

## Deep ripping results over several sites and seasons are not always clear

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### Kojaneerup

- The deep ripping site at Kojaneerup showed no consistent canola yield response in 2017
- Two consecutive frosts and extreme rainfall in late September reduced yield potential
- Small differences in yield were not consistent within yield zones nor replicates.

Deep ripping below any compacted layers on deep sands has reliably increased grain yields in most situations. This trial established in 2014 showed good yield responses in a barley crop in 2016, the year deeper ripping was implemented.

The trial site is typical south coast deep pale sand over gravel and clay at 50 to 120cm depth. The site has been clayed and limed with incorporation in both the years of application. The site has a seasonal water table under much of the lower flat area and a sandy rise at the east end. A shallow ripping treatment to 35cm was applied to alternate 12m wide plots the 700m length of the site in 2014. Randomised and replicated deeper ripping

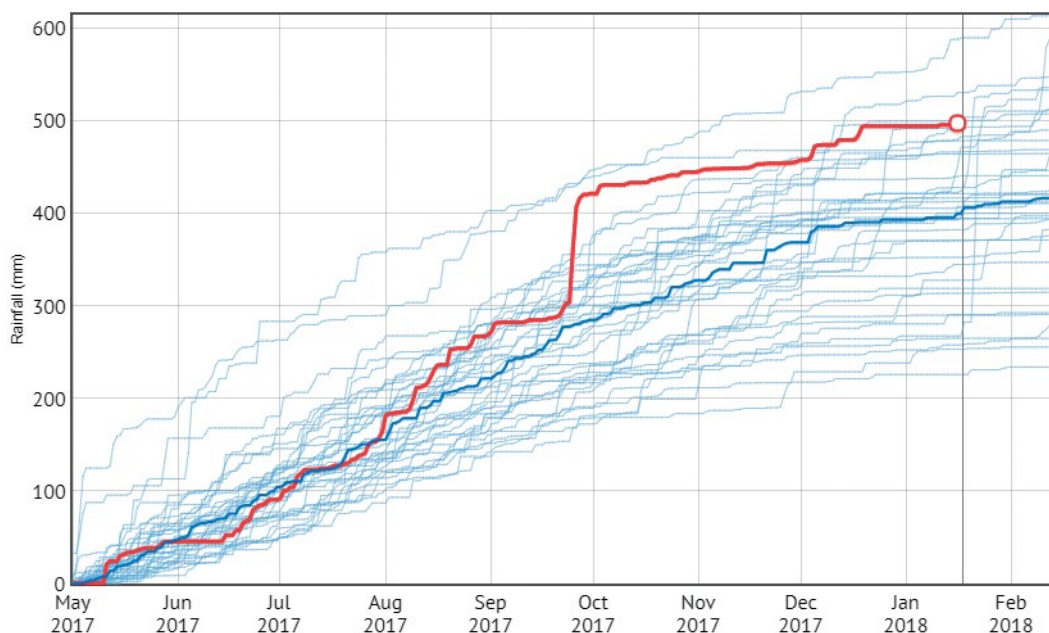
treatments to 120 and 70cm were done over the original site in February and May respectively in 2016.

Mako canola was sown over the site on 24 April 2017 and subsequent fertiliser, herbicide and fungicide applications were all part of normal paddock operations. The trial was direct harvested in mid November with yield data extracted for analysis from the yield map. Care was taken to harvest all plots within alternate replicates in the same direction to reduce the risk of harvest direction influencing mapped yield.

Canola yields in 2017 were reduced by waterlogging and frost with a site average yield of 1.7t/ha. August rainfall was above average followed by an exceptional 24 September event of over 140mm (Figure 1). Soil pits in deep sand at the west end of the trial site had shallow water indicating a perched water table at about 30-40cm during August and early September, the pits filled with water at the end of September for 2-3 weeks. The area experienced frost on 12, 13 and 23 September.

In previous seasons yield zones and ripping responses were evident over most of the site. However, in 2017 there was little yield zone and no consistent treatment differences (Table 1). While plots ripped at 120cm had on average higher yields than those ripped at 70cm, these responses are not statistically significant (Figures 2a and 2b; Table 1).

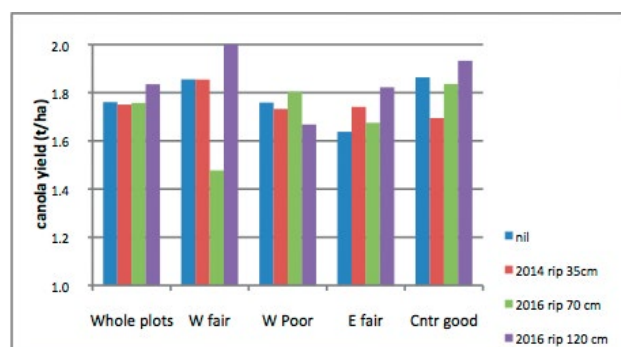
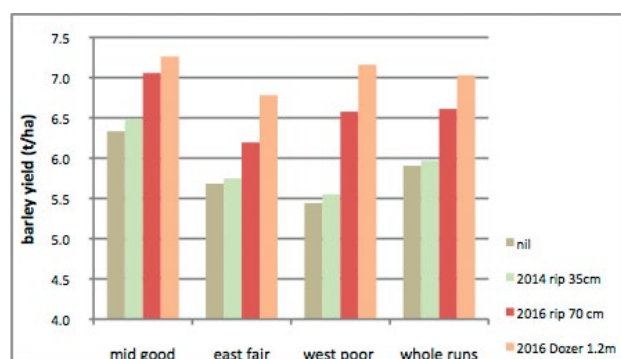
Season's Rainfall May 2017-Jan 2018 at KOJANEERUP



**Figure 1:** May 2017 to January 2018 rainfall at Kojaneerup from CliMate web app.

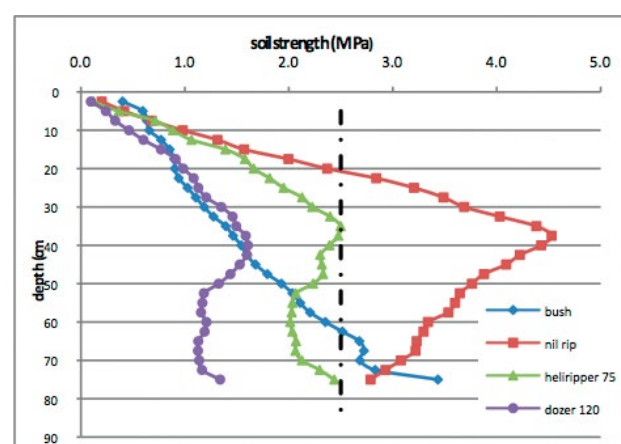
► **Table 1:** 2017 canola grain yield from deep ripping treatments at Kojaneerup. Zones are based on yields mapping between 2014 and 2016.

Yield zones/ treatment	Whole plots	W fair	W poor	E fair	Centre good
nil	1.76	1.86	1.76	1.64	1.86
2014 rip 35cm	1.75	1.85	1.73	1.74	1.69
2016 rip 70cm	1.76	1.48	1.80	1.68	1.84
2016 rip 120cm	1.84	2.03	1.67	1.82	1.93
F prob	0.479	0.102	0.353	0.312	0.145
lsd 10%	0.067	0.29	0.282ns	0.187ns	0.163
lsd 5%	0.085 ns	0.365	0.355ns	0.236ns	0.206



**Figure 2a and 2b:** 2016 barley and 2017 canola grain yields from deep ripping treatments at Kojaneerup. Whole plot length and selected yield zones are presented.

Penetrometer measurements in early September 2017 showed residual soil loosening to depth. The nil ripping treatment shows a typical compaction peak at 35-40cm of 4.5MPa, well above a root stopping strength of about 2.5 to 3.0MPa. The depth of compacted layer is also typical of cropped deep sands along the south coast extending from 25 to 60cm (Figure 3). Compaction has been effectively reduced by the Heliripper working at 75cm depth and even more effectively softened by the 120cm dozer ripping. The dozer ripping has made soil looser below 45cm than the nearby bush (Figure 3).



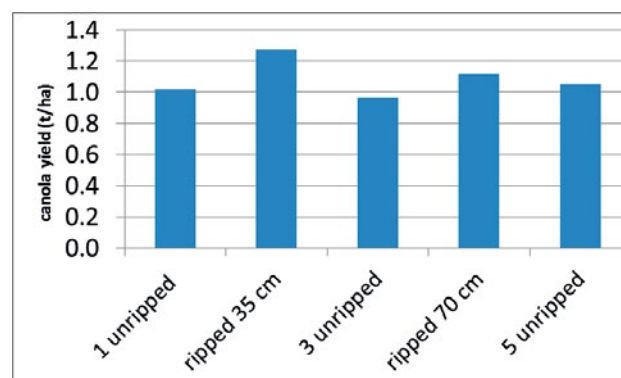
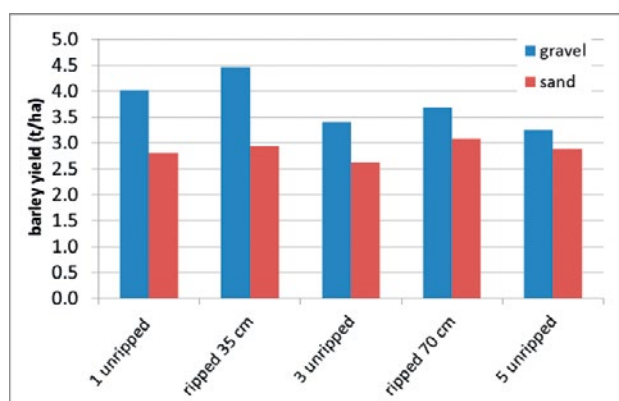
**Figure 3:** Soil strength profiles measured in September 2017 compared with uncleared adjacent bush. Dozer ripping was in Feb 2016 and Heliripper May 2016.

Measurements will continue on this site to explore the longevity of the deep ripping response.

## Bloxidge Road

The east end of Bloxidge Road site is similar to Kojaneerup with deep sand over gravel and clay at 80-100cm. This site has a very different pH with acid sand to depth compared to a slightly acid to neutral profile at Kojaneerup. There is also a shallow gravelly sand section at the west end to look at the same treatments on a different soil type. At the Bloxidge road site deep sand response was not as big as Kojaneerup, probably due to the acid soil profile.

At Bloxidge road, yield was measured by weigh trailer and for the 2017 canola, only the gravel end was measured. At this site relative yields of the five strips were very similar to 2016 barley showing a continued response to ripping with 35cm being better than 70cm depth (Figures 4a and 4b). Results from this demonstration are not replicated, treat results with caution.



**Figure 4a and 4b:** 2016 barley and 2017 canola yield responses to ripping with a Heliripper to 35 and 70cm. Only the gravelly laterite part was measured at harvest in 2017.

## Other southern sites

Several other sites between Esperance and West of Kojonup have ripping treatments on a variety of soils. Results of these trials are summarised in Table 2. Using these results to predict responses on soils other than deep sands is difficult. Also conducting replicated trials with farm scale machinery introduces soil variation across most sites making confident conclusions at smaller responses challenging to determine, but what the results suggest are:

- Only deep compacted sands are likely to have consistent responses.
- We can't always pick a consistent winning treatment on other soils, 35cm or deeper and use of inclusion plates
- There is often seasonal variation in response even at one site

- Responses do continue in CTF systems (so far)
- Amendments (lime, gypsum, chook manure) can increase yields either 1) increasing nil rip yields and there is no further response to ripping or 2) amendment enhancing ripping response
- Best responses on gravel and clay to shallow (30-40 cm) ripping, deep sand needs deeper ripping to get below compaction layer
- Response mechanisms depend on soil type and season – non wetting, subsoil compaction, or mineralisation of organic nitrogen by cultivation

Thanks to participating growers, GRDC investment in Subsoils and Building regional capacity projects.

**Table 2:** Summary of southern deep ripping site responses 2015-2017

season	site	Coomalbidup sand/gravel	Munglinup sand/gravel	Kojaneerup 70-120cm sand	55erling 80-100cm sand	55erling sandy gravel/laterite	Ongerup 10-20cm loam duplex	Muradup gravel 40cm duplex	Broomehill sandy loam duplex
2015	crop	no trial	wheat	canola	no trial	no trial	wheat	no trial	wheat
	unripped		2.87 3.57	1.68			3.05		1.5
	ripped		3.28 4.16	1.88			3.53		3.15
	YR range		0.4-0.6	0.2-0.3			0.5-0.8		0.9-1.5
	% YR		12%	15%			17%		questionable
	highest yield for least input		Best response to 60 cm and slotting. Lime increased yield	45 cm ripping best. 35 cm ripping ineffective. Unreplicated			30 cm best, not consistent among TD treats. No response in chook manure block.		50 cm and slotting best. Variable site with questionable conclusions
2016	crop	wheat	barley	barley	barley	barley	barley	barley	barley
	unripped	5.5	2.2	5.9	2.80	3.5	2.77	4.3	2.7
	ripped	6.0	2.7	7.03	3.09	3.7	3.85	4.63	3.1
	YR range	0.0-0.7	0.9	1.1-1.7	0.29	0.2	0.4-1.0	0.3	0.0-0.4
	% YR	9%	23%	19%	10%	6%	35%	7%	9%
	comment	Best yield 70cm wings increased response, slotting no further response	Lime increased yield. Deeper ripping and inclusion increased yield	Increasing yield with depth to 120 cm, all yield zones	Unreplicated, variable control yields	Unreplicated, variable control yields	Chookmanure increased yields. Slotting and 40cm ripping best result	Best yield at 35cm, deeper not as good. Discs at 15cm just as good	Mixed result with slotting. Negative result on chook manure block
2017	crop	canola	canola	canola	canola	canola	canola	canola	lupins
	unripped	2.0	1.5	1.7	no harvested	1.02	0.76	nothing useful	no results
	ripped	2.2	1.8	1.8		1.2	0.96		
	YR range	0.1-0.3	0.3	0.0-0.1		0.1-0.3	0.2		
	% YR	10%	20%	inconsistent		17%	25%		
	highest yield for least input	Best yield 70cm. Wings increased response, slotting no further response	Lime increased yields, slotting. Best yield 30cm	Waterlogging and frost, no consistent responses. 120cm OK on whole plots		Best response 35cm. Unreplicated. Consistent control yield.	Chookmanure increased yields. Part frosted, best yield 30cm rip.		