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By

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Abstract

Four different grazing systems: two rotational systems, a continuous grazing system, and a modified high-intensity, short-duration (mob) system were evaluated from an economic return and risk perspective. Stocking rates and average daily gains (ADG) were obtained from 2011 – 2014 from university ranch experiments in northern Nebraska. Simulation models were used to examine net returns and risk in each system and rank systems according to risk preferences. A twice through rotational grazing system was most profitable. Mob grazing was the least preferred, although when risk aversion increased, it rose in preference. Mob grazing could be profitable if adjustments increased animal performance.

Introduction

Rotational grazing systems have been a popular method for cattle producers to help gain efficiency. One of the newest types of rotational grazing is a modified form of the high-intensity, short-duration grazing also referred to as mob grazing. The system uses very high stocking rates on a small parcel of land with animals often moved several times per day. In this system, the land receives a long rest period, sometimes as much as one year. The system attempts to mimic the large grazing herds that once roamed the Great Plains. Several cattle producers in South Dakota and Nebraska have implemented this system and claim increased profitability per acre, but have not had this verified from an outside source.

Briske et al. (2011) found the benefits from rotational grazing systems were a function of management and not the system themselves. In order for the system to become more effective, management had to become more productive. Teague et al. (2008) and Norton (1998) found that one of the biggest problems of examining grazing systems was a scale issue. Since most experimental grazing systems are performed on a small scale an actual commercial operation is not represented. The cattle are affected differently because of the small size of the study. In the commercial ranch animal experience many different types of terrain and plant communities which affect the animal's performance.

As stocking rates increase the average daily gain (ADG) per animal decreases, but the overall gain per acre tends to increase (Smart et al., 2010). This means there is a tradeoff between the individual animal and the herd overall. The relationship between ADG and grazing pressure was very high with an R^2 of 0.96. The harvest efficiency increased when grazing pressure was increased, which indicates that animals eat more of the grass with higher stocking rates. The animals may utilize more forage with increased stocking rates but the increase is at a decreasing rate, which implies that 1) there is an optimum grazing pressure to utilize as much forage as possible and 2) that beyond this optimum, decreases in ADG will occur. According to Smart et al. (2010), a producer could benefit from a system like mob grazing if the tradeoff between individual animal ADG is compensated by greater gain per acre.

Derner et al. (2007) found that rainfall had a huge impact on livestock performance. A high correlation between rainfall and cattle performance suggest that moisture, with concomitant greater vegetation and growth, may be just as important as the stocking rate itself.

The purpose of this research was to assess the profitability of mob grazing compared with other traditional grazing systems in the study area. Next, the risk in each grazing system was estimated and compared across the systems. Finally, the management's ability to affect the performance of a system and therefore the profitability of a system was analyzed. By doing so, this study provides additional information to producers about the profitability of mob grazing including suggestions to improve the profitability if they choose to implement mob grazing.

Grazing Systems Study Methods and Key Assumptions

The empirical data for this study was obtained from the University of Nebraska (UNL) Barta Brothers research farm located in north-central Nebraska. The grazing system study lasted from 2011 to 2014. The specific data collected from the research was individual animal's average daily gain (ADG) and stocking rates used for each system. These data were used to estimate system profitability.

Yearling steer cattle were monitored in four different grazing systems (1) mob (MOB) grazing system in which the animals grazed 120 paddocks once throughout the grazing season, (2) a continuously grazed system (CONT) in which the animals grazed on the same pasture throughout the entire grazing season, (3) a four pasture one time use system (4-PR-1), with animals rotated through each of four pastures once throughout the grazing season, and a (4) four pasture two time use system (4-PR-2) with animals rotated through each of four pastures twice throughout the grazing season. Each system was replicated twice.

The system 4-PR-2 had an 80 day grazing period; it was also the system that most closely represented traditional grazing systems in the area. The grazing systems MOB, 4-PR-1, and CONT had a 60 grazing period for each of the four years examined, 2011 through 2014. In order to make the system more comparable 4-PR-2 results were standardized to a 60 day grazing period.

In order to scale up each experimental system to reflect realistic acreages on South Dakota and Nebraska cattle ranches, the budgets were set up with the assumption the total pasture size was 160 acres (65 ha). If pasture size was budgeted to be greater than 160 acres, the 4-PR-1 and MOB systems, which have very high stocking rates, would have far more than 500 head of yearlings and not accurately represent most cattle producers in South Dakota and Nebraska.

One of the key reasons producers implement mob grazing is to increase the organic matter in their fields. Animals are forced to either eat or trample the grass in the small areas. In addition, manure deposition is concentrated, and also more highly trampled than in other systems. The trampling rate for vegetation in the MOB system was measured at 60% in comparison studies (Smart and Clay, personal communication). This means that 60% of the vegetation in the MOB pastures was trampled and not consumed by the livestock. The trampling action of hooves should incorporate at least some of the vegetation into the uppermost soil layer, Increasing organic matter content should, in turn, increase soil water holding capacity, with greater vegetative growth, and potentially increased stocking rates. This cycle, in the long-term increases the system's overall efficiency.

One of the most important aspects of all grazing systems is the ADG of the animals in their system. In the first two years of the study, MOB and 4-PR-1 had very poor ADG (Table 1). Some of the animals in MOB even lost weight throughout the growing season. The weight losses or minimal gain led the overall ADG for each replication of MOB to be very low in the first two years. Although the ADG were higher in 2013 and 2014, the average rate of gain for MOB was still lower compared to the other systems. Finally, the 4-PR-2 system had the highest ADG compared with the other systems. The ADG was simulated in the budgets using a multivariate empirical distribution. This allows the distribution to focus on values that were actually observed in the study.

Table 1: Average Daily Gain in Pounds per Grazing System from 2011-2014

	2011	2012	2013	2014
4-PR-1 (1)	0.8	0.82	0.74	1.08
4-PR-1 (2)	0.63	0.58	0.64	1.41
4-PR-2 (1)	1.91	1.12	1.49	1.49
4-PR-2 (2)	2.18	1.16	1.40	1.70
MOB 1	0.33	0.38	0.49	1.09
MOB 2	0.24	0.45	0.62	0.83
CONT 1	0.94	1.22	1.03	1.54
CONT 2	1.06	0.81	1.15	1.49

Source: (Redden, 2014)

<u>**Budget Assumptions**</u>

The purchase price and selling price used in the budgets was from the Livestock Marketing Information Center (LMIC). The specific price used was the average yearling cattle prices for all South Dakota auctions reported by the USDA Agricultural Marketing Service (USDA-AMS). Cattle prices used in the budgets aligned with the time period when cattle are taken to pasture and removed. The purchase price was the average May price of cattle and the selling price was the average price in August. The prices were split into 100 pound (45 kg) weight increments (LMIC, 2014). In the simulated part of the research, the purchase price was constant per year. The selling price was assumed to be stochastic. Producers have control on how much weight the animals can potentially gain and they also have some idea on the potential sale price of the cattle by observing video auctions. The selling price was simulated according to a price slide developed by Dhuyvetter and Schroeder (2000). A price slide was included into the simulated budgets since smaller cattle tend to sell at a higher price per pound than similar cattle that weigh more.

The land rental cost came from the annual Nebraska Farm Real Estate Market Highlights 2013-2014. The specific data used was for the North Agriculture District, since the actual grazing took place in this district (Jansen & Wilson, 2014). The rental rate was relatively steady in the first three years of the study. However, in 2014 the rental rate increased drastically due to the higher value of livestock.

Many individual costs per animal are the same regardless of the grazing system. Some of these costs include marketing cost, precondition costs, mineral cost, and water costs. However, many of these costs variables have limited archived data for yearling cattle operations. Universities have good budget information on current year grazing systems, but lack archived data on all grazing budgets. Some data are available for cow/calf pairs or breeding heifers, which are entirely different systems with different costs. In order to mitigate this problem, a variable must be chosen that is relevant to grazing cattle and the same per animal no matter which grazing system is used.

According to the USDA, higher priced grazing fees reflect the fact that land owners cover certain costs associated with grazing cattle, whereas lower grazing fees require livestock owners to cover the costs (USDA-Wyoming Department of Ag, 2014). The grazing fee, which is known as the AUM rate, fluctuates yearly as input prices change. Therefore, the AUM rate would reflect these types of costs data (mineral costs, marketing costs, and vet costs) and could be used to represent them in the budget. One of the underlying assumptions of the AUM rate is the rental cost of land is included within the fee. Although this assumption is correct, it is not assumed to be part of the AUM rate for this analysis. When comparing the land rental rate and the AUM rate to actual current yearling budgets, the aggregated price vector per animal may be slightly lower than the average, but is within range of what is observed. Therefore, the AUM rate serves as a proxy for these additional costs.

For simulation purposes, the average AUM rate in the Nebraska Farm Real Estate Market Highlights 2013-2014 (Jansen and Wilson, 2014) was utilized. In the report, the AUM is listed for an average cow/calf pair. A conversion factor of 0.806 was used to estimate the AUM price for yearling steer animals. The maximum and minimum AUM values were obtained from the distribution of grazing fees reported by USDA-Wyoming Dept. of Ag. 2014).

Fencing costs play an important role in the profitability of different grazing systems. It was assumed the 160-acre pasture had a very good preexisting perimeter fence. The added fence cost per system would be the cost of installing cross fence and maintenance thereafter. The systems 4-PR-1 and 4-PR-2 used high tensile electrified wire fence to split the quarter section pasture into four more parcels. The useful life on this fence was 20 years. The MOB system used enough fencing in order to make two small paddocks. When the animals were moved from the first paddock to the second paddock, the fence in the first paddock would be torn down and moved to the other side of the second fence. This would create a leap frog process for the 120 pasture and could be used to minimize the cost of the fence. MOB used poly-wire fence that has a 5 year life span; this fence was chosen because of ease to build and tear down the fence (Mayer & Olsen, 2012)

Water is a very important resource in all grazing systems. In the budgets, the cost of water was assumed to be captured in the land rental price. It was also assumed that the pastures had a good water source in the middle of the quarter section. In the systems 4-PR-1 and 4-PR-2, the water source could still be used in all four pastures once they were spilt. This was not possible in the MOB grazing. Since MOB system has many different pastures, water must be pumped to the pasture and a storage container must be present to hold the water. A 350 gallon water tank and 1300 feet of 3/8 polyethylene tubing were also needed (Farm Ranch Store, 2014: Agrimart, 2014).

Labor availability and costs is one of the most important factors considered when choosing a grazing system. Based on our discussion with local producers who used mob grazing system, they estimated that it took them roughly one hour a day to move the fence and animals for mob grazing. Therefore, this one additional labor hour per day was also assumed for MOB grazing budgets. Since the grazing season was 60 days long; it was assumed that MOB would use 60 additional labor hours throughout the season. Systems 4-PR-1 and 4-PR-2 assumed to only use labor hours when the animals were actually moved with total of four labor hours for 4-PR-1 and eight hours for 4-PR-2. The farm labor costs per hour for the Northern Plains were obtained from USDA-NASS.

Method of Analysis

Budgets were developed using Microsoft Excel © spreadsheets, which makes it easy to link previous cells to later cells. This is especially useful for simulation purposes, since a small change in an early cell can affect all remaining cells. The budgets were constructed so that returns to labor and management was the last cell and all previous cells were used in the final calculations of returns to labor and management. Gross revenue, infrastructure and labor cost, and total cost per system were also observed but not investigated further in this paper (McMurtry, 2015). Simetar© is an Excel program specializing in risk analysis (Richardson, et.al. 2008). Simetar © is used to perform stochastic portion of the analysis. The specific analysis will be stochastic dominance with respect to a function and stochastic efficiency with respect to a function.

The actual returns to labor and management were evaluated using mean, standard deviation, coefficient of variation and mini-max. The mean measures the average returns per acre per system. The standard deviation measures the variation of net returns within a system, which is also the absolute risk of the system. The coefficient of variation (standard deviation divided by the mean) measures the relative risk in the system. A small standard deviation and a small mean could still translate into high relative risk. Finally, mini-max is used to measure the potential amount of loss a system could occur.

Next, the systems were evaluated stochastically to help gain further analysis into the risk involved within each system. Simetar© was used to perform stochastic dominance with respect to a function (SDRF) and stochastic efficiency with respect to a function (SERF). SDRF allows functions to be ranked by how the cumulative distribution of each functions lies with respect to the cumulative distribution of other functions. One advantage of SDRF is that the utility functions do not have to be restricted in any form. SERF is a stochastic method in which utility efficient alternatives are selected. It aligns alternative choices in accordance with certainty equivalents, which becomes more efficient compared to SDRF. The reason behind this is SERF selects all sets that are utility efficient alternative and equates sets against each other simultaneously.

The variables AUM rate, selling price, and ADG were made stochastic. The AUM rate was given a triangle distribution; where the minimum, maximum, and average rates were known but little else was known about the distribution. The selling price was given a normal distribution with a price slide in accordance with Dhuyvetter and Schroeder (2000). The normal distribution was used for the selling price because no average price was known. Finally, the ADG was given a multi-variant empirical distribution, since actual ADG information was known. This distribution will allow the stochastic values to be concentrated around actual observed values.

Within each budget in each year the returns to labor and management were simulated 1000 times. Next, the two replications for each system were combined into one system. This would give each system a total of 8,000 data points for four years; bringing the total data points to 32,000. These simulated returns to labor and management were used to perform the stoplight function, SDRF, SEFR, and to find risk premiums between each system.

The stoplight function assigns the probability of having returns below a certain cut-off value, above a certain cut-off value, and the probability of the returns being between the two values. SDRF and SERF are the same as defined above. The risk premium is the amount that a producer would need to be indifferent between two systems. In the negative exponential utility weighted risk premium function, the risk premiums are plotted with respect to risk aversion.

Empirical Results

The ranks of each system and its respective numerical ($) value per acre are shown in Table 2 and Table 3. Using actual returns to labor and management, grazing system 4-PR-2 was ranked number one in all four evaluation categories (e.g. mean, std dev, cv, and mini-max) making it the most preferred system. The MOB system is ranked last in mean and relative risk (cv). The only measurement MOB ranked favorably is the mini-max where it is ranked second. The CONT system was ranked third in mean and mini-max however when the actual dollar amount is compared for mini-max to the MOB system, there was less than $1 difference between the CONT and MOB grazing systems.

Table 2: Rankings of Average per Acre Returns to Labor and Management Using Different Static Risk Analysis Strategies

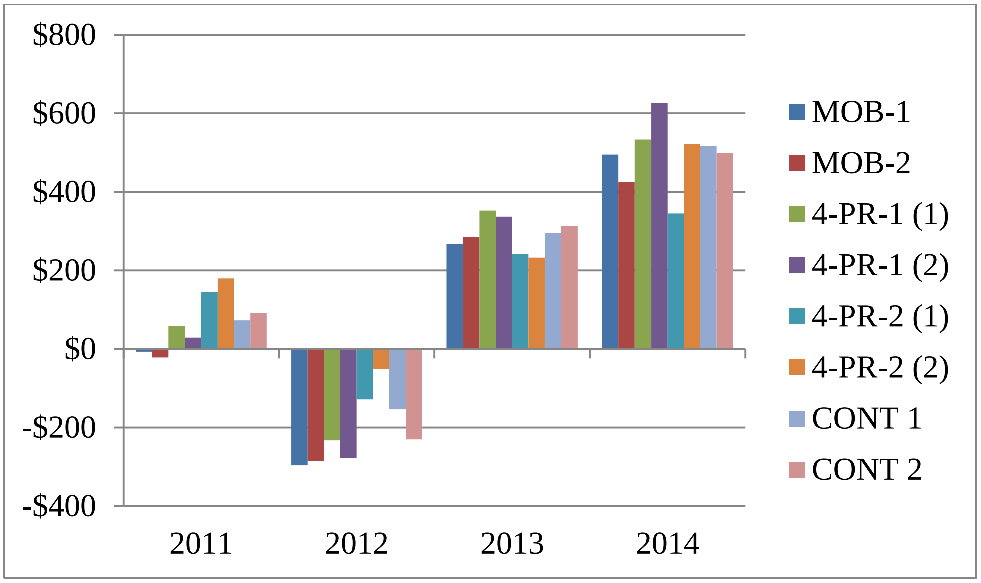
	Mean	Standard Deviation	Coefficient of Variation	Mini-Max
MOB	4	3	4	2
4-PR-1	2	4	3	4
4-PR-2	1	1	1	1
CONT	3	2	2	3

Table 3: Average per Acre Returns to Labor and Management Used for Risk Ranking

	Mean ($)	Standard Deviation ($)	Coefficient of Variation (%)	Mini-Max ($)
MOB	108.02	305.85	283.13	404.31
4-PR-1	178.43	337.03	188.88	455.63
4-PR-2	185.99	206.88	111.23	313.92
CONT	175.83	278.93	158.63	405.56

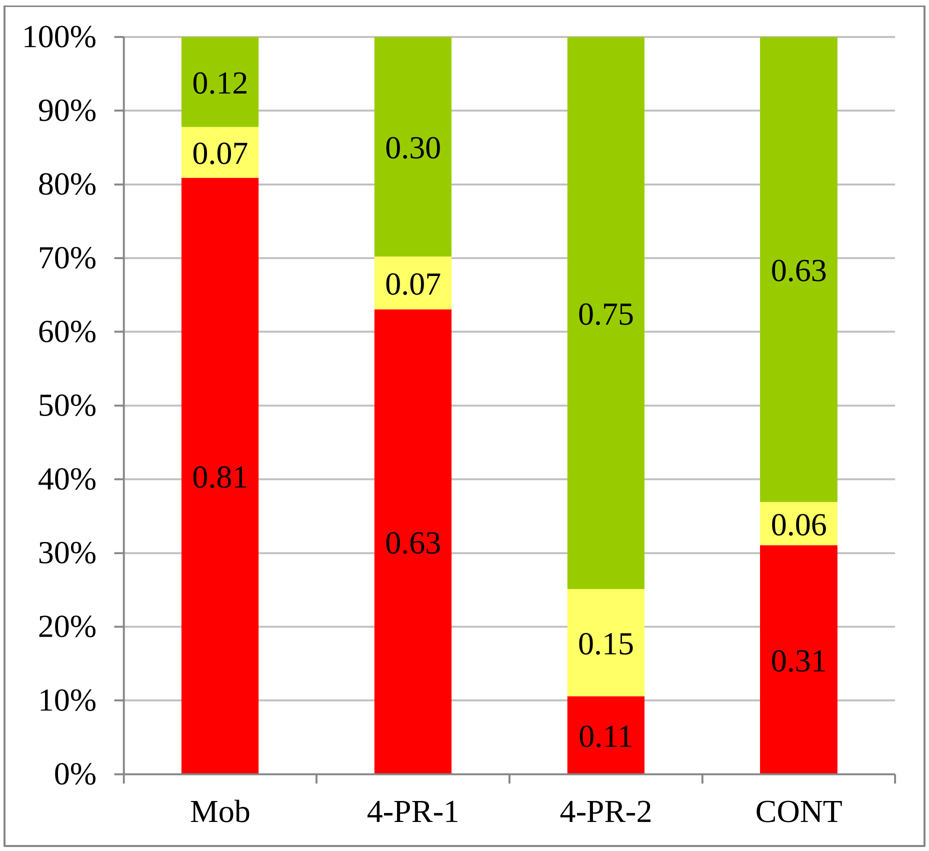
The yearly returns to labor and management per acre are shown in Figure 1. In 2011, the system 4-PR-2 had the highest returns to labor and management. In 2012, a year of drought conditions, all grazing systems had negative returns, but 4-PR-2 had the least negative returns. In 2011, both replications of MOB had negative returns. In 2012, greatest loss. In 2013 and 2014, the returns to labor and management for MOB was mixed but competitive with the returns to other systems.

Figure 1: Average per Acre Returns to Labor and Management per System from 2011-2014



In Figure 2, the stoplight function which assigned the probability of having returns below, in-between, and above certain cutoff values is displayed for each system. The bottom cut-off value is $0.00 in returns to labor and management per acre. This means the bottom portion of the figure displays the probability of negative returns. The upper cut-off value is $25, which is equivalent to the highest $/acre rent value in the study. The portion between the upper cut-off value and the lower cut-off value is the probability of returns being within this range. MOB had a probability of negative returns at 81%. The system 4-PR-1 has the probability of negative returns at 63%. The 4-PR-2 system has a high probability of returns being above $25 an acre at 75%. Although these probabilities give good insight into each system, further analysis is needed to determine risk.

Figure 2: Probabilities of Returns to Labor and Management Less Than $0.00 and Greater Than $25.00 per Acre



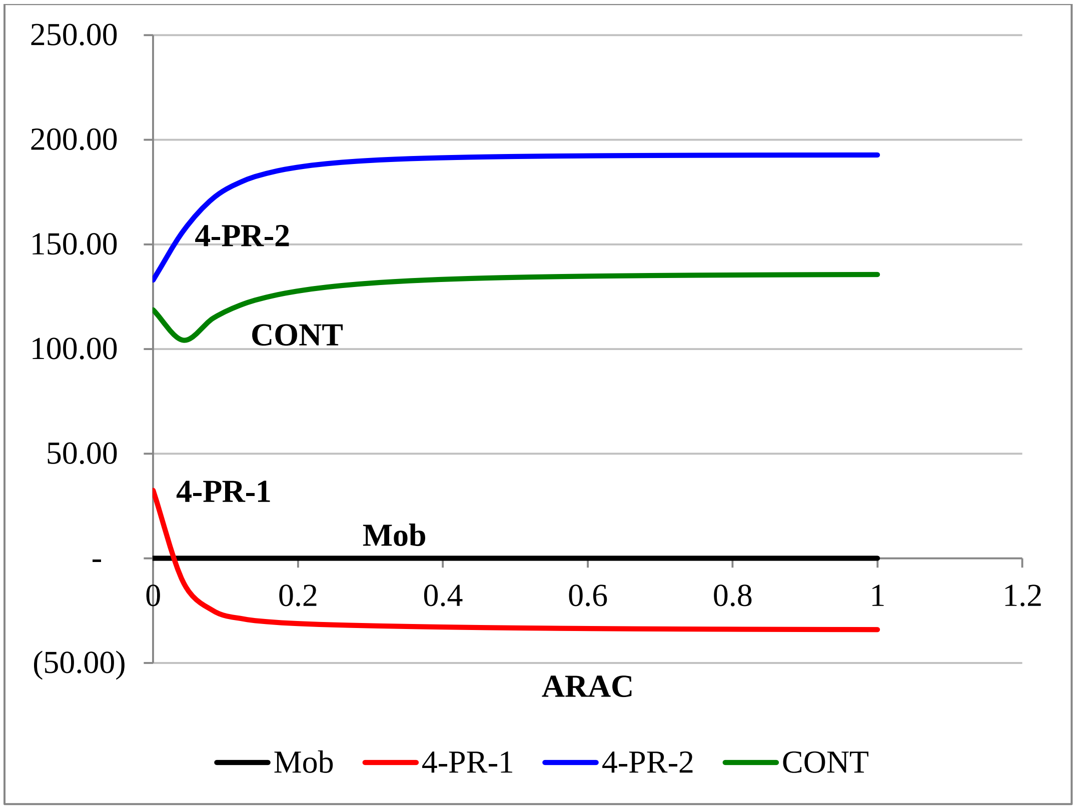
In Table 4, each system is ranked according to risk preferences at different risk aversion levels. When a producer is risk neutral MOB is the least preferred system and 4-PR-2 is the most preferred system. As a producer becomes more risk averse MOB becomes the third (out of four) most preferred system. However, 4-PR-2 remains as the most preferred system.

Table 4: Stochastic Dominance with Respect to a Function per Acre

Efficient Set Based on SDRF at					
	Lower RAC	**0**		Upper RAC	**1**
	Name	Level of Preference		Name	Level of Preference
1	4-PR-2	Most Preferred	1	4-PR-2	Most Preferred
2	CONT	2nd Most Preferred	2	CONT	2nd Most Preferred
3	4-PR-1	3rd Most Preferred	3	MOB	3rd Most Preferred
4	MOB	Least Preferred	4	4-PR-1	Least Preferred

Figure 3 displays the negative exponential utility weighted risk premiums relative to MOB per acre. The risk premium displayed would be the amount a producer would need to be indifferent between 4-PR-1, 4-PR-2, and CONT relative to MOB. When the absolute risk aversion coefficient (RAC) is equal to 0, a producer would need $132.96, $118.70, and $32.43 per acre to be indifferent between MOB and the 4-PR-2, CONT, and 4-PR-1 systems respectively. As risk aversion increases to 1 a producer would need a risk premium of $34.10 an acre to switch from MOB to 4-PR-1. However in order to switch from 4-PR-2 and CONT to MOB a producer would need a risk premium of $192.73 and $135.62 per acre, respectively. The high probability of negative returns found in the stoplight function, explain why a risk averse producer would need such a high risk premium to be indifferent between grazing systems.

Figure 3: Negative Exponential Utility Weighted Risk Premiums Relative to MOB per Acre



Evaluation of Potential Management Changes

According to Smart et al. (2010), as stocking rates increase, the average daily gain (ADG) per animal will decrease. However, the amount of decrease per animal varies among years and between different locations. In this empirical study the 4-PR-2 system had the lowest stocking rate, but also obtained the highest ADG. The overall difference in ADG between 4-PR-2 and MOB was very substantial (Table 4). Furthermore, interviews with local producers provided further insights on how management could affect the system. Each producer gave valuable information on how they adopted changes to MOB grazing to make it work for them.

For example, in the MOB system cattle are examined more often and disease problems can be more quickly addressed which can lead to higher ADG and improved returns.

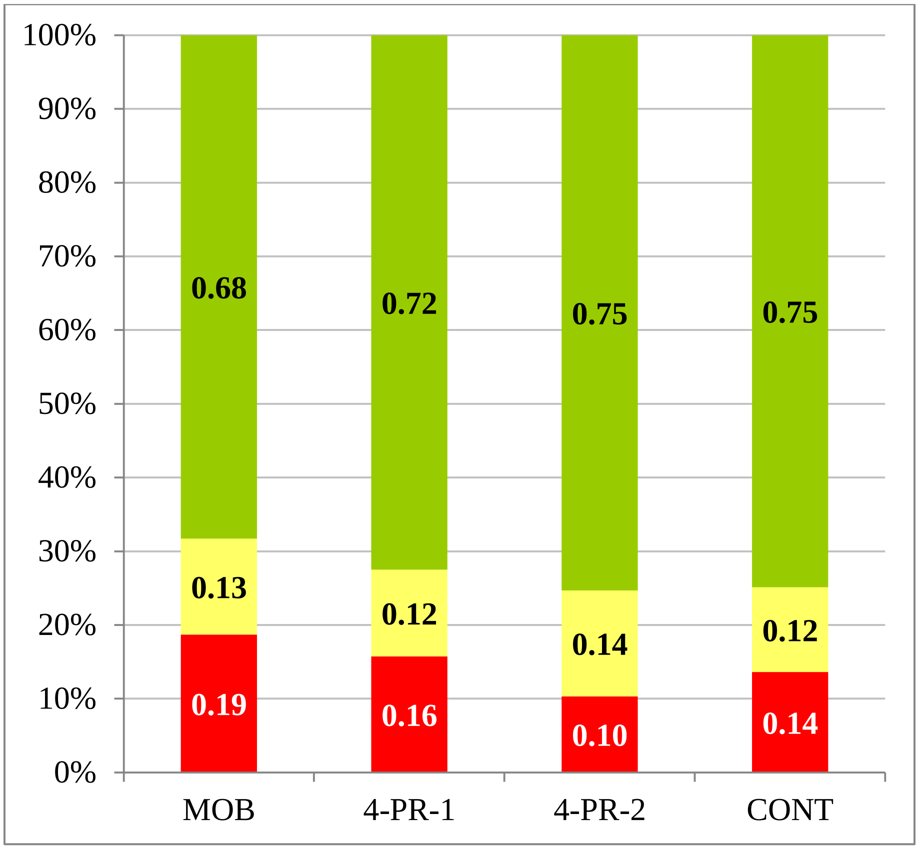
Table 4: Original percentage difference of ADG in other grazing system relative to 4-PR-2

System	2011	2012	2013	2014	Overall
4-PR-1	-65.1%	-42.0%	-52.6%	-19.3%	-45.9%
CONT	-51.0%	-10.3%	-24.9%	-1.9%	-25.2%
MOB	-86.4%	-63.1%	-61.6%	-37.9%	-64.4%

In this section returns were examined with the assumption that proper management could affect the ADG of the alternative system. The new assumption was that management changes would improve the ADG of the alternative systems, including MOB. The new ADG for 4-PR-1, CONT, and MOB was assessed at 12.5% lower than that of 4-PR-, rather than the -25% to -64% reported above (table 4). ADG was adjusted from 4-PR-2 since it was the baseline system and was closely related to grazing systems used in the local area. Also it was easier to standardize ADG from the baseline system and not from the original data.

If management is able to make improvements in ADG to 12.5% below 4-PR-2 important new trends appear. In figure 4, the stoplight function compares the probability of returns when ADG for MOB, 4-PR-1, and CONT is 12.5% lower than 4-PR-2. MOB still has the highest probability of negative returns at 19% followed by 4-PR-1, CONT, and 4-PR-2. In this scenario the probability of returns of returns above the cash rental rate for MOB is 68% compared to the 12% probability based on original estimates (figure 2).

Figure 4: Probabilities of Returns to Labor and Management Less Than $0.00 and Greater Than $25.00 per Acre with a 12.5 % Decrease in Animal Performance



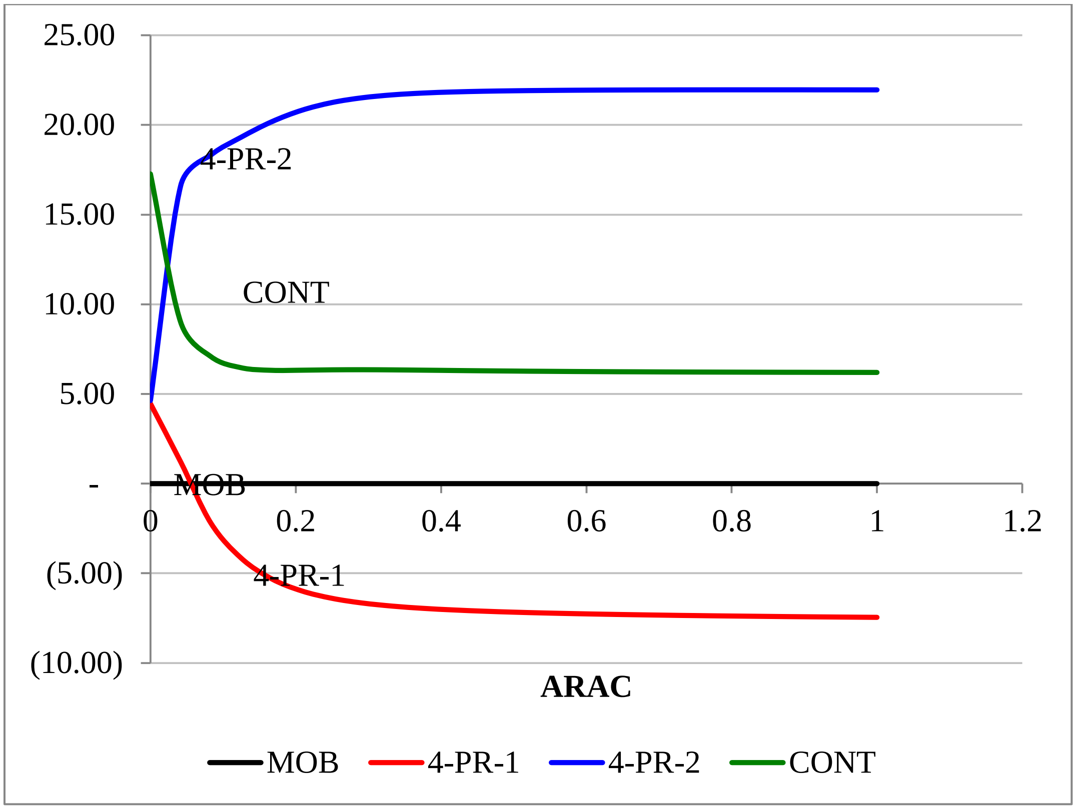
The SDRF in Table 5 shows that when the ADG is 12.5% lower for all three systems relative to 4-PR-2 the CONT system is the most preferred system when risk aversion is 0. The 4-PR-2 system is the second most preferred followed by 4-PR-1 and MOB. As risk aversion increases risk preferences among the systems change. 4-PR-2 becomes the most preferred system. CONT falls to the second most preferred system. MOB switches places with 4-PR-1 and becomes the third most preferred system. When the rate of gain is the same for both MOB and CONT; the CONT system is always preferred to the MOB grazing system. Stochastic efficiency shows that 4-PR-2 grazing system becomes the most preferred system when a risk aversion coefficient of 0.0417 is reached. MOB becomes the third most preferred system when a risk aversion coefficient of 0.0833 is reached.

Table 5: Stochastic Dominance with Respect to a Function per Acre with 12.5% Decrease in Animal Performance

Efficient Set Based on SDRF at					
	Lower RAC	**0**		Upper RAC	**1**
	Name	Level of Preference		Name	Level of Preference
1	CONT	Most Preferred	1	4-PR-2	Most Preferred
2	4-PR-2	2nd Most Preferred	2	CONT	2nd Most Preferred
3	4-PR-1	3rd Most Preferred	3	MOB	3rd Most Preferred
4	MOB	Least Preferred	4	4-PR-1	Least Preferred

The risk premium a producer would need to be indifferent between systems is displayed in figure 5. The changes in SDRF can easily be seen in this figure. At an ARAC of 0 a producer would need a risk premium of $4.46, $4.63, and $17.27 per acre to be indifferent between MOB and 4-PR-1, 4-PR-2, and CONT, respectively. As risk aversion increases the risk premium needed to switch from 4-PR-1 to MOB rises to a maximum of $21.95 an acre. The risk premium a producer would need to switch to MOB from CONT decreases to $6.00 an acre. Finally, at a maximum a producer would need $7.46 to switch from MOB to 4-PR-1 at an ARAC of 1. Although increased ADG makes MOB more competitive against 4-PR-1, the system still needs a better ADG relative to CONT or 4-PR-2 to be competitive with those systems.

Figure 5: Negative Exponential Utility Weighted Risk Premiums Relative to MOB per Acre with a 12.5% Decrease in Animal Performance



Summary, Conclusions and Implications

Four different grazing systems: two rotational systems, a continuous grazing system, and a modified high-intensity, short-duration (mob) system, replicated twice, were evaluated from an economic perspective. Mob grazing is defined as a system having very high stocking rates for a short amount of time. Livestock are forced to eat or trample the vegetation.

Stocking rates and average daily gains (ADG) were collected from the University of Nebraska (UNL) Barta Brothers ranch located in the North Agricultural District, near Rose, Nebraska. The study started in 2011 and lasted until 2014. Using the performance data and other cost data relevant to South Dakota and Nebraska, budgets were set up for each grazing system and extrapolated to a quarter section (160 acres) of rangeland.

Profitability of each system, which was measured as returns to labor and management, was found for each replication. Next, Simetar© was used to determine the risk in each system and rank the systems according to risk preferences. These risk preferences were used to find a risk premium, the amount a producer would need to be indifferent between two systems. Finally, a sensitivity analysis is used to rank each grazing system against a baseline system when management changes improve the performance of alternative grazing systems.

Some important results are as follows: 1) the rotational grazing system in which cattle pass through each paddock twice (4-PR-2) had the highest returns to labor and management, 2) the mob grazing system was the least preferred system per acre when risk was not considered, 3) when risk aversion increases, mob grazing becomes the third preferred system per acre, 4) a risk neutral producer would need a risk premium of $22.92-$79.84 per animal or $32.43-$132.96 an acre to switch to mob grazing, 5) if ADG decreases by 12.5% from the baseline system (4-PR-2) the continuous system is the most preferred system per animal and per acre.

Throughout the empirical analysis the 4-PR-2 system was preferred most of the time. The original analysis and stochastic data analysis ranked 4-PR-2 as the top system. MOB systems were ranked very low between all systems. In the actual data, MOB had the lowest mean net returns. In the stochastic data MOB was also ranked fourth. However, the system increased in risk preference when risk aversion increased. However, producers would still prefer 4-PR-2 and CONT over the MOB system in all situations.

A producer would prefer a grazing system with a lower stocking rate since the system had a higher ADG. One important implication of this study is that even though MOB is the least preferred system and 4-PR-2 is the most desirable, the number of times cattle are moved during the grazing season may be important. The 4-PR-2 system had the second highest number of times that cattle were moved. Therefore a producer may benefit from more moves. A producer could start with a system similar to 4-PR-2 and increase the number of moves. It would be imperative to keep an eye on animal performance and for management to learn more about the system in order to help improve it.

Another important implication found in this study is that rotational grazing systems are not always superior to a continuously grazed system. Although, the 4-PR-2 grazing system ranked above the continuous CONT grazing system, the CONT grazing system was consistently preferred to both 4-PR-1 and MOB. Management changes must also occur in order to make these systems more profitable. The learning curve may be very important in management of grazing systems, especially more intensive grazing systems.

This study had some limitations as well. First, the study was only conducted for four years, 2011 through 2014 which included the impacts of the 2012 drought on grass production and ADG. Some of the positive effects that producers association with mob grazing may take longer than four years to affect profitability and the full effects are yet to be seen.

Another important limitation was modeling the potential selling price. In the simulated budgets, a price slide was always assumed. However, in the actual budgets for two of the four years, cattle prices increased as the grazing season progressed. One final limitation of that study was that exact costs for certain parts of the budget could not be found. Some of these include marketing costs, preconditioning cost, or average vet costs. A price vector had to be used and may not be as accurate.

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