# Effects of Bedding on Winter Performance of Feedlot Cattle and Nutrient Conservation in Composted Manure

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**Abstract**

Winter feeding of weaned calves is becoming more common due to increasing amounts and diversity of feeds. However, mitigating winter weather stress is required for good animal husbandry and profitable enterprises. This study was conducted during the winters of 2001-2 and 2002-3 to evaluate steer performance, economic returns, and nutrient retention in manure. Steer calves born and raised at the Carrington Research Extension Center (n=107) were randomly allotted to three bedding treatments for two consecutive years and fed a high concentrate diet (62 MCal/lb NEg) from November until ready for market in the spring. The bedding treatments were no bedding, modest bedding, and generous bedding. Feed intake (Table 1) was not affected by bedding treatment (P<.05). However, weight gain responded positively (P<.05) to bedding in two of the four 28-day winter feeding periods. Steers without bedding gained 2.82 lbs/d, modestly bedded steers gained 3.68 lbs, and generously bedded steers gained 3.53 lbs/d. Feed efficiency tended to improve overall for bedded steers (P=.09). Carcass quality traits (Table 2) were positively affected by bedding (P<.05). Marbling score, the indicator for USDA carcass quality grade, improved with bedding as did the percent of carcasses grading choice. Twenty three percent of carcasses from non-bedded steers graded USDA Choice vs. 45 percent for modest and 63 percent for generously bedded steers. Economic return increased for bedded steers with a gross return of $756.92, $818.68, and $838.53, respectively, for no bedding, modest bedding, and generous bedding treatments. With increasing amounts of bedding, nutrient losses were reduced in composted manure (Table 3). Nitrogen losses were reduced from 65 percent for no bedding to 32 percent for modest bedding and 19 percent for generously bedded steers (Figure 1). Potassium ($K_20$) losses were also reduced with increased bedding, especially at the generous bedding level (Figure 2). More work is underway to explore other bedding materials and management methods for limiting nutrient losses.

**Table 1. Effect of bedding level on feed intake, gain, and feed efficiency of steers finished in North Dakota during the winter.**

| | --------- Treatment --------- | | | | |
|---|---|---|---|---|---|
| Item | No bedding | Modest bedding | Generous bedding | Std Err | P value |
| Number of head | 34 | 35 | 35 | | |
| Initial wt, lb. | 725 | 726 | 727 | 12.2 | 0.85 |
| Dry matter intake, lb/hd/d | | | | | |
| Period 1 | 20.5 | 19.91 | 20.74 | 1.41 | 0.92 |
| Period 2 | 22.84 | 21.59 | 21.64 | 1.86 | 0.87 |
| Period 3 | 22.51 | 21.86 | 22.88 | 1.45 | 0.89 |
| Period 4 | 22.11 | 23.43 | 23.41 | 1.23 | 0.72 |
| Overall | 21.99 | 21.96 | 22.16 | 1.56 | 0.99 |
| Avg daily gain lb.* | | | | | |
| Period 1 | 3.16 | 3.84 | 3.81 | 0.05 | 0.01 |
| Period 2 | 2.66 | 3.63 | 3.81 | 0.68 | 0.38 |
| Period 3 | 2.9 | 3.67 | 3.37 | 0.14 | 0.03 |
| Period 4 | 2.62 | 3.61 | 3.16 | 0.65 | 0.36 |
| Overall | 2.83 | 3.69 | 3.53 | 0.06 | 0.01 |
| Gain/feed | | | | | |
| Period 1 | 0.155 | 0.194 | 0.184 | 0.01 | 0.14 |
| Period 2 | 0.124 | 0.17 | 0.178 | 0.04 | 0.48 |
| Period 3 | 0.13 | 0.167 | 0.148 | 0.01 | 0.06 |
| Period 4 | 0.116 | 0.155 | 0.035 | 0.03 | 0.36 |
| Overall | 0.131 | 0.172 | 0.161 | 0.01 | 0.09 |

*Actual weight gains may be lower than reported due to more manure tags on the steers in the no bedding treatment.

**Table 2. Effect of bedding level on carcass quality of steers finished in North Dakota during the winter.**

| Item | Treatment | | | Std Err | P value |
|---|---|---|---|---|---|
| | No bedding | Modest bedding | Generous bedding | | |
| Final weight, lb. | 1121 | 1182 | 1172 | 18.41 | 0.02 |
| Carcass wt, lb. | 674 | 715 | 721 | 12.86 | 0.02 |
| Dressing percent | 61.95 | 62.33 | 63.43 | 0.38 | 0.02 |
| Marbling score* | 361 | 392 | 415 | 10.89 | 0.01 |
| Percent Choice | 23 | 45 | 63 | - | - |
| Yield grade** | 2.98 | 3.03 | 3.09 | 0.07 | 0.3 |
| Fat thickness, inches*** | 0.39 | 0.43 | 0.46 | 0.03 | 0.13 |
| Rib eye area, square in. | 11.47 | 12.09 | 11.99 | 0.25 | 0.06 |
| KPH, % | 2.43 | 2.51 | 2.43 | 0.05 | 0.14 |

* Marbling score is numeric value based on dispersion of fat inside ribeye muscle, 300-399 = select, 400-499=low choice. Higher scores = more marbling and higher carcass value

** Yield grade is a measure of fat to lean ratio, 1=lean, 5=fat.

*** Measured over 12 rib

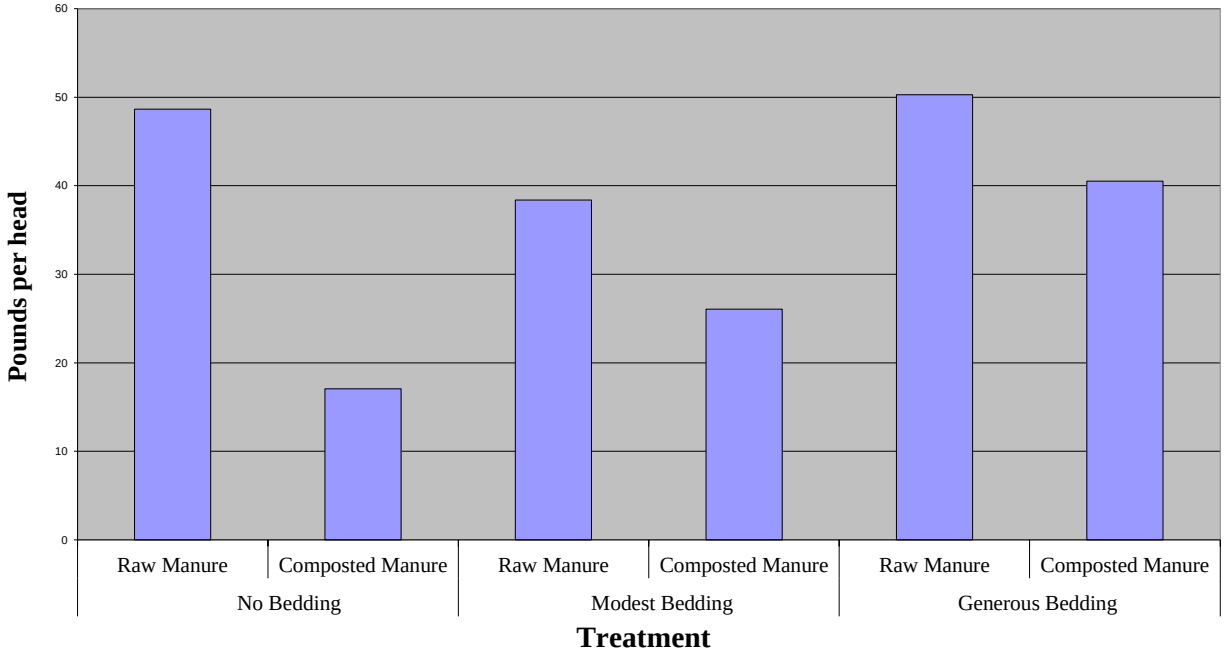
**Clean steers in bedded pens gained faster.**

**Non-bedded steers carry significant manure tag.**

**Table 3. Effects of bedding level and composting on nutrients for fertilizer in manure.**

| Item | Treatment | | |
|---|---|---|---|
| | No bedding | Modest bedding | Generous bedding |
| Dry Matter, % | | | |
| Raw | 48.3 | 23.6 | 29.7 |
| Composted | 51.2 | 38.8 | 42.2 |
| Dry Matter, lbs per hd | | | |
| Raw manure | 1170 | 1340 | 1901 |
| Composted manure | 569 | 719 | 795 |
| Percent retained | 49 | 54 | 42 |
| Organic Matter, lbs per head | | | |
| Raw manure | 772 | 967 | 1467 |
| Composted manure | 91 | 432 | 483 |
| Percent retained | 12 | 45 | 33 |
| Nitrogen, lbs per head | | | |
| Raw manure | 48.64 | 38.40 | 50.26 |
| Composted manure | 17.05 | 26.05 | 40.53 |
| Percent retained | 35 | 68 | 81 |
| Phosphorous, lbs per head | | | |
| Raw manure | 19.42 | 12.58 | 14.88 |
| Composted manure | 13.24 | 14.00 | 19.94 |
| Percent retained | 68 | 111 | 134 |
| Potassium, lbs per head | | | |
| Raw manure | 47.78 | 56.60 | 54.04 |
| Composted manure | 14.64 | 20.68 | 46.54 |
| Percent retained | 31 | 37 | 86 |

## Figure 1. Effects of Bedding and Composting on Nitrogen in Feedlot Manure




## Figure 2 Effects of Bedding and Composting on K20 in Feedlot Manure