Increase perennial grass productivity with serradella

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Purpose:	To evaluate the influence of perennial row spacing and grass suppression on the performance of serradella summer sown into subtropical perennial-grass pastures.
Location:	Peter Negus property. West side of Dandaragan Rd (~ 2km North of Rowes Rd)
Soil Type:	Deep sand. Texture is consistent to 1.5m
Soil Test Results:	(0-10cm): OC - 1.06%, P - 26 mg/kg, K - 19 mg/kg, S - 5.9 mg/kg, N - 5.33 mg/kg, conductivity - 0.04 dS/m pH(CaCl2) - 5.4 (0-10cm) 4.5 (10-40 cm) 4.8 (40-80 cm) 5.0 (80-120cm)
Rotation:	Volunteer pasture; perennial pastures sown August 2012, lupins sown into perennials in 2014.

Rainfall:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Tota
13	0	6	34	106	65	100	50	81	37	18	0	516

BACKGROUND SUMMARY

The productivity of deep sandy soils is marginal for continuous cropping but can be improved by establishing well-adapted perennial and annual pasture species. Perennials though are nitrogen hungry and can respond well to additional nitrogen. Sowing serradella into the summer active perennial can help supply this nitrogen and improve the composition of the pasture.

TRIAL DESIGN

Plot size: 15m x 7m

Machinery use: DAFWA cone seeder, with tines 22cm apart and aligned to sow between Gatton panic rows that had been established in 2012 (44 and 88cm apart).

Repetitions: 3

Crop type and varieties used: Yellow serradella line 87GEH72.1a (pending release)

Seeding rates and dates: 30kg/ha of pod plus 10kg/ha of ALOSCA® sown on 18 February

Fertilizer rates and dates: Super potash (3:1, 160kg/ha) was top-dressed across all plots prior to sowing

Herbicide rates and dates: As serradella was summer sown in February, no knockdown was used. All plots were sprayed with Broadstrike® (25g/ha) in May to control volunteer lupin. Three of the serradella treatments were sprayed with a grass selective herbicide (Select® at 500mL/ha) on 1 July to suppress the growth of Gatton panic and control annual grass weeds.

Other applications/ treatment rates and dates: To simulate grazing, plots were mown with a ride on lawn mower on 5 June and 9 July shortly after biomass assessments. Unimproved control plots were also mown on 19 August to reduce annual ryegrass seed set.

Table 1 Pasture improvement treatments

Treatment	Description
1	Unimproved annual control (i.e. no serradella, no Gatton panic and no grass suppression)
2	Gatton panic rows 44cm apart
3	Gatton panic rows 88cm apart
4	Serradella summer sown, plus grass suppression (i.e. no Gatton panic)
5	Serradella summer sown between Gatton panic rows 44cm apart, plus grass suppression
6	Serradella summer sown between Gatton panic rows 88cm apart, plus grass suppression
7	Serradella summer sown between Gatton panic rows 44cm apart
8	Serradella summer sown between Gatton panic rows 88cm apart

RESULTS/STATISTICS

Composition and plant density of pasture treatments
Four general pasture systems were evaluated (Figure 1):

a) unimproved control
b) perennial grass alone
c) serradella alone
d) perennial grass combined with serradella as a companion annual legume

When the serradella was summer sown in February, Gatton panic plots had about 300kg/ha green feed and density was around 7 and 14 plants/m^2 for 44 and 88cm perennial row spacing treatments respectively.

After the break of season on 8 May (42mm) serradella density in the control treatment (i.e. no perennial base) was 152 plants/m2; seedlings emerged at about the same time within perennial grass plots but serradella density was about 17% lower.

Productivity of four different pasture systems over time
The annual control pasture (which regenerated after a lupin crop the previous year) was primarily annual ryegrass. Individual plants were small, had few tillers and looked nutrient deficient.

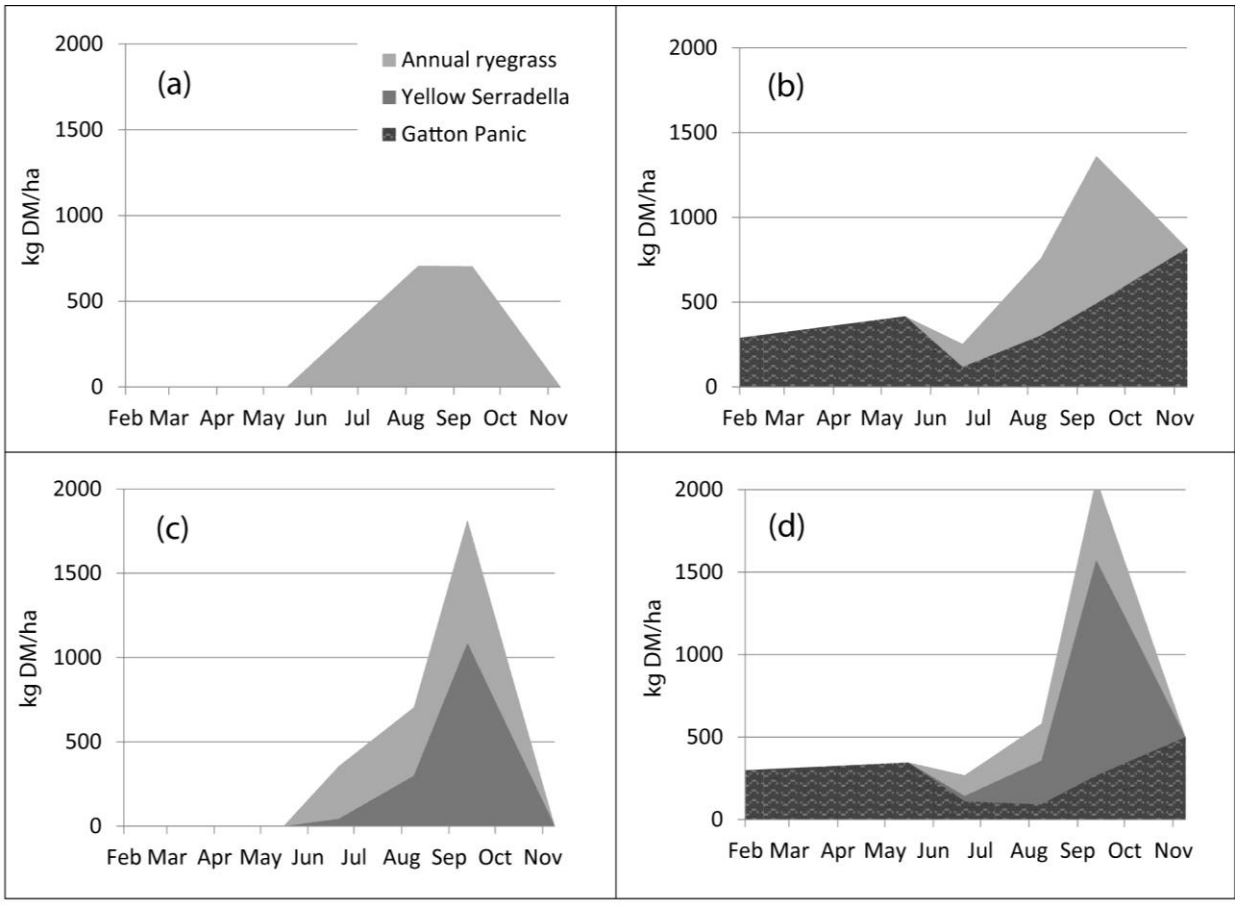

Figure 1. Pasture production (kg DM/ha) and composition of green feed over time for different pasture improvement treatments: (A) unimproved control, (B) subtropical perennial grass, cv. Gatton panic (C) summer-sown yellow serradella (D) serradella summer sown into Gatton panic

Figure 1a. Collectively the annual ryegrass pasture produced about 700kg/ha biomass and numerous spikes before being mown (19 August) to control seed set.

Figure 1b. The perennial pastures produced little growth (<500kg/ha) over the 2013-14 summers due to limited rainfall (just 14mm in January), as expected growth slowed over winter but responded to warm conditions in spring. Overall, biomass production was similar for both perennial row spacing treatments (av. 1.3t/ha); and on 24 September, pasture composition was primarily annual ryegrass (av. 63%).

Figure 1c. Summer sowing serradella into bare ground proved to be 33% more productive over winter than perennial only plots; moreover, plots had 59% legume content by spring.

Figure 1d. Summer sowing serradella into perennial pastures was the most productive overall, in terms of total winter biomass (av. 2.1t/ha), legume content (av. 63%) and potential summer feed.

Impact of perennial row spacing and herbicide suppression on pasture biomass.
Row spacing and grass suppression had little effect on the biomass of the perennial + serradella mix, although Panic growth was suppressed over the winter growing season in response to declining temperatures and the impact of the grass selective herbicide.

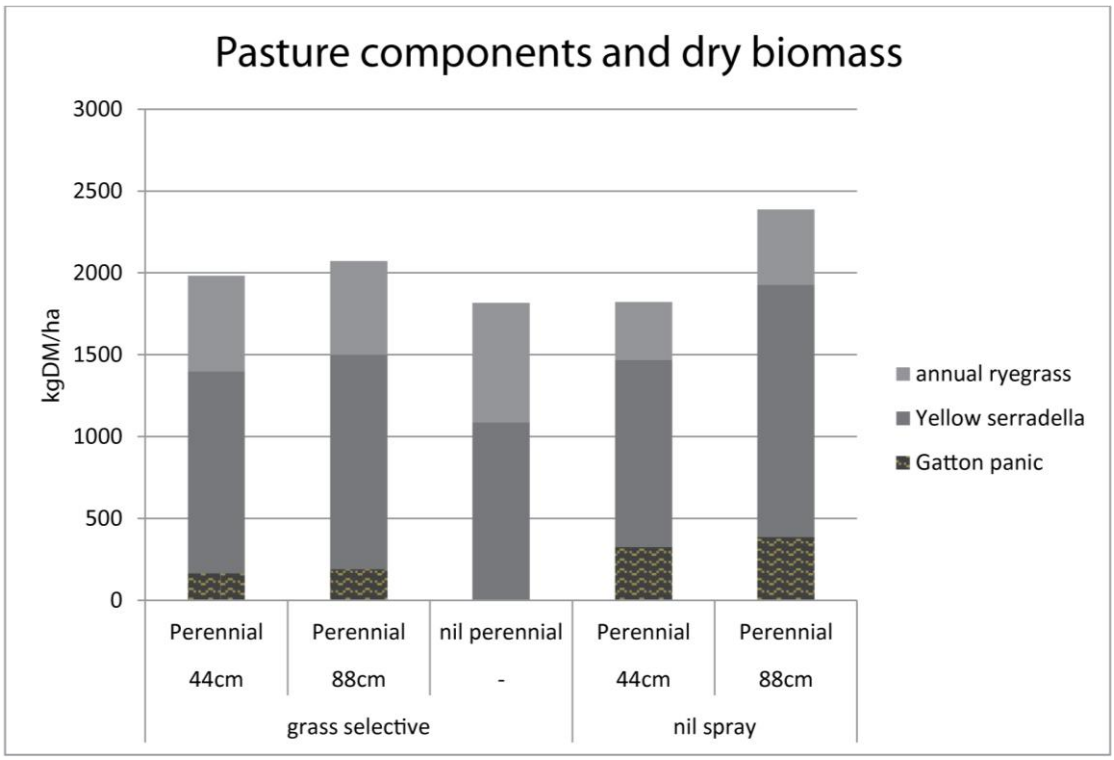

Figure 2. The impact of perennial row spacing (44 & 88cm) and herbicide suppression on pasture production (kg DM/kg) and composition. Cumulative growth up to 24 September. Lsd (5%) = 518

By 24 September, cumulative serradella growth was 1.1-1.5t/ha and legume composition around 63% with slightly more overall growth in the wide perennial row spacing (88cm) plots (Figure 2). The annual ryegrass proved to be resistant to clethodim (Select®); consequently most plants survived the grass selective herbicide. Interestingly, more ryegrass was grown in the nil perennial plots and grass selective plots (Figure 2). This suggests that in absence of competition from panic, ryegrass is more efficient than serradella at taking up resources that otherwise would have been used by perennial grass.

Impact of row spacing and herbicide suppression on serradella seed production
In this situation—where ryegrass proved to be highly resistant to clethodim—serradella seed production was not increased by suppressing the perennial base as anticipated (Figure 3). Rather, seed production was greatest in unsprayed perennial plots especially those with a wide-row spatial arrangement (i.e. 42% greater yield than narrow row spacing). Notwithstanding, all treatments produced over 400 kg seeds/ha which has set up a large seed bank from which to self-regenerate in subsequent years.

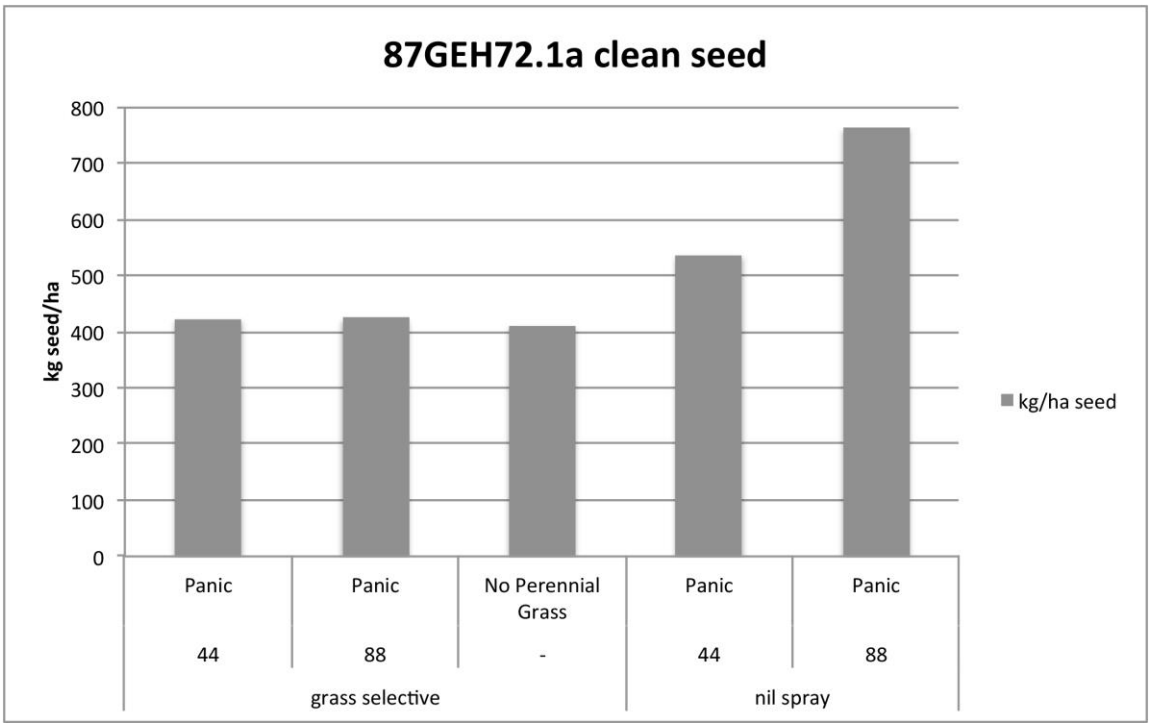

Figure 3. The impact of perennial row spacing (44 & 88cm) and herbicide suppression on serradella seed yield (kg seeds/ha). Lsd (5%) = 109

OBSERVATION/ DISCUSSION/ MEASUREMENTS

EverCrop research reported in this and previous Crop Updates (2010-2014) has built up a sound knowledge base on the viability, performance and economics of pasture cropping and companion annual legume based systems for fragile soils in the Northern Agricultural Region that are marginal for continuous cropping. Collectively, trials at Mingenew and Dandaragan over the past two seasons (2013 & 2014) have demonstrated that subtropical perennial grass pastures lift the overall productivity of deep sandy soils, extend the period of available green feed, convert summer rainfall into feed, reduce the winter and summer weed burden, and increase ground cover.

REVIEW

Geoff Anderson

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