

The Economic Value of Fencing and Improving Saline Land

A supplementary analysis to the Economics Theme of the SGSL project

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Introduction

The Economics Theme of the Sustainable Grazing on Saline Land Program completed comprehensive analyses to examine the influence of a range of key production and economic variables on the profitability of pasture improvement on saline land. There were four study regions as part of this project, based in the local of research sites of the SGSL Program. These were South West Victoria, Upper South East of South Australia, the Central Wheatbelt of Western Australia and the Central West Slopes of NSW. The economic analyses for each region examined the benefits of introducing improved pasture species and applying different management treatments to saltland. The effect of changing production assumptions and commodity prices on the profitability of saltland pasture were assessed. Estimates of production and pasture quality were based on experiments conducted on 6 sites in 4 States, which compared production from sown pastures to a control. The control was assumed to be saltland that was fenced and left to regenerate with volunteer species.

Whilst improving pasture on salt affected land was found to be profitable across a broad range of scenarios, an important finding of the analysis was that the increase in profit was generally achieved by increasing the intensity of production. This has potential implications for adoption of improved saltland pastures and consequently for extension.

In addition, the NSW analysis showed that better managing volunteer pasture by fencing led to greater a net benefit compared to improving pasture through cultivation and sowing. This was an important finding given the differences in cost and the the potential for establishment failure after sowing.

This supplementary analysis was commissioned to estimate the net benefit of fencing saltland to better manage volunteer pasture compared to doing nothing, for the three study regions for which this comparison was not undertaken.

Methods

There were four study regions as part of this project, based in the locale of research sites of the SGSL Program. These were South West Victoria, the Upper South East of South Australia, the Central Wheatbelt of Western Australia and the Central West Slopes of NSW.

The analysis compares unfenced saltland pasture with ‘fenced only’ pasture (Treatment 1), which enables grazing to be better controlled and allows volunteer pasture to regenerate. For all sites it was assumed that there is no grazing available from unfenced saltland.

The results of the previous study were included in this report for the sake of comparison. Treatment 2 is improved pasture (fencing and sowing). Whilst there were a range of difference treatments examined in the initial study those reported here for Treatment 2 show the benefits of the most production option from each site (eg Class 1 land in Victoria and P&B in SA, Table 1). The specific nature of Treatment 2 was different for each site due to differences in the range of suitable species for the different environments, the state of knowledge of production from saltland pastures and the interests of farmers in the region. A summary is shown in Table 1.

The effect of changing pasture production, pasture quality and area of saltland are examined for each treatment in each region.

Table 1: Overview of pasture production assumptions for farm models in each of the study regions.

| | WA | Victoria | SA | NSW |
|-------------------------------------|-------------------------------------|------------------------------------|---------------------------|---|
| Farm size (ha) | 2000 | 700 | 2000 | 900 |
| Area of saltland (ha) | 200 | 50 | 800 | 20 |
| Salinity Stress Index | moderate | low (class 1) & moderate (class 2) | low | moderate |
| Production system | crop-livestock | livestock | livestock | crop-livestock |
| Improved saltland pasture | saltbush & mixed annual understorey | tall wheat grass | puccinellea & balansa | tall wheat grass, mixed annual |
| Other pastures | mixed annual, lucerne | perennial rye, mixed annual | tall wheat grass, lucerne | perennial rye & mixed annual, phalaris, lucerne |
| Fencing cost | \$150/ha | \$420/ha | \$150/ha | \$420/ha |
| Saltland pasture establishment cost | \$300/ha | \$350/ha | \$250/ha | \$570/ha |
| Life of saltland pasture (years) | 20 years | 20 years | 15 years | 15 years |

The MIDAS (Model of Integrated Dryland Agricultural System) mathematical programming model was used. MIDAS is a steady-state, whole-farm, mathematical programming optimisation model that describes the physical, technical, biological and managerial aspects of typical broadacre farming systems within a defined region. The model allocates available resources in order to maximise the objective function of whole-farm profit, subject to resource, environmental and managerial constraints. A version of MIDAS for each region was used.

A full description of the study regions, whole-farm model and production assumptions can be found in the Economics Theme report.

Results

At assumed levels of production fencing off saltland is profitable in all regions. In WA the benefit of fencing is low, \$15/ha, compared with \$90/ha in NSW, \$59/ha in SA and \$127/ha in Victoria (Figures 1a-d).

In NSW and SA the marginal increase in profit from fencing (Treatment 1) is higher than the marginal increase in profit from pasture improvement (Treatment 2). (NB. The marginal increase in profit for treatment 2 is the difference in whole farm profit between Treatment 2 and Treatment 1). This is an important result as ‘fencing only’ provides a cheaper option for management, with less risk of establishment failure, and large potential benefits. In WA the increase in profit from fencing is much less than the subsequent increase from pasture improvement. The reason for this is that in Western Australia pasture improvement involves planting saltbush which enables the growth of considerably more annual pasture. In Victoria, the increase in profit from fencing is only half that of the subsequent increase from pasture improvement, however at more than \$100/ha it still offers a financially attractive option.

In the Western Australian analysis, Treatment 1 increases profit by reducing the requirement for supplementary feed by 4 kg/DSE (dry sheep equivalent). Treatment 2 increases profit by allowing the stocking rate to be increased. This is done through a reduction of pasture area as well as an increase in sheep numbers; therefore part of the profit is attributable to increased crop production.

In the NSW analysis the stocking rate, pasture area and rate of supplementary grain feeding did not change significantly as a result of Treatment 1 or 2. The economic benefit of the treatments was simply a consequence of being able to add more livestock to the farm enterprise with more pasture now available.

In South Australia the change in the livestock system and increase in profit is similar for both Treatment 1 and Treatment 2 (P&B). For both treatments there is an increase in stocking rate of 1.5 DSE/ha and a reduction in supplementary feed of 2 kg/DSE.

In Victoria, treatment 1 increases profit by increasing stocking rate by 0.5 DSE per hectare across the whole farm, while supplementary feed is unchanged. Treatment 2 results in a simultaneous increase in stocking rate and decrease in supplementary feed, hence the larger change in profit from this treatment.

Pasture growth rate

The production of fenced pasture dictates the net benefit of installing the fence (Figures 4a-d, Treatment 1). In WA, where the benefit is not high, a decrease in production of just 10% is enough to reduce the benefit to less than \$1/ha. In SA a reduction of 35% in relative production, decreases the net benefit to around \$30/ha (Figure 4c), whereas a 45% reduction in growth in NSW would lead to a similar benefit (by extrapolating Treatment 1 curve in Figure 4d). The Victorian site is more sensitive; a decrease in production of 10% more than halves the benefit of fencing (Figure 4b).

Reductions in the growth rate of improved saltland pasture led to proportionally greater reductions in benefits of improved pastures on all sites. For NSW and SA a reduction of only 10% in assumed growth rate of pasture reduces the benefits of improving saltland pasture to less than \$30 per hectare. For the WA site benefits are decreased to \$30 when relative production is reduced by 20%.

Area of saltland

The effect of area of saltland pasture on the profitability of fencing (Treatment 1) was minimal for the WA and Victorian analyses but more significant in SA and NSW (Figures 7a-d). For SA and NSW as the proportion of the farm affected by salt increases, the net benefit of fencing decreases. Examination of the results show that the grain fed per DSE increases in autumn as the area of saltland pasture increases. As previously indicated the benefits of saltland result from increasing the number of livestock. However higher rates of grain feeding lead to higher input costs, leading to a decline in the net benefit per as the area of saltland increases.

In WA the fenced pasture is of little additional value and does not alter the grazing patterns on the farm. The changes in stocking rate and supplementary feed are minor and therefore the net benefit of fencing remains proportional to the area of saltland. When pasture is improved the net benefit declines with increasing areas of saltland, for the same reasons outlined for Treatment 1 of the SA and NSW sites.

The net benefit of improved pasture on the Victorian site also declines with increasing areas of saltland for the same reasons stated above.

In contrast, when pasture is improved (Treatment 2) the net benefit increases as area increases, on the SA and NSW sites. This was an unexpected result because saltland pasture does not provide a uniform increase in the supply of feed throughout the year. It was anticipated that as the area of saltland increases a feed shortage would be created during periods when saltland pasture is in low supply. However the feed profile over autumn and winter is sufficiently improved on these two sites that stocking rate can be increased on the whole farm to a greater extent compared to Treatment 1, without significantly increasing grain feeding per DSE. It is important to note that as area of saltland increases whole farm profit declines, even though the benefit of pasture improvement increases.

Pasture quality

In both WA and SA Treatment 1 is much less sensitive to changes in pasture quality than Treatment 2. In SA a reduction in digestibility (%DMD) of 4 percentage points reduces benefit by only \$10/ha. In WA a reduction in digestibility (%DMD) of 4 percentage points reduces benefit by only \$2/ha. In contrast, when pasture is improved, these amounts change to \$40/ha and \$20/ha respectively.

The net benefit of Treatment 1 in NSW and Victoria is more sensitive to changes in pasture quality compared to the WA and SA sites. The difference in response between the states reflect production levels of Treatment 1 relative to the control and length (time) of the feed gap. The sites in eastern Australia are more productive, due to rainfall and soil quality, and the feed gaps during autumn are relatively short. Therefore stocking rate can be increased to a greater extent for a given area (proportion of the farm) of saltland, without significant changes to the level of supplementary feeding. Hence, it follows that reductions in quality will have a greater impact on the ability of farms to carry livestock which will lead, in turn, to a sharper decline in net benefit of fencing saltland.

A comparison of Treatments 1 and 2 on all sites but WA show that while profit is less sensitive to pasture quality for Treatment 1 it remains an important factor in the benefit achieved by the farmer.

Conclusions

This analysis indicates that the 'fence only' option offers the potential for large benefits for three of the sites assessed. In NSW and SA the marginal increase in profit from 'fence only' was higher than the marginal increase in profit from pasture improvement. There was a small benefit of the 'fence only' option for the WA site a however greater benefits arise from improving saltland with saltbush and understorey.

The results are significant because fencing without pasture improvement offers a cheaper option for management, with less risk of establishment failure. The main findings from the sensitivity analyses were:

- For all regions pasture quantity is a key determinant of profitability
- In WA and SA the economic benefit of fencing is relatively insensitive to pasture quality.
- Pasture quality is important for treatment 1 in Victoria and NSW.
- In WA a decrease in production of 10% erodes any benefit of fencing.
- In Victorian a decrease in production of 10% more than halves the benefit of the 'fence only' option.

- In NSW and SA a decrease in production of Treatment 1 to 45% and 35% respectively, decreases the net benefit of fencing to around \$30/ha. For both, a decrease of only 10% in assumed growth rate of improved saltland pasture (Treatment 2) reduces the benefits to less than \$30 per hectare.
- For treatment 2 in all states pasture quality is important.
- Fenced pasture is of limited value in filling the feed gap. As the area of saltland increases there is a greater requirement for grain feeding.
- In contrast, in NSW and SA, improved pasture provides more feed during autumn and winter which stocking rate to be increased without increasing the level (per DSE) of grain feeding.

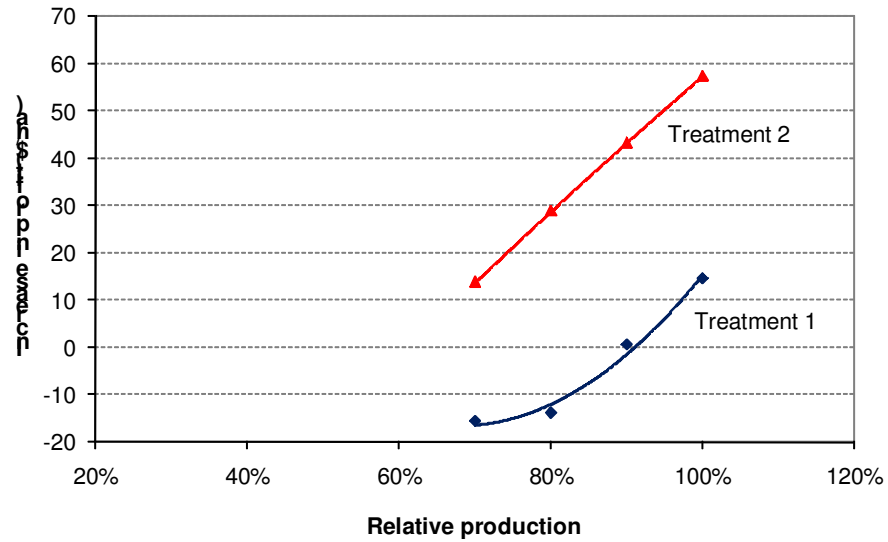


Figure 1a: Increase in profit per hectare from fencing (treat. 1) and improving (treat. 2) saltland at different production levels for Central Wheatbelt WA.

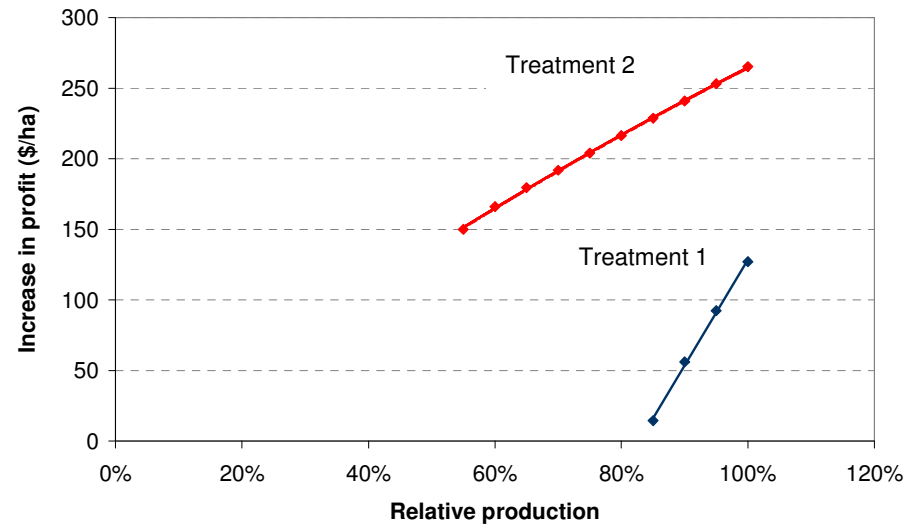


Figure 1b: Increase in profit per hectare from fencing (treat. 1) and improving (treat. 2) saltland at different production levels for South West Victoria.

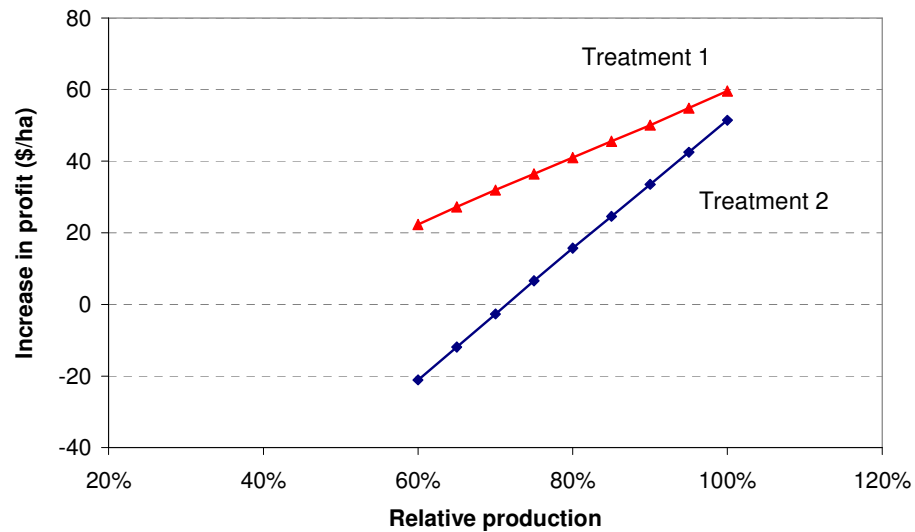


Figure 1c: Increase in profit per hectare from fencing (treat. 1) and improving (treat. 2) saltland at different production levels for Upper South East, SA.

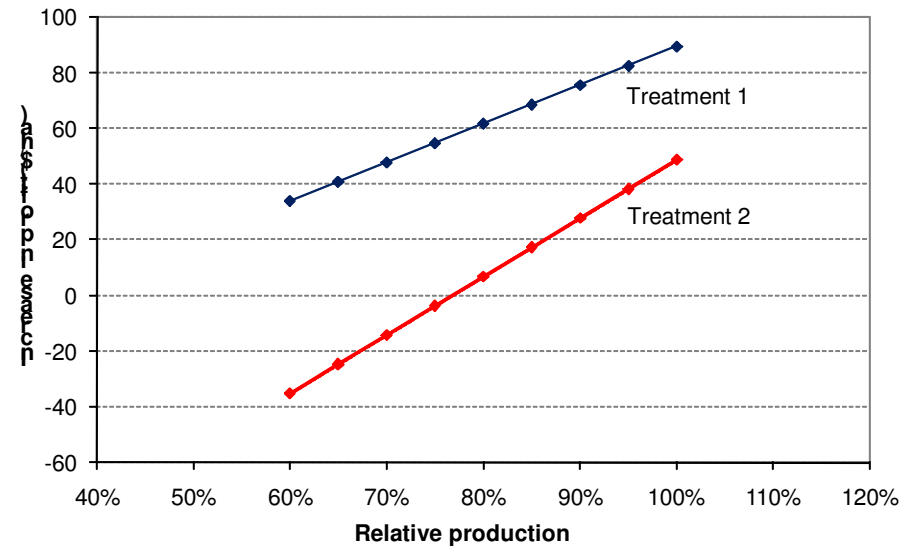


Figure 1d: Increase in profit per hectare from fencing (treat. 1) and improving (treat. 2) saltland at different production levels for Central West, NSW.

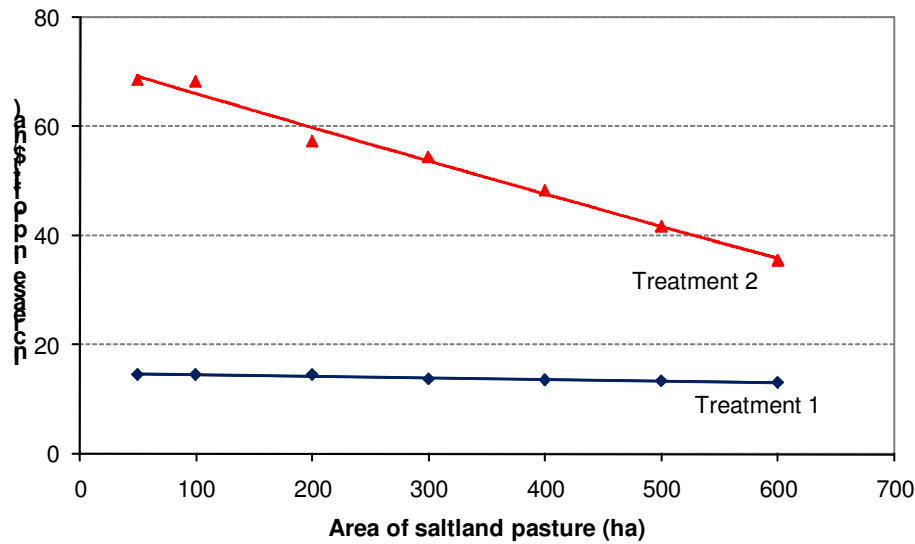


Figure 2a: Increase in profit per hectare from fencing (treat. 1) and improving (treat. 2) saltland at different areas of saltland for central wheatbelt WA.

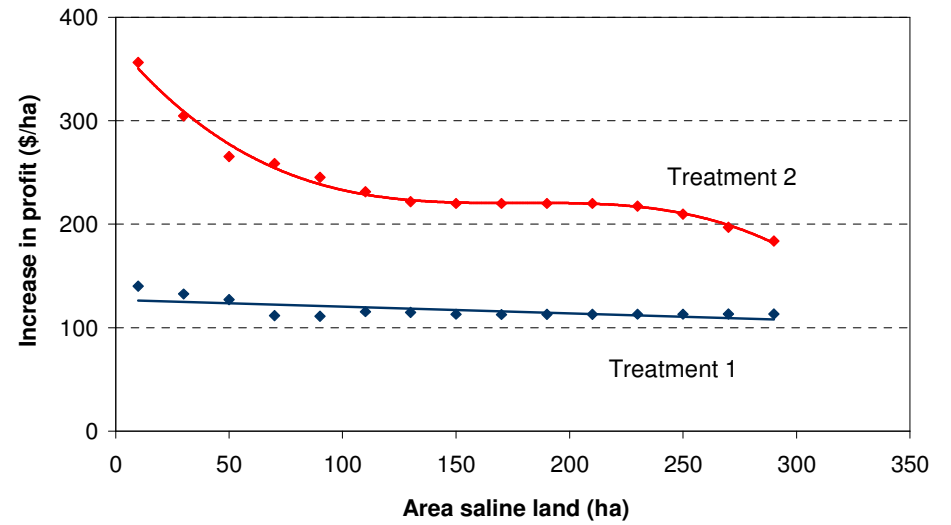


Figure 2b: Increase in profit per hectare from fencing (treat. 1) and improving (treat. 2) saltland at different areas of saltland for South West Victoria.

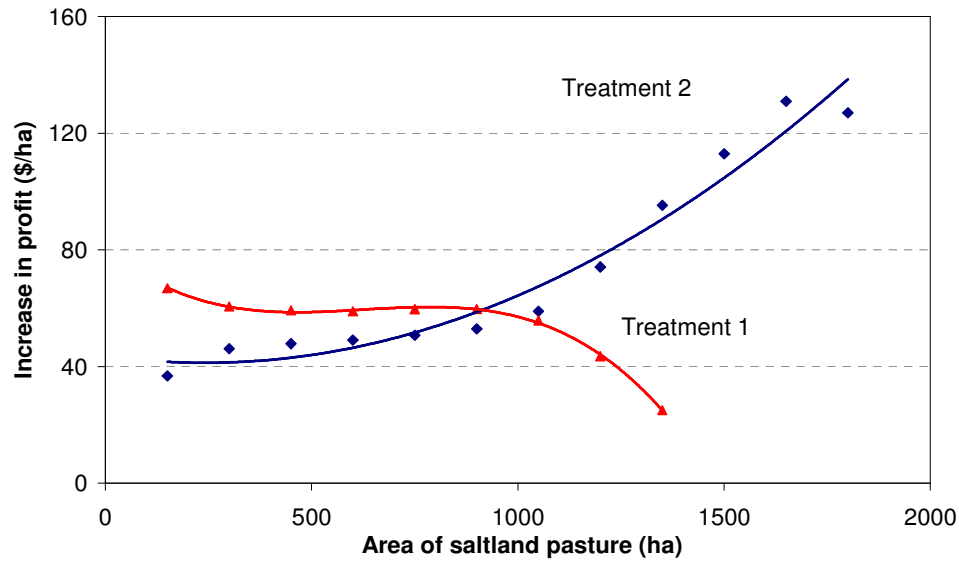


Figure 2c: Increase in profit per hectare from fencing (treat. 1) and improving (treat. 2) saltland at different areas of saltland for Upper South East, SA.

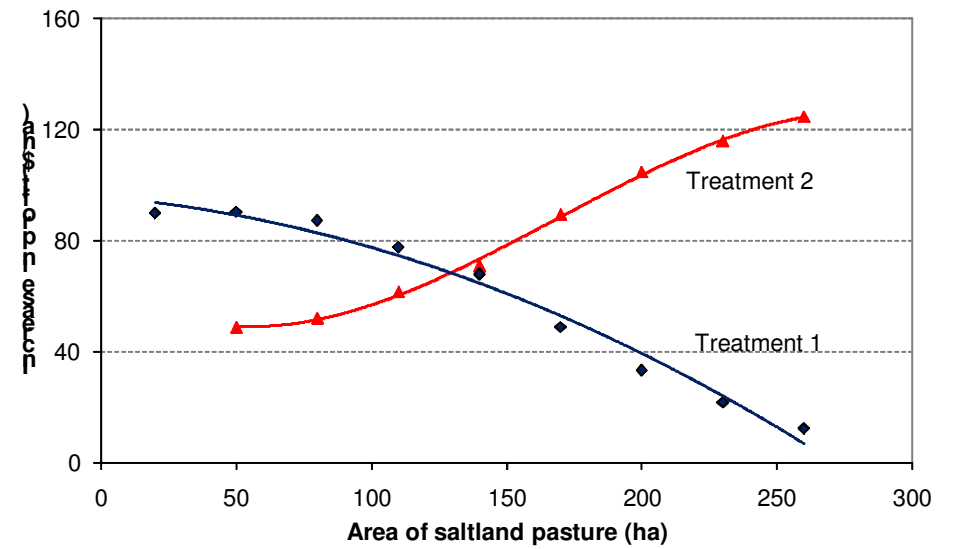


Figure 2d: Increase in profit per hectare from fencing (treat. 1) and improving (treat. 2) saltland at different areas of saltland for central west NSW.

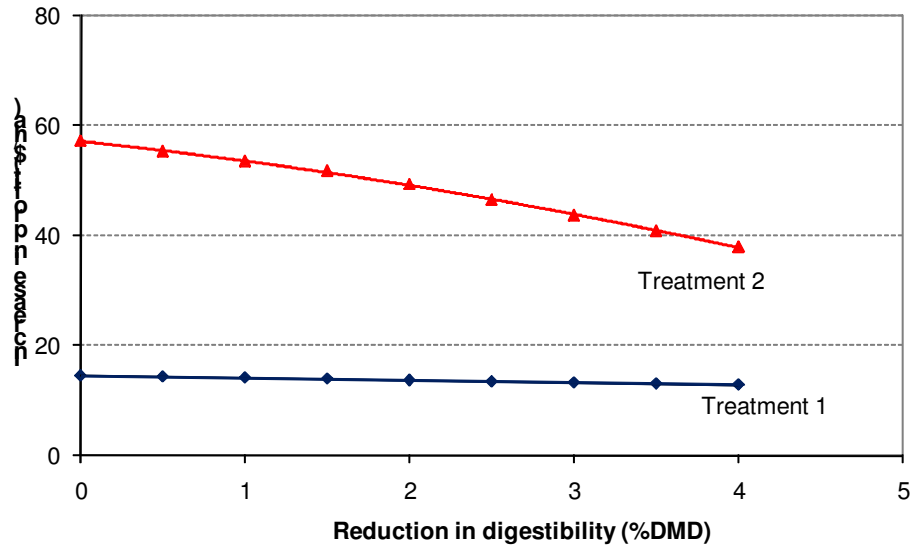


Figure 3a: Increase in profit per hectare from fencing (treat. 1) and improving (treat. 2) saltland at different pasture quality levels for central wheatbelt WA.

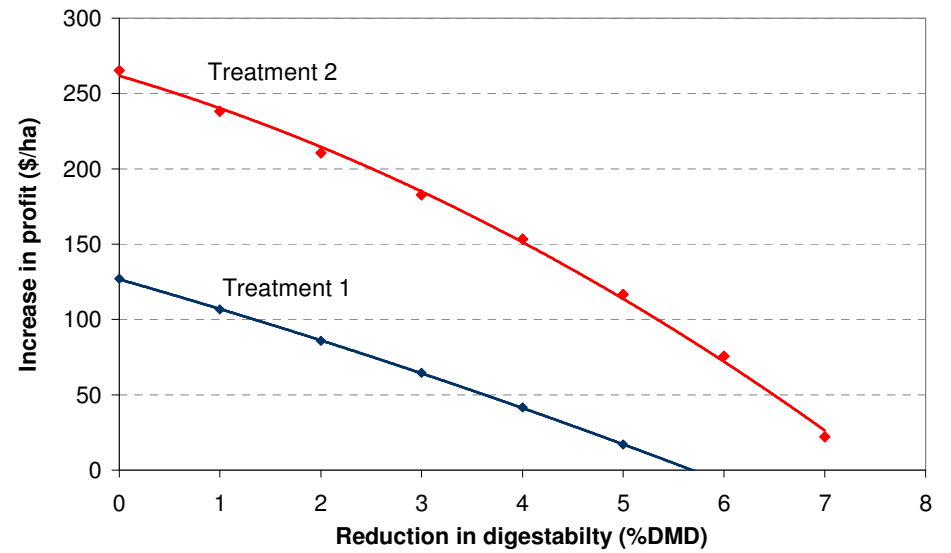


Figure 3b: Increase in profit per hectare from fencing (treat. 1) and improving (treat. 2) saltland at different pasture quality levels for South West Victoria.

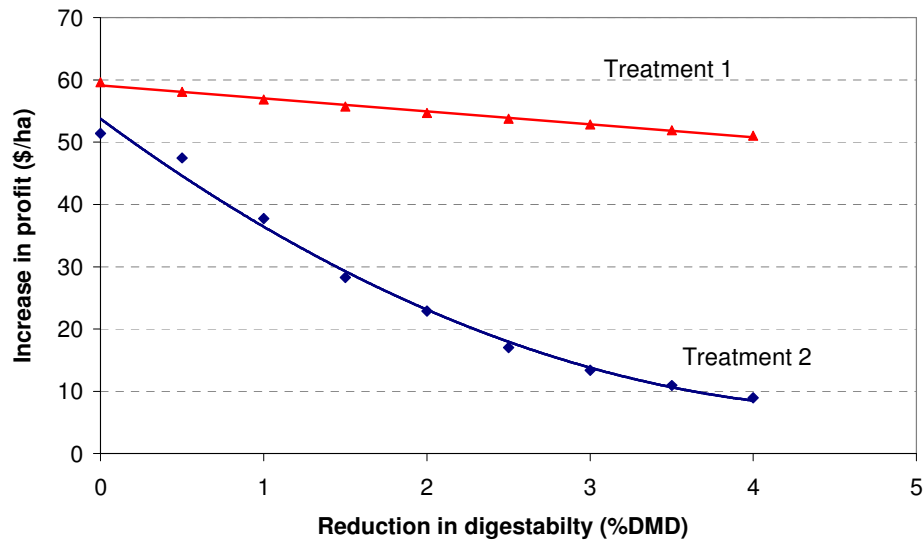


Figure 3c: Increase in profit per hectare from fencing (treat. 1) and improving (treat. 2) saltland at different pasture quality levels for Upper South East, SA.

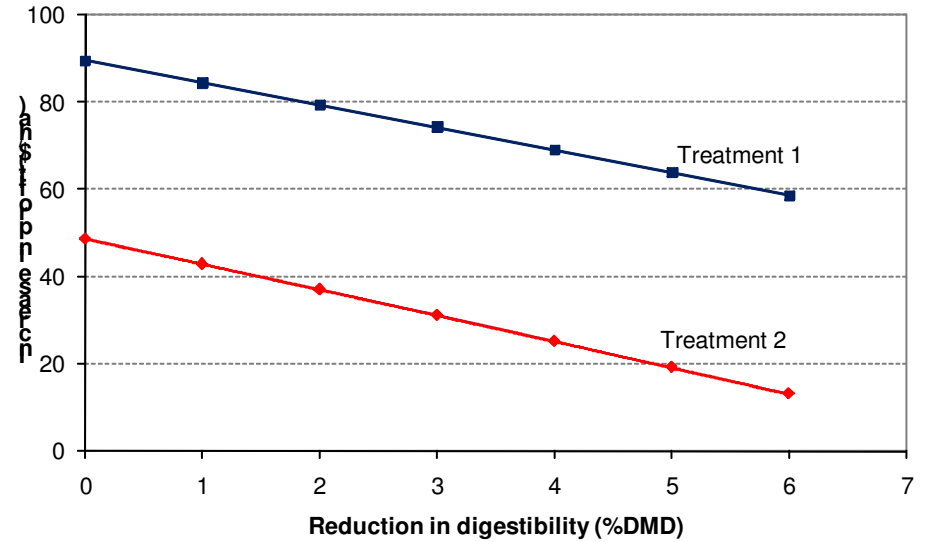


Figure 3d: Increase in profit per hectare from fencing (treat. 1) and improving (treat. 2) saltland at different pasture quality levels for central west NSW.

