Financial Returns from Different Grazing Management Systems in New Mexico

Jerry L. Holechek

The cost/price structure for cattle ranching has changed considerably between the 1950s and the 1990s. Generally real cattle prices adjusted for inflation have declined while ranching costs have increased since the early 1980s (Holechek et al. 1994).

Information has been lacking on the financial outcomes of different grazing management systems on the semi-arid ranges of central and eastern New Mexico. A 10 year study by Pieper et al. (1991) evaluated cattle and range vegetation responses to moderate continuous, heavy continuous, and four-pasture-1 herd grazing strategies on blue grama range in the central mountains of New Mexico. This study and ranch budgets routinely reported by the New Mexico Agricultural Experiment Station over several years provide the opportunity to evaluate financial returns from different grazing management strategies under inflationary, disinflationary, and price-stable economic conditions as measured by the consumer price index. Periods of all three of these conditions have characterized the United States economy since 1970.

Methods

The study used for analysis was conducted on the Fort Stanton Experimental Range between 1970 and 1979 with cattle (cow-calf) (Pieper et al. 1991). Rangeland and cattle production characteristics for the three strategies for the 10 year period are provided in Table 1. The vegetation is characterized by pinyon-juniper woodland interspersed with shortgrass prairie grassland. Primary forage species on the pastures are blue grama, sideoats grama, wolftail, and ring muhly. Major trees are one seed juniper and rocky mountain pinon-pine. Wavyleaf oak is the main shrub. The heavy continuous and four pasture treatments were stocked at 125% the rate used on the moderate continuous pasture. Grazing use on the moderate-continuous pasture averaged about 40-45% compared to 60-65% on heavy continuous and the four rotation pastures. Cows on all treatments were fed cottonseed meal pellets at a level of about 1 pound per day from January 1 until green forage was available in late spring. Total supplemental feed costs were about $20 dollars per animal unit per year. In two years (1974 and 1975) the heavily grazed continuous pasture had to be completely destocked due to lack of forage caused by drought. During the spring and early summer of 1974 alfalfa hay was fed for about 100 days on the moderate continuously grazed pasture due to drought. The feeding costs per day per animal unit were $1.11 in 1978, $1.30 in 1986, and $1.89 in 1990. No hay was fed on the rotation pastures in the 1974-1975 drought.

Table 1. Rangeland and cattle production characteristics for different grazing management strategies on the Fort Stanton Range in New Mexico.

	Fort Stanton Experiment Range - Cow/calf operation		
	Moderate Continuous	Heavy Continuous[1]	Best Pasture Rotation
Duration of study (years)	10	10	10
Average annual ppt (inches)	15	14.8	15.1
Average forage production, lbs/acre	740	607	819
Total palatable forage production in 1974, lbs/acre	235	103	379
Range condition	good	fair	good
Acres/animal unit	67	54	54
Forage use %	40-45	60-65	60-65
Calf crop %	92.6	91.3	84.6
Calf weaning wt., lbs.	435.0	425.0	406.0
Average calf wean wt./acre (lbs	6.2	7.0	6.4
Death losses, %	< 2%	< 2%	< 2%
Supplemental feed cost ($/animal unit)[2]	20	20	20

[1]Grazing had to be discontinued 2 out of 10 years due to lack of forage.
[2]Cows received about 1 lb. cotton seed meal pellets per day from January until late May/early-June depending on green feed availability. The supplement cost about 11¢/lb. on average.
Source: Pieper et al. 1991

Economic analyses were conducted using budgets for medium sized (250 animal unit) cow-calf ranches operated on 16,750 acres of land in the central mountains of New Mexico for 1978, 1986, and 1991. Livestock prices and budgets are given in New Mexico Agricultural Experiment Station reports and are summarized in Tables 2 and 3. Annual cattle costs for the heavy continuous and best pasture rotation treatments were based on a 10 year loan at 10% interest for the 1986 and 1991 periods and 12% interest for the 1978 period. This type of financing was also used for the extra fence used in the best pasture rotation system. Fence was considered to cost $1,000/mile in 1978, $1,200/mile in 1986 and $1,500/mile in 1991.

Returns from the heavy continuous grazed pasture were adjusted for the two drought years when it had to be destocked due to lack of forage. Here it was assumed the rancher was able to break even by selling his cattle and later repurchasing his cattle. It is recognized this might not be a valid assumption. In most cases the rancher would

Author is with the Department of Animal and Range Sciences, New Mexico State University, Las Cruces, NM 88003
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Table 2. Weights (lbs.), numbers, and prices ($/CWT) for cattle sold from three different grazing management strategies in the central mountains of New Mexico.

Livestock type	$/CWT 1978	$/CWT 1986	$/CWT 1991	Sale Weight (lbs.) Moderate cont.	Sale Weight (lbs.) Heavy cont.	Sale Weight (lbs.) Best Past. rotat.	Sale Numbers Moderate cont.	Sale Numbers Heavy cont.	Sale Numbers Best Past. rotat.
Calves	64.00	60.00	90.00	435	425	406	204	248	230
Cull bulls	35.21	44.00	62.00	1500	1466	1400	3	4	4
Cull cows	35.21	35.00	50.00	950	928	887	24	30	30

probably have to repurchase the cattle for a higher price than which he sold them. Net income and variable costs were eliminated for the two drought years (10 years total), but fixed costs were kept in the budget. Returns from the moderate continuously grazed pasture were adjusted for the 100 day hay feeding period in 1974.

Results

When data were averaged across periods and adjusted for extra cattle, fence, hay feeding, and drought costs, the annual net returns were about 16% higher for moderate continuous than heavy continuous grazing (Table 4). Moderate continuous grazing gave about 10% higher returns than the best pasture rotation system. Financial outcomes were also influenced by cattle costs, fencing costs, and drought. Stage of the business cycle had only a small influence on the financial outcomes from the three grazing strategies.

Total 10-year accumulated value using the 1981-1991 period from sale of cattle, purchase of extra cattle, and construction of fence was 8% higher for moderate compared to heavy continuous grazing (Table 5). However moderate continuous had only a 2% higher total return than the best pasture rotation grazing system.

Heavy versus Moderate Stocking

These results are consistent with other studies reviewed by Holechek (1993) in showing that on a short term basis (3-5 years) heavy grazing can be profitable if precipitation is near or above average. However, in the long run (5 or more years) heavy grazing is financially unsound because lack of forage from drought and deteriorating range conditions coupled with poor livestock performance cause heavy financial losses (Shoop and McIlvain 1971).

Heavily grazed shortgrass ranges produce less forage during drought than those moderately grazed (Table 1) (Holechek 1993). Further they recover more slowly after drought. Generally as aridity increases the above situation is accentuated. In the humid range types such as the tall grass prairie and southern pine forest, droughts are generally less frequent and severe than in the shortgrass prairie or Chihuahuan desert. In arid and semiarid regions, precipitation drives vegetation successional advance. Humid ranges receiving over 20 inches annual average precipitation degrade slowly and recover quickly when grazing pressure is reduced (Drawe 1988). Just the opposite occurs in the desert ranges of the Southwest where precipitation averages under 14 inches per year (Holechek 1991).

Variable versus Fixed Stocking

Some ranchers find it tempting to increase their stocking rates during the bottom of the business cycle when cattle prices and interest rates are low. The plan here would be to partially destock after 2-4 years when cattle prices peak along with other commodities during the inflationary phase

Table 3. Annual budgeted costs and returns for the average medium sized (250 AU) cow-calf ranch in the central mountains of New Mexico in 1978, 1986, and 1991.

Cost type	1978[4] MC[1]	1978[4] HC[2]	1978[4] BPR[3]	1986[5] MC[1]	1986[5] HC[2]	1986[5] BPR[3]	1991[6] MC[1]	1991[6] HC[2]	1991[6] BPR[3]
				Total $ Gross Return					
Calves	56,793	67,456	59,763	53,244	63,240	56,028	79,866	94,860	84,092
Cull bulls	1,584	2,065	1,972	1,980	2,580	2,464	2,790	3,636	3,472
Cull cows	8,028	9,802	9,369	7,795	9,744	9,314	11,400	13,920	13,305
Total	66,405	79,323	71,104	63,019	75,564	67,806	94,056	112,416	100,869
				Production Costs ($)					
Variable costs	12,192	15,625	15,625	18,704	23,380	23,380	24,260	30,082	30,082
Fixed costs	12,215	12,215	12,215	12,018	12,018	12,018	18,640	18,640	18,640
Total costs	24,407	27,480	27,480	30,722	35,398	35,398	42,900	48,722	48,722
Net Ranch Income	41,998	51,843	43,624	32,297	40,166	32,408	51,156	63,694	52,147

[1]No adjustment for 1,000 days of hay during drought in 1974.
[2]No adjustment for extra cattle cost or the 2 drought years during the 10 year study the pasture had to be completely destocked.
[3]No adjustment for extra cattle or fence.
[4]Calculated using 1978 cost/price structure for central mountain ranches provided by Gray et al. 1980.
[5]Calculated using 1986 cost/price structure for central mountain ranches provided by Torell et al. 1990.
[6]Calculated using 1991 cost/price structure for central mountain ranches provided by Torell and Word 1993.

Table 4. Financial returns from different cattle grazing management strategies in the central mountains of New Mexico.

	Moderate Continuous	Heavy Continuous	Best Pasture Rotation
Financial Returns - No adjustment for extra cattle, fence, hay feeding in drought or destocking in drought			
1974-1979 Net Return acre, $	2.51	3.10	2.60
1981-1986 Net Return acre, $	1.93	2.40	1.93
1987-1991 Net Return acre, $	3.05	3.80	3.11
Financial Returns - Adjusted for extra cattle, fence, hay feeding in drought, and destocking in drought costs			
1974-1979 Net Return acre, $	2.39	2.12	2.31
1981-1986 Net Return acre, $	1.78	1.55	1.56
1987-1991 Net Return acre, $	2.86	2.39	2.53
Average Net Return acre, $	2.34	2.02	2.13

of the cycle. Based on studies from prairie rangelands this strategy has merit with yearling cattle (Torell et al. 1991). Generally heavy stocking is most profitable under inflationary conditions (high cattle prices) while disinflation or deflation in the economy favors conservative stocking. On shortgrass ranges brief periods (2-4 years) of heavy stocking if not extreme (50-60% use) are not damaging if followed by a similar period of conservative stocking (25-40% use) (Klipple and Bement 1961).

Table 4 shows that application of heavy stocking rates was financially most advantageous when cattle prices were highest (1987-1991) without drought and adjustment for extra cattle costs. However, when drought and extra cattle costs are thrown into the analysis, the moderate continuous strategy gives the highest financial returns for all three periods. Therefore, the benefits versus the risk (drought) of variable over fixed stocking at a moderate rate appear doubtful with cow-calf operations. Martin (1975) reported similar findings for cow-calf ranches on semi-desert grassland ranges in Arizona. He found net returns obtained by increasing stocking rate 120, 130, and 140% of the average were only \$1 to \$2 greater per animal than for constant stocking at a moderate or conservative rate.

Drought is the biggest risk associated with the variable stocking strategy. Severe drought can be expected in about 1-2 years out of every 10 in the shortgrass type based on climatic records. The drought years are often clustered together. Key considerations for the rancher would be how many years since the last drought and are there financial resources to survive a worst case scenario (drought and low cattle prices). In the early 1980's drought in combination with low cattle prices resulted in nearly 40% of the ranches in New Mexico being listed for sale (Torell and Fowler 1985).

Torell et al. (1991) working with yearling cattle on midgrass prairie in eastern Colorado found a 24% increase in returns was possible with variable compared to fixed stocking. However, the yearling operator has more capability to adjust cattle numbers if drought occurs than the cow/calf operator.

Another question that comes up is how does a rancher detect bottom and tops in the business cycle. The key here is the Federal Reserve which controls the nation's banking system. In most cases time to sell cattle is when the Federal Reserve starts tightening interest rates (The Federal funds rate and the discount rate) to control inflation (Holechek et al. 1994). Conversely cattle prices generally bottom after an extended period of Federal Reserve tightening to control inflation such as in the middle 1970's and again in the middle 1980's. Cattle prices are also affected by cattle numbers, trade laws, real interest rates, prices of foreign beef, and grain prices (Holechek et al. 1994). Not many ranchers will have the financial skills to pin point exact turning points in cattle prices. Heavily leveraged ranchers who buy too soon can be quickly put out of business if they load up with cattle and prices continue to fall. Therefore a conservative gradualist approach to playing the business cycle will be most prudent. Poorly capitalized ranchers lacking in financial skills are advised to stick with moderate stocking.

Rotation versus Continuous Grazing

Some rotation grazing schemes have shown promise for sustaining higher stocking rates and improving range condition at the same time. This promise was fulfilled with the best pasture rotation grazing strategy (Table 1). However, most ranchers would have to purchase cattle and fence with this approach. The question then becomes is the reward worth the risk? Table 4 shows the best pasture grazing scheme adjusted for extra cattle and fence costs gave lower returns than moderate continuous grazing in all three periods (1978, 1986, 1991). Even if the rancher did not have to incur fence costs, the moderate continuous strategy still gives the highest financial returns.

The best pasture rotation scheme will be most advantageous to the rancher already heavily stocked who believes there will soon be an upturn in the business cycle and a subsequent increase in the value of his or her cattle. The rotation scheme would reduce some of the risk of drastic forage production decline from drought but would probably lower calf crops and weaning weights compared to continuation of heavy continuous grazing.

Part of the lower cattle performance from the best pasture rotation scheme in the Fort Stanton study is undoubtedly due to the 25% increase in stocking rate that was used with it compared to the moderate continuous pasture. The

Table 5. Total 10 year accumulated financial value (1981-1991) from different cattle grazing management strategies in the central mountains of New Mexico after adjustment for extra cattle, fence, hay feeding in drought, and destocking in drought costs.

	Moderate Continuous	Heavy Continuous	Best Pasture Continuous
Sale of livestock (\$)	383,575	329,976	342,538
Extra Cattle (\$)	0	28,768	24,497
Fence (\$)	0	0	15,345
Total	388,575	358,744	382,380

rancher who built fence and increased stocking on a gradual basis would be most likely to benefit from the best pasture rotation scheme. Here cattle and fence costs would be spread over several years and stocking rates could be increased in accordance with forage supplies.

It is important to recognize that the best pasture rotation system becomes the most profitable of the three strategies at the end of 10 years when extra cattle and fence costs no longer occur. This strategy appears quite sound for ranchers with a 10-30 year investment time frame.

Implications

Moderate continuous grazing appears more profitable and less risky than heavy continuous grazing or best pasture rotation grazing on shortgrass range in the central mountains of New Mexico. This was true under rising, falling, and stable cattle prices. Heavy grazing was financially unsound in the long run because of financing costs for extra-cattle and periodic destocking due to lack of forage in drought. Moderate continuous grazing resulted in fairly stable range condition rated good using the ecological climax approach. Heavy continuous grazing lowered both range condition and forage production compared to moderate continuous grazing.

Best pasture rotational grazing at a 25% higher stocking rate than moderate continuous grazing was financially unsound on a short term (10 year) basis because of reduced cattle performance and the financing costs associated with extra cattle and fence. However, this system improved range condition and increased forage on the pastures where it was applied compared to moderate and heavy continuous grazing. It could be useful as a range improvement tool particularly if stocking rates were increased gradually as range condition improved. Further it is financially effective for ranchers with long term (10-30 years) investment time frames.

Variable stocking to take advantage of the business cycle has been financially advantageous with yearling cattle on prairie ranges. However, the low reward relative to the risk makes this a questionable practice for cow-calf operations under semi-arid and arid conditions.

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