# GRDC PODCAST TRANSCRIPT

**Australian Grains Genebank**

[00:00:05] **Intro** This is a GRDC podcast.

[00:00:12] **Fiona Fagan** Hello, I'm Fiona Fagan. Recently, I was lucky enough to visit the Australian Grains Genebank in Horsham, in the Wimmera region of Victoria. It's a fascinating facility that stores seeds from around the world so they can be used for research and breeding. Now, a $30 million co-investment between GRDC and the Victorian Government will help connect the AGG with plant genetic resources around the world and fast-track development of new grain varieties. To find out more, I caught up with the national leader of the Australian Grains Genebank, Dr Sally Norton, and research leader for Plant Pathology at Agriculture Victoria, Dr Josh Fanning. I started by asking Sally to explain more about her role with the AGG.

[00:01:04] **Dr Sally Norton** So, I'm the national leader of the Australian Grains Genebank, so my role is to coordinate all of the activities related to bringing new material into the country, making sure that we've got it conserved and available and assisting in the distribution and on top of that, I also do a lot of work with the international community on engaging around genebank best practice and around looking at where we can source traits of interest for the benefit of the Australian industry.

[00:01:28] **Fiona Fagan** So tell us a bit more about the Australian Grains Genebank or AGG. How long has it been here and what is its main purpose?

[00:01:36] **Dr Sally Norton** So the AGG was officially opened in 2014 and what we are is a resource centre, basically a large seed library that contains a lot of the grain crops or the parents of the grain crops that are grown in farmers' field today. So our role is really underpinning the agricultural system for grain growers around Australia.

[00:01:56] **Fiona Fagan** So Sally, we're standing in the clean seed lab at the AGG and we've got some seeds here. Tell me what I'm looking at.

[00:02:03] **Dr Sally Norton** So the seeds we have out in front of us here represent some of the diversity that we have in the collection here. So there's a range of different size, shapes and colours of lots of different types here. So then we've got field pea on the bench here of different colours and sizes. The same with a lot of the cowpeas, the lentils and a lot of other crops here. So, what we're seeing is the range of colours, seed size, shape, we're seeing the range in cereal spike heads so they can have long horns, short horns, be black, brown, small, large. And right through to some of the tropical species where we have different varieties of sorghum, where we've got ones that are four or five or six metres tall, very open loose heads and yield very lowly compared to elite varieties where there'd be a kilo of seed on a head. And this shows the diversity that we can see, which also is representative of the genetic diversity or the DNA fingerprint, if you like, of what's underlying and the characteristics and traits that can be used by researchers and breeders moving forward.

[00:02:57] **Fiona Fagan** And how many varieties of seeds do you have here?

[00:03:00] **Dr Sally Norton** So the AGG currently holds about two hundred and eight thousand different types of seed, covering around about twelve hundred or so species, covering temperate and tropical agricultural food species and their wild relatives. So since we opened, we've provided over two hundred and fifteen thousand different seed samples to researchers and breeders around Australia, and about five percent of that distribution has gone internationally as well to support international agriculture as well. So what's really interesting and what many people don't know or wouldn't be aware of, is that of all of the grain crops that grown around Australia to create the foodstuffs we eat, didn't actually originate in Australia, they've been imported from overseas because they are highly adapted and highly productive in terms of grain yield. They're not naturally occurring in Australia, but what we do have is a wide range of super diverse Australian native species, and many of them only occur in Australia, which are highly resilient to the impacts of climate and pests and disease which can cause tremendous impacts on the varieties that are grown in paddocks today because they've evolved alongside the pests and diseases in Australia. So it's those wild relatives that are a tremendous resource and something that the AGG is focused on providing, in terms of Australian native species, but also wild species related to crops that have evolved overseas as well.

[00:04:15] **Fiona Fagan** So since it opened nine years ago, what have been some of the achievements here?

[00:04:19] **Dr Sally Norton** I think one of the biggest achievements we've had is that we've amalgamated three previous centres from around Australia into one centre. It's very streamlined; we have a really easily accessible web page where you can order seeds and see what we have; but I think what we've really done is really improved the products we're offering to industry. We've really focused on making sure that the seed we have here is of high quality and it's available. What we've noticed since we formed the AGG is that the demand for the seed that we store or conserve here in the AGG is increasing. So at the moment we're doing on average around about thirty thousand different samples a year going out the door, which is a tremendous increase compared to where we were nine years ago.

[00:04:57] **Fiona Fagan** Talk about the partnership between AG Vic and GRDC?

[00:05:01] **Dr Sally Norton** So the AGG's supported by Ag Vic and GRDC through a strategic program of work that is designed to really unlock the genetic potential, or unlock the characteristics or traits within the seeds here, as a resource for research and breeders to really underpin the productivity of the Australian grains industry. So in essence, what it means is that the program of work that we are currently doing, and will be doing into the future, will really enable Australian agriculture to be climate ready, and really allow the development of new varieties grown by farmers, more quickly with potentially high yielding and higher quality crops into the future. There's five priorities that together enable the AGG to deliver for the Australian industry. The first one, which I've mentioned before, is around characterising the collection using genotyping, which is really important to actually identify how much diversity we have in the collection, what diversity we need to bring in into the future, and what traits are of importance to the research and breeding communities. It's really easy to generate lots of genetic information. It's really quite challenging to actually use that information in a really informative and effective way. And so the other part of the program of work is developing web-based tools and platforms which allow people to make informed decisions on how they're going to use the material in the Genebank to really facilitate or speed up the development of new varieties. And to do this, we really are interacting with the international communities in terms of genebanks and research and breeding communities, to make sure that what the AGG is doing around that development and the genotyping is in line with what is beneficial to other organisations internationally as well, and to make sure that we're not recreating the wheel. The same around Australia, there's many programs around Australia funded by GRDC and Ag Vic, where there's genotyping tools already being used. So it's making sure that what the AGG is doing through this partnership, is actually aligned to what Australian industry needs. It's really, really important that what we do underpins the Australian industry. And the other thing we, looking forward, is we're looking for the future development of the Grains Genebank. What do we need in place in 30 or 50 years’ time to make sure that we're still delivering what we need, for the Australian industry and that's in terms of physical footprint, so buildings, infrastructure, but it's also about the people. What are the skill sets we need into the future? So that can be higher degrees like PhDs, but it could also be technical training as well. There's a range of new technologies in play at the moment around AI, machine learning, imaging and who knows what technologies will be coming at us in the next ten or twenty years into the future?

[00:07:34] **Fiona Fagan** $30 million in funding has just been announced for the AGG. What impact will that have on this centre?

[00:07:41] **Dr Sally Norton** So the impact of this dedicated funding will be immense. The strategic partnership, as I mentioned before, is going to allow us to really shift from that traditional seed bank to a resource centre that allows the maximum amount of information for each seed line to be available to industry. And what that means is that Australia's research and breeders can then develop varieties with more resilient traits and climate-ready for conditions between each growing seasons now, but also expected into the future. Those varieties could be delivered years quicker.

[00:08:08] **Fiona Fagan** Describe the impact the AGG has on grain growers now and also the impact it will have going into the future.

[00:08:15] **Dr Sally Norton** The AGG really is one of the most important points of contact for the grains industry. So, the AGG is the source of the plant lines or germplasm that come into the country that then are used to develop the varieties, in the farmer's field today and into the future. So that's really important because the new germplasm that coming in is being sourced to really meet conditions that we are expecting into the future. So now, most of the varieties growing, certainly around this region, are derived from material that's already in the AGG, and many of the future varieties, if not most of the future varieties, will be derived from material that is either in the genebank now, or in the pipeline for variety development, and into the future, a lot of that material be sourced through here as well.

[00:08:54] **Fiona Fagan** So on a global scale, how important is the current work being done here by the AGG?

[00:09:00] **Dr Sally Norton** So the AGG very much operates in that global network of genebanks, so we are one genebank in Australia for grain crops. We are the only one. And all of the material we grow in farmers' fields today as grain crops doesn't actually originate from Australia. So we are really reliant on bringing material in from overseas every year to source the new genetic diversity or traits or characteristics that researchers and breeders need to use to develop more resilient and climate-ready varieties. So in that international context, we're very much involved with a large number of genebanks around the world where we are accessing material, but we're also providing material back to them, so Australian developed material or Australian native species as well. And through the strategic partnership, what we're looking to do is actually connect the material we have in the AGG, which is sourced from many centres all around the world, is connect that information back to their system. So it's really adding value to their genebanks as well as ours.

[00:09:55] **Fiona Fagan** So talk me through the process of when a seed arrives here and what it takes then to have it stored away in the seed bank. Where does it all begin?

[00:10:04] **Dr Sally Norton** It begins by an acquisition by the Genebank, and that can either be importing seed from overseas, which has a very specific process to actually allow it to come into Australia, so we have quarantine here; so a full plant growth cycle of seed as it arrives into Australia, and then, the daughter seed, or to seed that comes off that mother plant, has to be certified to be clean of pests and diseases of concern to Australia before it can be released to the AGG. With a domestic deposit that's in the Genebank here; so we receive the seed in, we've already got that compliance in place; so, once it arrives here, it's cleaned, made sure we have all of the information we need on the computer database system and it moves out into the back drying room where seed is processed in a way so that the seed moisture content reduces to around about six or seven percent, and once you've got it dry, you can actually then safely stored at -20.

[00:10:52] **Fiona Fagan** Dr. Josh Fanning is the research leader for plant pathology at Agriculture Victoria. He uses the AGG to study pulse diseases and help integrate disease management practices in crops.

[00:11:05] **Dr Josh Fanning - Agriculture Victoria** The portfolio I manage goes across horticulture, biosecurity, microbes, as well as Field Crops Pathology.

[00:11:13] **Fiona Fagan** So what are some of the crops that you research here?

[00:11:16] **Dr Josh Fanning - Agriculture Victoria** So we're working on a range of crops in the Field Crops Pathology program. The gamete works in pulses, which is what I specifically work in, is lentils, field pea, chickpea, faba bean and vetch. But within the broader team, we work on oats, wheat, both durum and bread wheat, triticale and barley.

[00:11:32] **Fiona Fagan** So what is the purpose of the research that you do?

[00:11:35] **Dr Josh Fanning - Agriculture Victoria** So specifically in the Field Crops Pathology group, we're looking for options for growers to better manage disease in the field. So basically every crop has a disease that can cause total crop loss. Now, we don't typically see that in a lot of crops every year in Australia, but that's through good management. So through our research, we're helping growers be able to manage those diseases to ultimately produce more food for the world.

[00:11:58] **Fiona Fagan** GRDC has an investment into the management of ascochyta blight of chickpeas. What's the main aim of this project?

[00:12:05] **Dr Josh Fanning - Agriculture Victoria** So the investment that GRDC's got into ascochyta blight, is basically a group of researchers, and there's five programs of work in that investment led by different agencies, and we're all working as one team to basically manage or help growers manage chickpea ascochyta blight.

[00:12:22] **Fiona Fagan** So how does the AGG support the work that you're doing to search for ascochyta blight resistance?

[00:12:28] **Dr Josh Fanning - Agriculture Victoria** So the AGG, as we've heard from Sal before, provides new germplasm, or it provides a range of germplasm in Australia that we can access. So that germplasm may or may not contain new resistant sources to chickpea ascochyta Blight. So we can access that material from the genebank. We can then screen that or phenotype that material through the glasshouse, through the controlled environment, or in the field to be able to determine how much disease it gets; so whether it's resistant, so it gets very little disease, or whether it's susceptible, and gets lots of disease, or where it is on that spectrum. And then, once we know what that status is, we can then use that material that we get, when it is resistant, to be able to try and get more resistance into the varieties that are already commercialised or to provide that material to breeders to be able to get it into their germplasm that ultimately gets released to growers.

[00:13:19] **Fiona Fagan** One part of the Chickpea ascochyta blight project is taking place at the Horsham Smart Farm. Tell us about the work you're doing there around phenotyping.

[00:13:28] **Dr Josh Fanning - Agriculture Victoria** The Horsham Smart Farm includes both Grains Innovation Park in town here in Horsham, as well as our plant breeding centre. So at one location at the Grains Innovation Park, we've got our glasshouses, and then in the field at our plant breeding centre, we've got our field screening; and what we use both those facilities for is to ensure that we're getting accurate phenotyping for our growers. So just because it's in our glasshouse doesn't mean it's inaccurate to the field, as long as we calibrate our testing and our phenotyping or screening, to make sure it's field relative. So this is what we do across both those environments, and then we can screen the thousands of lines that we get, to be able to ensure that we know the resistance of those chickpea lines that we're giving to growers or giving to breeders to be able to ensure they get resistance in our varieties that are released.

[00:14:13] **Fiona Fagan** So how will the Chickpea ascochyta blight project benefit Australian chickpea growers?

[00:14:19] **Dr Josh Fanning - Agriculture Victoria** So if we have highly accurate information on the resistance of each variety, basically we can then allow growers, or we can tailor a management package for growers, to be able to manage that variety. So the more resistant variety we have, the less management we need. Often that means less fungicides. The best currently commercially released cultivar or variety in the southern region is rated moderately susceptible. So in most seasons, we're applying one to two fungicides in our low-rainfall environments. But in a high-rainfall environments, we're seeing six to eight fungicides depending on the season, and we've just come off the back of a really good season. So by getting more resistance into our germplasm, we need less fungicides, and growers can focus less on managing disease in chickpeas and focus on all their other crops that they're growing on their farms.

[00:15:07] **Fiona Fagan** So since the AGG has been here, have you seen improvements?

[00:15:11] **Dr Josh Fanning - Agriculture Victoria** So in this new chickpea investment with SARDI that we're doing in program three in Agriculture Victoria, we're seeing some fantastic lines come out of the AGG that we're getting that are highly resistant to ascochyta blight. And so we're going from varieties that we see now commercially that have large numbers of stem breakages in the field, so we see lesions of ascochyta on the stems that cause breakages and result in significant yield loss, we're now seeing lines in the field that only have leaf lesions or we may see even very few leaf lesions in those. So they don't have any stem breakages at all, so we're going to see very little yield loss due to that. It's just going to be a process of getting those lines into commercially released, or, Australian adaptable material, to be able to be released to our growers.

[00:15:57] **Fiona Fagan** Can you summarise what you think is the importance of the AGG to plant and disease research?

[00:16:03] **Dr Josh Fanning - Agriculture Victoria** So the AGG is essentially a warehouse for researchers. We can access all this germplasm, and then we can screen that germplasm for the traits that we then require, for the purpose that we're doing. So in our case, that's ascochyta blight and chickpeas in this example, and so having access to all that germplasm, all that material, we can then determine what the best material is to use in our program to be able to get the best solution for growers to manage that disease.

[00:16:30] **Fiona Fagan** Sally, Josh has just mentioned the work you are doing to manage ascochyta blight. How does it make you feel to know the AGG is making such a difference?

[00:16:39] **Dr Sally Norton** I think it's really such a good story of the material that we've been bringing through to support the ascochyta programs that Josh is working on and I think what's really important to understand is that ascochyta in chickpeas' one of the things we're making a difference in, but if we think of any crop, any pest disease or a climate resilient trait, it's a very similar story across the board. So it's really heart-warming to know that what my passion, and what I work in, is making such a difference to the Australian grain growers.

[00:17:08] **Fiona Fagan** Sally Norton, thank you very much for chatting with me today.

[00:17:11] **Dr Sally Norton** Thank you. It's been great.

[00:17:20] **Fiona Fagan** That was the national leader of the Australian Grains Genebank, Dr Sally Norton and earlier I spoke to Dr Josh Fanning, who is the research leader for plant pathology at Agriculture Victoria. This is a GRDC podcast. I'm Fiona Fagan. Thanks for listening.