Lupin Yield when Sown into Established Perennial Grass

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Key messages

Using wider rows to establish perennial pastures will provide an easier environment to sow a crop over the perennials with little or no reduction in perennial production.

Lupins can be grown successfully over perennial grasses, especially on the deep acid sands where perennial grasses are established.

Sub-tropical perennial grasses respond to nitrogen inputs; lupins are a good fit that can help supply shortfalls in N.

Aims

To evaluate the effect of the perennial row spacing on lupin yield when sown into an established perennial pasture.

Method

Background

Pasture cropping for grain (i.e. seeding an annual crop over a live perennial pasture) has proved to be viable at focus sites south west of Moora (Ward et al. 2012), Dandaragan (Ferris et al. 2014) and Mingenew (Hagan et al. 2014). Lupins have shown to grow and compete well with the perennial grass in these trials.

In August 2012, a new focus site was established 20km south of Dandaragan on a deep sandy soil. The chemical properties of the soil (0-10cm) were: pH ($CaCl_2$) 5.4, organic carbon 1.06%, conductivity 0.04 dS/m; and macro elements (in mg/kg) inorganic Nitrogen 5.3, Phosphorus 26, Potassium 19 and Sulphur 5.9.

Gatton panic (*Megathyrsus maximus*) was sown (August 2012) at 44 and 88cm row spacing using precision guidance technology: DGPS (+/- 2cm accuracy) and auto steer. Tines on the DAFWA cone seeder were positioned 22cm apart, so some seeding boots were blocked off to achieve the required perennial row spacing. Leading tines (44cm spacing) were modified to scalp away the non-wetting layer and form furrows into which coated seed was sown (4kg/ha) and pressed in (<1cm deep) with trailing press wheels. Perennial grass was not sown into control plots that were historically long term pasture consisting of ryegrass and mustard and radish. Plots were 7 x 15m and there were three replicates per treatment

The trial was pasture cropped as a part of Lupin (2013) / Serradella (2014) / Lupin (2015) rotation. Gatton panic can respond vigorously to nitrogen inputs (Valentine C. 2013). By including legumes in the rotation, growers can increase the performance of their perennial pastures in paddocks which traditionally would be ‘low input paddocks’

2015, Seeding lupins into perennials

This trial was purely the clump grass Gatton Panic and was mown to simulate grazing with sheep just before seeding with lupins. Unlike Rhodes Grass, Panic does not produce runners, so it isn’t required to be grazed as hard before seeding. Seeding into Rhodes grass can be problematic as the runners can get pulled up and tangled in the tines of the seeder. When using DGPS for accurate seeding into the Panic inter rows, there was little damage from the tines hitting the established sub-tropical grasses.

Results

Lupin establishment and biomass

Despite an indecisive break in 2015, the lupins established well and a germination count was done on June 10. It is generally desirable to have > 45 plants m^2 (Pritchard, 2015), the lupins though did not quite make this target, establishing a density of 40 plants/m^2 in the control (nil perennial) plots, 32 and 38 plants/m^2 in the 44cm and 88cm spaced perennial respectively.

Lupin density in the control treatments (i.e. no perennial base) was 40 plants/m^2; by comparison, crop plant density was 20% less for the narrow row pasture cropped treatments. The impact of the perennial base on lupin establishment was moderated by wide (88cm) perennial rows.

Lupin biomass (figure 1) was impressive with good chemical control of ryegrass and low weed burden helping plants compensate for a sub-optimal seed establishment. The lupin biomass was measured at its peak on September 30; the sub-tropical Panic grass would usually be starting to become active after its winter dormancy at this time, but due to little or no rain in September it had not yet started to produce large amounts of biomass, producing only 536 kg/ha and 494 kg/ha in the 44 and 88cm spacing respectively.

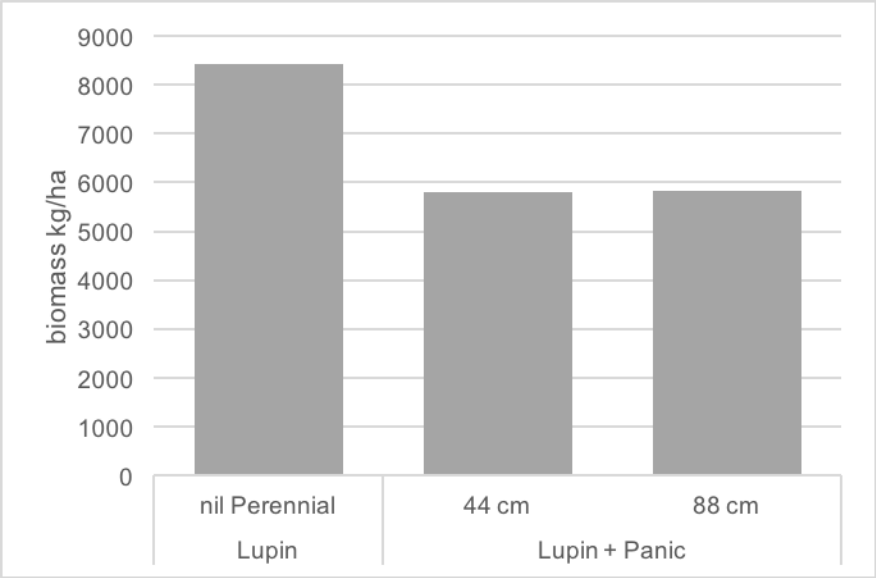

Figure 1. Lupin peak biomass recorded on Sep 30 2015. Lsd (5%) = (1400 kg/ha)

Competition from the summer active Gatton panic had a modest effect on peak biomass. A reduction of approximately 30% in overall biomass was observed when lupins were sown into panic. Peak biomass was comparable in both the 44cm and 88cm spaced perennials at 5.8t/ha.

Lupin grain yield

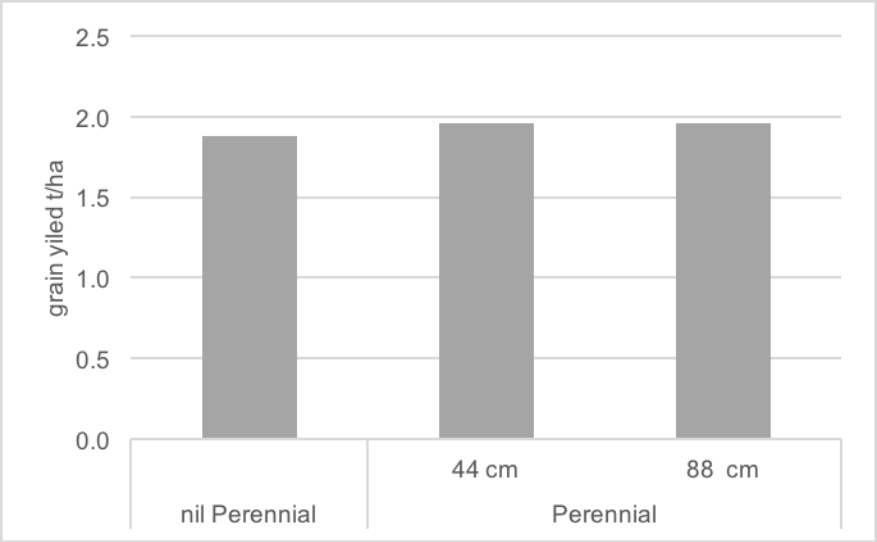

Figure 2. Lupin grain yield for annual control and pasture crop treatments. Lsd (5%) = (0.25 t/ha)

By harvest, the lupins sown into perennials had compensated for both lower plant density and biomass and there was no significant difference between lupin yield when pasture cropped into either narrow or wide row spacing or cropped into the nil perennial control plots.

The trials in the Northern Wheatbelt such as Mingenew, have milder winters and perennials remain more active when compared to cooler areas around Dandaragan, Moora and Gingin. The sub-tropicals in the Mingenew trials resulted in a greater yield penalty when pasture cropping, most likely due to the greater winter activity of perennials. Even with the cooler winter growing season in Dandaragan, from previous trials we would expect to see a slight yield penalty with lupins sown into perennials. A possible reason for the uniform yield across treatments is that the poor 2015 finish did not allow the higher biomass plots to be fully realised as seed.

Conclusion

In previous trials, wider perennial row spacing reduced the yield penalty when pasture cropping. While there was a significant reduction in lupin germination density in the narrow row spacing when compared to the wider rows, this did not translate to a difference in biomass or yield. This trial though supports previous results that the yield penalty when sown into perennial pastures is less in the cooler winter regions of Moora and Dandaragan when compared to the Northern Wheatbelt.

Key words

Pasture cropping, Precision guidance. Subtropical grasses

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