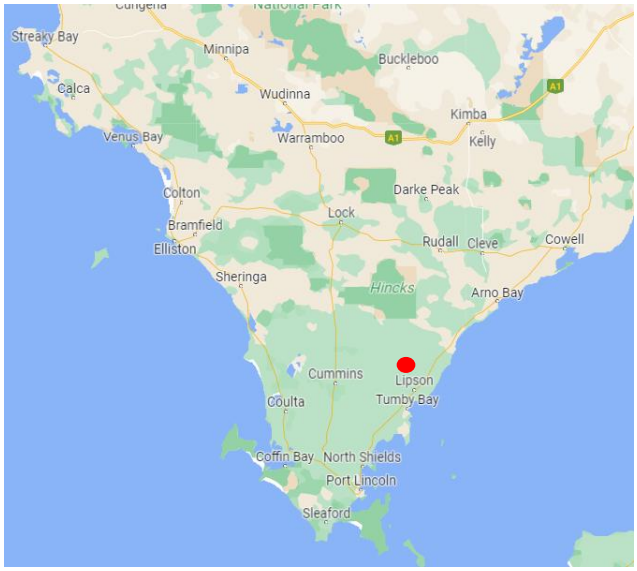
Regenerative Agriculture Program, mixed species + soil modification case study: Pugsley, Ungarra

Key messages

- Mixed species pasture forages can deliver profitable livestock outcomes equivalent to pulse crops.
- There is scope for beneficial outcomes for soil health and production by combining the positive contributions of tillage radish with mechanical intervention.
- There is a diversity of machines available for deep tillage/ripping and using the right machine for the right soil is imperative.



Background

Ben Pugsley farms at Ungarra with his wife Brooke and their four children.

The Pugsley farm is on sloping ground with sandy loams over tight, often sodic clays. Annual rainfall ranges from 375-425mm.

The Pugsley's run a predominantly cropping system, but purchase lambs in late winter/early spring to utilise productive forage pastures. While Ben does grow a significant amount of grain legumes, he believes the pasture forage crops provide a profitable 'nitrogen fixing break crop' that can fix nitrogen and control ryegrass while providing a high-quality feed.

How it began

In 2016-17, Ben started experimenting with sowing tillage radish and vetch as a mix to deliver multiple benefits. He had previously experimented with both species separately, but was encouraged by some initial experimentation that the combination could deliver benefits when established together.

Tillage radish provides good growth in late winter along with effective weed competition; the ability to use grass herbicides; provide high digestibility feed; as well as improving water infiltration on slightly compacted soils. The vetch component offers excellent feed, while fixing nitrogen. The vetch root system, although not as vigorous as tillage radish, complements the fibrous roots of the radish.

Even though Ben was incorporating tillage radish along with vetch, he was concerned that this wasn't sufficient to address all the compaction issues he wanted to remedy. He was interested in a deeper cultivation and/or deep ripping approach to see if this could further ameliorate the compaction and related poor root growth and water infiltration he was observing.

For Ben, often when there is tight, compacted clay 10-15cm below the surface soils, the tubers of tillage radish will just push up above the ground rather than into the soil.

Ben asked the question "If we rip prior to planting, can we encourage more below ground biomass?".

What did they do?

With support from the EP Landscape Board's Regenerative Agriculture Program through a soil carbon grant, Ben was able to establish a demonstration treatment comparison site to trial the impact on soil health when ripping and potentially inorganic amendments are added into a mixed species rotation. The project has allowed him to monitor the effect on his soils and production with deep ripping, application of gypsum, application of lime and the combinations of all three, including the interaction with his mixed species pasture forage.

He was able to compare the performance of the different treatments including a control to compare their performance. The demonstration would also allow assessment of results in subsequent years.

The Pugsley's also invested in herbicides to remove the grass weed component from their mixed-species pasture, as reducing grass weed seed set is one of the objectives of their mixed species rotation.

The ripping treatments, undertaken by a contractor, brought up a lot of clay to the surface. This required some additional cultivation to allow the site to be sown.

After the initial season with the mixed species pasture, Ben is interested in how subsequent crops perform and has continued monitoring the area over subsequence seasons.

What worked?

The demonstration returned an approximate 70% increase in below ground biomass (radish tubers) and an approximate 45% increase in above ground biomass. These results, however, were slightly complicated by a 10% reduction in emergence of the tillage radish following the ripping modification.

Ben has been very pleased with the results. The project demonstrated the benefit of using both ripping and mixed species in tandem to improve production, and also to improve soil health in the longer term. The vetch also visually benefitted from the soil modification and also grew larger plants but this was not directly quantified.

LEFT: Tubers from the unripped site averaged 10cm length. **RIGHT:** Tubers from the ripped and treated site averaged 20cm length.

What didn't work?

While Ben has been happy with the results, the delving/ripping approach was too aggressive and left the soil with too much surface clay.

The emergence of a wheat crop in the following year in the land that had been ripped was restricted, which Ben attributed to excessive clay on the surface, creating an emergence barrier for the wheat seedlings. If he's thought about it, he might have adjusted his seeding rate or other management as a result.

"It is something easy to forget. The work you do in the first year to get good emergence, but there are potentially consequences in the subsequent years as well."

What would you do differently if you were to do it again?

Going forward, while Ben appreciates the value of soil modifications, he wants to source a different designed implement which isn't quite as aggressive lifting soil and does more shattering and mixing given his relatively shallow subsoil B horizon clays. He continues to monitor his different treatment strips, as the site is cropped in future years, to see how the different interventions affect his longer-term cropping production.

Is there anything else that you would be keen to try?

Ben is keen to investigate and try some different forage brassicas to assess their potential value. Up to this point, he has only used tillage 'Dakota' type radishes, and while they are effective, there is potential benefit from other brassica types such as Subzero winter canola. With the experience Ben has now had, he keeps an interest in the different deep tillage ripping implements that are being used in his district.

What role do you think a mixed species/regenerative agriculture approach can have in EP environments?

Ben is interested in what others have been doing. His introduction into using a mixed species approach arose from his specific needs through the pasture phase. He is hoping there will be demonstrated benefits for his cropping rotations as well.

Acknowledgements

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More information

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