# Economics of Distillers Grains Supplementation in a Forage System with Spayed Heifers

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**Summary**

*In a two-year study, spayed heifer calves were backgrounded on cornstalks with 2 lb or 5 lb wet distillers grains with solubles supplemented daily. During the summer, heifers grazed native range and received no summer supplementation or were supplemented with modified distillers grains with solubles at 0.6% BW daily. Heifers were finished on a common regimen, and an economic scenario was applied to each phase of production and overall. Supplementing more in winter increased profit, but summer supplementation did not impact overall profitability. Numerically, heifers not supplemented during the summer were more profitable than supplemented heifers.*

**Introduction**

In a yearling system, growing calves backgrounded on corn residue through the winter are commonly supplemented to meet protein requirements, but summer supplementation is a relatively recent development that has arisen as a result of readily available, competitively priced distillers grains.

The historical backgrounding philosophy has centered on lowering winter feed input costs and then capitalizing on compensatory gain during summer grazing. However, recent research illustrated that backgrounding cattle at a higher supplement level during the winter phase resulted in increased feedlot gain, greater final BW, and increased profits (*2014 Nebraska Beef Cattle Report*, pp. 36-38). Further, heavier slaughter weights tend to be negatively correlated to slaughter breakeven and positively correlated to profitability *(2000 Nebraska Beef Cattle Report,* pp. 23-26). Previous research has shown summer supplementation of distillers grains to be profitable due to use of lower cost forages at the time, reduced finishing costs, and increased selling weight (*2011 Nebraska Beef Cattle Report*, pp. 24-25; *2012 Nebraska Beef Cattle Report,* pp. 112-114). The combination of winter and summer was recently completed (*2014 Nebraska Beef Cattle Report*, pp. 39-42) to determine if supplementing during one phase is better than the other or if it is additive.

The objective of this experiment was to determine profitability of winter and summer supplementation level and interaction of timing within a forage-based system using spayed yearling heifers.

**Procedure**

Each year of a two-year study, 229 crossbred heifers (initial BW = 473 ± 57 lb) were used in a completely randomized design with a 2 × 2 factorial treatment design. Factors were winter supplement level and summer supplement level. Winter supplementation level was: 1) 2 lb DM wet distillers grains with solubles (WDGS) (LO); or 2) 5 lb DM WDGS (HI) and summer supplementation level was: 1) modified distillers grains with solubles (MDGS) fed at 0.6% BW daily (SUP); or 2) no MDGS supplementation (NO SUP).

Economic assumptions were applied to the actual performance values and actual days in each production phase from year 1 and year 2 in this study (*2014 Nebraska Beef Cattle Report,* pp. 39-42). The economics are intended to represent the biology differences among treatments rather than absolute profit or loss. Initial purchase price was $170.00/cwt. Distillers grains price was calculated using a $5.50/bu corn price and pricing distillers grains at 85% of corn price on a DM basis, resulting in a cost of $197.59/ton of distillers grains (DM basis).

Daily stalk grazing was charged at $0.31 per heifer and WDGS charged at $0.097/lb fed (DM). Total winter cost was the sum of WDGS supplement cost and stalk grazing cost. Daily summer grazing costs were charged at $0.80 per head for non-supplemented heifers. Given supplemented heifers were provided 22% less acres due to MDGS supplementation and projected forage savings, daily grazing cost was reduced to $0.62 per head for supplemented heifers. Supplemented heifers were charged $0.20 daily to account for additional labor, fuel, and equipment to provide distillers supplementation. Non-supplemented heifers during the summer phase were charged $0.10 daily in yardage costs. Total summer costs included MDGS supplementation cost (if applicable), yardage, and summer grazing cost.

Yardage during finishing was assumed to be $0.45 daily. Feedlot diet was charged at $0.115/lb (DM) of DMI. Cattle were sold on a live weight basis at $124.38/cwt. Total finishing costs included finishing diet (DMI) cost and yardage during finishing.

Profitability was calculated as total revenue (selling price multiplied by final live weight determined on carcass adjusted basis) minus total costs (initial purchase cost, wintering costs, summer costs, and finishing costs). Interest was 6% and health and implant costs were $20/head.

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## Results

There were interactions with year so years were analyzed separately as a 2 x 2 factorial treatment arrangement. Feedlot pen (two per year) was the experimental unit.

There were no winter by summer treatment interactions or summer effects during the winter phase, as summer treatment had not yet been applied (Table 1 and 2). Corn residue cost, including yardage to deliver WDGS supplement, was consistent across treatments at $42.78 per head (year 1) or $46.19 per head (year 2). Supplementation costs, and consequently total wintering costs were greater ($P < 0.01$) for HI than LO by $40.12 in year 1, and $43.31 in year 2. Total winter backgrounding costs averaged $69.52 (year 1) or $75.07 (year 2) per head for LO cattle, and $109.64 (year 1) or $113.38 (year 2) per head for HI cattle.

There were no winter by summer treatment interactions during summer grazing. Grazing cost was greater ($P < 0.01$) for NO SUP at $102.40 (year 1) or $95.20 (year 2), compared to SUP at $79.87 (year 1) or $74.26 (year 2). These differences reflect that supplemented cattle were provided 22% fewer acres. For SUP cattle, supplementation costs were $52.34 and $49.93 greater, year 1 and 2, respectively ($P < 0.01$) and yardage costs were $12.80 and $11.90 (year 2) greater ($P < 0.01$). Total summer grazing costs averaged $157.81 for SUP compared to $115.20 for NO SUP in year 1 ($P < 0.01$), and $147.99 for SUP and $107.10 for NO SUP in year 2 ($P < 0.01$).

There were no winter by summer treatment interactions affecting finishing costs in either year. In year 1, finishing diet cost tended ($P = 0.06$) to be $21.54 greater for NO SUP cattle, there were no differences in yardage cost, and overall finishing cost tended ($P = 0.07$) to be $22.95 greater for NO SUP cattle, with no differences observed from winter treatment. Numerically, NO SUP cattle had a greater DMI and DOF, which created

**Table 1. Profitability of yearling spayed heifers supplemented distillers grains in a forage-based system, Year 1.**

| | LO[1] | | HI[2] | | | *P*-value[3] | | |
|---|---|---|---|---|---|---|---|---|
| Item | SUP[4] | NO SUP[5] | SUP | NO SUP | SEM | Winter | Summer | W x S |
| **Winter backgrounding phase** | | | | | | | | |
| WDGS cost, $ | 26.74 | 26.74 | 66.86 | 66.86 | 6.62 | <0.01 | —[6] | —[6] |
| Stalk cost, $ | 42.78 | 42.78 | 42.78 | 42.78 | 0 | —[6] | —[6] | —[6] |
| Total cost, $ | 69.52 | 69.52 | 109.64 | 109.64 | 0 | <0.01 | —[6] | —[6] |
| **Summer grazing phase** | | | | | | | | |
| Grazing cost, $ | 79.87 | 102.40 | 79.87 | 102.40 | 0 | —[6] | <0.01 | —[6] |
| MDGS cost, $ | 52.34 | 0 | 52.34 | 0 | 0 | 1.0 | <0.01 | —[6] |
| Yardage, $ | 25.60 | 12.80 | 25.60 | 12.80 | 0 | —[6] | <0.01 | —[6] |
| Total cost, $ | 157.81 | 115.20 | 157.81 | 115.20 | 0 | 1.0 | <0.01 | —[6] |
| **Finishing cost** | | | | | | | | |
| Diet cost, $ | 383.04 | 389.08 | 360.73 | 397.76 | 8.13 | 0.45 | 0.06 | 0.13 |
| Yardage, $ | 56.28 | 56.23 | 53.69 | 56.56 | 1.68 | 0.54 | 0.45 | 0.43 |
| Total cost, $ | 439.32 | 445.31 | 414.42 | 454.32 | 8.52 | 0.44 | 0.07 | 0.14 |
| **Profitability** | | | | | | | | |
| Initial cost, $ | 766.70 | 770.10 | 766.70 | 770.01 | 6.45 | 0.96 | 0.55 | 0.94 |
| Total cost, $ | 1,519.92 | $1,485.36 | $1,537.18 | 1,536.76 | 13.15 | 0.07 | 0.62 | 0.25 |
| Revenue, $ | 1,546.49 | 1526.62 | 1606.16 | 1664.17 | 17.97 | <0.01 | 0.32 | 0.08 |
| Profit, $ | 26.57[c] | 41.26[c] | 68.98[b] | 127.39[a] | 7.63 | <0.01 | 0.19 | 0.05 |

[1]LO = supplemented at 2 lb WDGS daily during winter backgrounding phase on corn residue.
[2]HI = supplemented at 5 lb WDGS daily during winter backgrounding phase on corn residue.
[3]*P*-Value: Winter = effect of winter supplementation treatment; Summer = effect of summer supplementation treatment; W x S = effect of treatment interaction.
[4]SUP = supplemented at 0.6% BW daily with MDGS during summer grazing period.
[5]NO SUP = not supplemented during summer grazing.
[6]Did not vary within treatment combination.
[7]Includes interest and health.
[abc]Within a row, means with unlike superscripts differ ($P < 0.05$).

**Table 2. Profitability of yearling spayed heifers supplemented distillers grains in a forage-based system, Year 2.**

| | LO[1] | | HI[2] | | | *P*-value[3] | | |
|---|---|---|---|---|---|---|---|---|
| Item | SUP[4] | NO SUP[5] | SUP | NO SUP | SEM | Winter | Summer | W x S |
| **Winter backgrounding phase** | | | | | | | | |
| WDGS cost, $ | 28.88 | 28.88 | 72.19 | 72.19 | 6.62 | <0.01 | —[6] | —[6] |
| Stalk cost, $ | 46.19 | 46.19 | 46.19 | 46.19 | 0 | —[6] | —[6] | —[6] |
| Total cost, $ | 75.07 | 75.07 | 118.38 | 118.38 | 0 | <0.01 | —[6] | —[6] |
| **Summer grazing phase** | | | | | | | | |
| Grazing cost, $ | 74.26 | 95.20 | 74.26 | 95.2 | 0 | —[6] | <0.01 | —[6] |
| MDGS cost, $ | 49.93 | 0 | 49.93 | 0 | 0 | 1.0 | <0.01 | —[6] |
| Yardage, $ | 23.80 | 11.90 | 23.80 | 11.90 | 0 | —[6] | <0.01 | —[6] |
| Total cost, $ | 147.99 | 107.10 | 147.99 | 107.10 | 0 | —[6] | <0.01 | —[6] |
| **Finishing phase** | | | | | | | | |
| Diet cost, $ | 396.00 | 409.25 | 400.40 | 391.8 | 23.10 | 0.79 | 0.92 | 0.66 |
| Yardage, $ | 55.80 | 55.80 | 55.80 | 55.80 | 0 | —[6] | —[6] | —[6] |
| Total cost, $ | 451.80 | 465.05 | 456.20 | 447.68 | 23.10 | 0.79 | 0.92 | 0.66 |
| **Profitability** | | | | | | | | |
| Initial cost, $ | 841.50 | 841.50 | 848.30 | 826.20 | 3.79 | 0.26 | 0.08 | 0.09 |
| Total cost, $ | 1,606.78 | 1,557.61 | 1,663.61 | 1,590.72 | 22.54 | 0.23 | 0.31 | 0.44 |
| Revenue, $ | 1,519.85 | 1,481.17 | 1,593.75 | 1,546.45 | 20.33 | 0.03 | 0.10 | 0.84 |
| Profit, $ | -86.93 | -96.50 | -69.86 | -44.27 | 9.34 | 0.02 | 0.15 | 0.18 |

[1]LO = supplemented at 2 lb WDGS daily during winter backgrounding phase on corn residue
[2]HI = supplemented at 5 lb WDGS daily during winter backgrounding phase on corn residue
[3]*P*-value: Winter = effect of winter supplementation treatment; Summer = effect of summer supplementation treatment; W x S = effect of treatment interaction.
[4]SUP = supplemented at 0.6% BW daily with MDGS during summer grazing period
[5]NO SUP = not supplemented during summer grazing
[6]Did not vary within treatment combination.

these tendencies for differences in finishing cost.

In year 2, there were no winter or summer treatment effects on diet cost, yardage, or total finishing cost. There were minimal performance differences in year 2 across treatments, consequently there were minimal finishing cost differences.

In year 1, initial cost was similar ($P > 0.55$) as initial weights were also similar by design. Total costs were \$32.52 greater (P = 0.07) for HI, due to additional winter supplementation costs. Summer supplementation numerically increased total costs \$15.43 due to MDGS cost and additional summer yardage cost, but was not statistically significant ($P = 0.62$). Revenue was \$98.62 greater ($P < 0.01$) for HI than LO cattle, due to the additional 80 lb of saleable weight. There was a winter by summer treatment interaction ($P = 0.05$) on overall profitability with HI, NO SUP most profitable at \$127.39 per head, followed by HI, SUP at \$68.98, LO, NO SUP at \$41.26 and LO, SUP at \$26.57.

In year 2, initial cost was similar ($P > 0.08$) by design. Total costs were not impacted by winter treatment ($P = 0.23$) but were \$47.23 numerically greater ($P = 0.31$) with summer supplementation due to MDGS and additional yardage cost. Similar to year 1, revenue was greater ($P = 0.03$) by \$69.59 for HI, but summer supplementation increased ($P = 0.10$) revenue \$42.99 as well. Similar to year 1, profit (less loss) was greater for HI than LO ($P = 0.02$) by \$34.65, and NO SUP ($P = 0.15$) was more profitable (less loss) than SUP by \$8.01. Profit differences between year 1 and year 2 are due to lower year 2 performance, and consequently lower revenue.

High winter supplementation level increased profit, but summer supplementation did not impact overall profitability. Numerically, NO SUP were more profitable than SUP. Lack of profit response to summer supplementation may be due to the greater distillers grains price and lower cattle performance in this data set compared to previous analyses.

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