Exploring the use of strip and disc systems on Eyre Peninsula to improve drought resilience

Strip and disc systems - Potential risks and benefits

The following is a list of potential risks and benefits that has been collated from consultation with SA growers who have adopted, considered adopting or chose not to adopt strip and disc systems. Much of the information is anecdotal and this list should be read as a working draft of issues growers should consider when looking at adopting strip and disc. The list is not comprehensive or in order of priority, and the project team welcomes feedback. Growers are always encouraged to seek their own professional advice prior to making decisions.

POTENTIAL RISKS

Fire

- Fire risk may be heightened due to the increased standing stubble load. Being prepared for a fire, including having the right equipment on hand as well as a fire management strategy, is essential.

Frost

- Anecdotal reports that systems with higher stubble retention may increase the risk of frost. The thatch of straw may mean the sun (solar radiation) is less effective at heating the soil up during the day and less heat is available to release back to the canopy at night.
- Thermography and temperature loggers monitoring surface and air temperature in plots with and without stubble showed that stubble reduced the minimum temperature, particularly in light-coloured stubbles with the effect diminishing as the season progressed. [1]
- Stubble is a major host of ice nucleating bacteria (INB) and by crop canopy closure stage, the stubble would be expected to be primed with INB, increasing the crop sensitivity to a frost event, at equal temperature. [2]

[1] https://sagit.com.au/project/frost-learning-centre-for-farmers-advisers-and-researchers-mhr121/
[2] https://sagit.com.au/project/frost-learning-centre-for-farmers-advisers-and-researchers-mhr121/

Pre-emergent herbicide options

- Growers concerned that there are no registered chemicals specifically for disc systems due to every disc system being different.
- All herbicide labels recommend knife point-press wheel systems for IBS practice, while some labels specifically rule against use under disc seeders. Crop safety concerns are linked to uncertainty around separation of seed from herbicide-contaminated soil and crop residue.
- Need herbicide safety trials on different soil types/rotations and by disc seeder type.

Herbicide residues

- Some growers report that their disc seeder does not move herbicide residue out of the way like a tyne seeder meaning it can remain close to the seed, such as when hair pinning occurs.

Hair pinning of stubbles

- Sowing with disc seeder into heavy, damp stubbles can result in hair pinning, especially in softer soil conditions - where the disc blade pushes crop residue into the furrow near the seed zone, rather than effectively cutting through residue and kept away from the seed zone.

Bigger stubbles

- Some growers report that disc seeders can block up with straw in the third year of adopting the system, due to accumulation of stubble biomass from low breakdown rate of standing stubble. Risks can be minimised by operating in the same direction of the harvester.
- Some growers have utilised residue managers to push residues aside (to the inter-row away from the disc) to reduce hair pinning. Use of residue managers needs careful individual evaluation as their effectiveness is based on stubble height, soil type and speed. Straw can ball up if there is too much stubble and cause blockages so residue levels need to be carefully monitored.
- Observations suggest the stripper straw gets brittle and can rot at the crown and this is what blocks the discs. It can also impact the effectiveness of row cleaners or residue managers such as the Aricks wheels.
- Research has shown herbicide spray coverage can be reduced in stripper stubble compared to medium or low-cut draper stubble[3]. Growers may need to look at increasing water rates or spraying in lower delta T conditions to improve coverage in stripper stubble.

Pest and mice pressure

- Stripper stubble can provide a more favourable environment for pests and protection from predators.
- Greater front losses at harvest may additionally make things worse for managing mice.

[3] Unlocking the value of strip and disc systems - GRDC

- Some growers report that they see more slaters, earwigs, millipedes and mice in their strip and disc system and feel it is harder to both monitor and manage.

Having to learn a new system

- Many growers fear they would be on their own with a disc system. If adopting a different system and things go wrong, it can have big impact on business.
- Changing systems means throwing away what you know works and it's a big risk
- Need a step-by-step manual on what the changes are
- Need to carefully manage downward force on-the-go with a disc seeder to ensure even and adequate soil penetration. High tech solutions (e.g. Active down force) can assist managing variable soil condition across paddocks.
- Growers report that some stripper fronts are rigid and do not float like some draper fronts which can cause issues in undulating areas where the stripper front does not pick up as well on the ends. Larger models have spring-loaded gauge wheels complementing the underside skids to offer greater floating stability and ground following capabilities.
- Firming wheels have been used by some growers to improve soil to seed contact. Different types are available and should be selected considering soil type and conditions.

Maintenance requirements

- Disc blades must be kept sharp so they can cut through stubbles and soil
- Growers report having to get new discs each season or season and a half
- Rocky and stony soils cause extra wear and tear – need to keep an eye on the discs and replace when worn
- Gauge wheels, firming wheels, residue managers and crumbler wheels require ongoing checks and maintenance

Investment costs

- New or even second-hand machinery is a large upfront investment when changing to the new system and growers are changing from what they know
- Uncertainty around if need a higher-capacity harvester to best manage the stripper front. Growers wondering if there is an optimal capacity.
- Need breakdown on profit margins for each area to justify investment. Moisture retention benefits are likely to only be on a small portion of the area (i.e. areas currently with inadequate soil cover).
- Need to know ownership costs over time that also considers maintenance costs
- If growers have to run a stripper and a draper front then it costs more
- Some growers may choose to retain their knife point seeder which makes the upfront investment larger due to no sale proceeds from the existing seeder. Also, running 2 seeders adds to the total cost.
- Parts may not be readily available everywhere, waiting for parts can have a major impact on the business

Cereal diseases

- Concern that the strip and disc system will increase risk of some diseases such as Rhizoctonia or crown rot

Harvest weed seed management

- Economics and efficacy of harvest weed seed collection with stripper fronts not well known
- Impact on horsepower, speed and fuel use not clear

Low yielding crops

- Growers report that using a stripper front is challenging in shorter, low yielding crops as grains can hit the hood and shatter out of the head leading to greater front losses
- Need engineering and design reviews to improve harvest in low yielding, short cereals

POTENTIAL BENEFITS

Improved stubble retention

- Observations suggest greater stubble retention is particularly valuable on lighter soil types to stabilise soils and potentially retain soil moisture

Improved soil moisture retention

- Some evidence that low draper front stubble retains less soil moisture than stripper front stubble but needs more research[4]
- Growers want data on soil moisture differences – if not saving moisture then the benefits have to add up somewhere else

Less soil disturbance

- Disc seeders create less soil throw and less or no residue burial and therefore can help reduce wind and water erosion
- Some growers say they are able to take advantage of smaller rain events at sowing as less soil is moved using a disc seeder, so less soil moisture is lost to evaporation
- Disc seeders leave the soil surface flatter with more stubble cover retained and no clods or straw clumps that can impact on germination and establishment

Improved efficiencies

- Seeding – disc seeders may allow growers to sow faster than they can with a tyne seeder. Driver comfort and maintenance generally ok at increased speed but need to ensure its ok in all soil types. Trials and monitoring are needed to ensure appropriate results are obtained on different soils of different structures, strengths, types and moisture levels.
- Harvest – stripper fronts only need to process the grain not the straw so harvest speeds can be increased and there is less wear and tear on header. May be able to cover more

[4] Unlocking the value of strip and disc systems - GRDC

ground in a given timeframe which can reduce risk as more of the harvest can be completed in optimal time windows.

- Potential to start seeding earlier in the day after a rain event due to stubble cover making soils less sticky, providing disc seeder can cut wet/dewy stubble.
- Anecdotal reports that strip and disc system can mean less operator hours seeders and harvesting, less fuel consumption per ha and getting the crop in quicker as well as off quicker. However, the size of the new front and seeder needs to be considered compared to existing equipment.

Improved harvestability in lentils

- Soil surface is left flatter with a disc seeder and a thatch is left with a stripper front header which can mean less wear and tear on machinery and cleaner samples especially when running a header front close to the ground reaping lentils. Rolling post-seeding can be avoided at best.

Less issues with rocks and stones

- Disc seeders are able to cope better with rocky and stony ground – don't pull up big rocks like tyne seeders do

Grazing value of stripper straw

- More straw left behind after harvest means more stock feed and also more soil cover retained after (controlled) grazing

Snail management

- Anecdotal evidence that stripper fronts can help manage snails in cereals as they get belted off by the front which reduces contamination in the harvested grain
- Possible that stripper fronts also crack snail shells which helps reduce whole snail numbers

Improved crop/weed competition

- Disc seeders allow for narrower row spacing to maximise crop-weed competition and increase yield potential while maximizing residue retention.
- Narrow row spacing disc seeding is part of an integrated weed management system, including low soil disturbance disc seeding.
- Narrow row spacing also improves the effectiveness of stripper front harvesting and potential weed seed collection at harvest.

This program received funding from the Australian Government's Future Drought Fund