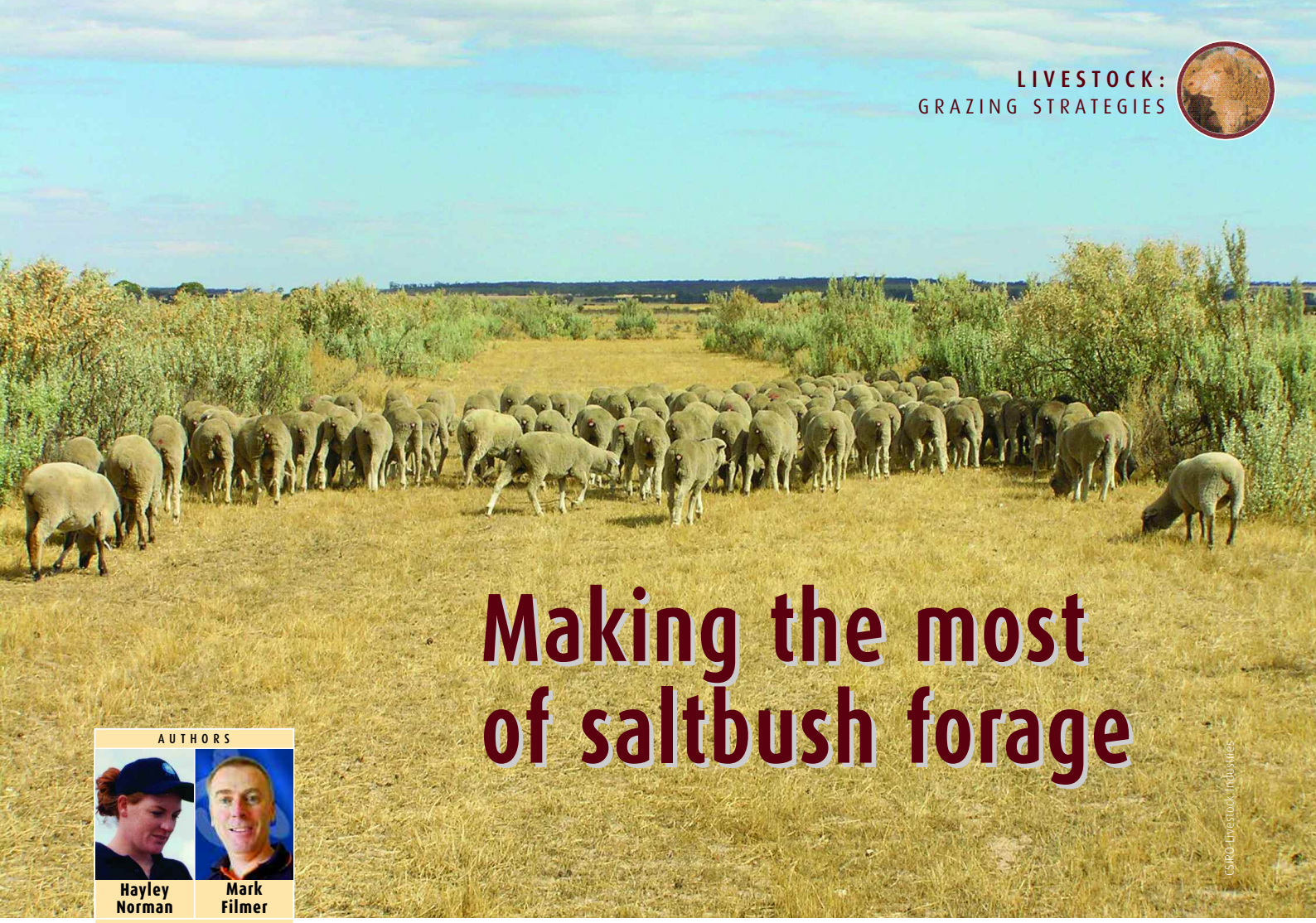

Making the most of saltbush forage

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for CSIRO LIVESTOCK INDUSTRIES

Saltbush alternative: *Researchers have completed a detailed study of two species of saltbush and the performance of livestock grazing these species.*

Old man and river saltbushes are grown as forage crops in many grazing enterprises, particularly in south-western Australia. Researchers from CSIRO and the Future Farm Industries Cooperative Research Centre have completed a three-year study aimed at improving the profitability of saltbush-based pastures. As part of this project they have carried out a detailed comparison of the two plant species, examining factors such as their nutritional value and the impact they have on various aspects of livestock performance.

At a glance

- The sheep grazing the old man saltbush plots were heavier at the end of the grazing than sheep from river saltbush plots.
- Saltbush species was significantly associated with daily weight change and wool growth.
- The sheep that were given a grain supplement lost less weight and condition and grew more wool than sheep that were not given a supplement. Provision of straw or low quality hay did not improve animal performance.
- Differences in performance between sheep grazing the two saltbush species are likely to be associated with differences in the nutritive value of the shrubs or voluntary feed intake.

The practice adopted by many producers of feeding sheep saltbush with adjacent crop stubbles is unlikely to be beneficial once the fallen grain has been consumed.

CSIRO Livestock Industries researchers have found that complementarity between saltbush and crop stubbles, although possible in an animal house where sheep have few feed choices, is likely only while spilled grain is available and so might not be viable in extensive grazing systems.

Supplements high in energy are more likely to be consumed by sheep grazing saltbush than roughage supplements.

The study has identified important differences in the effects various saltbush and supplement combinations have on livestock performance and farmers who have saltbush pastures will be able to use these findings to help improve the profitability of their grazing enterprises.

Background to the study

Old man saltbush *(Atriplex nummularia)* and river saltbush *(Atriplex amnicola)* species are planted extensively on many farms with saline land in south-western Australia. The two species are used interchangeably on these farms but river saltbush is thought to have greater waterlogging tolerance than old man saltbush.

Supplements high in energy are more likely to be consumed by sheep grazing saltbush than roughage supplements.

Saltbush provides green feed, with high levels of crude protein and vitamin E, for sheep during autumn when annual pastures are dead and of poor nutritional value. Being both perennial and active through summer and autumn, saltbushes can potentially minimise the leakage of rainwater into the water table and so reduce the effects of dryland salinity.

Although saltbushes provide a range of nutrients that are often lacking in annual pastures during autumn, salt accumulation

in saltbush leaves (up to 25 per cent of dry matter) restricts herbage intake by most classes of livestock to levels below their maintenance requirement.

Supplements are therefore required if a low-salt understorey of annual grasses and legumes is not amongst the saltbushes. Many researchers, producers and farm advisors believe that high-fibre supplements such as straw or crop stubbles might complement the diet of animals grazing saltbush.

The aim of this three-year study was to explore the relative value of grain, straw and hay supplements to weaner Merinos grazing either old man or river saltbushes.

Limited studies of saltbushes

Although old man and river saltbushes are two of the most commonly planted species in Australia, there have been only a few studies comparing their nutritional value (the animal production response per unit of feed intake). No detailed studies have been carried out comparing the plants' biomass production or feeding value, which is determined by the nutritional value and factors influencing voluntary intake, such as feeding behaviour and bite mass.

CSIRO researchers carry out study

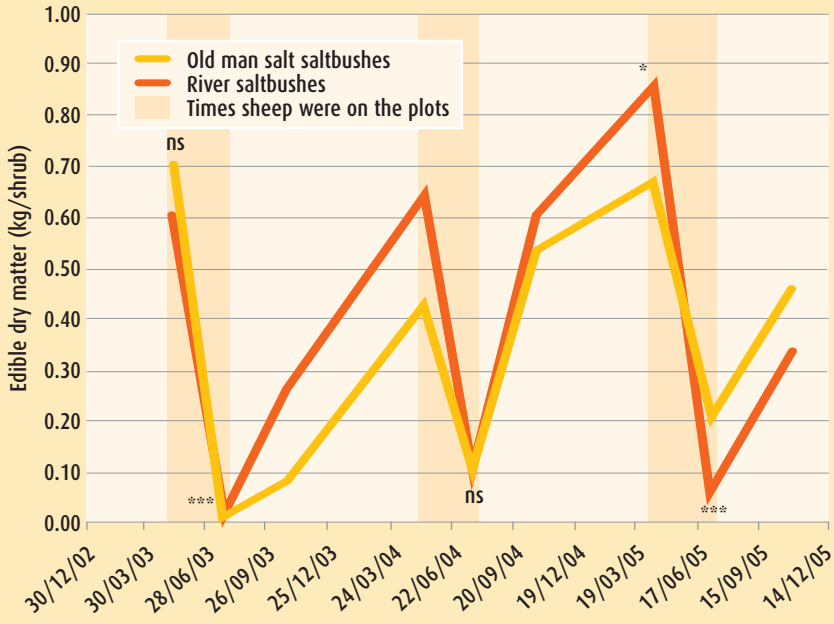
CSIRO Livestock Industries researchers carried out a detailed study of the two saltbush species, focussing on their nutritional value and their impact on various aspects of livestock performance. The research project was part of a Sustainable Grazing on Saline Lands Project funded by Land, Water and Wool.

The researchers examined whether sheep grazing river saltbush performed better (measured by liveweight change and wool growth) than sheep grazing old man saltbush.

They also examined supplementation strategies for sheep grazing saltbush-dominant pastures and tested whether feeding supplements to sheep grazing saltbush during autumn would help reduce weight loss and increase wool growth.

The study also sought to establish whether there were any differences in liveweight or wool growth in response to supplementation with grain or roughage when the quantity of supplement provided about 30% of an animal's daily metabolisable energy requirement. (Metabolisable energy is the energy from feed that can be used for animal production).

FIGURE 1 Edible dry matter of saltbush plants in Yealering trials*



* Mean edible dry matter per shrub for old man and river saltbushes growing on saline land at Yealering, Western Australia, and grazed each autumn.

Source: CSIRO Livestock Industries. Illustration: Kondinin Group.

The trial site

The study was carried out at Yealering, Western Australia, on a site with gravely sandy loam soils and marginal surface salinity (average of 3.2 dS/m ECe). The groundwater was moderately saline (15.8 dS/m ECe) and had an average depth of one metre below the soil surface.

The site featured a dense stand of saltbushes (that had been planted as seedlings) and very little annual understorey growth, partly attributable to a shallow water table. Sixteen 0.75 hectare plots of 11-year-old saltbushes (eight plots of each saltbush variety) were fenced during March 2003.

The aim of this three-year study was to explore the relative value of grain, straw and hay supplements to weaner Merinos grazing either old man or river saltbushes.

Grazing of trial plots

Grazing with weaner Merino sheep (13 sheep/ha during 2003 and eight sheep/ha during 2004 and 2005) started during autumn each year and continued into early winter. During 2003 and 2004 all animals were wethers and during 2005 wethers and ewes grazed the plots with an equal distribution of sexes in each plot.

Liveweight and condition score were monitored every 7–14 days for the duration of grazing. Each year, all sheep were removed from the plots on the same day —

CSIRO Livestock Industries

River saltbush: *It was believed that livestock grazing river saltbushes (above) would perform better than those grazing old man saltbushes but the opposite proved true.*

when most saltbushes had been defoliated to less than 60 grams of edible dry matter per shrub or when sheep were losing significant weight.

Wool growth per day was measured and midside samples were collected at shearing to measure strength and fibre diameter.

Saltbush and understorey biomass

At the start of the experiment, the old man saltbush plots contained 931 shrubs/ha and the river saltbush plots had 866 shrubs/ha. Saltbush biomass each autumn, before grazing, ranged from 400–700 kilograms of edible dry matter/ha.

During 2003, there was significantly more old man saltbush when grazing started. In contrast, there was significantly more river saltbush during autumn 2004 and 2005. Across species, saltbushes rarely grew more than 700g of edible dry matter/shrub/year (see Figure 1).

The volunteer understorey produced about 1.7 tonnes of dry matter/ha/year (measured at peak biomass during spring). Biomass during autumn, before grazing, did not exceed 500kg of dry matter/ha. In total, the plots provided about 1.0t dry matter/ha each autumn.

The researchers examined whether sheep grazing river saltbush performed better than sheep grazing old man saltbush.

Twenty-two plant species were regularly identified in the plots. Species that provided the most biomass during autumn included the saltbushes (48–72% of total edible biomass) and senesced annual grasses.

Grain, straw and hay offered

Three supplements were offered during this study: barley grain, cereal straw or low quality cereal hay, at a rate of about one-third the daily maintenance energy requirements of the sheep.

For each saltbush species, sheep in two or four of the eight plots did not receive any supplement and sheep in the remaining plots were given a supplement of either cereal straw (two or three plots at 350g/head/day) or barley grain (three plots at 175g/head/day) three times a week. The cereal straw was barley during 2003 and wheat during 2004. During 2005, the straw treatment was replaced by low quality oaten hay (organic matter digestibility of 55%), offered to animals at a third of their maintenance energy requirement (330g/head/day).

Animal production during the three years

In total, the plots maintained sheep for 650 (during 2003), 496 (2004) and 584 (2005) grazing days per hectare of saltbush during the autumn/winter grazing period. Year of grazing also had a significant impact on liveweight change, change in body condition score and wool growth.

CSIRO Land and Water

Green feed: *Sheep grazing old man saltbush (above) gained more weight than those grazing river saltbush plants. This old man saltbush stand is planted on the trial site at Yealering, WA.*

Saltbush species and sheep performance

Across the three experimental years, sheep grazing old man saltbush lost significantly less live weight than sheep grazing river saltbush (-24g compared with -39.5g/day). The sheep grazing old man saltbush also grew 6% more clean wool than sheep grazing river saltbush. Species of saltbush was not associated with changes in body condition score.

The inferior performance of sheep grazing river saltbush was not related to the quantity of edible saltbush or understorey biomass on offer. Differences in performance between sheep grazing the saltbush species are more likely to be associated with differences in the nutritive value of the shrubs or voluntary feed intake.

Laboratory analyses suggest that the old man saltbush had a higher digestibility value than river saltbush, a lower concentration of fibre and a higher concentration of crude protein. The old man saltbushes also had higher levels of salt in the leaves. These differences are consistent with previous experiments at another saline site at Tammin, WA.

Effect of supplements

Provision of a supplement (amounting to one-third of the animal's energy requirement for maintenance) led to less liveweight and body condition losses and a greater rate of wool growth.

In contrast to the researchers' expectations, there were no differences in liveweight, body condition score or wool growth between sheep fed the roughage supplement compared with sheep that were not given any supplements.

This finding suggests that the complementarity between saltbush and poor quality roughage that has been demonstrated in a number of animal house studies is not transferable to paddock scale grazing. During the animal house studies the sheep were fed a pre-determined mixture, whereas in a paddock animals have the option to chose their own diet and might not choose to eat the roughage.

It is also possible that the small quantity of poor quality understorey provided a similar benefit to the poor quality roughage supplement. Better quality hay is likely to provide complementarity with saltbush as it will be more attractive to the animals.

Only the grain supplements produced a positive response in terms of liveweight, condition or wool growth. Sheep fed the grain supplement had significantly higher liveweights; higher body condition scores and grew 5% more wool than sheep offered the roughage supplement.

Overall, the sheep given grain lost an average of 19g of liveweight/day, sheep without supplements lost 32.8g/day and sheep given a roughage supplement lost 42.7g/day.

The same relationship was observed for body condition score where sheep given the grain supplement had higher body condition scores than sheep not given supplements; sheep given the roughage supplement had the lowest condition scores.

Wool production also followed the same pattern; the sheep given grain grew on average 10.9g of clean wool/day, sheep without a supplement grew 10.5g of clean wool/day and sheep given the roughage supplement grew 9.6g of clean wool/day.

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