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Improving sheep nutrition through assessment of regional feedbase deficiencies

Author: Hamish Dickson
AgriPartner Consulting
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Key Messages

- Whilst broad trends such as the energy and protein content of pastures being highest during the early growth phase and declining as the plant matures remain true, significant differences were observed between species.
- During winter sampling the energy content of pastures was highest, however species such as canola, vetch, barley and oats had the highest energy content, while pastures such as veldt grass and regenerating pasture were the lowest at that time
- Canola had the highest energy content at 13.6MJ/kg DM, while veldt grass was the lowest at 10MJ/kg DM.
- Crude protein content of the pastures during winter varied considerably with cereals being significantly lower than legume species.
- The mineral content of pastures also varied significantly and provides useful results to inform on-farm decision making.
- Results have shown that minerals such as calcium were largely adequate, particularly in non-cereal species, however the oats and barley samples showed some deficiencies.
- Results from these analyses have shown that the majority of samples in the Mallee were adequate for both selenium and cobalt, representing a possible significant saving in operational costs for producers using large quantities of these supplements.
- The next year of sampling will provide an important comparative dataset to assess variance across years for the same species

Background

The low rainfall Mallee of New South Wales, Victoria and South Australia covers an area of approximately seven million hectares and is an important livestock and wool-growing area of Australia. Farmers in this region have identified that improving their understanding of the nutritive value of pastures in this environment can allow them to better manage their livestock and farm resources.

This project aims to achieve the following objectives:

- Identify the nutritional value and mineral content of a range of Mallee pastures and grazing crops including the variance between seasons over two years.
- Develop a dataset of the nutritional value and mineral content of low rainfall pastures for use by producers and industry.
- Increase producer confidence and decision-making ability in relation to sheep management through the development of region-specific feed base resources.
- Conduct grower events at the end of the project to extend results, and promote ongoing learning to growers through Lifetime Ewe training.

About the trial

Various pasture and crop types were selected for sampling and aimed to represent species which were relevant to the Mallee region and timely in respect to levels of interest from producers. Six of the most relevant and common pasture or grazing crop species were selected to be sampled each season. An additional five species were selected to be sampled twice per year representing more strategic analysis of species that are used less commonly or that may be used especially in a failed crop season.

The six 'core' sample species were:

1. Barley
2. Lucerne
3. Peas
4. Veldt
5. Vetch
6. Regenerating natural pasture (medic base)

The five 'strategic' sample species were:

1. Canola
2. Lentils
3. Oats
4. Serradella
5. Studenica vetch

Some pasture samples were collected from commercial farming properties, however the majority were collected from existing research and development sites across the Mallee. Table 1 shows the location and type of site for each sample species collected in the project.

Pasture/Crop	Location	Site type
Vetch	Werrimull, VIC	Pulse R&D
Barley	Speed, VIC	Cereal R&D
Oats	Speed, VIC	Commercial farm
Serradella	Piangil, VIC	Pasture R&D
Canola	Speed, VIC	Brassica R&D
Peas	Werrimull, VIC	Pulse R&D
Regenerating pasture	Piangil, VIC	Pasture R&D
Veldt	Patchewollock, VIC	Commercial farm
Lucerne	Speed, VIC	Hill seep R&D
Lentils	Werrimull, VIC	Pulse R&D
Studenica vetch	Koolonong, VIC	Vetch evaluation

Table 1 - Sampling location and site type for each pasture or crop.

Due to the start date of the project, sampling started in winter 2020, with successive samples collected in spring and summer to complete the growing season.

2021 growing season samples will be collected in autumn as the start of the growing season, continuing until summer as the end of the growing season/cycle.

Samples were collected by cutting plant material from each sample location using shears. The sample material was representative of the whole plant. Care was taken to avoid excessive soil material in the samples which could affect mineral analyses. The harvested material was immediately dried in a laboratory oven and subsequently sent to Feedtest laboratory (Werribee VIC) for nutritive value and mineral content analysis.

Results & Discussion

The laboratory analyses of the pasture and crop samples submitted showed the nutritive value across the season declined as the plants matured and became senescent. This can be seen in Figure 1 as the energy and protein content declined from fresh winter growth to senescent dry summer feed.

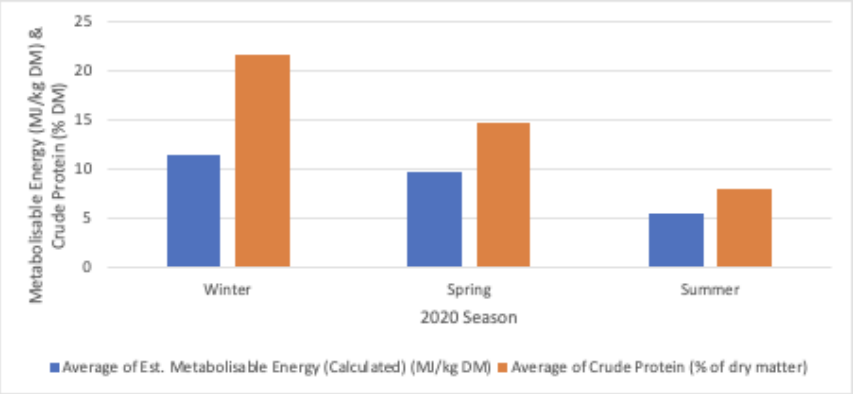

Figure 1 - Average metabolisable energy and crude protein content of all samples combined for each season.

The metabolisable energy content of the samples generally showed the same trend of declining from winter to summer across each individual species, however the level of decline varied between species (Figure 2). For example, vetch significantly declined from winter to summer, whilst lucerne was more stable in feed quality throughout the season.

The highest energy content species in winter included canola, vetch, barley and oats. The lowest energy content species included veldt grass and natural regenerating pasture.

Peas showed an increase in energy content from winter to spring and then declined significantly to summer as dry feed.

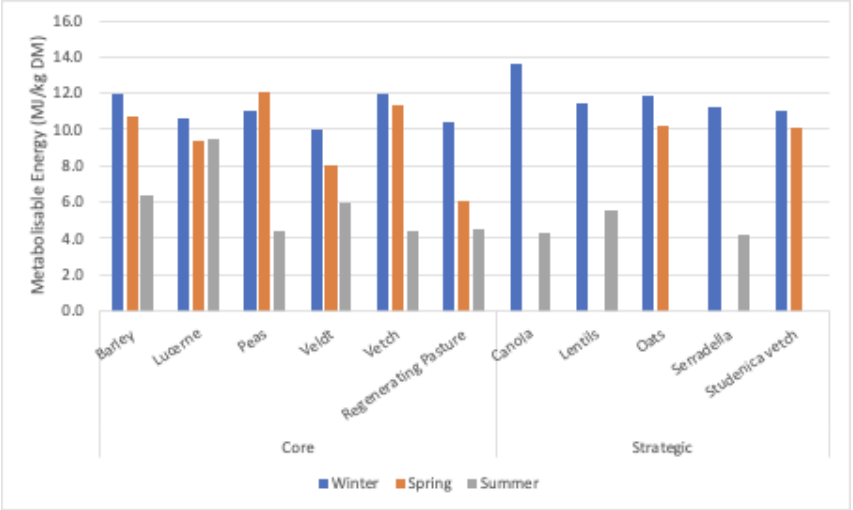

Figure 2 - Comparative metabolisable energy content of each species across seasons.

The crude protein content of different species again followed the trend of declining from winter to summer (Figure 3). In general, grass type species (barley, oats, veldt) showed lower protein content across all samples than compared to legume species (lucerne, peas, vetch).

Canola had the highest protein content of 30.3% in winter, while the barley summer sample had declined to less than 1% (not visible on graph below) to result in the lowest protein content of all species. Winter protein content of Studenica vetch was approximately 5% lower than core vetch sample.

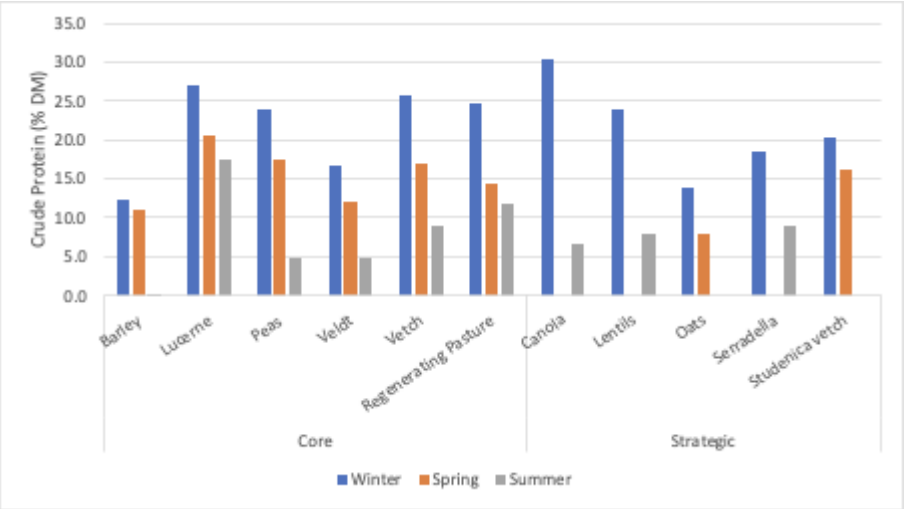

Figure 3 - Comparative crude protein content of each species across seasons.

All feed samples were also analysed for mineral content. The content of pastures for minerals such as calcium, magnesium, sulphur, cobalt, selenium and copper were assessed as the minerals typically of most interest to sheep producers.

Calcium content of all pastures were generally satisfactory in these samples as they reached the minimum required amount for sheep of 2000mg/kg DM, with many samples exceeding the typical upper reference range of 8000mg/kg Ca as well. The only sample to not meet the minimum required range was oats in the spring 2020 samples. In general, the cereals and grass pastures were lower in calcium content than legume species.

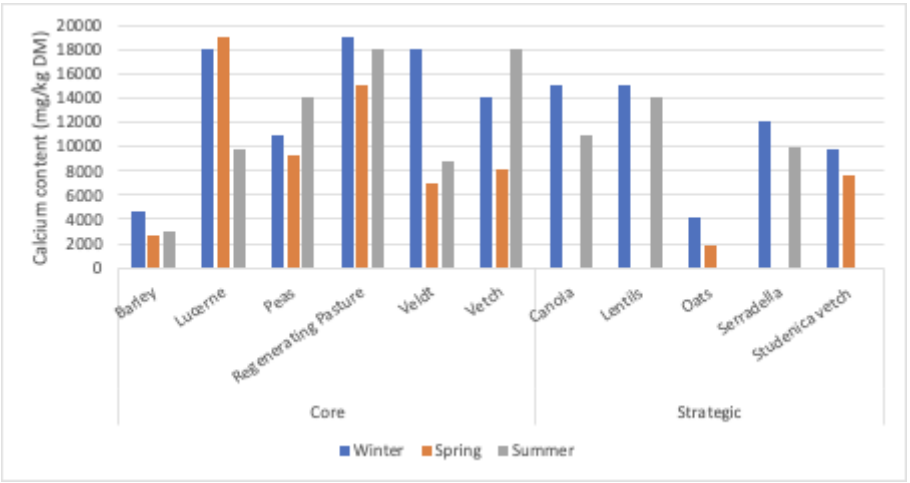

Figure 4 - Comparative calcium content of each species across seasons.

Sulphur content of pasture during winter was largely within normal range for sheep (1400 – 2600mg/kgDM), with all samples above the minimum level, however canola sulphur content exceeded the normal range to reach a maximum of 6100mg/kg DM. Spring and summer samples showed a significant number of deficiencies with over three quarters of samples (76.5%) of samples deficient in sulphur.

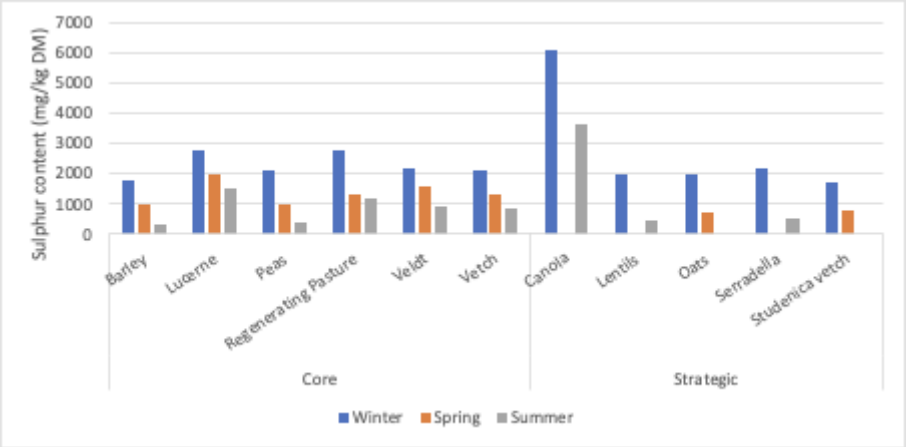

Figure 5 - Comparative sulphur content of each species across seasons.

Cobalt content of pastures was highly variable, however mostly adequate for sheep, with only 14.3% of samples below the minimum required level of 0.1mg/kg DM. Cobalt content of pasture typically increased as pastures matured from early winter growth to dry senescent summer feed.

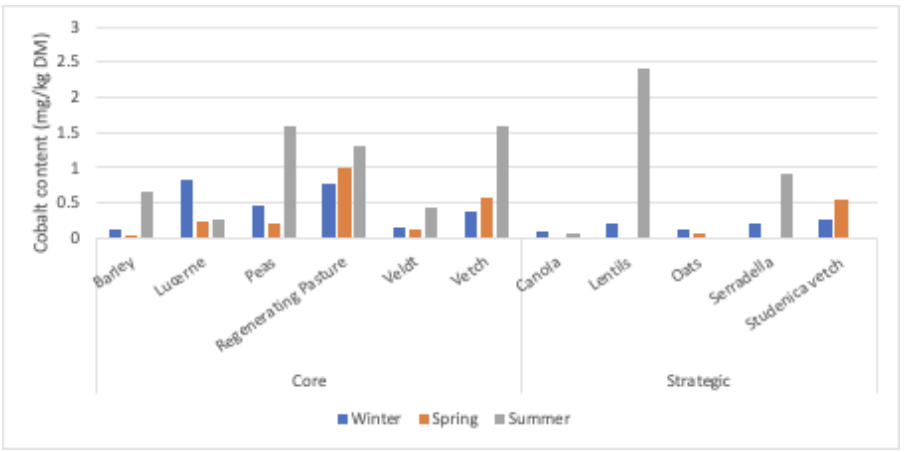

Figure 6 - Comparative cobalt content of each species across seasons.

Copper content of the species tested showed that most pastures were adequate for copper content as assessed by the minimum required level of 5mg/kg DM. Spring samples for barley, oats, lucerne and peas showed a deficiency.

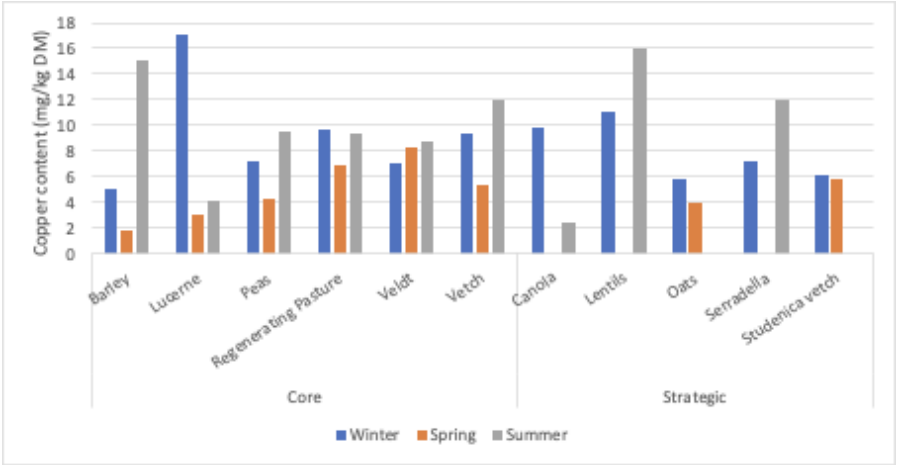

Figure 7 - Comparative copper content of each species across seasons.

Selenium content of the pasture was adequate in all samples except two (winter oats and winter canola) where the content was below the minimum required level of 0.1mg/kg DM. A strong seasonal trend was not apparent with spring in particular being highly variable across species, however in general an increase in selenium content from winter to summer was observed.

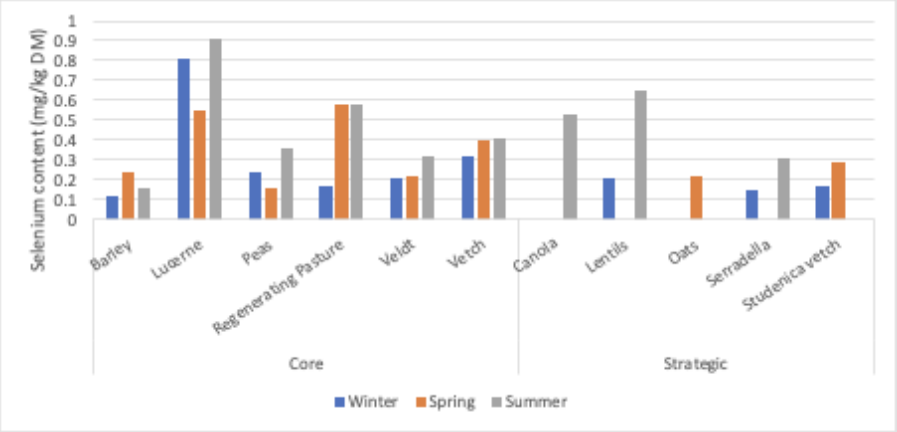

Figure 8 - Comparative selenium content of each species across seasons.

Discussion

The results have demonstrated the value of feed testing pastures and crops intended for grazing as some findings are outside of the expected results such as excessively low summer protein content of cereals, or some mineral analyses.

However, there are also some findings that have followed expected trends such as the general seasonal change in quality from winter (early growth) to summer (dry senescent feed). This was demonstrated in Figure 1 and reflects the accepted change in quality shown in Figure 9 where a significant decline in nutritive value occurs as the plant progresses past reproductive stage (ie flowering).

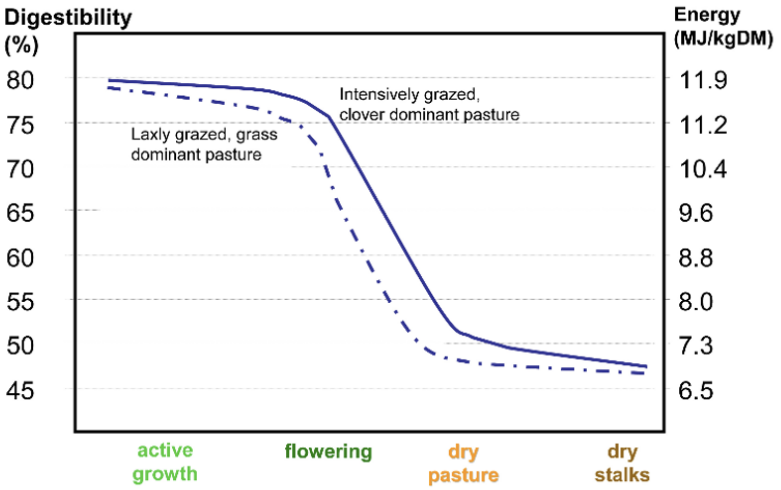

Figure 10 – Change in feed quality of pastures for each stage of growth (source DAFWA).

Whilst most species declined significantly in quality from winter and spring to summer, lucerne was the standout species that from spring to summer maintained energy content and only marginally reduced protein content from 20.5% to 17.5% (Figure 3). Whilst it would be expected that a plant species such as lucerne with some summer growth activity would maintain a higher quality in summer, these samples have demonstrated the extent to which it can provide a high quality summer feed resource compared to other species (Figure 10).

Figure 10 – Comparison of lucerne and veldt grass pasture sampled in summer (December) 2020.

Seasonal conditions in 2020 assisted slightly in this result as spring rainfall was average to above average for the regions where samples were collected. This would have ensured that species such as lucerne were able to continue to grow, whilst less summer active species continued to decline in quality, albeit at an expected slower rate, as they continued to mature.

Canola was a standout species for winter feed quality and highlights an opportunity for tactical grazing of this species when seasonal conditions permit. This may be in a good season where grazing can be expected to have little effect on grain yield, or in low rainfall year canola may present a grazing opportunity to extract value from a failed crop. However, other grazing and management considerations such as nitrate accumulation should be reviewed prior to grazing particularly in a failed crop scenario.

Implications for commercial practice

The mineral analyses showed several interesting findings that can impact substantially on farm management in the Mallee. Results have shown that minerals such as calcium were largely adequate, particularly in non-cereal species. The oats and barley samples showed some deficiencies and particularly if considering interactions from minerals such as potassium and sodium and magnesium, calcium supplementation for high demand animals such as pregnant or lactating ewes and young growing stock could still be considered important.

Many animal health products such as drenches and vaccines have additional selenium or vitamin b12 added to provide a supplement to stock. Cobalt is synthesised into vitamin b12 in the rumen and therefore if adequate levels of cobalt are available then adequate levels of vitamin b12 will be produced for the animal. Results from these analyses have shown that the majority of samples in the Mallee were adequate for both selenium and cobalt, representing a possible significant saving in operational costs for producers using large quantities of these supplements. In addition, excess supplementation of selenium in particular can produce toxicity effects and this has been observed previously in the Mallee where stock have been supplemented with selenium through a combination of drench, vaccine and loose lick products all containing selenium which created an animal toxicity as the feed base was already adequate for selenium levels.

These samples have assisted in identifying the nutritive value and mineral content of a range of Mallee pastures and crops. The samples will be used in combination with the second year of sample collection to create a full dataset of the nutritional value of Mallee feeds for producers and industry to utilise as a standalone resource, or included in packages such as Lifetime Ewe Management. The next year of sampling will provide an important comparative dataset to assess variance across years for the same species and will add further data points for a more extensive analysis and resulting information pack for producers.

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