Comparison of seeders adapted for sowing sub-tropical grasses

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Purpose:	To compare commercial seeding machines that have specifically been set up to sow sub-tropical grasses
Location:	Matt Taylor's property 'The Shiralee' (-30.587872° 115.465104°)
Soil Type:	Sand over gravel (north) grading to in deep pale sand (south)
Seasonal Rainfall (July '12 – Jan '13):	299 mm

BACKGROUND SUMMARY

A survey of 50 farm businesses in the Northern Agricultural region found that establishment was an issue for many growers who are yet to sow perennial sub-tropical grasses and for those with smaller areas (<200 ha). This is not without reason, as until the mid 2000's, establishment of perennial grasses in WA at the paddock scale was typically patchy, with areas of good plant density interspersed with many areas of poor density.

In general, the establishment of sub-tropical grasses has improved dramatically in recent years. Leading producers are now regularly achieving uniform establishment across the paddock each year, in spite of variable seasonal conditions. Major contributing factors have been furrow sowing, better weed control and the development of an establishment package for sub-tropical grasses.

Perennial grasses are often sown on infertile, sandy soils that have non-wetting surface soil and a low water-holding capacity. For successful establishment, the non-wetting surface soil needs to be scalped away and seeds need to be placed so that developing seedlings can utilize the available soil moisture. In addition, sub-tropical grass seed requires precise, shallow seeding at a depth of 5–10 mm. This compares with cereals which can be sown up to 10 cm deep. The sub-tropical grasses have very small seeds and consequently have insufficient energy reserves to emerge from depth.

A key element of the establishment package is using a seeder specifically modified for sowing sub-tropical grasses. Successful establishment has been achieved with a range of seeding machinery and configurations (tynes, discs) provided the machine:

- forms stable furrows that scalp away non-wetting sand, remove weed seeds and harvest rainfall
- uses press wheels to provide good seed contact with moist soil
- wide row spacing (typically 50–60 cm) to allow space for annual pasture growth over winter-spring.

This replicated demonstration trial compares three commercial seeders specifically adapted to sow sub-tropical grasses.

TRIAL DESIGN

The trial consisted of large farm scale plots with three commercial seeding machines with 3 replicates. For rep 1, each machine seeded 4 runs 850 m in a north-south direction; while for reps 2 and 3, each machine seeded 2 runs of 850 m due to space constraints.

Machinery use: The trial involved a comparison of 3 seeding combines:

- Matt Taylor – 27 row Case 5126 International combine with a 6" scarifying point modified with a 6" pipe 'collar' to move the sand out of the furrow, with the seed dropped into the furrow behind the point followed by a press wheel.
- Grant Creagh – John Shearer 6 row trash culti drill modified with 2 points in line with a 7" sweep at the front while the second 5" point acts to clean the sand out of the furrow, seed is dropped in the base of the furrow and pressed in with a press wheel, row spacing ~55 cm.
- Gavin Haywood – Disc seeder - modified 24 run A61 International combine. A furrow was created with an offset disc and seed was dropped into the furrow behind the disc and pressed in with a following press wheel, row spacing ~55 cm.

Crop type and varieties used: Evergreen Northern mix: 70% coated Gatton panic and 30% coated Rhodes grass (15% Katambora Rhodes grass & 15% Callide Rhodes grass).

Seeding rates and dates: 3 kg/ha, sown on the 15th Aug '12

Fertilizer rates and dates: No fertilizer was applied, except for a low rate (~30 kg/ha) of compound fertilizer mixed with the seed for the International combine with 6" points.

Herbicide rates and dates: A knockdown, Glyphosate 450 @ 2 L/ha + additives on 8/8/12.

RESULTS

Furrows created by seeding in sandy soil can be susceptible to sand infill which 'effectively' increases the seeding depth. As sub-tropical grasses are sensitive to seeding depth, sand moving into the furrows can reduce emergence. Sand infill before or during emergence of the seedlings is critical as later in the season furrows may completely fill. Sand infill was measured 21 days after seeding on 5th September and again on 30th October.

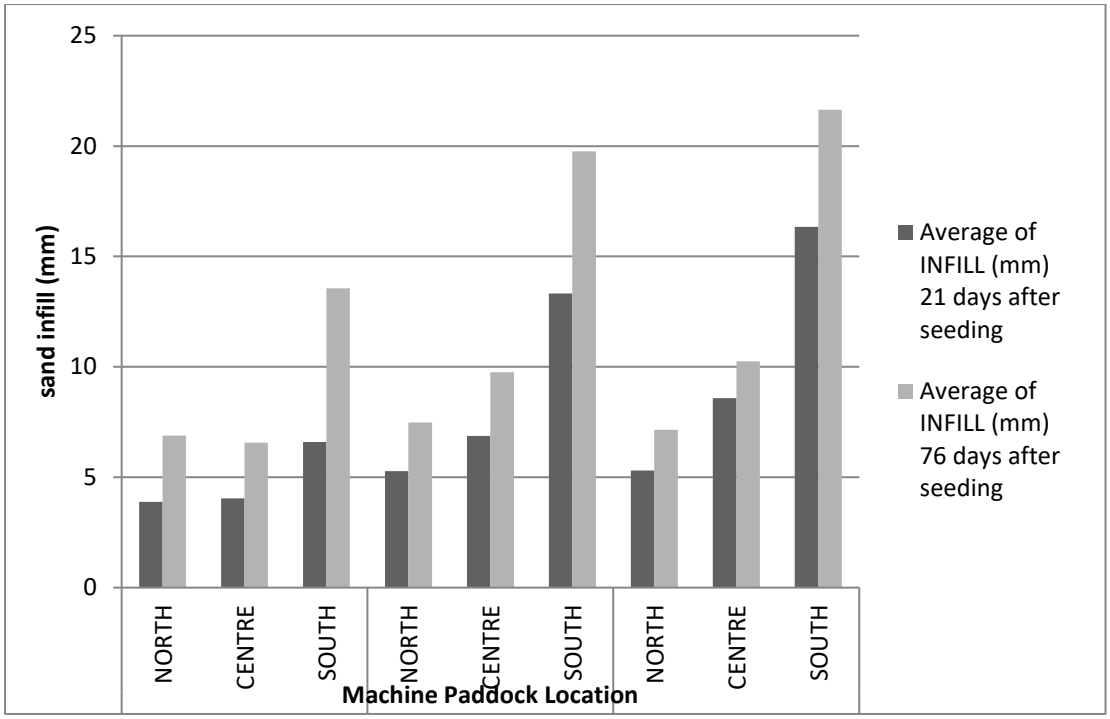

Figure 1. Sand infill into seeding furrows, 21 days after seeding (Sept. 5th) and 76 days after seeding (Oct 30th).

Within the trial, three sites were selected, north, centre and south. In the north the soil is a shallow sand (~30 cm) over gravel and there was a large amount of brome grass present, while at the southern end the soil is a pale deep sand with low groundcover after seeding. The sand infill measured on Sept. 5th was predominantly due to strong winds associated with a cold front a few days earlier which resulted in sand movement in the paddock. At that stage there was minimal emergence of the perennial grasses.

At the northern end of the trial there was less than 5 mm sand infill, but with all three seeders there was more sand infill in the furrows at the southern end (Figure 1). There was on average >10mm sand infill with the John Shearer seeder and >15 mm with the disc seeder. The average amount of sand infill ranged from 6.5 to 22 mm on 30 October. The soil type & groundcover after seeding appear to be main factors influencing sand infill, although there is a difference between the seeders.

Establishment counts plus species composition were measured on 30 October. As with the infill measurements, plants were counted in the shallow sand over gravel in the North section, as well as the sandier middle and the deep sand in the South section of the plots.

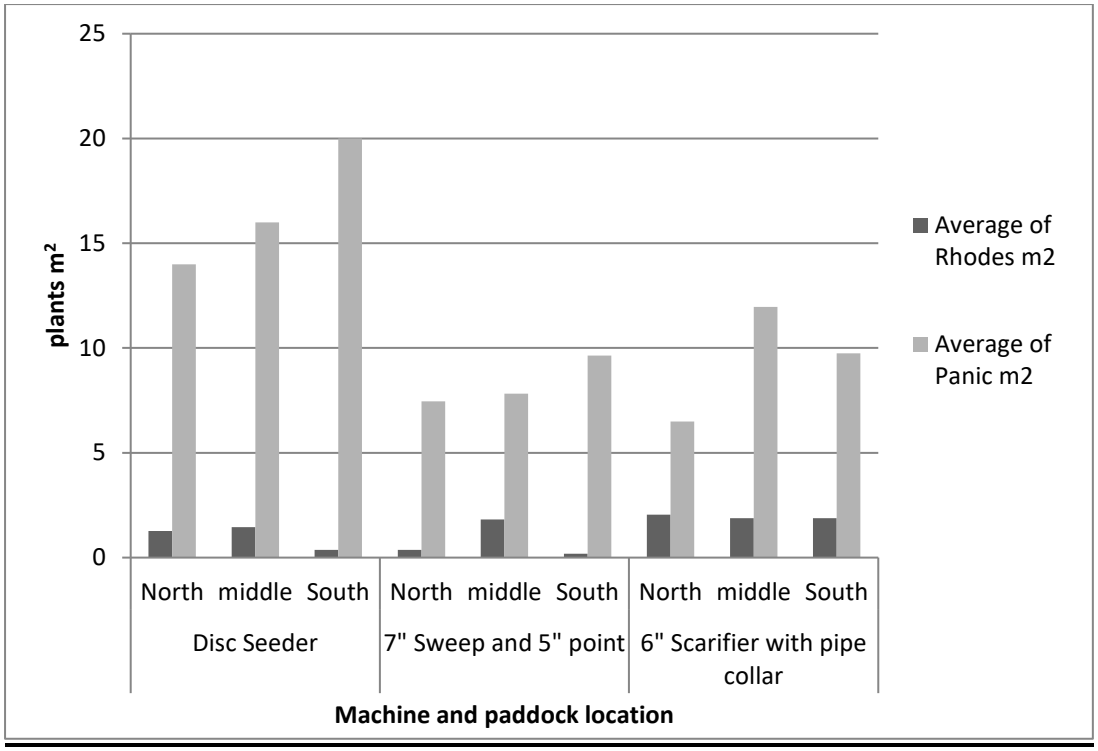

Figure 2. Establishment by Oct 30 (plants/m^2).

The seed mix contained 70% Gatton panic and 30% Rhodes grass; so as expected the panic grass established in much higher numbers; with 17 plants / m^2 for the disc seeder, 8 plants / m^2 for the John Shearer with sweeps and 5.5 plants / m^2 for the Case-International combine with 6" scarifier points. The number of Rhodes grass seedlings for the disc seeder, John Shearer (sweeps) and Case-International (points) were 1, 0.8 and 1.9/m^2 respectively. Generally, germination numbers for Panic were good, Rhodes grass though struggled to establish suitable seedling numbers in the sandier soil when sown with the discs or sweeps.

With the International disc seeder and John Sheerer combine with sweeps, plant numbers increased from the shallow sand in the North to the sandier soil in the center and South of the plots. The Case International combine with 6" scarifier points performed best towards the middle of the plots in medium to deep sand.

Plant numbers and health

While germination numbers are important to ensure a successful establishment; persistence of germinated varieties is ultimately what sets the paddock up with viable, long lasting plants. Persistence over time was measured using fixed pegs in the rows of each machine and at the three locations, North, middle and South. Individual plants were monitored between these pegs. Counts were taken 11 weeks and 26 weeks (6.5 months) after seeding to measure the total number of plants in an area and the health of the plants. Figure 3 shows the initial germination from the plots of the International disc seeder and then the subsequent summer decrease as plant numbers began to stabilize.

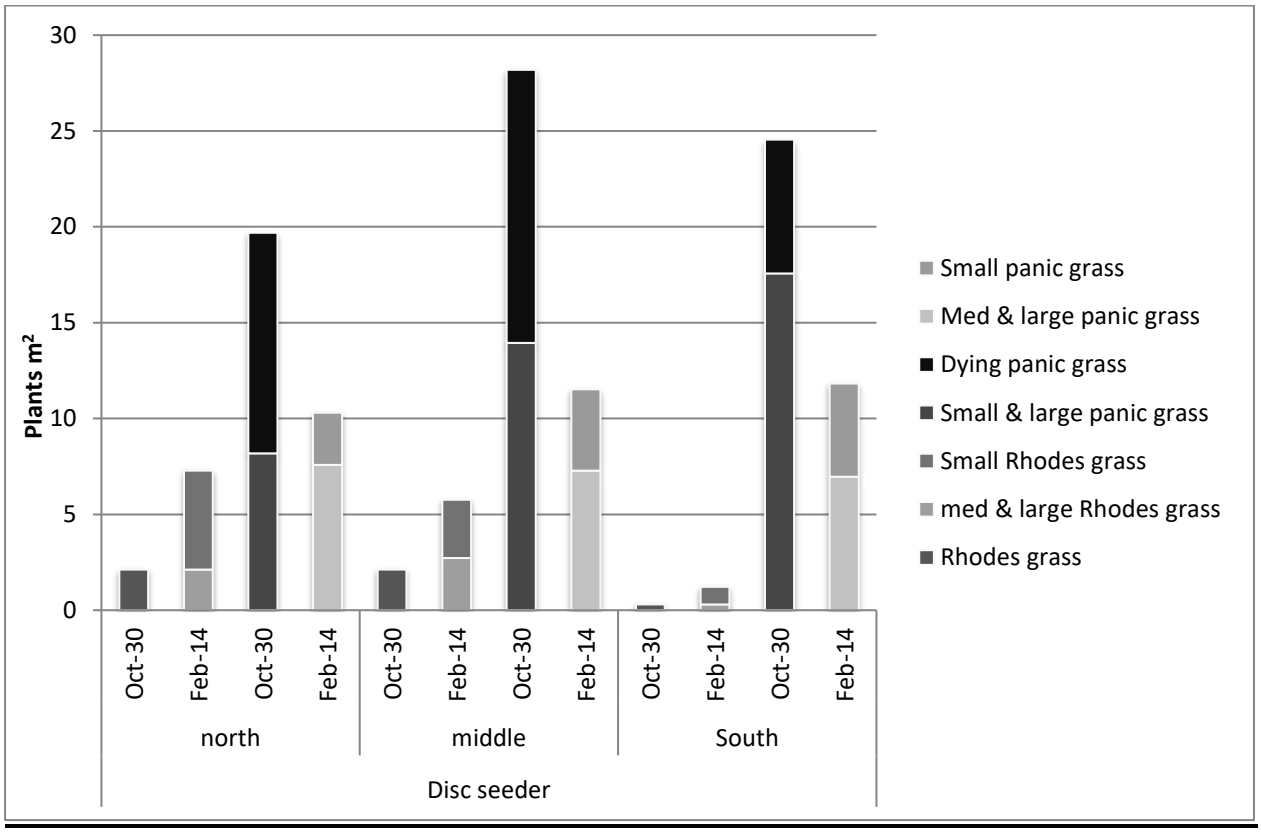

Figure 3. The persistence of establishment using the international disc seeder.

Initially, even though Rhodes made up 30% of the volume of the seed mix, it only made up 6% of the seedlings when counted 11 weeks after seeding. At this time, approximately 45% of Panic seedlings were small and stressed and as these plants died, the percentage of Rhodes grass in the population increased to 29%. Contrasting the Panic numbers over time, Rhodes increased between October and February. This could be in part due to runners of the Rhodes grass establishing new plants in this time. While Panic numbers stabilized well across the 3 sections of the trial, Rhodes did not establish well in the sandier South section, yet was well established in the North and middle of the trial.

DISCUSSION

All three seeders have resulted in successful establishment of sub-tropical grasses at the paddock scale. This reinforces that successful establishment can be achieved with a range of seeding machinery providing the basic principles are followed: i.e. furrow sowing, press wheels, precise shallow seeding together with wide row spacing.

The disc seeder appeared to have the least soil disturbance, with less loose soil on the soil surface after seeding, but had slightly more sand infill. This may be due to steep side walls and a relatively narrow furrow, while the seeders with tynes created larger – wider furrows, so sand moving into the furrow was spread over a wider base. The Case-International combine with a single point had the lowest sand infill.

The disc seeder resulted in the highest establishment of panic grass, but in late October many of these plants were still small seedlings and subsequently many died over summer. As number of plants, size and health of plants need to be taken into account, the disc machine may not provide an overall advantage as the proportion of healthy plants was much less. Visually, the Case-International combine appeared to produce a thicker stand; this was most likely due to the higher number of medium to large sized plants when compared to the other machines.

The knockdown did not completely kill the brome grass which subsequently recovered and competed with the emerging perennial grass seedlings in early spring. Combined with dry conditions in October (5 mm) the perennial grass seedlings were struggling in late October. More favorable seasonal conditions in November and December enabled the grasses to establish. The scalping points on the John Shearer were able to reduce the impact of brome grass more successfully than the other seeders.

Persistence will be measured over late summer until the break of the season. This machinery demonstration trial will be the focus of an extension video which features the producers describing the modifications to their seeders.

PEER REVIEW/REVIEW

Geoff Moore

ACKNOWLEDGEMENTS/ THANKS

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