Light grazing of stubbles over summer has no impact on no-till crop yield

The University of Western Australia, Facey Group and WANTFA
Contact: Ken Flower –ken.flower@uwa.edu.au

AIM
To assess the impact of sheep grazing over summer on crop residues, soil quality and no-tillage crop establishment and yields.

TRIAL DETAILS

Property:	Cunderdin College of Agriculture, Carter (Meckering), Bird Wickepin and Poultney (Yealering)
Plot size & replication:	5 m x 5 m with 4 reps at each site
Soil type:	Varied - see Table 1
Crop Variety:	Varied each year – see Table 2

BACKGROUND
Trampling by livestock can incorporate weed seeds and cause soil surface compaction. Also, excess removal of stubble often results in wind and water erosion. Recently there has been widespread adoption of no-till cropping in Western Australian (WA) with an estimated 86% of farmers using this conservation farming method. Soil cover is thought to be one of the key components of a no-till system for maintaining a favourable soil structure and high yields. Many farmers want to know what impact sheep grazing has on no-till crop yields? This research focussed in the impact of summer stubble grazing on following crop yields and ran from 2011 to 2013.

METHODOLOGY
The trial was initiated in the summer of 2010/11 and continued until December 2013. Six paddocks, with a range in soil types, were selected over four farms (Table 1). Two of the farms were managed by WANTFA in the Meckering/Cunderdin area and the other two were managed by the Facey Group in the Wickepin area. Each paddock had two paired treatments consisting of grazed and ungrazed (fenced in summer) plots, with four replications. Plots were 5 m x 5 m with a 2 m border between plots and 5 m between replicates. Grazing management was determined by the farmer.

Table 1. *Sites and soil types*

Site	Soil type
1. Cunderdin (C)	Red sandy clay loam
2. Meckering 1 (M1)	Sand over grey clay
3. Meckering 2 (M2)	Sand over clay loam at depth
4. Wickepin 1 (W1)	Sand over loam (some gravel at depth)
5. Wickepin 2 (W2)	Sandy loam with gravel
6. Yealering (Y)	Light sand and sand over clay loam with gravel

RESULTS & DISCUSSION

Grazing was managed by the farmer. Generally, relatively light grazing occurred at all sites over the summer periods with stocking rates ranging from 2.3 to 5.1 DSE ha^{-1} and grazing intensity from 112 to 357 DSE days ha^{-1}, when just grazed over summer with no winter grazing.

Soils

There were no differences in bulk density (0-10 cm) at the start (data not shown) and by the end of the experiment only one of the paddocks (W2) had a significant difference in bulk density, with the grazed being significantly higher than the ungrazed. There were few differences in soil chemical composition between grazed and ungrazed, except total N was markedly higher in the ungrazed plot compared with the grazed at one site (M1). This may have been due to the unchecked growth of pasture, including serradella, in the previous season, compared with the grazed plots.

Soil water

Soil water infiltration at saturation (FSI) reflects the steady-state infiltration capacity of the soil after wet-up. The infiltration was significantly reduced in the grazed plots at two sites with relatively heavy grazing over winter, otherwise there were no differences in infiltration between grazed and ungrazed plots.

Total soil water down to 1.5 m was measured before grazing and after grazing in 2012 and 2013 and there were no differences between treatments, indicating that light grazing had little effect on soil water levels.

Crop residues

There were few differences in crop residue dry-mass and percent ground cover between the grazed and ungrazed treatments at most sites and years, except where grazing over summer and winter occurred (i.e. pasture paddocks). In 2013, only the W2 site had significantly higher pre-seeding crop residue dry-mass compared with ungrazed. The main differerence between grazed and ungrazed was that the ungrazed stubble was mainly standing, while the grazed was flattened and sometimes not anchored to the ground.

Crop yield

Crop yields over the duration of the trial are shown in Figure 1. The crop types associated with each site and year are shown in Table 2. Crop yield was only decreased significantly at one heavy soil site (M1) by grazing over both winter and summer (Figure 1b). Therefore, light summer grazing appeared to have no significant effect on subsequent crop yield.

Table 2. *Crops grown in the different paddocks from 2011-2013*

Paddock	2011	2012	2013
C	Canola (Tanami)	Wheat (Yitpi)	Wheat (Mace)
M1	Pasture (volunteer)	Wheat (Magenta)	Pasture (volunteer)
M2	Pasture (volunteer)	Wheat (Magenta)	Pasture (volunteer)
W1	Canola (Cobbler)	Wheat (Magenta)	Pasture (serradella)
W2	Canola (Cobbler)	Wheat (Magenta)	Wheat (variety TBA)
Y	Wheat (Mace)	Canola (Cobbler)	Barley (Buloke/Vlamingh)

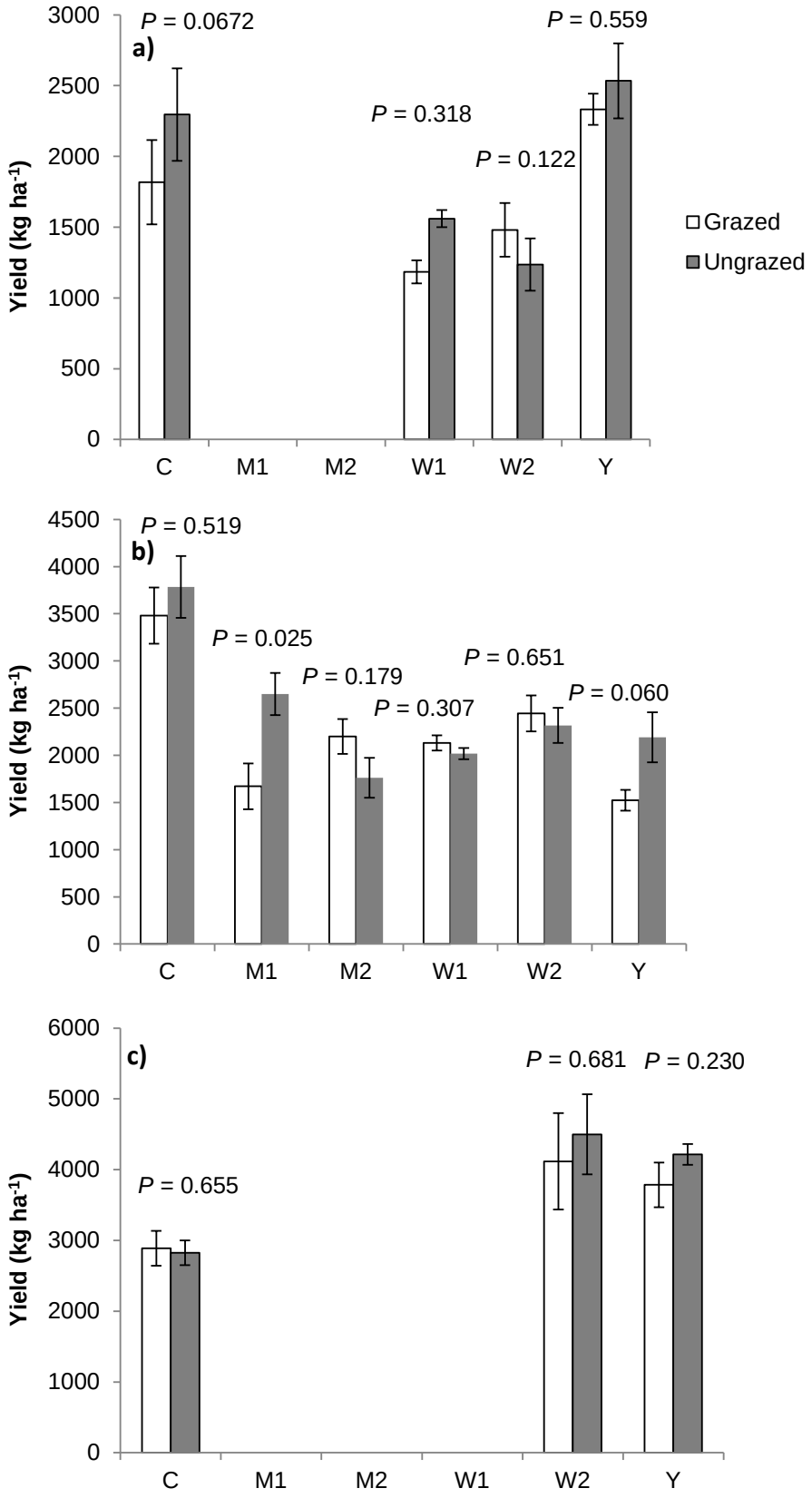

Figure 1. *Effect of grazing on crop yield in a) 2011, b) 2012 and c) 2013 Bars show ±SE (n=4). C = Cunderdin, M1 = Meckering 1, M2 = Meckering 2, W1 = Wickepin 1, W2 = Wickepin 2 and Y = Yealering*

CONCLUSION

Light grazing was shown to leave most of the crop residue horizontal and detached but there were similar amounts of residue to the ungrazed plots. Grazing over summer and winter reduced crop yield at one site and further work on this may be required.

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