Demonstration of New Annual Pasture Legumes

Aim: To demonstrate the productivity and persistence of annual pasture legumes (NAPLIP cultivar/species) on several soil types in the medium –low rainfall wheat belt environment.

Research Officer: Dr Angelo Loi
Company: Department of Agriculture Western Australia

Farmer: Anton Wilson
Location: Liebe Main Trial Site, Buntine-Marchagee Rd, West Buntine

Background: A second generation of annual pasture legumes and their root-nodule bacteria has been released to agriculture in Mediterranean-type environments. These new species emanate from selection activity focussed upon "alternative legumes". In 1992, in response to changing constraints upon production, a program was initiated which sought species with different ideotypic traits to the traditional annual medics and clovers used in agriculture in southern Australia. Traits sought in the new species were deeper root systems, improved persistence from higher hard-seed levels, acid tolerant symbioses, tolerance to pests and diseases and ease of harvesting with conventional cereal harvesters. Several cultivars of species new to Australian agriculture such as biserrula (*Biserrula pelecinus*), French serradella (*Ornithopus sativus*), gland clover (*Trifolium glanduliferum*) and improved varieties of arrowleaf clover (*Trifolium vesiculosum*) and yellow serradella (*Ornithopus compressus*) were developed and have had rapid adoption and impact in southern Australian ley-and phase-farming systems.

Treatments: The site was fertilised with 200 kg/ha of superphosphate and 70 kg/ha of muriate of potash. The insecticide Talstar (bifenthrin 100 g/L) was applied after sowing at 120 mL/ha to protect against damage from red-legged earth mites. The site was sprayed as post sowing pre emergence with 200 mL/ha of Spinnaker and later in the season with the herbicide Select (clethodim 240 g/L) to control grasses.

Methods: Plots are of 40 by 2.0m with a 1.2m buffer between plots, not replicated. The site was sown on the 18th of May.

Results: Dry matter cuts were collected on the 7th of October 2004. Several species were affected by the Spinnaker post-sowing pre-emergence treatment (eg Biserrula and Sphere medic). Serradellas were the least effected and overall the most productive and adapted cultivars. The ALOSCA granules were used to inoculate all treatments. All species nodulated very well and no failures were reported.

Table 1: Sowing rates and spring dry matter production (t/ha)

Common name	Variety	Sowing rate Kg/ha	Dry matter production t/ha (7/10/04)
Biserrula	Uninoculated Casbah	7	0.2
Biserrula	Casbah	7	1.7
Biserrula	Mauro	7	1.2
Hard seed french serradella	Erica	8	3.1
Hard seed french serradella	Margurita	8	3.7
French serradella	Cadiz	20	4.5
Yellow serradella	Charano	10	4.3
Yellow serradella	Santorini	10	3.3
Yellow serradella	Yelbini	10	4.5

Common name	Variety	Sowing rate Kg/ha	Dry matter production t/ha (7/10/04)
Crinsom clover	Caprera	15	3.8
Balansa clover	Paradana	7	1.8
Balansa clover	Frontier	7	1.2
Rose clover	Hykon	15	1.7
Eastern star clover	Portolu	15	2.8
Persian clover	Prolific	7	2.4
Subterranean clover	Dalkeith	15	2.6
Subterranean clover	Urana	15	2.3
Subterranean clover	Uninoculated.Dalkeith	15	2.0
Subterranean clover	Izmir	15	2.5
Sphere medic	Orion	10	1.4
Strand medic	Herald	10	1.6
Barrel medic	Caliph	10	1.7
Burr medic	Scimitar	10	0.9
Burr medic	Cavalier	10	0.9

Hard-Seeded French Serradella Demonstration

Aim: Assess the establishment of two new hard-seeded French serradellas, Erica and Margurita, in the medium rainfall zone using the under-sowing technique.

Research Officer: Gavin Bignell
Company: Liebe Group

Farmer: Anton Wilson
Location: West Buntine, MTS

Background: Erica and Margarita are hard seeded French serradellas which can persist through cropping rotations. The establishment costs of pastures can be significant, however with the decreasing profitability of many pulse break crops, new techniques for establishing legume based pastures need to be explored. In 2003 hard-seeded serradella pod was mixed with wheat seed and sown with the wheat crop. Due to the high level of initial hard seed there was very little germination of serradella in 2003. During 2003-2004 summer the hard seed of the serradella broke down and allowed a good establishment in the 2004 growing season.

Trial Details:

Plot size and replication	2 replicates, 100m x 30m
Soil type	Sandplain
Sowing date	Serradella was sown with the wheat in 2003
Conditions at sowing	Good soil moisture
Machinery	Knife points press wheels
Seeding rate	50 kg/ha of Serradella pod (seconds).
Fertiliser	Non in 2004
Herbicides and Insecticides	45 g/ha of Raptor
Paddock History	2003 = Wheat, 2002 = Wheat, 2001= Lupins

Results:
Both Erica and Margurita germinated exceptionally well this season. Dry matter mean production in October was approximately 4.3 t/ha. Dry matter production was slightly lower than the Cadiz sown into the same paddock this season, probably due to a lower seedling density.

Summary:
- Under sowing Hard-Seeded Serradella seems to be an economical and sustainable way of establishing pastures the year after a wheat crop, particularly if pods are produced in the farm.
- Sowing depth had no significant effect on germination or plant density, however it is recommended not to bury too deep pods of serradella (max 2-3cm) to avoid seedling losses.
- Weed control in the plots was very poor, this could have been a result of no use of wetter with the application of Raptor.

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Technically reviewed by: Angelo Loi, Department of Agriculture Western Australia

Pastures: More Than Sheep Feed!

Aim: To demonstrate the production of the new annual pasture and evaluate the subsequent benefit to a wheat crop.

Research Officer: David Scholz
Company: Elders Limited

Farmer: EG Carlshausen & Co
Location: Dalwallinu

Agronomy

Background: Maintaining a cropping focus can place demands on weed control and nutrition. Implementing an improved pasture phase can restore nutrient levels and allow an opportunity for herbicide rotations. Weeds are also a source of feed for livestock and weed control can be improved through pasture competition.

Losa is a new subterranean clover aimed as a Dalkeith replacement. Its characteristics include improved early vigour, early maturity and a high level of hard seededness. Erica is a hard seeded French serradella which, unlike Cadiz, will persist through a crop rotation. It has good pod retention and can be harvested like Cadiz. Drummer is an Italian tetraploid ryegrass which has vigorous growth and production, and high feed value. It is quick to germinate and can be used as an early source of feed and to out-compete the background Wimmera.

This trial will be sown to pastures for another year, and then sown to wheat in 2006 to measure the benefits of a good pasture rotation.

Trial Details:

Plot size and replication	25 x 100m, duplicated
Soil type	Yellow sand over gravel
Sowing date	15th May 2004
Conditions at sowing	Dry topsoil, 15mm fell night after seeding
Machinery	Nicholls bar, knifepoint p/w, 10 inch row spacing.
Seeding rate	9.5 kg/ha Losa, 7.5 kg/ha Erica, 21 kg/ha Drummer
Fertiliser	100 kg/ha Superphos
Herbicides and Insecticides	All: 16th June – 100mL LeMat 24th July- Legumes 45g Raptor, 500mL Buctril 200, 1% Hasten, 1% AMS 24th July- Ryegrass 500mL Jaguar, 500mL Ester 80 October – Wiped out with glyphosate. **Trial strips:** IBS - 1 plot each of Losa and Erica treated with 1.5 L/ha TriflurX at 80 L/ha. June – 1 early timing application of Raptor across Losa and Erica. 21st June – 2 rates of 40 kg/ha and 80 kg/ha urea top-dressed over ryegrass.
Paddock History	2003 = unimproved pasture, 2002 = unimproved pasture.

Observations:

Pasture performance

1. The plots gave an excellent germination. The ryegrass had vigorous early growth compared to the legumes. The strategy with this ryegrass is to intensively graze it down to two fingers height at 3 leaf, let it grow up to 3 leaves again, then graze it back hard again, then keep doing this until season end where it will be sprayed out.
2. In a very N deficient environment, the two strips of N dramatically increased the tillering and growth of the Drummer. N applications greatly improve the production of these ryegrasses and should be timed at seeding, and after every grazing to allow maximum growth during those times.
3. Erica performed similarly to the Cadiz/Charano mix in the neighbouring paddock. Good production and pod formation occurred before the pastures were sprayed out.
4. Losa was not as vigorous as the Drummer and the Erica and never really seemed to bounce away. This is not to say that it would not be valuable in a pasture mix. Losa seemed to be affected by several frosty mornings and a dry spell in spring, more so than Erica.

Herbicides

1. The 1.5 L/ha of Treflan was not detrimental to the Erica or Losa, and reduced ryegrass numbers were the result. However, it would not be advisable to use up a shot of Treflan in a non-wheat year.
2. Raptor – the early application did knock both the Losa and the Erica back, however it did a great job on the radish. The Losa and Erica did recover from this. Capeweed became a problem once the pastures were well advanced. The later application with bromoxynil set these capeweed back and there were fewer flowers. The Raptor – Buctril mix looks promising, particularly at an earlier timing and for a broad weed spectrum.
3. The Jaguar and Ester was very effective in controlling the broadleaves in the ryegrass. All broad leaf herbicides, except Group B's, are safe on ryegrass. Spray graze would work well with the ryegrass production system.

Summary:

- The Drummer ryegrass is a valuable source of early feed and can greatly improve stocking rates if managed in a rotational grazing system.
- Erica serradella is a hard seeded alternative to Cadiz with similar production, maturity and height. Losa is a new sub clover with early maturity and a potential fit for the mid-low rainfall areas.
- Good weed control can be obtained in legume pastures. Raptor and Buctril gave promising results in this demonstration. All broadleaf herbicides, except Group B's, are safe on ryegrass.
- This research will demonstrate the benefit of a lengthy pasture phase on a following wheat crop.

Technically reviewed by: Peter Carlton.

Elders would like to acknowledge Carlshausen's for their ideas, the use of the site and site maintenance and CSBP for the soil analysis.

Grain and Graze
Sub-tropical Perennial Grass Variety Trials

Aim: To determine the suitability of a range of sub-tropical perennial grasses to the medium rainfall zone of the NAR.

Research Officer: Brianna Peake, Geoff Moore
Company: Liebe Group, Department of Agriculture

Farmer: Gary Butcher, Ross Fitzsimons
Location: East Pithara, West Buntine

Background: The focus of the NAR Grain and Graze project is to increase the capacity of growers to change their rotations / systems to include perennials so that economic and environmental success is assured. This variety trial is a component of the Grain and Graze project and will be monitored for the 4-year duration of the project.

Previously, various sub-tropical perennial grasses have been found to grow successfully in the West Midlands area of the NAR, due to the combination of mild temperatures in early spring and the likelihood of rains in early autumn in this area. There have been few studies on the suitability of sub-tropical grasses in the eastern medium rainfall zone of the NAR. This trial includes a variety of the sub-tropical species that have been successful in the West Midlands (i.e. Rhodes grass, Green panic, Setaria), plus a few others that may be more suited to the Liebe area due to their reputed high drought tolerance (i.e. Bambatsi panic, Premier digit grass), as well as some newer species that have not been widely tested (i.e. Strickland finger grass and Siratro - a perennial legume).

Two sites with differing soil types were chosen; loamy soil at Pithara and a sandplain site at Buntine, to try and take into account variation in soil types within the region.

Trial Details:

Plot size and replication	16 treatments including controls with plots 7m x 3.6m with 3 replicates (Pithara), 12 treatments including controls with plots 7m x 3.6m with 3 replicates (Buntine).
Soil type	Red loamy sand (Pithara), Sand/Gravel (Buntine)
Sowing date	25/8/04 (Pithara), 26/8/04 (Buntine)
Conditions at sowing	Moderate soil moisture
Machinery	Sown with a five run experimental seeder, which has lucerne knife points at the front of a single disk opener (with wide depth wheel) followed by a press wheel. Fertiliser is deep banded in behind the lucerne point and the aim is to place the seed at a depth of about 5 mm.
Seeding rate	Varies on species and seed quality
Fertiliser	super:potash 3:1 @ 200 kg/ha at sowing
Herbicides and Insecticides	Knockdown – Roundup @ 2 L/ha

Paddock History	2004 = Cadiz

Results:
Table 1: Establishment counts (palnts/m^2) taken on the 27th of October 2004.

Buntine		**Pithara**	
Species	**Plants/m^2**	**Species**	**Plants/m^2**
Green Panic	49.6	Green Panic	51.1
Lucerne Spring	43.7	Signal grass	47.4
Callide Rhodes	41.5	Katambora	45.9
Katambora Rhodes	37.8	Lucerne Spring	42.2
Premier Digit Grass	33.3	Callide	39.3
Signal Grass	23.0	TWG Autumn	38.5
Splenda setaria	14.0	Premier Digit	12.6
Siratro	12.6	Strickland finger	10.4
Bambasti Panic	9.6	Bambatsi	8.1
		Splenda setaria	5.2
		Siratro	3

Summary:
- Germination of half the species at each trial site was above 33 plants/m^2
- Although most the species achieved this good germination many of the plants have now died or are looking very water stressed.
- On visual assessment, both the Rhodes species and Signal grass have experienced the highest survival rate and are looking the least water stressed.
- The grasses would benefit greatly from a summer rainfall event.

Technically reviewed by: Geoff Moore

Establishing Sub-tropical Perennial Grasses and Saltbush on a Site at Risk From Salinity

Aims:

1. To establish sub-tropical perennial grasses on a site at risk from salinity.
2. Determine the productivity and profitability of the perennial grasses.
3. Test the effectiveness of direct seeding of Saltbush, Bluebush and Acacia saligna across the site.
4. Investigate the potential for over-cropping barley within 33 metre saltbush alleys into chemically suppressed perennial grasses.

Research Officer: John Paul Collins
Company: Department of Agriculture

Farmer: Keith Carter
Location: Jibberding Hall Rd, Wubin

Background: The Liebe Group SGSL trial site was identified as a paddock highly at risk of encroaching salinity and the group applied for funding and technical support to trial sub-tropical perennial grasses in May 2002. The logic at the time was to establish deep-rooted summer-active perennials to use out of season moisture and provide some feed through the autumn feed gap.

The site was sown to the Evergreen Starter Kit (sub-tropical and temperate grasses and a herb) in 2001. From November 2001 until February 2003 there was only 130 mm of rain on the site. Remarkably, some of the Rhodes grass and Bambatsi Panic grass survived. Due to a low density (<1 plant/m^2) the site was resown to the Evergreen Mix (Rhodes grass, Bambatsi Panic, Gatton Panic, Setaria and Signal Grass) in September '03. The density increased to 1-5 plants/m^2 across the site except for some bare saline areas. It was decided to sow more salt and drought tolerant perennials in these patches. A mixture of saltbush, bluebush and acacia saligna were niche seeded in alleys 33 metres apart across the site in July 2004.

In the future, the inter-row areas will either be left to sub-tropicals if density improves, over-cropped with a barley crop or sown with an annual legume such as scimitar burr medic.

Trial Details:

Plot size and replication	46 ha (no replication)
Soil type	Sandy duplex
Sowing date	Original sub-tropicals sown in September 2001 Sub-tropicals were re-sown in September 2003 Saltbush, Bluebush and Acacias were sown in July 2004
Conditions at sowing	Moist seedbed
Machinery	An airseeder with knifepoints and press wheels was used to sow the subtropical grasses. A niche seeder was used to sow the saltbush mix.
Seeding rate	Subtropicals: 4 kg/ha Saltbush Mix: 300 grams/km
Fertiliser	No significant fertiliser application to date. A fertiliser program will be devised once there is a sustainable density of perennial grasses.
Herbicides and Insecticides	**January '03**: 73 mL/ha 2,4-D Ester and 90 mL/ha Garlon with 0.5% spray oil to control roly-poly **July '04**: Saltbush alleys sprayed with knockdown herbicide
Paddock History	**2001**: Sub-tropical perennial grasses **2002**: Sub-tropical perennial grasses **2003**: Sub-tropical perennial grasses **2004**: As above with alleys of a saltbush mix

Results:

Measurement	Range across the site		Comment
	Feb '03	Dec '04	
EM 38 – horizontal (mS/m)	70-160	60-260	Moderately to highly saline
EM 38 – vertical (mS/m)	90-170	90-280	As above
Soil $EC_{1:5}$:(2-5 cm depth)	20-160	20-260	As above
Plant density of perennial grasses (plants/m_2)	0-20	0-20	Density is highly variable
% Bare Ground	5-60%	15-80%	Highly variable over site
Feed on Offer (FOO) kg DM/ha	0-3500	700-5600	Creeping saltbush has increased over the site
Depth to watertable	No bores	2-3 metres	Water salinity exceeds seawater concentration

Summary:

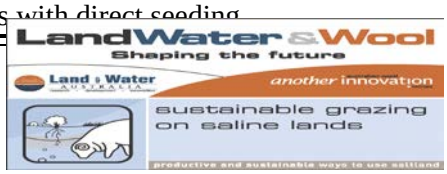
- Bambatsi Panic and Rhodes grass have good drought tolerance but maintaining a high plant density has proved difficult
- Due to low rainfall seasons, more drought tolerant species are required on the site hence plantings the saltbush alleys.
- Salinity varies over the site and therefore so does the ground cover, species composition and FOO. The increase in creeping saltbush has suggested halophytes may be a desirable option for the site.
- Roly-poly control can be achieved by spraying with 2,4-D Ester and Garlon and rolling.

Technically reviewed by: Brianna Peake

Establishment and Persistence of Saltland Pasture in a Saline Area

Aim:

1. Test a range of plants on a saline area to see which is most likely to persist.
2. Introduce safeguard ryegrass into the saltland pasture.
3. Establish lucerne on an elevated area adjacent to the Saltland.
4. Compare the success of nursery raised saltbush seedlings with direct seeding.



Research Officer: John Paul Collins
Company: Department of Agriculture, Ballidu Woolpro Group

Farmer: Bernie Driscoll
Location: Hospital Rd, Ballidu

Background: In 1999, the Ballidu area received a high annual rainfall, much of which occurred out of season and consequently the encroachment of salinity due to a rising water table was hastened. The Ballidu group were keen to explore options for productive use of the site by planting with saltland pastures, so a bus trip to Michael Lloyd's property (with a successful SGSL site) in Lake Grace was undertaken. Following the bus trip, and an initial planning session with the direct-seeding contractor, a plan was designed, with various treatments including lucerne, sub-tropical grasses, balansa clover and saltbush alleys. The site is extremely variable, ranging from fresh soils on elevated sandy-loam rises to highly saline bare scald areas.

Trial Details:

Plot size and replication	~ 60 ha (no replication)
Soil type	Sandy duplex
Sowing date	July 2003
Conditions at sowing	Moist seedbed
Machinery	28 - run combine seed drill to sow the lucerne, sub-tropical grasses and balansa. Niche seeder to sow the saltbush alleys.
Seeding rate	Sub-tropical grasses: ~4-5 kg/ha Lucerne: ~ 4 kg/ha Balansa: ~ 4 kg/ha Saltbush mix: ~300 grams/km
Fertiliser	No significant fertiliser application to date. A fertiliser program will be devised once there is a sustainable density of perennial grasses.
Herbicides and Insecticides	Initial knockdown herbicide prior to seeding with residual insecticide included to give germinating seedlings early protection against Red Legged Earth Mite
Paddock History	**2001:** Annual pasture **2002:** Annual pasture **2003:** Lucerne, sub-tropical grasses, balansa and saltbush **2004:** Lucerne, sub-tropical grasses, balansa and saltbush

Results:

Measurement	Range across the site		Comment
	Nov '03	Dec '04	
EM 38 – horizontal (mS/m)	-		Moderately to highly saline
EM 38 – vertical (mS/m)	-		As above
Soil $EC_{1:5}$:(2-5 cm depth)	20-1200		As above
Plant density of perennial grasses (plants/m_2)	20-40 of lucerne.	20-40 of lucerne.	A few sub-tropicals have only persisted in fresh areas
% Bare Ground	40-100%	20-100%	Highly variable over site
Feed on Offer (FOO) kg DM/ha	900-6000	400-7000	Iceplant abundant across site explaining high FOO
Depth to watertable	No bores	0.9-1.6 m	Water salinity exceeds seawater concentration

- Lucerne strike has been successful (plant density of 20-40 plants/m^2)
- 600 ewes and lambs were put onto the lucerne, saltbush and sub-tropicals area from the 12-25th of July and then again from the 23-29th of August. It is difficult to determine stocking rates because the sheep would have preferentially grazed certain sections of the site (ie Lucerne) and each section is not fenced off, however fencing each section of the site is a future plan.
- Safeguard ryegrass germinated well and in December 2004 pasture cuts were taken in the area where safeguard was sown. The FOO was 4.4 T DM/ha, presuming that all the ryegrass was of the safeguard variety.
- Balansa has also failed over most of the site due to high salinity levels, but germinated well in the areas where it was planted in a mix with the safeguard.

Summary:
- Saltbush and Bluebush appear best suited to the moderately to severely saline areas of the site.
- Lucerne has persisted well on the non-saline area adjacent to the saline area.
- Sub-tropical grasses didn't persist due to excessive levels of salinity and possible competition and alleopathic effects of iceplant.
- The sandy duplex soil type appears well suited to direct seeding, as there doesn't appear to be any difference in growth between saltbush seedlings and direct seeding.

Technically reviewed by: Brianna Peake