Understanding Grazing Intensity Choices on the U.S. Great Plains

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**Motivation**

Ruminant grazing systems differ in how grass is presented to the animals.

**Continuous Grazing**
- Livestock have unrestricted access to the entire pasture or rangeland throughout the grazing season.

**Rotational Grazing (RG)**
- Usually 4 to 15 pastures per herd are used and livestock graze on each paddock for weeks or months before moving to the next.

**Management Intensive Grazing (MIG)**
- More pastures (16+) per herd are used with short grazing periods of 1-14 days followed by a grass recovery period of 20-100 days.

**Research Methodology**

Our main interests are to understand the following research questions:

(Q1) (extensive margin) who adopts intensive grazing systems and why?

A logit regression model is applied to explain how factors such as perceived additional labor requirements, social networks, perceived profits affect adoption of intensive grazing. For research question #1, column (1) of Table 1 show that costs and profits are significant factors in the adoption choices, where perceived additional labor requirements perceived economic profits are the most important.

Consistent with Bandiera & Rasul (2006), we find evidence that social networks matter. Our measure of social networks is the percent of grassland under rotational grazing or MIG in a rancher's neighborhood. Producers’ personal characteristics such as operation years, education background, ranch size and location also factors that affect adoption choices. 

Our analyses do not show clear effects of perceived knowledge about RG/MIG on adoption.

Estimation results for research question #2 can be found in column (2), which suggest that costs, social networks are not factors and some personal characteristics including operation years and ranch size are also not factors, but perceived profits estimates and economic return as well as perceived work-life balance and land qualities are important factors.

As to research question #3, As shown in columns (3) and (4) of Table 1, costs and profits are most important factors that increase the probability of future RG and MIG adoptions, while social networks and operation experiences are also factors for RG. In addition, based on the chart below, the elasticity of practice supply is slightly below 1%, i.e., there will be just under 1% of increase in the fraction of adopters for 1% increase in one-time subsidy and the response is strongly significant.

**Data**

In early 2018 we sent out a survey regarding grazing management practices to beef cattle operators in the Dakotas as well as in Central and Northern Texas, as indicated by the map in Figure 2.

Figure 1. Ruminant grazing systems.

There are several potential private and social benefits associated with usage of more intensive grazing systems. Intensive grazing presents the herd with more uniform, succulent, and green pasture that increase ruminant profitablility then less land will be placed in cropping systems that are harder on the environment. More intensive grazing systems require infrastructure investments and labor costs. Despite the potential benefits and various efforts aimed at promoting adoption, U.S. Census of Agriculture data suggest that the number of ranchers using rotational grazing has been declining. We aim to better understand the factors affecting RG and MIG adoption decisions.

For research question #1, column (1) of Table 1 show that costs and profits are significant factors in the adoption choices, where perceived additional labor requirements perceived economic profits are the most important.

Consistent with Bandiera & Rasul (2006), we find evidence that social networks matter. Our measure of social networks is the percent of grassland under rotational grazing or MIG in a rancher's neighborhood. Producers’ personal characteristics such as operation years, education background, ranch size and location also factors that affect adoption choices. Our analyses do not show clear effects of perceived knowledge about RG/MIG on adoption.

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**Results**

### Table 1. Logit and ordered logit model estimation results

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
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</thead>
<tbody>
<tr>
<td>Operation years</td>
<td>-0.032**</td>
<td>-0.017</td>
<td>-0.018</td>
<td>-0.014</td>
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<tr>
<td>Internal fences</td>
<td>-0.200</td>
<td>0.212</td>
<td>0.394</td>
<td>0.273</td>
</tr>
<tr>
<td>Labor (RG)</td>
<td>-0.150</td>
<td>-0.601</td>
<td>-0.258</td>
<td>-</td>
</tr>
<tr>
<td>Labor (MIG)</td>
<td>-0.965***</td>
<td>0.512</td>
<td>-0.488**</td>
<td>-</td>
</tr>
<tr>
<td>Profit (RG)</td>
<td>0.909**</td>
<td>-1.179**</td>
<td>0.890**</td>
<td>0.216</td>
</tr>
<tr>
<td>Profit (MIG)</td>
<td>-0.410</td>
<td>1.688**</td>
<td>-0.394**</td>
<td>-</td>
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<tr>
<td>Initial cost</td>
<td>-0.299</td>
<td>0.131</td>
<td>-0.167</td>
<td>-0.394**</td>
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<tr>
<td>Maintenance cost</td>
<td>0.253</td>
<td>-0.289</td>
<td>-0.005</td>
<td>0.224</td>
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<tr>
<td>Neighborhood (RG)</td>
<td>0.874**</td>
<td>0.265</td>
<td>0.472**</td>
<td>-</td>
</tr>
<tr>
<td>Neighborhood (MIG)</td>
<td>0.339</td>
<td>0.297</td>
<td>0.31</td>
<td>-</td>
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<tr>
<td>Farm size</td>
<td>-0.020</td>
<td>-0.833**</td>
<td>-0.150</td>
<td>-0.163</td>
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<tr>
<td>Work-life balance</td>
<td>0.203</td>
<td>0.800**</td>
<td>0.125</td>
<td>0.067</td>
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<tr>
<td>Ranch size</td>
<td>0.001*</td>
<td>-0.001</td>
<td>0.000</td>
<td>-</td>
</tr>
<tr>
<td>Latitude</td>
<td>0.132**</td>
<td>-0.122</td>
<td>0.021</td>
<td>-0.021</td>
</tr>
<tr>
<td>Longitude</td>
<td>-0.014</td>
<td>-0.359</td>
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<td>-0.000</td>
</tr>
<tr>
<td>Education</td>
<td>0.568**</td>
<td>0.071</td>
<td>0.043</td>
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<tr>
<td>Liability ratio</td>
<td>0.050</td>
<td>0.265</td>
<td>-0.198</td>
<td>-0.123</td>
</tr>
<tr>
<td>LCC 1 4 th</td>
<td>-0.000</td>
<td>0.013*</td>
<td>-0.002</td>
<td>0.001</td>
</tr>
<tr>
<td>Slope less than 3%</td>
<td>0.007</td>
<td>-0.000</td>
<td>-0.004</td>
<td>-0.005</td>
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<tr>
<td># of Observations</td>
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<td>54</td>
<td>197</td>
<td>173</td>
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</table>

Standard errors in parentheses

**References**


**Acknowledgements**

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