Western Murray Land Improvement Group

ECONOMICALLY VIABLE OPTIONS FOR RETIRED IRRIGATION LAND

EVORIL

PASTURE ESTABLISHMENT CONSIDERATIONS

Improving the productivity and profitability of dryland pastures in the low rainfall zone of the south-west Riverina.

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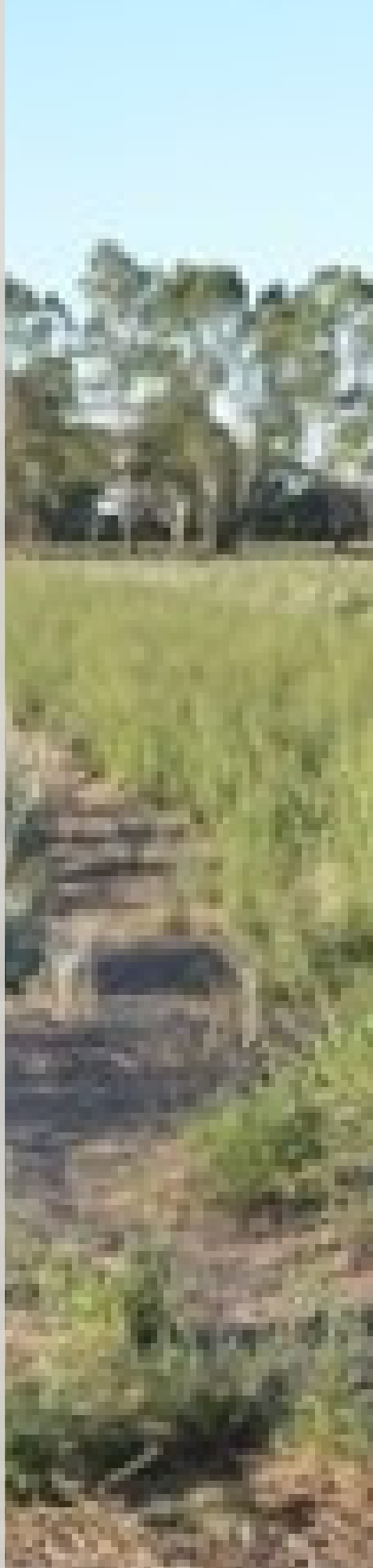


EVORIL PROJECT BACKGROUND

The Economically Viable Options for Retired Irrigation Land (EVORIL) was a five-year (2013-2018) research project initiated as a result of declining availability of irrigation water in the south-west Riverina region of NSW. As such, the aim of the project was to investigate the economic feasibility and productivity of various pasture species sown on previously irrigated land that has reverted to dryland.

EVORIL provided farmers with hands on appreciation and capacity to measure critical factors in establishing, growing and managing alternative pasture species varieties through replicated trials and demonstrations on farms. These trials assessed the suitability of grasses (including native species), legumes, saltbush and other native shrubs as part of a diverse landscape mosaic. EVORIL found that there is no single formula applicable across the region due to variations in soil type and land use history. Therefore, the project aims to provide information to landholders to allow them to make informed choices on their pasture management systems.

The EVORIL project trialed new and existing species taking into consideration dry matter production, palatability, seed production, hard seededness and persistence in modified landscapes encompassing a range of soil types typical of southwestern NSW. The trials identified a number of promising species that suit different site characteristics.

Compared to traditional irrigated subclover pastures, many of the promising species mature and set seed earlier, which is advantageous for a region with unreliable spring rainfall. Many species are also 'hard-seeded'. Having a high percentage of hard seed is important in drier environments. The hard seeds become a viable reserve for future seasons if establishment fails in any one year because of factors such as drought.

Many of the promising species are 'aerial seeders', so grazing management needs to take this feature into account. Refer to the section on 'Grazing management for regeneration'.

A list of all species trialed is outlined in WMLIG Technical Note 2.1 and 2.2.

The EVORIL project was delivered by the Western Murray Land Improvement Group (WMLIG) and the Central Murray BestWool BestLamb Group and financially supported by Murray Local Land Services and the Federal Government's National Landcare Programme. District landholders generously hosted on-farm trials and demonstrations.

PROMISING SPECIES

The main objectives/aims of this project are:

A combination of annual and perennial species that have been proven successful in producing dry matter and persisting are outlined in Table 1.

Table 1 - Summary of successful dryland species from the EVORIL Project

Lifetime Category	Successful Species
Annuals	Barrel Medic, Spineless Burr Medic, Snail Medic, Button Medic, Rose Clover, Gland Clover, Wimmera Ryegrass and Serradella in lighter soils. Cereals for forage rather than grain that provided more dry matter in a dry year per mm of rain
Perennials	Lucerne Forage Shrub: Old Man Saltbush

* Note that successful species refer to species that established, set seed, grew acceptable dry matter and persisted in the growing conditions experienced during the trial period.

Refer to EVORIL Technical Note 2.1 for trial species variety information.

Promising species were advanced to large demonstration plots to test animal performance and determine the financial return on investment. Soil types, typical rainfall and the successful species associated with eight large trial sites are outlined in Table 2.

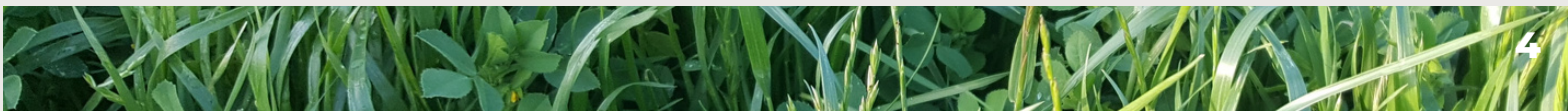
Table 2. Location of pasture trials, site aspects and successful species specific to each site.

Heading 1

	Stony Crossing Brown Silty Clay Rainfall: 342mm	Noorong Grey Medium Clay Rainfall: 355mm	Cobramunga Grey Medium Clay Rainfall: 355mm	Mallan 2 Grey Heavy Clay Rainfall: 355mm	Mallan * Grey Sodic Clay Rainfall: 355mm	Moulamein ** Grey Sodic Clay Rainfall: 372mm	Tullakool Brown Sodic Clay Rainfall: 372mm	Burraboi Brown Clay Loam Rainfall: 372mm
Native Grasses**	X						X	
Forage Cereal	X					X		
Wimmera Ryegrass		X	X	X		X	X	X
Mediterranean Fescue			X					
Gland Clover	X.	X						
Bladder Clover	X							
Snail Medic	X	X		X			X	
Rose Clover		X	X	X			X	X
Burr Medic		X		X	X			X
Barrel Medic		X		X	X			X
Lucerne		X	X	X	X		X	X
Serradella								X

Note: This table shows a range of soil types and rainfall zones that influence dryland pasture production in the region, not all sites shown were ex-irrigation country.

*This paddock was had a prevalent Barley Grass population prior to sowing and so only legumes were sown.
** This paddock was sown to Wimmera Ryegrass, which out-competed legumes after the first year.
*** Natural regeneration of native grasses occurred with appropriate grazing management.



MANAGEMENT

The project identified a suite of management considerations to improve establishment success. Planning and site management is key.

This section discusses paddock preparation in terms of weed control, soil nutrient testing and physical assessment, species selection and seed ordering, sowing, monitoring, grazing, seed production, residue management and regeneration considerations.

An ideal pasture system has a grass and legume mix. Grasses drive productivity and legumes improve quality and provide nitrogen for the grasses.

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PADDOCK PREPARATION

1.WEED CONTROL

There are several options for weed control; grazing management, herbicide application and competitive sowing rates. The selection is dependent upon the weed species present.

Ideal weed control is a least a two year proposition.

Chemical (herbicide) control

Herbicide selection in the initial preparation is dependent upon the weed species present at a site.

Sulfonyl-urea herbicides (e.g. Glean, Ally) should be avoided leading up to the sowing of pastures containing legumes and should not be used at all in the 12 months prior to sowing at an absolute minimum. Residues of sulfonyl-urea herbicides can cause root pruning in legumes which results in poor plant vigour due to reduced ability to harvest moisture and nutrients from the soil. Additionally, sulfonyl-urea herbicide residues can adversely affect nodulation. Poor nodulation results in poor nitrogen fixation and therefore reduced availability of nitrogen to the other pasture components.

The following case studies outline two different baseline weed scenarios. Trial Case Study 1 is a farm that has a barley grass dominant weed issue. A key point from this study was that barley grass dominated pastures require continued vigilance. Barley grass has a large regenerative potential and is a strong competitor. It is short seasoned, it has low palatability at seed set, and stock actively select other more palatable (improved pasture) species which reduces competition.

CASE STUDY 1

MALLAN

BEFORE Barley grass dominant pasture on grey self-mulching soil.

ACTION Initial preparation for weed control started in 2013. Glyphosate was used to control barley grass. Knockdown prior to sowing. Sown in 2014 with a mix of lucerne, clovers and medics. Barley grass continued to be an issue during the season.

The co-operator said that he was surprised at how persistent the barley grass was. 'I even tried slashing barley grass prior to seeding to get on top of it, however the next season (2015), there was still considerable barley grass in the new pasture'. Due to the continued issue with barley grass, only the legumes were sown. No grasses in the mix provided an option to continue to control grass weeds with selective herbicides, allowing the legumes to establish and seed down with the intention to sow the grasses in the following season.

RESULT Barley grass is continuing to be an issue, however there is now a more productive site as a result of a lucerne dominated pasture system.

KEY POINTS Weed control needs to start in the season prior at an absolute minimum, and still may require further selective action.

CASE STUDY 2

NOORONG

BEFORE Naturalised annual ryegrass dominant pasture on a medium grey clay soil.

ACTION Grass control was used to reduce competition, and not aimed at elimination. The naturalised ryegrass does provide valuable feed,however has disadvantages of being short seasoned. Legumes were incorporated into the existing ryegrass base to improve the quality of the pasture and provide nitrogen to drive more productivity out of the grasses and extend the growing season and take advantage of out of season rainfall events.

RESULT Nitrogen input into the system has improved productivity and quality of feed on offer. Having a competitive pasture means that weed control hasn't been necessary. To maintain the lucerne in the stand, it is imperative that there are rest periods between grazings that allow the plant to recover. More lucerne is lost from overgrazing than drought conditions.

KEY POINTS Naturalised ryegrass offered a good starting point for an improved pasture and eradication was both not practical nor desirable as removing all competition offers the opportunity for weed invasion. Legume establishment, particularly the lucerne, does benefit from reduced grass competition for light and moisture.

SUMMARY

If there is a good naturalised ryegrass background, then it may be worthwhile to maintain that feed base. It is most likely to be earlier maturing than Wimmera and so is set up for the shorter seasons where commercial Wimmera ryegrass has struggled. Depending on your willingness to take a risk, you could 'top up' the existing ryegrass with Wimmera so as to have plants that can make use of a longer season, but the risk is that a short season will effectively prevent the Wimmera from setting seed due to competition or open up the pasture allowing weeds to become established. The 'sowing legumes only' strategy works best in a barley grass dominant situation.

2. PLANNING – SOIL CHEMICAL AND PHYSICAL ASSESSMENT

Manage according to soil characteristics and nutrient status:
Soil variation across the region needs to be taken into account when preparing the ground for planting shrubs or sowing seed for pasture / crops. Many of the soils in the southwest Riverina are sodic and exhibit dispersive characteristics such as surface crusting and poor drainage.

Soil testing should be done to determine nutrient requirements and for indicators of potential soil structural issues. Key indicators for soil structural stability are salinity (EC), Exchangeable Sodium Percent (ESP) and Ca:Mg ratio.

Generally, where soils have an ESP >6%, it is advisable to carry out the least amount of soil disturbance as possible and apply soil ameliorants such as gypsum to minimise surface crusting.

Determine whether soils exhibit slaking or dispersive characteristics and manage accordingly.

Slaking and dispersion tests are relatively easy to do with minimal equipment and provide valuable information on how to manage your soil. See "Quick Reference Guide: Assessing aggregate stability" available on the Victorian Resources Online website or copies are available from WMLIG.

Gypsum can have its most beneficial effect at sowing time. It can provide better soil tilth, and can reduce crusting in sodic surface soils, hence improving pasture establishment. Time the application so that rain does not leach the gypsum from the surface soil by sowing time. Cultivation practices on sodic soils should aim to minimise soil disturbance and preserve soil organic matter. Non-inversion tillage is useful for leaving the more sodic subsoil at depth.

3. SPECIES SELECTION

Table 3 provides a guide for species selection to suit different management expectations as determined by the EVORIL project. More ticks the better, however selection is guided by soil type.

Species selection depends on what your expectations are for your pasture. A 'productive' mix would favour barrel, spineless and snail medics, while a 'reliable' legume base that sets a lot of hard seeds but not seeking high production would include gland and bladder clover.

Table 3: Species selection in different management expectations

Species	Dry Matter	Palatability	Seed Production	Hardseededness	Persistence
Barrel Medic	✓✓✓	✓✓✓✓✓	✓✓✓✓	✓✓✓	✓✓✓✓✓
Spineless Burr Medic	✓✓✓	✓✓✓✓✓	✓✓✓✓	✓✓✓	✓✓✓✓
Bladder Clover	✓✓	✓✓✓	✓✓	✓✓✓✓✓	✓✓✓✓✓
Gland Clover	✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓✓	✓✓✓✓✓
Rose Clover	✓✓	✓✓✓✓	✓✓✓✓✓	✓✓	✓✓✓✓
Snail Medic	✓✓✓	✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓
Lucerne	✓	✓✓✓✓			✓✓✓
Wimmera Ryegrass	✓✓✓✓	✓✓✓✓	✓✓✓✓		✓✓✓✓
Resolute Fescue	✓	✓✓✓	✓		✓✓
Cereals	✓✓✓✓✓	✓✓✓			✓

The base seed mix recommended by the EVORIL is for 2 kg of lucerne, 4 kg of ryegrass and 6 kg of mixed clover/medic seed.

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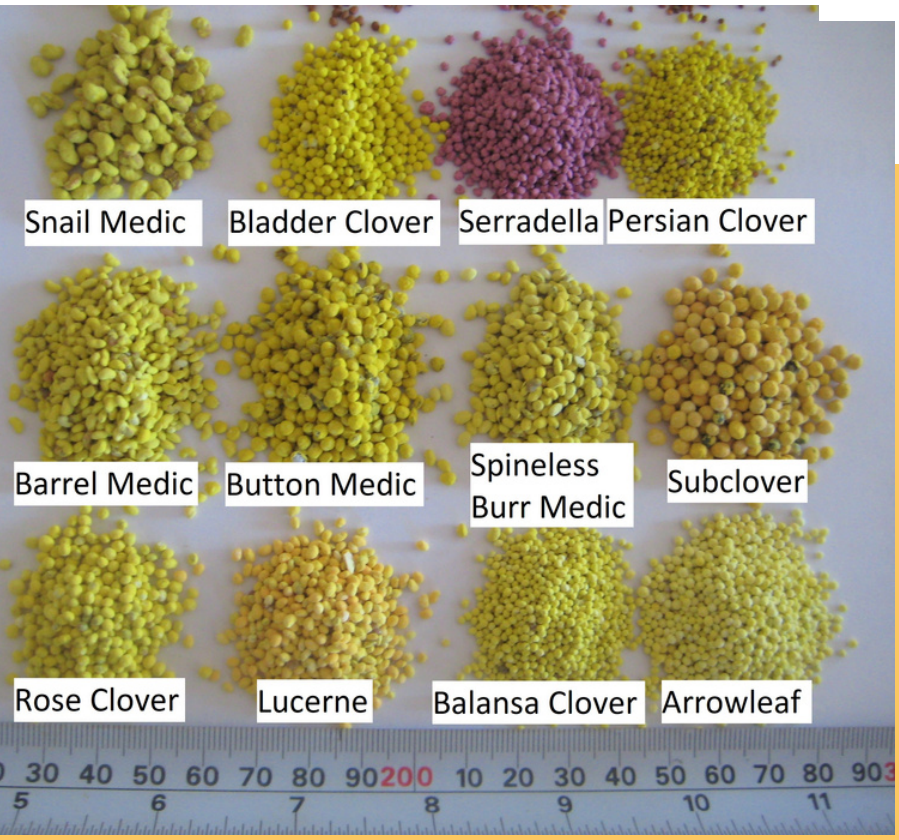
Table 4: Basic Seed Mix

Species	Sowing rate
Lucerne (winter activty rating 7-9)	2 kg/ha
Wimmera Ryegrass	4 kg/ha
Mixed legumes[1]	5 kg/ha (min)
Total	**12kg/ha (~ $60/ha)**

Table 5: Selected legumes seeds/kg

Legume options	Seed Size (seeds/kg)
Spineless Burr Medic	250,000
Barrel Medic	220,000
Button Medic	175,000
Snail Medic	60,000
Rose Clover	1,000,000
Bladder Clover	800,000
Gland Clover	1,400,000
Serradella (light soil)	1,100,000



A typical clover/medic mix aimed at productivity would consist of 2 kg/ha of barrel medic, 2 kg/ha spineless burr medic and 2 kg/ha of snail medic. These quantities are flexible, eg 0.5 kg/ha either way is fine if you want to add further species such as rose clover. Keep in mind that there is considerable differences in seed size between the species – rose clover is fine seeds (85 while snail medic seeds are almost 5mm long and 50,000 seeds/kg – which means in practice, 0.5 kg/ha of rose clover is potentially a lot of plants while very few snail medic plants.

Seed ordering

Plan and order varieties early. During the EVORIL project, it was evident that many desired annual legume species are not readily available when required for autumn sowing as a last minute order. As a result, you are left with a selection of less suitable species or sowing late after the autumn break when existing herbage has already established utilising soil moisture, nutrients and space[1].

'Stick to your guns, don't sow something that is not suitable simply because it is available in store, and take advantage of the extra year of weed control'

4. INTEGRATION OF CEREALS OR SHRUBS

CEREALS

Cereals typically use autumn-winter rainfall more efficiently than annual grasses, producing more dry matter/mm of water. While there are cereal varieties marketed as dual purpose for grain and grazing, most varieties can be grazed, with the differences being with the length of opportunity for grazing. Many dryland mixed farmers have cereal grain that is stored on farm, so dry matter can be grown cost effectively. Seed needs to be sown heavily (60-80kg/ha) to maximise early dry matter production given appropriate grazing. Cereals did produce the most dry matter in the EVORIL pasture trials.

Scenario 1
Grain only cereals

Grain only cereals:

Sown mid- April, ready to graze (mid-June) cereals can be grazed when the plants resist being pulled out of the soil after the development of the secondary root system. Continued grazing after stem elongation (early July) will remove the growing point of the plants and feed potential will be diminished.

If stock are removed to avoid grazing the growing point, then there are options for either late grazing, hay or grain, but not all three. If rain doesn't fall "early" then there may be limited opportunity for winter grazing which may require a re-evaluation of the scenario – either choose to graze anyway and have limited regrowth, or grow on and be used for standing feed, hay or grain.

Scenario 2
Forage cereals

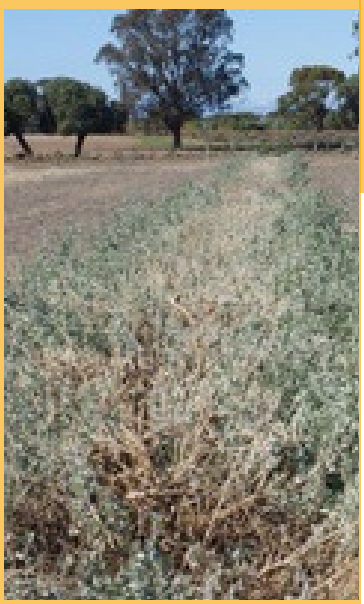
Forage cereals:

Can also be an option for grazing. These are quick maturing cereals such as forage barley or ryecorn, which appear to tolerate grazing past growth stage 30 as they seem to have the ability to re-tiller far better than the grain types.

Sow and then rotationally graze, once plants are firmly anchored in the soil, until the season runs out, lock some up for seed for next year. Seed will have to be purchased (at least for the first year).

Note: Negatives to growing cereals for forage or fodder is that they have to be sown each year which incurs a cost and requires sowing equipment or the use of contractors.

Grazing cereals also carry the potential risk of nitrate poisoning in high fertility situations or calcium deficiency if stock graze cereals for an extended period.



FORAGE SHRUBS

Trials of mixed forage shrubs including Old Man Saltbush (OMS), Myall, Tar bush, Western Black Wattle, Yarran and Sandhill Wattle have been investigated, however it was found that this added far too much complexity to the grazing system. When forage shrubs and improved pasture were planted/sown at the same time, the two components had competing managerial requirements that impacted on the successful establishment of the system.

Issues included:

1. Preferential nature of livestock grazing.
2. Extended exclusion periods for grazing can be detrimental to the management objectives of other forage shrub species, e.g. early saltbush grazing encourages a more horizontal growth habit which is a management objective, however this may impact negatively on the early growth stages of other shrubs planted at the same time.
3. Weed control can create situations where the most effective chemical for weed control in the pastures can create problems for the shrubs.

From the experience of the EVORIL project, mixing shrubs and saltbush did not work. Forage shrubs appear to be more suited to a "shelter belt" style planting that is periodically grazed.

Saltbush and improved pasture did work together but the conflicting establishment requirements need to be managed – a two phased approach, i.e. sowing/planting one component first and once established, introduce the second.

5. PASTURE ESTABLISHMENT TIPS

Sowing Rate:
Increased productivity from higher sowing rates more than compensates for the extra seed cost, as well as being a more competitive pasture (Refer to EVORIL Technical Note 2.2). An example of a successful sowing rate is outlined in Table 4.. In 2016, this 12kg/ha seed mix costs approximately $60/ha.

Inoculant tips:
Most legume seed comes pre-treated with inoculant. But if the seed is old stock or has been improperly stored, there may be very few rhizobia still alive. Seed would then need to re-inoculated.
Be aware that seed sown dry that has been inoculated with peat based products may also have poor rhizobial survival.

When introducing a new species, check the rhizobial requirement and determine if additional inoculant is required. If you are harvesting your own seed, you will need to take inoculation requirements into account.
The comprehensive guide, 'Inoculating Pasture Legumes', for rhizobial products and their appropriate inoculation techniques and application is available from the Western Australia Agriculture and Food website:
https://www.agric.wa.gov.au/pasture-establishment/inoculating-pasture-legumes?page=0%2C0

Fertiliser
The soil test will give you a good indication of the nutrient input required. There is no use spending money on improved pastures if the performance is limited by lack of nutrients.

To meet phosphorus requirements for dryland pastures, it is recommended to supply 10kg/ha of an NPKS fertiliser at sowing. Nutrient levels should be reassessed after 5 years.

Generally legumes produce up to 20/kg per ha of nitrogen per tonne of dry matter produced. Where legume content is poor and the season and or soil moisture is favourable then adding nitrogen fertiliser is a good back up.
Ensure sulphur levels are above 8 ppm (KCl). If gypsum has been applied in recent times then it is likely that sulphur levels will meet plant requirements.

It may be advisable to test for molybdenum, especially on acid soils to determine if the soil is deficient. Legumes, more specifically the rhizobia, require molybdenum to efficiently fix nitrogen.

The general recommendation for successful EVORIL pasture establishment and maintenance is to apply 50kg/ha of starter fertiliser at sowing and reassess nutrient levels in 5 years.

Sowing tips.
Using a seeder is far more preferable to broadcasting the seed. Seeder sowing results in the seed being placed and then covered with soil which gives the seed the best chance to establish. Broadcasting relies on the seed finding a suitable niche to start germination and then establish a root into the soil before drying out.

Calibration is important as seed is relatively expensive and getting the right quantity in the right area is essential for success – too heavy or too light results in uncompetitive areas in the paddock and allow weeds to flourish. See WMLIG Tech Note #5 Pasture Establishment Tips

Seeding rates required for a successful and competitive pasture will depend on sowing equipment (accurate placement, soil cover) and soil tilth (structure and moisture).

Dry sowing can be an advantage in making sure the pasture has the maximum growing season for creating a seedbank, but can result in poor survival of the rhizobial inoculant, weed competition or soil crusting inhibiting establishment.

Establishment (Key points)
- Control weeds at least the spring before renovating
- Research species and mix suited to your system (and soil type)
- Don't skimp on sowing rates. Competitive pastures help outcompete weeds.
- An option is to starting with legumes only. Establish varieties that allow the selective control of grass weeds. Re-establish grasses into the legume base once the grass seedbank is minimised. Grasses drive productivity and use nitrogen fixed by the legumes.
- First year is about seed set – the NUMBER ONE PRIORITY. Exclude stock during flowering and to allow the plant to set seed.

Remember:
Some legumes are very hard seeded and there may be little regeneration in Year 2 (gland clover, bladder clover, button medic, serradella).

ESTABLISHING FORAGE SHRUBS

Saltbush plant population targeted in the EVORIL project was 550 plants/ha. This was achieved by planting twin rows on 13 m centres (11 m "alley" between plants) with plants spaced 2.8m apart.

Saltbush can be established by nursery propagated plants or direct seeding. Direct seeding offers a cheaper alternative and can be quite successful if weed are controlled, the site has good soil surface tilth and sowing is followed by steady rain. The negatives are plant variability, inconsistent establishment and subsequent variable paddock population due to unfavourable environmental conditions.

Plant cost are typically in the range of 40 cents to $1.20 depending on plant source, selected clones and freight. The soil preparation required depends on the method of planting. Cultivation and planting when the soil is wet should be avoided as this can result in smearing and setting hard and cracking when it dries out.

Like most pasture, saltbush needs to be rotationally grazed, not stripped bare or set-stocked. Recovery is aided by retaining some leaf, which allows sufficient green area for the plant to photosynthesise. Stock should not be reintroduced until it is well-leafed or there is sufficient alternative feed to the saltbush.

While saltbush appears to be a valuable source of forage, it can be high in salt and of moderate energy content. From the saltbush tested by the EVORIL, forage grown on non-saline sites averaged 8.7 MJ/kg energy and 24% ash (salt) content. Sheep are limited to consuming 150g of salt per day and so can only eat a maximum of approximately 600g/day of saltbush, or 5.2 MJ/day. The limited intake results in inadequate energy for maintenance, and must be supplemented from other sources such as pasture or supplementary feeding.

The success of the pasture system relies on the uptake of new establishment, grazing and weed management strategies for the investment made in improved pastures to be warranted.

6. GRAZING - MANAGEMENT FOR REGENERATION

The priority of a first year pasture is to set seed.
The pasture system needs to be looked upon as a long term proposition. Many of the successful legume species produce aerial seeds – flowers and pods are produced on stolons or runners above the soil surface - and can be prone to overgrazing. Grazing management of these aerial seeders is critical in the establishment year to encourage maximum seed production.

In most seasons, there will be minimal grazing opportunity. In the first year it is important if grazing does occur, that it is a light grazing and that livestock are removed to allow enough time for the plants to recover and flower. This allows plants to set the maximum number of seed pods. Grazing management can be useful in manipulating pasture components to achieve desired outcomes. For example, grazing in early August to remove excess grass growth to reduce competition or smothering of the legumes.

Despite the best grazing management and seasons, some species such as gland clover will not be very prolific in year 2 due to their very hard seed. This is an advantage in the longer term, as once the seedbank is established, a poor season or opportunity cropping (keeping in mind the selection of in-crop herbicides to minimise any residues that may affect the pasture legumes) will only have a small effect on the pasture species composition.

Rotational grazing is more suited for the on-going management to maximise production and persistence. Grazing animals also assist in breaking down the hard seed coat and improve germination for the following season, as well as removing excessive litter loads prior to the autumn break. However some legumes produce large pods and can be susceptible to overgrazing over summer. Livestock can also be used to spread seed across the farm.

Lucerne:
The number one killer of lucerne is over-grazing. A grazing strategy that utilises the available feed and then allows the lucerne is to recover will maximise persistence. For further information on managing lucerne, please read the Evergraze-ActionGrowing and using lucerne in southern Australia'.

Nursery paddock option
An advantage of aerial seeding is the opportunity to harvest your own seed.An option may be to create a "nursery paddock" where the pasture can be more carefully managed and used as a seed source for sowing the rest of the
farm.

Native grasses
Native grass seed is generally very expensive, difficult to sow and successful establishment can be challenging. Harvesting of native seed is also a challenge due to variability and structure of the seed.

Realistically, establishment of native grasses is going to be more successful by encouraging existing populations rather than trying to re-introduce them from seed. Strategically placed (i.e. placed on the prevailing wind side of the target area) native grass nursery paddock is an alternative. With appropriate grazing management, grasses will naturally recolonise adjacent areas and spread. This is obviously dependent upon site attributes, seasonal conditions, and native species composition and site/grazing management.

Remember
Some aerial-seeders produce large pods and could be susceptible to overgrazing over summer

Grazing Results

Improved pasture quantity and quality

Improved pasture was compared to common district practice where the pasture receives minimal management and few inputs. On average, the EVORIL recommended mix increased pasture production by 183%. Pasture value was improved by both extending the season and having greater palatability and nutritional quality.

Figure 1: EVORIL Pasture Dry Matter Production Summary

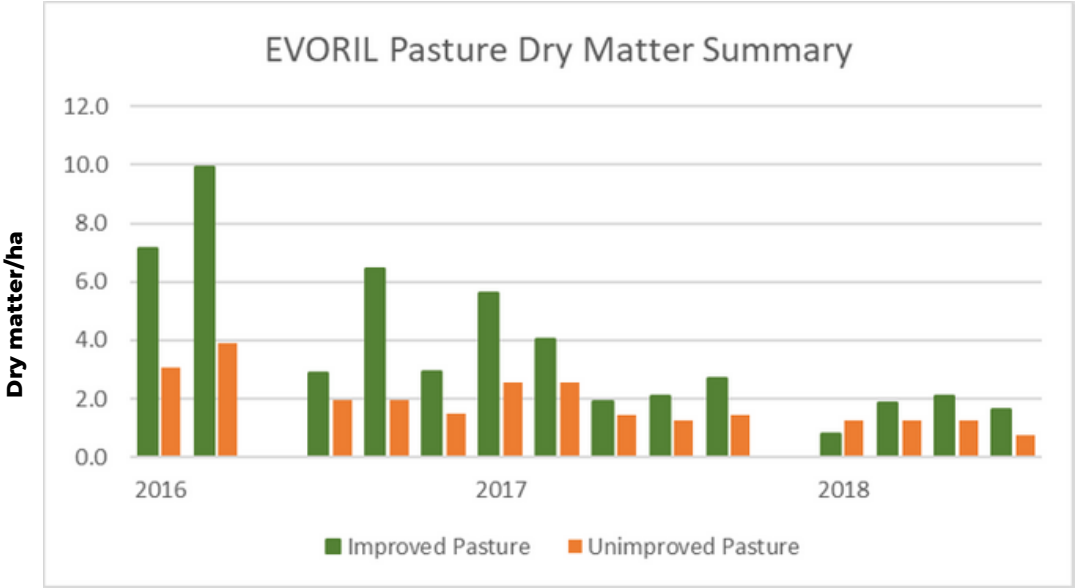


Table 6: Pasture quality comparison October 2016

FeedTest Analysis	Unimproved	Improved Mix	
Dry matter	3.9	9.9	t/ha
Energy	8.5	10.3	MJ/kg
Protein	11.7	12.7	% CP
Digestibility	56.7	65.5	% DOMD
ADF	32.7	29.3	%
NDF	51.8	45.4	%

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7. POST EMERGENT WEED CONTROL

Grass dominated pasture system:

Propaquizafop (e.g. Shogun or Correct) herbicide at the lower end of the recommended application rate (200ml/ha) has been the most successful herbicide for selective control of barley grass, whilst limiting the damage to ryegrass. Ryegrass will be killed at the higher end of the label application range.

Broadleaf weed control has been required on most sites. Brassica weeds, sow thistle and capeweed have been the most prevalent. The earlier the weeds are sprayed, the easier they are to control, but keep in mind some herbicides need the clovers and legumes to be past a particular growth stage. To date, 2,4 DB has been the safest "all rounder" but at $2.0/l or up to $6.0/ha, it is quite expensive.

Flumetsulam (Broadstrike) (@$14/ha) has also been useful, but will be detrimental to some legumes. Bromoxynil has also caused damage on some of the medics.

Lessons learnt:

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- The effectiveness of spray topping barley grass is too variable due to differences of plant maturity in the paddock.
- Read the label carefully. Don't assume that because it works on one group of legumes that other groups of legumes will be equally as tolerant.

Fencing

Large paddocks with set stocking makes managing improved EVORIL pastures very difficult.Electric fencing has been shown to be effective, from both stock control and a cost perspective. Flexibility with grazing has been essential in pasture establishment and management, eliminating stock preference and allowing crash grazing.

CASE STUDY 3

PENTAL ISLAND

Soil type: Medium grey clay

BEFORE

Border check irrigated annual pasture

ACTION

28 ha, comprised of 7 small paddocks was sown down in 2016 to the EVORIL pasture mix consisting of lucerne, barrel medic, spineless burr medic, snail medic and SARDI Persian clover. Lucerne establishment was excellent, with the population being approximately 20 plants/m2.

Old Man saltbush was planted in late winter 2017 at 1000 plants/ha. This population was achieved by planting twin rows of saltbush at 2m spacings on 10 m centres.

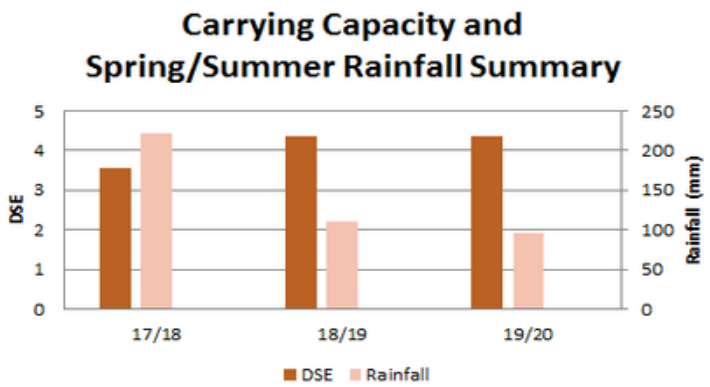
RESULT

Rainfall late in 2017 saw excellent establishment and growth from both the lucerne and saltbush. This resulted in the paddocks being rotationally grazed by ewe lambs from early December 2017 until late April 2018. Carrying capacity of the saltbush/pasture for this period was calculated to be 3.54 DSE/ha/yr*, with an average/weight gain of 120 g/day.

A similar grazing strategy was undertaken in 2018/19 using pregnant ewes. Late rainfall and larger saltbush plants saw grazing from mid-October until mid-February, with an increased carrying capacity of 4.36 DSE/ha/yr* while maintaining condition score 3.0.

2019/2020 grazing followed a similar formula, with ewe lambs entering the EVORIL paddocks in early October, followed by pregnant ewes in early February. This season, the sheep were supplementary fed with barley, which has been taken into consideration when calculating the carrying capacity of 4.37 DSE/ha/yr*.

Figure 2: Summary of the carrying capacity in DSE over the past 3 summers and summer rainfall.



Why is the system working?

Allowing the pasture/lucerne to establish prior to the saltbush being planted meant that the pasture could be grazed as required and not compromised by potentially competing management requirements of the lucerne and the saltbush.

Having several small paddocks making up the 28ha allows grazing to be managed to ensure both the lucerne and saltbush are not overgrazed and have a sufficient recovery period as well as maximising the amount of feed consumed by reducing selective grazing.

Both lucerne and saltbush are high in protein, but saltbush is moderate in energy and high in salt. To maximise productivity, there needs to be an adequate energy supply, either from pasture grown between the saltbush rows or supplementary feed such as grain.

The clover component of this pasture is not utilised due to grazing operations. Producers should consider this when selecting pasture mixes.

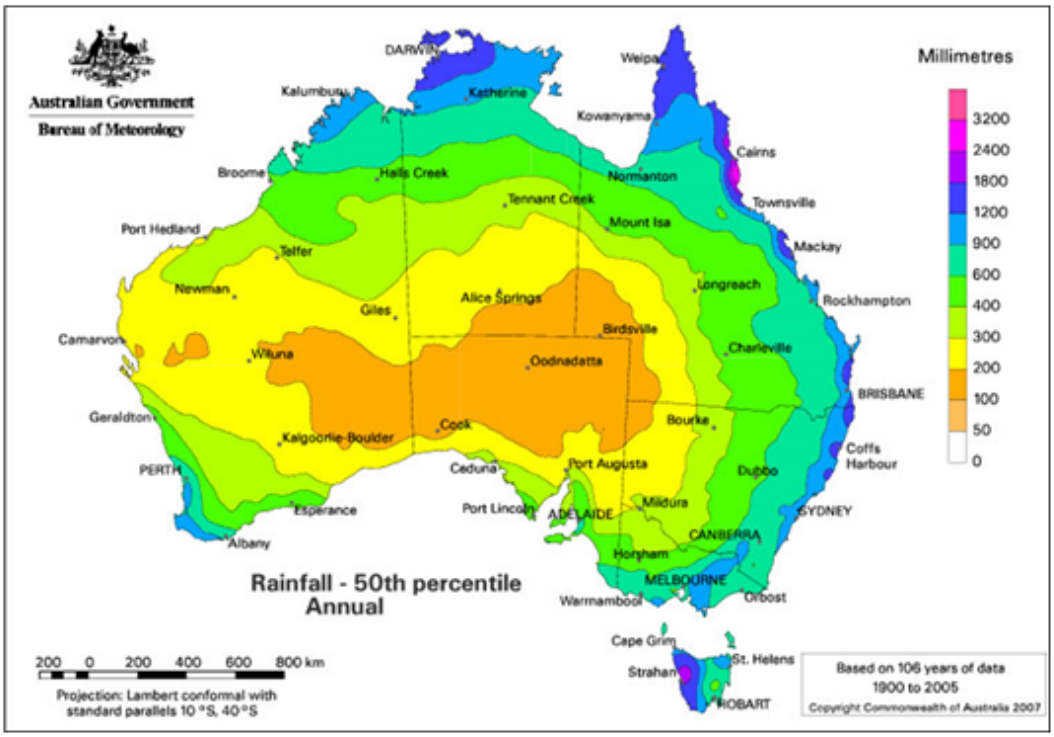
*From the period of May through to September, ewes were lambing down in the trial site at a stocking rate of around 3 DSE/ha but no specific grazing data records were taken. The above DSE stocking rate outlined above is therefore deemed a conservative figure. It is worth noting that standard district practice is a stocking rate of approx 2 DSE/ha/yr on dryland pasture systems in the region.

APPENDICES

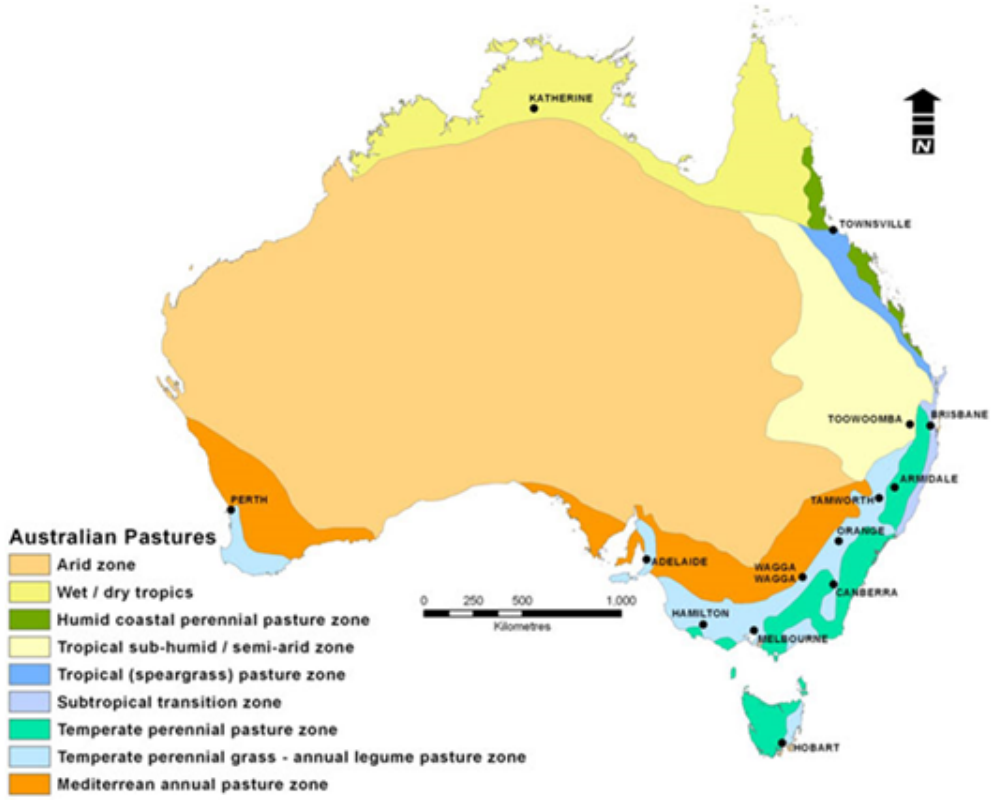
Climate Scenarios

Possible shifts in the rainfall pattern in the hot dry scenario the dry margin is projected to shift significantly east
Source: Evaluating transformative adaption options for Australian Extensive farming, CSIRO June 2016

Appendix 1 - Australian rainfall bands 1900-2005



Appendix 2 - Pasture Zones in Australia



REFERENCES

1. Wolf 2009 Country Pasture/Forage Resource Profile
2. EVORIL technical note 1 - Project overview & trial methodology
3. EVORIL Technical note 2.1 - Small plant trials: Grasses, Legumes, Herbs and Medics
4. EVORIl Technical note 2,2 - Producer Demonstration site Trials: Grasses, Legumes , Herbs and Medics
5. EVORIL Technical note 3.2 - Forage Shrubs and Grazing Considerations
6. EVORIL Technical note 4 - Management Considerations for Establishing Dryland Fodder
7. Tips for successful pasture establishment, Adrian Smith Murray Local Land Services

Western Murray Land Improvement Group

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