

# Covers, litter and the terms of trade

KATHERINE MAITLAND

After years of practicing no-till, retaining crop residues and applying chicken litter, Nuffield scholar Grant Pontifex has concluded growers need to grow more diverse, high-carbon cover crops to feed soil biology.

Paskeville farmer Grant Pontifex is dedicated to improving soil health and maximising the benefits of cover cropping on his family's properties on Kangaroo Island and Yorke Peninsula.

Those benefits include potential to maintain profitability in the face of rising costs and worsening terms of trade.

Grant, who has been spreading chicken manure from Port Wakefield poultry farms on his land for the past 12 years, is exploring the potential and practicalities of cover cropping and last year undertook a Nuffield scholarship to investigate the use of chicken litter, cover cropping and related to enhance soil health and crop performance.

“Currently, most agricultural soils do not have the capacity to sustain continuous cropping and high yield production without expensive synthetic inputs,” he said. “Agricultural practices have become simplified to large-scale mono-cropping with very little diversity in rotations.

“I have been planting cover crops on our Paskeville property for many years but wanted to take a more biological approach to farming coupled with scientific facts and replicated trials, and decided to use my scholarship to focus on how to boost



GRANT PONTIFEX WITH HIS BROTHER BEN, HOLDING DAUGHTER QUINN, AND FATHER NEIL PONTIFEX FRAMED BY A HEALTHY CROP OF CANOLA.

soil health and improve biology, water holding capacity and water use efficiency (WUE) with manure and cover cropping.

“This is important for all producers

because it has the potential to enable ongoing profitability despite the declining terms of trade in agriculture.

“I also wanted to look at more efficient ways of applying and getting the most out of manure as well as cover cropping in low rainfall environments, where it's not very common.

“My Nuffield study has helped me learn more about the role of soil biota, which I believe is important to understand in order to improve the soil food web functionality. I have also learnt diversity is important in cropping systems.”

While Grant is still in the early stages of writing his scholarship report, he feels his research has enabled him to understand, reflect on and change the way he farms and manages soil health; something he hopes he will also be able to convey to other growers.

“I have always enjoyed hearing from previous Nuffield scholars about their travels and have wanted to do my own



**MANUTEC PRESS WHEEL AND COULTER SYSTEMS  
AT THE CUTTING EDGE OF AUSTRALIAN FARMING**

**Manutec**  
AGRICULTURAL PRODUCTS

Ph: (08) 8260 2277 E: manutec@manutec.com.au  
F: (08) 8260 2399 www.manutec.com.au

research for a while,” he said.

“My scholarship has given me the opportunity to learn from others and to gain insight into production systems that are more resilient and ultimately more profitable than the ones we are currently using.

In four months of travel over eight months Grant visited the Netherlands, Ireland, United States, Canada, Mexico, Brazil, France, United Kingdom, and New Zealand; meeting with entrepreneurs, farmers, researchers and successful business owners in an effort to learn how producers in those countries are tackling the issue of soil health.

What he learnt is that ‘carbon is king’.

“Carbon is the most important element in the soil for crop production,” he said.

“Crop nutrient cycling and maintaining adequate soil cover depends on the composition of the residue. The carbon ratio of different plants is important when considering a crop rotation that will feed the soil microbes and supply armour to the soil.



MEETING ‘GREAT PEOPLE’, INCLUDING THE 2018 NUFFIELD SCHOLARS [PICTURED] AND OVERSEAS RESEARCHERS AND INDUSTRY LEADERS, HAS BEEN A FEATURE OF GRANT’S NUFFIELD EXPERIENCE.

“There is potential to build soil organic carbon (SOC) in grain production systems by planting cover crops after winter cash crops; although this will be dependent on moisture availability after harvest. Perennial species under-sown with cash crops could maintain living roots after cash crop removal.”

Grant says chicken litter is high in

organic carbon and a good manure to apply.

“The poultry industry will continue to grow as chicken becomes more popular as an economical, versatile meat, so there will be more manure available for use in broadacre cropping fields.

“A real opportunity exists to value-add this waste product and to benefit our soils and the environment. We just need to know more and develop best management practice for the use of chicken manure in broadacre grain production.”

Grant has also researched the benefits of cover cropping to ascertain if covers are beneficial every year or only as an opportunity crop in a wet summer and to determine if they promote an increase in soil biology, nitrogen fixation, nutrient cycling and mineralisation.

He is of the opinion that, in most parts of SA, summer cover cropping is most likely to be successful in years with above average summer rainfall, and sees a need for covers grown within a winter cash crop rotation to be terminated prior to grain fill to limit water use, especially in low rainfall regions.

“The role of a cover crop is to cover the soil, reduce erosion, capture moisture, feed the biology, suppress weeds, and cycle nutrients. Only heavy cover crop residues will provide an allelopathic environment to reduce the emergence of weeds.

“Cover crops can also help manage nitrogen, with high-carbon plants such as summer grasses able to provide good soil cover and high-carbon residue following a low-residue legume crop.



DURING HIS OVERSEAS STUDY TOUR, GRANT HAD AN OPPORTUNITY TO CHECK OUT THIS MACHINE, WHICH ROLLS STANDING VEGETATION ONTO THE SOIL AND SOWS A FOLLOWING CROP IN A SINGLE PASS.

“Interestingly, I learnt in my travels that multi-species covers that include warm and cool season grasses and broadleaves are better than single-species stands.

“Living plants build carbon. Cover crops, like cash crops, produce green leaves, which produce sugars for the plant. These sugars feed microbes in the soil, which then unlock nutrients from soil organic matter to feed the plants. If there are no living plants, as is the case with a fallow, the microbes will eat crop residues and then organic carbon reserves to stay alive.

“Covers need to be terminated at flowering to retain water for the following cash crop but fallow periods need to be eliminated from cropping rotations if we are to build soil organic carbon.”

Grant has conducted three cover cropping trials over several years with no conclusive results.

“I have not seen any difference in yield of the following cash crops and I don’t expect to for a while. Cover cropping is about improving soils by adding more carbon more often to keep soil biology alive. Improving soil carbon and water use efficiency (WUE) will only happen over many years.

“I have seen cover cropping in rainfall environments similar to South Australia’s working successfully around the world and am convinced regenerative systems including cover crops can enhance soil health successfully in this State. The key is to find the right cover crop species and combinations that tolerate dry, low-humidity climates, which will need further investigation.



THE PONTIFEX FAMILY’S AIR TRACTOR IN ACTION APPLYING A CHEMICAL TO A CROP OF CANOLA.

“There are many different cover crop species available and the selection or combination will vary depending on why the cover is being grown. Some plants are more drought tolerant than others, produce more carbon, cycle more nutrients or can help alleviate compaction better than others.”

... **What Grant learnt is that ‘carbon is king’.**

Grant believes summer cover cropping in SA can be successful, but summer covers might not be the only option for SA growers.

“At the moment I am considering whether we could grow a cover crop over winter, terminate it in spring and follow that with

a higher-value summer crop for harvest.”

He suggests other farmers give cover cropping a go and try different species, not the same crop every year.

“Have a go, and try six to eight different species in mix,” he said. “Plant after a 25mm summer rain event. Have a reason for doing it and an end goal. For instance, plant C4 summer grasses in a mix after lentils to provide more ground cover and terminate them before grain fill to preserve moisture and prevent seed set.”

Grant farms in partnership with his brother Ben, who manages two properties on Kangaroo Island: a 2,300 ha farm at American River and a 2,300 ha property at Vivonne Bay.

“The different locations spread our seasonal rainfall risk and give us a greater commodity spread. We share harvest machinery, labour and our spray plane but those are the only opportunities for scale efficiencies because all other operations happen at the same time.

“At Paskeville we use a Khart disc, Sonic boomspray, three CR 9.90 combines and a Shelbourne stripper head. On Kangaroo Island we have a Tobin Bullet disc, Nitro boomspray, a delver and the Air Tractor plane.

“We also have on-farm storage at both properties; 2,000 tonnes on Yorke Peninsula and 1,000 tonnes on Kangaroo Island.

“Logistically it is very difficult to farm in locations that are 300km apart and separated by water, but reliable, frost free, high rainfall country on Kangaroo Island

**NEEDHAM**  
Ag Technologies, LLC.

Quality After-Market Improvements for John Deere Single Disc Drills and Air-Seeders

*Parts are coloured for comparative purposes*

For more info, please contact our dealer  
**A.G. Schilling & Co, at Kadina, SA.**  
Phone: 08-8825-7224 Fax: 08-8825-7229  
Mark mark@agschilling.com.au  
Merridee merridee@agschilling.com.au

**AG SCHILLING & Co**

is well priced and our KI holdings complement our equity base on Yorke Peninsula.”

Average rainfall across the brothers’ three properties ranges from 400mm a year at Paskeville to 600mm annually on the Kangaroo Island properties.

“The soils are quite different as well,” Grant said. “On KI we have buckshot ironstone gravel over clay and some sand over clay with a pH of 4.5-6. On Yorke Peninsula we have clay loam and some loam over limestone with a pH of 7.5-8.5.”

In 2018 he sowed wheat, lentils, barley, linseed, chickpeas and oaten hay on the Paskeville property, where he applies chicken litter at a rate of 2.5t/ha every year and mushroom compost from time to time.

He has been using no-till methods for some years with the aim of improving soil health but has come to the conclusion that ‘no-till with no cover is no good’. “No-till is essential to maintain the soil food web but needs to be integrated with good soil cover to keep soil temperature low enough to reduce evaporation and enable soil biota to survive.

“The future for us involves more diversity, healthier more productive soils, better WUE, and more nutritious food production.”

Grant has already made changes to his farming operations on the basis of what he has learnt from his Nuffield research.

“Despite practicing no-till, retaining all crop residues for the soil and applying chicken manure on an annual basis we haven’t been able to build our soil organic carbon (SOC) much beyond 2.5% with our current system of annual winter cropping.



HAVING DIFFERENT GROWING CONDITIONS AND MATURITY TIMES ON THE PONTIFEX FAMILY’S YORKE PENINSULA AND KANGAROO ISLAND PROPERTIES SPREADS SEASONAL AND PRODUCTION RISKS AND ALLOWS MACHINERY AND LABOUR TO BE SHARED AT HARVEST.

“Growing more roots more often through diverse cover crop species in combination with annual cash crops will fix more carbon from the atmosphere into our soils and produce more carbon residue to feed the biology.

“To significantly increase SOC we need to grow more carbon, which means growing high-carbon plants more often and fewer legumes, which have a low C: N ratio.

“We are growing less legumes and more grasses that are higher C:N ratio plants. The residue of plants containing more carbon lasts longer so there is more food for microbes, and more cover means less evaporation. This year we will plant dry-tolerant species that have low water requirements and will possibly plant winter

covers followed by a summer cash crop.”

Grant says his scholarship, which he found a huge commitment but extremely rewarding, provided him with an opportunity to learn more about a topic he has been working on for more than 12 years.

“I feel privileged to have been given this opportunity and to have met so many great people who will have a lasting impact on my life. I have enjoyed the experience immensely and am extremely grateful to Nuffield Australia and my investor Nufarm Australia.

“It has made our business more resilient, encouraged employees to take on greater responsibility and broadened my knowledge of different farming systems.”

**Grain Growers**  
Supporting Australian grain farmers for 60 years  
**60 YEARS**  
1958 - 2018

Become a member to receive up-to-date news about industry issues and events across throughout the grainbelt.  
[www.graingrowers.com.au](http://www.graingrowers.com.au)