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NUTRIENT LOADINGS ON SOUTH DAKOTA FARMLAND: FEEDLOT LIVESTOCK WASTE

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As noted in the last issue of the *Economics Commentator*, South Dakota's livestock industry has undergone major structural change during the past two decades. The change includes a doubling in the average size of feedlot (from 61 to 121 head marketed per feedlot), with a strong sustained growth in the numbers of fed cattle marketed from feedlots with a capacity of 1,000-4,000 head. In contrast, other U.S. major cattle producing states experiencing recent structural change have experienced growth in feedlots from which several 10s of thousands of fed cattle are marketed annually.

The increased geographic concentration of fed cattle in South Dakota could be a source of environmental concern. Water and soil in South Dakota could be becoming contaminated with excessive levels of nitrates and phosphorus from livestock waste—as in several other major cattle producing states in the U.S. In fact, eastern South Dakota is included in one of four production areas nationally identified to have possible excessive animal wastes because of heavily-concentrated livestock production.

The purpose of this newsletter is to provide an overview of findings from an exploratory study of livestock waste from 78 feedlots in South Dakota. The focus is on the non-point pollution potential to farmland arising from livestock manure produced on the 78 feedlots-farms-ranches. Readers interested in more detailed findings from the study should request from the author a copy of the "feedlot manure" study.

Feedlots-farms-ranches studied

The one-time feedlot design capacity for the 78 cattle feeders studied ranges from 11 to 6,665 head and averages 890 head. These feedlots average nearly 12 times the average feedlot-size in South Dakota. The average cropland area for the 78 cattle feeders is 1,475 acres, which is 2.4 times the average of 605 acres for farms and ranches throughout the state.

The average concentration of fed cattle per acre of cropland for the feedlots covered in this study, therefore, is
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HOG AND PIG REPORT COMMENTS

Gene E. Murra
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The pork industry was shocked this Fall by the lowest cash prices in twenty years. The "under \$30" level created large losses for many producers. One result of that situation was an expectation of at least some liquidation in the nation's hog and pig inventory, if not immediately at least by mid-1995. In some respects, the December 1 Hog and Pig report (released on December 29th) met those expectations. However, clouds still are on the horizon.

First, the three percent increase in the Dec 1 total inventory (compared to last year) was below the increase expected. Most of that increase was in the heavier weight market hog categories, and they should be out-of-the-system by March of 1995. That means price pressure on the cash market should keep prices in the \$30's until early spring, or \$5-10 below 1994 early season prices.

Second, the three percent reduction in the breeding inventory was a greater reduction than the trade expected and, on the surface, should help prices during the Summer of 1995. Breeding intentions for the first half of 1995 are 1-4 percent below year ago levels and well below intentions given by producers in the September 1 report.

Third, there is some question as to whether or not the report captured all of the changes (increases?) of the newer entrants into the industry. For example, there have been reports of expansion in Iowa and yet that state's inventory was down by 5 percent. Large growth was recorded in North Carolina, Missouri and several Southern and Southwestern states.

Fourth, even if the report captured all "real" changes, there still are potential problems. If, as many believe, most of the reduction in inventory was caused by smaller producers cutting back or going out-of-business and larger producers holding steady or even expanding, larger production still could occur even with a smaller breeding inventory. For example, producers in 1-99 head operations
(Continued on p.4)

* See Dick Shane's *Grain Outlook* article on page 3 *

roughly five times that for the average feedlot in the state. Of the 78 feedlots covered in the study, 75 are located east of the Missouri River. Thus, the 78 feedlots-farms-ranches studied are (1) much above-average for the state in both feedlot design capacity and density of fed cattle per acre of cropland and (2) heavily concentrated in the eastern part of the state.

In addition to fed cattle, 51 (65%) of the 78 feedlot operators have other livestock enterprises. The most common other livestock enterprise involves beef cows. Forty-five (58%) of the 78 cattle feeders maintain beef cow herds ranging in size from 11 to 550 head and averaging 135 cows each. These beef cow enterprises average about 1.7 times the state-wide average herd-size of about 80 cows. Between 3% and 19% of the cattle feeders under study also have various swine, dairy, sheep, and poultry enterprises. In estimating the amounts of manure produced on the 78 feedlots-farms-ranches, attention was given to the manure produced by both fed cattle and the animals represented in these other livestock enterprises.

Procedures for estimating livestock manure nutrient loadings on farmland

Estimates were made of the amounts of total manure and the elemental nitrogen (N) and phosphorus (P) contained in the manure produced by the various species and types of livestock and poultry for application to farmland found on the 78 feedlots-farms-ranches. This included attention to estimated (1) amounts of manure initially voided by each category of livestock; (2) percentages of dry matter, nitrogen, and phosphorus in raw manure produced by different species of livestock; and (3) manure storage and handling losses prior to field application.

Of the total manure produced by each species and type of livestock, assumptions were made on the amounts scraped, collected, and spread on cropland versus dropped directly from grazing animals onto pasture land. Resulting from the analysis was a determination of the estimated N and P per acre from livestock manure on the cropland and pasture land operated by each cattle feeder. No attention was given in analysis to possible inappropriate timings of manure application or unevenness in the intensities of manure application/deposition on different parcels of land within individual farms.

Manure application intensities on cropland

Estimated annual spread manure application intensities on cropland for the 78 feedlots-farms-ranches range from 0.4 to 28.1 tons/acre and average 6.1 tons/acre. Ten percent of producers spread an estimated average of less than 1.0 ton/acre. At the other extreme, 8% of producers apply an estimated 15.0 tons or more per acre of cropland, with the greatest application 28 tons per acre.

Levels of manure nitrogen applied per acre of cropland range among producers from 6 to 507 lb/acre and average 98 lb/acre. The most common range of manure N application rates is 35-65 lb/acre, with nearly one-fourth of producers making applications within this range (Table 1). At the high end of the manure N continuum, 14% apply 140-225 lb/acre and 10% apply 225 lb/acre or more. Levels of manure phosphorus estimated to be applied per acre of cropland range among producers from 2 to 159 lb/acre and average 31 lb/acre. Ten percent apply 65 lb/acre or more.

Table 1. Levels of nitrogen and phosphorus from livestock manure spread on cropland: 78 feedlots-farms-ranches.

Nitrogen (N)		Phosphorus (P)	
Application (lb/A)	Percent of producers	Application rate (lb/A)	Percent of producers
Less than 10.0	9.0	Less than 4.0	10.3
10.0 - 19.9	9.0	4.0 - 5.9	5.1
20.0 - 34.9	11.5	6.0 - 9.9	12.8
35.0 - 64.9	24.3	10.0 - 19.9	25.6
65.0 - 99.9	12.8	20.0 - 29.9	12.8
100.0 - 139.9	9.0	30.0 - 44.9	10.3
140.0 - 224.9	14.1	45.0 - 64.9	12.8
225 or more	10.3	65.0 or more	10.3
	100.0		100.0

Manure application intensities on pasture land

Levels of manure nitrogen dropped by grazing cattle per acre of pasture land range among producers from zero to 117 lb/acre and average 33 lb/acre. Thirty-two percent of the 78 feedlots-farms-ranches have no livestock that graze on pasture land (Table 2). The most common grazing manure N dropping-rate ranges are 20-40 and 40-60 lb/acre, with 22% and 16% of producers having cattle that drop manure N within these respective ranges of intensity. At the high end of the continuum, the manure N dropping-rate for 10% of producers is 80 lb/acre or more.

Table 2. Levels of nitrogen and phosphorus from livestock manure that drop on pasture land: 78 feedlots-farms-ranches.

Nitrogen (N)		Phosphorus (P)	
Application (lb/A)	Percent of producers	Application rate (lb/A)	Percent of producers
Zero	31.8	Zero	31.8
0.1 - 19.9	9.5	0.1 - 4.9	6.3
20.0 - 39.9	22.2	5.0 - 9.9	15.9
40.0 - 59.9	15.9	10.0 - 14.9	15.9
60.0 - 79.9	11.1	15.0 - 19.9	12.7
80 or more	9.5	20.0 - 24.9	9.5
	100.0	25 or more	7.9
			100.0

Levels of manure phosphorus dropped per acre of pasture land range among producers from zero to 36 lb/acre

and average 10 lb/acre. The most common grazing manure P dropping-rate ranges are 5-10 and 10-15 lb/acre, with 16% of producers having cattle that drop manure P within each of these ranges of intensity. At the high end of the continuum, the manure P dropping-rate for 8% of producers is 25 lb/acre or more.

Discussion of findings

Based on literature sources indicating certain "scientific" and "regulatory" threshold levels for overall manure applications and manure N and P application intensities, it was determined that the average application of 6.1 tons/acre for the 78 feedlots-farms-ranches in this study is far less than any "danger-level" cited in the studies. Even the maximum spread manure application rate of 28 tons/acre of cropland for one cattle feeder in the South Dakota study falls far short of the 40 tons/acre of cropland maximum permitted in Missouri. However, the maximum permitted application rate for manure nitrogen in Indiana of 225 lb/acre is exceeded by 10% of the feedlots-farms-ranches in this study.

Although the literature-based reference points are indicative only, it would appear that the intensity of manure applications for the vast majority of the feedlots-farms-ranches covered in this study is not likely to be in an environmental danger-zone. This finding is particularly significant in view of (1) the average design capacity of the feedlots covered in this study being 12 times the average for all feedlots in South Dakota, (2) the average concentration of fed cattle per acre of cropland for the feedlots covered in this study being five times that for all feedlots in the state, and (3) eastern South Dakota (in which 75 of the 78 feedlots in this study are located) being included in one of four production areas nationally in which there exist possible excessive animal wastes because of heavily-concentrated livestock production.

Conclusion

This study provides evidence that the non-point pollution implications of cattle feeding in South Dakota are likely to be rather limited. South Dakota's cattle feeding industry is becoming more concentrated--with feedlots marketing between 1,000 and 4,000 head per year gaining much at the expense of feedlots marketing less than 1,000 head. However, this type of structural adjustment is on a far smaller scale than that in other major cattle producing states in the Central and Southern Plains and the West where the role of mega-feedlots marketing 10s of thousands of fed cattle each year has increased greatly over the past 1-2 decades.

As public concerns with environmental pollution continue to grow across our nation, it is critical to realize the major comparative advantage--relative to possible soil and water pollution from animal wastes--that arises from the unique structure of South Dakota's fed cattle industry.



KEY GRAIN MARKET FACTORS

*Dick Shane
Extension Grain
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Corn

Record US crop production of over 10 billion bushels will lead to a tripling of surplus stocks at the end of the marketing year. With such large stocks and a normal production year in 1995, producers can expect prices very similar to those experienced in 1994.

Short term price improvement is already factored into the Chicago Board of Trade (CBOT) futures market and is evidenced by the 12¢ carry from the March to the July contract. The July contract has been trading in a narrow range for several months. Excellent export demand early in the marketing year will help rally the corn price to \$2.45 at the upper boundary of the trading range. If El Nino cuts the South African crops short and China continues to ban grain exports, the July futures could rally to the \$2.65 level.

Any potential weather related price rally this spring will be moderated by the large stocks on hand. Any rally of this nature will require severe conditions in the Corn Belt. With this in mind, producers should evaluate current CBOT December corn futures to sell part of expected 1995 production at over \$2.00 per bushel localized price. Reownership later using a call option is still a possibility if the 1995 outlook changes drastically. Whatever your marketing plan, use only those alternatives that you are comfortable with and, if trying something new, start out small.

Soybeans

Conditions in the soybean market are similar to those in the corn market: large 1994 production, huge expected surplus stocks, and good early marketing year export demand. The big difference in these two markets comes from expected record production of soybeans in Brazil and Argentina this spring.

With large world soybean supplies, any spring market rally will take extreme weather conditions and even then price increases would not be near as large as in previous weather markets. Some weather premium is present in the CBOT November soybean futures. With normal planting weather, this premium will be quickly lost and use of marketing alternatives to price some 1995 soybeans now seems prudent. Cash forward contracts, hedging, synthetic puts, and fences all offer opportunities depending on your individual marketing plans.

Old crop soybeans in the bin can be sold anytime, as



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basis has narrowed about as much as can be expected given the large supplies. However, further winter price improvement will most likely cover storage costs if the South American crop doesn't get any larger.

Wheat

Wheat stocks are low in the US, but are offset by stocks in competing exporting countries. Even though their crops were poor, the Former Soviet Union countries are not expected to import much wheat due to the lack of foreign exchange. Therefore, current nearby futures prices around \$4.00 are very near, if not at, the near term top.

Deferred pricing opportunities in the wheat markets reflect an adequate world supply of wheat and the excellent condition of US winter wheat going into dormancy. With a good US crop and an improving world crop, pricing opportunities for 1995 wheat will come early in 1995--most likely before February 15. After this date, wheat prices will gradually decline to the low three dollar range by harvest time with good growing conditions this spring and summer.

For those of you thinking about fertilizing for protein in spring wheat, keep in mind the lack of stress on winter wheat for this growing season. This could mean large yields and below average protein in the 1995 crop. Keep a close eye on southern plains growing conditions this spring to help make this decision on protein.

(Hog and pig report ... continued from p.1)

save an average of about 7.5 pigs per litter. Those with an over 2000 head operation save an average of 8.5 pigs per litter. When one adds the consideration that the larger operations also average more litters per year per sow, it is conceivable that a smaller breeding herd could result in more pigs.

Finally, the report may help provide some forward marketing opportunities for producers. Futures prices in the mid-\$40's for the Summer of 1995 should be evaluated. Prices could go higher. However, prices offered are above breakeven for most producers and prices could go lower. Some price protection may be advisable for 1995.

ECONOMICS COMMENTATOR

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