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1973 NEBRASKA BEEF CATTLE REPORT

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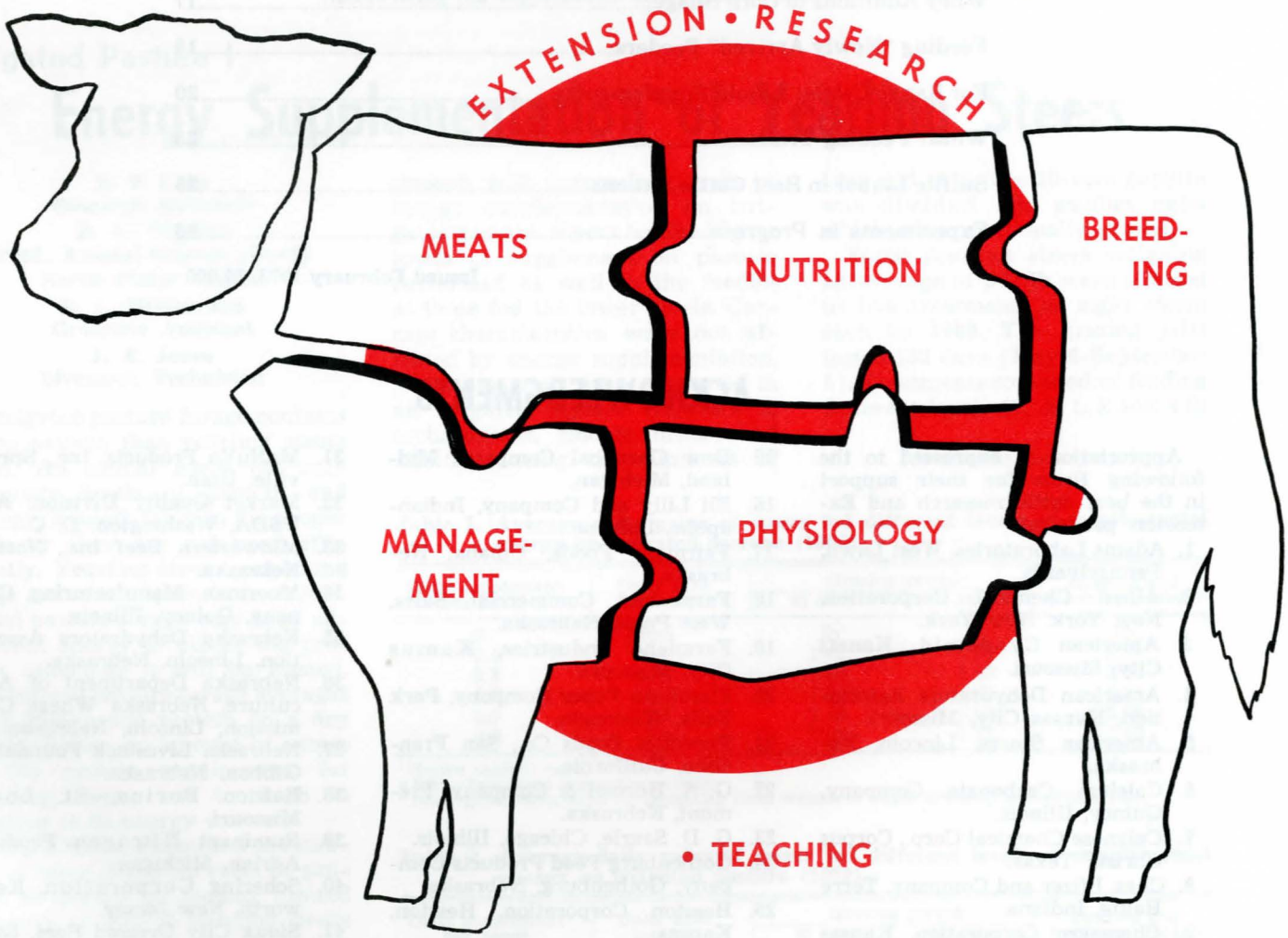

Prepared by the staff in Animal Science and cooperating Departments for use in the Extension and Teaching programs

University of Nebraska – Lincoln College of Agriculture
E. F. Frolik, Dean

Director of Extension
J. L. Adams

H. W. Ottoson
Director, Agricultural Experiment Station

R. G. Arnold
Acting Director, Resident Instruction

CONTENTS

Irrigated Pasture I. Energy Supplementation of Yearling Steers 3

Irrigated Pasture II. Effects of Supplemental Energy 5

Irrigated Pasture III. Effect of Moisture Content 6

Dehy as Roughage in Finishing Rations 7

Feed Value of Dehydrated Whole Corn Plant 8

Urea Supplementation of Pelleted Whole Corn Plants 10

Zinc Bacitracin in Rations 12

4-H Beef Carcass Contest Analysis 13

Acid Treated Corn: Finishing Rations 16

Whey Additions to Corn Silage 17

Feeding "Newly Arrived" Feeders 19

For Range Cattle: Liquid Supplements 20

Wheat Feeding Trials 23

Sulfite Liquor in Beef Cattle Rations 25

Experiments in Progress 26

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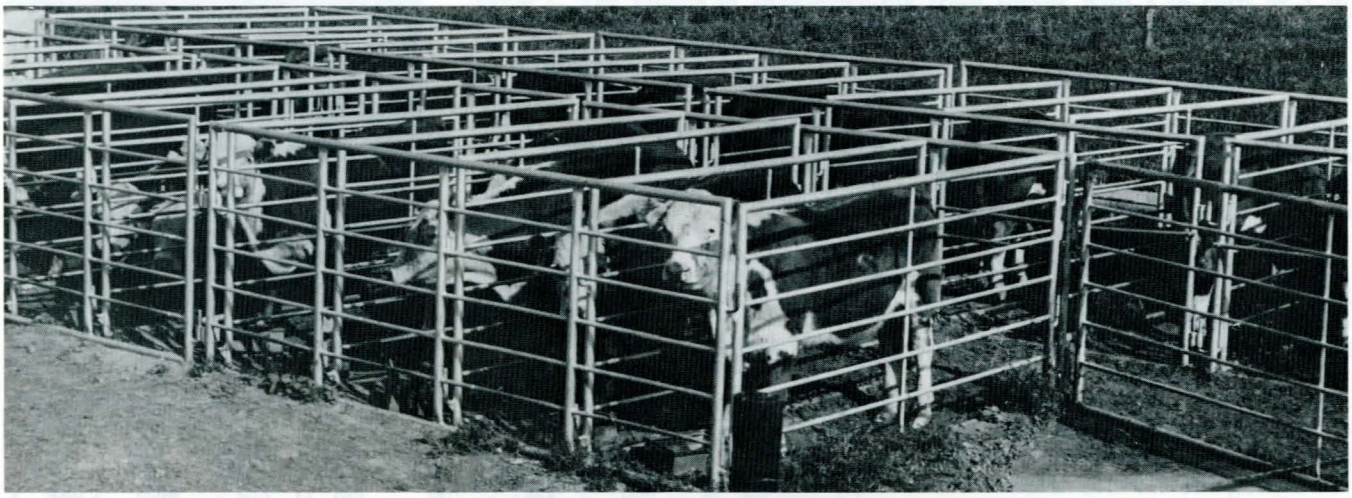


Steers being fed supplements on irrigated pasture.

Irrigated Pasture I

Energy Supplementation of Yearling Steers

R. P. Lake
Research Associate
D. C. Clanton
Prof., Animal Science (Beef)
North Platte Station
R. L. Hildebrand
Graduate Assistant
L. E. Jones
Livestock Technician

Irrigated pasture forage contains more protein than yearling steers need. An animal needs not only adequate **levels** of protein and energy, it needs them in the proper **ratio** or they are not used efficiently. Yearling steers consuming large amounts of protein from irrigated pasture forage may need additional energy to utilize the protein, otherwise it will be wasted.

Irrigated pasture forage averages near 20% crude protein on a dry matter basis—an amount in excess of the protein requirement for yearling steers, and too high in relation to its energy content.

Experiments attempted to establish a more desirable ratio of protein to energy by feeding limited amounts of corn to yearling steers on irrigated pasture. Results in two grazing trials showed that daily energy supplementation at or above the 1 lb level in the 1969 trial, and at the 4 lb level in the 1970 trial, increased gains. Supplementation above 4 lb did not result in additional gain.

The length of time required to finish steers in the feedlot decreased with increasing levels of energy supplementation on irrigated pasture. Steers fed the higher levels of supplement on pasture performed as well in the feedlot as those fed the lower levels. Carcass characteristics were not affected by energy supplementation.

Grazing trials were conducted in an irrigated pasture (mixture of orchardgrass, smooth brome and alfalfa) during the summers of 1969 and 1970. The 20-acre pasture was divided into smaller units which were rotationally grazed.

Forty yearling steers weighing an average of 572 lb were allotted to five treatments of eight steers each in 1969. The grazing trial lasted 122 days (May 6-September 5). Treatments consisted of feeding different levels (0, .5, 1, 2 and 4 lb

(continued next page)

Table 1. Average daily gains of steers fed different levels of supplemental energy on irrigated pasture (1969).

Daily supplement per head[a]	Daily EDE intake[b]	Grazing period		Grazing and finishing periods[c]
		63 days	122 days	
lb	Mcal	lb	lb	lb
0.0	0	1.45	1.32	2.27
0.5	0.8	1.67	1.43	2.33
1.0	1.6	1.65	1.63	2.34
2.0	3.2	1.78	1.58	2.68
4.0	6.4	2.09	1.82	2.45

[a] Rolled shelled corn.
[b] EDE=Estimated digestible energy.
[c] Daily gains calculated by adjusting final weight to equal dressing percentage (62).

Table 2. Average daily gains of steers fed different levels of supplemental energy on irrigated pasture (1970).

Daily supplement per head[a]	Daily EDE intake[b]	Grazing period		Grazing and finishing periods[c]
		63 days	119 days	
lb	Mcal	lb	lb	lb
0.0	0	1.56	1.43	2.56
1.0	1.6	1.45	1.45	2.56
2.0	3.1	1.85	1.50	2.57
3.0	4.7	1.91	1.65	2.73
4.0	6.3	2.27	1.94	2.81
5.0	7.8	2.07	1.87	2.71
6.0	9.4	2.16	1.87	2.73

[a] Supplement consisted of 94% corn, 5% molasses and 1% pellet binder.
[b] EDE=Estimated digestible energy.
[c] Daily gains calculated by adjusting final weight to equal dressing percentage (62).

Energy Supplementation

(continued from page 3)

per head daily) of rolled shelled corn. Steers in each treatment were fed as a group during the first 63 days of the trial and were individually fed the rest of the trial.

Forty-two yearling steers weighing an average of 502 lb were allotted to seven treatments of six steers each in 1970. Different levels (0, 1, 2, 3, 4, 5 and 6 lb per head daily) of an energy supplement (94% corn, 5% molasses and 1% pellet binder) were individually fed during the 119-day trial.

Supplements in both trials were fed at 9 a.m. daily. Steers were weighed after a 12-hour shrink (no feed or water) at beginning, middle and end of trials.

Finishing trials were started immediately after the grazing trials. Each energy treatment group was fed separately. All cattle in each finishing trial were fed the same high concentrate ration. It contained about 12% crude protein, .4% calcium and .35% phosphorus (dry matter basis). Steers were individually weighed at the beginning and end of the trials following a 15-hour shrink.

In the 1969 trial, each group of steers was slaughtered when visual appraisal suggested they had reached an average carcass grade of low choice. This resulted in marketing steers which had previously received either 2 or 4 lb corn per head daily on irrigated pasture after 89 days in the feedlot. The remaining cattle were slaughtered 15 days later.

Cattle in the 1970 trial were slaughtered at weekly intervals, with the group that received 6 lb of corn on pasture slaughtered first. Visual appraisal indicated they had reached low choice. This was 102 days following the start of the finishing phase. Cattle fed 5 lb of corn on pasture were slaughtered a week later, and so on, with those that received no grain on pasture slaughtered last.

Carcass data were collected at slaughter. Average daily gains and feed per pound of gain were calculated on the basis of final live weight adjusted to give equal dressing percent of 62.

Table 4. Feedlot performance and carcass data of steers which had previously received different levels of energy supplementation while grazing irrigated pasture (1970).

	Previous level of supplementation, lb/head/day						
	0.0	1.0	2.0	3.0	4.0	5.0	6.0
Days in feedlot	144	137	130	123	116	109	102
Av. wt., lb							
Initial	675	686	673	715	735	711	724
Adj. final[a]	1177	1168	1129	1174	1160	1100	1100
Adj. daily gain[a]	3.49	3.52	3.51	3.73	3.66	3.57	3.69
Av. dry matter consumed, lb							
Daily	20.7	21.1	20.9	20.5	20.5	21.6	21.6
Per lb gain	5.0	6.0	6.0	5.5	5.6	6.1	5.9
Av. carcass data							
Yield[b]	59.8	59.2	59.5	58.6	59.8	58.5	58.6
Grade[c]	12.6	12.5	12.0	11.5	11.8	11.7	11.8
Rib eye area. sq in	11.2	11.3	11.1	10.9	10.8	10.6	11.7
Fat thickness, in	0.9	0.8	0.9	0.8	0.8	0.8	0.9
Carcass wt., lb	730	724	700	728	719	682	682
Number of abscessed livers	0	0	1	1	1	0	2

[a] Final liveweight adjusted to give equal dressing percent of 62 and daily gains calculated on this basis.
[b] Yield equals hot carcass weight divided by final feedlot weight x 100.
[c] Carcass grade assigned; 11 = high good, 12 = low choice.

Table 3. Feedlot performance and carcass data of steers which had previously received different levels of energy supplementation while grazing irrigated pasture (1969).

	Previous level of supplementation, lb/head/day				
	0.0	0.5	1.0	2.0	4.0
Days in feedlot	104	104	104	89	89
Av. wt, lb					
Initial	744	744	763	763	799
Adj. final[a]	1097	1097	1094	1135	1094
Adj. daily gain[a]	3.40	3.39	3.15	4.18	3.31
Av. dry matter consumed, lb					
Daily	21.6	22.0	21.1	22.4	22.7
Per lb gain	6.4	6.5	6.6	5.4	6.9
Av. carcass data					
Yield[b]	58.2	58.5	59.2	62.7	57.9
Grade[c]	12.1	11.8	11.6	12.6	12.8
Carcass wt, lb	680	680	678	704	678
Number of abscessed livers	3	2	3	2	2

[a] Final liveweight adjusted to give equal dressing percent of 62 and daily gains calculated on this basis.
[b] Yield equals hot carcass weight divided by final feedlot weight x 100.
[c] Carcass grade assigned; 11 = high good, 12 = low choice.

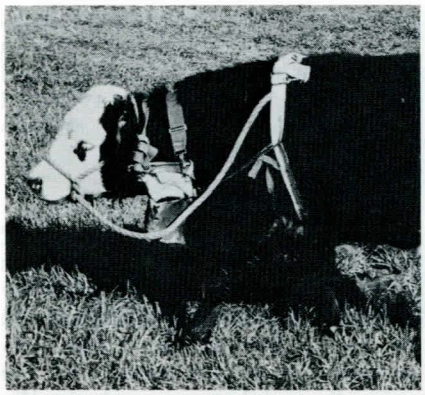
Grazing Trial Performance

In the 1969 trial, feeding of 1 lb corn per head daily significantly increased weight gain of steers above that of steers receiving either .5 lb per head or no corn (Table 1). Results obtained in the 1970 trial showed that 3 lb supplement or less did not significantly improve weight gain (Table 2). Steers receiving supplementation levels of 4 lb or above in the 1970 trial gained significantly more than those that received 2 lb or less. In both trials, feeding of 4 lb corn or energy supplement resulted in the greatest weight gains.

Finishing Trial Performance

Steers which received 2 lb corn daily while grazing irrigated pasture gained significantly more than the other steers during the 1969 finishing trial (Table 3). The adjusted average daily gain of steers in the 1970 finishing trial were not significantly different as a result of previous energy supplementation while grazing irrigated pasture (Table 4). Average dry matter consumption and feed conversion of the treatments were not different. Steers previously fed different levels of supplementary energy had as desirable carcasses as those not supplemented.

Weight gains of steers for the combined grazing and finishing periods were not significantly different due to supplementation on irrigated pasture (Tables 1 and 2).



Esophageal fistulated steer used to collect sample of diet.

Irrigated Pasture II

Effects of Supplemental Energy

R. P. Lake
Research Associate
D. C. Clanton
Prof., Animal Science (Beef)
North Platte Station

Weight gains in yearling steers grazing irrigated pasture may be improved by feeding limited amounts of a high energy supplement. Three possible explanations for the improved performance are increased dry matter consumption, increased diet digestibility and/or increased nitrogen utilization in the rumen. In three experiments, dry matter intake, apparent dry matter digestibility and nitrogen retention were measured for steers consuming irrigated pasture with and without supplementation.

It was found that supplemental corn reduced the dry matter intake of forage by about the same amount of dry matter the corn supplied. Estimated total dry matter intake of steers with and without 3 lb of corn supplementation was not significantly different when expressed as a percentage of the body weight. Steers consuming fresh forage plus 3 lb of corn per head daily had significantly greater nitrogen retention than those on fresh forage alone. A significant increase in apparent dry matter digestibility was found at the 3 lb supplementation level.

Table 1. The effects of supplemental energy on estimated intake of steers grazing irrigated pasture (1971).

	Grazing	Grazing plus 3 lb corn
Daily dry matter (as % of animal's weight)[a]		
Forage intake	2.89	2.57
Total intake	2.89	3.02

[a] Estimation values: **in vitro** dry matter disappearance; corn @ 81.2% and forage collected via esophageal fistulated steers @ 67.4%.

Table 2. The effects of supplementing fresh forage with 1 lb corn or 3 lb corn on apparent dry matter digestibility and nitrogen retention in yearling steers (1970 and 1971).

	1970		1971	
	Fresh forage	Fresh forage plus 1 lb corn	Fresh forage	Fresh forage plus 3 lb corn
Apparent dry matter digestibility, %	63.9	65.1	57.0	61.5
Nitrogen retained, gram per day	2.3	-1.9	-3.6	17.2

Intake Experiment

During the summer of 1971, an experiment consisting of four seven-day trials was conducted to determine the effect of supplementing 3 lb of corn per head daily on forage dry matter intake of steers grazing irrigated pasture. Steers were allowed to graze with and without daily supplemental corn. Dry matter intake was estimated using esophageal fistulated steers for collecting dietary samples and a total of eight steers per treatment (four per trial) were fitted with fecal bags for total collection. Dry matter disappearance **(in vitro)** of corn and dietary samples were used as estimates of their dry matter digestibility in estimating intake.

Total dry matter intake (expressed as a percentage of the animal's weight) estimated for steers fed 3 lb corn daily and allowed to graze irrigated pasture was not significantly different from that of steers grazing without supplement (Table 1). However, forage dry matter intake was significantly greater for steers not receiving energy from corn. Forage dry matter intake of supplemented steers was reduced by the amount of dry matter supplied by corn.

Digestibility, Nitrogen Balance

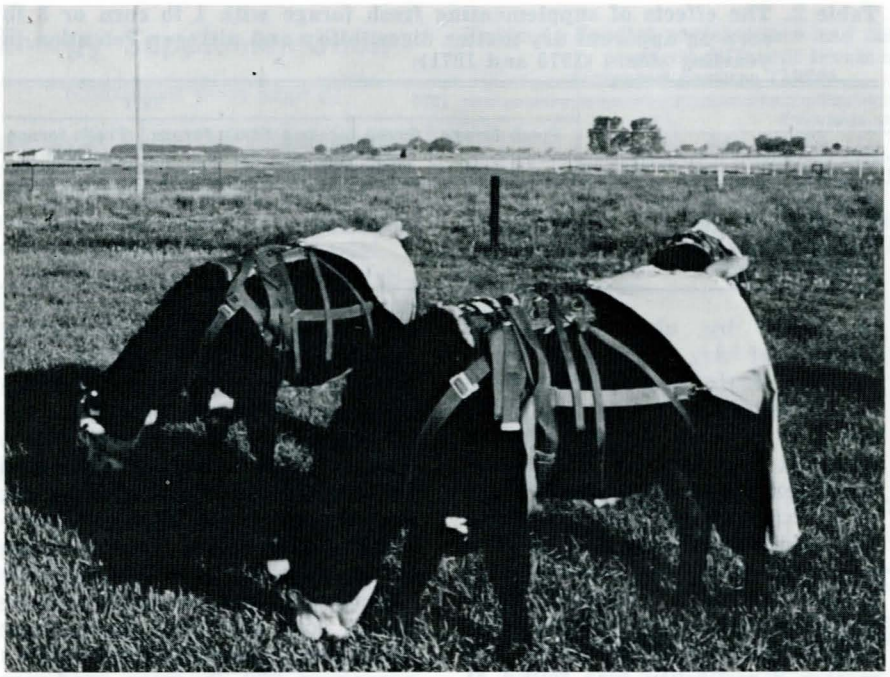
During summers of 1970, 1971, two experiments were conducted to determine effects adding energy supplement to fresh forage diets would have on dry matter digestibility and nitrogen retention.

Forage fed in these experiments was harvested from an irrigated pasture (mixture of orchardgrass, smooth brome and alfalfa). Treatments consisted of feeding fresh forage with and without 1 lb (1970 experiment) and 3 lb (1971 experiment) corn per head daily. Four steers averaging 616 lb and 8 steers averaging 629 lb were used per treatment.

Diet dry matter digestibility and nitrogen retained by steers consuming fresh forage and 1 lb corn were not significantly different than those of steers receiving only fresh forage (Table 2). Supplementation of 3 lb corn per head daily significantly increased dry matter digestibility above that of the unsupplemented forage diets (Table 2). The increased digestibility of the diets was probably due to the higher digestibility of the corn.

Steers receiving fresh forage and 3 lb corn had significantly greater nitrogen retention than those consuming only fresh forage. Increased nitrogen retention of steers receiving corn may have been due to additional energy causing a stimulation of microbial growth. Increased microbial activity could cause conversion of more rumen ammonia to microbial protein which could result in increased nitrogen retention.

These results suggest the use of up to 4 lb corn, or equivalent energy from other grain, per head daily. Protein in excess of the requirements will be better utilized with the addition of readily available energy resulting in increased animal growth. If the excess protein is not utilized, the nitrogen in it has to be excreted from the body which is a needless energy expense.



Steers with fecal bags used in determining dry matter intake indirectly.

Irrigated Pasture III

Effect of Moisture Content

R. P. Lake
Research Associate
D. C. Clanton
Prof., Animal Science (Beef)
North Platte Station
J. F. Karn
Laboratory Nutrition Supervisor

Yearling steers grazing on irrigated pasture do not always gain as well as expected and often during early summer do not gain as well as their counterparts on native range. It has been suggested that the high moisture content of irrigated pasture forage may limit the animal's dry matter intake, therefore limiting gains.

In this study, no significant difference in average daily gain was noted between steers fed fresh forage and those fed dried forage. However, a trend toward greater nitrogen retention in steers fed dried forage suggests a possible reason for slightly higher gains in those animals.

Table 1. The effect of drying irrigated pasture forage on voluntary intake and weight gain of yearling steers.

	Fresh forage	Dried forage
Dry matter content %	22	81
Dry matter intake		
Per day, lb	17.3	17.4
% of body wt.	2.79	2.86
Animal performance		
Av. daily gain, lb	2.05	2.18

Experiments

During May and June of 1971 and 1972, two 30-day trials were conducted to determine what effect drying fresh irrigated pasture forage had on dry matter intake and weight gain of yearling steers. Digestion and nitrogen balance trials were conducted in 1970 and 1971 to study the effect of drying fresh forage on apparent dry matter digestibility and nitrogen retention.

Twelve steers averaging 570 lb were fed in the 1971 performance trial; 10 steers averaging 517 lb were used in 1972. In the digestion and nitrogen balance trials 12 steers were fed fresh forage and 6 steers were fed dried forage.

Forage fed in these trials was windrowed and chopped from an irrigated pasture (mixture of orchardgrass, smooth brome and alfalfa) each morning. Part of the harvested forage (averaging 22% dry matter) was fed immediately. The remaining forage was dried in a forced air grain drying bin and fed the next morning. It averaged 74% and 88% dry matter, respectively, during the trials.

Results

Voluntary dry matter intake of individually fed yearling steers was not significantly affected by the moisture content of the forage (Table 1). Dry matter intake (expressed as a percentage of the animal's weight) was not significantly different for steers consuming fresh forage when compared to those consuming dried forage.

Steers receiving fresh forage consumed an average of 17.3 lb dry matter daily, or an average of 78.5 lb of fresh forage daily. Steers receiving dried forage consumed an average of 17.4 lb dry matter, or 21.6 lb of dried forage daily. Steers receiving fresh forage consumed about 61.2 lb of water daily from the ingestion of forage. Those receiving dried forage only consumed 4.2 lb of water from forage.

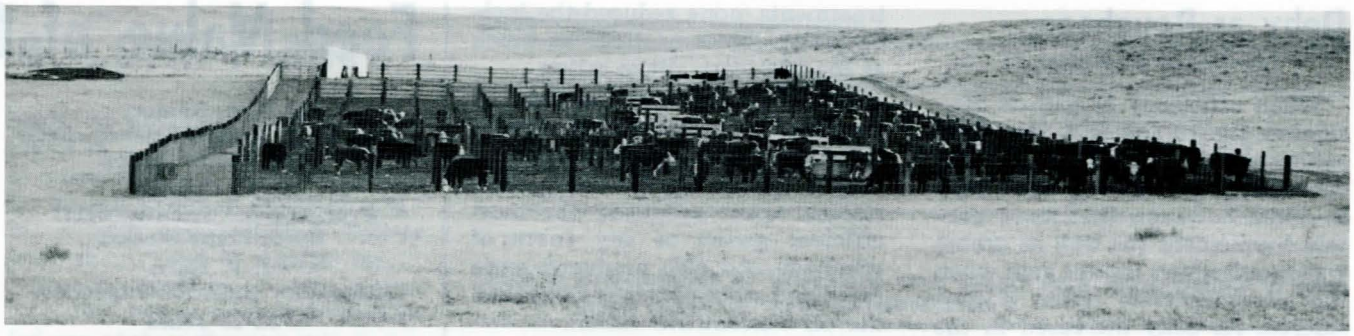
Average daily gain of steers that received fresh forage was 2.05 lb while those receiving dried forage gained 2.18 lb per day—not significantly different (Table 1).

Apparent dry matter digestibility of the fresh and dried forage, and nitrogen retention of steers receiving these forages were not significantly different (Table 2). Steers fed dried forage tended to have greater nitrogen retention than those fed fresh forage, possibly because of slight changes in chemical composition during drying.

Drying may have lowered the solubility of nitrogen-containing compounds, resulting in decreased ammonia losses from the rumen. More efficient nitrogen utilization may have in turn resulted in slightly greater weight gains in the steers fed dried forage.

Table 2. The effect of drying irrigated pasture forage on apparent dry matter digestibility and nitrogen retention in yearling steers.

	Fresh forage	Dried forage
Aparent dry matter digestibility, %	59.3	59.1
Nitrogen retained, gram per day	-1.6	6.6



Cattle fed dehy as a roughage.

Dehy as Roughage in Finishing Rations

Bill Schneider
Graduate Assistant
Terry Klopfenstein
Assoc. Prof.,
Ruminant Nutrition

Until the last decade, roughage was fed in finishing rations at levels high enough so that fiber length and exact level were not important. However, lower levels have been fed recently because:

1. Roughages are difficult to mechanize and expensive to transport.
2. Net energy from grains is usually cheaper than from roughages.
3. Increased emphasis has been placed on maximum daily gains and the need to keep nonfeed costs per pound of gain low.

The actual value of roughage in the finishing ration has become apparent with the use of all-concentrate rations. Adding roughage to an all-concentrate ration increases feed intake and daily gains and decreases incidence of abscessed livers and digestive upsets.

In two feeding trials conducted at the Scotts Bluff Station, two forms of dehydrated alfalfa were evaluated as nutrient and roughage sources. The following conclusions were drawn:

1. ¼- and ⅜-in dehy pellets have roughage characteristics at least equal to corn silage when measured by feed consumption and gains.
2. ¼-in dehy was the superior roughage source in both trials in rate and efficiency of gains.
3. Dehy products were not as effective as corn silage in reducing the incidence of liver abscesses.
4. Feeding of dehy reduced supplement cost.
5. Increasing dehy pellet size from ¼- to ⅜-in is not sufficient to prevent liver abscess.
6. ⅜-in dehy in rolled grain rations may result in sorting and subsequent variation in performance.

Study Design

Nine rations were fed in each trial (Table 1). Two pens of yearling steers (15 each) were fed per treatment. In the first trial ('70-'71) the treatments were:

1. All-concentrate.
2. 5% corn silage.
3. 10% corn silage.
4. 5% fine dehy (¼" pellet).
5. 10% fine dehy.
6. 15% fine dehy.
7. 5% coarse dehy (⅜" pellet).
8. 10% coarse dehy.
9. 15% coarse dehy.

In the second trial ('71-'72) the treatments included:

1. All-concentrate.
2. 10% corn silage.
3. 15% corn silage.
4. 10% fine dehy.
5. 15% fine dehy.
6. 10% coarse dehy.
7. 15% coarse dehy.
8. 10% coarse dehy crushed.
9. 15% coarse dehy crushed.

In Trial 2, the two treatments which involved crushed ⅜-in dehy were added in an attempt to prevent sorting of feed which was observed with the ⅜-in pellet rations in Trial 1. A series of rations containing decreasing levels of roughage was used to start the cattle. Only the roughage used in the final ration was used to start the cattle. Corn silage was used to start the all-concentrate cattle. No problems were incurred in starting cattle regardless of ration.

Table 1. Ration compositions (DM basis).

Ingredient	All-conc.[ab]	5% Corn silage[a]	10% Corn silage[ab]	15% Corn silage[b]	5% Dehy[a]	10% Dehy[ab]	15% Dehy[ab]
Roughage	—	5.0	10.0	15.0	5.0	10.0	15.0
Corn (rolled)	65.5	61.9	58.1	53.3	62.7	59.8	56.9
Wheat (rolled)	28.1	26.5	24.9	24.6	26.9	25.6	24.4
Molasses	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Soybean meal[3]	2.4	2.8	3.2	3.5	1.8	1.2	.6
Limestone[3]	1.0	1.0	.9	.8	.8	.6	.4
Salt[3]	.3	.3	.3	.3	.3	.3	.3
KCl[3]	.1	—	—	—	—	—	—

[a] Rations included in first trial.
[b] Rations included in second trial.
[c] Included in supplement with trace minerals, stilbestrol and vitamin A.

Results and Discussion

Cattle fed dehy rations and corn silage consumed more feed and gained more rapidly than cattle fed all-concentrate rations. The ¼-in dehy fed at the rate of 10 or 15% of the ration appeared to give as much response as 10% corn silage when intake and gain are considered.

(continued next page)

Dehy as Roughage

(continued from page 7)

When efficiency of gain is considered, the 10 and 15% fine dehy rations were comparable to the all-concentrate ration. One must keep in mind, however, that more protein supplement (as well as grain) was required per unit of gain when the all-concentrate ration is considered. As dehy increased in the diet, less protein supplement was required to maintain a 12% protein ration.

Results of Trial 1 indicate that the roughage level should exceed 5% in finishing rations regardless of source. When corn silage or ¼-in dehy was increased in the diets from 5 to 10%, an increase in both gain and efficiency was noted (Table 2). Rations containing 5% of the ⅜-in dehy appeared to produce gain more efficiently than higher levels of the same product. This increase in efficiency could be the result of sorting at higher levels of ⅜-in dehy. Thus, steers within a pen may have had inadequate energy or protein for maximum efficiency, depending on whether they preferred dehy or grain.

Although some decrease in liver abscess was noted among dehy treatments, none reduced the incidence of abscessed liver as much as the 10% corn silage ration.

All dehy products in Trial 2 produced performance equal to or better than corn silage-containing rations (Table 3). The ¼-in dehy rations again produced the most efficient gains of any form of roughage and also produced more rapid and more efficient gains than the all-concentrate ration.

All roughages, regardless of source, in Trial 2 produced more rapid and more efficient gains when fed at 10% of the ration as opposed to 15%. At 111 days on feed, the cattle fed all-concentrate rations performed comparably to cattle on roughage-containing rations. This may be an indication that the "hotter" rations may not produce ruminal disturbances and/or subsequent liver abscess problems until after prolonged feeding. All-concentrate fed cattle had significantly more abscessed livers than all other treatments, and cattle fed 15% corn silage had significantly less.

There were no noticable differences in grade or yield of cattle in either trial. Cattle on all treatments graded an average of low choice.

Table 2. Level and size of dehy pellets in finishing rations Trial 1 (158 days).

Diet	No. steers	Daily[a] gain	Daily intake	Feed/ gain	% Cond. livers
All-concentrate	29	2.64	16.85	6.39	79.3
5% corn silage	28	2.66	18.73	7.05	53.6
10% corn silage	30	3.02	19.57	6.47	33.3
5% ¼" dehy	30	2.77	18.13	6.56	66.7
10% ¼" dehy	28	2.97	18.99	6.42	57.1
15% ¼" dehy	29	3.00	19.22	6.44	75.9
5% ⅜" dehy	30	2.85	18.47	6.51	50.0
10% ⅜" dehy	28	2.80	19.38	6.92	75.0
15% ⅜" dehy	30	2.98	20.38	6.90	76.7

[a] Cattle were weighed on shrunk basis at start of trial. Final weights were adjusted to an equal dressing percent to avoid differences of fill.

Table 3. Level and size of dehy pellets in finishing rations Trial 2 (153 days).

Diet	No. steers	Daily[a] gain	Daily[b] intake	Feed/ gain	% Cond. livers
All-concentrate	30	2.90	21.63	7.46	80
10% corn silage	30	3.05	24.05	7.89	34
15% corn silage	29	2.96	26.54	8.97	18
10% ¼" dehy	30	3.10	21.75	7.02	50
15% ¼" dehy	29	3.08	21.90	7.11	42
10% ⅜" dehy	28	3.12	22.71	7.28	43
15% ⅜" dehy	30	3.05	23.37	7.66	63
10% ⅜" dehy (crushed)	30	3.16	23.24	7.35	40
15% ⅜" dehy (crushed)	30	3.05	22.99	7.54	53

[a] Cattle were weighed on shrunk basis at start of trial. Final weights were adjusted to an equal dressing percent to avoid differences of fill.

[b] Intake based on 100% dry matter.

Feed Value of Dehy

M. G. A. Rumery
Assoc. Prof., Animal Science (Beef)
North Platte Station
D. C. Clanton
Prof., Animal Science (Beef)
North Platte Station
J. F. Karn
Laboratory Nutrition Supervisor
L. E. Jones
Livestock Technician

Corn silage has long been recognized as an outstanding feed for cattle and sheep. More total digestible nutrients can be obtained from corn when it is stored as silage than when it is stored by other methods. However, some silo losses do occur.

Dehydrating and pelleting whole corn plants now appears as an alternative method of processing and handling corn forage. Experiments have been performed to expand the limited amount of information available on the feeding value of dehydrated whole corn plants, specifically when compared to corn silage or prairie hay.

Results in two experiments showed that dehydrated corn plant pellets, properly supplemented, can be used as a complete or partial ration for growing calves. The pellets could also serve as an excellent emergency feed during periods of inclement weather when it is difficult to get hay to cattle.

Dehydrated corn plant pellets can be used for roughage in a finishing ration but would probably be more effective if ground through a coarser screen than the ¼-in. screen used in this study.

The feasibility of using pelleted corn plants will depend upon the cost of processing in relation to the cost of silage, including storage costs and storage losses.

Experiments

The corn forage used was grown under irrigation on Bridgeport very fine sandy loam soil and yielded over 20 tons of green chop per acre. The prairie hay was grown in the Platte Valley and consisted of native grass species with no legume. It contained about 7% protein. The corn grain used in the finishing trial was No. 2 grade corn.

In the first experiment, alternate

Whole Corn Plant

loads of green chop corn were taken to a trench silo for storing as silage and to a dehydrating mill for drying, grinding (through a ¼-in. screen) and pelleting. Pellets were then stored in a metal bin.

Two replications of eight weanling steer calves were individually fed one of the following rations for a 119-day growing period: (1) full feed of corn silage, (2) full feed of corn pellets and (3) corn pellets fed at the same dry matter intake as the calves receiving corn silage.

One pound of 49% protein supplement containing required minerals and Vitamin A was fed to each calf daily. Urea nitrogen made up 8.5% of the protein equivalent in the supplement. The silage contained 29 3% dry matter and 8.3% protein. The dehydrated corn pellets contained 94% dry matter and 7.4% protein.

At the conclusion of the feeding trial a digestion trial was conducted, using four steers from each of the silage and dehydrated corn pellet fed groups.

In the second experiment six steer calves were individually fed one of each of the rations shown in Table 1 for 101 days. The supplement was the same as used in the first experiment. The silage, dehydrated corn pellets and grass hay contained 31.4, 93.5 and 85.7% dry matter and 7.7, 7.9 and 6.6% protein on a dry matter basis, respectively.

In the first and second experiment calves were weighed in the morning, following an overnight stand without feed and water.

The third experiment was a 138-day finishing trial to determine the value of dehydrated corn plant pellets as a roughage in a finishing ration. It was fed at 0, 5 and 10% of the dry matter in the ration, using either dry rolled corn grain or whole shelled corn grain for the concentrate. Two pounds of a 32% protein supplement containing appropriate minerals, vitamins and additives was fed each steer daily.

In the finishing trial the average of two full weights was used at the beginning of the trial. The final weight was arrived at by dividing the hot carcass weight by a constant dressing percent of 62.

Table 1. Rations fed in Experiment 2.

	I	II	III	IV	V
Corn silage	Full-fed				
Pelleted corn plants		Full-fed	67%	33%	
Native grass hay			33%	67%	Full-fed
Protein supplement, lb/day	1	1	1	1	1

Table 2. Performance of calves fed corn silage, corn plant pellets or corn plant pellets plus straw. Experiment 1.

	Corn silage	Corn plant pellets	Corn plant pellets+straw
Av. wt., lb			
Initial	398	409	400
Final	601	592	593
Daily gain	1.70	1.54	1.62
Av. feed consumption, lb/day			
Supplement	0.99	0.99	0.99
Silage	35.18	—	—
Pelleted corn plants	—	11.22	11.77
Wheat straw	—	—	0.56
Total dry matter consumption, lb/day	11.16	11.40	12.42
Dry matter/lb of gain, lb	6.56	7.40	7.67

Table 3. Performance of calves fed corn silage, corn plant pellets and native grass hay. Experiment 2.

	Treatment				
	I Corn silage 100%	II Corn pellets 100%	III Corn pellets 67% Hay 33%	IV Corn pellets 33% Hay 67%	V Native grass hay 100%
Av. wt., lb					
Initial	370	385	380	383	375
Final	530	547	530	518	477
Daily Gain[1]	1.57[a]	1.59[a]	1.47[a]	1.32[ab]	1.00[b]
Av. feed consumption, lb/day					
Supplement	1.0	1.0	1.0	1.0	1.0
Silage	27.8	—	—	—	—
Corn pellets	—	9.9	8.0	4.1	—
Native grass hay	—	—	4.0	7.7	10.3
Total dry matter consumption. lb/day[1]	9.7[a]	10.2[a]	11.9[b]	11.4[b]	9.7[a]
Dry matter/lb of gain[1]	6.2[a]	6.4[a]	8.1[ab]	8.6[b]	9.7[c]

[1] Values in the same row with the same superscript are not significantly different at the 5% level of probability.

Table 4. Performance of steers fed varying levels of dehydrated corn plant pellets with whole or rolled corn in a finishing ration.[1]

	Whole corn Corn pellet dry matter[1]			Rolled corn Corn pellet dry matter[2]		
	0	5	10	0	5	10
Number of animals	13	13	13	13	13	13
Initial wt., lb	622	626	622	627	627	619
Adj. daily gain, lb	2.98	3.17	2.94	3.21	3.28	3.10
Daily feed consumption[3]	17.1	17.6	17.9	17.4	18.2	17.3
Feed consumed/lb adj. gain, lb[3, 4]	5.74[ab]	5.55[b]	6.09[a]	5.42[b]	5.55[b]	5.58[b]
Carcass data:						
Yield, %	61.0	61.1	61.3	61.4	61.3	61.5
Grade	12.6	12.5	12.7	13.1	12.5	12.5
Rib eye area, sq in	11.7	12.1	11.9	12.3	11.1	11.9
Fat thickness, in	0.73	0.64	0.62	0.63	0.81	0.66

[1] Average of two replications.
[2] Percent of ration dry matter.
[3] Dry matter basis.
[4] Values with the same superscript are not significantly different at the 5% level of probability.

Feed Value of Dehy

(continued from page 9)

Results

First Experiment—The dry matter intake of calves full-fed corn plant pellets and those fed an amount of pellets based on the dry matter intake of the calves fed silage were similar. It was anticipated that the calves full-fed pellets would consume more dry matter than those full-fed silage. When it became obvious there was no difference, a small amount of straw was added to the diet of calves fed the controlled dry matter intake. These calves were chewing on fences, thus it was felt that lack of fibrous material might be limiting in the diet.

Gains of the three groups of calves were not significantly different. The calves fed silage gained the most, followed by those fed pellets with a small amount of straw. Dry matter consumption was greatest for the calves fed corn plant pellets plus straw and least for the silage-fed calves. Hence the silage-fed calves were the most efficient and the calves fed pellets plus straw were the least efficient (Table 2).

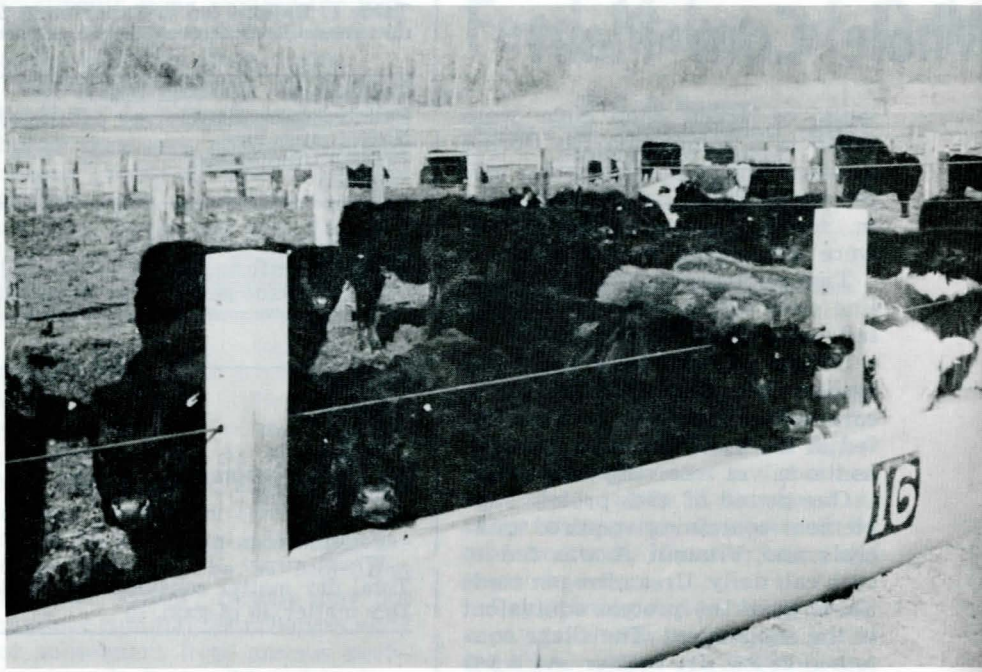
The results of the digestion trial explains to some extent the lowered performance of the calves fed pellets. Calves fed corn silage digested 71.6% of the energy and 63.6% of the protein in their ration compared to 57.5% and 51.7%, respectively, for calves fed the corn plant pellets.

Second Experiment—Calves fed corn silage or dehydrated corn plant pellets gained similarly, although calves fed pellets consumed more dry matter, thus having a lower feed conversion (Table 3).

Gains decreased and feed required per pound of gain increased as grass hay replaced corn plant pellets in the ration.

Third Experiment — When dehydrated corn plant made up 5% of the dry matter in the finishing ration gains were greater (not significant) than when an all-concentrate ration or a ration containing 10% of the dry matter from corn plant was fed (Table 4).

The steers fed dry rolled corn had a more rapid rate and efficiency of gain than those fed whole corn.



Calves fed pelleted whole corn plant and silage.

Urea Supplementation of Pellete

Kern Hendrix
Graduate Assistant
Terry Klopfenstein
Assoc. Prof.,
Ruminant Nutrition

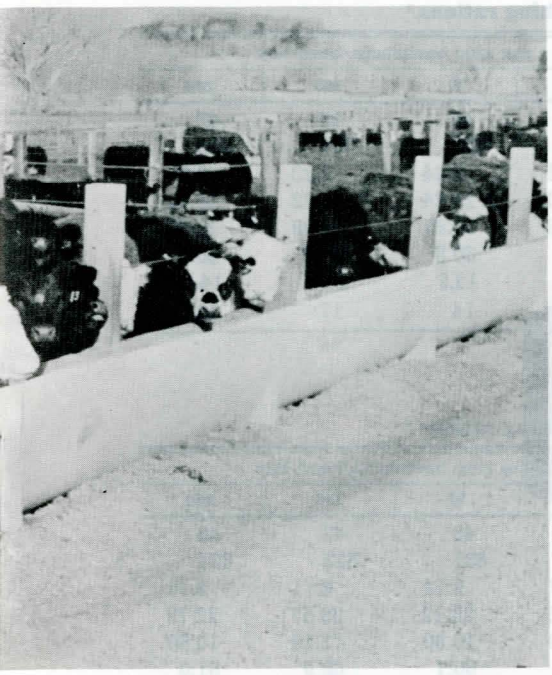
Pelleted whole corn plant (PWCP) may offer certain advantages when compared to corn silage for beef cattle. A very important advantage could be realized if urea could be more efficiently utilized as the supplemental nitrogen source with PWCP compared to silage. The ensiling process (fermentation) is potentially detrimental because of the conversion of protein to nonprotein nitrogen and the reduction in readily available carbohydrates.

Results of tests conducted to evaluate urea supplementation of pelleted whole corn plant indicate the following:

1. Rate and efficiency of gain of calves fed corn plant pellets supplemented with soybean oil meal was greater than when supplemented with urea. However, the difference in performance between the the two supplements was 30-40% of that which was seen in previous trials when corn silage was fed.
2. Performance of calves fed urea-treated corn plant pellets was superior to those fed corn plant pellets supplemented with urea at the time of feeding. Urea addition at the time of processing may be beneficial to urea utilization. The performance of calves fed urea-treated corn plant pellets and corn plant pellets supplemented with soybean meal pellets was similar over the entire feeding period.
3. Calves fed corn plant pellets gained more rapidly and efficiently than calves fed corn silage. The greatest difference occurred during the first 28 days of the feeding period and suggests that calves may start on feed faster when fed corn plant pellets.

Table 1. Dry matter and protein digestibility and nitrogen retention of steers fed corn silage and pelleted whole corn plant rations.

Item	Ration	
	Corn silage	Corn plant pellets
Dry matter dig., %	68.0	65.2
Protein dig., %	56.4	64.6
% nitrogen retained	23.4	29.8



Whole Corn Plants

Table 3. Performance of calves fed pelleted whole corn plant and corn silage.

Stage of feeding period	Item	Ration[1]			
		UTWCP[2] + corn	WCP[3] + urea	WCP[3] + SBM	Corn silage + SBM
	Number of head	35	34	36	35
	In wt, lb	365	376	373	371
	Daily gain[4], lb	2.27	2.15	2.39	1.83
0- 28 days	Daily feed[5], lb	11.19	11.42	10.86	10.75
	Feed/gain	4.93	5.31	4.54	5.87
	Daily gain, lb	1.92	1.78	1.84	1.63
28-132 days	Daily feed, lb	13.90	13.26	13.73	13.63
	Feed/gain	7.24	7.45	7.46	8.36
	Daily gain, lb	1.99	1.86	1.96	1.67
0-132 days	Daily feed, lb	13.32	12.87	13.12	13.02
	Feed/gain	6.69	6.92	6.69	7.80

[1] 90% pelleted whole corn plant or corn silage plus 10% supplement on dry matter basis.
[2] UTWCP refers to urea-treated whole corn plant.
[3] WCP refers to whole corn plant.
[4] Based on 28-day full weight shrunk 3%.
[5] On dry matter basis.

Study Design

The performance of calves fed PWCP supplemented with either soybean meal (SBM) or urea was compared to calves fed corn silage supplemented with SBM. A second objective was to evaluate the feeding value of PWCP to which urea, phosphorus and trace minerals were added during processing. This commercially available material contained 12% crude protein equivalent on a dry matter basis and will be referred to as urea-treated whole corn plant (UTWCP).

Two lots of 17 to 19 weanling heifer calves were fed one of the following rations for 132 days:

1. Urea-treated whole corn plant pellets plus corn, vitamins and minerals.
2. Whole corn plant pellets plus urea supplement.
3. Whole corn plant pellets plus SBM supplement.
4. Corn silage plus SBM supplement.

Complete rations full fed contained 90% corn pellets or corn silage and 10% supplement on a dry matter basis (Table 2). Since the corn plant pellets were 3/8 inch in diameter, the supplements were also pelleted to eliminate separation and sorting. The SBM supplement was fed in meal form with the corn silage.

Results

Results from a digestion and metabolism trial using growing calves (Table 1) show that protein digestibility and percent nitrogen retained are higher although total ration dry matter digestibility is somewhat lower for whole corn plant pellets when compared to corn silage. This suggested that urea may be more efficiently utilized when fed with PWCP.

Table 2. Composition of supplements.

Ingredient	Supplement[1]		
	Soybean meal[2]	Urea[2]	Corn[3]
		lb./ton	
Corn	——	1560.0	1838.7
Soybean meal	1813.7	——	——
Urea	——	224.7	——
Dicalcium phosphate	116.0	145.0	——
Limestone	——	——	95.2
Salt	62.0	62.0	62.0
Trace mineral	4.2	4.2	——
Vitamin A (30,000 IU/gm)	2.5	2.5	2.5
Terramycin-50	1.6	1.6	1.6

[1] Fed at rate of 10% of total ration dry matter.
[2] 45% crude protein on dry matter basis.
[1] Fed at rate of 10% of total ration dry matter.

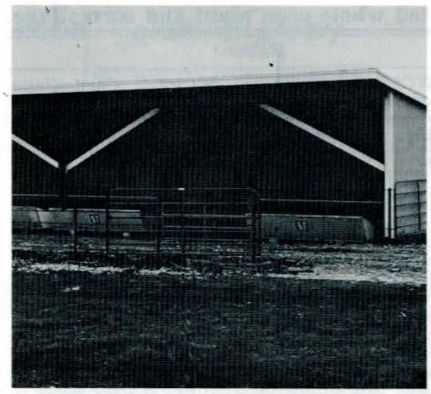
Over the entire feeding period, calves fed PWCP supplemented with soybean meal gained about .1 lb per day more than calves supplemented with urea (Table 3). Gains were about 3.5% more efficient with soybean meal supplemented calves. These differences are only 30-40% as large as those generally experienced when soybean meal and urea are fed with corn silage.

Calves fed urea-treated PWCP gained more rapidly and more efficiently than those fed PWCP supplemented with urea. There was no difference in performance between calves fed urea-treated PWCP and PWCP supplemented with soybean meal.

Calves fed PWCP gained nearly .3 lb per day more and required 16% less feed per lb of gain than those fed corn silage.

During the first 28 days of the feeding trial, calves fed PWCP supplemented with soybean meal had the highest rate of gain and required the least amount of feed per lb. of gain of all the treatments tested. Urea supplemented PWCP-fed calves gained .25 lb. per day less than soybean meal supplemented calves. Gains of calves fed urea-treated PWCP were intermediate between calves fed soybean meal and urea supplemented PWCP.

Calves fed urea-treated PWCP had the most rapid and most efficient gains from 28 to 132 days. Daily gains and feed efficiency were similar for calves fed PWCP supplemented with either soybean meal or urea. Gains were greater for calves fed PWCP than those fed silage.



New 200-head beef confinement unit at NU Field Laboratory near Mead.

Zinc Bacitracin In Rations

Stanley Farlin
Associate Professor
Ruminant Nutrition
Terry Klopfenstein
Assoc. Prof.,
Ruminant Nutrition
Walter Koers
Former Instructor,
Beef Nutrition

Heifers fed zinc bacitracin showed a 3-4% increase in rate of gain and a 5-7% increase in efficiency, while steers showed no response. No real advantage was found in feeding more than 70 mg of zinc bacitracin per head per day when levels of 0, 70, 140 and 280 mg were compared.

The 500 mg level resulted in depressed feed intake—more in an 85% wheat ration than in a 76% corn ration. There was not a consistent reduction in abscessed livers with any of the levels of zinc bacitracin.

Experiment 1 consisted of feeding 500 mg zinc bacitracin per head per day to steers for 250 days. The antibiotic was added to a ration containing 10% cobs and either 76% corn or 85% wheat. Steers consumed 5.3 and 9.9% less respectively of the corn and wheat rations containing zinc bacitracin (Table 1).

Rate Not Improved

This level of antibiotic did not improve rate of gain or efficiency of feed conversion. Table 1 shows the five steers receiving corn plus zinc bacitracin had abscessed livers while control had one. The four steers receiving wheat had abscessed livers while 3 of 5 steers consuming wheat plus zinc bacitracin had abscessed livers.

A second experiment involved feeding zinc bacitracin at 0, 70, 140 or 280 mg per head per day to steers and heifers fed on a finishing ration of 10% hay, 3% molasses, 5% supplement and grain mix consisting of 60% corn and 40% wheat. Steers and heifers were fed for 156 and 135 days respectively.

Zinc bacitracin at 70, 140 and 280 mg per head per day failed to improve rate of gain or feed efficiency of steers (Table 2). Carcass merit was not affected. Incidence of abscessed livers was not improved with 70 or 140 mg of antibiotic and the 280 mg level of zinc bacitracin resulted in only 2% fewer abscessed.

Heifers fed 70, 140 and 280 mg of zinc bacitracin gained 3, 2 and 4% faster, respectively, than control heifers and made 5, 2 and 7% more efficient gains (Table 3). No differences in carcass merit were observed. Heifers receiving the 70 mg level had 21% fewer abscessed livers than controls. A reduction of 6% in condemned livers was noted with the 140 mg level, however, no reduction was noted with 280 mg of zinc bacitracin.

Table 2. Levels of zinc bacitracin in finishing rations.[a]

	mg zinc bacitracin/head/day			
	0	70	140	280
Number of head	46	45	46	47
Initial wt, lb	683	675	677	680
Av daily gain,[b] lb	2.32	2.24	2.23	2.29
Daily feed, lb	24.96	24.34	24.72	24.72
Feed/lb gain, lb	10.76	10.87	11.09	10.79
Dressing %	60.1	60.9	60.0	60.6
Carcass grade[c]	14.1	13.9	14.0	14.0
No. abscessed livers	14	14	17	13

[a] Steers fed 156 days.
[b] Adjusted to 62% dress.
[c] 13=average choice; 14=high choice.

Table 3. Levels of zinc bacitracin in finishing rations.[a]

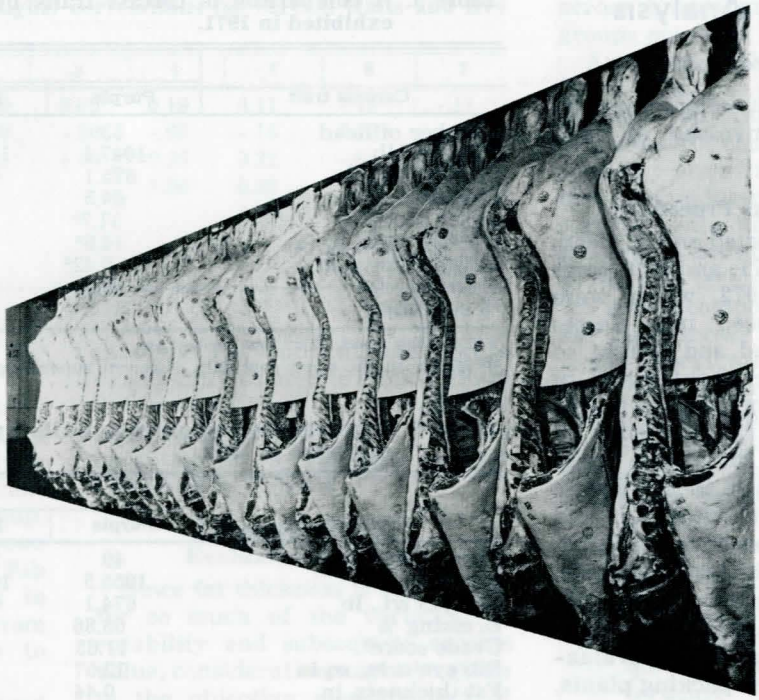
	mg zinc bacitracin/head/day			
	0	70	140	280
Number of head	47	48	47	48
Initial wt, lb	628	631	623	634
Av daily gain,[b] lb	2.07	2.14	2.11	2.15
Daily feed, lb	23.55	23.12	23.51	22.79
Feed/lb gain	11.38	10.80	11.14	10.60
Dressing %	60.8	60.7	60.9	61.0
Carcass grade[c]	14.5	14.3	14.6	14.3
No. abscessed livers	18	8	15	18

[a] Heifers fed 135 days.
[b] Adjusted to 62% dress.
[c] 13=average choice; 14=high choice.

Table 1. High level of zinc bacitracin in corn and wheat finishing rations.[a]

	Corn	Corn + zinc bacitracin	Wheat	Wheat + zinc bacitracin
Number of head	5	5	4	5
Initial wt, lb	576	592	592	588
Av daily gain, lb[b]	2.35	2.18	1.72	1.57
Daily feed, lb	16.74	15.86	13.86	12.49
Feed/lb gain, lb	7.12	7.28	8.06	7.96
Dressing %	65.6	64.2	62.6	62.5
Carcass grade[c]	13.2	13.6	13.5	12.8
No. abscessed livers	1	5	4	3

[a] Steers fed 250 days.
[b] Adjusted to 62% dress.
[c] 12=low choice; 13=average choice.



Carcass evaluation in the cooler.

4-H Beef Carcass Contest Analysis

K. R. Hansen
Graduate Assistant
T. E. Socha
Graduate Assistant
R. W. Mandigo
Assoc. Prof., Meats

Appraisal of the live animal has only one purpose: it is a tool for evaluating the potential of an individual to yield an edible product. With the slaughter animal the opportunity exists to evaluate the live animal, then relate that appraisal to the actual carcass traits.

Strict visual appraisal is at best difficult and will account for less than 35% of the variation in predicted carcass traits (Wilson at Kansas and Gregory at Nebraska). Live animal appraisal as a tool can be of use only if there is an appreciation for its accuracy and for the pitfalls which may be encountered. Considerable differences may exist in the live animal which will produce very insignificant changes in quantitative carcass characteristics (Butler, Texas A&M; Zinn, Texas Tech).

Livestock shows such as Ak-Sar-Ben are important to the livestock industry as a means of conveying "type" desirability to the livestock producer and as an educational experience for the youth who participate. However, it is equally important that actual carcass traits and value be obtained and related to the live appraisal if the activity

(continued next page)

Table 1. Overall means of traits for steers and heifers exhibited at Ak-Sar-Ben 4-H market beef show.

Carcass trait	1971	1972
Number of head	946	970
Live wt., lb	1051.9	1048.8
Carcass wt., lb	662.5	665.2
Dressing %	63.0	63.4
Grade score[a]	11.88	11.71
Rib eye area, sq in	12.49	12.44
Fat thickness, in	0.49	0.48
% kidney fat	3.1	3.0
% cutability	50.16	50.50

[a] 11=high good, 12=low choice, etc.

Table 2. A comparison of carcass traits by sex.

Carcass trait	Steers	Heifers
Number of head	1707	209
Live wt., lb	1070.1	975.4
Carcass wt., lb	678.5	620.7
Dressing %	63.4	63.6
Grade score[a]	11.8	11.8
Rib eye area, sq in	12.8	12.1
Fat thickness, in	0.47	0.49
% kidney fat	3.1	3.3
% cutability	50.5	50.4

[a] 11=high good, 12=low choice, etc.

Table 3. A comparison of carcass traits and cutability factors by breeds and crosses exhibited in 1971.

	Breed[b]										
Carcass trait	HER	ANG	CHA	SH	HXA	HXC	HXS	AXC	AXS	CXS	Other
Number of head	315	191	7	46	58	80	14	172	7	11	45
Live wt., lb	1001.3	983.9	1124.8	976.1	995.8	1106.3	1006.3	1052.4	973.7	1086.7	1064.5
Carcass wt., lb	623.3	626.2	729.2	608.3	631.9	701.5	666.3	670.4	627.5	694.2	679.5
Dressing %	62.3	63.6	64.9	62.3	63.4	63.5	66.3	63.8	64.4	63.8	63.9
Grade score[a]	11.9	12.7	10.9	12.9	12.2	11.4	11.1	11.7	12.4	10.7	11.7
Rib eye area sq in	11.9	12.0	16.3	10.7	12.5	13.9	12.9	13.2	12.6	13.5	13.0
Fat thickness, in	0.53	0.59	0.44	0.68	0.51	0.35	0.48	0.42	0.55	0.33	0.41
% kidney fat	3.1	3.4	3.4	3.6	3.3	3.0	3.6	3.4	3.2	3.7	3.2
% cutability	49.8	49.5	52.5	48.0	50.2	51.7	50.2	50.9	50.2	51.2	50.8

[a] 11=high good, 12=low choice, etc.

[b] HER=Hereford, ANG=Angus, CHA=Charolais, SH=Shorthorn, HXA=Hereford X Angus, HXC=Hereford X Charolais, HXS=Hereford X Shorthorn, AXC=Angus X Charolais, AXS=Angus X Shorthorn, CXS=Charolais X Shorthorn, "OTHER"=three breed crosses and those which were unidentifiable.

Beef Carcass Analysis

(continued from page 13)

is to be a total educational experience for those involved in meat production.

Experimental Procedure

Data were collected on 946 steers and heifers in 1971, and 970 steers and heifers in 1972, which were entered and placed into classes according to breed and weight so that classes were about equal in number. The animals were placed visually into four ribbon groups by the judge so that the purple group would correspond to those animals with the highest cutability and grade; blue — second; red — third; and white being the least desirable. Following the live placing, the cattle were sold at auction for slaughter and subsequent carcass evaluation at several area packing plants. Personnel, trained in carcass evaluation, were on hand at each plant to obtain measurements.

Cutability was determined according to the following U.S.D.A. equation: percent closely trimmed, boneless retail cuts from the round, loin, rib and chuck = 51.34 — (5.784 x fat thickness) — (.462 x kidney, heart and pelvic fat) — .0093 x warm carcass weight) + (.740 x loin eye area). Quality grade was determined by the U.S.D.A. Meat Grading Service.

Live weight was that taken upon arrival at the show and used for classification into classes. Dressing percentage was based on warm carcass weight. The area of the rib eye was measured using the transparent grid method.

Results and Discussion

The overall means for 946 steers and heifers exhibited in 1971, and 970 steers and heifers exhibited in 1972, at the Ak-Sar-Ben 4-H Beef Show are shown in Table 1.

Sex — An evaluation of the data by sex (Table 2) indicates that the heifers exhibited were not typical of market heifers in general and more nearly resemble steer data. Thus, steer and heifer data were combined for comparison of breed and ribbon groups.

Breed—Angus and Shorthorn tended to grade higher than other breeds and crosses but were fatter as indicated by fat over the rib and percent kidney, heart and pelvic fat (Table 3, 1971 data). The Shorthorns were lower in cutability, reflecting a small rib eye area and the greatest amount of fat over the rib. Cutability was higher for crossbreds than for straightbreds with the exception of the straightbred Charolais, which also had a lower grade score than the other breeds and most crosses.

Data by breeds are presented as a point of interest as the numbers are variable and, in some cases, too small for accurate comparisons. Table 4 presents breed data for 1972 breed groups, with all crossbreds included in one category. In general, the same trends were present in the 1972 data as seen in the previous year.

Ribbon Award—the evaluation of individual animals and their placement into ribbon groups is of principal interest. Live weight, carcass weight and dressing percent did not differ significantly between the four ribbon groups (Table 5). In all other comparisons, the white group was significantly ($P < .01$) different from two or all three of the other groups, being substantially lower in cutability and rib eye area and higher in grade, fat thickness and percent kidney, heart and pelvic fat. This would indicate that segregation of the least desirable cattle was more

Table 5. A comparison of carcass traits by ribbon group for market beef exhibited in 1971.

Carcass trait	Ribbon group			
	Purple	Blue	Red	White
Number of head	53	311	428	154
Live wt., lb	1047.1	1047.5	1016.9	1023.5
Carcass wt., lb	675.1	668.2	639.4	656.6
Dressing %	64.5	63.7	62.9	64.2
Grade score[1]	11.7[a]	11.2[b]	11.8[a]	12.4[c]
Rib eye area, sq in	14.0[a]	13.2[b]	12.4[c]	12.2[c]
Fat thickness, in	0.42[a]	0.43[a]	0.46[a]	0.63[b]
% kidney fat	3.0[a]	3.5[b]	3.0[a]	3.9[c]
% cutability	51.6[a]	50.8[b]	50.5[b]	48.9[c]

[1] 11 = high good, 12 = low choice, etc.

[abc] Means in the same row with different superscript letters significantly ($P < .01$).

Table 6. A comparison of carcass traits by ribbon group for market beef exhibited in 1972.

Carcass trait	Ribbon group			
	Purple	Blue	Red	White
Number of head	49	299	453	169
Live wt., lb	1055.5	1052.4	1046.6	1046.6
Carcass wt., lb	674.1	670.7	663.2	658.4
Dressing %	63.86	63.71	63.3	62.9
Grade score[a]	11.65	11.62	11.82	11.63
Rib eye area, sq in	12.57	12.55	12.37	12.42
Fat thickness, in	0.44	0.46	0.50	0.48
% kidney fat	3.0	3.0	3.1	3.0
% cutability	50.75	50.67	50.34	50.6

[a] 11=high good, 12=low choice, etc.

Table 4. Summary of carcass traits and cutability factors by breed exhibited in 1972.

Carcass trait	Hereford	Angus	Shorthorn	Crossbreds
Number of head	265	152	61	492
Live wt., lb	1017.8	1016.4	1005.5	1080.9
Carcass wt., lb	636.7	651.8	638.1	688.1
Dressing %	62.6	64.1	63.5	63.7
Grade score[a]	11.66	12.11	12.26	11.55
Rib eye area, sq in	11.62	12.20	11.07	13.14
Fat thickness, in	0.56	0.52	0.55	0.42
% kidney fat	3.0	3.2	3.1	3.0
% cutability	49.7	50.2	49.3	51.2

[a] 11=high good, 12=low choice, etc.

Table 7. Within class (breed/weight) correlations for carcass traits and live placing.

		1	2	3	4	5	6	7
Dressing %	(1)	1.00	0.20	0.80	0.19	0.11	-.13	-.11
Rib eye area	(2)		1.00	-.30	-.09	-.16	0.70	-.15
Fat	(3)			1.00	0.35	0.32	-.84	0.28
Kidney fat	(4)				1.00	0.28	-.50	0.08
Grade score	(5)					1.00	-.36	0.06
Cutability	(6)						1.00	0.25
Ribbon	(7)							1.00

accurate than separation of the outstanding cattle.

Only 5.6% of the cattle evaluated (1971) were placed live into the purple ribbon group, which may account for the significant differences observed for this group. Little difference existed between the larger blue and red groups. Rib eye area was the only trait to follow a consistent pattern from largest in the purple group to smallest in the white group.

The 1972 cattle, when compared by ribbon group (Table 6) were not different when all breeds were pooled. However, within breeds the same general statements can be made; that is, the judge was generally successful in differentiating the white group but there was little difference in the other three. Fat thickness, shown in Table 7, accounts for more of the variation in cutability than any other single factor (correlation — .84) but showed no difference between the first three groups (1971).

Research findings elsewhere have shown that:

—34% of the variation in separable lean (Cole, Tennessee) of the carcass was accounted for by thickness of outside fat.

—A negative correlation exists between percent fat trim and percent boneless primal cuts. (Zinn, Texas Tech).

—59% of the variation in boneless primal cuts was accounted for by fat trim.

—Fat thickness accounts for more of the variation in percent boneless steak and roast meat than any other single variable studied (Abraham, Texas A&M).

Table 7 shows the within-class (breed/weight) correlations of carcass traits and live placing in 1971. Overall correlations are presented in Table 8 for 1971. Rib eye area increased in its relationship to cutability when correlated within class. Fat and cutability were most highly related to ribbon group but were still low. All correlations were significant ($P<.05$) with the exception of rib eye area and fat thickness in Table 8.

Reevaluation of Evaluation Methods

Since fat thickness is responsible for so much of the variation in cutability and subsequent carcass value, consideration might be given to the objective measurement of fat in show animals. Davis at Ohio found correlation coefficients of .96 between ultrasonic measurement and actual carcass fat, and .52 between visual appraisal of fat thickness and actual carcass fat. About 90% of the time, a reliable technician could measure an animal in three minutes or less to an accuracy of within .1 inch of actual carcass fat thickness.

Including ultrasonic measurement of fat thickness as an evaluation criteria could be of value in predicting carcass merit in live animal appraisal at market beef shows. This would leave the appraisal of muscling and the adjustment of fat measurement to the judge. Live placings would then more accurately reflect actual carcass cutability.

Another possibility for improving the practical evaluation of beef cattle is classing animals on a weight basis without regard to breed, thereby making comparisons across breeds and within weight groups possible.

Appraisal of the live animal and the utilization of market beef shows as an educational tool and as a means of conveying "type" desirability are of real importance to the beef industry. The advent of carcass evaluation of all animals has led to an accurate picture of evaluation techniques and defined the actual composition of the market beef show. This, along with technological advances allowing objective measurements of carcass traits, has helped these market beef shows to gain in their potential as an important educational experience for all who participate.

Summary

1. Many type differences exist in the live animal which do not appreciably affect carcass quantity or quality characteristics.
2. The rib eye area results concurred more with the judge's placings than did carcass fat thickness (Tables 5 and 6).
3. Fat thickness was the most variable single trait and accounted for 70% of the variation in percent cutability.
4. Visual appraisal by the judge accounted for 6% of the variation in percent cutability.
5. No differences in quality existed between heifers and steers.
6. Live animal appraisal was most successful in differentiating the lower 15% of the individuals.

The utilization of ultrasonics in the evaluation of fat and a classing system based on weight without regard to breed might add some objectivity and accuracy to the live animal appraisal, making the final live evaluation more closely parallel that of the carcass rankings.

Table 8. Overall correlations for carcass traits and live weight.

		1	2	3	4	5	6	7	8
Live wt.	(1)	1.00	0.88	-.15	0.34	0.21	0.17	0.17	-.22
Carcass wt.	(2)		1.00	0.33	0.38	0.27	0.23	0.21	-.28
Dressing %	(3)			1.00	0.12	0.16	0.16	0.11	-.15
Rib eye area	(4)				1.00	-.18	-.05	-.07	0.58
Fat	(5)					1.00	0.35	0.31	-.83
Kidney fat	(6)						1.00	0.27	-.51
Grade score	(7)							1.00	-.34
Cutability	(8)								1.00

High moisture corn from bunker silos.

Bunker silos used for storage of high moisture corn.

Acid Treated Corn

Finishing Rations

Walter Tolman
Dist. Ext. Spec. (Animal Science)
Northeast Station
Paul Q. Guyer
Extension Livestock Specialist
(Beef Cattle)

Organic acids are being used as preservatives of high moisture grain because they are known to inhibit mold growth. Advantages suggested for their use include low investment in storage facilities and little need for rapid feeding to avoid spoilage.

Acid treatment proved effective in preserving high moisture shelled corn at Northeast Station. The feeding value of acid treated corn was similar to that of air dried corn in two feeding trials. The differences were not statistically significant.

Shelled corn at about 25% moisture was treated with a commercial mixture of acetic and propionic acid and stored in open steel bins lined with sheet plastic. No spoilage was observed as this grain was stored into the summer. Cattle ate the acid treated corn well. The sharp odor and corrosive effect of the freshly treated corn were greatly reduced in a few hours.

More Valuable Fed Whole

High moisture corn preserved by either acid treatment or storage in an oxygen-limiting bin was more valuable fed whole than rolled before feeding. In one of the two feeding tests whole air-dried shelled corn was fed with about the same performance as with the same grain rolled before feeding. Acid was applied at about the same rate per pound dry matter to dried grain. The feeding value of dried corn seemed unchanged by the acid.

The protein level of rations was brought to about 12%, dry basis, with a supplement supplying about half the protein equivalent from urea. The supplement also furnished Vitamin A and minerals. In the first test the roughage was corn silage; in the second, alfalfa haylage. Roughage levels were reduced to 8-10% of the dry matter (1½-2 pounds roughage dry matter daily) when the cattle reached full grain feed.

Carcass quality and yield grades were similar for all rations and no unusual incidence of liver abscess or off feed developed.

Table 1. Performance of fleshy heifers fed corn stored by different methods.[a]

Shelled corn		Av da gain[b]	Feed/Gain[c] (lb)	Quality grade[d]	Yield grade
Stored	Fed				
Dried	Rolled	1.89	10.0	12.8	3.3
Dried acid treated	Rolled	1.84	9.8	12.9	3.4
HM[e] acid treated	Rolled	1.86	10.0	13.0	3.2
HM acid treated	Whole	1.94	10.2	13.3	3.5
HM whole	Rolled	2.04	9.2	13.0	3.4
HM whole	Whole	2.15	8.7	12.7	3.5
HM ground	Ground	1.68	10.7	12.7	3.3

[a] Alfalfa haylage was roughage fed—feeding period from December 15, 1971 to March 4 and March 23, 1972 (90 day average).
[b] Final wt adjusted to 62% dress.
[c] Dry matter basis.
[d] Low choice 12, av choice 13, high choice 14.
[e] HM=high moisture.

Table 2. Performance of fleshy steers fed corn stored by different methods.[a]

Shelled corn		Av da gain[b]	Feed/Gain[c] (lb)	Quality grade[d]	Yield grade
Stored	Fed				
Dried	Rolled	3.14	6.3	13.0	3.7
Dried	Whole	3.21	6.4	13.0	3.7
Dried acid treated	Rolled	3.14	6.4	13.0	3.6
HM acid treated	Rolled	2.85	6.8	13.3	3.6
HM acid treated	Whole	3.24	6.2	13.0	3.8
HM whole[e]	Rolled	3.05	6.4	12.9	3.7
HM whole[e]	Whole	3.26	6.2	13.0	3.6
HM ground	Ground	2.89	6.7	12.6	3.5

[a] Corn silage was roughage fed—feeding period from March 29, 1972 to July 13 and July 20, 1972 (105 days average).
[b] Final weight adjusted to 62% dress.
[c] Dry matter basis.
[d] Low choice 12, av choice 13, high choice 14.
[e] Corn heating and molding due to slow feeding in warm weather.

Table 3. Comparative effect of grain storage and processing using air dried corn rolled before feeding as the base.

Shelled corn		Heifers		Steers	
Stored	Fed	Gain	Feed efficiency	Gain	Feed efficiency
		Change from dried rolled corn			
		(%)	(%)	(%)	(%)
Dried whole	Whole	—[a]	—[a]	+2	-2
Dried whole acid treated	Rolled	-3	+2	0	-2
HM whole acid treated	Rolled	-2	0	-9	-8
HM whole acid treated	Whole	+3	-2	+3	+2
HM whole	Rolled	+8	+8	-3	-2
HM whole	Whole	+14	+13	+4	+2
HM ground	Ground	-14	-7	-8	-6

[a] Was not tested in heifer trial.

Mixing silage and whey.

Whey Additions to Corn Silage

Kern Hendrix
Graduate Assistant
Terry Klopfenstein
Assoc. Prof.,
Ruminant Nutrition

Cattle fed high energy rations perform about the same whether the ration is supplemented with urea or with soybean meal. However, when cattle are fed lower energy growing rations, such as those based on corn silage, performance is less with urea as the protein source than with soybean meal.

The greatest difference in performance occurs during the first 4-6 weeks in the feeding period, due to an initial adjustment or adaptation of cattle to urea. Previous Nebraska research with finishing cattle suggests that this initial adjustment to urea can be overcome by feeding ½ lb of dried whole whey daily during the first 21 days on feed.[1]

In two feeding trials conducted to evaluate the addition of whey to corn silage rations, the following conclusions were drawn:

1. Performance and feed efficiency were improved by the addition of ¼ lb of cottage cheese whey dry matter to urea-supplemented corn silage rations.
2. No further increases in daily gain early in the feeding period were obtained by adding higher levels (½ or 1 lb) of whey. However, feeding 1 lb of whey resulted in the highest daily gain (but no improvement in feed efficiency) during the last two-thirds of the 133-day period.
3. Calves fed corn silage supplemented with soybean meal were superior in both gains and feed efficiency to urea, especially during the first four weeks of the feeding period.
4. The addition of ½ lb of dried whole whey or 1/3 lb partially delactosed whey improved performance of urea supplemented calves.
5. When dried whole whey was withdrawn after 28 days of feeding, the added performance in urea-fed calves was maintained throughout the feeding period. No further increase in performance was obtained by continuous feeding.

[1] EC 70-213, "Nebraska Beef Cattle Report," University of Nebraska-Lincoln College of Agriculture Extension Service, 1970.

Table 1. Composition of supplements.

Ingredient	Trial 1	Trial 2	
	Urea[a]	Soybean meal[b]	Urea[b]
	lb/ton		
Soybean meal (44%)	—	1671.50	—
Urea	303	—	211.25
Corn	1382.83	105.75	1554.00
Molasses	100.00	75.00	75.00
Dicalcium phosphate	90.00	67.50	67.50
Salt	75.00	56.25	56.25
Limestone	16.50	12.50	12.50
Ammonium sulfate	16.00	—	12.00
Trace minerals	5.00	3.75	3.75
Vitamin A (30.000 IU/gm)	3.00	2.25	2.25
Antibiotic (TM-50)	2.00	1.50	1.50
MGA (100 mg/lb)	—	4.00	4.00
Stilbosol-2	6.67	—	—

[a] 50% CP; fed at the rate of 1.5 lb/head/day.
[b] 37% CP; fed at the rate of 2 lb/head/day.

Study Design

Trial 1 was conducted to determine the influence of feeding various levels of liquid cottage cheese whey to calves fed corn silage supplemented with urea. Two lots (1 steer and 1 heifer replicate) each containing 35-39 calves were on each of four treatments. Calves on each treatment received a full feed of corn silage and 1½ lb per day of a urea supplement (Table 1). Treatments were as follows:

1. Control, no whey.
2. ¼ lb/hd/day whey dry matter.
3. ½ lb/hd/day whey dry matter.
4. 1 lb/hd/day whey dry matter.

Trial 2 was conducted: To evaluate the addition of whey to corn silage rations supplemented with either soybean meal or urea.

To determine if the benefit of whey additions early in the feeding period could be maintained when whey was removed from the ration after the first four weeks of the feeding period.

To compare dried whole whey to partially delactosed whey when each was fed throughout the trial.

The partially delactosed whey contained 45% lactose compared to 70% for dried whole whey. Laboratory analysis shows that 1/3 lb of partially delactosed whey will supply essentially the same quantity of protein, minerals and vitamin as ½ lb of dried whole whey. The 1/3 and ½ lb feeding levels were chosen, respectively, for the partially delactosed and whole

(continued next page)

Whey Additions

(continued from page 17)

whey, which resulted in a difference in the quantity of lactose (milk sugar) being fed.

Sixteen lots of heifer calves (6 calves per lot) were used. All lots received a full feed of corn silage. Eight lots were fed 2 lb per head per day of a soybean meal supplement while the remaining eight lots received 2 lb per head per day of a urea-based supplement. Composition of the two supplements is shown in Table 1. Within each type of supplement, two lots were on one of the following four whey treatments:

1. Control, no whey.
2. ½ lb dried whole whey/hd/day for the first 28 days of the feeding period.
3. ½ lb dried whole whey fed entire feeding period.
4. 1/3 lb partially delactosed whey fed entire feeding period.

Results

Trial 1—During the first 42 days, feeding ¼ lb of whey dry matter increased daily gain by .2 lb (Table 2). Feeding ½ or 1 lb resulted in no further increase in daily gain. Silage intake was slightly increased by feeding ¼ lb of whey but ½ or 1 lb resulted in no further stimulation of silage consumption. The differences in feed intake among the three levels were largely due to the whey additions. Feed efficiency was improved by feeding ¼ or ½ lb of whey, although when 1 lb was fed, feed efficiency was slightly less than when no whey was fed.

For the entire feeding period, ¼ or ½ lb of whey increased daily gains about .1 lb while 1 lb increased daily gain by nearly .2 lb. Feed efficiency and corn silage consumption were both increased slightly by feeding ¼ lb of whey but no further increase occurred at higher levels.

Trial 2 — During the first 28 days of the feeding period, calves fed soybean meal gained .5 lb per day more and required about 1.80 lb less feed per lb of gain than those fed urea. Feeding dried whole whey or partially delactosed whey to calves fed either supplement increased gain by .1 to .2 lb per day except for one treatment where the addition of whey did not increase daily gain (Table 3). In each case, delactosed whey appeared to give the greatest increase in daily gain. Intake of corn silage during the trial was not influenced by supplemental protein source or whey additions. Differences in total feed intake were due to the intake of whey.

Table 3. Performance of calves fed whey and corn silage supplemented with soybean meal or urea.

Stage of feeding period	Supplement	Item	Whey treatment 1: Control—no whey	2: 0.50 lb DWW[a] first 28 days	3: 0.50 lb DWW[a] throughout	4: 0.33 lb DLW[b] throughout
0-28 days	SBM[d]	Number of head	24	24	24	24
		Initial wt, lb	473	477	481	479
		Daily gain, lb	2.24	2.12	2.38	2.44
		Daily feed[c] lb	14.75	15.22	15.22	15.06
		Feed/gain	6.58	7.18	6.38	6.17
	Urea	Daily gain, lb	1.76	1.93	1.85	1.97
		Daily feed, lb	14.75	15.22	15.22	15.06
		Feed/gain	8.38	7.89	8.23	7.64
0-114 days	SBM	Daily gain, lb	1.60	1.59	1.46	1.43
		Daily feed, lb	15.79	15.91	16.26	16.10
		Feed/gain	9.87	10.01	11.14	11.26
	Urea	Daily gain, lb	1.31	1.51	1.52	1.44
		Daily feed, lb	15.75	15.87	16.22	16.06
		Feed/gain	12.02	10.51	10.67	11.15

[a] DWW refers to dried whole whey.
[b] DLW refers to partially delactosed whey.
[c] On dry matter basis.
[d] SBM refers to soybean meal.

Daily Gains Differ

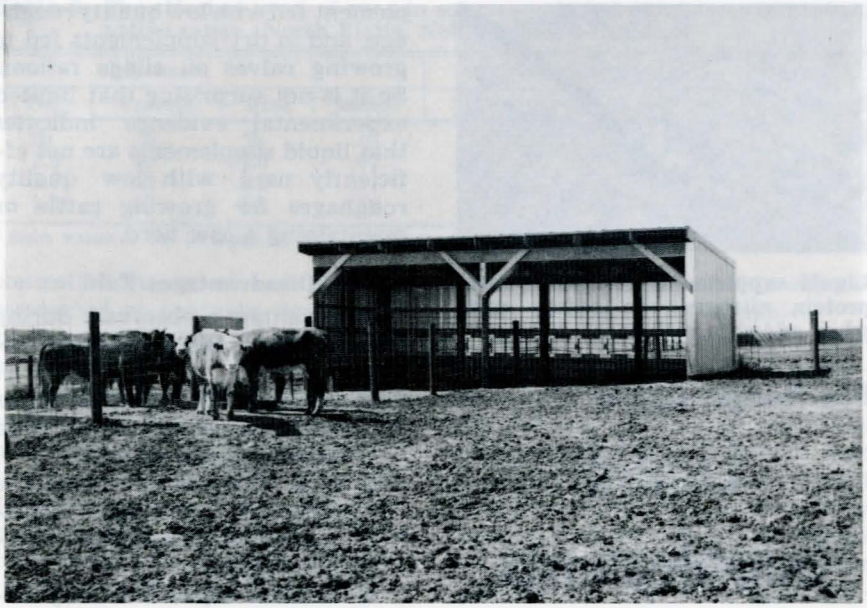
For the entire feeding period, soybean meal-fed calves gained about .3 lb per day more than those fed urea. However, this difference in daily gain was reduced to less than .1 lb per day by feeding dried whole whey to the urea fed calves. Continuous whey feeding to urea supplemented calves did not result in any greater benefit than feeding dried whole whey only during the first 28 days of the feeding period. Continuous feeding of partially delactosed whey resulted in about half the gain stimulation observed with dried whole whey. Daily gains were decreased about .15 lb per day by continuous whey feeding to soybean meal supplemented calves.

There was no difference in feed intake due to type of supplement fed or whey treatment. Feed efficiency was 18% greater for calves fed soybean meal than for those fed urea without whey but this difference was reduced to about 6% by feeding whey to the urea supplemented calves. Continuous whey feeding reduced feed efficiency in soybean meal supplemented calves. However, the addition of ½ lb of dried whole whey during the initial 28 days or throughout the feeding period improved feed efficiency by about 12% in calves fed urea. Feeding 1/3 lb of partially delactosed whey for the entire period improved feed efficiency by about 7% compared to no whey.

Table 2. Performance of calves fed varying levels of cottage cheese whey (Trial 1).

Stage of feeding period	Item	Level of cottage cheese whey fed, lb/day[a]: Control—no whey	0.25	0.50	1.00
0-42 days	Number of head	76	72	75	74
	Initial wt, lb	436	427	439	439
	Daily gain,[b] lb	1.68	1.88	1.89	1.87
	Daily feed,[c] lb	13.17	13.93	14.05	14.93
	Feed/gain	7.84	7.41	7.43	7.98
0-133 days	Daily gain, lb	1.64	1.77	1.73	1.83
	Daily feed,[c] lb	14.33	15.02	15.26	16.16
	Feed/gain	8.74	8.49	8.82	8.83

[a] Expressed as dry matter.
[b] Based on 42-day full weight shrunk 3%.
[c] Dry matter basis.



Sheds in hospital pens provide a dry, draft free environment which contributes to quicker recovery.

Feeding "Newly Arrived" Feeders

Paul Q. Guyer
Extension Livestock Specialist (Beef Cattle)
Walter Tolman
Dist. Ext. Spec. (Animal Science) Northeast Station

How important is feeding management for newly arrived feeder calves? Some answers were provided by the results of starting tests conducted with cattle during late summer in 1970 and 1971 at the Northeast Station. Primary objectives of these tests were to study the addition of grain and/or antibiotic to starting rations containing green chopped corn, oatlage or alfalfa silage as the basic feed.

[1]Aureo-S 700 (trademark) was used in this study.

Table 1. Effect of varying supplement on rate of gain.[a]

Treatments	Soybean Meal 1&2	Simple grain mix 3&4	Complex grain mix 5&6	No Antibiotic 1, 3, 5	Chlorotetracycline-Sulfamethazine 2, 4, 6
Number	60	64	60	94	90
Initial wt (lb)	464	472	466	466	469
Gain (lb)	63	63	66	57	70
Av da gain (lb)	3.00	3.00	3.10	2.70	3.37
Total number treated for respiratory disease	17	21	8	34	12
Severe cases of respiratory disease	10	8	2	17	3

[a] Replicate lots on test 18 and 24 days—late August and early September, 1970.

Table 2. The effect of added grain when green chopped corn plant and alfalfa haylage are fed to "new" cattle.[a]

	Green chopped corn plant		Alfalfa haylage	
	Control	2 lb corn	2 lb corn	5 lb corn
Number of head	70	70	70	70
In wt (lb)	515	523	516	513
Total gain (lb)	53	59	52	52
Average daily gain (lb)	2.21	2.46	2.17	2.17
Feed consumed daily (dry basis)	11.27	12.55	13.23	14.32
Feed per cwt gain (dry basis)	5.1	5.1	6.1	6.6

[a] Conducted in late August and early September, 1971—Av 24 days.

The studies showed that cattle fed 350 mg chlorotetracycline plus 350 mg sulfamethazine[1] in their starting supplement gained more rapidly and had fewer respiratory disease cases treated than cattle not fed antibiotics. Green chopped corn, oatlage and alfalfa haylage all worked well as the basic feed in the starting ration.

Hay Fed to Appetite

Gains were not significantly increased, however, by adding more grain to the starting ration of cattle fed well-eared green chopped corn, or to those fed oatlage having a moderately high grain content. Increasing grain from 2 to 5 lb per head daily during the starting period of cattle fed alfalfa haylage did not improve performance either.

Starting procedures for both trials were as follows:

1. Calves were weighed and started on test as soon as possible after arrival, before being watered or fed.
2. Good quality grass hay was fed to appetite the first day in the lot.
3. The experimental ration (at the estimated rate of consumption) and a half feed of grass hay were fed the second day.
4. From day 3 on, the experimental ration was fed to appetite, except that slow starters were fed a small amount of hay up to 7 days.

High Grain Yield

In 1970, heavy steer calves originating near San Antonio, Texas (22 hours in transit), were fed a basal ration of oatlage made from a crop with a high grain yield. Treatments were as follows:

1. Control—oatlage (about 55% dry matter) to appetite plus 1½ lb soybean oil meal and ½ lb of a protein-mineral-vitamin supplement.
2. Treatment 1 plus 350 mg chlorotetracycline and 350 mg sulfamethazine daily.
3. Simple mix (corn 40%, soybean oil meal 10% and oatlage 50%, dry basis) to appetite, plus ½ lb protein-mineral-vitamin supplement.

(continued next page)

Feeding New Arrivals

(continued from page 19)

4. Treatment 3 plus 350 mg chlorotetracycline and 350 mg sulfamethazine daily.
5. Complex mix (corn 15%, oats 15%, bran 10%, soybean meal 10%, oatlage 50% dry basis) to appetite plus ½ lb protein-mineral-vitamin supplement.
6. Treatment 5 plus 350 mg chlorotetracycline and 350 mg sulfamethazine per head daily.

Cattle fed antibiotic gained more rapidly than controls. There were fewer sick calves and fewer severe cases among those fed antibiotic. Rate of gain was not significantly affected by the different supplemental concentrates fed. Oatlage was an excellent starting feed for calves in this test.

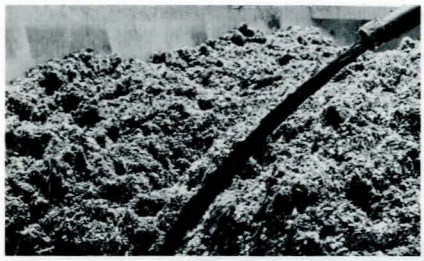
Heavy heifer calves and short yearling heifers were the experimental animals in the 1971 trials. They were purchased at auctions in Springfield, Missouri and Falls City, Nebraska. Delivery from Springfield required about 10 hours, from Falls City about 5 hours.

On arrival, cattle were assigned to one of four treatments as follows:

1. Green chopped corn plant (early dent stage at the start) plus 2 lb of supplement.
2. Treatment 1 plus 2 lb corn.
3. Alfalfa haylage (about 50% dry matter) and 2 lb corn.
4. Alfalfa haylage and 5 lb corn.

Vitamin A and trace minerals were included in the protein supplement for cattle fed green chopped corn plant and in a small amount of corn for the cattle fed alfalfa haylage. Aureo-S 700 crumbles were fed to all cattle.

In this test both alfalfa haylage and green chopped corn were good starting feeds. Cattle fed green chopped corn required less feed per unit gain and gained faster at the higher level of energy. The increased gain when 2 lb of corn was fed with green chopped corn does not appear great enough to justify feeding additional grain. The incidence of respiratory disease was very low among these heifers; thus these data are not presented.



Liquid supplements containing nonprotein nitrogen can reduce costs when added to rations.

For Range Cattle

Liquid Supplements

D. C. Clanton
Prof., Animal Science (Beef)
North Platte Station

The use of liquid supplements for cattle on range and pasture has attracted much interest in the last few years for two primary reasons: there's less labor required to feed it and often it has a low cost per ton. Other advantages cited but not documented include improved feed conversion, better calf crops, easier nutrient assimilation and better urea utilization.

The purpose of using either a liquid or a dry pelleted supplement on fall and winter range or pasture is to meet a nitrogen deficiency in the diet. Other nutrients such as phosphorus are involved but are not the main concern.

The desirability of liquid supplements depends upon how well nitrogen from urea (or possibly other nonprotein nitrogen sources) is utilized by beef cattle fed low quality forages such as grass hay, native range or pasture.

Several studies have shown that urea is poorly utilized in dry supplement fed with low quality roughage, and in dry supplements fed to growing calves on silage rations. So it is not surprising that limited experimental evidence indicates that liquid supplements are not efficiently used with low quality roughages for growing cattle or maintaining a cow herd.

Disadvantages Told

Disadvantages observed during studies with liquid supplement include:

1. Nitrogen from urea is not as effective as nitrogen from natural plant sources.
2. It is difficult to control the amount consumed, consequently the possibility of toxicity exists.
3. Product separation may occur during storage.
4. There may be no price advantage.

Growing Cattle

Several experiments at different locations have shown that urea in supplements is not well utilized by cattle fed low quality forage.

One of the more comprehensive experiments has been conducted at the University of Nebraska North Platte Station from 1966 to 1970 (Tables 1 and 2). These data show that when urea is added to a 24% natural protein supplement, elevating it to a 40% protein equivalent supplement, there is no improvement in performance. Elevating it to 40% protein with natural protein did improve performance. Although performance was not impaired when 3% urea (8.4% protein equivalent) was used, it was impaired when 6% urea (16.7% protein equivalent) was used.

Results of these experiments indicate urea is not utilized in dry pelleted supplements. Thus it is likely that it would not be utilized in liquid supplements either. Few

Table 1. The value of urea in supplements fed to calves wintered on native range (North Platte, Nebraska 1966-70).

Protein in supplement	Protein equivalent from urea	Average daily gains				
		1966-67	1967-68	1968-69	1969-70	Average
%	%	lb	lb	lb	lb	lb
0	0	0.05	-0.37	-0.45	-0.13	-0.22
40	0	0.60	0.58	0.44	0.52	0.54
32	0	0.66	0.55	0.36	—	0.52
40	8	0.54	0.65	0.35	0.52	0.52
24	0	0.54	0.40	0.25	—	0.40
40	17	0.54	0.43	0.12	0.32	0.35

Table 2. The effect of level of urea in supplements fed to calves wintered on native range (North Platte, Nebraska 1966-70).

Supplement			Average daily gains				
Fed	Protein	Urea	1966-67	1967-68	1968-69	1969-70	Average[a]
lb	%	%	lb	lb	lb	lb	lb
1.5	40	0.0	.67	.55	.44	.53	.56
1.5	40	3.0	.61	.62	.35	.51	.54
1.5	40	6.0	.58	.46	.12	.36	.41

[a] Each value is the average of 38 individually fed steers.

controlled experiments have been conducted to evaluate liquid supplements with low quality roughage diets.

Lewis **et al.** (1970) fed a liquid supplement to calves wintered on native range at Cottonwood Station in western South Dakota. The performance of these calves was compared to that of calves fed a soybean meal base supplement. Both the dry and the liquid supplements were 44% protein equivalent. Urea was the nitrogen source in the liquid supplement. There was an attempt to adjust the dry supplement intake to equal that of the liquid supplement. This was difficult to achieve. The average daily intakes for the two groups were .80 and .67 lb for the dry and liquid supplement, respectively. The average daily gains were .07 and -.18 lb, respectively, for the dry and the liquid supplemented calves.

Carriers Compared

Another experiment conducted at Cottonwood Station (Luther **et al.** 1970) compared corn grain and liquid molasses as carriers for urea in supplements fed with prairie hay to calves during the winter. The composition of the corn-urea supplement was 76% corn, 13% urea and the balance mineral, Vitamin A and antibiotic. The liquid supplement was a commercial preparation. No attempt was made to make the two supplements comparable in nutrient content. It was necessary to feed some oats and molasses with the corn-urea supplement during the initial part of the experiment to get desired consumption.

The results (Table 3) indicate that the calves fed liquid supplement did not do as well as the others and neither group had acceptable performance. Palatability evidently was impaired by the high urea levels. In light of the Nebraska work showing urea not to be utilized by calves on low quality forage, the results of this experiment seem to be explainable.

Still a third experiment conducted at Cottonwood Station (Slyter 1971) compared a corn-urea supplement (78% corn and 12% urea) which was 40% protein with a commercial liquid supplement which contained 33% protein. They each contained about the same amount of urea. As a result of poor palatability, the corn-urea supplement was diluted with more corn so that it ended up about the same protein content as the liquid supplement.

Average daily gains (Table 4) appeared to be better for calves fed the corn-urea supplement than for those fed the liquid supplement when both furnished about the same amount of protein. Palatability of the commercial liquid supplement at the same level of urea appeared superior to the corn-urea supplement. The authors indicated that adequate level of nitrogen intake was difficult to maintain when the level of urea exceeded about 8% of the supplement.

The results of experiments conducted in Kansas, as discussed by Perry (1970), indicate that liquid protein supplements do not compare with dry natural protein supplements for supporting growth in beef cattle receiving sorghum silage, winter range forage or summer range forage.

Nelson **et al.** (1971) conducted four experiments in New Mexico comparing liquid supplements to dry supplements when fed to beef calves wintered on native grass pasture. Results were quite variable in the four experiments.

In three experiments the average difference in weight gains were 2, 17 and 24 lb in favor of the dry supplements. In the fourth there was a 20 lb advantage in favor of the liquid supplement. In this experiment the intake of liquid was two lb per head daily while the dry supplement was limited to one lb per head daily.

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Table 3. Liquid vs dry supplement for calves receiving grass hay (S. D. 1969-70—200 days).

	Pelleted corn-urea supplement	Liquid protein supplement[a]
Number of steers	24	24
Av initial wt, lb	392	378
Av daily gain, lb	0.59	0.50
Av daily ration, lb		
Prairie hay	13.35	13.17
Supplement	0.77	0.66
Oats	0.10	—
Molasses	0.05	—
Total	14.27	13.83

[a] Rum-Liq 44 furnished by Farmers Union Grain Terminal Association, Ellis, South Dakota.

Table 4. Liquid vs dry supplements for calves receiving grass hay (S. D. 1970-71—158 days).

	Corn-urea supplement	Liquid protein supplement[a]
Number of steers	30	31
Av initial wt, lb	431	429
Av daily gain, lb	0.89	0.76
Av daily feed, lb		
Prairie hay	15.32	14.84
Urea supplement	0.81	0.92
Soybean meal	0.08	0.09
Ground corn	0.22	0.00
Adaptation supplement	0.23	0.24
Total	16.66	16.09

[a] Rum-Liq 33 furnished by Farmers Union Grain Terminal Association, Ellis, South Dakota.

Liquid Supplements

(continued from page 21)

In these experiments cottonseed meal was used as the main source of natural protein. The quantities of supplement eaten were not considered in these comparisons, thus interpretation was difficult. In general the liquid supplement did not perform as well as the dry natural protein supplements when considering the fact in most cases the calves were allowed to consume more of the liquid supplement.

Maintaining Cows

Few experiments have been conducted with liquid supplements using beef cows. Southwell **et al.** (1967) at Georgia compared cottonseed meal, urea-molasses mixtures hand-fed and self-fed when fed with about 29 lb of coastal bermuda grass hay per head per day. The average daily supplement intakes were 1.5, 2.5 and 4.5 lb, respectively, for the three groups. The average daily gains were .69, .03 and 1.17 lb, respectively, for the three groups. The cost of wintering the cows was the lowest for those fed cottonseed meal.

Research conducted by Totusek **et al.** (1971) and Rush **et al.** (1972) at Oklahoma State University compared liquid and dry self-fed supplements containing urea with dry supplements containing only plant protein (Tables 5 and 6). (The supplements contained 30% protein equivalent except for the molasses supplement. The 30% protein liquid supplement contained 90% of the protein equivalent from urea.)

Consumption of the dry supplements was regulated at desired levels by the inclusion of salt. Consumption of the liquid supplement was limited when necessary with the inclusion of aluminum sulfate. The liquid supplement was not as satisfactory as either the plant protein supplement or the supplement with 50% of the protein equivalent from urea. In the second experiment liquid supplement was no better than straight molasses.

An experiment conducted in 1969-70 at the North Platte Station compared the performance of three groups of cows on native range forage for 32 days, followed by 20 lb of grass hay per head per day for 52 days.

The three treatment groups were (1) no supplement, (2) one lb of 32% plant protein pellet and (3) self-fed 32% protein liquid supplement. Weight gains of the cows that received the liquid supplement were between those of the other two groups (Table 7). The adjusted weaning weights of the calves and reproductive performance of the cows indicated there was little advantage from feeding either of the supplements.

Nine cows in the group fed the liquid supplement did not eat the supplement, thus others ate more than their share. Uniform consumption of self-fed supplements is a serious problem with their use.

Table 7. Liquid supplement for wintering cows (North Platte, Nebraska 1969-70—84 days).

	No supplement	Natural protein, 32%	Liquid supplement, 32%
Number of cows	51	53	53
Av daily intake	0	1.0	1.1
Av weight, lb			
Cow initial, 12/16/69	927	940	942
Cow final, 3/10/70	972	1022	1006
Daily gain, lb	0.54	0.98	0.76
Cow at weaning, 10/6/70	991	1024	1018
Calf adj. weaning 10/6/70	384	378	374
Reproductive data			
Calving 1st estrus, days	51	51	55
1st estrus by 6/15, %	65	66	53
% pregnant, 10/6	94	96	96

Table 5. A comparison of self-fed liquid and dry supplements for range cows (Oklahoma 1969-70, 139 days).

	Supplement[a] (all self-fed)		
	Natural protein (dry)	Urea[b]	Liquid supplement[c]
Number of cows	9	10	10
Daily supplement, lb	3.26	3.25	3.20
Av % salt in mixture	28.3	21.7	
Initial wt 11-21-69, lb	1038	1031	1015
Wt change, lb	-111	-51	-155
Condition score,[d] 4-9-70	4.2	4.0	3.2
Birth wt of calves, lb	65	69	70
Weaning wt of calves, lb	413	401	380
Number of cows rebred	8	10	7

[a] All supplements contained 30% protein equivalent.
[b] To supply 50% of protein equivalent.
[c] About 90% of protein equivalent from urea.
[d] On a 1-9 basis, with 1 the poorest condition.

Table 6. A comparison of self-fed liquid and dry supplements for range cows (Oklahoma 1970-71, 84 days).

	Supplement[a] (all self-fed)			
	Natural protein (dry)	Urea[b] (dry)	Liquid supplement[c]	Molasses
Number of cows	10	9	9	9
Daily supplement, lb	2.6	2.9	3.4	6.8
Salt in mixture, %	25-29	20-25		
Initial wt, 12-5-70, lb	1075	1026	1023	1063
Wt change, lb	-122	-156	-186	-177
Condition score 2-27-71[d]	4.0	3.5	2.9	2.2
Birth wt of calves, lb	80	82	79	78
Weaning wt of calves, lb	540	542	548	542
Number of cows rebred	10	9	9	8

[a] All supplements except molasses contained 30% protein equivalent.
[b] To supply 50% of protein equivalent.
[c] About 90% of protein equivalent from urea.
[d] On a 1-9 basis, with 1 the poorest condition.

Cattle eating wheat rations.

Wheat Feeding Trials

Bill Fulton
Graduate Assistant
Terry Klopfenstein
Assoc. Prof.,
Ruminant Nutrition
Walter Woods
Former Professor
Ruminant Nutrition

When wheat is the major grain in high concentrate rations, depressed animal performance often occurs. Wheat has often been a competitive feed grain, however, and due to its greater availability compared to other feed grains a strong interest has been observed in feeding of wheat in western Nebraska.

Wheat produces higher levels of lactic acid and lower rumen pH values than corn in rumen fermentation. These factors individually or in combination may be the cause for reduced intake of ruminants fed rations containing large amounts of wheat.

The results of five trials clearly indicate that wheat varieties vary in their feeding characteristics. Gage wheat has consistently been the best feeding variety while Scout wheat has produced the lowest animal performance. Inconsistent results have occurred when chemical buffers have been added to wheat rations in an attempt to increase animal performance. Buffering wheat rations may be beneficial if less caustic buffers are as effective as sodium hydroxide has been in these tests.

Table 1. Performance of steers fed different wheat varieties[a] (Trial 1)

	Source of grain			
	Corn	Gage wheat	Trader wheat	Scout 66 wheat
Number of head	6	6	6	6
Adjusted daily gain[b], lb	2.84	2.01	1.77	1.75
Daily dry matter intake, lb	23.4	20.0	17.4	18.2
DM required/100 lb adj. gain	716	886	906	925

[a] Trial length 139 days. Initial weight 720 lb. Cattle tied and fed twice daily.
[b] Final live weight adjusted to 62% yield.

Table 2. Performance of cattle fed different wheat varieties[a] (Trial 2).

	Source of grain			
	Corn	Trapper wheat	Gage wheat	Scout 66 wheat
Initial weight, lb	710	724	716	689
Final weight, lb	1024	912	945	858
Average daily gain, lb	2.34	1.41	1.70	1.26
Daily dry matter intake, lb	17.54	10.15	13.13	10.47
Dry matter required/100 lb gain, lb	761	735	798	879

[a] Trial length 134 days. Cattle tied and fed twice daily.

Variety Trials

Variable results have been reported from different stations regarding maximum levels of wheat that can be fed without reducing performance. With these in mind, possible differences in the feeding characteristics of different wheat varieties were tested in two experiments.

Trials 1 and 2 each consisted of 24 head of steers fed individually. In both trials 4 experimental rations were used with 6 animals being fed each ration. In each trial, three wheat varieties and a corn control ration were fed. In Trial 1, the wheat varieties were Gage, Trader and Scout 66 grown at Lincoln, Genoa and Elsie, Nebraska, respectively. In Trial 2, Trapper, Gage and Scout 66 grown at the Mead Field Laboratory were fed.

The rations contained 90% concentrate and 10% corncobs. Chopped hay was used to start the cattle.

In both trials, steers fed the corn control ration gained at a considerably faster rate than steers receiving any of the wheat rations (Tables 1 and 2). The decrease in average daily gain was primarily due to the decrease in feed intake when wheat was fed. However, cattle fed Trader and Scout 66 gained some less than those fed Gage. Varietal differences may be confounded by differences in location of production in the first test.

In Trial 2, cattle gained more rapidly and more efficiently on corn than on wheat. Scout 66 produced the lowest daily gain and Gage the highest of the three varieties. The results confirm evidence that differences do exist in feeding characteristics.

Buffer Trials

The problem in feeding wheat initially begins with a reduction in

(continued next page)

Feeding Wheat

(continued from page 23)

daily feed intake. This may be due in part to the lowered rumen pH and/or increased levels of lactic acid in the rumen when wheat is fed. Preliminary studies suggest that hydroxide and fat additions to high rumen lactate producing rations such as wheat have reduced rumen lactate levels and increased average daily feed intake. The purpose of the following three studies was to compare animal performance as influenced by wheat rations with and without fat and hydroxides.

In Trial 3, two lots of 7 steers each were fed the following rations containing 90% concentrate and 10% roughage (ground corncobs): corn; wheat; wheat + ½% NaOH; wheat + 1% NaOH + 3% fat, and wheat + 3% fat + 1% NaOH.

Trial 4 was similar in design except a ration containing 1% NaOH + KOH was substituted for the ½% NaOH ration. In Trials 3 and 4, the complete rations were mixed several days prior to feeding. The cattle were started on feed with chopped hay.

In Trial 5, two lots of 44 steers each were fed the following rations containing 90% concentrate and 10% roughage (chopped hay): corn; 45% corn + 45% wheat; corn + 1% NaOH + 3% fat; and 45% corn + 45% wheat + 1% NaOH + 3% fat. The cattle were brought on feed through a series of 5 rations with decreasing levels of roughage.

In Trial 3, rate of gain, feed consumption and efficiency of feed conversion were higher for cattle fed corn or wheat + 1% NaOH + 3% fat compared to those fed the wheat ration. The addition of sodium hydroxide (½ or 1%) or fat alone to the wheat ration did not enhance performance (Table 3).

In Trial 4, adding sodium hydroxide, a mixture of sodium and potassium hydroxide and fat resulted in a small increase in daily gain compared to the wheat control (Table 4). However, the combination of sodium hydroxide and fat increased both rate and efficiency of gains compared to the wheat control. The rate of gain of cattle fed the wheat ration containing both the sodium hydroxide and fat additions was not equal to that of corn although efficiency of gains were equal. These results suggest that the level of wheat used may have been too high to be controlled by the levels of sodium hydroxide and fat that were used. In Trial 5, wheat was reduced to 50% of the grain in the wheat control ration.

In this trial, cattle fed the 45% wheat + 45% corn ration gained as rapidly and as efficiently as those fed only corn (Table 5). The addition of fat and sodium hydroxide depressed performance in both rations. This appeared to be due to the caustic nature of sodium hydroxide. In the earlier trials, rations were mixed several days prior to feeding. In this trial, the rations were mixed just prior to feeding. It appears that when rations containing hydroxides are mixed and stored for a few days, the caustic nature of the sodium hydroxide may be reduced.

In contrast to previous research, the 45% wheat + 45% corn ration did not depress performance. However, this may be due to the type of wheat used in this study (lowered lactate-producing ability) and the increased length of time used to start the cattle (30 days).

Table 3. Performance for cattle fed corn, wheat and wheat + fat + hydroxides[a] (Trial 3).

	Source of grain					
			Wheat +			
	Corn	Wheat	½% NaOH	1% NaOH	3% Fat	1%NaOH + 3% Fat
Number of head	13	14	13	14	14	12
Adjusted daily gain,[b] lb	3.16	2.54	2.63	2.59	2.41	3.04
Daily dry matter intake, lb	19.32	16.31	16.00	16.08	16.13	17.60
DM required/100 lb gain, lb	612	641	609	621	669	578

[a] Trial length 141 days.
[b] Final live weight adjusted to 62% yield.

Table 4. Performance of cattle fed corn, wheat, and wheat + fat and hydroxides[a] (Trial 4).

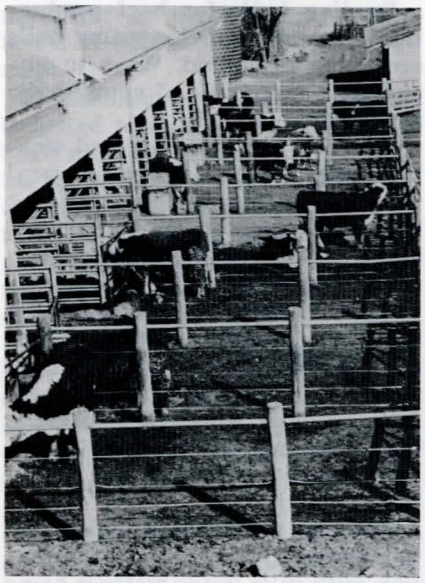
	Treatment					
			Wheat +			
	Corn	Wheat	1%NaOH + KOH	1% NaOH	3% Fat	1% NaOH 3% Fat
Number of head	14	13	10	14	14	13
Adjusted daily gain[b] lb	2.90	2.16	2.29	2.07	2.27	2.51
Daily dry matter intake, lb	20.4	16.32	16.92	16.43	16.15	17.40
DM required/100 lb gain, lb	703	760	739	794	713	695

[a] Trial length 163 days. Initial weight 697 lb.
[b] Final live weight adjusted to 62% yield.

Table 5. Performance of cattle fed corn and wheat rations plus 1% NaOH and 3% fat[a] (Trial 5).

	Treatment			
	Control		NaOH + Fat	
	Corn	Corn + wheat	Corn	Corn + wheat
Number of head	88	86	85	84
Adjusted daily gain,[b] lb	2.86	2.82	2.24	2.40
Daily dry matter intake, lb	20.7	20.7	19.5	19.7
DM required/100 lb adj. gain, lb	724	737	875	819

[a] Trial length 149 days. Initial weight 677 lb.
[b] Final live weight adjusted to 62% yield.



Steers receiving sulfite liquor or molasses.

Sulfite Liquor In Beef Cattle Rations

Terry Klopfenstein
Assoc. Prof.,
Ruminant Nutrition
Walter Koers
Former Instructor
Beef Nutrition
Stanley Farlin
Associate Professor
Ruminant Nutrition

Sulfite liquor—the liquid by-product of paper pulp production—has been dumped into streams in the past. Now, results of a series of three experiments indicate that sulfite liquor can be effectively used as a liquid feed ingredient in beef cattle rations.

The liquid has desirable handling characteristics and is effective in controlling dust and preventing separation of fine feed ingredients. It contains higher levels of calcium, sulfur and lignin than molasses but contains less digestible carbohydrates, therefore, less available energy.

Cattle consumed rations containing sulfite liquor very well. Feed conversion was reduced somewhat when higher levels of sulfite liquor were fed. This decrease was proportional to the lower energy content of the sulfite liquor compared to molasses.

Experiment 1. In this cattle finishing trial, 96 steers were fed eight rations (2 pens/ration) containing 5 and 10% (as fed basis) of either molasses, calcium sulfite liquor, ammoniated sulfite liquor or molasses with calcium sulfate added to equal that in the calcium sulfite liquor rations. Chopped grass hay provided the roughage. Supplemental nitrogen was supplied by urea.

Rations containing sulfite liquor were consumed readily by the cattle and supported performance very similar to that obtained on the control molasses rations (Table 1). Performance was slightly lower for the cattle fed ammoniated sulfite liquor. The addition of calcium sulfite to the molasses ration did not depress performance. Therefore, it can be concluded that the sulfur level in the sulfite liquors is not a problem.

Experiment 2. Molasses and sulfite liquor were evaluated in high roughage growing rations. The rations contained 50% corncobs and 50% concentrate. Six rations were fed to 2 pens each of 6 cattle. Molasses, calcium sulfite liquor and ammoniated sulfite liquor were each fed with a soybean meal supplement and with a urea-containing supplement.

With all sources of liquid carriers (molasses, calcium sulfite liquor and ammoniated sulfite liquor) performance was somewhat reduced when urea was fed compared to soybean meal (Table 2). Performance was similar for molasses and both sulfite liquors when soybean meal was the supplement. The molasses-urea combination produced performance somewhat higher than the sulfite liquor-urea combinations. Past experience would indicate that steers fed the molasses-urea combination should have gained .25 to .5 lb per day less than those fed the soybean meal-molasses combination. Therefore, we would conclude that performance by the sulfite liquor-urea combinations was adequate.

Experiment 3. In this experiment, 72 steers were used to investigate blends of sulfite liquors and molasses in finishing rations. Corncobs served as the roughage and urea as the source of supplemental nitrogen.

As the level of sulfite liquor increased, performance tended to decrease. Steers fed the combination of 1% sulfite liquor (dry

(continued next page)

Table 1. Sulfite liquor additions to beef cattle finishing rations.[a]

Item[b]	5% Mol.	10% Mol.	5% Ca. S.L.	10% Ca. S.L.	5% Amm. S.L.	10% Amm. S.L.	5% Mol. +$CaSO_4$	10% Mol. +$CaSO_4$
Number of animals	12	12	11	12	12	12	12	12
Initial weight, lb	661	641	648	660	651	657	655	656
Av daily gain, lb[c]	2.58	2.23	2.54	2.31	2.46	2.18	2.58	2.37
Feed intake, lb[d]	20.6	18.8	21.1	18.3	20.6	18.3	20.6	18.8
Feed/gain	7.98	8.43	8.30	7.44	8.37	8.39	7.98	7.93
Dressing %	59.2	58.6	59.8	57.9	59.6	58.7	59.3	57.8
Condemned livers, %	25.0	33.4	33.4	8.4	33.4	50.0	25.0	16.7
Grade[e]	12.1	11.2	12.2	11.8	11.8	11.8	11.9	12.0

[a] 156 days.
[b] Mol.=molasses; S.L.=sulfite liquor; Amm.=ammoniated; Ca.=calcium; $CaSO_4$=calcium sufate.
[c] Adjusted to a dressing percentage of 62.
[d] Dry matter basis.
[e] 11=high good; 12=low choice; 13=average choice.

Table 2. Sulfite liquor in growing rations.[a]

Item	Molasses[b]		Ammoniated sulfite liquor[b]		Calcium sulfite liquor[b]	
	SBM	Urea	SBM	Urea	SBM	Urea
Initial wt, lb	527	544	529	532	557	530
Daily gain, lb	2.50	2.45	2.66	2.23	2.49	2.10
Daily feed, lb[c]	17.1	17.1	17.6	16.5	17.2	15.3
Feed/gain[c]	6.84	6.98	6.62	7.40	6.91	7.29

[a] 105 days, 12 head/treatment.
[b] 4% of ration on dry matter basis.
[c] Dry matter basis.

Sulfite Liquor

(continued from page 25)

basis) and 3% molasses were equal in rate of gain and superior in efficiency of gain to those fed molasses alone (Table 3). Combinations of sulfite liquor and molasses will probably be used as liquid supplement carriers or dry ration ingredients and it appears the combination will work well.

A summary of the three experiments conducted comparing molasses, calcium sulfite liquor and ammoniated sulfite liquor are shown in Table 4. Daily gains and efficiency of gains were not greatly different between the various carriers. These data would indicate that sulfite liquor is only slightly less efficient than molasses as a feed ingredient, which is probably related to its lower digestible carbohydrate content.

Table 3. Blends of sulfite liquor and molasses.[a]

Molasses[b], %	4	3	2	1	0	1
Calcium sulfite liquor[b], %	0	1	2	3	4	0
Ammonated sulfite liquor[b], %						3
Initial wt, lb	794	776	788	783	795	810
Daily gain, lb	2.54	2.54	2.37	2.32	2.26	2.40
Daily feed, lb	20.4	19.3	19.7	20.8	19.7	21.7
Feed/gain	8.03	7.60	8.31	8.97	8.72	9.04
Grade[c]	11.2	11.1	11.5	11.0	10.8	10.9

[a] 92 days, 12 head/treatment.
[b] Dry matter basis.
[c] 11=high good; 12=low choice.

Table 4. Sulfite liquor summary.[a]

	Molasses	Calcium sulfite liquor	Ammoniated sulfite liquor
Daily gain, lb	2.46	2.34	2.39
Daily feed, lb[b]	18.8	18.3	18.9
Feed/gain	7.65	7.73	7.96

[a] Five separate comparisons, each carrier source represents total of 60 steers.
[b] Dry matter basis.

Experiments in Progress

Combinations of urea and proteins. Dehydrated alfalfa, corn gluten meal and distillers dried grains are being tested in combination with urea as protein supplements to high roughage growing rations. These proteins may have unique complimentary effects with urea in supplying supplemental nitrogen.

Feeding value of paunch waste. Paunch waste, a troublesome pollutant, is being tested as a roughage in cattle finishing rations.

Utilization of crop residues for calves. Chemical and physical treatments of crop residues are being conducted. Feeding value of these treated materials is being tested.

Wheat feeding. Studies are being continued in the use of buffers and fat in high wheat rations. Basic reasons for the problems involved in wheat feeding are being studied. In addition, further study of different wheat varieties is planned.

Confinement cattle feeding. Performance of cattle in a housed confinment unit is being compared to cattle fed in conventional lots. Appropriate waste handling systems are being tested.

Feed additives. A new feed additive is being evaluated as a growth promotant for finishing cattle.

Feeding value of corn varieties. Various corn varieties, including high lysine corn, are being evaluated in the laboratory and in feeding trials to determine if differences in feeding value exist between varieties used for high moisture corn.

Protein levels in finishing rations. Source of protein during the starting program and its effect on subsequent performance are being evaluated. The effect of reducing ration protein level at various times during the finishing phase is being investigated.

Feeding bulls for beef production. Protein levels for young bulls are being evaluated. Ways to improve carcass grade of young bulls are being studied.

Methods of processing and storing high moisture corn. Several methods of storage and feeding high moisture corn are being evaluated. Shelled high moisture corn stored whole and fed whole and ground is being compared with the same corn stored ground, stored 30% ground and 70% whole, and stored whole mixed with 10% alfalfa haylage. Ways of improving feed consumption of high moisture stored ground are being investigated.

Starting programs. Feeding two antibiotics in the feed in combination with sulfa in the water is being evaluated in relation to gains and incidence of respiratory disease the first three weeks after arrival of "new" cattle in the feedlot.

Silage additives. The effects of an additive on direct cut alfalfa and another added to corn silage are being studied at the Northeast Station.

Feed value of hail-damaged corn. As a result of hail during the summer of 1972 much damaged, inferior quality corn was put in silos in the North Platte area. Most of the forage has practically no grain in the silage. Growing calves are being fed silage made from hail-damaged corn with varying amounts of grain added at the time of feeding to determine its energy value. One silage which was not hail-damaged contains about 50% of the dry matter from grain. Appropriate protein, mineral and vitamin supplements are fed to all calves.

Potassium in range supplements containing NPN. Steer calves are being individually fed supplements containing nonprotein nitrogen while grazing native winter range. Potassium is being used in supplements which contain relatively small amounts of dehydrated alfalfa or soybean meal. Previous tests have indicated that potassium deficiency may be involved in the reason why nonprotein nitrogen is not well utilized in range supplements. Relatively speaking, soybean meal and dehydrated alfalfa contain high levels of potassium. It is hoped that it can be determined if potassium is deficient in

winter range forage and if it is necessary to provide extra high levels of potassium in the supplement.

Controlling supplement intake on irrigated pasture. Previous studies have shown an advantage to feeding up to 4 lb of energy supplement to yearling steers on irrigated pasture. In the spring of 1973 an experiment will be initiated to study methods of limiting intake of a supplement on irrigated pasture.

Rate of developing replacement heifer calves. Three groups of heifer calves are being developed at different rates of growth from weaning (200 days before breeding) until breeding at about 15 months of age. The rates of development are: (1) no gain for 100 days and then 2 lb per head per day gain for 100 days; (2) 1 lb per head per day gain for the entire 200 days; (3) 2 lb per head per day gain the first 100 days followed by no gain the last 100 days. Thus the heifers will all average 625 to 650 lb at breeding time. Reproductive performance and calf production for 3 or 4 lactations will be measured.

Estrous cycle control. Studies are underway with both heifers and mature cows to test different hormonal procedures for controlling the estrous cycle. Emphasis is given to the use of a removable implant used alone and in combination with other hormonal materials.

Twinning studies. Increasing the frequency of twin births provides a means for increasing the returns on a cow-calf operation. Procedures being tested involve utilization of hormonal materials to increase the number of eggs produced by the ovary. For the most part such treatments are superimposed on cycle control treatments.

Growth stimulation in calves. Various hormonal preparations are being used to stimulate growth rates in suckling steer and heifer calves. The steer calves are sold at weaning and the heifer calves are maintained to study their subsequent reproductive activity.

Pelvic activities. Pelvic activity is studied from both basic and applied standpoints. Some studies involve hormonal factors that appear to increase its size which other studies are related to natural mechanisms that operate to regulate pelvic activity at the time of calving.

Fabricated beef cuts. The feasibility of producing fabricated beef cuts which have been flaked, formed and sectioned is being studied. This technique involves high speed flaking of beef trimmings and by-products, reformulation, compression to a fixed form in a dye and sectioning to portion controlled consumer cuts. The study is designed to determine the feasibility of upgrading the value of many beef trimming cuts to higher value products.

Source of nitrogen for wintering beef cows. A study involving dry pregnant cows being grazed on corn stalks during the wintering period is being replicated. Sources of nitrogen fed in a range cube include soybean meal, urea and biuret. In Trial 1 performance of all cows was acceptable; however, there were differences based on source of nitrogen.

Self feeding of soybean meal and biuret on corn stalks. Sixty cows are being used on a corn stalk grazing winter trial where soybean meal or biuret is being offered on a self-fed basis as the source of nitrogen. Cows will have access to a protein-mineral mixture, corn stalks and stacked crop residue for emergency winter feed.

Calving difficulty. A study using crossbred cows bred to a third breed sire is being continued. Observations include cow body measurements and calf measurements at birth. Correlations are made between such measurements as vertical and horizontal pelvic measurements, calf weight and calf measurements including shoulder, hook and thigh measurements.

Internal parasites of the beef cow. A lifetime study of the internal parasite level and seasonal change is being continued. Cows are sampled four times a year with egg and oocyst counts made in cooperation with the Veterinary Science Department.

Effects of selection for weaning weight, yearling weight and muscling in beef cattle. Three 150-cow-6-sire lines of Hereford cattle are selected on basis of (1) weaning weight, (2) yearling weight and (3) an index of yearling weight and muscling. A fourth line of similar size is being formed from the foundation animals to serve as a control herd that will be maintained without deliberate selection. Unselected female offspring from each line have been individually fed to obtain information on correlated response in feed efficiency and carcass merit. Project was carried on at Fort Robinson Beef Cattle Research Station from 1960-71 but is now at U.S. Meat Animal Research Center, Clay Center, Nebraska and is cooperative between U. S. Department of Agriculture and University of Nebraska.

Germ plasm evaluation program. This program conducted at U.S. Meat Animal Research Center, Clay Center, Nebraska, is designed to characterize breeds in the full spectrum of economic traits relating to growth, feed efficiency, reproduction, maternal ability, carcass and meat traits. The basic objective of this program is to develop an understanding related to optimizing such biological factors as growth rate, cow size and milk level in different feed environments and production situations. The first cycle (1970-72) of this program is designed to characterize Hereford, Angus, Jersey, South Devon, Limousin, Simmental and Charolais breeds. The second cycle (1973-74) is designed to characterize Hereford, Angus, Red Poll, Brown Swiss, Gelbvieh, Maine Anjou and Chianina breeds. The project is cooperative between U.S. Department of Agriculture and University of Nebraska.

Evaluation of heterosis on productive efficiency and carcass merit in beef cattle. The Angus, Hereford and Shorthorn breeds are included in this experiment to evaluate the effects of heterosis on economic traits on a full life cycle basis and procedures for using heterosis through continuous breed crossing programs. About 250-300 breeding age females are used in the different phases of this experiment. Three kinds of two-breed crosses and the three-breed rotation are being compared with the straightbreds. The earlier phases of the experiment were carried out at Fort Robinson Beef Cattle Research Station but it is now at U.S. Meat Animal Research Center, Clay Center, Nebraska. The project is cooperative between U.S. Department of Agriculture and University of Nebraska.

Purpose and Origin of the Beef Feedlot Research Fund

Cattle feeders and related industry organizations listed below have contributed to this fund which has been used primarily for the development of a feed plant and a confinement feeding barn. Financial support by the feeding industry increases the quality and quantity of the department's research in support of the industry. Inquiries and contributions are welcome and should be directed to the Chairman of the Animal Science Department.

A. J. Anderson & Sons, Lexington.
Walter & Jerry Bendfeldt, Bendfelt Feed & Cattle, Axtell
Oscar Bredthauer Feed Yards, Grand Island
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David Burkholder, Will Feed, Inc., Cozad
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