production with fertilizers and tilling and everything else. And so when the market shifts to carbon itself a lot that will be the solution. No one will want that IP because it will be worthless.

Kelly Bronson [00:52:47] I wonder if some Sara might just say, I read your paper as being slightly more than just problematic investment in cultured meat. Are there other kinds of problems that you were meaning to address?

Sarah Martin [00:52:59] Yeah I think we have to really look at who's who's shaping those markets. And I I would I would be cautious about creating new kinds of markets, for example the carbon markets, or at least thinking about how they are formed. I guess my point is that how the markets are formed and who's actually operating in those markets we need to pay very close attention to and that the folks who are operating in those areas don't necessarily have the same considerations for the environment that the folks around these tables do. And there's also recent information, especially around the block chain technology, that is a huge environmental drag. There's huge issues around block chain as far as the energy use of maintaining block chain and so I have some concerns about that. And then the other. I mean the main point is that in agrifood in general we're seeing huge corporate concentration and they those operators are really shaping the market and we really have to pay attention to those and I really think that the Government needs to intervene, especially around competition, to start directly challenging the power of those corporations and how they're shaping our agrifood systems. And I think we also have to look very carefully at intellectual property and its emergence since about the 1990s especially around agrifood. That's where a lot of the corporations have really staked their claim is around intellectual property and they seemingly are doing that in the future as well.

Kelly Bronson [00:54:47] I wonder if Andrea might respond to that given the given ISED's [...]

Andrea Johnston [00:54:50] I could talk about the competition, of course. In Canada we have the Competition Bureau and our culture, in many ways, is just like the telecoms like we want consumer choice and so when Bear and Monsanto merged it had to go through a review just like we want to ensure there is choice in the telecommunications. I mean I think the reality is in every economic sector that's the consolidation is happening more and more. But I'm wondering too what one thing we haven't really talked about it and what I'd be interested in is consumers. I mean at the end of the day the marketplace is consumer preference and that's why you're seeing Cargill and Tyson pivot from their traditional market segments to alternatives. And so I'd be really curious to know kind of like how do it's fascinating that Loblaws is taking you on. And they don't take you take people on without a lot of business analytics so they must feel that there is a an emergent consumer for what you're producing. And I don't know, maybe it's too early, but have you seen kind of your market your demand increasing over the last couple years?

Jarrold Goldin [00:56:04] Yes you know the first thing I want to say and I agree with everybody's points and they're really in line but when when you consider the issue of food security the one consideration for lab grown meat. I mean what if there's a natural disaster or a war that uses chemical weapons where the lands that we use and the pastures to graze the meat are completely wiped out? I would argue that having the option that's fortified in place efficiently to grow meat could be could be a great choice for if and when those disasters happen. And the neat thing about cricket powder, as one example of the insects, is the shelf life. We're doing a shelf life study. We're two years into it. There's no degradation like it's quite amazing and if it's stored in a cool dry place or made with a pasta that has you know a 5 10 year shelf life we may be able to store this food literally for the idea of food security, should there be natural disasters or manmade disasters. So I don't think we should completely dismiss it, irrespective of the IP, irrespective of the politics, irrespective of the economics. Just for that reason alone may be a good reason to consider it. To answer your question, what I can tell you is that we had this thesis that there's pent up demand from this low house consumer for food that's healthy and sustainable, but we never had a platform to test that thesis. So we feel that President's Choice, and their amazing team of innovators who who who chose to go forward with this, gave us that platform and without being very specific I can tell you that in the first quarter sales were four times higher than what they thought they would be. And because of its success, like I said, they're rolling it out into Shoppers Drug Mart. Now, there is a long way to go still, and I'm sure there'll be ebbs and flows, but they are committed. Their they'll be rolling out new products every quarter and it's part of their innovation strategy around sustainability. And like I said I have these meetings with them, these people are trying to do what we're trying to do. I know they're Loblaws. I know it's Maple Leaf food, but but they also have children and they also have grandchildren and they also care about the environment and people's health. So you know it sucks that economics is tied to all of this. I have to put a roof on my head, pay for my children's education. It would be awesome if we didn't have to but we do. And we're working in the system that we have. With respect to the Government loans, I have a question for you. Are most of that funding grants or loans?

Andrea Johnston [00:58:59] They are it's different programs have a payable contribution. In terms of this in terms of the super clusters it's in its industry matching funds so it's like a grant but other programs are repayable contribution. So if a company like Maple Leaf is looking to invest in a certain area and is successful in Government it's a repayable contribution after a certain number of years.

Jarrold Goldin [00:59:26] So because we we are the recipient and and we're excited and so grateful to have received about seven hundred and fifty thousand dollars in funding. But they're 7, 8, 9 percent interest rates. So it's tough for me to feel proud of a Government that has lending money as a business of the Government. Again, I'd rather give

away less without any interest and then more with. And again I know it's not easy but it's just frustrating because you know we we we are losing our business to third parties and you know it may soon not be ours. You know it's possible that it's not ours anymore. And we have some wonderful Canadian anchor companies that I encourage to step up and and care to make a difference because if the Governments can't do it then we're going to have to rely on the corporations.

Kelly Bronson [01:00:21] Shall we move it out to the audience? Ryan I think you had a question.

Ryan Katz-Rosene [01:00:29] Two specific questions. To Seth, there were two questions that came up earlier yesterday I believe that I'm curious to hear your your answers to them. There was or today. Scott asked a question about the carbon sponge or the the saturation point of carbon and I'm curious to hear your response to that and Toolika had asked the question yesterday about sure let's use ruminants but why do we have to eat them. I'm curious to hear your your response to that. And I have a question for Andrea. A lot of the panels keep coming back to restorative agriculture and/or agro ecology, which we've defined differently, but agro ecology is clearly growing as a as a concept in the food movement and the agriculture movement, sustainable ag movement, and it's become mainstream now in global policy terms in terms of you know every tweet that I see from the FAO is supporting agro ecology, spurring agro ecology, and and sometimes I feel like the Government's response is is completely deaf to that in its focus on almost the opposite, hyper industrialization of our of our food sector to to to maximize these economic benefits and gains from trade and I'm just curious to know if that is on the agenda at all in terms of an awareness of agro ecology in in Government. Is that is that just not filtering through? Is it is it is it just sort of seen as a as a thing for the developing world? I'm just curious to hear about whether that registers.

Kelly Bronson [01:02:22] Who'd like to start?

Andrea Johnston [01:02:23] So I'll start in terms of well I mean the terminology agro ecology. I think the terminology the Government uses is clean growth, sustainable development. They haven't not sure they're picking up that specific term. And so I'll take an example from ISED, we have something called the Strategic Innovation Fund, and it enables R&D, scaling up for four companies, and in order to get repayable contributions they have to commit to reducing greenhouse gases if they're creating a new manufacturing facility. What we're trying to do is just embed it in the economic discussion rather than have it as a separate piece. You know whether that were successful in that and you can demonstrate the usefulness it's hard to tell. But we're trying to just not have a separate discussion about sustainable development. It has to be mainstream or it's not going to happen. And like I come back to the example of McDonald's in out west with sustainable beef, I mean, they develop the criteria for sustainable beef. They selected Canada and Canadian livestock ranchers to take this pilot on and it creates a momentum on its own and it's it's just the reality is there's going to be tons of non Government organizations, multinationals, out there, they understand the need for sustainable production, they understand where consumers are going, and in fact they have more of an ability to make change than the Government of Canada does. So we kind of have to find where our partners are and sometimes our partners are multinationals and we have to kind of work with them in developing those standards.

Jarrod Goldin [01:04:24] If I can just add to that before Seth gets to his question. On a granular level I can tell you that people reach out from OMAFRA all the time to come and visit us, to come and see what we're up to, to host them for tours. CFIA, Jeff Leal, he was the Minister of Agriculture, actually was from Peterborough and where our farms are so there was some really interesting conflicts of interest for him because he was fully supportive of what we were up to. But it will never be enough for me. I will always feel that they can do more. I'm curious why they're not pounding on our door as the largest supplier right now. A Canadian company has the opportunity to grow. We have to chase them. It surprises me that there aren't more people who are decision makers with the purse strings knocking on our door saying, you know, it's for real now it's legitimized. How can we be of more support?. So I'm grateful and there's legitimate personal interest from aspects of the Government that we've seen, but I always wish they'd do more.

Kelly Bronson [01:05:27] I think there were a few questions in the audience maybe back there a bit.

Miscellaneous [01:05:33] [...]

Seth Itzkan [01:05:35] Do you want me to deal with that question before? Excuse me. Did you want me to field the question that was already asked? So about the sponge so you know you can you know just on your laptops right now you know just google carbon cycle. You know I've been doing this for years. The terrestrial biosphere is the largest sink you know by far and no one really knows how much really has been lost, but the estimates are like a terratone, a thousand a thousand billion tons. When Rhettan law at Ohio State University one of the world's sort of leading soil climate scientists I mean you know he is. His numbers are conservative. He talks about hundreds of gigatons I mean I'll take it you know. I mean all right if it if it if it maxes out at 100 20,0 gigigatons, ean OK, that's an eyealright problem lem e I gueguess. The real sort limiting factor as, far as I cancan I is, the parts per million of CO2 in the atmosphere. That's the actual limiting factor. That's the sort of the the the osmotic force or the chemical force and between the ice ages and the interglacial ages of the last million years or so it's fluctuated between about 190 and 290 parts per million. And so the wh,at's called the intinterglacial se sort of temporary warm periods that's two290 arts per million th.aT's the high. When we get to the ice age wh,ich is actually the more dominant regime climate

regime if you will, it's like one 190 parts per million sea. See we're 400 400 now. We already in an entirely different atmospheric chemistry landscape. There's something called the equilibrium temperature which is actually what the temperature would be in an equilibrium state for the forcing that the parts per million.

[01:07:52] It's 10 degrees C warmer than now. People just have no idea what's coming and how devastating it can be if we don't drastically change. And so this whole thing about the IPCC report it's like I hear people say Oh my God I'm so worried about that. I'm like you have no idea how watered down that document is. I mean that is that's that's just like you know kool aid with no alcohol in it at all. You know and we need to be doing straight shots of you know what. OK. So. So the reality because of the mandate of the IPCC is only to give a number by 20 100 and that's it. So they can say one point five two degrees C by 20 100 if we do what that's not how physics works it doesn't just stop at twenty one hundred.

[01:08:39] It's an S curve. We're at the birth of the flat part of the S curve and you know when it goes up like that when that when the sea ice is gone. Remember in eighth grade and middle school you did that little experiment with the with the water with the ice in it and you put it on the Bunsen burner and it was always the same temperature and the ice was getting smaller and smaller exposed. And all of a sudden when the ice was gone the temperature went like that.

[01:09:02] It's not a gradual increase it's an escort. That's what's happening right now. The only reason we're not devastated already is because there's still ice. Okay. When the ice is gone it bang like that rapid temperature increase. Sorry.

[01:09:19] I don't even remember the question. I'll get out. I think we'll go to the end it's okay. I will go there.

[01:09:25] Just really quickly the question about the saturation. It's really sort of a non question we have to be doing this. And the only real saturation is parts per million in the atmosphere when it gets down below 300. That'll be it. Okay time to be happy.

[01:09:40] Okay okay. So I've actually got three comments one is just coming back to Ryan's comment about agro ecology and this is I mean definitely a FCO is is promoting it. There is obviously a global s implication but the European Parliament is looking at it so it is being looked at in the global north and being looked at seriously. So I think that's from a Canadian perspective. Don't discount the fact that it's not helped happening elsewhere. Secondly actually I do agree with you there Andrea. Bob you know large corporations getting on board and made driving the change. I come from Loblaw's I'm a retired Loblaw's executive. That's where an enormous amount of change can be made and McDonald's certainly in what they're doing. And if others get on the bandwagon can have a very very marked impact much more so in some ways than Government. And then finally and I don't want to rain on Gerard's parade too much because I think it's a very interesting prospect. What is have Gerard though I would contend that a lot of your success at the moment is not environmental interest it's because this enormous amount of interest in protein and in fact you haven't you have a product that is there and meeting consumers desire to bulk up on protein. I do think though and where I think that the fantastic thing about your product is is that it is actually is dealing with the ick factor as we've talked about in the past and as the factor dissipates and I think what you're doing is going to be increasingly then I think your product will have more of a role in terms of from an environmental opportunity. And you're looking at the science of it. Thank you.

[01:11:17] Great. I think there is some women who had questioned this.

[01:11:20] I mean you thank you very much.

[01:11:28] Two leaker stogie with humane Canada. I wanted to first say how much I appreciated all of the panel's presentations. Thank you all and thanks for bringing these wonderful people all of the panels were fantastic. I just wanted to raise a couple of questions or points on the basis of animal welfare and humane considerations because sometimes we tend to talk a lot about other aspects and innovation and investment sure and environment and climate change. Just recently in the previous panel I wanted to respectfully talk about animal welfare. So a paradigm for those who may not know of how to define animal welfare is three aspects three pillars well or in a Venn diagram three circles. One being biological functioning the second being affective states and the third being natural condition and Jared. This question is mainly to you or this comment. You spoke about the crickets in in the farmer in the barns that you have and you spoke about the fact that they're there behaving normally. So that speaks a little bit to biological functioning perhaps we don't really have a great understanding of the experiences of many species on this planet basically even some of the mem alien species that we're farming and certainly some of the fish species there we're still learning a lot about. We probably have very very very little knowledge if any about insects and their experiences so I wonder about the effective states of these animals that like what is it that they're experiencing positive and negatively they're not going outdoors at all from. From how I understood the farming setup. So what natural conditions are being provided to them. So just a question really about that as a viable approach from an animal welfare perspective and a question regarding how are they slaughtered. How are they actually milk like prior to milking how are they killed. And the second comment or on a different topic regarding

animal welfare that I just wanted to mention is that while there may be many questions and many concerns regarding cell cultured meat products from an animal welfare perspective there's actually many people who are very excited about this form of production because of the fact that we don't have to slaughter and kill and use animals in that process.

[01:14:10] Thank you. Thanks. Just first quickly to Paul's comment. Thank you and I agree with you in part when that study came out on the gut biome and how cricket powder and poo improved probiotic microbiota associated with better health. Our sales that week shot up it's for its health reasons that we have early adoption. It's not for bodybuilders per say or people looking to bulk up on protein. And we learned very quickly after kind of launching as a six day sustainability company that people were pretty selfish. They'll talk about sustainability and spending backs on sustainability but they won't. But they will spend dollars if they think it will improve their health or the health of their kids. But that we're at the beginning of that story. And I appreciate your point. There are entomologists that had been studying insects for years. I think that there is a lot of knowledge we're working with entomologists at different universities in Canada to answer some of these questions and look at how we can maximize yield and just look at the chemistry and sociology and all these different aspects and elements so that if we're going to do it and it's gonna be industrialized that we do it a bit differently than our predecessors have done with other livestock so that it's that it's healthy it's not something we have to undo and redo like we're discussing it with a lot of the other production. So we use CO2 gas to to harvest them. Basically there is a stress response. I can tell you that microwaving them for to to kill them to call them that the evidence we've seen so far is there's almost no measurable stress response. So some microwaving them to call them is likely the most humane way to do it. Unfortunate we don't think the public we'll understand the optics of that. So we we have another learning curve to get to because you know we say we use ice and the CO2 gas from dry ice or direct CO2 gas and we slowly put them to sleep and then they eventually pass on and then we rinse roast and grind them in different climates. We can absolutely have outdoor access. You know that's only because we're in Canada and we have to deal with the winters. But if we were around the equator it's very possible we could do this in kind of more normalized or naturalized settings. But but as far as you know you know compared to other livestock I think they're they're in pretty good shape.

[01:16:45] And you know serving a purpose I guess I mean we have to eat can I respond to the ethical question of killing and killing thank you.

[01:16:59] First of all you may have noticed I've just put on this shawl and now I'm holding this club. This is a Maasai shawl for my colleagues in Kenya and this is a club. You may notice there is a golf ball on the top of it.

[01:17:13] Not quite sure how the golf ball got into the there area in Kenya but it did. But anyway so we have a chapter in Kenya and I traditionally now when I give talks I do wear the shaw. And I do hold this club and they have made me an honorary member of their village and I'm proud and happy for that. And even today they're working on a project that we're involved with.

[01:17:38] But I just want to say that I participated in the killing of a goat.

[01:17:45] The last time I was there and what sort of shocked me was they said well we know you're Jewish and your method of slaughter is to slice the throat we believe ours is more humane and is it OK with you if we kill the goat. The goat. According to our and this was a profound experience for me as you can imagine. And their method is simply too. It's just suffocated. And they just put their hand over its nose and I know you think that sounds horrible. But within 15 seconds it was passed out and within a minute after that we were drinking sport literally that's how them as I do it. And that's how they're going to do it. And that's the reality on the ground. And the other reality on the ground is that we're helping them expand their herd. And do holistic plan grazing. And we're working with the University of Nairobi to monitor the soil so it's the heart. It's the whole thing. And when there is carbon markets they'll be rewarded for it. So that's just that's a day in my life.

[01:19:03] In this in this field this quick question for Jared.

[01:19:12] Full disclosure I have not yet worked up the courage to crunch down a cricket but I'm working on it anyway. But what I would like to know more is about the potential for insects as animal feed. I know in Terra feed corporation is doing some really interesting stuff on the West Coast in terms of aquaculture but you know I don't know the culinary preferences or nutritional equipments of most livestock so I'd be curious to hear about you know not only just substituting for conventional livestock production but also lowering the impact of the existing systems as well. Thanks.

[01:19:45] No problem. So there's almost two completely different businesses within the world of edible insects for livestock feed. There's all this stuff that's going on with BSF or black soldier fly larva there. They're raising in the tens of millions of dollars. There's a project in South Africa that's massive and they're using mainly pre and post consumer waste. Then there's the other side and I think like we discussed maybe yesterday there's gonna be feed formulations. They're gonna take some meal worms with some black soldier flies with some crickets and look at the chemistry that will be this feed formulation for fish or this for chicken. I think the most exciting part and it's a pity that Cate left is

that you know a scientist from Italy called us and he said what steroids and antibiotics and stuff are you using to grow like 35 million crickets and twenty thousand square feet and we said none. And he said well that's impossible you can't raise livestock without prophylactically or doing something otherwise they're gonna get sick and die. So long story short it's the cockroach story. These insects have hyperbolic immune systems and now we're beginning to understand why and it's likely due to specific protein peptides that give them this enhanced immunity. So the question is if you feed that to other vertebrates. Can that be transferred and so far the answer seems to be yes. Shrimp aquaculture is to add a 10 percent of worm powder to the traditional shrimp meal doubled the survival rates of the hatchlings. So we're trying to reframe the framework that this isn't so much about an alternative to fish meal. This might be an alternative to steroids prophylactic antibiotics and things of that nature. And you know it it's shocking that it's shocking that feeding insects boars insects is better for their health than feeding them. You know something that's being manufactured. So it's a great question where we're doing a lot of projects and dog food particularly lap pets formulating treats is no problem because you don't have to make label claims dog food especially in the U.S. is very highly regulated. So that's an exciting opportunity in that space to take some of that diverted meat that's going toward the pet food markets and and bring it back to human if there there's an opportunity for insects and pet food just a few more questions.

[01:21:59] We're going to try and go back to Ryan is doing with the two peoples.

[01:22:02] Kyle thanks.

[01:22:05] Kyle Martin approved so I'm the chef on the committee you're in the panel here. I have a question about labor as your production Jared has been scaling up very quickly obviously being on the shelves of Loblaws. How is your labor costs expanded and also what about health concerns for workers compared to you know the beef industry and pork industry and stuff like that where there's obviously a higher risk associated with repetitive motion and work with knives and stuff like that. What sort of factors are impacting you so on on the cricket farming side.

[01:22:37] It's not as laser labor intensive as one would imagine. On the processing side is where we need the innovation in technology to help us scale up and add and amortize that without necessarily using labor. I think that answers the first question. So yeah we're growing we up to 30 employees now. I mean it's awesome. These are very passionate farmers. It's hot in those barns you could not do the job just for the dollar there. There's got to be something more to you to care to be there because it's tough work. And then on the safety side most allergens are issues is an inhalation. So so we are working with allergists to understand that piece better from the consumption side and the farm worker side. So we encourage them to wear masks at this point. Does that answer your two questions.

[01:23:38] Sorry. How we can grow.

[01:23:42] You know the insect market or any other sustainable protein. You have to consider the workers that are actually doing the work in terms of work life balance but safety as well. So how much of that is actually considered as we're looking at the dollars that are gonna be invested into these different industries.

[01:23:57] Right. Yeah it's a fair question and I think to the earlier point this is so new we are so nice here and there. This is the beginning of the journey. Those I think maybe are more sophisticated questions and easier answers and it at answered in industries that have a long history and you can look at that and you can measure that data but we're trying to like I said before incorporate as much of that as we can along the way. So each each move we make each step we take we're doing it as honestly and transparently as possible with everybody's best interest in mind and that includes the work we're doing in Africa and empowering those people where by the way we are giving away our intellectual property to empower these communities to raise their own locally domestic insects to think maybe we could gather two questions before we get panel response so greedy.

[01:24:49] Sure.

[01:24:50] Quick sneak question to Sarah about what should we do in light of all this. But I also have a question for Seth around carbon markets and carbon credits and the claims that are being being made around the amount of soil carbon that it does depend on how degraded the soil is how much carbon builds up it can take a lot of years to build it up to the amount that we need to get to sequester what we need to sequester like you know depending on where you are. It could be 50 to 100 years. Some places will be faster but how do you deal with the uncertainty around carbon credits for these systems because carbon estimations are can be 100 to 200 percent off. And it takes 10 to 20 years to really see changes from one year to another.

[01:25:39] You can have fluctuations Hi everybody.

[01:25:49] Thank you very much for this panel. My name is Laura shine. I'm doing I'd like to say finishing a HD in entomology and the arrival of Entomology in Canada. And my question is actually very quick for Jared. It has to do with do you have any numbers or ideas about repeat consumption since you've made it into Loblaws because of the

novelty factor is obviously a very motivating one. Do you have any idea how that translates into actual adoption before force gets to his question.

[01:26:18] Not yet but after November 8 when we haven't beaten with them we will thanks for the question.

[01:26:33] What's to be done. So I want to be really clear I'm not against business. I'm not against corporations. I'm not against people setting up businesses. My concern is corporate concentration which is fundamentally anti capitalist actually. And in the control of the market and so I think that the Government has a role in regulating corporations especially around food. I think it's fundamental and around innovation and businesses. There's a lot of evidence that actually Government research Government funded research really has dropped driven a lot of important innovations not only large corporations. And so I'm absolutely not against the sort of changes that McDonald's is making or Loblaw's is doing as far as contributing to a more sustainable environment. But I am concerned about just a few corporations. If we look at the last couple of years agrifood input corporations have gone from control. You know they control somewhere over 80 percent of the market. They've gone from six to four globally. And so these have significant influences on what we as consumers can access. And I you know I totally agree about the Competition Bureau but they also approved with some modifications the bear takeover of Monsanto in in Canada. And that's a concern. It's a real concern around who controls access to seeds. The choices farmers have those sorts of things. And so um I it's I really want to underscore this I'm not against business but I am against one or two businesses or a handful of businesses controlling you know whether it's the concept of consolidation in Canada of supermarkets or despite the good work they do. That I think it's really important that we think carefully about the role of the Government and because they're the ones who actually can police the police competition in a fair way so did you I mean answer the question about the volatility of soil carbon and yeah it's a highly volatile medium.

[01:29:09] It can change quickly and that is a challenge. And we've seen both.

[01:29:19] We've seen soil carbon degrade quickly and also improve quickly so it is palatable.

[01:29:26] What's the word malleable medium.

[01:29:32] And so the solution is that when you improve it you have to continue the methodology. You know you have to just if you're grazing you're doing cover crops you need to just keep doing it. Take to get it. So if there is a saturation point well the data will show it.

[01:29:50] I couldn't imagine that happening for 10 or 20 years. Anyway but some people say you know it will build carbon for 100 years or thousand. I mean who knows.

[01:30:00] But we just have to start doing it as far as the market is concerned. This will be open source transparent scheme so there's not going to be any like monkey business going around that that the carbon in the soil will drive the efficacy of the market you know and so if the carbon goes down then the value of the certificate goes down. Right. It's an immediate reflection. It's not based on a theoretical concept. Well there's so much gold in Fort Knox you know the price of their certificate is directly mapped to a verified ton of carbon in the ground. And if you don't have a ton of carbon in the ground the price of the certificate goes down if you have more than a tonne of carbon in the ground the price of the certificate goes up and people say hey what did they do right. I want to do more of what they're doing and less of what those people are doing.

[01:30:57] So I think it's a fascinating concept. I did not come to this from the investment side.

[01:31:05] Ryan put me on this panel so you can blame him. And I didn't get too great.

[01:31:12] I mean I was a traditional climate activist you told me 15 years ago I'd be supporting raising you. Like what. I mean I was a vegetarian and even the equivalent of a vegan it was called macrobiotic back in the day. So I'm dating myself but this is this is where the science as far as I'm concerned this is where the science is leading us. Science is leading us to regenerative grazing and the markets or the market mechanisms or whatever you want to call it is leading us to these type of carbon certificates.

[01:31:41] Great thanks that I think we have time for two quick questions do we. Yes. Matthew Jose and Erick Erickson really patient. OK.

[01:31:49] Oh gosh. OK so lots to say but I guess I'm going to enjoy the fact that we can have so great people here so Susan. Sorry Andrea I miss your last name. I really appreciate the fact that you are here with us. And I want to. I was supposed to ask the question but you answered very well Sarah. I would love to hear your position on this whole issues. We've been talking so much about all kinds of perspectives and data and science and research. One of my frustration I guess right now is the divestment the d d investment whatever of the Government in research and independent research which I think is a real problem. And my fear when I'm listening to some of the Government

policies and governance going on within Canada about climate change but also about the food policy that's coming around the corner and I think we need to bring back the agri food policies that we need and the food movement has been really vocal trying to diversify the type of voices that are emerging and the agro ecology element. I think we are missing the boat very highly. If we do not engage with that debate and I think that's from I'm I'm here at the table but I'm really speaking as is Canadian citizens. That's very much interested in the future of agriculture and health and the economy. You know I think all of this is coming together but I'm just very curious to know what is it that's on the Canadian Government agenda forward like not only the high tech end of agriculture which is going to just concentrate even more the market and the enterprise.

[01:33:39] Thanks.

[01:33:43] Yeah good luck. Actually I kind of built on this because it's very similar. I mean I was it's funny you ask my question. I was going to the last two days. Lots of us. Many of us had very interesting proposals or suggestions way forward. You know we can disagree on is this better than something else. But more or you know we all recognize this. And I'm just not want to tell you to Andrea because I think I think it's all addressed to all of us as citizens. But I'm wondering what we could have done we one point four one point five billion dollars of a pipeline in issues which actually address not only climate change but also food the future of agriculture and so forth.

[01:34:27] So it's not a question of us it's a provocation but I think.

[01:34:31] But we have to get at the scale of what we're doing it currently. Right. And I think we have to be more autistic and systemic in our approach and maybe as citizens we haven't put enough pressure.

[01:34:44] So just just before a very close address is not an elected official and we don't want to place all our concerns about the Canadian Government on her shoulders but unfortunately we do have to. And now there are people need to get to train stations and so on and so forth. Thank you so much. Thank you to the audience for coming out. Thank you to the panelists for for seeing the potential and the the usefulness of a venue of an event like this. And thank you to sponsors who helped make this happen. Thank you to Gibbs for doing a lot of the web and I.T. stuff and Shannon and some of the other volunteers. I think I am. I just want to reiterate how deeply grateful I am to everyone here basically for helping to make this event the event. It was very finally this is just the first phase of a project on conceptualizing what the future of sustainable protein might be or the future of sustainable agrifood. Mike the next phase is going to get more in the way of policy oriented takeaways that we might be able to draw from this discussion and we'll have to think a little bit. Creatively and innovatively about how to try to interpret some of the the differences of opinion that we've seen and emphasize the points of consensus that we've seen as well. So join me in thinking yourselves as. And once again panelists before you leave there Shannon does have a little lunch bag for you. I didn't.

[01:36:54] Thank you.

[END]