40th
LIVESTOCK RESEARCH ROUNDUP
OCTOBER 24, 1990

Dickinson Research Center
Dickinson, North Dakota

PROGRAM SCHEDULE
40TH LIVESTOCK RESEARCH ROUNDUP
OCTOBER 24, 1990

1:00 pm	WELCOME – MR. Tom Conlon, Supt.
1:05 pm	Dr. Bill Dinusson – "A Century of Research on Beef Cattle in North Dakota"
1:25 pm	Mr. Bill Stegner – "Ways That I Have Profited From The Practical Application of Research on My Ranch"
1:45 pm	Dr. Harlan Hughes – "Economics of Marketing 1990's Calf Crop"
2:05 pm	Mr. Mark Fiest – "Development of Golden Dakota Cattle and The Specialty Marketing of Kobe Beef"
2:25 pm	Break
2:40 pm	Mr. Russ Danielson and Mr. Jim Nelson – "Modern Replacement Heifer Selection and Management Techniques for the 1990's"
3:30 pm	Dr. Jim Karn – "New Advances in Protein Supplementation"
3:50 pm	Research Center Reports – By Animal Scientists Mr. Jim Nelson and Mr. Doug Landblom
4:30 pm	Adjournment
	All times approximate

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SECTION I

PROGRESS REPORTS

OF

LIVESTOCK RESEARCH

AT THE

DICKINSON RESEARCH CENTER

BY

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Reduced Dosage Synchronization In Beef Cows Bred Naturally

J. L. Nelson and D. G. Landblom

Introduction

Estrus synchronization in beef cows that have a normal 50-60 day post calving interval can be achieved by the injection of prostaglandin $F_2\alpha$ ($PGF_2\alpha$) to cause luteal regression. Both a single and a double injection regimen followed by timed insemination or insemination at estrus are being recommended. Currently, 25 mg. $PGF_2\alpha$ I.M. per cow is the recommended dosage. In a double injection program the injections are made eleven days apart. Under current conditions this double injection program would cost the producer approximately $5.50 per cow for the drug alone. It is conceivable that drug cost per cow could be lowered by reducing the dosage, and this would encourage more producers to utilize the product.

Research by Williams et al. (1983) showed favorable results when heifers were administered 12.5 mg. of $PGF_2\alpha$ I.M. as compared to the recommended dosage of 25 mg. I.M.. T. J. Flakoll and R. B. Danielson (1988) reported that yearling beef heifers administered either 5 mg. $PGF_2\alpha$ in the dorsal tail vein or 25 mg. $PGF_2\alpha$ I.M. in the hip had similar estrus activity (78.9% vs 76.5%). Previous research at this station, Landblom and Nelson (1985), indicated good synchronization of heifers with reduced rates of $PGF_2\alpha$ given I.M..

Based on this information, the question remained: "Would lactating beef cows respond to a reduced dosage of $PGF_2\alpha$ given I.V.?". It was also proposed to evaluate the breeding of the synchronized cows with bulls in order to reduce labor. If producers could synchronize their cow herds they should have earlier and more uniform calf crops that would have a better chance of heavier weaning weights because of their extra age. Those producers who are able to incorporate A.I. into the program will have the advantage of using superior genetics from progeny tested bulls.

Materials and Methods

The experiment was conducted during the 1989 summer breeding season. Seventy two lactating beef cows of mixed breeding and age with a post calving interval of at least 43 days (43-87 days) were used in the trial. The cows were stratified by breed, age and post calving interval and randomly allotted to either a 8.3 mg. I. V. dosage of $PGF_2\alpha$ (Treatment 1) or a 12.5 mg. I.V. dosage of $PGF_2\alpha$ (Treatment 2) or a standard 25 mg. I. M. dosage of $PGF_2\alpha$ (Control) All cows received their first injection on May 24, 1989. This was followed by a second injection on June 5, 1989. Control cows were crowded into a narrow working alley and injected into the hip area using an automatic multiple dose syringe equipped with a 1.0"- 16 gauge needle. Treatment 1 and 2 cows were caught in a manually operated head gate. A rope halter was used to secure their heads to the side and expose their jugular vein. Injections were made aseptically into the jugular vein using disposable plastic syringes and 1"-18 gauge needles.

Following the first injection, sterile gomer bulls wearing a Chin-ball marking harness were placed with each group to aid in estrus detection. Cows were checked for estrus three times a day. Following the second injection, a fertile, mature Charolais bull was placed with 12 cows from each treatment group. After seven days (June 12) the cows were resorted and placed in various breeding pastures for the duration of the summer. In October, the cows were pregnancy tested and cull cows sold.

Calving records were recorded on 66 cows that were in the original allotment. Those cows that calved between March 13 and March 28, 1990 were assumed to have conceived at the synchronized estrus. Cows calving after March 28 were recorded as conceiving to the cleanup bulls.

Results and Discussion

Synchronization response data is found in table 1. The percentage of cows showing estrus following the first injection varied from 29% in the Control herd to 50% in the reduced dosage Treatment 1 herd. Calving data indicate that 72.7% (16/22) of the Control cows conceived on the synchronized estrus. One cow proved to be open and two cows were sold prior to calving (not related to the trial). Using a drug cost of $15.95 per 30 ml of $PGF_2\alpha$, the total drug cost for this herd was $117.04 based on 22 cows receiving two treatments. This cost calculates to $7.32 per calf conceived at the synchronized estrus.

In Treatment 1, (8.3 mg. $PGF_2\alpha$ I.V.), conception at the synchronized estrus was 50% (12/24). Total cost of the drug was $42.36 for the 24 cows treated twice. This amounts to $3.53 per calf conceived at the synchronized estrus.

In Treatment 2, (12.5 mg. $PGF_2\alpha$ I.V.), 40.9% (9/22) of the cows conceived on the synchronized estrus. One cow was open and two cows were sold prior to calving. Total cost for the drug given twice to the 22 cows was $58.52. Based on 9 calves conceived on the synchronized estrus, cost per calf conceived was $6.50.

A ratio of 12 synchronized cows per mature bull did not appear to overtax the bull or create any breeding problems. Perhaps the fact that the cattle were housed in drylot with feed and water close at hand was helpful.

The extra handling of those cows receiving the I.V. injections undoubtedly caused more stress than those that received the I.M. injections. This could be partly responsible for the lower conception rates in Treatments 1 and 2.

Table 1. Results of reduced $PGF_2\alpha$ dosage synchronization in lactating beef cows.

Treatment	Control	Treat-ment 1	Treat-ment 2
Dosage of $PGF_2\alpha$	25 mg.	8.3 mg.	12.5 mg.
Route of administration	I.M.	I.V.	I.V.
Number of cows treated	24	24	24
Date of 1st injection	May 24	May 24	May 24
Cows showing estrus	29.1%	41.6%	50%
Date of 2nd injection	June 5	June 5	June 5
Number Open and sold	1	0	1
Number sold prior to calving	2	0	2
Calves born before 3/28/90	16	12	9
Calves born after 3/28/90	5	12	12
Conceived @ sync estrus	72.7%	50%	40.9%
Calving percentage	95.4%	100%	95.4%
$PGF_2\alpha$ cost per herd	$117.04	$42.36	$58.52
Drug cost/calf conceived as a result of treatment	$7.32	$3.53	$6.50

Summary

A double injection program was used to synchronize lactating beef cows using either a 25 mg. $PGF_2\alpha$ I.M. injection or a reduced dosage (8.3 mg or 12.5 mg) I.V. injection of $PGF_2\alpha$. The percentage of cows exhibiting estrus following the first injection ranged from 29% in the Control to 50% in Treatment 2. Based on calving dates, 73% of the Control, 50% of Treatment 1. and 41% of Treatment 2 cows conceived on the synchronized estrus. Cost of the $PGF_2\alpha$ treatment per calf conceived was $7.32 in the Control, $6.50 in Treatment 2, and $3.53 in Treatment 1.

The extra stress on the cows plus the extra labor needed to administer the $PGF_2\alpha$ intravenously combined with the lower conception rate do not support a reduced dosage program. Although only one year's data is available, it appears that natural service can be used to breed a limited number of synchronized cows when housed in drylot.

LITERATURE CITED

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12.5 vs. 25 mg. Prostaglandin $F_2\alpha$ for Synchronization of Beef Heifers Using a 10 Day System. Dept. of Animal & Range Science Annual Report. NDSU, Fargo, ND pp 46-49.

Canola Meal vs Soybean Meal and Two Levels of Protein for Backgrounding Steer Calves

J. L. Nelson and D. G. Landblom

Introduction

Canola (the reformed, genetically improved replacement for rapeseed) is currently being processed in North Dakota at the Archer-Daniels Midland Co. crushing plant in Velva, N.D. To qualify as Canola (the name stands for Canada oil-low acid) the crop must contain less than 2% erucic acid and have low levels of glucosinolates which directly effect palatability for livestock and poultry. Canola meal (CM), a by product of the oil making process, is a high protein feed that has 75-85% of the protein value of soybean meal (SBM) on a pound for pound basis.

When compared nutritionally to SBM, (see table 1) CM is lower in crude protein (38 vs 44%), lower in metabolizable energy (2700 vs 3100 kcal/kg), higher in fat (3.8 vs 0.8%) and higher in both calcium and phosphorous. However, CM contains a lower concentration of by-pass protein than does SBM which could reduce cattle performance. In Western Canada, CM is widely used in cattle diets because of its competitive price relative to SBM.

This trial was designed to measure and compare the feeding value of CM or SBM when used to supplement typical backgrounding rations fed to fast gaining crossbred steer calves.

Another aspect was to determine if feeding a higher level of protein than recommended by the National Research Council (NRC) would be beneficial in terms of increased gain, feed efficiency and overall economics. Some cattlemen believe that using high protein levels (above 13%) in backgrounding rations will result in greater dry matter intake, faster gains and improved feed efficiency. However, since protein is generally expensive, feeding more than required to balance a ration will increase feeding costs.

This trial compares the performance of backgrounding steers fed normal NRC balanced rations or rations that contained 20% additional crude protein.

Table 1. Comparison of nutrient values (as fed) in canola meal and soybean meal.

Nutrient[a]	Canola meal	Soybean meal
Dry matter, %	92.5	90
Protein, %	38	44
Fat, %	3.8	0.8
Fiber, %	11	6.5
ME, kcal/kg	2700	3100
Calcium, %	0.7	0.25
Phosphorus, %	1.17	0.60
Bulk density, lb./ft^3	35.2	37.0
Ash, %	6.8	5.8

[a]Nutrient values taken from 1985 Feed Ingredient analysis table, International Minerals and Chemical Corporation; and Feeding with Canola Meal, 1984, Canola Council of Canada. Publication No. 63.

Methods

On January 5, 1990, forty-five Charolais crossbred steers were weighed, implanted with Ralgro, vaccinated with a seven-way booster vaccination and treated for lice with Lysoff. Following processing, the steers were randomly allotted into three uniform treatment groups. Each group was composed of three replicated pens with 5 steers per pen.

The pens were 32'X112' in size and provided 16' of feed bunk, an automatic waterer, and 9'X 48' of slotted board fence for wind protection on the north and west sides.

Complete mixed rations of chopped mixed hay, chopped wheat straw, dry rolled corn and barley, minerals, salt and vitamin were fed. The rations were supplemented with either canola meal (CM) or soybean meal (SBM) to meet NRC recommendations for crude protein. The rations were prepared in an Arts Way "Silamix" mixing wagon equipped with electronic scales. The rations were fed in the bunks with feed available at all times. Stale or rejected feed was removed periodically and subtracted from the lot totals.

Initially, the rations were formulated according to NRC recommendations for 700 pound steers projected to gain three pounds per day or better. Formulations were changed with every 100 pounds of weight increase, according to the following schedule:

Steer weight	Crude Protein NRC	Crude Protein NRC+20%
700 lbs	10.8%	12.96%
800 lbs	10.8%	12.96%
900 lbs	10.3%	12.36%

Treatment 1 rations were supplemented with canola meal at current NRC recommendations. Treatment 2 rations were supplemented with canola meal but at a level 20% higher than current NRC values. Treatment 3 rations were supplemented with soybean meal at current NRC recommendations and served as the control ration in this trial.

The steers were fed from January 5, to March 29, 1990, a period of 83 days. All steers were individually weighed every 28 days with a two day average weight used as the final weight. One steer was removed from Treatment 2 due to sickness. The steers were sold at auction on March 29th in Dickinson, N.D. with weights averaging 1000+ pounds.

The rations as fed are shown in Table 2. All weights are averages for the trial and are on a dry matter basis.

Table 2 Average feed consumption in pounds of dry matter per head per day.

	Treatment 1 Canola meal	**Treatment 2 Canola meal +20%NRC**	**Treatment 3 SBM**
Ingredients			
Corn	11.63	11.46	11.12
Barley	5.33	5.50	5.02
Mixed Hay	3.23	1.53	3.03
Wheat Straw	1.92	2.25	2.13
Canola Meal	0.98	2.44	----
Soybean Meal	----	----	0.82
Limestone	0.60	0.16	0.15
T.M. Salt	0.11	0.11	0.11
Vitamins ADE	0.0046	0.0045	0.0043
Total/day	23.80	23.46	22.36

Table 3. Average weights, gains, feeding economics and marketing analysis for backgrounded medium to large framed crossbred steer calves fed either Canola meal or Soybean meal at two levels of protein.

	Canola Meal NRC	Canola Meal NRC+20%	Soybean Meal NRC
Number of head	15	15	14
Days fed	83	83	83
Initial weight, lbs.	711.8	712.3	712.9
Final weight, lbs.	1016.3	1018.4	1000.9
Gain, lbs.	304.5	306.1	287.9
Ave. Daily Gain, lbs.	3.67[a]	3.69[a]	3.47[a]
Feed summary:			
Total feed per head, lbs..	1975	1948	1857
Ave. Feed/head/day, lbs..	23.80	23.47	22.37
Pounds of feed/pound of gain	6.49	6.36	6.45
Economics:			
Feed cost / head	$107.30	112.94	$99.96
Feed cost per day	$1.29	$1.36	$1.20
Feed cost/lb. gain	$.3524	$.3690	$.3472
Marketing analysis:			
Market value @ .7095/lb.	$721.06	$722.59	$710.14
Expenses:			
Calf value at @ .83/lb.	$590.79	$591.21	$591.71
Feed cost per head	$107.30	$112.94	$99.96
Implant cost	$0.99	$0.99	$0.99
Interest cost @ 11.5%	$18.24	$18.43	$18.11
Total expenses	$717.32	$723.57	$710.77
Net gain or (-loss)	**$3.74**	**(-) $0.98**	**(-) $0.63**
(a) no significant difference in ADG at .05 significance level. LSD (cal by T) = .5250			

Discussion

The steers made very good and economical gains, an indication that the rations were well balanced and palatable. The dry and mild winter weather also helped to promote excellent gain. One steer from treatment 2 was removed on January 26 due to sickness caused by a thiamin deficiency.

Results

The data collected in this trial indicate no significant differences between CM or SBM when they are fed on a pound of protein basis. Steers starting on feed at 712 pounds made gains of 3.47 lbs/hd/day when supplemented with SBM and 3.67 lbs/hd/day when supplemented with CM (differences were not significant). Feed efficiency was not different between the two supplements (6.45 vs 6.49 lbs of feed / lb gain. Feed costs per cwt. gain were $0.52 higher for the CM supplement ($34.72 vs $35.24) than for the SBM supplement. The higher feed cost resulted in higher total expenses for the CM fed steers ($717.32 vs $710.77). However, because the CM fed steers were heavier at market, they had the best net return at $3.74.

In the comparison of NRC vs NRC+20% crude protein, there was no advantage in ADG for the higher protein levels (3.67 vs 3.69 lbs/day), and only a slight advantage in feed efficiency (6.49 vs 6.36 lbs feed/lb gain). The extra protein caused an increase in feed cost by $1.66 /cwt gain. Thus, the net return of the NRC ration was $4.50 higher than the NRC+20% ration. Based on this study, if SBM was valued at $190.00 /ton, Canola meal would have a value of $159.00 /ton or roughly 84% the value of SBM.

Summary

Steers weighing 700 pounds were fed complete mixed rations supplemented with Canola meal (38% CP) or Soybean meal (44% CP) at National Research Council recommendations for gains of 3.0+ lbs /day during an 83 day feeding period. There was no difference in ADG or feed efficiency. Rations supplemented with CM to meet NRC recommendations returned $4.37 more net profit than rations supplemented with SBM. Feeding 20% more protein than recommended by the NRC increased the cost /cwt. gain by $1.66, without improving ADG or feed efficiency.

Both Soybean meal and Canola meal are excellent sources of supplemental protein for growing steers. When SBM is valued at $190.00 per ton, Canola meal would be worth $159.00 per ton based on the results of this trial.

Supplementing Various Phases of Beef Cattle Production With a Heat Processed Molasses Supplement

By

D. G. Landblom and J. L. Nelson

Heat processed molasses blocks (HPM block) are a unique blend of molasses solids, supplemental protein, vitamins and minerals designed for self-feeding as energy/protein supplements to beef cattle in a variety of situations.

Since no animal performance data has been reported in the literature to document the merits of this type of supplement, an initial investigation was conducted during the 1988-89 wintering period. Pregnant unsupplemented control cows were compared to cows that either received the 12% crude protein HPM block or dry rolled barley. Cows supplemented with dry rolled barley gained more ($P<.01$) than cows that were fed a control diet. When performance between the two supplements was compared, animal response was nearly equal, but the cost of supplementation with the 12% HPM block was substantially higher (Landblom, 1990).

After completion of the initial study, three addtional studies were conducted in 1989, to further evaluate the HPM block supplement. In trial one, the focus was to determine if self-fed molasses block energy would improve reproductive performance under spring and mid summer grazing conditions . Trial two, on the other hand, focused on the supplements impact on animal performance during the fall grazing period before and after calves were weaned. In trial three, a specially fortified molasses block was fed immediately after weaning and during a short backgrounding period to determine if the supplement would help fresh weaned calves get started on feed faster, aid in reducing total dry matter intake, and improve overall postweaning performance.

A detailed summary of each trial follows.

TRIAL ONE

Reproductive Performance of Lactating Beef Cows Supplemented With a 12% Crude Protein Heat Processed Molasses Supplement

Introduction:

Economics of beef cattle production clearly show that a cow must produce a calf every year and calve within a short calving season. Thus, the goal of every cow-calf producer should be to have every cow conceive early and calve within a short calving interval of 45-50 days. While this is an attainable goal, cows must be in breeding condition and cycling before the breeding season begins if the goal is to be reached. When energy intake is restricted, the postpartum interval between calving and the return to regular estrus cyclicity will be lengthened, resulting in impaired first service conception rates (Dunn et al. 1969,

Roberts et al. 1970, and Wiltbank et al. 1962, 1964, 1965 and 1970). Early spring pasture is highly nutritious, but contains high levels of water with the dry matter available to the grazing animal ranging from approximately 28% in the very young plant to 45-55% as the plant matures (NRC, 1984). Although the period of high water content is relatively short, the timing is critical when a cow herd is being prepared for rebreeding. It is during the critical early spring grazing period that supplemental energy has been shown to be beneficial in shortening the postpartum interval. Grain supplements (range cake, blocks, etc.) have proven to be effective in replenishing the energy shortage that commonly occurs on early spring pasture, however, their use requires daily or alternate day feeding. Heat processed molasses supplements provide an alternative to the chore of daily feeding, since they are designed to release from .5 to 1 pound of supplement per head daily. The product is marketed as a supplement that will aid in replenishing the energy debt associated with grazing early spring pastures without the expense of daily feeding.

The purpose of trial one is to evaluate a 12% crude protein heat processed molasses supplement with respect to consumption, cow and calf body weight change on spring pasture, and to determine whether intake from the slow release system is adequate to effectively shorten calving intervals and thereby increase first service conception rates when compared to unsupplemented control cows.

Procedure:

Sixty-nine Angus x Hereford cows ranging in age from 3-9 years were randomly assigned as they calved to either a unsupplemented control group or a treated group that received 12% crude protein heat processed molasses blocks free choice. After 40.1 days in drylot it became apparent, because of the lingering drought, that our original projected pasture stocking rate would have to be reduced by twenty percent. Therefore, on May 2, 1989, the number of cows was reduced to 28 head per treatment. While in drylot the cows were fed the complete mixed rations shown in table 1. We found the level of dry matter fed during the first 40.1 days after calving was not sufficient to maintain body weight. Therefore, when the cows were reallotted on May 2nd, the level of daily dry matter was increased approximately 3 pounds in each treatment. After reallotment, the cows and calves were kept confined for an additional 24 days until the mixed grass pastures assigned to this study had attained suitable grazing height. On May 26th the cows and calves were weighed and moved to pastures that contained both improved and native grass species common to the area. The major grasses present included the following: crested wheatgrass (Agropyron cristatum), western wheatgrass (Agropyron smithii), needle and thread (Stipa comata), green needle (Stipa viridula), plains reedgrass (Calamagrostis montanensis), threadleaf sedge (Carex filifolia) and blue grama (Bouteloua gracilis). The grazing period was 82 days long and ended on August 16th.

Using mature Charolais bulls, breeding began on June 1st and ended on August 16th, a period of 76 days. The bulls were fertility tested within two days of being placed in each pasture, and had average to above averge semen quality scores. One tub of HPM supplement was available to the supplemented group at all times during the study. When the tubs were nearly empty, they were replaced with a full tub so that the animals were never out of supplement. Each tub was weighed when it was put out and the empty tub was weighted back.

Evaluation of the supplement's effect on animal and reproductive performance was based on the following criteria: cow and calf body weight change, supplement consumption, calving interval (number of days between calves), postpartum interval (number of days between calving and pregnancy) and the calculated first service pregnancy rate based on actual calving date.

Results:

Animal performance, supplement intake, reproductive performance and supplementation economics were evaluated from calving to August 16th, 1989, and are shown in table 2. During the first 40.1 days after calving in drylot, control cows were fed 24.8 pounds of dry matter and supplemented cows were fed 24.4 pounds plus 1.25 pounds of 12% HPM supplement that was fed free choice. This level of intake provided the control cows with 25.1 Mcal. and the supplemented cows with 26.5 Mcal. of metabolizable energy per day, which was not sufficient to maintain body weight. Control cows lost more weight (-130 pounds) ($P<.01$) than the supplemented cows (-84 pounds). During the remaining 24 days in drylot, a compensatory gain response occurred when the dry matter feed intake was increased from 24.8 pounds to 28.1 pounds in the control group and from 26.5 pounds to 28.4 pounds in the supplemented group. Daily gains during this short period before turnout on grass were 4.58 and 5.0 pounds per head, respectively, for the control and supplemented groups, and are shown in table 2.

Supplement intake during the drylot phase is also shown in table 2. Free choice preference for the molasses block fluctuated with the level of dry matter being fed. When intake was insufficient, preference for the free choice supplement was elevated, but following reallotment and feed increase, preference dropped .71 pounds per head daily from 1.25 pounds to .54 pounds.

Cow and calf gains on pasture are shown in table 2 as well. In the 82 day grazing period, control cows gained better ($P<.05$) than those cows with access to molasses blocks. Calf gains for the control calves were slightly better, but the difference was not great enough to be significant. 12% HPM Block consumption was approximately .18 pounds per day during June and July when forage quality was good to excellent, but increased sharply to 1.47 pounds per day towards the end of the grazing period when grasses were more mature.

Reproductive performance is summarized in table 3. Supplementation had a slight, but positive effect on first service pregnancy rate, and calving and postpartum intervals. First service pregnancy rate was 6.3% higher, and the calving and postpartum intervals were both 6.1 days shorter. While a positive trend existed, the differences were small and nonsignificant. Pregnancy testing 60 days after bulls were removed on August 16th revealed that 3 cows out of 28 were open (10.7%) in the supplemented group.

The economics of supplementation were summarized by combining the HPM block consumed in drylot and during grazing. A total of 83.5 pounds was eaten per cow-calf pair and cost $16.01.

Summary:

Feeding a 12% crude protein HPM supplement did not significantly improve animal or reproductive performance, but did increase the cost of operation by $16.01 per cow-calf pair.

TRIAL TWO

Supplementing Cows and Calves on Native Range Before and After Weaning with With a 20% Crude Protein Heat Processed Molasses Supplement

Introduction:

Heat processed molasses supplements are also recommended for improving the nutritional status of cows and calves grazing late fall pasture. Grass quality changes occur rapidly with the advancing season. Native range plants contain from 13% to 16% crude protein, and TDN levels of 65% to 70% during the immature stages of growth. As the plants mature and become increasingly more lignified in the fall of the year, their crude protein content falls within a range of 3.8% to 6%, and their TDN levels drop to a range of 46% to 56% (Enzminger and Olentine, 1978). Normally, cows nursing calves and grazing mature fall pastures lose weight while their calves continue to gain (Manske et al. 1988), but not to their full genetic potential.

Several supplements and methods of supplementation have been tried over the years to improve animal performance on dry mature ranges (Shirley, 1986). The objective of this investigation was to determine if supplementation with a 20% HPM supplement would curtail the cow weight loss documented by Manske and co-workers, and increase calf weaning weight. A second objective was to determine if the supplement would aid in maintaining cow body weight into the early winter grazing period after weaning.

Procedure:

Trial two was conducted using the same 28 cow-calf pairs that had been previously allotted to the control and supplemented groups in trial one. The grazing period was divided into two phases. Phase one was the period before weaning, and ran from August 16 to October 18, 1990. Phase two was the period after weaning from October 19th to December 12th. Cow-calf pairs grazed native range at the Dickinson Research Center's Pyramid Park grazing area located south of Fryburg, North Dakota, which is crossfenced into two equal sized pastures. Water for both pastures is available from a well and spring fed dugout. The two herds exchanged pastures every two weeks to minimize pasture variability. The 20% HPM supplement was fed throughout the investigation period, in a number of locations that varied from one-fourth to one-third of a mile from the two water sources. One tub served the 28 head allotment. Animal weights were taken at the beginning and end of each phase, and at 28 day intervals.

Results:

The results of phases one and two have been summarized in table 4. In phase one, which was the 63 day period before weaning, cows were gaining weight during August and September, but with advancing pasture maturity weight loss was evident by mid October. Average gains for the phase were .48 pounds daily for the control cows, and -.06 pounds daily for the HPM supplemented cows. During phase one, supplemented cow-calf pairs consumed .57 pounds/pair daily for a total of 36.1 pounds for the period. After weaning, grazing continued for an additional 55 days, at which time weather contitions dictated that the cows be brought back to Dickinson. Both groups continued to lose nearly the same amount of weight. The control cows lost an average -.65 pounds, and an average loss of -.60 pounds was recorded for the supplemented group. For the 55 day period, a total of 50.6 pounds of 20% HPM supplement was eaten per cow.

Combining the two phases for the period from August 16th to December 12th, the average daily body weight loss/head was -.05 pounds for the control cows, and -.31 pounds for the supplemented cows. Supplement consumption for the 118 day grazing period was 86.7 pounds/head, and cost $16.65.

Summary:

Free choice supplementation of cows and calves before weaning and cows only after weaning with a 20% HPM supplement did not curtail cow body weight loss or increase calf weight gains, but did add an additional $16.65 to the cost of operation.

TRIAL THREE

Estimating Weaning and Short Term Backgrounding Performance of Calves Supplemented With and Without a Fortified 12% Crude Protein Heat Processed Molasses Supplement

Introduction:

A fortified 12% crude protein heat processed molasses supplement has been specially formulated for feeding to stressed cattle, and is promoted to help calves get started on feed faster, and to reduce dry matter intake making calf feeding more economical. As a specialized supplement with a specific application, the product contains a number of additional ingredients not included in the products used in trials one and two. The additional ingredients include elevated levels of vitamins A (200,000 IU/lb.), D (20,000 IU/lb.), E (40 IU/lb.), and thiamine (100 mg/lb.). Also included, but not guaranteed on the label, are yeast culture, Bacillus Subtillis, vitamin B_{12}, niacin, vitamin K, calcium pantothenate, riboflavin, and EDDI for footrot.

The first objective of the investigation was to determine if previous exposure to a conventional unfortified 20% HPM supplement on pasture would help calves get started eating the fortified supplement sooner after weaning, which reportedly would help calves keep their resistance up during the stressful first week after weaning, and subsequently, to help stressed calves find feed bunks faster thereby making the transition from grazing to a drylot environment in less time. Our second objective, once weaning was completed, was to evaluate backgrounding performance using the fortified supplement, and our final two objectives were to monitor the impact of special fortification on the incidence of upper respiratory disease, and to document backgrounding economics.

Procedure:

Eighty-one crossbred Charolais steers and heifers averaging approximately 625 pounds that were either exposed or non-exposed to a 20% conventional HPM supplement during the grazing season were assigned to one of the following three treatments that were replicated three times using nine animals per pen. Treatments included: (1) an unsupplemented control, (2) a 12% fortified HPM supplement with previous exposure on pasture, and (3) a 12% fortified HPM supplement, but without prior exposure.

Surface area of the supplement tubs were approximately twice the size recommended by the manufacturer. During the first week in drylot after weaning, calves had access to the entire surface area, but after the first

week each tub was affixed with a lid that cut the exposed area in half. This provided 190 sq. in. of licking area for the nine calves in each lot, or 21.1 sq. in. per calf.

On the day calves were weaned they were fed long alfalfa hay. After the initial feeding of long hay, the calves were fed the succession of complete mixed rations shown in table 5. Dry matter intake was closely monitored during the first 8 days after weaning, and then weekly for the remainder of the 62 day feeding period. Dry matter intake was obtained by weighing back the supplement tubs and complete mixed ration in each bunk on alternate days or weekly depending on the stage of the trial, and then computing dry matter based on moisture content. Moisture content was obtained by oven drying bunkline samples that were collected as each ration was unloaded.

Initially, the calves were weighed at weaning and again twenty-four hours later to determine their twenty-four hour weight loss, and then weekly during the first twenty-eight days of the study. Following the twenty-eight day weight, the calves were not handled for weighing until the trials completion. Upon completion the calves were weighed on two consecutive days (December 18th and 19th), and the average of the two weighings became the final weight.

Results:

Results of this investigation have been summarized in tables 6, 7 and 8. Table 6 summarizes dry matter intake and daily gains at selected intervals. Our first objective was to measure the effects of feeding a 12% fortified HPM supplement to newly weaned calves, and to determine if previous exposure to a conventional 20% HPM supplement would help the newly weaned calves find the supplement faster once in drylot. Dry matter intake was monitored every other day during the first 8 days after weaning. Supplementation during the first two days improved dry matter intake ($P<.05$), but there was no added advantage for previous exposure. Further measurements for dry matter intake, over the next two weeks, tended to favor the supplemented calves, but intake for the entire study tended to be greater for the control calves. Neither of the differences were statistically significant, however. Body weight fluctuated dramatically during the sixteen day period after weaning. Twenty-four hour weight loss was nearly identical across treatments, and averaged -36.4 pounds. Calves given the control ration, without supplement, regained their weaning shrink loss more rapidly ($P<.05$) than the supplemented calves.

Our second objective was to determine how supplementation with the 12% fortified HPM supplement would influence backgrounding performance. Weight gains, feed consumption, feed costs, and a marketing summary are shown in table 7. For the 62 days on feed, control calves gained more ($P<.05$) weight than calves from either of the supplemented groups. Average daily gains were 2.03, 1.56, and 1.53 pounds/head/day for the control, the previously exposed group, and those exposed at weaning, respectively. Supplement intake was strongly influenced by previous exposure. Calves that had access to the 20% conventional HPM supplement on pasture before weaning consumed 2.3 times more ($P<.01$) supplement during the entire trial than those calves whose initial access occurred at weaning. Calves that had previous exposure consumed .86 pound of supplement daily, and the unexposed calves consumed .37 pound of supplement daily. When conventional and supplement dry matter intake were combined, the control calves consumed more total dry matter than either of the supplemented groups, but the differences were not significant. The combined dry matter intakes were 15.2, 14.9 and 14.0 pounds/head daily for the control, previously exposed, and those exposed at weaning, respectively.

Feed costs were directly effected by the level of supplement consumed, since the fortified HPM supplement that cost $.232/pound replaced conventional feed that cost $.0513/pound. Previous access before weaning, therefore, resulted in the highest feed cost/hundredweight of gain of $58.65. Feed cost/hundredweight of gain for the control group was $38.25 and was $51.04 for the group with initial access to the fortified supplement at weaning.

In our marketing analysis, we determined net return to management by deducting expenses for feeder calves, direct feed and supplement costs, and interest at 12% from our gross return when the calves were marketed. Values for each treatment are shown in table 7. Net returns were $20.91/head for the control, $8.75/head for the group initially exposed to the fortified supplement at weaning, and $1.83/head for the group that had access to the 20% HPM supplement on pasture before weaning.

Health problems were relatively high in all treatments. One of the primary promotional features for the fortified supplement was that the built-in fortification would help enhance resistance against disease in stressed calves. Based on the incidence of respiratory disease complex, as shown in table 8, there does not appear to be any particular advantage for feeding the fortified 12% HPM supplement to abate the problems associated with respiratory disease complex.

Summary:

A fortified 12% crude protein HPM supplement was evaluated in a 62 day backgrounding study using crossbred Charolais steer and heifer calves. Calves had either access to a 20% conventional HPM supplement before weaning, or no prior access when weaned on to a 12% fortified HPM supplement, and were compared to unsupplemented control calves. Twenty-four hour weaning shrink was uniform across treatments. Total dry matter intake was slightly higher for the supplemented calves during the first sixteen days of the trial, but intake for the entire study favored the control calves slightly. The differences were nonsignificant in both cases, however.

Compensatory gain following weaning shrink, and gains for the entire 62 day study were greater ($P<.05$) for the control calves, which gained nearly one-half pound/day more than either of the supplemented groups. Faster gains for the control calves translated into poorer feed efficiencies for the supplemented calves. Control calves converted 7.49 pounds of feed/pound of gain ($P<.05$), where as the calves that had prior access on pasture required 9.55 pounds, and the calves without prior access required 9.15 pounds of feed/pound of gain.

Economically, feed costs/hundred pounds of gain were substantially higher among the two supplemented groups, and were $38.25, $58.65 and $51.04 for the control, calves with prior access before weaning, and calves that did not have prior access before weaning, respectively. Net returns for the 62 day backgrounding favored the control calves also. Control calves returned $19.08 more than calves that had access to supplement before weaning, and $12.16 more than calves whose first exposure was at weaning.

Inclusion of vitamins A, D & E, B-complex vitamins and fermentation by-products in the fortified 12% HPM supplement did not reduce the incidence, morbidity, or the number of treatments necessary to stabilize calves diagnosed as having respiratory disease complex.

In the final analysis, there was no advantage for using a fortified 12% HPM block for newly weaned calves.

Table 1. Trial one rations fed during drylot phase after calving. 1989.

		Control		12% HPM Block	
Ingredients	**Int'l. Feed Number**	**DM %**	**LBS./HD**	**DM %**	**LBS./HD**
Fed From: 3-10 to 5-1-89					
Corn Silage	3-02-820	66.4	16.5	67.5	16.5
Alfalf Cubes	1-00-063	32.0	8.0	31.8	7.8
Soybean Meal	5-20-637	.86	.20	----	----
Sod. Phos. (XP-4)	6-04-287	.35	.087	.29	.073
TM Salt	----	.40	.098	.41	.098
Vit. A, D & E1/	----	.037	4.2 gms.	----	----
Totals		100.0%	24.9 Lbs.	100.0%	24.5 Lbs.
Calculated Metab. Energy, Mcal.			25.1 Mcal.		24.7 Mcal.
Estimated Energy From Supp., Mcal.					1.8 Mcal.
Fed From: 5-2 to 5-26-89					
Corn Silage	3-02-820	67.1	18.8	68.9	18.9
Alfalf Cubes	1-00-063	32.0	9.0	30.4	8.3
Soybean Meal	5-20-637	.18	.05	----	----
Sod. Phos. (XP-4)	6-04-287	.32	.09	.29	.078
TM Salt	----	.37	.10	.36	.098
Vit. A, D & E2/	----	.041	5.3 gms.	----	----
Totals		100.0%	28.1 Lbs.	100.0%	27.4 Lbs.
Calculated Metab. Energy, Mcal.			28.4 Mcal.		27.7 Mcal.
Estimated Energy From Supp., Mcal.					.68 Mcal.

1/ Provided 46,255 IU of vit. A, 9,248 IU of vit. D, and 4.6 IU of vit. E per head per day.
2/ Provided 58,369 IU of vit. A, 11,670 IU of vit. D, and 5.8 IU of vit. E. per head per day.

Table 2. Trial one drylot gains, HPM block consumption, feed, and supplement cost after calving for control and supplemented cows and calves. 1989.

	Control		12% HPM Block	
	Cows	**Calves**	**Cows**	**Calves**
Gains:				
Calving to May 2nd:				
No. Head	35	35	34	34
Days Fed	40.1	40.1	38.9	38.9
Calving Wt., Lbs.	1191.0		1234.0	
Birth Wt., Lbs.		96.0		94.0
May 2nd Wt., Lbs.	1061.0	182.0	1150.0	185.0
Gain, Lbs. Cow SE Mean 9.203 Calf SE Mean 6.237	-130.0[b]	86.0[a]	-84.0[a]	91.0[a]
ADG, Lbs.	-3.24	2.14	-2.16	2.34
May 2nd to May 26:				
No. Head	28	28	28	28
Days Fed	24	24	24	24
Weight May 2nd, Lbs.	1064.0	180.0	1156.0	179.0
Weight May 26th, Lbs.	1174.0	235.0	1276.0	236.0
Gain, Lbs Cow SE Mean, 5.063 Calf SE Mean, 2.071	110.0[a]	55.0[a]	120.0[a]	57.0[a]
ADG, Lbs.	4.58	2.29	5.0	2.38
12% HPM Block Consumption:				
Calving to May 2nd				
Lbs./Cow-calf pair	----		48.7	
Lbs./Cow-calf pair/day	----		1.25	
Cost/Cow-calf pair @ $.192/Lb.	----		$9.34	
May 2nd to May 26th				
Lbs./Cow-calf pair	----		12.9	
Lbs./Cow-calf pair/day	----		.54	
Cost/Cow-calf pair @ $.192/Lb.	----		$2.47	
Dry Matter Feed Consumed:				
March 10th to May 2nd				
Feed/Head, Lbs.	996.7		951.5	
Feed/Head/day, Lbs.	24.8		24.4	
Metabolizable Energy/Hd/Day	25.1 Mcal.		24.7 Mcal.	
HPM Block Metabol. Energy/Hd/Day	----		1.8 Mcal.	
May 2nd to May 26th				
Feed/Head, Lbs.	674.0		658.0	
Feed/Head/Day, Lbs.	28.1		27.4	
Metabolizable Energy/Hd/Day	28.4 Mcal.		27.7 Mcal.	
HPM Block Metabol. Energy/Hd/Day	----		.68 Mcal.	
Feed Cost:				
March 10 to May 2nd				
Feed Cost/Head, $	$59.27		$55.70	
Feed Cost/Head/Day, $	$1.48		$1.43	
May 2nd to May 26				
Feed Cost/Head, $	$39.73		$38.31	
Feed Cost/Head/Day, $	$1.66		$1.60	

Table 3. Trial one grazing gains, HPM block consumption, reproductive performance and supplement cost for control and supplemented cows and calves. 1989.

	Control		12% HPM Block	
	Cows	**Calves**	**Cows**	**Calves**
Gains:				
May 26 to Aug. 16th				
No. Head	28	28	28	28
Days Fed	82	82	82	82
Turnout Wt., Lbs.	1173.0	233.0	1280.0	237.0
Final Wt., Lbs.	1260.0	465.0	1324.0	463.0
Gain, Lbs. Cow SE Mean 7.979 Calf SE Mean 5.838	87.0[a]	232.0[a]	44.0[b]	226.0[a]
ADG, Lbs.	1.06	2.83	.54	2.76
HPM Block Consumption:				
Lbs./cow-calf pair	----		21.9	
Lbs./cow-calf pair/day	----		.27	
Cost/cow-calf pair @ $.192/Lb.	----		$4.20	
Reproductive Performance:				
No. Cycling Before Breeding	9/28 (32.1%)		9/28 (32.1%)	
No. Open Cows	0/28 (0%)		3/28 (10.7)	
Pregnancy Rate				
Cycle Pregnancy Occurred 1/				
1st	19/28 (67.8%)[a]		20/27 (74.1%)[a]	
2nd	4/28 (14.3%)		2/27 (7.4%)	
3rd	5/28 (17.9%)		1/27 (3.7%)	
Calving Interval, Days	370.2[a]		364.1[a]	
SE Mean 4.072				
Standard Deviation, Days	21.7		19.6	
Postpartum Interval, Days	88.5[a]		82.4[a]	
SE Mean 4.083				
Standard Deviation, Days	21.9		19.5	

1/ One cow in the HPM block group died from compaction.

Table 4. Trial two gains, 20% HPM consumption, and economics for cows and calves supplemented before weaning and cows after weaning that grazed fall and early winter native pasture. 1989.

	Control		12% HPM Block	
	Cows	**Calves**	**Cows**	**Calves**
Phase I Before weaning (Aug. 16 to Oct. 18):				
No. Head	28	28	28	28
Days grazed	63	63	63	63
Initial wt., lbs.	1260.0	465.0	1324.0	463.0
Final wt., lbs.	1290.0	635.0	1320.0	623.0
Gain, lbs.	30.0	170.0	-4.0	160.0
ADG, lbs.	.48	2.70	-.06	2.54
Supplement fed before weaning:				
Pounds/cow-calf pair	-----		36.1	
Pounds/cow-calf pair/day	-----		.57	
Cost/cow-calf pair @ $.192/lb., $	-----		$6.93	
Phase II After Weaning (Oct 18 to Dec. 12):				
No. Head	28		28	
Days grazed	55		55	
Initial wt., lbs.	1290.0		1320.0	
Final wt., lbs.	1254.0		1287.0	
Gain, lbs.	-36.0		-33.0	
ADG, lbs.	-.65		-.60	
Supplement fed after weaning:				
Pounds/cow	-----		50.6	
Pounds/cow/day	-----		.92	
Cost/cow @ $.192/lb., $	-----		$9.72	
Combined Phases:				
No.. Head	28	28	28	28
Days grazed	118	63	118	63
Initial wt., lbs.	1260.0	465.0	1324.0	463.0
Final wt., lbs.	1254.0	635.0	1287.0	623.0
Gain, lbs.	-6.0	170.0	-37.0	160.0
ADG, lbs.	-.05	2.70	-.32	2.54
Combined Supplement Consumption:				
Pounds/cow-calf pair	-----		86.7	
Pounds/cow-calf pair/day	-----		.73	
Cost/cow-calf pair, $	-----		$16.65	

Table 5. Trial three rations fed during the 62 day backgrounding period in percent of diet.

Ingredient	Int'l. Feed Number	Starter	1st Change	2nd Change	3rd Change	Final
Corn Silage	3-02-820	58.2	54.7	47.6	47.0	46.3
Mixed Hay	----	39.0	33.7	30.9	22.5	18.0
D. Rolled Bly	4-00-535	----	5.0	17.1	25.5	31.4
Soybean Meal	5-20-637	2.24	6.1	3.9	4.45	3.7
Dical 1/	6-00-080	.29	.27	.28	.26	.17
Cal. Carbonate	6-02-632	----	----	----	.036	.17
TM Salt	06-04-152	.29	.27	.28	.28	.29
Vitamin AD&E, 2/	----	.01 100.0%	.01 100.0%	.01 100.0%	.01 100.0%	.01 100.0%

1/ A blend of dicalcium and monocalcium phosphates.

2/ Provided 500 IU of Vitamin A, 100 IU of Vitamin D and 5 IU of Vitamin E per pound of finished feed.

Table 6. Trial three dry matter feed intake and daily gains measured at selected intervals for calves supplemented with a fortified 12% HPM supplement after weaning. 1989

	Control	Exposed/ 12% Fortified HPM 1/		12% Fortified HPM 2/		
	Conventional Feed	Conventional Feed	12% HPM	Conventional Feed	12% HPM	Mean SE
Intervals:						
Oct. 18-20th Combined DM	4.6^{a}	4.5	4.8^{ab} .26	6.0	6.1^{b} .09	.4277
Oct. 20-22 Combined DM	7.7^{a}	7.4	8.2^{a} .76	7.8	8.0^{a} .24	.8206
Oct. 22-24 Combined DM	11.3^{a}	9.1	10.4^{a} 1.33	10.2	10.7^{a} .46	.3730
Oct. 24-26 Combined DM	12.5^{a}	12.1	13.2^{a} 1.13	12.9	13.3^{a} .44	.2986
Oct. 26- Nov. 3 Combined DM	12.4^{a}	11.9	13.3^{a} 1.42	12.7	13.4^{a} .69	.3450
Entire Trial: Oct. 18 to Dec. 19	15.2^{a}	14.0	14.9^{a} .86	13.6	14.0^{a} .37	.3541
Average Daily Gain:						
Oct. 18-19 (24 Hr. Loss)	-37.0^{a}	-36.3^{a}		-35.9^{a}		2.148
Oct. 19-26	6.6^{b}	4.3^{a}		4.3^{a}		.3548
Oct. 26-Nov. 3	2.5^{a}	2.3^{a}		2.3^{a}		.3798
Entire Trial Oct. 18 to Dec. 19	2.03^{b}	1.56^{a}		1.53^{a}		.1213

1/ The 20% HPM/12% fortified HPM group had access to a 20% HPM supplement on pasture before weaning followed by the 12% fortified HPM supplement after weaning.

2/ This group received the 12% fortified HPM supplement after

Table 7. Trial three weaning and short term backgrounding performance of calves supplemented with a 12% fortified HPM supplement after weaning that had been either exposed or non-exposed to a 20% HPM supplement before weaning. 1989

	Control	Exposed/12% Fortified HPM	12% Fortified HPM	Mean SE
Gains:				
No. Head	27	27	26 1/	
Days Fed	62	62	62	
Initial Wt., lbs.	622.0	628.0	624.0	
Final Wt., lbs.	748.0	725.0	719.0	
Gain, lbs.	126.0	97.0	95.0	
ADG, lbs.	2.03[b]	1.56[a]	1.53[a]	.1213
Feed Summary:				
Conventional Feed				
DM Fd. /Hd., lbs.	939.5	868.8	844.1	
DM Fd. /Hd. /Day, lbs.	15.2[a]	14.0[ab]	13.6[b]	.3383
DM Fd. /Lb. of gain, lbs.	7.49	8.97	8.89	
12% HPM Consumption				
Pounds/Head	----	53.1	22.7	
Pounds/day	----	.86[a]	.37[b]	.7161[-01]
Combined Conventional & 12% HPM DM Intake:				
DM/Hd. /Day, lbs.	15.2[a]	14.9[a]	14.0[a]	.3541
DM Feed/Lb. of gain	7.49[a]	9.55[b]	9.15[ab]	.5462
Economics:				
Conv. Feed Cost/Hd., $	48.20	44.58	43.23	
12% HPM Cost/Hd. @ $.232/lb., $	----	12.32	5.27	
Total Feed Cost/Hd., $	48.20	56.90	48.49	
Marketing Summary:				
Gross Ret./Hd. based on final weight, $ 2/	634.95	630.49	625.18	
Expenses:				
Feeder calf @ $.89/lb., $	- 553.58	- 559.19	- 555.63	
Feed Cost, $	- 48.20	- 56.90	- 48.49	
Interest @ 12%, $	- 12.26	- 12.57	- 12.31	
Net Return, $	$20.91	$1.83	$8.75	

1/ One calf died of pneumonia.
2/ Market value for the heavier weight control calves was $85.00, and the lighter weight 12% fortified HPM calves brought $87.00/cwt.

Table 8. Distribution of calves diagnosed with respiratory disease complex and treated. 1989

	Control	Exposed/12% Fortified HPM	12% Fortified HPM
No. and (%) Treated	7 (25.9%)	9 (33.3%)	11 (40.7%) 1 calf died

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Marketing Shrink Study

James L. Nelson and D. G. Landblom

Introduction:

Cattlemen in North Dakota have rather limited options when it is time to market their livestock. Normally, these options would include selling on the farm to an order buyer or neighbor; shipping their cattle to a stockyard, buying station or commission house both in state or nation wide; or selling at a local or regional auction market facility. Whenever producers have less than "semi-truck" load groups of cattle to market they are forced to "pool" with other producers or to market locally in order to avoid exorbitant transportation costs. However cattle are marketed, body shrink and selling price become of paramount importance and ultimately determine the size of the payment received.

The Dickinson Research Center was asked to document body shrink and selling price when cattle are marketed at local "auction markets" based on the time of delivery prior to actual sale. Several factors that influence selling price include: the overall appearance and condition of the cattle; the amount of stomach fill; and the conformation and general health of the animals. In order to research this topic, cattle from the Dickinson Research Center Ranch Headquarters were marketed in two phases.

In **phase 1**, eighty head of Charolais crossbred heifer calves approximately 8 ½ months old were marketed. These heifers had been weaned on October 18, and fed a mixed ration of corn silage, mixed tame hay, rolled barley and supplement, designed to promote gains of two pounds per day. On November 15, each heifer was individually weighed and paired with a similar heifer based on weight and type. One heifer in each pair was randomly assigned to be hauled to market the day before the sale (early) or hauled to market on the day of sale (late). On Wednesday, Nov. 15th, after weighing and sorting, the (early) heifers were loaded onto livestock trailers and hauled approximately 26 miles to Stockmen's Livestock Market in Dickinson, ND. The (late) heifers were returned to their feedlot pens where they had access to feed and water until the next morning. On Thursday, November 16, these (late) heifers were individually reweighed, loaded on livestock trailers and hauled to Stockmen's Livestock Market.

Just prior to the time of sale, both groups were sorted into uniform sale groups by employees of Stockmen's. The (early) and (late) market heifers sold one group following the other starting at 2:00 P.M. Both groups were sold in less than twenty minutes.

Phase II of the marketing-shrink trial was conducted identical to Phase I except that steers were marketed instead of heifers. Sixty nine head of Charolais crossbred steers were sold on January 4, 1990. These steers had been weaned on October 18, 1989 and fed a backgrounding ration of mixed chopped hay, corn silage and barley plus supplement. On January 3, all the steers were individually weighed and paired with a similar steer of like weight and type. One steer of each pair was randomly assigned to the "early" treatment while the other steer was assigned to the "late" treatment and returned to the feeding pens. The "early" steers were loaded into stock trailers and hauled approximately 26 miles to Stockmen's Livestock Market in Dickinson. Upon their arrival at the market (approximately 12 noon), the steers were penned and given access to both hay and water, which is the normal handling procedure at Stockmen's.

The following day, January 4, the "late" marketed steers were reweighed, loaded into stock trailers and hauled to Stockmen's. Arrival time of the "late" steers was approximately at 11:30 AM. Both groups of steers were sorted by yard employees into uniform sale groups just prior to selling. Both groups were sold one following the other starting at 12:30 PM. Both groups were sold in less than 25 minutes.

Discussion:

After two marketings, the results have been similar. (see Tables 1 and 2) In both cases, cattle delivered on the day of the sale had less total shrink and returned more net dollars. In Phase I, heifers delivered on the day of the sale had a 1.88% shrink compared to a 5.62% shrink on those hauled in the day before the sale. They also averaged $12.26 more ($474.45 vs $462.19) than the "early" heifers. Steers sold in Phase II performed much like the heifers. The steers hauled to market the day of the sale had 2.93% shrink compared to 6.47% for those hauled in the day before. They also returned an average of $29.17 more than the "early" delivered steers. Due to the strong demand for cattle during both marketings, there was no noticeable price discount for the cattle delivered on the day of the sale because of body fill.

Summary:

Based on the results of this trial, it appears that cattlemen could expect less shrink on their cattle if they were able to deliver their cattle on the day of the sale, preferably as close to sale time as possible. During periods of strong demand, buyers did not discount prices of cattle carrying a normal "fill". Cattle delivered on "sale day" returned $12.26 / head more in phase 1 and $29.17 / hd more in phase II than did the heifers and steers delivered to the market the day before the sale.

It is planned to continue this trial in order to see if the results obtained this year can be repeated.

Table 1. Results of the marketing-study. Phase I – Heifers marketed at Stockman Livestock in Dickinson, ND.

	Time of Delivery to the Market	
	Day before Sale (Early)	**Day of Sale (Late)**
Date sold	Nov. 15, 1989	Nov 16, 1989
Number of heifers sold	40 head	40 head
Weight off the farm	23,972 lbs.	23,391 lbs.
Arrival time at the market	1:00 PM (11/15/89)	9:45 AM (11/16/89)
Time of actual sale	2:30 PM	2:30 PM
Hours at market prior to sale	25.5 hrs.	4.75 hrs.
Weight across the market scale	22,625 lbs.	22,950 lbs.
Total shrink	1,346 lbs.	441 lbs.
Percent shrink	5.62%	1.88%
Sale results:		
3 hd. Ave. wt. 723# @ $76.00	$1,649.20	
14 hd. Ave. wt. 617# @ $82.75	$7,153.74	
21 hd. Ave. wt. 512# @ $83.00	$8,926.65	
1 hd. Ave. wt. 585# @ $71.75	$419.74	
1 hd. Ave. wt. 470# @ $72.00	$338.40	
Total return	$18,487.73	
Average return per head	$462.19	
4 hd. Ave. wt. 721# @ $77.25		$2,228.66
20 hd. Ave. wt. 592# @ $82.75		$9,805.88
15 hd. Ave. wt. 515# @ $85.00		$6,566.25
1 hd. Ave. wt. 490# @ $77.00		$377.30
…. Total return		$18,978.09
…. Average return per head		$474.45
…….Dollar advantage per head----------		**$12.26**
…….Dollar advantage- Total----------		**$490.30**

Table 2. **Results of the marketing-study. Phase II – Steers marketed at Stockman Livestock in Dickinson, ND.**

	Time of Delivery to the Market	
	Day before Sale (Early)	**Day of Sale (Late)**
Date sold	Jan. 3, 1990	Jan. 4, 1990
Number of steers sold	35	34
Weight off the farm	27,630 lbs.	26,953 lbs.
Arrival time at the market	12:15 PM (1/3/1990)	11:30 AM (1/4/1990)
Time of actual sale	12:45 PM	12:45 PM
Hours at market prior to sale	24.5 hrs.	1.25 hrs.
Weight across the market scale	25,840 lbs.	26,055 lbs.
Total shrink	1,789 lbs.	787 lbs.
Percent shrink	6.47%	2.93%
Sale results:		
11 hd. Ave. wt. 808# @ $85.75	$7,627.46	
19 hd. Ave. wt. 741# @ $86.00	$12,117.40	
5 hd. Ave. wt. 571# @ $91.25	$2,605.19	
Total return	$22,350.05	
Average return per head	$638.58	
26 hd. Ave. wt. 809# @ $86.75		$18,247.86
6 hd. Ave. wt. 650# @ $89.25		$3,485.21
2 hd. Ave. wt. 557# @ $87.00		$970.05
Total return		$22,703.12
Average return per head		$667.74
Dollar advantage per head----------		$29.17
Dollar advantage- Total - (based on 35 hd)----------		$1,020.60

Short Term Swine Identification for Market Hogs

James Nelson, Doug Landblom, and Dr. Irwin Huff, DVM

PURPOSE:

Identification of swine from the producer's farm to the slaughter plant is important to the consumer of pork products and to the swine industry of North Dakota and of the USA. By identification through slaughter, dangerous drug residues that are found in meats and meat products can be traced to their source and the causes corrected. Also, identification helps locate foci of serious diseases such as brucellosis, tuberculosis, and pseudorabies **so that these diseases can be managed better or eradicated**, thus reducing the cost of production and assuring that pork products continue to be a safe, economical source of animal protein for human consumption.

A good swine identification device must be easy to apply, easy to remove at slaughter, low in cost, have a high degree of retention, and be readable when it reaches the kill floor. The identifier must not leave any residue in the meat, or adulterate the finished pork product in any way.

The regulations permit the use of swine identification devices approved by the Administrator of the Animal and Plant Health Inspection Service (APHIS). At this time the Administrator approves back tags and ear tags for sows and boars and tattoos for butchers. Those responsible for identification include every person who handles swine in interstate commerce.

In North Dakota only back tags are used on sows and boars and tattoos are used on butchers. Experience in North Dakota and elsewhere has shown that a high percentage of the back tags placed on sows and boars are lost before they reach the slaughter plant kill floor where they are retrieved. Slaughter trace back then is difficult and often impossible on animals that have lost their tags or have been retagged in market channels.

North Dakota swine producers have asked the Dickinson Research Center to help solve the tag retention problems, in cooperation with Dr. Irwin Huff, AVIC, USDA, APHIS, Bismarck, N.D.

This project compares several methods of short term swine identification and notes the problems and advantages of each, since the major problem with the slaughter check program has been the lack of good, consistent identification.

PROCEDURE: STUDY NUMBER ONE

On January 17, 1990, two groups of Hampshire females weighing approximately 300 pounds were combined and moved into a 9'X 60' holding pen. Twenty-three gilts and two second litter sows were used in the trial, and each animal received five tags. These included a paper back tag applied to the pig's forehead and to the top of the shoulder area. Each paper tag was coated with approximately a 1/8" thick layer of a cattle back-tag cement. The tags were applied using firm hand pressure to insure good contact with the animal's hair and skin.

Each pig also received three plastic tags applied with a Tag-Fast III applicator. One tag was inserted in the muscular area of the neck approximately 8-10 inches above the base of the ear. A second tag was applied through the ear from the back or shoulder side. The initial tagging process started at 9:00 A.M. and was completed by 9:20 A.M.. A third plastic tag was inserted into the loose skin located at the base of the ear at 11:45 A.M., after it was discovered that a high percentage of the neck tags had already been lost. During actual tagging, the pigs were not restrained in any way other than by crowding them together in order to simulate conditions found at most livestock marketing facilities. It required about twenty minutes to apply the four tags to the twenty five pigs. After tagging was finished, the pigs were confined to the holding area for approximately seven hours before being returned to their outside pens.

Tag retention was monitored by checking each pig for missing tags according to the following schedule: five readings were made on day one, two readings on days 2 and 3, and one on days 4 and 5. Results of the observations are shown in Table 1.

OBSERVATIONS:

It was obvious by the end of the first day that none of the tagging systems or tag locations were satisfactory. The easiest tag to apply was the paper tag applied to the top of the shoulder. Application of a paper tag to the pig's forehead was harder to accomplish than was application to the shoulder since the pig's head was constantly moving. Application of glue to the tag required considerable time and would best be accomplished while wearing gloves since invariably, the glue managed to get on the fingers. Inserting a plastic tag into the neck area was the simplest of the plastic tagging methods. Application of the tags into the base of the ear or through the ear itself required more skill and patience. One injection needle was broken and two were bent during the tagging operation. There did not seem to be any difference between the two needle types (one a pin type, the other a hypodermic needle type) provided by the Hantover Corporation. They both allowed easy insertion of the tags.

DISCUSSION:

In this initial trial, the paper back tag applied to the top of the shoulder had the best overall retention, **with 12 of the 25 tags applied (52%) remaining after 5 days.** Twenty-three of the paper tags applied to the forehead area were missing after the first seven hours.

The Tag-Fast III plastic tags applied to the neck area were simple to install, but they had very poor retention. **Twenty-two of the 25 installed were missing by the end of the first two hours.** Apparently the "T"-locking device on the end of the tag failed to "lock" under the skin or in the tissue, and therefore, the tags were easily removed by rubbing or biting by other pigs. Of the 25 plastic tags applied to the base of the ear, 19 were missing by three hours after application. The plastic tags inserted through the ear were lost at the rate of 15 of 25 (60%) by five hours after tagging.

It appears that the plastic tags need to have a different or an additional locking device to insure retention, especially when the tags are inserted into the neck region. Perhaps a "porcupine quill" or "fish-hook" design could be incorporated into the tag design. Also, it seemed that the plastic tag should have a shorter, stronger "stalk" for attachment. The installed tags seemed to stick out from the skin or ear and attract attention. This allowed the tags to catch on fences and buildings or to be bitten by other herdmates.

The paper tags that remained on the shoulder were easy to read, even after five days. If the cement used on the paper tags had a chance to set up, most of the tags stayed on for the duration of the trial. Perhaps if the hair had been clipped before the tag was installed, the tag would have had a better chance of adhering to the skin and been less subject to loss. **By the end of the trial there were not enough of the paper tags remaining on the forehead to make a valid conclusion.** A number of the forehead tags were badly defaced prior to their actual loss, due to their having been chewed and rooted on by other pigs.

We need to go back to the drawing board and improve the design of the plastic tag if it is to be successful. The paper tag applied to the shoulder has good potential if it's retention can be improved, perhaps by using greater care during application.

Table 1. 1990 swine identification trial – missing tags.

Type of Tag	**Paper Tag**		**Tag-Fast III**		
Location	**Forehead**	**Shoulder**	**Neck**	**Ear**	**Base of ear**
	Tags lost No. %	**Tags lost No. %**	**Tags lost No. %**	**Tags lost No. %**	**Tags lost No. %**
Date: Jan 17					
Time: 9:10-9:30 AM	----------25 Tags Installed----------				
9:30 AM	2 (8%)				
10:15 AM	9 (36%)	2 (8%)	11 (44%)	1 (4%)	
11:20 AM	14 (56%)	2 (8%)	22 (88%)	3 (12%)	25 Tags Installed
11:45 – Noon					
1:15 PM	20 (20%)	4 (16%)	23 (92%)	6 (24%)	12 (48%)
3:20 PM	23 (92%)	6 (24%)	24 (96%)	15 (60%)	19 (76%)
Date: Jan 18					
Time: 8:15 AM	23 (92%)	6 (24%)	24 (96%)	15 (60%)	19 (76%)
3:15 PM	23 (92%)	6 (24%)	24 (96%)	15 (60%)	19 (76%)
Date: Jan 19					
Time: 8:30 AM	24 (96%)	6 (24%)	24 (96%)	15 (60%)	20 (80%)
3:20 PM	24 (96%)	6 (24%)	25 (100%)	15 (60%)	20 (80%)
Date: Jan 20					
Time: 7:00 AM	24 (96%)	6 (24%)	25 (100%)	15 (60%)	20 (80%)
Date: Jan 22					
Time: 8:00 AM	24 (96%)	12 (48%)	25 (100%)	18 (72%)	20 (80%)
Percent retention after 119 hours	4%	52%	0%	28%	20%

PROCEDURE: STUDY NUMBER TWO

On March 21, 1990, twenty-three Hampshire gilts weighing approximately 350 pounds were moved from pasture lots into adjoining swine handling pens. Starting at 9:15 AM, each pig was sorted into a 2' wide working alley and blocked with a piece of plywood so they could not move forward or backup. Each pig was then tagged with a rubber Bangle tag, a round metal tag and two paper "back" tags.

The Bangle tags were provided by Dr. James P. Davis, Senior Staff Veterinarian, APHIS, Federal Building, Room 729, Hyattsville, Md 20782. They were prototype tags having rubber like consistency and were approximately 1.5 inches in diameter. They were attached to the upper right ear using a #3 hog ring and application pliers (Decker Mfg. CO., Keokuk, Iowa). While not important to the trial, the tags used came in several colors including: black, red, green, blue and orange.

A round (approximately 1" diameter) metal tag was placed in the top of the left ear using a #3 hog ring. These tags were obtained from Stockmen's Livestock in Dickinson, N.D.. However, they are available through several livestock supply catalogs.

Each pig also received 2 paper "back tags", one applied to the forehead and one applied to the top of the shoulder. Each tag was covered with "back tag" cement approximately 1/8 inch thick, and an effort was made to press them firmly into the hair and skin.

> Note: In a separate trial, we checked on the amount of glue applied to each tag by weighing, adding cement and reweighing twenty-one tags. The average amount of glue applied averaged .86 gms. (.57 – 1.22 gms.).

After the tags were installed, the pigs were held in a 9' x 60' holding pen until 4:30 PM when they were returned to their original pens. The pigs were individually checked for tag retention at 10:30 AM, 1 PM and 4 PM on day one, at 8:00 AM and 4 PM on day two, and once a day at 8:00 AM on days three, four and five.

RESULTS: Trial results of the second study ane shown in table 2.

Table 2. Swine Identification and Tag Retention Study-Number 2.

	Location			
	Paper Backtag		Ear tag	
			Metal	Bangle
	Forehead	Back	Left ear	Right ear
Date	**[Number Lost]**		**[Number Lost]**	
3-21-90				
1 PM	15	6		1
4 PM	19	6	1	
3-22-90				
8 AM	20	6	1	1
4 PM	20	8	1	1
3-23-90				
8 AM	20	8	1	1
3-24-90				
8 AM	20	8	1	2
3-25-90				
8 AM	20	8	1	2
Number lost	20/23	8/23	1/23	2/23
Percent lost	87%	36%	4%	9%

DISCUSSION:

As in our first trial, the back tags applied to the forehead area proved to be a disappointment. Fifteen of 23 (65%) were missing by 1:00 PM of the first day. By 8:00 AM on day two, 20 of 23 (87%) were missing. The back tags applied to the top of the shoulder had better retention but still left much to be desired. At the end of five days, eight of 23 (35%) were missing.

Both of the ear tags (metal or rubber bangle) had a retention rate of over 90%. The one metal tag that was lost, evidently had not been securely fastened because both the ear tag and the hog ring were missing and yet the ear was not torn or damaged. In the bangle tag treatment group, one bangle tag was missing even though the hog ring was still intact, while in the other case, everything was lost, indicating poor fastening procedure.

We found that neither of the ear tags correctly fitted the hog ring application pliers we used. To accommodate the No. 3 hog rings and the round tags, the pliers needed to have wider, deeper jaws. Having the correct size and shape of application pliers would have made the tagging operation much simpler.

The pigs did not like to be confined and were not anxious to have their ears pierced with the hog rings and tags. However, we were able to tag them all without resorting to a pig (snout) holder for restraint. Application of any tag to a pig's ear requires patient and careful technique along with some form of confinement or restraint. Naturally, this adds to the amount of labor, time and expense required to identify the pigs. It appears that both a metal tag or a "bangle" tag applied to the top of a pigs ear with a #3 hog ring, will provide good, short term identification of boars and sows being shipped to market. However, this trial did not address removal problems, once the pigs reached the slaughter plant.

The paper back tag applied to the top of the shoulder was the easiest tag to apply and had fair to average retention. We felt that retention could be improved by using a glue with a faster drying time, since most tag losses occurred during the first few hours post application.

SUMMARY:

Neither the plastic tags applied with the Tag-Fast III applicator or the paper tags glued to the pig's forehead were satisfactory for short term swine identification because of poor retention.

Paper back tags applied to the top of the shoulder were the easiest to apply and had better than a 60% retention rate. The paper tags applied to the shoulder would provide an easy amd satisfactory method of identification if the glue used had a rapid set up time. Both the round metal tags or the "bangle" tags provided good, short term identification although application was more difficult and time consuming than with the paper tags. This trial did not address tag removal problems at the slaughter plant.

Multi-Species Grazing of Native Range In Western North Dakota

J. L. Nelson, D. G. Landblom, Phil Sjursen, and T. J. Conlon

Introduction:

Grazing more than one ruminant species is sometimes referred to as multispecies grazing. Basically, the objective is to increase the efficiency of transfer of nutrients from vegetation to animal products.

Cattle and sheep differ in their dietary preference for plant species, their ability to digest various types of forage, and their pattern of forage harvesting. Grazing sheep and cattle together increases the productivity of pastures both by achieving the plant species balance that produces the most forage, and by maximizing the use of the forage being produced. However, the results depend not only on the combining of sheep and cattle, but also vary according to the level of management practiced.

Ranchers need to know how to harvest and sell the forage they produce to the best advantage. Based on the physical nature of his ranch; the economic outlook for different kinds of livestock; and his personal likes and dislikes, a rancher can select cattle or sheep or some combination of them to turn his annual crop of grass and forage into the greatest net profit and personal satisfaction for himself.

Purpose:

This trial was designed to measure and compare grazing native range with a single species (cattle) or multispecies (sheep and cattle). Since the native range vegetation is composed of grass, forbs and browse, stocking with both cattle and sheep should maximize the forage utilization, increase the overall net return and reduce the number of "weedy" forbs such as fringed sage, green sage, gumweed, thistles, etc. Expenses for such items as additional fencing and water development in order to run sheep on a traditional cattle ranch are being documented, as well as dog and coyote predation problems.

Procedure:

A 640 acre native pasture at the Dickinson Research Center Ranch Headquarters, Sec. 16-143-96, was utilized for this trial.

On June 29th, forty-eight pair of crossbred (AXH) cows and their Charolais sired calves were weighed and allotted to either the west half (Control) or the east half (Multispecies) of Sec. 16. One two year old Charolais bull was included in each herd. The herd grazing the east pasture was joined by a flock of 24 head of dry yearling white faced ewes, provided by the Hettinger Research Center.

The grazing season started on June 29th and ended on October 3rd, a period of 96 days. The bulls were removed on September 14th. On October 3rd, the cows, calves and sheep were individually weighed and removed from the pastures. Animal gains were calculated on the difference between initial and final weights. Gain per acre was calculated by dividing the total liveweight gain by the pasture size, in this case, 320 acres. The bull weight changes were not utilized in the calculations.

Prior to the start of the trial, each pasture was mapped based on soil type. Permanent exclosures were constructed on each of the soil types and included Clay; Clay Pan; Sand; Silt and Shallow. Small exclosure cages on each soil type allowed herbage production estimates to be made by clipping ¼ meter squared frames both inside (ungrazed) and outside (grazed). Pastures were sampled prior to grazing (June 29) and again at the end of the grazing season (October 4). Three samples representing both grazed and ungrazed herbage were collected at each of the soil type sites. Each of the samples was sorted into a grass or a forb component while clipping. A permanent transect was established at each site in order to monitor changes in species composition during the trial.

The stocking rate for 1990 was reduced 30% from normal due to the dry conditions existing at the start of the trial. Including the extra 24 ewes on the east pasture increased the stocking rate by 20% over the control (west) pasture.

Results:

The 1990 growing season started with marginal precipitation in April and May. During the month of June precipitation was recorded on 12 days and totaled 3.75 inches. However, July and August precipitation amounted to only 1.44 inches which was 2.49 inches below the long term average at the Dickinson Research Center.

Cow and calf gains were normal and better than expected given the dry conditions during the 96 day grazing period. (see table 1) The ewes gained on average 0.13 lbs. per head per day and were in excellent condition for rebreeding at the end of the trial.

Total herbage production per 320 A. pasture was 278,554 lbs. on the west pasture and 266,034 lbs. on the multispecies (MS) pasture. Total grass production was 197,769 lbs. on the MS pasture and 198,759 lbs. on the control pasture. Forb production was 68,265 lbs. vs. 79,796 lbs. for the MS and control pastures respectively.

It was obvious from this trial that the current four and five strand barb wire fences designed for cattle would not adequately control the movement of sheep. A regular sheep sized water tank was installed in order to allow easy access to clean, drinking water.

Although coyotes were known to be in the area, there were no losses due to predation.

Summary:

Grazing sheep and cow-calf pairs on native range from June 29 to October 3, 1990 allowed both species to make normal growth without sacrificing either pasture quantity or quality. Savings in ewe feed alone could be estimated to average $2.50 per month or roughly $8.00 per ewe for the 96 day grazing period. Barb wire fences (4 – 5 strand) were not adequate for controlling the movement of the sheep. Data from several years will be necessary in order to show whether or not the control of undesirable forbs by sheep will be practical to cattle producers in western North Dakota.

Table 1. Results of Multispecies grazing on native pastures in 1990.

	East Sheep and Cows	West Cows
Acres grazed	320	320
Days grazed	96	96
Number of head		
Cow-calf pairs	24	24
Sheep (dry ewes)	24	------
Bulls-for 76 days	1	1
Weight gained (lbs.)		
24 Sheep	301.5	-------
Ave. per head	12.6	
24 Cows	565.5	244
Ave. per head	23.6	10.2
24 Calves	5,802.5	5,588.0
Ave. per head	241.8	232.8
1 Bull	47	(-) 152.0
Average		
Gain / hd./ day*		
Sheep	0.13	------
Cows	0.25	0.11
Calves	2.52	2.43
* Bull weights not included.		

Brood Cow Performance In Western North Dakota:
Drylot Phase

By

D. G. Landblom and J. L. Nelson

Introduction:

Calf weaning weight, nutrient requirements of the cow and the overall cost of production are parameters affected by a cow's level of milk production, body condition, and mature body weight. Several investigations have been conducted to measure the interrelationship of cow size, maintenance requirements and calf weaning weight. They clearly show that energy requirements for maintenance are dependent on cow weight, and that as mature cow weight increases calf weaning weight also increases (Klosterman et al., 1968; Urick et al., 1971; Jeffrey and Berg, 1972; Miguel et al., 1972; Benyshek and Marlowe, 1973; Turner et al., 1974; NRC, 1984; Rode and Bowden, 1987).

Weaning weight can be raised by increasing mature body weight, increasing milking ability, or through a combination of both factors. Although selection for increased milk production among beef breeds results in heavier calves at weaning, infusing dairy blood into the beef herd is a more rapid method for increasing milk production (Cundiff, 1970). However, it is also associated with poorer reproductive performance when post partum energy levels are inadequate (McGinty and Frerichs, 1971; Halloway et al., 1975, and Wyatt et al., 1977). Rahnfeld and co-workers, in an evaluation of breed crosses maintained under two environments, reported that cows having the greatest milk yield were also identified as having below average weight of calf weaned per year. The reduction reported was due to reduced conception rates, high calf mortality and high cow losses during wintering. In their study, cows reared with insufficient energy intake sacrificed themselves to feed their calves. Loss of body condition put conception rates and winter survival in jeopardy.

Lactation status not only affects maintenance energy requirements, which are higher for cows of high milk production potential per unit of body weight than cows with low milk production potential (Ferrell and Jenkins, 1982), but it also increases forage intake of free ranging beef cows. Kronberg et al., (1986) found that the forage intake of lactating Hereford and Simmental x Hereford cross cows was 23% and 39% more, respectively, than their non-lactating counterparts.

Environmental differences under which beef cattle are raised in North Dakota vary widely from year to year, and within each year. In addition to dealing with environmental differences, cattlemen have a number of genetic options to choose from when deciding which genetic combination is best suited to their particular situation. The challenge for cattlemen therefore, is matching the genetic options available to them to the feed resources on their farms and ranches. This project is designed to help cattlemen in the decision making process, when evaluating cattle with varying production characteristics, by documenting the feed energy inputs necessary for cows with varying body weight and milking ability to reproduce and over winter successfully. Within the investigation there are three major relationships of importance: 1) the relationship between nutrition and reproduction, 2) the relationship between nutrition and total beef production, and 3) the relationship between grazing intensity and its affect on species composition, plant density change and overall carrying capacity.

The project is divided into two phases. Phase I is the drylot period when cows are confined and fed harvested feeds. Phase II is the grazing period. For the purpose of this progress report, only the drylot data will be reported and related to weaning weight.

Cow breed combinations being used to document energy inputs for western North Dakota were selected according to their expected mature body weight and milking ability, and are characterized as being light, medium and heavy for body weight, and low, medium and high for milking ability. The Hereford breed serves as the foundation and control breed and is characterized as being of medium body weight and low for milk production. Developed from the Hereford breed, the other breed combinations and categories are shown below:

Mature Body Weight

Light:	Milking Shorthorn X Angus X Hereford (MSxAxH)
Moderate:	Hereford (H) Angus x Hereford (AxH)
Heavy:	Simmental x Hereford (SxH)

Milking Ability

Low:	Hereford (H)
Medium:	Angus x Hereford (AxH) Simmental x Hereford (SxH)
High:	Milking Shorthorn x Angus x Hereford (MSxAxH)

* All combinations are terminally crossed to Charolais sires.

Procedure:

In 1986, the initial breed groups were fed long crested wheatgrass hay ad libitum and one pound of dry rolled barley per head daily during the gestation phase. As each cow calved she and her calf were weighed and transferred to postcalving lots where they were allowed free choice access to the complete mixed lactation ration shown in table 1. On May 21st the groups were moved to crested wheatgrass pasture, and then exposed to fertile Charolais bulls on June 1st. The breeding season was completed on July 31st.

In 1987, the cows grazed crop aftermath until December 14, 1986 when they were moved into drylot and started on the silage based gestation rations shown in table 2. The groups were maintained on the rations for a one week adjustment period before being weighed on two consecutive days. Weights from the two consecutive weighings were averaged and the gestation phase was started on December 22, 1986. As each cow calved, she and her calf were weighed and transferred to separate cow lots reserved for each breed

after calving, and started on the complete mixed lactation ration shown in table 2. The groups were maintained on these rations until they were turned out on crested wheatgrass spring pasture April 30, 1987. The previous year, 30 percent of the MS x A x H cows were open at the end of the breeding season. Therefore, in 1987 eight pounds of dry rolled barley was fed per head during the first heat cycle of breeding to the higher lactating Milking Shorthorn and Simmental cross cow groups. Fertility tested Charolais bulls were with the cow groups from June 1st to August 1st.

In 1988, the groups were handled in much the same way as in 1987, but didn't graze crop aftermath as long. They were adjusted to the silage based gestation rations shown in table 3, and weighed on trial December 15, 1987. A longer drylot lactation period was needed in 1988 because of drought. Below normal spring precipitation and above normal temperatures combined to reduce crested wheatgrass growth substantially. The cow groups were turned out on crested wheatgrass on May 27, 1988 when suitable growth was attained. Feeding of eight pounds of dry rolled barley supplement to the higher lactation groups (MS x A x H and S x H) began on May 27th also. Fertility tested Charolais bulls were with all groups from June 1st until August 15th. The breeding season was extended two additional weeks because of the prolonged high temperatures experienced during June and July.

In 1989, drought conditions also shortened crop aftermath grazing. The cow groups were adjusted to the drylot rations shown in table 4, and were weighed on trial November 10, 1988, after two consecutive weighings. Spring turnout on crested wheatgrass and the feeding of barley flushing supplement to the two highest lactating groups (SxH and MSxAxH) both occurred on May 25, 1989. As in previous years, fertility tested Charolais bulls were put with the cows on June 1st and removed on August 15, 1989.

The experiment began in 1986 with an unequal number of cows in each breed group that were properly bred to Charolais. In all subsequent years the herds have been maintained at ten cows. Replacements for cows that have had to be removed from the study have been limited. Replacements are being made at two specific times during the production year. Cows that lose calves anytime before the start of the breeding season on June 1st are replaced with a comparable pair from a reserve gene pool. Those cows that are examined for pregnancy and identified as open at weaning are replaced with a comparable bred cow from the reserve pool when the winter feeding period is started.

Dry matter intake during gestation has been regulated based on body weight measurements taken biweekly. The breed groups are fed to gain approximately two pounds daily during the last trimester of pregnancy so that they will have a net gain after calving ranging between .2 and .4 tenths of a pound per day. The (H) and (A x H) groups are fed 22 pounds of dry matter as a basal ration, and the (MS x A x H) and (S x H) groups are fed 24 pounds of dry matter as a basal ration. Adjustments to the basal dry matter intake levels are made upward or downward based upon body weight changes at each biweekly weighing, and are further adjusted for cold weather according to the following schedule: 15°F (no adjustment), 0°F (+9%), -15°F (+18%), and -30°F (+27%).

In this study, energy input is being measured in megacalories per pound of calf weaned per exposed cow and is obtained by charting the total calculated digestible energy consumed during gestation and lactation in drylot against the pounds of calf weaned from all exposed cows. Additional measurements include: 1) gestation and lactation body weight changes, 2) gestation and lactation dry matter feed consumption, 3) wintering economics, and 4) milking ability estimates at selected dates during the grazing season.

Milk production is estimated using the weigh-suckle-weigh method (Neville, 1962). The estimates are being made approximately mid June, late August, and late October of each year.

Statistical analysis was conducted with MSUSTAT (version4.10).

Results and Discussion:

Four of seven drylot wintering cycles scheduled for this long term investigation have been completed. Drylot wintering begins in mid December after the cow groups have completed grazing crop aftermath, and continues until approximately mid May when the breed groups are turned out on crested wheatgrass pasture. Starting and completion dates have varied each spring and fall in response to seasonal precipitation and its affect on grazable forage. The summer grazing period on native range begins the third week of June each year, and is completed when pastures are sufficiently grazed based on clipping appraisals.

The Nutrient Requirements of Beef Cattle (1984) handbook currently recommends that dry pregnant mature beef cows weighing approximately 1100 pounds should consume 21.0 pounds of dry matter that contains 53.2% TDN, and it further recommends that 1200 pound cows in the same stage of pregnancy consume 22.3 pounds of dry matter containing 52.9% TDN. Our past winter feeding experience indicates that NRC recommendations need to be adjusted upward approximately 10% to account for the more harsh environment of southwestern North Dakota. Rahnefeld and co-workers found in their work with ten breed crosses that NRC feeding standards needed to be adjusted upward an average 17% to account for the environmental differences they encountered in Canada. In our study, we have found that each cow group has required feeding of a different level of dry matter in order to maintain body weight at or near the projected levels. The wintering and lactation rations fed are shown in tables 1, 2, 3 and 4, and a comparison of the levels of dry matter fed versus NRC recommendations is shown in table 5. The heaviest body weight (SxH) and the lightest body weight (MSxAxH) groups have been fed 8.2% and 13.9% above NRC standards, respectively, and experienced a slight weight improvement up to calving, as shown in table 6. The moderate body weight groups (H and AxH), were fed 9.1% and 5.7% above NRC standards, respectively, but had a slight weight loss up to calving. The values used appear to be sufficient for wintering provided that feed levels after calving contain adequate energy for lactation and body weight gain. Rations used during the short lactation period after calving, but before turnout on crested wheatgrass, have provided adequate energy for lactation and body weight gain. Gains for each body weight group are as follows: light weight (MSxAxH) .94, moderate weight (H) 1.13, moderate weight (AxH) .89, and heavy weight (SxH) .70. Feed intake to produce these gains during the short period between calving and turnout on spring pasture appears to be one of the keys to reproductive success.

Drylot costs for wintering and lactation are also shown in table 6. When combined, the total average wintering costs were as follows: light weight (MSxAxH) $171.11, moderate weight (H) $154.32, moderate weight (AxH) $165.00 and heavy weight (SxH) $175.78.

Table 7 contains a four year production summary. The highest milking ability groups (MSxAxH and SxH) had longer postpartum intervals, but the difference between them and the other two lower milking ability groups (H and AxH) were not significant.

Milking ability had a positive (P<.01) effect on weaning weight. The highest milking group (MSxAxH) produced calves that weighed 642.8 pounds, which was significantly heavier than the lowest milking ability group (H) that weaned calves averaging 578.2 pounds. Pounds of calf weaned per cow exposed is a measurement in part for reproductive failure. Therefore, the significant advantage measured for weaning weight is lost when reproduction is taken into account. Pounds of calf weaned per cow exposed to date are as follows: light weight (MSxAxH) 587.1 pounds, moderate weight (H) 547.8 pounds, moderate weight (AxH) 578.1 and the heavy weight (SxH) 588.7 pounds.

Feed costs per pound of calf weaned per cow exposed, which are also shown in table 7, were relatively close. Costs incurred to date per pound of calf weaned per cow exposed are $.2813 (H), $.2914 (MSxAxH), $.2829 (AxH) and $.2985 (SxH). Expressing these costs in term of net return over feed and processing makes the differences easier to understand. Table 8 shows a partial economic analysis in which feed and processing charges have been deducted from the gross returns per cow exposed. The moderate weight/moderate milking ability (AxH) group returned the most net dollars of $13,938.72. This was $402.22 more than the heavy weight/moderate milking ability (SxH) group that netted a total of $13,536.50. The light weight/high milking ability (MSxAxH) group returned $29.08 less, and the moderate weight/low milking ability (H) group returned $310.98 less than the highest returning (AxH) group.

Summary:

There are three more production years and grazing data to be incorporated into this project before it is finalized. It is apparent, however, that while the cows used in this study represent only a small number of the breeds and combinations available to select from in the beef industry, their diversity in terms of body weight and milking ability are manageable within the environment of southwestern North Dakota.

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Table 1. Ration dry matter composition and ingredient cost per pound of dry matter. 1986.

	Int'l. Feed Numb.	Dry Matter Ration %	Dry Matter Cost/Pound
Gestation:			
Crested Wheatgrass Hay	2-05-424	96.3	.025
Dry Rolled Barley	4-00-535	3.7	.037
Feeding Charge			.0025
		100.00	
Crude Protein: 9.6%			
Calcium: .38%			
Phosphorous: .27%			
* Mineral Fed Free Choice			
Lactation:			
Alfalfa	1-00-071	19.1	.0222
Crested Wheatgrass Hay	2-05-424	21.4	.025
Corn Silage	3-02-822	39.8	.01944
Dry Rolled Barley	4-00-535	13.1	.037
Sunflower Meal		5.9	.0584
Trace Mineral Salt	6-04-152	.35	.064
Dicalcium Phosphate	6-01-080	.35	.191
Processing			.0125
		100.00	
Crude Protein: 11.0%			
Calcium: .54%			
Phosphorous: .38%			

Table 2. Ration dry matter composition and ingredient cost per pound of dry matter. 1987.

	Int'l. Feed Numb.	Dry Matter Ration %	Dry Matter Cost/Pound
Gestation:			
Corn Silage	3-02-822	59.5	.01944
Oat Hay	1-03-276	39.7	.02108
Trace Mineral Salt	6-04-152	.51	.064
Dicalcium Phosphate	6-01-080	.29	.191
Processing			.0125
		100.00	
Crude Protein: 8.1%			
Calcium: .45%			
Phosphorous: .24%			
Lactation:			
Alfalfa	1-00-071	25.6	.0222
Corn Silage	3-02-822	46.4	.01944
Oat Hay	1-03-276	20.3	.02108
Barley Dist. Dry Grain	5-02-144	2.1	.050
Soybean Oilmeal	5-20-637	3.4	.1139
Trace Mineral Salt	6-04-152	1.1	.064
Dicalcium Phosphate	6-01-080	1.1	.191
Processing			.0125
		100.00	
Crude Protein: 10.7%			
Calcium: .87%			
Phosphorous: .43%			

Table 3. Ration dry matter composition and ingredient cost per pound of dry matter. 1988.

	Int'l. Feed Numb.	Dry Matter Ration %	Dry Matter Cost/Pound
Gestation:			
Corn Silage	3-02-822	57.9	.01944
Oat Hay	1-03-276	41.3	.02108
Trace Mineral Salt	6-04-152	.4	.064
Dicalcium Phosphate	6-01-080	.4	.191
Processing			.0125
		100.00	
Crude Protein: 8.1%			
Calcium: .48%			
Phosphorous: .26%			
Lactation:			
Alfalfa	1-00-071	24.3	.0222
Corn Silage	3-02-822	48.2	.01944
Oat Hay	1-03-276	20.5	.02108
Soybean Oilmeal	5-20-637	4.8	.1139
Trace Mineral Salt	6-04-152	1.1	.064
Dicalcium Phosphate	6-01-080	1.1	.191
Processing			.0125
		100.00	
Crude Protein: 10.7%			
Calcium: .85%			
Phosphorous: .44%			

Table 4. Ration dry matter composition and ingredient cost per pound of dry matter. 1989.

	Int'l. Feed Numb.	Dry Matter Ration %	Dry Matter Cost/Pound
Gestation:			
Corn Silage	3-02-822	47.4	.04
Alfalfa Hay	1-00-071	17.6	.05
Alfalfa Cubes	1-00-063	9.1	.05
Oat Straw	1-03-283	18.2	.025
D. R. Barley	4-00-549	6.9	.04792
Sod. Phosphate (XP-4)	6-04-287	.36	.4306
Trace Mineral Salt	6-04-152	.43	.065
Vitamin A, D & E		.027	.4534
Processing			.0125
		100.00	
Crude Protein: 8.4%			
Calcium: .51%			
Phosphorous: .26%			
Lactation:			
Corn Silage	3-02-822	55.7	.04
Alfalfa Hay	1-00-071	21.6	.05
Alfalfa Cubes	1-00-063	9.8	.05
D. R. Barley	4-00-549	12.1	.04792
Sod. Phosphate (XP-4)	6-04-287	.38	.4306
Trace Mineral Salt	6-04-152	.40	.065
Vitamin A, D & E		.027	.4543
Processing			.0125
		100.00	
Crude Protein: 9.6%			
Calcium: .54%			
Phosphorous: .29%			

Table 5. Daily feed allowance per cow in relation to NRC standards. 1986-1989.

Body Wt. **Breed**	**Light** **(MSxAxH)**	**Moderate** **(H)**	 **(AxH)**	**Heavy** **(SxH)**
Gestation:				
Actual, Lbs.	24.6	23.9	24.0	25.1
NRC	21.6	21.9	22.7	23.2
% above NRC	13.9%	9.1%	5.7%	8.2%
Lactation:				
Actual, Lbs.	32.4	28.0	31.3	33.5
NRC	23.2	23.1	24.0	24.7
% above NRC	39.7%	21.2%	30.4%	35.6%
Total Combined Digestible Energy, Mcal.	5063.0	4792.0	4976.3	5245.9
Digestible Energy/Pound of Calf Weaned, Mcal	8.62	8.75	8.61	8.91

Table 6. Four year mean gestation and lactation gain, dry matter feed consumption and partial economics. 1986-1989.

Body Weight Breed	LIGHT (MSxAxH)	MOD (H)	MOD (AxH)	HEAVY (SxH)	SE
Gestation:					
No. Head	40	38	40	37	
Days Fed	107.2	100.2	96.7	103.9	
Initial Wt., Lbs.	1154	1176	1229	1267	
Calving Wt., Lbs.	1163	1157	1210	1271	
Wt. Change, Lbs. 4/	9[a]	-19[a]	-19[a]	4[a]	10.78
ADGain or Loss, Lbs.	.08	-.15	-.20	+.04	
Gestation Economics:					
DM Feed, Lbs.	2640	2391	2320	2610	
DM Feed/Hd/Day., Lbs.	24.6	23.9	24.0	25.1	
Feed Cost/Lb. of DM, $	.0367	.0366	.0366	.0368	
Feed Cost/Hd., $	96.89	87.51	84.91	96.05	
Feed Cost/Hd/Day, $	.90	.87	.88	.92	
Lactation:					
No. Head	39 2/	37 1/	40	36 3/	
Days Fed	49.1	54.2	58.1	51.2	
Calving Wt., Lbs.	1163	1154	1216	1259	
Spr. Turnout Wt., Lbs.	1209	1215	1267	1295	
Gain, Lbs. 4/	46[a]	61[a]	51[a]	36[a]	14.59
ADG After Calving, Lbs.	.94	1.13	.89	.70	
Lactation Economics:					
DM Feed/Hd., Lbs.	1590	1515	1816	1715	
DM Feed/Hd/Day, Lbs.	32.4	28.0	31.3	33.5	
Feed Cost/Lb. of DM, $	.0441	.0441	.0441	.0441	
Feed Cost/Hd., $	70.12	66.81	80.09	75.63	
Feed Cost/Hd/Day, $	1.42	1.23	1.38	1.48	
Combined Wtr. Costs:					
Gestation Cost, $	96.89	87.51	84.91	96.05	
Lactation Cost, $	70.12	66.81	80.09	75.63	
Flushing Feed, $	4.10	--	--	4.10	
Total Average					
Wintering Cost, $	171.11	154.32	165.00	175.78	

1/ One Cow Removed
2/ One Cow Removed
3/ One Cow Removed
4/ Values unlike superscripts differ significantly (P<.01).

Table 7. Four year mean production summary. 1986-89.

Breed	**(MSxAxH)**	**(H)**	**(AxH)**	**(SxH)**	**SE**
Body Wt.	LIGHT	MOD	MOD	HEAVY	
Category 1/	1258 Lb.[a]	1294 Lb.[ab]	1320 Lb.[bc]	1352 Lb.[c]	15.05
Milking Ability	HIGH	LOW	MED	MED	
Category 1/	16.0 Lb.[c]	10.5 Lb.[a]	12.7 Lb.[ab]	14.6 Lb.[bc]	.6177
No. Exposed	38	37	38	37	
No. Exposed That Weaned A Calf	35	35	36	35	
Weaning Percent	92.1%	94.6%	94.7%	94.6%	
Postpartum Interval, Da. 1/	85.5[a]	80.9[a]	84.7[a]	90.9[a]	3.138
Tot. Lbs. of Calf Weaned					
From Exposed	24,426	21,394	23,333	23,026	
Cows 1/	(642.8)[b]	(578.2)[a]	(614.0)[ab]	(622.3)[ab]	13.35
Lbs. of Calf Weaned/Cow					
	22,308	20,270	21,966	21,783	
Exposed 1/	(587.1)[a]	(547.8)[a]	(578.1)[a]	(588.7)[a]	27.62
Wintering Cost/ Lb. of Calf Weaned/Cow					
Exposed	$.2914	$.2813	$.2829	$.2985	

1/ Values with unlike superscripts differ significantly (P<.01).

Table 8. Partial economic model estimating net returns for each of the body weight groups. 1/

Body Weight Class **Breed**	**LIGHT** **(MSxAxH)**	**MODERATE** **(H)**	**MODERATE** **(AxH)**	**HEAVY** **(SxH)**
Total Lbs. of Calf Weaned From Exposed Cows	22,308	20,270	21,966	21,783
Gross Return/Cow Exposed, $	$20,411.82	$19,337.58	$20,208.72	$20,040.36
(Mkt. Value/cwt.) 2/	($91.50)	($95.40)	($92.00)	($92.00)
Less Total Wintering Cost, $	-$6,502.18	-$5,709.84	-$6,270.00	-$6,503.86
Net Return, $	$13,909.64	$13,627.74	$13,938.72	$13,536.50

1/ This partial economic model includes direct costs for feed and processing only. No other variable or fixed costs are included.

2/ Market value is the three year average for years 1988-89 & 90 during September and October at Dickinson, North Dakota.

SECTION II

WAYS THAT I HAVE PROFITED FROM THE PRACTICAL APPLICATION OF RESEARCH ON MY RANCH

by

MR. WILLIAM STEGNER

RHAME, NORTH DAKOTA

Ways That I Have Profited From The Practical Application of Research on My Ranch

by

Mr. William Stegner

I assume that everyone is smarter about something than I am. I do not pretend to say that I am doing the best over any others. However, all my life, I've been excited about what I am doing, and any one farming wheat and feed grains, who feels they are not reaching the optimum in net profit should seriously study, and contemplate marketing our cheap feed grains and roughages through livestock. Bill Helming believes that with sound management, marketing grain through livestock is the way to beat the pack. It has enabled me to get completely out of debt.

I feel very fortunate having been able to take advantage of the vast amount of research from NDSU and the Dickinson Research Center. Creep feeding has contributed immensely to increased weaning weights, improved rebreeding of our cows and increased the calving of more twins. Their recommendations of using small grain straw residue contribute to less bloat in our calf wintering rations, stretches the winter feed supplies, and allows us to yard feed our cow-calf pairs into the summer if drought conditions limit pasture growth. Research results from seeding tame grasses with alfalfa, to increase more pounds of beef per acre has mandated that only our creeks and hills are left with native grasses. Their recommendation of genetic diversity available through artificial insemination is the most important contribution to selling more pounds of beef.

One of the most important areas in my operation is production testing through the North Dakota Beef Cattle Improvement Association under the leadership of Dr. Kris Ringwall from the NDSU Research Center, Hettinger, ND.

I have been using this program from its very beginning. It has allowed us to accurately select and continue to use the best high producing sires, drop the lower producing ones, and select new proved, and promising sires. It is the continuous use of superior productive bulls for increased daily rate of gain, that has given us the high producing cow herd we have today.

How many have established long term goals? I consider this very important. Have you truly assessed the full potential of opportunities available to us by living in North Dakota? Grain farming and raising cattle compliment each other, and as individual enterprises, there's no way of making as much money in these two enterprises standing alone as with fitting them close together and complimenting each other. I was convinced of this early in my career and I'm more convinced than ever today. I operate a grain and cattle ranch consisting of about 5000 acres. There are 1514 acres in CRP and 2550 acres in farmland. We calve out about 465 cows and run between 100 and 150 replacement heifers. I have one good steady hired man who has been with me 27 years. We also have a part time man. I do the farming and my man, Vernon Fuchs, works mostly with the cattle. Early in the late forties, my brother, Harold, and I started our cattle business by purchasing different groups of calves in the fall, feeding them through the winter and selling them early in the spring. One of the first observations was the huge difference in gainability in the groups of calves as well as individual calves. We had a tight haired red calf that ate very little and stood in the shelter most of the time. After 2 weeks we returned him to the sales ring, weighing the same as when we first purchased him. Our neighbor bought this calf and had the same experience. We chucked and laughed about our misjudgments. The experience taught us the importance of having a fast gaining calf.

Every animal takes a certain amount of maintenance "Feed cost" to stay alive. It is the pounds of gain above maintenance costs that start to make the money. So the faster a calf will gain, the less interest and maintenance costs, and the more money can be made as the calf reaches heavier weights.

The fastest and surest way for us to do this, is with artificial insemination using progeny tested bulls already proven capable of siring fast gaining calves.

Now I know the majority of operators will say A.I. takes too much time at a critical period of the year when haying season is starting, summer fallowing to do, fences to fix, manure to haul, and crops to be sprayed.

But I say to myself, what is the most important job to do that will make the most difference in making the highest net income possible in the long term? Without question, it is being able to utilize all my pastures, straw from grain crops, and the cheap feed grains as efficiently as possible. The potential is immense because we are near the center of the nation – barley and oats can be purchased wholesale – the elevator price is less the freight to the West Coast, New Orleans, or the Great Lakes. The only way I can get calves weighing up to 900 pounds in the fall, is by using A.I. and using the top two percent of the bulls in the nation along with feeding a liberal amount of grain.

My most important job is the breeding season for my cattle. All my other work centers around this most important job. We do not put up a lot of alfalfa hay as it is too work intensive at this critical time of the year. For about the last 12 years, I have been buying my neighbors alfalfa hay, as he straight grain farmed and did not have livestock.

A successful cattle operation involves feeding a considerable amount of grain to maximize gain, and grain is a good roughage producer. We do this by saving all our straw and putting it through a tub grinder, mixing barley with the straw and feeding in bunks. To maximize the growth in barley and wheat, we summer fallow good, and use a lot of fertilizer, and use Glean and Treflan to control weeds. We have run this operation on 100% straw and grain. The oats and barley run about 16% protein, so we do not buy any protein supplement. We feed a mineral quite high in vitamin A.

Replacements are selected from the heifer calves. The balance of the heifer calves, and all steer calves are fed until the first part of March, and then trucked to Scott City, Kansas where the Brookover Cattle Co. feeds them until ready for the slaughtering plant. I have been having these calves custom fed for the last 10 years.

On March 5 this year, 221 steers arrived at the Brookover Cattle Co., Scott City, Kansas, with in weights of 933 pounds. While there they had an average daily gain of 3.58 lbs. The cost of gain was $49.94/cwt. The 118 heifers had in weights of 808 pounds. Their average daily gain was 2.98 pounds and cost of gain was $54.77/cwt.

In 1988, we had 442 calves with 205 day weights of 706 lbs. In 1989, we had 460 with 205 day weights of 675 lbs. Thirteen calves weighed over 800 lbs. with one weighing 900 lbs. at weaning.

We synchronize the heifers and A.I. them. We grain them well before and during breeding. More and more of these heifers are having twins along with some twins from the cow herd. This enables us to attain close to 100% calf crop.

We have a complete set of feed bunks in our A.I. pasture which is adjacent to our working corrals. Also we have feed bunks in the Crested wheatgrass pasture next to our calving barn where the cow-calf pairs go to pasture. Pasture grass is only a small supplement to the ration our cattle eat. All of our pastures are seeded to Nordan Crested and alfalfa. This grass can take consistent overgrazing through wet and dry years and not kill out and still not allow weeds to take over.

Getting back to our A.I. program, in the 27 years we have been dedicated to this, we have made a number of changes through the years. We now rely heavily on Gomer bulls. The smaller, young Gomer bulls do the best job. Many of the larger bulls will ride a cow, and get down without marking her.

We plant lots of winter wheat, and rye—lately more rye and sweetclover due to a smaller carry over of straw bales. Generally there are enough bales to last 2 or 3 years. The last 3 drought years have resulted in downsizing from 465 cows to 370. About 100 to 150 heifers are kept for replacements, and they are yard fed until harvest time. They are a good solution to keeping the weeds down in the corrals.

There is a 10 HP electric hammermill in our feed building that when turned on in the morning will shut itself off when a predetermined amount of barley is ground.

I run Simmental cattle with a percentage of Angus. I like Simmental cattle mainly because they have some of the best data in selecting the best bulls. They milk well and in Germany they have been used in dairy herds. They make a tremendous cross with Angus.

During calving, the cows are checked every 2 hours night and day. Our calving barn is 48 x 120' with adequate pens with feed and water. If a cow starts to go a little too long in calving, we can easily check the position of the calf, and quite often gently pull the calf to be sure the calf arrives live and well. Frozen Colostrum is available and can be thawed in a few minutes in an electric coffeepot. All the twins immediately get colostrum milk. If a cow somehow accidently looses a calf, we put a twin on her. At one time we had 104% calf crop this spring.

The calves are started on oats creep feed about the first of June. The confinement of the cattle gets the calves started early in eating oats. This allows the transition to weaning go a lot smoother. When the calves settle down, we then bunk feed them with chopped straw, oats and molasses with Bovatec which helps keep the dust down and less coughing among the calves. When the calves are sold to the slaughtering plant, they all bring the same price per pound and there is no commission charge.

Now what are the opportunities for economic development in North Dakota? We are number one in feed barley and about number two in oat production. We have hardly touched the potential of utilizing straw in the cattle ration. It is estimated that North Dakota has 22,000,000 ton of roughage which could be used in cow-calf feeding. Scranton Equity Elevator has shipped feed barley out by the Unit Train loads. The Sept. 10 Ag Week News states much of North Dakota's feed barley is heading to California feedlots. Utilizing our own feed grains and straw can add enormous economic activity to our state. The Carrington Experiment Station has determined that one can make more money yard feeding cow-calf pairs over grazing. They recommend getting started by buying a quarter or so of land with some old buildings and corrals, and get started growing feed grains and saving the straw to feed cow-calf pairs.

Since the beginning of the year, I have sold 200 cows which have averaged $818.00, and the 115 heifers and 219 steers averaged $923.00 out of the Brookover Cattle Co. Feedlot.

BCIA Herd #117
Calf Record for 11 Years

	1st Calf Heifers			Mature Cows		
Year	**Early**	**1st 21 days**	**2nd 21 days**	**1st 21 days**	**2nd 21 days**	**Ave Cow Age**
1979	14%	66%	88%	31%	78%	5.4
1980				33%	74%	6.3
1981	12%	78%	94%	48%	92%	5.1
1982	4%	66%	88%	35%	82%	4.3
1983	1%	66%	90%	37%	87%	4.3
1984	5%	72%	92%	34%	83%	4.7
1985	2%	63%	90%	36%	81%	4.8
1986	5%	83%	94%	37%	86%	4.9
1987	3%	66%	89%	25%	72%	5.5
1988	15%	73%	90%	35%	87%	4.7

Calving Start Date	**Weaning Date**	**Actual Weaning Weight**	**205 day Adjusted Weight**	**Ave Weaning Age**	**Weight. per day of Age**
Mar 17	Oct 9	434	516	180	2.4
Mar 15	Oct 22	465	516	191	2.4
Mar 12	Oct 13	486	537	195	2.5
Mar 8	Nov 10	484	489	222	2.2
Mar 12	Oct 5	513	607	183	2.8
Mar 9	Oct 17	528	581	197	2.7
Mar 7	Oct 17	536	584	198	2.7
Mar 8	Nov 11	658	641	223	3.0
Mar 7	Oct 28	646	674	205	3.2
Mar 9	Oct 5	614	706	187	3.3
	Nov 3	667	675		

Weaning weights of the top 13 calves in 1989				
835	825	805	810	890
810	820	900	810	
830	860	805	800	

SECTION III

A CENTURY OF RESEARCH ON BEEF CATTLE IN NORTH DAKOTA

BY

W. E. Dinusson, Professor Emeritus

A CENTURY OF RESEARCH ON BEEF CATTLE IN NORTH DAKOTA

By

W. E. Dinusson, Professor Emeritus

J.H. Shepperd published the first research on beef cattle in 1898, Bulletin number 33 of the newly established Agricultural Experiment Station. He compared barley vs. wheat bran and shorts for finishing cattle. It is interesting to note that – "eight head of steers which had escaped from a railroad car by the door being accidentally left open were secured for this test. They came from the range west of the Missouri River". One of these steers could not be handled so three steers from the experiment station herd were added. The steers averaged about 30 months of age and weighed 990 pounds. The gain on barley was 1.7 pounds, for bran and short 1.35 pounds per day.

The next bulletin on cattle, number 54 in 1902, was by Dr. Van Es on observations on "Abortions in cattle and scours in new born calves". Bulletin 73, in 1906, gave a report on "Fattening steers on barley and rejected wheat". Two trials, the first with 12 steers, the second 22 steers showed, according to Shepperd and Richards that those on barley plus bran did okay, but the steers on rejected wheat and bran had to be finished on corn and bran. Bulletin 77 by Van Es reported on bovine tuberculosis.

In the 1920's J. H. Shepperd published two interesting circulars – one on Izzie, a stee he observed and 154 on "The Trail of the Short Grass Steer". These were written in narrative style and the observations very interesting reading.

In 1924, Bulletins 174 on protein supplements for cattle and 194 on silage trials are worth noting. With five lots of five steers each, millet silage gave gains 1.3 lbs per day, sunflower silage 1.3 lbs, sweet clover-straw silage 1.1 lbs, sweet clover alone 1.7 lbs as compared to corn silage 2.0 lbs per day. This trial was noteworthy because horses fed on millet hay alone had died. Difficulty in getting consumption, particularly on sunflower and sweet clover silage was reported and note made that bloating occurred and of "sweet clover disease". Seventy-five years later sunflower silage was again reevaluated.

In 1927, bulletin 211, written in J.H. Shepperds' own narrative style, on the use of sweet clover for pasture proved a point. Dr. H.L. Walster suggested the trials and offered use of sweet clover for pasture and pushed Shepperd into doing the trials. Shepperd was reluctant because he didn't think cattle would eat the clover. In 1925 and 26 F.W. Christenson was also working with sweet clover silage and beet top silage. Two groups of 30-977 pound steers were fed for 82 days. The gains were 2.45 and 2.22 lbs per head daily for the two silages – this was not published until 1939.

The classical research of the 20's was that of A.F. Schalk and R.S. Amidon. Bulletin 216 in 1928 "Physiology of the Ruminant Stomach" reported on new concepts in ruminant nutrition. This provided the basis for an entirely new approach to research on the ruminant and made Schalk and Amidon known the world over.

The decade of the 30's was not very productive. T.H. Hopper and associates reported a slight advantage for corn over barley for finishing steers (Bulletin 290). F.W. Christensen evaluated emergency feeds, Kochia and Russian thistle. Most of the work was with laboratory animals because money for research was scarce.

The 1940's had limited research on cattle. J.H. Longwell published "Does crossbreeding produce better beef cattle?" The results were inconclusive. Kenny Ford from the Dickinson station did work on the "Pasturing of mature corn with cows and young steers". Research on the use of supplemental vitamin A for cows was started and in 1951 Earl Klosterman, Don Bolin and Kenny Ford reported that unless there was extreme drought and scorched pastures in the summer vitamin A supplementation for wintering cows was unnecessary. The Dickinson Experiment Station held their first Research Roundup in 1949.

In the decade of the fifties research on cattle was increasing. Full vs 3/4 rations for beef cows showed that during years of short feed supply the lower level could be used without too much loss in calf crop. The summer finishing of steers and spayed heifers was evaluated. Effect of winter gains on subsequent pasture gains was studied. Corn silage was compared to grains for finishing steers. Range studies and grass specie evaluations were made. Grazing studies were also underway at the Mandan station.

At the Fargo station facilities for beef cattle research were very limited. Some observations were made using rumen fistulas. Physical forms of roughage i.e. pelleting vs chopped, were fed to limited number of calves to see if the rumen function was affected. Dwarfism in beef cattle and breeding studies were made.

When I implanted the first beef heifers in 1946 with stilbestrol, little did I realize that this would initiate an entirely new area of research on additives and implants for cattle. "The Effects of Stilbestrol, Testosterone, Thyroid Alteration and Spaying on the Growth and Fattening of Beef Heifers" was published in the Journal of Animal Science in 1950. Since that time almost every station in the U.S. and Canada have investigated the use of stilbestrol or similar substances for altering growth and gain in beef cattle.

I joined the staff of the Animal Husbandry Department in 1948. Upon returning to North Dakota I noticed two things. There was an increasing interest in finishing beef cattle and although the state had risen to number one in barley production, the cattle feeders were buying corn and the feed barley was being shipped to the corn belt for feeding. It was obvious that research on how best to use North Dakota feeds was a must. Cattlemen put pressure on the legislature for money and in 1960 the Research Center came on line. Barley was compared to corn for finishing Beef heifers and was found to be very competitive if rations were properly formulated. In this same trial stilbestrol implanted heifers gained 15% faster than controls. This research was followed by comparisons of effects of change in physical form. i.e. meal, vs rolled vs pelleted barley on gains. Steam rolling vs dry rolling of barley was also tested. Different proteins supplements were evaluated. In comparisons of feeding long vs chopped vs pelleted alfalfa to wintering calves showed pelleted alfalfa increased gains by 61 percent on 44 percent less hay per pound of gain, and chopping hay increased gains by 20% on 24% less hay than steers fed long hay. After the acquisition of "oxygen-free" storage bins, early harvested high-moisture barley and oats were evaluated for finishing cattle. Whole vs rolled oats were compared and proso (hog millet) found to be equal to barley for finishing cattle. Because of demand several by-products were tested as feeds for cattle. Molasses beet-pulp (pelleted) at more than 20% of ration reduced gains and efficiency.

The Dickinson station continued to do excellent research in the 60's. In addition to the range and pasture studies, feeding grain on pasture, steam rolled barley and beet pulp in rations were evaluated. Systems of handling calves were evaluated, i.e. level of wintering and its effects on subsequent pasture gains. Did creep-feeding of calves pay? Alfalfa was compared to brome and crested hays. Wheat vs barley vs oats in finishing rations was evaluated. Types of shelter – open shed vs board vs slatted board fences – were compared. Chopped crested hay showed an advantage over that fed in long form. The value of straw in rations of wintering cows was measured. The flushing of cows nursing calves on pasture with barley pellets gave a benefit to early breeding and conception rate. In an experiment to find the value of substituting barley for hay in wintering rations showed that as a "hay stretcher" one pound of barley replaced four pounds of hay. To conclude this decade, Triticale was found inferior to barley for finishing steers. MGA was found to be effective in controlling estrus in feedlot heifers. The 20th Annual Research Roundup (1969) summarizes the first 20 years of research at the Station.

The decade of the 70's saw a continuation of very productive research. At the Dickinson station Biuret supplementation for heifer calves on late fall grazing was effective in increasing gains. Early vs late calving was compared as well as early vs late castration of calves. Again Vitamin A injections for cows did not improve performance. Self-feeding vs hand feeding was compared with self-feeding slightly better. Rumensin and Ralgro were effective in increasing gains and feed efficiency in finishing steers. The Hei-gain device was found wanting in finishing heifers. The production of "hamburger" beef was evaluated. Pre-conditioning and creep feeding of calves were evaluated. The use of Longhorn bulls reduced calving problems.

At the Fargo station, Ergot was found to be a problem with feeding triticale. Adding one-half percent of ergot to finishing rations for steers and heifers caused a loss in weight. Even a level of 0.15% of ergot added to rations reduced gains and in one trial 0.06% ergot in the triticale reduced gains and produced unthriftiness in the cattle. Hard red spring wheat and durum were found equal to barley for fattening steers but more difficult to feed. Mixing barley or beet pulp with the wheat improved performance. Either a corn roughage pellet or sunflower full pellet was acceptable in providing a "built-in-roughage" in high energy rations. Whole oats was inferior to rolled oats and both produced less gain than dry-rolled barley. Pelleted molasses beet pulp could be substituted up to 36% of the barley in a 50:50 roughage to concentrate ration. Pigeon grass screenings substituted up to 60% of the grain appeared to be no better than roughage in finishing rations.

The research at the Central Grasslands Station at Streeter was initiated with a grazing trial to evaluate a new implant, Compudose, and the use of Rumensin for yearling steers on pasture when fed in a barley pellet-two pounds per head per day. Compudose alone increased gains by 15 percent; two pounds of barley increased gains by 15 percent, the Rumensin increased gains by 6.7 per cent and all three together increased gains by 37 percent. These steers were transferred to the Dickinson station for finishing.

In the 80's the Dickinson station did research on the use of anhydrous ammonia treated straw in rations for wintering cows. Enzymes, Rumensin and Bovatek as well as Probiotics and Ivomec were evaluated with steers. Protein supplements, including sunflower meal were re-evaluated as supplements for steers. Sunflower seeds as 20% or more in rations for backgrounding reduced gains.

At the Fargo station silage made from immature sunflowers was not good in rations for wintering beef cows. Malt sprouts, sunflower meal and alfalfa pellets were compared as protein supplements for finishing cattle. Tylosin plus Rumensin was beneficial in rations for early weaned calves. By products of the

sunflower industry were evaluated. Sunflower hulls were effective as a roughage in finishing rations. Sunflower seeds, with the high oil content, had to be limited so that not over one pound of oil was consumed per head daily or reduced gains occurred. Compudose, Ralgro and Ralgro-Synovex gave increased gains, but buffers were ineffective in finishing rations.

At the Carrington Irrigation Station different levels of protein were evaluated for growing calves. Ralgro was compared to Synovex S for steers.

At the Streeter station flax screenings at a level of 22%, replacing oats in a barley-oats mix in the diet, reduced gains but reduced cost because of lower price as compared to oats. For finishing steers whole corn, ground corn and a 50:50 mixture were about equal. Growing calves gained 30% faster when fed ground barley as compared to whole barley.

The research on grazing trials, systems and species of grass evaluations have been all but omitted. These should be summarized elsewhere. The same is true of the many experiments on physiology of reproduction, breeding systems and reproductive diseases. These are too numerous to be included in this very brief summary.

In summary it should be noted that a majority of the experiments at all stations were with feedstuffs native to North Dakota. This is as it should be because they are different from those produced in the states south and east.

Research is an everlasting necessity. Past results may, or may not, be applicable. Cattle have changed, cultural practices have changed, varieties of grains of 20 years ago are no longer grown. Will these changes have an appreciable effect on the cattle industry? Only future research will tell.

SECTION IV

ECONOMICS OF MARKETING 1990'S CALF CROP

BY

HARLAN HUGHES

ECONOMICS OF MARKETING 1990'S CALF CROP

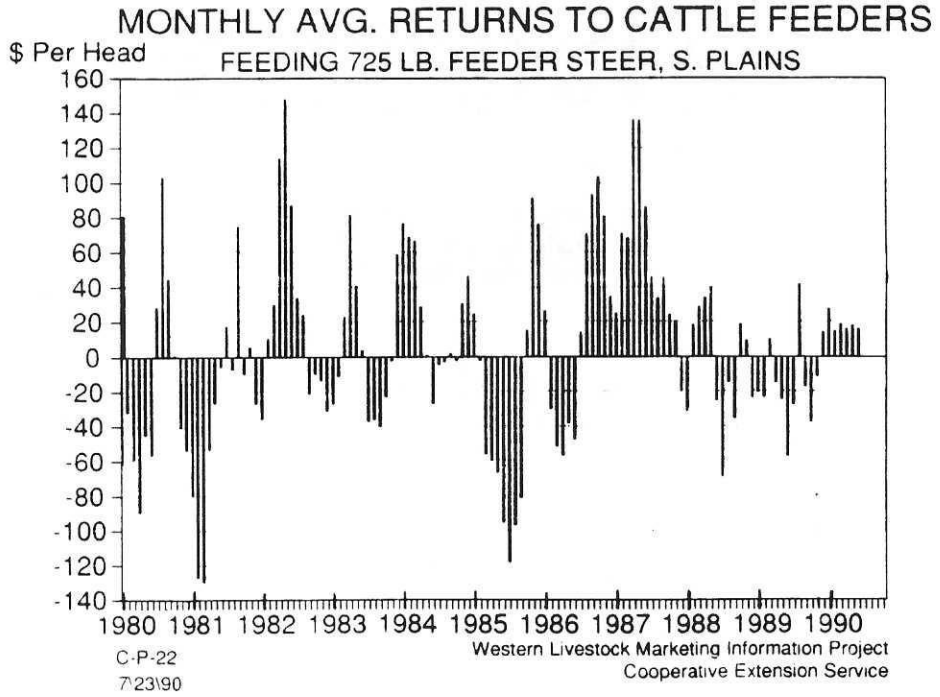
BY

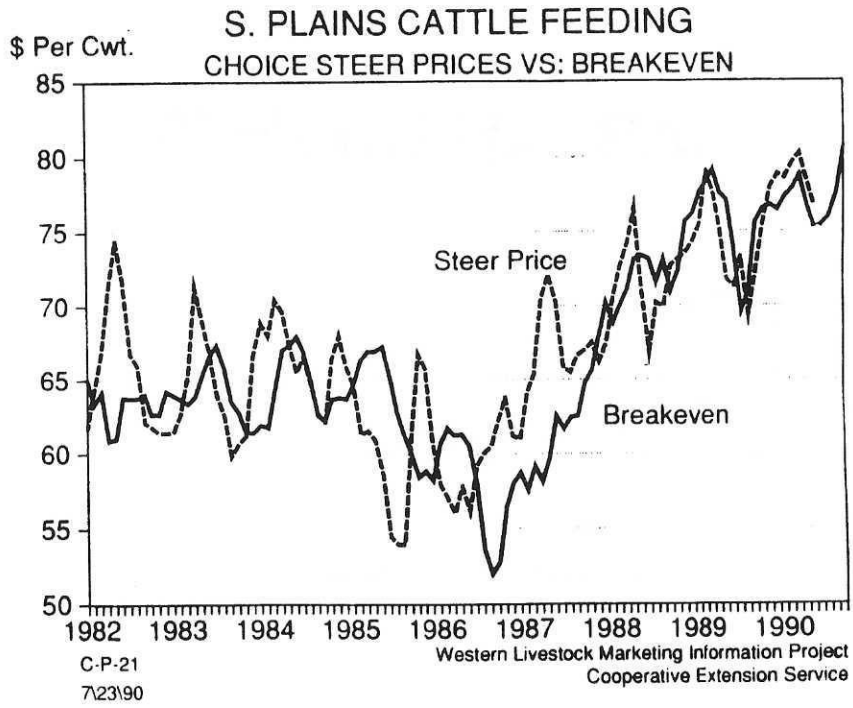
HARLAN HUGHES

BEEF CATTLE OUTLOOK

Background

Cattle feeders have enjoyed both high slaughter cattle prices and modest profits for the first half of 1990. It appears that the "wall of cattle" so often projected this spring is moving through the marketing system in a systematic manner and to date (mid August) is having a minimal impact on slaughter cattle prices.





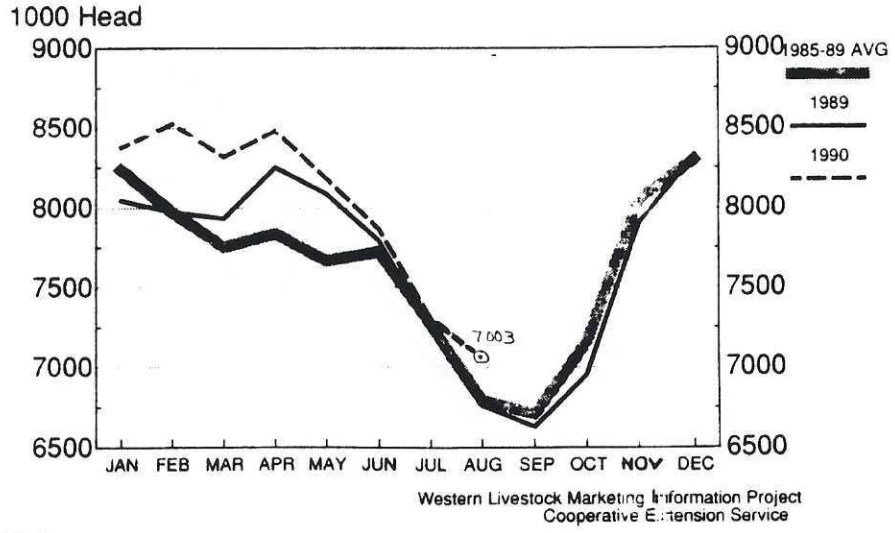
This year's lighter weight feeders are taking more time to finish, feedlot operators have stayed very current, cow-calf operators have reduced cow slaughter by 6 percent, non-fed slaughter is down by 2 percent, and stronger beef demand all appear so far to have prevented the lower prices predicted for this summer. The August 7-State-Cattle-On-Feed Report suggests, however, that we still have increased cattle numbers to work through the system.

Last fall's bunched placements of light-weight feeder cattle off drought damaged winter wheat pastures resulted in eight months of increased monthly 7-State-Cattle-On-Feed inventories over year ago numbers.

7-STATE CATTLE ON FEED (AUG. 1, 1990)

	1989	1990	90% OF '89
	←1000 hd→		
ON FEED AUG 1	6,763	7,003	104
PLACED IN JULY	1,291	1,520	118
SOLD IN JULY	1,700	1,750	103

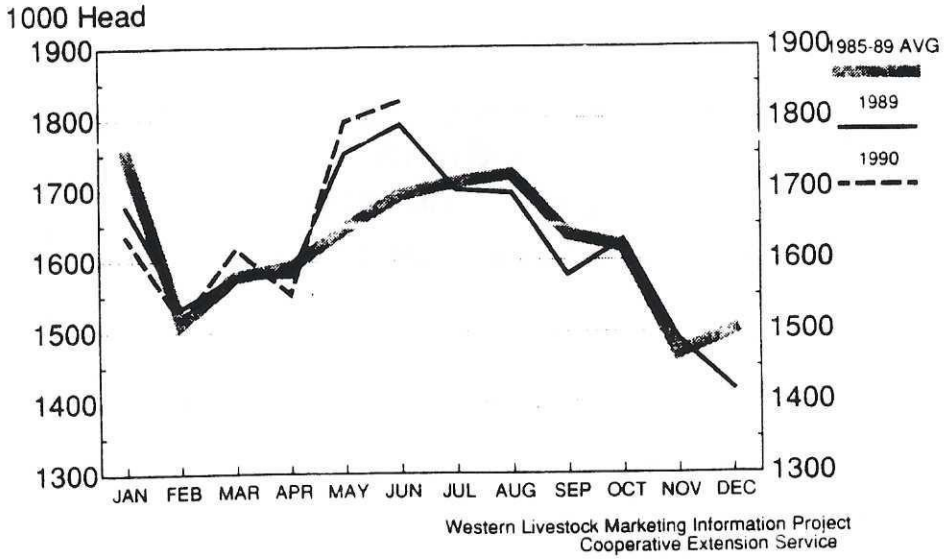
OL90-1



07-24-90
C-N-10

Increased marketings have not parallelled the increased 7-State-Cattle-On-Feed inventory. Marketings from the 7 primary cattle feeding states in the last four months have been only 1.8 to 3 percent over a year ago. Total cattle slaughter for the first six months, adjusted for cow and non-fed slaughter, was approximately 1.5 percent below that of the first six months in 1989. Constant to slightly reduced supply in the current quarter, coupled with strong demand, has led to the early August price strength.

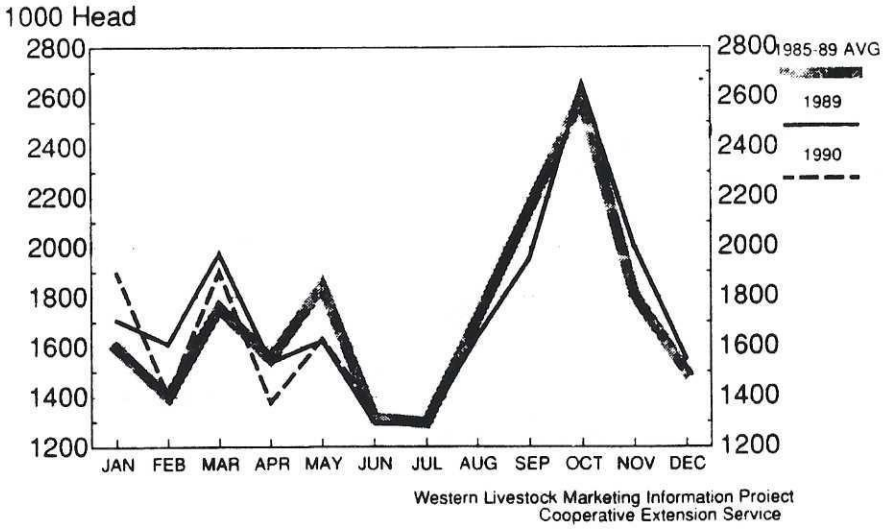
FED CATTLE MARKETINGS
MONTHLY, SEVEN STATES



07-24-90
C-M-11

The 118 percent July placement rate in the 7 major cattle feeding states suggests lower cattle prices in the last quarter of this year.

FEEDLOT PLACEMENTS
MONTHLY, SEVEN STATES



07-24-90
C-N-08

Suggested Planning Prices

Beef prices continue to surprise most market analysts by remaining relatively stronger than previously predicted. While the early August price strength was clearly demand driven rather than supply driven, most analysts are predicting that demand will weaken after Labor Day. The net result is that slaughter cattle prices could weaken from the high $70's in early August to the mid to low $70's again in the last part of the current third quarter.

The increased July placements reported in the August 7-State-Cattle-On-Feed Report suggests that fourth quarter slaughter prices may increase only to the mid $70's—less than earlier projected. Prices are expected to increase through the first quarter of 1991 and then weaken seasonally to the low $70's in the third quarter of 1991. The 1991 average annual slaughter price is projected to be only $1-2 below the 1990 annual price.

Dr. James Mintert, Kansas State University Agricultural Economist, predicts Western Kansas third quarter 1990 quarterly average prices at $74-77, fourth quarter 1990 average at $77-80, first quarter 1991 average at $77-80, and second quarter 1990 average at $78-81 per hundred weight. We would adjust these down $2-3 per hundred weight to localize to West Fargo. Our recommended planning prices for the Dakota's and Minnesota over the next 16 months are presented in Table 1.

Table 1 PROJECTED SLAUGHTER STEER, FEEDER-CALF, AND YEARLING FEEDER STEER PRICES

YEAR	QUARTER	CHOICE 1000-1100 LB STEERS OMAHA	MED-FRAMED 400-500 LBS	WEST FARGO 600-700 LBS	#1 FEEDER STEERS 700-800 LBS
1988	1ST	68.54	93.81	82.80	79.34
	2ND	72.50	92.70	82.54	77.02
	3RD	66.92	92.14	80.98	76.62
	4TH	70.14	92.00	82.25	80.50
	ANNUAL	**69.52**	**92.79**	**82.40**	**78.45**
1989	1ST	73.85	95.92	85.86	82.07
	2ND	73.85	92.56	84.75	80.29
	3RD	70.09	99.53	84.33	81.36
	4TH	72.46	92.31	85.62	82.07
	ANNUAL	**72.56**	**95.08**	**85.14**	**81.45**
1990	1ST	77.20	96.48	82.53	78.98
	2ND	77.52	100.67	89.08	82.89
SUGGESTED PLANNING PRICES 1/					
	3RD	72-74	99-102 2/	85-88 3/	83-87 4/
	4TH	75-78	94-99	84-88	82-86
	ANNUAL	**76-78**	**96-98**	**85-87**	**81-84**
1991	1ST	77-80	99-104	86-90	84-88
	2ND	75-78	94-99	85-88	83-87
	3RD	70-74	93-96	83-86	80-85
	4TH	72-76	88-94	81-85	79-83
	ANNUAL	**73-75**	**94-96**	**84-87**	**80-82**

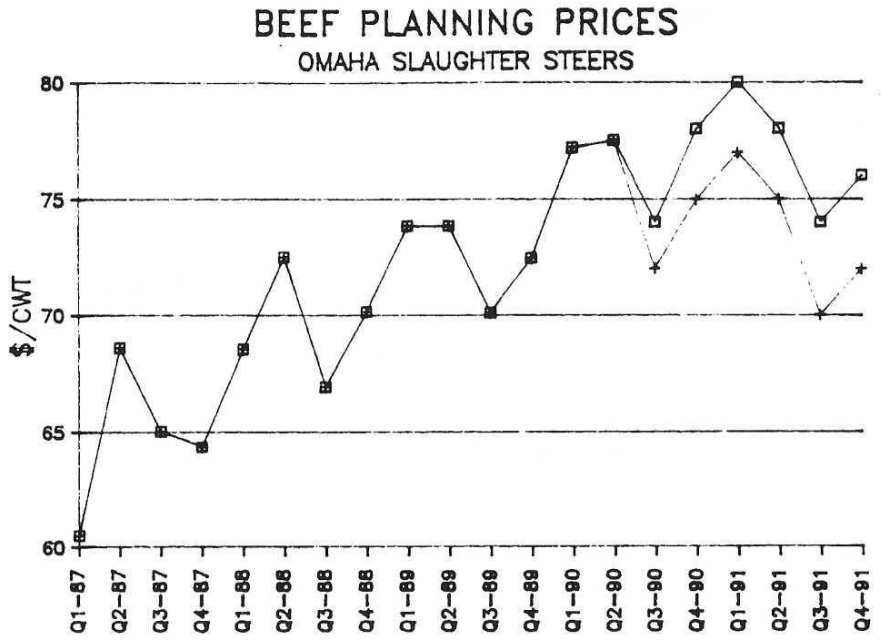
1/ Assumes $2.50 farm gate corn price and no major recession brought on by the current Mid-East energy crisis. Calculated by minnpr.cal4 on 72.

2/ WLMIP projections Table 1.111 7/31/90 minus $6 to localize to West Fargo, North Dakota.

3/ Price spread calculated from 700-800 pound price projections using FARGO.CAL90 on disk 72.

4/ Jim Mintert's Western Kansas City projections minus $3 per cwt to localize to West Fargo, North Dakota.

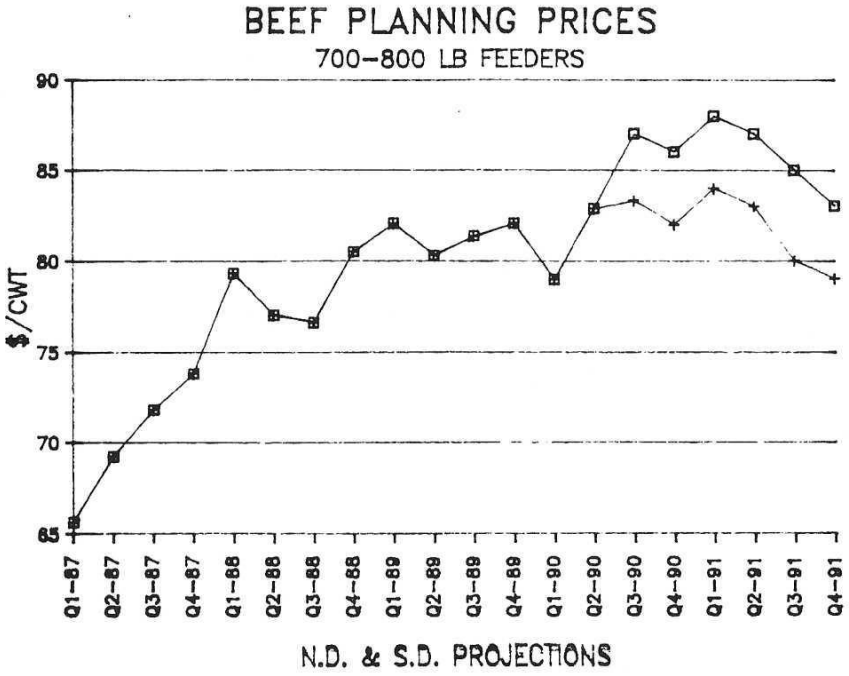
Feeder cattle and calf prices continue to carry relatively strong price premiums to fed cattle. Producers selling yearling steers off grass this year are projected to earn $63 per head return to labor, management, and grass. This is substantially above spring projections which were weighted downward by the potential wall of cattle discussed earlier.

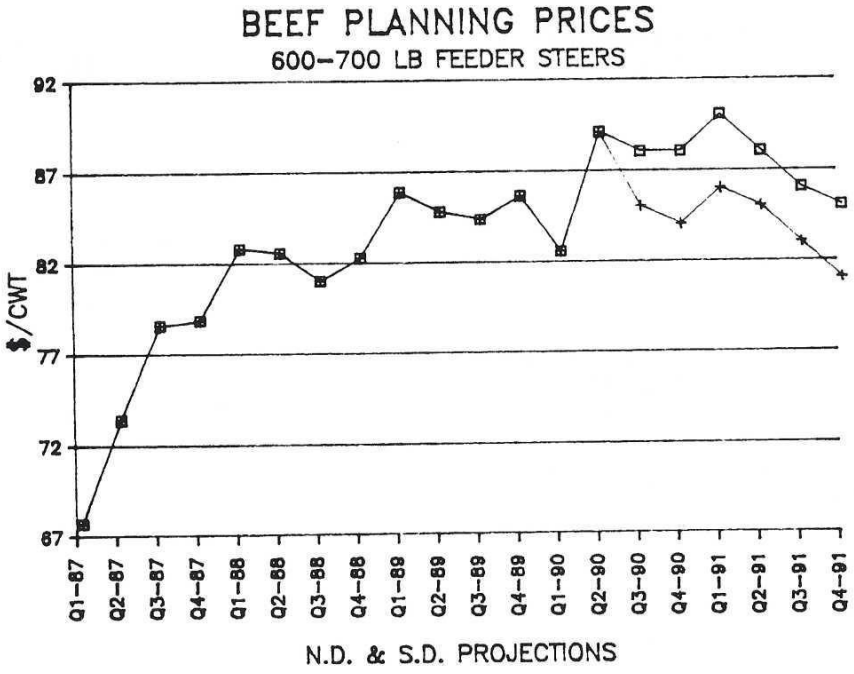


STEERS-ON-GRASS WORKSHEET
BY
HARLAN HUGHES

	$92.00 Steers On Grass			$83.89 Steers Off Grass	
I. INCOME PROJECTION				$/HEAD	YOUR FARM
INCOME	780 lBS	@	$85.00	$663	XXXXXXXX
II.BUY/SELL MARGIN	$8.11; 1980-1989 Average			-$5.49	
BUY	600 lBS	@	$92.00	$552	
SELL	600 lBS	@	$85.00	$510	
BUY/SELL GROSS MARGIN				$-42	
III. GROSS VALUE OF GAIN					
GAIN	180 lBS	@	$85.00	$153	
IV. PRODUCTION COSTS					
SALT & MINERAL				$.84	
VET & MEDICINE				$4.00	
INTERST				$22.23	
SUPPLEMENTAL FEED				$.00	
MARKETING (PUR)				$2.00	
GROWTH STIMULANT				$.00	
DEATH LOSS				$8.28	
GRASS (Water , Fence, & Taxes)				$2.00	
LABOR				$.00	
HEDGING COST				$.00	
SELLING COST				$6.75	
TRUCKING COST				$1.95	
TOTAL COST				$48.05	
V. SUMMARY					
GROSS VALUE OF GAIN				$153	
BUY/SELL GROSS MARGIN				$-42	
COST OF GAIN				$-48	
RETURN TO GRASS,LABOR, & MGT ($/HD)				$63	

Feeder cattle prices are likely to weaken along with slaughter cattle prices during September. Also, fall feeder cattle prices will remain sensitive to feed grain prices. Heavy weight feeder cattle prices this fall should be $2-5 above last year and weaned calves should average equal to or above last year.

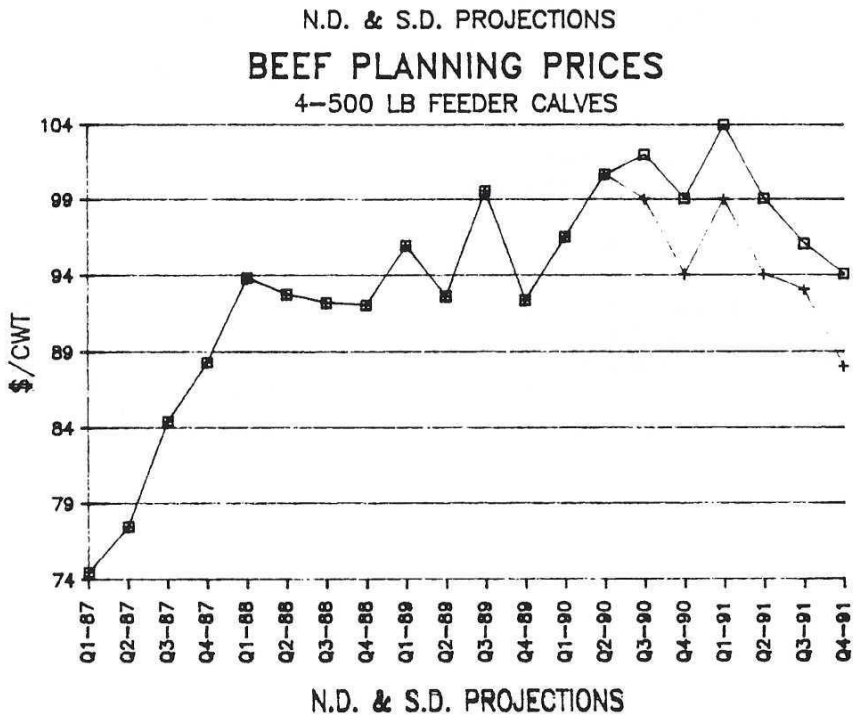




Record Cow-Calf Returns Projected

Cow-calf producers are projected to have another good year in 1990 with what could be record calf prices. Current North Dakota projection for the 1990 calf crop is $107 per cow returns to labor, management, and equity capital. This $107 projected return is based on a high equity herd weaning 500 pound steer calves. A 50 percent equity herd is projected to return only $49 per cow. As debt per cow goes up, projected net return goes down. Returns to high equity cow-calf operators are projected to remain strong at least through 1991.

Although, 1990 apparently marks the start of the new cattle cycle, the size of the cattle herd has remained essentially flat since January 1, 1988. It seems likely that the annual growth in the nation's cattle herd during the early stages of this new cycle will be slow. The slower the growth in the nation's herd, the longer calf prices will remain strong.



BEEF COW BUDGET SUMMARY
100 COWS 0% IN DEBT 1990

		OPPPORTUNITY COST		YOUR FARM
GROSS INCOME PER COW:		$411		_____
FEED COSTS: (OPPORTUNITY COST)				
SUMMER	$88		_____	
AFTERMATH	$3		_____	
WINTER	$123	$215	_____	_____
LIVESTOCK EXPENSE:				
VET & MED	$8		_____	
FLY TAGS	$4		_____	
WORMER	$7		_____	
UTIILITIES & GEN FARM	$9		_____	
POWER & FUEL	$9		_____	
MISC	$7		_____	
MARKETING	$8		_____	
BREEDING	$9		_____	
BEDDING	$2	$63	_____	_____
INTEREST ON FEED & L.S. EXP		$0		_____
FIXED EXPENSE:				
BLD, FAC, COWS & HEIFERS		$26		_____
INTEREST ON BORROWED CAP		$0		_____
TOTAL COSTS		$304		_____
RETURNS TO OPERATOR AND UNPAID FAMILY LABOR, MANAGEMENT AND EQUITY CAPITAL		$107		_____

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BEEF COW CASH FLOW SUMMARY 1990
100 COWS 0% IN DEBT

		OPPPORTUNITY COST		YOUR FARM
GROSS INCOME PER COW:		$411		_____
FEED COSTS: (CASH COSTS OF PRODUCTION)				
SUMMER	$8		_____	
AFTERMATH	$.30		_____	
WINTER	$44	$52	_____	_____
LIVESTOCK EXPENSE:				
VET & MED	$8		_____	
FLY TAGS	$4		_____	
WORMER	$7		_____	
UTIILITIES & GEN FARM	$9		_____	
POWER & FUEL	$9		_____	
MISC	$7		_____	
MARKETING	$8		_____	
BREEDING	$18		_____	
BEDDING	$0	$69	_____	_____
INTEREST ON FEED & L.S. EXP		$0		_____
FIXED EXPENSE:				
BLD,FAC, COWS & HEIFERS		$14		_____
DEBT REPAYMENT		$0		_____
TOTAL COSTS		$135		_____
FAMILY LIVING DRAW		$100		
RETURNS TO OPERATOR AND UNPAID FAMILY LABOR, MANAGEMENT AND EQUITY CAPITAL		$176		_____

COWBUD90.CAL4 ON #87

Management Implications

Four fall marketing alternatives analyzed in Table 2 are: (1) finishing yearling steers currently on grass (750-1200 pounds), (2) backgrounding 1990 steer calves (500-750 pounds), (3) finishing backgrounded calves (750-1200 pounds) and (4) growing and finishing 1990 steer calves (500-1200 pounds). Ration costs are based on $2.50 farm gate corn price and $50 hay.

Please Note The Section

FINISHING STEERS OFF GRASS
750 TO 1200 POUNDS
8/13/90

ASSUMPTIONS

START DATE	9/ 1/90	START WT=	750	END WT=	1200 LBS
INTEREST %	12 %	PUR PR	$85.00	LOT COST	.10 PER DAY
CORN PRICE	$2.50	HAY $/T	$50.00	SHRINK =	4.00%
RATION COST	$4.77	NEM =	91.51	NEG =	61.00
VET & MED/HD	$2.84	MKT COST	$6.50	HAULING=	$.50 / CWT
DEATH LOSS	1.00%	SELL PR	$80.00	BUY/SELL	$-5.00

FEEDLOT PERFORMANCE

DATE	AVE. TEMP	CURRENT FEEDLOT WEIGHT	GAIN THIS PERIOD	GAIN AVERAGE TODATE	AVE DRY INTAKE	AVERAGE EFFIC.	COST/LB OF GAIN MARGINAL	COST/LB OF GAIN AVERAGE	TOTAL COST PER PERIOD
9/ 1/90	* *	750.00	* * *	* * *	* * *	* * *	* * *	* * *	* * *
9/14/90		773.21	1.66	1.66	17.70	10.68	$.59	$.59	$7.49
9/28/90		813.65	2.89	2.27	18.36	6.36	$.44	$.38	$6.65
10/12/90		854.86	2.94	2.50	19.05	6.47	$.45	$.41	$6.77
10/26/90		896.37	2.97	2.61	19.72	6.65	$.46	$.43	$6.95
11/ 9/90		938.00	2.97	2.69	20.35	6.84	$.48	$.44	$7.14
11/23/90		979.56	2.97	2.73	20.88	7.03	$.49	$.46	$7.34
12/ 7/90		1020.72	2.94	2.76	21.33	7.26	$.50	$.47	$7.57
12/21/90		1061.36	2.90	2.78	21.79	7.51	$.52	$.48	$7.83
1/ 4/91		1101.34	2.86	2.79	22.20	7.77	$.54	$.48	$7.62
1/18/91		1139.87	2.75	2.78	22.26	8.09	$.57	$.49	$7.94
2/ 1/91		1178.03	2.73	2.78	22.76	8.35	$.58	$.50	$8.18
2/10/91		1202.21	2.69	2.77	23.07	8.59	$.60	$.50	$5.40
162 DAYS			TOTAL	452	3377				
			AVERAGE	2.77	20.72	8.59			

COSTS OF PRODUCTION EXCLUDING MARKETING

FEEDLOT COSTS	PER HEAD	$/LB GAIN
FEED COST	$161.09	$.36
LOT COST	$16.30	$.04
INTEREST	$34.02	$.08
VET & MED	$2.84	$.01
________	$.00	$.00
________	$.00	$.00
DEATH LOSS	$9.60	$.02
	=======	======
TOTAL	$223.86	$.51

FEED & RATION USED

RATION Feed	MOISTURE	DM LBS/DA	FEED USED PER HEAD
CORN GRAIN	14.00%	16.37	54.66 BU
UREA	.00%	.02	3.22 LBS
ALFALFA	10.00%	4.49	.40 TON
Phs DICAL	.00%	.01	1.61 LBS
LIMESTONE	.00%	.11	.32 LBS
TOTAL DRY MATTER	89.17%	21.00	3377 LBS
AS IS POUNDS		23.55	3787 LBS

COST OF GAIN (Exc Mkting Costs)

==================== SUMMARY ====================

MARKETING ASSUMPTIONS

SALE PRICE	=	$80.00	$960
MARKETING, HAULING & SHRINK	=	$4.24	$51
BASIS		$.00	$0
FARM GATE PRICE		$75.76	$909
FEEDER COST $85.00 /CWT BOUGHT	=	$53.13	$638
GROSS MARGIN	=	$22.63	$272
COST OF GAIN PER CWT SOLD	=	$18.65	$224

ECONOMIC ANALYSIS

RETURNS TO LABOR, MGT & FACILITIES	=	$3.98	$48 PER HEAD
BREAKEVEN SELLING PRICE	=	$76	
BREAKEVEN PURCHASE PRICE	=	$91	

FINgrass.CAL ON DISK #72

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PROJECTED BACKGROUNDING PERFORMANCE
HIGH AVERAGE DAILY GAIN
8/13/90

START DATE	11/ 1/90	START WT=	500	END WT=	750 LBS
INTEREST %	12.5	% PUR PR	$96.00	LOT COST	.10 PER DAY
CORN PRICE	$2.50	HAY $/T	$50.00	SHRINK =	2.00%
RATION COST	$4.77	NEM =	91.51	NEG =	61.00
VET & MED/HD	$2.84	MKT COST	$6.50	HAULING=	$.50 / CWT
DEATH LOSS	1.00%	SELL PR	$86.00	BUY/SELL	-10

DATE	AVE. TEMP	CURRENT FEEDLOT WEIGHT	<--- GAIN ----> THIS PERIOD	AVERAGE TODATE	AVE DRY INTAKE	AVERAGE EFFIC.	COST/LB OF GAIN MARGINAL	AVERAGE	TOTAL COST PER PERIOD
11/ 1/90	* *	500.00	* *						
11/14/90	31	518.40	1.31	1.31	12.49	9.50	$.67	$.67	$12.35
11/28/90	27	549.96	2.25	1.78	13.14	5.83	$.43	$.51	$6.39
12/12/90	18	579.03	2.08	1.88	13.82	6.66	$.48	$.51	$7.18
12/26/90	14	607.90	2.06	1.93	14.44	7.00	$.50	$.51	$7.51
1/ 9/91	7	634.67	1.91	1.92	15.04	7.87	$.56	$.53	$8.34
1/23/91	7	663.47	2.06	1.95	15.60	7.58	$.54	$.54	$8.06
2/ 6/91	6	693.36	2.14	1.97	16.19	7.58	$.54	$.54	$8.06
2/20/91	13	729.49	2.58	2.05	16.84	6.53	$.47	$.54	$7.06
2/27/91	19	750.43	2.99	2.10	17.38	5.81	$.43	$.53	$3.01
118 DAYS		TOTAL	250.43	1767.50					
		AVERAGE	2.10	14.85					

<---------- FEEDLOT ----------> COSTS	PER HEAD	$/LB GAIN	<---------- RATION ----------> Feed ----	MOISTURE	DM LBS/DA	--- FEED --- USED PER HEAD
FEED COST	$84.31	$.34	CORN GRAIN	14.00%	11.70	28.65 BU
LOT COST	$11.90	$.05	BARLEY GRAIN	14.00%	.00	.00 BU
INTEREST	$20.38	$.08	ALFALFA	10.00%	3.21	.21 TON
VET & MED	$2.84	$.01	Phs DICAL	.00%	.01	1.18 LBS
_____	$.00	$.00	LIMESTONE	.00%	.07	.15 LBS
_____	$.00	$.00				
DEATH LOSS	$6.45	$.03	TOTAL DRY MATTER	89.17%	14.99	1768 LBS
	-------	-------	AS IS POUNDS		16.81	1982 LBS
TOTAL	$125.88	$.50				

SUMMARY			
SALE PRICE	=	$86.00	$645
MARKETING, HAULING & SHRINK	=	$3.09	$23
BASIS		$.00	$0
FARM GATE PRICE		$82.91	$622
FEEDER COST $96.00 /CWT BOUGHT	=	$64.00	$480
GROSS MARGIN	=	$18.91	$142
COST OF GAIN PER CWT SOLD	=	$16.78	$126
RETURNS TO LABOR, & MGT		$2.13	$16 PER HEAD
BREAKEVEN SELLING PRICE	=	$84	

BCKGHIGH.CAL ON DISK #72

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FINISHING SLAUGHTER STEERS
750 TO 1200 POUNDS
8/13/90

START DATE	3/22/91	START WT=	750	END WT=	1200 LBS
INTEREST %	12 %	PUR PR	$86.00	LOT COST	.10 PER DAY
CORN PRICE	$2.50	HAY $/T	$50.00	SHRINK =	4.00%
RATION COST	$4.77	NEM =	91.51	NEG =	61.00
VET & MED/HD	$2.84	MKT COST	$6.50	HAULING=	$.50 / CWT
DEATH LOSS	1.00%	SELL PR	$75.00	BUY/SELL	$-11.00

DATE	AVE. TEMP	CURRENT FEEDLOT WEIGHT	<--- GAIN ---> THIS PERIOD	AVERAGE TODATE	AVE DRY INTAKE	AVERAGE EFFIC.	COST/LB OF GAIN MARGINAL	AVERAGE	TOTAL COST PER PERIOD
3/22/91	* *	750.00	* *						
4/ 4/91		773.21	1.66	1.66	17.70	10.68	$.59	$.59	$7.50
4/18/91		813.65	2.89	2.27	18.36	6.36	$.44	$.38	$6.64
5/ 2/91		854.86	2.94	2.50	19.05	6.47	$.45	$.41	$6.76
5/16/91		896.37	2.97	2.61	19.72	6.65	$.46	$.43	$6.94
5/30/91		938.00	2.97	2.69	20.35	6.84	$.48	$.44	$7.13
6/13/91		979.56	2.97	2.73	20.88	7.03	$.49	$.45	$7.33
6/27/91		1020.72	2.94	2.76	21.33	7.26	$.50	$.47	$7.56
7/11/91		1061.36	2.90	2.78	21.79	7.51	$.52	$.48	$7.82
7/25/91		1101.34	2.86	2.79	22.20	7.77	$.54	$.48	$7.61
8/ 8/91		1139.87	2.75	2.78	22.26	8.09	$.57	$.49	$7.94
8/22/91		1178.03	2.73	2.78	22.76	8.35	$.58	$.50	$8.18
8/31/91		1202.21	2.69	2.77	23.07	8.59	$.60	$.50	$5.40
162 DAYS		TOTAL	452	3377					
		AVERAGE	2.77	20.85	7.51				

<---------- FEEDLOT COSTS	PER HEAD	$/LB GAIN	----- Feed ---- RATION	MOISTURE	DM LBS/DA	<--- FEED ---> USED PER HEAD
FEED COST	$161.09	$.36	CORN GRAIN	14.00%	16.37	54.66 BU
LOT COST	$16.30	$.04	UREA	.00%	.02	3.22 LBS
INTEREST	$34.42	$.08	ALFALFA	10.00%	4.49	.40 TON
VET & MED	$2.84	$.01	Phs DICAL	.00%	.01	1.61 LBS
_____	$.00	$.00	LIMESTONE	.00%	.11	.32 LBS
_____	$.00	$.00				
DEATH LOSS	$9.00	$.02	TOTAL DRY MATTER	89.17%	21.00	3377 LBS
	=======	=======	AS IS POUNDS		23.55	3787 LBS
TOTAL	$223.66	$.51	COST OF GAIN (Exc Mkting Costs)			

========== SUMMARY ==========			
SALE PRICE	=	$75.00	$900
MARKETING, HAULING & SHRINK	=	$4.04	$49
BASIS		$.00	$0
FARM GATE PRICE		$70.96	$852
FEEDER COST $86.00 /CWT BOUGHT	=	$53.75	$645
GROSS MARGIN	=	$17.21	$207
COST OF GAIN PER CWT SOLD	=	$19.22	$224
RETURNS TO LABOR, MGT & FACILITIES	=	$-2.01	$-17 PER HEAD
BREAKEVEN SELLING PRICE	=	$76	
BREAKEVEN PURCHASE PRICE	=	$84	

FIN7TO12.CAL ON DISK #72

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+

GROWING & FINISHING STEER CALVES
500 TO 1200 POUNDS
8/13/90

START DATE	11/ 1/90	START WT=	500	END WT=	1200 LBS
INTEREST %	12	% PUR PR	$96.00	LOT COST	.10 PER DAY
CORN PRICE	$2.50	HAY $/T	$50.00	SHRINK =	4.00%
GROWER RATION COST	$3.69	NEM =	73.2	NEG =	45.00
FINISHER RATION COST	$4.77	NEM =	91.51	NEG =	61.00
VET & MED/HD	$3.50	MKT COST	$6.50	HAULING=	$.50 / CWT
DEATH LOSS	1.00%	SELL PR	$75.00	BUY/SELL	$-21.00

	DATE	AVE. TEMP	CURRENT FEEDLOT WEIGHT	<--- GAIN ----> THIS PERIOD	AVERAGE TODATE	AVE DRY INTAKE	AVERAGE EFFIC.	COST/LB OF GAIN MARGINAL	AVERAGE	TOTAL COST PER PERIOD
G										
R ======>	11/ 1/90	* *	500.00	* * * *	* * * *	* * * *	* * * *	* * * *	* * * *	* * * *
O	11/14/90	31	515.34	1.10	1.10	13.93	12.71	$.76	$.76	$.00
W	11/28/90	27	541.64	1.88	1.49	14.42	7.68	$.43	$.18	$6.51
E	12/12/90	18	566.97	1.81	1.59	14.94	8.26	$.47	$.26	$6.98
R	12/26/90	14	591.74	1.77	1.64	15.43	8.72	$.49	$.32	$7.35
	1/ 9/91	7	614.01	1.59	1.63	15.90	10.00	$.56	$.37	$8.40
R	1/23/91	7	638.15	1.72	1.64	16.33	9.47	$.53	$.40	$7.96
A	2/ 6/91	6	662.95	1.77	1.66	16.79	9.48	$.53	$.42	$7.96
T	2/20/91	13	691.19	2.02	1.71	17.29	8.57	$.48	$.43	$7.20
I	3/ 6/91	19	719.88	2.05	1.75	17.82	8.70	$.49	$.44	$6.88
O	3/20/91	26	748.02	2.01	1.77	18.33	9.12	$.51	$.45	$7.20
N ======>	3/21/91	28	750.05	2.03	1.77	18.61	9.17	$.51	$.45	$.51
======>	4/ 4/91	31	790.44	2.89	1.87	17.93	6.21	$.43	$.44	$5.99
F	4/18/91	43	831.82	2.96	1.96	18.63	6.30	$.43	$.44	$6.07
I	5/ 2/91	44	873.39	2.97	2.04	19.33	6.51	$.45	$.44	$6.27
N	5/16/91	51	915.17	2.98	2.11	19.95	6.69	$.46	$.45	$6.44
I	5/30/91	57	956.91	2.98	2.17	20.51	6.88	$.47	$.45	$6.[illegible]
S	6/13/91	63	998.21	2.95	2.21	20.96	7.11	$.49	$.45	$6.8[illegible]
H	6/27/91	64	1039.06	2.92	2.26	21.48	7.36	$.51	$.45	$7.12
I	7/11/91	68	1078.96	2.85	2.29	21.76	7.64	$.53	$.46	$7.41
N	7/25/91	71	1117.85	2.78	2.31	22.02	7.93	$.55	$.46	$7.73
G	8/ 8/91	69	1156.45	2.76	2.34	22.57	8.19	$.57	$.47	$7.98
	8/22/91	70	1194.27	2.70	2.35	22.90	8.48	$.59	$.47	$8.28
======>	8/25/91	68	1202.36	2.70	2.36	23.25	8.62	$.60	$.47	$1.80
	297 DAYS			TOTAL	702	5537				
				AVERAGE	2.36	18.64	7.91			

<---------- FEEDLOT COSTS	PER HEAD	$/LB GAIN	----- Feed ----	RATION MOISTURE	DM LBS/DA	--- FEED --- USED PER HEAD
FEED COST	$245.18	$.35	CORN GRAIN	14.00%	16.37	89.63 BU
LOT COST	$29.80	$.04	UREA	.00%	.02	5.27 LBS
INTEREST	$46.97	$.07	ALFALFA	10.00%	4.49	.66 TON
VET & MED	$3.50	$.00	Phs DICAL	.00%	.01	2.64 LBS
lab & mgt	$.00	$.00	LIMESTONE	.00%	.11	.52 LBS
	$.00	$.00				
DEATH LOSS	$9.00	$.01	TOTAL DRY MATTER	89.17%	21.00	5537 LBS
			AS IS POUNDS		23.55	6210 LBS
TOTAL	$334.45	$.48	COST OF GAIN (Exc Mkting Costs)			

SUMMARY

SALE PRICE	=	$75.00	$900
MARKETING, HAULING & SHRINK	=	$4.04	$49

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BASIS		$.00	$0
FARM GATE PRICE		$70.96	$852
FEEDER COST	$96.00 /CWT BOUGHT =	$40.00	$480
GROSS MARGIN	=	$30.96	$372
COST OF GAIN PER CWT SOLD	=	$27.87	$334
RETURNS TO LABOR, MGT & FACILITIES	=	$3.09	$37 PER HEAD
BREAKEVEN SELLING PRICE	=	$72	
BREAKEVEN PURCHASE PRICE	=	$103	

FIN5TO12.CAL ON DISK #72

The economic implications of these four marketing alternatives are summarized in Table 2. Please note the definition of Table 2's bottom line and that the bottom lines are based on relative optimistic planning prices. Those deciding to background and/or finish backgrounded calves can again reduce the projected feed costs of gain by taking advantage of this year's low priced feed barley.

It is my general conclusion that the economic reward to some form of retained ownership utilizing feed barley is more favorable for the 1990 calf crop than it was in 1989 or 1988; however, the strong demand for feeder cattle from existing cattle feeders will again make the returns to retained ownership below the long-term average. Many cow-calf producers will again elect to sell their calves at weaning time.

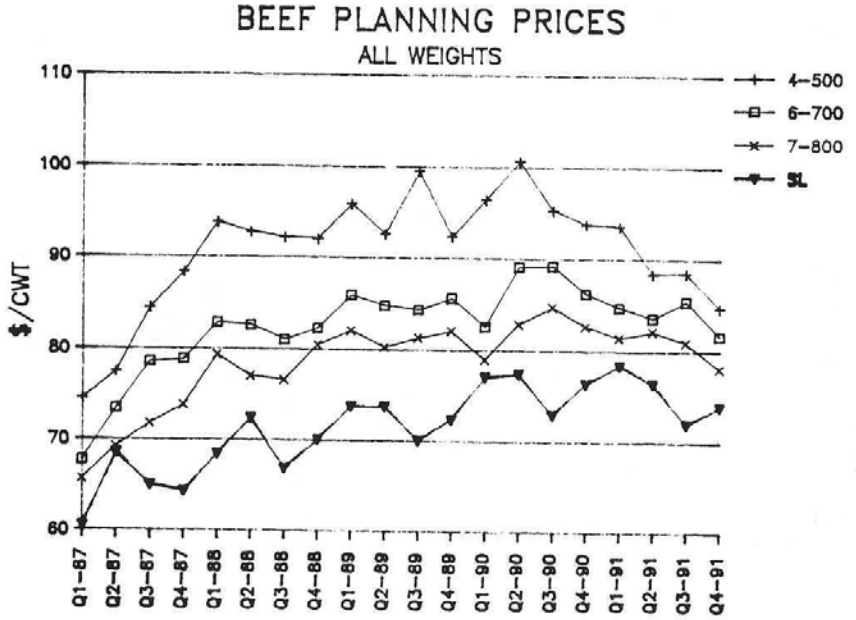

TABLE 2. ECONOMIC PROJECTIONS FOR MARKETING ALTERNATIVES
8/14/90

ITEMS	YEARLING OFF GRASS	BCKGND CALVES	FINISH BKG CALF	GROW & FINISH STEER CALVES
MARKETING ALTERNATIVES	(1)	(2)	(3)	(4)
		adg=HIGH		
STARTING DATE	**9/ 1/90**	**11/ 1/90**	**3/ 1/91**	**11/ 1/90**
BEGINNING WEIGHT (LBS)	750	500	750	500
SALE WEIGHT (PAY WT IN LBS)	1200	750	1200	1200
PROJECTED ADG (LBS/DAY)	**2.77**	**2.10**	**2.77**	**2.36**
DAYS ON FEED	162	119	162	297
SALE DATE	2/10/91	2/28/91	8/10/91	8/24/91
PROJECTED SALE PRICE	**$80.00**	**$86.00**	**$75.00**	**$75.00**
TOTAL INCOME	$960.00	$645.00	$900.00	$900.00
BEGINNING VALUES				
PROJECTED PURCHASE PRICE	**$85.00**	**$96.00**	**$86.00**	**$96.00**
VALUE ($/HD)	$637.50	$480.00	$645.00	$480.00
GROSS MARGIN	$322.50	$165.00	$255.00	$420.00
FEED COSTS (2)	$161.09	$84.31	$161.09	$245.18
FEED COST PER LBS OF GAIN	$.36	$.34	$.36	$.35
RETURNS OVER FEED COSTS	$161.41	$80.69	$93.91	$174.82
INTEREST ON BEG. VALUE	$34.02	$20.38	$34.42	$46.97
VET & MEDICAL COSTS	$2.84	$2.84	$2.84	$3.50
LOT COST	$16.30	$11.90	$16.30	$29.80
HAULING, MARKETING & SHRINK	$51.00	$23.00	$49.00	$49.00
DEATH LOSS (1%)	$9.60	$6.45	$9.00	$9.00
SUB-TOTAL	$113.76	$64.57	$111.56	$138.27
TOTAL COST OF GAIN ($/LB)	**$.61**	**$.60**	**$.61**	**$.55**
TOTAL COST (INC. BEG. VALUE)	$912	$629	$918	$863
BREAKEVEN SELLING PRICE	$76.03	$83.85	$76.47	$71.95
RETURNS TO LABOR, MGT, AND FIXED FACILITIES	**$48**	**$16**	**$-18**	**$37**

(1) MKTALT2.CAL disk #87
(2) Corn priced at $2.50/bu and hay at $50/ton.

SECTION V

PROTEIN SUPPLEMENTATION – THEORY AND PRACTICE

By

DR. JAMES F. KARN, RESEARCH ANIMAL SCIENTIST

NORTHERN GREAT PLAINS RESEARCH LABORATORY

MANDAN, NORTH DAKOTA

Protein Supplementation – Theory and Practice

Dr. James F. Karn

Why supplement:

Protein supplements should be provided whenever dietary protein levels are below the animal's requirement. However, protein supplementation of ruminants is more complex than it is for simple stomached animals such as pigs. In ruminants both the needs of the animal and needs of the microorganisms that inhabit the rumen must be considered. We need to remember that protein is made up of amino acids and amino acids contain nitrogen. The animal needs specific amino acids at the upper part of the small intestine and the rumen microorganisms need nitrogen. If either the needs of the animal or the microorganisms are not met by dietary protein, the animal's growth or production is limited.

Protein that is changed (degraded) in the rumen by the microorganisms is converted to ammonia. If the microorganisms cannot use the ammonia, then it ends up in the urine and back on the ground. That is one reason why a feed protein that is highly degraded in the rumen may not be used efficiently. Ammonia is used by rumen microorganisms to grow and reproduce. The microorganisms are ultimately digested and provide protein (amino acids) to meet the animal's needs just as ungraded feed protein does.

When buying a protein supplement one needs to consider more than the price and percent crude protein. It is important to consider the class of ruminants (beef cows, steers, calves, dairy cows) being supplemented, the type of feed the animals will receive and level of production desired. It is easy enough to provide nitrogen to rumen microorganisms, but it is much more difficult to get specific amino acids to the animal's small intestine where they are needed.

By-pass or escape protein are terms used to describe protein that gets through the rumen unchanged or degraded by rumen microorganisms. Use of this type of protein is one way of providing for the amino acid needs of the animal. The amount of by-pass protein provided by various plant and animal protein sources is difficult to measure and may not be consistent among batches of feed or for different feeding conditions. However, comparative escape or by-pass values for some common sources of protein are shown in table 1.

One benefit of having microorganisms in the rumen is that under some conditions such as high concentrate feeding, urea can be used as a "protein" substitute to reduce feed cost. Another benefit of rumen microorganisms results when they digest cellulose in forage fed to cattle or sheep. It is for this latter reason that we need to be concerned about the nitrogen needs of the microorganisms as well as the protein (amino acid) needs of the animal. If rumen microorganisms do not have enough nitrogen from degraded feed protein, they will digest less cellulose and the animal will not grow or produce as well as it could. This situation may be caused by a general feed protein deficiency or by too much by-pass protein in relation to nitrogen in the rumen. If there is an excess of by-pass protein, the animal's protein (amino acids) needs may be met, but growth or production may be limited by lack of energy.

When and what to supplement:

Typical beef cattle supplementation situations probably can be discussed in three groups.

1. **Finishing rations:**

In this feeding situation urea has been successfully used as a protein substitute, because of the presence of large quantities of readily fermentable carbohydrate (corn, barley, or milo). Available carbohydrate allows the rumen microorganisms to rapidly use ammonia resulting from the feed urea. There has been some work indicating that by-pass protein may be beneficial in finishing rations also.

2. **Low quality roughages:**

Low quality roughage may result in either a nitrogen deficiency for the rumen microorganisms or a protein (amino acid) deficiency for the animal or both. Supplying needed protein improves both diet digestibility and feed intake (Peterson, M.K. 1987). Urea is not recommended for use with low quality roughage, whether in a feedlot or pasture situation. Some research however, suggests that urea might be beneficial in low protein forage if rumen microorganisms are nitrogen deficient. Nevertheless natural protein sources have been shown to produce consistently better results than urea with low quality roughages. Soybean meal is probably the most commonly used protein source. In an Oklahoma study (Cantrell et al. 1985), stocker steers grazing native range supplemented with 1.07 lbs soybean meal gained 0.49 lbs per day more than unsupplemented steers over a 56-day period from August 18 to October 11 (Table 2).

3. **High Quality roughage:**

Based on crude protein levels generally found in high quality roughage, you would not expect a need for protein supplementation at all. However, some forage protein may be degraded so rapidly in the rumen that the resulting ammonia cannot be used by the microorganisms and thus is wasted, resulting in a protein (amino acid) deficiency by the animal. In a Nebraska study (Anderson et al, 1988) steers grazing a smooth bromegrass pasture containing 10.4 to 13.4% crude protein gained 0.26 to 0.33 lb more weight per day than unsupplemented steers when fed 0.5 lb of a by-pass protein (table 3).

Summary:

Whenever diet protein levels are below animal requirements, a protein supplement should be provided. In general urea or other protein substitutes should only be used with high concentrate feeding. For optimum efficiency in other supplementation situations, it is important to provide a supplement that complements the protein in the basic diet with respect to release of nitrogen for rumen microorganisms and provision of by-pass protein (amino acids) for the animal.

References

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Peterson, M.K. 1987. Nitrogen supplementation of grazing livestock. Proceedings. Grazing Livestock Nutrition Conference. July 23-24. Jackson, WY.

Satter, L.D. 1983. Protected protein and NPN—How can they be harnessed in dairy rations? Animal Nutrition and Health. Nov.-Dec. pp. 14-18.

Table 1. Estimates of protein escaping destruction in the rumen.*

Feedstuff	Estimated amount of protein escaping ruminal degradation, %
Casein	10
Grass silage (unwilted)	15
Oats	20
Barley	20
Whole soybeans (unprocessed)	20
Alfalfa silage (<35%DM)	20
Peanut meal	25
Sunflower meal	25
Alfalfa hay	25
Alfalfa silage (>55%DM)	30
Cottonseed meal (solvent)	30
Corn silage	30
Soybean meal	30
Cottonseed meal (expeller)	35
Extruded whole soybeans (300°F)	40
Corn	40
Sanfoin	50
Brewers grains	50
Distillers dried grains	55
Corn gluten meal	55
Fish meal	60

*From Satter, L. D. 1983.

Table 2. Performance of steers grazing reclaimed native range and fed protein supplements.*

	Treatments	
	Control	**Supplement**
Number steers	20	20
Initial wt, lb (8/16)	494	489
Gain, lb/day (total)		
8/16 to 9/18, 33 days, lbs	1.41[a]	1.73[b]
9/18 to 10/11 23 days, lbs	0.01[a]	0.75[b]
8/16 to 10/11, 56 days, lbs	0.83[a]	1.32[b]

*From Cantrell et al. 1985.
[ab]Means with different superscript letters differ (P<.05).

Table 3. Gain response to escape protein for steers grazing smooth brome pastures.*

	Escape protein supplement. lb/d				
Item	**Control**	**.24**	**.51**	**.75**	**None[a]**
Number	14	14	13	8	10
Initial wt, lbs	615	613	617	595	613
Daily gain, lbs[b]	2.0	2.1	2.3	2.2	2.0

*From Anderson et al. 1988

[a]Animals that refused to consume supplement.

[b]Control vs supplemented (P<.01); supplement level linear (P<.01): supplement level quadratic (P=.23)

SECTION VI

HEIFER SELECTION AND MANAGEMENT TECHNIQUES FOR THE 1990'S

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HEIFER SELECTION AND MANAGEMENT TECHNIQUES FOR THE 1990'S

Russ Danielson

Cow calf operators are annually confronted with the decision of determining which animals will parent the next generation in their herds. Logically, the choice of sires should receive the greatest attention when making these selections as the individual bull will leave a larger number of offspring in the herd than will a cow. The intent of this presentation will concentrate on selection and management of the female, more specifically, the yearling heifer that is expected to reach puberty, successfully conceive, deliver a live calf, provide sufficient nourishment to the calf and rebreed a second time prior becoming 30 months old.

One of the first considerations that cow-calf operators need to make is to determine if raising replacement females is economically advantageous to purchasing bred heifers or cows as the herd replacements, females that are closer to producing a marketable product. Separating the cost of raising replacements from overall herd costs may reveal that resources used to raise replacement heifers could be better used to expand other aspects of the cattle operation. If the decision remains to provide replacement females from within the herd, the next question is: How do I go about selecting and managing the replacement heifer? The answer is simple. It depends!

The profitability of any beef cattle operation is a function of gross income less production costs. Annual gross income for the cow-calf operator is primarily dependent on the number, weight and quality of the calves that are available for sale. Fertility directly dictates the number of calves, growth rate directly influences sale weight and carcass characteristics ultimately influence the price received per pound. Research data quantifying the relative importance of these three traits reveal that fertility is five times more important than growth rate which in turn, is twice as important as carcass characteristics in determining the potential gross annual income from the beef breeding herd.

USE THE AVAILABLE PERFORMANCE RECORDS

The process of providing and developing replacement heifers for the breeding herd actually begins when matings were made in the previous generation. The amount of performance information available for use in selection has expanded to not only include weights of the individual parent, but to also include the performance of ancestors, half sibs and any progeny with the use of Expected Progeny Difference estimates. EPD's are currently available for the growth factors of birth, weaning, yearling weights and frame size. Maternal EPD's include factors for direct calving ease, maternal calving ease, milk and milk plus growth.

It is well to note that not all breeds of cattle calculate EPD estimates for all of the listed traits and commercial cow-calf operators that utilize more than one breed of bulls in a crossbreeding program should not attempt to compare EPD's between breeds. To date, the genetic reference points for traits are not the same for each breed and as EPD's are comparison estimates for individuals within the same breed, attempts to compare EPD values from individuals of different breeds should not be made. The fundamental importance of herd fertility and the goal of having a live calf born unassisted should indicate that special consideration be made for those traits that directly effect reproductive success in a breeding herd. Most breed sire summaries include EPD values for maternal milk allowing a producer to select the optimal level for his herd. Remember the milk EPD for a bull is the expected difference in weaning weight for a daughter's calf that is due strictly to the daughter's milk production. The impact of a sires' milk EPD estimate is not realized in the herd until the second generation is weaned. A practical definition for the most desirable amount of milk production in a cow is the amount of milk that will allow the calf to achieve its full potential for growth to weaning with the fewest feed inputs to the cow without detrimentally effecting her ability to rebreed. If feed resources for the cow herd do not meet the requirements for body maintenance, milk production and growth, reproduction in the herd suffers. The direct result when performance exceeds feed resources is likely to be an unacceptable number of open females at weaning time.

WHEN SHOULD REPLACEMENT HEIFERS BE SELECTED

The success of selecting replacement heifers is dependant on the age she reaches puberty, her ability to successfully mate and conceive and whether she calves by her second birthday. The age, weight and breed composition of the heifer directly influence the onset of first estrus. A heifer must be bred on or before reaching 15 months to calve with her herdmates to stay within the management calendar of the operation. There is little opportunity to manipulate the management calendar in most beef herds.

Heifers that are be mated to calve at two years of age must reach an acceptable minimum weight prior to breeding at 14 months. The general goal is for the heifer to weight 65 percent of her mature weight at breeding. This weight gain occurs during two critical growth phases for the heifer, from birth to weaning and from weaning to breeding. The goal is to devise a management system that keeps the heifers growing at a respectable rate from birth to breeding. Selection of replacement heifers based solely on weight gain during the pre-weaning period is ill advised. It is true that heavier heifers tend to be born earlier in the calving season and may also be out of heavier milking cows. However, the consequences of continually choosing the heaviest heifers at weaning can detrimentally effect herd reproductive rate and can ultimately increase the feed requirements for maintenance and lactation in the cow herd. Heavier weaning weights

correspond with heavier birth weights increasing dystocia and in some extremely fast growing heifers an imbalance in the endocrine system may result in infertility. The antagonism of heavy weaning weights increasing mature cow size in the herd to the point of exceeding available feed resources is also a real possibility along with producing calves that finish at higher than optimum slaughter weights.

The post weaning nutritional management of the heifers can be designed to accommodate a range of weaning weights to successfully achieve high pregnancy rates in the replacements. Operators would be wise to delay selection of replacement heifers beyond weaning time. The longer the selection is delayed the greater the opportunity of accurately choosing the most productive heifers. Obviously, heifers that are unthrifty, structurally unsound, reproductively undesirable or extremely small in comparison to their herdmates at weaning should not be considered as herd replacements. Each operator must determine the economic feasibility of whether selection of replacement heifers occurs at weaning, at yearling, at mating, following breeding or at the time of pregnancy testing. The most common selection method is to eliminate heifers at various times from weaning to calving. The normal attrition rate in cow herds is 15-20 percent annually. If the herd is supplying all the female replacements, it is necessary to retain a minimum of 35-55 percent of the heifer calf crop to maintain a constant herd size. To increase the opportunity to select for traits in addition to fertility, up to two-thirds of the heifer calf crop may be required. Specialized intensive management systems may allow the producer to make female replacement selection following early weaning of the first calf and market the cull females as finished market animals.

CONSIDER THE GOALS OF THE ENTIRE INDUSTRY

The industry expectations for beef cow herds in the 1990's will require seedstock and commercial operators to concentrate on both production and product traits. The wise choice of breeding stock will extend beyond the producer's pasture fence. When the inventory of cattle in the U.S. builds, discounts for inferior cattle will be evident likewise, premiums for superior cattle should exist. The prudent producer will be prepared for the situation when it occurs. Females selected for herd replacements must be efficient factories regularly producing calves that fit the specifications of feedlot operators, packers and retailers as the beef industry responds to consumer demands. The cow calf operator needs to continually adjust his available feed and management resources to fit a suitable performance oriented system that will allow economic success within a consumer driven industry.

SECTION VII

THE DEVELOPMENT AND SCIENTIFIC TESTING OF FEEDING DAKOTA CATTLE TO MEET THE JAPANESE BEEF MARKET

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ABSTRACT

As political and economic changes bring about the reduction of importation quotas in Japan, there has been an accompanying change in the beef eating habits of the Japanese consumers. The increases in beef consumption currently occurring in Japan have happened in three major areas: (1) High and middle value meats sold to individual customers; (2) Middle value meats sold to middle and upper class eating establishments; and, (3) all grades of beef to all customers.

During the past 18 months, Sawyer Beef International has been actively negotiating contracts for supplying beef to several Japanese firms. A brief chronology of the negotiations and resulting contracts are contained in Appendix H. As a result of these negotiations, the company has entered into a joint venture with one of these Japanese companies involved in the importation of American beef and beef genetics to create and test a program to develop a beef breed and/or type that meets the specific demands of Japanese beef eating preferences.

This Japanese export project entails genetic identification of each individual animal under contract. Nutritional intake is monitored by a feeding process that records daily feed intake through computer controlled modules worn by each animal. Control animals are fed a specially formulated ration that is free of growth stimulants. The animal is otherwise maintained under a normal feedlot environment. The current results of this joint project have been that Sawyer Beef has been able to compete extremely well with other locations in the U.S. in terms of feed and yardage costs. This favorable position has been maintained while achieving a meat quality that the Japanese buyers have indicated meets their rigid standards for color, texture, and taste. Taste is defined as the taste necessary to accommodate the Japanese consumer. These tests have also proven that Sawyer Beef produces what is considered to be the “classic carcass” for the U.S. market. The acid test for product marketability has been the interest and reactions of multiple Japanese export-import firms.

Through its contacts with several Japanese meat purchasing companies, and a result of the joint venture discussed above, Sawyer Beef International, Inc., has been able to acquire contracts for the purchase of feeder calves, and the feeding of these animals. This operation is highly profitable in its own right.

The results of the feeder operations growth has been very encouraging. Japanese companies have shown a continuing interest in both the quality and consistency of the results of Sawyer Beef’s efforts. This project is the compilation of data from the the testing and feeding of Dakota Cattle in an attempt at meeting the meat quality demands of the Japanese beef market.

Introduction

Japan has been the largest importer of American beef in the world for years, accounting for over 70% of U.S. beef exports. It was only through the publicity surrounding the GATT talks, however, that beef exports to Japan became a popular issue in the U.S. Reports of beef carcasses bringing as much as $12/lb. at the wholesale level in Japan generated considerable excitement and enthusiasm in the industry.

On January 20, 1988 the U.S. and Japan agreed to liberalize the importation of beef into Japan by eliminating their import quota system. The lifting of these import restrictions has created an opportunity for U.S. beef producers to sell to a potentially lucrative market if they can offer an appropriate product to the Japanese. The primary concerns Japanese meat buyers have regarding an appropriate U.S. beef product are the meat's taste or flavor, degree of marbling, color of the meat and fat, shelf life, purge and packaging. The Japanese increasing demand for beef creates an extremely broad retail price structure ranging anywhere from $100/lb. to $3/lb. for beef. Demand for the very expensive premium quality Japanese Kobe beef has a primary usage limited mainly to special occasion dinners, gift offerings, and fine cuisine in white tablecloth restaurants. The greatest demand, however, is being realized in the lower to medium quality beef which is available to the common individual at a more reasonable and affordable price. U.S. Choice beef is a sufficiently marbled grade of beef that provides acceptable qualities which makes it an appropriate product for supplying the ever increasing demand in the everyday relatively low priced Japanese market.

Due to the limited availability of space and resources required for beef production, the cost of producing livestock products in Japan is relatively high (compared to U.S.), requiring the producer to offer an exceptionally superior grade of beef to the customer. Therefore, very special breed selection and production methods have been applied in the Japanese beef industry. This is where the breeding of Wagyu cattle and the uses of very different production systems that target a special carcass quality and composition comes into play. Japanese cattle feeders prefer cattle that can be fed for a very long time (22 to 30 months) without finishing or going off feed. In contrast, cattle in the U.S. will reach a minimum acceptable level (small) of marbling in a very short feeding period (approximately 140 days).

As a result of the trade liberalization, Japanese beef producers are concerned about protecting their small but highly profitable beef cattle industry from the anticipated glut of beef imports caused by the stiff competition between the Australian and U.S. exporters. Therefore, rather than attempting to produce and market premium quality beef to directly compete with the highest quality Japanese Kobe beef (this may prove to be counter-productive), it would be in the best interest of the U.S. producer to position themselves as friends of the Japanese cattle producer by targeting the Japanese demand for the lower to medium quality beef. Rather than posing as a direct competitive threat to the Japanese cattleman, increased sales of American Choice beef have actually increased demand for the premium quality Japanese beef in their country.

The purpose of this report is to give N.D./U.S. beef producers a broad perspective into the aspects of the Japanese diet trends, Japanese beef production, grading, and marketing, and mainly an insight on the feasibility of American cattlemen successfully developing and marketing an appropriate grade of beef through extended feeding programs and marketing techniques capable of competing profitably in the Japanese market. It is very likely that highly successful beef producers will have production and marketing capabilities in the U.S. as well as joint venture enterprises with Japanese interests.

Final Comments

Economic and cultural changes in Japan offer a great marketing opportunity for U.S. beef. While beef as a luxury item is indeed firmly established, beef as an everyday food is not. American Choice beef appears to be very well accepted by Japanese consumers. While U.S. Choice beef is adequate for the majority of our sales, there is also quite possibly a niche between U.S. Choice and premium quality domestic beef. The size and strength of demand in this market niche remains to be determined. The largest deterrent to greatly expanded sales of U.S. beef seems to be the lack of adequate shelf life of fresh product. Grass-fed, inferior Australian beef often sells for the same price as frozen U.S. Choice beef side by side in retail sales cases. The North Dakotan beef producer needs to improve export marketability if they are to reap the feasible benefits of this market and the rest of the potentially lucrative Pacific Rim market. U.S. packers must develop a sanitation and packaging system that will increase shelf life and reduce purge. Fresh meat is much more desirable than frozen at the retail level. Quality control must be more stringent to develop and maintain consumer confidence. The producer needs to place more emphasis on a global marketing strategy. The market exists; it is just up to the producer to put forth the money, time, and effort necessary to capture their share of it.