Final report

PDS 1905 - The Sense in Supplementation

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Abstract

The Sense in Supplementation aimed to demonstrate the economic benefit of supplementation in three (3) lamb finishing enterprises, by providing supporting economics for a range of grain and lamb prices allowing an 'optimum' supplementation regime to be calculated.

By validating the potential economic benefits of including supplementation in a lamb finishing program, producers on the Monaro would have added confidence to capitalise on this opportunity to increase profits in their lamb finishing enterprises.

The project was designed to provide six years (2014 - 2020) of comparative benchmarking data for prime lamb enterprises, extension of these results through media outlets and the delivery of on-farm events.

The project was performed on three (3) host properties, a total of six (6) demonstration sites which formed the basis for extension activities including case-studies and producer publications.

For all demonstrations where animals were properly randomised between treatments there was no difference in weight gain between supplemented and un-supplemented lambs, undoubtedly related to the good seasonal conditions experienced. The lambs had low voluntary intake of supplements and no difference in weight gained. Use of supplements to maintain animal performance while achieving higher utilisation of pasture is still likely to be effective but to be tested properly it would be best done in more below average seasonal condition and with sufficient stock numbers to properly test the hypothesis.

Executive summary

Background

During a previous PDS on lamb finishing systems it was identified that for one of the pasture finishing systems (Cobana) the use of energy rich supplements had enabled more complete utilisation of the available herbage without compromising per head animal performance. Despite the extra cost of feeding this strategy had enabled larger profits per ha exceeding the profit achieved on most other forage systems which were tested in the absence of feed supplements.

It was decided to test the utility of feeding supplements in lamb finishing enterprises to more fully utilise pasture biomass and increase profits across a range of forage types including grass based pasture, Lucerne and forage brassicas. Many Monaro producers now seek to finish lambs to slaughter specification on specialist forages but often they are moved off paddocks before the biomass is fully utilised. The work is intended to show the cost benefit to feeding supplements at pasture achieved through being able to finish more lambs per ha and improve the feed efficiency of the forage base. The work was to be conducted over two summers and commenced in December 2020.

Objectives

The aim of this work was to demonstrate the benefit of supplementing lambs at pasture through the ability to retain lambs longer and utilise the sources of forage to levels below the benchmark for good un-supplemented lamb growth without compromising the ongoing growth of the lambs.

- While previous work had suggested higher utilisation of pasture could be achieved by using energy based supplements this work was done in more average to below average seasonal conditions.
- The extraordinary good seasonal conditions of Summer 2020-21 created two conditions which made it difficult to show any benefit to supplementation due to the constraints to stock numbers carried forward from the long run of poor seasons preceding it. The cooperating farmers found it difficult to
    a) Manage biomass properly before lamb entry
    b) Stock at an appropriate density to cause the biomass to decline over the grazing period.
- Overall there was no clear benefit in the kg/ha of lambs produced.

Methodology

For each forage type a cohort of weaned lambs were grazed on adjacent paddocks split in accordance with paddock size to balance overall stocking rate. Herbage mass and quality was assessed upon exit of the lambs. At the same time a representative herbage sample was tested for ruminant feed value.

A subsample of 50 lambs from each paddock was weighed and If lambs spent more than 3 weeks on a paddock an interim weight was taken. The amount of supplement consumed was monitored and a sample sent to an accredited laboratory for feed testing. GrazFeed was used to compare the measured result to the expected result for each scenario and ultimately an economic return calculated.

Results/key findings

For all demonstrations where animals were properly randomised between treatments there was no difference in weight gain between supplemented and un-supplemented lambs. This is undoubtedly related to the very good seasonal conditions experienced which meant that the quality of the herbage diet of the lambs was already as good or better than the supplements provided. As a result the lambs had very low voluntary intake of supplements and no difference in weight gained.

There really is a nil result as the extra feed did not make a significant difference to animal performance due to the extraordinary seasonal conditions. This is the reason for not completing the second year measurements due to the ongoing issue of record seasonal conditions and insufficient animal numbers to take advantage of it or to place sufficient stocking pressure on the systems to make supplementary feeding a viable option.

Benefits to industry

While the premise of routine provision of supplements to lambs was not useful under the prevailing seasonal conditions this does not mean that the strategy would not be successful in more normal seasons or for circumstances where the stock numbers could be bolstered to ensure much higher utilisation of available herbage.

Future research and recommendations

Use of supplements to maintain animal performance while achieving higher utilisation of pasture is still likely to be effective but to be tested properly it would be best done in more average to below average seasonal condition and with sufficient stock numbers to properly test the hypothesis. Results are likely to be more definitive if an additional treatment was included so that the lambs could be run at a much higher stock density in addition to the baseline stock density.

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1. Background

1.1 Previous trial results

During a previous PDS on lamb finishing systems it was identified that for one of the pasture finishing systems the use of supplements had enabled the host producer to more completely utilise the available herbage without compromising per head animal performance. Despite the extra cost of feeding this strategy had enabled large profits per ha exceeding the profit achieved on most other forage systems which were tested in the absence of feed supplements. It was assumed that this economic benefit accrued largely due to the higher production (kg lamb weight gain/ha) achieved enabling overhead costs to be amortized across more product. It was postulated that the benefit accrued in pasture use efficiency outweighed the cost of additional feed.

The seasonal conditions experienced in that initial trial were average to below average and the farm in question ran high stocking rates ensuring there were sufficient stock to graze far more pasture biomass than was growing and hence pasture biomass and quality declined over the grazing period.

1.2 Opportunity

The Monaro region had experienced a long run of average to below average seasons and it was seen by MFS members that there was opportunity to finish lambs properly without compromising stocking rates through the continual supply of energy supplements over the summer period. Since previous work had not compared supplemented vs un-supplemented lambs on the same property it was decided that the concept should be demonstrated through a paired paddock scenario where supplemented and un-supplemented treatments could be compared directly on the same pasture at the same time.

1.3 Benefits

It was anticipated that the demonstration would show that when compared under the same pasture conditions the supplemented lambs would sustain growth for longer and enable the utilisation of pastures to much lower residual herbage mass. This was expected to increase the kg of lamb produced per ha of finishing pasture the value of which would outweigh the cost of feeding. Clear results would give the MFS membership and Monaro farmers generally, the confidence to instigate a systemic policy of supplementing lambs over summer enabling them to sustain higher stocking rates and improved returns per ha.

2. Objectives

The work reported aimed to demonstrate how the supplementing lambs at pasture over summer could enable lambs to graze paddocks down to lower biomass levels helping to utilise sources of below the target benchmark levels for good lamb growth without supplements.

1. It was expected that the results would encourage MFS members who produced prime lambs to use supplementation throughout the finishing period and accrue the benefit of finishing more lambs per ha without compromising the finished weight of the lambs.
2. To demonstrate the physical benefit of producing more kg of lamb per ha would translate into higher economic returns

Unfortunately, the extraordinarily good summer season of 2020-21 created two conditions which made it difficult to show any benefit to supplementation. Constrained stock numbers carried forward from the preceding long run of poorer seasons meant the host farms found they had insufficient stock to

a) Manage biomass properly before lamb entry
b) Stock demonstration paddocks at an appropriate density to utilise biomass at a rate that would significantly exceed pasture growth.

Due to these seasonal constraints, there was no clear difference in performance between the supplemented and un-supplemented systems. These extraordinary seasonal conditions have prevailed through the following two summers with the same issues of remaining understocked ensuring that pastures were dramatically underutilised even without supplementation.

3. Demonstration Sites and Methodology

For each forage type a cohort of weaned lambs were to be grazed on adjacent paddocks with the same pasture/forage species with the group split in accordance with paddock size to be run at the same overall stocking rate.

3.1 Sites

Demonstrations were conducted on three farms using four pasture/forage types.

Farm 1: "Undowah" Bibbenluke

Two pasture types were tested at this location - first was a Lucerne/Phalaris/Ryegrass mix and the second a pure lucerne stand. Both were grown on heavy self-mulching black clay/loam soils of basalt origin.

Demonstration 1:

A mixed pasture was reserved in spring for the first demonstration site and excellent spring conditions meant the paddock had become overgrown before the lambs entered the paddock on 16th December 2020. The pasture was very tall with most of the green herbage being Lucerne along with mature Phalaris in its flowering phase. The ryegrass had largely reached the point of senescence. Lambs grazed the paddocks until they were moved on the 8th of January 2021. Supplemented lambs were fed Dried Distillers Grain (DDG) pellets via self-feeders.

Demonstration 2:

At the completion of demonstration 1 the lambs were weighed and moved immediately into the second set of paddocks which was straight lucerne which had been cut for hay then rested for a couple of months before the commencement of trial grazing. The supplemented animals continued to be fed the same DDG pellets and the lambs continued to graze the paddocks until the 1st of February when they were again weighed, and the demonstration ceased.

Farm 2: "Maffra" Bobundra.

This site was intended to test supplementation on pure lucerne, and a demonstration was commenced on the 15th of February. Baseline herbage data and initial weights were collected but the paddocks were adjacent and the lambs broke through the gate and were boxed together for some time before it was discovered meaning this demonstration site had to be abandoned.

Demonstration 3:

An alternate demonstration commenced at Maffra on the 29th of April but unfortunately the paddocks were not adjacent and differed in management during their preparation and in both paddocks there was considerable ingress of grasses and weeds. Furthermore despite clear protocols the paddocks were stocked with animals from different cohorts that were dissimilar in their age and weight at the commencement of grazing. The paddocks were very similar soil types being red stony clay loams based on Basalt. Lucerne was the dominant part of the green herbage mass present in each paddock however their prior management was different and feed quality characteristics varied considerably.

Farm 3: "Shirley" Holts Flat

This site was to provide forage brassica as the grazing base and in this case it was sown as a mix with a short term ryegrass. Due to difficulties with managing insect pests and chemical withholding periods this site was delayed in its commencement and lambs did not commence grazing until the end of April. The paddocks were very similar having been established at the same time and being simply a recent subdivision of a larger paddock.

Demonstration 4:

This site was again on a red stony basalt soil but the total herbage mass in the paddock at the commencement of grazing was quite limited but in reaction to this the stocking rates used had been very light.

3.2 Measurements

3.2.1 Pasture

The herbage mass and quality was assessed upon entry of the lambs into the paddock and residual herbage mass assessed at the exit of the lambs. A median quadrat sampling technique was used so as to take 10 median quadrat cuts along a representative transect in each paddock. The median quadrat has 5 cells with each cell 50cmx30cm. At each placement of the median quadrat all five cells are assessed and the two highest and two lowest yielding cells assessed visually leaving the median yielding cell to be cut. In taking 10 cuts this means that 50 visual assessments are made so increasing the power of the method to determine the average biomass compared with cutting 10 single quadrats placed at random. Cuts were taken along a representative transect in each paddock. At the same time a toe point sampling of herbage to ground level was taken to collect a representative sample of green herbage for testing ruminant feed value.

3.2.2 Animals

A subsample of 50 lambs were weighed upon entry to each demonstration paddock and then again on exiting the paddock. This enabled weight gain to be calculated over the grazing period so ideally the lambs experienced the same degree of curfew before each weighing. If lambs were to spend more than 3 weeks on a paddock ideally an interim weight would be taken but this was not always possible, particularly as the date of exit was not planned at the commencement of grazing instead being a response to the pasture conditions.

3.2.3 Supplements

For the cohort of animals being supplemented the amount of supplement consumed was monitored and a sample of the supplement sent to an accredited laboratory for feed testing. This enabled the response to supplement to be anticipated.

3.2.4 Modelling of results

GrazFeed was be used to compare the measured result with an expected result for each scenario This was intended to validate GrazFeed as a tool to assist with making decisions on supplementary feeding strategies and ultimately to assist in determining the economic return from the feeding strategy tested.

3.3 Economic analysis

Cost benefit was intended to be determined by a trial budget methodology simply comparing differences in benefits gained by the supplemented lambs compared with the costs accrued. The lack of difference between treatments made this analysis a little pointless.

3.3 Extension and communication

Updates have been presented at two Field Days, in newsletters to a distribution list of upwards of 210 pax, the MFS 2021 & 2022 Annual Reports, as well as being published on the MFS website which is accessible to the public.

3.4 Monitoring and evaluation

The monitoring and evaluation (M&E) process used for data collection was done in compliance with the project objectives and undertaken by well respected local analyst, Doug Alcock, GrazProphet. All findings and results are stored securely on the MFS sharepoint and one drive.

4. Results

4.1 Herbage mass and quality results

Demonstration 1:

The total herbage mass was very high for the Undowah pasture paddocks. Between 4500 and 5000 kg of dry matter was present on the 16th of December 2020 and much of this was green Lucerne and Phalaris. Being overgrown the Lucerne was leggy with long stiff stems which served to lower average feed quality. On the un-supplemented paddock, the feed quality at the commencement of grazing had a dry matter digestibility (DMD) of 63% and a crude protein (CP) of 15.7%. On the supplemented paddock the DMD was 65% and CP 17% so the paddocks were very similar at the beginning of the trial.

Figure 1 Undowah Mixed Pasture Herbage Mass and Quality

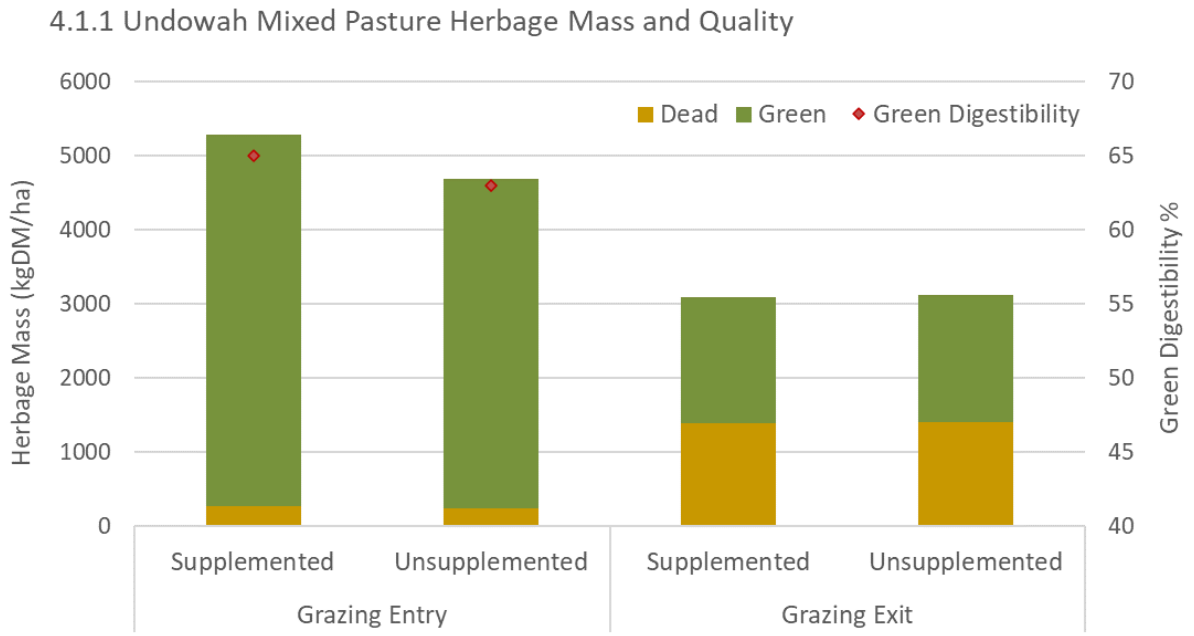


Plate 4.1.1 Entry Biomass (Supplemented pasture)

Self-Feeder used at Undowah

Lambs at Undowah

By the end of the grazing period on the 8th of January 2021 the green herbage mass had declined to around 1700 kg DM/ha on both paddocks but the amount of dead in the total biomass had risen sharply from around 250 kg DM/ha to around 1400 kg DM/ha. This was to be expected in such an overgrown pasture as wastage and senescence might reasonably be expected to be high.

Demonstration 2:

The two paddocks were very similar in herbage mass being almost 100% green and around 2750 kg Green DM/ha on the 8th of January. As this was relatively fresh regrowth of the Lucerne the feed quality was higher than the pasture paddock at the commencement of grazing with the supplemented paddock at a DMD of 70% and CP 20.5% while the un-supplemented paddock had a DMD of 67% and a CP of 19.8% again very consistent between paddocks. The host manager decided to move the lambs off the trial paddock and cease supplementary feeding on the 1st of February 2021. At this time the residual green herbage was still around 1300 kg Green DM/ha so again full utilisation of the Lucerne had not really been achieved.

Figure 2 Undowah Lucerne Herbage Mass and Quality

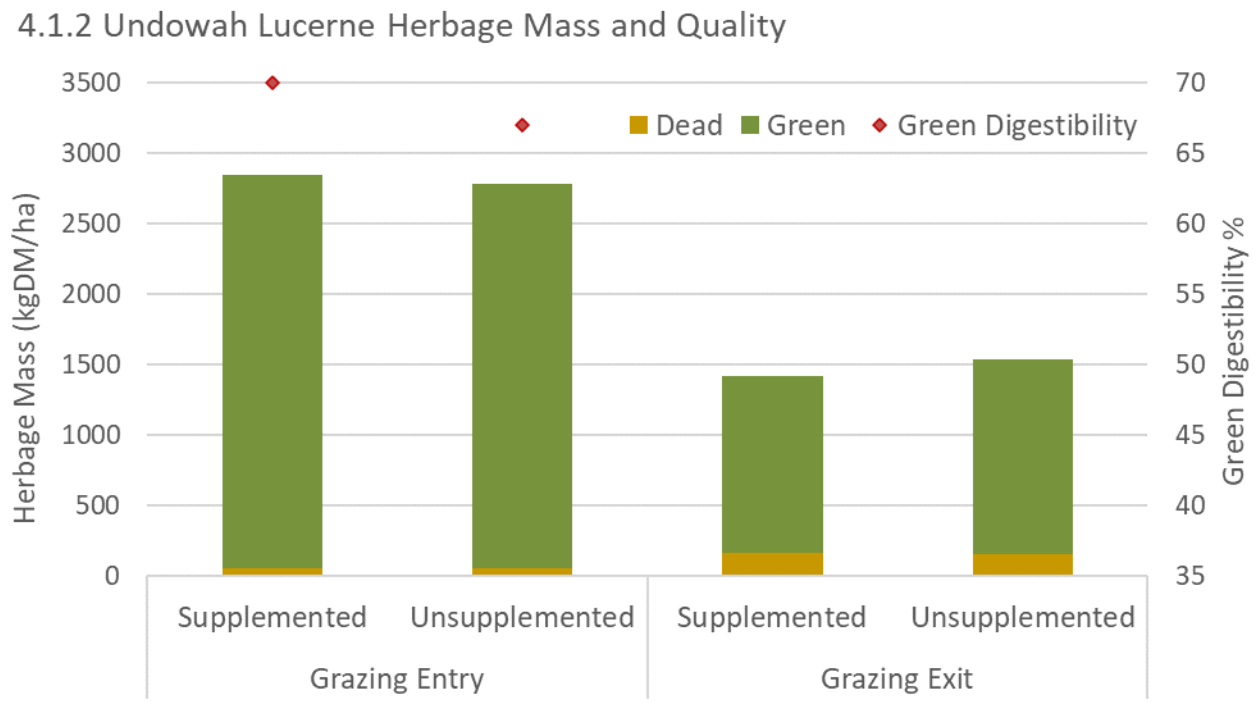


Plate 4.1.2 Undowah un-supplemented Lucerne paddock

a) Entry

b)Exit

Demonstration 3:

At the commencement of grazing on the 28th of April the herbage mass on the Brassica/Ryegrass at Shirley was moderate at around 1600 kg Green DM/ha on the supplemented paddock and 1350kg Green DM/ha on the un-supplemented paddock. The digestibility was the same on each paddock at 83%. As the paddocks were only lightly stocked (5 lambs/ha) over the grazing period the amount of green herbage only declined marginally and the decision to remove animals from the demonstration was made primarily because aphids had begun to build in number again and the cooperating farmer decided action needed to be taken.

Figure 3 Shirley Herbage Mass and Quality

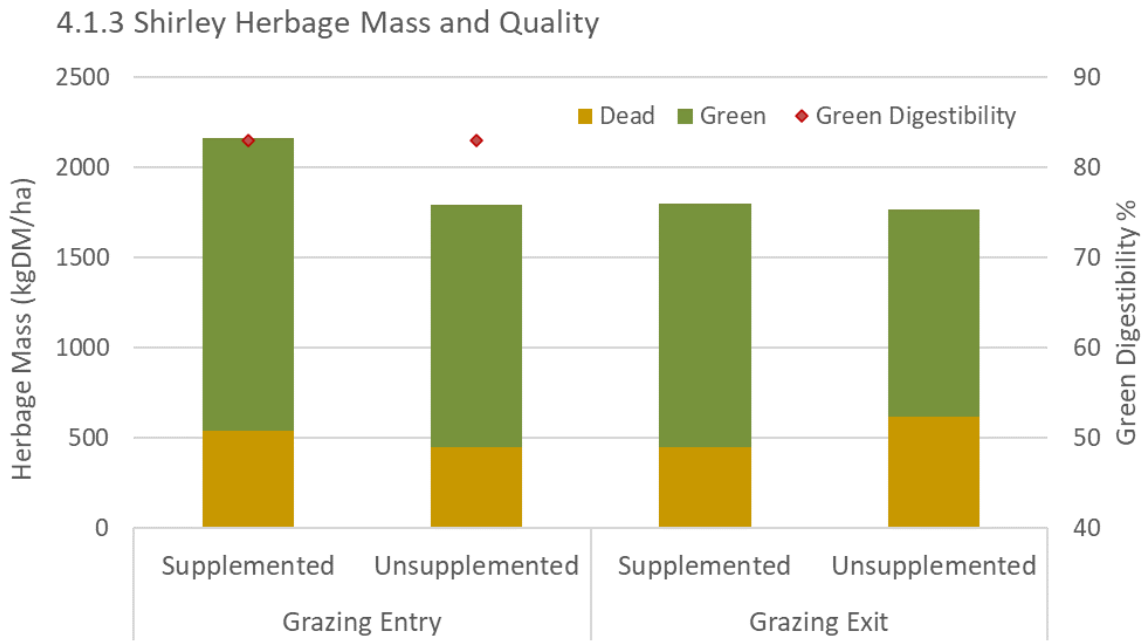


Plate 4.1.3

Shirley unsupplemented paddock at entry

Shirley supplemented paddock at entry

Demonstration 4:

At the commencement of grazing on the 26th of April 2020 the supplemented paddock had considerably more total biomass although the green biomass was similar. Presumably due to lower grazing pressure in the preparation period the lucerne on the supplemented paddock was more mature and was lower in quality as a result. Even though the supplemented paddock had an advantage of around 100kg green DM/ha it was a full 5 percentage points lower in digestibility. At

the end of grazing on the 4th of June the residual green herbage on each paddock was similar but the dead herbage mass was still higher on the supplemented paddock.

Figure 4 Maffra Herbage Mass and Quality

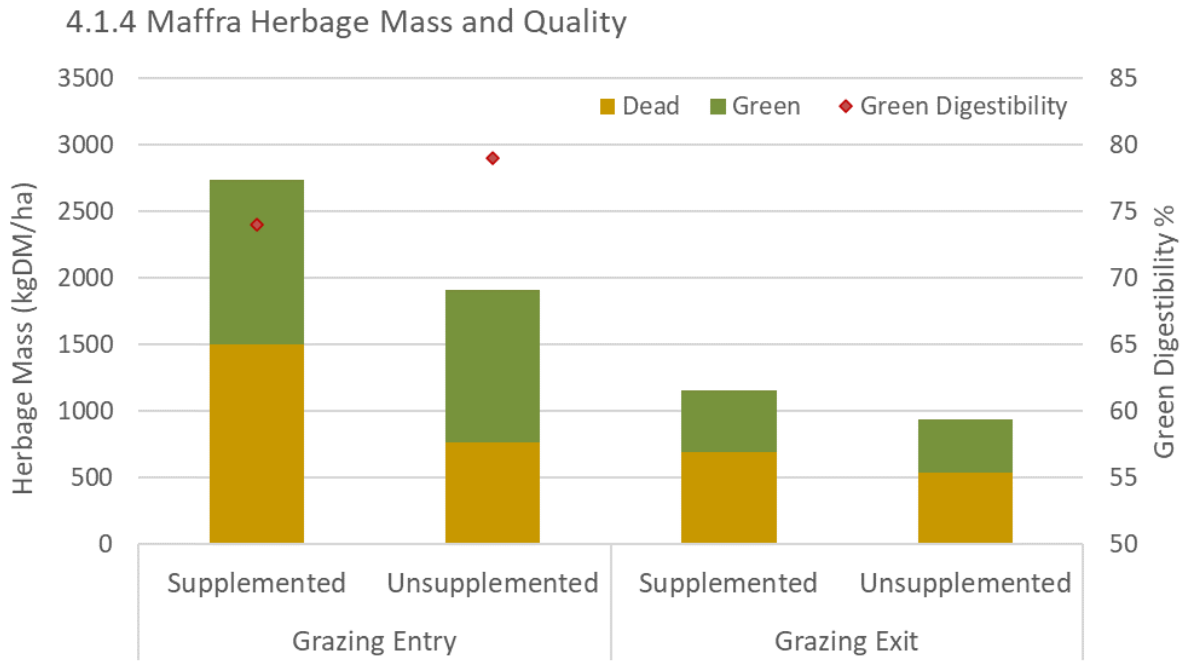


Plate 4.1.4

Maffra supplemented Lucerne at entry

Maffra unsupplemented Lucerne on entry

Maffra unsupplemented Lucerne on exit….

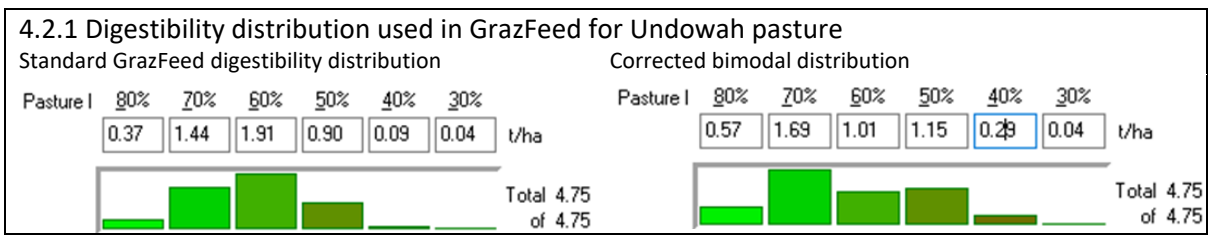
4.2 Animal Performance

50 lambs from each treatment on each demonstration were randomly selected from each group as a monitor group and these animals were weighed before entering the paddocks and as grazing periods were all relatively short, they were weighed again only upon exiting the trial paddocks. Herbage and livestock data were used as inputs to the GrazFeed decision support tool to evaluate how closely this tool would have predicted the actual lamb growth rates both with and without supplements.

Demonstration 1. "Undowah" Bibbenluke

Due to the very large amount of herbage available to graze the lambs were able to exert a high level of selectivity in their grazing. GrazFeed automatically allocates a portion of the herbage mass into digestibility pools ranging from 80% down to 30% depending on the biomass and digestibility of the total Green and Dead herbage pools as defined by the user. Diet selection is simulated by allowing animals to graze from the most to the least digestible pools according to the availability in each pool. In this case the default gives a distribution shown below left. Unfortunately while this gives the average digestibility expected it does not allow for the large difference between the leaf and stalk of the mature green lucerne and underestimates the degree of selection and hence the diet quality of the lambs. As GrazFeed allows this distribution to be modified by the user the graph below right shows a more bimodal distribution which has a greater amount of biomass in the 80% and 70% digestibility pools but also shifts the stem/stalk into lower pools which gives the same overall average digestibility but allows a greater degree of selection.

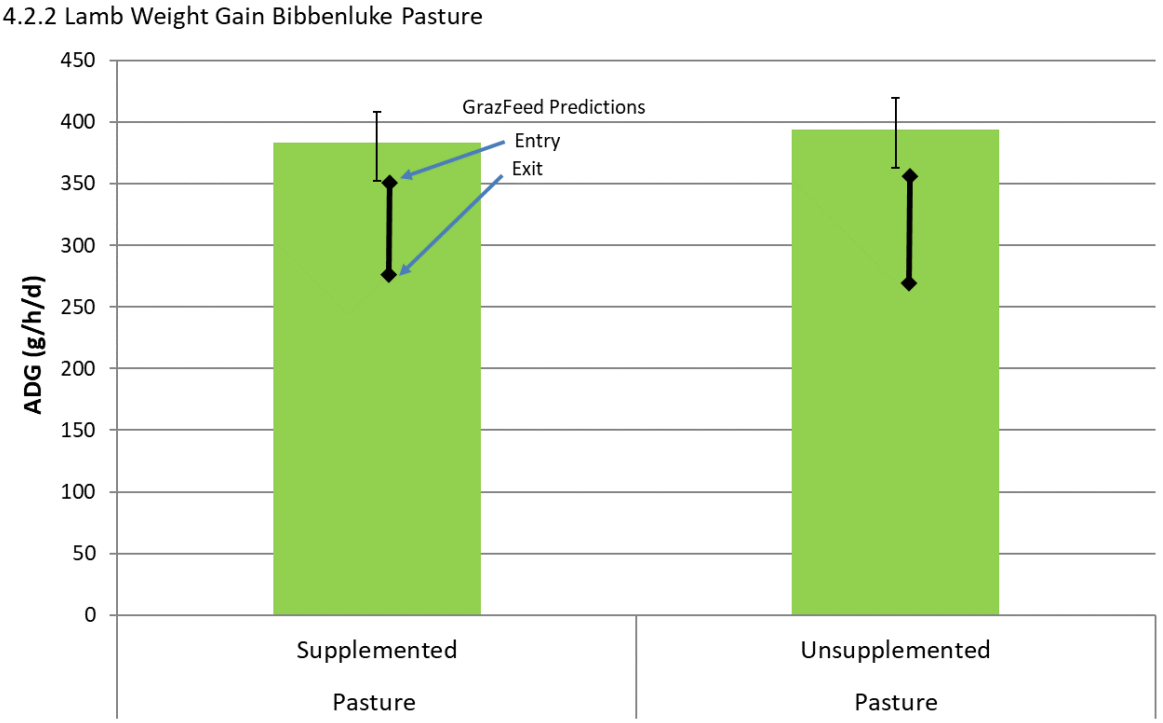
Figure 5 Digestibility distribution used in GrazFeed for Undowah pasture



Adjusting the inputs in this way brings the predicted animal performance more into line with the actual measured performance. The graph below shows the measured performance of each cohort with a 95% confidence interval based on the actual variation in the 50 measured animals. Also shown is a bar chart showing the range of predicted performance from GrazFeed with the top of the bar representing the expected performance based on pasure conditions at the commencement of grazing and the bottom the performance at the time of the animals moving off the pasture.

It can be seen, based on the actual 157g/h/d of DDG pellets consumed (ME 12.3 Mj/kgDM; CP 21.1%), the performance of the lambs with and without supplement was expected to be quite similar and indeed this is what occurred in practice. It is notable however that the prediction still gave an underestimate of the animal performance which given that this is consistent across paddocks is most likely to be a result of error in estimating the true genetic potential of the animals (ie underestimate of Standard reference weight), some compensatory growth which has not been accounted for or possibly most likely error instigated by differences in gut fill at entry and exit.

Figure 6 Lamb Weight Gain Bibbeluke Pasture



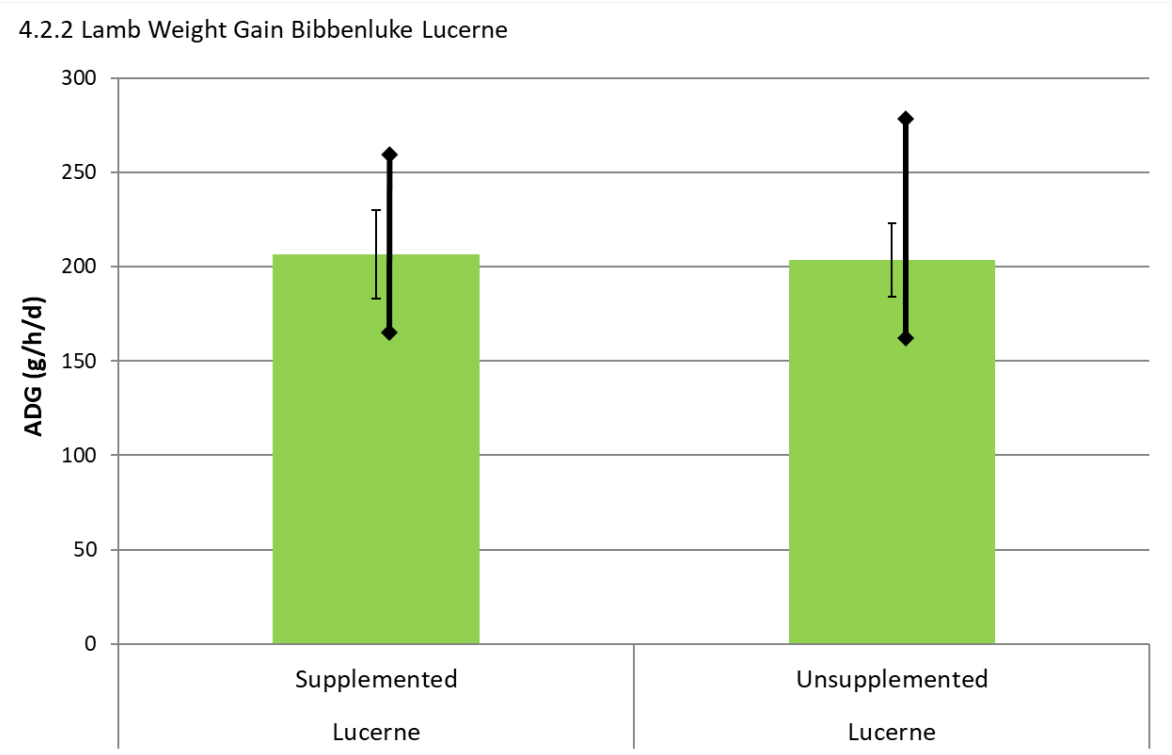
The lambs performed at a very high level achieving 380-390 g/h/d growth rates regardless of the treatment. This performance seems reasonable given the very high availability of green Lucerne in the paddock meaning a very high degree of diet selection was possible. The very high residual herbage mass meant the lambs could achieve maximum intake while only grazing the very best of the forage available. Due to the very high diet quality and high digestibility of the largely Lucerne diet selected there was very low voluntary intake of supplements which averaged only 157g/h/d which was almost directly substituted for the forage diet giving a negligible difference in weight gain. This low voluntary intake of supplements is quite logical as the likely average digestibility of herbage consumed by the lambs was higher than the digestibility of the supplement.

Demonstration 2: "Undowah" Bibbenluke

A small fall in performance compared with the initial grazing might reasonably be expected as the lambs were older and heavier so any further weight gained would be at a higher fat to lean ratio adding a considerable energy cost.

GrazFeed modelling indicated the weight gains for un-supplemented lambs entering the Lucerne was expected to be around 280g/h/d and 270g/h/d for the supplemented lambs and weight gain over the 20 day grazing was expected to average 210 - 220g/h/d. Actual weight gains were just over 200g/h/d. Again, due to the lambs being able to select a very high digestibility diet there was no difference in performance due to the supplements. On this occasion the GrazFeed model gave a good account of what should have been expected but only if the actual intake of 113g/h/d of the DDG pellets is modelled. However, if the model was allowed to offer the supplement to the lambs *ad lib* it predicted a much higher intake of supplement than was actually achieved. It is uncertain why this might be and may be associated with palatability or familiarity with the feed. In any case to get a good prediction of performance it appears important to monitor and model actual supplement intake rather than predicted intake.

Figure 7 Lamb Weight Gain Bibbenluke Lucerne

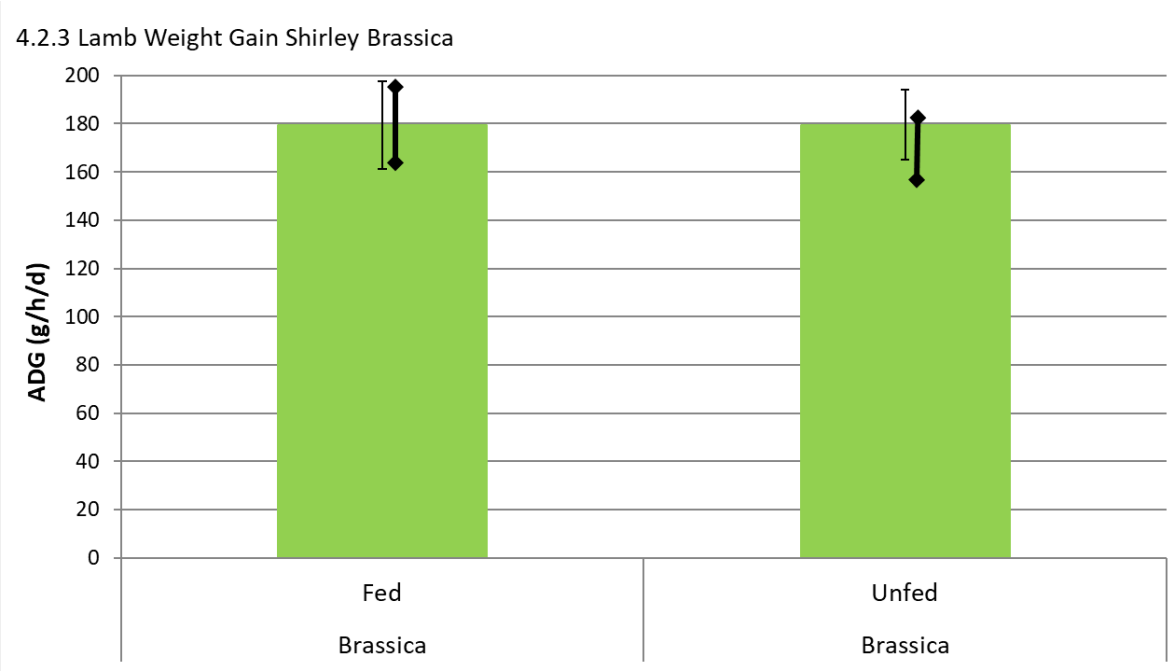


Demonstration 3: Shirley

Due to the extraordinary season at the time of commencing this demonstration only one cohort of lambs remained on the property. All other lambs had been finished and had left the property. Lambs were grazed at a very low stocking rate of just 5/ha on the Shirley brassica/ryegrass site and the quality of the herbage on offer was very high. Despite this the herbage mass was below benchmarks for highest intake and growth rate but this limitation did not change significantly across

the grazing period since biomass was not significantly diminished. It is also likely that despite lower than desirable biomass the average height of forage was compensating to a degree and the very low stock density allowed the animals a great deal of choice of where in the paddock to graze. These animals were offered barley as a supplement and again, provided the GrazFeed was run with the actual amount of 60g/h/d grain consumed (ME 13.3 Mj/kgDM ;CP 11.5%) it gave an excellent prediction of the likely lamb growth rate but unsurprisingly at such a low voluntary intake there was no difference between the supplemented and un-supplemented groups. Due to the autumn start date the lambs on this trial commenced grazing at over 40kg liveweight so only modest weight gains could be expected due to a greater proportion of gain being fat rather than lean tissue.

Figure 8 Lamb Weight Gain Shirley Brassica



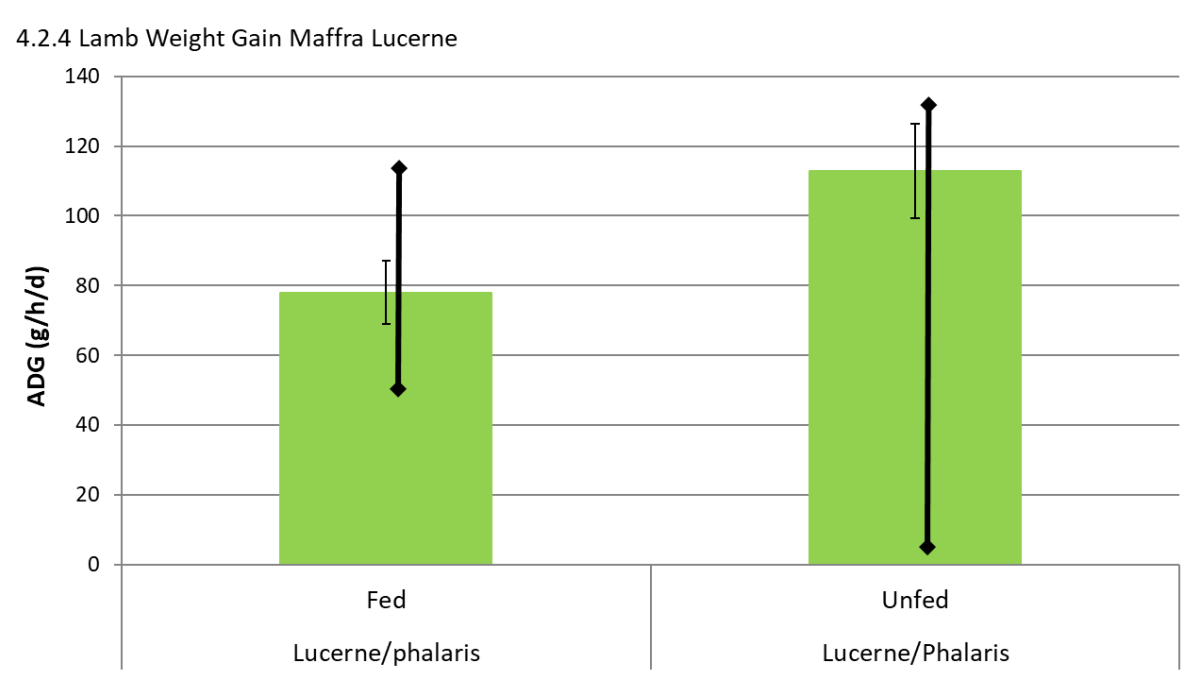
Demonstration 4: Maffra

After an aborted start for this demonstration in February the subsequent late commencement date served to limit both the choice of paddocks and the choice of lambs available. At this site the two mobs were not allocated evenly to the paddocks and rather than just 50 lambs measured all animals were tagged and entry and exit weights were collected for all lambs present. Unfortunately the lambs were not from a single cohort and the average entry weight of the lambs on the supplemented paddock was already 44.9 kg while the average weight entering the un-supplemented paddock was just 36.6 kg. This automatically meant that even with equal volume and quality of nutrition the heavier lambs would not grow the same as the lighter lambs.

The supplemented lambs ate an average of 346 g/h/d of wheat grain which tested an ME of 14.2 Mj/kgDM and 16.4% crude protein. These lambs gained just 78g/h/d on average and allowing for their actual intake of grain GrazFeed predicted an average live weight gain of 117g/h/d at the time of entry to the paddock and just 50 g/h/d by the end of the grazing period. The measured average live weight gain sits in the middle of this predicted range. The modelled weight gain for the un-supplemented lambs was 134 g/h/d at entry and just 6 g/h/d by the end of the grazing period. This much wider range in growth rate is to be expected as the performance of the lambs is not being buffered by any supplementary energy. The measured average daily gain on the unsupplemented

paddock was 101g/h/d. Due to the differences in the starting weights of the two cohorts of lambs it is difficult to draw any solid conclusions about the added value of the supplementation.

Figure 9 Lamb Weight Gain Maffra Lucerne



4.3 Economic analysis

At two of the three sites there was no discernible difference in weight gain between the supplemented and un-supplemented lambs. At Maffra there was a difference but in favour of the un-supplemented lambs but this was more likely due to the large differences in starting weights and potentially the genetics of the two groups of lambs and certainly nothing to do with the supplements. Given the poor response and the unexpectedly low levels of voluntary supplement intake the cost of supplementation was also very low.

In light of the results there was no differences warranting any economic analysis.

4.4 Extension and communication

Throughout the duration of this PDS project, educational and information activities were delivered at an on-farm event, via email communication and through a Q & A presentation. Members and non-members were provided with an opportunity to interact and ask questions, discuss results and seek clarification where necessary on the data provided.

Updates and data were provided to members with a reach of approximately 197 individuals. Two field days were held, the first on 23 June 2021 with the Final Report being delivered on the 15 March 2023.

Unfortunately the results do not demonstrate a clear benefit for producers. It did however, provide additional knowledge and education for producers together with a better understanding of the impact that climatic conditions have on outputs and productivity.

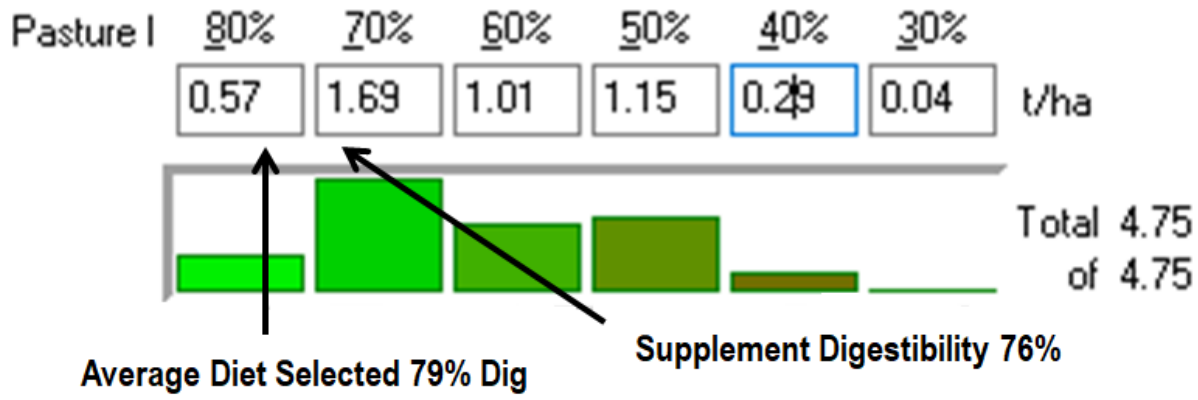
4.5 Monitoring and evaluation

Monitoring and evaluation was undertaken throughout the entire project with all data and findings being stored in the MFS One Drive account. Due to unprecedented weather conditions, the project did not provide significant evidence to indicate a benefit however MFS members and non-members were still able to observe and learn from the data provided during the presentation, engaged in dialogue and were provided the ability to inform future practice.

5. Conclusion

Since supplemented and un-supplemented lambs showed very little difference in the performance during any of the four demonstrations, clearly under the seasonal circumstances experienced, lamb performance was never being excessively limited by pasture quantity or quality. Under these circumstances the voluntary intake of supplements was low for all but Demonstration 4 and that there was effectively a direct substitution between pasture and supplement. Again this makes sense when we look at the predicted intake of pasture from Demonstration 1. The herbage diet selected is calculated to be 79% digestible while the DDG pellets have a digestibility of only 76%. Logically the lambs are satisfying the majority of their appetite with herbage which is of better quality than the supplement so when the supplement is eaten then it substitutes for herbage of a very similar quality in the diet.

Figure 10 The distribution of herbage into digestibility classes for Demonstration 1



At every site other than Maffra the animals were removed from the paddock while the forage available had still not significantly limited their performance. The original premise was that the use of supplements would allow higher pasture/crop utilisation rates without sacrificing lamb growth rates but during the course of the demonstration feed supply was too high and stock numbers too low for anything like full utilisation to occur. Unfortunately coming off the back of drought the cooperating farmers had low stock numbers and hence no ability nor the economic imperative to push the trial paddocks hard enough to see any advantage to the feeding.

As all seasonal indicators suggested that the summer of 2021-22 would again be well above average and stock numbers on local farms had still not built back up it was decided continuing with the second year of measurements would not yield any more informative results than the first. If work of this sort was to be repeated in the future several actions might ensure the hypothesis is better tested including

1) Higher overall stock densities to ensure much more complete forage utilisation
2) Aim for higher utilisation rates (lower residual herbage mass) before stock are moved on.

3) Instead of running the same stocking rates for supplemented and unsupplemented groups it would make more sense to differentiate and run supplemented groups at higher stock density. It might also pay to add a treatment so supplemented stock were run at two different stocking rates. Stocking rates could be determined via a simple feed budget with a lower residual herbage mass planned for the supplemented group and the exit of lambs from the paddock contingent on reaching the target residual herbage.

5.1 Key Findings

- In extremely good seasons there is sufficient feed quantity and quality that no increment of gain can be achieved by supplementing lambs.
- In these seasons sufficient stock numbers are unlikely to be achievable to attain full utilisation of pasture and forages.
- When pasture conditions are so good lambs have very low voluntary intake of energy supplements.
- To fully test the benefits of routine supplementation of finishing lambs the system would need to be tested at much higher stock densities and in more average to below average seasonal conditions.

5.2 Benefits to industry

Unfortunately the seasonal conditions did not allow the concept of using supplements to help fully utilise pastures and forages by growing lambs to be properly tested. There is nothing in our data set to support the original premise but nor do the results collected during such an exceptional season properly discount the value of routine supplementation in more average to below average seasons.