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MATCHING CATTLE NUTRIENT REQUIREMENTS
TO A RANCH'S FORAGE RESOURCE, OR
"WHY WE CALVE LATE"

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Our goal at Deseret Land and Livestock is to maximize long-term profit. Our profit is a function of the following factors: the prices we receive for our production, our amount of production, the costs of production, and the productive capabilities of our land and labor. Prices, production, and cost are managed on an annual basis. The long-term outcome of one's management is determined by their attention and skill in enhancing the capability of land and labor.

These factors of profit can vary tremendously within and between years. For example, prices for 400-500 pound steer calves from 1979-1989 varied nearly \$.58/pound over the period and on average the prices varied \$.17/pound within any given year during this time, with a maximum within year difference of \$.26/pound (Cattle-Fax 1991). Our range forage production has varied in the same 10 year period from less than two weeks of active growth to over three months. Finally fuel and interest on borrowed money costs have oscillated dramatically over this same period with all costs tending to increase.

The tremendous variability of both the biological and financial environments in which ranchers do business make it a very high risk business. No single fixed strategy, no matter how good, will maximize long-term profitability. We believe that in this type of business environment the key to success is to have the flexibility to adapt.

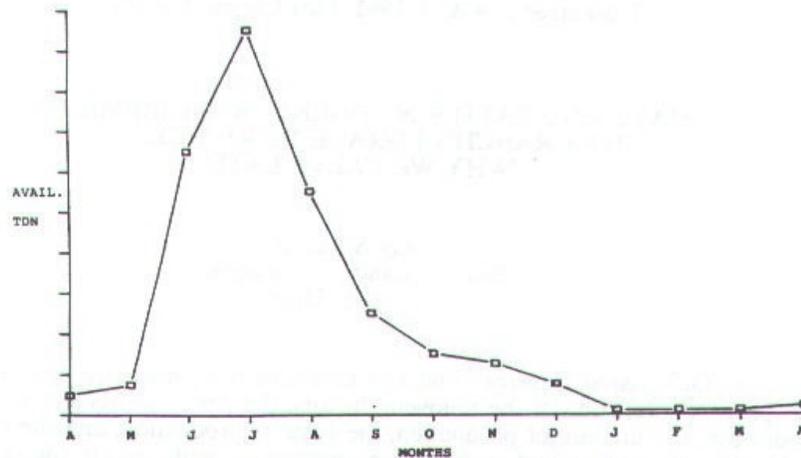
We calve late because it provides us with the best fit between the cattle's nutritional requirements over their production cycle and the ranch's naturally produced forage. This match has helped us become a low cost operation, has reduced our susceptibility to inflationary pressures on cost, has increased our production, and has broadened our marketing opportunities.

Over the last twelve years, we decreased our total cost per pound of calf produced from over \$.90 to \$.62. We have gone from a cow/calf operation to a cow/calf/yearling operation. Finally we now look for marketing opportunities year-round instead of having to sell the calves each fall.

The basis for these changes comes from an understanding of our annual forage availability curve. This curve represents the quantity and quality of the naturally produced and available forage on the ranch (Figure 1).

The horizontal axis shows months in a year starting with April. The vertical axis is

Figure 1. FORAGE AVAILABILITY CURVE



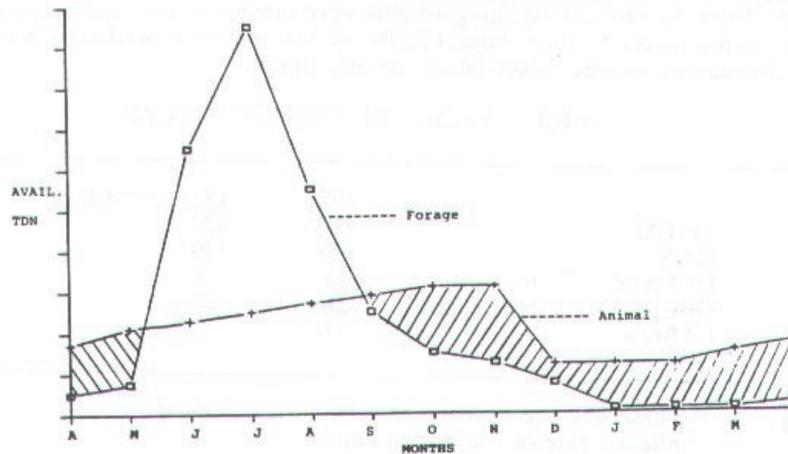
available TDN (Total Digestible Nutrients). This curve is unique to our environment thus each operator needs to identify and understand his own situation.

Deseret Land and Livestock is located in northeastern Utah near Evanston, Wyoming. Our lower elevations, where we winter the cows, are around 6,300 feet and most of the precipitation comes as snow (10 inches annual precipitation at 6,300 feet). We usually go to -30 degrees Fahrenheit and have been as low as -52 degrees Fahrenheit. The normal hay feeding season in this area is from mid-December to late April. On average we start having some growth in April. This is followed by six weeks of rapid growth in May and June. Year in and out the vast majority of our annual production occurs during this period. Maximum TDN on our lower elevation ranges occurs the third week of June. By mid-July growth has nearly ceased and the plants start to lose nutrients rapidly. The rate of decline for TDN slows and stabilizes at fairly low levels (40-50%) as the plants become dormant in the early fall. Forage becomes nearly unavailable as snow and sub-freezing temperatures tend to keep the ground covered from mid-December until mid-April.

Between years, forage availability can vary six-fold in production depending on soil moisture and minimum temperatures. Daily minimum temperatures in the spring can shift our rapid growth period plus or minus two weeks. Snow cover and past grazing practices can affect current production as well as long-term productive capability.

Present and future operating costs and cattle production are affected by how well the animal requirement curve is matched to the forage availability curve (Figures 2 & 3). In the past, we focused on trying to maximize calf weaning weights. We calved the heifers in late February and the cow herd in early March. Calving took place over 100 days. Then we would wean in early November. Figure 2 shows how this strategy led to big differences between the forage curve and the animal requirement curve (shaded area). The differences were made up by haying the surplus summer forage and purchasing other high cost feed supplements or otherwise animal performance suffered.

Figure 2. PAST FORAGE AVAILABILITY & ANIMAL REQUIREMENT CURVES



Cow requirements change with their physiological demands. Post calving is probably the most physiologically demanding time for a cow. She must recuperate from the rigor and trauma of calving, lactate and recover body condition to cycle, and rebreed. A rising plane of nutrition post calving is key to when she has her first estrus and if she conceives. We fed our best wild hay during this critical period. Our calving period was over 100 days and the conception was in the low eighty percentile. We tried to improve this performance by developing and growing alfalfa under circular sprinklers. This was not a cost effective idea because of the high investment and operating cost in our low production environment (54 days of frost-free growing season).

Calving on a feed row led to a lot of other problems; we needed to pair off the cows with calves and separate them from the springers to reduce mis-mothering. Diseases spread easily on a feed row because of the close contact between calves. The attention of our labor was fragmented between calving and irrigating and as such, neither was done well. Finally, the cattle tired of hay and wanted to be turned out on the new green grass growth. Invariably, they chased the watery forage and lost condition.

During the summer the cows grazed out on generally abundant native forage while we were busy putting up hay for the long feeding period. As the season progressed into fall the forage quality decreased and the cows lost condition because they were unable to meet their maintenance requirement while they were nursing a calf. We would finally wean the calves when they were not gaining very well and the chances of snow were increasing. Our cows condition necessitated that we begin feeding hay as soon as we got extremely cold and/or snowy conditions. However, our cows were so accustomed to being fed hay by mid-December that they would gather around stack yards, even if winter conditions were not extreme and natural feed was available.

Our past strategy had problems, it required a lot of hay feeding and this represented our highest annual cow production cost. Additionally, hay production and feeding led to our 2nd, 3rd, and 4th highest costs, namely: cow depreciation (the costs associated with developing

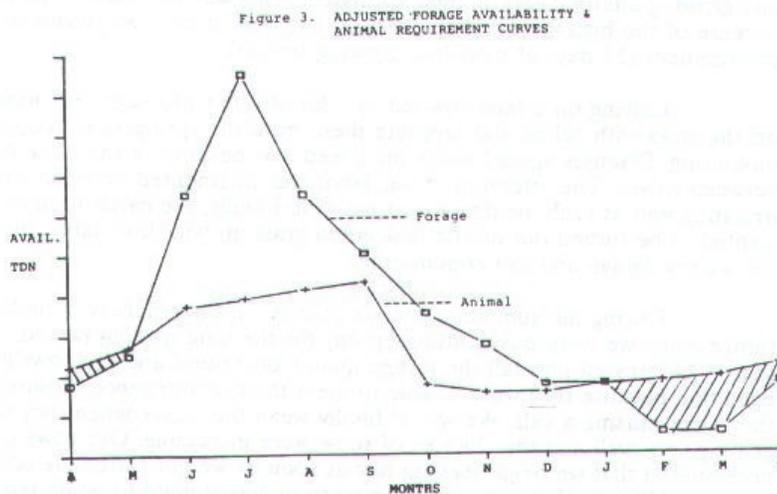
replacements), operating interest (the difference between cash the ranch was taking in and the cash going out), and labor (Table 1). Our calf weaning weights were mediocre and costly inputs would have been required to raise them. Finally, we had a limited marketing window with November weaned calves being our only option.

Table 1. Selected Cost/Cow/Year

	1979	1979 (Adjusted)*	1989
Total	234	420	207
Hay	100	179	34
Depreciation	35	63	19
Operating Interest	28	50	2
Labor	17	30	25

* These cost are adjusted to 1990 costs assuming an inflation rate of 5% per annum.

Figure 3 shows how we have adjusted both the animal requirement curve and the available forage curve to reduce the differences between them (shaded area).



We started our adjustment by reducing the high cost of hay production. We evaluated both the production in tons/acre and the TDN of this hay by field. Fields varied tremendously in their production. The extremes were 0.6 tons/acre production with 48% TDN to nearly 3 tons/acre and yield with 54% TDN. When the farm costs were prorated over the fields, production costs ranged from \$18 to \$90 per ton. On a cost/ton basis, our overall average was \$49. From this analysis we discovered that in 30% of the fields, it was costing more to produce hay than to purchase it. We chose not to hay 25% of the area because a lot of haying costs are not

directly variable with production and thus the total amount of hay produced is very important to the overall cost/ton. The benefits realized by eliminating haying these low production fields were a \$ 10-15/ton drop in hay cost, more total tons of hay harvested on less land (Table 2) and a shortened haying season which increased hay quality because the plants are less mature when cut.

Table 2. Hay Production Changes at the Ranch

	Acres	Tons	Tons/ac	\$/Ton
1979	7100	7300	1.02	49
1984	5600	9000	1.6	30
1990	1716	4000	2.32	35

The uncut area (1,700 acres) was available for other uses. We eventually started using it to summer our yearlings and winter our cows. Winter grazing of these meadows helped reduce our total hay demand (eventually leading to some hay sales) and lowered the cost to winter our cows. We reduced the cost of haying even more by windrowing hay and letting the cows free-choice graze it. We allocate windrowed hay by using a portable electric fence. As time went on we kept introducing new practices that reduced our hay feeding season (Table 4) while increasing beef production (Table 3) and the production capability of our land and labor.

Currently, we calve our cows starting April 5th. They generally calve out on pastures (usually crested wheat grass/sagebrush) that were rested during the active growing season the previous year. This has dramatically increased our available standing forage in the spring. This standing forage tends to melt the snow up to four weeks earlier than pastures that are grazed down the previous year and have not regrown. The vertical stalks of standing forage intercepts the radiation from the winter sun (which is low on the horizon) more efficiently than grazed down forage. Therefore, standing plant material captures more radiation and re-radiates this energy which helps melt the snow.

Cows calving in these large rested pastures can find a secluded and dry place to calve. Cows have continuous access to feed (not waiting for a tractor to come every 24 hours). The crested wheatgrass tends to meet their nutritional requirements because the old growth provides their energy requirements and it shelters the basal leaves over the winter which are green and high in protein. The range starts its active growth in May but the dry forage keeps it from being too washy. As time goes on, new growth predominates the plants and thus the cows plane of nutrition is constantly increasing.

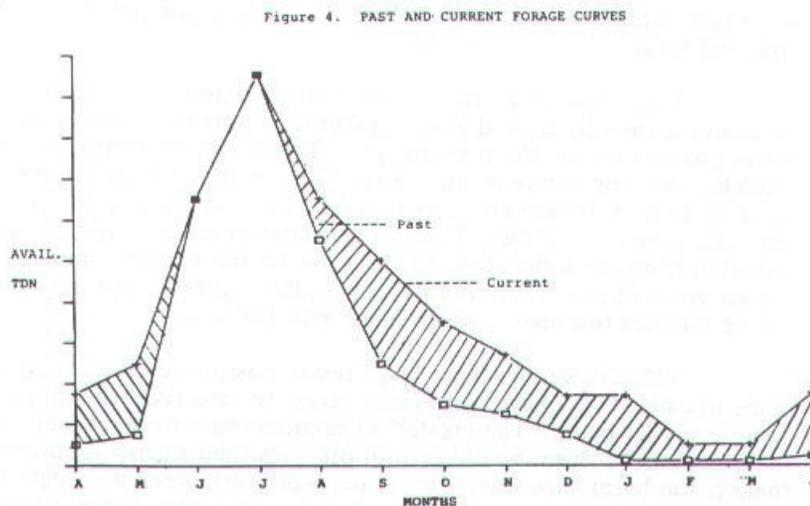
Our calves are born on the range when the plants are dormant or in slow growth and just prior to rapid growth. We minimize disturbance of the cows and calves while calving because we do not separate them as pairs and springers into different pastures. Instead, we let the cows drift onto new feed and clean up the stragglers. When rapid growth starts we move rapidly from one pasture to the next. This helps minimize re-biting of the plants and maximize the potential that the plants will recover from grazing. Any pasture that generally has poor plant recovery will be

rested the following year during rapid growth. This helps insure the health of our ranges and their production capabilities. Greater production capability reduces the variation in annual forage production.

We put the bulls in with the cows for breeding the third week of June. This time coincides with maximum range TDN. Now over 90 percent of our calves are born in 28 days. This gives us more uniform calves. The other important aspect of concentrated calving is that we can switch the men's attention to irrigation to help insure meadow production.

During the summer, we still hay but we have decreased our total needs. This, in turn, has shortened the haying season which has allowed us to re-irrigate our meadowland, which has significantly changed our forage curve. On the cut areas, the re-watering produces highly nutritious regrowth that extends our ability to provide green (high TDN) feed longer into the fall. On the uncut areas it allows the plants to stay green at the base for more nutritious fall and winter feed.

Figure 4 shows the difference (shaded area) between our past forage production curve and the current curve. The notable differences are in the spring and fall. In the spring rested crested wheatgrass and in the fall re-irrigated meadow production make up the differences between the curves.



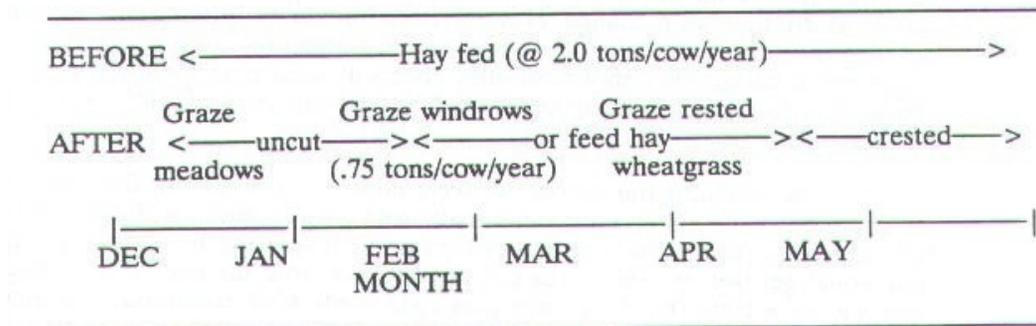
We wean the calves in mid-September and early October. Later calving and earlier weaning has decreased the total age of the calves by 33 days, but the actual weaning weight per calf has increased from 389 pounds in 1983 to 406 pounds in 1990. This and other production changes are outlined in Table 3.

Table 3. Production Changes Between 1983 and 1990

	1983	1990
Avg. Age at Weaning	200	167
Avg. Calf Weaning Weight	389	406
Gain/Day of Age at Weaning	1.55	1.95
Total Pounds at Weaning	822,000	1,141,000
Jan. 1 Cow Inventory	2590	3012
% Weaned from Jan. 1 Inventory	82	93
% Fertility	84	92
Winter Supplement Cow \$/Head	96	47
Cost/# of Calf Before G/A	.74	.54

Weaning earlier in the Fall and putting the cows on more nutritious forage allows the cows to gain and improve in body condition before the long arduous winter. This added condition has improved their ability to rustle for feed (even in snowy conditions). Normally the cows spend the early winter months in uncut meadow pastures. Later, some go onto windrowed hay and others are fed hay as necessary. In late March, the cows go to fields that have standing forage and protection to have their calves. Whenever the cows graze out and are not being fed hay we save over \$1,500/day. Table 4 contrasts past and current program to winter our cows.

Table 4. Hay Feeding/grazing Before & after Program Changes



Because we had available meadow feed we had an opportunity to stock it with yearlings during the summer. Over time we started retaining our own yearlings. This yearling program is now very advantageous to the ranch because it provides additional flexibility. We can adjust their number to match our expected forage availability without adjusting cow numbers. This class of animal is very easy to handle and move and they have a great potential to gain. In 1990, the yearlings have increased our total ranch beef production by 487,460 pounds. This production increased without us increasing our cow herd, labor, fencing, housing, equipment, or working facilities.

Yearlings have added marketing flexibilities to the ranch. We know what the value of them as calves are, what it will cost to winter them off the ranch and through experience and genetic control are able to predict their production ability. We use partial budgets, varying the prices to identify whether it would be more feasible to keep them as short yearlings, long yearlings, sale as calves, or a combination of these options. Cash flow and it's relationship to our operating interest has been an important part in choosing between these options. Partial budgets are done before the calves are weaned. After weaning, the calves go to the aftermath crop residue and a feedlot to keep them growing at about 1.5 pounds/head/day. This is done off the ranch in a much milder environment and has cost us around \$110/head/season (October-April) or around \$.40/pound of gain. Summer forage on the ranch costs us (with opportunity costs)\$\$.20/pound/head until the yearlings are shipped in the Fall.

We try to contract the calves at budgeted prices before weaning them. However, this is not critical because we have a low cost gain opportunity over a long period of time (Oct. - Oct.). This provides a broad marketing window in which to contract the calves/yearlings at prices favorable to our budget. Our experience is that at some time during this marketing period we can outperform our budgeted prices.

To summarize, we have based our operation on matching our animal requirement to our natural forage production ability. This match has dramatically increased our beef production without increases in costs. Most operators are currently doing a lot better job than we were twelve years ago and should not expect as dramatic of a change. However, one should go through the exercise of defining their forage curve and see how well it's matched to their animal requirement curve. The amount of difference will determine the cost of production. Cost control is the best hedge against the high risks inherent in our business.

By matching our curves, we have enhanced our overall flexibility. Our opportunities have increased geometrically with added flexibility. Before, we had little flexibility (high costs, few marketing options), we were like a football team that would get two or three yards on the first play from the line of scrimmage. Now we are a team that frequently gets eight yards. Our likelihood of getting a first down is greatly increased because we have numerous options to attack the defenses that stand in the way of profitability.