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Canada

Does it Pay to Fertilize a Mature Forage Stand on a Severely Saline Field?

K.G. Wall, A.D. Iwaasa and H. Steppuhn

ADF Project# 20140152
"Development of best management practices for cost-effective and successful establishment of saline forages for Saskatchewan"

Our Vision

Driving innovation and ingenuity
to build a world leading agricultural and food economy
for the benefit of all Canadians.

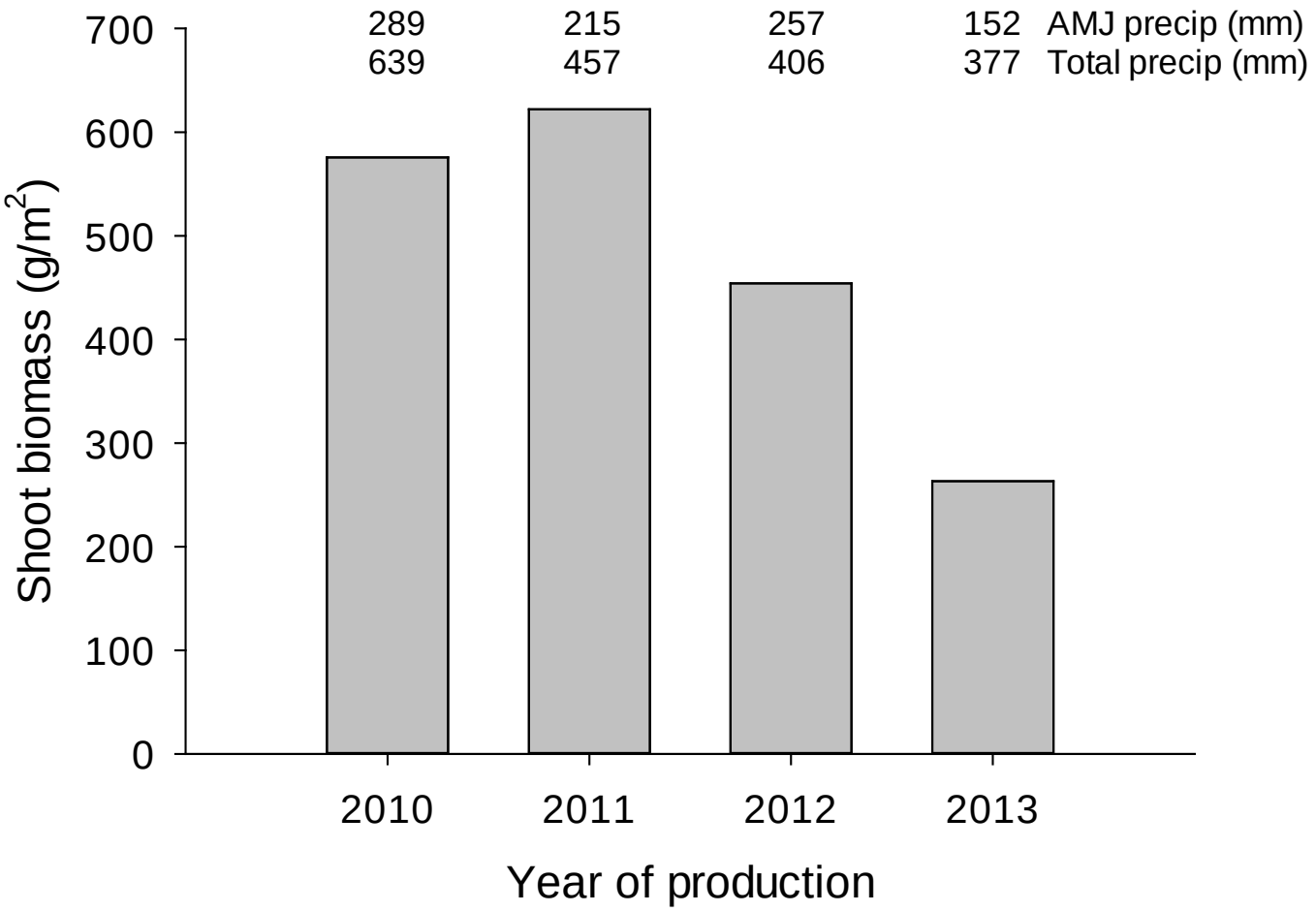
Our Mission

Agriculture and Agri-Food Canada provides leadership
in the growth and development of a competitive, innovative
and sustainable Canadian agriculture and agri-food sector.


Canada

Root-zone Salinity Classification

- *0 – 2 dS/m non-saline*
- *2 – 4 dS/m slightly saline*
- *4 – 8 dS/m moderately saline*
- *8 – 16 dS/m severely saline*
- *16+ dS/m very severely saline*


289 215 257 152 AMJ precip (mm)
639 457 406 377 Total precip (mm)
700
600
500
400
300
200
100
0
Shoot biomass (g/m2)
2010
2011
2012
2013
Year of production

Reduced forage production on a field can be the result of several factors:

Decline in fertility

Unfavorable weather, particularly drought, untimely rainfall or frost.

Soil related problems due to salinity, texture, poor water infiltration, or poor drainage.

Long-term management problems, which have resulted in the loss of desirable species and invasion of undesirable species.

Seeded Pasture and Hayland Classes

Condition	Criteria
Excellent	At least 90% of the production coming from desirable species. Vigour of desired species high. Density of desired species is moderate (optimum). * Maintain management practices.
Good	75-89% of production coming from desirable species. Vigour of desired species high. Density of desired species is moderate (optimum). * Maintain management practices.
Fair	50-74% of production coming from desirable species. Vigour of desirable species is medium to low. Density of desired species is to high or too low. * Requires rejuvenation and changes in management.
Poor	Less than 50% of production coming from desired species. Vigour of desired species is low. Density of desired species is too low. *Requires rejuvenation and changes in management.

Objective:

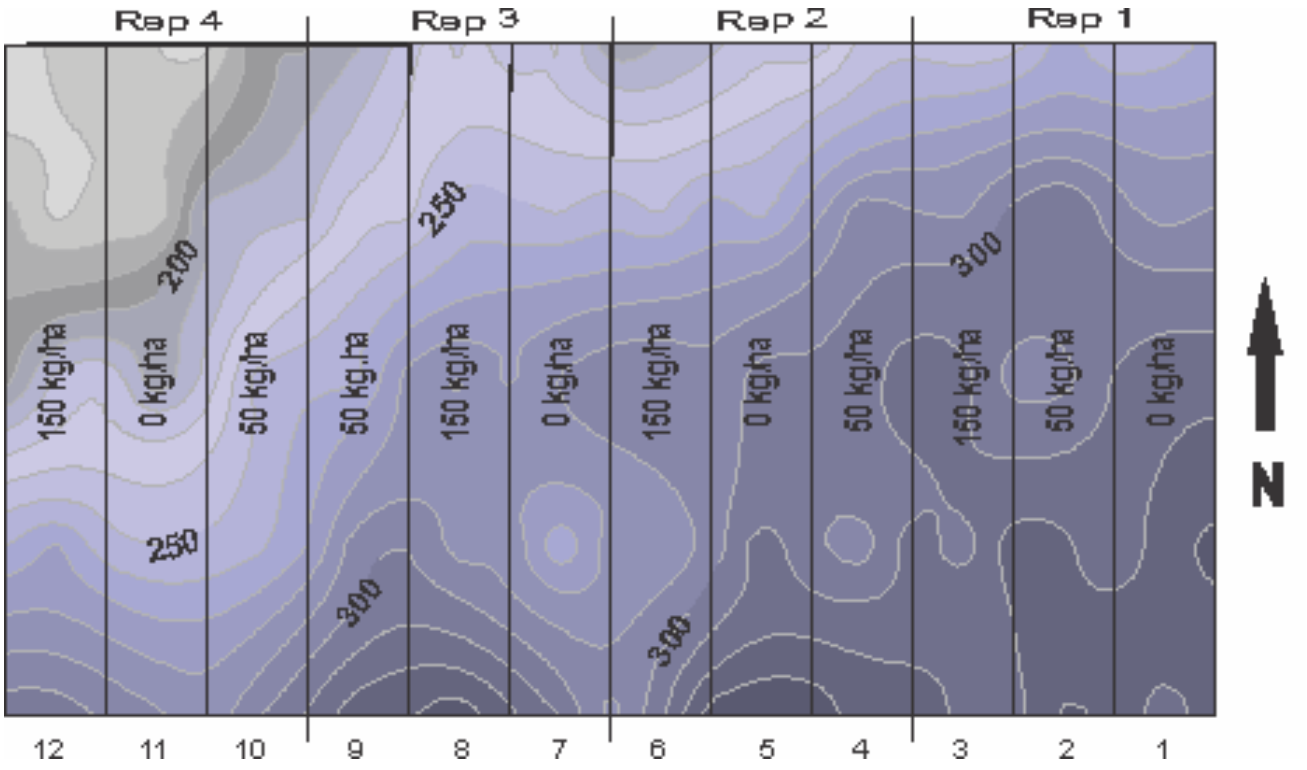
Compare the productivity, economics and resulting feed quality of two one-time fertilizer applications on a mature stand of green wheatgrass on a severely saline field.

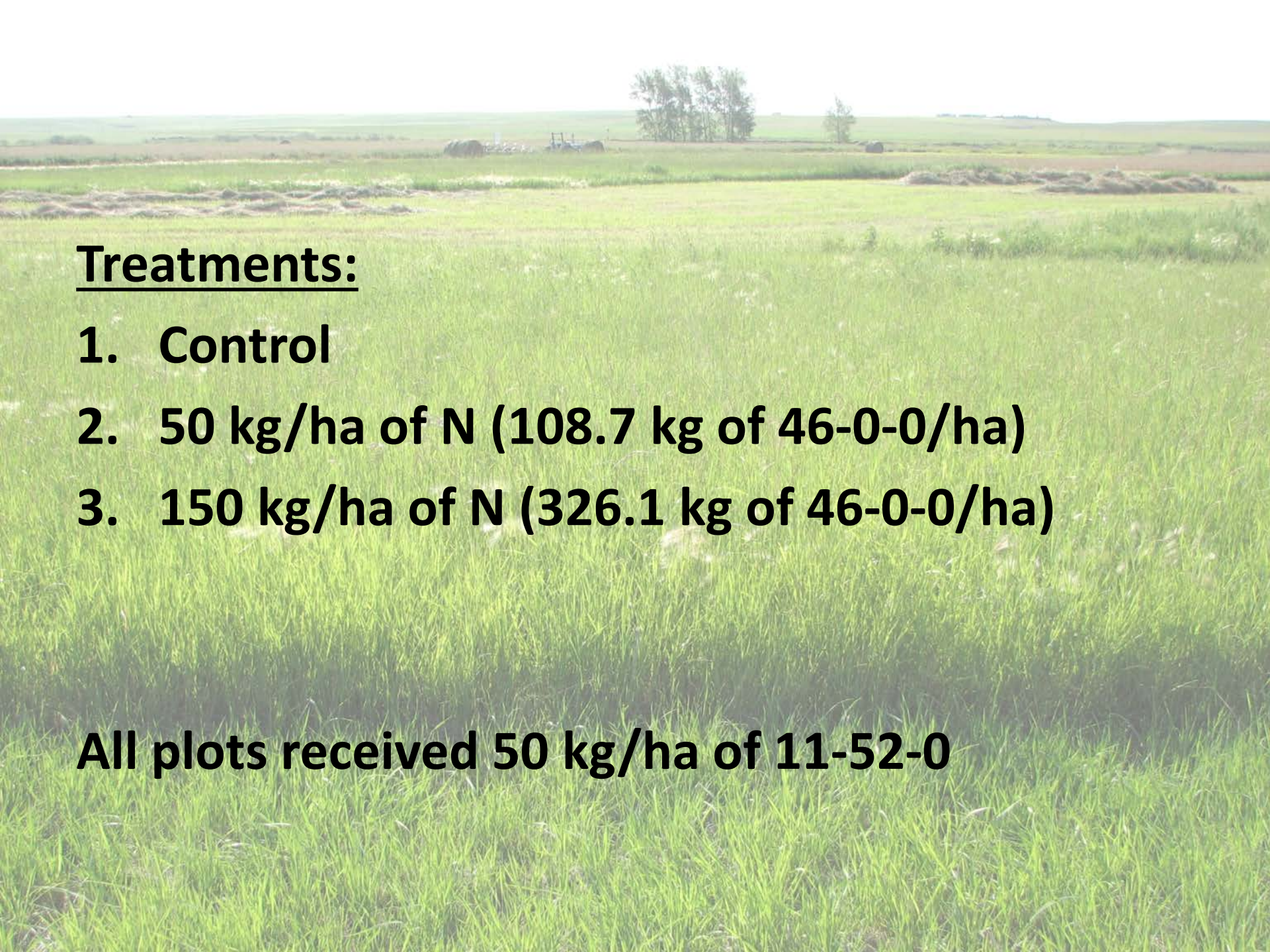
	Conductivity EC_e (dS/m)				
N Applied Kg/ha	Rep 1	Rep 2	Rep 3	Rep 4	Average
0	20.3[a]	19.8[a]	18.2[a]	16.3[a]	18.7[a]
50	21.7[a]	20.4[a]	17.4[a]	16.0[a]	18.9[a]
150	21.1[a]	19.2[a]	17.8[a]	15.3[a]	18.4[a]
RMSE	2.6	3.4	3.2	3.0	3.4
Prob > F	0.79	0.91	0.95	0.93	0.93

Average saturated soil paste extract electrical conductivity (EC_e) from samples taken May 22nd 2014 (0-60 cm).

	Conductivity EC_e (dS/m)				
N Applied Kg/ha	Rep 1	Rep 2	Rep 3	Rep 4	Average
0	17.5[a]	19.1[a]	19.5[a]	14.4[a]	17.6[a]
50	18.5[a]	19.8[a]	18.2[a]	17.5[a]	18.5[a]
150	20.3[a]	20.0[a]	19.7[a]	16.2[a]	19.0[a]
RMSE	2.8	3.6	2.6	4.2	3.3
Prob > F	0.53	0.95	0.77	0.68	0.58

Average saturated soil paste extract electrical conductivity (EC_e) from samples taken October 28th 2015 (0-60 cm).


Rep 4
Rep 3
Rep 2
Rep 1
150 kg/ha
0 kg/ha
50 kg/ha
50 kg/ha
150 kg/ha
0 kg/ha
150 kg/ha
0 kg/ha
50 kg/ha
150 kg/ha
50 kg/ha
0 kg/ha
200
250
250
300
300
300
N
12
11
10
9
8
7
6
5
4
3
2
1



Treatments:

1. Control
2. 50 kg/ha of N (108.7 kg of 46-0-0/ha)
3. 150 kg/ha of N (326.1 kg of 46-0-0/ha)

All plots received 50 kg/ha of 11-52-0

	NO_3-N (kg/ha)	
N Applied kg/ha	2014	2015
0	20.8[a]	15.1[a]
50	19.7[a]	14.6[a]
150	22.4[a]	18.1[a]
RMSE	4.0	8.1
Prob > F	0.26	0.53

Average soil nitrogen (NO_3-N) levels, from samples taken May 22nd 2014 and April 16th 2015 (0-60 cm).

	P_2O_5 kg/ha	
Replication	2014	2015
0	451.3[a]	403.7[a]
50	384.9[ab]	381.7[a]
150	346.4[b]	380.3[a]
RMSE	95.8	69.1
Prob > F	0.04*	0.65

Average soil phosphorus (P_2O_5) levels in kg/ha, from samples taken May 22nd 2014 and April 16th 2015 (0-60 cm).

	K_2O (kg/ha)	
Replication	2014	2015
0	2671.3[a]	2775.7[a]
50	2737.1[a]	2876.8[a]
150	2846.7[a]	2800.9[a]
RMSE	399.2	467.1
Prob > F	0.56	0.86

Average soil potassium levels (K_2O) in kg/ha, from samples taken May 22nd 2014 and April 16th 2015 (0-60 cm).

2014 Shoot Biomass

2015 Shoot Biomass

	Percent of total yield	
N Applied kg/ha	2014	2015
0	9.3[a]	27.5[a]
50	7.7[a]	18.0[a]
150	13.3[a]	14.9[a]
RMSE	6.8	19.4
Prob > F	0.71	0.17

Average foxtail barley yield expressed as a percentage of the total biomass of AC Saltlander green wheatgrass and foxtail barley combined.

Average revenue in $ per hectare. Net revenue expressed as the revenue minus the cost of the nitrogen fertilizer. 2014 feed price = $110/tonne, 2015 feed price = $154/tonne.

Fertilizer purchased in the fall of 2013 ($520/tonne)					
N Applied Kg/ha	Cost of N $/ha	2014 Revenue $/ha	2014 Net $/ha	2015 Revenue $/ha	2 Year Net $/ha
0	0.00	$309.10	**$309.10**	$216.37	**$525.47**
50	$25.69	$383.46	**$357.77**	$297.97	**$655.74**
150	$77.07	$383.02	**$305.95**	$320.78	**$626.73**
Fertilizer purchased in the spring of 2014 ($795/tonne)					
0	$0.00	$309.10	**$309.10**	$216.37	**$525.47**
50	$39.28	$383.46	**$344.18**	$297.97	**$642.15**
150	$117.83	$383.02	**$265.19**	$320.78	**$585.97**

Preliminary Conclusions

- Yields can be increased with the addition of fertilizer, despite high salinity levels.
- If feed prices are low and fertilizer prices are high it may not be economical.
- Money may be better spent on fields with lower salinity.
- Fertilizer may help forages compete against foxtail barley.
- Fertilizing may be a better option than breaking the stand.
- The addition of a low to moderate rate of N may be the better option.
- The use of Super U or slow release nitrogen products may be more efficient.
- Feed quality??

Acknowledgements:

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