NIRS and Phosphorus test - a quality result

A GrazingFutures Case Study

Background

Ben McKenzie manages Yaralla, a 26,000ha property near Cunnamulla for his parents Jim and Trish. They also own Gamarren, another 26,000 property, where Jim and Trish are based. Yaralla is a mix of brigalow, gidgee, mulga and box country and Gamarren has more light sandy soil.

The McKenzie's run primarily a merino sheep and goat enterprise, currently stocking approximately 6,000 sheep and 4,000 goats wire. Ben also has 400 of his own cattle which he agist both on his parent's place and nearby properties.

Overview

The McKenzie's experienced their fifth failed wet season in 2017. Above average rainfall during winter 2016, with milder temperatures, grew considerable herbage and salines. This feed had since dried off but remained as the primary component of the available feed.

Image 1 – Ben McKenzie with some of the ewes and lambs at Yaralla

In June 2017, Ben and his parents attended the Mulga and Nutrition Workshop hosted by the GrazingFutures BMP team. During the workshop, producers gained an improved understanding of the nutritional requirements of stock and how this applied specifically to stock grazing mulga, particularly considering supplementation options. There was also information on how to include mulga in a forage budget, the nutritional qualities of mulga and grazing management strategies. The workshop allowed producers to combine their own experience, local knowledge and the science to achieve practical outcomes for their stock and businesses. Discussions with experts and peers at this workshop motivated the McKenzie's to get faecal NIRS and phosphorus (P) testing done on their stock.

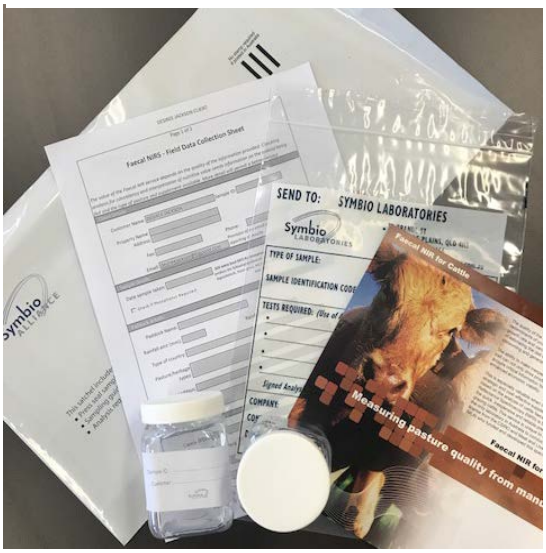
When the McKenzie's attended the workshop, the cattle were about to calve, the sheep were due to lamb in September (2-3 months' time) and the stock were all in good condition. With diminishing feed and little rain forecast, the McKenzie's were conscious of maintaining the body condition score (BCS) of their stock, rather than responding when the feed was gone and the stock were going backwards.

Ben was aware his feed was high quality but lacking bulk. Given the time delay between testing and supply of lick he had already begun to notice a drop-in condition of his cattle. The sheep were maintaining their body condition, however would have rapidly increasing requirements, so were at risk of losing condition soon.

Cost to do and methods used

Ben undertook the faecal diet quality testing through Symbio Laboratories and a leading western Queensland nutrition consultant. The cost was $65 for each NIRS test and $38 for the P test (plus GST). This included the consultant report and advice about how to apply the information.

Image 2 – Sample kit provided to collect and post dung samples to the laboratory



The time taken to collect and dry the dung samples was minimal. Four separate samples were sent in to represent four different mobs, at a total cost of $412 (plus GST). Each sample was a pooled faecal sample collected from watering points. Each sample was made up of 10-15 different fresh dung pats from a paddock (approximately a teaspoonful from each) which were mixed together and dried. This process was completed in each of the four paddocks and the dried samples were packaged separately into a jar per paddock, then sent to the laboratory.

Initial P testing is usually done in the middle of the wet season to get the best representation, Ben chose to test immediately as they had no previous experience of their P status. He didn't want to wait that long in case the stock needed supplementation immediately.

The mobs selected for testing were running in paddocks representative of different country types. Ben sampled two paddocks from each property. This way he could gauge the consistency of the results and also compare different mobs – cows with calves, early pregnant cows, late pregnant cows and late pregnant heifers. The cattle were mostly in BCS 3. The pooled samples represented a total of 200 head of cattle, but the results were applied to a total of 320 cows as the feed available was very similar.

Although the faecal testing was done on cattle, in this case, the results could also be applied to sheep on comparable pastures. Usually sheep and cattle would have to be sampled separately. This is because when the feed available is a mix of pasture and herbage, sheep have a superior ability to select a higher quality diet (which usually includes more herbage). Due to the previous seasons, the feed available was 100% herbage so the grazing behaviours of the sheep and cattle would have been similar.

Jim and Trish had 2,200 ewes at Gamarren and 1,700 ewes at Yaralla that were pregnancy scanned following faecal testing. The scanning percentages in the Gamarren ewes averaged 137% with 9% dry ewes. The Yaralla ewes averaged 115% with 23% dry ewes. The ewes were all in BCS 2-3 and were due to lamb in September. Given the high percentage of twins, their nutritional management was important and the information provided by NIRS was used to guide their feeding regime.

Faecal testing results

Table 1 shows the results the McKenzie's received from their NIRS faecal and P testing, with a description of the four mobs and paddocks.

Table 1 – The four mobs/paddocks sampled and their respective results.

Sample	CP%	Digest %	Nitrogen %	ME intake MJ/100kg LWT	Ash%	Dried non-grass %	P %	DMD:CP	P:N
1	**Vegetation**: Shaded coolabah, brigalow and gidgee country **Pasture available**: Predominantly dry herbage/burr **Stock**: Droughtmaster X breeders; 100% 5-9mth pregnant								
	14.5	68.6	1.7	23.4	20.8	100	0.13	4.7	0.06
2	**Vegetation**: Gidgee, pulled brigalow, regrowth brigalow country **Pasture available**: Predominately dry burr, herbage/saline **Stock**: Droughtmaster X Angus/Charolais breeders; 80% 1-6mth pregnant								
	14.3	69.8	1.9	24.2	11.3	100	0.13	4.9	0.06
3	**Vegetation**: Shaded gidgee, coolabah and small sand hills **Pasture available**: Predominantly dry herbage/burr **Stock**: Droughtmaster x Angus/Charolais heifers; 100% 5-8mth pregnant								
	14.7	62.7	1.4	19.4	8.2	100	0.11	4.3	0.05
4	**Vegetation**: Shaded gidgee, coolabah and small sand hills **Pasture available**: Predominantly dry herbage/burr **Stock**: Droughtmaster X Brangus breeders; 30% 8-9mth pregnant, 70% 1-4mth calves								
	15.6	65.9	1.6	21.5	13.3	100	0.13	4.2	0.05

The interpretation of these results suggested that in all paddocks P% was extremely low at 0.11-0.13%. It should be around 0.21 for dry cows and 0.28 for heavily pregnant or lactating cows. These low levels were probably limiting the ability of the cattle to have pasture intake sufficient to meet their nutritional requirements. The results also reflected a high diet quality due to the 100% herbage content (dried non-grass component). The ash % can be a reflection of how close to the ground stock are grazing, for example, if the non-grass component was coming from mulga, the ash % would be very low as they would not be consuming much soil when they graze.

Image 3 – Cow and calves in one of the paddocks that was sampled for NIRS and P testing

The high-quality diet is shown through the crude protein (CP%), nitrogen % and digestibility (digest %). To give these numbers some context, the digestibility of early green growth (high quality) tropical pastures could be approximately 60-70% and the crude protein is usually around 8-10%. Although this herbage was very high quality, it was possible that dry matter intake was limiting, meaning stock may not have been able to get enough quantity of feed. It is also important to consider the balance of nutrients with each other. The ratios included in the results help to determine the most important nutrient to consider for supplementation, as well as how the diet currently balances. In this case, the DMD:CP ratios are low, meaning that energy is more likely limiting than protein.

The results applied similarly to the sheep, however as sheep are better at recycling P, their requirements are slightly lower. The McKenzie's have used various supplements in the past but this information gave them a definitive answer for what their stock needed and allowed them to determine how to provide it in the most economical way.

Supplementation changes

After receiving the NIRS and P results and analysing what it meant for his management, Ben made significant changes to his dry lick. Previously, his supplements had been generic commercial licks containing trace elements that are expensive and not addressing his stock's specific needs, particularly for P.

Image 4 – Kynofos and CSM mix

Ben switched to a Kynofos and cotton seed meal (CSM) dry lick. The initial mix was 50:50, using the CSM as an attractant, and aiming to supply an intake of at least 50g of Kynofos per day to his breeders. Often salt can be used as an attractant, however the McKenzie's have found salt is a deterrent in their country.

The sheep were also being fed P. They were much quicker to start on the P so less CSM was needed. The initial mix was also 50:50, but the CSM was rapidly reduced to 70:30, Kynofos:CSM. In the first six weeks, Ben allowed the stock to consume as much P as they needed to replenish their diminished reserves. The CSM was then decreased to approximately 10% and their intake was monitored with the aim of supplying 10g of P per day (equivalent to 50g of Kynofos) to the cattle and 2g per day (equivalent to 10g of Kynofos) to the sheep.

Their previous dry licks had mostly been urea based. In this instance, the NIRS testing showed the diet quality was very high. As such, improving diet quality and protein content of the diet using urea would not have benefited the stock. Interpretation of the results suggested dry matter could become a problem if there were insufficient quantities of feed available. Ben managed grazing pressure and moved his cattle to other paddocks to provide enough herbage to meet their requirements. If the quantity of feed became a concern, Ben intended to feed whole cotton seed (WCS) or CSM pellets to supply additional energy, protein and dry matter to his cows.

Given they had a high percentage of twin bearing ewes, the McKenzie's elected to provide the sheep with additional supplement of CSM pellets. Pellets were simply trailed out twice weekly in the paddock.

Something that surprised Ben was that P was just as deficient in the heavier black soil country as in the red country where he had expected it to be low. This is most likely a result of prolonged dry seasons decreasing the availability of the P in the plants, irrespective of soil stores in the heavier country.

Effectiveness

Ben believes in feeding for a purpose in order to see a return on investment. In this case, the aim was to maintain or decrease loss of BCS through the peak nutritional demand (early lactation) and therefore improve conceptions the following year. The NIRS and P testing helped Ben refine and target the P deficiency and utilise use the high-quality feed available with confidence.

The cattle mostly maintained BCS of more than two through early lactation. The branding percentage was 90%, though this figure had been influenced by some of the cattle being purchased as pregnancy tested in calf (PTIC). More important than this year's weaning rates, will be the conception rates next year. Given the cows were in reasonable condition coming out of the dry season, Ben expects good conception rates. From a nutritional perspective, if cattle are BCS of less than two, the expected conception will be below 40%. This situation could have been the case for the McKenzie's without P supplementation as the low P levels would have decreased pasture intake, as well as reduced reproduction rates through a P deficiency. If the McKenzie's have good summer feed this season then their stock is now in a much better position to respond. The extra condition on the livestock means they have insurance if there is another poor wet season.

The ewes maintained a BCS 2 on this supplementation program. The McKenzie's sold some of the ewes scanned with singles from Gamarren before they lambed. Then the twin ewes were spread more effectively across the available feed.

The P lick cost $1040/tonne and the CSM cost $688/tonne excluding GST. This is more expensive than his previous lick, but the stock requires much less and it is addressing their specific nutritional needs. The CSM pellets were purchased for $410/tonne excluding GST. Pellets were chosen over WCS as recommended by the nutrition consultant as the most cost-effective way to supply the energy and dry matter needed for pregnant ewes. The freight from Brisbane to the property was approximately $80/tonne excluding GST plus $70 fixed shipment fees.

Challenges

Ideally, Ben would have liked to start feeding earlier to prevent condition loss in the cattle and ensure good lamb birth weights in the sheep flock.

Image 5 – CSM pellets

Although NIRS testing has been used primarily for cattle, using an experienced consultant to interpret reports allows the corrections for sheep to be made. In this situation the McKenzie's could use the results from the cattle as a guide for their sheep. In seasons with more grass content than herbage in the diet they would do separate tests for sheep and cattle. This would allow them to manage the different classes of stock more accurately for their requirements.

The winter rain in 2016 was unique in that the high proportion of herbage meant the diet quality and particularly the protein was much higher than normal. In the future, the McKenzie's may consider a custom-made urea-based dry lick to provide protein if needed, in combination with energy supplements like WCS in very poor seasons. NIRS will be able to identify what is the most critical, allowing the McKenzie's to feed for a result and get the return they need.

Producer thoughts

Ben said that attending the Mulga and Nutrition Day gave him an understanding of how he could use the information from NIRS faecal testing in his enterprise. While he was already considering supplementing, the material from the workshop and the test results gave him a specific answer about the requirements of his stock.

Image 6 – Cow and calf receiving Kynofos mix

He said the day highlighted to him that commercial licks often contain things that aren't required so it is important to work out the cost of a lick based on the key nutrient/s your stock are lacking. This could mean that a more expensive lick on a per tonne basis is actually more economic, as it contains the nutrients your animals need or they will therefore require less of it to meet their needs. A $100 faecal NIRS and P test can give you the answer to what nutrients you really need to target.

The McKenzie's will likely do more NIRS testing as the seasons change to get a benchmark for the quality of the diet under different seasons. They will also do another P test in their next good wet season to give them a benchmark for the P levels in their country. This will guide them as to when and how much P they will need to supplement, and they shouldn't need to repeat the P test once they have that yardstick.

Diet quality testing has given the McKenzie's a way to confirm what they normally do, using their experience on the land and 'back of the envelope' calculations, to refine their estimate of what the pasture can provide for their stock.

More information

If you are thinking about NIRS and P testing, you can find out more information on the Symbio Laboratories website https://www.symbiolabs.com.au/agriculture-testing/faecal-nir-for-cattle/. A good time to start is before you purchase your next lot of supplement or before you begin supplementing for the next dry season. It can be done any time of the year though and as frequently as you like, keeping in mind the diet quality could change substantially. A supplement chosen at the start of the dry season based on diet quality tests, might not meet the livestock needs at the end. One test is required per mob. How many mobs you chose to do will depend on the variation in the pasture available between the mobs as well as when and what you intend to supplement.

P testing is ideally done initially in the middle of the wet season on cattle not being supplemented with P. This allows you to get an idea of the P status of your country under the best circumstances and then guide whether you decide to supplement P every year, in the wet or dry season, or how much. If you are not currently supplementing P though, it may be a good idea to check it straight away so you can supply it immediately if needed.

There are also some great resources on the Future Beef website https://futurebeef.com.au/ on the nutrient requirements of stock, understanding the label of a supplement and much more. If you still want more information, contact your local DAF extension officer and keep an ear out for the next MLA Nutrition EDGE workshop near you.

For further information about the Drought and Climate Adaptation Program visit www.longpaddock.qld.gov.au.

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