Yield of wheat after direct drilling with a modified combine

R.K. Belford, E.R. Harvey, D. Tennant, and R. Jarvis

Western Australian Department of Agriculture,
Baron-Hay Court, South Perth, W.A. 6151

Direct drilling on sandy soils in Western Australia has consistently caused poorer early growth and yield of wheat than after cultivation. Many factors may interact to depress crop growth after direct drilling (1), but improved growth after deep ripping suggests that soil strength may be too high without at least some cultivation. We therefore evaluated an experimental one-pass seeder which used leading tines to loosen soil below the depth of seeding, followed by seeding tines to sow wheat 3 cm deep.

Methods.

Wheat was grown on loamy sand at Merredin (1986) and Wongan Hills (1987). At Merredin, the leading tines loosened soil to between 3 and 13 cm (with tines either 18 or 5 cm wide), followed by seeding tines 5 cm wide. Similar configurations were used at Wongan Hills, with the addition of ripping treatments to 13 and 30 cm deep, before sowing. Both trials had a control treatment of scarifying before seeding. Trials were sown in plots 60 m long (80 m in 1987) and 2.5 m wide, laid out as a randomized block design with four replications. Measurements were made of soil penetration resistance, crop development and dry weight, water use, root distribution (1986 only), and yield and yield components.

Results and discussion.

At Merredin in 1986, crop development, growth and grain yield was poorer after direct drilling with shallow loosening than after cultivation. However, grain yields after direct drilling increased with increasing depth of the loosening tines such that at 13 cm depth, yields were equivalent to those after cultivation.

At wongan hills, early development and growth were influenced more by seed depth than by tillage method. at harvest, deep ripping gave the highest grain yield, and the shallow loosened treatments the lowest. as in 1986, direct drilling with the modified combine increased grain yield as the depth of the loosening tines increased.

Much of the improvement in crop growth and yield was associated with lower soil strength below the seed, thereby helping root penetration at early stages of growth; these experiments both showed a close relationship between grain yields after direct drilling and soil penetration values (i.e. soil penetration resistance integrated over 30 cm), with this regression accounting for 92% and 88% of the variability in yield at Merredin and Wongan Hills respectively. However, treatments scarified before sowing yielded better than expected from the degree of soil loosening, suggesting that factors other than soil strength (probably nitrogen availability) were influencing crop growth and yield in this situation.

Using a modified combine, wheat crops direct drilled on sandy soil can therefore yield as well as those established after cultivation, provided that the loosening tines work at least 10 cm deep and ahead of the seeding tines. Future work will optimize depths and widths of tines for different agronomic situations, e.g. minimizing wind erosion on the northern sandplain in W.A., or manipulating subsequent pasture growth on the South coast. Weed control strategies may need further evaluation in such systems.

1. Cornish, P.S. (1985), Proc. 3rd Aust. Agron. Conf. Hobart, 380.