

Cover cropping:

Cotton growers share their cover cropping strategies

Cover cropping is the process of growing a crop during a fallow period, creating ground cover that helps increase water infiltration, slow evaporation, improve soil carbon and soil mineral nitrogen, and protect the top soil.

The CottonInfo REOs recently went on farm with cotton growers across their valleys to investigate how they include cover crops in their farming systems, and the benefits they get from doing so.

Gwydir

Grower	Paul Slack Slack Holdings
Cropping area	Total hectares: 4860 ha. Cotton: 1620 ha dryland Other cropping area: 1620 ha fallow, 1620 ha wheat
Soil type	Grey clay and self-mulching black vertosols.

Paul Slack has been growing cotton for 34 years at 'Belvedere' Gurley in the Gwydir Valley.

Paul believes having cover on the ground in the form of a cover crop (be it dead or alive) helps to trap moisture and hold the ground together to stop surface erosion. His farming system involves cover cropping, particularly to improve his soil moisture.

Each year, Paul rotates the cropping area on his farm, growing one third of the farm in a summer crop, one third of the farm in a winter crop, and one third of the farm in a fallow or double crop. In summer, he grows cotton and corn, in winter, wheat, with chickpeas as a double crop.

"Moisture is king, and our best cover crop is straw," said Paul. "Ideally, we'd have mulched straw on top, but we don't due to our slope: it would simply wash off.

We need a standing, well-anchored cover, be it straw or the remnants of a previous crop.

"Our winter wheat crop is the most crucial part of our system – providing a cover crop for the cotton and the corn.

"Cotton and corn are our pillar crops, so we need to trap the moisture to get the cotton through, and the wheat stubble does that.

"We use our chick peas as our double crop in the wheat and we take them through to seed to give us cover during the growing period. Once harvested though, the cover isn't as good as the wheat.

"Obviously you need a decent wheat crop to get a good body of straw, and you need moisture to do that. So, we use wheat as our cover crop of choice, as we can

yield something out of it, and use it as a cover.”

Even in years when the wheat doesn’t yield well, he sees cover cropping as a cost-effective method to trap moisture and build the moisture profile of his soil.

“There is a bit of expenditure to run a planter over it and plant seed, but if it builds the moisture profile, then it is certainly a cheap alternative to doing nothing. In a dry year like this, it can mean the difference between having a crop or not,” Paul said.

In addition to moisture management, Paul believes cover cropping has other benefits, such as helping with disease management and weed control.

“I went away from growing wheat and barley as a double crop as we were experiencing so much crown rot. Since moving from wheat and barley to chickpeas, our crown rot levels have dropped right off. I’ve trialled millet as a cover crop also, and if you have a good stand, it will outcompete a lot of the weeds.”

Paul’s advice to other growers considering cover cropping is to do a small on-farm trial first, and to consider the results of local trials, such as the Dryland Cotton Research Association (DCRA)/Kaylex trial underway at ‘Bellevue’ Moree and the Plant Breeding Institute.

“Field peas have shown strong results in that trial, despite having a pretty limited market if you wish to take them through to grain. I’d be interested in trialling them on my farm, based on the results of that trial,” Paul said.

“I hosted the DCRA/Kaylex trial on my farm last season – it compares a range of options: bare fallow, wheat stubble, chickpeas etc, and shows you what’s working. It would be interesting to increase the size of the trial areas and even look at mixes, like they do in England with multi-species cover crops, such as canola and vetches together as a fumigant to lower disease levels. There’s certainly still a lot we can learn.”

Pictured: Paul Slack.



Macquarie

Grower	Alex Ballhausen
Cropping area	Total hectares: 1800 ha. Cotton: 150 ha Other cropping area: 1650 ha
Soil type	Red Loam

Alex Ballhausen has been growing cotton at Narromine in the Macquarie Valley for seven years.

Cover cropping for Alex involves planting cotton into a sacrificed cereal crop, and is a critical part of his farming system, as his soils are prone to crusting and shedding water. Alex believes cover crops have many benefits on his farm: allowing even infiltration of water, adding to general soil health, reducing the effect of wind and sandblasting of young plants, and reducing evaporation.

Alex grows cotton/wheat and cotton/wheat/sweetcorn rotations. He has an overhead irrigation system, and finds that his cover crops assist in breaking up the energy of the droplet from the sprinklers, and reducing the lateral movement of the water on the soils surface.

“Given my soil type it is essential to have adequate ground cover, or a cover crop to plant into,” said Alex.

“Last year, with the dry winter, my cover crops were inadequate – despite some irrigation to encourage growth. Spot yields in my fields varied by up to 5 bales/ha where water was running to and away from high and low areas. This year, I will definitely allocate more time, energy and water to ensuring the cover crops are adequate to maximise the returns from the cotton.”

Alex is conscious of balancing the need for a healthy cover crop with the need for sunlight for the emerging seedlings.

“I don’t want the cover crop to get too high, as the interception of sunlight can be detrimental to the soil temperature needed for emergence and seedling growth. This was the case for me in 2016, as it was too wet to terminate the cover crops at the optimal time.



“As my soils aren’t prone to waterlogging, the thicker the cover crop the better – as long as ideally, it doesn’t get higher than 300mm.

“In a perfect world, it would be great to have good cover crop cover until row closure. Lighter cover crops have been ok, but the benefit disappears too early as the stubble breaks down.”

Through his nitrogen application, Alex has found that there may be a nutrient tie up from the cover crop.

“We only apply deep-banded starter pre-plant, then spread urea in crop. This season we spread all our nitrogen before December 25, and results were pleasing, whereas in previous seasons the last application was spread around January 5, which we now feel is too late as tie up was delaying availability to the crop.”

Alex is interested in investigating this potential tie up further to understand the impact and the nutrients affected, through strip trials of different rates of nitrogen, and different timing of applications. He’s also interested in understanding more about the ideal quantity of cover cropping.

Pictured: Alex Ballhausen (overpage), Alex’s strip tiller.



MacIntyre

Grower	Andrew Newell "Korolea" Boggabilla
Cropping area	Total hectares: 1750 ha Cotton: 1000 ha irrigated
Soil type	Black self-mulching

Andrew Newell's family have been growing cotton at "Korolea" and "Royston" Boggabilla for 39 years.

Andrew sees cover cropping as an important part of the farming system, due to the benefits it provides in collecting moisture, controlling weeds, creating organic matter and encouraging microorganisms to improve soil health.

"Cover cropping for us is a green manure, where you are turning the crop back into the soil rather than growing it for harvest. Nature always keeps the ground covered, so we are learning from nature and controlling what we grow to ultimately increase our yield through improvements to our soil and our crop's root system," said Andrew.

Andrew's approach is to grow vetch as a cover crop, which he sows when it rains straight after a cotton crop.

"For the past three years, we have put vetch in most fields that aren't back to back, in the hope that the nitrogen fixing properties of vetch will help. We were hoping to do a vetch and barley blend this year but we haven't had the moisture to plant. We have also used chickpeas and barley in the past, but ended up taking them through to harvest, whereby our normal approach is to terminate the crop prior to seeding, generally around November.

"We use offsets to work it in, then that field goes back into cotton the following year in October. This allows us enough time to do our ground prep work for the following season.

"This rotation saves us from having nothing on the ground from May to the following October. We plant the cover crop up the rows – Bollgard 3 has meant that we can leave the hills there and have the offsets at a slight angle when we work the cover crop back in."

Andrew is already seeing short term benefits, and is planning on making cover cropping a long-term strategy.

"We have already seen the soil soften – we are seeing worms in the paddock and the soil is more friable. It looks healthy, feels healthy, and the machines go through it much easier. It's still too early for us to see a yield improvement, but the benefits to the soil are so obvious that it can only be better for the crop," he said.

Timing is a key challenge for Andrew, both in terms of planting the cover crop, and controlling weeds.

"We need to be ready to plant our cover crop if and when moisture becomes available, which can be a challenge from a timing perspective," he said. "The timing of spraying weeds is also really important. We have learnt that it's good to pre-spray before planting vetch, while a light roundup over the vetch not only controls turnip weeds, but also slows the vetch down and delays flowering."

As an irrigated grower, Andrew has learnt from the knowledge and experience of dryland growers on cover cropping.

"We have generally learnt from looking and observing; there is a huge amount of organic matter on the farm

next door to our property in Brazil and we can see the difference that makes. As irrigators, we can definitely learn from what some of the dryland growers are doing: they have such knowledge about conserving and working with moisture.”

Andrew is particularly interested in learning more about the impact of cover cropping on the moisture profile – the benefit to the soil’s water holding capacity and water use efficiency, and whether the cover crop is allowing him to stretch his irrigations out longer, or is making it easier for water to infiltrate to get a bigger profile.

“My burning question around cover cropping is the impact on yield: this is a long-term approach for us, but I’m interested to know the time period in which we might start seeing the impact of cover cropping on yield. And, if yield increases, how will we know if it is cover cropping that has made the biggest contribution?”

“I’m also curious as to whether we could build a machine to plant our cover crop on either side of the cotton plant line on the hill, so that we have stubble to protect cotton seedlings: that could really help with our establishment.”

Pictured: Andrew Newell participating in CottonInfo’s soil health campaign, #soilyourundies!



Darling Downs

Growers	Georgie and Paul Krieg Glen Royal Farms Pty Ltd
Cropping area	Total hectares: 980 ha. Cotton: 300 ha irrigated, 300 ha dryland Other cropping area: 380 ha
Soil type	Box, Mywybilla, River Gum

Paul and Georgie Krieg have been growing cotton at Brookstead on the Darling Downs for 30 years.

They cover crop their dryland country to retain moisture and provide a better seed bed and plant stand. Their general crop rotation is cotton, followed by wheat, fallow for 10 months, then back to cotton.

“We use wheat as our cover crop, and we grow it through until harvest – using that seed for planting seed the following year,” Georgie said.

“In our box country, the cotton seedlings can get sandblasted, and the wheat stubble helps prevent this by stopping the movement of soil in stormy and windy conditions. It also helps deliver organic matter and nutrients back into the soil.

“Cover cropping is essential for us: the years we didn’t get a cover crop planted we couldn’t plant cotton the following year, as we didn’t have enough moisture.

“The stubble catches the storm rain better. If you get a storm in early spring and you don’t have stubble, the water tends to run straight into the wheel tracks and doesn’t soak into the whole field.

“With a cover crop, we have been able to plant in marginal conditions, due to the better retention and distribution of moisture. The years we haven’t retained stubble, we’ve had terrible plant stands in the dryland – the germination of cotton is much better with the stubble cover.”

The Krieg’s are interested in investigating using new varieties of wheat or barley, for potentially better stubble cover.

“We did try growing millet one year, but it increased our costs as we had to hire a contract harvester,” Paul said.

“We’ve moved away from fertilising the wheat. Generally, we apply starter at planting and use the left-over fertiliser in the soil from the dryland cotton. If needed, we can spread urea ahead of a rain change.

“For us, cover cropping our dryland country is a necessity. The moisture retention is miles above leaving it there as a black fallow,” he said.

Pictured: Georgie and Paul Krieg



Murrumbidgee

Grower	Darrell Fiddler De Bortoli Farming
Cropping area	Total hectares: 1200 ha Cotton: 400 ha irrigated Other cropping area: 400 ha rice, 400 ha dryland wheat
Soil type	Transitional Red brown earth

Darrell Fiddler has been growing cotton at De Bortoli Farming at Benerembah, via Griffith in the Murrumbidgee Valley, for seven years.

Darrell grows low input wheat following cotton as a repair crop to fix compaction, increase organic matter, and improve the biological activity in the farm's soil.

"We cover crop to maintain yields in our cotton," said Darrell. "The wheat isn't irrigated, and the stubble is ploughed back in after harvest. The organic matter from the stubble helps to lower the pH in some high pH fields.

"When it breaks down, the organic matter also helps to increase native nitrogen levels in the soil. Growing the wheat as dryland is the cheapest tool available to us to help undo compaction."

Over the past five years, Darrell and the De Bortoli team have grown a low input wheat crop after each cotton crop, with yields averaging 3.7 tonne/hectare.

"If the season is positive, we might topdress the crop with 100 kg of urea. In other seasons, the wheat might not even grow well enough to produce a break-even crop: but the upside is still the repair work the crop is doing on compaction.

"In 2016, we started our normal approach of planting wheat directly after the cotton, but we had to stop as it was too wet to plant all the bays in the bankless channel system. It was a wet spring, and the crop yielded 4.8 tonne/hectare.

"This gave us a great comparison between having wheat in the rotation and leaving the other bays in



fallow. From our cotton yield map (see figure), you can see that the cotton has yielded 2 bales/ha better where the wheat crop was sown (the bay closest to the road).

“This shows us the direct impact the cover crop is having on our cotton yields – the wheat crop is a very important part of the system.”

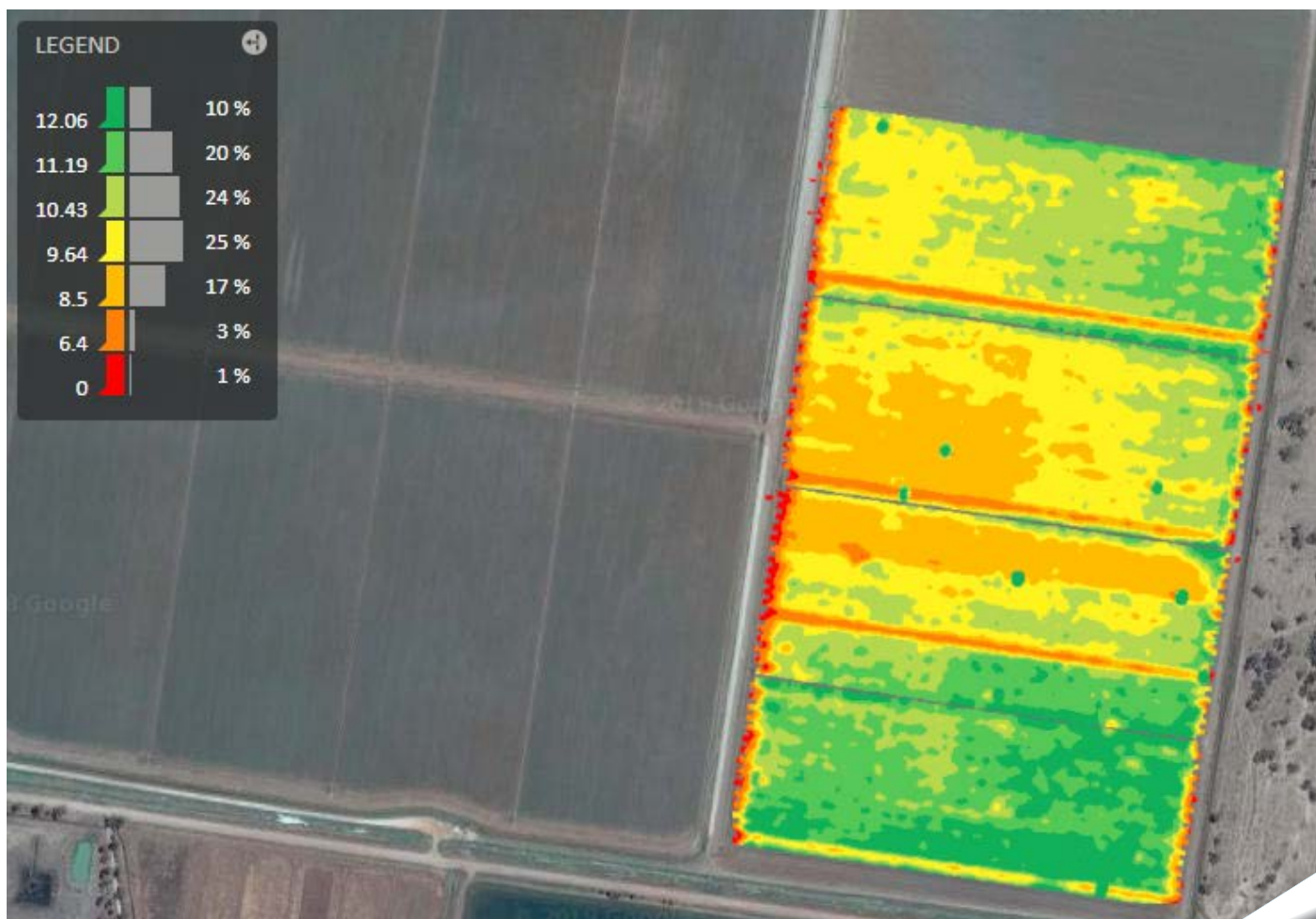
Darrell is interested in comparing wheat and barley as winter cover crops, and would also like to trial growing a summer cover crop to increase groundcover.

“I’d really like to get ground cover right throughout the year and would like to trial a summer crop cover such as self-sown wheat or another crop that would grow without additional irrigation water.

“It would be interesting to know if a summer cover crop would be effective in our climate, with our high evaporation and low summer rainfall of just 150mm over six months. And, if it is possible, what the best crop options are.

“I’ve learnt a lot about cover cropping from other growers – there are some keen cover croppers on Twitter! Goondiwindi grower Nigel Corish was also a great source of information when he came to our farm on a CottonInfo researchers tour a few years ago: his Nuffield study provided some really useful information on soil health.”

Pictured: Darrell Fiddler (overpage), the yield map.



Namoi

Growers	Ian and George Gourley Gourley Pastoral Co
Cropping area	Total hectares: 1000 ha Other cropping area: 4000 ha
Soil type	Black soil

Ian and his wife George have been growing cotton near Narrabri for the last 20-25 years.

Gourley Pastoral Co utilise cover cropping on their dryland country for many reasons, but predominately water infiltration and moisture retention. Added benefits of this program include improved rotations, and increased stubble cover.

“Cover cropping means that we can utilise moisture in the soil profile through better water infiltration as well as better and more even moisture retention,” said Ian.

“It also gives us an opportunity to rotate our herbicide chemistry by growing different crops. Standing stubble from a winter crop also protects small emerging plants from the big winds and sandblasting we often see in the Namoi area.

“Depending on seasonal conditions, our rotation is generally dryland cotton followed by wheat, a pulse crop, wheat and back into cotton.

“We have tried a lot of different crops in this system such as chickpeas, field beans, wheat and millet. Our system allows us flexibility – enabling us to either grow a crop to maturity where we can benefit from the yield, or give us the chance to terminate prior to seed set, depending on the season.

“This gives us an opportunity to create income from the rotation crops. Yields from 0-2 tonne have been averaged from the cover crops.”

Ian believes cover cropping delivers far greater benefit than bare fallow, and encourages any other growers considering cover cropping to consider their full rotation and economic results over the long-term.

“A key learning from cover cropping would be to consider your rotation over five whole years, rather than only looking one season ahead.”

Pictured: Ian Gourley

