# GRDC VIDEO TRANSCRIPT

**Improving input use – a case study with James Venning and Andrew Sargent**

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

[00:00:12] **Prue Adams** Precision agriculture. It's been around for a while; it's meant to make a difference for the better. But does it always? Hello there, I'm Prue Adams, and today I'm speaking with two growers in similar parts of South Australia who have different takes on the value of precision ag or PA. First up, James Venning, near Bute. He's continually experimenting with everything from variable-rate seeders to protein monitors. I caught up when it was all go during harvest and asked what precision ag works for him.

[00:00:47] **James Venning** So variable-rate fertiliser has been a pretty important one in the last few years. Fertiliser prices have obviously gone crazy high, like MAP's normally around that $600 a tonne and it's been north of a thousand for a couple of years now. So placing it exactly where it's most efficient and where it's going to get most return on investment is pretty important. So that's been working really well for us.

[00:01:05] **Prue Adams** Just generally with fertiliser, how do you go about your regime when it comes to PA? You've got a pretty detailed set of maps and information that you work from, haven't you?

[00:01:15] **James Venning** Yeah. If I wanted to rewind to back where we first started, we would just replace the phosphorus that we've taken off. So, if you take off a tonne to the hectare of cereal grain, it's normally four kilos of phosphorus is what you are removing the grain, so we've just been replacing that. And then as we sort of kept going, we've realised that some of these higher pH soils were tying up phosphorus and that wasn't really acceptable. So, then we started to look at ways to find those soil types and sort of segregate them to then do different practices on those soils. So now through a few different techniques, with satellite imagery, and we use a Veris machine to measure the pitch of the soil, we zone those areas, and we can really ramp up the phosphorus on those areas, because there's straight line yield responses to up to 200 kilos of MAP on these soils.

[00:01:59] **Prue Adams** So then you're fairly specific about where you put the phosphorus, aren't you? There are areas where you might only put six units and others where you might put 20, 30 or upwards.

[00:02:07] **James Venning** Yeah. When I first was doing it, someone said, "Oh, why wouldn't you just stuff it? You just put plenty of fertiliser out there everywhere". But if you go put 200 kilos of MAP on the whole farm, that's just going to break the bank. There's no reason to be putting it on an acidic sand. Acidic sands are very, very efficient at using phosphorus. So, we're not actually spending any more money on phosphorus. We're just taking it from the acidic sands that are really efficient users and we're putting it on the greyer ground that's higher pH, the sort of chalky soils.

[00:02:31] **Prue Adams** How does the Veris machine actually work?

[00:02:33] **James Venning** So the Veris machine gets towed behind a ute or a tractor, and you drive up or down your tramlines, and it logs a GPS point every time it strikes the ground. So, it strikes the ground, scoops the soil, analyses the pH, and then it's just got a little water tank there that just washes the soil back off it. So, then it's ready to go to strike the soil again and measure it again. While it's also doing that, it's got a few discs on the front that measure electronic conductivity of the soil and that's just basically trying to profile the soil, if it's a sand or it's a loam or it's a clay, different sorts will conduct electricity differently.

[00:03:03] **Prue Adams** So then how do you go about your liming practice?

[00:03:05] **James Venning** Yeah. So that's another little thing that we get off, because we've got the pH map, we're also getting a nice pH map for correcting acidic soil. So, anything below six and a half gets traded with lime. So, we're trying to bring out the soil to that six, six and a half by spreading lime. So, for certain soils, maybe five and a half, that needs two tonnes of pure lime to get up to six and a half. If it was four and a half, it needs four tonnes. But that's only on ten centimetres too so we've got, actually, subsoil acidity too. So, we're sort of taking that into consideration as well with how much lime we're applying on some of these soils. It's not uncommon for the spreader to be applying 10 tonnes to the hectare of lime over a sand hill and then you go over to a chalky flat and the spreader completely turns off and doesn't apply any at all.

[00:03:44] **Prue Adams** So how would you have done that in the past? Would you have just blanket spread a certain amount and hoped for the best?

[00:03:49] **James Venning** In the past, like we're here on the Yorke Peninsula, the local grower group used to be called the YP Alkaline Soils Group so everyone just thought that the soils on the Yorke Peninsula was alkaline. Head was completely in the sand at some of the acidity that was creeping in, and my father would have never considered applying lime ever and now that we're growing a lot more lentils, this has really been the driver. It's just trying to increase productivity of lentils over some of these soils.

[00:04:11] **Prue Adams** I see that in one of your PowerPoints you said lentils can't be trusted to manage themselves. How do you mean that?

[00:04:17] **James Venning** Yeah, so I guess lentils, they're a little bit of a finicky crop. On a really good soil they'll go crazy, and they'll grow so much biomass and then potentially have no more water left come spring to produce grain and then the complete opposite happens on the sands. They don't really build the biomass and you've just got to sort of treat them a little bit nicer on the sands to try and push them. So, we increase our seeding rate a lot on the sands with lentils to try and get that biomass grown and then treat them really mean on some of these really good soils. So, I'm really thinking they looks sparse and terrible early, but you know that they're going to grow really, really well and they compensate and then you've actually saved some water for the critical time of the year when they're grain filling.

[00:04:52] **Prue Adams** I mean; a lot of people have yield maps. Do they use them properly?

[00:04:55] **James Venning** Oh, I think a lot of people don't even really use the yield maps at all. It's a nice little thing that's buzzing along in the harvester and it's pretty easy, once harvest is all finished, is to put your feet up, go to the beach and relax. But to really improve performance, you've got to measure it first and then analyse it and if we're not really analysing our yield maps, we're probably not really doing them justice, really.

[00:05:13] **Prue Adams** Is there sort of a step process that you go through in terms of analysing you're yield maps to make them work for you?

[00:05:18] **James Venning** You've probably got to have an idea in mind of what you want to do. So, the average yield map probably doesn't really teach you too much. Like, if you're sitting on the harvester, you know the parts of the paddock that are good and that they're not but what the power of a yield map can sometimes do is when you couple it with the knowledge of the season, you can really tell a lot of things. So, a yield map in a dry year is just a fantastic measurement of water use efficiency. So, a sandy soil that's really good at using water will be high yielding in a dry year, and then a really pinchy flat that's a bit stony, the soil's shallow, so those yield maps in those years are really, really powerful at being able to profile the soil. And you don't need to spend millions of dollars scanning and buying all these special tools. If you've got a yield map there and you pick the right season it'll do it for you.

[00:05:59] **Prue Adams** Now we've been sitting in the header today, just getting some shots for the video that accompanies this podcast, and you've got three screens, you've got a protein monitor up there as well, not everybody has that. What are all the screens? What sort of information are you collecting?

[00:06:13] **James Venning** Two of the screens are probably not 100 per cent required, but the fact that harvesters these days, there's so much more going on that now the software companies need to catch up a little bit and provide us with screens that can function better. So, there's two identical screens in there that are just running different parts of the harvesters because we just need a bit more horsepower with it but the third screen is a crop scan protein analyser, so that just measures protein and moisture on the go. Probably takes a log every 30 metres or something and gives you a nice, pretty picture of the protein, just like a yield map over the paddock. Where that's important is protein is a different measurement. Yield's one thing, protein is sort of a different thing. If there's high protein there's probably insinuation that there's higher levels of nitrogen left in the soil once you've finished growing the crop.

[00:06:52] **Prue Adams** So how do you manage frost? Because you use PA for frost management too, don't you?

[00:06:58] **James Venning** Yeah, so I guess frost is a bit of a hard one and a lot of people will argue that there's nothing you can do, it's just luck of the draw. So here there's a bit of data from the weather station network that sort of suggests that you're 50 per cent more likely to get a frost in August than you will in September. So, if you're wheat crops flowering in late August you're 50 per cent more likely to get a frost than if it's flowering in early September. So delaying flowering is pretty important. So that can be done by a few different things. So, like, district practice is probably just to delay sowing for the whole paddock. But the problem with that is the whole paddock never gets frosted here, we've got a June swale landscape. The hills never get frosted, the flats will. So, you delay sowing on the whole paddock, you're basically accepting a lower yield on the better stuff as well. So, we've done a few things. We've planted the flats only to winter wheat. So, winter wheat, it needs a cold requirement before it even goes reproductive. So, it will sit there and basically be like your lawn until a certain time in the year and then will decide to bolt. So that's one thing but that's not something you can always do. You've got to get an early start to plant that in, you know, April. You can't be planting that in May. So, then the other thing we've done is, is we've used a multi-species mix. So, for instance we use Catapult, Scepter and Calibre all in the same box. And therefore, you're just basically flowering at three different times. And it's a bit unconventional, but if those paddocks that always get frosted, you'd probably guarantee half of it won't get frosted because half of it won't be flowering at the right time.

[00:08:19] **Prue Adams** So if you didn't have that satellite imagery which showed you where the problematic areas are, what would you do?

[00:08:25] **James Venning** Yield maps again. So, if you've had frost in that paddock before and you've noticed really low yields in those areas. It doesn't always work perfectly like that. Like sometimes the frost won't always be in the same spot but it usually outlines the low-lying areas. Another piece of information you can get is elevation data out of your harvester, that will show you the low lying areas. So, there's a lot of free data that we're getting from the harvester that, when used in context, can be really powerful.

[00:08:48] **Prue Adams** What do you see as the next big game changer in precision ag?

[00:08:53] **James Venning** So I think it's probably all about yield potential and predicting your potential. So being able to measure the availability of moisture in your soil I think would be a real big game changer. So, you know that a certain soil over summer will just give up all the water to the sun. Whereas a sandy soil is almost like a bit of a mulch so there's moisture quite often deep in a sand that's not on a clay. So being able to sort of have a bit of a big picture view of the paddock as to what is likely going to be you're yield map. Also just probably being out of map for compaction. That's something that deep ripping can return very high yields here. You won't always return on some soils so trying to predict is probably something that is quite hard, and we're still trying to work out where we should and where we shouldn't deep rip.

[00:09:32] **Prue Adams** Yeah, because we have been here before when you have been deep ripping and how has that particular area gone this season?

[00:09:39] **James Venning** Fantastic. The barley in that paddock was the best barley we had in the whole farm. And it's probably not historically our best country. So, if you can turn your worst into your best, it's definitely a good thing.

[00:09:49] **Prue Adams** Fantastic. Well, the next step is being able to really track that across all the paddocks.

[00:09:54] **James Venning** Yeah, we've done deep ripping before in certain soils and not seen responses so why didn't that return in that sort of soil? Whereas why does it return in a different soil? There's so much to be learnt and if we can work that out and be able to spatially measure that, locate the right areas and just only spend the money and the time on those areas, that will be a big game changer.

[00:10:12] **Prue Adams** What do you think it is that stops growers from taking up precision ag?

[00:10:17] **James Venning** I think it can be a little bit intimidating. If you just start somewhere and doing something little. You got to always start with a problem though. You can be sitting back thinking, you know, I want to do precision ag, what can I do? It's like, well, that's not the right attitude. It's more like, I've got a problem, how can I fix it? If precision ags the answer, that's great, because there are so many problems that can be fixed, but you don't want to start with a solution and then try and find the problem to fit it.

[00:10:39] **Prue Adams** Nearby at Crystal Brook, Andrew Sargent's family were early adopters of precision ag. His father, Malcolm, was instrumental in starting SPAA, then called the Southern Precision Agriculture Association. But Andrew admits he's a bit jaded by the incompatibility, the software updates which set you back, the lack of open source back up. He'll explain what that means during this interview. Listen through until the end to find out what he thinks needs to happen.

[00:11:09] **Prue Adams** Over the years, what has worked and what hasn't worked? Where are the frustrations? Are they in compatibility? Across machines? Across brands? Are they in not being able to access the support that you need?

[00:11:23] **Andrew Sargent** So I'd like to say it's across brands, but our equipment's all one brand at the moment. So, it's been within, systems within that brand, getting stuff from software on to hardware on to tractors and getting them to run reliably. Support-wise, to get that done has also been a challenge. The local dealership has been great. Any time we've had a problem they'll check the next year and there'll be a software update and it would almost fix one problem, but then create another one, like all software updates do.

[00:11:50] **Prue Adams** Now, you did a Nuffield Scholarship on this a few years back. What was the subject matter for that? I mean, it did relate to precision ag and the frustrations that go with being able to use it.

[00:12:02] **Andrew Sargent** That was what drove me to choose the topic that I did, and that was looking at open-source agtech so that potentially we could sort some of these issues out.

[00:12:10] **Prue Adams** And when you talk about open-source AgTech, what does that actually mean?

[00:12:14] **Andrew Sargent** The source code for the program, so what makes the program run, is open and available. Anyone can view it, modify it, improve it, as opposed to proprietary software where that's all locked away and only the manufacturer can access it.

[00:12:27] **Prue Adams** And is that not readily available in agriculture?

[00:12:31] **Andrew Sargent** No, I can't think of anywhere. There's no commercially available stuff that's open source that I know of. And since I started my Nuffield or when I started my Nuffield there was a few projects that were just getting going and it is becoming more of a thing now, you see it mentioned a lot more and stuff. But yes, it's still early days, I guess, for it in ag.

[00:12:49] **Prue Adams** What difference would it make to have that open access compared to where you're at the moment? Do you think that it would solve a lot of the issues that you have with the technology?

[00:12:59] **Andrew Sargent** Yeah, I think it would help a lot with compatibility issues. I mentioned I talked to one manufacturer about, "Oh yeah, we should just have a standard data format and we should all use that". And they sort of said, "Well whose standards are we going to use? Are we going to use ours, are we going to use theirs?" And he's got a point, like, I guess that's the problem with standards is there's too many standards. But I think having all of that more easily accessible by other manufacturers makes it easier for them to implement other systems into their own. If there are bugs there's more people looking at it to find those bugs, to potentially fix those bugs. You know, in I.T. and robotics, it's made a huge difference to the way that's developed, and I think we're probably missing out a bit by having such a closed-off system in ag.

[00:13:37] **Prue Adams** During the Nuffield, obviously, you went to Europe and to Canada and the US. Were they doing it any better and if so, how?

[00:13:47] **Andrew Sargent** Well, the guys I went visited with guys that were doing stuff with open source, and they seemed to be getting on pretty well with it. When I was in Europe, there seemed to be a lot of support for a project called AgOpenGPS, which was developed in Canada but has really found a lot of support in Europe and a lot of those smaller farms where guys might have a tractor that's only worth $20,000, and they can't justify putting a $20,000 autosteer system in there. They've been able to build up their own autosteer systems and be able to have the same as the big boys, I guess, and that's really gained a strong following there. And they're getting along great with it. They've been able to customise it to see what they want to do. Like guys that plant trees have been able to make a tree planting part for it so they can plant their trees accurately, set up tramlining things for it because that's what they needed for their farming system. So that really seemed to be a good example of what was actually working well.

[00:14:37] **Prue Adams** So does it need the big farming bodies to get behind doing something that is open source? Is that what is required in terms of making these platforms available?

[00:14:49] **Andrew Sargent** I guess it would help. And I guess it depends on what data you're talking about. As far as yield data and stuff that's coming off of controllers and monitors in vehicles, you're always going to be a little bit stuck because they're coming from a larger manufacturer. But stuff such as spray records and paddock records and that sort of thing that we're recording either manually or into one of a multitude of different paddock management systems, I think there's probably a great opportunity there for farming bodies to get involved there and maybe develop their own system that's open source, that that data can then be taken off by one of these commercial parties to provide some value. If they've got some algorithm that seems to be all the rage these days, that they can provide value back to the farmer then they can use your data that's in that platform, rather than you having to put all your data into each of these platforms that wants to sell you something.

[00:15:40] **Prue Adams** When you talk about a community-run sort of open-source platform or sort of community-enabled, I suppose, does it mean that there are chat rooms and therefore the ability for growers to feed in what works and what doesn't work, and then be able to change it? Is that how that works?

[00:15:57] **Andrew Sargent** Yeah, 100 per cent. So yeah, rather than going to your local dealer for support or your local service tech, you'd go to an online forum or chat room on telegram or something like that and you can ask a question there, and instead of one guy that answer your question, there might be 20 guys there that can come back and say, we've had the same problem, this is what we've done. And then that's also all still there, available for the next person that has that problem. Rather than having to ask the question, they can just look for it and get their answer and be on their way.

[00:16:23] **Prue Adams** Yeah. One of the things that you were saying before is that where there's a gap is in the data being provided at the time that you need it. What do you mean by that?

[00:16:33] **Andrew Sargent** Talking to Aaron Olp in the Midwest, in the States, when I was on my Nuffield travels, it came up about timeliness of data and how useful that data is. And the more timely you can get the data, the more useful the decisions you can make are. There's no good trying to make decisions six months later, when you've sat down at your computer and gone through and worked out what your yields were and, and all of that, you need it at the time you're trying to make the decision. So yeah, I think by it not being simple and intuitive to collect and interpret the data it makes it harder and farmers less inclined to do it which means they're not getting the value out of the data that they potentially could.

[00:17:13] **Prue Adams** And so, you know, given that precision ag is trying to sort of get that extra, you know, one or two per cent on top, is it almost counterproductive sometimes that, with that, you're losing somewhere else because you're trying to troubleshoot?

[00:17:27] **Andrew Sargent** I guess all tech is all supposed to make our lives easier. And yeah, when it works, it does and you do see benefits from it for sure. But yeah, if you're having issues and that delays you're seeding by 2 or 3 days because you've had stoppages every day for whatever reason, you'd probably have to start to question whether or not you're getting the value out of it that you really should be once you take into account the losses that you've also had to face.

[00:17:51] **Prue Adams** So if you could wave your magic wand, what would you do first when it comes to improving the tech when it comes to precision ag?

[00:17:59] **Andrew Sargent** Just make it all work. That'd be the goal, I mean, we use apps that are probably developed by a 40-year-old bloke living in his mom's basement, and they're more intuitive, easier to use than stuff that we've got that's developed by multinational companies, so wave the magic wand and get a few of these blokes out of the basements and get them working in to agtech and just get something that's easy.

[00:18:27] **Prue Adams** Sounds like a challenge to all you guys and girls sitting in your mom's basement. Make something that works for ag. Fun place to end on a big topic. Thanks to grain growers, James Venning and Andrew Sargeant for their different takes on precision agriculture. This is a GRDC podcast. I'm Prue Adams. Thanks for listening.