Beef Systems Grazing Strategies: Effect on Backgrounding and Finishing Net Return

Progress Report

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Abstract: Cow-calf pairs, grazing native range, from the NDSU-Dickinson RE Center and the SDSU-West River Ag Center (n = 159) were used to evaluate weaning date and backgrounding method. Treatments were: 1) Normal Wean (Jun-Nov) - feedlot direct (NW-FLT), 2) Early Wean (Aug) – feedlot direct (EW-FLT), 3) Early Wean (Aug) - grazed dryland unharvested corn (Aug-Nov) - feedlot (EW-CN), and 4) Normal wean (Nov) - grazed dryland unharvested corn (Nov-Dec) - feedlot (NW-CN). Feedlot arrival date for finishing at the UNL-Panhandle RE Center feedlot, Scottsbluff, NE was staggered. Harvest end point was based on ultrasound BF depth. Mean differences were determined using the SAS MIXED procedure. For backgrounding, EW-CN and EW-FLT steer growth was similar and more rapid [(Gain: (P = 0.043) and ADG: (P = 0.004)] than NW-FLT and NW-CN. The EW-CN system COG of $1.05/kg was lowest when compared to $1.31, $3.77, and $1.37/kg for the NW-FLT, NW-CN, and EW-FLT, respectively. Stockpiling corn resulted in excessive crop shrink (P = 0.013) reducing days of grazing by 70%. Backgrounding net returns/steer were $87.50, -$33.38, $104.58, and $69.56 for the NW-FLT, NW-CN, EW-CN and EW-FLT, respectively. The value of backgrounded beef produced per acre from corn grazing when expressed as bushels per acre was 87.5 and 26.2 bu/acre for the EW-CN and NW-CN, respectively. For finishing, EW-FLT steers grew slower (P = 0.0011), consumed less DM/d (P = 0.0001), were more efficient (P = 0.008), and COG was lower (P = 0.0002). Carcass closeout values for HCW, FD, dressing %, and YG did not differ; however, EW-FLT steer carcasses had smaller REA (P = 0.053), greater marbling score (P = 0.0005), and numerically greater % Choice quality grade (P = 0.11). EW-FLT steers placed directly in the feedlot at weaning were associated with lower placement cost, more DOF (P = 0.0001), and higher feed and yardage costs. Net return to finishing of $39.62 per head for the EW-FLT was greater, when compared to $3.11, -$84.06, and $0.16 for the NW-FLT, NW-CN, and EW-CN, respectively. Experimental results suggest that greatest beef systems net return will be obtained when EW steers graze dryland unharvested corn and are sold at the end of backgrounding; however, when held through final harvest, early weaning and direct feedlot placement were associated with greatest net return.

Introduction

Previous research has evaluated forage utilization by early (August - EW) vs normal (November - NW) weaned beef cows and the effect of weaning date on cow and calf performance. These studies show that weaning calves early has a positive impact on growth and efficiency during the backgrounding phase, improves cow body condition score, reduces range forage utilization, and shortens the lifetime feeding period of steers held for retained ownership (Landblom et al., 2006). Economic analysis of retained ownership concluded that early weaning improved feedlot production efficiency by reducing daily and per carcass revenue relative to normal weaning (Fausti et al., 2007). And subsequently, Landblom et al. (2008) documented that significantly altering weaning date can have a positive impact on business profitability in the beef cattle enterprise. The objective of this study was to evaluate the effect of weaning date (August vs November) and backgrounding method on backgrounding and finishing net returns.

Materials and Methods

Spring calving cows (Mar-Apr) originating at the South Dakota State University Antelope Station (ANT), Buffalo, SD, and the North Dakota State University Dickinson Research Extension Center (DREC), Manning, ND were used in a 2 x 2 factorial arrangement comparing weaning date (August vs November) and backgrounding method (feedlot vs grazing dryland unharvested corn). Pen or pasture served as the experimental unit and backgrounding, finishing, and carcass data were analyzed using the

SAS MIXED procedure. The protocols used in this study were approved by the North Dakota State University Animal Care and Use Committee.

Steer calves in the EW system were weaned on August 15 and calves in the NW system were weaned the first week of November. At each weaning date, steers from each research facility were randomly assigned to either feedlot or corn grazing backgrounding treatments. Corn grazing steers were held in drylot and fed hay for two weeks before being put into replicated dryland unharvested corn fields. Early weaned steers began grazing unharvested corn on August 25th and the NW steers began grazing corn on November 21st. For the feedlot treatment, EW and NW steers were shipped by commercial truck to the University of Nebraska Panhandle Research Extension Center feedlot, Scottsbluff, Nebraska where they were finished and harvested at a commercial Abattoir. Steer weight and backfat depth of 12.7 mm were used to determine final harvest endpoint. Measurement for backfat depth was conducted 30 – 45 days before final harvest using a SonoVet ultrasound machine and 3.5 MHz probe. Final harvest date was determined by calculating the required number of DOF to attain 12.7 mm BF.

Systems measurements were: corn forage nutrient change, corn forage utilization, backgrounding performance type and economics, treatment effect on animal health, corn grazing grain equivalent value, finishing performance and economics, and carcass closeout values.

Steers in the systems investigation were vaccinated before spring turnout on native pasture and then were vaccinated 3-4 weeks before each weaning date, and again at weaning with modified live IBR, BVD types I and II, $PI_{3,}$ BRSV + Mannhiema haemolytica, and an inactivated 7-way Clostridial vaccine + H. somunus. In addition, the calves were poured with a parasiticide. After weaning, the calves were observed closely for the onset of health problems and were treated according to the attending veterinarian's recommendation. The following information is being recorded: body temperature, number of pulls, product used for treatment and cost, percent death loss, and system cost due to death loss.

Results and Discussion

Systems Backgrounding - Considering the results of Fausti et al. (2007) in the previous study, the present investigation was conducted to compare calf growing methods for EW and NW calves after weaning that compared feedlot backgrounding with grazing unharvested dryland corn before finishing based on a high quality grid. Standing peak dryland corn forage nutrient quality was determined mid-September and tracked through to mid-January. Corn forage CP declined from Sep to Nov (9.16 to 8.66) and IVDMD declined from 75.2% to 57.0% (Table 1).

Peak DM corn production for the EW steers averaged 2.20 Ton/acre (Table 2) and peak DM corn production for the NW group was 1.93 Ton/acre (Table 3). Early weaned steers utilized an average 1.46 Ton/acre over the 70 day grazing period and NW steers utilized 0.41 Ton/acre. Field loss in stockpiled corn set aside for grazing after normal weaning was excessive averaging 0.90 Ton/acre. Compared to the EW treatment, the large field loss reduced available days of grazing by 70%.

Comparative systems backgrounding performance is shown in Table 4. Steer weight at EW did not differ (P=0.44), but gain among the NW-CN steers was reduced significantly (P=0.043) due to field crop shrink. Average daily gain for EW and NW steers was similar and greater (p=0.004) than the control steers despite significant crop shrinkage. System backgrounding economics are shown in Table 5 where gain value, input costs, net returns, and cost/kg of gain are summarized. The backgrounding cost/lb. of gain was $0.5933, $1.71, $0.5097, and $0.6564 for the NW-FLT, NW-CN, EW-CN, and EW-FLT, respectively. Net return/steer among the steers in EW-CN system was 33.5% greater than the EW-FLT system and 16.3% greater than the NW-FLT system. Stockpiling corn for grazing after normal weaning was not successful resulting in a net loss/steer of -$33.38. The stocking rate for early weaned calves that grazed unharvested dryland corn was calculated to be 0.25 acres/calf/month and the stocking rate for stockpiled corn reserved for unharvested corn gazing after normal weaning was determined to be 0.82 acres/calf/month (Table 6). Following grazing by calves, cows grazed stalk residue. Stalking rate for cows expressed in acres/cow/month is shown in Table 6 for 1,000, 1,200, and 1,400 pound cows. The stocking rate for 1,200 pound cows grazing corn stalk residue previously grazed by EW and NW calves was 0.70 and 0.87 acres/cow/month, respectively.

For the purpose of comparing beef production from corn grazing during backgrounding with grain production, steer net return value per acre after expenses was converted to a corn grain equivalent yield per acre. Comparative values are shown in Table 7 over a range of corn prices per bushel from $3.00 to $5.00/bu. At $4.00/bu, the corn equivalent value of beef produced among the EW steers was equivalent to 87.5 bushels of corn/ac. The corn equivalent value of beef produced among the NW steers was equivalent to 26.2 bushels of corn/ac.

The effect of alternative weaning date and corn grazing on finishing performance is shown in Table

8. Early weaning and corn grazing backgrounding resulted in variable feedlot starting weights (P = 0001), and a large variation in the number of days on feed (P = 0.0001); however, harvest age (P = 0.27) and 4% shrunk harvest weight (P = .409) did not differ. For gain and FE, EW-FLT steers gained at the slowest rate (P = 0.001), were more efficient (P = 0.008), and feed and yardage cost/lb. of gain were lower (P = 0.0002). By contrast, EW-CN steers that were the most profitable at the end of corn grazing backgrounding were less efficient (P = 0.008) and feed and yardage cost/lb. of gain was higher (P = 0.0002) during retained ownership finishing. The NW-CN steers that grazed stockpiled dryland corn were the least efficient (P = 0.008) and had the highest feed and yardage cost/lb. of gain (P = 0.0002).

The primary health issue was bovine respiratory disease, which has been summarized in Table 9. The incidence of BRD among EW steers sent directly to the feedlot after weaning mid-August was markedly greater than for any of the later arriving treatment groups and treatment cost was 3.5 times greater than either the control or treatment groups that grazed corn during backgrounding.

The effect of alternative weaning date and corn grazing on carcass closeout measurements is shown in Table 10. Carcass closeout values for HCW (P = 0.78), dressing percent (P = 0.51), fat depth (P = 0.243), and yield grade (P = 0.23) did not differ. Corn grazing steers had significantly larger ribeye area (p = 0.053). Days on feed, which varied due to management system, directly affected marbling score (P = <0.0001) and the number of carcasses that grading USDA Choice or better (P = 0.10). The number of days on feed and the percent USDA Choice were 141.5/66.7%, 165.7/79.2%, 192.0/81.1%, and 280.8/94.4% for the NW-CN, EW-CN, NW-FLT, and EW-FLT, respectively.

The combined effect of calf placement cost, ingredient cost, treatment cost, freight, and interest cost affected finishing net return and are shown in Table 11. Calf placement cost had the most influence on net return. Closeout net returns were $3.11, -$84.06, $0.16, and $39.62/head for the NW-FLT, NW-CN, EW-CN, and EW-FLT, respectively.

Implications

Results suggest that greatest beef systems net return will be obtained when EW steers graze dryland unharvested corn and are sold at the end of backgrounding; however, when held until final harvest, early weaning and direct feedlot placement were associated with greatest net return.

This project is scheduled to be repeated during the 2008-2009 production year.

Acknowledgement

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Table 1.Corn Nutrient Change (Sept. – Jan.)

	C- Prot	*NDF*	*ADF*	*IVDMD%*	*IVOMD*	*Ca*	*P*
	%	%	%	%	%	%	%
Whole Plant/Stalks:							
Sept. 25, 2007	9.16	61.0	30.0	75.2	74.8	0.20	0.16
Nov. 15, 2007	8.66	70.2	40.5	59.0	57.0	0.23	0.12
Jan. 12, 2008(Residue)	4.36	79.8	50.3	43.5	40.9	0.32	0.05
Corn Grain:							
Sept. 25, 2007	14.1	12.2	3.10	90.8	90.4	0.03	0.37
Cobs:							
Sept. 25, 2007	4.33	81.5	39.2	64.1	63.1	0.01	0.12
Litter (trash on ground):							
Jan. 12, 2008	9.57	72.1	36.7	64.7	64.8	0.31	0.11

Table 2. Early Wean Corn Utilization

	Peak	*Calf*	*Cows*
	Production T/Ac	Utilization T/Ac	Residual Stalks T/Ac
Fields:			
4	2.05	1.11	0.94
6	1.92	1.24	0.68
8	2.64	2.02	0.62
Total Tons	6.61	4.37	2.24
Avg DM, T/Ac	2.20	1.46	0.75

Table 3. Normal Wean Corn Utilization

	Peak Production Sept	*Start Graze Nov*	*Field Loss*	*Calf Utilization*	*Cows Residual Stalks*
	T/Ac	T/Ac	T/Ac	T/Ac	T/Ac
Field					
5	2.11	1.18	0.93	0.54	0.64
7	1.6	0.89	0.71	0.27	0.62
9	2.08	1.02	1.06	0.41	0.61
Total Tons	5.79	3.09	2.70	1.22	1.87
Avg DM, T/Ac	1.93	1.03	0.90	0.41	0.62

Table 4. Alternative Beef System Backgrounding Performance

	NW- Control Pasture	*NW – Corn Grazing*	*EW – Corn Grazing*	*EW – Feedlot*	*SE*	*P-Value*
Weaning Date	Nov 7	Nov 7	Aug 15	Aug 15		
No. Steers	54	24	24	57		
Pre-Unhvsted Corn Grazing (Drylot):						
Days in Drylot[a]	----	13	13	----		
Drylot St. Wt.(Aug 15, Nov 7), lb	----	627	468	----		
Drylot End Wt., lb	----	639	481	----		
Drylot Gain, lb	----	12.0	13.0	----	2.91	0.52
Drylot ADG (Drylot), lb	----	0.923	1.00	----	0.22	0.53
System Days	84	21	70	86		
System Wt at Ely Wean (Aug 15) lb	436	457	468	405	22.1	0.44
System End Wt., lb	600	693	662	611	33.19	0.15
Gain, lb	164[ab]	54[b]	181[a]	206[a]		0.043
ADG, lb	1.95[b]	2.57[a]	2.59[a]	2.40[a]	0.126	0.004

[a]Weaned steers were held in drylot for 13 days before placement in the corn fields to get over weaning.

Table 5. Alternative Beef System Unharvested Corn, Pasture, and Feedlot Economics (2007)

	NW- Ctrl Pasture/ Feedlot	*NW – Corn Grazing*	*EW – Corn Grazing*	*EW – Feedlot*	*SE*	*P-Value*
No. Steers	54	24	24	57		
Gain Value [a,b,c,d]	$9,979	$1,413	$4,724	$10,980		
Input Cost:						
Pasture (Rent @$14.00/ac)[e]	$5,254					
Corn ($164/ac)		$2,214	$2,214			
Feedlot				$7,302		
Backgrounding Net Return	$4,725	-$801	$2,510	$3,678		
Backgrounding Net Return/Head	$87.50	-$33.38	$104.58	$69.56		
Cost/Lb. Gain	$0.5933	$1.71	$0.5097	$0.6564		

[a]NW Control Gain Value (8,910lb@$112/cwt)
[b]NW Corn Grazing Gain Value (4,334lb@$109/cwt)
[c]EW Gain Value (1,296lb@$109/cwt)
[d]Gain Value (9,804lb@$112/cwt)
Pasture Rent Calculation: 2.78 months, 2.5 AUM; = 6.95 Ac/AUM @ $14/Ac; = $97.30 x54 = $5,254.20

Table 6. Steer and Cow Stalking Rate for Unharvested Corn and Stalk Residue Grazing

	Normal Weaned Cows	*Normal Weaned Steers*	*Early Weaned Cows*	*Early Weaned Steers*
Steer Unharvested Corn, Ac/Steer/Month		0.82		0.25
Corn Residue, T/Ac	0.624		0.748	
Stalk Residue Requirement, Ac/Cow/Month				
1,000 Lb Cow	0.73		0.59	
1,200 Lb Cow	0.87		0.70	
1,400 Lb Cow	1.02		0.82	
Residue Value @$40/Ton Hay Equivalent	$337.00		$420.00	

Table 7. Corn Grazing Grain Equivalent, Bu/Acre

	Corn Bushel Price	*Early Wean – Grain Yield Equivalent*	*Normal Wean – Grain Yield Equivalent*
Steer Grazing Gain Value	$3.00	116.6	34.9
	$4.00	87.5	26.2
	$5.00	70.0	20.9
Corn Stalk Residue Grazing (Cows)	$3.00	10.4	8.3
Based on $40/Ton Hay	$4.00	7.8	6.2
	$5.00	6.2	5.0
Combined Steer Gain and Cow	$3.00	127.0	43.2
Stalk Grazing Value	$4.00	95.3	32.4
	$5.00	76.2	25.9

Table 8. Effect of Alternative Weaning Date and Corn Grazing on Steer Finishing Performance

	NW- Control Pasture/F-lot	*NW – Corn Grazing*	*EW – Corn Grazing*	*EW – Feedlot*	*SE*	*P-Value*
Start Wt., lb	600.0[c]	747.7[b]	690.3[d]	404.8[a]	0.00	<0.0001
Shrunk Finished End Wt., lb[a]	1186.9	1224.0	1249.9	1203.1	23.01	0.409
Days on Feed	192[d]	141.5[b]	165.7[c]	280.8[a]	3.44	<0.0001
Kill Age, Days	408.1	415.1	404.6	412.1	3.17	0.270
Gain, lb	586.9[c]	476.3[b]	559.6[d]	798.3[a]	9.46	0.0001
ADG, lb	3.06[b]	3.37[c]	3.38[c]	2.85[a]	0.056	0.0011
Fd/Head/Day (As Fed), lb	29.7[b]	36.0[d]	33.0[c]	27.0[a]	0.749	<0.0001
Fd/Head/Day (Dry Matter), lb	20.2[b]	24.5[d]	22.4[c]	17.8[a]	0.506	<0.0001
DM Feed:Gain, lb	6.60[b]	7.27[c]	6.62[b]	6.27[a]	0.157	0.008
Fd & Yard Cost/Day, $	$2.096[b]	$2.723[d]	$2.383[c]	$1.715[a]	0.053	<0.0001
Fd & Yard Cost/Lb of Gain, $	$0.6850b	$0.8080c	$0.7050b	$0.6017a	0.016	0.0002

[a] 4% Shrink

Table 9. Alternative Production Effect on Health Pulls and Treatment Costs

	NW- Control Pasture/Feedlot	*NW – Corn Grazing*	*EW – Corn Grazing*	*EW – Feedlot*
Pulls: 1	3.7%	3.75%	0.0%	17.5%
2				8.77%
3				3.51%
Avg. Treatment Cost/Head	$1.72	$3.87	$0.0	$9.92

Table 10. Effect of Alternative Weaning Date and Corn Grazing on Carcass Measurements

	NW – Control Pasture/F-Lot	***NW – Corn Grazing***	***EW – Corn Grazing***	***EW – Feedlot***	***SE***	***P-Value***
Hot Carcass Wt., lb	737.8	745.3	762.9	745.5	14.77	0.78
Carc. Dressing Percent, %	62.0	60.6	61.1	60.6	0.72	0.51
Ribeye Area, sq. in.	11.51[b]	12.3[a]	12.3[a]	11.7[b]	0.17	0.053
Fat Depth, in.	0.586	0.547	0.581	0.638	.0304	0.243
Yield Grade[a]	3.46	3.35	3.45	3.59	0.075	0.229
Marbling Score	442[b]	438[b]	453[b]	539[a]	12.75	0.0005
% Choice Carcasses	81.1	66.7	79.2	94.4	6.32	0.109

[a]Yield Grade correlation to percentage of boneless, closely trimmed retail cuts: 1 = 54.6%, 2 = 52.3%, 3 = 5.0%, 4 = 47.7%, and 5 = 45.4%

Table 11. Effect of Alternative Weaning Date and Corn Grazing on Finishing Economics

	NW – Control Pasture/ F-lot	***NW – Corn Grazing***	***EW – Corn Grazing***	***EW – Feedlot***
Expenses:				
Calf Value	$666.00	$783.22	$724.50	$566.72
Feed and Yardage	$402.06	$384.85	$394.52	$480.34
Treatment Cost	$1.72	$3.87	$0.0	$9.92
Freight ($4.5/mile; 425 miles)	$23.90	$29.88	$27.71	$16.20
Interest @ 6.0%	$34.18	$27.55	$30.90	$49.00
Total Expense	$1,127.86	$1,229.37	$1,177.63	$1,122.18
Carcass Value	$1,130.97	$1,145.31	$1,177.79	$1,161.80
Profit (Loss)	$3.11	-$84.06	$0.16	$39.62

Safe-Zone Project: Southwest North Dakota Market Cow Survey

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Introduction

Beef producers often consider market cows as "culls" instead of considering them as a significant food source. According to the North Dakota Farm Business Management program (2007), approximately 15% of cows and bulls in the North Dakota program are replaced annually. Sale of these market animals amounts to approximately 17.7% of total returns to the cow-calf business in North Dakota (ND Farm Bus. Mgmt. Program, 2007). This compares closely with national herd replacement sales and total returns of approximately 16% (National Market Cow and Bull Beef Quality Audit, 2007).

The National Market Cow and Bull Beef Quality Audit (C&B-BQA) was established in the early 1990s to assist producers in recognizing and optimizing cattle value, to monitor the health status of the national cow herd, to encourage marketing cattle in a timely and appropriate manner, to demonstrate ways that will prevent quality defects in market animals, and to encourage producers to be proactive in ways that will ensure a that the consuming public has a safe and wholesome beef supply (National Cow and Bull Beef Quality Audit, 2007).

Considering the goals of the National Market Cow and Bull Beef Quality Audit, a sample of market cows from four southwestern ND ranches were gathered and marketed through Long Prairie Packing Company, Long Prairie, Minnesota to document critical market cow management checkpoints to include drug residue surveillance, bruise trim-out, disease condemnation, cow condition, and the relationship of cow condition to carcass closeout values.

Cows committed to the project, which originated from participating ND Beef cattle Improvement Association members, were delivered to Stockmen's Livestock Exchange, Dickinson, ND on November 5 and 13, 2008. Prior to shipment the cows were processed, which included recording individual cow ID, age, weight, body condition score (BCS), sample collection (blood, fecal, and ear notch), and USDA backtag. Samples collected were forwarded to the NDSU Veterinary Diagnostic Laboratory for BVD virus types I and II, Johne's disease (Mycobacterium paratuberculosis), and Bovine Leukemia virus analysis. Additionally, drug residue analysis (penicillin, gentamicin, sulfamethazine, oxytetracycline, and tilmicosin) was conducted at the packing plant during routine surveillance. Data received from the packing plant included hot carcass weight (HCW), grade, trim (light, medium, or heavy), carcass value per hundredweight ($90.00/cwt base price), dressing percent, and carcass value.

Market Cow Results –

Testing for drug residues (penicillin, gentamicin, sulfamethazine, oxytetracycline, and tilmicosin) and viruses were negative for all cows in the survey. Trim due to bruising was minimal; however, trim can be excessive when market cows and bulls are handled roughly, prodded with electric prods, or transported as mixed loads. Market cows are a significant food source and need to be handled as a perishable product.

Laboratory analysis results for BVD virus Types I and II, Johne's disease, and Bovine Leukemia virus were negative for all cows in the survey.

Information obtained from the market cow survey is summarized in Tables 1 and 2. Freight charges for hauling the cows to Long Prairie Packing were $4.17/loaded mile for the first load ($47.24/cow) and $4.41/loaded mile ($44.05/cow) for the second load. The tables were prepared following an initial database sort based on hot carcass weight followed by grouping the cow's into100 pound hot carcass weight categories. In Table 1, cow age, BCS, origination weight, harvest weight, and transit shrink are summarized. With one exception, as cow age increased, BCS, origination weight, and harvest weight increased also; however, increasing cow age did not appear to influence transit shrinkage which averaged 5.43%.

Table 2 summarizes packing plant closeout values. As cow age and weight increased, hot carcass weight, dressing percent, carcass grade, and total carcass value improved. Young, thin cows with carcass weights less than 500 pounds had very low dressing percent, carcass grade, and carcass values averaged $394.00/cow. In the C&B-BQA 21% of all carcasses were too light (<500 pounds) and 27% were too heavy (>1,000 pounds). Although the southwestern ND survey includes a much smaller number of cows, the array of hot carcass weights was similar. The carcass value differential among cows in the survey ranged from a low of $394.22 to a high of $838.80with a median carcass value of $619.07. Comparing the lightest hot carcass weight group to the median carcass value, there is a difference of $224.85, which is a significant improvement in market cow value. The data in this survey indicates that there is sufficient economic incentive for producers to predetermine the cows they plan to remove from the herd and early wean their calves or put them on feed after weaning. When lactation is terminated by early weaning, cows will regain body condition rapidly while grazing native range. Depending on weaning date, early weaned cows can gain one body condition score (80 pounds) or more depending on the length of the grazing period.

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Table 1. Market Cow Survey Sorted by hot carcass weight: Age, BCS, Weight and Transit Shrink

Carcass Wt. Range	No. Head	Group Pct	Cow Age	Origination BCS	Origination Weight	Harvest Weight	Pct Shrink
Averages			6.47	5.17	1395.3	1319.3	5.43
Total Cows	79						
<499	8	10.1	5.0	4.1	1001.3	944.9	5.63
500-599	25	31.6	6.4	4.6	1184.6	1121.1	5.36
600-699	30	38.0	7.2	5.2	1347.8	1279.1	5.09
700-799	12	15.9	7.0	5.4	1486.3	1404.3	5.52
800-899	3	3.8	8.4	6.3	1631.7	1549.7	5.02
900-999	1	1.27	4.8	5.5	1720.0	1616.9	6.00

Table 2. Market Cow Survey Sorted by Hot Carcass Weight: HCW, Grade, Trim, and Carcass Value

Carcass Wt. Range	No. Head	Cow Age	HCW	Dressing Percent	Carcass Grade	Trim[a]	Carcass Value/CWT	Total Carcass Value
Averages		6.47	687.9	51.61	2.86	0.83	$90.00	$619.07
	79							
<499	8	5.0	438.3	46.5	1.38	1	$89.88	$394.22
500-599	25	6.4	546.1	48.8	2.0	2	$90.14	$492.29
600-699	30	7.2	642.7	50.4	2.6	1	$90.17	$579.47
700-799	12	7.0	726.2	51.8	3.2	0	$90.33	$655.94
800-899	3	8.4	842.0	54.5	4	1	$89.50	$753.69
900-999	1	4.8	932.0	57.6	4	0	$90.00	$838.80

Safe-Zone Project: Cow and Calf Pathogen Survey

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Project Brief

Foodborne illnesses in the United States (US) are caused by a wide variety of microorganisms and are estimated to cause 76 million illnesses, 325,000 hospitalizations, and 5,000 deaths annually (Mead et al., 1999).

In the United States, *E. coli* O157:H7 is the most common microbial cause of bloody diarrhea and hemolytic uremic syndrome (HUS), which can lead to acute renal failure and death among humans (CDC 2009; Garg et al., 2003). Undercooked or raw ground beef (hamburger) has been implicated in many Center of Disease Control (CDC) documented outbreaks resulting in a substantial health burden in the United States. Cattle feeding practices have been identified as either the main source of infection or indirectly through contaminated irrigation water. Direct contamination of meat occurs when contaminated hides come in contact with carcasses during skinning and illness in humans is frequently associated with consumption of undercooked hamburger. Effective preharvest intervention strategies that will reduce the proportion of cattle carrying pathogenic *E. coli* may reduce human exposure to this pathogen.

Of all food borne pathogens that affect humans, *Salmonella* is widely considered to be one of the most important. A foodNet report estimated *Salmonella* related infections in the US to be 1.4 million illnesses, 15,000 hospitalizations and 400 deaths annually (Voetsch et al., 2004). .

Among the many *Salmonella* serotypes, the most common associated with infection in humans are S. typhimurium and S. enteritidis. *Salmonella* can live in the intestinal tracts of humans, other animals, and birds. Foods of animal origin may be contaminated with *Salmonella*; therefore, eating raw or undercooked eggs, poultry, or meat can cause infection. Foods prepared with raw eggs can be an unrecognizable origin of contamination. Meat from poultry and ground beef are sources of contamination that should be well cooked before consumption.

The ability of Salmonella to become resistant to antimicrobials has hampered efforts in treating illnesses caused by this pathogen and has made the production and tracking of food products, especially those from cattle, more important. Antimicrobial resistance is the ability of microorganisms to evade the effects of antimicrobials through newly developed biological mechanisms (CDC, 2008). The ability of microorganisms to evade or to become resistant to antimicrobials can be acquired through integrons, which are genes that consist of a central variable region that often harbors antibiotic-resistance gene cassettes (Amita et al., 2004).

Using cow-calf pairs located at the Dickinson Research Extension Center, the purpose of this pathogen survey project is to track the prevalence of pathogenic *E. coli* and *Salmonella* serotypes through the production continuum beginning on fall native range and ending at final harvest (steer calves). *Objectives*: (1) Determine seasonal prevalence change for pathogenic *E. coli* that carry shiga toxin genes and *Salmonella* spp., (2) Determine the level of antimicrobial resistance (AMR) and multidrug resistance in Salmonella strains isolated from beef cattle at different stages of production, and (3) Determine the association between the presence of Integron-1and AMR to 15 different antimicrobials (amikacin, amoxicillin/ clavulanic acid, ampicillin, ceftiofur, chloramphenicol, ciprofloxacin, gentamicin, kanamycin, nalidixic acid, streptomycin, sulfizoxazole, and trimethprim-sulfamethoxazole) in isolated *Salmonella* strains.

Fecal grab samples and rectoanal swab samples are being collected beginning before weaning on fall pasture and continuing through weaning, mid-winter (Feb), at spring pasture turnout on improved crested wheat, and on pasture mid-summer. The calves will be sampled on fall pasture, at weaning, at the end of unharvested corn grazing, midway through the finishing period (Feb), and just prior to final harvest. Laboratory isolation and definitive PCR serotype determinations will be conducted under the direction of Dr. Margaret Khaitsa, Veterinary Epidemiologist, NDSU Veterinary and Microbiological Sciences Department.

Expected outcomes include: (1) Establishment of seasonal shedding patterns for shiga toxin producing *E. coli* serotypes and *Salmonella* spp., (2) Establishment of antimicrobial resistance patterns of Salmonella isolated from beef cattle throughout the production continuum, (3) Establish the connection between Integron-1 presence and resistance patterns to the antimicrobials tested.

Information obtained from the survey will be used to develop intervention strategy research originating at the ranch level and carrying over into the feedlot.

When this research brief was prepared, the spring and summer cow samples remained to be collected. For the feedlot steers, fecal grab, rectoanal swab, and mid-line hide samples remain to be collected prior to final harvest. Data will be presented in the next annual report.

Acknowledgement

Without the expert assistance of the following individuals this project could not be conducted: Mick Riesinger, Garry Ottmar, Wanda Ottmar, Bob Paluck, Chad Smith, and Dawn Doetkott.

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BEEF SYSTEM METHODS IMPACT BACKGROUNDING AND FINISHING NET RETURNS

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Abstract: Cow-calf pairs, grazing native range, from the NDSU-Dickinson RE Center and the SDSU-West River Ag Center (n = 159) were used to evaluate weaning date and backgrounding method. Treatments were: 1) Normal Wean (Jun-Nov) - feedlot direct (NW-FLT), 2) Early Wean (Aug) – feedlot direct (EW-FLT), 3) Early Wean (Aug) - grazed dryland unharvested corn (Aug-Nov) - feedlot (EW-CN), and 4) Normal wean (Nov) - grazed dryland unharvested corn (Nov-Dec) - feedlot (NW-CN). Feedlot arrival date for finishing at the UNL-Panhandle RE Center feedlot, Scottsbluff, NE was staggered. Harvest end point was based on ultrasound BF depth. Mean differences were determined using the SAS MIXED procedure. For backgrounding, EW-CN and EW-FLT steer growth was similar and more rapid [(Gain: (P = 0.043) and ADG: (P = 0.004)] than NW-FLT and NW-CN. The EW-CN system COG of $1.05/kg was lowest when compared to $1.31, $3.77, and $1.37/kg for the NW-FLT, NW-CN, and EW-FLT, respectively. Stockpiling corn resulted in excessive crop shrink (P = 0.013) reducing days of grazing by 70%. Backgrounding net returns/steer were $87.50, -$33.38, $104.58, and $69.56 for the NW-FLT, NW-CN, EW-CN and EW-FLT, respectively. For finishing, EW-FLT steers grew slower (P = 0.0011), consumed less DM/d (P = 0.0001), were more efficient (P = 0.008), and COG was lower (P = 0.0002). Carcass closeout values for HCW, FD, dressing %, and YG did not differ; however, EW-FLT steer carcasses had smaller REA (P = 0.053), greater marbling score (P = 0.0005), and numerically greater % Choice quality grade (P = 0.11). EW-FLT steers placed directly in the feedlot at weaning were associated with lower placement cost, more DOF (P = 0.0001), and higher feed and yardage costs. Net return to finishing of $39.62 per head for the EW-FLT was greater, when compared to $3.11, -$84.06, and $0.16 for the NW-FLT, NW-CN, and EW-CN, respectively. Experimental results suggest that greatest beef systems net return will be obtained when EW steers graze dryland unharvested corn and are sold at the end of backgrounding; however, when held through final harvest, early weaning and direct feedlot placement were associated with greatest net return.

Key Words: Beef Systems, Early Weaning, Corn Grazing

Introduction

Previous research has evaluated forage utilization by early (August - EW) vs normal (November - NW) weaned beef cows and the effect of weaning date on cow and calf performance. These studies show that weaning calves early has a positive impact on growth and efficiency during the backgrounding phase, improves cow body condition score, reduces range forage utilization, and shortens the lifetime feeding period of steers held for retained ownership (Landblom et al., 2006). Economic analysis of retained ownership concluded that early weaning improved feedlot production efficiency by reducing daily and per carcass revenue relative to normal weaning (Fausti et al., 2007). And subsequently, Landblom et al. (2008) documented that significantly altering weaning date can have a positive impact on business profitability in the beef cattle enterprise. The objective of this study was to evaluate the effect of weaning date (August vs November) and backgrounding method on backgrounding and finishing net returns.

Materials and Methods

Spring calving cows (Mar-Apr) originating at the South Dakota State University Antelope Station (ANT), Buffalo, SD, and the North Dakota State University Dickinson Research Extension Center (DREC), Manning, ND were used in a 2 x 2 factorial arrangement comparing weaning date (August vs November) and backgrounding method (feedlot vs grazing dryland unharvested corn). Pen or pasture served as the experimental unit and backgrounding, finishing, and carcass data were analyzed using the SAS MIXED procedure. The protocols used in this study were approved by the North Dakota State University Animal Care and Use Committee.

Steer calves in the EW system were weaned on August 15 and calves in the NW system were weaned the first week of November. At each weaning date, steers from each research facility were randomly assigned to either feedlot or corn grazing backgrounding treatments. Corn grazing steers were held in drylot and fed hay for two weeks before being put into replicated dryland unharvested corn fields. Early weaned steers began grazing unharvested corn on August 25th and the NW steers began grazing corn on November 21st. For the feedlot treatment, EW and NW steers were shipped by commercial truck to the University of Nebraska Panhandle Research Extension Center feedlot, Scottsbluff, Nebraska where they were finished and harvested at a commercial Abattoir. Steer weight and backfat depth of 12.7 mm were used to determine final harvest endpoint. Measurement for backfat depth was conducted 30 – 45 days before final harvest using a SonoVet ultrasound machine and 3.5 MHz probe. Final harvest date was determined by calculating the required number of DOF to attain 12.7 mm BF.

Systems measurements were: corn forage nutrient change, corn forage utilization, backgrounding performance type and economics, treatment effect on animal health, corn grazing grain equivalent value, finishing performance and economics, and carcass closeout values.

Steers in the systems investigation were vaccinated before spring turnout on native pasture and then were vaccinated 3-4 weeks before each weaning date, and again at weaning with modified live IBR, BVD types I and II, $PI_{3,}$ BRSV + Mannhiema haemolytica, and an inactivated 7-way Clostridial vaccine + H. somunus. In addition, the calves were poured with a parasiticide. After weaning, the calves were observed closely for the onset of health problems and were treated according to the attending veterinarian's recommendation. The following information is being recorded: body temperature, number of pulls, product used for treatment and cost, percent death loss, and system cost due to death loss.

Results and Discussion

Systems Backgrounding - Considering the results of Fausti et al. (2007) in the previous study, the present investigation was conducted to compare calf growing methods for EW and NW calves after weaning that compared feedlot backgrounding with grazing unharvested dryland corn before finishing based on a high quality grid. Standing peak dryland corn forage nutrient quality was determined mid-September and tracked through to mid-January. Corn forage CP declined from Sep to Nov (9.16 to 8.66) and IVDMD declined from 75.2% to 57.0%.

Peak DM corn production for the EW steers averaged 2.0 MTon/acre and peak DM corn production for the NW group was 1.75 MTon/acre. Early weaned steers utilized an average 1.46 MTon/acre over the 70 day grazing period and NW steers utilized 0.37 MTon/acre. Field loss in stockpiled corn set aside for grazing after normal weaning was excessive averaging 0.82 MTon/acre. Compared to the EW treatment, the large field loss reduced available days of grazing by 70%.

Comparative systems backgrounding performance is shown in Table 1. Steer weight at EW did not differ (P=0.44), but gain among the NW-CN steers was reduced significantly (P=0.043) due to field crop shrink. Average daily gain for EW and NW steers was similar and greater (p=0.004) than the control steers despite significant crop shrinkage. System backgrounding economics are shown in Table 2 where gain value, input costs, net returns, and cost/kg of gain are summarized. The backgrounding cost/kg of gain was $$1.31, $3.77, $1.05, and $1.37 for the NW-FLT, NW-CN, EW-CN, and EW-FLT, respectively. Net return/steer among the steers in EW-CN system was 33.5% greater than the EW-FLT system and 16.3% greater than the NW-FLT system. Stockpiling corn for grazing after normal weaning was not successful resulting in a net loss/steer of -$33.38. The stocking rate for early weaned calves that graze unharvested dryland corn was calculated to be 0.1012 hectare/weaned calf/month and the stocking rate for stockpiled corn reserved for normal weaned calves in the study was determined to be 0.324 hectare/weaned calf/month.

The effect of alternative weaning date and corn grazing on finishing performance is shown in Table 3. Early weaning and corn grazing backgrounding resulted in staggered feedlot start weight (P = 0001), and a large variation in the number of days on feed (P = 0.0001); however, harvest age (P = 0.27) and 4% shrunk harvest weight (P = .409) did not differ. For gain and FE, EW-FLT steers gained at the slowest rate (P = 0.001), were more efficient (P = 0.008), and feed and yardage cost/kg of gain (P = 0.0002) were lower. By contrast, EW-CN steers that were the most profitable at the end of corn grazing backgrounding were less efficient (P = 0.008) and feed and yardage cost/kg of gain was higher (P = 0.0002). The NW-CN steers that grazed stockpiled dryland corn were the least efficient (P = 0.008) and had the highest feed and yardage cost/kg of gain (P = 0.0002).

Carcass closeout values for HCW (P = 0.78), dressing percent (P = 0.51), fat depth (P = 0.243), and yield grade (P = 0.23) did not differ. Corn grazing steers had significantly larger ribeye area (p = 0.053). Days on feed, which varied due to management system, directly affected marbling score (P = <0.0001) and the number of carcasses that graded USDA Choice or better (P = 0.10).

The combined effect of calf placement cost, ingredient cost, treatment cost, freight, and interest factors affected finishing net return. Calf placement cost had the most influence on net return. Closeout net returns were $3.11, -$84.06, $0.16, and $39.62/head for the NW-FLT, NW-CN, EW-CN, and EW-FLT, respectively.

Implications

Results suggest that greatest beef systems net return will be obtained when EW steers graze dryland unharvested corn and are sold at the end of backgrounding; however, when held until final harvest, early weaning and direct feedlot placement were associated with greatest net return.

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Table 1. Systems Backgrounding Performance

	NW- Ctrl Pasture/ Feedlot	*NW – Corn Grazing*	*EW – Corn Grazing*	*EW – Feedlot*	*SE*	*P-Value*
Weaning Date	Nov 7	Nov 7	Aug 15	Aug 15		
No. Steers	54	24	24	57		
System Days	84	21	70	86		
System Weaning Wt., kg[a]	197.9	289.8	212.3	183.7	10.02	0.44
System End Wt., kg	272.2	314.3	300.3	277.1	15.05	0.15
Gain, kg	74.5[ab]	24.5[b]	88.0[a]	93.4[a]		0.043
ADG, kg	0.887[b]	1.16[a]	1.26[a]	1.09[a]	0.057	0.004

[a]Weaned steers were held in drylot for 13 days before placement in the corn fields to get over weaning.

Table 2. Alternative Beef System Unharvested Corn, Pasture, and Feedlot Economics

	NW- Ctrl Pasture/ Feedlot	*NW – Corn Grazing*	*EW – Corn Grazing*	*EW – Feedlot*
No. Steers	54	24	24	57
Gain Value [a,b,c,d]	$9,979	$1,413	$4,724	$10,980
Input Cost:				
Pasture (Rent @$14.00/ac)[e]	$5,254			
Corn ($164/ac)		$2,214	$2,214	
Feedlot				$7,302
Backgrounding Net Return	$4,725	-$801	$2,510	$3,678
Backgrounding Net Return/Head	$87.50	-$33.38	$104.58	$69.56
Cost/kg Gain	$1.31	$3.77	$1.05	$1.37

[a]NW Control Gain Value (8,910lb@$112/cwt)
[b]NW Corn Grazing Gain Value (4,334lb@$109/cwt)
[c]EW Gain Value (1,296lb@$109/cwt)
[d]Gain Value (9,804lb@$112/cwt)
[e]Pasture Rent Calculation: 2.78 months, 2.5 AUM; = 6.95 Ac/AUM @ $14/Ac; = $97.30 x54 = $5,254.20

Table 3. Effect of Alternative Weaning Date and Corn Grazing on Steer Finishing Performance

	NW- Ctrl Pasture/ Feedlot	*NW – Corn Grazing*	*EW – Corn Grazing*	*EW – Feedlot*	*SE*	*P-Value*
Start Wt., kg	272.2[c]	339.2[b]	313.1[d]	183.6[a]	37.2	<0.0001
4% Shrunk End Wt., kg[a]	538.4	555.2	566.9	545.7	10.44	0.409
Days on Feed	192[d]	141.5[b]	165.7[c]	280.8[a]	3.44	<0.0001
Kill Age, Days	408.1	415.1	404.6	412.1	3.17	0.270
ADG, kg	1.39[b]	1.53[c]	1.53[c]	1.29[a]	0.025	0.0011
DM Fd/Head/Day, kg	9.12[b]	11.1[d]	10.2[c]	8.07[a]	0.23	<0.0001
DM Feed:Gain, kg	6.56[b]	7.26[c]	6.64[b]	6.26[a]	0.072	0.008
Fd & Yard Cost/Day, $	$2.096[b]	$2.723[d]	$2.383[c]	$1.715[a]	0.053	<0.0001
Fd & Yard Cost/kg of Gain, $	$1.51[b]	$1.78[c]	$1.56[b]	$1.33[a]	0.016	0.0002