Alternative bedding materials for beef and sheep housing systems in Wales

HYBU CIG CYMRU
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Contents

Introduction

Numerous bedding materials for livestock are available but their cost and effectiveness varies. Straw is typically the bedding material of choice for the majority of farms, however, its availability and cost is now becoming a concern. Changes in farming policy have reduced the amount of cereals grown in the UK. Consequently straw is a much less available commodity than it once was. In addition, for arable farms, new cereal varieties and straw shorteners have reduced straw yields whilst high nutrient prices have meant that straw is seen as a valuable bi-product that can be chopped and ploughed back into the land. In some areas of Eastern England, straw is increasingly being sought for use as a biofuel. This reduction in cereal straw availability combined with high haulage costs has meant that livestock farmers in low cereal growing areas such as Wales are looking for alternative materials for bedding their livestock.

Alternative bedding material should be scrutinised carefully and the following should be considered:

1. Will it keep my animals dry and clean?
2. Will it maintain a healthy environment - are my animals healthy?
3. Will it provide a comfortable, safe bed for my animals?
4. Is it readily available?
5. Is it cost effective?
6. Can I store it easily?
7. Can I compost the resulting manure?
8. Can the resulting manure be applied to land?
9. What effect does the subsequent manure have on the land and future crop growth?

Bedding materials should be comfortable to lay on, non-abrasive, non-slippery, highly absorbent of water and urine, and display low levels of environmental bacterial.

Animal health and welfare are a high priority when assessing a bedding material. Animals kept in poor environmental conditions will have impaired growth rates and often exhibit higher disease incidence. Therefore it is essential the material is chosen with animal welfare in mind.

Cereal Straw

Straw is the most commonly used bedding material for livestock, it has good thermal properties and moderate absorption capacity; which makes an effective bed. However, due to adverse weather conditions, changes in cropping policies and the pressure to cultivate land quickly, straw is becoming less plentiful. The main straws used are barley, wheat and oat straw.

Cost 2010
Barley straw costs around £50 - 75/tonne ex field
Wheat straw costs around £40 - 65/tonne ex field
Oat straw costs around £50 - 75/tonne ex field

Availability
Barley and wheat straw are the most abundant straws in the UK, however, oat straw is becoming more widely available in certain areas.

Absorbance
Straw generally has a dry matter of 25%. Oat straw is highly absorptive with wheat and barley being less so (2.4-2.8 L/Kg, 2.1 L/Kg, and 2.0 L/Kg respectively).

Quantities
Deep litter bedding is preferable, adding to it as needed. Similar quantities of all straws should be used. Barley straw is a robust straw and lasts longer than wheat straw which is quite brittle and breaks down easily. However, barley and oat straw are palatable so a proportion will be consumed.

Benefits
Straw is still the most abundant material for

animal bedding, even though the majority is grown in East Anglia and East Yorkshire. It also creates a warm comfortable bed and can be a palatable forage.

Animal Health and Welfare
In wet years, mycotoxin counts may be high which are harmful to animals. Mould spores cause dust which may cause respiratory issues in young farm animals.

Mycotoxins

There are about 300 harmful mycotoxins identified and the following factors increase the likelihood of mycotoxins developing in straw:

- Growing wheat after maize
- Physical damage
- Poor storage
- Poor growing conditions
- Inadequate drying of home stored cereals

Ruminants are less sensitive to mycotoxin effects than pigs and poultry, however, if prolonged ingestion of mycotoxins occurs reproduction and growth may be impaired. In acute cases clinical symptoms such as weight loss, low milk production and lowered immune status can be found.

Disposal
Straw is broken down readily and can be spread on farm land after use. Standard straw N value 5.9, P 3.1, K 6.6.

Woodchip

Wood sources are readily available in Wales and woodchip can be utilised to create a good free draining bed for indoor sheep and cattle on relatively dry diets providing the woodchip is less than 30% moisture content (preferably around 20%). There are several options for sourcing woodchip. Home-grown wood or some types of recycled wood that can be chipped on the farm are likely to be the most cost-effective options. If purchased, it may be more expensive than conventional straw bedding depending on transport costs, and total amount used, however, it can be used for numerous seasons and recycled timber reduces costs further.
Research has shown that woodchip offers many animal health and welfare benefits with limited bacterial growth and less dust causing respiratory problems.

Cost 2010

Green bulk woodchips	£80/T
Recycled wood (untreated)	£40/T

Availability

Home grown wood from woodland or hedgerow management can be utilised but should be dried for 6-12 months before use. Most seasoned hard and soft woods work equally well for bedding but larch is generally deemed unsuitable due to its tendency to splinter. Moisture content and the type of chipper used can also affect splintering. Bulk woodchip can be supplied but may be green and high in moisture requiring extra drying time and space.

Woodchips, shavings and sawdust that have come from virgin timber are not waste and therefore not subject to waste controls when used as animal bedding. Virgin timber is whole trees and the woody parts of trees (not the foliage) and wood off-cuts, shavings and saw dust from mills and manufacturing processes (using virgin timber). The resulting manure would not be waste and should be spread on land in accordance with Nitrate Vulnerable Zone (NVZ) rules and the Code of Good Agricultural Practice (COGAP).

Woodchips made from untreated recycled wood

Woodchips sawdust and shavings from untreated waste wood; for example, packing crates and single use pallets are waste but they can be suitable for animal bedding. Untreated recycled wood is a cheaper option but it needs to be checked for nails and sharp objects which could injure the animals. Treated timber is not permitted for animal bedding because of the risks posed to the animals being bedded upon it, the potential food chain impacts and problems with dealing with the soiled bedding. A waste exemption will need to be registered with the Environment Agency to use these wastes as animal bedding. The exemption is U8 further details can be found on the EA website www.environment-agency.gov.uk/business/sectors/117083.aspx

The exemption is free of charge and can be registered online or on a paper form. www.environment-agency.gov.uk/business/topics/permitting/116406.aspx Alternatively contact the EA customer service centre on 08708 506 506 for further information and the appropriate forms.

EA have a position statement to allow the composting or Anaerobic Digestion of soiled bedding materials that have been used in accordance with U8 exemption. www.environment-agency.gov.uk/static/documents/Business/MWRP_RPS_077_Composting_bedding_material_Sep_10.pdf

Farmers who registered an exemption to use waste such as woodchips or paper as animal bedding before the sixth of April 2010, would have registered a paragraph 15 exemption with a paragraph 12 exemption to compost it and then a paragraph 7 to spread it. They will need to re-register in the new exemption system by the first of October 2013. For more information about these changes see the EA website. www.environment-agency.gov.uk/agriculturalwaste

Absorbance
The woodchip must be below 30% moisture for maximum absorbency. The larger chips are free draining allowing liquid to pass through. The bottom layer absorbs moisture well when in prolonged contact leaving the upper layers relatively dry and friable.

Quantities
A shallow 10cm depth is preferable, applying a fresh layer of approximately 5cm every 7-10 days if animals are on a dry diet, more frequently if fed a silage based ration.

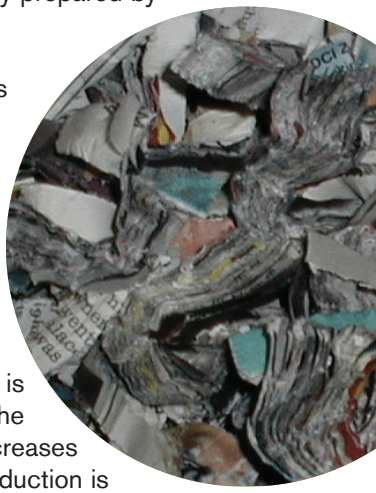
Benefits
Can be re-used for numerous winters, promotes high welfare and cleanliness of animals and is readily available. It does not need spreading very thoroughly as the animals move it around when walking. There is little dust and the bedding needs replacing less frequently.

Animal Health and Welfare
Animals are at least as clean as on straw, and health and welfare are equally as good. There is less dust causing less respiratory problems. Untreated recycled wood may contain nails or staples which may cause injury.

Disposal
The muck needs to be heaped and turned every 4-6 weeks. The compost can then be either sieved and the coarse woodchips re-used next winter as bedding with remaining compost spread to land or re-used in its entirety following a period of composting. (If you are using recycled woodchips you will need to register a waste exemption with the Environment Agency see the recycled wood section above).

For further details on woodchip for bedding indoors see “Woodchip for Livestock Bedding” at hccmpw.org.uk

Paper is highly absorbent bedding with a dry matter of approximately 90%. It is not very dense so is easily displaced by heavy animals and unless cut into small particles it tends to “drag” around animals’ legs and leave bare patches of floor. It is difficult to obtain directly from the source but can be bought already prepared by bedding companies at a higher cost.



Waste shredded paper and cardboard, dried paper sludges and plasterboard backing paper can all be used for animal bedding. These are wastes so you must register a waste exemption to use them. (see recycled wood section for details of how to register an exemption).

Paper crumb

This is a by-product from the paper industry. The short fibres are removed in a sludge type material and rolled to remove excess moisture at source. Typically the dry matter is around 50% but can be kiln dried with success, reducing the moisture content (mc) to less than 10%. The procedure increases the moisture absorbency of the product but the cost of production is also significantly increased.

Lime ash (also known as paper sludge ash)

Lime ash is the short fibres washed out when paper is recycled. The slurry contains lime, which is a filler and whitener from previous paper making. This is burnt, filtered and 15% water added which results in a product that resembles a sand material. It has been sold for the last 4 years throughout the UK as a bedding desiccant. Lime ash should not be used as bedding by itself. It has a high pH so it needs to be used with other bedding materials to prevent the animals getting burnt. To date 300,000 tonnes have been used by livestock farmers throughout the country. It is mainly used in the dairy industry to prevent mastitis but it can be applied to beef and sheep housing if mixed with straw, shavings or sand.

An end of waste protocol is being researched and developed for paper sludge ash: http://www.environment-agency.gov.uk/business/topics/waste/114433.aspx

Cost 2010

Prepared bedding at 10%mc	£70/T plus delivery costs
Crumb from source at 50%mc	£10/T delivered - depending on area
Lime Ash	£20/T delivered - depending on area

Availability
Prepared bedding is easily obtained yet incurs a higher cost. Shredded paper direct from source is more difficult to find. Paper crumb from source is available to most areas of the UK and price is dependent on haulage costs. Lime ash is readily available throughout the UK.

Absorbance
Highly absorbent if kiln dried to below 10% moisture content, if the raw product is used it is significantly less absorptive. Lime ash is a highly absorptive material and needs moisture adding to it to prevent the bedding "sticking" to the animals.

Quantities
Prepared paper bedding - Beef and sheep require a 10cm depth at start of winter. Cows need 200kg/ cow per winter which is approximately £14/cow/winter. Raw paper crumb can be used at a similar depth but may need "top dressing" more frequently to ensure a dry bed. Lime ash can be added at a similar depth to paper crumb but must be mixed with another material.

Benefits
A kiln dried product with high absorbency, good thermal properties, comfortable, low dust and degrades quickly. Low spore and pathogen levels. Raw crumb is less absorbent but much cheaper as a bedding source so can be used more liberally. Lime ash is readily available and cheap, it can be stored outside on farms and the high pH reduces pathogen loading.

Animal Health and Welfare
Prepared bedding may help reduce/control pathogen levels, animals are kept warm and clean and reduced dust levels reduces respiratory problems. Raw paper crumb seems to exhibit no health or welfare issues for the numerous famers that are already using this bedding, although no clinical trials have been performed. Lime ash is highly alkaline and used on its own may cause teat scalding. It should not be used without a top layer of straw or other material for calves or lambs as the powder "cakes" on the animals and the high pH can cause scalding of the noses.

Disposal
Can clump together, which may make it difficult to spread or compost effectively. If clumps can be broken down effective composting and spreading can be achieved. Lime ash is non organic and does not degrade when composted. It can be spread on fields but because of the alkaline nature it is advisable that soil analysis is undertaken.

If it is being composted it will need an exemption to be registered under T23 http://www.environment-agency.gov.uk/business/sectors/117109.aspx and an exemption to spread under U10 http://www.environment-agency.gov.uk/business/sectors/117085.aspx

Bracken

Bracken has been used as a bedding material for livestock for hundreds of years and is still used in certain areas. The fronds are cut in late summer/autumn when brown and can be baled using conventional machinery. Bracken grows successfully in all parts of the UK but usually on hillsides which may make it more difficult to harvest. Bracken spores are known to have carcinogenic properties and the material should therefore be handled with care.

Cost 2010
Cost of on farm cutting, baling and transportation. Bracken is not usually sold to third parties.

Availability
Readily available in certain geographical areas. Terrain may cause difficulties in harvesting.

Absorbance
It is suggested that bracken has the potential to be more absorbent than straw with a dry matter content often around 24%.

Quantities
Quantities used are similar to conventional straw.

Benefits
Freely available in certain areas, creates a comfortable bed, can be stored easily and animals don't usually eat it.

Animal Health and Welfare
Studies suggest that bracken fern may cause bladder lesions or carcinomas in cattle. It is also thought to cause haemorrhages in cattle and sheep with sheep slightly more tolerant than cattle. There are numerous studies conducted on the subject of the specific carcinogenic effects of bracken. However, there is little information on how the effects can be minimised if using bracken bedding. Anecdotally, these health issues do seem to be more prevalent in areas where bracken bedding is used.

Disposal
Bracken breaks down more readily than straw so can be used easily as fertiliser. Total N 3.86, P 1.5, K 8.1.

Pea Haulm

Pea straw is normally used as forage feed due to its high protein content. It is difficult to bale as it is very brittle and breaks up with machinery. It cannot be left on the ground prior to combining for more than a few days as it starts to degrade and become unfit to use. It is reported to make a poor bed as it isn't very absorbent.

Cost 2010
£60/tonne plus delivery costs at the time of printing

Availability
Available from larger straw merchants however only small amounts are grown in certain regions so not available in any quantity.

Absorbance
Reputed to have poor absorbency and no definitive figures are available on this material.

Quantities
Pea straw should be used initially in the same quantity as other corn straws, however, it may need replenishing more frequently due to the brittle property of the material.

Benefits
Can be used as a forage feed.

Animal Health and Welfare
Reputed to have poor absorbency so animals become dirty easily.

Disposal
Pea straw breaks down readily so can be composted and spread easily. If it is being composted it will need an exemption to be registered under T23 http://www.environment-agency.gov.uk/business/sectors/117109.aspx and an exemption to spread under U10 http://www.environment-agency.gov.uk/business/sectors/117085.aspx

Rushes have been used as bedding material for livestock for hundreds of years and is still used when bedding is scarce and expensive. Rushes grow in wet boggy areas and can only be cut in very dry conditions due to its nature and ground conditions. It can be baled using conventional machinery when ground conditions allow. Cutting nearer the ground will reduce plant vigour but care needs to be taken as tough tussocks can damage machinery.

Cost 2010
Cost of on farm cutting, baling and transportation. Rushes are not usually sold to third parties.

Absorbance
Dried rushes are not as absorbent as straw and are normally around 20% dry matter. Difficult to get only rushes without hard grazing and grasses will reduce dry matter and absorbency.

Quantities
Greater quantities than straw will be needed.

Benefits
Removing the rushes from the field after cutting will reduce regrowth.

Animal Health and Welfare
Can contain high cyanide contents and have caused poisoning and partial blindness in cattle.

Disposal
Degrades quickly and can be spread onto land. Total N 4.1, P 1.8, K 4.9. If not correctly composted problems can occur with seeds spread onto land. If it is being composted it will need an exemption to be registered under T23 http://www.environment-agency.gov.uk/business/sectors/117109.aspx and an exemption to spread under U10 http://www.environment-agency.gov.uk/business/sectors/117085.aspx

Rape Straw

Oil seed rape is readily available in the east of England and 0.597 million ha of rape was sown in 2010 which is a 9% increase on 2009. Rape straw has a high oil content and therefore a high calorific value as a bio fuel. It is difficult to dry correctly for use as a bedding material and the bales can be volatile and ignite easily when stored. It has a stalky structure and is best used as a bottom layer with a cereal straw on top.

Cost 2010
Cost £40/ tonne ex field.

Availability
Readily available in certain areas.

Absorbance
The absorbency of rape straw is not stipulated, however, farmers using the straw suggest that it is free draining rather than absorbent due to the high oil content and the physical stalky structure.

Quantities
Used as a bottom layer for deep litter with a layer of cereal straw on top to create a comfortable bed. This system will reduce cereal straw requirements. It is suggested by farmers already using the rape straw that a deep bed of around18-24 inches initially with an upper layer of cereal straw is required.

Benefits
A cheap free draining bedding material which is readily available in certain areas of the UK.

Animal Health and Welfare
Rape straw must be dried to below 20% moisture content to prevent moulds from spoiling the product and causing animal health issues. This may prove difficult to achieve in the UK. It is a very stalky straw, and may not be suitable for certain animals e.g. lambs or calves.

Disposal
Breaks down readily and can be spread on land after use.

Canary Reed Grass

Canary reed grass (CRG) is a viable alternative to straw as a bedding material for housed livestock. It is a perennial crop which offers high yields from low inputs and can be harvested with conventional machinery at any time of the year. It can be grown on marginal land and is drought tolerant. CRG is normally grown for biomass fuels.

Cost 2010
Cost of growing on farm £40 per tonne.

Availability
Difficult to obtain as baled straw, however, it can be grown readily in most of the UK. It is harvested with conventional grassland machinery and yields around 8t/ha.

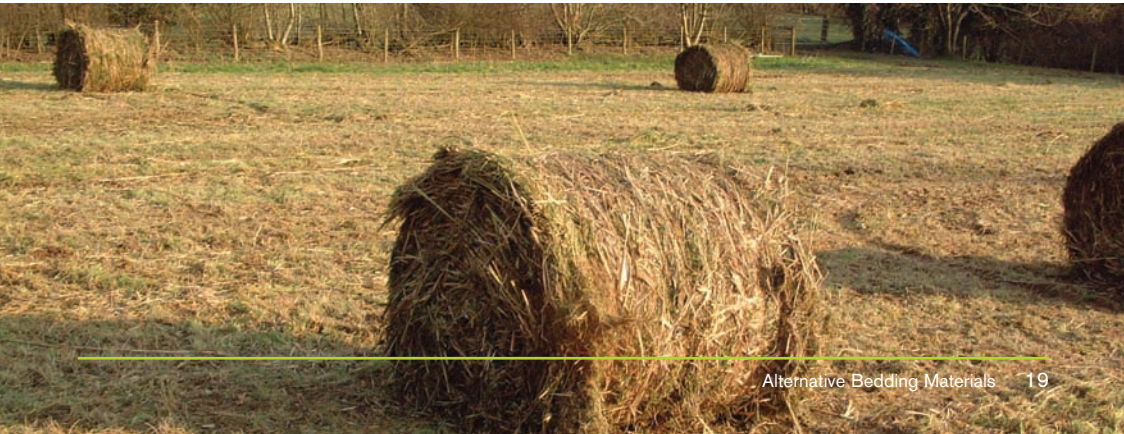
Absorbance
CRG has similar absorbency to cereal straws.

Quantities
Similar quantities to straw should be used.

Benefits
Creates a comfortable bed with good thermal properties and the animals stay as clean as they would on ordinary straw. It is drought and flood tolerant and can be grown in most areas.

Animal Health and Welfare
Later harvests may mean the quality is sub optimal and mould spores may be prevalent. This may cause an animal health issue.

Disposal
Degrades quickly and can be spread onto land.



Miscanthus

Miscanthus or elephant grass is a crop usually grown for biomass fuels. It is usually found growing in areas where there is a bio fuel power station. It is a tall stalky crop and can only be harvested after the second year of planting. The crop is grown from rhizomes and can be invasive and needs specialist planting equipment. When harvested, miscanthus has high moisture content and must be chopped and dried before use, this may mean the cost of production is too high for most farmers. Typically miscanthus is being used in the equine industry and the poultry industry to good effect. Bedding companies chop the straw into fine pieces, dry it to below 20% mc and sell it in pre-packed, small bales.

Cost 2010
Typically prepared miscanthus bedding is £15 per tonne higher than cereal straws.
Miscanthus is a coarse bedding if not cut into fine pieces.

Availability
Prepared bedding is available nationally, however, large dried bales are only available in certain areas of the country.

Absorbance
Miscanthus is stated to be highly absorbent after dried to below 25% mc.

Quantities
A good depth of around 24 inches initially with additional material added as necessary. Initially the bed is not very dense but adding a small amount of moisture helps create a good base so bare patches of floor are not seen.

Benefits
Highly absorbent, creates a comfortable bed with good thermal properties, animals remain clean and warm on this bedding.

Animal Health and Welfare
Bought from a bedding manufacturer the straw is dust free and free of mycotoxins. The high moisture content of the plant when harvested may mean farmers may struggle to dry the product sufficiently to stop moulds forming.

Disposal
Degrades quickly and can be spread onto land.

Conclusion

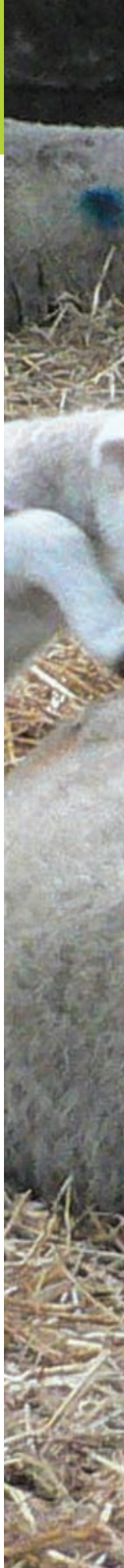
Not all bedding material has been covered in this booklet. Other bedding materials are available. When considering bedding materials remember to consider its absorbency, animal health and welfare, disposal, costs and availability.

Care should be taken with the chosen bedding material so that contaminants e.g. nails, heavy metal, glass, plastic are removed to avoid injuries and fatalities. There are a few products that cannot be used for bedding material e.g. poultry litter, recycled rubber, glossy paper, woodchip produced from wood that has had chemical preservatives or glues. These materials may have a negative effect on the health of the animals and on the soil if the used bedding is applied to the land. It is illegal to spread recycled rubber on the land.

A number of adjustments can be made to reduce the amount of bedding required:

- make buildings well ventilated to reduce moist air to keep bedding dry
- a scraped (concrete) feed area which is cleaned out a few times a week will considerably reduce bedding requirements since the majority of dung and urine is excreted while feeding
- ensure no water from gutters and water troughs get into the bedding
- place water trough by scraped feed area
- different rations produce different amounts of fluid in dung and urine, e.g. more bedding will be needed if silage is fed compared to whole crop, concentrates or straw
- excess salt can increase water uptake and increase amounts of urine
- store in a dry place

It is always an option to use alternative bedding materials with traditional cereal straw. For example research has shown that woodchip, pea haulm and rape haulm works well for drainage and are good underneath straw. Paper also works well mixed in with straw.



	Cost 2010	Availability	Absorption	Benefits	Animal Health	Disposal
Straw	£45-75/t	widely	moderate	abundant	mould spores	easily composted and spread
Woodchip	£40-80/t to purchase	widely	low	abundant	must be below 30% mc	composted for 2-3 years
Paper	£10 - £70/t	widely	low to high depending on product	liming effect, abundant cheap depending on product sourced	may cause teat scald using lime ash	may clump and cause difficulty spreading, may increase nitrogen requirement
Pea Haulm	£60/t	limited	low	palatable - forage	animals become wet and dirty quickly	easily composted and spread
Oilseed Rape straw	£40/t	limited	low	clean and dust free	very stalky material	easily composted and spread
Canary Reed Grass	cost of growing and baling	limited	moderate	can be grown and harvested using conventional machinery	mould if not dried correctly	easily composted and spread
Miscanthus Prepared bedding Bales ex field	£15/t higher than straw	limited	high	clean dust free high yielding crop	none moulds if not dried correctly	easily composted and spread
Bracken	baling	niche	moderate	cheap, warm	potentially carcinogenic	easily composted and spread
Rushes	baling	niche	moderate	cheap		easily composted and spread