Sowing Barley into Sub-Tropical Grasses

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Partners: EverCrop-WA, Future Farm Industries CRC

Purpose:	To evaluate the performance of perennial grass and crops (Barley in 2013) when pasture cropped over different perennial species established on deep pale sands.
	Chris Vanzetti's, Barberton West Road, (~20 km south-west of Moora)
Soil Test Results:	Surface pH(CaCl2), 5.3 and OC, 1.1% (0-10 cm)
Rotation:	From 2009 - 2013, Barley, Lupin, Barley, Lupin, Barley.

SUMMARY (KEY MESSAGES)

- Overall biomass production was greater and the distribution of green feed over time was wider for the pasture-crop compared to 'crop only' or 'permanent pasture' system.
- All pasture-crop treatments yielded over 2 t/ha of grain (barley) in 2013. However pasture crops generally incurred a yield penalty relative to 'crop only' controls: grain yield was nil to 18% less when the pasture-crop received 50 kg N/ha and 19-26% less when it received 80 kg N/ha.
- Pasture crops can improve the perennial base by delivering additional fertilizer with the crop and enforcing a rest from gazing during the winter growing season. In 2013, the flow benefit of extra nitrogen in the preceding pasture-crop was greater perennial growth over the subsequent summer. But this response has been variable between years and dependent on the amount and timing of summer rainfall.

BACKGROUND AND AIM

Over the past five years personnel with the Future Farm Industries CRC's EverCrop project have been evaluating the viability of pasture cropping over different subtropical species at a focus site south-west of Moora. The trial has been based on a barley-lupin rotation with crops sown into annual and perennial pastures. Results to date have been very promising for both barley (2009, 2011) and lupin (2010, 2012) crops with little or no yield penalty (0-15%) in pasture crops when fertilized in line with district practice (Ward *et al.,* 2012).

The perennial grasses at the focus site were originally sown in 2008; they established well but over time the density of Rhodes grass has declined. For instance, in 2012 Rhodes grass (unlike Gatton Panic) did not recover well from the grass selective herbicide (Verdict®) sprayed on the lupin crop. This report compares the grain yield results for the 2013 barley crop sown alone or into Gatton panic and Rhodes grass plots. It also highlights biomass production over time for Gatton panic based systems as a pasture crop could be used to supplement available feed of subtropical perennial grass pastures, especially in winter when they become dormant.

TRIAL DESIGN

Plot size: 6 x 30 m (42 plots)

Machinery use: DAFWA cone seeder (1.5 m wide), 180 mm row spacing, discs with trailing press wheels

Repetitions: Three replicates (14 treatments)

Crop type and varieties used: Buloke* Barley

Seeding rates and dates: May 23, 2013. Barley sown at 80 kg/ha

Fertilizer rates and dates:

at seeding	80 kg/ha Agstar Extra
Jun-17	50 kg/ha Sulphate of Ammonia 80 kg/ha Muriate of Potash 30 kg/ha Urea
Jul-14	100 kg/ha Urea on High N plots 30 kg/ha Urea on Low N plots

Herbicide rates and dates:

pre	1.0 L/ha Glyphosate 450
at seeding	1.0 L/ha SpraySeed®,3.0 L/ha Treflan™ 0.8 L/ha Barracuda®

TRIAL LAYOUT

Treatment description

Crop only, High N Crop only

Gatton panic only, 36 cm row spacing

Gatton panic 36 cm, pasture cropped, High N Gatton panic 36 cm, pasture cropped

Gatton panic only, 72 cm row spacing

Gatton panic 72 cm, pasture cropped, High N

Gatton panic 72 cm, pasture cropped Rhodes grass only, 36 cm row spacing

Rhodes grass 36 cm, pasture cropped, High N

Rhodes grass 36 cm, pasture cropped

RESULTS/STATISTICS

Biomass of Gatton Panic and Barley

- Figure 1 shows standing green biomass of over time for Gatton panic and barley grown as ‘pasture only’, ‘crop only’ or a combined (pasture-crop) system. The perennial grass was mown twice in summer (January 30 and April 21) to simulate grazing.
- Perennial pasture growth is dependent on seasonal conditions, especially temperature and rainfall in spring and summer. Between November 2012 and January 2013, 130 mm of rain fell resulting in useful growth of the perennial grasses over summer (Figure 1). Gatton panic produced between 860 and 1400 kg/ha of feed in January. But available green feed declined under dryer conditions and then with the onset of cooler temperatures in winter (June-July).
- Barley sown alone produced 5.4 t/ha of biomass but 26% less (4.3 t/ha) when sown over subtropical grasses. This difference was less (15%) when an extra 70 kg/ha of urea was applied to the ‘crop only’ and pasture-crop plots (7.5 vs. 6.5 t/ha biomass respectively).

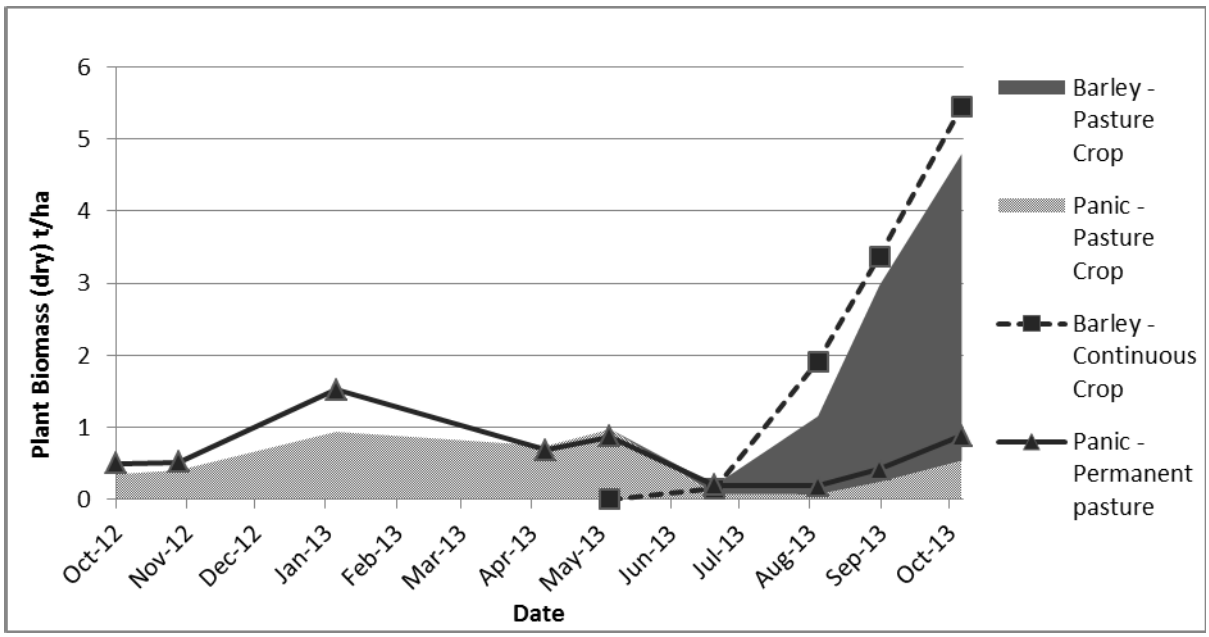


Figure 1. Standing green biomass over time for Gatton panic and barley grown as 'pasture only', 'crop only' or combined (i.e. pasture-crop system; shaded area) when fertilized with 50 kg N/ha.

- An additional 70 kg/ha of urea was top dressed on 'High N' plots each year. Last year (2013) when soil moisture and temperature were favourable for perennial growth, 49% more biomass was produced in summer and 27% more in spring by subtropical grasses in the High N compared to the Low N plots (Figure 2). However, a significant growth response to nitrogen has not been observed in previous years, thus fertilizer inputs may need to be carefully weighed up based on the presence of a pasture crop and how the season is progressing.

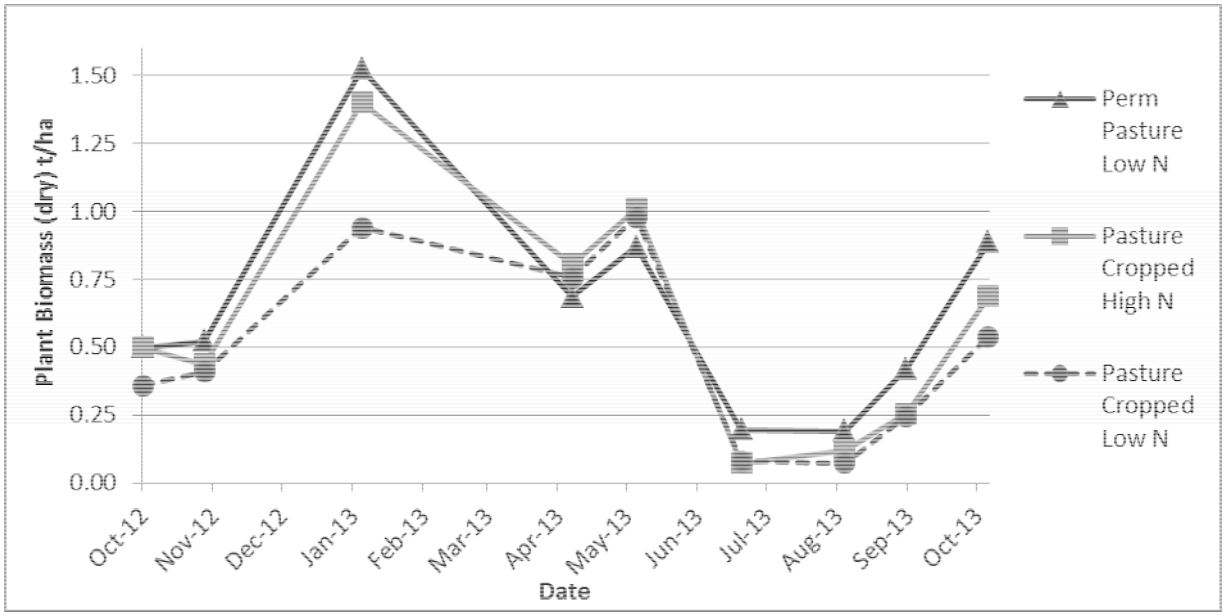


Figure 2. The response of Gatton panic to two rates of nitrogen: Low N (50 kg N/ha), and High N (80 kg N/ha). (see Trial details for fertiliser type, application time and rates).

Grain Yield of Barley

- The good season (121 mm for November 2012 – April 2013 and 310 mm for May to October) highlighted a nitrogen deficiency in both the barley crop and perennial grass pasture which is a common issue on high leaching deep sandy soils.

- There was a significant yield boost (41%) in response to additional nitrogen (80 v 50 N) for the 'crop only' treatments (i.e. no perennial base; Figure 3).
- Barley sown in line with district practice (50 kg N/ha; no perennial base) yielded 2.4 t/ha. Using this as a reference (or 'control') there was a yield penalty (nil to 18%) for crops sown across perennial grass treatments (Figure 3). Additional nitrogen (extra 30 kg N/ha) overcame this penalty. However, if viewed from the perspective of equivalent nitrogen input the yield penalty was greater (19-26%) for pasture crops fertilized at the higher nitrogen rate (80 kg N/ha) relative to the 'crop only' high nitrogen control (3.5 t/ha).
- When seeding annual crops into perennial grass pastures, there are logistical advantages to seed between wider rows. The trial results showed that:

(a) there was no significant difference in grain yield for barley sown between narrow or wide row (36 vs 72 cm) Gatton panic plots (Figure 3), and
(b) there was little difference in panic biomass production between perennial row spacing treatments (data not shown).

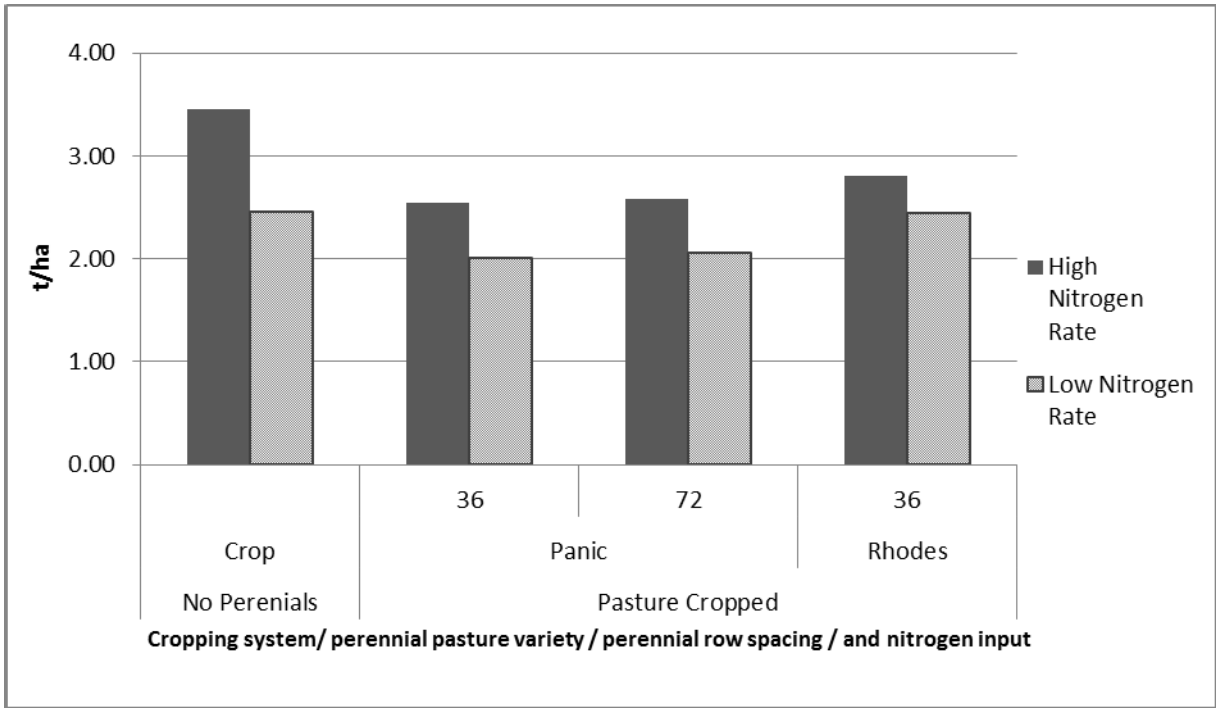
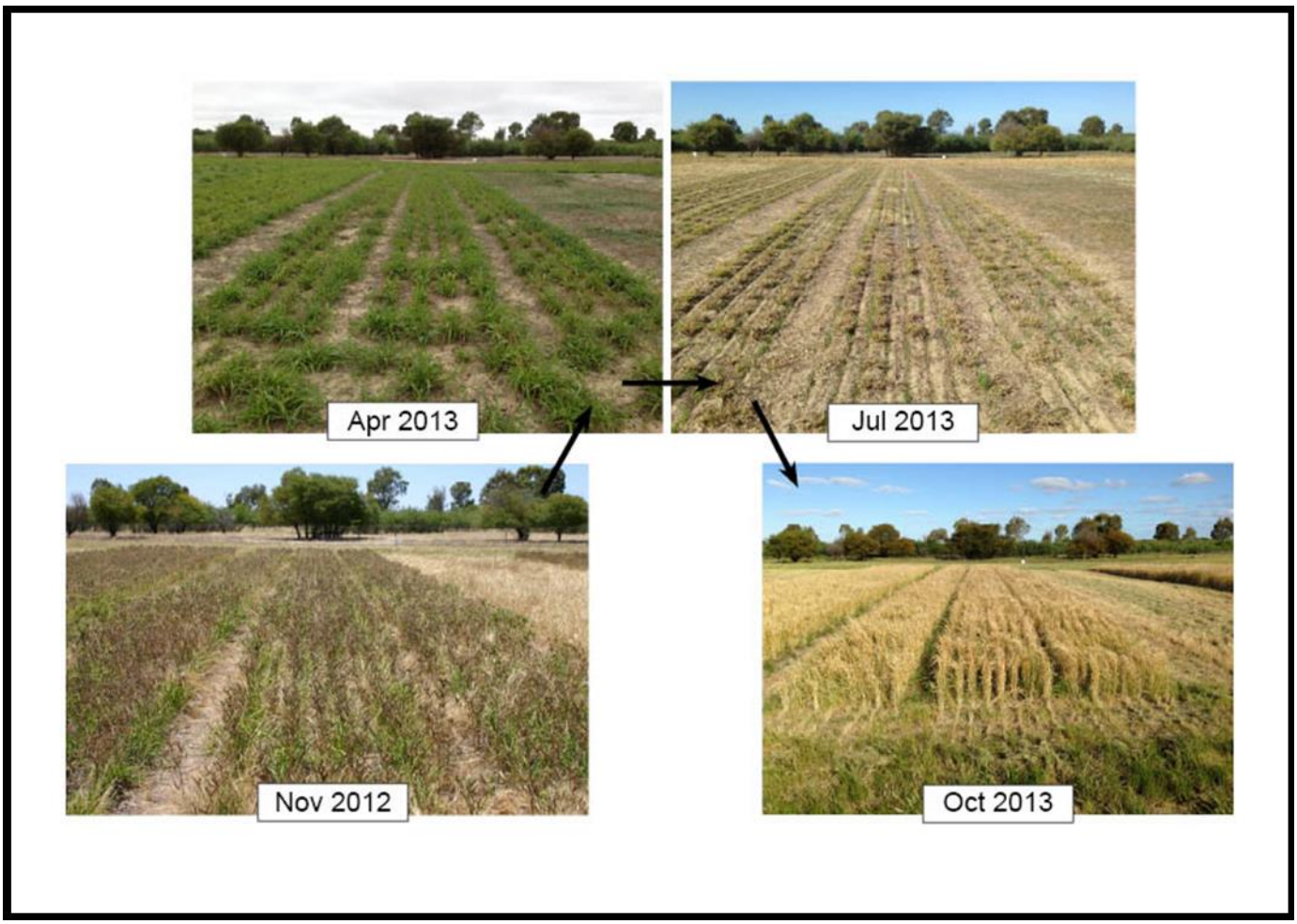


Figure 3. Barley grain yield for 'crop only' and pasture-crop treatments fertilized at two rates of nitrogen (50 & 80 kg N/ha) when sown over perennial grasses established on wide or narrow row spacing. Lsd (5%) = 0.53



The following images show a representative crop rotation over one year. The Gatton panic plot shown has a narrow (36 cm) row spacing, and was fertilized at the high nitrogen rate.

- November 2012. Lupin crop just before harvest, showing early spring growth of panic grass in the understory.
- April 2013. Green feed production over summer in response to several summer rainfall events.
- July 2013. Perennial growth slows with the onset of cool conditions and plants become dormant in winter. This image shows barley recently planted between the perennial rows using a disc seeder. Conventional tines can be used, but GPS with auto steer is needed to avoid damaging the perennial pasture.
- October 2013. Barley crop just before harvest showing the recovery of perennial grass from winter dormancy.

OBSERVATION/ DISCUSSION/ MEASUREMENTS

Results from the Northern Agricultural Region have shown that crops can be sown over subtropical perennial grasses without jeopardizing persistence of the perennial base. However, perennial grasses vary in their tolerance to in-crop herbicides and crop yield is dependent on effective weed control, adequate fertility and moisture, and winter dormancy (or suppression) of the perennial pasture.

Pasture cropping systems can also lift overall biomass production, improve the feed value of stubbles, provide out of season fodder, and reduce the likelihood of wind erosion and groundwater recharge on deep sandy soils.

The application of additional nitrogen can lead to greater biomass in both the annual crop and perennial pasture. However, this is dependent on seasonal conditions and the economics of applying additional nitrogen needs to be considered carefully on low moisture holding, infertile, sandy soils in the Northern Agricultural Region.

ACKNOWLEDGEMENTS/ THANKS

Thanks go to Chris Vanzetti (host farmer) and the DAFWA Geraldton Research Support Unit. This research was funded by the Grains Research and Development Corporation through the Future Farm Industries CRC as part of the Evercrop Project (P2 FP09).

**Buloke barley is protected by Plant Breeders Rights Act 1994 (PBR)*