Disc seeders under the microscope

Jack Desbiolles, AMRDC[1], University of South Australia

Last year, the Grains Research and Development Corporation (GRDC) and the University of South Australia supported a nation-wide survey of farmers and contractors who currently use – or have used in the past – disc seeders in a no-till cropping context.

The survey aimed to identify disc seeder strengths and weaknesses, as experienced by users across a range of soil and rainfall conditions. The survey also highlighted how disc seeders can be best integrated into no-till farming systems.

The survey compiled 195 responses received from six states (WA 32; SA 31; Vic & Tas 19; NSW 65; Qld 48).

The main soil limitations at seeding experienced by the respondents included soil stickiness (73 per cent of responses), hardset and compacted soils (51 per cent), stony soils (41 per cent), abrasive soils (31 per cent) and non wetting soils (21 per cent). Additional limitations cited included soft loose soils, waterlogged conditions, recently cleared ground (stumps/sticks), ironstone and high slope.

The vast majority (95 per cent) of respondents commonly operated their disc seeder in standing stubble, with 88 per cent running a straw spreader/slasher on their harvester.

Reasons for initially purchasing a disc seeder

Reasons for purchase fell into three categories:

- Cropping system benefits (sush as, sustainability, agronomy, and economics);
- Machinery motivations (such as, performance, design); and,
- Influence of people (such as, neighbours, research results, demonstrations).

Overall, the top five most cited purchase motivations were:

- Heavy residue retention and handling ability (49 per cent);
- Machine design features (39 per cent);
- Low soil disturbance (27 per cent);

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Poor handling of sticky clay soils was a major limitation reported in 60 per cent of responses.

Respondents cited the ability to handle and retain heavy stubble as a primary benefit of disc seeders.

Disc seeders were cited as well suited to narrow row spacing requirements such as for pasture establishment and renovation.

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- Seed placement accuracy (27 per cent); and,
- Brand reputation (18 per cent).

The data also revealed that particular issues were more relevant in different states. For example, disc seeders were primarily seen in SA to offer benefits of not pulling up stones and enabling a complete 'zero-till' farming system, while a greater emphasis on achieving faster seeding and providing lower draft benefits were higher ranked in WA.

About 91 per cent of disc seeder users stated that their motivations for purchasing a disc seeder still applied today. But the remaining nine per cent had faced problems with their disc seeder that drove them to consider either a better suited disc seeder design or revert back to a tyne seeder.

Their reasons included the availability of newer and now improved disc seeder technologies, negative experience with a specific machine or particular technology limitations such as, poor herbicide incorporation ability, poor depth control in soft soil, lack of penetration in dry years, poor handling of wet sticky clays etc.

Benefits of disc seeders

The top benefit identified (53 per cent of all responses) was the ability to handle and retain heavy stubble, ensuring more permanent soil cover, cancelling the need to manage stubble (including burning) and making harvesting and seeding easier.

Themes of soil moisture preservation via low soil disturbance at seeding and residue retention throughout the year as well as seed placement quality and row to row depth control, were also highlighted.

These factors combined into another significant benefit – improved reliability, speed and quality of crop establishment, particularly under marginal moisture conditions, with often an improved yield potential.

Faster seeding (time savings and improved crop seeding timeliness) and a range of cost savings (fuel, power, seeds, labour) were also highlighted as significant economic benefits of disc seeders.

The enhanced performance in heavy stubble and marginal moisture supported greater cropping system flexibility by enabling rotations over a wider range of soil/stubble conditions. In addition, more opportunity crops and post sowing pre-emergence knockdown applications were possibile.

Other noted benefits included improving soil health and quality (biology and structure), soil erosion control, lower weed pressures, and improved cropping results in stony paddocks.

Limitations of disc seeders

Poor handling of sticky clay soils was a major limitation reported in 60 per cent of responses. The problems encountered included seed boot outlets clogging and soil accumulation against elements in close contact with the rotating disc (for example, seed boot guard, gauge wheel), overloading scrapers and generating high drag forces causing the slowing down or stalling of disc rotation, resulting in furrow bulldozing and poor seed placement.

These problems lead to delays when conditions became moist/wet. Inadequate herbicide incorporation, lack of ground penetration ability, early bearing failures and significant residue pinning were the other main limititations cited.

Inadequate herbicide incorporation led to poor weed control efficacy and herbicide failure. This limitation promoted a shift away from herbicides requiring mechanical incorporation by sowing (such as trifluralin). It also prompted users to develop custom solutions such as adapting harrows behind the disc seeder, applying and incorporating the product pre-sowing (and sowing deep) or applying and incorporating the product after sowing and pre-crop emergence.

Triple discs in many instances, and hybrid disc/tyne systems were found to achieve adequate herbicide incorporation.

Lack of ground penetration was a common limitation in hard soil conditions, such as when dry sowing, moisture seeking at depth, sowing into compacted pastures, or sowing across wheel tracks and heavy residue patches. Poor penetration resulted in inadequate or irregular soil cover, often leading to partial or staggered seed germination, low crop vigour and/or crop establishment failures.

These problems were related to lack of machine weight and/or inability to apply enough down pressure on disc units. Penetration ability was often poorest with twin disc concepts while undercut single disc designs were found superior.

Significant residue pinning was reported in situations of heavy, wet residue over loose or soft soil conditions. Poor straw spreading at harvest, lodged and matted stubble, shallow seeding of sensitive crops (for example, canola), and blunted discs were often key factors influencing these problems.

About 30 per cent of responses also reported irregular seed placement, damage and high wear in stony soils and poor disc drive in soft soils as significant limitations in their cropping context.

Irregular seed placement (high scatter, variable depth across soil types, poor soil cover) arose due to a range of situations, such as poor seed boot design, uneven penetration across soil types, seed bounce with excessive airflow, variable depth con-

trol in loose ground, and seed entrainment in wet conditions. Problems were increased when shallow seeding into rough and uneven ground.

Many users who work in stony soils reported damage (for example, cracking, early wear, blunting, bending, and snapping) to gauge wheels, rubbers, discs, and press wheels. They also experienced high wear rates on discs and seed boot guards.

Operating under rough conditions (both stones and compacted soils) increased the likelihood of early wear and bearing failures.

Poor disc drive was a significant limitation when operating in loose sandy soils and soft/wet sticky soils, due to the inability to overcome frictional resistance (drag) applied to the disc from a range of sources. This leads to gradual slowing down and stalling of disc rotation and subsequent furrow bulldozing. The lack of disc drive was deemed worse with single disc concepts, and exacerbated when seeding shallow and when operating with worn discs.

Wet clay conditions created smearing and furrow compaction, as well as uneven furrow closure for approximately one in five respondents.

Sixteen per cent of respondents complained of a surprisingly high draft from their disc seeders, linked to the heavy weights of some machines (for example, up to 22 tonnes with air cart).

A similar proportion of respondents experienced limitations with low crop vigour often linked to poor seed placement, furrow compaction/lack of tilth issues, and early sensitivities to herbicides like trifluralin, particularly in cold winters.

The bigger picture

A common theme often expressed by the respondents was that the severity of some of these problems – such as poor ground penetration, significant residue pinning and high draft requirements – declined over time. The soils tend to soften under zero-till – often combined with the benefits of controlled traffic – and the improving biological soil life significantly hastens the rate of stubble breakdown.

A number of respondents also indicated acceptance of limitations such as poor herbicide incorporation, bearing failures and high wear in stony areas, when looking at the 'bigger picture'. The quality of the overall seeding job achieved (particularly under harsh or challenging soil conditions) and the agronomic and economic benefits generated in the farming systems, often outweighing any limitations.

Low soil disturbance attributes of disc seeders were seen to minimise seedbed moisture loss, reduce weed pressure and improve crop establishment in marginal moisture conditions.

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Contact: Jack Desbiolles Agricultural Machinery Research and Design Centre University of South Australia Email: jacky.desbiolles@unisa.edu.au Tel: 08 8302 3946

For the full report contact your local no-till farmers association.

[1]Agricultural Machinery Research and Design Centre. ■