SUMMARY OF SLAUGHTER-WEIGHT CALF PRODUCTION SYSTEM

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Thanks for your inquiry with regard to the slaughter-weight calf program we're investigating at Utah State University. We have been studying this cow-calf production system as an alternative for cow-calf producers in Utah who may have grazing rights on public lands curtailed for one reason or another. I will outline the major points of the system below. A formal publication is in preparation. When it is finished, I will send you a copy.

- Cows are of larger-frame (1350 lbs. in body condition score 5), with fairly heavy milk production potential (15-20 lbs./day). Cows are all crossbreds with most having three breeds represented. Most breeds common to the Intermountain West are represented, i.e., Hereford, Angus, Simmental, Gelbvieh, Tarentaise, Charolais. They're quite a mixture.

- Cows are mated for spring calving (March-April). They are mated through artificial insemination to bulls with exceptionally high EPD for yearling weight yet fairly high calving ease indexes. To this point we have used only two bulls: a Simmental bull, Incumbent (EPD Yearling Wt. = +48 lbs.); and an Angus bull, Max (EPD Yearling Wt. = +100). Both of these bulls are available through ABS and both have high calving ease indexes if used on **mature** cows. We have never pulled a calf from either of these bulls. I am sure there are many other bulls and breeds that would be acceptable.

- Cows of predominantly Angus breeding are mated to the Simmental bull. Cows without Angus breeding are mated to the Angus bull. This aids in maintaining hybrid vigor in the calves and the Angus breeding in all of the calves helps insure early marbling in the carcasses to aid USDA quality grade.

- All of the calves sired by these bulls are terminal, being managed to reach slaughter weight as soon as possible. Female calves sired by these bulls would not likely be acceptable candidates for replacement heifers either due to low maternal EPDs or strictly due to large mature body size.

- Since most cow-calf producers are reluctant to institute an intensive AI program, we generally recommend estrus synchronization followed by mass breeding. With proper management, 50-60% of the cows will conceive to this single insemination. Good-quality clean-up bulls are then used to breed the cows not conceiving to this insemination. Clean-up bulls should emphasize maternal traits as replacement heifers will be coming from this group of cows.

- We envision the cows with calves sired by the high-growth bulls as being intensively managed on privately owned, irrigated pastures and meadows. Cows with calves sired by the more maternal clean-up bulls would graze less productive private lands or public land allotments that have curtailed grazing.

- Replacement heifer production is a problem with any terminal production system. For producers who wish to institute an intensive AI program where 80-100% of the cows conceive to the high-growth bulls, replacement heifer production is a real concern. With data collected to this point, we feel that cows should be mated to the high-growth bulls only ages three through nine years. This means that the first two calves from a cow could be from maternal type bulls. Also, the last couple of calves of a cow could be from maternal -type bulls. With respect to high-producing cows those are probably the best times to raise replacements. During the cow's prime, milk production is usually quite heavy. Of course, heavy nutrient flow to a suckling heifer calf can permanently reduce live time productivity due to fat infiltration of the developing mammary gland.

- Of course, replacements can be purchased.

- With regard to calves sired by the high-growth bulls, we have estimated that by 80 to 100 days of age that mothers milk and pasture grass will no longer supply adequate nutrition to allow the calves to fully express their genetic potential for growth. Consequently, a cereal grain-based creep feed is offered free-choice. The creep feed formula we use is as follows. Any balanced formula would likely work.

Ingredient	Usage, %
Cracked barley	55.23
Crimped oats	30.00
Soybean meal (44%)	6.23
Dry molasses	5.00
Limestone flour	2.50
White mixing salt	.70
Vitamin-mineral premix	.17
Dicalcium phosphate	.12
Bovatec 68	.06

As a general rule of thumb, the calves usually consumed approximately 1% of their body weight in creep feed each day.

- All male calves are castrated at about two months of age. All calves both male and female are implanted with Ralgro at 80-day intervals starting at two months of age.

- All cows and calves are maintained in optimal health with appropriate vaccination and parasite control programs as prescribed by a qualified veterinarian.

- From approximately May 15 through October 31 cow-calf pairs graze a well-managed irrigated pasture system. We've generally used the New Zealand electric fence system and allowed the cow-calf pairs enough pasture for approximately 24 hours at a time. This method was used because it allowed us to estimate how much pasture was being consumed per day. The pastures used were orchard-brome hay fields. Pasture growth became somewhat limited during the hotter summer months July through August. We plan to study the use of other forages during this period, perhaps alfalfa grazing.

- The following measurements were made during the grazing period from May 15 through June 30.

  * Nutrient content of pasture forage, dry basis.

CP, %	ADF, %	ME, Mcal/lb.
15.68	35.21	.977

  * Forage DM consumed/pair/day: 42.38 lb.
  * Calf body weight: 366 lbs.
  * ADG of calves: 3.12 lbs.

* Milk harvested by calves 18.1 lbs./day
* Estimated forage DM harvested by calves 10.41 lbs./day
* Estimated forage DM harvested by cows 31.97 lbs./day
* ADG of cows .32 lbs.

- The following measurements were made during the grazing period from July 1 through August 31. As mentioned earlier, this was the most limiting time for forage production with the cool season grasses used.

  * Nutrient content of pasture forage.

CP, %	ADF, %	ME, Mcal/lb.
14.05	37.31	.929

  * Forage DM consumed/pair/day 45.27 lbs.
  * Calf body weight 593 lbs.
  * ADG of calves 3.55 lbs.
  * Milk harvested by calves 20.19 lbs./day
  * Estimated forage DM harvested by calves 12.67 lbs./day
  * Creep feed DM consumed by calves 4.56 lbs./day
  * Estimated forage DM harvested by cows 32.60 lbs./day
  * ADG of cows .12 lbs.

- The following measurements were made during the pasture grazing period from September 1 through October 31.

  * Nutrient content of pasture forage.

CP, %	ADF, %	ME, Mcal/lb.
14.35	36.55	.945

  * Forage DM consumed/pair/day 47.16 lbs.
  * Calf body weight 828 lbs.
  * ADG of calves 3.79 lbs.
  * Milk harvested by calves 16.72 lbs./day
  * Creep feed DM consumed by calves 7.61 lbs./day
  * Estimated forage DM harvested by calves 16.53 lbs./day
  * Estimated forage DM harvested by cows 30.63 lbs./day
  * ADG of cows .23 lbs.

- Calves are normally weaned on October 31. There are usually ample supplies of forage available on our irrigated pastures until that time. Of course this varies with topography, climate, water supplies, etc. The calves are then placed on a 90-day feeding program from November 1 until approximately February 1. **Remember this is usually the yearly market high for slaughter cattle**. The following diet was used during this feeding period:

Ingredient	Usage, % (As-Fed)
Alfalfa hay	39.41
Ground barley	21.12
Ground corn	20.00
Corn silage	10.00
Sugar beet pulp pellets	5.00
Soybean meal (44%)	3.69
White mixing salt	.44
Vitamin-mineral premix	.25
Dicalcium phosphate	.08
Rumensin 80	.02

- The following measurements were made during the calf feeding period from November 1 through February 1:

  * Beginning body weight 828 lbs.
  * Ending body weight 1176 lbs.
  * ADG of calves 3.87 lbs.
  * Average daily DM consumption of calves 24.27 lbs.
  * Daily ME consumed
    24.27 lbs. x 1.22 Mcal ME/lb. = 29.61 Mcal ME/day
  * ME consumed per lb. of gain
    29.6 ÷ 3.78 = 7.83 Mcal ME/lb. gain

- At this point I will describe the nutritional management of the cows that raise these calves.

  * After the calves are weaned (October 31) the cows usually graze stock piled hay crop aftermath for approximately 30 days or until about December 1. In our particular situation there are no winter pastures available, so the cows are fed a harvested forage diet. We have emphasized the use of ammoniated cereal straw supplemented with alfalfa hay during the winter and spring when grazing is not available. If the diets are properly balanced, we have found this feeding system to be the most economically efficient.

  * From December 1 through January 31 the cows received 6.0 lbs. of good quality alfalfa hay (16.2% CP, .871 Mcal ME/lb., as-fed) and free-choice ammoniated wheat straw (10.6%, .761 Mcal ME/lb., as-fed). Free-choice consumption of ammoniated straw was approximately 23 lbs. per day (as-fed). Since ammoniated straw contains virtually no phosphorous or vitamin A, the cows also received .5 lbs. of a vitamin-mineral supplement formulated to match the deficiencies of the ammoniated straw. Cows received 22.4 Mcal ME/day during this period and gain .92 lbs./day, which is about the recommended level for this stage of gestation.

  * From February 1 through May 14 the cows remain on an ammoniated straw based diet. Since this is the late gestation - early lactation period the amount of alfalfa hay supplementation is increased to 10.0 lbs. per cow per day. The cows still have free-choice access to ammoniated straw and received .5 lbs. of vitamin-mineral supplement.

* 10.0 lbs. of alfalfa hay (16.2% CP, .871 Mcal ME/lb., as-fed).

* 20.7 lbs. of ammoniated straw (10.6% CP, .761 Mcal ME/lb., as-fed).

* .5 lbs. vitamin-mineral supplement.

* Cows were receiving 26.2 Mcal ME during this period and lost .23 lbs./day, which is not an excessive loss considering the superior milking ability of these cows. Most cows were in good body condition at calving with an average body condition score of 5.4.

- The following is a summary of ME inputs comparing cows with calves sired by the high-growth bulls to cows with calves sired by the clean-up bulls, which would be considered of average growth genetics.

		Total ME Input	
Period	**Days**	**High-Growth**	**Average-Growth**
Postweaning grazing, cows	30	658	658
Wintering period, cows	60	1344	1344
Late gestation, early lactation, pairs	105	2751	2751
Early summer grazing, pairs	45	1863	1823
Mid summer grazing, pairs[a]	62	2963	2767
Late summer grazing, pairs[a]	62	3385	3097
Calf finishing period, high-growth	90	2665	
Calf finishing period, average growth	182		5218
TOTAL		15602	17658

[a]Includes creep feed consumed by calves. All calves had free-choice access to creep starting at 80-100 days of age.

The use of the high growth bulls resulted in a **13% reduction** in total energy input compared to the average growth bulls **in this environment**. If you put a price on energy, say $.0406 per Mcal of metabolizable energy, the savings in dollars would be about $83 per slaughter-weight animal produced.

- The following table shows the performances of calves sired by the high versus average growth bulls from birth to slaughter weight.

Item	Sire Type, EPD YW		SEM[a]	P[b]
	High	Average		
Birth weight, lbs.	89.5	84.3	1.14	.002
Weaning weight, lbs.	828.1	689.8	11.26	.0001
Age at weaning, days	219	221	2.19	.49
ADG to weaning, lbs.	3.37	2.73	.045	.0001
Milk provided, lbs.	18.83	17.86	1.09	.53
Slaughter weight, lbs.	1177	1197	6.39	.029
Age at slaughter, day	309	402	2.48	.0001
ADG weaning to slaughter, lbs.	3.87	2.80	.046	.0001

[a]Standard error of mean
[b]Numbers less than .05 indicate the difference is reliable.

- The following table shows the carcass characteristics of the calves sired by the high versus average growth bulls.

Item	Sire Type, EPD YW		SEM[a]	P[b]
	High	Average		
Backfat, in.	.31	.45	.011	.0001
Carcass weight, lbs.	676	701	3.51	.0001
Ribeye area, sq. in.	12.5	11.6	.09	.0001
KHP[c], %	2.4	3.3	.058	.0001
USDA Quality Grade[d]	1.98	2.62	.069	.0001
USDA Quality Grade	2.33	3.25	.045	.0001
BCTRC[e], %	51.6	49.4	.104	.0001

[a]Standard error of mean.
[b]Numbers less than .05 indicate the difference is reliable.
[c]Kidney, heart and pelvic fat.
[d]1.0 = Standard, 1.5 = Select -, 2.0 = Select +, 2.5 = Choice -, 3.0 = Choice.
[e]Boneless, closely trimmed, retail cuts.

Another way to summarize this data would be to compare the amount of retail cuts produced per unit of metabolizable energy used:

Item	Sire Type, EPD YW	
	High	**Average**
Carcass weight, lbs.	676	701
BCTRC, %	51.6	49.4
BCTRC, lbs.	349	346
Total ME expenditure	15602	17658
BCTRC per ME used	**.0224**	**.0196**

Thus the use of the high-growth bulls resulted in a 14% increase in the amount of consumable product produced per Mcal of metabolizable energy used by both calf and the cow.

- We have also conducted consumer taste-panel testing to ascertain if the retail cuts produced by the calves reaching slaughter weight at 300 days of age are acceptable to the consumer. The following table summarizes our findings. We did not compare cut from high-growth versus average-growth calves in this case. Rather, we compared rib steaks from the 300-day old slaughter-weight calves with USDA Choice rib steaks from a commercial outlet.

Item	Tenderness[a]	Juiciness[b]	Flavor[c]	Overall Acceptability[d]
USDA Choice	4.4	4.7	5.2	5.0
300-day slaughter-weight calves	5.7	4.8	5.5	5.6

[a]1 = very tough, 7 = very tender
[b]1 = very dry, 7 = very juicy
[c]1 = poor flavor, 7 = very acceptable flavor
[d]1 = unacceptable, 7 = very acceptable

The difference in tenderness would be expected as age at slaughter is the major determinant with regard to tenderness. One would expect cuts from a 300-day old slaughter-weight calf to be tender. The lack of difference in juiciness was surprising in view of the fact that the rib steak from the 300-day old calves was much leaner than those of the USDA Choice steaks. This may have been due to the fact that the rib steaks from the 300-day old calves were much higher in moisture content. Tissues from younger animals is generally always higher in water than tissues from older animals. Flavor is generally associated with fat content. The lack of a major difference in flavor was again surprising in view of the fact that the USDA Choice steaks were much higher in fat content. The results of the consumer taste-panel testing showed the steaks from the 300-day old slaughter-weight calves to be slightly more acceptable than USDA Choice steaks mainly due to improved tenderness.

- Sometimes attaching economic inputs is somewhat misleading since there is a great deal of variation from ranch to ranch and area to area. But most producers seem to be far more interested in economic inputs and outputs than other aspects of the project, understandably so. I have included our actual and estimated costs simply as a guide.

Cows grazing stockpiled hay crop aftermath (Nov. 1-31)		$17.82
Cows wintering period, mid gestation (Dec. 1-Jan. 31)		
	Alfalfa Hay	11.88
	Ammoniated Straw	23.03
	Vitamin-Mineral Supplement	3.00
Cows wintering period, late gestation-early lactation (Feb. 1-May 14)		
	Alfalfa Hay	34.02
	Ammoniated Straw	41.30
	Supplement	5.25
Early pasture grazing by cows and calves (May 15-June 30)		34.33
Mid pasture grazing by cows and calves (July 1-Aug. 31)		
	Pasture forage	50.52
	Creep feed	36.48
Late pasture grazing by cows and calves (Sept. 1-Oct. 31)		
	Pasture forage	52.63
	Creep feed	37.75
Calf finishing feed period (Nov. 1-Feb. 1)		109.22
Breed costs		25.00
Cow depreciation		20.00
Hired labor		30.00
Equipment		25.00
Veterinary		10.00
Interest on operating capital		15.00
Marketing expense		5.00
Insurance		2.50
Taxes		6.50
Land ownership cost (?)		40.00
TOTAL ANNUAL COW COST		**$626.33**

Breakeven Price Needed for Slaughter-Weight Calves:

$$\frac{\$626.33}{1176 \text{ lbs. x } .95 \text{ (Weaning \%)}} = \textbf{\$.5606/lb.}$$

Market Value of Calf (1176 x $.70/lb. {?}) = $823.20
Ranch Value of Calf (1176 x $.5606) = 659.27
NET RETURN PER COW **$163.93**