



Scottish Government
Riaghaltas na h-Alba



Straw and Forage Study

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Underpinning:
Special Economic Studies - 2017/18*

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SUMMARY

- i. The Scottish Government commissioned SRUC to report on the unfavourable harvest conditions, and its effects on straw and forage availability, pricing and the agricultural sector. To undertake this work SRUC completed desk research and drew on its network of local SAC agricultural consultants across Scotland.
- ii. Spot market straw prices in Scotland have risen around £50/t since harvest 2017 due to weather related impacts on supply and demand. Current prices are around £130/t delivered in the Central belt with more remote areas in the west and north paying another £15-£20/t and the islands more again.
- iii. The average straw price paid by many livestock producers for the season as a whole is likely to be lower than the spot market suggests due to significant purchases on long-term agreements; which are generally at a lower price level.
- iv. SAC Consulting estimate that an example 110 cow upland suckler herd may have incurred additional costs of around £8,000 due to higher straw use (from the extended housing period) and higher straw prices, leading to a potential reduction of 19% in beef enterprise gross margin.
- v. Straw shortages in Scotland have necessitated increased imports from England. The high costs of transporting straw are responsible for the large differentials in price between arable areas in Scotland and England and livestock areas in the north and west of Scotland.
- vi. The wet weather at harvest reduced the quantity of straw that was baled, as it was too wet to bale, and arable farmers had to plough some straw in to complete autumn sowing. On some livestock farms the farmers decided to harvest the cereal crops whole and chop them for silage (due to their poor grass silage crops) to feed their cattle, removing straw from the market.
- vii. The wet weather has also increased potential demand, due to cattle having to be housed much sooner in the late summer in West of Scotland due to the waterlogged nature of the grass fields requiring more straw for bedding and feeding. Making silage became difficult from mid-summer onwards and many farms had a reduced or lower quality stock of silage going in to winter.
- viii. Livestock farmers have also sought to reduce straw use by selling cattle early either as store (for other farmers to fatten), or as finished by increasing the rate and quality of feed enabling the cattle to reach final weight sooner. Finding alternative bedding materials including woodchip, sand and paper waste.
- ix. Straw use in Scotland is estimated at around 1.32mt, mainly for livestock feed and bedding and potential production (if all were baled) of 1.66mt. Straw

supply in Scotland is concentrated in the arable east and demand in the north and west.

- x. In the UK potential straw production is estimated at around 10mt. The largest user of straw is feed and bedding at around 7.8mt in 2016. Straw use for bioenergy has risen strongly in recent years quadrupling to 810kt in the 3 years to 2017 and now representing 10% of usage in livestock feed and bedding.
- xi. This additional bioenergy demand for straw is almost entirely located in England and may have relatively little effect on straw availability and prices in Scotland during a normal harvest. However, in a poor harvest such as 2017 the loss of straw supply in England is likely to have increased prices and straw prices in Scotland, due to the need to pay to transport straw from further south than previously would have been necessary.
- xii. The study highlights a number of issues affecting the outlook for straw and forage availability including:
 - The growing possibility of a late spring boosting straw and forage use. SAC Consulting estimate that each week that livestock turn out to grass is delayed, adds potentially another 36kt of straw demand, at a cost of around £5.0m.
 - The knock-on effects of the poor silage and straw harvest include an expected loss of livestock condition, reduced lambing and calving rates this spring and reduced livestock growth rates this summer. In addition waterlogged fields may have soil structure damage that will limit crop yields and take time and cost (drainage/re-seeding) to remedy.
- xiii. The study also identified a range of strategies that farmers may adopt to reduce straw use and minimise the risk of future higher costs including:
 - Increased use of slatted housing, housing modifications or greater out wintering of stock aided by shelterbelt establishment.
 - Increased growth rates to reduce the required length of housing period.
 - Increased use of alternatives to cereal straw such as sand, woodchip, rapeseed straw, energy crops etc.
 - More long-term agreements between livestock and arable farmers, including 'straw for muck' deals, bringing more stability to straw supply and price.
- xiv. Areas for further research include optimising the animal welfare and environmental benefits of slatted housing and the potential to increase straw production from cereal and other crops such as energy crops.
- xv. Forthcoming planned activity, under the Scottish Government's SRDP Farm Advisory Service Animal Welfare programme to address several of the impacts on farm of this season's straw and forage shortage, have been highlighted.

CONTENTS

SUMMARY	3
1. Introduction – objectives and approach.....	6
2. Straw prices	7
3. Weather impacts on 2017 straw and forage situation	10
4. Scotland straw supply and demand	12
5. UK straw supply and demand	14
6. Silage situation 2017 harvest in Scotland	18
7. Example farm enterprise financial impacts.....	20
8. Outlook and future farmer strategies	23
9. Areas for further research and delivery	26
Appendix 1 - Scottish estimated straw production -2015 and 2017	27

1. Introduction – objectives and approach

1. In response to high prices and reported shortages Scottish Government under RESAS Policy Underpinning support has commissioned SRUC to conduct a study into straw and forage pricing, availability and farm management strategies.

Objectives

Straw supply and demand balances

- Desk-top study by region in Scotland for typical years and some assessment of the current year based on crop areas and livestock numbers. Net straw balance – negative or surplus.
- Wider view/market and industry views on straw availability across the UK (England), use in bio-energy etc.

Regional survey of straw and forage situation across Scotland

Survey of regional SAC Consulting consultants:

- What has happened in that area to the harvest, straw supplies and demand, prices, issues with competition and haulage?
- Alternatives for bedding – uptake of different materials, how effective they have been.
- Impact on cattle market – from early selling, fattening.
- Strategies to reduce the reliance on straw in the future and reduce risks.

Approach

2. This study has been conducted through desk-top research, contact with industry and a survey of SRUC's regional consultancy offices during January and February 2018.

2. Straw prices

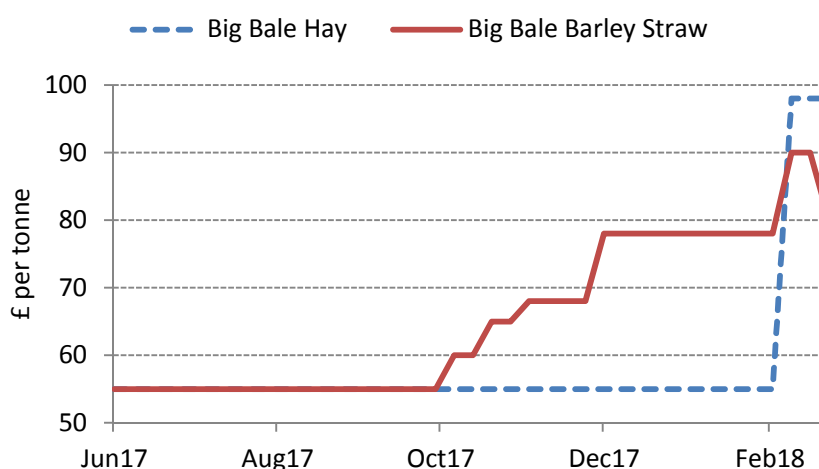
Straw pricing - 2017 harvest

3. When assessing straw prices it is important to be clear on the basis on which they are reported; whether that be ex-farm or delivered;
 - a. Ex-farm prices reflect the value of straw loaded onto a truck on the seller's farm; typically a cereal farm in the arable areas of the country, such as the east of Scotland or England.
 - b. Delivered prices reflect the value of the straw on a truck once it has been delivered to the purchasing farmer, typically a livestock producer.

Delivered prices will be significantly higher (£10 to £50/t higher) than ex-farm prices depending on the transport distance involved.

4. Reported ex-farm prices on arable units (before transport costs) for big bale barley straw in southern Scotland rose 64% from £55/t in September 2017 to reach £90/t by February 2018, according to the British Hay and Straw Association.

Figure 1 – Ex-farm straw and hay price evolution, South Scotland



Source: The British Hay & Straw Merchants Association, Farmers Weekly

5. From the SAC Consulting survey of regional offices, the price of wheat and barley straw in January 2018 was between £18/t and £70/t more than it was at harvest time, depending on the region. The average price increase on the spot market recorded by SAC Consulting was between £47/t and £51/t. This took average prices for barley straw from harvest 2017 to January 2018 as follows:
 - a. East of Scotland - rising from £52/t to £99/t ex-farm.
 - b. West of Scotland - rising from £97/t to £145/t delivered.
 - c. Orkney – rising from £145/t to £200/t delivered.

6. Straw is also sold on a long-term multi-annual basis between arable and livestock farms. It is understood that price levels on these contracts were generally at lower levels, but no figures are currently available for these transactions. The Farm Business Survey for 2017 crop year will record these values, but this is not due until March 2019.

Table 1 – Scotland barley straw prices

Source	Region	Basis	Harvest '17 (£/t)	January '18 (£/t)	Change (£/t)	Change %
SAC	Orkney	Delivered	145	200	48	33%
SAC	West	Delivered	97	145	48	50%
SAC	East	Ex-farm	52	99	47	90%
BH&SMA	S. Scotland	Ex-farm	55	90	46	84%

Source: SAC Consulting

Table 2 - Scotland wheat straw prices

Source	Region	Basis	Harvest '17 (£/t)	January '18 (£/t)	Change (£/t)	Change %
SAC	West	Delivered	87	133	47	54%
SAC	East	Ex-farm	50	95	51	102%

Source: SAC Consulting

Principles of straw pricing

7. Straw prices in any given area are fundamentally the result of:
 - The straw price in the nearest surplus/or deficit region.
 - o A surplus region is one where more straw is available for sale than is being sought by buyers (livestock producers).
 - o A deficit region is one where more straw is being sought by buyers (livestock producers) than is available on local arable farms.
 - o Individual regions can move between surplus and deficit within a season and between seasons according to the local balance between straw supply and demand.
 - The transport costs to/from the nearest surplus/or deficit region.
8. Straw prices in all regions reflect the national (GB) straw supply and demand situation; i.e. if straw is scarce nationally prices will rise everywhere.
9. In a typical year the nearest available surplus regions for straw for livestock farmers in the west of Scotland are in the arable regions of eastern Scotland. The cost of mainland transport in this situation would be typically in the £20-35/t range depending on distance.
10. In 2017, it appears that Scotland itself had few, if any, surplus regions due to the reduced quantity baled and therefore straw had to be sourced from England.
11. Straw is regularly imported into the south of Scotland and is often sourced from the arable regions of east Yorkshire. This year the surplus regions in England were located further south than normal due to the difficult harvest in the north. This resulted in greater transport costs than usual. The following table illustrates this.

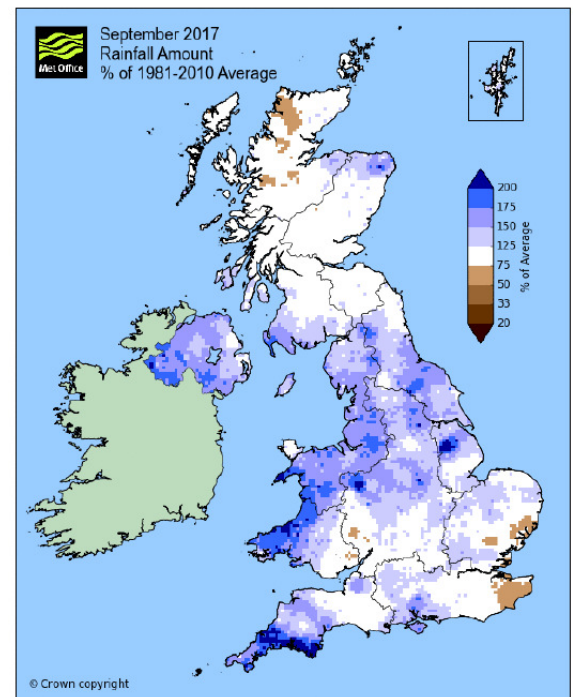
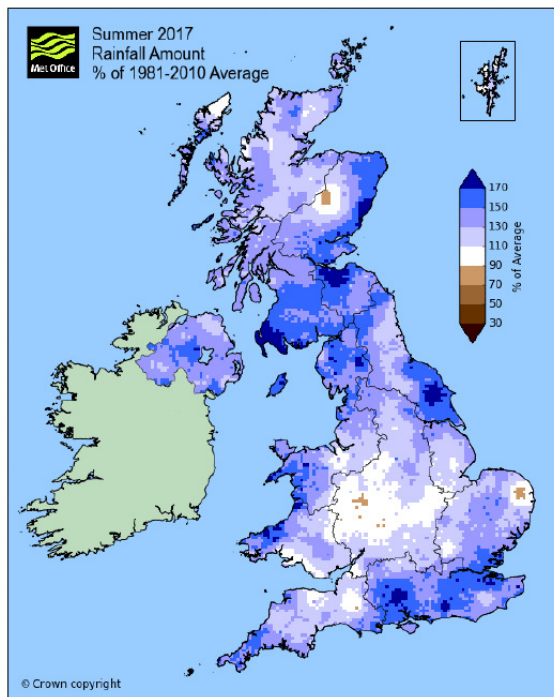
Table 3 – Illustrative straw pricing examples

Surplus region	Ex-farm price in surplus region (£/t)	Transport cost to SW Scotland (£/t)	Delivered price SW Scotland (£/t)
East Lothian - 2016	60	25	85
East Lothian - 2017	110	25	135
Yorkshire - 2017	100	45	145
Kent – 2017	80	80	160

Source: SAC Consulting

3. Weather impacts on 2017 straw and forage situation

12. Summer 2017 rainfall was above average across most of Scotland and much of England, particularly importantly in northern arable areas including eastern Yorkshire. These conditions made it difficult to harvest cereal crops and to allow straw to dry out fit for baling.



13. The wet weather at harvest reduced the quantity of straw that was baled behind the combine in Scotland and England for a number of reasons:

- Straw that was intended for baling was left on the ground and got repeatedly soaked. After a few weeks the quality of the straw deteriorates to the point where its value falls and it can also be difficult to collect, it then starts to disintegrate. In addition, farmers seeking to get winter cereal crops drilled eventually cannot wait any longer for it to dry out and the straw has to be ploughed in.
- Given the wet weather other farmers decided not to try and bale the straw at all and therefore turned on the straw choppers on their combines which therefore made it easier for them to get on drilling their autumn crops, but the straw was not baled.
- On some livestock farms the farmers decided to take the cereal crops whole and chop them for silage (due to their poor grass silage crops) to feed their cattle, removing more straw from the market.

14. The wet weather has also increased potential demand due to:

- Cattle having to be housed much sooner in the West (July/August/September rather than October normally) due to the waterlogged nature of the grass fields requiring more straw for bedding and feeding.
- Making silage became difficult from mid-summer onwards and many farms had a reduced or lower quality stock of silage going in to winter. Farmers would then seek to buy more straw to compensate but this has proved very difficult this year.

4. Scotland straw supply and demand

2017 situation

15. From the SAC survey of regional offices across Scotland undertaken in January and February 2018, cereal straw yields were reported as generally lower and quality poorer than normal. Straw intended for feeding has been used for bedding or, on the East coast, has been used to cover carrots or has been chopped and incorporated. Across all areas of Scotland there are areas of cereals that have been left unharvested and there is some straw unbaled, also contributing to reduced supplies. Straw was frequently baled late or in wet conditions contributing to it being of poorer quality.

Straw production

16. SAC Consulting estimate that in 2017, based on the area of cereals grown, Scotland was potentially capable of producing around 1.62mt of straw of which 1.45mt would be cereal, the rest mainly rapeseed. These estimates are based upon:
- The area of cereals grown in hectares, as reported in the Scottish Government's June 2017 Agricultural Census.
 - Typical harvestable straw yields in tonnes per hectare, from SAC's Farm Management Handbook and a study by Copeland & Turley (see following table).
 - See Appendix 1 for full details.
17. In reality in a typical year, only a proportion of straw is baled, particularly in arable areas where a share of it is incorporated into the soil for a range of cost, soil health and timeliness reasons. Although the overall potential of straw production in 2017 was similar to levels two years earlier in 2015 of 1.66mt it is understood from the SAC Consulting survey that a lower proportion of straw than normal was baled, so supply is expected to be lower than in 2015.

Straw use

18. For 2015 SAC Consulting estimated that usage of straw was around 1.32mt, comprised of bedding 0.82mt, feed 0.39mt, carrots 0.17mt. These estimates are based upon:
- The regional number of livestock by species and class as reported in the Scottish Government's June 2015 Agricultural Census. Livestock numbers were adjusted to reflect typical life cycle times and lifespans.
 - Typical straw use per livestock head for feed and bedding based on SAC's Farm Management Handbook data. These estimates also used SAC Consulting regional assessments of the animal housing situation by species, based upon estimated split between straw bedding, slatted and outdoor wintering and the length of the housing period.

- The area of carrots grown and typical quantities of straw applied for overwintered carrots. Almost all carrots grown in Scotland are overwintered under straw.

19. The net results of this study are detailed by region and for the country as a whole in the following table. Scotland as a whole had the potential for a small straw surplus of 0.34mt (20% of production) in 2015, however, given that an unknown but significant share of straw is incorporated then any surplus is likely to be much smaller in practice. The table illustrates the regional spread of supply and demand with a potential surplus in eastern regions and deficits in the West, particularly the south west.

20. Equivalent figures are not available at this time for the 2017 harvest year. There are also no figures available on the proportion or quantity of straw actually harvested. Given the widespread reports of straw being sourced in England it is highly likely that Scotland as a whole is deficit in straw. There may be some straw being stockpiled for sale later in the season in Scotland, but again no figures of the quantities stored on farm are available.

Table 4 - Scotland – straw supply and demand balance 2015

Region	Potential total straw production *	Straw use in bedding	Straw use in feeding	Straw use in carrots	Straw use total	Potential straw balance
North West	112,326	84,480	47,620	20,086	152,186	-39,860
North East	521,004	286,416	77,157	51,028	414,601	106,403
South East	877,771	231,926	70,708	99,948	402,582	475,188
South West	149,180	219,094	133,766	1,576	354,437	-205,256
Total	1,660,281	821,917	329,252	172,637	1,323,806	336,475

Source: SAC Consulting, SAC Consulting adapted from survey and analysis for study – “Biorefining Potential for Scotland Mapping bio-resource arisings across Scotland”, Prepared by Ricardo Energy & Environment (and SAC Consulting) for Zero Waste Scotland, September 2017

5. UK straw supply and demand

21. Typically the UK is estimated to produce around 10mt of cereal straw which is mainly used in animal bedding and feed. Other uses include mushroom and strawed carrot production and more recently bio-energy. DEFRA estimates of straw supply and use by different sectors are detailed below with an estimated surplus available for other uses of around 1.595mt in 2016.

Table 5 - UK straw supply and demand estimates 2016

UK Supply/Demand 2016	Straw use 000's t
Cereal straw availability	10,400
Cereal straw usage	
- Animal bedding	5,800
- Animal feed	2,000
- Mushroom industry	40
- Carrots	405
- Power stations	560
Total	8,805
Surplus cereal straw resource available in the UK for other markets	1,595

Source: Crops grown for Bio-energy in England and the UK: 2016, December 2016, DEFRA.

22. It is known that UK straw production in 2017 was affected by the poor weather across Scotland and north and western areas of England and Wales. Poor weather in Yorkshire reduced the quantity of straw baled and this was particularly troublesome for Scottish livestock producers, as it is traditionally the nearest large arable area that can supply straw into Scotland. As a consequence, straw had to be sourced from further south in England than normal with straw reported coming from as far as Kent. These more distant supplies incurred additional transport costs, raising the costs of delivery into Scotland.

Types of bedding material

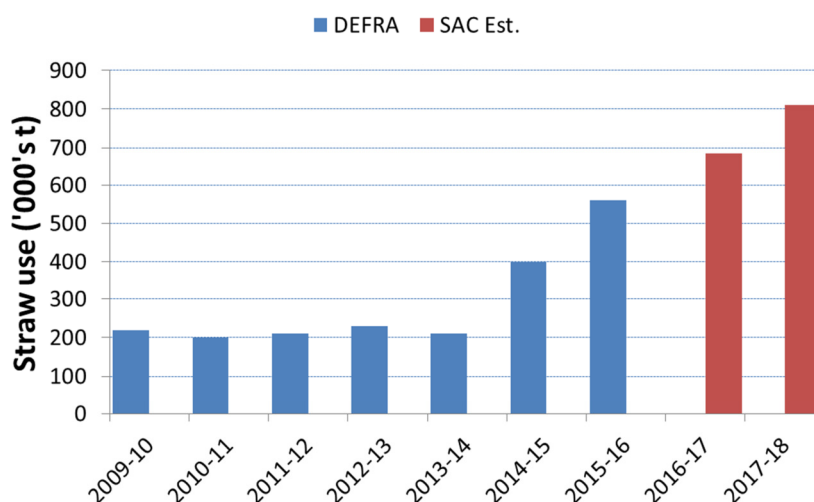
23. Cereal straw is the dominant material used for bedding livestock in the UK however, there are a range of alternatives with differing characteristics, costs and availabilities. AHDB prepared a comprehensive Bedding Materials Directory¹ in 2011 which provides a useful overview of the materials that can be used. Some aspects of the Directory may require adjustment due to changes in the price and availability of some materials, particularly those linked to bio-energy production.

¹ http://www.beefandlamb.ahdb.org.uk/wp/wp-content/uploads/2013/06/bedding_materials_directory_2011_low_res131011.pdf

Straw use in bio-energy

24. Data collected by Ofgem as part of its sustainability reporting under the Renewables Obligation, indicates that UK usage of straw in large-scale power generation totalled 560,000t in 2015/16; a 39% increase on the previous season. It is understood that another large straw fired power plant has come on line in 2017 (Snetterton, in Norfolk) which has added a further 250,000t of straw demand, and is expected to have pushed the total demand to 810,000t or more in 2017/18 and reduced the available surplus (as estimated in 2016) by 15% to 1.345mt. This rise in demand for straw for bio-energy has undoubtedly led to a significant reduction in straw availability for other uses and is expected to represent the equivalent of around 10% of livestock feed and bedding straw demand in 2017/18. This is therefore expected to have made a material difference to straw availability and potentially pricing during the difficult year for harvest in 2017.

Figure 2
Straw use in UK power stations



Source: Crops grown for Bio-energy in England and the UK: 2016, December 2016, DEFRA, SAC Consulting

25. Straw has uses in other energy applications including small scale heat production and as a feedstock in Anaerobic Digestion plants. The scale of any such use is unknown from official sources though it is not understood to be a particularly large source of demand at the present time.

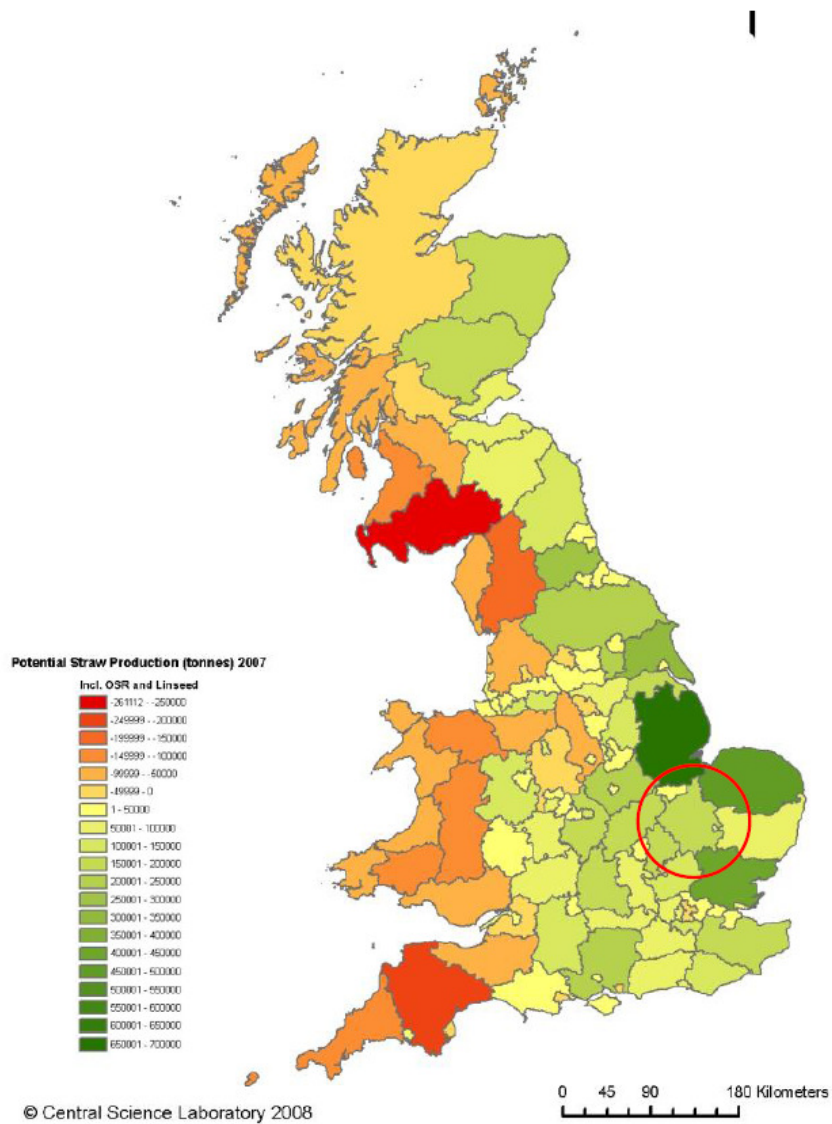
Other straw use trends

26. Higher welfare livestock production systems typically involve a greater use of straw. There has been a move to increase pig production using straw bedded courts such as under the RSPCA Assured food label.

Regional straw supply and demand balances

27. Across the UK, there are wide regional variations in straw production and use resulting in regions of straw surplus and deficit. The following Figure illustrates the general pattern, with straw surplus regions located in the cereal growing regions of the east, and straw deficits in regions in the north and west with south west Scotland a notably strong deficit region. These figures are from a 2008 study and it is likely that the situation has changed particularly in some southern and eastern regions of England where increased straw use in bio-energy production has reduced the size of the available surplus. In a difficult season like 2017 it is also likely that some normally surplus straw producing regions will have turned into deficit regions though up-to-date figures are unavailable.

Figure 3 – UK and England regional straw availability/deficit estimates



Source: National and regional supply/demand balance for agricultural straw in Great Britain, James Copeland & David Turley, Central Science Laboratory a study for NNFCC 2008

6. Silage situation 2017 harvest in Scotland

Mary McDowell SAC Consulting Nutritionist

28. Early cut silage yielded well and is of good quality, unfortunately most of the silage across Scotland was cut later due to the weather and is lower in energy and protein. In some areas of the West 2nd and 3rd cut silages were not taken, which has put pressure on supplies, resulting in some farmers having to buy in silage or feed extra concentrates. Also in some areas of the North and the West, livestock were housed up to 6 weeks earlier than normal, putting extra demand on limited forage and bedding supplies.
29. This year's summer made for extremely difficult harvesting conditions in many areas of Scotland. Below is a summary of the average results from 1st and 2nd cut silages in 2017 compared to those in 2016. Unsurprisingly on average, the Dry Matter (DM) has been lower this year for both pit and bale silage, particularly in 2nd cut silage. So far, 30% of all silages analysed were below 25% DM, albeit with a huge range. DM is the biggest variable and will have a huge effect on rations. For example, the difference in feeding a suckler cow to appetite with low DM silage compared to high DM silage could be up to 30kg of fresh weight! With such variation it is important to analyse silage in order to feed livestock as accurately as possible, especially with forage in tight supply.

Table 6 - Beef and sheep pit silage

	2016 Average		2017 Average	
	1 st cut	2 nd cut	1 st cut	2 nd cut
DM g/kg	282	300	278	274
D Value (%)	67	67	65	66
ME MJ/kgDM	10.7	10.7	10.4	10.6
CP g/kgDM	100	116	106	117
NDF g/kgDM	510	467	518	485

Source: Analytical Service Department, SAC Consulting

Table 7 - Beef and sheep baled silage

	2016 Average		2017 Average	
	1 st cut	2 nd cut	1 st cut	2 nd cut
DM g/kg	363	355	354	320
D Value (%)	65	67	64	65
ME MJ/kgDM	10.4	10.7	10.2	10.4
CP g/kgDM	98.5	113	109	116
NDF g/kgDM	512	485	519	503

Source: Analytical Service Department, SAC Consulting

30. Where forage is in short supply, alternatives such as fodder beet, carrots or turnips may be a viable partial substitute to bulk out supplies until turnout. In addition, draff is a great forage replacer if there is supply, as it is a well balanced feed and a good source of digestible fibre for cattle. Also, hay (typically transported from England this year) may be an option to consider, although price is high, it is good quality and high DM, which would complement some of these wet silages. Another idea where farmers have a feed mixer wagon could be to use sugar beet pulp with the wetter, poorer, quality forage. This will provide energy and improve palatability.

31. Overview of 2017 silage harvest:

- Overall dry matter of both pit and bale have analysed lower this year- particularly 2nd cut.
- 30% have all silages analysed have been below 25% DM.
- Huge range of results from 13%-79% DM.
- Most farmers now into 2nd cut so will need to adjust rations.

32. Some options where forage is in short supply:

- Alternatives to partially substitute/bulk out forage supplies until turnout: fodder beet, carrots or turnips, potatoes.
- Draff has increased in price in some areas but is a great forage replacer. Well balanced feed and good source of digestible fibre for cattle.
- Hay from the South - price is high but is of good quality and high DM which would complement these wetter, poorer quality forage.
- The market value of many of the alternatives such as draff, hay and root crops are relatively high at present and in terms of cost relative to feed value these may not necessarily be any cheaper than mainstream forages such as straw and silage. However, there may be other reasons farmers will use them including local availability and the manner in which they can complement other feeds.

7. Example farm enterprise financial impacts

Overview

33. In order to gauge the scale of impact that changes in straw pricing and availability are having, SAC Consulting has prepared some simple analysis based on standard enterprise data from the SAC Farm Management Handbook 2017/18 (FMH). Two examples from cereal and beef production have been provided.

Example 1 – Cereals enterprise

34. The financial impacts of the 2017/18 straw harvest on individual cereal farms will depend on a range of factors including:

- How much straw they were able to bale, how much they had to plough in.
- The quality of the straw they harvested.
- The price they received - related to how much they sold on lower priced long-term agreement or higher priced spot price and their location.

35. The assessment compares “Typical” figures from the FMH with potential outcomes in the 2017/18 season. Changes include a doubling of the ex-farm straw price and differences between farms where straw was baled and where it was not possible to bale. In practice there will be a wide variation in the quantity of straw baled on individual farms depending on local weather and other factors.

36. These figures are presented on an enterprise basis for wheat and spring barley and on an assumed cereal farm basis totalling 121ha of cereals (the average cereal area in the Farm Business Survey 2015/16 Cereal farm dataset).

Table 8 – Cereal enterprise financial impacts

	Winter wheat				Spring feed barley			
	Typical	2017/18 season	Change (£)	Change (%)	Typical	2017/18 season	Change (£)	Change (%)
Straw yield (t/ha)	4.2	4.2	0	0%	2.9	2.9	0	0%
Straw price - ex-farm (£/t)	40	80	40	100%	45	90	45	100%
Straw income (£/ha)	168	336	168	100%	131	261	130.5	100%
Total output (£/ha)	1,328	1,496	168	13%	819	949	130.5	16%
Straw as % of output (%)	13%	22%			16%	28%		0
LESS Variable costs	416	416			279	279		
= Gross margin1 - straw baled (£/ha)	912	1,080	168	18%	540	670	130.5	24%
= Gross margin2 - straw not baled (£/ha)	912	744	-168	-18%	540	409	-130.5	-24%

Table 9 – Cereal farm financial impacts

Per farm - 121ha cereal enterprise		Typical	2017/18 season	Change (£)	Change (%)
Straw price - ex-farm	(£/t)	42.5	85	42.5	100%
Straw baled					
Gross margin1	(£/ha)	87,816	105,875	18,059	21%
Straw NOT baled					
Gross margin2	(£/ha)	87,816	69,757	-18,059	-21%

Source: SAC Consulting and SAC Farm Management Handbook 2017/18

37. As the tables indicate, where straw has been baled and sold at the higher price, then output and gross margins are greatly increased. On a typical per farm basis the gross margin of the cereal enterprise could have been boosted by £18,059 or 21% from additional straw sales of that value. Where the straw could not be baled due to the wet weather, gross margins would be reduced below budget levels by a corresponding amount. Effects on fixed costs such as machinery, fuel and labour have not been considered.

Example 2 – Beef suckler enterprise

38. An upland beef suckler unit in the south west of Scotland has been used as an example to illustrate the potential impact that changes in straw use and pricing may have had on the enterprise gross margin.

39. In this example sucklers are housed in cubicles, reducing straw used for bedding however young stock and calving cows are housed in straw bedded pens. Also due to the extended housing period this year, approximately 20-25% longer will be spent indoors given that animals were often housed three to four weeks early, while turn out to pasture may be two to three weeks later given the late spring. Based on a typical 26 week housing period these additional 5-7 weeks equate to an additional 20-25% in straw usage.

40. At the same time straw prices delivered on-farm are expected to rise around £50/t from an average of £74/t as budgeted in the SAC Farm Management Handbook 2017/18 to the estimated average paid of around £124/t.

41. The impacts of these changes on the variable costs and gross margins of the suckler enterprise, on a per head and per herd basis, are presented in the following table. Effects on fixed costs such as machinery, fuel and labour have not been considered, neither have any reactive management changes made such as selling store cattle earlier.

42. These estimates reveal that potentially the impact of the straw situation may be to add around £8,000 to the cost of straw for this enterprise due to increased

usage and higher prices with an equivalent reduction in enterprise gross margin equal to 19%. These changes will be significant for many beef producers though the effects on individual units will very much depend on their specific circumstances. The effects are likely to be greater in more remote areas particularly in the north and west.

Table 10 – Upland suckler cow enterprise financial impacts

Upland Sucklers					
May-Jun calving		Typical	2017/18 season	Change (unit)	Change (%)
Output	(£/hd)	652	652	-	-
Variable costs					
Straw - bedding	(t/hd)	0.33	0.43	0.10	30%
Straw - feeding	(t/hd)	0.5	0.65	0.15	30%
Straw - cost	(£/t)	74	124	50.00	68%
Straw - cost	(£/hd)	61	134	72.38	118%
Other costs	(£/hd)	213	213	-	-
Total	(£/hd)	274	347	72.38	26%
Gross margin	(£/hd)	378	305	-72.4	-19%
Per Farm - Specialist Beef (LFA) - 110 suckler cow enterprise					
Gross margin		41,534	33,572	-7,961	-19%

Source: SAC Consulting and SAC Farm Management Handbook 2017/18

8. Outlook and future farmer strategies

Risk of a late spring grows

43. Straw and forage use in the remainder of the housing period will be dependent on the date at which stock can be turned out. The cold weather and widespread heavy snowfall across Scotland and the UK at the end of February and early March is expected to have delayed grass growth and turnout. Based on cumulative temperatures at the end of February (T-Sum 200) SAC Consulting estimated grass growth in parts of Scotland could be delayed by up to three weeks, any actual delay will depend on forthcoming weather. The recent snow fall is also expected to have forced the early housing of ewes approaching lambing. This could have serious and costly implications for livestock farmers as they approach the spring lambing, calving and crop establishment period.

Additional straw costs

44. SAC Consulting estimate that straw use for bedding and in feed by livestock in Scotland is typically around 1.15mt per year (Table 4). Assuming that 80% of this use occurs in the core 6 month winter period, this equates to 920kt or 153kt per month or 36,000t per week. Therefore, every additional week added to the length of the winter housing period would be expected to require an additional 36,000t of straw, which at an assumed price of £140/t would lead to additional costs of £5.0m per week.

45. Where sufficient straw is available, straw use may rise further. Alternatively livestock farmers may take other steps to manage the situation, including turning cattle out and feeding them outdoors, finishing cattle quicker and selling cattle off farm sooner.

High price and poor forage quality – knock-on effects throughout 2018

46. Also, with the lack of straw generally and particularly of good quality this is having an impact on livestock nutrition and condition. Poor quality straw being fed when it should not be (mouldy) or farmers deciding not to include straw in suckler cow rations and therefore using more silage. Silage in some areas is poor quality, more acid and of low quantity compounding the issue. SAC Consulting staff are conducting an increased level of forage sampling and analysis and offering more ration advice as farmers seek to make the most of their available supplies and maintain livestock performance. Nonetheless, livestock condition is expected to be poorer than usual this spring which may have a knock-on effect on growth rates and lambing and calving performance in 2018.

Options to reduce reliance on straw in the future

47. Use of slatted cattle and sheep accommodation or scraped passages, this would require significant investment in buildings and slurry storage, slurry de-watering.
48. Modifications to existing buildings to ensure rain water is not entering the buildings and ventilation is optimal, helping to keep bedding drier for longer.
49. Out-winter or keep livestock out for longer, however, that could increase risks of compaction and have negative impacts on grass yields for the following season. To help minimise this there may need to be a change to smaller, hardier breeds that are more suited to out-wintering such as Luining.
50. Increased planting of shelterbelts (particularly in the islands) would also aid out wintering.
51. Utilise alternatives to straw - such as wood fines and sand.
52. Increase wintering and finishing of livestock in arable areas, there is the potential for beef and sheep breeders in livestock regions to increase the number of livestock sent away for wintering and finishing to arable areas thereby reducing the need for importing straw and other feeds. Arable farmers then gain by retaining much of the straw (and grain) organic matter and nutrients on the farm where it is produced.
53. Improving cattle growth rates to enable them to finish at grass and reduce or eliminate the need for housing and straw bedding. This can be achieved through a range of means; improved grass quality, better livestock health and genetics and supplementary feeding.

Options to manage the price and increase the supply of straw and alternative bedding materials

54. Increased forward contracting of straw purchases - this is already widespread with livestock farmers having long standing agreements to purchase specific quantities of straw from arable farmers. These agreements can include a range of situations from the livestock farmer buying straw in the swath (lying on the ground) and arranging baling and transport themselves to more comprehensive agreements, where the arable farmer is responsible for baling, storage and transport. Prices may be agreed in advance or be determined at harvest. An increase in this type of contract would result in more straw being baled as the arable farmer would be more assured of the end market and price he would receive. For the livestock farmer this type of agreement brings greater certainty of supply and costs. These agreements have limitations particularly if adverse weather prevents baling, but overall can benefit both arable and livestock farmers.

55. Muck for straw agreements - arable farmers are increasingly conscious of the need to maintain and improve soil organic matter and structure to support productive crops and reduce expenditure on cultivation and artificial fertiliser. In addition, the large-scale and tight time windows on many arable farms drives the need to simplify operations. This has created a growing reluctance on many arable farms to bale straw for sale to livestock farmers. An increase in 'muck for straw' agreements has been seen in recent years where the arable farmer allows a nearby livestock farmer to take the straw in return for spreading the muck back on the arable farm. This gives the livestock farmer access to straw that otherwise might not be baled, and allows the arable farmer to retain organic matter and nutrients. These agreements are only viable between nearby farms and hence restricted to arable areas. However, by increasing the proportion of straw baled an increase in such agreements can boost the overall national availability of straw for use by the livestock sector.
56. Greater use of rapeseed straw which is not often baled at present. Rapeseed straw is a useful base material for bedding providing a free draining structure. It is of low absorbency and unpalatable so is not a direct replacement for cereal straw but a useful supplement. There is the potential for around 150kt of rapeseed straw to be produced in Scotland. To achieve this, arable farmers would need to be guaranteed a price sufficient to justify the additional costs and loss of nutrients and organic matter.
57. Dedicated straw crops – SAC Consulting have seen an increased interest from farmers in livestock regions growing crops purely for straw to supply to neighbouring livestock farms. One example being a farmer in Dumfriesshire seeking to grow 100ha of crop purely for this purpose. Grasses are currently being grown in the UK purely for straw production, but so far this has almost entirely been for energy production. The commonest crop is Miscanthus which has heat and solar energy demands similar to that of maize. Therefore Miscanthus production is concentrated in the southern half of England. The crop will grow on favourable sites in southern Scotland but yields are lower and costs high per tonne of output. Reed canary grass is a hardy alternative much more suited to Scottish conditions as it is a native plant. There are practical issues in growing these crops for livestock bedding, namely that it is not always possible to harvest them until part way through the winter due to the need for leaves to drop. However, breeding and agronomy work is underway to improve both crops for use in livestock production so their relevance may increase in future.

9. Areas for further research and delivery

Further research

58. Animal welfare and environmental aspects of slatted housing - effect of stocking density and building design on animal welfare, livestock performance and environmental impacts.
59. Crops for straw – research the potential for maximising straw production from annual cereals (varieties, management) and growing alternative crops for straw in Scotland – suitable species (miscanthus, reed canary grass), value as a livestock bedding material, costs of production relative to existing straw sources.

Farm Advisory Service delivery programme

60. As part of the Farm Advisory Service delivery, SAC Consulting are planning a number of campaigns (meetings and advice notes) on Animal Health in the next financial year, to support the industry in a number of areas relevant to the current and future forage situation including:
- Slatted Buildings and the welfare issues to consider.
 - Acid silages - cattle are not performing well on silage which appears on many farms to be acidic. Cutting straw out exacerbates the situation. Advice on nutrition.
 - Worming - cows not being wormed and fluked early which leads to further condition loss. Advice on herd management and fluke control.
 - Calf health - taking straw out of rations for in-calf cows increases risks of long bone deformity. Advice on animal management and health.

Appendix 1 - Scottish estimated straw production - 2015 and 2017

Crop	Estimated Straw yield (t/ha)	Ref	2015 Area (ha)	2015 Potential output (t)	2017 Area (ha)	2017 Potential output (t)
Wheat for combining	4.20	a	109,562	460,162	109,489	459,854
Winter barley for combining	4.10	a	51,808	212,412	47,509	194,787
Spring barley for combining	2.90	a	255,878	742,046	243,838	707,130
Winter oats for combining	4.70	a	7,586	35,656	9,168	43,090
Spring oats	3.00	a	18,029	54,086	23,456	70,368
Triticale for combining	3.90	a	626	2,440	601	2,344
Mixed grain for threshing	3.90	a	75	291	16	62
Winter rape for oilseed	4.30	b	35,198	151,352	33,843	145,525
Spring rape for oilseed	2.69	b	599	1,609	345	927
Linseed	1.50	b	151	227		0
Total straw				1,660,281		1,624,087
Cereal straw				1,507,093		1,477,635

Source

(a) SAC Farm Management Handbook 2015

(b) Copeland J & Turley D (2008), National and regional supply/demand balance sheet for agricultural straw in Great Britain, Prepared for the NNFCC

