Stocker Cattle Ownership vs. Contract Grazing: a Comparison of Risk-Adjusted Returns

John D. Anderson, Curt Lacy, Charlie Forrest, and Randy Little

Selected Paper
Southern Agricultural Economics Association
Annual Meeting
Mobile, AL
February 2 – 5, 2003

Abstract:
Stocker cattle ownership is compared to contract grazing using stochastic simulation. Returns are evaluated for both cattle owners and caretakers in contract grazing agreements. For caretakers, contract grazing is significantly less risky than cattle ownership. For cattle owners, contracting reduces risk only slightly while significantly reducing expected returns.

The authors are Assistant Extension Professor, Department of Agricultural Economics, Mississippi State University; Assistant Professor, Department of Agricultural Economics, University of Georgia; Extension Professor, Department of Agricultural Economics, Mississippi State University; and Professor, Department of Agricultural Economics, Mississippi State University.

Stocker Cattle Ownership vs. Contract Grazing: a Comparison of Risk-Adjusted Returns

With a temperate climate, abundant forage, and an extensive marketing infrastructure, the Southeastern U.S. is well-suited to beef cattle production. Traditionally, most beef operations in the southeast have been oriented toward cow/calf production, with calves being sold at or shortly after weaning; however, grazing stocker calves has also been an important enterprise for a significant number of producers.

Statistics on the size of the southeastern stocker grazing/backgrounding industry are not readily available. In any case, the stocker industry is likely not as large as it could be. Each fall, thousands of southeastern calves are shipped to wheat pastures and feedlots in the High Plains. Table 1 provides some evidence regarding the extent of stocker grazing/backgrounding activities in the Southeast. It appears from the information summarized in this table that in most southern states a relatively small percentage of calves (other than perhaps replacement heifers) remain on the farm post-weaning. For example, the number of stocker/feeder steers and heifers on farms in Florida on January 1, 2002, represented just over 5% of the previous year's calf crop. For Virginia, that percentage was 34%, the highest for the 11 southeastern states reported here.

Stocker grazing/backgrounding represents a relatively simple means of adding value to calves; however, it is a value-adding opportunity that many producers may not view as attractive for a number of reasons. Cash flow obligations may compel some producers to sell calves at weaning; other producers may lack access to capital required to purchase calves. Producers may also view grazing/backgrounding as too risky—particularly if money must be borrowed to purchase calves or if loan payments must be deferred to retain calves.

In view of the capital constraints facing many producers, contract grazing of stocker calves is a production alternative that may have much appeal in the Southeast. Under this

system, a cattle owner contracts with a caretaker to graze cattle on pasture that is owned or leased by the caretaker. This paper will examine the advantages and disadvantages of contract grazing in the Southeast. The objective of this paper is provide information to cattle and pasture owners that will assist them in making contract grazing decisions. Specifically, this paper will examine various contractual arrangements and grazing fee rates from the perspective of both the cattle owner and the pasture owner. The impact on returns over variable costs for each of these parties under different contract terms will be calculated. The effect of risk on grazing decisions will be accounted for in the analysis by calculating certainty equivalents for both cattle and pasture owners assuming varying degrees of risk aversion.

Use of Contracts in Livestock Production

The use of contracts in livestock production has been widespread since the 1950s. Contracting has undoubtedly been more common in the poultry industry than in the beef or pork industries; however, contract pork production has increased dramatically over the past decade. Contracting in the beef industry has been less prevalent than in either the pork or poultry industries, though the practice in the fed cattle sector has fostered a great deal of debate (e.g., see Ward et al.).

Contracts can be classified as one of two general types: marketing contracts or production contracts. A marketing contract represents an agreement between a contractor (buyer) and a producer (seller) that establishes a price (or method for determining price) and other terms and conditions under which a product will be exchanged. Production contracts establish which inputs into the production process will be provided by the contractor and which will be provided by the producer. The contractor also specifies how the producer will be compensated for his contribution to the production process.

Johnson et al. examine the use of contracts by farmers using data from USDA's farm costs and returns survey. They found that in 1993, only 2% of cattle farms used either marketing or production contracts. The value of production under both types of contract represented 23% of the value of production on these farms. By contrast, nearly 89% of poultry farms used contracts, and some type of contractual arrangement covered 86% of the total value of production on poultry farms. Summarizing results of a study by USDA's Agricultural Risk Management Service conducted in 1997, Banker and Perry report that less than 10% of the value of cattle was sold under marketing contracts and that 14% of the value of cattle production was produced under some type of production contract.

From a producer's standpoint, contracting offers several important advantages.[1] For one thing, contracts allow producers and contractors to share production and marketing risks. In reducing risks, contracts contribute stability to a producer's income. Contracts may also give producers access to technology and/or technical expertise that they would not have access to on their own. Such technological advantages improve the efficiency of production. Contracts also ensure that producers have an outlet for their production—as long as specifications set forth in the contract are met. Finally, contracting often benefits producers whose access to capital is limited. By reducing risks, contracts can improve the producer's creditworthiness. More importantly, production contracts generally specify that a significant portion of inputs will be provided by the contractor, thus significantly reducing the producer's need for capital and relieving some cash flow burdens.

Of course, contracts are not without their disadvantages. Clearly, the reduction in risk accompanying the use of contracts will most generally be expected to come at the expense of lower average returns. In addition, the use of contracts—particularly production contracts—will

require the producer to give up some degree of autonomy. Finally, producers who depend on contract production to ensure sufficient income to pay for investments in facilities and/or equipment may find it difficult to ever terminate the contractual arrangement. Even worse, if the contractor decides to terminate the contract, producers may find themselves with no way to service debt on highly fixed assets.

Contract Grazing

Contract grazing arrangements would generally fall under the category of production contracts. In a typical contract grazing arrangement, a cattle owner contracts with a caretaker to turn calves out on pasture owned or leased by the caretaker. The caretaker is paid a yardage fee (a flat charge per day on pasture under the caretaker's management), a set amount per pound of gain for the time the cattle are in his care, or some combination of yardage and a per pound of gain fee. Any number of arrangements are possible regarding which inputs will be provided by the owner, which by the seller, and who will bear the cost of death loss. These items should be clearly spelled out in a written contract (Kidwell).

Relatively little academic work has been done on the issue of contract grazing. In a related vein, May et al. look at pasture rental agreements from a resource management perspective, investigating how different pasture rental arrangements affect stocking rate decisions. They find that per acre agreements result in 2% higher stocking rates than per head lease rates.

Johnson, Spreen, and Hewitt compare contract grazing to integrated production. Using stochastic dominance techniques, they find that from a pasture owner's perspective, contract grazing dominates cattle ownership at any per pound of gain payment rate greater than $0.45. At a payment rate of less than $0.08/lb of gain, owning cattle dominated contract production from

[1] For a more detailed discussion of the advantages of contract production see Johnson et al. and Sporleder.

the pasture owner's perspective. This results in a wide range of payment rates over which the preferred alternative is indeterminate.

In a similar study, Harrison et al. find that contract grazing significantly reduces risks for pasture owners but not for cattle owners. This finding is broadly consistent with Johnson, Spreen, and Hewitt. Both of these studies are limited to considering contracts for which payment is made on a per pound of gain basis. Moreover, although different payment rates are considered, contracts do not differ in terms of who is providing various inputs (cattle owner or pasture owner).

Teegerstrom et al. investigate several different ownership options for cattle producers. Using decision theory analysis to compare cow/calf production, ownership of summer stocker calves, and contract grazing, they find that the optimal alternative could be cow/calf production or contract grazing, depending on the decision theory criteria used to evaluate the decision. They also use portfolio analysis to define the optimal combination of pasture rental (i.e., renting owned pasture to somebody else), contract grazing, summer stocker ownership, and cow/calf production. With this approach, they find that for slightly to moderately risk averse producers, the optimal portfolio consists of renting pasture to somebody else and contract grazing. As risk aversion increases beyond that level, renting out pasture becomes the only activity in the optimal portfolio.

This study will compare various contract grazing arrangements to stocker ownership. The issue will be examined from the perspective of both the caretaker and the cattle owner, examining how the level and variability of returns is influenced by the terms of alternative contracts.

Data and Methods

Stochastic simulation using winter grazing enterprise budgets is used to generate 500 observations on returns over variable costs (RVC) for stocker ownership and three different contracting options for both cattle owners and caretakers. Grazing returns are primarily influenced by cattle prices (in the case of stocker ownership) and by cattle performance (reflected in average daily gain and death loss). These parameters are varied within a winter grazing budget from the University of Georgia Agricultural Economics Department to simulate the 500 RVC observations. Contracting options differ in the rate and method of payment as well as in which costs are paid by the cattle owner and which by the caretaker. In all simulations, budgets assume that 150 head of 4-weight steers are placed on winter annual pasture. Table 2 summarizes the four contracting options compared in this study.

Empirical distributions of cattle prices and average daily gain (ADG) were used in simulating RVC values. ADG values were derived from 13 gain/acre figures recorded in stocker grazing trials in central Mississippi from 1975 through 1988. To convert gain/acre value into ADG values, a stocking rate of 1.5 head per acre and a grazing period of 170 days were assumed. These stocking rate and grazing period values are consistent with the production practices used in the Mississippi grazing trials.

Prices used in the simulation consist of Georgia auction market prices reported in *Livestock, Meat, and Wool Weekly Summary and Statistics* (USDA-AMS) from September 1980 through May 2002. To obtain observations on RVC from winter grazing, two prices are required: a fall stocker calf price and a spring feeder calf price. In this simulation, a September – November average price for 400-500 pound steers was used along with a May average price for

700-800 pound steers. In the simulation, prices were randomly selected from the empirical distribution in pairs: a fall stocker price and the associated feeder price for the following spring.

A death loss series for a winter grazing program was not available for use in this study. In order to generate a stochastic series for death loss, a gamma distribution with a mean of 2% and a standard deviation of 0.75 was used (Ã(á=5.33,â=0.375)). For the 500 simulated observations, this distribution resulted in death loss values ranging from 0.30% to 5.37% with a mean of 2.00%. Table 3 provides descriptive statistics on the price and ADG data used in developing the simulation model for this study.

The University of Georgia budgets used in this study do assume that some supplemental feeding is required, including a starter ration and some hay. While the expense for starter ration may be fairly consistent from year to year, supplemental hay expense likely varies from year to year depending on pasture conditions (influenced primarily, of course, by weather). In the simulation, these expenses are not varied. Likewise, there may be some correlation between average daily gain and hay expense. If pasture conditions are poor (excellent), ADG will be low (high) and hay expense high (low). Data were not available for incorporating this hypothesized correlation into the simulation. For that reason, feed expense is not stochastic in this simulation.

Results

A summary of the simulated RVC values is presented in Table 4. Note that, not surprisingly, direct ownership (i.e., owning stockers that are grazed on owned or rented pasture) results in higher returns than any of the contracting options for both cattle owners and caretakers; however, it also results in the most variable returns. Of the four contracting options, from the caretaker's perspective, Contract 2 results in the highest average returns, while from the cattle owner's perspective, Contract 4 results in the highest average returns.

From the cattle owners' perspective, none of the contracting options examined here compare very favorably with grazing owned cattle on owned (or rented) pasture, even for a very risk averse individual. For all of the contract terms considered, a slight reduction in risk comes at the expense of a very significant reduction in returns. For caretakers, it is not immediately obvious which stocker grazing option is optimal for a risk-averse individual. Using a mean variance approach, Contracts 1 and 2 clearly dominate Contract 3 since they have a higher mean and a lower variance; however, ranking cattle ownership and the various contracting options is not possible using mean-variance analysis.

To clearly rank alternative grazing arrangements for producers of varying risk aversion levels, a Constant Relative Risk Aversion (CRRA) utility function was used to convert RVC values to utility estimates. The CRRA utility function is represented mathematically as

$$(1) \qquad E(U)_r = \sum_{i=1}^{n} w_i \frac{W_i^{1-r}}{1-r}, \; r \neq 1$$

or

$$(2) \qquad E(U)_r = \sum_{i=1}^{n} w_i \ln(W_i), \; r = 1,$$

where $W_i = W_0 + RVC_i$, r is a risk aversion coefficient, and w_i is the weight associated with each observation i. Simulated ending wealth is represented by W_i, and initial wealth is represented by W_0. Initial wealth is assumed to be \$200,000. Utility values are calculated for risk aversion coefficients 1, 2, 3, and 4, with r=1 representing slightly risk averse and r=4 representing extremely risk averse.

By solving equation 1 for *RVC*, certainty equivalents (CE) can be calculated for each level of risk aversion. The CE represents the lowest sure price for which a decision maker would be willing to sell a risky prospect (Hardaker, Huirne, and Anderson). For any two alternatives i

and j, if $CE_i > CE_j$, then alternative i is preferred to j. Calculated CE values are presented in Table 5. These results indicate that for slightly to moderately risk averse caretakers ($r \leq 2$) stocker ownership is preferred to any contracting option. At any higher level of risk aversion, the preferred option is Contract 2. Even for very risk averse caretakers, stocker ownership is preferred to contracting options 1, 3, or 4. Also, as expected, for cattle owners of any level of risk aversion, grazing owned cattle on owned (or rented) pasture is preferred to contracting.

Analysis of Alternative Contract Rates and Terms

Sensitivity analysis was conducted to determine a grazing fee that would leave the decision maker (cattle owner or caretaker) indifferent between ownership and contracting. Two different contractual arrangements were considered: one in which all medical and supplemental feed expenses are paid by the cattle owner (Contract A) and one in which these expenses are covered by the caretaker (Contract B). To conduct this sensitivity analysis, CEs were calculated, again from 500 simulated observations on RVC, at a series of different grazing fee rates. Table 6 presents calculated CE values from the caretaker's perspective. Table 7 presents calculated CE values from the cattle owner's perspective. In both tables, results are presented for two levels of risk aversion (r=1 and r=3).

These results illustrate a potential difficulty in establishing contract grazing arrangements. From the caretaker's perspective, a slightly risk averse caretaker (r=1) would prefer to own cattle rather than graze somebody else's cattle under contract at any grazing fee of less than approximately $31.35 per cwt of gain. On the other hand, a similarly risk averse cattle owner would prefer turning cattle out on owned (or leased) pasture to grazing under contract at any grazing fee of greater than about $18.60 per cwt of gain. In short, it seems that, in general, grazing fee arrangements that are attractive to pasture owners may not be particularly attractive

to cattle owners and vice versa. This may, in fact, help explain why contract grazing is not a more common practice in the southeastern U.S.

Clearly, it is important not to apply this principle too rigidly. Otherwise, one would assume that contract grazing should never occur. A number of factors other than the grazing fee also affect contract grazing decisions. Cattle owners may face land and management (i.e., time) constraints that make it impossible for them graze all of their cattle on owned or leased land. Likewise, pasture owners may face capital constraints that make it impossible for them to own cattle (or as many cattle as they need to fully utilize their land resource). In each of these cases, contracting could be an attractive option.

A final simulation was conducted to determine the impact of market price and animal performance on grazing fees. In this analysis, a break-even grazing fee was calculated for both the cattle owner and the caretaker for Contract 1 (from Table 2) using the 500 simulated cattle prices, ADG, and death loss values. The difference between the cattle owner's break-even grazing fee and the caretaker's break-even grazing fee represents profits to the entire system. These profits (or losses) were allocated between the owner and the caretaker according to the share of total variable costs paid by each. In this manner an "equal-return" grazing fee was estimated for each of the 500 simulated observations. The results of this simulation are summarized in Table 8.

Linear regression was performed to estimate the effect of market and animal performance variables on the "equal-return" grazing fee. Using ordinary least squares (OLS) estimation, the following equation was estimated (with standard errors in parentheses below the estimated coefficients):

$$(3) \qquad GF = \underset{(0.62)}{51.55} + \underset{(0.01)}{0.30}MARGIN - \underset{(0.25)}{8.10}ADG + \underset{(0.11)}{1.15}DL,$$

where *GF* is the equal-return grazing fee (in $/cwt of gain); *MARGIN* is the spring feeder calf price minus the associated fall stocker calf price (in $/cwt); *ADG* is the average daily gain achieved by grazing steers; and *DL* is the percentage death loss on grazing steers. Using this equation, a "fair" grazing fee can be calculated for any assumed buy/sell margin, average daily gain, and death loss percentage. Table 9 summarizes a number of such calculations. Figures in Table 9 may provide a benchmark for evaluating grazing fees; however, they should be interpreted with caution. These figures are based on returns calculated from a hypothetical budget. This budget is representative of cattle owner and caretaker costs, but individual operators could have operating costs that differ significantly from those used in the budget. Also, the buy/sell margin, average daily gain, and death loss are all unknown at the time grazing decisions must be made. Uncertainty regarding these factors will obviously affect grazing fee decisions by both cattle owners and caretakers.

Summary and Conclusions

Contract grazing of stocker calves may represent an important opportunity for many southeastern cattle producers. Contract grazing could allow pasture owners to receive regular income from their land and labor resources while limiting the amount of capital that they have at risk. This could be a particularly attractive option for producers with limited access to capital, those facing cash flow problems, or those whose financial position leaves them vulnerable to the level of financial risk associated with purchasing stocker calves. From the cattle owner's perspective, contracting could allow them to increase their investment in cattle in spite of land and/or management constraints.

One difficulty of evaluating contract grazing options is that very little about grazing contracts is standardized. A virtually unlimited number of arrangements is possible, each

differing in some degree in who pays for inputs and who bears death loss and how compensation is provided. This fact highlights the importance of having a written contract specifying all the details of the contract grazing arrangement.

In this study, four hypothetical contract grazing arrangements were compared to stocker ownership. From both the perspectives of both cattle owners and caretakers, stocker ownership offered a higher level of returns than any of the contracts. For caretakers, contracting offered a significant reduction in the variability of returns. In fact, moderately risk averse caretakers would prefer contracting (under certain terms) to ownership of cattle. Conversely, for cattle owners, reductions in risk were minimal so that even extremely risk averse cattle owners would not prefer any of the contracting options grazing considered here to grazing cattle on owned (or leased) pasture. This result is consistent with previous research (Harrison et al.).

Using sensitivity analysis, this research illustrates one of the obstacles to the widespread use of contract grazing arrangements. In general, from a cattle owner's perspective, contract grazing is not a preferred option except at a grazing fee rate that is too low to be attractive to pasture owners. Other factors can and obviously do override this concern (e.g., capital constraints that make it impossible for a pasture owner to obtain cattle directly or time constraints that make it difficult for a cattle owner to directly oversee the grazing operation). Still, this principle may help explain why contract grazing is not more common among cattle producers in the Southeast.

References

Banker, D. and J. Perry. "More Farmers Contracting to Manage Risk." USDA Economic Research Service. *Agricultural Outlook Reprint*. Washington DC: February 2000.

Hardaker, J.B., R.B.M. Huirne, and J.R. Anderson. *Coping with Risk in Agriculture*. CAB International. New York: 1997.

Harrison, R.W., B.W. Bobst, F.J. Benson, and A.L. Meyer. "Analysis of the Risk Management Properties of Grazing Contracts versus Futures and Options Contracts." *Journal of Agricultural and Applied Economics*. 28(1996): 247-262.

Johnson, F., T.H. Spreen, and T. Hewitt. "A Stochastic Dominance Analysis of Contract Grazing Feeder Cattle." *Southern Journal of Agricultural Economics*. 19(December 1987): 11-19.

Johnson, J., M. Morehart, J. Perry, and D. Banker. *Farmer's Use of Marketing and Production Contracts*. USDA Economic Research Service. Agricultural Economics Report No. 747. Washington DC: December 1996.

Kidwell, Boyd. "Contract Grazing." *Progressive Farmer*. November 2000.

May, G.J., R.D. Jones, M.R. Langemeier, and K.C. Dhuyvetter. "Factors Influencing Optimal Stocking Rates from a Tenant Perspective." Selected Paper. Society for Range Management Annual Meeting. Kailua-Kona, HI. February 2001.

Sporleder, T. "Managerial Economics of Vertically Coordinated Agricultural Firms." *American Journal of Agricultural Economics*. 74(1992): 1226-1231.

Teegerstrom, T., G. D'Souza, P. Osborne, and K. Jones. "To Contract or Not to Contract? A Decision Theory and Portfolio Analysis of Cattle Contract Grazing." Agricultural and Resource Economics Review. 26(October 1997): 206-215.

Ward, C., T. Schroeder, A. Barkley, and S. Koontz. "Role of Captive Supplies in Beef Packing." USDA Grain Inspection Packers and Stockyards Administration. GIPSA-RR 96-3. Washington DC: 1996.

Table 1. Cattle and Calf Inventory in Selected Southern States: January 1, 2002

State	Number of Operations	Beef Cows (1,000)	2001 Calf Crop (1,000)	≥500 lb Calves		≥500 lb calves as % of calf crop
				Steers (1,000)	Heifers[a] (1,000)	
AL	25,000	750	680	60	41	14.9%
AR	27,000	927	820	145	65	25.6
FL	16,500	958	940	25	25	5.3
GA	21,000	594	580	40	30	12.1
KY	39,000	1,485	1,080	215	100	29.2
LA	13,200	466	405	24	17	10.1
MS	21,000	576	540	55	27	15.2
NC	22,000	434	450	43	20	14.0
SC	10,000	210	185	13	13	14.1
TN	45,000	1,060	1,050	118	75	18.4
VA	22,000	690	720	175	70	34.0
U.S. Total	814,400	33,099.7	38,280.8	16,799.8	10,057.1	
South as % of U.S.	32.1%	24.6%	19.5%	5.4%	4.8%	

Source: *Cattle*. USDA-NASS. February 1, 2002
[a]Excludes heifers retained as replacements.

Table 2. Four Alternative Contract Grazing Agreements

Payment Provisions	Contract 1	Contract 2	Contract 3	Contract 4
$/head/month	$2.00	N/A	N/A	$14.00
$/cwt of gain	$35.00	$40.00	$42.50	N/A
Death loss covered by cattle owner	0%	2%	0%	0%
Supplemental feed paid by	Caretaker	Caretaker	Caretaker	Owner
Minerals paid by	Owner	Caretaker	Caretaker	Owner
Medication & Implants paid by	Owner	Owner	Caretaker	Owner

Table 3. Description of Price and Production Data Used in Comparing Stocker Ownership and Contracting Options

Data Series	Average	Std. Dev.	Minimum	Maximum
Stocker Price	$78.23	13.34	$58.13	$100.70
Feeder Price	$65.48	9.24	$44.12	$82.62
Average Daily Gain	2.19	0.38	1.54	2.83

Table 4. Simulated Return Over Variable Cost Estimates for Stocker Ownership and Contracting Options

	Own	Contract 1		Contract 2		Contract 3		Contract 4	
	Stockers	*Caretaker*	*Owner*	*Caretaker*	*Owner*	*Caretaker*	*Owner*	*Caretaker*	*Owner*
Mean	$7,009	$5,519	$723	$6,599	-$397	$4,932	$1,220	$1,204	$5,375
Std. Dev.	9,513	3,426	7,682	3,880	7,457	4,075	7,519	100	9,504
Min.	-13,716	-1,605	-14,421	-1,069	-14,376	-3,473	-13,190	796	-15,158
Max.	35,769	12,284	24,059	13,657	21,836	13,164	23,665	1,393	34,094

Note: N = 500.

Table 5. Simulated Certainty Equivalent Values for Stocker Ownership and Contracting Options

	Own	Contract 1		Contract 2		Contract 3		Contract 4	
r	Stockers	*Caretaker*	*Owner*	*Caretaker*	*Owner*	*Caretaker*	*Owner*	*Caretaker*	*Owner*
1	$6,792	$5,490	$578	$6,563	-$535	$4,892	$1,081	$1,204	$5,157
2	6,576	5,462	433	6,526	-672	4,851	942	1,204	4,940
3	6,362	5,433	289	6,490	-808	4,811	805	1,204	4,724
4	6,148	5,404	147	6,453	-943	4,770	668	1,204	4,509

Table 6. Impact of Grazing Fee on Caretaker Certainty Equivalents

	Contract A			Contract B	
Grazing Fee	r=1	r=3	Grazing Fee	r=1	r=3
$30.50	$6,320.86	$6,278.86	$45.20	$6,400.44	$6,309.44
30.60	6,376.79	6,334.52	45.30	6,456.31	6,364.94
30.70	6,432.72	6,390.19	45.40	6,512.19	6,420.44
30.80	6,488.65	6,445.85	45.50	6,568.07	6,475.94
30.90	6,544.58	6,501.52	45.60	6,623.94	6,531.44
31.00	6,600.51	6,557.18	45.70	6,679.82	6,586.93
31.10	6,656.44	6,612.84	45.80	6,735.69	6,642.43
31.20	6,712.37	6,668.50	45.90	6,791.56	6,697.92
31.30	6,768.30	6,724.16	46.00	6,847.44	6,753.41
31.40	6,824.23	6,779.82	46.10	6,903.31	6,808.90

Note: CE for ownership of calves and ownership/rental of pasture is $6,791.88 for r=1 and $6,361.50 for r=3.

Table 7. Impact of Grazing Fee on Stocker Cattle Owner Certainty Equivalents

	Contract A			Contract B	
Grazing Fee	r=1	r=3	Grazing Fee	r=1	r=3
$18.40	$6,911.31	$6,577.83	$32.40	$6,937.52	$6,643.57
18.50	6,853.40	6,520.27	32.50	6,879.55	6,585.83
18.60	6,795.49	6,462.70	32.60	6,821.58	6,528.09
18.70	6,737.58	6,405.13	32.70	6,763.61	6,470.34
18.80	6,679.67	6,347.56	32.80	6,705.64	6,412.59
18.90	6,621.76	6,289.99	32.90	6,647.68	6,354.85
19.00	6,563.85	6,232.42	33.00	6,589.71	6,297.10

Note: CE for ownership of calves and ownership/rental of pasture is $6,791.88 for r=1 and $6,361.50 for r=3.

Table 8. Break-even Grazing Fees for Cattle Owners and Caretakers Under Terms of Contract 1

	Owner's Break-even Grazing Fee	Caretaker's Break-even Grazing Fee	Equal Return Grazing Fee
Average	$39.38	$30.15	$32.28
Std. Dev.	13.79	5.65	4.63
Minimum	4.44	21.34	22.58
Maximum	74.09	44.90	51.28

Table 9. Equal-Return Grazing Fees ($/cwt gain) Under Different Buy/Sell Margin and ADG Assumptions

Buy/Sell	ADG										
Margin	1.50	1.60	1.70	1.80	1.90	2.0	2.10	2.20	2.30	2.40	2.50
0.00	41.69	40.88	40.07	39.26	38.45	37.64	36.83	36.02	35.21	34.40	33.59
-5.00	40.18	39.37	38.56	37.75	36.94	36.13	35.32	34.51	33.70	32.89	32.08
-10.00	38.67	37.86	37.05	36.24	35.43	34.62	33.81	33.00	32.19	31.38	30.57
-15.00	37.16	36.35	35.54	34.73	33.92	33.11	32.30	31.49	30.68	29.87	29.06
-20.00	35.65	34.84	34.03	33.22	32.41	31.60	30.79	29.98	29.17	28.36	27.55
-25.00	34.14	33.33	32.52	31.71	30.90	30.09	29.28	28.47	27.66	26.85	26.04

Note: Death loss is assumed to be 2%.