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Focus Site Project Review

The Story of Soya

Hendy Farm, Hundred House

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1 Summary

Keith Williams farms at Hendy, Hundred House, Llandrindod Wells; a 400 acre upland farm with approximately 885 welsh mountain ewes, supplying Waitrose. Ewes are mated with Lleyn and Texel rams. He also runs a small flock of Texels which are performance recorded studying growth rates and muscle depth. 380 acres of the farm is owner occupied with an additional 20 acres rented, all of which is in Glastir. He has a closed suckler herd of 20 pedigree Welsh Black cattle.

Business aspirations:

Run a low cost feeding system and to reduce labour intensity, thereby freeing up time to allow for other farm related jobs.

Continue to produce a high quality product to meet premium market requirements.

Maximise output per ewe.

Run a successful farm business that does not rely on subsidy to be profitable.

Hendy Farm has been extensively involved in knowledge exchange activities since 2008, and is currently participating as a Farming Connect Focus Farm, studying the use of protected protein soya product (in this case, Keith used Sopralin) and high quality silage in a TMR system during 2016-2017. Keith first trialled the TMR system during early 2016, after hearing sheep expert Dr John Vipond speak about the system at a Farming Connect Meeting.

Focus Farm Project key objectives:

To investigate if feeding clamp silage plus a protected soya protein product (Sopralin) to twin/triplet bearing ewes would meet energy and protein needs in late pregnancy. The project considered:

- The cost of feeding Sopralin in a TMR system compared with traditional compound feeding systems.
- The estimation of savings in labour compared with traditional feeding systems.
- Using Body Condition Scoring as part of the ewe health assessment regime.
- Using metabolic profiling to assess whether the feeding regime meets the nutritional requirements of the flock.

1.1 Project Conclusions

The data collected at Hendy farm proved that using Sopralin in combination with the TMR feeder has resulted in meeting the flock's nutritional requirements, as well generating financial savings and a reduced labour requirement. However, in order for the ewe's nutritional requirements to be fully met when using Sopralin, it is ESSENTIAL that high quality silage (metabolisable energy –ME- of 10.5 or above) is fed to the ewes, with mineral supplementation, and that the ewe's body condition score is assessed and acted upon in the weeks before lambing. Project outcomes/learning points were:

1. Cost savings in feed

The previous system at Hendy cost £5.50/ewe up until the point of lambing. 23 tonnes of concentrate were being used totalling £5,290. Sopralin is more expensive than soya compound, however there is no need to use as much of it. The cost of using Sopralin is £1.36/ewe + vitamins and minerals, a cost saving of approx. £4/ewe. Only 2 tonne of Sopralin was used totalling £970 + £130 mineral supplement equalling £1,100. The total saving pre-lambing for the 885 ewe flock at the Hendy is estimated to be approx. £4,190.

2. Reduction in labour requirement

Cost savings in terms of labour are difficult to quantify as Keith does not employ anybody on the farm, other than a lambing student for a couple of weeks during the lambing period. The previous system resulted in feeding concentrates to the ewes 56 days pre-lambing, twice a day, totalling an hour of time. Now with the TMR system Keith feeds the flock 30 days pre-lambing, and only once a day, taking a maximum of 10mins per day. The TMR system has resulted in a more bespoke feeding system, and has released time for other activities on the farm.

3. Avoidance of competition for food and aggressive feeding behaviour

In comparison to using concentrates at feeding periods, the ewes at the Hendy are more content and rest for longer periods using the TMR system. Keith has observed that 20% of ewes do not feel the pressure to feed immediately when fresh feed is distributed. A TMR system facilitates an easy care grouping of the ewes, meeting the nutritional needs dependant on lambs per ewe. This additionally reduces any aggressive behaviour as ewes are separated.

4. Reduction in % of disease and other previous flock health issues

The previous feeding system at Hendy, using concentrates, resulted in ewes eating up to 1.5kg/feed/day more, exacerbating issues such as acidosis and twin lamb disease. Using Sopralin has reduced these occurrences and means starchy compounds found in concentrates can be avoided, which can cause metabolic upsets. Additionally, prolapses have decreased in number on the farm, which increase when concentrates are overfed or when ewes are overfat.

The project also showed the value of the use of metabolic profiling as a spot check on the health status of the flock, particularly as a tool to identify any issues that may not be identifiable by visual or physical observation. Liver and rumen fluke issues were identified in the flock as a result of this testing.

5. High quality silage is essential to meet the nutritional needs of the ewe, if using Sopralin.

The silage at Hendy didn't have enough ME previously when trialling Sopralin at lambing in early 2016. Keith recognised this and decided to cut silage earlier that year, at 5.5 weeks, to increase the dry matter (and therefore ME) content. The beneficial effects of Sopralin can only be fully realised if a high quality (above 10.5 ME) silage is produced.

It was also important to remember to ensure other nutritional requirements were met; Keith supplemented the forage+sopralin mix with vitamin and mineral supplements.

1.2 Take home points for the industry:

It is tempting to continue using a traditional compound feeding system that has always worked for your sheep enterprise. However, without too much effort, significant cost savings can be made by assessing and adjusting your feeding regime. Sheep farmers have the opportunity to better utilise home-grown forage to meet animal production requirements, thereby making savings and resulting in a more profitable enterprise.

1. The value of making changes to your feeding system.

Producing good quality silage gives you flexibility as regards feeding options, and an opportunity to cut cost. Calculate how much you spend per ewe/day pre-lambing on concentrates and compare to other feeding methods e.g. the Total Mixed Ration (TMR) system.

Providing the right nutritional and energy requirements for the ewe will ensure good milk production and other benefits before and when lambs are born, therefore high quality silage is essential. Analyse your silage, to get clarity on the nutritional status of the building blocks of your feed regime. Silage quality determines what you need to do, in order to meet the requirements of the pregnant ewe. To meet the metabolisable energy (ME) requirements, 100g of soya per lamb carried per day for the last 3-4 weeks of pregnancy is a good rule of thumb. Alternatively, if the ME levels of the forage is above 10.5ME, then 50g of protected soya product (for e.g. Sopralin) per lamb carried will be sufficient.

The nutritional requirements of singles should be adequately met with good quality silage only, and only supplemented with a DUP block if required to rear twins.

Minerals and vitamins are also essential and can be used in a powdered supplement form sprinkled on top of silage at a cost of just under 1p/ewe/day, or incorporated into the feeder wagon. As a rule of thumb, 25g is needed per/ewe/day of vitamins/minerals.

Sufficient trough space is needed, to ensure all ewes have access to feed including ewe lambs and older ewes¹. The labour cost savings associated with the system are only realised if using clamp rather than bale silage. Bale silage would need to be split/unrolled/chopped in order to achieve similar forage intakes to that of clamp silage, and forage quality is likely to be more variable.

Additionally, the system provides a constant diet throughout the day, with no large shifts in rumen pH, as is often associated with daily concentrate feeding. Stress and aggression can trigger lambing difficulties and health issues, resulting in a poor health status overall and impacting negatively on the financial performance of any sheep enterprise².

1.1 What you need to do, if wanting to make a TMR system work effectively:

- 1) Analyse your forage to ensure the correct balance of forage and supplementary feed is used.
- 2) Take into account breed requirements, number of lambs and stage of pregnancy.
- 3) Group the flock by nutritional requirement. Scan the ewes and group according to the number of lambs. Singles will require a different diet to twins and triplets.

¹ <http://www.wejameson.co.uk/ewes-in-late-pregnancy/>

² Catherine Nakielny, KN Consulting

1.2 You can then get the benefits of:

- 1) A consistent, mixed diet for all animals available throughout the whole day. This is especially important for young ewes and shy feeders.
- 2) Labour savings due to a reduction in feeding frequency requirements.
- 3) Altering the composition of the TMR as lambing nears –the diet can be easily adjusted as ewe requirements change during pregnancy.
- 5) Reduced risk of acidosis compared to feeding concentrates once or twice a day.
- 5) Access to a wider range of ingredients, with you controlling feed intakes of these ingredients.
- 6) Once the cost of the TMR wagon is accounted for, the cost of the feeding activity itself is significantly reduced, in comparison to standard labour intensive feeding systems.

2. There may be underlying health/nutrition issues in your flock that you can't identify via a physical or visual assessment –the value of metabolic profiling.

Metabolic profiling is a valuable method of assessing whether the diet for ewes pre lambing is providing enough energy, protein, calcium, magnesium and trace elements. It can identify issues that are not able to be assessed via visual and physical assessments, and provides evidence for making necessary dietary adjustments³.

Metabolic profiling, and subsequent testing indicated that whilst gut worm levels were not an issue, liver and rumen fluke levels were. This shows the importance of investigating liver and rumen fluke levels on-farm.

³ Liz Jones, Ddole Road Veterinary Clinic. Hendy FC Open Day presentation.

2 Business Review

2.1 KPIs and business performance indicators

The key performance indicators (KPIs) Keith wanted to work on in this project were:

- Financial savings, relating to cost of feed/ewe
- A reduction in labour requirements
- Flock protein status via metabolic profiling
- Consistent ewe Body Condition Scores (optimum 2.5 to 3.0).

Progress against these KPIs is detailed under section 3.2 of this report.

2.2 Potential impact of the project on business

The aspiration is that the system is low cost in comparison to a conventional system previously used on the farm. Savings have been made with feeding costs during 2016/17. The total saving pre-lambing for the 885 ewe flock at the Hendy is therefore calculated to be approx. £4,190. However, investing in a second-hand mixer for the system incurred some initial outlay of £4,750, but a new mixer wagon was required by the business anyhow. The cost of the TMR wagon will be covered within 2 years, based on these figures.

The system still enables lambs to be produced and finished to a high standard to meet premium markets, but at a lower cost.

3 Project Review

What is Sopralin?

Sopralin is a high quality protected vegetable protein which as a result of treatment, contains a high level of Digestible Undegradable Protein (DUP). Protected soya has been used elsewhere in the farming industry, particularly in the dairy sector, but is not in common usage in the sheep sector. It is a highly palatable feed that can be fed on its own or used in a variety of diets. The savings in time, cost and labour offer big savings to farmers over conventional approaches where farmers often overfeed Rumen Degradable Protein (RDP).

Nutritional requirements pre lambing.

A ewe's energy and protein requirements increase hugely in the last eight weeks of pregnancy. This period is when ewe death rates are at their highest. It is vital to meet these requirements through careful nutritional management. Lamb mortality is highest in lambs with low birth weight and/or born to ewes in poor body condition.

3.1 Aims of the project

To investigate if feeding clamp silage plus a protected soya protein product (Sopralin) to twin/triplet bearing ewes would meet energy and protein needs in late pregnancy. The project considered:

- The cost of feeding Sopralin in a TMR system compared with traditional compound feeding systems.
- The estimation of savings in labour compared with traditional feeding systems.
- Using Body Condition Scoring as part of the ewe health assessment regime.

- Using metabolic profiling to assess whether the feeding regime meets the nutritional requirements of the flock.

3.2 Project results and discussion

	KPI/performance attribute	What was the project result?
1	Financial savings associated with cost of feed/ewe	The previous system at Hendy cost £5.50/ewe up until the point of lambing. 23 tonnes of concentrate were being used totalling £5,290. Sopralin is more expensive than soya compound, however the volumes required are significantly lower. The cost of using Sopralin is £1.36/ewe + vitamins and minerals, a cost saving of approx. £4/ewe . Only 2 tonne of Sopralin was used totalling £970 + £130 mineral supplement equalling £1,100. The total saving pre-lambing for the 885 ewe flock at the Hendy is therefore calculated to be approx. £4,190.
2	A reduction in labour requirements	The feeding system pre TMR involved feeding the ewes 56 days pre-lambing, twice a day, totalling an hour of time per day. With the TMR wagon, Keith feeds the flock 30 days pre-lambing, and only once a day, taking a maximum of 10mins per day. This relates to a saving of 51 hours during the lambing period.
3	Flock protein status via metabolic profiling	This indicator is essential in order to provide peace of mind as regards ewe health and performance. Knowing flock protein status means that you can ensure protein levels are optimised to achieve performance. Metabolic profiling indicated that energy and protein status of the flock was good, but that the long term protein status was marginal/poor. Other underlying issues needed to be assessed in order to address this issue. More detail regarding the Metabolic Profiling results is provided at section 3.2.1.
4	Consistent ewe Body Condition Scores	Keith would say himself that he 'drives his ewes hard', and ensuring that they are not over-fat (and therefore costing the business) is a priority. However, he is therefore very aware that maintaining an adequate body condition score (BCS) is essential (maximum production at minimum cost). Metabolic profiling helped show that the flock as a whole is not operating at the desired 2.5 -3.0. In order to achieve this consistent BCS, additional supplementation during early lactation was required, in conjunction with an investigation as to whether fluke and gastric worms were significant issues.

3.2.1 Metabolic testing results

Metabolic testing was undertaken pre-lambing (March 2017) to establish whether the ewe's diet was providing enough of the following:

- Energy
- Protein
- Mineral Status

Metabolic profiling is a valuable method of assessing whether the diet for ewes pre lambing is providing enough energy, protein, calcium, magnesium and trace elements. It can identify issues that are not able to be assessed via visual and physical assessments, and provides evidence for making necessary dietary adjustments⁴.

Blood tests for metabolic profiling were done on 20 ewes (range of twins and triplets), 3 weeks before the start of lambing. The results concluded that⁵:

	Results and recommendations
Energy balance	The energy results for both twins and triplet ewes sampled were good. The BCS of many of the ewes sampled was below the target of 2.5-3.0 and therefore depending on grass growth, these ewes may require additional supplementation during early lactation to ensure that they do not lose further body condition.
Protein status	Blood urea-N provides an indication as to the amount of Effective Rumen Degradable Protein (ERDP) in the ration. The urea-N results were all above the cut-off of 1.7 mmol/l and therefore the amount of ERDP in the diet is able to meet these ewes' <i>current</i> needs. However, the majority of the albumin results were marginal/low (cut-off 30 g/l) and therefore the long term protein status of the group appears to be marginal/poor. This is consistent with the poorer body condition of many of these ewes, with some of the thinner ewes having considerably low albumin results e.g. ewes 6414 and 6415 are BCS 1.5 and have albumin results of 23 g/l and 25 g/l respectively.
Mineral status	The magnesium results were within normal limits for all but one of the ewes sampled. The amount of magnesium in the diet is therefore able to meet these ewes' <i>current</i> needs. The group mean copper result for the ewes carrying triplets was marginal (marginal range 3.0 – 9.4 $\mu\text{mol/l}$), whilst the group mean result for the ewes carrying twins was within the normal range (9.4 – 19.0 $\mu\text{mol/l}$). There were a number of ewes in both groups with marginal copper results, however none below this marginal range. Blood copper estimation is a less reliable indicator of total body copper status than liver copper estimation and at this stage it would be worth investigating the copper status of the flock further, however supplementation on the basis of these results alone is not warranted. The calcium results are within normal limits for all but two of the ewes sampled and therefore the calcium status of these ewes is satisfactory.

Conclusions made, based on the above results were as follows:

'The results of this test indicate that the energy and short-term protein status of the flock is good, however the long-term protein status is marginal/poor. This may be a consequence of concurrent disease and it would certainly be worth taking faecal samples to rule out the presence of liver fluke or heavy gastrointestinal nematode worm burdens. High levels of diseases such as lameness can also result in this pattern of results. If concurrent disease can be ruled out, then these low albumin results are probably a consequence of marginal protein status earlier in gestation. In this instance, there is little that can be done at this stage, however it may inform winter feeding management in the future.'

⁴ Liz Jones, Ddole Road Veterinary Clinic. Hendy FC Open Day presentation.

⁵ Results provided by the Dairy Herd Health & Productivity Service, University of Edinburgh.

Given the marginal result of the triplet group, it would be worth reviewing the copper status of the flock and if there are concerns, liver samples from cull/barren ewes should be submitted for further investigation. Supplementation on the basis of these results alone is not warranted.'

Take home messages for Hendy's twin and triplet ewes on the silage/Sopralin mix:

- Ewe energy levels were good, but continued supplementation would be needed until enough grass was available, in order to ensure milk production levels stayed high.
- The diet provided sufficient Effective Rumen Degradable Protein.
- Albumin levels were low (and lowest in the low BCS ewes), indicating possible liver damage or long term protein deficiency issues, and that this should be investigated further.
- The magnesium and calcium levels were normal, indicating that the mineral supplementation was adequate.
- Copper levels were low, and should be investigated further.

3.2.2 Action taken as a result of the metabolic profiling work.

As recommended, Keith and his vet investigated the reasons behind the low albumin and BCS levels, and undertook a fluke and worm egg count from 10 triplet ewes. Results indicated that whilst gut worm levels were not an issue, liver and rumen fluke levels were. The flock had not been treated for fluke since autumn 2016, and no treatment for rumen fluke had been used in recent times. This provides an illustration of the importance of investigating fluke levels on-farm, and also encouraging greater awareness of the impact of liver and rumen fluke on flock performance.

3.2.3 Silage analysis

As indicated previously, the choice of supplementation is dependent on the quality of forage produced. Therefore silage analysis is an essential tool in order to build up an appropriate and cost effective feeding regime. Analysis of the 2016 clamp silage indicated that it had a dry matter of 34%, crude protein levels of 14.4% and critically, a ME of 10.9%.

Therefore, the quality of the silage was sufficiently good (ME above 10.5 is required) to consider using Sopralin as the feed supplement, and that the decision to cut earlier in 2016 was correct, as it resulted in a higher ME silage product, giving Keith the flexibility to try out a new feeding regime in 2017.

3.2.4 SWOT project analysis

STRENGTHS	<ul style="list-style-type: none">• The TMR system provides a constant diet throughout the day, with no large shifts in rumen pH associated with concentrate feeding once or twice a day.• Cost savings of £4/ewe.• Meet nutrient requirements of the flock and not exceeded. Improve overall performance of flock.• Reduced likelihood of ewe deaths through prevention of twin lamb disease and acidosis.• Reduction in vaginal prolapses due to excessive concentrate supplementation.• Clamp silage enables maximum forage intake.• Increasing the digestible undegradable protein levels in prolific ewes prior to lambing is important for lamb birthweights, lamb growth, udder development/milk production and subsequent lamb production.• Sopralin is a good source for DUP –the protected protein status means that the product has double the DUP content of unprotected soya.• Heavier lambs enter the market place as a result = potential increased returns.• DUP does not depress fibre digestion resulting in higher forage intake.• Identifying nutritional deficits in ewe diet enables more healthy and overall better performance from flock.• Little wastage in comparison to conventional feeding systems.• More production from grazed grass and home-grown feeds.• Rationing stock depending on lamb yield and level of performance results in less waste and inefficiency.• Use of time for other farming practices.
WEAKNESSES	<ul style="list-style-type: none">• Sopralin is not hugely palatable and it usually takes 3 days to get ewes used to it.• Initial costs including silage analysis, veterinary costs (blood sampling, fluke and egg worm counts) and mixer wagon.• Use of Sopralin – dependant on the production of high quality silage.• Often wide variation in forage quality between farms and also within the same farm means that system has to be based on feed quality evidence.• Weather is changeable and unpredictable, which could result in a delay in harvest and lower quality silage/yield produced.• Relies on the use of a feed mixing system.• TMR is not compatible with bale silage.• The system does not work with ring feeders. Ewes don't have the ability to pull out all material and digest it resulting in a lower intake.• Ewes must be at a good body condition.• System easiest if ewes fed indoors pre lambing, which may not be feasible for upland outdoor regimes.• System cannot withstand sudden changes to feeding pattern, and is reliant on good assessment of dietary requirements, which may not be within the capabilities of some farms.• Silage may not be eaten according to predictions. Silage intake needs to be monitored and ewes should be condition scores checked regularly.

	<ul style="list-style-type: none"> • Need to assess/anticipate mineral and vitamin requirements. A lack of supply of minerals and vitamins compromising body functions and decreasing overall lamb vigour. • Inadequate trough spacing can be a risk. • Young ewes and shy feeders not separated results in lack of energy uptake – takes more effort separating ewes into groups.
OPPORTUNITIES	<ul style="list-style-type: none"> • Opportunity to feed 3 times a week or every second day as separate feeds to further reduce labour requirement for the system. • The value of metabolic profiling; identifying underlying health status issues before they become a major economic issue. • Encourages more proactive feeding adjustments by the farmer, to optimise production and keep costs down for e.g., alternative feed options when silage crops are low quality e.g. adding 0.25kg of beet pulp or soya hulls. • Opportunities to research whether Sopralin/TMR feeding regime is compatible with particular sheep breeds. • Ewes with triplets at optimum BCS and having good health status produce more birth-weight per unit of maternal weight.
THREATS	<ul style="list-style-type: none"> • Parasites and stressful weather resulting in poor condition score of flock. • Poor growing year/weather conditions for silage crop – unable to cut at 5.5 weeks • Energy per hectare used from grass is dependent on how much is grown, crop quality, how well it is preserved and how much is wasted when fed. This varies from farm to farm. • Wet silage may result in reduced total DM intakes and cause balling and physical separation whereas dry silage may lead to greater sorting and increased risk of acidosis, which can also lead to higher wastage levels. Understanding the quality of silage is critical to the success of any forage based feeding regime. • Farmer knowledge levels are critical for optimising the use of a TMR system, and avoiding using contaminated silage. • Poor preservation and storage techniques as a result of farmer ability and poor infrastructure may be an issue. • Sopralin/import prices increase further decreasing cost savings and overall profit margin. A risk that soya may be a very price sensitive product post-Brexit. • Wet weather conditions may promote the presence of liver and rumen fluke within the flock. • Poorly maintained grassland at crucial times can affect ewe condition, and has an impact on the volumes (and associated cost) of supplementation required.

3.2.5 Farmer perspective of the project

Keith has enjoyed participating in the project and has every intention to continue with the system, especially after seeing the cost savings it delivers. Additionally, Keith being a one man band recognises the benefits of reduced labour requirements, allowing for other farm related jobs to be undertaken.

Body condition scoring, metabolic testing and other veterinary tasks have allowed Keith to develop good communication with the local vet, resulting in an improvement in flock health. He is extremely satisfied with how content the ewes were in the shed over the lambing period. There was much less competition for feed/aggressive behaviour which resulted in less problems overall, for example, twin lamb disease and prolapses.

Keith has shared his positive experience of using the TMR system through the wider farming community and through attending/running Farming Connect open events. Whilst some farmers may not be willing to make the financial investment in a mixer wagon, Keith believes the money has been well spent, generating a return in less than 2 years, and has saved him a significant amount of time on-farm.

Moving forward Keith wishes to move to an outdoor lambing system to further ease the workload and reduce labour intensity. Keith believes a “work smarter not harder” approach is best to achieve a cost and time efficient, productive business. By running a low-cost system while making the most of animal and plant genetics, and selling into a premium market, he is ensuring his business is safeguarded against future challenges⁶.

3.2.6 Alignment to sector’s strategic goals

This work contributes to the Welsh Red Meat Sector’s strategic objectives, specifically in relation to:

- Improving on-farm output from the red meat sector by at least 7% by 2020, by increasing helping to contribute to increasing the national average flock performance.
- Increasing the average weight of lambs produced per ewe in Wales, by at least 10 (to 56kg).
- Develop new business focussed programmes to improve the management, efficiency and profitability of Welsh red meat businesses.
- Establish mechanisms that will maximise outputs from grass based systems and reduce reliance on bought in (imported) feed.
- Develop and encourage flock health planning, disease prevention and effective quarantine practices to improve biosecurity and reduce the impact of disease.
- Inform/educate the industry about cost saving/conservation, energy and water efficiency, ways to reduce waste and ways to improve knowledge, openness and transparency.

4 Impact on the industry

4.1 Impact on individual business

For the full summary list of the impact of the project on the business, refer to the Project Conclusions in section 1.1 of this report.

The project has revealed that there are significant cost, time and labour savings to be made when using Sopralin and high quality silage in a TMR system, summarised below.

- A more profitable sheep enterprise
- Reduced aggressive feeding behaviour
- A healthier sheep enterprise
- Cost savings after initial cost of mixer feeding, silage testing and veterinary costs
- The value of cutting silage earlier – ensuring higher DM content
- Less labour (one man band) and increased time efficiency

⁶ <http://www.fwi.co.uk/uncategorized/farmers-weekly-sheep-farmer-of-the-year-2013-keith-williams.htm>

- Focus on achieving condition score targets
- Focus on attention to detail
- The more production is derived from home-grown forage, the cheaper the system will be to operate and the more margin will be made⁷.

4.2 Impact on wider industry

Take home points for the industry are as follows (also provided in the Summary section of this report).

1. The value of making changes to your feeding system.

Producing good quality silage gives you flexibility as regards feeding options, and an opportunity to cut cost. Calculate how much you spend per ewe/day pre-lambing on concentrates and compare to other feeding methods e.g. the Total Mixed Ration (TMR) system.

Providing the right nutritional and energy requirements for the ewe will ensure good milk production and other benefits before and when lambs are born, therefore high quality silage is essential. Analyse your silage, to get clarity on the nutritional status of the building blocks of your feed regime. Silage quality determines what you need to do, in order to meet the requirements of the pregnant ewe. To meet the metabolisable energy (ME) requirements, 100g of soya per lamb carried per day for the last 3 weeks of pregnancy is a good rule of thumb. Alternatively, if the ME levels of the forage is above 10.5ME, then 50g of protected soya product (for e.g. Sopralin) per lamb carried will be sufficient.

The nutritional requirements of singles should be adequately met with good quality silage only, and only supplemented with a DUP block if required to rear twins.

Minerals and vitamins are also essential and can be used in a powdered supplement form sprinkled on top of silage at a cost of just under 1p/ewe/day, or incorporated into the feeder wagon. As a rule of thumb, 25g is needed per/ewe/day of vitamins/minerals.

Sufficient trough space is needed, to ensure all ewes have access to feed including ewe lambs and older ewes⁸. The labour cost savings associated with the system are only realised if using clamp rather than bale silage. Bale silage would need to be split/unrolled/chopped in order to achieve similar forage intakes to that of clamp silage, and forage quality is likely to be more variable.

Additionally, the system provides a constant diet throughout the day, with no large shifts in rumen pH, as is often associated with daily concentrate feeding. Stress and aggression can trigger lambing difficulties and health issues, resulting in a poor health status overall and impacting negatively on the financial performance of any sheep enterprise⁹.

1.1 What you need to do, if wanting to make a TMR system work effectively:

- 1) Analyse your forage to ensure the correct balance of forage and supplementary feed is used.
- 2) Take into account breed requirements, number of lambs and stage of pregnancy.
- 3) Group the flock by nutritional requirement. Scan the ewes and group according to the number of lambs. Singles will require a different diet to twins and triplets.

⁷ <http://www.nutrientmanagement.org/what-we-do/tools/feed-planning-for-sheep-and-cattle/>

⁸ <http://www.wejameson.co.uk/ewes-in-late-pregnancy/>

⁹ Catherine Nakielny, KN Consulting

1.2 You can then get the benefits of:

- 1) A consistent, mixed diet for all animals available throughout the whole day. This is especially important for young ewes and shy feeders.
- 2) Labour savings due to a reduction in feeding frequency requirements.
- 3) Altering the composition of the TMR as lambing nears –the diet can be easily adjusted as ewe requirements change during pregnancy.
- 5) Reduced risk of acidosis compared to feeding concentrates once or twice a day.
- 5) Access to a wider range of ingredients, with you controlling feed intakes of these ingredients.
- 6) Once the cost of the TMR wagon is accounted for, the cost of the feeding activity itself is significantly reduced, in comparison to standard labour intensive feeding systems.

2. There may be underlying health/nutrition issues in your flock that you can't identify via a physical or visual assessment –the value of metabolic profiling.

Metabolic profiling is a valuable method of assessing whether the diet for ewes pre lambing is providing enough energy, protein, calcium, magnesium and trace elements. It can identify issues that are not able to be assessed via visual and physical assessments, and provides evidence for making necessary dietary adjustments¹⁰.

Metabolic profiling, and subsequent testing indicated that whilst gut worm levels were not an issue, liver and rumen fluke levels were. This shows the importance of investigating liver and rumen fluke levels on-farm.

4.3 Impact on Welsh Government's cross cutting and priority themes

Climate change

The varying quality of forage available after often increasingly unpredictable summers and the increasing cost of imported feeds will make formulating rations -based on silage analysis data- increasingly important.

Using the TMR system improves efficiency as less feed is wasted. Managing feed rations ensures that fertiliser land applications (and other grassland investments) aren't wasted into the natural environment. Additionally the system reduced carbon emissions associated with feed delivery vehicles by up to 75%.

If the principles of this project are adopted more widely, they will contribute to a reduction in emissions from feed production and transportation. Ensuring standards of animal welfare are high will improve feed efficiency and reduce inputs. This will help reduce nitrogen use and methane production per unit of milk and meat produced across the sector as a whole¹¹.

Animal Health and Welfare (AHW)

The TMR ad-lib system used at Hendy has reduced competition and aggressive feeding behaviour and the overall stress placed on the flock in comparison to a conventional feeding system. It has also helped

¹⁰ Liz Jones, Ddole Road Veterinary Clinic. Hendy FC Open Day presentation.

¹¹ <http://www.nutrientmanagement.org/what-we-do/tools/feed-planning-for-sheep-and-cattle/>

evidence the value of metabolic profiling in understanding the disease incidence and nutritional status of one's livestock.

Future Generations

The project encourages young farmers who are working or looking to work in the sheep industry to be forward thinking and to grasp opportunities to run a business more efficiently. This includes reducing cost, labour and time; all are increasingly important post Brexit in such a volatile industry.

Tackling Poverty

Running flocks more efficiently will allow businesses to use time more wisely and to be able to focus on elements such as flock health resulting in increased productivity. More cost efficient business practices result in the potential for increased returns, whether that be from on or off farm income.