Dryland Legume Pasture Systems (DLPS): Demonstrations on lower Eyre Peninsula

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Location
Butler
Clinton Charlton
Rainfall
Av. Annual: 363 mm
Av GSR: 278 mm
2021 Total: 346 mm
2021 GSR: 228 mm
Yield
2019: 5.3 t/ha dry matter
2020: 2.9 t/ha wheat
2021: 2.5 t/ha dry matter
Paddock history
2020: Wheat
2019: Pasture
2018: Barley
Soil type
Loam
Plot size
10 m x 2 m
Trial design
Complete randomised block design - 3 reps x 2 blocks - sandy and heavy soil
Yield limiting factors
Broadleaf weeds
Livestock
Enterprise type: Sheep
Type of stock/breed: Various

Location
Lipson
Andrew Bates
Rainfall
Av. Annual: 309 mm
Av GSR: 235 mm
2021 Total: 362 mm
2021 GSR: 267 mm
Yield
2020: 3.8 t/ha dry matter
2021: 3.5 t/ha wheat
Paddock history
2021: Wheat
2020: Pasture
2019: Wheat
Soil type
Loamy sand - loamy clay
Plot size
10 m x 2 m x 3 reps

Key messages
- Medic species appear to be well adapted to be able to produce pasture biomass and regenerate well after a year of cropping on the alkaline soils of the lower Eyre Peninsula (EP).
- Vetch species can produce high quantities of biomass in the year of planting and may be best suited to farming systems with more intensive cropping enterprises that have run down pasture seed reserves.
- The alternative species evaluated did not appear to be well adapted to the soil type/ environments/ farming systems that they were planted into.
- Pasture species must have a level of tolerance to broadleaf herbicides to allow for the removal of broadleaf weeds, which in some situations and soil types is seeing pasture production severely restricted with broadleaf weeds.
- Soil type differences did appear to reflect differences in pasture production, particularly getting pastures to establish on sandy soil types, but the work was unable to identify a superior pasture species beyond medic or vetch adapted to the lower EP's sandy soils.

Why do the trial?
This article will report on findings from two pasture trials conducted on the lower Eyre Peninsula in the 2019-2021 growing seasons. These trials are part of the demonstration component of the Dryland Pasture Legume Systems (DLPS) project developed with the former LEADA committee/AIR EP Medium Rainfall RD&E committee to answer several questions about how pasture performance could be improved in the region.

Demonstration 1: What is the best pasture species/ mix of species to plant in paddocks with differing soil types?

Background
Paddocks across the region often have soil types that vary, ie. changing from heavier flats to sandier rises, with pH varying from below 6 to above 8. Getting pasture species established and maintaining good production levels across this landscape is often challenging.

How was it done?
These trials, in the Butler area, investigated which pasture species was best able to perform on differing soil types, by sowing two replicated pasture species in different parts of the same paddock, one on a sandy rise and one a heavier flat. A total of 16 pasture species/ mixes were sown in each of the trials.

The pastures were sown in 2019, with the same plots over-sown to wheat in 2020 and then pastures were allowed to regenerate in 2021. Establishment counts and peak biomass cuts were taken from the pasture species in spring 2019. Grain yield and quality were measured in 2020. Establishment counts and early spring biomass were measured in 2021.

Pastures

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2019 pasture production and 2020 grain yields were reported in the EPFSS 2020.

Analysis of collected data was undertaken using GenStat version 19.

What does this mean?

In 2021 high populations of pasture species established on both soil types but there were no significant differences between any of the treatments that were sown in 2019. Most of the pasture that did establish appeared to be some type of medic and may have been the result of seed reserves set prior to 2019.

Biomass cuts taken in September 2021 showed that the highest biomass generally resulted from treatments where medic varieties were established in 2019.

Demonstration 2: Regenerating species

Why do the trial?

Typically, some pasture paddocks relying on regenerating species experience poor establishment, resulting in unproductive paddocks for the remainder of the season. Sometimes it is difficult to forecast when a paddock will establish poorly, and it can be three weeks after the break in the season when this can be determined. If a regenerating pasture paddock has poorly established, is it more profitable to spray off and re-sow a pasture or let what has come up continue?

What was it done?

The trial site was selected at Lipson, in a paddock where regenerating pasture establishment has been less than satisfactory. Three weeks after the break in season, all germinating plants were removed with a knock-down herbicide. Plots of medic (cv Sultan-SU), vetch (cv Timok), and serradella (cv Margurita) were sown in two differing soil types in the same paddock on 14 May 2020. Each pasture species block consisted of 5 x 2 m x 10 m blocks of plots, replicated three times in each of the heavy and sandier soil types. A further plot of self-regenerating pasture (left unsprayed) was also included in a randomised complete block design. Establishment, early biomass, late biomass, and feed value were measured. Results were reported in the EPFSS 2020.

Wheat (cv Scepter) was sown on the two sites on 28 May. The trial was sown with 80 kg/ha DAP and 100 kg/ha urea was applied to both sites.

Table 1. Pasture establishment and biomass production (early September) at Butler, 2021.

Variety/ species (seeding rate kg/ha)	Heavy Flat		Sandy Rise	
	Establishment (plants/m²)	Biomass (t/ha)	Establishment (plants/m²)	Biomass (t/ha)
Bartolo bladder clover	156	3.75	99	2.49
Bindaroo button medic	87	3.43	74	2.89
Biserrula (5)	199	3.25	88	2.58
Casbah biserrula	148	3.33	52	3.24
Clover	132	2.48	134	1.99
Margurita French serradella (7.5)	158	3.50	159	2.62
Seraph/PM-250 strand medic	272	3.86	108	2.24
Prima gland clover	118	2.45	47	2.25
SARDI rose clover	124	3.00	106	2.55
Scimitar spineless burr medic	192	3.20	278	2.51
Sultan-SU barrel medic (10)	192	3.88	291	3.27
Sultan-SU (10) + Vetch (10)	190	3.53	203	2.91
Sultan-SU (2.5)	147	2.89	104	1.97
Timok vetch	114	3.37	38	2.20
Toreador disc medic (7.5)	153	4.10	199	2.60
Vetch (40)	126	3.83	61	3.01
LSD (P=0.05)		*0.92*		*0.68*

Table 2. Pre-seeding soil mineral nitrogen results (kg/ha) to 80 cm depth N Lipson, 2021.

	Heavy soil (kg/ha)	Sandy soil (N 0-80 cm)
Vetch	29.5	72.7
Regenerating pasture	41.7	82.2

Table 3. Wheat yield (t/ha) sown into residue of differing 2020 pasture sites at Lipson.

2020 Pasture	Wheat yield 2021 (t/ha)	
	Sandy Site	Heavy Site
Self regenerating	3.26 a	3.24 b
Margurita	3.40 a	3.05 a
Timok	3.50 ab	3.29 b
Sultan-SU	3.73 b	3.25 b

What does this mean?

2021 wheat yields following the lowest producing pasture (Margurita) were lower on the heavy site. On the sandy site, lower wheat yields where recorded when sown into Margurita and the regenerating pasture, indicating that poor producing pastures can have a lasting effect on subsequent wheat yields.

Conclusions from the three years on DLPS demonstrations conducted on Lower Eyre Peninsula support traditional rationale:

• Medic species appear to be well adapted to be able to produce pasture biomass and regenerate well after a year of cropping.

• Vetch species can produce high quantities of biomass in the year of planting and may be best suited to farming systems with more intensive cropping enterprises that have run down pasture seed reserves.

• The alternative species evaluated did not appear to be well adapted to the soil type/ environments/ farming systems that they were planted into.

• Pasture species must have a level of tolerance to broadleaf herbicides to allow for the removal of broadleaf weeds, which in some situations and soil types is seeing pasture production severely restricted with broadleaf weeds.

• Soil type differences did appear to reflect differences in pasture production, particularly getting pastures to establish on sandy soil types, but the work was unable to identify a superior pasture species adapted to Lower Eyre Peninsula's sandy soils beyond medic or vetch.

Pastures