

David Glanz: Australian agriculture operates across 58% of the continent and accounts for about 14% of exports. It's a big deal, and nowhere bigger than in Queensland, which with 127 million hectares of agricultural land, accounts for more than a quarter of the national total. So keeping Queensland agriculture, and let's not forget fisheries, productive, safe from introduced pests and at the same time in harmony with sustainable practices, is a big job. It's a balancing act in which technology increasingly plays a role and my guest today is responsible for getting that balance right.

David Glanz: I'm David Glanz and I'm talking in Brisbane with Beth Woods. Beth is Director-General of the Queensland Department of Agriculture and Fisheries. She's also a fellow of the Australian Academy of Technology and Engineering, and she's a member of the Academy's Agriculture Forum and its membership committee. Thanks for joining me, Beth.

David Glanz: Travis Tobin, who's the head of the Queensland Farmers Federation, has said recently that biosecurity incursions are one of the greatest threats to Queensland agriculture. He was talking specifically about African swine fever, but I assume there are many other nasty things lurking around waiting to take a bite out of the agriculture and fishery sector here. What's your approach and how have you, how's it changed over the years?

Beth Woods: I think anyone who's in a leadership position in agriculture would identify biosecurity as the number one risk. It's an increasing risk for a range of reasons. We are a much more mobile community. We shift things around. In the good old days, everybody had all the key pieces of equipment on their property. These days a piece of equipment might cost \$1 million or more, so you're more inclined to lease it or to hire it. So for example, all of the urban areas in Australia are busy putting tunnels in. Nobody owns their own tunneling equipment. It's used around the world. We know that all that sort of equipment is a great way to bring a range of biosecurity threats into Australia. So in terms of how the approach has changed, this is really an area where we're constantly looking at the opportunity to apply new technologies.

Beth Woods: When we started our current program to address red imported fire ant in Southeast Queensland, which is the most expensive program that we've been involved in in the last 50 years in Queensland, a \$411 million program over the next 10 years, we went out and looked for nests on foot. Then we went down the track of training dogs to smell out nests and we still use both of those means in certain locations, but increasingly we're relying on remote sensing, imaging and on being able to tell where we have high risk areas and focus our on the ground attention on those those areas. And that's of course all made possible because imaging technology has improved. It's improved in accuracy, it's improved in analytical skill and it's improved in terms of cost per pass, so that it's a great example of being able to deal with a biosecurity response more efficiently because of technology.

Beth Woods: If I use exactly the same response, we all remember when the Human Genome Program was done and how much that cost. By comparison of course, now our improvements in genetic testing, but also our improvements in instrumentation around genetic testing, means that you can do that very quickly and cost effectively for people. You can also do it for fire ants.

Beth Woods: So we can tell instantly if we get a new outlier of fire ants, whether this is in fact a spread from our existing population or whether this is something that's come in with a new shipment. And that means that you either treat it as an outlier of the existing, or you start to worry about what shipment did it come in on, where did it come from? And that's because very quickly and easily we can identify how that ant relates to the populations that are known around the world. We can do that because again, it's very easy to share large volumes of data, because we've got massive improvements in technology. So just two quick examples of how technology is making a difference.

David Glanz: And I'm assuming that given the vast size of Queensland, that satellite or drone imagery is really important in monitoring land clearance or just general activity on the land across huge areas.

Beth Woods: Yeah, certainly the Queensland Government has made a significant investment in improving that imagery and it's used for a whole range of government purposes. You mentioned veg management and it is used to be able to routinely look at changes in vegetation cover and identify where unregulated or illegal clearings occurred and be able to respond to that very quickly, because in an ideal world, you want to get there when 20 hectares have been cleared, not 2000 or 20,000. And that's possible if you are looking at comparisons of images from this time last week and today, just as an example.

Beth Woods: But similarly, last year Queensland suffered unprecedented bushfire activity up and down a front that was almost 2000 kilometers long and unbelievable reliance on imagery occurs in those sorts of fire events. And the fire and emergency services within the Queensland Government are constantly investing in improved imagery, not just from space town, although that's obviously very useful in its own right, but also from behind and in front of the bushfire front. Because imaging in different spectral scopes can give you different information about the temperature, the speed, the way in which the fire is developing, and of course that sort of imaging machinery is also on the the planes that drop water, et cetera.

Beth Woods: So you end up with those services being able to look at the combination of a vast array of information that's in the moment and that increases your ability to manage, increases your ability to give accurate advice to people about when they need to move and where it's safe to move and ideally also improves the safety of firefighters. Much better information to try to avoid sending them into harm's way. After the event, of course, it also allows us to pinpoint exactly what areas have been affected and to estimate what the economic impact is likely to

be, which industries are going to have recovery issues, even down to the questions of where are we likely to have a concentration of animals that may have been burned or injured by the bushfire front, where we may have animal welfare needs to be met.

David Glanz: Your department has a huge remit. I was reading your, I think most recently annual report-

Beth Woods: Not the one that I'm currently plodding my way through, which is the new draft.

David Glanz: No, but the one that's currently on record, so any figures or insights I'm taking from there. But your department has responsibility, obviously at one end for economic activity and Queensland agriculture, fisheries, forestry and so on generates something like \$20 billion a year and I'm sure that figure has gone up since the annual report was lodged. So you have a responsibility to huge workforce, to farmers, graziers and so on, at the same time. One of your responsibilities at the other end is for instance, the Great Barrier Reef, if I'm correct? How do you balance that out? I noticed that at the moment as we speak, there's some legislation going through parliament about Great Barrier Reef protection. This has been slammed by graziers as being anti grazier. I'm sure you get criticized from both sides, but how do you satisfy the economic needs, but at the same time work on behalf of sustainability, which at the end of the day is a scientific fact, not an opinion?

Beth Woods: Yeah, I think that's an interesting challenge and I do need to correct you. We aren't principally responsible for the Great Barrier Reef. That's in fact the Department of Environment and Science. Again, very much based on science, but we do come in very strongly as part of the mitigation of potential damage to the reef. So the priority actions at the moment in relation to reef for the Queensland Government, the big threat which is around mitigating impacts of climate change, clearly an issue across all industry sectors, but of vital interest in the agriculture sector.

Beth Woods: And the second one is about water quality going into the Great Barrier Reef lagoon. And since the majority of the area in reef catchments is used for agriculture, that comes right into our heartland.

Beth Woods: So in this question of balancing economic activity versus sustainability, there really is no magic bullet. Governments of course have political commitments and ultimately while we are a democratic country, government will look to honor their policy priorities that they take to the people. And that in my mind is the first place where we need to be active, not just within government, but across the science community, because we have, I think, a population that's increasingly less numerate, less science skilled. If you look in terms of numbers or the proportion of the population that's doing any sort of STEM study to an advanced level, seems to be low and continuing to fall. So that's a challenge for all of us.

Beth Woods: But secondly, it's just hard to get that information out about the actual data in many of these questions. Then there's the opportunity of course to apply science and technology to actually improve practices. That's I think a really important challenge that we have to take on and that I think industry is actually very willing to take on with us. We've had a long history of working with the farm community around sustainable agriculture. People are more or less able to engage in that in industry because it often costs money to change and it increases risk in the short term to change your practices. So we know from a long period of working in this space that you'll have difficulty encouraging people to change if they're not profitable to start with. And that if you can find ways to introduce more sustainable practices that are easily integrated into existing business practices, that that will be a much faster way to affect change than if we're talking about something really radical.

Beth Woods: And thirdly, of course, what farmers and others in the community always hope for is a silver bullet. And I guess the other insight that I have is that there are very few silver bullets in the systems that we are working within agriculture. You hardly ever poke the system in one place without seeing down the track it poking out in another place. So ultimately we have to accept that we've got a human population that needs to eat. And unless you're one of the people who take the hard line view that there's too many people and you're going to rapidly reduce human population, then it really is a game of trying to optimize how to feed the world's population and how to optimize other human activities and the preservation of landscapes and environment. And that really is not a perfect science. It's a balancing act which we're involved in all the time.

Beth Woods: I suppose our biggest example of it at the moment is that we're in the middle of a major reform of our fisheries legislation and regulation. It's all about trying to maintain sustainable fisheries into the future, having the minimum impact on non target species, and keeping both commercial fishers in business and meeting the needs of recreational fishers. There are an awful lot of recreational fishers and as a general rule they're convinced that it's commercial fishers who are taking too many fish. Commercial fishers point to the numbers of recreational fishers, and they've grown substantially because they basically grow with the population. And our role is to try and underpin that consultation processes with those interest groups, as well as conservation interest groups and indigenous interest groups and provide them with the data that we collect about what is the population, at what percentage of the modeled biomass pre fishing we're currently sitting, and really negotiating how we're going to get from what might be a less than sustainable level to where we need to be.

Beth Woods: We've been reasonably successful at keeping most of our fisheries above the line, but it's a ongoing challenge. And of course again it comes back to somewhere where we're looking to improve the management of fisheries by the application of technology. So vessel monitoring systems are increasingly involved in this. Ideally we would love to be able to measure everything that's caught directly. We are looking at all the latest technology in being able to put

cameras and sensors on boats and actually measure take as it comes in and characterize it between species. We're constantly looking at improved techniques for estimating biomass and the movement of biomass of various both target and non target species in our fisheries resource.

Beth Woods: And again, it's really an important feature of science that people are happy to share those techniques. So in key fisheries we'll send people to wherever we think in the world is the best at measuring scallops, for example, because that's what you want to be doing to be ensuring that you've got the best possible data on which to firstly make your estimates of what needs to happen, and secondly to work with the populations whose behavior you're trying to change, to actually get them to come on side.

Beth Woods: We can make all the rules that we like, but there's 960,000 recreational fishers in Queensland. I will never have enough boating and Fisheries patrol people to be watching all of them every day. So it's actually hearts and minds job.

David Glanz: They have to be convinced.

Beth Woods: They have to be convinced that this is the way you should behave. And in the same way as in Australia we choose to drive on the left hand side of the road, I need 95% plus of them to believe that five is enough to catch of this particular species. And the fishing season is closed between this date and this date because that's when spawning occurs. So all of those things have to be built on real evidence and they have to be built on being able to communicate to people that this is factual data and that it is built on proper estimation of what the fishery can bear.

David Glanz: Back on land, I mean obviously the big question is drought. Still affecting most of Queensland, lots of New South Wales even-

Beth Woods: About 67% at the moment in Queensland.

David Glanz: Yeah. Obviously a lot of New South Wales, some of Northern Victoria. It's a country which, the cliché goes, you get droughts, then you get floods and then you get droughts and you get floods. But the data is indicating that climate change means that the droughts are becoming more severe and more frequent. And even the floods are becoming more severe as well. Over 88% of the state is given over to agriculture, forestry and fishery. My understanding is the overwhelming bulk of that is grazing. So is your role to help farmers adapt to those challenges? I don't know, with different kind of livestock or grazing techniques? Or at what point do you say, area X is simply no longer farmable and I'm not sure what the mechanism would be, but essentially the farming there should stop in the broader interest of the state.

Beth Woods: It certainly is our role to firstly understand where we've got areas in drought and we obviously utilize a combination of meteorological data and groundcover

data to understand that. And we've been doing that for many years. That data is up on our government websites through a site called Long Paddock and has been sequentially improved over a long time. We've been talking about climate risk for a long while rather than climate change. Queensland's the most variable climate in terms of agricultural activity on the driest continent. So you're absolutely right, our extremes seem to be getting worse. But we've already been dealing with what I would argue are marginal agricultural environments. And as a result of that, we've had a focus since back in the mid nineties on science driven training for farmers on improved decision making under risk and uncertainty, through a group called APSRU, Agricultural Production Systems Research Unit, which is a joint endeavor between this department or between the Queensland Government, CSIRO and the University of Queensland.

Beth Woods: And I think we can claim a significant improvement in the sophistication of farming decision making on that basis. And we are continuing down that track through a current investment called DCAP, Drought and Climate Adaptation Program, headquartered at University of Southern Queensland, but continuing to be about management under risk and uncertainty and improving our skill in that regard. That's part of a general move across Australia to move from drought support to drought preparedness and the increase in business resilience. We've long had some broad policy positions which say we don't support agricultural activity, which is unviable. We have been moving for many years away from drought support programs, which encouraged people to keep animals on pastures or on properties where there was no feed. But when you're working in a highly variable climate, the name of the game is actually making use of feed when it's there.

Beth Woods: So the idea of excluding certain areas from agriculture, I don't think is the appropriate way to go. The appropriate way to go is to actually say, how do we manage this so that we make use of feed when there's sufficient feed there while leaving a reasonable ground cover and get animals out of the system at the point where feed becomes short? So that we're not in fact pushing systems beyond their limit. It's good evidence that that's working really well. We will have a decline this year, not an increase, I'm sad to say, in the total value of the sector, because I think we've got to the point where all the strategies that people can put in place to mitigate drought, they've probably done. So our estimate is we'll probably go down around the \$18 billion value for the sector this year, but the demand on a range of our drought support programs has actually dropped because there are no animals there to be fed or watered. People routinely de-stock in this part of Australia.

Beth Woods: I'd argue that in fact in some areas to the south, that's not yet a fully accepted practice, but I think perhaps other parts of Australia will need to move to managing a highly variable climate. We've been moving in that direction now for 20 plus years. So we've actually seen over this drought that the value of the sector's basically been able to be maintained while the demand for drought support assistance has actually gone down. And if you have a look at our farm

debt, rural debt data, taken across all the banks, what you can actually see is that people have been paying down debt and the dollars which have been released when they're destocked, so you get a bunch of money obviously when you sell off what you've got, has been put away into tax effective deposits-

David Glanz: For a rainy day.

Beth Woods: For the rainy day. And that's exactly what you would want to happen. So I'm not arguing that every property is perfect, but across the sector, what I think we can see is really well-informed improvement in management strategies. And then I could go on to talk about the fact that rural water use efficiency in both dryland and irrigated cropping has gone up astronomically. Again, research driven and improved management within the business sector. So a really measurable improvement in management skill, and that's been accompanied also by the use of advanced breeding techniques based on our molecular biology capability, which allows you to be able to identify what are the characteristics that actually deliver improved, water use efficiency and actually be able to select actively for them.

David Glanz: I understand you're a Queensland Government champion for northern Cape York?

Beth Woods: That's right.

David Glanz: For indigenous communities?

Beth Woods: Yes.

David Glanz: Tell me a bit about that and the passion that you bring into it, but also what's happening on the ground.

Beth Woods: Okay. So each of the Directors-General across the Queensland Government links up with an Aboriginal community that's within a traditional community setting, as the government champion. The role is to be the friend, used to be the friend in George Street. It's now the friend in 1 William Street. But the aim of the exercise really is for there to be a senior government person who takes a continuing interest in that community and in the challenges that it's facing. So my community is the Northern Peninsula Area. It's the little bit right on the tip of Cape York. So all those people who have on their bucket list that they want to get to the tip of Cape York, you'll be heading to Northern Peninsula Area, where you can walk out and see the monument Cape York. And it's also of course the kickoff place for moving across into the Torres Strait, which is just a fascinating part of Australia.

Beth Woods: On the ground it's a really interesting community. It has lots of historical challenges. It's a very significant community in relation to some of the recent media discussion about impacts of climate change in the Pacific, because

Northern Peninsula Area has five small communities within it, two of which are Torres Strait Islander communities who came to settle on the mainland when their traditional homes on Torres Strait Island, on Saibai, were in fact subject to inundation by seawater. So they were, some of the first communities to really have to look at this question of can we continue to live in this location?

Beth Woods: So it's an area where I think some of the really interesting things that link up perhaps with the Academy's interests are, how do you provide energy cost effectively? How do you provide water of good quality in a very remote location cost effectively? How do you ensure that you've got really top notch communications? And they've come into play really only in the last 12 months. Up until then you could really only rely on being able to phone out of the community when the weather was suitable and the rest of the time you couldn't. It's a community that is a really important location from a biosecurity perspective. And of course that's something I've got to a day job interest in, because this is the place where the barge from the Torres Strait comes and lands. It's the entry point potentially for a whole lot of pests and diseases that are active in PNG and in Indonesia come funnel down through that special economic zone in the Torres Strait where people are allowed to move to and fro.

Beth Woods: So perhaps many Australians don't realize that PNG nationals have a right to move into the Torres Strait and vice versa. So there's a mixing ground there and it's a front line for things like for example, drug resistant tuberculosis, which has really got a grip in some locations in PNG and this is the place where you would expect to see it start to come down and impinge on an Australian community.

Beth Woods: So it's a proactive health location, a proactive quarantine location, and a small community which is trying to figure out how it can best generate jobs and business from all of you and I and the rest of Australia who want to travel through that location. And that's challenging because they haven't had to deal with a lot of visitors previously. Personally, I find it wonderful to work with that community and I wish I could help them to meet their dreams and aspirations faster. But at the moment, the big issue of the moment is the local community taking over the management of water and water quality. And that's a challenge for a small community that doesn't have a lot of technical resources close at hand.

David Glanz: Well, it's been absolutely fascinating. Thank you very much for your time, Beth. And maybe we'll talk again.

Beth Woods: Thank you.