



Feeding Broiler Litter to Beef Cattle and Sheep

H. John Gerken, Jr., Extension Specialist, Animal Science

Cattle and sheep producers searching for ways to reduce feed costs and/or stretch feed supplies should consider broiler litter as a possible source of protein, energy, and minerals for wintering, growing, and finishing rations.

Litter from a broiler house consists of bedding material such as wood shavings, peanut hulls or corncobs, and poultry excreta. It may also contain wasted feed and feathers. Cage layer waste, another poultry waste with potential livestock feeding value, is not discussed in this publication. The Virginia Department of Agriculture and Commerce approved the use of dried poultry waste (DPW), including broiler litter, in commercial manufactured cattle feeds in 1976. The purpose of this publication is to inform livestock producers on the correct use of broiler litter in rations prepared on the farm.

Broiler litter is available in the poultry-producing areas of Virginia where it has been mainly used as fertilizer in the past. When properly included in nutritionally balanced rations, it is more valuable as livestock feed than as fertilizer. Broiler litter contains significant amounts of crude protein, total digestible nutrients (TDN), calcium, phosphorus, and trace minerals. The nutrient composition of litter resembles that of alfalfa hay. Table 1 provides a comparison of the approximate nutrient content of broiler litter with alfalfa. When shelled corn is valued at \$2.50 per bushel and soybean meal at \$210 per ton, broiler litter can have a replacement value, on a dry-matter basis, in excess of \$80 per ton in cattle and sheep rations.

Table 1. Approximate Composition of Broiler Litter Compared With Alfalfa Hay

	Average Dry Matter	Percent Composition (Dry Basis)				
		Crude Protein	Crude Fiber	TDN	Calcium	Phosphorus
Alfalfa Hay (Early Bloom)	90	18.4	29.8	57	1.25	0.23
Broiler Litter	65-90	28.0	14.9	60	2.3	2.0

Safety and Precautions

Extensive testing at VPI&SU and elsewhere, and several years of practical feeding experience on farms, has demonstrated the nutritional value of broiler litter in cattle and sheep rations. No deleterious effects have been observed in cattle. Copper toxicity is a potential problem producers must be aware of when

broiler litter is fed to sheep. A logical concern is that of unknown potential hazards from medicinal drugs used in poultry rations, pesticides, residues, molds, heavy metals other than copper, or disease causing pathogens that might be present in litter. No guarantee of total freedom from such hazards is possible; but, based on current scientific knowledge, it has been demonstrated that when reasonable methods and safeguards are used broiler litter can be safely fed to livestock. Broiler litter should not be fed to milk-producing dairy animals and its use should be discontinued 15 days prior to slaughter of cattle or sheep.

It has been demonstrated that:

1. Pathogens such as E. Coli and others can be isolated from fresh broiler litter but can be reduced to safe levels or eliminated by mild heat treatment such as deep stacking or ensiling.
2. Molds are not a problem if litter is stored and handled properly.
3. No pesticide residue problem has been detected but caution should be exercised by broiler producers to avoid possible contamination of litter intended for livestock feeding. Livestock owners intending to feed litter should be aware of any pesticides used in the broiler growing operation and reject litter when residues could exist, or have tests run to assure safety before feeding.
4. Broiler litter may contain medicinal drug residues but no unapproved levels have been detected in the tissues of cattle or sheep fed such litter following a modest withdrawal period. Virginia regulations for DPW in manufactured feeds stipulate a 15-day withdrawal before litter-fed animals go to slaughter. It is recommended that producers follow this same precaution when using farm-prepared rations containing broiler litter.
5. No metal toxicity problems have been observed other than copper toxicity in sheep.

Producers intending to feed broiler litter to their livestock are cautioned that unforeseen problems in any of the above areas could become apparent in the future. As with any new technological development, not all risks can be evaluated or removed initially. Producers who feed litter accept responsibility for risks which, although considered minimal, are still possible.

Feeding Value Of Broiler Litter

Broiler litter is fairly high in crude protein, averaging 28% or higher on a dry basis. Protein nitrogen makes up 40-50% of the total nitrogen and non-protein nitrogen compounds such as uric acid; ammonia and urea are also present. Both the protein and non-protein forms of nitrogen in broiler litter are efficiently utilized by cattle and sheep. Broiler litter is not a satisfactory feed for non-ruminants such as horses, swine, or poultry since they are unable to utilize non-protein nitrogen compounds.

Litter containing either wood shavings or peanut hulls will analyze up to 60% TDN on a dry basis. When rations are formulated in terms of available energy, broiler litter has an approximate metabolizable energy value of 1.0 Mcal per pound on a dry basis. The energy in broiler litter is readily digested by ruminants and performance has been similar with all types of litter materials normally used in broiler growing operations.

Calcium and phosphorus are present in broiler litter at a level of 1.5 to 2.5% of each element. The calcium to phosphorus ratio is normally about 1:1. When broiler litter makes up 20% or more of the ration, litter will supply ample calcium and phosphorus to meet the animal's requirements for these minerals. Litter is lacking in vitamin A and a supplemental source will be needed unless other feeds in the ration supply an adequate amount. On the average, broiler litter will contain 75% dry matter and 25% moisture as it comes from the house. Dry matter percentage may vary from less than 65% to 90%. Also the proportion of litter material can vary depending on the amount used and the number of flocks of birds

reared before the house is cleaned. Because of this potential variability in composition and nutrient content, it is desirable to have an analysis made on each batch intended for livestock feeding to obtain accurate estimates of moisture, protein, fiber and ash content. Samples of litter can be sent to the VPI&SU Forage Testing Laboratory for analysis.

Handling and Processing Broiler Litter

Avoid litter that has a dry matter content of less than 65% as wet spots and mold can be troublesome. Extremely dry litter can be dampened by sprinkling lightly with water. This helps to reduce dust and may facilitate more rapid heat buildup during deep stacking. Litter should be free of nails and wire, glass, rocks, dirt, or other foreign material. Do not use litter from sources where careless management has permitted such contamination to occur.

Upon removal from the house, broiler litter should be processed for feeding by either deep stacking, ensiling alone, or by ensiling with corn forage. Deep stacking consists of piling the litter in a stack 6 or more feet deep and allowing the material to go through a heating process for a period of two weeks or more. Deep stacking should be done in an open shed or outside; it should not be done in an enclosed building as spontaneous combustion (fires) may result. Outside stacks need not be covered if the damp outer layer is discarded before use. Covering the stack tightly with plastic film is an alternate procedure that will reduce weather damage. After deep stacking, litter should contain 85-90% dry matter.

Litter can best be ensiled alone when it contains about 35-40% moisture. However, adding water to litter may result in material which is sticky and hard to handle. Thus, it may be best to ensile it without added water.

Litter can be ensiled with whole plant corn at harvest time. Litter should be added at the level of 30% of the total silage dry matter. To achieve this level of dry matter, it will usually be necessary to combine about 20% litter and 80% corn forage on a wet basis. This can vary depending on the moisture content of each and a moisture test will be helpful in determining the correct proportions to use. The example below can be applied when ensiling litter at harvest time or when mixing deep-stacked litter with silage prior to feeding.

How To Combine Broiler Litter With Corn Silage To Achieve A 70/30 Dry Matter Mix

1. Weigh or estimate weight of a wagon load of corn silage. The average weight of freshly chopped silage will be about 20 pounds per cubic foot.
2. Weigh a known volume of litter such as the amount in a level-full front end loader scoop.
3. Estimate as accurately as possible the moisture content of litter and silage.
4. Combine litter and silage in the correct proportions according to the procedure used in Table 2.

Table 2. Example of Proportions of Corn Silage and Broiler Litter to Mix to Achieve Proper Mixture of 30% of Dry Matter

	Desired Dry Matter, %		Dry Matter In Feed, %		Parts In Mixture		Percent of Mixture
Corn Silage	70%	divided by	35	X 100 =	200		83%
Broiler Litter	30%	divided by	75	X 100 =	40		17%
					<u>240</u>		<u>100%</u>

Table 3 gives the pounds of litter to mix with one ton (2000 lbs.) of corn silage to achieve the desired level of 30% of the dry matter in the silage-litter coming from litter. The examples cover the normal range of dry matter content for both silage and litter. For example, if silage contains 30% dry matter and litter

70%, the addition of 380 lbs. of litter to one ton of corn silage would result in a 2380 lb. batch of the correct proportions.

Table 3. Pounds of Broiler Litter to Add to One Ton (2000 lbs.) of Corn Silage to Supply 30% of The Dry Matter As Litter

<u>Dry Matter Percent</u>		<u>Pounds of Litter</u>
<u>Silage</u>	<u>Litter</u>	
30	70	380
	80	330
	90	250
35	70	440
	80	350
	90	280
40	70	500
	80	440
	90	320

Using Broiler Litter In Cattle Rations

Broiler litter ensiled with corn forage at harvest makes a satisfactory feed for all classes of beef cattle. It can be fed as the only feed for cows or supplemented with grain for young, growing cattle or fattening cattle. Use forage test results to determine the amount to feed and the level of supplemental grain and/or protein to add depending on the type of animal fed and the expected level of gain. In most cases, sufficient protein will be present in the litter silage to eliminate the need for any additional protein beyond that supplied by the corn or other grains included in the ration. Deep-stacked litter or litter ensiled alone can also be added to corn silage at feeding time in the proportions necessary to balance protein requirements. When silage is unavailable, deep-stacked broiler litter can be used in a variety of dry rations with hay or grain.

Beef-cow wintering rations are well suited to the use of broiler litter. Pregnant cows can be wintered on 35-40 lbs. of the litter-silage mixture described above. Cows nursing calves will require 40-50 lbs. per day. Cows may also be wintered on a mixture of 80% deep-stacked broiler litter and 20% ground corn or other palatable concentrate. The reason for mixing grain with the litter is to insure adequate consumption since litter alone will meet the protein and energy requirements of pregnant cows if they ate enough of it. Feed 14-15 lbs. of the litter corn mixture to pregnant cows daily and increase this to 18-20 lbs. per day after calving. A small amount (2-3 lbs.) of hay or other dry roughage should also be fed to provide additional fiber and bulk.

Calves may be successfully wintered on a ration of 50% broiler litter and 50% ground corn along with hay fed free-choice. Feed 7 pounds of the mixture per day to 400-500 pound calves being wintered to gain 1.0 to 1.1 pounds per day. The mixture could also be fed with as little as 5-10 lbs. of silage or 2-3 lbs. of hay per head daily.

Calves wintered on corn silage and intended for sale in the spring will make excellent gains on a ration of 20-25 pounds of silage and 4-5 pounds of broiler litter with no additional supplement. Calves that will go on pasture next spring can be wintered on 20 pounds of silage and 4 pounds of broiler litter daily to gain at the rate of 1.0 pound per day.

Up to 20-25% of the dry matter in beef-cattle finishing rations can be broiler litter. It can be fed either as litter ensiled with corn silage or by mixing deep-stacked litter with silage or other ration ingredients at feeding time. When

fed with silage plus concentrates, such as ground corn at 1% of body weight, 20% broiler litter in the ration on an as-fed basis will provide all the protein needed to balance the ration. For example, yearling steers weighing 700-800 pounds and gaining at the rate of 2.9 pounds per day require about 1.95 pounds of crude protein and 15.5 pounds of TDN daily. A daily ration of 30-35 pounds of corn silage, 6-7 pounds of broiler litter, and 8 pounds of corn will supply the energy and protein required. Litter should be withdrawn from the ration 15 days before cattle are expected to go for slaughter.

Special Considerations Regarding The Feeding Of Broiler Litter To Sheep

Much of the research on the feeding of broiler litter has been done with sheep. Results have demonstrated that sheep can utilize the energy, protein, and other nutrients in broiler litter very efficiently. Broiler litter can be used in both feeder lamb and ewe rations if certain restrictions and precautions are observed. The limitations on feeding broiler litter to sheep comes about because sheep are sensitive to high levels of copper in their feed, and the fact that copper levels in broiler litter may be quite high because of the use of copper compounds in broiler production. Extended feeding of sheep with feeds having high levels of copper will result in toxicity and death. For this reason, sheep producers planning to use broiler litter in their feeding programs should:

1. Limit the feeding of broiler litter in all sheep rations to not more than 60 days.
2. Use broiler litter in feeder lamb rations at the lowest level required to balance protein needs.
3. Withdraw litter from feeder lamb rations 15 days before slaughter.
4. Feed broiler litter to ewes only as an emergency measure when other feeds are in short supply.
5. Limit the feeding of rations containing broiler litter to ewes to a period of not more than 60 days during a single winter feeding season.
6. If possible, have litter tested for copper and avoid using litter having in excess of 100 ppm copper in sheep rations. Litter containing about 200 ppm copper has caused copper toxicity in ewes fed rations containing 25% and 50% litter for long periods of time (more than 130 days).

Using Broiler Litter In Sheep Rations

Feeder lambs can be fed a ration of 25% ground hay, 25% broiler litter, and 50% ground corn. Include 10-20 pounds of ground limestone per ton and feed iodized salt (not trace-mineralized salt) free-choice.

Ewes can be self-fed a mixture of 50% ground hay, 25% corn, and 25% broiler litter. Limestone should be added as above. Free-choice feeding of iodized salt is also recommended.

A mixture of 50% litter and 50% ground corn can be fed to pregnant and nursing ewes. Feed 3/4 to 1 pound per head daily before lambing and 1 1/2 to 2 pounds per head after lambing. Feed the larger amount to ewes nursing twin lambs. In addition, ewes fed this ration will need hay or other roughage.