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Sustainable grazing on saline lands : producer network economics : observations and results of investigations and analysis 21 case studies in Western Australia

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SUSTAINABLE GRAZING ON SALINE LANDS PRODUCER NETWORK ECONOMICS

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Sustainable Grazing on Saline Lands Producer Network Economics

Observations and results of investigations and analysis of 21 case studies in Western Australia

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Summary

Costs and returns from 21 case study projects from the Western Australian Producer Network component of the SGSL program were analysed in a discounted cash flow investment analysis framework. Project sites were established on saltland pastures during the difficult (dry) 2002 to 2005 period.

Returns from grazing were based on a valuation of 10 cents per sheep grazing day and 50 cents per cattle grazing day – with adjustments for any costs of supplementation. A grazing day was considered as a substitute for a maintenance feed ration, hence is the equivalent of a day's feed costs saved.

Twelve of the case studies demonstrated a payback period of less than 10 years if infrastructure costs were included, and 16 were 'profitable' if infrastructure costs were excluded.

Profitability is most strongly influenced by the costs of establishment and subsequent productive performance. The average cost of establishment was $324/ha (excluding infrastructure) and $510/ha (including infrastructure) but the demonstration nature of the sites means these costs are higher than commercial practice.

Infrastructure costs are site-specific and depend on the project location, its orientation and position in the landscape, the plant species used, and whether existing fencing and water supplies can be utilised. These costs averaged $216/ha for those sites which required such extra capital.

There was a large range of establishment costs from $77 to $787/ha (excluding infrastructure) and from $156 to $1,383/ha (including infrastructure). This reflected the wide range of site locations, methods used, and plant species seeded.

Highest risk of failure and low profitability occurred in the low rainfall areas – although some successes were evident. Greatest successes occurred in the medium and high rainfall districts where there is a greater selection of suitable pasture species and potential for high grazing production.

Observation and analysis of the 21 case studies provides strong encouragement that revegetating saltland with appropriate salt-tolerant pasture species is a profitable investment with associated aesthetic and environmental benefits.

Contents

1. SGSL Producer Network in Western Australia

Sustainable Grazing on Saline Lands (SGSL) was a national project conducted from 2001 through 2006 sponsored by Land & Water Australia and Australian Wool Innovation. Partners included Meat & Livestock Australia, the CRC for Plant-based Management of Dryland Salinity, and State agencies in Western Australia, South Australia, Victoria, New South Wales and Tasmania. It had five themes and two integrated 'streams' of work – scientific research and a producer network component. This document reports on the Economics Theme for the Western Australian Producer Network.

SGSL provided subsidies for interested farmer groups to set up research sites on members' properties. During 2002-05, 69 sites were established by participating farmers in Western Australia ranging from low rainfall sites in the north-eastern wheatbelt to high rainfall sites in the lower Great Southern and South West agricultural areas. While much of the research involved establishment strategies for saltland pastures, a wide range of factors was investigated.

Of the 69 sites, 21 case studies were used in the preparation of this report. Sites were visited and discussions held with host farmers and/or group co-ordinators to collect details of establishment costs and grazing performance where available. These were placed in an investment analysis framework to provide guidance on the 'profitability' of each site.

Figure 1: Old man saltbush lines and balansa clover alleys - Pingaring

2. Economics Theme – objectives and questions

The project objectives were to:

1. provide assessments of the economic value of forage produced from salt-tolerant perennial pastures at each of the SGSL R&D sites
2. identify the economic constraints to the adoption of saltland pastures
3. understand the factors affecting the profitability of saltland pasture systems
4. provide estimates of the value of additional pasture supply from saltbush to identify potential areas of future R&D
5. update whole-farm models for each of the southern States with the latest production data for saltland pastures and livestock systems
6. **collate and integrate economic information collected from SGSL producer network sites.**

Objective 6 provides the reason for this report. However, information from producer network sites also contributes to each of the other objectives.

Key questions

Two main questions were identified at the start of project:

1. Are saltland pasture systems profitable?
2. What and how do various factors affect the profitability of saltland pastures?

It is against this background that 21 Producer Network sites were visited and information collected for individual analysis. Sites were very variable – in location/climate, hostility, emphasis of the research, and technology used. However, this variation is important in drawing out some key messages for future development of profitable saltland pastures.

3. Method of analysis

Each of the 21 sites was considered as a discrete individual case study. Information from each site was collected and inserted into a prepared investment analysis framework with the following features:

- Discounted annual cash flow
- Partial analysis – only considered the site area with no interaction with the rest of farm
- The first time any operation aimed at pasture improvement commenced (e.g. preparatory weed control) was considered to be Year 1
- Subsequent costs and returns were discounted at 7% annual rate
- Term of analysis = 10 years. The framework allows a 20-year analysis but it was considered that farmers' investment horizons are generally a maximum of 10 years.

The following explanations of the analysis will assist in understanding the results:

- WITH vs WITHOUT – annual cash flows were constructed for the site during establishment of the saltland pastures and subsequent production (WITH pasture improvement) but also for the site assuming no pasture improvement (the do nothing or WITHOUT scenario). It is the difference between the two scenarios which determines whether pasture improvement is warranted.
- Whole project – each case study incorporated costs/returns for the whole site and not just for the saltland which might only be a small part of the site. This means that some 'good' land is often included for treatment around the obvious salt-affected area.
- All 'cash' costs of the site were incorporated – e.g. chemicals for weed control, fertiliser, seed, contractor charges. It included allowances for machinery operations done by the host farmer based on 80% of contract rates. Any subsidy/grant monies were excluded. The demonstration/research nature of sites meant that costs per hectare were generally in excess of 'commercial' costings.
- Taxation implications of the investment by the host farmer were not considered.
- There was no cash cost allowance for the farmer's time spent on the site. In most cases this would be considerable but detailed records were not kept and, like normal whole farm budgets and gross margins, the return to the farmer's labour is extracted from 'profit'.
- Subsidy/grant funds received into the project were ignored.
- Returns were based on valuing grazing days. Number of grazing days was the only 'production' measurement available – and even then only for some sites. Some sheep body weight and condition scoring work was done on three sites which showed there was effectively no change in either indicator while the animals were grazing the new pasture. Animals were being 'maintained' on the pasture hence a proxy value of the equivalent feed costs 'saved' was derived for the analysis. Sheep = 10 cents per sheep grazing day. Cattle = 50 cents per cattle grazing day. The value of 10 cents per sheep grazing day = (roughly) the equivalent value (cost) of feeding a sheep a maintenance diet (of grain and hay). For cattle, an equivalent agistment rate was used – currently commercial rates in WA of around $3.50/hd/week = 50 cents/head/day.
- All the case studies were on small sites (largest 49 ha, smallest 4 ha, average 26 ha) and generally aimed at supplying extra feed into the autumn feed gap. It was assumed the animals were already on hand and did not need to be specially purchased to utilise the

site. Hence there was no consideration in the analysis of funding the capital involved in the livestock.

- Changes in value of the land asset were ignored – as were any aesthetic and/or environmental benefits. Many host farmers in fact indicated that these were primary motivators for action – but it is difficult to place a $ value on them in a $-based investment analysis.
- Case studies were selected on the basis of whether there was sufficient available information to conduct an analysis. Some sites were overlooked either because there was failure to establish and abandonment of the site (mostly) or records of site development were not maintained. In many cases, estimates were made on carrying capacities before and after treatment after discussion with host farmers and by association with sites where grazing records were obtained.

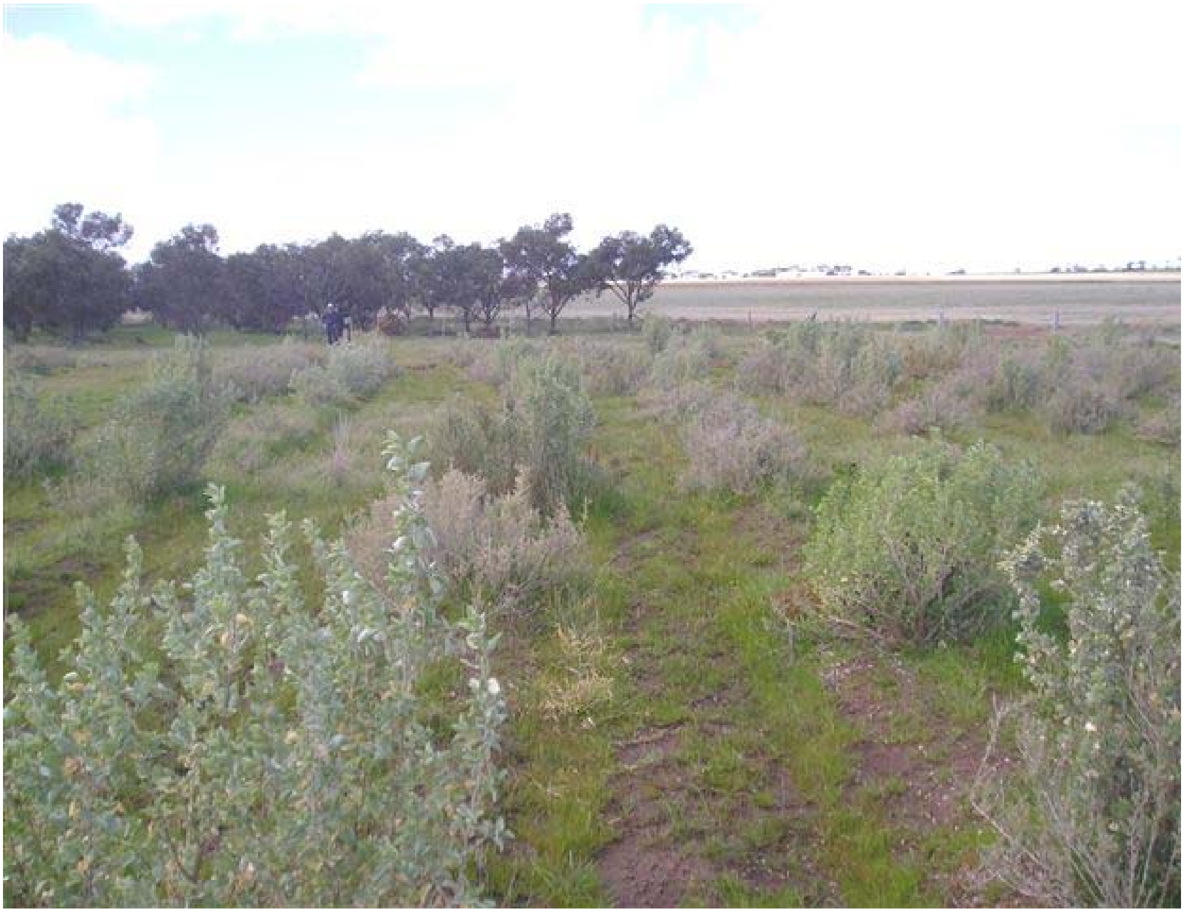

Figure 2: Direct seeded saltbush - Katanning

4. Location of sites

Producer Network sites were spread across the agricultural region of Western Australia. The 21 case studies can be conveniently grouped into three rainfall zones:

- Low rainfall (less than 400 mm) – seven sites located at Wubin, Morawa and East Ballidu in the north-eastern wheatbelt; Koorda, Trayning and Bonnie Rock in the eastern wheatbelt; and Ravensthorpe in the south-eastern wheatbelt.
- Medium rainfall (400 to 600 mm) – 11 sites at Yerecoin and Coomberdale in the lower Midlands; Quairading, Bullaring and Dowerin in the central wheatbelt; Broomehill, Tambellup and Katanning in the Great Southern; and Fitzgerald in the central south coast.
- High rainfall (600+ mm) – three sites at Jerdacuttup on the South Coast; Mt Barker in the Albany hinterland; and Boyup Brook in the South West.

As a general observation, establishment improved in the higher rainfall zones with sites a lot ‘softer’ and more suited to perennial plant species than the more ‘hostile’ lower rainfall locations. However, there were some very successful saltbush establishments in the lower rainfall areas. Production potential for low rainfall sites is lower than elsewhere with profitability therefore more dependent on the costs of establishment.

Figure 3: Saltbush lines - Morawa

5. Key messages

There was a wide range of situations captured in the 21 case studies. Some sites were assessing establishment in 'barley grass' areas where others were into the bluebush/samphire zone; some sites used saltbush in various configurations with/without understorey where others left saltbush out of the mix; some sites required extra fencing and/or special water supplies where others did not. It is difficult to generalise about the profitability of saltland pasture improvement but a number of factors were identified which need to be considered by farmers in their planning – and planning itself is a major issue for successful and profitable saltland rehabilitation.

Saltland pasture systems can be profitable. Twelve out of 21 case studies demonstrated payback periods of less than 10 years – even though costs were higher than normal commercial practice. Profitability depends on a number of interacting factors.

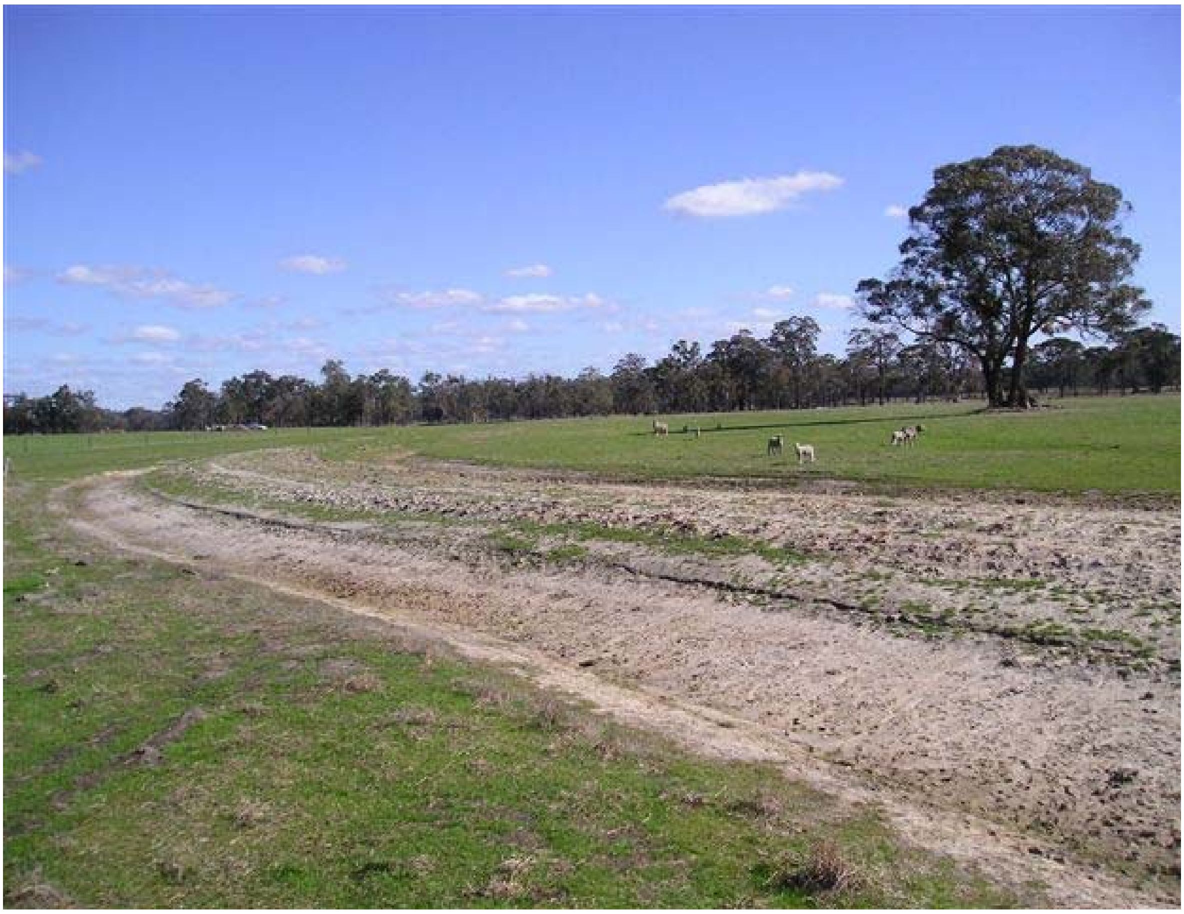

Figure 4: W-drain and perennial pasture - Mount Barker

6. Factors affecting profitable saltland pastures

6.1 Site specifics

Each site - be it low or high rainfall, mildly or highly saline – needs to be considered on its merits. Farmers wanting to establish new pastures on saltland would be wise to obtain good agronomic advice because experience in the SGSL project has improved understanding of what grows well where!

The two main issues to consider are planning, and matching species selection to the site.

The costs of infrastructure alone averaged $216/ha for those case studies which required extra fencing and water supplies. While farmers cannot choose where their saltland occurs, it would be wise to plan paddock layouts to minimise these capital costs – at least in the early stages of adoption to avoid costly mistakes.

Planning should also include considerations of how the saltland pasture area is going to be used. It needs to be easily accessible if crash grazing with high numbers of stock for short periods – or maybe it will simply be a matter of opening a gate for joint grazing with an adjoining paddock. If it is 'plantation' saltbush requiring hay/grain to be brought to the site, then proximity to these feed supplies and easy access is required.

As a result of the SGSL project, agronomists now have improved 'intelligence' on matching the appropriate pasture species to the particular characteristics of individual sites. There is no point in trying to establish unsuited species. Farmers can save money by excluding them from the pasture mix.

Similar comments can be made for methods of establishment. Direct seeding (of saltbush) is cheaper than establishment by seedlings but needs to be assessed for possible success on a site-by-site basis. There is no doubt that seedlings were significantly more successful than direct seeding in the conditions provided over the 2002-05 period. But direct seeding is successful in good conditions.

New entrants to the saltland pasture industry should concentrate efforts on their 'softer' sites in the first instance – to obtain experience with a higher chance of success.

6.2 Costs of establishment

The major issue with profitability of saltland pastures is the link between production and costs of establishment. Obviously, the lower the cost of establishment the better the chance of a short payback period – as long as success of establishment is not compromised. Once the planning is done, species selected and technique of establishment decided, then attention to detail must be applied to reduce the chances of failure.

*The cost of establishment (without infrastructure costs) for 21 case study sites averaged **$324/ha** with a range from $77 to $787/ha. If infrastructure costs are included, the average cost of establishment was **$510/ha** with a range from $156 to $1,383/ha. The costs of establishment for the Producer Network demonstration sites is generally much higher than might apply in 'commercial' practice.*

Cost of establishment is a major driver of profitability and is impacted by the following factors:

6.2.1 Infrastructure costs

The high costs of fencing and ensuring animals grazing saltland have access to a good supply of fresh water can kill the profitability of a pasture improvement project. Planning is the key. Farmers should plan paddock layouts to minimise the costs of extra fencing and/or water supplies or raceways etc.

One way of obviating the need for additional infrastructure is to use whole paddocks for pasture improvement projects and thereby utilise the existing fences and water supply. If the salt-affected land is intruding on a paddock, then instead of fencing that area off into a discrete treatment area, consider treating the whole paddock (with a mix of different treatments depending on soil type and capability), or simply treating that required part of the paddock and adopting a grazing system which is adapted to the range of plants in the paddock.

6.2.2 Chance of failure

Costs of establishment are magnified if there is failure. Not only is there a doubling up of the costs when re-establishment is attempted the following year, but there is also another year's delay in receiving any returns.

Other than seasonal effects, the three main causes of failure for farmers to address are:

Weed control

Plan ahead. Prepare the site for pasture establishment by controlling weed seed set in previous years, then use best practice in the year of seeding. Some SGSL sites were rushed in as 'spur-of-the-moment' decisions to meet perceived project funding commitments without adequate preparation – and with consequent higher risk of failure.

Drainage

There is a strong interaction between waterlogging and salinity in affecting the capability of pasture species to germinate and persist. Properly planned surface water control earthworks (e.g. W-drains, raised beds, spinner drains, etc) should be installed if necessary before attempting pasture establishment. Two good examples of successful planning of surface water control are Drage (Mt Barker) and Walker (Boyup Brook).

Species selection

As a result of the SGSL experience, there is now greater understanding of matching plant species to site characteristics.

6.3 Timing

Many of the SGSL sites during 2002 to 2005 were established in less-than-ideal conditions with a lack of spring rain to assist establishment from August-September plantings. The period happened to be drier than normal. While no-one can forecast what might occur post-planting, farmers should give it every chance by planting as early as possible into good moisture once soil temperatures are satisfactory – and have an exit strategy if conditions are not suitable.

One of the issues with partial failures (e.g. poor saltbush establishment) is that subsequent weed control is difficult without affecting the surviving plants, and treatments (e.g. grazing) for the mature plants are held up while the new plantings consolidate. In many cases, it might be best to ignore the survivors and start all over again.

6.4 Productivity and utilisation

Production (in conjunction with cost of establishment) is the other major issue which impacts on profitability. It is affected by success of establishment (lower density = less production), plant species used, location (climate and site hostility), and how it is utilised.

All the case studies were assumed to use their saltland pastures in autumn in a feed replacement strategy. This was certainly the strategy for most of the low and medium rainfall sites and hence the 10 cents/head/day valuation of grazing is the most appropriate. However, the high rainfall sites and the higher production medium rainfall sites will be grazed at other times of the year as part of their normal livestock management. The saltland pastures are incorporated into their whole farm system and hence a ‘feed replacement’ or ‘agistment’ proxy valuation is less applicable. Whole-farm economic modelling using the SGSL research sites is expected to address this deficiency.

Acting on advice from specialists with previous experience in grazing saltland pastures (especially saltbushes), all farmers intended to use a ‘crash grazing’ strategy in autumn – high numbers of animals for short periods. The reasoning is that it should force animals to eat the less desirable species, including the saltbush, so the paddock can be bared down for equal recovery once the animals are removed. Stocking rates of 25-30 sheep/ha are common but it obviously depends on mob sizes.

There did not appear to be preference for any particular class of animal. Wethers, ewe hoggets, ewes with lambs, lambs alone, heifers, steers have all been used to graze saltland pastures.

The case study data involve a number of estimates of carrying capacity where actual grazing performance was not available – mainly because the sites had not yet been adequately established. Estimates for each site were based on the following five actual examples:

Tammin (Tony York) – reasonably hostile high salinity bluebush land established to rows of saltbush with low levels of understorey. The farm has progressively established small areas over the last 25 years and now has about 400 ha of saltland pastures. Normal expectation for autumn feed is 25 sheep/ha for five weeks (**= 875 sheep grazing days/ha/year**).

Broomehill (Craig Bignell) – 49 ha established during 2004 to very dense tall wheat grass (TWG) with low levels of legume underneath. Carrying capacity recorded during 2006 was 1,595 ewe hoggets for 44 days with minimal supplementation and no change in bodyweight or condition score **(= 1,400 sheep grazing days/ha/yr**).

Katanning (John Pepall) – 40 ha successfully established to direct-seeded saltbush rows with grass understorey in 2003 on the barley grass zone just above the samphire and bare salt scalds. Recorded 470 sheep grazing days/ha in 2004 and 300 sheep grazing days/ha in 2005 (good season – did not need the feed, hence left largely ungrazed). Measurement during autumn 2006 revealed 700 sheep grazing days/ha on one plot and 1,100 sheep grazing days/ha on another plot – both with minor supplementation and with no change in bodyweights or condition scores (average (say) **= 800 sheep grazing days/ha/yr**).

Tambellup (Dean Hull) – 10 ha site with strong establishment of TWG and fescue in 2004 on variously constructed raised beds. During 2006 grazed 410 wethers for 120 days on total 24 ha with minimal supplementation, then sold as 58 kg shippers. Two weeks later, another 320 wethers on the same area for 30 days without supplementation **(= 2,450 sheep grazing days/ha/yr**).

Fitzgerald (Terry and Linda Lee) – 36 ha site established 2003 to a mix of TWG (mainly), lucerne (on better drained slopes), saltbush and puccinellia near the scalds. Annuals broadcast 2004. First grazed with 70 wether lambs in December 2004 for 10 weeks (136 sheep grazing days/ha). Grazing not required 2005. Feb/March 2006: 770 wether lambs for 30 days (no change in body weight or condition score) + August 2006: 640 ewe hoggets for 20 days **(= 1,000 sheep grazing days/ha/yr**).

Keying off against sites where actual grazing performance was measured provides estimates of carrying capacities of around 400-600 sheep grazing days per hectare per year for low rainfall sites, 800-1000 sheep grazing days per hectare per year for medium rainfall sites, and upwards of 1000 sheep grazing days per hectare per year for high rainfall sites. There will be exceptions to these ‘standards’ where establishment and production are better/worse than average.

There are a number of issues to consider when assessing financial performance of improved saltland pastures:

6.4.1 How to value grazing?

The analyses done for the WA Producer Network sites were solely based on valuing a sheep (or cattle) grazing day – from a perspective of what the equivalent cost would be to feed the sheep a similar maintenance diet (e.g. in a feedlot), or the equivalent agistment cost for cattle. The assumption is that all sites are used to help fill the autumn feed gap and/or as a substitute for supplementary feed – which is what most host farmers intend. However, this is a simplistic way of assessing the value of introducing extra feed into a farming system. It is expected the research component of SGSL will address alternative valuations – including the whole-farm implications for enterprise mixes and scale.

All the sites were small – average 26 ha with a range of 4 to 49 ha. As stand-alone projects, it is considered reasonable to view them as assisting in filling the autumn feed gap.

Farmers cannot choose how much saltland to revegetate unless it exists on the farm in the first place. Some farmers will have zero area, some will have a little, and some will have a lot. As total area of saltland pastures increases there are increasing implications on the whole farm system – total stock numbers, changes in total feed supply, cropping area, and probably more subtle things like flock structure and turnoff strategies. There has been no attempt to embrace these types of implications in the analyses presented here. Again, it is anticipated that the research site economic modelling might address some of these issues.

6.4.2 Stand-alone or with supplementary feed?

Most case study sites were attempting to establish a mixture of plant species – perennials/ annuals, grasses/legumes, shrubs/creepers. The understanding is that mixtures provide a balanced diet for livestock without the need for additives or supplements. However, on more hostile sites where understorey survival and persistence are doubtful, a case can be made for establishing ‘plantation’ saltbush then bringing the required hay or grain supplement to the saltbush so livestock can make maximum use of it. It is now well known that saltbush alone cannot maintain animals. One case study (Hulls at Trayning) uses such a system for maintaining cattle at 1 steer/ha for around five months – by bringing baled barley straw to the close spaced (2,500 stems/ha) saltbush.

6.4.3 Lead time to production

All analyses of case studies assumed nil production during the year of establishment or the first year after. Light grazing (say 50% of full rate) was allowed in year 3 with full grazing in year 4 and thereafter. To explain further – if a site was established in September, there would be no grazing in the autumn immediately following, with first grazing the next autumn – i.e. about 18 months after establishment. However, some case studies sustained establishment failures during the period of study so each failure effectively put the assumed production back another year.

6.4.4 Life of new pasture

In all cases, the new improved saltland pasture was assumed to last at least 10 years (the period of analysis) and beyond, before re-establishment was necessary. There was no decline in productivity over the term of analysis. That is, any future costs of pasture deterioration and/or renovation were not part of the analysis. The evidence for this approach comes from some historical sites which have been maintained for over 20 years (the late Clive Malcolm, pers. comm.)

6.4.5 WITH vs WITHOUT

The pasture prior to improvement was allocated a value depending on the comments of the host farmer. Most stated it was worthless and contributed nothing to the grazing production of the farm. In cropping areas, some farmers said it actually cost them money because they would still plant a crop across the affected land but at best only harvest half of it at a significant yield penalty compared with the good land in the paddock. However, unless it was a bare saltland scald, it appeared unrealistic not to allocate at least some production capability to each site – even if it was only sea barley grass. The standard used was 20% of the post-improvement production deteriorating down to 10% by the end of the 10-year period. However, there were some variations for individual sites depending on the comments from the host farmer and individual assessment of the capability of each site e.g. softer high rainfall sites might be allocated 50% down to 40% of post-improvement production.

Another feature of the spreadsheet set up to analyse each case study was the incorporation of the capability to assess the impact of growing the salt-affected area. In theory, the salt area would grow at a faster rate if the new improved pasture was not present. This provides the capability to partition the grazing returns differentially between the affected and unaffected land – and also differentially between the WITH vs WITHOUT scenarios. Whilst the function remains in the spreadsheet, it is not used due to lack of evidence. Some guesses were made by host farmers consulted early in the analysis period but it was thought that there were not enough approximations to warrant a level of sophistication above the limitations of the data available.

6.4.6 Supplementation on saltland pastures

Where livestock were provided with a supplement on the saltland pasture, the calculated cost of that supplement was deducted from the value of the grazing day. For example, one of the case studies at Tambellup (Hull) supplemented sheep with grain at an average cost of 3 c/head/day. The value of the saltland pasture then became 7 c/head/day (10 minus 3) in calculation of the returns.

6.4.7 Year-round grazing

While most sites were aimed at supplementary feed replacement in autumn, a few sites were grazed at other times of the year. In the analysis, a grazing day at any time of the year attracted the same value (10 cents for sheep, 50 cents for cattle). However, from first principles we know the value of feed is a lot less in spring (for example) when there is plenty of alternative feed available on the farm than in autumn when supplies are generally tight.

Another issue is that different plant species established on saltland respond differently to the growing conditions provided. Whereas sites based on saltbush were generally spelled after autumn grazing until the following autumn, other sites with a mix of annual grasses and perennials like TWG and fescue obtained good grazing in autumn but only needed to be spelled for two to four weeks before gaining the opportunity for further significant grazing through winter and spring.

6.4.8 Maintenance

None of the case study sites was old enough to provide details of maintenance requirements. Farmers with existing saltland pastures generally commented that they had no maintenance costs. There appears to be a lack of information or research work on what is required for pasture persistence and maintenance of production. In the absence of definitive data, some ‘proxy’ allowance for the costs of maintenance was applied - $6/ha for low rainfall sites, $10/ha for medium, and $20/ha for high rainfall sites. These were the annual costs even though it is probably expected that fertiliser (for example) might only be applied once in two to five years, or weed control might only be an occasional event. The maintenance costs commenced in the first year after completion of the pasture establishment.

7. Risk

The allocation of incentive funds to help farmers set up their SGSL on-farm demonstrations and research sites was significant in attracting host farmers into the project. It was a major factor in assisting them to avoid the risk of using their own funds in an experimental venture – and was a significant 'bait' to attract them into a land use which they otherwise would not have considered. The experience has largely been positive.

However, a significant number of the Producer Network sites either failed completely or required on-going attention to get them to a satisfactory establishment. The two major reasons for failure/poor results were:

- **Adverse seasons**

It was unfortunate that the SGSL project coincided with a run of abnormally dry springs in Western Australia. Spring rainfall is critical when most plantings are being done in the August/September period once soil temperatures have risen above the required threshhold. Saltland pasture specialists are often quoted that at least two rainfall events of at least 10 mm each are required to germinate and establish saltbushes. However, 2002 was a statewide drought, 2003 was an excellent production year for annual crops but dried off quickly, 2004 and 2005 again did not fulfil potential due to dry finishes. SGSL could not have picked a worse sequence of seasons, nevertheless, there were successes at most sites.

There will always be this risk of adverse conditions with late winter/spring plantings. But farmers in WA's wheatbelt are used to 'playing the season' and judging when to go and when to hold back should be second nature. On reflection, action on some of the SGSL sites should have been delayed rather than the pastures being forced in under less-than-ideal conditions.

- **Matching treatments to sites**

It was the nature of the on-farm research of SGSL that farmers wanted to trial a range of different treatments – some of which we might now consider inappropriate for the particular site. But it is by attempting different things that greater wisdom is gained.

Through SGSL, there is now much improved understanding of 'best practice' in saltland pasture selection and establishment. While nothing is 'fail safe', the information obtained through the SGSL Producer Network has provided better site specific recommendations.

Success should be measured in terms of the experience gained rather than the result itself.

In general, there were more establishment failures and/or lack of profitability among the low rainfall sites. This was not exclusive. Good results were obtained at two of the low rainfall sites. Similarly, poor results were obtained at four of the medium rainfall sites. It depended on the type of treatment and site, as well as the seasonal influences.

However, it is logical to suggest that the low rainfall sites have higher risk. They were more hostile (higher salinity), restricted in possible pasture species (e.g. saltbush rather than perennial grasses), have less likelihood of rainfall post-seeding, and more severe summers. Alternatively, the higher rainfall sites had 'softer' planting environments, were more suited to a wider range of perennials, more likely to receive extended spring rainfall, and have less severe summers.

Farmers generally view risk in saltland pastures from the perspective of establishment failures rather than in terms of production deficiencies - probably because it is a new enterprise for many. Hence the information obtained through the SGSL project has been important in combating those risk aversions by providing greater surety of successful establishment. There is now a prevailing attitude among participating farmers that planting saltland pastures is not greatly more risky than a normal crop or other pasture development program – as long as some guiding principles are followed.

However, the uncommitted majority of uninvolved farmers probably perceive revegetating saltland as expensive, more risky, and largely not profitable. Results from SGSL will be used to break down those perceptions.

Figure 5: Saltbush with mixed pasture understorey - Yerecoin

8. Performance

Each of the Western Australian case studies needs to be assessed individually to understand and interpret the results of the investment analysis. Details for each appear at Appendices 1 and 2.

In general, the 21 analyses provide encouragement that saltland pastures can be profitable where appropriate management strategies are matched to site capability. Bearing in mind that the SGSL Producer Network sites are generally more expensive to establish than 'commercial' practice, it is a pleasing result that 12 sites will recoup the development cost inside 10 years. Where the costs of infrastructure were omitted, there were 16 sites out of the 21 that paid back inside 10 years.

A summary of results for all 21 sites appears in Table 1.

Table 1: Indicators of profitability – summary of 21 case studies

Result	Including costs of infrastructure		Excluding costs of infrastructure	
	Average	**Range**	**Average**	**Range**
Establishment cost per hectare	$510/ha	$156-1,383/ha	$324/ha	$77-787/ha
Payback period*	12 of 21 sites payback inside 10 years	4->20 yrs	16 of 21 sites payback inside 10 years	2->20 yrs
Benefit-Cost Ratio (BCR)*	1.25	0.13-6.19	1.64	0.22-6.19
Internal Rate of Return (IRR)**	6% (14 sites only)	<-10-37%	8% (19 sites only)	<-10-37%
Net Present Value (NPV)**	+$3,315	-$9,237-+$54,761	+$6,177	-$6,214-+$54,761
Project Area	26 ha	4-49 ha	26 ha	4-49 ha

* Payback period and BCR do not account for any lost production from a 'do nothing' approach. These two indicators assume there is no lost opportunity from a WITHOUT scenario. It simulates a stand-alone investment comparing possible future returns with how much is invested in the initial establishment.

** IRR and NPV are calculated from a true WITH vs WITHOUT perspective. NPV is obviously related to size of project – refer Project Area.

There are many assumptions in each analysis which need to be understood to interpret individual results. An alternative means of assessment is to compare recorded (or assumed) grazing days against ***what the grazing days need to be to break-even*** on the investment. Remember this includes delays of two to four years after establishment is commenced before full grazing days are achieved – and it is only a 10-year analysis.

Table 2: Comparing break-even grazing days with assumed production in analysis (Note: excluding costs of infrastructure)

Rainfall	Site	Assumed achieveable grazing days /ha/year in analysis	Break-even grazing days required /ha/year	Chance of achieving at least break-even*
Low rainfall (<400 mm)	Wubin	400	925	Minimal
	Ballidu	500	415	Fair
	Koorda	400	810	Minimal
	Trayning	140^	610	Minimal
	Bonnie Rock	400	216	Good
	Ravensthorpe	800	430	Good
	Morawa	500	2,225	Minimal
Medium rainfall (400-600 mm)	Quairading 1	1,000	600	Good
	Bullaring	800	310	Excellent
	Broomehill	1,450	570	Excellent
	Yerecoin	800	710	Fair
	Tambellup 1	2,450	1,034	Excellent
	Fitzgerald	1,020	665	Excellent
	Katanning	1,000	635	Excellent
	Dowerin	850	410	Excellent
	Quairading 2	800	1,025	Fair
	Moora	850	720	Fair
	Tambellup 2	1,000	545	Excellent
High rainfall (600+ mm)	Jerdacuttup	540^	87	Excellent
	Mt Barker	2,000	1,300	Excellent
	Boyup Brook	365^	310	Good

^ grazed with cattle

* Chance of achieving at least break-even is rated by the author based on site inspection and actual grazing results recorded from four of the sites.

Only four sites are rated 'Minimal' meaning that the other 17 have a reasonable chance of at least achieving the number of grazing days per hectare per year to break-even on the investment costs.

9. Sensitivity

Actual costs of establishment were recorded from each study and hence should not be varied to test for profitability under lesser/higher levels. However, the demonstration nature of each site meant that costs were probably higher in general than what might be expected in more ‘commercial’ practice. Without infrastructure costs, it is now generally accepted that saltland pastures can be established for less than $300/ha. Some people have got it down to $100/ha through minimum machinery operations and reduced seeding rates in site-specific situations. However, $300/ha appears a reasonable ‘standard’ in the medium to high rainfall districts where increased site preparation is required and greater densities of perennials are desired.

The costs of infrastructure can be important. In most cases some fencing and extension to water supplies was necessary. The cost is site-specific and depends on the location of the project area and how it might be integrated into the farm layout. With proper planning, some farmers might avoid such costs. However, as a guide for farmers doing budgets for saltland pasture establishment, an additional $65/ha has been added to the ‘average’ site costs.

A ‘general’ 26 ha case study using $365/ha establishment cost was set up to test the sensitivity of results to variations in the major assumptions. Ranges tested were:

Discount rate:	5%, 7%, 9%
Term of analysis:	10 years, 15 years
Grazing days/ha/yr:	400, 800, 1200, 1600
Value of a sheep grazing day:	5 cents, 10 cents, 15 cents

There is nil grazing in either year 1 or year 2, 50% grazing days in year 3, and 100% grazing days in year 4 and subsequent years. A standard maintenance cost of $10/ha was used for each year from year 4.

Results from this ‘general’ case study are presented in Tables 3A and 3B..

To use Table 3A, choose your preferred position. Select your preferred discount rate (e.g. 7%), then select your preferred term of analysis (say 10 years), then your own estimate of likely grazing performance (e.g. 800 sheep grazing days/ha/yr), and finally your estimate of the value of a sheep grazing day (say 10 cents). Read off the result of analysis in the last two columns. For the tracked example, Payback period is greater than 10 years with a Benefit Cost Ratio of only 0.78 – not a profitable result! You would need to get establishment costs down and/or increase the potential number of grazing days to turn it into a profitable project.

Table 3A ‘simulates’ a low-medium rainfall site with $365/ha establishment cost. For a medium-high rainfall site with greater expectations of higher sheep grazing performance refer to Table 3B.

To use Table 3B, choose your preferred position. Select your preferred discount rate (e.g. 7%), then select your preferred term of analysis (say 10 years), then your own estimate of likely grazing performance (e.g. 1200 sheep grazing days/ha/yr), and finally your own estimate of the value of a sheep grazing day (say 10 cents).

Read off the result of analysis in the last two columns. For the tracked example, payback period is eight years with a Benefit Cost Ratio of 1.17 – a profitable result! In the medium-rainfall medium salinity sites, this is roughly in line with observed expectations. Better sites are likely to yield substantially more than 1200 sheep grazing days.

For those farmers who have little knowledge of the production from saltland pastures, the analysis also provides a perspective on how many grazing days are needed to break-even on an investment of $365/ha. Judgement can then be made as to whether the break-even levels are a likely prospect (see Table 4).

Table 3A: Low-medium production general case study – break-even grazing days/ha/yr and sensitivity of payback period and Benefit Cost Ratio to assumptions

Discount rate (%)	Term of analysis (years)	Grazing days/ha/yr	Value of sheep grazing day (cents)	Payback period (years)	Benefit Cost Ratio
5	10	400	5	>10	0.21
			10	>10	0.42
			15	>10	0.63
		800	5	>10	0.42
			10	>10	0.84
			15	7	1.25
	15	400	5	>10	0.33
			10	>10	0.66
			15	14	0.98
		800	5	>15	0.66
			10	10	1.31
			15	7	1.97
7	10	400	5	>10	0.19
			10	>10	0.39
			15	>10	0.58
		800	5	>10	0.39
			10	>10	0.78
			15	8	1.17
	15	400	5	>15	0.29
			10	>15	0.59
			15	>15	0.88
		800	5	>15	0.59
			10	12	1.17
			15	8	1.76
9	10	400	5	>10	0.18
			10	>10	0.36
			15	>10	0.54
		800	5	>10	0.36
			10	>10	0.72
			15	8	1.08
	15	400	5	>15	0.26
			10	>15	0.52
			15	>15	0.79
		800	5	>15	0.52
			10	14	1.05
			15	8	1.57

Table 3B: Medium-high production general case study – break-even grazing days/ha/yr and sensitivity of payback period and Benefit Cost Ratio to assumptions

Discount rate (%)	Term of analysis (years)	Grazing days/ha/yr	Value of sheep grazing day (cents)	Payback period (years)	Benefit Cost Ratio
5	10	1,200	5	>10	0.63
			10	7	1.25
			15	6	1.88
		1,600	5	>10	0.84
			10	6	1.67
			15	5	2.51
	15	1,200	5	14	0.98
			10	7	1.97
			15	6	2.95
		1,600	5	10	1.31
			10	6	2.62
			15	5	3.93
7	10	1,200	5	>10	0.58
			10	8	1.17
			15	6	1.75
		1,600	5	>10	0.78
			10	6	1.56
			15	5	2.34
	15	1,200	5	>15	0.88
			10	8	1.76
			15	6	2.64
		1,600	5	12	1.17
			10	6	2.35
			15	5	3.52
9	10	1,200	5	>10	0.54
			10 s	8	1.08
			15	6	1.63
		1,600	5	>10	0.72
			10	7	1.45
			15	5	2.17
	15	1,200	5	>15	0.79
			10	8	1.57
			15	6	2.36
		1,600	5	14	1.05
			10	7	2.10
			15	5	3.15

Table 4: Break-even grazing days/ha/yr for assumption ranges

Discount rate (%)	Term of analysis (years)	Value of a sheep grazing day (cents)	Break-even grazing days per hectare per year (days)
5	10	5	1,913
		10	957
		15	638
	15	5	1,221
		10	611
		15	407
7	10	5	2,055
		10	1,027
		15	685
	15	5	1,365
		10	682
		15	455
9	10	5	2,215
		10	1,108
		15	738
	15	5	1,526
		10	763
		15	509

Actual grazing days recorded at one site (Hull at west Tambellup) were 2,450 – greater than any of the break-even points in Table 4. The impression gained from the table is that there is a good chance of exceeding the break-even levels for most of the medium and high rainfall sites at least.

10. Factors not considered

The analysis presented in this report does not consider three areas which bear further discussion.

10.1 Externalities

It is often mentioned in landcare circles that the best way of dealing with landscape salinity issues is to involve participants from across the whole catchment so it can be addressed in an integrated way. Drainage in particular requires co-operation across fencelines and property boundaries as any discharge is managed through its whole flow path. Recharge can be reduced by changes in land management practices upslope for the benefit of downslope and/or discharge areas.

There has been no consideration of externalities in this analysis. Conceivably, all saltland has some interaction with its surrounds – either through run-off if untreated and reduced discharge if treated – but quantifying it for all the different case study situations is too difficult. Even if some physical measurement (of change) is obtained, there is no easy way to value it so these types of costs/pricing have been omitted from the analysis. Instead it concentrates on the financial impact on a farmer’s cash flow.

10.2 Whole farm implications

The investment analysis takes the form of a partial development budget which considers the project area alone and which has no interaction with the rest of the farm. This is a reasonable approach in the circumstances given the small size of project areas being considered as discrete individual entities. However, as areas of saltland pastures increase, there are progressively greater impacts on the whole farm business. As mentioned previously, there are implications for total stock numbers, feeding strategies, crop areas, flock structures, paddock management – and many other things making up the enterprise mix and its management.

Analysis of these impacts is not possible from the Producer Network sites. It is expected that the modelling work done in conjunction with the SGSL research sites will address some of these issues.

10.3 Other farm investments

Just because an analysis for saltland pastures indicates profitability does not mean that a farmer should make the investment. It would be wise to assess the investment against a range of other investments the farmer might make both on and off the farm. The same amount of money required to establish saltland pasture could be used in alternative pursuits e.g. extra nitrogen fertiliser on crop, children’s education, better credentialed ram, etc.

Equally, if project analysis indicates lack of profitability, there may be other legitimate reasons for proceeding anyway. Many people have commented that ‘economics’ is not necessarily the main motivator. The aesthetic and environmental benefits have equal or higher importance.

11. Conclusions

Financial analysis of 21 case study sites in Western Australia indicates that revegetating saltland with salt-tolerant pastures has good prospects of profitability. Between 12 and 16 of those 21 sites indicated an ability to recover the original investment costs from grazing returns inside 10 years from establishment.

The major influences on profitability are costs of establishment and subsequent production performance. Average costs of establishment of $300/ha plus another $65/ha for fencing/water supplies have a good chance of recovery from the more than 1,000 sheep grazing days/ha/yr expected in the medium-high rainfall districts.

Low rainfall districts have higher risks to establishment and need to keep costs down without compromising successful establishment in order to demonstrate profitability from the lower (400-800 sheep grazing days/ha/yr) production expected.

Costs of establishment are strongly affected by infrastructure costs and farmers are advised to plan their projects to minimise the capital costs of fencing and water supplies.

All analyses are based on grazing days valued at 10 cents/day (sheep) and 50 cents/day (cattle) minus the daily cost of any supplementation. A spreadsheet model has been constructed to allow analysis using alternative values as required.

Appendix 1: Payback period and Benefit Cost Ratio

Rainfall	Site - Location	Area (ha)	Revegetation cost ($/ha)		Grazing days/ha/ yr	Payback period (years)		Benefit-Cost Ratio	
			Including fencing & water supplies	Excluding fencing & water supplies		**Including fencing & water supplies**	Excluding fencing & water supplies	Including fencing & water supplies	**Excluding fencing & water supplies**
Low (<400 mm)	Carter - Wubin	35	**294**	**294**	**400**	>20	>20	0.44	0.44
	Driscoll - East Ballidu	41	**256**	**190**	**500**	11	8	0.92	1.20
	Fuchsbichler - Koorda	4	**921**	**330**	**400**	>20	>20	0.19	0.49
	Hulls - Trayning^	14	**731**	**514**	**140^**	>20	>20	0.17	0.23
	Smith - Bonnie Rock	33	**156**	**77**	**400**	9	5	1.05	1.85
	Tink - Ravensthorpe	45	**312**	**181**	**800**	8	5	1.17	1.87
	Tubby - Morawa	5	**1,383**	**787**	**500**	>20	>20	0.13	0.22
Medium (400-600 mm)	Aynsley - Quairading	38	**303**	**199**	**1,000**	8	6	1.18	1.68
	Bell - Bullaring	20	**254**	**155**	**800**	5	3	1.74	2.59
	Bignell - Broomehill	49	**254**	**254**	**1,450**	4	4	2.55	2.55
	Duggan - Yerecoin	11	**824**	**364**	**800**	>20	8	0.53	1.13
	Hull - Tambellup	10	**410**	**333**	**2,450**	5	4	1.97	2.37
	Lee - Fitzgerald	36	**394**	**323**	**1,020**	7	6	1.28	1.54
	Pepall - Katanning	40	**595**	**321**	**1,000**	11	6	0.88	1.57
	Pickering - Dowerin	35	**259**	**189**	**850**	6	5	1.56	2.08
	Stone - Quairading	9	**476**	**365**	**800**	17	12	0.61	0.78
	Tonkin - Coomberdale	30	**470**	**132**	**850**	>20	8	0.40	1.18
	Witham - Tambellup	19	**531**	**282**	**1,000**	9	5	1.06	1.84
High (600+ mm)	Bell - Jerdacuttup^	40	**217**	**217**	**540^**	2	2	6.19	6.19
	Drage - Mt Barker	20	**895**	**568**	**2,000**	10	6	1.02	1.54
	Walker - Boyup Brook	14	**770**	**733**	**365^**	8	8	1.13	1.18
	Average	26	**510**	**324**		<10 yrs = 12 out of 21	<10 yrs = 16 out of 21	1.25	1.64

Appendix 2: Internal rate of return and net present value

Rainfall	Site - Location	Area (ha)	Revegetation Cost ($/ha)		Grazing days/ha/yr	Internal Rate of Return (10 yrs) (Total project) (%)		Net Present Value (10 yrs) (Total project) $	
			Including fencing & water supplies	**Excluding fencing & water supplies**		**Including fencing & water supplies**	**Excluding fencing & water supplies**	**Including fencing & water supplies**	**Excluding fencing & water supplies**
Low (<400 mm)	Carter - Wubin	35	**294**	**294**	**400**	n/a	n/a	-$6,214	-$6,214
	Driscoll - East Ballidu	41	**256**	**190**	**500**	0	5	-$896	+$1,813
	Fuchsbichler - Koorda	4	**921**	**330**	**400**	n/a	-8	-$3,109	-$747
	Hulls - Trayning^	14	**731**	**514**	**140^**	n/a	n/a	-$9,237	-$6,203
	Smith - Bonnie Rock	33	**156**	**77**	**400**	n/a	-8	+$310	+$2,935
	Tink - Ravensthorpe	45	**312**	**181**	**800**	4	16	+$2,721	+$8,616
	Tubby - Morawa	5	**1,383**	**787**	**500**	n/a	-8	-$4,898	-$2,514
Medium (400-600 mm)	Aynsley - Quairading	38	**303**	**199**	**1,000**	-9	-5	+$2,451	+$6,406
	Bell - Bullaring	20	**254**	**155**	**800**	17	33	+$4,420	+$6,395
	Bignell - Broomehill	49	**254**	**254**	**1,450**	14	14	+$22,244	+$22,244
	Duggan - Yerecoin	11	**824**	**364**	**800**	n/a	0	-$4,481	+$574
	Hull - Tambellup	10	**410**	**333**	**2,450**	22	27	+$4,330	+$5,094
	Lee - Fitzgerald	36	**394**	**323**	**1,020**	1	4	+$4,430	+$6,991
	Pepall - Katanning	40	**595**	**321**	**1,000**	-1	12	-$2,854	+$7,992
	Pickering - Dowerin	35	**259**	**189**	**850**	0	6	+$5,525	+$8,012
	Stone - Quairading	9	**476**	**365**	**800**	-10	-6	-$1,793	-$798
	Tonkin - Coomberdale	30	**470**	**132**	**850**	n/a	4	-$615	+$61
	Witham - Tambellup	19	**531**	**282**	**1,000**	4	19	+$610	+$5,335
High (600+ mm)	Bell - Jerdacuttup^	40	**217**	**217**	**540^**	37	37	+$54,761	+$54,761
	Drage - Mt Barker	20	**895**	**568**	**2,000**	2	10	+$416	+$6,958
	Walker - Boyup Brook	14	**770**	**733**	**365^**	4	5	+$1,484	+$2,009
	Average	26	**510**	**324**		6 (14 only)	8 (19 only)	+$3,315	+$6,177