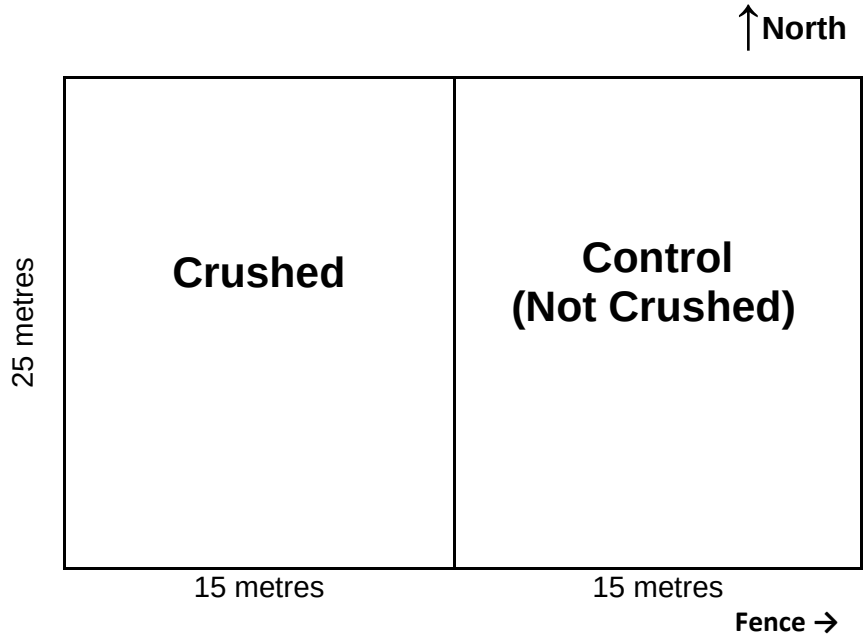
Cultivation improvement through rock crushing

Facey Group
Contact: Chloe Turner – agrec@faceygroup.org.au

AIM

To assess the returns on investment from rock crushing ironstone, to create better yields through increased arability.

TRIAL DETAILS



Property:	**Craig Jespersen**
Soil type:	Ironstone with gravelly loam
Machinery:	Reefinator RGV300
Crop Variety:	Lupins
Sowing Date:	1st May 2016
Seeding Rate:	90kgs
Fertiliser (kg/ha):	90kgs Vigour, Inoculumn injected with water infurrow
Paddock rotation:	Wheat, Canola, Wheat, Lupins
Herbicides:	22nd April - Glyphosate 1.4ltr, 24D 680 400mls, SOA 0.5kg, LI700 100mls 30th April - Paraquat 1ltr, Simazine 1.4kgs, Metrabuzin 300gms, Trifluralin 2ltr, Alpha cypermethrin 100mls, Chlorpyrifos 100mls. 30th May - Brodal 200mls 14th June - Select 500mls, SOA 1kg, Hasten 1%

METHODOLOGY

Germination counts were taken on the 25th July 2016. Biomass and yield assessments were completed prior to harvest. An economic analysis was also completed to estimate the return on investment.

RESULTS & DISCUSSION

Visually the germination in the control (not crushed) was significantly less than the crushed area, given the ability for the airseeder to create a seed bed and bury the seed. Figure 1 shows the average plant establishment for each treatment, as well as the variation of each through each standard deviation.

The recommended plant density for narrow-leafed lupin crops is 40-45 plants/m2. Trials have shown, however, that optimum plant densities change depending on location and season. Normally there is no yield penalty if plant densities are higher than the recommended range up to 70 plants/m2 but yield losses can be substantial if plant populations decline below 40 plants/m2 (Pritchard 2015).

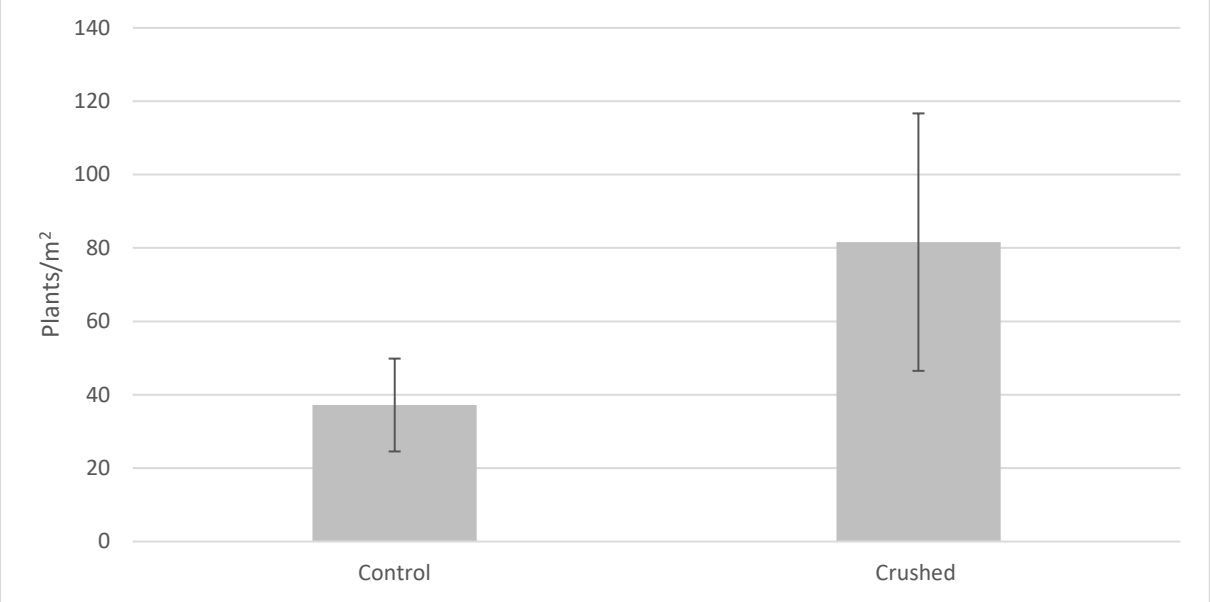


Figure 1: Establishment plants/m^2 (with standard deviation)

Plant biomass cuts were taken from 5 x 0.5m^2 random locations throughout the plots and converted to tonnes per hectare, Figure 2 shows that the rock crushed area had a greater average and less variation. From these samples, the lupin grains were extracted to give yields for each treatment, which was then converted into tonnes per hectare (Figure 3). Overall the rock crushed area gave a higher average yield of 2 t/ha with less variation across the plot. The control (not rock crushed) averaged approximately 1.5t/ha with greater variation across the plot. Given a lupin plants ability to close the canopy in competition for light, it is expected that the variations would have been greater if the trial area was sown to a cereal crop.

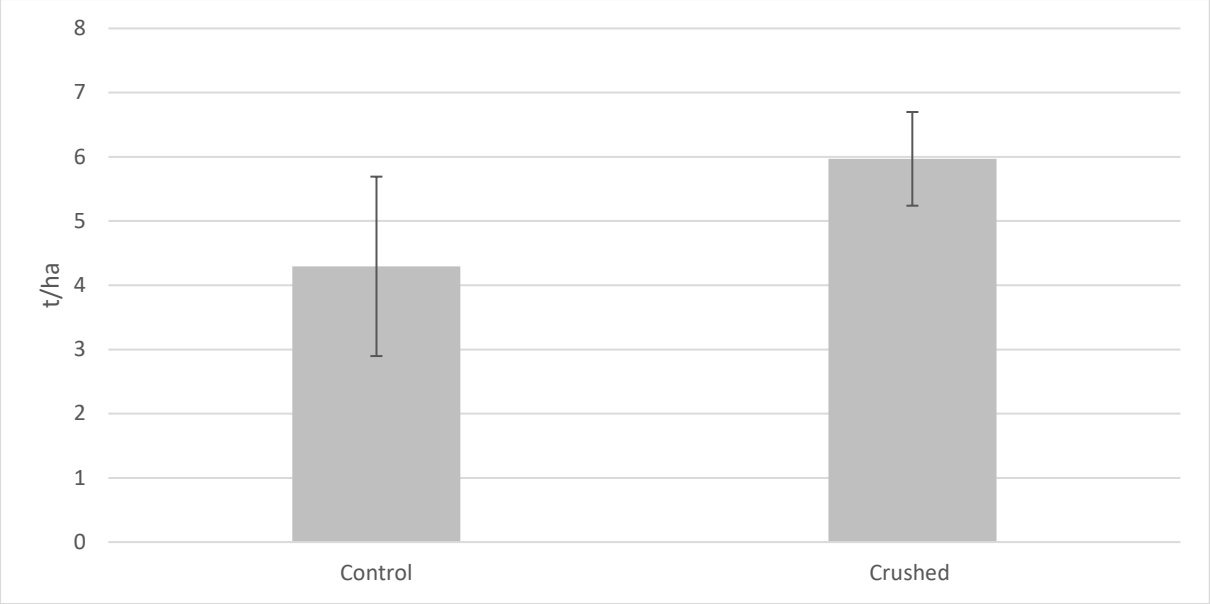


Figure 2: Harvest plant biomass

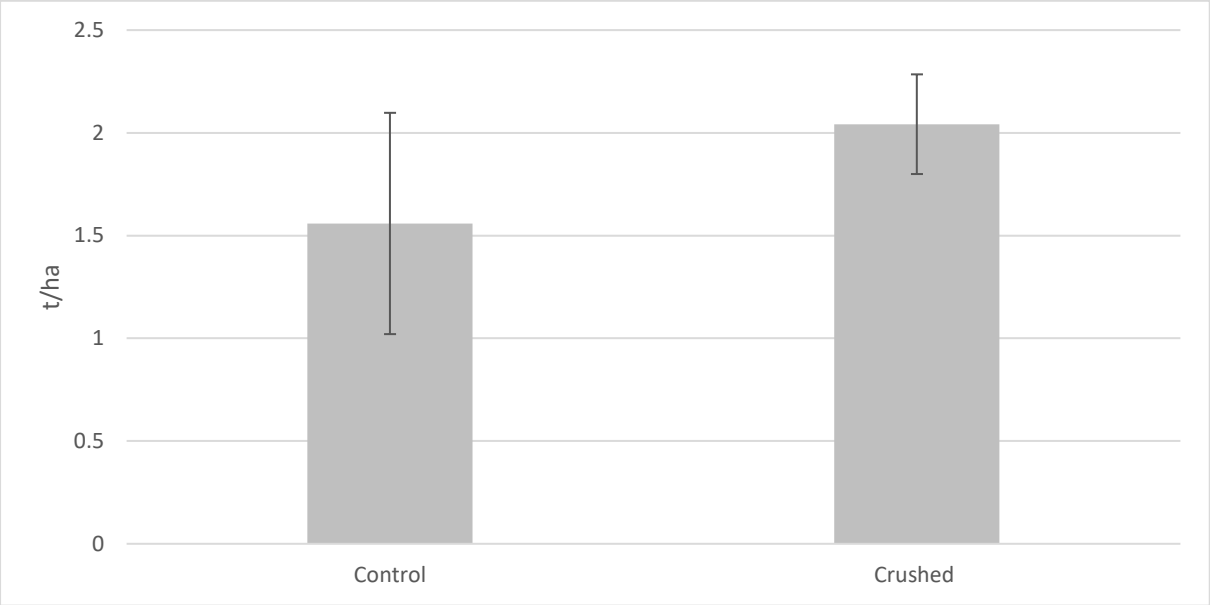


Figure 3: Harvest yield

ECONOMICS

The return on investment from the rock crushing treatment applied shows that it would require approximately 3 years to provide a return on investment for this trial. As this is trial was only for one year, the return is assumed to be the same each year to provide a payback period. As lupins have the ability to compensate for bare areas, it is likely that if the trial area was planted to cereals, the variation between yields and return on investment would be much greater and the payback period much sooner.

Table 1: Treatment return on investment

Treatment	Crushed	Control
Treatment cost/ha	$ 400.00	-
Yield t/ha	2.04	1.56
Grain Price $/tonne	$ 290.00	$ 290.00
Yield x Grain Price	$ 592.20	$ 452.09
Additional income for treatment/ha	$ 140.12	-
ROI - year 1 %	-65%	
Payback period	3 years	

The cost per hectare is an indicative price for this trial only. Costs for implementation on farm will vary depending on how deep farmers need to rock crush and the hardness of the rock, which varies the speed and number of runs to achieve the arability required.

Other than the economic benefit of improved yield, there is the major benefit of less wear and tear on the airseeder and the ability to remove un-seedable ridges and outcrops to make paddocks much easier to work, especially with parallel run lines that also must be taken into account.

CONCLUSION

The benefits from rock crushing this trial were visually apparent at plant establishment and in the yields. The short and long term effect of increasing arability on farm will be apparent in the residual return on investment for years to come.

REFERENCES

Pritchard, I 2015, *Lupin essentials – growing a successful lupin crop*. Available from: <https://www.agric.wa.gov.au/lupins/lupin-essentials-%E2%80%93-growing-successful-lupin-crop>. [8 February 2017]

ACKNOWLEDGEMENTS

Craig Jespersen for providing and managing the trial site.