



Bedding Products for the Scottish Livestock Producer



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INTRODUCTION

Bedding cattle on straw is the usual practise in Scotland but availability in some parts of the country is extremely low and the cost of getting straw delivered can be high. Timeliness of harvesting and re-planting has seen a lot of straw being chopped and incorporated into the soil at harvest time and this has led to reduced availability to producers.

Using no bedding or keeping stock in poor conditions could be classed as a welfare issue and could cause a penalty on the Single Farm Payment. It will certainly reduce animal performance and increase the risk of ill health.

Other products suitable as bedding material are on the market and this booklet explores these materials and their suitability, lists materials unsuitable for bedding and provides some cost savings from the use of alternative bedding sources. In many circumstances the storage of straw needs to improve and a section gives useful tips on straw management. A summary table on bedding materials is at the end of this booklet.

Although this booklet is targeted at the cattle producer a small section has been added for sheep and pigs.

WHAT IS THE OBJECTIVE WITH BEDDING?

- Keep the animal dry
- Keep the animal clean
- Maintain a healthy environment
- Creature comfort
- Cost effective
- Safe to use
- Easily stored

Cattle will readily lie on comfortable and dry bedding material. A dry bed will reduce humidity in the shed, and result in less contact with dung and urine with subsequent reduction in disease risk and exposure. It will also result in less finished cattle needing 'clipping' prior to sale.

If cows suckling calves are clean there will be less likelihood of the calf ingesting material which could lead to Johne's or diseases including scours, all of which affect production and can be fatal.

A dry environment will reduce ammonia levels.

Exceptionally dry, dusty and mouldy bedding can cause pneumonia and abortions. Mycotoxins and bacteria in the environment could be a health hazard. These types of conditions do not provide a safe working environment for the farmer or stockman so steps should be taken to minimise exposure.

WHAT PRODUCT DO I USE?

To answer this several questions need to be asked:

- How available is the product?
- Is there a reliable supply?
- Can it be disposed of (eg.spread on land) safely?
- Does the price make it unbeatable?
- Does it have the structural strength and absorbency?
- Does it heat up and evaporate excess moisture?
- Is it safe?

The product used should be absorbent. International literature gives an indication of weight of water held per unit weight of dry material, as follows, with higher numbers showing more absorbency.

Straw	Wheat	2.1
	Barley	2.0
	Oats	2.5
Sawdust	Hardwood	1.5
	Softwood	2.5
Shavings	Hardwood	1.5
	Softwood	2.0
Sand		0.3
Peat Moss		10.0

Care should be taken with the chosen bedding material so that contaminants such as nails, other metal, plastic, glass, glues, paints and heavy metals are excluded otherwise problems with cattle could result in fatalities. One casualty could make the use of a cheaper bedding material a costly exercise.

THE IMPORTANCE OF EVAPORATION FROM THE BED

The following calculations show that at normal stocking rates a dry spring calving cow will have produced around 1.35 m (over 4 foot) depth of liquid from their dung and urine. Obviously the build up of dung in the building is nowhere near this deep therefore either the extra depth of water runs out of the building or is evaporated and removed as part of the natural ventilation of the building.

A 600 kg cow will produce approximately 45 litre of slurry/day.

For a 5 month winter this is 6.75 m³ slurry/cow.

The area allowance for a 600 kg cow on straw bedding is 5 m²/cow.

So the depth of slurry falling on the straw over the winter would be 1.35 m deep (4 ½ ft deep)

A significant proportion of the water in dung and urine disappears through evaporation.

BEDDING MATERIALS

Cereal Straw

This is likely to be the most readily available bedding material in Scotland, but cost of transport to remote areas can be high.

All cereal straws can be used for bedding. The most effective will be those with the longest strands of fibre i.e. stems, to maximise the physical structure of the bedding. Hence straw from longer varieties is likely to be more effective than straw from short varieties. Quality will be compromised in drought conditions as stems will be shorter.

Using chopper balers and/or straw choppers/blowers reduces the structural strength of the bed allowing stock to sink into it, delaying or even preventing the build up of anaerobic conditions necessary to generate heat.

On intensive feeding systems roughage intake is necessary and bedding animals daily will permit straw intake. However, it is advised that cattle have access to straw other than from their bed.

Figure 1 - Cattle on straw



To save cost, if straw is not produced on farm, it should be bought at harvest time either in bout or bale from the arable farmers and stored dry.

Rape, Bean and Pea Haulm/ Straw

These have excellent physical structure and drainage characteristics. The stemmy structure gives the appearance of being an uncomfortable bed but it is this strong, long structure which keeps stock on top of the bed and allows good drainage. These straws are often a neglected and cheap source of bedding especially with local availability. The total straw usage can be reduced by about 30% if these alternative straws are put in the bottom of the cattle housing to a depth of 2 feet, with cereal straw put on top.

Although all straws can catch fire, rape straw is more volatile.

Oatfeed

Likely to be sold under a brand name/s oatfeed is a co-product from the human porridge and oat milling industry. With a good level of absorbency it can be purchased bulk with delivery all year round.

As it is likely to be palatable to some classes of stock it should not be used on animals e.g. dry cows, which may become over-fat.

Canary Reed Grass

A perennial crop which is usually left in the field until mid winter when it dries and is ready for cutting. However in rainy conditions which would make harvesting difficult, the product could be very wet and less beneficial.

If dry it would have similar absorptive capacity as straw.

Yields are around 8t/ha and conventional grassland machinery is used.

Welsh trials have shown use of the product does not affect performance of stock. Research shows that this crop in marginal areas could be a viable alternative to straw. Alternatively the crop is useful for biomass.

In some areas the plant is considered noxious as it can invade (take over) other species. It can be difficult to eliminate.

Elephant Grass (*Miscanthus*)

Another perennial crop, used for biomass which is planted by rhizomes so stands of the crop could be difficult to eliminate. Specialist planting equipment is necessary for sowing in early spring.

Often used as bird cover for shooting. Has been used in SW England for bedding. However, it is thought that it would be unsuitable for general use as a bedding product.

Can yield 10-20 t/ha.

Sawdust

Sawdust must be produced from untreated wood and be free from contaminants.

Sawdust from untreated wood may be used but stock tend to walk through it rather than on top of it eventually making a seal, particularly at normal stocking rates. Drainage, particularly of urine is initially good but due to the lack of anaerobic conditions and heating, keeping the bed dry is entirely dependant on the sawdust absorbing moisture. Sawdust of fine particle size will cake on teats quicker and show higher bacterial counts. As a result the normal approach with sawdust is to initially put in 0.3 – 0.5 m depth of sawdust and to completely muck out the pen 1 – 2 months later or to put in more and scrape off the soiled top layer every week.

Where it is readily available and cheaper than straw, it can be successfully used by alternately bedding with straw, then sawdust.

Care should be taken if clamping damp sawdust due to a risk of internal combustion as the product heats.

Shavings

Shavings must be produced from untreated wood and be free from contaminants.

This product using thin slivers of wood works successfully, often dry on top and wet underneath when used as bedding but tends to be expensive. It can be delivered in bulk as well as by bale and is more commonly used for individual animals and in the horse industry. If it can be sourced locally it could be a useful means of bedding.

Woodchips

Woodchips must be produced from untreated wood and be free from contaminants.

Large woodchips (up to fist size) similar to those used in outside corrals provide good structure and excellent drainage. However, their open nature means there will be no heat developed so liquid will gradually build up and potentially run out of the shed. Unless this can be diverted into slurry handling facilities, the use of woodchips should be avoided. Unlike with straw, topping up is less frequent. Woodchips of small size should be avoided as cattle are more likely to get dirty.

A lot of work has been conducted by IGER and ADAS in Wales on bedding on woodchips (size around 30mm). Like Scotland straw is at a premium over a large part of Wales. The work in Wales showed various key points.

1. Moisture content should be less than 30% to maximise absorbency.
2. Easier to dry whole than when chipped.
3. Straw coped better with wetter diets.
4. Storage needed to keep woodchip dry.
5. Wood type is important
6. No difference in health and welfare of stock

The product was used alongside straw on Welsh demonstration farms to determine cost and benefits. In one year straw was cheaper than woodchips. Finishing lambs did less well on woodchips. With ewes and lambs woodchip and straw were equally beneficial.

Woodchips need composting before returning to the land. To achieve this they need turning every 4-6 weeks, and extra water may have to be added. They must not be applied to land until fully broken down – this can take 2 – 3 years. Could be used for 2nd year as bedding, but need topping up. There is likely to be less nitrogen loss in composting from woodchips than from straw.

(Further reading on www.hccmpw.org.uk. Woodchip for livestock bedding project).

Woodfines

Woodfines must be produced from untreated wood and be free from contaminants.

This product is made from recyclable wood that used to go to landfill. It consists of finely chopped clean timber, MDF, offcuts, pallets, etc which go through an intensive cleaning process using magnets. The final product is clean but cannot be guaranteed 100% contaminant free. It should be composted before application to land. Woodfines resist trampling and do not cling to stock.

Figure 2 - Woodfines - indication of particle size and cattle on woodfines.



The product is readily available through most of mainland Scotland and is often sold under different brand names. The price is likely to vary with location.

SAC have been using woodfines on their beef unit near Edinburgh. On an intensive diet the cattle need bedding once per week – unlike straw which was every day. Another advantage is that cattle do not eat it – this is important when you want high performance from cattle which could be reduced if they eat a lot of bedding. However, please note that with ruminants a long form of roughage is still necessary in intensive diets.

Peat

Peat has been used as a bedding material for generations especially in the West Coast and Ireland. Competition from garden centres has pushed up cost and in Ireland it is used to generate electricity. Politically it is not considered a “green” material as it takes many hundreds of years to renew itself. Please note that peat is not allowed under organic farming systems as a bedding material.

The advantage of peat is that it absorbs three to four times more moisture than straw, thus reducing ammonia emissions and the muck can be readily spread on fields. An artic load of peat is about half the cost of an artic load of straw (60 bales at £12.50/bale). Peat costs around £14/t ex works but once again delivery costs are ‘the killer’. Ideally purchase in summer when product is drier. If stored outside rain will penetrate the outer four inches but if covered with snow which melts slowly the product is likely to be better.

Mixing with straw keeps the peat open, otherwise it goes hard on top and loses absorbency. Some farmers are bedding with peat and going in to shake it up with a front-end loader once a fortnight. Figure 3 shows cattle on a straw and peat mix and under a high concentrate finishing regime. They are clean but if on a silage based diet they would require extra bedding.

Figure 3 Cattle on peat/straw mix



Sand

Unlike the previous organic products sand is inorganic and bacterial build-up is slower. A coarser sand is more free draining than fine sand. Beneficial when used in cubicles and has been shown to reduce mastitis cell counts. Calving on sand is not recommended as it sticks to the newborn calves. If stirred through, topping up can be less frequent. It will also settle in slurry lagoons and will shorten the working life of machinery. It is likely to act as a soil improver if spread on heavy land.

Lime

A cheap source of bedding in some areas. Often used on cubicles where it can reduce bacterial numbers and mastitis. It is also beneficial to ewes with a foot rot problem.

Care should be taken to ensure the product is not calcium oxide or hydroxide as it could cause blisters. If spreading back on to fields care needs to be taken to avoid too much alkalinity either over the whole field or in patches. Soil analysis is recommended as lime could be beneficial on some land. The product is best used when mixed with straw.

Composted Material

FYM can be composted in sheds over the summer by piling it up in the centre and turning it over once a fortnight. The high temperatures sterilise the material and produce a 90% DM product similar to peat. If it gets wet again eg.shed not watertight, the bacterial count will increase. A producer who has used the system found he saved 2 months straw before he needed to bed with straw again on top of the compost,

Paper

Dry paper waste products have no physical structure or drainage characteristics and very limited absorption capacity. Bacteria can build up quickly. As a consequence they will have to be mucked out monthly or even more frequently. The product may be unsuitable for finishing cattle or calving cows .

Figure 4 Paper bedding



Plasterboard

Waste plasterboard is available in some areas now that it is being re-cycled rather than consigned to landfill. It will have little physical structure but initially will provide good drainage and absorption capacity. However after around 2 months it will gradually turn to porridge and will need to be completely mucked out and replaced. One big advantage of plasterboard is its alkaline characteristic when it is eventually spread as a fertiliser. Could use with straw. Re-cycling companies are likely to divide the product into a gypsum component and a bedding component with the latter used for bedding. However, this product will get wet and have low absorbency so it may be more appropriate to use in combination with straw.

Rushes

Rushes are ideal as a base layer before straw is applied. Some places will have better 'crops' than others but could yield 8 round bales per acre. Cutting rushes reduces vigour and helps grass content to increase. Exclude stock from field for a few days, cut and ted the material and it will dry quicker than hay.

Risk of spread of rushes from rush seeds in bedding, but actually rushes are encouraged by old ineffective drainage systems, less competitive grasses, poor fertility and reduced pH.

Bracken

Once upon a time bracken was a common source of bedding in the hills and uplands of Scotland.

Harvested in the autumn as the bracken dies back, and where the toxins are at lower levels it 'makes' quickly and is ideal for the bottom of the cattle shed. There is a risk of spores being spread when harvesting and these are carcinogenic. Young stock should be excluded.

Buyer Beware

With several of the products listed above it is advisable to obtain a declaration from the vendor of the product that it is animal friendly. This product liability will give you some assurance that the product does not knowingly contain contaminants which could be injurious to stock or stockmen.

Climate Change

It is recognised that methane and nitrous oxide production from cattle systems contribute to climate change and that efficient production systems will go some way in meeting target reductions. It should be noted that some of the bedding products could also be implicated e.g. when peat is harvested or applied back to ground carbon will be released to the air.

PRODUCTS WHICH MAY NOT BE USED

Recycled Rubber

Recycled rubber cannot be used as it is illegal to spread it on the land as a fertiliser.

Poultry Litter

Poultry litter must not be used due to ABP (Animal By-Product) regulations and the risk of disease e.g. salmonella and botulism. There is a likelihood that stock will ingest this material.

Waste Compost

Green compost is not allowed nor is compost with food waste or municipal compost.

Effect of FYM from Wood Products on Soil

Soil bacteria need nitrogen to breakdown carbon from the wood and as there is high carbon content in wood products extra nitrogen is needed for this breakdown. If N is being utilised by the soil bacteria it is, initially, unavailable for plant growth.

The problem can be avoided by composting the material in a midden for a longer period than with straw based FYM. This material could also be spread at a lower rate.

When calculating nutrients for your crop take account of the type of bedding material and adjust nutrients as necessary.

Typical FYM Analysis (Straw)

pH	5.5 – 6.5
N (kg/t)	6.0
P (kg/t)	3.5
K (kg/t)	8.0

How does FYM using alternative bedding products compare?

Some analysis of FYM from wood products suggest lower P & K levels.

The typical analysis above is a guideline only and there could be considerable variation depending on stocking density, rations fed and dry matter of the FYM. It would be of value to get the FYM analysed as it could result in a saving in fertiliser application.

REDUCING BEDDING REQUIREMENTS

Before considering buying alternative bedding products checks should be undertaken on existing straw management procedures especially if there is limited straw available.

✓ **Building Maintenance**

Ensure water from gutters, leaking water troughs, etc does not get into the bedding.

✓ **Ventilation**


Make buildings as well ventilated as possible. Rapid air changes are critical to remove moist air and to help keep bedding dry. Reduced stocking density in buildings will allow a greater area to be exposed to air circulation.

✓ **Scraped Feed Stance**

The majority of dung and urine is produced while cattle are feeding. Having a concrete feed stance, around 8 foot wide, along the troughs which can be scraped out once or twice a week can reduce bedding requirements by around a third.

✓ **Feed**

Different rations will produce different amounts of fluid from dung and urine.

Ration	Amount of Moisture Produced
Silage	High
Hay	
Wholecrop	
<i>Ad-lib</i> concentrates	
Straw	

Also ensure minerals are not over fed, particularly salt which can lead to a luxury uptake of water. Caustic soda treated grain also increases urine production.

- ✓ Leave stock out longer in autumn e.g. wean later or wean at same time and turn cows back out. However, this is only suitable if conditions permit or there are hard areas for feeding, etc.
- ✓ Try and get stock out earlier in spring. Often easier said than done but there may be a dry sheltered area on the farm and spring grass has a high nutritive value.
- ✓ Do not keep finishing cattle too long. Market at acceptable fat levels. Remember laying down fat costs money. But do not scrim on the straw – you may have to do extra clipping.

STRAW STORAGE

Wet bedding such as the outside of bales of straw stored outdoors will have little or no absorptive capacity and will have semi rotted, reducing physical strength. The overall effect is that wet straw is only around 10% as effective as dry straw in bedding stock.

Many producers leave straw bales in the field as they have no room to store them. Although round bales do throw off more rain than square bales there is still a proportion of the outside layer which becomes soaked. The following table shows the percentage of straw in either a four foot or a five foot round bale which becomes wet depending on the depth the rain penetrates the bale. Net wrapping reduces rain penetration.

Depth of wet straw	4 foot bale-% wet straw	5 foot bale-% wet straw
2"	16	13
4"	31	25
6"	44	36
8"	56	54
10"	66	56

The outside layer of round bales represents a large proportion of the total straw in the bale. If the bales are used for bedding then a similar amount of dry straw will be required to "dry out" the wet outside layers effectively doubling the amount that is wasted. For example if the rain penetrates four inches into a four foot bale then approximately 30% of the bale will be wet requiring another 30% needed to cover it. **As a result only 40% of the bale is actually contributing to bedding the cattle.**

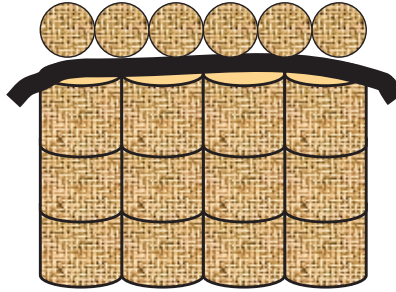
This of course only represents half the story. The 60% not making a positive contribution to bedding still incurs all the cost of dung handling spreading etc.

Erecting a very cheap building eg telegraph poles and tin sheets, can easily be justified in keeping bedding straw dry. As straw increases in value the cost of a simple pole barn cannot be ruled out if it can save 20% of the straw.

Attention to detail allows straw to be cheaply stored outside with little or no wastage. One system is tube-lining. Another is based on stacking round bales 3 or 4 high and then covering them with a thick plastic sheet, similar to the top sheet used on a silage pit. It is important that the sheet overhangs by at least half a metre all around the stack to minimise runoff onto the side bales.

To keep the sheet weighted down 3 foot round bales of straw go on top of the sheet. The advantages of using small 3 foot round bales are that:

- They are easier handled when the stack is being built.
- Reduces wastage
- Wet 3 foot round bales are obviously lighter, safer and easier to handle over the winter when the stack is being used.



BEDDING FOR SHEEP

Woodchips

SAC investigated the potential for softwood woodchips to replace straw in a trial using Blackface lambs finished on an all concentrate diet over a six-week period. There was no significant effects on performance, average daily gains were 110 g/day on straw and 124 g/day on woodchips

- Lambs on woodchips had darker fleeces but were not significantly dirtier as assessed by the Food Standards Agency scoring system, so all lambs were acceptable for slaughter – woodchips can successfully be used as a bedding material for finishing lambs.
- Lambs on woodchips had a slightly greater (but not statistically significantly different) incidence of footrot with some bonding of dung to feet producing slight scald but not a welfare problem.
- Bedding costs were 25% higher on woodchips owing to the much greater amount of material required and its poorer absorbency. Straw usage was 1.3 tonne per 100 lambs – cost £0.52 per lamb (straw @£40/ton). Woodchips: 5 tonnes per 100 lambs – cost £0.75 per lamb. (woodchips @£15/ton) The straw and woodchips required top ups, the straw on a weekly basis with woodchips every 2 – 3 weeks. Please note; with current costs for straw and woodchips there is little difference in cost per lamb.

Woodchips are an effective alternative and are also useful for pregnant ewes but straw would be needed around lambing. White pine shavings have been used as an alternative to straw in individual ewe and lamb pens used for lambing. Pens were not cleaned out between lambs, just extra handfuls of shavings added and care taken to tie up water buckets to reduce spillage. The extra bedding costs were rewarded with lower labour input, fewer lambs being laid on and lower costs for antibiotics with delayed incidence of e-coli type scours.

Woodfines for holding lambs overnight prior to slaughter

Farmers are increasingly finding that abattoirs will not accept wet sheep for slaughter so that lambs being finished off grass or forage crops need to be housed overnight, at least, prior to transit. If held inside, woodfines is a suitable material as the skins do not get contaminated with straw. Used like this and allowed to dry between batches woodfines provide a useful holding area which can also be used for handling, shearing, etc.

Lambs on woodchips



Lambs on straw



BEDDING FOR PIGS

All straws are suitable for both indoor and outdoor pigs but care must be taken in storage so that pig health is not adversely affected. Attention to detail regarding leaking drinkers, dunging areas, siting of arcs, etc. will all alleviate cost of straw by reducing usage.

Rape, pea and bean straws can be used but may not be suitable for young pigs but is ideal as base with 'other straws' on top. If changing from cereal straw to pea/bean straw watch out for vice issues.

It has been noted by producers that woodfines are absorbent resulting in air quality being good and that pigs thrive. Fine sawdust would be unsuitable as it is dusty.

There are likely to be many suitable products for bedding pigs either as a complete alternative to straw or else for mixing with limited straw supplies.



FEEDBACK ON COSTS

Winter 2010/11

Farm 1:

A small scale trial was undertaken on a farm in Upper Banffshire as part of a student's dissertation where one pen of suckler cows and calves were bedded on straw and another pen on woodfines. Observations were made on health and cleanliness and the 2 systems were fully costed over a 10 week period (including material, labour, fuel, etc)

Cows on woodfines were cleaner as the material does not appear to 'stick' to coats like straw. Savings amounted to £10.50/cow for the 10 week period. Costs; Woodfines-£28/t; Straw-£18.15/bale.

Farm 2:

120 cattle, 18 months of age on silage diets. Saving in 3 week period was £6/head on the peat and woodfines as compared to straw.

70 spring calving cows on woodfines.

Saving £5/head/week (plus time saving of not bedding). Costs; Peat £21.50/t; Woodfines-£23/t; Straw-£18/bale.

Farm 3:

32 feeding cattle bedded on peat over summer months.

Saving £25/head over 2 month period as compared to being bedded on straw. Costs; Peat-£21.50/t; Straw-£16/bale

Winter 2011/12

What is the price of straw going to be? This will determine if alternative bedding materials are worthy of consideration. Likely cost of Woodfines will be £30 to £35 per tonne delivered. Peat will be £15ex plant.

Note an artic load of straw is about 60 round bales, with peat it is 27tonnes and with woodfines it is 24 tonnes.

Do your own sums and see if alternative materials are going to reduce your costs.

CONCLUSION

It is likely that straw will continue to be the most common bedding material but it will be difficult to predict future prices and availability.

In some instances it could be prudent to look at other products which could be used as an alternative to, or in conjunction with, straw depending on the cost of delivery.

Many potential bedding materials are in the market-place with many only available on a local basis. Contact should be made with sawmills, composting/recycling plants, large builder merchants, etc.

In some cases the bedding products will be palatable to stock. This needs to be accounted for when bedding animals but also in rationing eg if they eat too much bulk it could reduce intake of a high energy feed required to maintain a target level of performance.

Some of the products listed will be sold under brand names and when bought in from small companies could be expensive.

Keeping dry in storage is essential and this can be done simply if sheeted using bales as sides to a clamp. Often buying out of season will gain financial benefit.

Straw is no longer a by-product but a valuable product in its own right and it is better utilised as a dry product so attention to detail at harvest time and in the autumn/winter months could ensure that the product baled will go further as bedding material. Using a dry product will be beneficial to animal health and this should give a cost benefit to the farming enterprise.

GUIDE TO BEDDING MATERIALS

	Physical Structure	Drainage	Mucking Out Interval	Fertiliser Value	Frequency of Bedding	Spreadability
Oat straw Wheat straw Barley straw	★★★★	★★★★	6 months	★★★★★	2 – 4 days	★★★
Rape straw Bean haulms Pea haulms	★★★★★	★★★★★	6 months	★★★★	2 – 4 days	★★
Sawdust	★	★★★★	1 – 2 months	★★	In/Out	★★
Shavings	★★	★★★★	2 – 3 months	★	In/Out	★★
Wood fines	★★★	★★★★	2 – 3 months	★	In/Out	★★
Woodchips	★★★★	★★★★★	6 months+	★	In/Out	★
Peat	★★★	★★★★★	1 – 2 months	★★★★★	2 – 3 weeks	★★★
Sand	★★★	★★★★★	2 – 3 months	★★	In/Out	★
Plasterboard	★★	★★★★	2 months	★★★	In/Out	★★
Paper	★	★	1 month	★★★	In/Out	★★
Green compost	★★	★★	1 – 2 months	★★★★★	In/Out	★★★
Oat feed	★	★★	1 – 2 months	★★★★★	In/Out	★★★

Star rating from ★★★★★ = excellent to ★ = poor.

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