Increasing Pasture Production Through Amelioration on Sandy Soils in the Coorow Area

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Take Home Messages
- Soil amelioration increases dry matter production on non-wetting sandy soils.
- Mixing pasture varieties increases dry matter production, feed nutrition value and soil coverage.

Aim
1. To demonstrate the effects of soil amelioration on poorly fertile sandy soils in the Coorow/Warradarge area.
2. To evaluate new pasture species options to increase the total pasture biomass and nutritional value.

Background
Large pockets of poor fertility sandy soils are located in the Coorow/Warradarge area that currently produce limited pasture or crop growth. Being able to bring these areas back into a pasture rotation with the introduction of soil amelioration and new pasture options will increase the productive potential of these paddocks. A flow-on effect using correct timing of amelioration and stock management will decrease erosion risks from wind and water, which was an issue in the region for the 2020 season.

This demonstration site has been developed by the West Midlands Group in collaboration with the Liebe Group and guidance from the groups' members. The objective of this trial is to identify how soil amelioration can increase pasture production whilst evaluating multiple pasture mix options that can be grown on this soil type.

Trial Details

Trial location	Charles Wass property, Coorow
Plot size & replication	10m x 100m
Soil type	Sandy loam
Paddock rotation	2017 Pasture, 2018 Pasture, 2019 Bison triticale
Sowing date	07/05/2020
Sowing rate	See treatment list
Fertiliser	07/05/2020 - MAPZMOP @ 100 kg/ha
Herbicides, Insecticides & Fungicides	Dry sown, none used

Treatments

	Treatment
1	Bison triticale (70 kg/ha)
2	Bison triticale (50 kg/ha) & Santorini/Magurita Serradella (20 kg/ha)
3	Bison triticale (50 kg/ha) & Volga Vetch (20 kg/ha)
4	Rose clover (10 kg/ha)
5	Santorini/Margurita serradella (10kg/ha)
6	A shotgun mix of left-over seed (70 kg/ha)– Santorini/Marguerita serradella, Volga vetch, Bison triticale, Dictator 2 barley, Izmir/Dalkeith sub-clover, Appid Leafy turnip, Rose clover, Spartacus barley, Southern Green ryecorn

Soil Composition

Table 1: Soil test results for the ameliorated area of the trial site taken pre-seeding.

Depth	Colour	OC (%)	nitrate nitrogen	Col P (mg/kg)	Col K (mg/kg)	S (mg/kg)	ph (CaCl2)	mir% clay %	mir% sand%
0-10	GRYW	0.26	6	6	< 15	1.6	5.5	16.81	78.31
10-20	GRYW	0.36	8	7	< 15	1.2	5.5	15.43	81.39
20-40	YWGR	0.27	5	6	17	1.0	5.2	17.50	76.41
40-60	YW	0.08	3	3	< 15	1.0	4.8	9.15	85.74
60-80	YW	0.08	< 1	< 2	< 15	1.0	5.5	13.34	78.65
80-100	GRBK	0.08	< 1	< 2	< 15	1.1	6.0	10.12	85.82

Table 2: Soil test results for the unameliorated area of the trial site taken pre-seeding.

Depth	Colour	OC (%)	Nitrate nitrogen	Col P (mg/kg	Col K (mg/kg)	S (mg/kg)	ph (CaCl2)	mir% clay	mir% sand
0-10	GRYW	0.36	8	7	<15	1.2	5.5	15.43	81.39
10-20	GRYW	0.25	2	5	15	0.8	5.6	19.24	79.76
20-40	YWGR	0.13	1	4	< 15	0.6	5.6	14.82	80.85
40-60	YW	0.11	< 1	2	< 15	0.7	5.5	15.74	80.99
60-80	YW	0.10	< 1	< 2	< 15	0.8	5.4	14.89	78.79
80-100	YW	0.10	< 1	< 2	< 15	1.4	5.9	10.01	86.94

Results

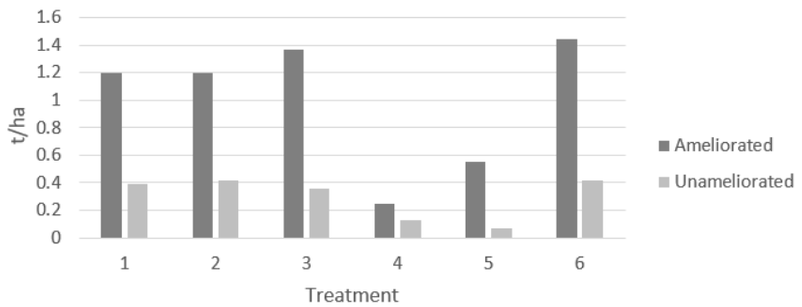

Figure 1: Average dry matter (t/ha) for the ameliorated and un-ameliorated pasture mix treatments.

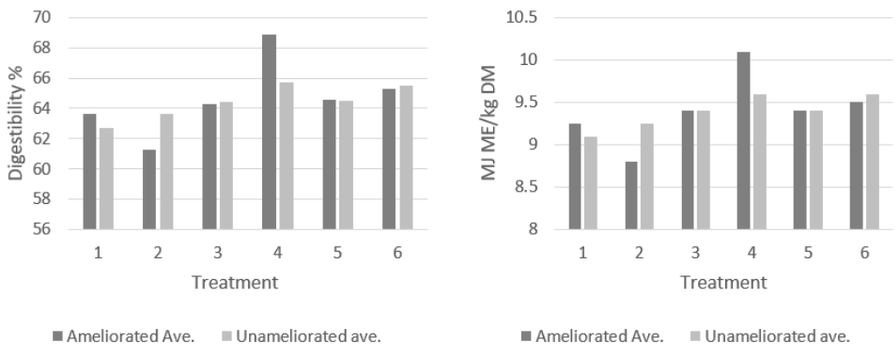

Figure 2: Average digestibility and Metabolisable Energy (ME) of each pasture mix taken at the end of July 2020.

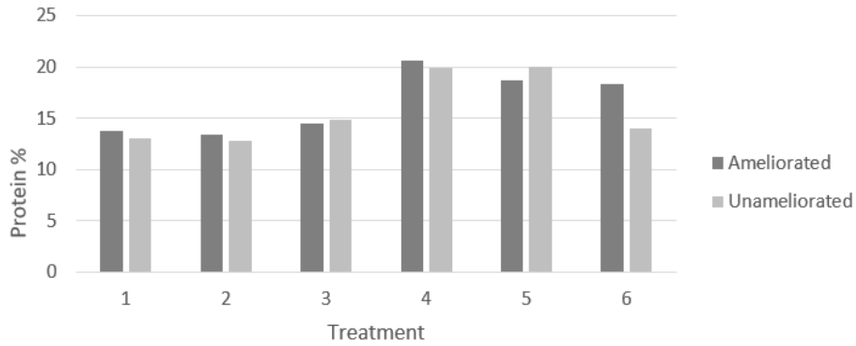

Figure 3: Average Protein percentage for each pasture mix, sampled at the end of July 2020.

Comments

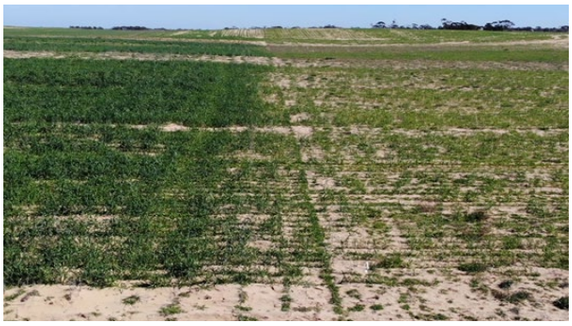

Image 1: A comparison of the ploughed (left) and unploughed (right) plots at Charles Wass's Gen Y trial on the Wass property, 2020.

In June 2019 the site was ameliorated using a Plozza plough by the grower and seeded immediately after to Bison triticale. The choice of ameliorating in winter decreased the risk of erosion that occurs when ameliorating earlier in the season. Pasture varieties and mixes were chosen at the start of the 2020 season and dry-sown on 5th May. A large wind event occurred on 24th and 25th May causing large amounts of wind erosion and furrow fill. By the 26th June, all treatments had germinated although patchy in areas. Biomass samples collected throughout the season by WMG in conjunction with Angelo Loi (DPIRD).

Pasture samples for both the ameliorated and un-ameliorated treatments were collected at the end of July, to compare differences in dry matter production between ameliorated and un-ameliorated treatments. It was evident that the amelioration increased plant growth rate for all pasture treatments leading to an increase in the total t/ha of dry matter produced (Figure 1). Treatment 6 produced 1.02 t/ha more dry matter in the ameliorated treatment compared to the un-ameliorated. Treatment 4 only produced 0.12 t/ha of dry matter due to plant size and minimal coverage of the plants (due to slow growth and establishment in winter) (Figure 1). The reduction of soil water repellence and increase in clay content was a factor that increased dry matter production for the ameliorated treatment using the Plozza plough (Table 1).

Visually pasture treatment 6 germinated the quickest whilst also aiding in fast ground cover decreasing the risk of soil erosion. It produced the highest amount of dry matter of 1.44 t/ha (Figure 1). It was noticeable in this treatment that areas where one species of pasture did not grow, this was replaced with another species allowing for increased coverage of the soil and limiting pockets of bare soil, decreasing erosion risk.

Digestibility ranged from 61% up to 69% while Metabolisable Energy (ME) ranged between 8.5 and 10.2 ME and indicates that all pasture mixes were good quality, but this quality declined after reaching the peak growth period in spring (Figure 2). Treatments containing Bison triticale had a lower digestibility in comparison to the pastures containing the legumes or mix of legumes/cereal. This was due to the triticale having reached stem elongation by the time it was sampled. It may be more beneficial in the future to lightly graze the cereal treatments early in the season. A second option would be to grow a forage cereal to increase biomass and decrease the risk of the plant running up when stressed due to climatic factors.

Protein percentage was highest in treatment 4 at 20.5% in ameliorated soil and 19.9% in the un-ameliorated treatment (Figure 3). Treatments 1 and 2 have the lowest protein amounts. The difference between these treatments is the addition of Bison triticale. It outlines the benefits of including a pasture legume in the pasture mix to increase protein percentage. In the future, a lower rate of Bison triticale should be used in pasture mixes due to its competitiveness especially against the slower-growing legumes.

The combination of soil amelioration and improved pasture mixes had a significant and positive impact on pasture dry matter production at this site in 2020. Adding pasture mixes into the paddock rotation increases the flexibility of the amelioration timing decreasing the risk of erosion and increasing establishment rate and time. Continued research into the further evaluation of pasture species that are suited to the soil type and environment is needed and further.

Acknowledgements
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Scan the QR code to view a video interview with Charles.