CLEMSON EXTENSION

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# Feeding Poultry Litter to Beef Cattle

Millions of tons of poultry wastes are produced annually in the U.S. Land application of poultry wastes has been a common practice for centuries; however, in many instances, land area is a limiting factor and waste disposal becomes a liability as well as a potential environmental problem.

Litter in poultry houses has to be replaced throughout the year. During the winter, however, pastures are too soft to support heavy trucks used in land application of wastes. Seeking alternative uses for the litter during the wet part of winter in the Southeast's Piedmont areas is encouraged.

The ability of ruminant animals like beef cattle to utilize the nitrogen components in poultry litter to synthesize protein, along with the fiber-digesting ability of cattle, suggest that poultry litter could be considerably valuable as a cattle feed source. Also, in addition to the positive environmental aspects of re-feeding litter, this practice would also save energy by reducing the reliance on typical feed ingredients such as oil meals and grains.

It has been estimated that a broiler complex that processes one million birds a week would produce approximately 65,000 tons of poultry litter, annually. If the litter were applied to land at the rate of four tons per acre, it would require 16,250 acres of land to accommodate this volume of litter.[1] In this discussion, poultry litter applies to bedding (bark, shavings, and sawdust), manure and feed residues from poultry (broilers, pullets, and turkeys) that have been reared on earthen floor houses. Our research experience with cage layer waste without bedding materials has shown that, although possible, it is difficult to incorporate into cattle diets and is not discussed in this leaflet.

## REGULATORY STATUS

In 1967, the Food and Drug Administration (FDA) published a policy in the Federal Register (21 CFR 500.4) not sanctioning the use of poultry litter as animal feed. In 1980, the FDA published a policy (45 FR 86272) revoking its earlier (1967) policy. The latter policy essentially leaves to individual states the regulation of feeding animal waste.

In 1982, the American Association of Feed Control officials published a model regulation for processed animal waste. The important points of this regulation are: (1) the waste must be processed so it will be free of pathogenic organisms; (2) if it can be documented by records that animals producing the waste have not been fed drugs, no withdrawal period is required and the waste can be fed to any class of animals; and (3) if it cannot be documented by records that the animals producing the waste were not fed drugs, a 15-day withdrawal is required prior to slaughtering animals or prior to using milk or eggs to satisfy human safety regulations. Many states have adopted this regulation as their official position relative to animal waste recycling.[2]

Attempts to commercialize animal waste by-products and ship them across state lines for re-feeding would involve the FDA and could jeopardize the current hands-off approach that the agency appears to be taking.

## NUTRIENT COMPOSITION OF POULTRY LITTER

Poultry litter comprises poultry manure, feed spilled from feeders, feathers, bedding material, and dirt from the floor of the poultry house. In the Piedmont, the major bedding material is pine tree (sometimes hardwood) sawdust and, occasionally, other tree

processing by-products such as shavings and de-bark materials. Occasionally, other by-products are used as bedding (peanut hulls, wheat straw, etc.). In Canada, a large wheat producing country, wheat straw is a major source of bedding material in poultry houses.

The highest quality poultry litter, from a nutrient content standpoint, that I have analyzed came from broilers reared on chopped wheat straw in Canada. Research at Clemson compared pine tree de-bark to hardwood bark in poultry litter. The hardwood bark was much more digestible.[3] Actually, the least digestible litter tested is what is primarily used — pine shavings, sawdust and de-bark; therefore, any changes in litter material will probably be an improvement for re-feeding purposes.

The nutrient content of poultry litter is presented in *Table 1*. The protein content of these samples was 23.9. There can be a considerable range in protein content. Also, protein content does not continue to rise with time beyond a certain point, i.e., very old litter may not contain any more protein than litter with three batches of broilers run across it.[5] This is probably due to microbial action converting the nitrogen in protein to ammonia which can be detected by smell in houses under certain conditions.

Some nitrogen from protein can be preserved by spraying propionic acid across litter at intervals. Also, from this table, one can see that about one-fourth of the crude protein is in the form of non-protein nitrogen (NPN). In some samples, we have found the NPN to represent as high as half the total nitrogen content. This is important since the higher NPN values represent a less usable form of the protein and would indicate a lower protein quality.

The total digestible nutrient (TDN) content of poultry litter (55 percent) suggests that it is a relatively low energy feed in comparison to some feeds. This level of TDN would compare to average quality fescue hay; however, poultry litter cannot be fed alone like hay and must be supplemented with grains, probably due to its negative palatability characteristics. Performance of animals on poultry litter suggests that the laboratory analysis for TDN may be overestimating its actual available energy.

Table 1. Nutrient Content of Poultry Litter[4]

| Composition | Average | Range |
|---|---|---|
| | % | |
| Dry Matter | 78.3 | 69-84 |
| Composition of Dry Matter | | |
| TDN (calculated) | 55.0 | 26-64 |
| Crude Protein | 23.9 | 13-31 |
| Crude Fiber | 26.9 | 14-46 |
| NPN (Protein Equivalent) | 5.7 | 10-11 |
| Ash | 21.5 | 10-47 |
| Calcium | 2.1 | 1.0-3.5 |
| Phosphorus | 1.6 | 1.1-1.9 |
| Potassium | 1.7 | 1.3-2.1 |
| Magnesium | 0.44 | 0.3-2.1 |
| Sulfur | 0.21 | 0.01-0.41 |
| Copper | 0.036 | 0.0011-0.060 |
| Arsenic | 0.0036 | 0.0018-0.0062 |

The percent calcium (2.1) and phosphorus (1.7) in poultry litter suggests that, in most diets, little or no calcium and phosphorus supplementation will be necessary. Supplementation with a good trace mineralized salt containing a high level of vitamin A (at least 200,000 I.U. vitamin A per lb —300,000 I.U. would be better) will suffice for mineral and vitamin supplementation in most situations. Milking cows need .28 percent calcium and .22 percent phosphorus in their diets, while rapidly growing stocker cattle need approximately .5 percent calcium and .25 percent phosphorus in their diets. Magnesium supplementation would be needed for cows during the grass tetany season.

The high ash content (21.5) primarily represents the amount of dirt contamination that has occurred in the litter. Old litter will be very high in ash content since considerable dirt has been mixed into the litter.[6] The biggest negative effect of high ash content is that it dilutes the nutrient content of the feed. Therefore, cattle tend to eat more of the high ash containing litter probably because of its lower energy content.

If a lab analysis indicates lower protein and energy levels than normal, check the ash content for a possible explanation.

## PROCESSING AND STORAGE OF POULTRY LITTER

It is important to take whatever steps are necessary to prevent the contamination of litter with metal, glass, and other debris. Preventing these from being dropped into the litter during the housing of the birds is the best prevention method. Magnets on mixing equipment are also advisable to pick out some of the metal that may be present. Glass or metal can be harmful, or even fatal, to cattle when swallowed.

Process litter to eliminate harmful bacteria (coliforms, salmonella, and others) that may be present in the litter. These microorganisms can be destroyed with heat.[7] Processing also is important for improving palatability.

The preferred method of processing is to remove the litter from the poultry house and to move it immediately to an open-sided covered shed. The litter should be stacked at least six-to-eight feet deep and preferably packed with a tractor to obtain proper heat development yet prevent overheating and severe caramelization.

Litter can be stored in pit silos, upright silos or above-ground bunkers. In pit or bunker silos, it is important to prevent water penetration into the silo by using plastic on top of the litter. Packing with a tractor is also recommended. Poultry litter can be blown into upright silos, provided the moisture is below 30 percent. Above that moisture level, blower pipe clogging may occur. Having a concrete bottom in pit and bunker silos is highly recommended because of the difficulty in feeding in the mud that invariably occurs in wet weather. Concrete sides are optional; however, there is less spoilage with sides in a pit or bunker silo.

Before feeding, allow four to six weeks of storage for proper processing. The litter will have a chocolate-like smell if properly processed. There will also be some ammonia smell.

**CAUTION**

Poultry litter stored in an enclosed structure can develop too much heat to the point of spontaneous combustion which is difficult to control and can result in burning the building that houses the litter. Open sides of the structure and some packing are important to get the proper heat production and dissipation of excess heat.

Poultry litter ensiling can be improved by adding ground grain or silage to it at the time of ensilage. A mixture of 20 percent poultry litter and 80 percent silage is a good mixture for ensiling. Adding 10-25 percent grain to litter at ensiling improves fermentation and energy value of the feed.

## RATIONS AND FEEDING RECOMMENDATIONS FOR BEEF CATTLE

Our research has shown poultry litter to be a cost-effective feed for cattle, provided it is processed and fed properly.[8,9,10]

Cattle need to be adjusted slowly to poultry litter. Consumption of a ration containing high levels of poultry litter is very low, initially; therefore, putting only a small percentage of poultry litter in the ration and increasing it incrementally over a two-week period is recommended.

After about a two-week adjustment period, cattle consume the poultry litter containing diets with little discrimination; however, it is recommended that any grain added to the diet be ground (or at least cracked, if the grain is corn). Some selective feeding occurs when whole grains are fed and the overall effectiveness of the feeding program is reduced.

*Tables 2* and *3* present some suggested rations along with their calculated nutrient contents. Ration 1 could be used for wintering dry, pregnant beef cows. A 1,000 lb brood cow would consume 20-25 lbs of Ration 1 depending on the amount of available grazing. Cattle should receive about 2 lbs of hay or other roughage per head per day or about 4 lbs per head every other day to maintain proper rumen functions for Rations 1-4.

Ration 2 can be used for lactating brood cows. Evaluate cow body condition and milk production capabilities and adjust the corn level in the ration accordingly (increase the level of corn if body condition is poor and/or milk production level is superior). Cows will consume about 25 lbs of Ration 2 during

Table 2. Suggested Poultry Litter - Ground Corn Rations

| Ingredients | Ration, lbs/ton, as fed | | | |
|---|---|---|---|---|
| | 1 Dry cows | 2 Lactating | 3 Stockers | 4 Finish |
| Poultry Litter | 1,500 | 1,300 | 1,000 | 500 |
| Ground Corn | 500 | 700 | 1,000 | 1,500 |
| % Corn | 25 | 35 | 50 | 75 |

Add vitamin A at 1500 I.U./lbs of ration. Provide free-choice trace mineralized salt (trace mineralized salt should contain 200-300,000 I.U. of vitamin A/lb if vitamin A is not added to ration). Rumensin or Bovatec may be added as specified per label instructions.

Table 3. Nutrient Content of Rations (Dry Matter Basis)

| Ration Number | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| | % | | | |
| Dry Matter | 80.7 | 81.7 | 83.2 | 85.6 |
| Crude Protein | 20.5 | 19.1 | 17.0 | 13.6 |
| TDN | 63.8 | 67.3 | 72.5 | 81.3 |
| Calcium | 1.3 | 1.4 | 1.1 | .5 |
| Phosphorus | 1.1 | 1.2 | 1.0 | .7 |
| Cost/Ton[a] | $40.27 | $50.38 | $65.54 | $90.80 |

[a] A cost of $15/ton was assigned to poultry litter and $3.25/bu. for corn.

the winter if pasture growth is nominal. A small amount of hay along with Ration 2 is recommended.

Ration 3 is recommended for stocker cattle grazing pastures. Stocker calves weighing about 600 lbs will consume 15-18 lbs of Ration 3 per head per day. Self- feeders work well with Ration 3 to reduce time spent feeding. Also, poultry litter in the ration is very effective in preventing founder in stocker cattle on self-feeders. Ration 3 also works well for replacement heifers. A small amount of hay or other roughage (pasture) is recommended along with Ration 3.

Ration 4 is recommended for cattle for which rapid gains are desired (finishing cattle or bulls on performance tests). A small amount of long hay is recommended along with Ration 4.

Mixing poultry litter with silages either at ensiling or feeding time is an excellent way to feed poultry litter. Some producers layer poultry litter on top of corn silage in a pit silo (about 80 percent corn silage and 20 percent poultry litter silage). Usually, the silage-litter mix can be blended in about the same proportions that it was put in by using the front-end loader to remove segments of the ensilage.

Sometimes portable grinder-mixers are used to blend litter and grains. Use of either a hay screen or removal of screens seems to work well for breaking up the litter.

Many approaches for processing and handling litter are being used, depending on the size of the operation and the type of equipment that can be justified. Some small cow-calf operators put poultry litter in troughs, pour the ground grain over the litter and mix the two in the trough with a pitchfork or shovel.

With increasing human population densities, more demand for unadulterated water in streams, and limited land area for application of poultry litter in some areas, poultry litter feeding to beef cattle will probably continue to increase with time. This is an environmentally sound and economically feasible practice that deserves careful consideration for integrated beef and poultry operations.

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