



# Effective Bedding Management

Incorporating results from a farmer survey on bedding management, mastitis & on-farm bacterial analysis





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**Disclaimer:**

The Protocol followed by Kingshay for the study was that considered most appropriate to the technical knowledge and practical conditions at that time and was designed to reflect farming practice.

All results and interpretations reported are specific to the issues described in the report and also to the conditions which prevailed during the study.

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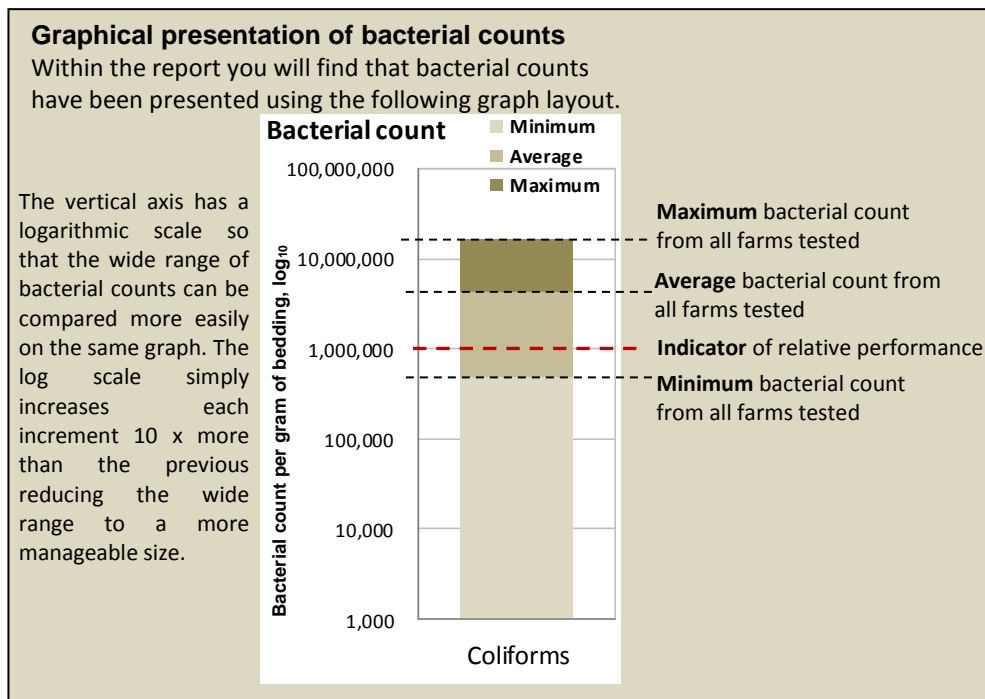
# AIM OF THE REPORT

The bedding material for cows, whether in cubicles or loose yards, is an expensive but essential part of the management of housed cows. Choosing the right bedding for your farm system will depend on many different criteria, from personal preference to cost and availability.

Having decided on your bedding, management before and during use is crucial to achieve good cow comfort and hygiene, the two main reasons for using a bedding material. Poor comfort leads to poor animal health and therefore productivity. Poor hygiene potentially leads to an increase in Somatic Cell counts (SCC) and clinical mastitis. This report presents data and other information on bedding choice and management, particularly in relation to environmental pathogens (harmful bacteria) and mastitis.

Part of the information for this report was provided by farmers through a survey questionnaire. These were completed during the winter of 2010/2011 by farmers from across the UK. The range of herd size (60-1000 cows) and yield (4,800-10,000 litres per cow) from those that returned the forms enabled us to get an overall view of bedding used across the whole of the dairy sector.

Additional data for this report came from on-farm sampling of bedding from a number of farms that were using different bedding and various bedding management protocols. This data was collected by the Kingshay technical team and sent for analysis at an independent laboratory.



# SUMMARY

## SUMMARY OF POINTS IN THIS REPORT

### MAIN POINTS

- Management of bedding materials, both before and during use, is more important than bedding type when considering cow hygiene
- Trends in bedding material use have moved towards more farmers using alternatives to straw - page 4
- Choice of bedding depends on many different criteria - page 4
- Bacteria levels in all used bedding materials range considerably between farms regardless of bedding material - pages 10 to 15
- Sand bedding had the lowest bacterial counts on tested farms but good management is crucial to achieve the full benefits of the antibacterial properties of this material – page 14

### OTHER KEY POINTS WHEN CONSIDERING CHANGING BEDDING MATERIAL

- **Cost of change** e.g. specific machinery is sometimes required for dispensing some materials
- **Slurry handling** systems are not always compatible with some bedding types - page 9
- **Storage** of bedding should ideally always be under cover. Storage buildings need to have adequate access for delivery
- **Availability** of some materials may be specific to certain areas or otherwise become cost restrictive
- **Price** is often the main consideration but compromising cow health can outweigh any cost savings

All bedding materials need to be applied in adequate quantities otherwise they will not provide sufficient comfort and hygiene. Cost cutting on bedding will often lead to lower health and productivity with the resulting reduced profitability far outweighing the cost of additional bedding.

Regardless of the bedding material used or how cow beds are managed, a high standard of pre-milking udder hygiene is still required to maintain udder health and reduce the risk of mastitis.



# THE HOUSED ENVIRONMENT

Providing a clean and comfortable bed is crucial to optimise cow welfare. Increased comfort will lead to improved fertility and milk yields as well as enhanced longevity. Poor bedding quality and incorrect bedding management can lead to dirty cows with a much greater chance of mastitis. Getting the bedding right will also help to reduce hock and knee injuries in cubicles.



## Cubicle design

Cubicle design is important in maintaining clean dry bedding throughout the day. Incorrect design can lead to milk, faeces and urine collecting towards the back of the cubicle contaminating bedding; this is especially important in the case of *Klebsiella* and *E. coli* which are present in faeces.

The base of the cubicle is also important. Using a good quality mat or mattress can reduce the amount of bedding that is needed whilst a smooth flat surface will be much easier to clean allowing removal of all soiled bedding.

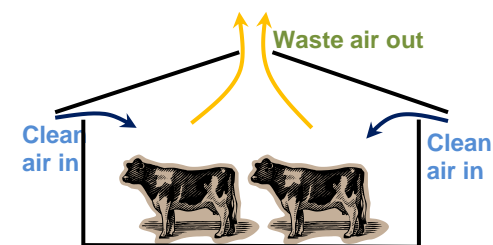
## Loose Housing design

For effective bedding utilisation in loose yards:

- Use a kerb to allow easier cleaning
- Allow wide access to yards
- Avoid water spill onto bedded areas
- Do not compromise on the quantity of bedding used

## Ventilation

Regardless of bedding type, good ventilation in both cubicle and loose housing will improve air flow and reduce humidity. Warm air rising from animals cools and condenses and, if it can't escape from the building, falls as water droplets back down into the bedding area. This moisture helps to create the right environment for the growth of mastitis causing pathogens.



## Scraping and cubicle cleaning

Keeping passages as clean as possible reduces the contamination of bedding. Excess slurry in passages increases the contamination of bedding via legs and feet. Scraping frequency will depend on stocking rate relative to concrete areas and in cubicle housing the width of passageways.

Clean the back of cubicles well at least twice a day and replace used bedding. Bed up cubicles at least once a day.



The following Kingshay Farming Notes and Tried and Tested reports will give you more information on improving cubicles, loose yards and ventilation to help create a more hygienic environment:

### Farming Notes:

*Cubicle Modification part 1 and part 2*  
*Loose Housing: Design and Operation*  
*Ventilation*  
*Building design and Layout*

### Tried and Tested Reports

*Cubicles and Mats and Mattresses*  
*Yard Scrapers*



# CHOOSING A BEDDING MATERIAL

Choosing a bedding type for your farm will depend on many different criteria. The survey results showed that farmers had many different reasons for choosing a particular bedding material (see adjacent Table):

- **Paper** - chosen for absorbency, cost effectiveness and hygiene
- **Sand** - preferred for comfort and hygiene
- **Gypsum** - preferred for absorbency and cost effectiveness
- **Straw** - a consistent but average performance across all criteria
- **Sawdust** - favoured for compatibility with slurry systems, ease of use and storage

These results are the average opinion score for each bedding type. The range of views within each criterion indicates that opinions on the benefits of a particular product vary and will depend on the management, building design, storage facilities and personal preference.

Comparing data from the 2010/2011 survey with previous survey data from Kingshay Members in 2006 showed some trends in bedding use:

- A decrease in straw use, mainly due to price and availability
- A change to recycled materials such as gypsum and ash
- Increase in the use of sand due to a belief in the potential for improved hygiene and ease of management

FARMER REASONS FOR CHOOSING THE MOST COMMON BEDDING TYPES\*

Choice criteria	Paper	Gypsum	Sand	Sawdust	Straw
Absorbency	●●●●	●●●●	●●	●●●●	●●●
Availability	●●●●	●●●●	●●●●	●●●	●●●●
Compatibility with slurry system	●●●	●●●●	●●	●●●●	●●●
Ease of use	●	●●●	●●●	●●●●	●●●
Cost effective	●●●●	●●●●	●●●●	●●●	●●●
Cow comfort	●●●	●●●	●●●●	●●●	●●●
Ease of storage	●●	●●●	●●●	●●●●	●●●
Hygiene/mastitis control	●●●●	●●●●	●●●●	●●●	●●●

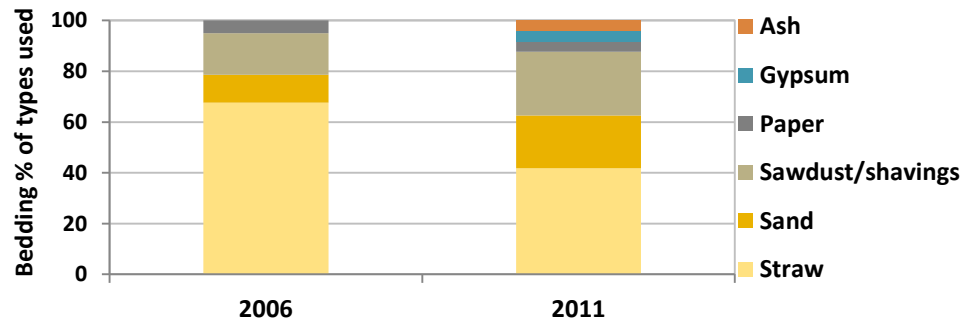
\*Reason for choice using a scale where 1 = low 4 = high



## Farmer comments from the survey on choosing a bedding material:

- “Straw is becoming more expensive and the quality is variable. Maybe it is time to consider other options”
- “Gypsum is good for soil structure”
- “Sawdust doesn’t block slats”
- “Thinking of going to sand bedding – but worried about slurry handling”

Popularity of cubicle bedding materials used



# BEDDING TYPE AND ENVIRONMENTAL BACTERIA

Most farmers who completed the bedding survey agreed that the main criteria for choosing bedding was hygiene and mastitis control. Bedding can potentially improve cow hygiene by keeping the cow cleaner. Bedding type and quantity can also affect the environment in which bacteria survive and multiply. Bedding hygiene should contribute to the control of environmental mastitis. The following table describes the common mastitis pathogen types and their main on-farm source:

TYPES OF MASTITIS CAUSING BACTERIA

Mastitis Pathogen	Type *	Description
<b>Coliforms:</b> <i>E Coli, Klebsiella spp.</i> <i>Enterobacter spp. Citrobacter spp</i>	Environmental Gram -ve	Found in faeces, bedding and on wet dirty udders. Increased bacterial levels in warm, wet conditions Cows show clinical signs.
<i>Streptococcus uberis</i>	Environmental / Contagious Gram +ve	Associated with straw yards, outbreaks at pasture and dry period infections. Once in the udder Strep. uberis can act as a contagious pathogen and spread between cows during milking.
<i>Pseudomonas spp</i>	Environmental Gram -ve	Invades the teat canal. Often associated with water or teat dip contaminated by the pathogen, thriving in anaerobic conditions. Very poor response to antibiotics making it difficult to treat.
<i>Streptococcus agalactiae</i> and <i>dysgalactiae</i>	Contagious Gram +ve	Previously a major cause of mastitis, its prevalence is decreasing. Can produce large increases in bulk SCC and spreads rapidly through the herd. Very sensitive to antibiotics so relatively easy to control.
<i>Staphylococcus aureus</i>	Contagious Gram +ve	Mainly sub clinical infections and very difficult to cure during lactation. Can spread through the herd if milking routines and parlour function are impaired.

\*Gram negative and Gram positive pathogens are so called due to the laboratory technique for their identification. Gram positive mastitis infections are likely to respond better to antibiotics compared to mastitis caused by Gram negative bacteria.

## Acceptable levels of bacteria?

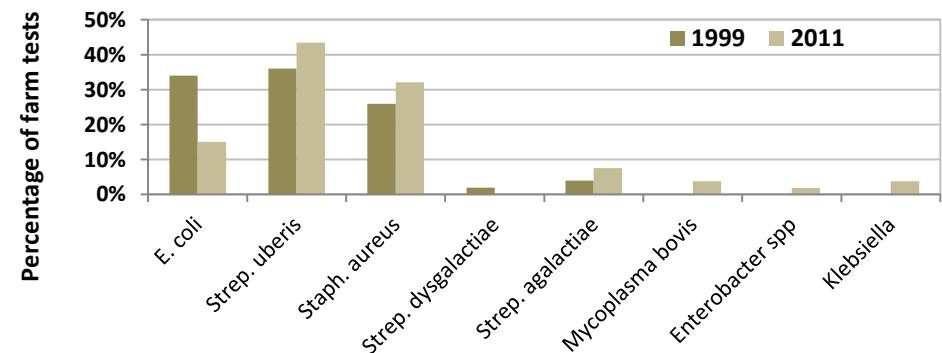
It had been thought that Coliforms needed to be treated when levels increased above 1 million per ml. However, research by Cook (2008) showed that treatment was appropriate when individual bacterial counts were at 100,000 Coliforms/ml. There is limited information on treatment intervention levels for other pathogens.

If pathogens are present on the bedding material then there is a risk of mastitis infection. Preventative measures should be implemented at all times to reduce the risk of infection.

## The spread of environmental bacteria

Comparing survey data with a previous Kingshay survey in 1999 suggests that over the last 10 years environmental type bacteria have become more widespread and variable (see adjacent graph).

Bacteria found in milk samples



Note: E. coli is known to still be prevalent on farms. An E. coli infection is generally easier to identify and therefore individual milk testing of cows with this infection is, possibly, less commonly undertaken.

# ENVIRONMENTAL BACTERIA RESULTS

The Table below shows the average levels of Bactoscan and SCC of the farms completing survey questionnaires, and also laboratory analysis results from on-farm bedding samples, in relation to bedding type.

RESULTS OF BEDDING SURVEY BACTERIAL AND SCC DATA AND ON-FARM ANALYSIS OF ENVIRONMENTAL BACTERIA

Bedding type	Survey results			On farm bacterial counts (Used bedding, millions per gram)					
	Average Bactoscan	Average SCC	Average % of cows >200,000 SCC	Total gram negative	Coliforms	Total Strep	Total Staph	S. aureus	Klebsiella
Straw	27	185	15.0	26.665	7.833	2.450	4.000	0.010	0.003
Sand	18	169	11.1	2.125	1.245	0.380	2.883	0.110	0.000
Sawdust	22	165	10.0	9.967	2.900	2.275	2.433	0.567	0.000
Shavings	16	195	11.7	*	*	*	*	*	*
Paper	17	149	9.2	7.332	2.998	2.689	4.885	1.282	0.000
Loose housed straw	21	185	12.9	29.778	9.572	1.933	1.657	0.034	0.003

## Key points from these results:

- Cows bedded on straw tended to have higher Bactoscans than those on other bedding types
- Cows housed in straw loose yards had lower Bactoscans than cows on straw bedded cubicles
- Higher average SCC levels were recorded in herds using shavings compared to other products. Farms using paper based products had the lowest SCC's
- Bacterial counts for the environmental bacteria Coliforms were highest for samples taken from straw yards and straw bedded cubicles and lowest for sand cubicles
- Bacterial Streptococcus species were much lower on sand compared with other bedding types

## Kingshay results compared with previous industry standards

The results of the on farm bacterial analysis should help to provide a modern perspective on results published in the Journal of Dairy

Science, 1975 by Rendos *et al*, even though the Kingshay results were not generated from detailed scientific experimentation. Analysis techniques have improved and these results come from UK farms using current standards for cubicle management.

Kingshay results show the following main differences compared with Rendos *et al*:

COMPARISON OF KINGSHAY RESULTS WITH RENDOS *ET AL*

	Coliforms		Klebsiella		Streptococci	
	Kingshay	Rendos	Kingshay	Rendos	Kingshay	Rendos
Straw	7.83	3.10	0.003	0.06	2.45	8.60
Sand	1.25	0.50	0.000	0.00	0.38	6.30
Sawdust	2.90	52.70	0.000	4.40	2.28	53.00

- Straw has higher levels of Coliforms whereas sawdust has considerably less
- Sawdust had much less evidence of Klebsiella bacteria
- Straw, sand & sawdust all have lower levels of Streptococci bacteria



# ENVIRONMENTAL BACTERIA CONTROL AND COST

## Farm environmental bacteria testing

Whatever bedding you use, milk testing to assess the type of bacteria usually reveals more than one contagious bacteria on most farms. 72% of surveyed farms in the Bedding Survey commonly found more than one pathogen in milk samples.

The range of pathogen types on a farm can give an indication of where the main source of mastitis infection could be coming from, but individual samples from infected or high SCC cows are required for effective treatment.

Only 47% of surveyed farms had tested for bacteria type and of these only 11% had tested recently. **Regular testing will help to target mastitis control and treatments.**

SCC has a direct link to clinical mastitis. Reduced levels of SCC are an indication of a lower bacterial challenge. The table below shows how SCC is related to the percentage of cows with clinical infections.

**RELATIONSHIP BETWEEN SCC AND INFECTION STATUS**

Somatic Cell Count	% of cows infected
0 – 99,000	6
100,000 – 199,000	17
200,000 – 299,000	34
300,000 – 399,000	45
400,000 – 499,000	51
500,000 – 599,000	67
Over 600,000	79



For more information on mastitis control refer to the range of Kingshay Farming Notes covering mastitis control

The Bactoscan level is an indication of the hygiene of your cows, although this can also be influenced by other factors, in particular milking plant hygiene and parlour routine (see box below). Levels of SCC in the herd can be attributed to a number of different factors but udder hygiene is fundamental to keeping SCC and clinical mastitis under control.

**Parlour routine.** Environmental pathogens can never be removed entirely but can be effectively managed with a holistic approach to mastitis. This includes a good parlour routine including foremilk stripping, pre-milking teat cleaning and post dipping. Regular parlour checks are central to ensuring that equipment is performing within its capabilities to prevent the risk of mastitis and damage caused to the teats.

## The cost of mastitis

The cost of a case of clinical mastitis is estimated at £231 with approximately 42 cases of mastitis per 100 cows. The average annual loss of production from mastitis for 100 cows (including high SCC's) is valued at £9,179 (Kingshay Health Manager, 2011).

### LOSS OF MILK PRODUCTION FROM DIFFERENT BACTERIAL PATHOGENS

Source Schukken *et al*, 2009

Bacterial pathogen	Milk lost in the first 50 days	
	Cow	Heifer
Gram-negative	304kg	228kg
Gram-positive	128kg	133kg
Difference	176kg	95kg

Severe cases of mastitis can result in a 20% forced cull rate whilst mild cases of mastitis can result in a 10% cull rate (Kossaibati and Esslemont, 2000). Health Manager data indicates that the average culling rate for the recorded herds is 4%. This is a similar figure to results analysed from the Bedding Survey. The survey showed no correlation between mastitis culling rate and bedding type used.

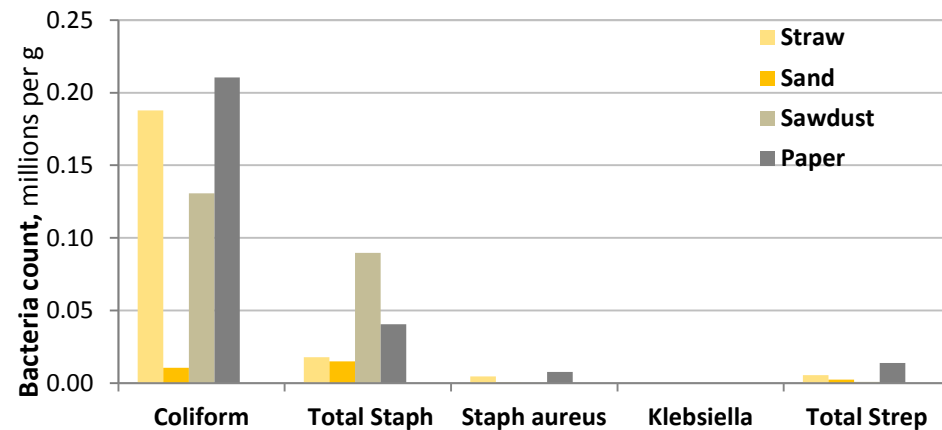
# BEDDING TYPE AND MASTITIS

Bacterial counts on bedding will depend on a number of management factors i.e. starting bacterial level, hygiene during storage and management during use. Fresh and used bedding samples were taken from a number of farms during the winter of 2010/2011 and were analysed for bacteria.

## Fresh bedding

- Large variations in the fresh samples were detected between the same bedding type. This underlines the importance of clean and dry storage of good quality bedding before use.
- Bacterial levels were generally low in fresh bedding although even small levels of bacteria will multiply rapidly given the right conditions and so clean and dry long term storage is essential.

Bacteria numbers on fresh bedding

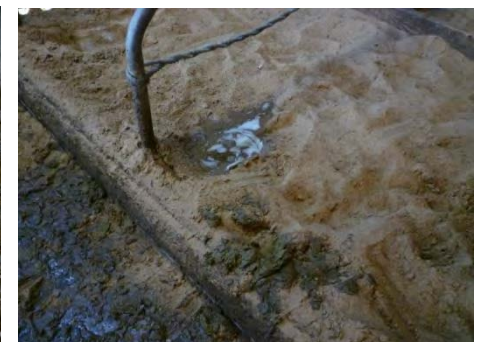
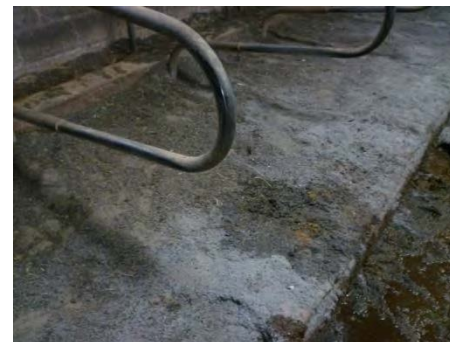
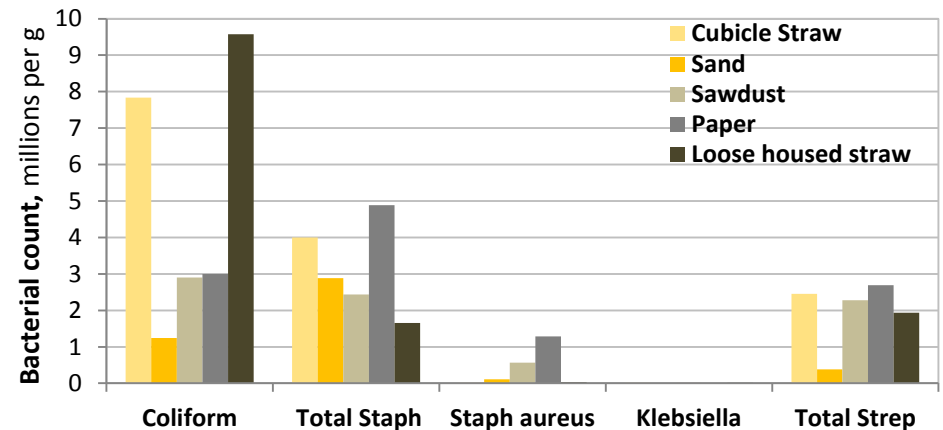


## Used bedding

As expected, much higher levels of bacteria occurred on used bedding.

- Straw had much higher levels of coliforms than other bedding types, in particular loose housed straw
- Klebsiella counts were generally low and were not detected on sand or paper, although this could be a result of the sampling process

Bacteria numbers on used bedding



# COST OF BEDDING MATERIALS

## The cost of bedding

Cost of bedding is an important consideration although this will vary from farm to farm and from product to product. Costs will depend on:

- The type of bedding used
- The amount of bedding used. This varies considerably between farms depending on the farm system e.g. cubicle type, slurry handling facilities and personal choice.
- The price of bedding. This will vary according to availability and farm location relative to the source of the chosen bedding.

The table below gives the results of the average daily use of the commonly used bedding types from the Bedding Survey. The cost per cow per day is based on average bedding costs calculated from survey data.

BEDDING COST PER COW PER DAY (Range of data in brackets)

	Quantity used / day / cow (kg)	Bedding cost* / tonne (£)	Cost / day / cow housed (p)
<b>Cubicles</b>	Average - Range		Average - Range
Straw	2.1 (0.5 – 4)	54	11.3 (2.5-21)
Sand	9.6 (5 – 17)	14	13.4 (7-24)
Sawdust	0.9 (0.3 – 2)	102	9.2 (3-17)
Shavings	1.8 (0.9 – 3)	81	11.3 (3-23)
Paper	1.3 (0.8-2)	96	12.5 (8-19)
Gypsum	0.6 (0.2-1)	27	1.6 (0.5-3.0)
Ash	4.5 (1.5-8)	18	8.1 (2.5-15)
<b>Loose housed</b>			
Straw	12.1 (10-18)	54	65 (54-97)

\*Average market value

**When comparing your existing bedding costs with other products use the price you pay for your current bedding. Then consider the potential cost and use rates of an alternative bedding type suitable for your farm system.**

## Other considerations when choosing a bedding material

- **Slurry system.** All bedding materials affect the slurry in cubicle housed systems. This is commonly an issue with regard to viscosity when sucking or pumping material as well as crust formation and sedimentation. Sand bedding can present particular issues regarding pump/macerator abrasion and wear
- **Cubicle surface.** The harder the surface the greater the likelihood of hock and knee damage. Harder surfaces will require more bedding to provide extra cushioning and reduced abrasion. Good quality mats and mattresses can reduce the amount of bedding required
- **Material availability.** Most products are cheaper nearer to their originating source. Not all products are cost effective for a farm
- **Handling equipment.** Changing to a different bedding material may require investment in new machinery or require increased labour to bed-up
- **Storage facilities.** Clean and dry storage of all bedding materials will reduce the contamination and growth of bacteria before it is used. Bacteria thrive in warm damp conditions so the aim should be to keep bedding material as dry as possible at all times. Outside areas used for sand storage should be kept as clean as possible



The following sections will give more information on the pros and cons of the most common bedding materials as well as a brief overview of alternative products.



# FRESH STRAW

Straw is the most commonly used bedding material and was used by more than 80% of the surveyed farmers. Only 42% of farms used it for cubicle bedding whereas all survey respondents used it for loose yards. Alternative bedding options for loose housed stock are discussed on pages 17 and 18.

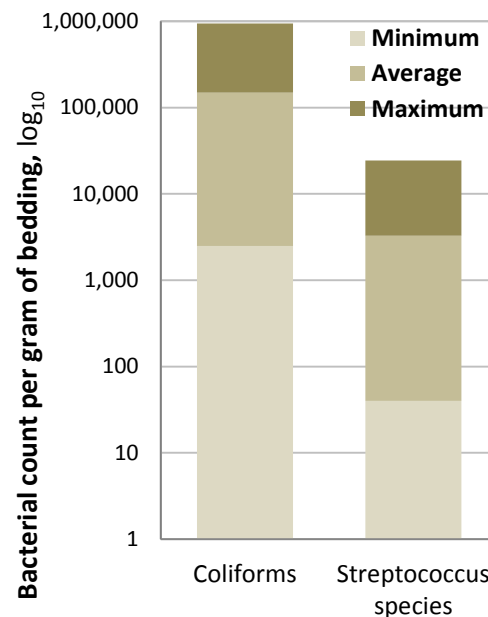
Clean dry straw will reduce bacterial counts before use.

Samples of fresh straw collected from a number of farms had a wide range of dry matter from 80% to 90% with an average of 87%. Keeping straw dry will reduce the growth of bacteria. Bacteria levels also ranged considerably between farms depending on the storage environment.

The adjacent graph shows the results of the bacterial counts for environmental bacteria analysed from farm samples. The range in bacterial levels emphasises the need to store straw in a clean dry and well-ventilated building.

A dry matter greater than 85% is required to stop moulds and reduce bacteria growth. Straw with a moisture content above 20% should not be used for bedding.

**Bacterial counts - fresh straw**



**Note:** The vertical axis on the graph has a logarithmic scale. This enables data with a wide range of values to be compared on the same graph.

## Storage recommendations

- Straw should be baled dry and stored dry where possible.
- Protect stored straw from the elements, using plastic sheeting for outdoor stacks.
- Round bales shed water better than square bales (these should always be covered). If round bales are uncovered and touching, run off is reduced.
- Larger, denser bales will have less water infiltration than small, lightly packed bales. However large bales will retain more moisture if the straw is damp when baled.
- Always discard damp/wet/mouldy bales. Do not use for dry cows, as they provide the perfect breeding ground for mastitis causing pathogens
- Similarly youngstock should not be bedded on wet or mouldy straw as moulds can contribute to the risk of pneumonia and respiratory disease.



# CUBICLE STRAW

A high proportion of cubicles are bedded up with straw although price and availability have driven many users to seek alternatives. Daily straw requirements will depend on the cubicle surface (see page 9). High use rates are expensive and investment in better mats and mattresses can be cost effective if large quantities of straw are being used to increase cow comfort. However, reducing the amount used may compromise the cleanliness of cows as straw has lower absorbency properties than some alternative products.

## PROS AND CONS OF STRAW FOR CUBICLE BEDDING

Pros	Cons
Readily available	Large storage area required if stored from harvest
Easy to use	May not be compatible with slurry systems particularly when used with slats. Can cause problems when pumping or sucking
Good all rounder	Not particularly absorbent
Can encourage cubicle use	Getting expensive if bought-in
Easy to clean from beds	

Using plenty of straw can make a very comfortable bed and can reduce the negative effects of poor cubicles.

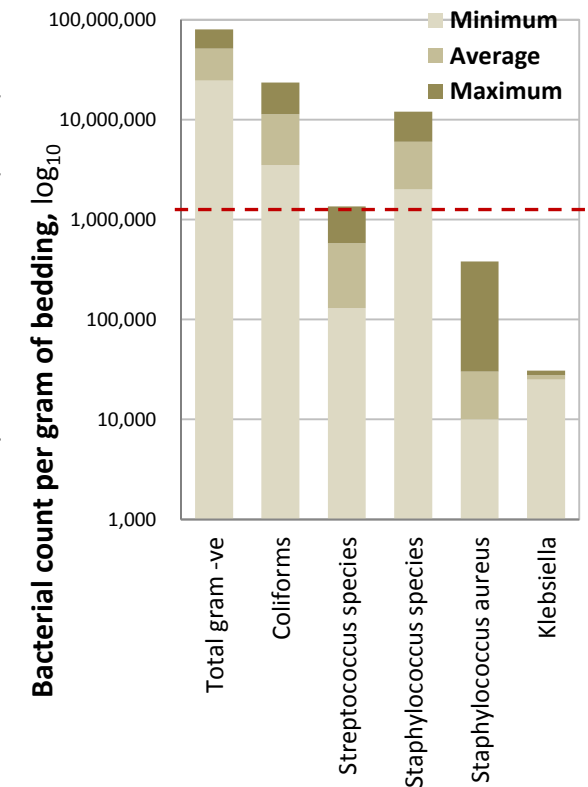


## Bacterial counts

Bacterial counts on cubicle straw were found to be particularly high for environmental Coliforms compared with other bedding types (page 7). The adjacent graph shows the range found in bacterial levels on used straw in cubicles. Large differences in bacterial levels between farms are largely a result of factors described on page 3. Daily management can reduce the level of bacteria on the bedding and reduce the mastitis challenge.

**Note:** The vertical axis on the graph has a logarithmic scale. This enables data with a wide range of values to be compared on the same graph

Bacterial counts on used cubicle straw



## Farmer comments on straw for cubicles

“Straw in cubicles gives me a quick and easy routine keeping the cows reasonably clean and comfortable”

“Using lots of straw on mats allows slurry to become FYM”

“Straw is great for weeping wall systems”

# LOOSE HOUSED STRAW

Straw use on loose yards ranged from 10 – 18kg per day per cow on the surveyed farms. Adequate bedding should be used daily to keep cows clean and reduce contact with bacteria. The bedding below the surface at a depth of 5-7.5 cm has been shown to reach 37°C, an ideal temperature for the multiplication of pathogens (Hughes,1999). Ensuring that adequate clean bedding is added daily will help to limit the contact between the pathogens and the cows.

## PROS AND CONS OF STRAW FOR LOOSE HOUSING

Pros	Cons
Readily available	Large storage area required if stored from harvest
Easy to use	High bacterial loads if not well managed
Good all rounder	Not particularly absorbent
Alternatives less familiar	Getting expensive if bought-in

### Key management practices:

- Stocking densities on straw yards are approximately 1.25m<sup>2</sup> per 1,000 litres of milk per cow; i.e. an 8,000 litres cow needs 10m<sup>2</sup> of yard space.
- Yards should be cleaned at least every five weeks. Within 14 days of establishing a new bed, temperatures at 5cm depth will reach 37°C.
- The heat generated within the bed will dry it out, however if ventilation is poor the rising moisture will condense and fall back on the bedding, increasing the potential for bacterial growth.
- Rape straw or miscanthus (see Alternative Bedding Materials on page 17) can provide a free-draining base reducing wheat straw requirements.
- Do not use wet straw for bedding as this will only increase the total requirement of straw and increase bacterial growth

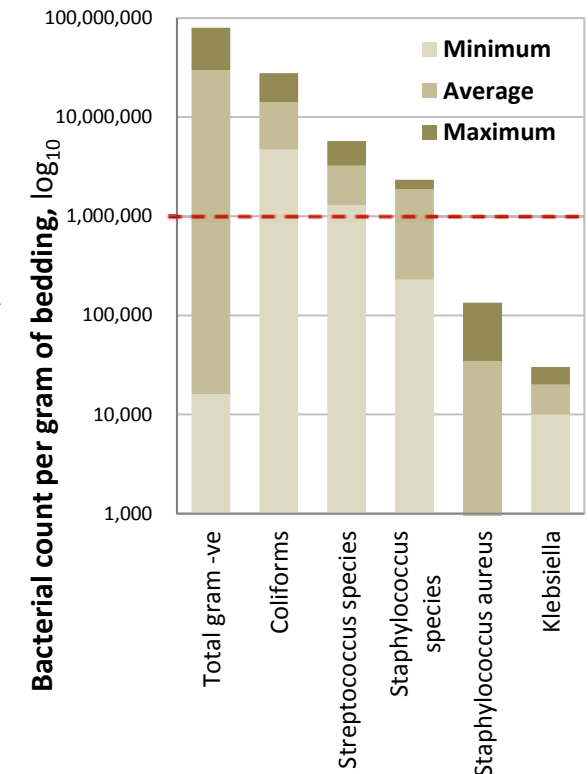
### Bacterial counts

Bacterial counts on loose housed straw yards were found to have similarly high levels of Coliforms as cubicle straw and although there was a wide range between farms the levels were generally higher for all bacteria compared with other bedding types.

The adjacent graph shows the range found in bacterial levels on used straw in loose yards.

**Note:** The vertical axis on the graph has a logarithmic scale. This enables data with a wide range of values to be compared on the same graph

Bacterial counts on straw yards





# SAWDUST

25% of the surveyed farmers used sawdust or shavings as cubicle bedding material. Many farmers find this material suits their farm, particularly with regard to ease of use, storage and compatibility with slurry handling systems.

## PROS AND CONS OF SAWDUST BEDDING

Pros	Cons
Compatible with all slurry systems	May be dusty when applied to beds
Easy to use	Usually very light and easily blown off cubicles
Easy to store, but must be kept dry	Can become pasty and stick to cows teats
Readily available	Kiln dried products are best but can be expensive
Fairly absorbent	Fine sawdust tends to have higher pathogen loads
Generally competitively priced	Can form crusts on cow heels and harbour digital dermatitis
Can dry out slurry reducing dung splash	Waste wood shavings can be abrasive and potentially contaminated e.g. pieces of metal or large pieces wood

Sawdust can be prone to increased moisture content and should be stored in a clean well ventilated building. Moisture content of fresh sawdust prior to use showed a wide range of moisture levels i.e. 55% to 81% leading to increase bacterial counts.



Sawdust can be dusty when applied to beds

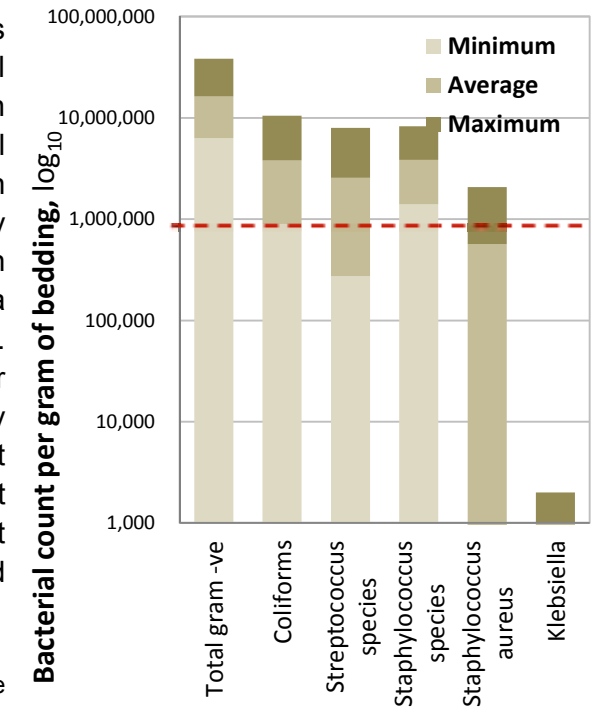


## Bacterial counts

The adjacent graph shows the range found in bacterial levels on used sawdust in cubicles. The bacterial counts were lower than straw bedding, particularly Coliform bacteria. As with all products there was a wide range between farms. These results were better than some previously reported data for sawdust (see page 6) and suggest that well managed sawdust bedding can be a good substitute for straw.

**Note:** The vertical axis on the graph has a logarithmic scale. This enables data with a wide range of values to be compared on the same graph

## Bacterial counts on used sawdust



## Farmer comments on sawdust:

“Sawdust bought in bags is a bit more expensive but very dry and easy to handle.”

“Sawdust doesn’t block slats”

# SAND

Sand as a bedding material had the lowest bacterial levels for both fresh and used material. This gives it an advantage over all other materials when looking to improve udder health. However, good management is required to ensure the hygiene benefits are maintained. Organic materials e.g. dung or leaked milk left on the sand bed will allow bacteria to multiply. Ensure that:

- Dung and contaminated sand are removed daily
- The back half of the cubicles are cleaned out at least twice a year
- Good quality sand is used i.e. fine washed sand with no silt or clay
- Sand is stored correctly (see below)

### Sand storage:

- Buy dry sand and store in a well-ventilated building
- If stored outside cover with a sheet if the sand is dry
- Do not cover wet sand as this will encourage bacterial growth
- If stored outside ensure good drainage to prevent water accumulation around sand heaps



### PROS AND CONS OF SAND BEDDING

Pros	Cons
Low pathogen material	Abrasive material that can damage milk and slurry pumps
Good cow comfort	Contractors have been known to refuse to spread slurry containing sand
Readily available	Sediments in slurry stores and can also block drains
Provides additional grip	Can't use lime as it can set hard when wet
	Need to regularly maintain levels in deep sand cubicles
	Over time it will polish the concrete in passages

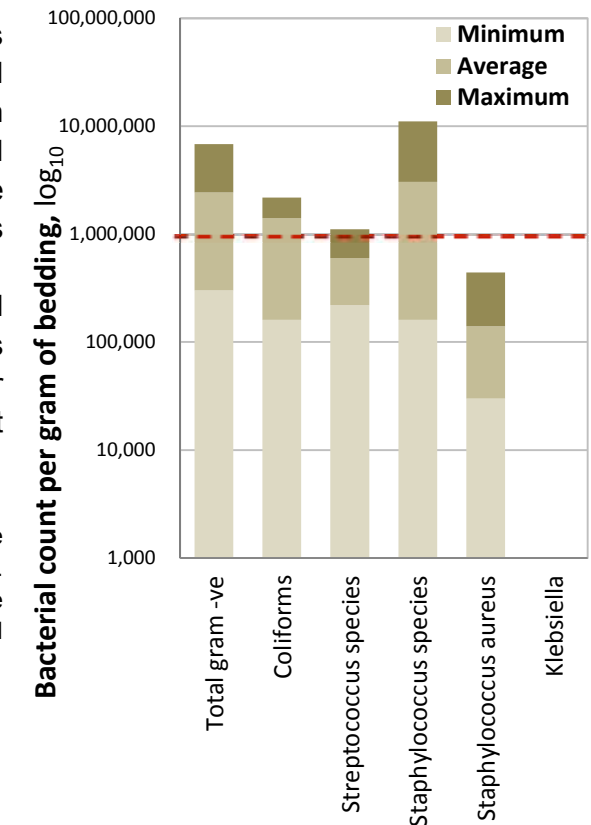
### Bacterial counts

The adjacent graph shows the range found in bacterial levels on used sand in cubicles. The bacterial counts were on average the lowest of all beddings tested.

Not all test results for sand had low bacterial figures emphasising the need for good cubicle management even with sand.

**Note:** The vertical axis on the graph has a logarithmic scale. This enables data with a wide range of values to be compared on the same graph

Bacterial counts on used sand



### Farmer comments on sand bedding:

“Sand is cheap, easily available and although it needs specialist application machinery it does everything I need”

“Sand on mats is superior to straw on concrete and sawdust on mats in terms of both comfort and hygiene”

“Sand makes passages less slippery”

“Contractors do not like pumping sand through umbilical systems”

“Sand not compatible with pre-dipping and dry wiping”

# PAPER BASED BEDDING

Paper waste bedding was used by a small number of farmers who completed the survey but the product does provide a viable alternative to straw or sawdust. Like all bedding alternatives cubicle management is key in ensuring cows are kept clean and comfortable.

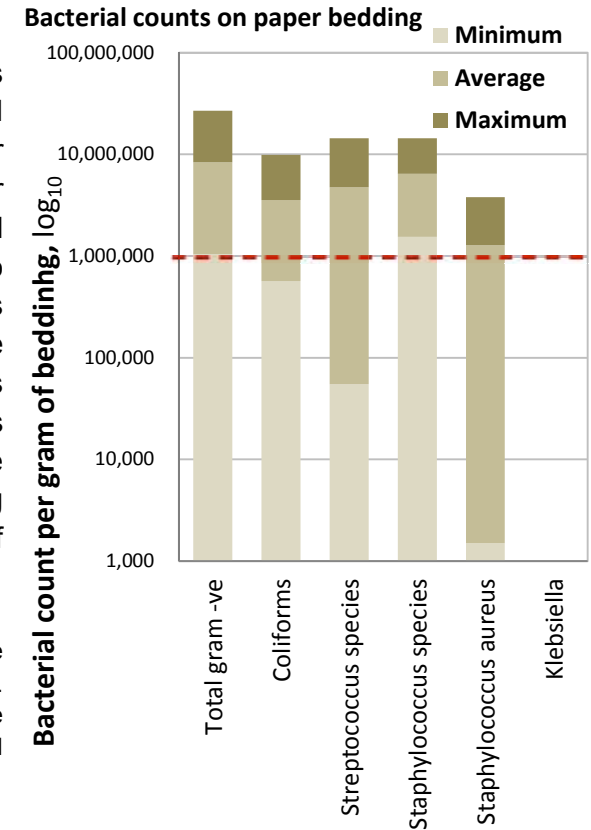


## PROS AND CONS OF PAPER BEDDING

Pros	Cons
Fairly dense so won't blow away	Can be dusty when applied
Consistent quality	Can stick to legs and teats causing abrasions if used too sparingly on a mat/concrete base
Good absorbency	Damp paper bed can form hard abrasive pellets and can cause hock damage
Cows normally remain dry and clean if adequate quantity used	If used as a deep bedding material the bottom material can set creating a hard concrete like base
Will dry out slurry and reduce splashing	Can make scraping difficult and may block slats.
Compatible with most slurry systems	Large quantities can settle in slurry stores

## Bacterial counts

The adjacent graph shows the range found in bacterial levels on used paper bedding in cubicles. Paper based bedding was found to be a good alternative to straw and sawdust in terms of bacterial count. A wide range in bacterial counts between farms emphasises the need for good cubicle management and using adequate quantities of bedding.



**Note:** The vertical axis on the graph has a logarithmic scale. This enables data with a wide range of values to be compared on the same graph





# BEDDING SUPPLEMENTS

**Lime** increases the pH of the bedding when well mixed in. A pH above 9.5 creates an environment unsuitable for the growth of environmental bacteria. Lime will also assist in moisture absorption. Overuse can cause skin damage to teats and udders. Applications of approximately 1 cupful per cubicle should be restricted to 2/3 times a week.



**Ash** is highly absorbent and improvements in pathogen numbers have been found when ash has been used as a conditioner. The product mixes well with sand, sawdust, paper or shavings, or alternatively it can be used as a base for straw loose housing. Ash is highly alkaline and is not recommended for use on its own as this can result in skin damage. An iodine based teat dip with good emollient levels is recommended when bedding on ash. When a Chlorhexidine dip (such as Masodip, Mastocide or Tru-blu C Hex 110) is used, ash reacts with the chemical and can cause teat burn.

**SOP** (Sirio Operating Process) is a product designed to inhibit pathogenic micro-organisms and stimulate beneficial micro-organisms (good bacteria), particularly in loose yard bedding. By applying directly to the bedding surface it is claimed to create a more hygienic environment reducing clinical mastitis and digital dermatitis.

## Farmer comments on SOP usage:

“Tried SOP in past with no effect!!!”

“It can’t be a coincidence - when I used SOP my mastitis cases went down”

**Powdered disinfectants** can be applied along the edge of the cubicle. These anti-bacterial products are specifically for cubicle use and lower or raise the pH to reduce bacterial growth. Products include Stalosan F, Cubi-Powder, Bolshaw Cubicle Care, Antibacta, Cubisan and Vulkamin.

**Plasterboard/gypsum** is a bedding product steadily growing in popularity. This product can be purchased as recycled gypsum-impregnated plasterboard paper or as a raw material and provides the following benefits:

- It can be mixed with straw, sawdust or paper or used on its own
- It is an inorganic product and has an alkaline pH providing an inhospitable environment for bacteria growth
- Gypsum does not cause skin damage to teats or udders
- Benefits to the soil when spread with slurry may occur under some soil conditions

Gypsum can be applied daily or piled up at the front of the cubicle and dragged down on to the cubicle surface once, twice or three times per week. To ensure a comfortable, clean, dry bed it is recommended that the gypsum be maintained at a depth of 1cm to 3cm.



# ALTERNATIVE BEDDING PRODUCTS

**Rape, Bean and Pea Haulm/Straw** are coarse stalky products more suited to a base layer for yard bedding providing good drainage. A layer 60cm (2ft) deep under a covering of more comfortable cereal straw reduces the usage of straw by ~30% (SAC). These products need to be stored under cover as the coarse material reduces the density of bales which increases water infiltration. Rape straw can be difficult to dry and once baled can spontaneously ignite.



**Canary Reed Grass** is a perennial crop grown for bedding and can yield 8t/ha. The crop can be grown on marginal land, is drought tolerant and has similar absorptive capacity to straw when dry. Welsh trials showed the product has no adverse effects on the performance of livestock when compared with straw.

**Miscanthus (Elephant grass)** is a perennial crop increasingly used for bedding as well as biomass for renewable energy projects. Yields are good (10-20t/ha) and one of its many uses is livestock bedding. Harvested only after the second year of planting, it can be put through a standard forage harvester and stored in bulk or cut then baled with a specialist baler. The crop has a high moisture content which needs to be reduced to below 20% before use, which pushes up the costs of bedding products. Home grown crops leave rhizomes which are difficult to get rid of in following crops.



**Peat** has been used by farmers for generations especially in the West Coast of Ireland. Full of tiny capillaries, it absorbs up to four times more moisture than straw. Availability is limited environmental sustainability is poor.

**Wood chips** although a cost effective solution are really only suitable for bedding cattle on reasonably dry diets. Due to the nature of dairy cow diets using woodchips is not generally viable as there is too much moisture in the dung.

## Bedding Recovery Unit

This works as a two stage process. Firstly, long fibres are separated from the slurry which requires a separator producing a high dry matter crumb. The second phase involves using a drum dryer which contains micro-organisms. These organisms raise the temperature inside the drum to 65°C which not only dries the material but also kills any pathogenic bacteria that may be present. The process ensures that the resulting product is of a consistent quality, with a dry matter of 40% to 42% post drying, whilst also eliminating the pathogens responsible for mastitis. The initial cost of setting up the process is approximately £250,000 for a system suitable for 300 cows; however grants may be available and the savings in bedding and fertiliser can make this a cost effective option.



# ALTERNATIVE HOUSING SOLUTIONS

## Pack bed

The design is based on loose-housing with animal comfort in mind, and with the aim to reduce lameness cases. It is typically bedded with shavings or fine sawdust, and designed to be cleaned out annually. There are strict guidelines on management to ensure that the pack doesn't get too wet and maintains adequate hygiene standards:



- Aeration to a depth of 18 to 24cm should be carried out twice daily, incorporating oxygen into the bedding to encourage microbial composting
- The more air that is incorporated into the bedding, the better the microbial activity and the higher the temperature reached
- Failing to aerate sufficiently will create anaerobic decomposition resulting in lower temperatures that encourage mastitis pathogens
- Additional bedding should be applied every 2 to 5 weeks depending on the weather and stocking rate
- Bed depths can build up to over 1m high
- Building floors are normally clay instead of concrete
- There is also significantly more space required per cow than with cubicles i.e. 9.5 -13m<sup>2</sup> per cow

### Data from the Dairy Herd Improvement association in the USA on the benefits of pack bedding v alternative systems showed:

- An increase in milk production, heat detection and fertility
- Reduction in mastitis; mastitis defined as >200,000 SCC
- Variable response to bulk tank SCC – some herds were higher

High levels of environmental pathogens were measured in the bedding and therefore pre-milking routines were crucial to maintaining udder health

## Soil/composting

This is a housing system from the Netherlands. It is based on a bedding pack design but with a greater emphasis on animal welfare. Purpose built buildings provides an environment which is exceptionally well ventilated with plenty of light and space. The open-sided buildings maximise ventilation which is crucial to reduce bed moisture levels.

The bedding is based on a green waste compost/soil mix which is removed annually and processed by a specialist company.

## Sand loose yards

The anti bacterial properties of sand potentially make it an ideal material for loose yards, providing it is managed well:

- A minimum depth of 15-20cm is required from the base.
- Use the same stocking density as for straw loose housing
- Sand is replaced completely every six months.
- Dung pats need removing twice daily, usually by hand.



Sand yards for calving cows can result in high levels of ingestion of sand by the cow when cleaning the calf. This can have serious health consequences and can result in death.



## Useful contact numbers

Milk testing		Contact	Website
The Vale Vet Group		01884 253355	<a href="http://www.valevetgroup.com">www.valevetgroup.com</a>
NMR		0844 725 5567	<a href="http://www.nmr.co.uk">www.nmr.co.uk</a>
Eclipse Scientific		01354 697 028	<a href="http://www.eclipsescientific.co.uk">www.eclipsescientific.co.uk</a>
QMMS		01749 871171	<a href="http://www.qmms.co.uk">www.qmms.co.uk</a>
CIS		01923 695 319	<a href="http://www.thecis.co.uk">www.thecis.co.uk</a>
Bedding suppliers	Product		
Envirosystems Ltd	Envirobed – paper bedding	01772 860085	<a href="http://www.envirosystems.co.uk">www.envirosystems.co.uk</a>
4R Products	Gypsum and paper	0800 0121 769	<a href="http://www.4rproducts.co.uk">www.4rproducts.co.uk</a>
Gordon Coggrave - Rootwise	Gypsum	01325718279	
Gypsum Supplies Group	Gypsum	0800 0920993	<a href="http://www.gypsumsupplies.co.uk">www.gypsumsupplies.co.uk</a>
R.A. & C.E. Platt Ltd	Sawdust	01978 854666	<a href="http://www.plattsanimalbedding.co.uk">www.plattsanimalbedding.co.uk</a>
Steven Cottee Services Ltd	Sawdust	01793 782 341	<a href="http://www.stevencotteeservices.co.uk">www.stevencotteeservices.co.uk</a>
Sand, stone and gravel suppliers	Sand	01793 714999	<a href="http://www.sand-stone-gravel-in-wiltshire-gloucestershire.co.uk">www.sand-stone-gravel-in-wiltshire-gloucestershire.co.uk</a>
L.B Silica Sand Ltd	Sand	01525 372000	<a href="http://www.lbsilicasand.co.uk/silica-sand-industrial.php">www.lbsilicasand.co.uk/silica-sand-industrial.php</a>
Hills Group	Sand	01672 516999	<a href="http://www.hills-group.co.uk">www.hills-group.co.uk</a>



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