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June Versus March Calving for the Nebraska Sandhills: Economic Risk Analysis

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A June calving system can be more profitable than a March calving system without increasing economic risk.

Summary

Price risk analysis of economic and financial net returns from June and March calving systems was used to rank and identify preferred production/sale strategies according to risk preferences of producers. Analysis of economic net returns identified selling a June-born steer at weaning from the breeding on meadow (meadow-bred) treatment as preferred strategy regardless of risk preferences. Post-weaning, selling a June-born finished yearling steer from the meadow-bred treatment was ranked highest. Analysis of financial net returns identified selling a June-born yearling steer from the meadow-bred treatment prior to summer grazing as preferred for all but those strongly risk averse; selling a June-born steer from the meadow-bred treatment at weaning ranked second.

Introduction

Production agriculture is subject to several sources of economic risk: output price, yield, and input and cost. A simple comparison of average net returns from alternative production strategies overlooks risk. Comparison of the June-born calving system to the traditional March-born calving system also should include an evaluation of the economic risks involved. The objectives of this research were to: 1) identify the risk efficient (preferred) set of production strategies in the two calving systems based on the economic and financial net returns; and 2) rank the production stages in order of risk preference based on the economic and financial net returns distributions. We hypothesized that the production stages in the June system would be preferred over the same stages in the March system.

Procedure

Economic and financial net returns distributions were generated for each production stage for both the March and June calving systems using average input levels and animal weights, 1998 input costs and real (inflation adjusted) prices received from 1992 through 1998. Thus, the variation in net returns reported here is due strictly to variation in cattle prices. Economic net returns indicate the ability of an individual stage of production to generate an economic profit, i.e., the ability to stand alone as a separate enterprise without being subsidized by an earlier or later production stage. Financial net returns indicate whether producing to a stage of production will generate a positive cash flow. The 15 numbered sales strategies (Table 1) correspond with the stages of production and the alternative systems. For example, number 7 refers to selling a

Table 1. Number identifiers for production/sell strategies for March and June calving systems.

Production stage/	March	June			
		Calf feds		Yearlings	
Sell at:	Calf feds	Range	Meadow	Range	Meadow
Weaning	1	4	7	—	—
Yearling calf onto grass	—	—	—	10	13
Into feedlot	2	5	8	11	14
Slaughter	3	6	9	12	15

weanling calf born in June and bred on the meadow. Risk analysis considers not only the level of net returns from all strategies, but also the variation in those returns. Ranking strategies according to risk is not an easy task unless some strategies totally dominate all others. A dominating strategy would have higher net returns under all price situations. Generalized stochastic dominance (GSD) analysis of the economic and financial net returns distributions is a tool that can identify the preferred sales strategies and can rank all strategies according to the risk characteristics of the producers. GSD is the tool we chose to rank the financial and economic net returns.

GSD analysis does not make *a priori* assumptions regarding the net returns distributions or the risk attitude of decision makers.. The analysis allows for the ranking of alternative strategies over selected risk attitudes of the decision maker. GSD has been frequently used to rank crop rotations, crop varieties, pest and fertilizer management alternatives and other agricultural risk management strategies.

First- and second-degree stochastic dominance are special cases of GSD. First-degree stochastic dominance (FSD) assumes only that the decision maker prefers more to less, with no assumption about the decision maker's risk attitude. Second-degree stochastic dominance (SSD) assumes the decision maker prefers more to less and is risk averse. FSD and SSD are limited in their ability to discriminate between risky alternatives due to the nature of the underlying distributions being compared. FSD can only choose between two alternatives when the net returns for all situations for one alternative either are equal to or greater than net returns for the other alternative. SSD can rank two alternatives when the net returns over all situations exceed those of the other at all points in the cumulative probability distribution. This criterion cannot rank two alternatives where cumulative probability of alternative b's net returns exceed alternative a's at low levels of probability and then the cumulative probability of alternative a's net returns exceed b's at higher levels of probability. The cumulative probability of a level of net returns is the probability that net returns are equal to or less than a certain level. Since FSD and SSD alone are limited, we have used stochastic dominance with respect to a function (SDRF), which gives more power for ranking alternatives, with the rankings depending on the risk attitude of the decision maker. SDRF is the most generalized decision criterion associated with GSD analysis.

Table 2. Stochastic dominance analysis rankings of *economic* net returns from March and June calving systems.

Criteria	Preference Rankings[a] More preferred → Less preferred
FSD	***7***,4,1,15,12,3,5,10,13,6,9,2,8,11,14
SSD	***7***,4,1,15,3,12,5,10,2,8,13,11,6,9,14
SDRF	
Approximate Risk Attitude	
Strongly Risk Preferring	***7***,4,1,15,6,12,3,9,13,10,5,11,8,14,2
Moderately Risk Preferring	***7***,4,1,15,3,12,6,5,10,9,13,8,11,2,14
Slightly Risk Preferring	***7***,4,1,15,3,12,5,10,13,6,8,2,9,11,14
Risk Neutral	***7***,4,1,15,3,12,5,10,8,13,6,2,9,11,14
Slightly Risk Averse	***7***,4,1,15,3,12,5,10,8,13,2,6,11,9,14
Moderately Risk Averse	***7***,4,1,15,3,12,5,2,8,10,11,13,6,14,9
Strongly Risk Averse	***7***,4,1,15,3,12,5,2,8,10,11,13,14,6,9

[a]Refer to Table 1 for strategy codes. Bolded, italicized strategies are in the most preferred set.

Table 3.Stochastic dominance analysis rankings of *financial* net returns from March and June calving systems.

Criteria	Preference Rankings[a] More preferred → Less preferred
FSD	***15,6,7,8,13,5***,10,4,9,12,14,11,3,1,2
SSD	***6,8,15,7,13,5***,12,9,4,14,11,10,3,1,2
SDRF	
Approximate Risk Attitude	
Strongly Risk Preferring	***13***,5,7,8,10,4,15,12,6,9,11,3,14,1,2
Moderately Risk Preferring	***13***,7,5,8,10,4,15,12,6,9,11,3,14,1,2
Slightly Risk Preferring	***13***,7,5,8,10,4,15,12,6,9,11,14,3,1,2
Risk Neutral	***13***,7,10,5,8,4,15,12,6,9,11,14,3,1,2
Slightly Risk Averse	***13***,7,8,5,10,4,15,12,6,9,11,14,3,1,2
Moderately Risk Averse	***13,7,8,15,6***,5,12,9,4,10,11,14,3,1,2
Strongly Risk Averse	***6***,9,15,12,7,8,4,5,13,14,11,3,10,1,2

[a]Refer to Table 1 for strategy codes. Bolded, italicized strategies are in the most preferred set.

Results

The results of the GSD analysis of economic and financial net returns are presented in Tables 2 and 3, respectively. FSD, SSD, and SDRF analyses of the economic net returns (Table 2) identify sale at weaning of June-born calf feds from the meadow breeding treatment (strategy 7) as economically preferred. All that is necessary to assume about the decision maker is that he/she prefers more to less since strategy 7 was the dominant strategy with FSD. If our goal is to only find the dominant strategy for economic returns, then FSD was adequate. Notice

(Continued on next page)

that specifying the risk attitude made no difference in the preferred set. Sale at weaning of a June-born calf fed from the range breeding treatment (strategy 4) was ranked second followed by sale at weaning of a March-born calf fed (strategy 1). However, if we are interested in the ranking of all alternatives, then the risk preference of the decision maker becomes important which can be seen by comparing the rankings after the top four strategies as the risk attitude changes.

When the analysis turns to the financial net returns, FSD and SSD cannot rank single alternatives. FSD and SSD analysis of the financial net returns identified six strategies as all in the risk efficient set (equally preferred; Table 3). The numbers in bold italics note the six equally preferred strategies. However, the more discriminating SDRF analysis identifies sale of a yearling calf from the meadow breeding treatment prior to summer grazing (strategy 13) as the risk efficient (preferred) strategy for strongly risk preferring to slightly risk averse producers. Moderately risk averse producers would be indifferent between five alternatives, all in the June calving system. The preferred strategy for strongly risk averse producers is the sale at slaughter of a June-born calf fed from the range breeding treatment (strategy 6). With some knowledge of a decision maker's risk attitudes, SDRF was able to rank the 15 strategies in most cases. Regardless of the risk attitude, SDRF analysis of the financial net returns ranks the March calving system strategies low and often least preferred. Recall that this analysis considered only risk due to cattle prices. There may be other risks that have not occurred with our research that should be considered. If future research delineates possible other risks, they will be incorporated into the analysis.

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