*Healthy Food, Diverse Farms, Vibrant Communities*

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# *Monitoring winter cattle diets*

*Written by Kevin Dietzel*

***Abstract***

*Three winter feeding strategies for growing calves—low-input, medium-input, and high-input—were tested by weighing the animals periodically to determine rates of weight gain for each strategy. Calves fed distiller's syrup on stockpiled pasture and then as a supplement to hay (high-input) performed better than calves not supplemented on stockpile and then supplemented with soybean hulls during the hay feeding period (medium-input). The low-input group of calves nursed until late January and grazed on stockpiled pasture the entire time. This group's performance was on average the same as the other two groups (combined) that had been weaned in the fall.*

## ***Background***

*Winter is the most expensive time to feed any class of beef cattle. For farmers trying to limit or eliminate grain in their animals' diets, it is also the most difficult time to maintain performance and health. The primary reason is that the cheapest and healthiest ruminant feed—grass—is not actively growing. This means that the grass must be saved up for the winter, either by making it into hay, "baleage" or "haylage" (different forms of ensiled forages), or by saving it in the pasture as "stockpiled pasture" to be portioned out through wintertime rotational grazing. Making hay or haylage is costly. Stockpiling pasture requires a great deal of planning, adequate pasture acres and the ability to use that forage in the winter, which is weather-dependent. The quality of all these feeds can vary greatly depending on the weather, timing of harvest and method of harvest. Stockpiled pasture also tends to lose quality with time (Boyles et al., 1998), due to the natural oxidation and leaching of nutrients.*

*Many farmers supplement forages with grain, but others prefer not to feed grain to ruminants. Reasons for eliminating grain are animal health, nutritional benefits of the meat, markets and cost. Animal health is affected mainly because the starch in grains is fermented rapidly in the rumen, which can cause acidosis and liver abscesses (Nagaraja and Titgemeyer, 2007). Meat from grass-fed animals is usually lower in total fat and has higher levels of beneficial omega-3 fatty acids and conjugated linoleic acid (CLA) than beef from grain-fed animals (Clancy, 2006). In addition, many consumers are asking for meat produced from animals fed no grain.*

***Jacob and Linda Myers and their children***

*Two alternatives to grain that are readily available in some regions are distiller's syrup and soybean hulls. Distiller's syrup is a by-product of ethanol production. Its main advantage is that it costs much less than grain. Soybean hulls have moderate energy content and do not contain starch. Therefore they provide some of the benefits of not feeding grain. Note that both of these feeds are grain by-products and therefore may disqualify the meat from these animals being labeled "grass-fed" according to both the American Grassfed Association standards (www.*

***Bruce Carney***

*americangrassfed.org) and the USDA Agricultural Marketing Service "grass fed marketing claim standards." However, many private grass-fed beef labels allow grain by-products since these do not contain starch, which they feel is the most detrimental component in grains.*

*This report documents the performance of three winter management strategies that were tried on one farm, with animals from two different farmers, in winter 2010-11: high-input, medium-input and low-input systems.*

***Hypothesis—****We hypothesized that:*

*1) Calves on stockpiled pasture with distiller's syrup as a supplement (high-input) will have a higher rate of gain than calves on stockpiled pasture with no supplement (medium-input).*

*2) Calves in the high-input system will have similar rates of gain to calves in the medium-input system.*

*3) Calves weaned later (left to nurse on the cows through the winter) (low-input) will have better rates of gain than calves weaned in the fall, regardless of the supplements those calves receive (high- and medium-input).*

## *Method*

### *Animals*

*Ninety-six calves from two different farms were used for this trial, 81 from Bruce Carney and 15 from Jacob Myers. The calves were born in April and May and weaned on October 30, 2010. The calves were primarily Angus crosses. Some of the animals had been infected with rotovirus at birth (and were treated prior to commencement of the trial), and others became sick during the trial and had to be treated.*

*The medium- and high-input groups were weaned in the fall (October 30, 2010), and the low-input group was weaned in mid-winter (January 29, 2011).*

***Diets—****The low-input group grazed on stockpiled pasture for the entire trial.*

*The medium- and high-input groups had two distinct feeding stages: Stage 1 was stockpiled pasture grazing, and in Stage 2, they were fed hay.*

***In Stage 1 (stockpile grazing)****—December 4, 2010–January 9, 2011—both the high-input and medium-input groups were grazed on similar stockpiled pasture. This was a perennial pasture with a diverse mix of grasses and legumes, with 30-60% fescue grass. Both groups were moved to new pasture every three to nine days and received Redmond salt and minerals. Group 2 received distiller's syrup free-choice in lick tubs as an additional supplement (see* ***Table 1****, page 3 for the nutrient analysis of distiller's syrup).*

***In Stage 2 (hay feeding)****—January 9–February 19, 2011—the medium-input group was grazed on sorghum sudangrass regrowth and fed large round bales of grass/legume mix hay and 3.5 lbs./head/day of soybean hull pellets (****Table 1****), and the high-input group was fed small square bales of hay and distiller's syrup in the pasture (****Table 1****). The syrup was fed by pouring it onto a round bale of prairie hay (****Table 1****) or corn stalks (no analysis available). This was necessary in this stage due to the syrup freezing on the lick tubs and cattle not being able to eat it. Both groups received Redmond salt and minerals.*

***Weights****—Animal weights of all groups were recorded on October 30, 2010. The low-input group was weighed again at weaning, on January 29, 2011. The medium- and high-input groups were weighed at the*

**Table 1**

| Group | Weaning Date | Diet: Stage 1 | Diet: Stage 2 |
|---|---|---|---|
| Low-Input | 1/29/2011 | -Stockpiled pasture | |
| Medium-Input | 10/30/2010 | -Stockpiled pasture | -Sorghum sudangrass regrowth<br>-Large round bales of legume/grass hay<br>-3.5 lbs./head/day soybean hull pellets |
| High-Input | 10/30/2010 | -Stockpiled pasture<br>-Distillers syrup (free choice) | -Small square bales of hay<br>- Distiller's syrup fed by pouring on a bale of prairie hay or corn stalks |

**Table 1.** *Description of the three different winter feeding systems monitored for the study.*

| Table 2 Feed Type | Dry Mater | Crude Protein | Soluble Protein | NDF | ADF | NDFD-30 | IVDMD | NEG | RFQ |
|---|---|---|---|---|---|---|---|---|---|
| | % | % | % | %DM | %DM | %NDF | %DM | Mcal/lb. | |
| Soy hulls$_a$ | 89.77 | 10.77 | | 38.06 | | | | 0.24 | |
| Distillers syrup$_b$ | 30 | 28.5 | | | | | | 0.6 | |
| Stockpiled pasture$_c$ | 29.88 | 10.73 | 43.48 | 58.14 | 35.71 | 62.81 | 60.23 | 0.28 | 136.3 |
| Hay (small square)$_c$ | 87.52 | 15.42 | 33.62 | 48.62 | 34.49 | 57.53 | 68.62 | 0.32 | 128 |
| Hay (large round)$_c$ | 89.1 | 11.86 | 33.04 | 66.9 | 44.4 | 45.35 | 51.27 | 0.14 | 79.9 |
| Prairie hay$_c$ | 85.8 | 4.52 | 26.14 | 76.37 | 49.85 | 33.69 | 38.47 | 0.04 | 45.3 |

***Table 2.*** *Nutritional value of diet components.*
*(a) Analysis provided by Sure-tech Laboratories, Indianapolis, IN;*
*(b) Reference values from Shurson , N.D. and Weigel et al., N.D.;*
*(c) Samples analyzed at Analab, Fulton, IL.)*

*beginning and end of each distinct feeding period: on December 4, 2010, and January 9 and February 19, 2011.*

***Data Analysis—****All data were analyzed using JMP Pro 9 (SAS Institute, Cary, NC). Outliers were discarded before running statistical tests. Analyses of variance (ANOVA) were performed, and differences in means were determined using the Tukey-Kramer Honestly Significant Difference (HSD) test.*

*To compare the medium- and high-input systems to the low-input system, the average daily gain (ADG) from October 30, 2010 to February 19, 2011 of the fall-weaned calves (medium- and high-input) was compared to the ADG from October 30, 2010 to January 29, 2011 of the winter-weaned calves (low-input), as the winter-weaned calves were not weighed again on February 19. Weights were not measured for all animals in the medium- and high-input groups on October 30 so the data used were only from a subset of those animals, and the two groups had to be combined for comparison with the low-input group.*

*Whether calves had been sick with rotovirus or had been treated during the trial was not a significant effect so the data from these calves were not excluded from the analyses.*

## Results and Discussion

***Feed Supplements—During Stage 1 (stockpile grazing)****—the medium-input group had a mean ADG of 0.44 lbs. and the high-input group had a mean ADG of 0.86 lbs. (see* ***Table 3,*** *page 4). This difference was highly significant at p< 0.001. The high-input group received on average 0.97 gallons of distiller's syrup/head/day at a cost of $0.11/gal, for an additional cost of $0.11/head/day. This comes to a total additional per head cost of $3.83. Carney noted that the high-input calves would potentially have eaten more syrup if it had not frozen in the lick tubs. This could have led to even higher rates of gain in that group.*

***In Stage 2 (hay feeding)****—the mean ADG for the medium-input group was 0.63 lbs. and the mean ADG for the high-input group was 0.86 lbs. (see* ***Table 4,*** *page 4). This difference was significant at p< 0.05. The overall mean ADG for the entire trial period (stage 1 and 3) was 0.54 lbs. for the medium-input group and 0.86 lbs. for the high-input group, which was significantly different at p< 0.001. Assuming all other costs were about equal, the cost of feeding soybean hulls was $0.30/head/day or $12.23/head for all of Stage 2. During Stage 2, the high-input group received on average 0.79 gal/head/day of syrup, at a cost of $0.09/head/day, or a total per head cost of $3.73 per head.*

*The mean total pounds gained per head (both Stage 1 and 2) for the medium-input group was 41.7 lbs. and 66.1 lbs. for the high-input group. This difference was highly significant at p< 0.001. The total supplement cost for the medium-input calves was $12.23/head and $7.57/head for the high-input calves. The additional 24.4 lbs. gained per head in the high-input group cost $4.66 less than the medium-input group. Analyzed on cost alone, distiller's syrup would appear to be a far more economical feed supplement than soybean hulls. Unless distiller's syrup becomes significantly more expensive, it will likely be the more economic feed choice compared to soybean hulls.*

*Other reasons farmers would prefer soy hulls include the possibility of trace toxins or antibiotic residues in ethanol by-products (Olmstead, 2009, Zhang et al., 2009). We also must mention here that because multiple other factors differed between the two groups (different pastures, different frequency of pasture moves, different hay), we cannot say with confidence that the difference in rate of gain between the two groups was caused by just the different feed supplements. The animals were only weighed once at each weighing time, allowing the possibility for weighing errors in an instance such as if one animal just had a drink and the others had not. In order to be confident in the reproducibility*

**Table 3**

| | Diet | | | | |
|---|---|---|---|---|---|
| **Group** | **Avg. Wt. on 12/4/10** | **Avg. Wt. on 2/19/11** | **Stage 1** | **Stage 2** | **Overall** |
| | **Lbs.** | | **Average Daily Gain (lbs.)** | | |
| Medium-Input | 424 | 455 | 0.44bb | 0.63 b | 0.54 b |
| High-Input | 420 | 479 | 0.86 a | 0.86 a | 0.86 a |

***Table 3.*** *Calf start and end weights, and rates of gain for the comparison of the diets in the medium- and high-input systems. Values within a column followed by different letters are significantly different (p<0.05).*

*of these results, we would need to conduct another trial with all factors held constant other than the supplements and increase the number of groups on each diet and the number of farms participating.*

***Weaning Time—****Fall-weaned calves (a subset of the high- and medium-input systems combined) had a mean ADG of 0.40 lbs. for the period of October 30, 2010 to February 19, 2011 (see* ***Table 4****). Winter-weaned calves (low-input system) had a mean ADG of 0.45 lbs. for the period of October 30, 2010 to January 29, 2011. These differences were not significant (p=0.58). However, these groups were not treated the same. The winter-weaned calves and their mothers were grazed on stockpile for the entire trial period while the fall-weaned calves were fed either distiller's syrup or soybean hulls and hay for a part of that period. In addition, differences in the timing of the final weighing existed.*

*Also, only a subset of the high- and medium-input calves could be used in the comparison with the low-input calves, as not all of them were weighed on October 30. This loss of experimental units could have contributed to the inability to find significant differences between the systems.*

*It is, however, useful to know that without any inputs or stored feed, the calves left on their moms performed as well as the calves in the other two groups that both received supplements and stored feeds. Essentially, the milk they were receiving from the cow served as their "supplement." It is also important to note that even the high-input system in this study was relatively low-input compared to many other systems where significant amounts of grain are fed and the animals are kept in a lot or building.*

*A factor to continue monitoring in the winter-weaned group is the performance and fertility of the cows in the year following. They may have been in poorer condition coming out of the winter, potentially leading to problems with calving, milk production for their next calf (leading to low weaning weights) and rebreeding.*

*Also important to note, fescue grass in the stockpiled pastures may have led to fescue toxicosis (subacute, and therefore hard to diagnose), which may have led to reduced performance in all groups.*

## Conclusions

*Obtaining rigorous data in grazing systems, especially on working farms, can be a challenge. From this study we are able to conclude that the low-input system had the best rate of gain when compared to the average of the medium- and high-input systems, though this difference was not statistically significant. The calves in the high-input system performed better than calves in the medium-input system. However, due to multiple different treatments between the groups, we cannot confidently state which factor contributed most to this difference in performance.*

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**Table 4**

| | Weaning Date | | |
|---|---|---|---|
| **Group** | **Avg. Wt. (lbs.) on 10/30/10** | **Avg. Wt. (lbs.) on 1/29/11** | **Average Daily Gain (lbs.)** |
| Winter weaning (low-Input group) | 456 | 572 | 0.45 |
| Fall weaning (medium- and high-input groups) | 425 | 461 | 0.40 |

***Table 4.*** *Calf start and end weights, and rates of gain for the comparison of weaning dates.*