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AN ECONOMIC COMPARISON OF YEAR ROUND VS CONVENTIONAL GRAZING SYSTEMS IN IOWA

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AN ECONOMIC COMPARISON OF YEAR ROUND VS CONVENTIONAL GRAZING SYSTEMS IN IOWA

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Abstract

Year round grazing systems that utilize stockpiled forage and/or crop residue are often promoted as a way for Northern and Western cow-calf producers to reduce winter feeding costs and improve overall profitability. This study compared the profitability of a conventional spring calving/summer grazing-winter drylot herd to a year round system that utilized both spring- and fall-calving herds with weaned calves retained as stockers. Forage supplies in the year round system were derived from stockpiled forage and corn crop residues. We developed a model that randomly generated production values with parameters based on the results of a 3-year study conducted at the Iowa State University McNay Research and Demonstration farm near Chariton, Iowa. The simulated production values were combined with livestock and forage prices prevailing from 1993-2001 to estimate income per head generated by each system. Average income over the nine-year period was equal. However, the year round system was economically superior in 3 years, equivalent in 1 year, and inferior in 5 years.

Introduction: Harvested winter feed has long been recognized as a major cost for cow-calf producers. Consequently, substantial research effort has focused on reducing winter feed costs. Extended grazing systems have been the most common area of focus (Adams et al. 1994, Adams et al. 1996, May et al. 1999, Prevatt et al. 2001). Although numerous studies have generated promising results, the technical and economic feasibility of an individual grazing system depends on local climate and forage production characteristics. Few studies have applied their results to Iowa and the Western Corn Belt. To help fill this void, Janovick et al. (2002) initiated a three year experiment near Chariton, Iowa in 1998 comparing the production characteristics of two alternative grazing systems: 1) a year round system (YRG) that utilized stockpiled forage and corn crop residues, and 2) a conventional system (CG) that primarily utilized harvested hay as the winter feed source. The year round system was comprised of spring- and fall-calving herds, whereas the CG system used only a spring-calving herd. To achieve a seasonal forage balance, the YRG required 25% more land to support the same number of cows as CG, as the YRG system utilized two herds. Calves born into the YRG were backgrounded after weaning during winter and stocked on pasture in the summer to help utilize excess forage growth in pastures. CG was comprised entirely of spring calving cows that were wintered in a

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drylot and fed hay. Calves were removed from the system at weaning. The objective of this study was to compare the economic outcome of these two systems.

Materials and Methods: A model was developed that compared income per head generated by each system for the 9-year period from 1993-2001. Livestock prices were from the Oklahoma City Auction Market. Production costs included in the model were specified in nominal terms (not adjusted for inflation). Hay was valued at the estimated harvest cost, ranging from $18 to $24 per ton each year (Edwards et al. 1993-2001a). Land was valued at the per acre lease rate for improved pasture in South Central Iowa (Edwards et al. 1993-2001b). For the backgrounding/stocker enterprise, veterinary costs totaled $14 per head, and $0.20 per head per day was charged to cover additional labor and facilities. Interest on the value of the breeding herd and weaning value of retained calves was charged at a rate of 8.5%.

Since YRG calves were retained up to one year, an economic comparison would likely be sensitive to the status of the cattle price cycle. Generally, periods of upward trending prices favored YRG and downward trending prices favored CG. The experiment described in Janovick et al. (2002) was conducted during the contraction phase of the cattle inventory cycle, when calf prices were trending upward. To represent both expansion and contraction phases, the economic model was expanded from the three-year experimental period to a nine-year period beginning in 1993. Production values were randomly selected for each year with the parameters derived from the experiment. Table 1 lists the stochastic variables included in the model. Each variable was modeled with a uniform probability distribution. The minimum and maximum parameters assigned to each variable are listed in the last two columns of the table. Table 2 shows the economically relevant production variables derived from the stochastic variables listed in table 1. The random variable parameters in table 1 were calibrated to ensure the distribution of the variables in table 2 were consistent with the outcome of the experiments. The model ran 100 iterations, effectively creating 100 production scenarios for each year.

In the winter-feeding program under CG, the model deviated from the experiments. On average, each cow in the conventional system consumed 1.8 and 1.9 additional tons of hay compared to the spring and fall calving cows in YRG, respectively. The experimental design, however, prescribed the CG cows to be placed in the drylot in November through March. In contrast, the spring calving cows in the YRG grazed corn stalks for 90 days during this period. Realistically, corn stalks available to YRG cows would also be available to CG cows. Consequently, an economic model patterned strictly after the experimental design arguably offers an unfair advantage to YRG. To make a more equitable comparison, the model was modified to allow the cows in the CG to spend 90 days on corn stalks, thereby reducing average annual hay consumption to an estimated 3,200 lbs per cow (difference between the amount fed to the spring calving YRG and CG cows during the crop residue phase of the winter forage system).

Results and Discussion: Table 3 presents the income per head comparison between YRG and CG. The mean, minimum and maximum labels in the row headings refer to the range of results from the 100 iterations or random "production scenarios." The table values, denominated in dollars per head, were computed by subtracting the outcome of the conventional system from the outcome of the year round system. Consequently, positive values favor YRG and negative values favor CG. In three of the nine years, 1996, 1999, and 2000, YRG was clearly superior. In 1998, the two systems were equivalent. In the remaining five years, CG was superior. Consistent with a priori expectations, YRG was more profitable during the contraction phase (1996-2001) than the expansion phase (1993-1995) of the cattle cycle. The nine-year average income criteria suggest the two systems were approximately equivalent.

The overall impact was divided into of four categories: 1) harvested feed costs, 2) the backgrounding/stocker enterprise, 3) land costs, and 4) converting half the herd to a fall calving cycle. The year-to-year variation in overall profitability was driven primarily by the stocker enterprise. The stocker enterprise was profitable all three years that overall per head income levels favored YRG, and unprofitable in four of the five years income per head favored CG. The stocker profitability extremes ranged from $-114 per head in 1994, to $166 per head in 1996. The impact of the other three categories was relatively stable over the nine-year period. Hay and land costs typically offset each other as hay costs ranged from $24 to $37 per head in favor of YRG, while land costs ranged from $25 to $28 per head in favor of the CG.

Generally, economic outcome of YRG was mixed. The data clearly suggests the backgrounding/stocker enterprise was primarily responsible for the years YRG was less profitable than CG. Consequently, a natural extension of this research would be to consider alternatives to the backgrounding/stocker enterprise used in the experiment. For example, the marketing objective in the experiments was to sell the stocker calves when excess forage was utilized. Basing market-timing decisions on price outlook rather than remaining forage supplies may yield more consistent profits. Another alternative could be to sell the spring born calves at weaning and market the surplus forage as hay rather than as feeder calves. This strategy, however, would require the operation to be located in an area with an active hay market. The impact of these strategies on the seasonal forage balance and overall profitability needs further investigation.

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Table 1. Variables defined in the model as stochastic, individual yearly outcomes from the experiment, and the assigned parameters of the probability distribution.

	Year of Study			Model Parameters	
	1	2	3	Low	High
Weaning WPDA[a] Fall Calves (lbs)	NA	2.56	2.62	2.40	2.70
Weaning WPDA Spring Calves (lbs)	3.08	3.01	2.61	2.60	3.10
Weaning Date Fall Calves	Mar 3	Mar 2	Jan 17	Feb 10	Mar 10
Weaning Date Spring Calves	Oct 28	Oct 18	Oct 26	Oct 1	Nov 1
Pasture Turnout Date	Apr 22	Apr 26	May 2	Apr 15	May 15
Days on Pasture (Stocker Calves)	105	98	99	90	120
Drylot ADG Spring Calves (lbs)	0.96	1.04	0.98	0.80	1.10
Drylot ADG Fall Calves (lbs)	1.77	1.48	1.38	1.23	1.69
Pasture ADG Spring Calves (lbs)	1.29	1.54	1.27	1.10	1.51
Pasture ADG Fall Calves (lbs)	1.49	1.40	0.88	1.00	1.38
Hay Fed: YR Fall Calving (lbs/hd)	924	0	2,334	868	1,303
Hay Fed: YR Spring Calving (lbs/hd)	1,373	0	2,411	1,008	1,513
Hay Fed: Conv. (lbs/hd)[b]	4,732	4,720	5,307	2,566	3,850

a. WPDA refers to Weight Per Day of Age.

b. Hay consumption for the conventional system was modified from the experiment to allow the cows access to corn stalks for a time period consistent with the spring calving cows in the year round system.

Table 2. Economically relevant production variables derived from a combination of random variables from table 1.

Variable	
Weaning weight (W)	= WPDA * (Weaning Date- Birth Date[a])
Placement Weight (S)	= W + ADG_{drylot} * D + $ADG_{pasture}$ * Days on Pasture
Drylot Days (D)	= Turnout Date – Weaning Date
Hay Fed to Drylot Calves	= D * Daily Hay Ration[b]
Concentrate Fed to Drylot Calves	= D * Daily Concentrate Ration[c]

a. Birthdates were assigned a constant date each year: fall calving September 2, and spring calving on April 15.

b. Hay was fed at a rate of 15 lbs per day to the spring calves and 10 lbs per day to the fall calves.

c. Concentrate was fed at a rate of 2 lbs per day to the spring calves and 3 lbs per day to the fall calves.

Table 3. Overall and itemized income per cow comparison of the alternative grazing systems (Year Round –Conventional).

	1993	1994	1995	1996	1997	1998	1999	2000	2001	Mean
	-----------------------------				Dollars Per Head				----------------------------	
Overall Impact[a]										
Average	-31	-104	-47	138	-31	0	93	50	-56	1
Minimum	-73	-152	-85	79	-79	-42	35	-6	-113	-49
Maximum	12	-62	13	173	24	55	165	100	-8	52
Hay Costs										
Average	31	31	31	31	31	31	31	30	30	31
Minimum	37	37	37	37	37	37	37	37	36	31
Maximum	24	24	24	24	24	24	24	24	24	31
Backgrounding/Stocker Enterprise[b]										
Average	-7	-114	-78	166	17	-10	123	67	-43	14
Minimum	-55	-172	-130	127	-22	-64	73	8	-109	-37
Maximum	38	-61	-24	216	82	38	186	119	-2	73
Land Costs										
Average	-29	-29	-31	-31	-32	-33	-34	-33	-34	-30
Minimum	-29	-29	-31	-31	-32	-33	-34	-33	-34	-32
Maximum	-29	-29	-31	-31	-32	-33	-34	-33	-34	-32
Accrual Inventory Adjustment[c]										
Average	-25	10	28	-29	-49	8	-30	-11	-8	-12
Minimum	-60	-33	-21	-64	-83	-43	-71	-59	-49	-54
Maximum	14	56	59	2	-11	56	15	54	34	31

a. Overall impact refers to the total combined impact to the remaining four categories in the table.

b. The backgrounding/stocker enterprise category refers to the additional income generated by retaining the calves in the year round system through the backgrounding and stocker phase.

c. Accrual inventory adjustment accounts for the weaned calf value differences between the spring calving cows in the conventional system and the fall calving cows in the year round system.