

Plastic free Baling: Testing the impacts of bringing back sisal twine.

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Abstract/ executive summary

Plastic baling products have replaced natural twine in the UK since the 1960s. Despite its benefits plastic comes with unquantified environmental impacts. This field lab group of farmers trialled sisal twine, assessing it for ease of use, forage quality and cost. The benefits of sisal: ease of disposal, minimal environmental impact and stability of feed quality were positive enough for all trialists to consider using sisal again for hay but not wrapped silage. The belief that sisal is harder to work with and does not maintain feed quality was shown not to be the case in the UK context, as long as storage is dry. Cost is a significant barrier to on-farm adoption: sisal bales cost 40% more to make than plastic net bales. Availability of machinery is another barrier: both the lack of twine rather than net balers in the UK, and of balers which can wrap four spools at once, thereby halving binding time. We recommend a 'sustainable bale coverings' supplement be included in the SFI and Countryside Stewardship schemes to encourage supply chain development, cost reductions, and investment in baler innovation.

Introduction

As baler technology has progressed, so too have the products used to compress and tie the bales together for handling/preserving. Natural fibre twines often constructed from flax or sisal were the dominant product for baling until the advent of Polypropylene (plastic) twine in the mid 1960s which was popularised for its ability to tie tighter and produce a bale which would not break open from twine rotting, in theory the re-usability of plastic presented additional functional justification for what was at the time a more expensive product. There was then a considerable market shift to plastic twine brought about by an increase in production dropping prices and the seamless operational shift due to machine compatibility, which subsequently generated a crash in global sisal production from its peak in 1970. Although this was a large and notable market shift, it was more transitional than revolutionary in its nature.

A greater shift, with more prominence for the purposes of this trial, was the transition from twine bound to net-wrap bales, and the general dominance of round bales in modern hay making. This transition has limited data for quantifying its speed and scale but several primarily American agricultural publications from the mid 1990s to early 2000s outlined the following perks of net-wrap against twine products; 1. Faster application 2. Better water shedding due to better surface smoothness and compression (prolonging feed quality) 3. Speed and ease of unbinding for feeding 4. Ease of collection. These factors alongside the earlier shift from a degradable product to a failsafe plastic product, have seen the market

today being dominated by net-wrap and therefore net-wrap machinery rigs across the sector. It is also worth noting the versatility of net-wrap for its ease of use for silage plastic wrapping post binding.

With this recent history in mind, we can observe the production justifications for an industry today dominated by plastic use for making bales. In the UK, approximately 10 to 12 million round bales are made every year (hay, straw and silage), using the equivalent plastic to 651 million single-use carrier bags. As is the case with many rapid innovations/transitions, there are several questions to be asked around the holistic consequences of plastic baling, some have been researched and some are still relatively anecdotal.

1. What is the additional carbon intensity of plastic products over sisal or other grown products?
2. What is the significance of plastic ingestion in feeding systems?
3. What is the significance of land contamination by misplaced plastic baling products?
4. What pressures do plastic baling products put on recycling and waste management systems?
5. Under the introduction and increase of a plastic tax, would this product be economically viable?

With research underway on these issues and interest on 'cleaning up' agricultural production methods increasing, it is crucially important to explore solutions which pose the opportunity for a positive transition. This trial has been conducted to test and trial the feasibility of bringing back sisal bound bales in a modern agricultural context.

To our knowledge this research project is the first of its kind in a UK context, this is most likely due to the industry leaning on the rigorous and seemingly conclusive research conducted in the USA some 20+ years ago, which found net wrap to produce a superior forage quality. However, the outdoor bale storage and continental winter conditions experienced in these previous experiments would allow us to argue that these conclusions need re-testing within a UK specific context, where bales are stored in dry/covered conditions. There is also a need to test baling approaches with the modern environmental considerations outlined above applied to concluding outcomes.

For this field trial 12 farmers were contacted and confirmed for their interest in making sisal bales alongside net-wrap or twine baled forage. The resulting predicted bales would be 2,500 bound using sisal and 2,500 bound using the farmer's conventional means, most of the forage would be hay with some haylage and some straw being made. This trial would aim to assess the economic and general management implications of using sisal as a baling product considering its perceived and increasing justifications as an environmentally progressive alternative to plastic.

Methods and constraints

This trial involved three key work packages for later analysis and review; 1. The contracting implications of making bales with sisal twine. 2. The management and handling implications

of using sisal bales for feeding over a single season 3. A small sub-set of bales were tested for their feed quality against net wrapped bales under the same condition.

Hay making

For this trial, Cotesi Sisal twine was used which had been oil treated to prevent rodent issues. All trialists were asked to obtain their own means of baling with sisal, which would be posted to them (this included if a contractor was required to make twine bales), and were then tasked with ensuring that both sisal and conventional bales from the same field were stored under the same conditions before being used during the feeding season, this ensured the maximum possible amount of variable control despite this being a multi-farm field trial. When bales were made notes were taken on the weather conditions and how the curing process had been (such as left to sweat in the field, number of times turned etc.)

The principal contractor for the trial who was performing over 1,000 sisal bales with a Krone Bellima F130, recorded more a detailed analysis of bale making and its implications; this included records for the time that each bale was taking to mechanically produce, which was recorded 20 times and averaged for both net wrap and for sisal. The additional 'down time' used in rigging spools and adjusting balers was obtained per bale by dividing the total bales achieved for each system across an hour's work, these figures were obtained over several working days.

Cost evaluations were also recorded on the costs of materials (broken down to a cost per bale) and the contracting costs associated with each bale which included driver costs, tractor depreciation, fuel, and baler depreciation. The result was a cost per bale reflective of the whole contracting system.

Feeding operations

Over the 2024-25 winter, trialists used both their conventional and sisal bales for general forage handling and feeding, they were asked to log their experiences and details of their specific system. This experience was collected in the form of an end of season questionnaire (Appendix 1), which aimed to capture the sense of usability in modern farm settings for sisal bales. This questionnaire encompassed economic, operational, health and safety, environmental and scalability perceptions. Due to the small sample size within the trial these results would not be necessary for any statistical analysis, only basic analysis and results descriptions were performed.

Forage analysis

On the 29th of May 2025 the following spring after bailing and feeding, 13 samples of hay were taken from a total of 39 bales stored and harvested from three separate locations on the Lizard peninsula, Cornwall. All sites provided fully protected storage on a well-drained ground surface. Site 1 included nine sisal bales and nine net wrap bales, site 2 included nine sisal bales and site three included six sisal bales and six net wrap bales. For each hay bale a 20cm deep by 12cm wide core was taken from the side of the bale well above ground level, all bales had

been stored on their ends. The choice of this sampling location on the bale was made to ensure that forage was analysed at the point where the greatest potential variability would be caused by the binding material and technique. These sub-samples were then bulked into sets of three and a representative sample from these were sent to a laboratory for hay forage analysis. Analysis was performed and values calculated for the following characteristics of the feed: Dry matter content, crude protein, oil-B, ash, neutral detergent fiber, acid detergent fiber, sugar, metabolizable energy, digestible energy, a digestibility value was also provided for the forage as a percentage. Statistical analysis of the results was performed to determine if there is any significant difference between the treatments of sisal or net-wrap baling methods.

Results

In the 2024 season 1,945 bales were made with sisal binding under the trial. Of the twelve farms initially signed up, only 5 farms were able to conduct the trial. The details of the trialist activity is presented in table 1.

Table 1: The farms under trial and their respective sisal applications. Sites used for analysis are outlined.

Trialist n	Sisal bales made	Forage type	Storage type	Use type
1	270	Hay, from improved permanent pasture	Large, covered barn	Forage sales
2	40	Haylage, from herb rich ley	Plastic wrapped and stored outside	Beef
3	375 (analysed)	Hay, from improved permanent pasture	Large, covered barn	Beef
4	1,230 (analysed)	Hay, from various low input pastures and herb rich ley	various barns	Beef
5	30	Hay, from improved permanent pasture	Covered barn	Goats

A number of initial factors emerged during the trial which resulted in under half the trialists being able to take part. The early part of the hay making season for 2024 was met with poor weather which made the window of opportunity for harvesting good quality forage very narrow, and many farms inside and outside of the trial expressed a much more rushed baling season than usual. Ordinarily this factor would not be a large issue to overcome, but it compounded with a lack in availability of twine balers across the trial farms, which created a complexity of organising contractors or equipment hire proving too much in a tight season.

Of the seven farms which could not continue the trial, five quoted the equipment requirements as their barrier to entry instead of the sisal product itself, one farm could not rely on the sisal to hold big square bales together and left the trial, the remaining farm received sisal in the post but did not communicate with the trail after that point. Additional notes from the field conditions were that much of the hay made during 2024 was later than desired, generating a perceived loss in forage quality across the board, most of the forage was taken in from the field on the same day as being baled.

Making bales with sisal

The contracting research of sisal concluded three key areas of reduction in bailing productivity when using sisal as an alternative to net wrap.

1. Sisal is a bulkier product, meaning carrying a greater volume of material on the bailer than net wrap and changing the spools more frequently than net wrap.
2. The older twine system is both more technical and prone to faults caused by variability.
3. Net has a full width covering, so it requires approximately 2.5 turns of the bale before it is cut, and the bale can be released. Twine needs to be wrapped around the bale 20 times for a full-width covering. With two twines being fed at the same time, this requires 10 turns. The additional time this takes is about 10-15 seconds.

The reference average bailing time for a modern net wrap bale provided by the contractor was 90 seconds. The additional 10-15 seconds combined with records of additional adjustment times linked to using the sisal and twine baler yielding another additional 38-43 seconds of time consumption, we obtained an average additional 40%-time consumption for the use of sisal twine baling systems compared to net wrap bales (Table 2).

Table 2: Bailing time consumption between methods.

Baling system	Bailing time	Loading/adjusting	Total time per bale
Net wrap	90 seconds	37 seconds	127 seconds
Sisal Twine	100 – 105 seconds	75-80 seconds	180 seconds

The price of sisal was obtained by purchasing a pallet for import, this including shipment and VAT resulted in a cost of £2,360.00, each pallet included 40 packs of 6 spools each, each pack cost £59, every spool held on average 1,320.8m of twine, and therefore every meter cost £0.007445p. given that each bale involves 20 wraps around a roughly 4m bale circumference, the material cost per bale is £0.596p. A net wrap roll cost was obtained at £165 for 3600m, on each bale 10.2m was used, resulting in a net wrap material price per bale of £0.467p.

Contracting rates were presented as; Operator = £30/h, Tractor depreciation = £10/h, Fuel = £20/h, Depreciation of baler = £1.50/per bale. The results of the economic assessments are shown in Table 3.

Table 3: Economic assessments of the contractor or farmers costs associated with producing sisal and net wrap bales.

Contracting Rates Sisal	
Driver/h	£30.00
Tractor depreciation/h	£10.00
Fuel l/h	£20.00
Bales per hour	20.00

Net Contracting Rates Net wrap	
Driver/h	£30.00
Tractor depreciation/h	£10.00
Fuel l/h	£20.00
Bales per hour	28.00

Tractor cost per bale	£3.00
Baler depreciation /bale	£1.50
Sisal	£0.596
Cost per bale	£5.10

Tractor cost per bale	£2.14
Baler depreciation /bale	£1.50
Net wrap	£0.47
Cost per bale	£4.11

Handling and feeding

Five responses were given to the questionnaire, four trialists submitted their questionnaire online while trialist 3 provided their answers in an in-person interview.

A competitive alternative to net wrap from an economic standpoint.

- Four trialists reported that sisal was more expensive product, quoting the additional time needed to make the bales as a key factor in this viewpoint, only one of the four mentioned the additional material costs as a factor.
- Trialist 5 expressed a view that twine wrapped hay is a superior product to net wrapped bale and that the sisal is more stable on the bale than polypropylene, indicating that they believe a bale of a greater value is created therefore justifying the additional costs.

Result: Generally trialists found a greater economic justification for using net wrap, but in a system already using plastic twine, the sisal becomes more competitive.

Sisal performance during harvesting and storing.

- No trialists reference issues taking bales from the field to storage.
- Two of the five trialists referenced bales which were left out in the field (2+ weeks) having some rotting issues after the hay had been stored and re-handled.
- Two trialists also referenced issues with sisal bales rotting where twine had been in direct contact with the floor and at the edge of their storage space where there was maximum exposure to dampness.
- Trialist 2 noted that the Ensiling of haylage was better in their net wrapped bales (all of these bales were also plastic wrapped).
- Trialist 4 noted that the appearance of the sisal bales is scruffy but this does not convey to a performance change.
- Trialist 5 referenced the greater resistance that sisal has from slipping when compared to plastic twine.

Result: The trialists note the specific requirements for sisal to be used on hay which is removed from the field quickly and stored in a dry environment stacked end to end, given these controls no issues would have been highlighted.

Mechanical handling.

Four trialists mention no changes to the mechanical handling of sisal bales, trialist 1 referenced that there are fewer snagging points for binding material to catch on and favoured sisal for this reason.

Result: There is no negative impact of sisal for mechanical handling, given that the twine has not rotted, there may be a benefit from less snagging points.

Key differences observed when moving, cutting and feeding with bales.

- Two trialists observed no changes from operating with sisal.
- Two trialists found the sisal to be more cumbersome to cut into for feeding, both referencing the additional spotting and cutting requirement when dealing with multiple strings as opposed to net sheets.
- One trialist found the sisal easier to cut into when the factored in the detailed picking out of small plastic fragments needed when dealing with net wrap bales.

Result: It is likely that the workability of sisal bales is highly dependent on the experiences and preferences of the user, but the key point of difference is in how the bales are cut open before feeding.

Feed quality.

All trialists using hay found no change to the feed quality when compared with their conventional bales, trialist 2 who made haylage, found that the forage did not mature as well under the plastic wrap when bound with sisal.

Result: Sisal used for hay bales is unlikely to cause any forage quality issues, but under a plastic wrapped haylage or silage there may be fermentation issues.

Disposal.

Result: All trialists outlined the benefit of knowing they can compost the product and all intend to dispose of the product in this way.

Health and safety.

Result: No trialist found any health and safety issues outside of the different bailing technology.

Animal welfare.

Result: No trialists outlined any apparent animal welfare issues, noting that although ingestion may still be a risk, it is better than the prospect of plastic ingestion.

Using sisal again.

Four of the trialists would use sisal again, however one of these trialists outlined a desire to have a better bailing system, another mentioned needing to assess costs.

The fifth trialist also outlined a need for a better bailing system before they could consider using sisal again.

Result: The general result from using sisal has been positive enough for all trialists to consider using it again for hay, but under a plastic wrapped haylage or silage there are issues to overcome. Cost will also be a factor farmers need to consider.

Recommending sisal to others.

Result: The trialists expressed the need to understand the application and machinery constraints of others before recommending sisal but would recommend the product under the right conditions.



Forage Analysis

Of the 13 samples tested, only 10 were able to be used in any statistical or graphical comparisons due to one site not having any control/conventional bales for comparison, however the forage results are still of use for the trialist as they determined that there was no obvious depreciation in their feed quality resulting from sisal use.

Figure 1 presents the comparative feed quality components tested, the box and whisker plots outline a greater variability across the sisal samples for most components, while metabolizable energy, crude protein and sugar content were the only components with greater variability across the net wrap bales.

Across almost all components, the sisal averages were greater than those on net wrap bales, while Oil B and metabolizable energy were virtually equal, for all components except ADF this represents a better score, while acid detergent fibre is preferable to have scored lower. This ADF score and the lower scores of digestible energy and D value are the only components where net wrap achieved a more favourable score.

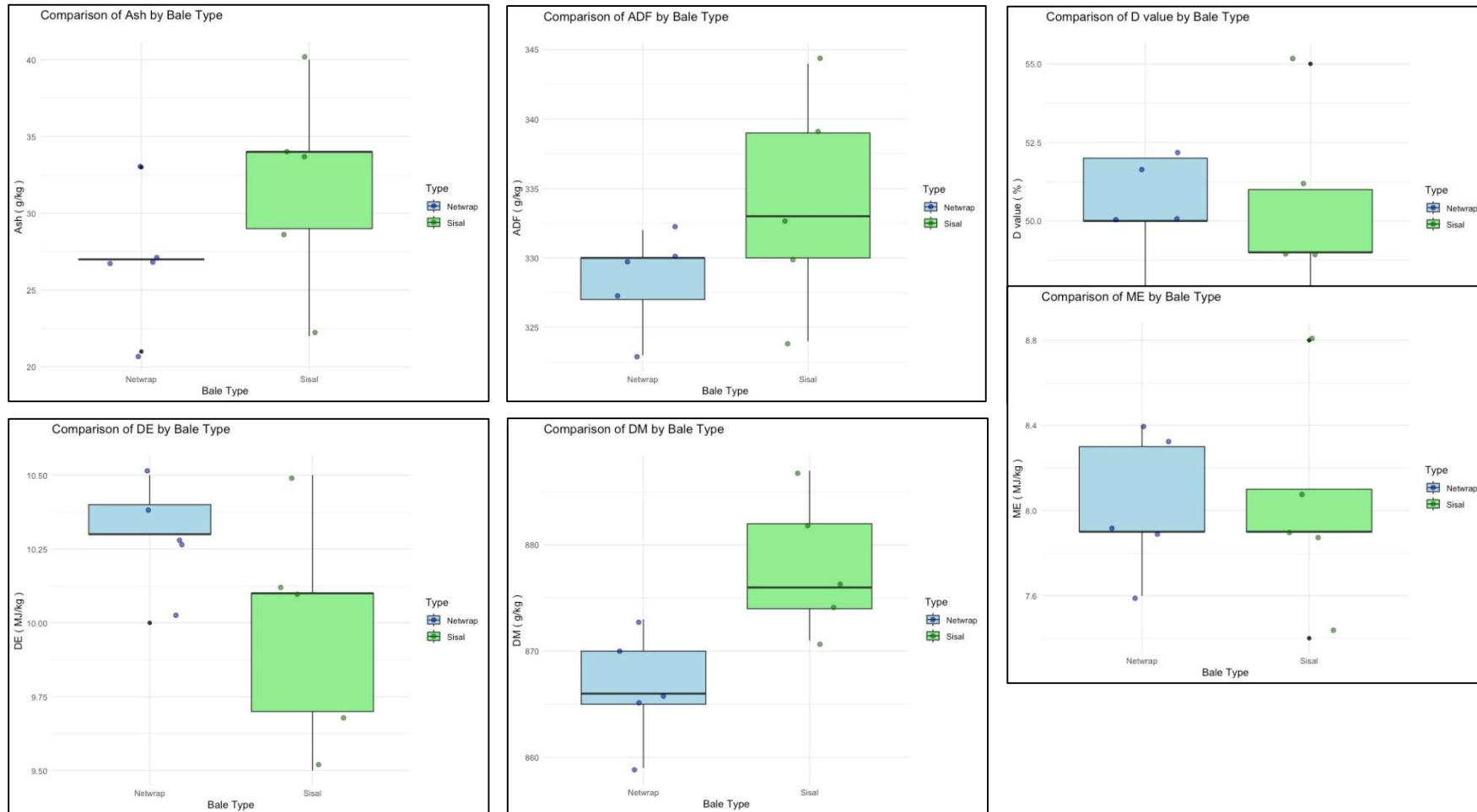
These results are observationally valuable, but in order to discuss these tests with any degree of assurance, Mann – Whitney U tests were performed to determine any statistical significance in these differences; of all the tests conducted, only the dry matter content was statistically significant, indicating that in this trial sisal developed a higher dry matter content in the outer 20cm of the bales sampled, all other differences are non-significant and did not achieve anywhere near to the 95% percentile of certainty required (Table 3).

Across all the components tested it can be summarised that there is minimal difference between the forage quality of the two bailing approaches, however dry matter content is higher in the outer 20cm on sisal bales, where the interaction between forage and the binding method is greatest. There is also a non-significant but noteworthy higher digestibility score for net wrap on average.



Figure 1: Box and whisker plots comparing the records of forage analysis conducted on the sisal (green) and net wrap (blue) bales.

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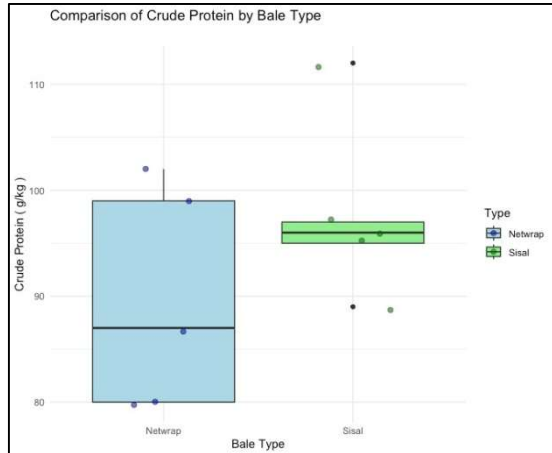
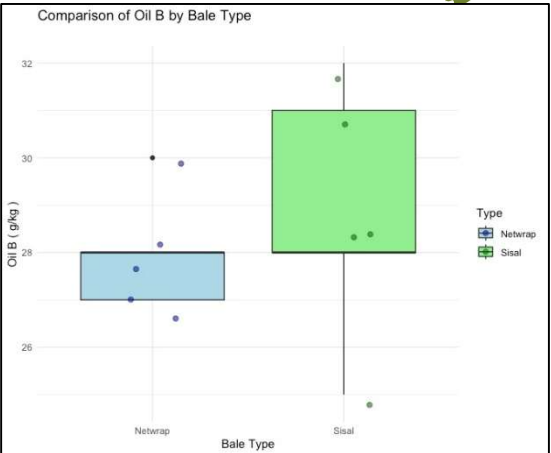
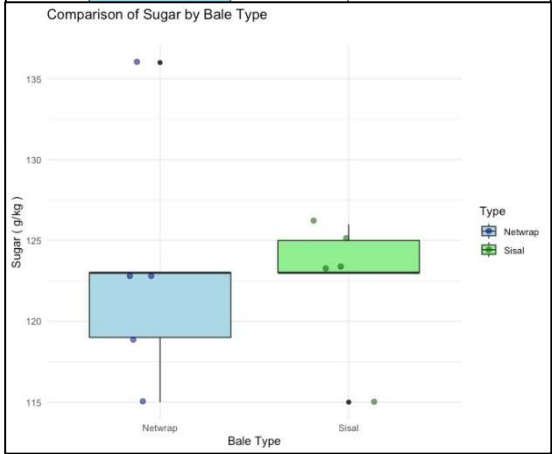
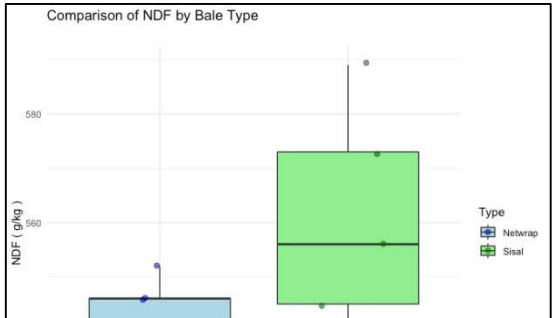


Table 3: Mann-Whitney U results for testing the statistical significance of the differences between sisal and net wrap bale forage constituents.

Parameter	Mann-Whitney U Statistic	P-value	Statistical Significance ($\alpha=0.05$)	Interpretation
DM (Dry Matter)	3.0	0.040	Significant	Sisal hay has significantly higher dry matter content than Net wrap hay.
Crude Protein	8.0	0.317	Not Significant	No significant difference in crude protein content between the two bale types.
Oil-B (Fat)	10.0	0.521	Not Significant	No significant difference in fat content between the two bale types.
Ash	8.0	0.317	Not Significant	No significant difference in ash content between the two bale types.
NDF	8.0	0.317	Not Significant	No significant difference in Neutral Detergent Fiber between the two bale types.
ADF	8.0	0.317	Not Significant	No significant difference in Acid Detergent Fiber between the two bale types.
Sugar	11.0	0.705	Not Significant	No significant difference in sugar content between the two bale types.
D value	12.0	0.893	Not Significant	No significant difference in D-value (digestibility) between the two bale types.
ME	12.0	0.893	Not Significant	No significant difference in Metabolizable Energy between the two bale types.
DE	8.0	0.317	Not Significant	No significant difference in Digestible Energy between the two bale types.

Discussion

An immediate and substantial observation resulting from this trial is the drop in participation from uptake and interest in the trial, to the actual conducting of the trial, where only five of the twelve initial trialists were able to coordinate and perform baling with sisal. Although this outcome could be seen as negative (and certainly had a negative impact on the strength of the results obtained), it arguably provided one of the most important observational outcomes from the trial. Being that conventional baling technologies and methods greatly dis-favoured the adoption of older twine baling which would have been required in this trial. There is an argument to make that favourable weather in a hay season might narrow this gap, it cannot however be used to explain or defer from the barrier to entry, which is produced not by the

material, but by the mechanism of use it is currently designed for and the lack of twine balers in the UK landscape.

From an economic standpoint we can observe that sisal is indeed a more expensive product, however prices are of course prone to many market forces which cause fluctuation, and it would be hard to determine how much of the 27% material cost gap could be closed if a large market demand for sisal were to boost production and shipments. The argument could also be posed and explored that true cost is not recorded in price, and that for example the embodied energy of the product should be compared to ensure a more holistic material comparison can be made.

A more substantial financial implication, which would be less prone to market forces, is the increased time cost associated with a change in baling system to a less efficient system to accompany the sisal twine. This issue can perhaps be overcome by ensuring that the UK imports more modern twine balers which can wrap four spools at once (halving the binding time), or indeed by adopting/developing a new type of sisal product which competes with net wrap in its ease of application.

The trial outlines some small but important changes which could be made to the product, such as ensuring the sisal is wrapped as tight as possible to increase the number of spools which can be carried and maximising the total length of twine which can be held on one spool. These types of changes to product design and baler availability would require a trail with greater engagement from product designers and may require years of costly development, while our trial results are immediately interpretable for those looking to adopt changes in the near/immediate future at the farm level.

The outcomes from the trialist's experiences using the bales are mixed but would reject any strong belief that sisal bales are harder to work with or less efficient for use on the farm. There are apparent learnings required which include the changes needed in leaving bales to cure in the field during any poor weather or storing bales on their sides or close to sub-optimal areas of a barn, all of which can cause breakages. It is likely that most farmers could be capable of adapting their techniques to incorporate some sisal use in their forage systems.

It is indeed clear from this trial that plastic wrapped bales of haylage or silage will however develop more rotting related issues and it would be fair to conclude that this is not a suggested product combination. The obvious perks of ease of disposal, environmentally positive emotional impact and the lack of any obvious change in feed quality were evidently positive enough for all trialists using hay bound sisal to forgo any negatives and confirm their openness to using sisal again. However, the cost issues discovered in our economic analysis were also picked up amongst the trialists and this factor was outlined as an issue for review when considering using sisal again, it is unclear what how much the cost factor would play a part in decisions to use the product outside of a trial setting.

Forage analysis was conclusive in rejecting a held belief that sisal bales do not produce a forage of the same quality to net wrap. It is likely that the UK context of storing bales in fully dry environments was the key difference driving our results when compared to other research on outdoor bales which concluded otherwise. The significantly higher dry matter content in the

sisal bales may however indicate a possible causal factor for this previously held belief: a dryer hay may have been subject to more air exposure, which may therefore indicate a greater surface area on sisal bale sides compared to net wrap, this in-turn would also act as a more effective sponge for moisture and could also encourage a more varied curing process on the outer parts of the bale. This would also help to explain the poorer Ensiling observed by trialist 2, at this point without further experimentation, these are simply observations with potential for explaining previously reached conclusions in other research.

This field trial was small in the total number of trialists, the number of contractors willing to record cost data and the availability of resources for testing of the forage. As with all experiments, increased sample sizes would help to strengthen conclusions, this field trial would need to be replicated at much greater scale to ensure the results are more scientifically just. The methods of testing however and the parameters measured are indeed scalable and useful for determining the viability of a product, while more research could be done to determine environmental impacts and components such as carbon and energy accounting. It would also have been informative to have tested bales which went wrong (such as rotting or snapping) to determine if the sisal failed on a bales of good feed quality or on bales which were generally rotting.

It would be desirable to ensure the correct logistical implications are factored into future replications of this trial to ensure better uptake, our recommendation would be to first develop a database of willing contractors and farmers with twine balers who could act as facilitators within their immediate community (such as happened on the lizard, Cornwall) and financially supplement them to make bales at no additional costs to the farmers they are contracting for.

Broadening this experiment to other grown binding products would also be a beneficial direction for research to take. For example, the use of twine designed for large square bales, compostable net wrap products, flax twines and generally products from other manufacturers would be equally as valid to test as the sisal used in this trial and may yield valuable results.

To summarise our findings, there has been an indication that commonly held beliefs around sisal bound hay being harder to work with and not maintaining feed quality are not well informed for a UK context. We therefore suggest that this material should not be disregarded as a viable binding product when looking to reduce plastic use and contamination on farm.

Costs are a clear issue when considering the feasibility of a wider roll out for sisal twine; not only is the material cost currently unacceptable, but more farmers would also need to obtain twine balers or to hire contractors simply for using the product. Many of whom would not be able to sell a net wrap baler because of its versatility for wrapping silage or haylage bales, or indeed making bales while rain is in the forecast. We conclude here that cost and system of use has made the product currently unviable except for those with a strong willingness and finances to remove plastic use from their farm, or to those who are already running a system with only a twine baler, for whom the transition would be much less costly.

Despite an apparent need for continued research, product development and perhaps manufacturer driven change, there could also be the allocation of financial supplement for

using compostable baling materials to help drive industry change. This kind of financial intervention would not be dissimilar to the previous SFI payment of GRH8: Haymaking supplement (late cut), which provided the financial incentive for cutting hay later and therefore encouraging a better sward for biodiversity. If this type of approach were to be taken there could be two methods of calculation; firstly the supplement could be set at a price which reflects the monetary value of the environmental benefits achieved in changing to compostable binding products, which would be a difficult value to obtain, or using results from this research and assuming approximately 24 bales per hectare, there could be a supplement of £24 per hectare to reflect the additional cost of using a sisal twine system.

Conclusion

From a farmer's perspective, the trial has revealed many small, and one large barrier to uptake of the use of sisal twine on round bales. The biggest barrier is in the design of mainstream round balers. Despite almost every manufacturer having a model of baler which takes twine, very few offer this option in the UK. The only way that this will change is if customer demand dictates it. Our recommendations from this trial would be for a 'sustainable bale coverings' supplement to be included in the SFI and Countryside Stewardship schemes. This would encourage supply chain development, cost reductions, investment in baler innovation, and farmer acceptance. We suggest setting this at £1 per bale, or £24 per hectare. This would cover additional expenses for both the sisal twine and the extra time taken for baling.

This option would also allow for the development and use of alternatives such as:

- Kiwi Econet - Jute net
- Nature's Netwrap - biodegradable net
- Tama EZ Web - recyclable plastic webbing
- Cordex solar degradable net - In development, but similar to Envirocord

An alternative to promoting sisal for round bales would be using it on large square bales as the balers could already use the product, there are however likely to be problems with the strength of the twine. Industry partners and manufacturers have expressed interest in trialling sisal twine in large balers, but there first needs to be more investigations into how to maximise the strength of a sisal cord to make it a viable option. This could be through using multiple plies and making it up to the maximum thickness that a baler can accept. The current strongest option is half the strength of its plastic alternative.

Some farmers within the trial have expressed their interest to carry on using sisal twine if they can source it at a reasonable price. However, the principle contractor in this trial has already sold their baler as they found it was too lightweight for the farms and grasslands in their area. They are looking to replace it with a more modern and heavy-duty baler which also accepts twine, this will most be a Massey Ferguson 4 twine machine.

With this, they will be able to offer a more viable contracting option, and therefore have the capacity to order sisal twine in sufficient quantity to access a reasonable price. They will also be using the Tama EZweb recyclable plastic webbing for any round bale silage.



Through his Fossil Free Farm project, (a Nuffield Farming scholarship looking into fossil free farming technologies, techniques and systems around the world) which has included this trial, Stuart Oates will be continuing to engage with manufacturers of other alternatives, helping them test and trial their offerings, to ensure that all farmers are able to move away from current plastic net options if they wish to do so. The Fossil Free Farm project will ensure longevity and application of this trial's outcomes. Through speaking at farming events, engagement in policy development and general advocacy, it's hoped that the sisal trial could be the beginning of a bigger movement towards a fossil free future.

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