



farmtalk



This article contains information most relevant to the less than 350 mm rainfall mallee farming region

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Machinery Considerations For Improved Residue Handling at Seeding

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Inter-row sowing offers practical residue handling as well as agronomic benefits

iv) Physical decomposition decreases stubble mass and reduces the proportion of cellulose in the internodes, which decreases shear strength and facilitates residue cutting.

v) As a result, greater handling difficulties can be expected on the header trail where stubble levels including chaff are concentrated and remain wetter for longer. Rolled/trampled stubble is often wetter and can also be more difficult to handle than standing, but over time decomposes more quickly.

Some machinery principles apply:

i) Stubble height should be kept below approx. 60-65% of the effective tine vertical clearance* not to restrict residue handling (*distance from the ground surface to the first major obstruction on the tine shank or mounting head).

ii) Stubble height should be no more than 65-70% - and preferably less than 50%- of the lowest value of inter-tine spacing** (**narrowest clearance between components of any two tines or between tine and wheel, in any direction). Inter-tine spacing is best maximised by increasing seed row spacing, tool rank spacing and the number of ranks.

iii) The more continuous is the residue shedding process, and the fewer the cumulative interactions with tines, the smaller are the resulting clumps.

What it means

There are preferred tine parameters/layout to optimise residue handling:

• **Shank cross section:** a 40-50mm circular, smooth wearing cross-section will aid stubble shedding by minimising restrictions to quick and regular rotation around the tine shank.

• **Shank shape:** Straight shank designs, vertical or slightly leaning back, best encourage imbalances in stubble clumps leading to smoother flow and quicker shedding.

The issue

Adopting one pass cropping practices into stubble requires specific considerations to ensure adequate residue flow through the tine seeder and maintaining minimal straw clumping and soil throw.

Knowledge has been developed from no-till experience and research trials, and can assist farmers with machinery decision making.

What we know

Stubble condition is critical:

i) Residue management starts at harvest, aiming to uniformly spread residue across the paddock and achieving a short uniform length, commensurate with optimum harvesting efficiency (up to twice the paddock residue level can be found on the header trail).

ii) Wheat stubble levels can amount to 1.3-2.8 times the grain yield and can create handling problems from 3-4t/ha.

iii) Wetter stubble increases friction and adhesion properties, affecting the ease of flow across a tine layout, and offers significantly higher resistance to cutting and lower resistance to bending than dry stubble. This condition promotes hair-pinning issues, especially with disc coulters or narrow edge-on shanks.



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- **Review/modify tine layouts:** Target an overall balance between tine vertical clearance and layout capacity. Trials showed that inter-tine spacings of 550-600mm was mostly adequate in 350-450mm high wheat stubble (3.5-4.5 t/ha density). A 100 mm longer stubble increased the minimum inter-tine spacing threshold to 650-700 (rolled stubble) and 800mm (standing). These values are only indicative and may need to be increased towards the rear of the machine.



Pig's Tail wrapping on a John Shearer 620 shank. NSW trials showed potential residue handling benefits esp. with edge-on and spring coil tines (see www.weldalloy.com)



Trash guard shape should be optimised to minimise increases in soil throw

Management options to consider

Complementary strategies at seeding:

- Only sow into heavier stubble after sufficient drying has occurred.
- Use lower reaching narrow points and shallower tillage depths to help maximise tine vertical clearances.
- Harvesting on the diagonal to the expected direction of seeding will minimise residue handling pressures associated with the harvester trail.
- Slower operating speeds reduce residue clumping levels and lower risks of blockage in heavy stubble by giving more time to clear residue clumps as they form.

Low cost add-on technologies (\$5-25/row):

They can improve residue flow, but improvements remain limited by existing clearances and main layout features.

- Metal or plastic trash guards, provide a rounded, straight and vertical interface, regardless of tine shank designs. These must provide a gradual transition from the narrow point shoulders to avoid soil/residue trapping and minimise soil throw and furrow emptying.
- Polymer coil wrapping (*Pig's Tail*TM): left and right handed coils are tight fitted around existing shanks to achieve a smooth, low friction rounded edge interface and provide a low cost trash gaiter option.

Residue manager technologies: (\$210-670/row)

- Coulter discs fitted at the front of the seeder bar can

promote residue and creeper weed cutting. Their suitability in sticky soil or soft soil conditions is limited. Heavy weight loading and high draft are required for penetration in compact soils. Residue cutting with discs at best relies on a sharp and pointed edge working against strong soil backing ('parting' action) and some degree of differential speed at the disc periphery ('sliding cut' action). Hair-pinning under coulters can worsen residue handling of following tines, and cutting performance is optimised with matching operating depth to blade capacity.

- Residue managers include a tug wheel concept for tines designed to continuously pin residue down beside the tine shank as it proceeds through stubble to assist the shedding process, and row cleaners (star/notched wheels) moving stubble across to prevent hair-pinning with disc openers (adjustable sweep angle and good floatation are required to achieve satisfactory performance).

Precision guidance benefits:

2cm DGPS tractor guidance enables accurate inter-row sowing at row spacings above 0.22m, effectively minimising or cancelling stubble clumping or hairpinning.



High clearance straight shanks with circular section promoted superior residue handling in SA trials



Residue cutting is most effective after wet summers and in hard soil conditions.

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Visit www.msfp.org.au for more technical information on seeding systems research.

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