Ways to Reduce Bedding[3,5,10]

- ***Consider whether you are using too much bedding*** — reduce bedding to only the amount needed to soak up urine and moisture.

- ***Remove as little unsoiled bedding as possible when cleaning stalls.***

- ***Try out an alternative bedding product*** — some new bedding products are more absorbent than traditional bedding options (*see Bedding Comparison Chart*). ***You will use less bedding and have less to manage***.

- ***Try using rubber stall mats. They:***
  - provide excellent cushioning and a level, firm footing.
  - reduce bedding: only needed where manure and urine fall.

This brochure is also available at
http://www.metrokc.gov/wsu-ce/agriculture/beddingmgt.htm

Resources

1 Bary, A., C. Cogger and D.M. Sullivan. 2000. *Fertilizing with Manure*. Washington State University Cooperative Extension. Available at http://cru.cahe.wsu.edu/cepublications/pnw0533/pnw533.pdf

2 *Best Bedding:* Woody Pet™ by a Nose. 2001 (August). Horse Journal.

Titles 3-6 available from King County Department of Natural Resources Livestock Programs. Contact Laurie Clinton via (206) 296-1471 or laurie.clinton@metrokc.gov

3 Blickle, A. 2000. *A Guide to Environmentally Friendly Horsekeeping for Equine Businesses*. Horses for Clean Water. Maple Valley, WA.

4 Blickle, A. 2000. *How to Compost and Use Horse Manure*. Horses for Clean Water. Maple Valley, WA

5 Blickle, A. 2002 *Rubber Stall Mats: A Useful Manure Management Option for Your Horse Farm*. Horses for Clean Water. Maple Valley, WA.

6 *Keys to Success (Composting)*. Price-Moon Enterprises, Inc. Available online at www.O2compost.com.

7 *Manure Storage and Compost Facilties for Operations with Limited Numbers of Livestock*. USDA-NRCS & Washington County Soil and Water Conservation District. Hillsboro, OR.

8 Miles, C., T. Flores, W. Matthews and J. Clougherty. 1999. *From Beginning to End: A Manure Resource Guide for Farmers and Gardeners in Western Washington*. WSU Cooperative Extension in cooperation with Thurston Conservation District.

9 *Bedding in the Horse Stable: A Breathe of Fresh Air.* Equine Research Centre. Guelph, Ontario. http://www.erc.on.ca./bedding.htm

10 Blickle, A. 2002. *Reducing Bedding: Another Useful Manure Management Option For Your Horse Farm*. Maple Valley, WA.

*** For more information on this topic contact the Livestock Advisor Program at (206) 205-3111.**

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King County
Department of
Natural Resources and Parks

Cooperative Extension
Washington State University
King and Pierce Counties

Strategies For Livestock Manure Management

What can you do with all that manure and used bedding ?!?

- You *CAN'T* do anything about the amount of manure your animals produce.

- You *CAN* do a lot towards reducing the amount of bedding you use.

- You *CAN* compost — the composting process reduces manure and used bedding volumes by 50%.

- *PLANNING* is the key — whether you store manure or compost, you need a disposal strategy. Just piling it up causes problems! See inside for ideas on reducing and recycling manure and used bedding.

WSUCE-KC Agriculture and Natural Resources
Fact Sheet #539 - September 2002

Options for Recycling Your Manure and Used Bedding[1,3,8]

Whether you store raw manure or choose to compost, you need a strategy for using or disposing of it. Manure and compost are valuable on-farm and off-site resources. Having a viable management plan is important towards making the best use of these resources while guarding against excess nutrient leaching and runoff. Use the information below to evaluate *your* best manure and used bedding management strategy.

On-Farm Management Options for Manure and Used Bedding

	Unprocessed	**Composted**
Advantages	• low cost (need only a cover for pile and means of spreading) • low labor input • nutrient content usually higher • improves soil structure	• easier to spread on land • poses lower water quality risk • less likely to contain weed seed and/or pathogens • less odor • slow release form of nutrients • compost is a superior soil amendment for improving soil structure • can reduce volume of material to spread by approximately 50%
Disadvantages	• can be difficult to spread • poses higher water quality risk • more likely to contain weed seed and/or pathogens (aggressive deworming program may be necessary for pastureland) • odor can be a problem • may need to add N source to pile if bedding content too high	• composting requires more time, labor and money than storing and applying raw manure
Considerations and Additional Information	• must have adequate land upon which to spread manure (raw manure volume is approximately twice that of composted manure) • pathogens are a human health concern if material is handled improperly • serious water quality hazards and regulatory violations can result if composted or raw manure is piled/stored on-site indefinitely • the herbicide clopyralid will not break down during animal digestion, storage of manure or composting. For more information see *Clopyralid Herbicide and Compost* at www.metrokc.gov/wsu-ce/agriculture/PDFs/Clopyralid.pdf	

Off-Site Management Options for Manure and Used Bedding

	Give away or sell raw manure	**Give away or sell compost**	**Haul manure from premises**
Advantages	• avoid time, labor and costs of composting while getting rid of manure	• finished compost is easier to give away or sell than raw manure • quite possible to make profit on initial system investment	• easiest and quickest management option
Disadvantages	• system may necessitate meeting and helping people interested in acquiring manure (easy access to pile can eliminate this need)	• composting requires more time, labor and money • same as for raw manure	• higher expense (pick-up, rental, disposal fees)
Considerations	• *county and state regulations exist regarding transportation of these materials off-site – please check with your local county health department for current regulations* • pathogens are a human health concern if material is handled improperly • may require loading and transport equipment • good advertising important towards success of system • check with your local conservation district for manure share programs and farm management plans that include manure management		• *check to verify manure is hauled to permitted facility licensed to compost manure* • reducing the amount of bedding material you use results in less used bedding for you to dispose of and reduced hauling costs

BEDDING COMPARISON CHART[2,9]

8.9	Dust Control	Odor Control	Absorption	Cushion	Cleaning Ease	Composting Rate	Low Palatability	Cost/Unit (2002 dollars)	Comments
Straw	low	low	low	medium	low	low		$6-10 (bale)	• shifts easily, exposing bare floor if not deeply bedded or if animal is very active
Shavings	high	medium	medium	medium	medium	medium	X	$7-8 (4 ft^3, compressed) $4-15 (yard^3, bulk price, quantity dependent)	• do not use treated wood • verify wood type is not toxic to your animal (e.g, walnut, cedar) • kiln dried recommended • limited availability
Corrugated Kraft	high	high	high	high	medium	medium	X	$10 (40 lbs)	• air trapped in corrugation provides springy cushion • good for fiber animals (e.g, llamas, alpacas, sheep)
Sawdust	low	medium	high	medium	high	medium	X	$6-8 (4 ft^3, compressed) $7-16 (yard^3, bulk price, quantity dependent)	• variability between products • kiln dried recommended • enhances performance of straw and shavings when used as base layer
Wood Pellets	high	high	medium	medium	high	medium/fast	X	$3 (40 lbs) $5-6 (40 lbs) (*with zeolite*)	• see comments for shavings • pellets containing zeolite, or addition of PDZ sweetener necessary for odor control • do not use on outside stalls or dirt floor; pellets readily absorb moisture from ground and air
Peat*	high	high	high	high	high	fast	X	$7-10 (4 ft^3, compressed)	• upfront cost is high, but maintenance cheaper than straw or shavings • dust issue easily managed • excellent for horses with respiratory or skin allergies • limited availability

*Comments based on personal communication; peat was not compared in side by side studies with other bedding options for dust or odor control, absorption, cushion or cleaning ease.

ESTIMATING THE STORAGE CAPACITY YOU NEED TO STORE OR COMPOST MANURE[7]

Animal	Average Weight (lbs)*	Volume of Manure Produced / 6 months (ft^3) **
Beef	900	150
Beef	500	80
Horse	1200	175
Poultry	7	1
Sheep	90	10
Pig (growing)	65	13
Pig (gestating sow)	275	27
Alpaca	130	16

* if your animal is larger or smaller than the listed weight, adjust volume of manure produced accordingly (e.g., a horse weighing 600 lbs will produce 1/2 of 175 ft^3 or 88 ft^3 of manure / 6 months)

Bedding type	Volume (ft^3) of bedding / lb of bedding
straw	0.35
wood shavings	0.11
sawdust	0.08

Sample calculations for a 4 horse operation using wood shaving bedding over a six month period (in cubic feet (ft^3))

(A) Manure storage requirement

Number of animals X *Volume of manure produced / 6 months (ft^3)* = ***Manure storage needs (ft^3)***

4 horses X 175 ft^3 = **700 ft^3**

(B) ***Soiled bedding storage requirement***

(lbs bedding / month) X *Volume (ft^3) of bedding / lb of bedding* = *ft^3 bedding / month*

40 lb wood shavings / month X 0.11 (ft^3) = 4.4 ft^3 bedding / month

ft^3 bedding / month X *6 months* X *0.5 compaction* = ***Soiled bedding storage needs (ft^3)***

4.4 ft^3 bedding / month X 6 months X 0.5 compaction = **13 ft^3**

(C) ***Manure storage needs (ft^3)*** + ***Soiled bedding storage needs (ft^3)*** = **Total Storage Capacity Needed**

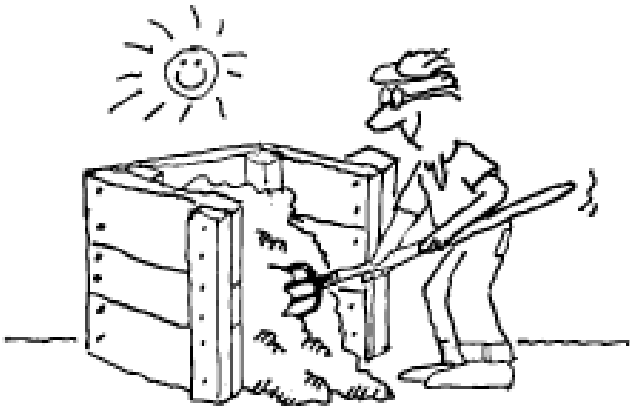
(A) 700 ft^3 + **(B) 13 ft^3** = **713 ft^3**

** 1 cubic foot (ft^3) equals 1/27 cubic yards (yd^3), or 1 yd^3 equals 27 ft^3

Recycling Manure and Used Bedding[3,4,6,7,8]

On-Farm Composting

- Composting is a biological process in which microbial organisms (bacteria and fungi) work to decompose raw plant and animal matter into nutrient rich humus material.
- The active phase of composting lasts approximately 30 days, followed by a curing phase of approximately 45-60 days.
- Characteristics of finished compost are:
  - brown to dark brown in color
  - pathogen and weed seed free with proper composting technique
  - crumbly texture and earthy smell
  - 30-50% organic matter content
  - C:N ratio less than 25:1
  - pH between 5.0 and 8.0
- **The volume of a compost pile can shrink 50% in size during the active composting phase — this means a significant reduction in the amount of material that needs to be managed.**



Important Factors in Composting

Aeration: oxygen is necessary to decompose plant and animal material. Aeration speeds up the composting process.

Moisture: compost piles should remain moist but not too wet. A handful of compost mix should feel wet (like a wrung out sponge), but should not drip when squeezed.

Temperature: 130-150 °F during the active phase (1-2 months) is ideal. Temperatures above 160 °F kill composting microorganisms and stall the process. Temperatures during the curing phase should be kept between 80-110 °F.

C:N ratio: refers to the balance between carbon and nitrogen levels in the compost. A 30:1 ratio is ideal for the initial compost mix.

Protection: compost piles should be sheltered under a mulch, tarp or shed. This protects them from rain and sun to avoid the leaching of nutrients from the pile and extremes in moisture and temperature.

Composting Methods[3]

Windrow

- compost piles are turned manually to expose material to oxygen
- aeration and rate of decomposition are dependent on how often the pile is turned

Passive Aeration

- compost piles are not turned
- perforated PVC pipes are inserted into pile to provide aeration
- composting process takes longer, but involves less labor and equipment

Aerated Static Pile

- compost pile is aerated using a system of perforated pipes through which air is pumped
- temperature and rate of decomposition controlled by adjusting airflow
- more direct control allows management of larger piles

Compost Troubleshooting Chart [3,6,8]

Problem	Probable Cause(s)
Bad odor	• C:N ratio too low (<20), excess N released as ammonia • lack of aeration (oxygen), decomposition process becomes dominated by anaerobic bacteria • pile is too wet; microorganisms die in waterlogged pile and aeration is impeded
Slow decomposition rate	• C:N ratio is too low (<20); results in temperatures above 160 °F which kill microorganisms • C:N ratio is too high (>60); thermophilic temperatures are not generated • lack of aeration, microorganisms limited by lack of oxygen
Viable weed seed, pest larva and pathogens in compost	• adequate temperature not reached during the composting process; temperatures of 130° F or higher must be sustained for at least several days to eliminate viable weed seeds, pest larva and pathogens