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Do Higher Alfalfa Seeding Rates Increase Forage Yield And Quality In The Seeding Year?

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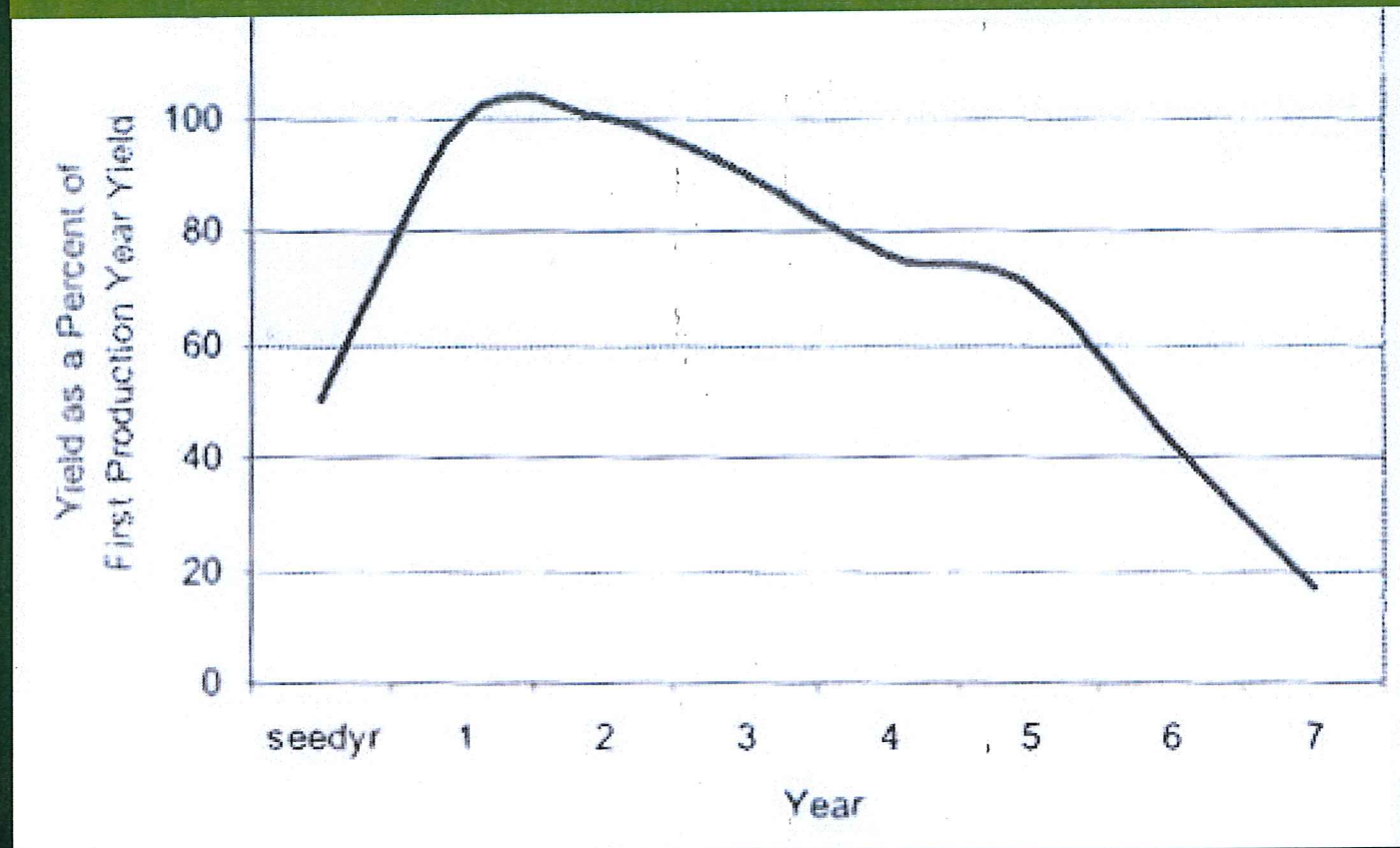
What affects alfalfa yield and persistence?

- Stand age
- Plant/stem density
- Water availability
- Diseases
- Soil fertility



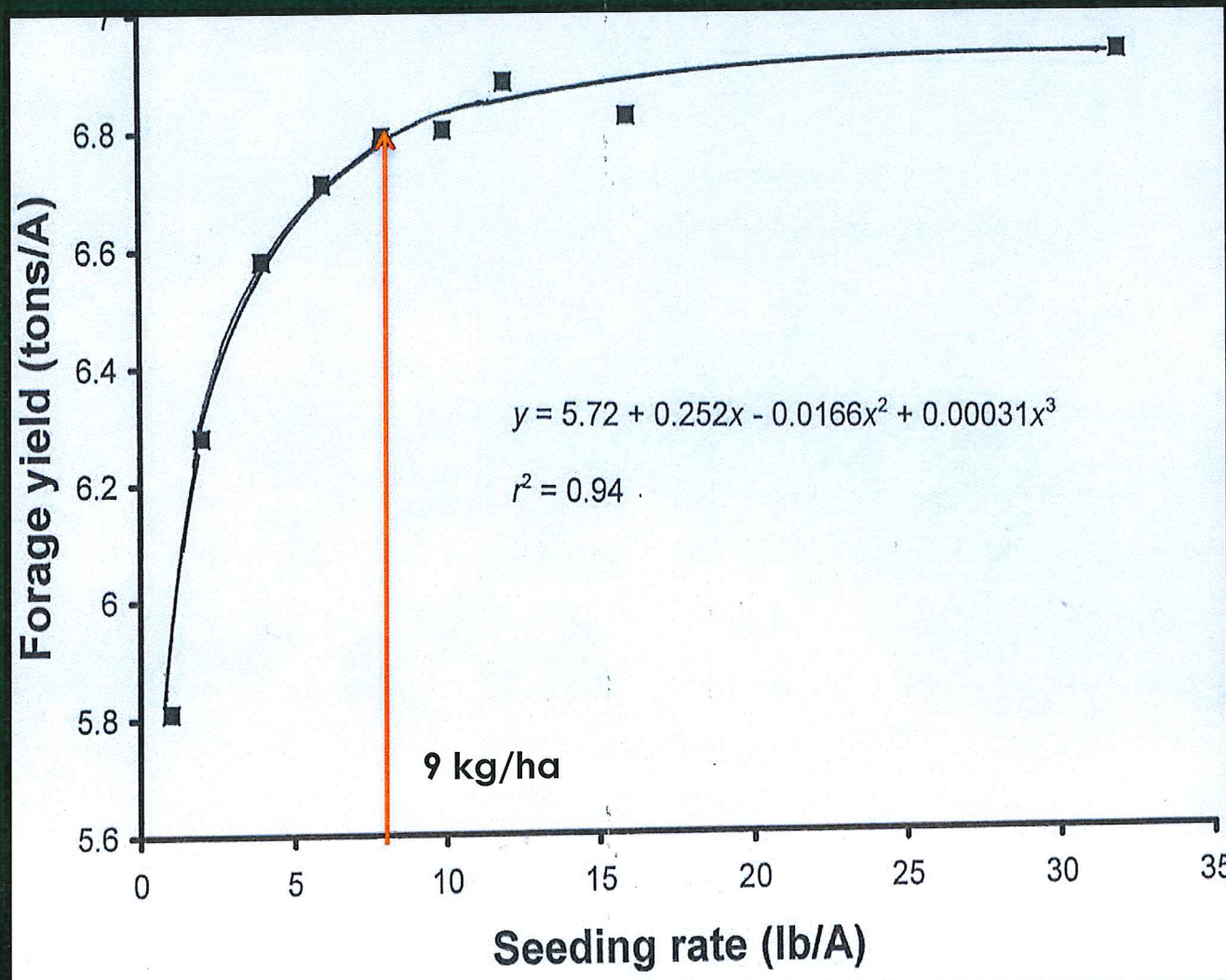
Yield and age of stand

Effect of stand age in alfalfa yield 1971-present



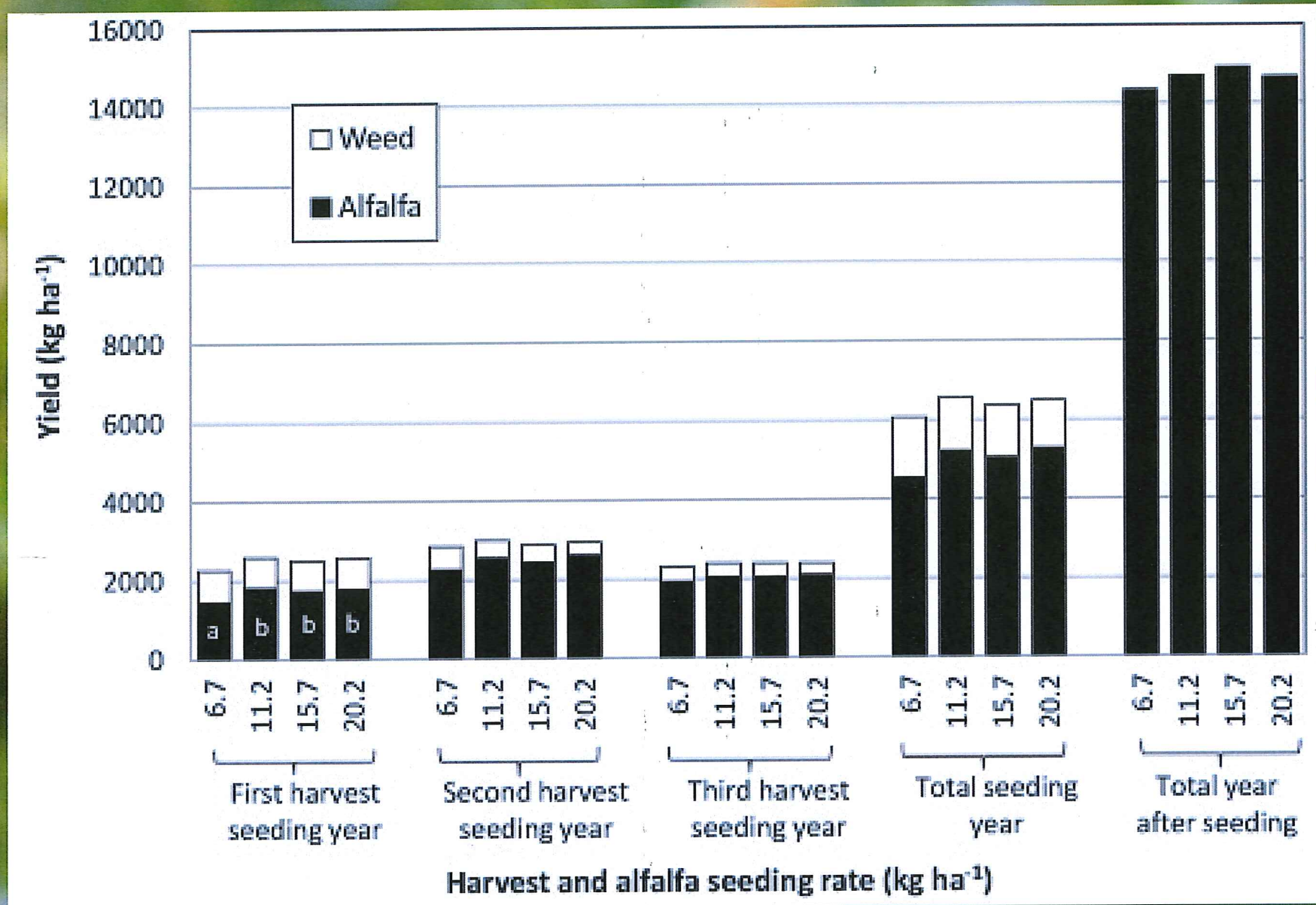
Undersander, 2008

Seeding rates and yield

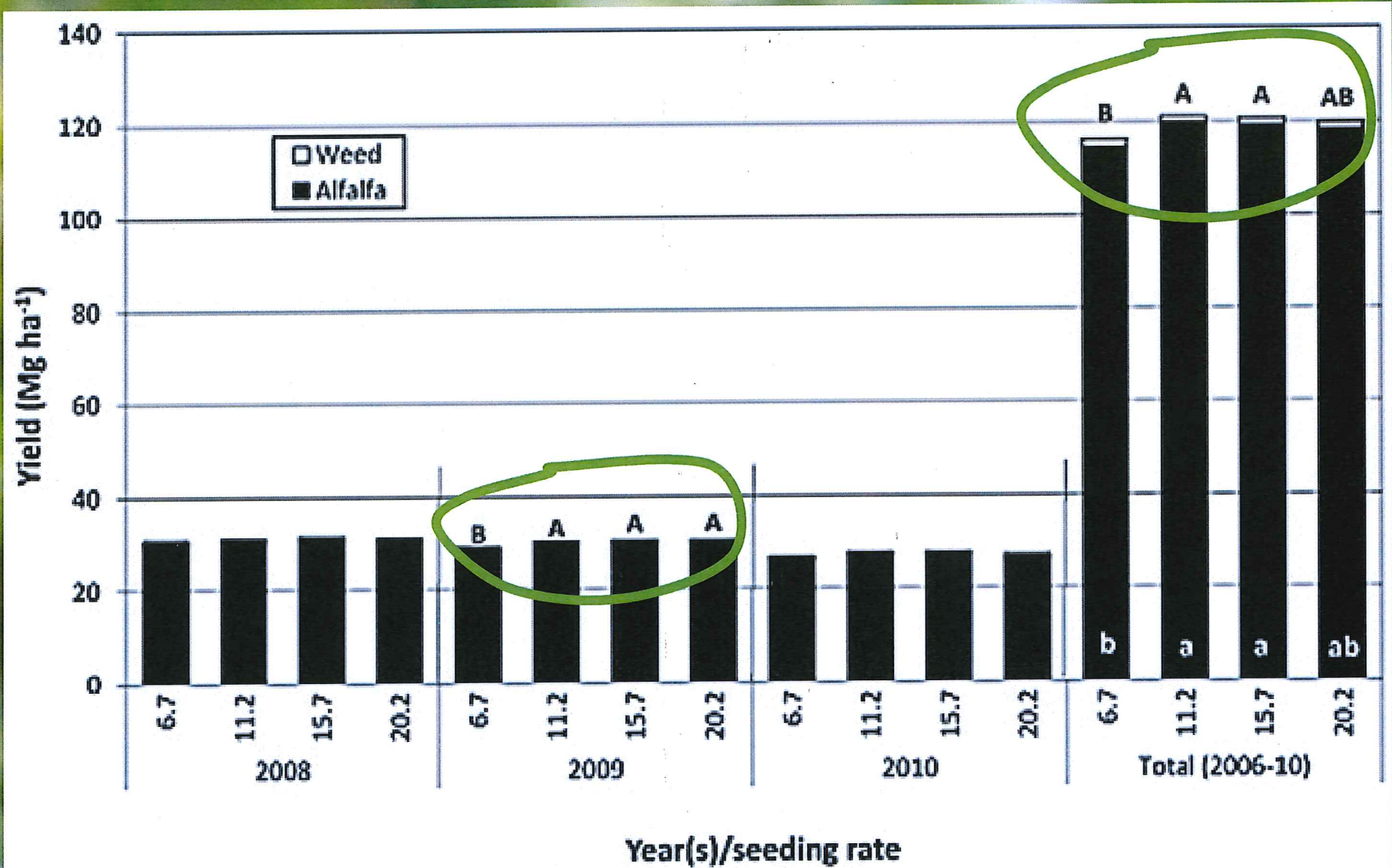


Meyer, 2007

No differences in **forage yield** in the seeding year with **6.7 to 20.2 kg seed/ha** (Hall et al., 2010)

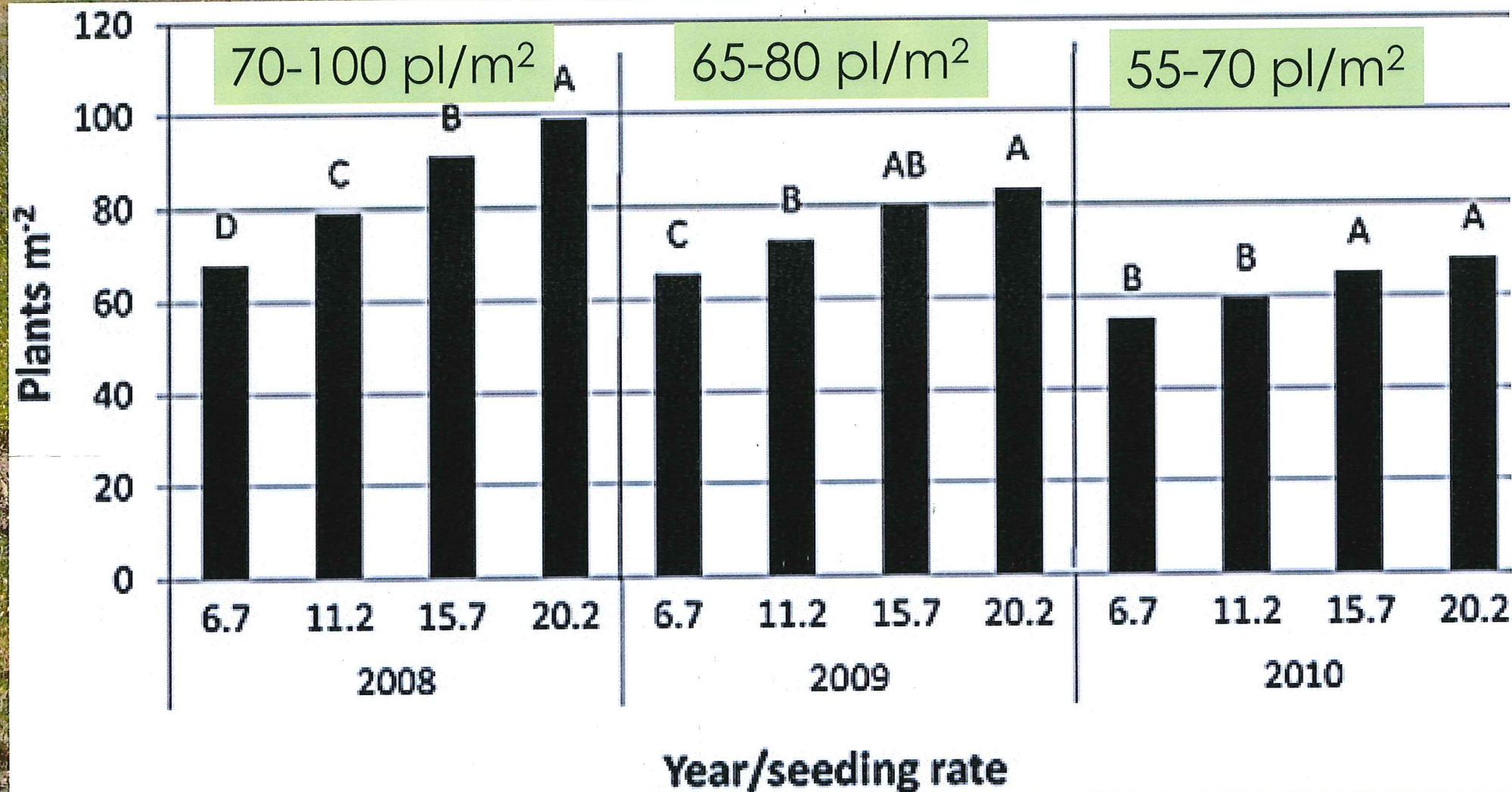


Alfalfa yield in years 3-5 (Hall et al., 2012)



Seeding rate during years 3-5

(Hall et al., 2012)



Frequently asked questions

- Do we get greater yield if we increase the seeding rate in the seeding year?
- Do we get a better stand and greater persistence with higher seeding rate?
- What is a better estimator of forage yield plants/m² or stems/m² each year of the stand?



Objectives

- 1) Determine the relationship between plant and stem density, and forage yield in glyphosate-tolerant alfalfa stands age in North Dakota.
- 2) Develop an accurate and efficient method to appraise alfalfa for multi-peril insurance.



Materials and Methods

- Three experiments
- **Exp 1. Seeding rate study**
 - Established at Fargo, Prosper, and Carrington, ND, in 2013
- **Exp. 2 Plant and stems density on forage yield**
 - Established in a 3-year old glyphosate-tolerant alfalfa in Prosper, ND
- **Exp. 3. Plant and stems density on forage yield**
 - Established in a 6-year-old glyphosate-tolerant alfalfa in Fargo, ND



Experiment 1

- A replicated experiment was established at three locations Fargo, Prosper, and Carrington. The experimental design is an RCBD with six seeding rates:
- 1, 5, 10, 15, 20, and 25 kg commercial seed/ha
- Presteez RR, WS=1 & FD=3

Experiment 2

- Established in June 2011.
- Glyphosate-tolerant alfalfa cultivars:
 - MaxiPro 3.10 RR
 - Consistency 4.10 RR
 - Graze-N-Hay 3.10 RR
- Plant densities:
 - T1, low < 10 plants/m²
 - T2, 11-26 plants/m²
 - T3, 28-49 plants/m²
 - T4 > 50 plants/m²

Experiment 3

Established in March 31st 2007

Cultivar DKA34-17RR.

CRD, 5 reps

Plant densities:

T1 < 31 plants/m²

T2 32-39 plants/m²

T3 40-47 plants/m²

T4 48-52 plants /m²

- T5 > 53 plants/m²

Materials and Methods



Plot planter- 8 rows at 15 cm apart. Plots 1.5 m wide x 6 m long.

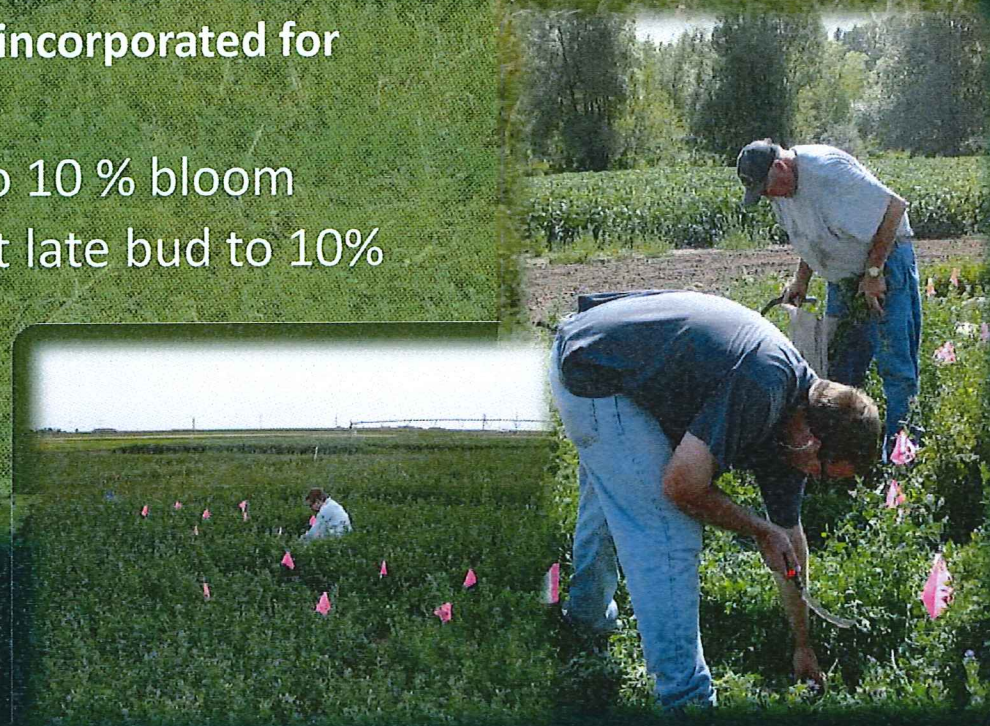


Forage harvester- Carter flail harvester, scale incorporated for whole plots, and by hand in 1m² plot

Seeding year : two harvests at late bud to 10 % bloom

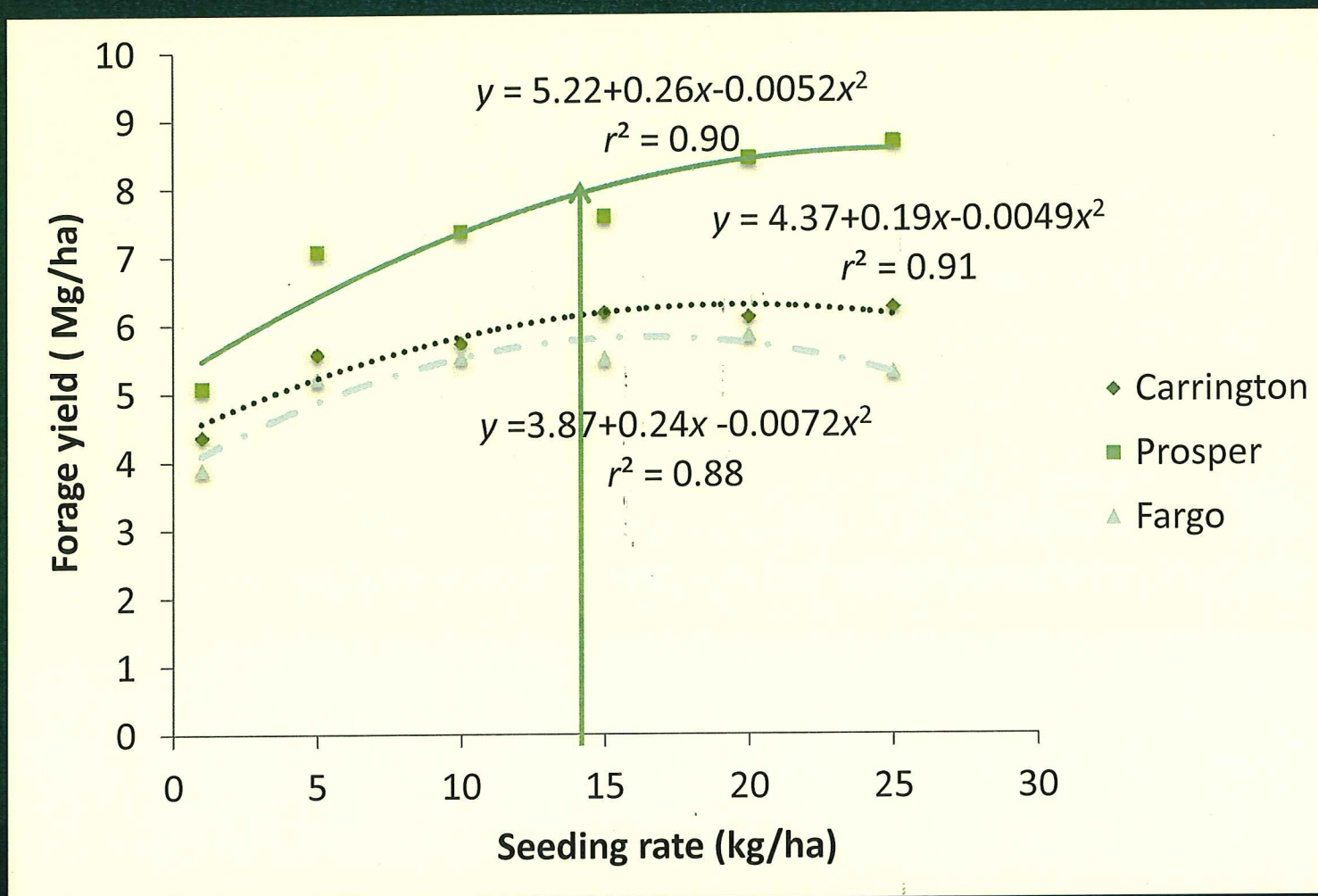
Production years: three or four harvest at late bud to 10% bloom

Plant and stem density was taken in 1m²

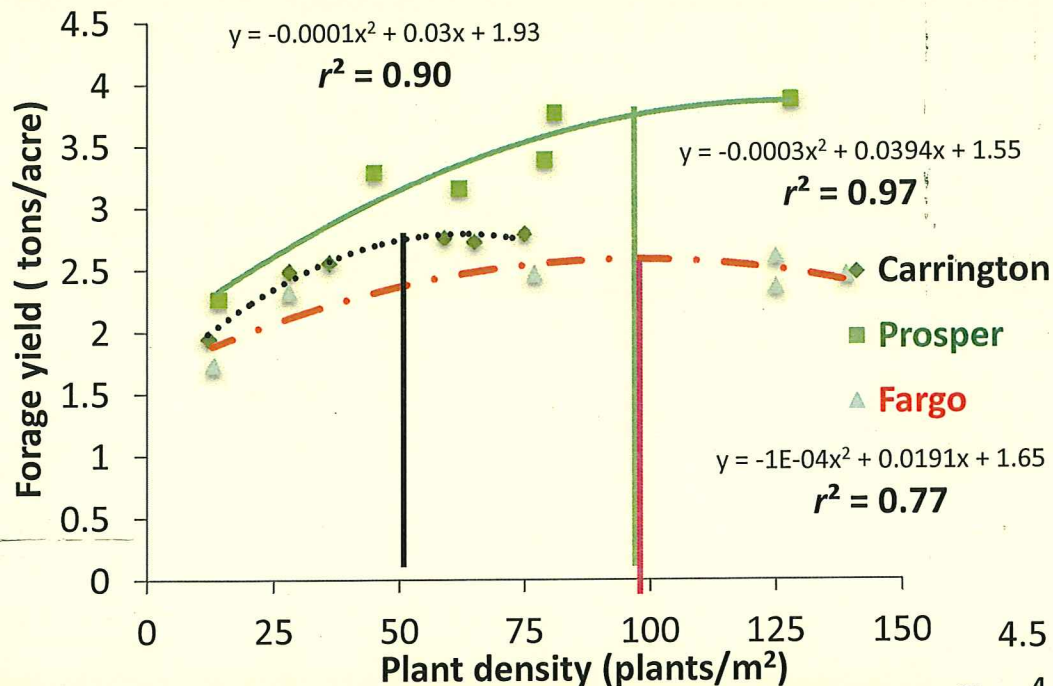


Results Exp. 1

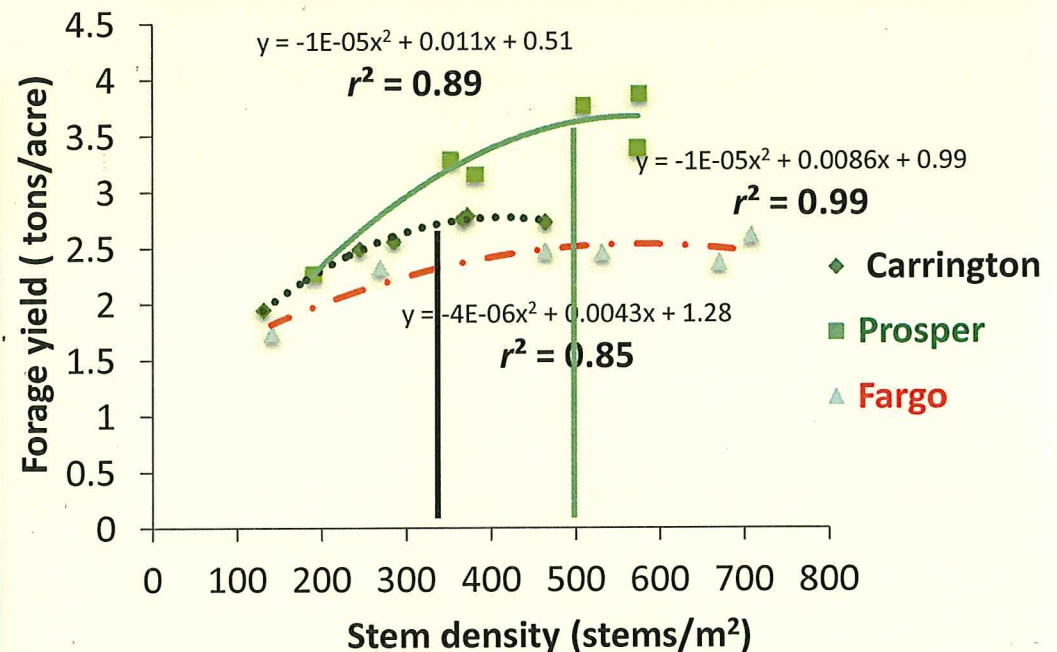
Yield vs. seeding rate in the seeding year



Results Exp. 1- Seeding year



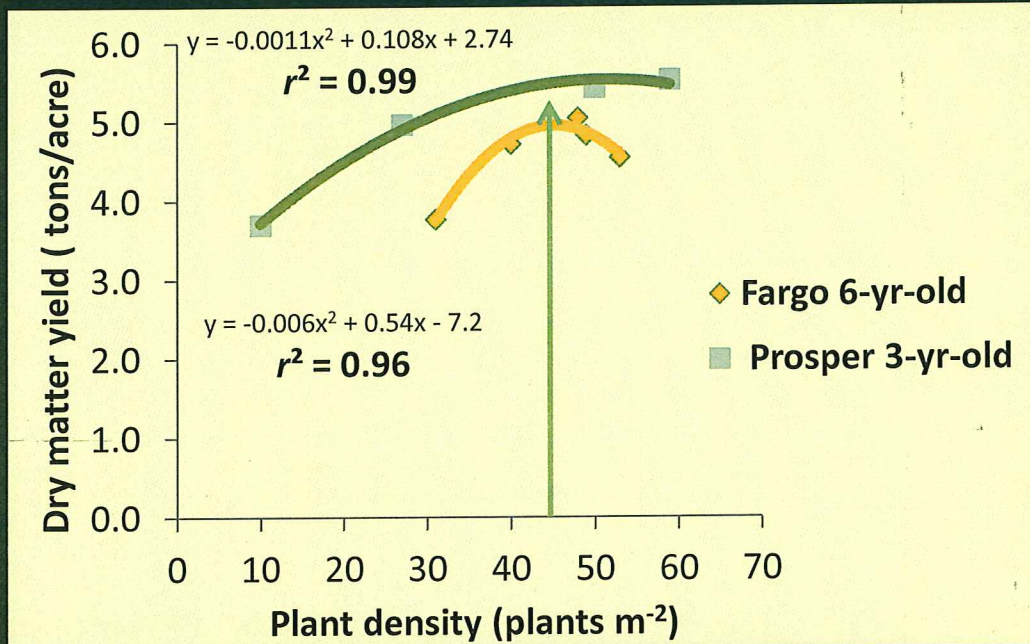
Fargo and Prosper maximum yield with approx. **90 plants/m²** and **500 stems/m²**
 Carrington maximum yield with approx. **50 plants/m²** and **350 stems/m²**



What seeding rate is economical in the seeding year?

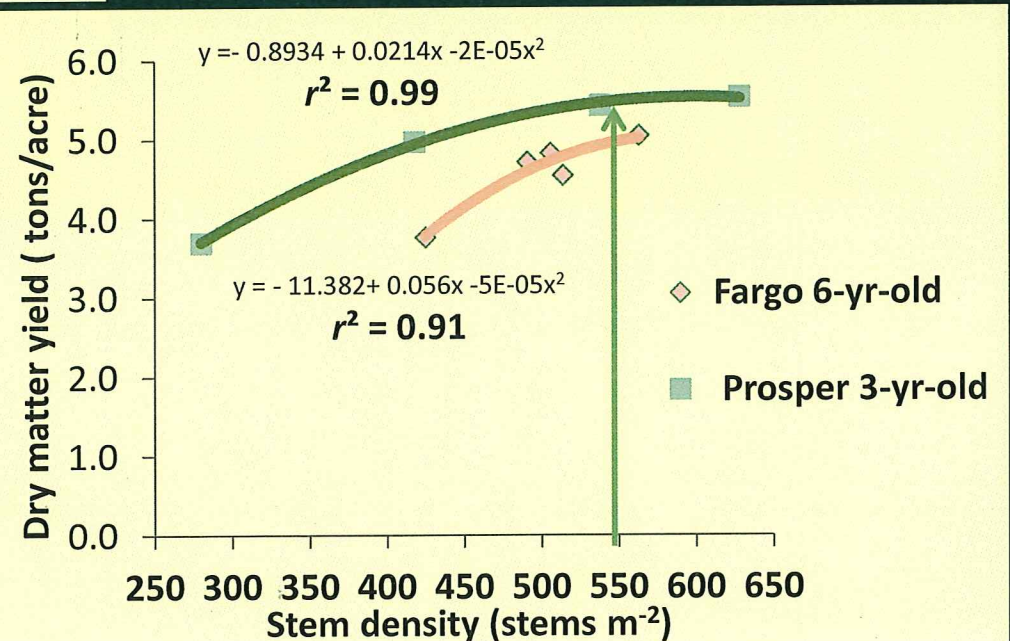
Seeding rate	Forage yield	Seed cost/acre	Seed cost/acre	Gross revenue	$(Y_{\max} - Y_x)^*$ \$200/ton	@ \$8.5	@ \$5.5
lbs/acre	tons/acre	\$ @ 8.50/lb	\$@5.50/lb	\$200/ton	\$		\$
1	1.99	8	5	398	208	200	203
4	2.66	38	25	532	74	36	50
9	2.69	76	49	538	68	-8	19
13	2.87	114	74	574	32	-82	-42
18	3.03	152	98	606	0	-152	-98
22	3.01	190	123	602	4	-186	-119

Results Exp. 2 and 3



Year 3-6

550-600 stems/m²
40-50 plants/m²



Does forage quality improves with higher plant density?

- In all experiments, at all locations and in each different cut—
- Significance found in CP only in 1 location
1 cut: 1st cut 6-year-old alfalfa.
- Low density: 24.8 % CP
- High density: 23.6% CP





Conclusions

Increasing seeding rate above 14 kg/ha does not increase the forage yield in the seeding year.

The cost of additional seed is greater than the increment in yield above 10 kg/ha.

Number of plants and stems are correlated with forage yield.

Summary

Seeding year

400-500 stems/m²

70-80 plants/m²

10-14 kg/ha

Stem density and plant density-correlated with forage yield in the seeding year.

Both could be used to estimate yield potential.

No effect on quality

Year 3-6

550-600 stems/m²

40-50 plants/m²

In older stands stem density predicts slightly better the yield potential.

As plants get older they have more stems per plant independent the density

Slight increase in CP in the first cut with higher density

Thank you for your attention
and interest

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QUESTIONS???

