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Wintering Fall-Calving Cow Pairs by Grazing Standing Corn Plants vs. Mechanically Harvested Feeds such as Hay or Straw

A Comparison of the Performance and Economics

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Introduction

Fall calving is an alternative that may be considered by cow-calf producers. Compared to traditional spring calving, fall calving usually results in decreased calfhood losses due to inclement weather and diseases. Additionally, fall-born calves are normally marketed in the spring when feeder calf prices are historically highest. The major disadvantage of fall calving is the expense associated with wintering a lactating cow and growing calf when grazing is usually precluded by snow cover.

Standing whole corn plants have the advantage of being able to stand above heavy snow cover and withstand wind. Corn plants also can potentially produce more digestible energy per acre than most other crops. Previous work at Utah State University (Wiedmeier et al., 2003) has shown that standing whole corn plants can be successfully grazed through the winter by dry, pregnant beef cows. Cows assigned to the study gained a full body condition score during the winter indicating that this feed resource may yield adequate digestible nutrients for lactating cows and growing calves.

The objective of this study was to compare the performance and economics of fall-calving cow-calf pairs wintered by grazing standing whole corn plants with that of those wintered by feeding a traditional grass hay diet or a diet composed of ammoniated wheat straw supplemented with wheat middlings.

Materials and Methods

Forty-five (45) fall-calving (August-September) crossbred beef cows (1368 lbs) and their suckling calves (295 lbs) were stratified into nine groups of five cow-calf pairs each (three replications per group).

Approximately 3.75 acres was seeded to silage-type corn in 30 inch rows. Corn plants received recommended levels of nitrogen and standard weed and pest control measures. Irrigation water was limited to two floodings due to water restrictions. At maturity the corn plot was separated into three 1.25 acre grazing paddocks using hard electric wire. One group of five cow-calf pairs was then randomly assigned to each of the three grazing paddocks.

Grazing of the corn plants began the first week of December. Grazing was controlled using portable polywire electric fencing. Two rows of corn plants were offered to the cattle at each setting. One row remained standing while the row immediately behind was laid down using an ATV. The electric polywire was stretched over the downed row. Pairs remained within the polywire boundaries until corn plants were utilized to the desired level. The cattle then received another two-row set. Desired intake of corn plants was estimated by measuring stalks per lineal foot and regularly sampling stalk and analyzing for dry matter and nutrient content.

Six 1.25 acre paddocks were established on a plot previously harvested for corn silage using hard electric fencing. One group of five cow-calf pairs was then randomly assigned to each of these six paddocks. Paddocks were then randomly assigned to receive one of two winter feeding regimens (three paddocks per regimen): either grass hay or ammoniated wheat straw supplemented with wheat middlings. Paddocks with whole corn plants or grass hay received ad libitum access to a commercial protein-vitamin-block commonly used to supplement beef cattle during the winter. Levels of vitamins and minerals commensurate to those provided by the blocks were added to the wheat middling for cattle consuming the ammoniated wheat straw. Intake of wheat middlings was limited by mixing with varying amounts of salt. All paddocks had fresh, clean water at all times. Table 1 summarizes the nutrient content of the three winter feeds.

Table 1. Nutrient content of the grass hay, ammoniated wheat straw, wheat middlings, and corn plants used as winter feeds.

Feed	CP[1]	NDF[2]	EE[3]	Ash[4]	NDSC[5]
Grass hay	9.7	68.2	2.1	11.6	8.4
Ammoniated wheat straw	10.3	78.4	1.3	7.3	2.7
Wheat middlings	17.7	38.2	5.2	5.2	33.7
Corn plants	6.5	56.7	2.8	4.8	29.2

[1]Crude Protein; [2]Neutral Detergent Fiber; [3]Ether Extract; [4]Total Mineral Content; [5]Neutral Detergent Soluble Carbohydrate

Grass hay and ammoniated wheat straw were fed directly from medium-sized square bales. Bales were weighed and delivered as needed to feeders in appropriate paddocks allowing ad libitum access. Supplement blocks used with the grass hay and standing corn plant diets were weighed and delivered to paddocks as needed for ad libitum access. Cows and calves were weighed the first week of each month and assigned a body condition score (1-9; 1 = emaciated, 9 = obese).

Results and Discussion

Performance of cows and calves relative to winter diet is presented in Table 2.

Table 2. Body weight and body condition score changes of cows and their suckling calves wintered on grass hay, ammoniated wheat straw and wheat middling, or grazing whole standing corn plants.

	Dec-Beginning			Dec-Change			Jan-Change			Feb-Change			Total Winter Change				
Diet	Cow BW[1]	Cow BCS[2]	Calf BW	Cow BW	Cow BCS	Calf BW	Cow BW	Cow BCS	Calf BW	Cow BW	Cow BCS	Calf BW	Cow BW	Cow BCS	Calf BW	Calf WW[3]	Calf ADG[4]
GH[5]	1368	5.2	297	119	-.17	32.4	19.2	.23	57.6	39.8	-.10	61.9	60.0	-.03	192	489	2.14
SM[6]	1367	5.2	298	18.3	-.33	61.9	17.9	-.06	42.5	40.5	.10	83.3	40.2	-.3	138	436	1.53
SC[7]	1368	5.2	288	.9	-.27	49.4	1.7	.07	60.3	-8.4	.33	52.2	-5.8	.13	162	450	1.81

[1]Body Weight; [2]Body Condition Score (1= emaciated, 9=obese); [3]Weaning Weight, lbs.; [4]Average Daily Gain
[5]Grass Hay; [6]Ammoniated Wheat Straw and Wheat Middlings; [7]Standing Whole Corn Plants

- Cow performance as judged by body weight change favored the grass hay diet. However most of the change occurred in December, with changes in January and February being similar regarding all diets. Thus this difference is likely due to gut fill factor during the first month of the study.
- Cow performance as judged by body condition score change, which is more reliable than body weight change, indicated that cows on all diets maintained an acceptable score throughout the wintering period.
- The grass hay diet resulted in the highest average daily gain of calves. The ammoniated wheat straw/wheat middlings and stand corn plant diets resulted in calves gaining .61 and .33 lbs/day less than the grass hay diet. The poorer performance of the calves on the ammoniated wheat straw and standing corn plant diets may have been due to lower utilization of those diets by the calves. Calves were much less familiar with the straw and corn plants than would be the case with grass hay. In December the standing corn plant diet resulted in the lowest calf gain. Gains were similar to the grass hay diet in January and February indicating adaptation. The ammoniated wheat straw/wheat middlings diet resulted in intermediate calf gains in December but the lowest calf gains in January and February. This indicates that calves were not adapting to the straw. It was not practical to measure milk production of the cows in this study, but it is doubtful that differences in milk production could account for difference in calf gain since the performance of the cows on all diets was similar.

Dietary dry matter intake during the winter feeding period is summarized in Table 3 and actual prices of the feeds used in the study are summarized in Table 4.

Table 3. Cow-calf intake of dry matter from grass hay, ammoniated wheat straw/wheat middlings, or standing corn plants, lbs/pair.

Diet	December	January	February	Total
Grass Hay				
grass hay	1426	1384	1542	4352
block	47	23	23	93
Ammoniated Wheat Straw				
straw	889	1040	1162	3091
wheat middlings	278	228	210	716
Standing Corn Plants				
corn plants	922	1270	1405	3597
block	64	44	35	143

Table 4. Actual prices of feeds used during the study and for economic comparisons.

Feed	$/lb Dry Matter
Ammoniated wheat straw[1]	.0261
Wheat middlings[2]	.0372
Grass hay[3]	.0333
Standing corn plants[4]	.0181
Supplement blocks[5]	.1376

[1]Based on $30/ton for straw and $17/ton for ammonization, as-fed; [2]Based on $67/ton, as-fed; [3]Based on $60/ton, as-fed
[4]Based on $259.87[1]/acre growing cost and 14,380 lbs grazeable dry matter/acre; [5]Based on $275/ton, as-fed

Using the feed values listed in Table 4 and the total feed dry matter intakes summarized in Table 3, the cost of wintering (December – February) the cow-calf pairs using the three feeding systems described in this study are listed in Table 5.

Table 5. Winter feeding costs.

Diet	Total dry matter intake, lbs/pair	Cost, $/pair
Grass hay		
grass hay	4352	144.92
block	93	12.80
total	**4445**	**157.72**
Ammoniated wheat straw		
ammoniated wheat straw	3091	80.68
wheat middlings	716	26.64
total	**3807**	**107.32**
Standing Corn Plants		
corn plants	3597	64.75
block	143	19.68
total	**3740**	**84.43**

The least expensive method of wintering the cow-calf pairs was grazing standing corn plants followed closely by the ammoniated wheat straw/wheat middlings diet. It required $73.29 more to winter a cow-calf pair on grass hay compared to grazing standing corn plants. Although the cows performed similarly on the three diets, calf performance was superior on the grass hay diet. Thus a profit/loss analysis is necessary to ascertain the superior wintering method for fall cow-calf pairs.

For the profit/loss analysis we compared the ranch value of the calves (amount required to break even) with the estimated market value of the calves. Feed costs accrued in this study cover only the months of December, January and February. The "End Notes" contains information on how feed costs were calculated for each of the feeding methods. The superscripts denote which section is applicable. Thus feed costs for March and April were $49.89/cow[2] for grass hay, $44.75/cow[2] for ammoniated straw/wheat middlings, $24.23/cow[2] for standing corn plants. Feed costs May through November were estimated to be $71.02/cow[3]. We also estimated the non-feed costs to be $92.81/cow/yr[4] and the weaning percentage to be 90%[5].

Table 6. Calculations estimating the profit/loss associated with each of the three winter feeding methods.

1.) Grass hay*:
($157.72 + $49.89 + $71.02 + $92.81) / (489 lbs x .90) = $.85 / lb
Ranch Value ($.85 x 489 lbs) = $415.65
Market Value[6] ($.9966 x 489 lbs) = $487.34
Profit/ (Loss) $71.69

2.) Ammoniated straw/wheat middlings*:
($107.32 + $44.75 + $71.02 + $92.81) / (436 lbs x .90) = $.81 / lb
Ranch Value ($.81 x 436 lbs) = $353.16
Market Value[6] ($.9966 x 436 lbs) = $434.52
Profit/ (Loss) $81.36

3.) Grazed standing whole corn plants*:
($84.43 + $24.23 + $71.02 + $92.81) / (450 lbs x .90) = $.68/ lb.
Ranch Value ($.68 x 450 lbs) = $306.00
Market Value[6] ($.9966 x 450 lbs) = $448.47

Profit/ (Loss)	**$142.47**

*The calculation of the breakeven price needed for weaned calves is:
(Study feed cost + March-April feed cost + May-November feed cost + non-feed cost) / (weaning weight of calves x weaning percentage)

The profit/(loss) value generated by each of the three winter feeding methods does not include land or land opportunity cost associated with the feeding methods. In Table 7 we used a $1,500/acre land cost amortized over 30 years at an adjusted discount rate of 2% (reflecting appreciation in land values) to determine an Annual Amortized Land Cost (AALC) assuming100% has to be paid for (i.e., considering full opportunity cost). By subtracting the AALC (or opportunity cost) for our correlating land payment from the profit/loss estimate of the desired feeding method we are able to determine a profit/loss estimate that includes land or opportunity costs. For example, if the payment is 50% the correlating AALC is $33.49. If our winter feeding method is grass hay our profit/loss estimate is $38.20 including land cost ($71.69 - $33.49 = $38.20).

Table 7. Calculations estimating the profit/loss associated with each of the three winter feeding methods including land or opportunity costs.

Land Payment Balance		**AALC**	**GH**	**AWS/WM**	**SCP**
			$71.69	**81.36**	**142.47**
$1,500.00	Full Payment	($66.97)	$4.72	$14.39	$75.50
$1,350.00	90% Payment	($60.28)	$11.41	$21.08	$82.19
$1,200.00	80% Payment	($53.58)	$18.11	$27.78	$88.89
$1,050.00	70% payment	($46.88)	$24.81	$34.48	$95.59
$ 900.00	60% Payment	($40.18)	$31.51	$41.18	$102.29
$ 750.00	50% Payment	($33.49)	$38.20	$47.87	$108.98
$ 600.00	40% Payment	($26.79)	$44.90	$54.57	$115.68
$ 450.00	30% Payment	($20.09)	$51.60	$61.27	$122.38
$ 300.00	20% Payment	($13.39)	$58.30	$67.97	$129.08
$ 150.00	10% Payment	($6.70)	$64.99	$74.66	$135.77
$ -	0% Payment	$0.00	$71.69	$81.36	$142.47

Table 7 is provided to more accurately estimate unique returns using the three winter feeding methods. Land payments may be higher or lower than the $1,500/acre used in this analysis. In addition, it may or may not be desirable to take into account land opportunity costs. In any case, Table 7 provides information that will allow the reader to come to a more accurate return using their desired parameters.

End Notes:

1. Growing cost for standing corn plants – 2002 Utah Agricultural Statistics and Utah Department of Agriculture and Food Annual Report Enterprise Budget: Corn Silage page 127.
2. Based on dry cow requirements (calves were weaned March 1) of 24.56 lbs DM/cow/day for grass hay, 21.12 lbs DM/cow/day for ammoniated wheat straw and 4.9 lbs DM/cow/day for wheat middlings, 21.94 lbs DM/cow/day for standing corn plants and prices listed in Table 4.
3. Fuego Tall Fescue/Ambassador Orchard grass mix annual maintenance cost of 139.72/acre based on Utah Pasture Handbook 2002 “Pasture Establishment and Maintenance Budgets,” by Dr. Don Snyder, published by Utah State University Extension and the Utah Agriculture Experiment Station. Pasture yield of 6.2 tons dry matter and requirements of 46 lbs/DM pair/day May through October based on Utah State University Extension “Comparative Productivity of Five Cool-Season Pasture Grasses Under Intermittent Flood Irrigation Grazed by Beef Cow-Calf Paris Using Management Intensive Grazing Practices,” January 2004, AG/2004/Beef-01. November aftermath and mineral costs based on 1997 Utah Agricultural Statistics and Utah Department of Agriculture and Food Annual Report Enterprise Budget: Cow-Calf page 116.

4. 1997 Utah Agricultural Statistics, and Utah Department of Agriculture and Food Annual Report Enterprise Budget: Cow-Calf page 116.
5. Mark E. Nelson “Calving Season Strategies,” Kansas State University Cooperative Extension Service, October 1988.
6. Average Price (450 lb steers) for first week of March 1990-2004-Utah Department of Agriculture and Food Market News. In the analysis we did not include a slide for the weight difference between the three groups of calves due to their light weights.

Conclusions

From this study and analysis it is apparent there are alternative methods to wintering fall calving beef cows in the Intermountain West. Traditionally, harvested grass hay has been fed but usually at a cost that is higher than non-traditional approaches such as those investigated here. Grazing standing whole corn plants requires further study with additional years of data to determine productive and economic viability.

References

Wiedmeier, R.D., D. Snyder, D.R. ZoBell and K.C. Olson. 2003.
http://extension.usu.edu/files/factsheets/zobellfin2.pdf