

Row spacing in cereal and broadleaf crops

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Summary:

- A review of published data show that in general there is no effect of wider row spacing on wheat yield where grain yield is less than 3.5 t ha^{-1}
- Above 3.5 t ha^{-1} some significant yield decreases in crops with wider rows have been recorded
- Broadleaf crops seem to be less sensitive to row spacing than cereals

Introduction:

Increased interest in no-till farming systems and stubble retention has focused attention on row spacing. The traditional row spacing in much of southern Australia has been 18 cm (7"), but there is a trend for farmers to use wider row spacing for a range of reasons. Perceived advantages of wide row spacing include:

- Increased stubble handling ability of seeding equipment
- Lower draft of equipment
- Lower cost of machinery
- Soil water saved for the grain filling period
- Faster sowing speeds (as soil throw between neighbouring rows is reduced)
- Ability to use incorporated by sowing (IBS) herbicides at higher label rates than a conventional system such as Trifluralin and Pendimethalin.

Perceived disadvantages of wide row spacing include:

- Slower ground cover of crop
- Increased evaporation from soil surface
- Reduced competitiveness with weeds
- Increased need to band fertilizer as higher rates of fertiliser can become toxic when concentrated in wider rows
- Grain yield reduction

What effects do wider rows have on yield?

Widening row spacing can reduce grain yield in cereals. However, in low yielding environments this is not always the case. There are numerous reports of experiments where increased row spacing lowered yields (Anderson et al. 2000; Doyle and Felton 1984; Fettell and Bamforth 1986; Smith et al. 1995). Similarly, numerous

experiments have been reported where increasing row spacing did not decrease yield (Amjad and Anderson 2006; Fettell and Bamforth 1986; Smith et al. 1995; Yunusa et al. 1993). Recent wheat trials in southern and central NSW have no effect on yield of widening row spacing where grain yield was less than 3.5 t/ha and significant decreases where yield was greater than 3.5t/ha (Figure 1).

Widening row spacing in canola and lupins does not appear to reduce yield when row space is increased to about 35cm (Jarvis 1992; Xie et al. 1998) and wider (Felton et al. 2004). Recent experiments in southern NSW have shown no differences in yield of narrow compared with wide row spacing (Figure 2). The dry conditions of 2007 and 2008 mean we have no recent data on row space from high yielding canola trials.

Retained Stubble and Row Spacing:

Reported effects of row space with retained stubble show a trend for yield to be reduced at wider rows (Anderson et al. 2000; Doyle and Felton 1984; Fettell and Bamforth 1986) (Figure 3). Retaining stubble resulted in lower yield compared to burning or cultivating but the difference was reduced at wide row spacing. Data from trials in central west NSW show that retaining stubble can increase grain yield (Haskins, unpublished).

Evaporation from Soil:

The effects of row spacing on evaporative loss from the soil vary. French and Schultz (1984) estimated that during an average growing season in South Australia the least amount of water lost to evaporation was 110mm. Van Herwaarden and Passioura (2001) found that for wheat canopies of different size in southern NSW, soil evaporation was linearly related to the fraction of shaded soil at anthesis, with evaporation decreasing by 1.4 mm for every additional percent of shaded soil area. Increasing row spacing of wheat from 17 to 30 cm in Syria has been reported to increase evaporation from 183 mm to 205 mm (Eberbach and Pala 2005). Row spacing of 9, 18, 27 and 36 cm have been reported to have no effect on evaporation from soil surface in wheat crops with average evaporation being 88mm in two experiments in low rainfall WA (Yunusa et al. 1993). There is insufficient information on the effect of amount of stubble on soil evaporation.

Weed Competition:

Increasing row spacing reduces the crop's competitive ability with weeds because it increases the space available for the weeds between the rows and decreases the competitive ability of the crop. Wider row spacing configurations however do allow higher rates of IBS herbicides such as Trifluralin and Pendimethalin to be used with tined seeders

where a 'hot blanket' of herbicide is incorporated in between the seed rows.

Conclusion:

Data reviewed here show that wheat yield can be reduced at wider row spacing when grain yields are greater than 3.5 t ha⁻¹. Broad leaf crops appear to be less sensitive to row spacing. Potential reductions at higher cereal yields need to be balanced against the operational advantages afforded by wider row spacing. This review is in the process of being extended and reanalysed.

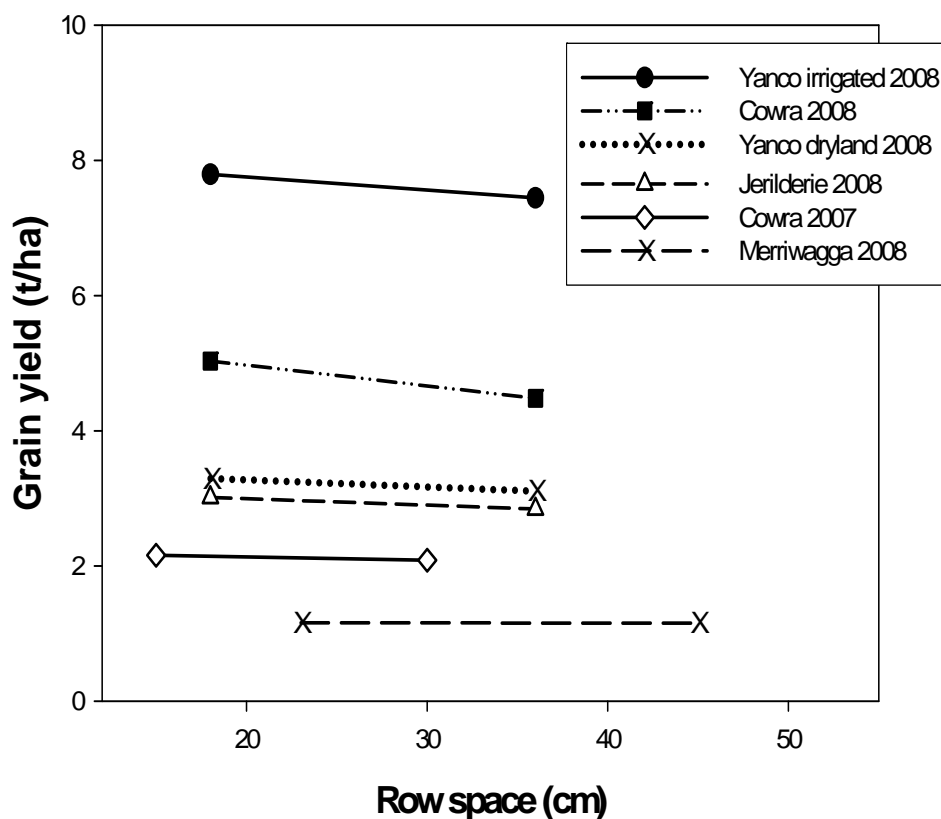


Figure 1. Grain yield of wheat row space trials grown in southern NSW in 2007 and 2008.

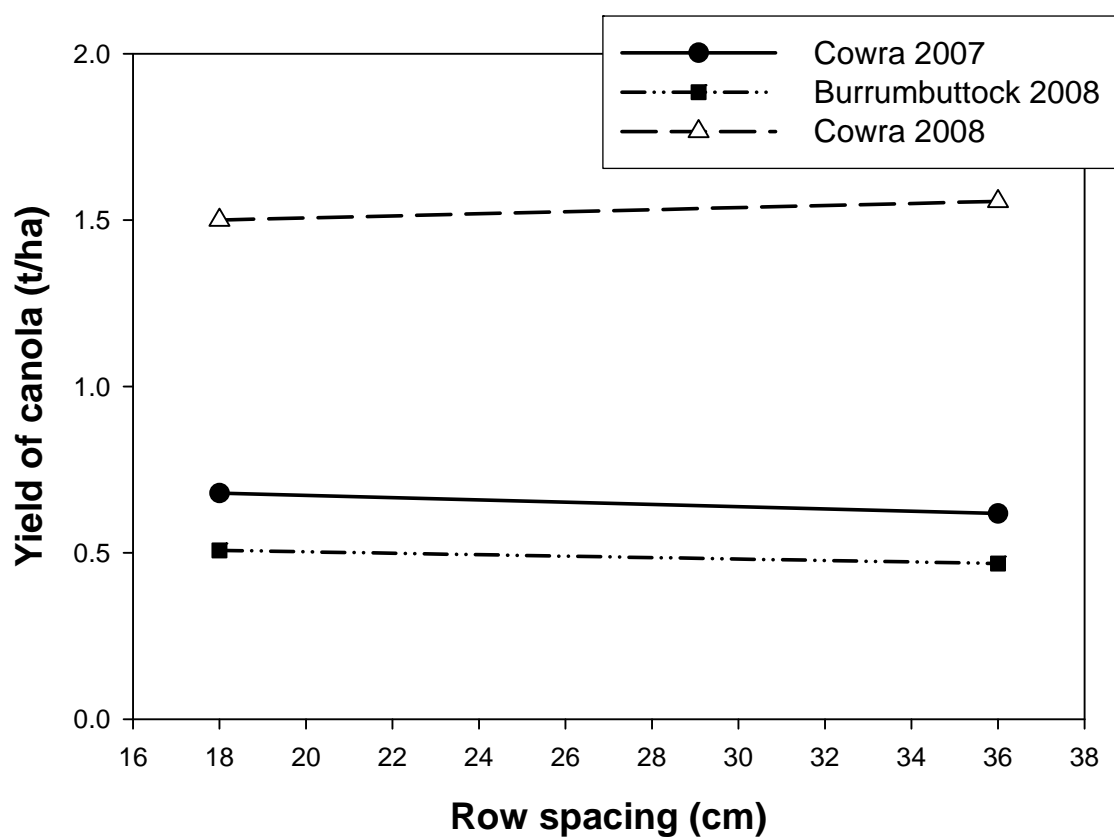


Figure 2. Grain yield of canola row space trials grown in southern NSW in 2007 and 2008.

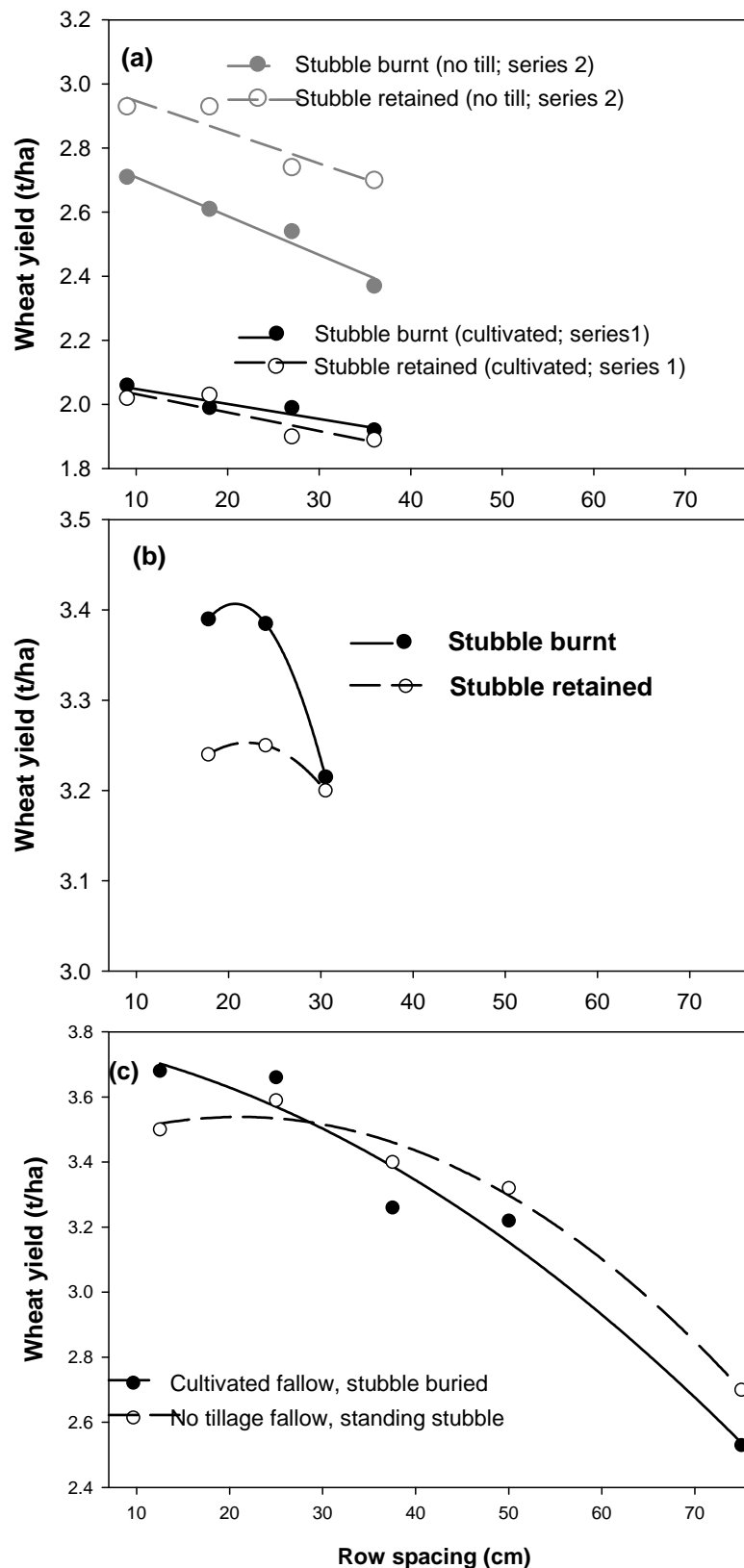


Figure 3. Relationships between row spacing in wheat with and without stubble present and grain yield in WA (a; Reithmuller 2004), central NSW (b; Fettell and Bamforth 1986), and in northern NSW (c; Doyle and Felton 1984). Stubble was on the soil surface and stubble was either burnt (a and b) or stubble incorporated (c).

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