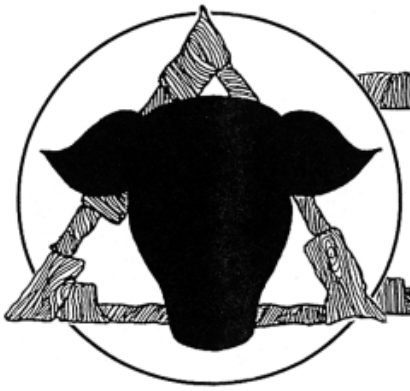

Managing for Today's Cattle Market and Beyond

Managing Your Herd's Composition

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Management decisions related to the composition of cattle on your rangeland probably impact the long-term profitability of your operation more than any other management decision. This article briefly addresses herd composition issues surrounding 1) the age cows should be culled at and whether they should be replaced or not replaced, 2) merits of fall calving, and 3) the impact of different sale weights and dates on profits.

Determining Optimal Culling Decisions

Range cow culling and replacement decisions are driven by future cow productivity, feed costs, and the current and future market value for replacements, calves, and slaughter cows. As the spread between market prices changes through time optimal culling decisions change. This article looks at how selected culling decisions would have changed from 1971 through 1995 using the culling Decision Support System (DSS) developed by Tronstad and Gum. The DSS calculates whether cows of a given age and pregnancy status should be kept or culled depending on cattle prices. Culling rules generated from this DSS are available for free to everyone with access to the World Wide Web at the address of *http://ag.arizona.edu/AREC/cull/culling.html* (note that the address is case sensitive). Click and point input into the DSS yields a graphic solution on culling recommendations that can aide ranchers making culling decisions. Culling decisions are an important part of managing your herd's composition. These decisions not only determine the age of cows on your ranch but they also have implications for managing herd size.

Management decisions considered in the culling model for each cow of a given age are: 1) Pregnancy test and replace open cows with a bred heifer now. 2) Pregnancy test and cull open cows but don't replace open cows with a bred heifer at this time. 3) Cull and don't replace now. 4) Keep and allow for breeding in six months. 5) Replace with a bred heifer immediately. 6) Keep and allow for breeding immediately. Pregnancy testing at $2/head has value in the first two management decisions but has insufficient economic merit in the last four. If pregnancy testing has value for cows of a given age then it follows that cows which test pregnant (open) should be kept (culled). A decision to cull and not replace (#3) indicates that a cow is getting old (decreased production expected) and market conditions are not conducive to maintaining or building herd size. The decision for cows to be kept and bred immediately or in six months indicates that these cows are most probably pregnant. These decisions just indicate that cows of this age should have the opportunity to be bred now or in six months in case they are open. If calving is feasible in the spring or fall, cows that are open can be productive six months earlier than with only a spring or fall calving season. Allowing for biannual calving is important to the economic viability of keeping open cows. Because the

viability of biannual calving is greatly impacted by the cost differential between spring and fall calving, this cost differential is varied when deriving optimal culling recommendations.

The herd will diminish in size whenever a decision to cull and not replace is generated from the DSS. Conversely, the herd can increase in size using the DSS by bringing additional replacements into the herd when cows 13 years of age (maximum age is 13.5 years) are recommended for "replace with a bred heifer" rather than "do not replace at this time." Increasing herd size in this manner is sound provided that production costs are still $100/head per six month feeding period, as assumed in the model. The DSS does not directly evaluate land purchase decisions for expanding herd.

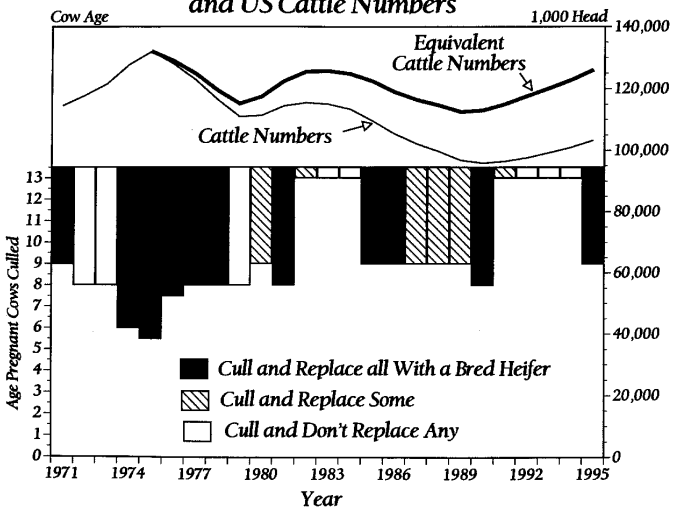
Biological factors included in the DSS model center around cow age and recent fertility. Biological productivity estimates were made from the San Carlos Apache Experimental Research Registered Hereford herd, located about 60 miles east of Globe, AZ. Range conditions are semi-arid with an elevation of approximately 5,000 feet. Estimates of cow and calf weights, plus fertility were made from individual cow records for the years from 1982 to 1989. Fertility encompasses the three basic stages of 1) conception, 2) calving, and 3) survival of calves until weaning. See the article of Range Cow Culling: Herd Performance, at *http://ag.arizona.edu/AREC/cull/culling.html* — biological factors for a more detailed description of the data. Market price relationships and the dynamic programming algorithm are also described in more detail at this web address.

Market prices for replacements, slaughter values and sale calves were considered in the analysis. Uncertainties surrounding future cattle prices complicates the culling decision. Price uncertainties were accounted for in the model by estimating historical price relationships. The model is highly dependent on current price levels, since current prices are a better predictor of where prices will be six months from now than a long-term average price. That is, the model calculates an expected value of returns six months from now utilizing current price levels and historical price movements. The model evaluates culling decisions for the months of May and November. Historical prices show sale calf prices to be lower for November than May, and this is incorporated into the analysis. Current prices and returns are weighted more heavily than distant prices and returns, due to discounting.

Recommended Culling Rules from the DSS

Figure 1 gives a sample of what the recommended culling rules from the DSS would have been from 1971 through 1995. The figure illustrates the recommended culling age and subsequent replace, replace some, or do not replace culled pregnant cows in the fall considering only a spring season calving operation. Decision rules are not directly impacted by an estimated cattle cycle length. But the rules are influenced by the relative values of slaughter cows, bred replacements, and calf prices which fluctuate as the composition and total number of cattle vary.

Figure 1. Culling Age of Pregnant Cows and US Cattle Numbers



Note: Culling Decision Rules for "Spring Only" Calving. Cattle Inventory Numbers from USDA and Cattle-Fax.

Cattle numbers are also given to illustrate how the DSS coincides with a historical build-up or drop off in herd numbers. Equivalent cattle numbers (*Cattle-Fax*) are meant to adjust for heavier carcass weights, a faster "turn over" rate, increased feeder cattle imports, and the movement of dairy steer calves into the fed beef mix. From 1985 to 1995 total cow numbers dropped by 1.44 million head or 3.11 percent. But 93 percent of this decline was from a reduction in the number of dairy cows. Overall, US beef production has increased by 6.3 percent from 1985 to 1995. Average slaughter weights have increased from 656 to 711 lbs. per carcass, an 8.4 percent increase. A faster turnover in fed cattle has also pulled more cattle forward to increase beef supplies. These factors account for the much higher equivalent cattle number for 1995 than actual numbers suggest.

Starting in 1971, the DSS recommends that pregnant cows greater than 9 years of age be culled and replaced with a bred heifer. Then as cattle numbers

increase more severe culling is recommended. The DSS indicates that pregnant cows 8 years of age and older should be culled and not replaced. Open cows and cows culled due to physical calamities are also not recommended for replacement when "don't replace any" occurs. In the fall of 1974, the real value of an 1,100 lb. slaughter cow was only $30 to $35 per head less than bred replacement prices. By the fall of 1975, cattle numbers had increased further and slaughter cow prices were higher than the price for bred replacements. Thus, the DSS recommended that pregnant cows 5.5 years of age and above should be culled. Because prices were relatively low in 1975, even 6 year old cows had a poor chance of fetching a good price for their calves in two to three years or before their productivity would start to decline (conception rate, weaning weight, odds of being culled from physical calamities or dying). A bred heifer brought into the herd at this time will have a better chance at attaining a high price for her calf when she is in her prime.

Cattle numbers were increasing in 1981 and the model indicated that pregnant cows greater than 8 years of age should be culled and replaced with a bred heifer. The rule to replace was driven by the fact that the price of slaughter cows were near or exceeded the cost of a 2.5 year old bred heifer. The following three years were followed by keeping virtually all pregnant cows and not replacing any cows culled. Although cattle numbers were relatively high and prices were generally low, the price of replacements relative to slaughter values were not conducive for replacing pregnant cows with bred heifers. The DSS rarely recommends to replace cows culled when the cost of a replacement is $100/head (1991 dollars) more than their salvage value as a slaughter cow. From 1991 through 1994 the DSS indicates that pregnant cows should not be culled until they are 13 years of age, the maximum age allowed for in the model. During this period replacement prices exceeded the salvage value of most cull cows by at least $120/head.

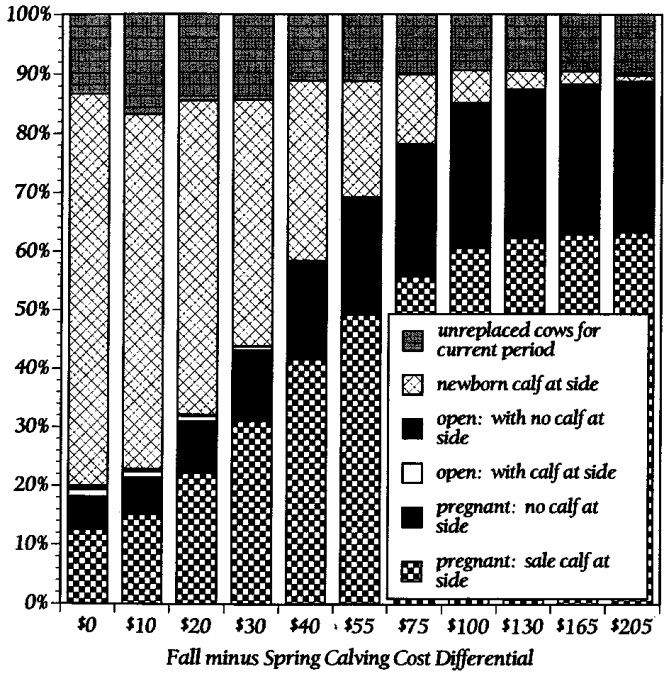
The DSS is limited in that only the "average" biological performance for an age group is considered. Clearly, some cows raise a superior calf consistently year after year. In order to help identify whether an above or below average performing cow should be culled or maintained in the herd, "cost of mistake" values are available from the DSS. For example, if the DSS indicates that pregnant cows 9 years of age and older should be culled and replaced with a bred heifer, consider the calculated one-period "cost of mistake" for keeping this cow. If the "cost of mistake" is only $5 to $10 per head then it would only make sense to keep an above average performing cow. However, if the "cost of mistake" value is over $50/head, it is very doubtful that even a superior cow will be able to raise a calf that is worth $50 more than an average cow for a given age group. The easiest way to see how simple it is to use the DSS and whether this tool can aide you in making culling decisions is to go to the web address of *http://ag.arizona.edu/AREC/cull/culling.html* (case sensitive address).

Merits of Fall Calving

As previously mentioned, open cows can be made productive six months earlier with biannual calving seasons than only a one season calving period. Thus, fall calving has economic merit for keeping open cows, provided that the cost of fall calving does not greatly exceed that for spring calving. Calving in two different seasons may also improve the demand for peak labor requirements. Income variability will be less selling calves in two different seasons and markets. But the primary reason for considering fall calving is that calf prices are historically higher in the spring than fall. Calf prices in May have exceeded November calf prices in all but 4 out of the last 25 calendar years. From 1971 through 1991, May calf prices averaged $6.96/cwt. more than November prices in 1991 dollars. These are advantages to fall calving but what is the tradeoff between higher production costs in the form of increased feed costs and/or decreased weaning weights?

Figure 2 shows what the long-term composition of a herd would be expected to look like in the fall using culling rules from the DSS and varying the cost fall calving exceeds spring calving (i.e., cost differential) anywhere from $0 to $205 per year. When the cost of fall and spring calving are equal, fall calving makes up almost 80 percent of all cows in order to take advantage of higher spring calf prices. Spring calving still exists to take advantage of biological and market opportunities. Cows that are open and culled due to physical calamities can be productive 6 months earlier and market conditions which favor buying replacements in the fall can be taken advantage of. Although most ranchers raise their own replacements, the economic cost of bringing a replacement into the herd is the foregone market value of what a replacement heifer can be sold for rather than the feed and associated costs of raising a replacement. For this reason, the DSS keys off of the market value of replacements.

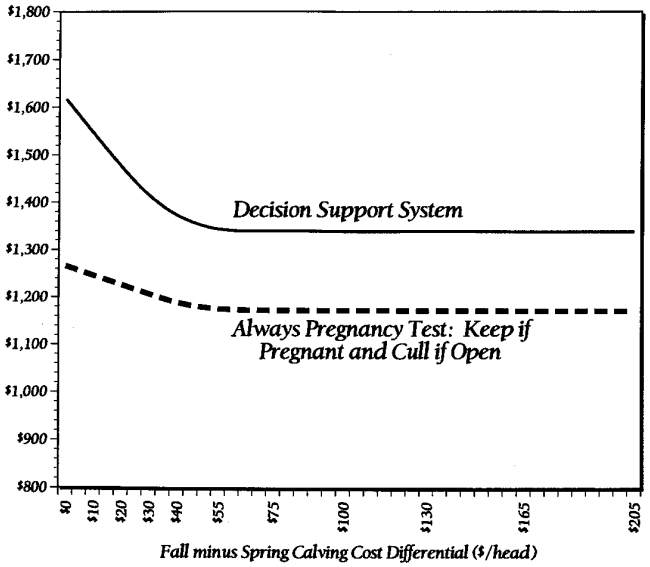
Figure 2. Herd Composition in the Fall



The DSS indicates that on average about 10 percent of the herd will not be replaced with a bred heifer in the fall. For "cost differentials" that are below $55, many of these "vacancies in the herd" will be replaced with a bred heifer in the spring. But for the calving cost differential of $205, bringing a bred replacement into the herd in the spring is not an economically viable option. If a ranch could support 100 cows, the 10 percent average herd vacancy indicates that a ranch might have 95, 75, 90, 100, and 90 cows in a 5 year period. But it is very important to note that the DSS calculates a reduction in feed and production costs of $100/six months for not carrying these cows. If all feed and associated production costs are fixed then the above ranch would run nearly 100 cows year after year. Keep in mind that production costs are not entirely fixed if forage or future fertility can be carried over from one year to the next.

Figure 3 gives the discounted present value of returns for an average slot in the herd after 20 years. Values portray current and future returns of existing cows plus the future returns of the cows they are replaced by. These present value numbers could be used to evaluate how much one could afford to pay for a ranch (per animal unit) with the cows included, assuming the above production costs of around $100/six months. The strategy of following the DSS is compared in figure 3 to a more traditional strategy of pregnancy testing all cows and culling only those that are open. The later strategy has a fixed annual herd size. Results indicate that the DSS would increase returns by $351 or 28% when fall and spring calving costs are

Figure 3. Present Value of Culling Strategies



equal. If the cost of fall calving exceeds spring calving by $205 (i.e., spring only calving), the DSS would increase returns by 14% or $168. The DSS generates about twice the percentage increase in returns when biannual calving is viable because more "buy low" and "sell high" opportunities can be capitalized on.

Sale Weight versus Calf Numbers

The tradeoff between sale weight and calf numbers is complicated by the fact that the price spread between light and heavy calves can vary dramatically from year to year. Variability in rainfall and subsequent forage from year to year also complicates the tradeoff between sale weight and calf numbers. To gain some insight into this tradeoff, the profitability of different sale weights and calf numbers from 1980 through 1993 were compared using prices and representative range conditions from Arizona. Target steer calf sale weights of 350, 450, 550, 650, and 750 pounds were compared. For the number of days it took calves to go from 450 to 550, 550 to 650, and 650 to 750 pounds, .5, .6, and .7 AUMs of forage, respectively, were charged for these heavier weaning weights. The charge was made by reducing total cow numbers, which reduces the number of calves available for sale.

Spring and fall calving operations were also compared in the analysis. All sales were either made in mid-May or mid-November. Birth dates for November sales were calculated by using daily gain rates of 1.5 lbs./day for weights from birth to 450 lbs. and 1.75 lbs./day for weights from 450 to 750 lbs. Daily rates of gain were reduced by 10% for May sale dates. Depending on when the calf was born and sold, supplementation varied from 0 lbs. (350 and 450 lb. sales in

November) to 400 lbs. (750 lb. sale weight for May) in order to attain the above rates of daily gain. These average annual supplement costs varied from $0 to $51.28, respectively. The retail cost of a 50% corn meal and 50% cottonseed meal mixture was charged for supplement. Another expense item that varied with different sale date and weight options was the opportunity cost of money. That is, calves sold at 750 lbs. could have been sold at an earlier weight. If a calf had been sold at say 450 lbs., interest could have been earned on this money by placing it in the bank or against an operating loan. Expenses for all other items were the same for all sale weights since cow numbers were reduced appropriately (AUM rate above) to account for heavier calf weights. Details of the analysis are given in Gao.

Figure 4. Relative Return of Strategies

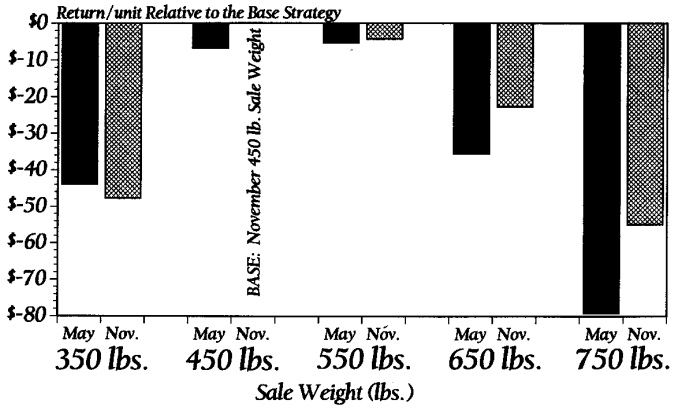


Figure 4 gives the relative average annual return from following the different sale date and weight combinations. November sales of 450 lb. calves generated the highest return under the assumptions outlined above so all other returns are compared to this strategy. Sale weights of 450 and 550 pounds for both May and November sales were at the top and differed by less than $7 per unit. Although the highest average calf price was for light 350 lb. calves, this higher price did not offset the lighter sale weight. As sale weights exceeded 550 lbs., the benefit of higher sale weights was more than offset by a decrease in price and decline in the number of calves and cull cows sold. The difference in return from May sales was anywhere from $1 to $24 per unit less than November sales for the same weight. Under the assumptions made, seasonal differences appear to have less of an impact on profits than sale weights. These results also indicate that heavier sale weights alone are most likely not your answer to increasing ranch profitability or minimizing red ink.

In summary it is important to note that a flexible sale date and weight combination could have easily generated more net return than the "fixed strategies" above. A strategy that would take advantage of market opportunities for buying replacements when they are cheap or feeding calves to a heavier weight when corn prices are high and forage is available would outperform the best "fixed strategy" of always selling 450 lb. calves in November. Staying in tune with market conditions and available resources is key for becoming or maintaining your status as a low cost producer. The days of maintaining the same fixed herd composition year after year and surviving as a cow-calf operation may be gone.

References

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