(...)

Good morning, Sean. It's really nice to meet you. I've heard about you and the things that you do for the citrus industry for a very long time. Nice to finally meet you on a beautiful day in Powell.(...) And to hear what you have to tell us about-- about what you do. So please introduce yourself and give us some background on what you do. Thanks, Louise.

(...)

Yeah, so my name is Sean Moore. I'm the Integrated Case Management Research Portfolio Manager with Citrus Research International.

(...)

I've been with the citrus industry for almost 30 years now. And yeah, it's been a wonderful career. I have worked on most of the major pests that occur in citrus.

(...)

And my big love is for integrated pest management, which in a nutshell is putting together the entire system that the farmer can use to farm in a sustainable,(...) biologically orientated manner.

(...)

And also where I've probably developed--(...) a lot of my expertise is in microbial control, which is using-- basically using germs or pathogens for controlling insects, particularly viruses.

(...)

And then that led me to a very strong collaboration with Rhodes University for the past probably 25 years.

(...)

So I am also a visiting professor there with the Department of Entomology and Microbiology and a deputy director with the Center for Biological Control.

(...)

Yeah, and that is a joy, sowing into young people's lives and seeing them learn and embrace what they're learning and then being taken up into the agricultural industry and giving back.

(...)

That's quite a mouthful. And I would imagine that that certainly keeps you busy. And many of your students probably really enjoy your inputs because you really have walked the walk, not just talk the talk.

(...)

And I know Dievelte has a question for you about integrated pest management. We hear about it so much. Yes, so we get on the farms often, like I presume you guys as well. What is IPM? Because if you-- and this is from my knowledge-- if you say to a farmer, "What is IPM?" He's going to say, "No, it's just little hohikis we put in the ocean."

(...)

But it's far more than that. It's all system integrated.(...) So what is IPM? Can you--(...) maybe just tell us more about that.

(...)

So IPM probably has its roots back in the 1950s, 1960s when there were products like DDT available, which were extremely effective.(...) But after a couple of years of use, people realized that it kills everything. Not only what is bad, but also what is good. And the people.

(...)

Yeah, I don't think DDT was a big culprit in killing people. I think that was mostly cyanide fumigation of trees. That was a bad one.

(...)

And that led to a widespread awareness that was fueled by people like Rachel Carson, who wrote the book Silent Spring in the 1960s. That drew global attention to the fact that we needed to modify the way in which we managed pests, particularly pertaining to chemical pesticides.

(...)

And as a result of that, the concept of integrated management was developed, which was basically the sensible combination of chemicals and biologicals. And that developed in the 1970s into the more sophisticated concept of integrated pest management.

(...)

And integrated pest management in a nutshell is a monitoring-based decision-making system to determine how to control your pests and diseases.

(...)

There are no assumptions, and there is a realization that every single orchard may be different, every single season may be different, every single cultivar may be different. So there isn't a one-size-fits-all. So it does require a good understanding of the pests and of the natural enemies, because that must be brought into the equation as well,(...) and of the system in which they fit.

(...)

The Southern African citrus industry has a very proud legacy of biological control, including the introduction of biocontrol agents from elsewhere that didn't occur here to control our pests, because they occurred, they were brought from the region in the world where our pests originated from, so it was a natural fit.

(...)

And in the old days, up to 1980s, farmers didn't really need to spray much,(...) other than controlling thrips and redskel and mealybug early in the season, and then almost without knowing it, depending on the naturally occurring natural enemies to keep the pests under control.

(...)

Unfortunately,(...) that's been terribly undermined to a large extent by the citrus black spot regulations from the EU,(...) which has resulted in farmers having to spray a lot more to control this disease.

(...)

And that undermines the biological control component in the orchards,(...) and also leads to farmers, including pesticides with those mandatory citrus black spot sprays, just because they simply don't have the machinery to get around the farm for the other pests at different

times. So that's what we're trying to do now, is trying to reinstall an understanding of IPM and the need to go there.

(...)

That's so weird, because the same people putting the regulations on for the CVS is the same people putting the regulations on, you can't spray so much.

(...)

And yet the two are working end in end. Yeah, exactly. I mean, I'm glad you saw it. There is a deep irony there.

(...)

availability registration of pesticides in Europe, and that reduced the available active ingredients by probably about two thirds.

(...)

Then in 2002, they had an environmental sustainability initiative, which also spoke about reduction of pesticides. In 2009, there was another director from the EU that made it mandatory for all European states to table a national IPM plan and to put that into place. And then in 2019,(...) the European Green Deal was put on the table, which spoke about reducing chemical pesticide usage by 50% within six years from now.

(...)

And that personality there is need for very quests in this regard. Even so, Gutwclusively he has found Joelat and I called a few of our members to start doing remembers credits, which piece set in 2014, allowed, to provide with a private ready for public Finished. Is that a good

advice? So we don't see that in Germany as a stress model. Again, close but understood, Episode Worse for outpatient data storage within Europe. Yes,(...) the... And I had a, I made a comment earlier,

(...)

when was it last week, when we had the talk about,(...) our live talk, about this article that went out about the greening and the whole firestorm that thing caused. And I said, well, the same people that want to now stop a major production area, want to put the people out of work.

(...)

And then two months later, probably gonna be Facebook profile pictures with South African flags on, says please send blankets and food.

(...)

Where they could have just left them and do the job that they're supposed to do. - Yeah.

(...)

I mean, there was a big noise made about that greening announcement in Lebeche, - Yeah. - which Elizabeth,(...) as if Europe hasn't been receiving fruit for many, many years from greening areas. So it was really quite silly. - Yeah.(...) - Thank you very much for your taking the whole story about IPM back to the sixties and bringing it from there because it gives perspective on,

(...)

as you say, in the 1960s and 70s, people were spraying things that,

(...)

like the forever chemicals, some of them that will be with us forever.

(...)

And I know that trying to introduce

(...)

IPM to some more traditional growers,

(...)

you must find some resistance or especially initially when you started with this.

(...)

How's that going? Are you managing to get growers to go, well, actually insects can help us. We don't have to spray that a lot of everything. What is the trend? I mean, I know some very older farmers, (speaking in foreign language)

(...)

So how's that going? - Yeah, well, it's not only the older farmers because remember the really older farmers did farm with far fewer pesticides than are being used now, but the young farmers who've only started farming

(...)

in the last 10 or 15 years, this is the environment in which they were taught to farm, in which they learned to farm.

(...)

So it is difficult.

(...)

It really is about education.

(...)

I mean, we can talk until the cows come home and we can show scientific data

(...)

from real field trials where we show the efficacy of biological control.

(...)

But I think that farmers who haven't done that feel that it's a very frightening leap(...) to go from spraying the prescribed chemical-based program that they might be following now to reducing those inputs and relying on something that they can't even see. - Partnering with insects. - Yeah.

(...)

So it is a challenge,

(...)

but we're doing our best to spread the message.

(...)

- I've got a question. When you bring these pathogens and insects, natural predators from other areas into a place like South Africa, or from South Africa to wherever they need to go to fix, well, the problem is there.

(...)

How long does that take? Because if you look at how long a new variety is taken to be bred,(...) and how long it is for plant material that comes in to be classified as virus-free or clean,

(...)

it's a long process.(...) So, and I presume you can't just take

(...)

a little bug from our country and take it to South America, for instance, because it might cause havoc and vice versa. So how long does that whole thing take to say, "Okay, right, this little thing's safe to bring into South Africa?" - Yeah, that's an interesting question. So one needs to apply for a permit for importation, and you need to justify it for its end purpose. And then once it's in the country, then you would need to,(...) in many cases, if the information isn't available, do a series of non-target assays to see if the parasitoid or

predator that you're importing is going to attack any other insect that is not a pest that might be closely related. - And it might be a naturally-occurring predator to what we've got here. - Yeah, so, I mean, there is a sensible, careful process to go through. However, if one looks at the history of biological control,

(...)

which has been going on for, I don't know, more than 100 years,

(...)

there was an article published some years ago where the history of biocontrol for agricultural pests throughout the world was reviewed.(...) And of something like 5,000 introductions, which involve 2,000 different species, there was virtually nothing that had ever gone wrong.(...) So the risk of introduction is greatly exaggerated.(...) And remember that these insects, these parasitoids and predators, they don't need passports like we do. They're not stopped at the border. They're free to move.

(...)

So we need to recognize what their benefits are weighed up against their risk. And even sometimes when there is a risk, it is so negligible compared to the benefit(...) that it is worth going ahead.(...) And yeah, so I think that the history of biocontrol speaks clearly about its safety and that we don't need to be scared of introducing new parasitoids and new predators. - I've got another question connecting to that. And we spoke to Paul yesterday,

(...)

and I said that leading up to this article that's gone wild,

(...)

that CRI was looking at educating the Mrs. Joneses and Mr. Joneses with the backyard gardens.(...) How does IPM fit into that? Because I can see,(...) well, that guy will go to the co-op or to the builders warehouse or the building or whatever and say, I've got a thing in my garden, the sales guy behind the garden says, you need to spray this.

(...)

Is there a way that we can incorporate(...) some of those things into like the backyard gardens?

(...)

- Yeah, so I mean, obviously the backyard gardens, they're not exporting, so they're not looking for a perfect product. - But it could be the breeding ground for the-- - It definitely could be. So my advice to friends and neighbors who have trees in their backyard is just put ant bands on the trees, keep the ants out, and the naturally occurring parasitoids and predators won't be disrupted. And you'll set a really nice clean crop, clean enough for you to use and to share with your neighbors. - So it's just some place that try to control ants in your garden. - Yeah,(...) because in the backyard, they're not spraying. - No.

(...)

But in the backyard, they bring mealybugs and they bring scale and they bring-- - They're all there. They're all there. But as long as the parasitoids and predators are not being disrupted by chemical sprays or by ants or by dust, then they should never have to spray.

(...)

- Interesting. - Yeah. - Sean,(...) one of what we understand, one of the biggest pests of concern in the citrus industry is false codling moth.

(...)

Tell us the story about cryptogram, please.

(...)

- Yeah, that's an interesting story. I was appointed as an entomologist in the citrus industry in 1995.

(...)

And I became the sixth research entomologist(...) in what was then Outspan,(...) which is now CRI.

(...)

And we talk about the big five insect pests in citrus being red scale,(...) mealybug, thrips, fruit flies, and FCM. And each one of those five researchers was responsible for one of those pests. And I thought, well, why did you employ me? What can I do?(...) So I thought, well, let me cultivate an expertise in something that's novel, something that no one is doing yet.(...) And I'd heard a-- - Sorry for me, I'm old, we're here at this stage. - I wasn't so young. I'm a late bloomer. I think I was about 30 then. - Okay, okay.

(...)

- So I remembered a presentation that I'd heard from a guy by the name of Keith Jones at the University of Greenwich in the UK(...) speaking about insect viruses. So I contacted him and I said, well, I'd like to do this. How should I go about it? So he said, well, he only knows of one academic in South Africa that's working on viruses. And that's Don Henry, Professor Don Henry at Rhodes University. So I went to go and see him. And he was working on a tetrovirus, an RNA virus of the pine emperimoth. And he said, well, he'll love to work with me.

(...)

And so I thought, well, what's the most important pest on citrus that might have a virus?(...) And the answer was false codling moth. So the search began and we very soon found a virus and I registered to do my PhD and that went all the way from discovering this new virus. And I wasn't the first in the world to discover it. As soon as I started doing the literature survey, I realized that there was a German team that had discovered such a virus on Cape Verde several years previously.

(...)

But we were the first ones in Africa to do that, South Africa.

(...)

And then testing the virus both in the laboratory,

(...)

then developing a production method to bulk it up in the laboratory,

(...)

quality control procedures, formulation,(...) and eventually large scale field trials.

(...)

And once I'd finished my PhD and handed it in, I thought, but we can't leave it here because here's something that works and here's something that the farmers need and it's not a chemical.

(...)

So,(...) Vaughan Hetting, the CRI CEO and I,(...) and Jock Danquitz, chairman of our board at the time, sat down and said, well, let's start a company so that we can produce this thing for farmers because no one else in South Africa and probably Africa has the expertise to do that.(...) So that's where it began. Of course, now it's a flourishing company that's carrying on with Artme.(...) I decided I'm not a commercial guy. So I went back into research and left the commercial guys to run the company.(...) - But what's the process of finding that virus? Because in my mind's eye, and I'm pretty sure other people as well, you see there's somebody sitting with the injection

(...)

with moths and they're just injecting them to see which one kills them. - Yeah, so you look for the symptoms. I mean, it's the same as a person.(...) If you're looking for a virus in people, you just look for the sick people and you'll find the virus in them, very similar.

(...)

So it's really, the concept is taking a natural phenomenon, taking like COVID in people, multiplying it in the laboratory and reintroducing it. So you are simply what in people we call an epidemic, in animals we call it an epizootic. You're simply artificially creating an epizootic in the field. - It's about the same when people say about COVID also, but we weren't COVID.

(...)

- So you very modestly stopped just there. Tell us where CryptoGran is today and what it is doing.(...) - Yeah, well, I think it's doing very well.

(...)

I think it's become a product of choice and there are a couple of other companies from Switzerland who've followed suit also with an FZM virus product.

(...)

But the work has continued. We've really developed a center of expertise at Rhodes University and within CRI,(...) where we are slowly but surely continually discovering new viruses.

(...)

Recently we discovered what I think is probably the most exciting finding in the history of insect virology, where students of mine were the first to discover

(...)

another genus of virus in the leachymoth. It's called a nucleopolyhedrovirus, which is different to the one in CryptoGran, which is a granular virus.(...) And it has an extraordinarily but safe broad host range, where it's not only effective against leachymoth, which it comes from, but it's also effective against false codling moth, macadamia nut, bora, oriental fruit moth.

(...)

So it has the capacity to be a globally useful globally useful in environmentally safe,

(...)

effective pesticide for numerous high profile pests around the world.(...) But yeah, it's all catapillas, all moth pests. - Very exciting. - Yeah. - How does it feel to have that moment

where you say, "Holy crap." (laughing) - Yeah, it's an exciting job. It's wonderful to discover new things. I think that's the joy of research is,

(...)

well, one thinks of science as dreary and you follow a recipe and you've got to dot every I and cross every T, but research is actually extremely creative because you're always in the pursuit of something new, something undiscovered,

(...)

some new organism or some new system. So it is very exciting.

(...)

- So my last question about cryptogram, it's being used internationally as well?(...) - Well-- - Is it mostly here? What's the story? - Yeah, mostly here. False codling moth only occurs in Africa, south of the Sahara and Israel as well since the 1980s.

(...)

False codling moth is a very poor coloniser and a very poor disperser. So the phobia from our export markets for introduction of false codling moth, although understandable, is exaggerated because if one looks at the false codling moth susceptible commodities that have been exported throughout the world for more than 100 years, there's been not so much as even a threat of establishment elsewhere,(...) particularly if one considers fruit as the potential pathway.

(...)

So it's pretty much just in Africa and I'm not sure if it's used in Israel,

(...)

but the new virus I was speaking about, which is now commercialised under the name Multimax, that has the potential to be used in Europe, North America, Australia, all over.(...) - Wow, very, very interesting. And that's studies that was discovered at Rhodes University. - Right, at Rhodes University and CRI, yeah. - Phenomenal, well done, it's incredible to hear that. - And you look at that and then in that press release that was published in Europe, it says that they've warned against the, what was the words? - Basically how sloppy South Africa is with the stuff. This is now the response to the Asian greening misinformation, suddenly the Spanish jumped on the bandwagon and you will know all of this. Anyway, so very, very interesting. If you look at current circumstances within the citrus industry and going forward, what do you see to be the biggest challenges on the pest horizon? What are the big problems?

(...)

- Before you answer, I just wanted to start the cameras quickly. - We have half an hour and then we have to just start the cameras again. So you've got a bit of time to think.

(...)

Are you finding this okay? - Yeah, yeah, it's fine. - It's actually fun to just have a chat interesting things pop out.(...) That's the idea. - I hope you edit the nonsense out. - No, no, no. - No nonsense. - No, there's no nonsense there. - A few arms of ours. - So my question is what is, we're sitting where we are today, what do you see as the biggest threat for the citrus industry from an intimate, intimate knowledge,(...) intimate knowledge?

(...)

(laughing) - We know what you want to say. - I'm not gonna help you. - I'm still stopping. (laughing)

(...)

- Well,(...) I'll give you two answers to that. The one is the successful re-establishment of IPM.

(...)

The biggest barrier in our path is the regulation of citrus black spot by the EU. If that can be changed to CVS just being viewed as a cosmetic organism, cosmetic pest or cosmetic disease,

(...)

I believe that would make a big difference in enabling us to adopt a softer, less disruptive

(...)

IPM approach to pest management.

(...)

And then we would have to educate both the farmers and the ag chem industry as well to get them to embrace the different approach. - So do you start there? - The agricultural pesticide industry.

(...)

And then the second one, which I'm sure you've heard of, is the imminent arrival of the Asian citrus civet,(...) which is in Africa and the disease it carries, which is Asian greening, is

the most devastating disease known to citrus worldwide. It's decimated the Florida citrus industry.(...) It's starting to get worse in the Brazilian citrus industry.

(...)

So we, as CRI, as the Southern African citrus industry, are working very hard to put in place systems and find solutions before it arrives,

(...)

because once it arrives, it's going to be very, very challenging. I think I'll be retired by then, I hope.

(...)

- Well, thank you very much for that answer. I mean, those are two very big, scary things. And we understand that the appeal to the World Trade

(...)

Organization is underway, that the South African industry is working hard to get that done. - And you'll be part of the delegation going there, if I'm correct? - I will, yes.(...) - Well, the very, very best of luck with that, because there's industries, I think, they're holding their breath.

(...)

- Yeah, look, we will do our best, and we believe that our argument is sound,

(...)

but we can't predict the outcome.

(...)

So, yeah, we hope for the best,(...) but we prepared for any outcome. - Well, I would say South Africa's got a good opening batsmen lineup going there. - Yes,(...) yes, good luck. (laughing)

(...)

- I think I'm one of the middle order batsmen.

(...)

(laughing) - Well, thank you very much. Is there anything else you wanted to add, like maybe a kind of a wrap up about-- - Or message to growers? - Message to growers, yes. - Yeah, my message to growers is on the IPM message, don't be afraid, be brave, you can do it.

(...)

And if you are afraid,(...) begin on your latest maturing cultivars, such as your Valencias,

(...)

because you can tolerate a conspicuous level of infestation of your biocontrol pests like millebug and redscale, because there's so much time for those to come under biocontrol before harvest. So give it a go, don't be scared, adapt, because in a few years from now, I think we are going to be compelled to move towards IPM, so don't wait until then. Start doing it now.

(...)

- Thank you very, very much, Sean. It's really been very, very interesting chatting to you, and thanks for coming to chat to us. - Thank you, Louise and Dear Valt, appreciate it. - Great stuff, thanks.

(...)

- Sure.

(...)

- Sounds like we're in a race.