Cells, crops and cover at Wanilla

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Maintaining ground cover is top priority for David Giddings in his cropping and grazing operation at Wanilla, on Lower Eyre Peninsula, where a combination of claying, no-till and surface cover provides a healthy environment for his crops. For his sheep enterprise he uses a cell grazing system, which he finds simple and cost-effective and can manage to ensure a good cover of vegetation is maintained.

Ground cover is the key to a successful and sustainable farming operation according to Lower Eyre Peninsula farmer David Giddings, who strives to maintain a cover of organic matter across his property all year round.

"Cover is the crux of farming full stop," said David, a no-till farmer for more than a decade. "If you're not maintaining cover, you're not managing your business."

This focus on protecting the soil surface has led him to adopt a no-till stubble retention cropping system and a cell grazing system based on perennial pastures for his livestock enterprise.

The main soil type on David's 2,600 ha property is a duplex sandy loam with two distinct horizons above a clay sub-soil.

The top A horizon is about 100 to 150 mm of a partially non-wetting sandy loam with 1.5% organic matter. Below this is an A2 horizon soil, generally no more than 100 mm deep, of bleached white sand with low fertility and organic matter contents of from 0.3 to 0.5%. "It's not a very impressive soil type. It has inherent problems, one of them being infertility."

David uses his best soils for cropping but in some low-lying areas the clay sub-soil is sodic and water tends to sit on top of the clay layer, leading to water logging of the root zone above it, and he has established pasture on those non-arable areas.

Waterlogging can also be an issue in some of the cropping paddocks but David is using ground cover to help counteract waterlogging by soaking up excess water. "The main way I prevent waterlogging is by maintaining maximum cover at all times," he said. "I don't want water to run and pool in low-lying areas of my paddocks. I want to hold the water where it falls, with as much cover as possible."

He has also clayed about 60% of his property to improve the performance of non-wetting soil in his cropping paddocks. Claying is the application of clay subsoil to increase the soil's ability to accept water.

DAVID GIDDINGS (LEFT), CHAS PEDLAR AND ROB FLAVEL IN THE MACHINERY SHED.

Most of the David's claying was done using a clay spreading process that involved digging clay from a series of 60 metres by 30 metres pits and spreading it across adjoining areas.

A land plane was used to scrape off the topsoil, usually about 200 tonnes, which was piled on two sides of the pit. It then dugs up clay subsoil from the base of the pit and deposited it at a rate of 150 to 250 t/ha in lines across the adjoining 10 to 15 hectares.

The fuel cost to run the land plane makes it uneconomical to cover more than 10 to 15 ha at a time so a new pit was created wherever clay is needed.

The clay was then pulverised by driving a tractor towing three sections of railway line hooked together with chain across the clay lines, which covered about 40% of the treated area, to break up and spread the clay.

This pulverisation and spreading was a critical part of the process because it is important the clay is spread evenly, David said. Areas were usually screeded with the railway line sections four times, with the tractor working at a different angle each time to ensure the clay was spread as evenly as possible.

Once the clay was evenly spread in a layer about 25 mm thick across the soil surface an offset disc was used to incorporate the clay into the topsoil to a depth of about 300 mm.

David has also used a delver to bring clay up into the topsoil in areas where it is closer to the soil surface. However, only a relatively small area of his property was suited to this technique.

Clay spreading costs from $60 to $80 a hectare, plus $30 a hectare to incorporate it. "It's a relatively expensive process, but the long-term benefits far outweigh the cost. If you've got non-wetting problems it's imperative that you do the clay spreading.

"It's about getting more cover. Sometimes you have to go through the pain to get the long-term gain. Without it, the soils

GIDDINGS FARM SNAPSHOT

FARMERS:
David Giddings and partner Taisha Sutton, with support from David's father Graham, a retired farmer.

AREA:
2,600 ha (1,850 ha of cropping land and approximately 500 ha of grazing)

LOCATION:
Wanilla on Lower Eyre Peninsula (36 kilometres north-west of Port Lincoln)

SOIL TYPES:
Duplex sandy loam; sodic clay

RAINFALL:
450 - 500 mm

CROP ROTATION:
Continuous cropping with wheat canola

LIVESTOCK:
Approximately 4,000 dry sheep equivalents (DSEs)

are not going to improve. Water infiltration can be a problem on non-wetting sand and claying allows water to penetrate a lot better.

"There are numerous benefits from claying. Over time there is more organic matter production, more cover and a much improved soil."

David started the claying process on small areas of land in the early 2000s, before a major bushfire raged through Wanilla in 2005; destroying all of his ground cover and leaving the land bare and vulnerable to wind erosion. While the paddocks were bare he took the opportunity to clay the rest of the areas he had identified as likely to benefit from it and began the slow process of re-establishing surface cover. He says the soil is still recovering from the fire and ground cover is yet to return to previous levels.

Water infiltration can be a problem on non-wetting sand and the soils he treated with clay now absorb and hold water better than they did previously, allowing an earlier start to sowing. Previously he often had to delay sowing to allow time for the sand to become wet enough for crops to germinate. "Claying has allowed us to sow our crops extremely early; some country three weeks earlier than we previously could. I'm probably the earliest sower in this area," he said.

David continuously crops 1,850 ha. He used tillage until the mid-1990s, when he began considering no-till after completing a Bachelor of Applied Science in Agriculture through the University of Adelaide and used a tillage system. There was little profit in grazing sheep at the time so he focussed his attention on cropping. After initially considering a disc seeder he chose a tined machine, purchasing a 10.6 metre DBS (Deep Blade System) Auseeder precision seeder in 1999. Four seasons ago he upgraded to a 15.2 metre DBS seeder fitted with 203 mm narrow points on 300 mm spacings.

The long narrow points ensure disturbance at depth, enabling crop roots to penetrate to the clay faster. In many places the clay is within 400 mm of the soil surface, so the points usually go within 200 mm of the clay layer, which also breaks up any hard pans.

Before the DBS seeder David used a six metre modified trash combine but found it wasn't a good fit with the scale of his cropping operation. "Trying to sow 1,200 ha with that machine was hard yakka."

DAVID GIDDINGS (LEFT) AND ROB FLAVEL FRAMED BY A MATURING CANOLA CROP.

The combine didn't handle large stubble loads well either.

"We had a 7720 header, which struggled to chop and process the straw effectively at harvest. Back then we were growing a lot of bulk and it was often hard to get through the stubble. Stubble handling is one of the main reasons we went to a DBS."

David values no-till for its labour and time effectiveness but sees ground cover preservation as the most important benefit of his no-till stubble retention system.

> **"No-till basically revolves around getting more cover. Maintaining cover improves soil structure, which in turn helps crops grow better."**

Spray topping, the late application of herbicides to prevent weed seed set, has proved an effective way of combating rye-grass in the past three years. David sprays his wheat crops with Roundup when the heads reach 45% moisture and ryegrass is at the flowering or soft dough stage.

In 2009, spray topping had a significant impact on ryegrass weeds. "I think we got a 95% kill on ryegrass, which had a dramatic impact on seed banks in paddocks, to the point where there was a little ryegrass in some paddocks and none in others," he said.

Spray topping wasn't as effective last year, with only 65% of the ryegrass killed and 10 to 15% yield loss. "The wheat was flowering when we sprayed because we got 130 mL of rain at the end of August and the chemical really knocked it around. The timing just didn't line up as well as it did in 2009.

"It's not possible to spray top wheat in a many areas of South Australia without severely denting your wheat yield but it generally really suits this area, where it's fairly mild, always wet and crops grow quickly.

"Anyone in this area who is not spray topping should really look at it because the impact it can have is dramatic."

In his grazing business David has implemented cell grazing to ensure year-round cover on his pasture paddocks. He learnt about the concept in 2006 when he attended a 'Grazing for Profit' course, now named 'Business of Farming', run by PrincipleFocus.

Cell grazing is essentially rotational grazing at high stocking rates, achieved by running a large mob of sheep in small paddocks for a relatively short period before moving them to fresh feed in an adjacent area.

David has five main cells each divided into six to eight paddocks of 10 to 15 ha by electric fencing. He uses the analogy of a pizza to describe the layout of each cell, with each paddock a slice of the pizza. The sheep access a central watering point through gates at the pointy end of the 'pizza slice' and are shifted to fresh grazing through another gate.

Infrastructure is a key component of a successful cell grazing system. Each cell has a permanent perimeter fence – David had existing cyclone fencing – and the paddocks or 'pizza slices' within the cell are divided by electric fencing. He has found electric fencing a low cost option that is easy to install. "Electric fencing works extremely well. It's highly effective and very cheap. It has changed the way I run sheep," he said.

The central watering point, which has to meet the watering needs of approximately 4,000 sheep, is also critical to the system. David uses a solar pump, bought with the assistance of a $10,000 government rebate, to pump water through 50 mm poly pipe to a main storage tank. The water is then diverted to two satellite tanks and pumped to the trough.

The pipe work, troughs and solar pump cost about $25,000, with the electric fencing and energiser about $15,000. The existing cyclone fencing helped reduce costs. David considers the overall cost negligible compared to buying cropping machinery and estimates that his cell grazing system cost little more than a set stocking system."Compared to a set stocking set up, the only additional cost of a cell grazing system is the internal electric fencing."

Cell grazing is also labour efficient. All the sheep are contained in one location; there is one trough to monitor and the mob is moved to an adjacent paddock, which in most cases is 200 metres away. The sheep often virtually shift themselves, particularly when they graze a paddock for three days, David said. In spring, when they are moved daily and there is plenty of feed, they need more encouragement. "Shifting sheep is not a big issue. It's not like you're shifting them two kilometres every day. The only problem you have is when the pasture is 50 centimetres high.

"As far as labour goes, I think it's more efficient. I really think it's the future for running large-scale sheep operations because you don't have as much husbandry

"That's the thing with cell grazing; it's low risk, low cost, has a low labour input and is highly profitable while improving the environment. It fits my operation very well."

and you don't deal with individual mobs of sheep."

David's pastures are a mix of perennial and annual plants. The period the sheep spend in each paddock is influenced by the time it takes the pastures to recover from grazing.

In winter, when pasture growth is slow, they remain in each paddock for three days. As the growth rate increases in late July and early August they are moved after two days grazing in a paddock. In spring each paddock is grazed for only one day.

Given these rotations in a cell system with 30 paddocks, each paddock is rested for 90 days in winter, then 60 days and 30 days in spring.

"The system revolves around rest and the reason you need so much rest is to give the perennials time to recover," said David. "The aim is to keep the plants in phase two of growth, where they are tillering and at their most palatable and nutritious."

The pasture cells are rested throughout summer, ensuring full cover during this time, while the sheep graze stubble. The ewes are moved back to the permanent pasture for lambing, during which they have access to all areas of the five cells.

The dry feed in the pasture paddocks reduces the need for hand feeding and the animals 'smash down' dry vegetation with little feed value and trample seed into the ground, which aids germination and pasture regeneration.

At the end of the six to eight week lambing period all the sheep are aggregated into a single mob and moved into one of the paddocks in the cell system to begin the cell grazing process.

David uses a mixture of summer and winter-growing perennials and annuals in his pastures, with the species mix determined largely by the soil type. On better soil a mix of lucerne and chicory works well. On semi-saline areas puccinellia and wheat grass perform better. Other species in his pastures include phalaris, fescue and balansa clover.

The perennials are important because, no matter what the season, some of them are always growing and so are able to use available sunlight and water. "When they have access to water they grow and make the most of what the environment provides," he said. An annual will eventually die off and if you get a big summer rain after it has hayed off the water is wasted."

This year David's overall stocking rate is eight DSE a hectare, which he believes means the property is understocked. In 2006, his first year of cell grazing, he was carrying 12 DSE to the hectare but that was more than the pasture could cope with at the time. "Eventually when my system is where I want it to be, I think I

THIS TROUGH (RIGHT) IS THE HEART OF THE CELL GRAZING SYSTEM AND HAS TO MEET THE NEEDS OF ALL THE SHEEP ON THE PROPERTY.

ANOTHER PERSPECTIVE OF THE TROUGH AT THE HUB OF THE CELL SYSTEM (LEFT), WITH CHICORY PROMINENT IN THE PASTURE IN THE FOREGROUND.

PADDOCK PERSPECTIVES (FROM LEFT): DAVID GIDDINGS CHECKS THE CONDITION OF A CHICORY AND LUCERNE PASTURE. CEREAL STUBBLE RESIDUE IS STILL CLEARLY EVIDENT UNDER THIS CANOLA CROP. INTERNAL ELECTRIC FENCING MAKES IT EASY TO MANAGE GRAZING PRESSURE.

should be able to run about 12 DSE to the hectare," he said.

He finds matching stocking levels with the carrying capacity of the pastures the most difficult aspect of cell grazing. "It's really about looking at the system as a whole and keeping a close watch on how much cover you have. If you maintain cover your stocking rate is well matched to carrying capacity. If it gets too bare it means you have too many sheep."

David aims for low stocking density in his stubbles so the sheep eat only grain and don't start to reduce the bulk of organic matter. "I never graze the sheep on stubble to the point where I lose too much cover. Cover is king. If I'm losing cover I would get rid of sheep. Cover dictates where sheep are placed on the farm."

He acknowledges that having the sheep eat the grain removes nutrients from the cropping paddocks but accepts this as one of the compromises in a mixed cropping and grazing operation.

"You have to look at it from a business point of view.

"The sheep operation generates $200,000 a year after expenses; roughly enough to pay off a farm in five to seven years. It really is the easiest way to make money out of agriculture at the moment; far easier than cropping."

Grazing represents 15% of the farming operation, generating about $400 per hectare after variable costs. With 500 ha of non-arable land on the property, grazing ensures David generates profit from the maximum amount of land.

"I have this non-arable area that is unproductive unless you graze it. I wanted to graze it in a sustainable way, by improving soil and developing better ground cover, not by raping and pillaging the land and leaving it bare.

"But the grazing system had to be simple because cropping is still the main part of my business. I don't want to spend a lot of time on livestock and cell grazing is actually a lot more labour-effective than the older styles of stocking."

Using fertilisers and chemicals in a cell grazing system is optional. David fertilises heavily when the perennials are establishing to promote a deep root system. "Fertilising in the establishment phase helps anchor the plants and gives them decent-sized crowns," he said.

New paddocks need a year to establish before grazing and are fully established after two to three years. Perennials occasionally run to seed and cross into other paddocks, which David sees as important to the overall system. "You want new plants coming into the population all the time so you need to let the perennials set seed every now and again."

He sprays his pastures with omethoate in spring to control redlegged earth mites, which attack establishing clover and other annuals. "I spray to protect the annual portion of the pasture. Annuals are important in the mix and probably provide 50% of the feed."

A blend of perennials and annuals in the pasture maximises the biodiversity, which reduces the risk of pest problems. It also provides a more nutritious diet for the sheep. "I don't winter-clean or spray grass out of lucerne," David said. "The grass balances the mix and gives the sheep good early feed."

There is potential to increase the size of the livestock enterprise, with another 85 ha that is marginal for cropping and already has water infrastructure in place. The deep sand soil in this marginal area doesn't favour crops but may support a lucerne-based pasture.

David estimates that, with this additional land set up for cell grazing, he should be able to carry 6,000 DSE, which he believes is likely to be his grazing limit. Not only is the balance of the property suited to cropping, but water access would be an issue with a larger grazing operation. "Getting enough water would be a hassle," he said. "The underground water here is scarce and highly variable. I am lucky to have two excellent bores but two of my six blocks have no bore water so I would have to pump water if I wanted to run sheep on them."

David is currently concentrating on fine tuning the cell grazing system and maximising the amount of surface cover in his paddocks; something he says is a matter of time and experience.

> **"Pastures are not like cropping; you can't really get a recipe and follow it. It's more about experience and monitoring what happens through different seasons. It's more touchy-feely."**

He finds that the time invested in cell grazing pays off. "A lot of people don't really understand the potential of good pastures, pastures that are established and managed well, and how productive they can be.

"That's the thing with cell grazing; it's low risk, low cost, has a low labour input and is highly profitable while improving the environment. It fits my operation very well."