# National Biosecurity Forum

Day 2 Session 1

10 November 2020

## Introduction

This is the transcript the National Biosecurity Forum, presented by the Department of Agriculture, Water and the Environment.

## Transcript

[Webinar begins]

Nicholas Housego: Right-o, good morning ladies and gentlemen. We're underway with day two of the National bio-security Forum. By way of getting started, I'd like to start the session with an acknowledgement of country and it being the 10th of November. We're also in the middle of NAIDOC week so it's very significant that we do this. I'd like to begin by acknowledging the traditional custodians on the land on which we are meeting and that being in Canberra, where we're hosting the meeting is the Ngunnawal tribe.

Nicholas Housego: I pay my respects to elders past, present and emerging and to those aboriginal and Torres Strait Islanders who are with us today, you are most welcome and let's hope for a happy and strong NAIDOC week. We're underway. Okay, today we're focused on the innovations in bio-security. Just a quick recap, yesterday we had about 220 people join us for the session, which was fantastic.

Nicholas Housego: We had Andrew Tongue and Gabrielle Vivian-Smith, both of them talking highly. One about the awards and the other one about the Kim Ritman award. To honour Kim Ritman we're now handing out a national science award in his honour and Brendan Rodoni, one of the diagnostic technicians has picked that up which is fantastic. We'll here more about them on Thursday. Okay, so this is the second day of the 2020 National Bio-Security Forum and the first of three days of webinars on a diverse range of bio-security topics.

Nicholas Housego: If this is the first day for you that you're joining us, yesterday we held that plenary session, as I discussed and now we want to be focusing today on bio-security innovations. To help manage growing bio-security risks and safeguard Australia from exotic pests and diseases, innovation, research and development is key. There are a range of projects being undertaken across the country that will support a smarter, more innovative approach to bio-security management.

Nicholas Housego: Our first speaker today is Dr. Elisa Bayraktarov from Griffith University in the eco-commons program. She's going to speak to us about the Queensland bio-security commons innovation project. Following her will be Jessica May who is the acting assistant secretary of the risk and innovation branch at the department of agricultural water and the environment. Today she is going to be speaking to us about innovation programs and innovation challenges as well as introduce us to a few of the exciting projects that are currently underway with the program.

Nicholas Housego: She will be joined by Dr. Alexander Schmidt-Lebuhn and Dr. Tara Sutherland from the CSIRO and Peter Barrow from Atamo who will each speak to us about innovation projects that they are currently involved with. We'll also be joined by Dr. Jo Luck, the programme director for plant bio-security and the research initiative. Plant bio-security research initiative is a partnership between the nation's plant researcher and development corporations working with Plant Health Australia and the department and other industry, state and federal bio-security stakeholders.

Nicholas Housego: Jo's going to speak to us further about the research work that is supporting Plant Health. That gives us a little bit of an overview of the day, it's fairly tight. Most of the speakers will be speaking for five minutes only. Those who are book ending, top and tailing the process will get 10 minutes. By way of getting us started, the bio-security commons and innovation project Dr. Elisa Bayraktarov, EcoCommons and program manager at Griffith University, we're going to hand the floor over to yourself. Away you go.

Dr. Elisa Bayraktarov: Welcome, welcome to my talk. My name is Elisa Bayraktarov, I'm the project manager of the EcoCommons program and I'm absolutely thrilled to kick of the innovation session with some ideas about how virtual laboratories can support analysis needs in the bio-security sector. All right, at EcoCommons what we do, we support environmental problem solving and we do this by partnering up with research, government and industry and we provide seamless access to biodiversity data.

Dr. Elisa Bayraktarov: As well as the tools for analytics and also training to researchers and practitioners in Australia. What we have specialised in is building virtual laboratories for solving environmental problems. What our virtual laboratories do is take huge amounts of data into analytical workplace to provide answers that can be used, for example, conservation or for more sustainable use of our natural resources.

Dr. Elisa Bayraktarov: We do this by built a national research infrastructure, of course we don't do this alone. It's a big partnership program of with the Griffith University is part of so it's nine institutions that have joined forces to develop the EcoCommons program. The Australian research data commons is our major single investor and our mission is to build a platform of choice to analyse and model ecological and environmental problems. Our vision is to see Australian researchers and practitioners have access to trusted, world-leading ecological and environmental modelling tools.

Dr. Elisa Bayraktarov: So to illustrate what I mean by virtual laboratories, I think we need to step back and have a think, what are the workflows that many ecologists and practitioners deal with when they're trying to find solutions to environmental problems. Mainly ecologists and practitioners, what they do is they run Species Distribution Models that tell us where species are currently distributed. Imagine pest species, for example. We want to know whether to distribute. So in order to run a Species Distribution Model what I need to do is I need to get access to all the available data on presences and absences and there are great places like the Atlas of Living Australia or TERN that provide access to this data.

Dr. Elisa Bayraktarov: Then I have to prepare, clean, crunch the data and prepare it for input into models and then I need to select a Species Distribution Modelling algorithm and there currently about 25 being used by science. Then I evaluate my model, see whether the data is being visualised properly and then I have the distribution of the species of interest. Whenever I want to do the same thing for a new species or whenever new data becomes available, I basically have to repeat this whole workflow.

Dr. Elisa Bayraktarov: Also, I can project the species distribution, how it is currently into the future taking into consideration future emission scenarios. Whenever the new data becomes available or I want to run this model for a new species, I have to run this workflow over and over again. Imagine you're an ecologist and you're a relatively good coder, you'll probably spend around three to five days figuring out coding this whole lab.

Dr. Elisa Bayraktarov: What if I tell you that with virtual laboratories we can reduce this time effort from five days into as little as one hour? How do we do this? We provide access to lots of data sources and we link those ones to tools and workflows and we back this all up by high-compute and cloud storage. By doing this all in one space, everything becomes much more streamlined, transparent, reproducible and also sharable with my colleagues.

Dr. Elisa Bayraktarov: In EcoCommons we also provide great training and we have a user support network. We have a great community engagement and a good governance model. Primarily, we have developed the so-called biodiversity in climate change virtual laboratory or the BCCVL and the BCCVL is currently an existing service where various data sets come together and users can run analysis on, for example, how climate change is effecting the biodiversity and the distribution of species.

Dr. Elisa Bayraktarov: They do this by using a really nice point and click interface to run the models. The beauty of the BBCVL is really that everyone can run trusted Species Distribution Models as well as calculate future climate projections with highly created data and without any prior coding experience. It is a very efficient way to produce high-impact results.

Dr. Elisa Bayraktarov: Now an example of the data sets that we are bringing together, data sets that are contained, for example, in the Atlas of Living Australia and accessible through their species quota. Increasingly, at EcoCommons, we are using the infrastructure of the BCCVL to develop new platforms such as the Collaborative Species Distribution Modelling Portal or CSDM which has been developed as a proof of concept interface for users from governments and to enable them to run and share Species Distribution Models.

Dr. Elisa Bayraktarov: The CSDM assists governments, for example, to deal with threatened species listing or any other applications where the distribution of species are of interest. In a more bio-security setting, what you usually do is you want to know where pest species or invasive species may distribute. This is an example on fire ants, we used our existing service, the BCCVL and data from the United States and Latin America and we calculated where fire ants will distribute currently.

Dr. Elisa Bayraktarov: We already used BCCVL for that, the service already exists and in order to calculate where those fire ants exist, you can see that the maps show in white low probability of the distribution of fire ants and red high-probability, so suitable habitat. We can take these results and project them globally and we can zoom into Australia and this is what we get.

Dr. Elisa Bayraktarov: These are the results that I have showed you before based on data from the United States and Latin America and zoomed in to produce the global projection with two different models. A generalised linear model and a MARS model. We can see the habitat suitability for the fire ants. You can see the second model, the MARS model is a little bit more conservative because the area of habitat stability is more pronounced.

Dr. Elisa Bayraktarov: This would get much more fine-tuned and better if we used actual data from Australia. And now we need to recognise that ere is significant additional potential to use this in a much broader number of bio-security settings and not just in terms of Species Distribution Modelling. As a consequence, together with Queensland government, bio-security Queensland and the Australian Department of Agriculture, Water and the Environment, Cebra is the centre of excellence for bio-security risk analysis at the University of Melbourne.

Dr. Elisa Bayraktarov: At EcoCommons we have submitted a proposal to the current ARDC investment round to develop the so-called bio-security commons innovation programme. What we're proposing is to use the SDM modelling as an example and add it to other additional workflows. For example, to inform surveillance design and dispersal modelling to estimate impacts, to estimate the location of the sources, to estimate proof of freedom or the time of eradication. These are all decision making workflows and processes that are interlinked, based off of Species Distribution Modelling output.

Nicholas Housego: Two minutes, just letting you know two minutes.

Dr. Elisa Bayraktarov: All right, this actually brings me to the end of my presentation. We have submitted this proposal. Stay tuned next week, I think it's the time where we'll find out whether we've been successful and please get in touch with us if you want to know more or check the ARDC webpage next week to find out whether the bio-security innovation project has been successful.

Nicholas Housego: Elisa, thank you very much, fabulous for finishing just before time. Okay, I'm going to more to the next one, bio-security innovation program and bio-security innovation challenge. Jess May, away you go.

Jessica May: Good morning everyone, I am Jessica May. I'm the acting assistant secretary of the rick and innovation branch in the Department of Agriculture, Water and the Environment. Today I'm going to be talking to you about the bio-security innovation program and also the bio-security industry innovation challenge that we ran recently.

Jessica May: The first slide that I'm going to talk about really is about the fact that bio-security is facing many challenges in Australia. The challenges aren't static and they continue to evolve and are increasingly complex are only getting bigger. We're also been impacted by COVID-19 and when the pandemic ends the pressures facing the bio-security system will return. To deal with the increased bio-security risk, we can't just throw more resources at it, obviously so the solution that we're really looking for is innovation.

Jessica May: We're identifying more ways to innovate the management of bio-security risk which will allow us to manage the challenges of the ever-changing bio-security landscape. We need to focus our resources on areas of high risk and develop smarter approaches and technology to help us better target risk pre-border, post-border and that includes pushing most of our risk offshore.

Jessica May: The bio-security innovation program was announced in 2018 by Minister Littleproud... I just can't seem to change my slide, hang on. There we go. It's a $25.2 million program over five years so it roughly works out about $5 million a year so it's really to support the national bio-security system to work smarter into the future. It provides government with opportunities to collaborate with innovators and the business sector, universities and research entities to identify technologies and approaches that will contribute to the long-term effectiveness and sustainability of Australia's national bio-security system.

Jessica May: The program is in its third year and so far it's funded 56 projects, 32 of which are now complete. Today, after my presentation you'll get to hear from quite a few of the people who have gone through the innovation program to deliver their projects. It's obviously an open program, so we work with people from industry, businesses and we match them to a sponsor within the department. Currently the bio-security innovation program opened yesterday for projects to apply for next financial year's round of funding.

Jessica May: It operates as an investment fund so we work with you to develop a project and the first step is really to send us a quick synopsis that's probably 100-300 words of what you're thinking and then we'll work with you to develop a proposal that can go to our bio-security research and innovation steering committee for choosing for the next financial year. We really want to try and partner with others in their community, with businesses, with start-ups to really start to think about new and innovative ways of doing things into the future.

Jessica May: We can help with getting your application ready so feel free to contact us on any of the details on the screen and we will work with you if you don't already have a contact within the department to develop your idea and also to progress it further. The next thing I'm going to talk about is the bio-security industry innovation challenge that we ran a few months ago.

Nicholas Housego: You've got a minute.

Jessica May: Okay. The industry innovation challenge was something that we've never done before. We'd looked at the BRII which is run by the department of industry where we go out to business and ask them to solve some of our biggest challenges. This was sort of like a mini version of that, that we ran in May this year. We had four key challenges and they were really to look at new ways to do audits, new ways for treatment verification, container traceability and new trapping for exotic invasive ants.

Jessica May: We had a great success, over 120 people dialled in and then we received over 23 proposals. We chose three of those to move on to a three month virtual incubation with Canberra Innovation Network. We had some really great ideas come through so those three people that were chosen to progress were zirkarta, they investigated their platform to perform remote audits which use geo-spacial technology, electronic forms, videos and photos to help reduce the inconvenience and time required to conduct successful audits.

Jessica May: We then had SensaData for the treatment verification one, so they investigated their Smart-r-Tag to monitor fumigant levels inside containers and good while the fumigation process was taking place. Finally, for the invasive ants one we had Northern Territory Department of Primary Industry and Resources. They investigated the use of pheromones as lures for ant traps and developed a 3D printable trap for deployment in the future.

Jessica May: This challenge really opened our minds to a range of solutions that may be possible to solve bio-security challenges in the future and we're still investigating with these people and whether they're going to go into the next round of the bio-security innovation program. It really gave us a platform to reach a wide range of innovators that the department typically does not collaborate with to develop solutions to our bio-security problems. Thank you so much for your time today, Jess.

Nicholas Housego: Wonderful, just in time. Wonderful. We are very tight for time so I appreciate you presenters really sticking to the guns. Okay, the next one is a mobile phone application to detect Brown marmorated stink bugs and that's Dr. Alexander Schmidt-Lebuhn out of the CSIRO.

Dr. Alexander N. Schmidt-Lebuhn: Thanks very much for giving the opportunity to speak and to be here today. This is about a project using computer visions, so artificial intelligence image recognition or classification you could say. I think the Brown marmorated stink bug doesn't really a lot of introduction because it was in the media at the time and it was an infestation in the Sydney area.

Dr. Alexander N. Schmidt-Lebuhn: This insect is a major bio-security risk, it's a pentatomidae bug from Asia that is very generalist so it attacks a lot of different plants. In particular, for example, things like fruit trees and nut trees. It would be a very bad idea to get it into the country. It's caused lots of damage in various parts of the world from America, Europe and Caucasus, for example.

Dr. Alexander N. Schmidt-Lebuhn: There is a need for efficient and portable identification tools both at the border and behind the border if there has been an infestation. As it happens, about two years ago... I'm from CSIRO's national research collection, about 10 years ago after I had recently finished an identification tool that I delivered to the Department of Agriculture, we partnered with Microsoft and a consultancy called Altis to develop an image recognition app prototype.

Dr. Alexander N. Schmidt-Lebuhn: Originally, because I have come out of an identification tool project working on weed seeds intercepted at the border, we thought that as our first example that we're working on to see if we can use image recognition to help us develop a tool that is really portable everywhere. It can go round, just hover over the seed and identify. Our project was then to extend that and test the feasibility of using the exact same approach in this cell phone app format for a mobile stink bug identification.

Dr. Alexander N. Schmidt-Lebuhn: Just very quickly, what we did, we did a priority list of four pest species including the Brown marmorated stink bug but also for example you have the spotted stink bug also from Asia. In five native species we did not differentiate between males and females because these insects don't have very strong dimorphism. We restricted ourselves to adults only, ignoring the infant stages.

Dr. Alexander N. Schmidt-Lebuhn: The Australian Nation Insect Collection curated and re-identified hundreds of specimens partly in their own collections, partly inter-institutional loans to give us material to photograph. One challenge we had to overcome was then how to get decent photographs that give us the whole depth of view because these insects are rather bulky. We used stack-shots for that to take about 20 images of the same specimen and then have them computed together so everything is in focus.

Dr. Alexander N. Schmidt-Lebuhn: In the end we trained and re-trained Microsoft Custom Vision computer vision model with about 400 to 800 training images per class. Treating the Dorsal and ventral views so the back and belly views of these insects as separate classes because they look so different and we exported them ultimately to test in our iPhone or iPad prototype.

Dr. Alexander N. Schmidt-Lebuhn: The results inside the computer, the performance models that you get when the model is trained in the cloud, so to say they're extremely good. If you send this model the same kind of image as it has been trained, it is extremely competent at identifying these species but that is of course not a 100% realistic estimate of how it will perform in the app in the field.

Dr. Alexander N. Schmidt-Lebuhn: We also did these handheld tests after exporting it to the app format where you're of course then dealing with problems such as low focus, light conditions and whether you get the angle right and our experiments there however have also shown that it works extremely well on our main concern: Halyomorpha with the asterisks at the end, that is the Brown marmorated stink bug, so it's extremely confident on that as it is on a few other of the pest species but it struggles with two of the native species.

Dr. Alexander N. Schmidt-Lebuhn: The native ones are not marked with asterisks here.

Nicholas Housego: You've got another minute.

Dr. Alexander N. Schmidt-Lebuhn: Thank you. If I have another minute then I think what I would like to do is to very quickly show a video of how that looks in the hands of the users so you can see what is going on. The important thing going on here with this app is that you need to ensure that you've got the specimen in focus and more or less maximise so that it fits the image so you get the best and most confident results.

Dr. Alexander N. Schmidt-Lebuhn: You can turn on a little light in case the light conditions are a problem, if the camera is dark. You also get species profiles here if you want and little links to other resources which could be something like, "Okay, is this something that I need to manage? Where's it distributed?" Things like that. What I wanted to show here is that in contrast to many other identification apps you get constant feedback about how certain the model is and what the alternatives are and you can then click on some of the alternatives that you see and then see if that is maybe the correct answer because you then see the example photo, et cetera.

Dr. Alexander N. Schmidt-Lebuhn: Okay, thank you very much.

Nicholas Housego: Alex, superb work. Thank you all, this is great innovation that we're getting to see here so wonderful to get a chance to see if first hand from the individuals who have helped build it and present it. Okay, now we're going to Dr. Tara Sutherland from the CSIRO on the spot test to reduce antibiotic use for the treatment of mastitis in dairy cows.

Dr. Tara Sutherland: Yes, thank you so much for giving me the spot. What we're looking at is developing a device that's to help farmers treat mastitis on the farm. This is a collaborative effort between CSIRO and XING technologies which is a small biotech company that came out of UQ. I'm from CSIRO so I'm only going to talk about the aspects that we're interested which is very much around reducing antibiotic usage across the whole agricultural industry, in this case in the dairy industry.

Dr. Tara Sutherland: I will talk a tiny bit about the technical development side that we're involved in as well but if you want more detail on that then please contact me afterwards. There's two components, there is the work that's being done by XING with input from us on developing the device but we're also very interested in understanding what the end-user needs are so that any device that we make is essentially a win-win for everybody so we do get take-up.

Dr. Tara Sutherland: We do this based on interviews, in this project it's with dairy farmers, vets and dairy consultants and also of course doing literature reviews. I'm just quickly going to share some of the user journeys that we've got, the details are not important. The main thing is that we're looking at both diagnosis, this is what's showing on the screen, of mastitis and treatment to understand what happens, who's involved, what they do, the risks and the opportunities.

Dr. Tara Sutherland: When I say the opportunities, what's the best type of device that we could produce that would actually get uptake on the farm? This is the information that we get from the diagnosis and the treatment of mastitis and essentially what happens is all the diagnosis and treatment is done by the farmers, very rare for the vets to be called in. They do get information from the milk processor who take the milk and they look at it.

Dr. Tara Sutherland: Essentially then the farmer chooses the last antibiotic that worked on the farm, he treats the cow with that and if any antibiotic fails then he goes to the next antibiotic. He may do that again and then if that fails, the cow is culled. It's very simplified but essentially that's the process. We look at all the different personas who're involved.

Dr. Tara Sutherland: This is the persona from a farmer of a small dairy, we talk to farmers of larger dairies, we talk to the milk processors, we talk to vets and we talk to dairy consultants. We've really tried to understand the type of device that they like, how they're motivated, the sort of things that they do, what influences them. Then, really importantly what the pain points are and then try to match that with the objective.

Dr. Tara Sutherland: Our objective is very much around reducing antibiotic usage.

Nicholas Housego: Tara, you've got one minute.

Dr. Tara Sutherland: Yep, that's good. We come out from that with a device and essentially the device that we want is something that replaces the current blanket treatment with antibiotics to something that identifies the species that actually will respond to antibiotics. Then the device that XING is making, it's based on a Rapid Nuclear Acid Extraction technology that they've developed in-house. There's then a Point of Care Cartridge that does real PCR and then that's put into a Multiplex Optical Reader to give the results.

Dr. Tara Sutherland: It allows Point of Care testing, it's automated, multiple samples. The idea is that it gives a rapid output and then the information goes to the cloud so that the farmer can access it there. If you'd like more details, please contact me directly. That's the end, thank you very much.

Nicholas Housego: Now, we have development of pyrethroid surface sampler for aircraft disinsection. Peter Barrow, you've got the floor.

Peter Barrow: Our project started... Well, I'll start at the end, our project is to develop this device that you can see on the screen right now. It is designed to give an immediate feedback for the bio-security staff that are checking for the presence of pyrethroids on aeroplanes. The challenge started back in March 2017.

Peter Barrow: This was funded under the BRII program with the Department of Industry. The challenge issued was to find an immediate method for detecting whether there is pyrethroids present on the aeroplanes. The reason for doing that is that it is the most common way for exotic diseases carried by mosquitoes to get into the country.

Peter Barrow: They find that container ships and so on take way too long for mosquitoes to survive to get in so aeroplanes is the most common method for mosquitoes to get in. There is a WHO mandated spraying regime for airlines but they didn't know whether the airlines were actually doing it as to the standard and just how effective that was.

Peter Barrow: The challenge was issued to find a way, we did an initial feasibility study and found that the pyrethroids responded to light in the UV vis spectrum and so we submitted an application to develop a product that would use that technology. That then proceeded to a proof of concept development which finished in first quarter last year with a demonstration to the Department of Agriculture executive.

Peter Barrow: Following on from that, we now have a supply contract to collect about 20,000 samples from incoming flights in to Australia. The sampling program was set to start in about March this year then this little pandemic occurred so as you can imagine we're sitting waiting at the moment for regular flights to resume.

Peter Barrow: There are some flights coming in, obviously with the repatriation efforts that are ongoing but I think it's about 1% of the pre-pandemic travel so...

Nicholas Housego: Peter, speaking of one, you've got one minute.

Peter Barrow: Okay, sure. Our next steps for this challenge is to start testing some of those flights that are coming in and then once flights do resume, the bio-security staff will be on flights sampling. The outcome from that will be a database of some 20,000 samples that will tell us how well the spraying regime is working and also how long the spray last.

Peter Barrow: They think that it lasts eight weeks per spray per plane but they don't have any real life data when measuring against the cleaning regime of aeroplanes and customers actually walking up and down isles and rubbing on things and so on. The aim will be to form a measuring regime to make sure that the airlines are actually keeping the exotic diseases out of the country.

Nicholas Housego: That was a fantastic series of presentations, well done. Thank you. Jo Luck, I'll quickly introduce you. Program director, plant bio-security in the research initiative. You've got the floor.

Jo Luck: Thanks very much Nick, good morning everyone. I'm going to provide some examples of how PBRI is collaborating to support innovation in plant health and Nick mentioned at the top of the day that we have seven research and development corporations that form part of our members along with Client Health Australia, Department of Agriculture, Water and the Environment and the Council of Rural RDCs.

Jo Luck: Our main purpose is to foster collaboration, to invest in cross-sectoral plant bio-security and innovation. The way that we do that is through agreeing, which is often not easy, on the priorities for plant bio-security innovation that can result in benefits to more than one industry. That may be pests like Fall Armyworm, a focus on pests that have multiple hosts and I'll touch on some research that we're doing in a minute.

Jo Luck: Or it may be through different platforms or technologies that can benefit multiple industries. Once we have agree priorities we then co-ordinate and leverage that co-investment for research and that is usually lead by a single RDC with co-investment. Either cash or in kind from other members.

Jo Luck: Lastly, we promote and facilitate collaboration so not only within the members of PBRI but we recognise the importance of international and national collaboration for better bio-security outcomes for our industries and their regional communities and the environment. When we first formed in 2017, we developed a strategy. We had a focus to developing investments around and you can see out key focus areas on the right hand side of the screen.

Jo Luck: What I want to do is just give some brief examples of projects that fit under these key focus areas. The first is Fall Armyworm which arrived in the beginning of this year and was closely followed by COVID-19 and the travel restrictions that came with that. Initially our response for our Northern states and territories was to have awareness workshops but unfortunately these weren't able to be held.

Jo Luck: With funding from the PBRI the Plant Health Australia were very quick on their feet and developed some podcasts which were able to be heard in tractors or heard in their own time about how Fall Armyworm is identified and managed in Northern America, South Africa and more recent episodes are identifying and responding to the insect here in Australia and so you'll hear from our research scientists working at the coal face.

Jo Luck: We also have projects characterising the pesticide resistance of the Fall Armyworm. It has landed in Australia with existing resistance to pesticides. We're identifying beneficial insects such as parasitoids for integrated pest management over the pest. We also have a project on in-field testing using lamp technology for detection of larvae.

Jo Luck: No doubt there'll be more projects being developed on Fall Armyworm. Xylella fastidiosa is another pest that effects over 500 hosts. This is really a prime target for PBRI to co-invest in research to be better prepared for the potential arrival of this bacteria. We're so concerned about this pest that we've appointed a program manager, Craig Elliot who is in charge of awareness for our growers both in horticulture and the wine industry.

Jo Luck: He looks at the international developments in olives, in citrus, in grapes and also any research gaps that we need to identify and support back here in Australia. We've also recently funded a project looking at the potential of our native insects to carry and acquire and transmit this disease which occurred overseas in olives. That project has just started and is a collaboration with New Zealand.

Jo Luck: Just zooming out a little bit, the PBRI is involved in a very large project lead by GRDC on boosting the diagnostic capacity for our country and for our plant industries. This is around strengthening our priority plant pests. We have a top 42 list, Xylella is number one, this is a very large project with investment from all the states and territories in kind and cash.

Jo Luck: All the RDCs looking, collaborating on getting better diagnostics behind every one of those 42 pests and diseases and strengthening our protocols in-field. We've heard about the Brown marmorated stink bug, we have a project looking at environmental DNA traces of this insect for better detection. Again, in collaboration with New Zealand this is lead by Cesar in Australia.

Jo Luck: This is in order to more quickly or rapidly detect this insect which is causing a huge amount of concern at our borders. Hopefully this technology will be transferred to other insects in future. We heard about Kim Ritman yesterday, a really moving tribute for Kim Ritman who was a foundation member of the PBRI.

Jo Luck: Kim proposed to the PBRI members that we have celebrations of the international year of plant health across the year and we supported a program of activities including our every day plant health heroes which are being posted to the Plant Health Year website. You'll see a cross-section of the community, both school age kids, our research scientists, our regulators all working together to support plant health in this country.

Jo Luck: Collaboration is really important, not only in our national community but we recognise how important international collaboration is in order to avoid duplicating really important research that could be done overseas and bolstering our preparedness back home in Australia. We have recently signed, last Friday actually, an MOU with ACIAR, our international agricultural research agency, B3 New Zealand and Euphresco in Europe which is a plant health organisation aimed at plant health research and better co-ordination. We had our inaugural PBRI Symposium in August in Brisbane in 2019 and we were set to hold one next year, again alternating with B3 New Zealand's conference.

Jo Luck: We now have pushed this back to May 2022 so please put these dates in your diary. This will be a showcase of cross-sectoral plant bio-security research in this country and we are hoping to hold it in 2022 in a regional town. Lastly, I'll just mention that the PBRI has been refunded for another three years and we are currently working on our new investment priorities for the next three years.

Jo Luck: That will be in order to support better bio-security in Australia and more research to underpin that so thank you.

Nicholas Housego: Jo, thank you very much for that. Right on the money too, by the way, timing-wise. Well done. Okay, we've gone through a range of presenters there, we've had a look at the first session which was Elisa Bayraktarov and she was talking about the bio-security Commons project driven through Queensland. There are a couple of questions that came up about that which we'll be bringing to you.

Nicholas Housego: The bio-security innovation program by Jessica May, the assistant secretary for the risk and innovation within the department. The mobile phone application of Alex's that looked at the brown marmorated stink bug and how you could get photos of it in the field to get some diagnostics works done. The on the spot test to reduce antibiotics for the treatment of mastitis in dairy cows, Dr. Tara Sutherland. Again, some questions have popped through on these.

Nicholas Housego: Peter, the development of pyrethroid surface samplers for aircraft disinsection was one of the key areas that came up for conversation and then innovation, research and development supporting plant health which Jo just finished with. Peter, I've got the first that's coming in to you and this is a couple of ones. Some people have asked, what are pyrethroid surface samplers? What is it? What's it trying to look for?

Nicholas Housego: Maybe there's a bit of a 101 series here just to give people some high-level views of what the product is.

Peter Barrow: Okay, sure. Pyrethroids are used to kill mosquitoes basically. Your household spray that you spray around when you're trying to kick the mosquitoes off your back pergola contain pyrethroids. There's a formulation of that spray on aeroplanes prior to departure, used to be: at the top of descent, the cabin staff would walk down with two spray cans and coat everyone very nicely with pyrethroids.

Peter Barrow: What they do now is they get on before people are on the plane and spray it and there are photos around of this huge, befogged cabin which is being coated with pyrethroids. There's one main form that they use but there is about five or six other ones they use in different applications.

Peter Barrow: The pyrethroid surface sampler is a device that lifts a small sample off a surface and measure the weight of pyrethroid per square metre on that surface and gives an instantaneous answer.

Nicholas Housego: Is it safe for humans? We assume that it is because it's being used.

Peter Barrow: Yes, it is but it's somewhat unpleasant to be underneath the spray can as they walk down the isle which is why they don't do it anymore.

Nicholas Housego: Yeah, I used to have a full head of hair before they stopped that. Now look what's happened, away we go.

Peter Barrow: Not got any mosquitoes on you.

Nicholas Housego: Yes, so BMSB. We just want to talk about the app Alexander, if we could. The device using Microsoft AI, how quickly could you teach it to detect other insects or other bugs? Is it just for BMSB? Alex.

Dr. Alexander N. Schmidt-Lebuhn: Of course, it isn't just suited for that because we also did it with seeds already so I would say... I mean I'm not an AI researcher myself but my feeling is that the big bottleneck these days is not the image recognition model itself, as long as you've got something where they are visual difference that a human taxonomist could also work with.

Dr. Alexander N. Schmidt-Lebuhn: I think the big bottleneck in may cases is actually having a large number of training images from specimens that are reliably identified so we don't have a garbage in, garbage out situation. I think there are many, many cases where we can apply this. There's one other caveat though, of course, and it is the size of whatever you want to identify.

Dr. Alexander N. Schmidt-Lebuhn: This handheld smartphone app solution will of course then hit it's limits when you're dealing with really, really tiny mites or something like that at some point.

Nicholas Housego:

Yes.

Dr. Alexander N. Schmidt-Lebuhn: For things like bugs and beetles and seeds, flowers or weeds, that will help us a lot to narrow the possibilities down, link to other information, collect data in the field and so on.

Nicholas Housego: There's a lot going into the apps isn't there so fantastic development. Elisa, we've got a question here that's come through saying, what could you expand on that are some of the big issues that you're going to be focusing on for 2021, 2022, 2023? What's the key focus that you're going to be driving at?

Dr. Elisa Bayraktarov: At EcoCommons the funded part of the EcoCommons program is going to run between this year and March of 2023 and we are building a platform that focuses on species distribution modelling but also other analytics that people might use for solving of environmental questions.

Dr. Elisa Bayraktarov: Now, in terms of what problems we're going to want to solve for the bio-security sector, I can't tell you just yet because the project has been just submitted and we don't know whether funding will be received.

Nicholas Housego: Give us a look under the bonnet, come on. Give us a little bit of advance knowledge.

Dr. Elisa Bayraktarov: Advanced? How do we deal with hitch hiker pest species? Fire ants distribution would be an interesting one, something that we'd be keen on exploring would be to build safe havens for sensitive data so people can run analysis on data that should not be leaked to the public and only accessible to licenced users.

Dr. Elisa Bayraktarov: That would be something that we'd be exploring. What else? Distribution of pest species.

Nicholas Housego: Ok, there's plenty going on isn't there?

Dr. Elisa Bayraktarov: Yeah, definitely.

Nicholas Housego: Despite COVID putting a wrapper of almost that feeling of going slow, I've noticed the scientific teams have been busy doing a lot of work throughout this process. Okay, Tara. How long do you believe before the vets will have access to this device? Is that going to be happening in the next two to three years?

Dr. Tara Sutherland: I think that's an excellent question and it's certainly something that we hope will happen very quickly but I'm not really in a position to estimate when that will be around. I think these devices need to come out in the short-term. I think if all goes well then that's a fairly reasonable timeframe but I would have to talk to my collaborators before giving you a...

Nicholas Housego: Are the dairy farmers themselves saying, "We want this?"

Dr. Tara Sutherland: Yes, when we talk to them in general they are. Across the whole spectrum there are a group of people that are interested in new technologies but there's also been a lot of technologies come out that have not maybe worked as well as they want. That's why we're very interested in working very closely with them, to make sure that we actually do deliver something that's useful for them.

Dr. Tara Sutherland: Yeah, they're very forward-thinking in the industry.

Nicholas Housego: That's fantastic, that's what we need, a lot of that activity to actually bring product in so that it can exist. Jessica, question here that's popped up is: how do we have better engagement with industry as well as what's going on innovation-wise within the department? Is there a chance for better partnering?

Jessica May: Yes, definitely. We have something called the Seed which is a way where we share innovation journeys and stories out there. Similar to everyone else we've been hit with the COVID pandemic so we did have something planned for earlier in the year where we were going to go out and do a bit of a road show and meet with everyone and meet all the Universities and accelerators around the country. I think the Seed will keep you up to date with everything that we've got going on in the innovation space but always just reach out to our team. That's what we're there for, for that on-going collaboration with externals.

Jessica May: We're always available, we're always happy to talk to you and hopefully when the pandemic ends I can actually get out there and meet people face to face.

Nicholas Housego: Wouldn't that be nice?

Jessica May: Yeah.

Nicholas Housego: Here we are virtually doing it, so we're reaching out to a lot of people. I've got another question for Peter and then I'm going to come to you Jo but the question for Peter that I've got here is, how quickly do you see you moving to a commercialization of your process?

Peter Barrow: We're progressing towards that at the moment. We've continued the development beyond the proof of concept and are working towards developing the other markets that are available for detecting specifically pyrethroid based chemicals at the moment.

Peter Barrow: The other markets are, if you imagine the belt across the middle of the world where mosquitoes tend to hang out and where malaria and other exotic diseases live there big programs run by people like the Gates Foundation that put sleeping nets and so on and also indoor residual spraying of villages in place.

Peter Barrow: The next challenge for us it to start measuring data off those nets and those villages to get a profile of how effective those programs are as well. We're attacking those markets at the moment.

Nicholas Housego: You're much about data, you're collecting a lot of data in this space.

Peter Barrow: Yes, yes. That's right. The only way to profile how effective these things are, other than you can measure the end result which is how many humans are dying from malaria but if you can get in and know that the programs are effective and can be more effective, you can be more proactive in reducing the number of people who're effected.

Peter Barrow: Bill Gates said recently that, despite all the focus on COVID killing millions of people, there's actually a bigger killer in the world right now and that's malaria.

Nicholas Housego: Okay, one other question that's popped in, can the tech be adapted to testing for other chemical residues other than just pyrethroids?

Peter Barrow: Yes, basically the technology will work with any chemical that has a signature in the UV vis light spectrum so we've now got a list of seven different chemicals, one of which is not a pyrethroid based chemical. As we find applications for measuring different chemicals, we do the profile of them at the University of Western Australia. and then work out how to put that signature into the device for measurement.

Nicholas Housego: Okay, Jo. Thank you Peter. Jo, questions for you around we've had COVID and it's really taken us by surprise for the last nine, 10 months but it doesn't look like it's going to go away. It's really going to be here for very much the next year. Yes, there will be vaccinations coming out for humans and all sorts of things over the course of that time period.

Nicholas Housego: What's been happening on the plant health front? Have we been really able to maintain good stewardship of plant bio-security or has there been slippage because of the absence of travel, the difficulty of just communicating live face-to-face. Give us a bit of insight as to what's been happening in your space.

Jo Luck: I don't think communication has stopped whatsoever. I mentioned a project that we switched to doing podcasts to get messages out, some of the ground work may have slowed down but there are other ways of communicating plant bio-security messages and that has continued, from my perspective, throughout the year. We've found ways of doing that.

Jo Luck: We're very interested in diseases that take us by surprise and the holy grail of getting a better handle on disease that maybe be next on the horizon is really important to us. We want to gather all the intelligence we have and use all the partnerships that we're forming to be more on top of pests and diseases that may be the next Fall Armyworm, for example.

Nicholas Housego: Oh, yeah. Okay. Been busy, busy busy. That's the main thing that's been happening.

Jo Luck: Nothing stops, pests and diseases don't stop.

Nicholas Housego: No, they don't sleep do they?

Jo Luck: No, no, no.

Nicholas Housego: It's 24/7 and thought they had a weekend? They don't have a weekend. All right, well thank you everyone for your participation. It's been fantastic, these have been great innovation insights as to what's going on in the bio-security world. I want to thank all of the presenters for taking the time to prepare and engage with us on this on for the National bio-security Forum.

Nicholas Housego: I think it's been a good help to the minds that are present here as to thinking about what are the thing that we need to continue doing but do differently to improve on.

[Webinar ends]