Economic valuation of saltbush for the Wheatbelt area

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Contents

Key messages

- To reduce uptake time, introduce saltbush to sheep during Autumn when there is no green feed available.
- On a 'typical' wheatbelt farm salt land pasture can provide profits in the range of $90/ha on mildly saline soils. Making salt land pasture the optimal rotation on saline soils rather than crop and pasture rotations.
- Start out small and increase. Saltbush has the greatest profit per hectare at low areas so for more conservative farmers start out with less area (15-20 ha) and increase. However, it can take up to 5 years for the saltbush to reach potential, so the returns won't be obvious overnight.
- To maximise the returns from salt land pastures subtle management changes are required including running a higher stocking rate and increasing cropping area on other more productive soils.

Background

Commonly, in a mixed farm system, stock consume annual pastures during the growing season, stubble and dry pasture during the Summer/Autumn period and fill in feed gaps with supplement. However, feeding supplement quickly becomes costly, particularly in poor year with lower pasture production. With the goal of increasing profitability, this project examined the use of salt land pastures as an additional fodder option.

Salt land pastures (SLP) consist of saltbushes and a grazable pasture understory. SLP was selected as the desired experimental feed source by the farmers in this project, after discussions with the AgVivo team, because SLP has the potential to provide multiple benefits within the farm system, including;

a. Improved productivity of saline land – saltbush establishment draws-down the water table (Barrett-Lennard and Malcolm, 1999). This drawdown allows salts to be flushed from the topsoil of the moderately saline land, thereby creating growing conditions more suited to annual pastures.
b. Additional feed supply provided by the saltbushes.
c. Livestock shelter – shelter provided by shrubs can be used by stock at vulnerable times such as lambing which helps to increase animal survival.
d. Increased wool growth due to additional nutrients provided by grazing saltbush.
e. Reduced erosion risk due to the wind protection provided by the saltbushes year-round.

The aim of this report is to provide information to help farmers determine if SLP will be a valuable addition to their system. The report will firstly document some of the key producer feedback from the producer trials. Secondly, provide some analysis to help understand the value of SLP and illustrate how it can be integrated within the farm system. Thirdly, provide case study results from the farmers involved in the project.

Farmer feedback

The following section covers feedback from the producers on their SLP experience. Including set up requirements, benefits provided from the salt bush and future goals/improvements. Note, the producers have only had saltbush established for a year or two, so the feedback is only based on their initial experience.

1. **What are the set-up requirements?**
    a. Establishment rate
        i. ~660 shrubs/ha
    b. Establishment cost
        i. Machine hire: ~$300/day
        ii. Shrub cost: ~$0.6/bush
    c. Labour
        i. Two labour sources can approximately plant 20ha per day.
    d. Other
        i. Fencing may be required depending on the individual circumstances
2. **What variety of saltbush?**
    a. A mix of varieties were established. The main varieties used were: Anameka, Oldman, River and Bluebush.
3. **Where on the farm was the saltbush planted?**
    a. Initially the farmers have planted the saltbush on marginal country, including gully's and other non-arable areas. However, there was interest to expand their SLP onto more of their saline soils.
    b. One farmer planted salt bush in a pasture paddock that was unproductive due to being eaten by kangaroos. The farmer noted that this had been successful

because the kangaroos don't eat the saltbush.

4. **Did the sheep eat the saltbush?**
    a. The sheep tended to avoid the saltbush initially, especially if there was green pick available, but with some training sheep quickly got a taste for it. For a quicker transition introduce sheep to saltbush during Autumn when there are limited feed sources to choose from.
5. **What grazing management was used?**
    a. Grazing management changed between farmers. In some cases, the saltbush was used for lambs in other cases it was used for ewes. Given the newness of the strategy, farmers tended to graze the saltbush a bit opportunistically however the general consensus for the future was to use the saltbush as an Autumn feed to allow deferment of pastures and/or for ewes at lambing because of the added benefit of wind protection.
6. **How much grazing did the saltbush provide?**
    a. Saltbush provided between 235 – 490 grazing days per hectare, while sheep were maintaining weight. Note; the inter row feed supply may have a significant impact on this result.
7. **Has the use of saltbush resulted in changes to carrying capacity?**
    a. The farmers have not yet made any conscious management decisions in response to the additional feed source. Partly because the area of saltbush planted was relatively small. However, they all saw potential to increase carrying capacity once they fine tune their saltbush management.
8. **Future improvements?**
    a. Increase shrub coverage on non-arable land.
    b. Improve management: utilise saltbush paddock for lambing (July) and late Autumn for pasture deferment.

Economics

Modelling Method

Assessing the benefits and costs of a grazing system is not straightforward. This is because the profitability of such systems depends on several factors including pasture growth rates and growth pattern, pasture quality and palatability, the class of livestock and pattern of grazing, and the cost of pasture establishment and maintenance. In addition, profitability can be affected by interactions with other enterprises on the farm. Examples of important interactions include disease and pest breaks, nitrogen fixation by leguminous pastures from which subsequent crops benefit, weed control opportunities, grain feeding, stubble grazing and complementary or competitive machinery usage.

For these reasons, accurate and meaningful economic analysis of grazing systems requires a technique that adequately captures the production relationships and their economic impacts. In this analysis, we used the Central Wheatbelt version of the whole-farm model called AFO. Full details of the model can be found here: AFO documentation.

Description of the typical farm

The typical farm represented in this section of the analysis has a range of soil types and corresponding crop and pasture production as per

Table 1.

Table 1: soil types represented in the 'typical' wheatbelt farm and the corresponding yield of wheat in a pasture wheat rotation.

	Area (ha)	Wheat yield (kg/ha)
Deep pale sand	382	966
Deep yellow sand	374	1721
Yellow gradational loamy sand	309	2357
Sandy loam over clay	116	2051
Rocky red brown loamy sand/sandy loam; Brownish grey granitic loamy sand	926	2051
Red brown sandy loam over clay; Red clay valley floor; Grey clay valley floor	779	2263

	Loamy sand over clay	98	2074
	Saline	216	1650

Description of the salt land pasture represented

The saltbush represented in this analysis had a dry matter production that varied from 526kg/ha/year to 1014kg/ha/year depending on grazing management (infrequent grazing reduces saltbush production because saltbush growth reduces as it reaches maximum size).

Saltbush establishment draws-down the water table which allows salts to be flushed from the topsoil of the moderately saline land, thereby creating growing conditions more suited to annual pastures. As such the understory pasture had a 2% higher dry feed quality and 25% higher growth rates than the standard annual pasture on saline soils.

The cost of establishing saltbush as per Table 2.

Table 2: SLP establishment costs

Item	Cost ($/ha)
Machine hire	$15/ha
Shrub cost	$396/ha
Understory cost	$80/ha
Labour (@ $50/hr)	$42.5/ha
Total ($/ha)	$533.5/ha
Cost per year ($/ha/yr)[1]	$56.22

Note: these costs varied between farms. The value presented is the approx. averaged over the farms.

[1] PMT based on 20yr shrub life and 4.5% real interest rate.

Analysis part A: Understanding the value of SLP

For this component of the analysis we used a 'typical' wheatbelt farm. The farm has a mix of soil types including 216 ha of mildly saline soil. The saline soil was assumed to have 30% lower crop and pasture production.

Without the option of SLP it was optimal to run a crop pasture rotation on the saline soil. However, with SLP included it was optimal to run SLP on all 216 ha, of saline soil.

What is the value of SLP?

On the 'typical' wheatbelt farm represented in this analysis, the establishment of SLP on the saline soil increased the profit by ~$20k ($94/SLP ha).

The increase in profit resulted from a reduction in supplementary costs ($11k), an increase in meat and wool income ($10k) due to a slight increase in stock numbers and an increase in grain sales ($11k) due to an increase in crop area. These benefits come at the cost of establishing the SLP which is ($12k).

All farms are different and there are other factors which affect the profitability of SLP (some of which are covered later in this report) so the results provided above will not directly apply to a given farm. However, it does provide confidence that SLP can play a profitable role within the farming system. This is a similar conclusion to other evaluations of saltbush that have previously been conducted.

Does the value come from the additional feed provided by saltbush or the improved pasture understory?

As previously mentioned SLP consists of two components. Firstly, the saltbush which provides an additional source of feed and secondly, the pasture understory which, due to the establishment of saltbush, has increased production.

Figure 1: shows the value of changing saltbush and understory production. This result shows that changing the production of saltbush has a smaller impact on profit than changing the production of the understory. This indicates that the biggest benefit of establishing SLP is the resulting improved soil conditions which allows for better pasture production. However, the feed provided by the saltbushes is still a valuable addition. In a scenario where understory production is not improved, the production from the saltbush still covers the establishment costs.

Figure 1: also indicates that, from a research point of view, it is more important to focus on accurately quantifying the understory production rather than the saltbush production.

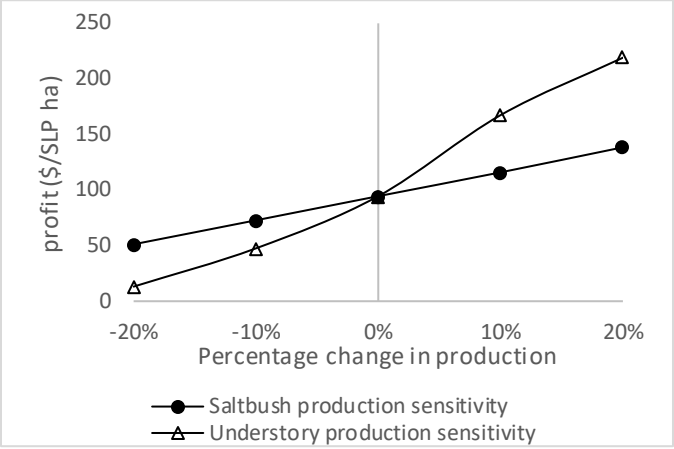

Figure 1: change in profit per hectare of SLP when saltbush and understory production is altered. Note, only when changing saltbush production, understory production is held constant and vice-versa.

What affects the value of SLP?

There are multiple factors that can affect the profitability of SLP. Two main factors examined in this analysis were (i) meat price and (ii) the area of SLP established. As illustrated in Figure 2, meat price has a high correlation with the profitability of SLP. This is because feed on its own doesn't generate any income. The value of feed is realised through the sale of meat and wool. Thus, if the meat price increases so does the value of feed because the meat produced by grazing the feed is worth more.

Figure 3 shows that the value of SLP changes depending on the area of SLP established. This demonstrates that the feed niche that the SLP is filling is finite and becomes less valuable as more of that feed is produced. One implication of this is that there is a role for multiple different types of SLP that each target a different niche.

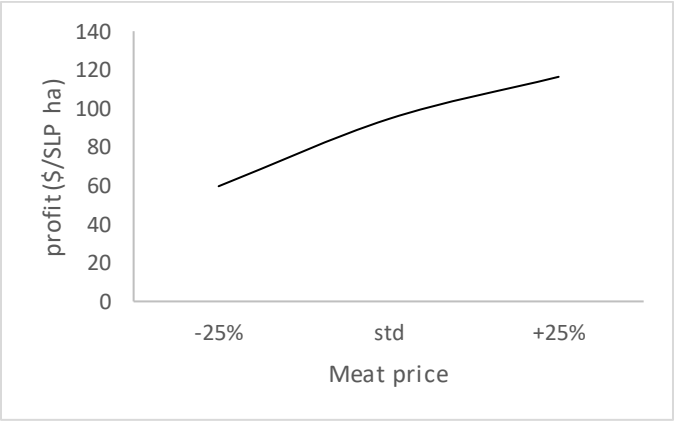

Figure 2: change in profit per hectare of SLP when meat price is changed.

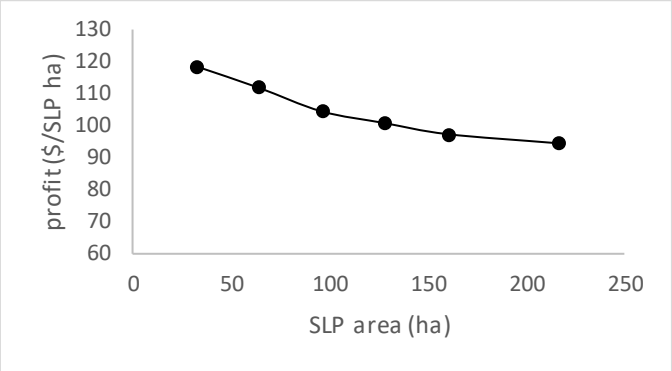

Figure 3: change in profit per hectare of SLP for different areas of SLP.

Grazing plan

Figure 4 shows the optimal feed budget for the 'typical' wheatbelt farm. This indicates that it is optimal to graze SLP at multiple times throughout the year. Part of the reason for this is because saltbush has a lower production if it is infrequently grazed because its growth plateaus as it reaches its potential size. The timing of grazing SLP is further complicated by the change in quality and quantity of the pasture understory. For example, if the understory is not grazed at all during the growing season it will end with a lower quality.

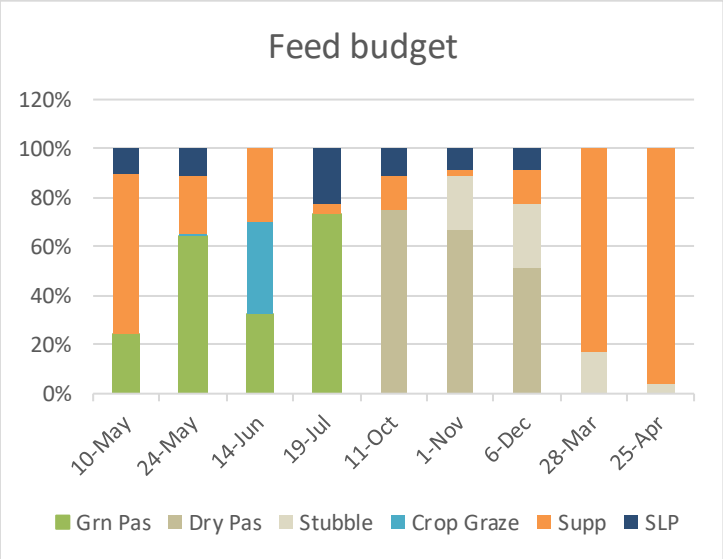

Figure 4: visual representation of the optimal livestock feed budget for the 'typical' farm.

Analysis part B: Economic value of SLP in multiple scenarios

Across the region the spread of dryland salinity is an issue for many farmers, although the presence or imminence of salinity does vary spatially. To reflect the change in soil types, and the likely variation in the value of SLP between farms, the following section evaluates the profitability of SLP for each of the farms involved in the project. The reader can then select the scenario that most closely aligns to them.

Farm 1:

Farm 1 is a mixed farm running 70% crop with a self-replacing merino flock, mating surplus ewes to terminal sires. The soil plan of the farm is described below. 50 ha of SLP was established on farm 1 resulting in extra $7165 whole farm profit ($143/SLP ha).

	Area (ha)
Deep pale sand	1000
Deep yellow sand	300
Yellow gradational loamy sand	650
Rocky red brown loamy sand/sandy loam; Brownish grey granitic loamy sand	600
Red brown sandy loam over clay; Red clay valley floor; Grey clay valley floor	150
Saline	50

Farm 2:

Farm 2 is a mixed farm running 65% crop with a self-replacing merino flock. The soil plan of the farm is described below. Farm 2 doesn't have any saline soil so the value of the SLP was significantly reduced however it was still profitable. 30 ha of SLP was established on farm 2 resulting in extra $1475 whole farm profit ($49/SLP ha).

	Area (ha)
Deep pale sand	75
Rocky red brown loamy sand/sandy loam; Brownish grey granitic loamy sand	2175
Red brown sandy loam over clay; Red clay valley floor; Grey clay valley floor	450
Loamy sand over clay	300

Farm 3:

Farm 3 is a mixed farm running 70% crop with a self-replacing merino flock. The soil plan of the farm is described below. 15 ha of SLP was established on farm 3 resulting in extra $2500 whole farm profit ($166/SLP ha).

	Area (ha)
Deep yellow sand	390
Sandy loam over clay	195
Red brown sandy loam over clay; Red clay valley floor; Grey clay valley floor	1300
Saline	325

Conclusion

Every farm is different so the results in this analysis are only a guide.

Is SLP profitable? Yes, however the profitability ranges significantly ($50/ha to $166/ha) based on soil type, area planted, stocking rate and other management factors.

How much should I grow? This depends on a number of factors including farm soil type. The area of SLP established on the farms involved in this project varied from 15 – 50ha and all cases were profitable with some farmers indicating they would like to plant more.

What variety should I grow? This analysis didn't specifically examine different varieties of saltbush. However, due to the variation in characteristics between varieties, it is expected that different varieties of saltbush will suit different feed niches. Anameka is a more expensive saltbush variety that comes with greater palatability and nutritional value. Due to its relatively high palatability experts recommend that if using Anameka it should be planted in a monoculture. Other varieties, however, can be mixed which increases diversity and provides a mix of benefits. Experts also noted that Anameka is not recommended to be planted on waterlogged soil or highly saline soils.

Is it profitable to grow SLP on non-saline soils? SLP provides great benefit on saline soils because the saltbush grows better on saline soils and also because the saltbush increases the pasture production. However, it was still profitable to establish a small amount of SLP on poorer non-arable soils. With that

said, the general recommendation would be to focus SLP establishment to saline soils.

Do I need to change any other management areas to get the most out of my SLP? Yes. To maximise the benefits of SLP stock numbers and stocking rate should be slightly increased.

Caveats:

This analysis was part of a small producer demonstration project and therefore had limited resources. As such, the economic analysis has not considered the full array of saltbush scenarios/options. Additionally, many of the saltbush production parameters, used in this analysis, were sourced from earlier work (O'Connell *et al* 2005) and thus may not be 100% accurate.

This is an exciting area with the potential for a more comprehensive analysis. If a larger project was ever funded, it should consider the following:

- Revisit the saltbush production parameters for different saltbush varieties
    - Growth during the year
    - Quality (digestibility of organic dry matter) during the year
- Revisit the impact of establishing saltbushes on the quality and quantity of interrow pasture
- Examine diet selectivity of stock grazing salt land pastures throughout the year.
- Examine how different saltbush varieties can fill different niches in the farm system
- Examine the value of salt land pastures in different seasons. Saltbush is drought tolerant and is therefore likely to added value in poor seasons.
- Examine the benefits of saltbush as a source of shelter for livestock.
- Examine the effects of saltbush on wool production.

Acknowledgements

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