



Optimizing Nitrogen Fertilizer Rates for Annual Cereal Forage Production

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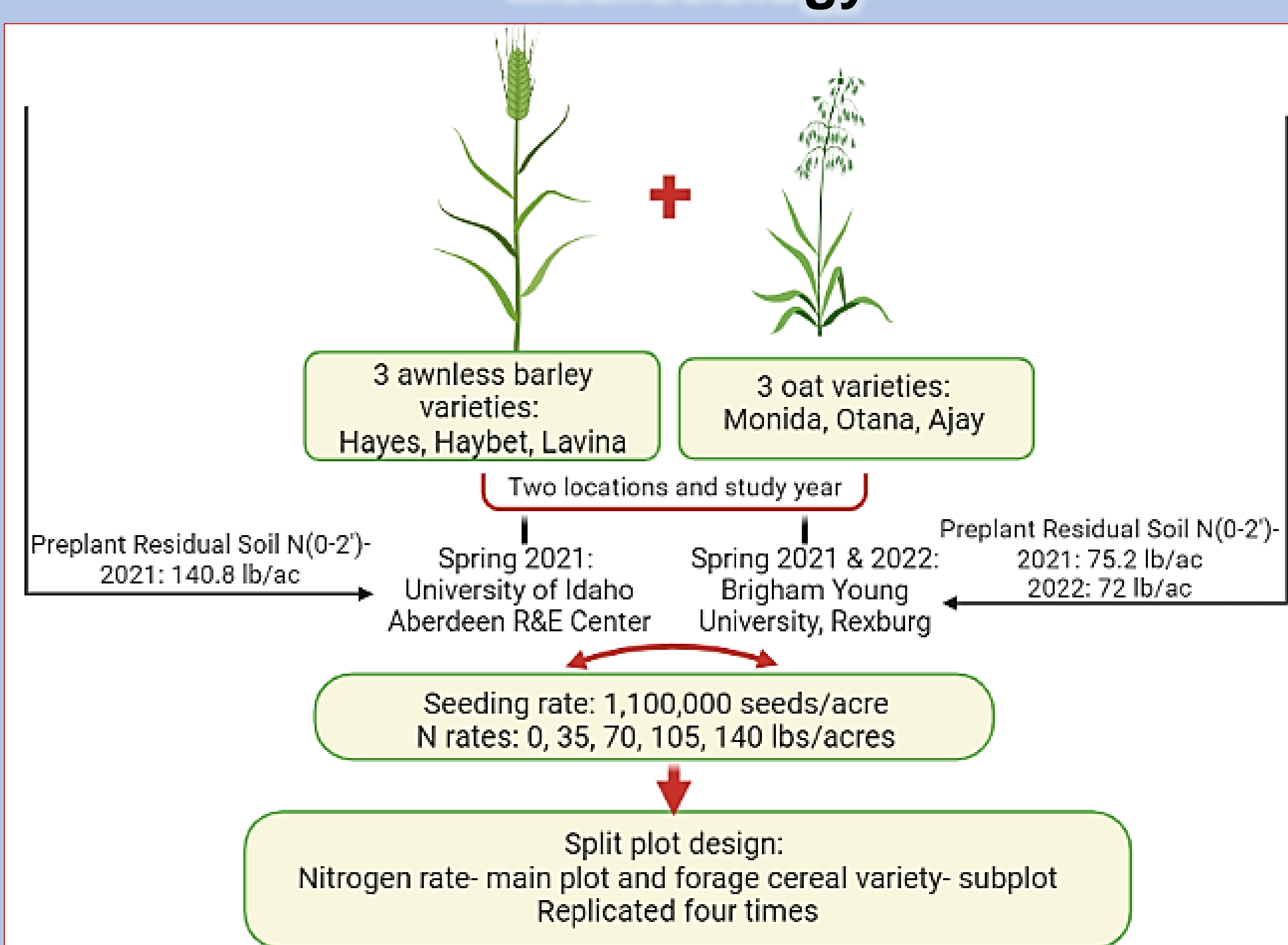
Introduction

- Southern Idaho dairy and livestock production has increased, requiring additional inputs in high-quality feed.
- Profitable forage production is a factor of the quantity of biomass produced and quality of feed for livestock
- Small grains provide flexibility for a crop rotation. They may be harvested once, followed by another cash crop, or harvested multiple times in the season.
- Small grain forage varieties have different characteristics that affect yield, regrowth, and feed quality requiring careful selection to match a producer's production goals and environmental constraints.

Objective

Evaluate the effect of nitrogen (N) rate on biomass production, regrowth vigor and forage quality of six varieties of awnless forage barley (*Hordeum vulgare*) and forage oat (*Avena sativa*)

Methodology



Results

Tests of Between-Subjects Effects

Aberdeen 2021						
Effect	P>F value					
	First Cut yield (ton/ac)	Total Yield (ton/ac)*	Crude Protein (CP %)	Total Digestible Nutrients (TDN)	Relative Feed Quality (RFQ)	
Variety	0.000	0.000	0.000	0.000	0.000	
Residual soil plus Fertilizer N	0.314	0.440	0.000	0.056	0.041	
Variety * Residual soil plus Fertilizer N	0.981	0.916	0.972	0.997	0.906	

Rexburg 2021 & 2022						
Effect	P>F value					
	2021 First Cut yield (ton/ac)	2022 First Cut yield (ton/ac)	Total Yield (ton/ac)*	Crude Protein (CP %)	Total Digestible Nutrients (TDN)	Relative Feed Quality (RFQ)
Variety	0.000	0.035	0.000	0.000	0.000	0.000
Residual soil plus Fertilizer N	0.000	0.000	0.000	0.000	0.436	0.371
Variety * Residual soil plus Fertilizer N	0.272	0.601	0.273	0.603	0.546	0.365

*Here, Total Yield refers to 2 cutting events for barley and oat varieties at both locations in the year 2021

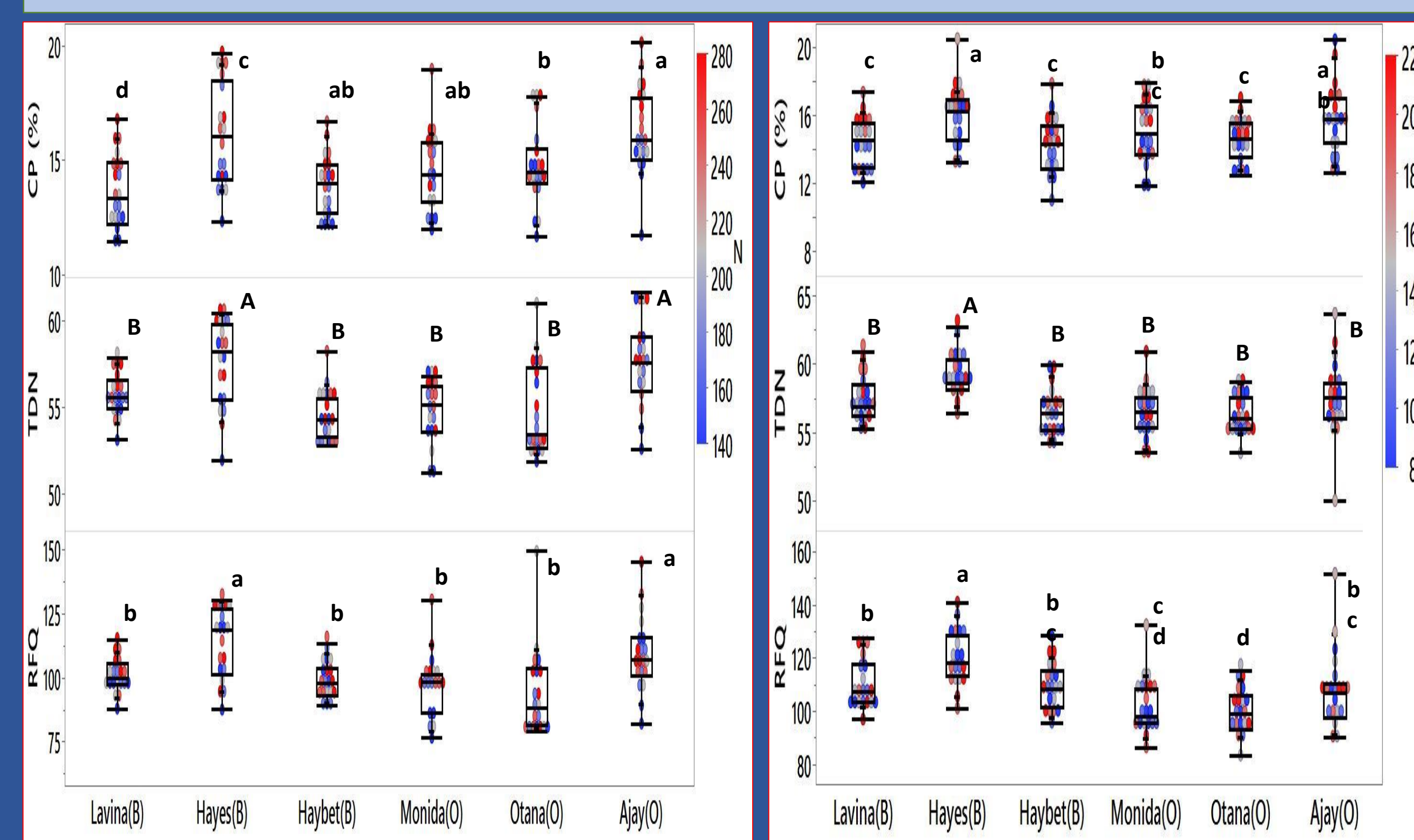
Economic Analysis

Aberdeen 2021										
N rates+ Pre-Planting Residual soil N = 141 lb/ac										
Varieties	0 lb/ac		35 lb/ac		70 lb/ac		105 lb/ac		140 lb/ac	
	1 st harvest	2 nd harvest	1 st harvest	2 nd harvest	1 st harvest	2 nd harvest	1 st harvest	2 nd harvest	1 st harvest	2 nd harvest
Lavina (B)	\$503	-	\$595	-	\$595	-	\$658	-	\$504	-
Hays (B)	\$184	-	\$231	-	\$63	-	\$171	-	\$-0.4	-
Haybet (B)	\$539	-	\$595	-	\$558	-	\$412	-	\$348	-
Monida (O)	\$308	\$-62	\$410	\$46	\$185	\$15	\$256	\$17	\$244	\$45
Otana (O)	\$393	\$-121	\$380	\$-138	\$198	\$-26	\$222	\$-54	\$257	\$-34
Ajay (O)	\$297	\$-15	\$326	\$-57	\$202	\$-15	\$276	\$3	\$164	\$90

Rexburg 2021										
N rates+ Pre-Planting Residual soil N = 75 lb/ac										
Varieties	0 lb/ac		35 lb/ac		70 lb/ac		105 lb/ac		140 lb/ac	
	1 st harvest	2 nd harvest	1 st harvest	2 nd harvest	1 st harvest	2 nd harvest	1 st harvest	2 nd harvest	1 st harvest	2 nd harvest
Lavina (B)	\$-157	\$-93	\$72	\$-110	\$236	\$-66	\$268	\$-141	\$260	\$-137
Hays (B)	\$-298	\$-42	\$-197	\$-136	\$-90	\$-108	\$-121	\$-41	\$-114	\$-132
Haybet (B)	\$24	\$-62	\$191	\$-154	\$168	\$-134	\$187	\$-60	\$100	\$-173
Monida (O)	\$-180	\$139	\$112	\$112	\$59	\$262	\$158	\$382	\$73	\$233
Otana (O)	\$-133	\$149	\$-12	\$70	\$244	\$220	\$185	\$54	\$66	\$166
Ajay (O)	\$-106	\$247	\$-60	\$147	\$84	\$176	\$138	\$162	\$25	\$255

❖ At Aberdeen, max returns at 35 lb/ac N rate, except Otana oats, (at 0 lb/ac N).
 ❖ At Rexburg, max net returns at 105 lb/ac N rate except Otana oats (at 75 lb/ac).
 ❖ Optimum N rates (including pre-planting residual N) for max returns = 175 lb/ac.
 ❖ Hays barley yielded consistently low or negative net returns.

Impact of Varieties and Nitrogen rates on CP, TDN and RFQ



Fertilizer + residual soil N had a significant impact on CP percentage at both locations, whereas their significant effect was observed on forage RFQ at the Aberdeen location. CP was lowest for Haybet at both locations whereas V*N interaction had no significant impact on the CP, TDN and RFQ.

Conclusions

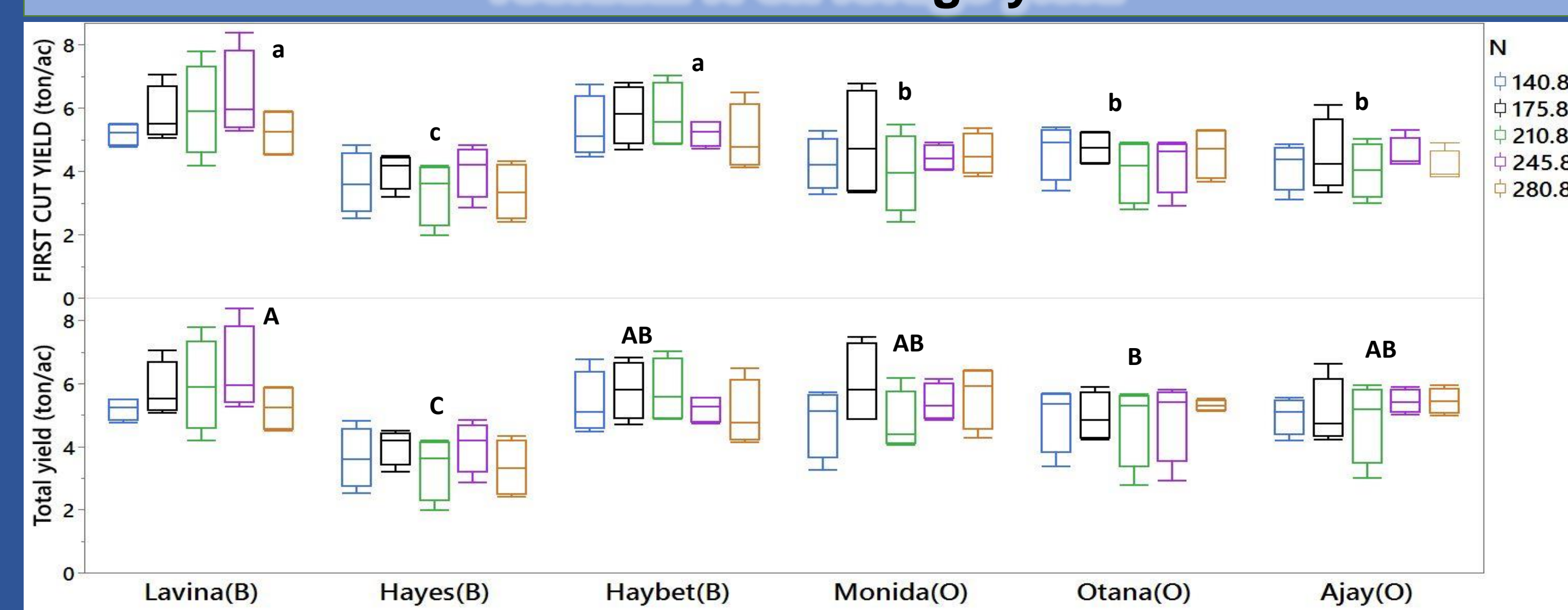
- The N rate had a significant impact on forage biomass production at Rexburg. Following the first cut, there was little to no regrowth for all barley varieties, but all oat varieties produced an additional 0.50 to 2.60 ton/ac.
- Hayes yielded less than Haybet and Lavina at both locations. The lack of a significant response to the N rate at Aberdeen may be due to 141 lb N/ac in the top 2' of the soil at planting.
- There was not a significant effect of Variety*N on forage yield at both locations

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Aberdeen : Impact of Varieties and Nitrogen rates with preplant residual N on forage yield



Rexburg : Impact of Varieties and Nitrogen rates with preplant residual N on forage yield

