Alfalfa yield and nutrient uptake as affected by pH and applied K

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Potassium function in forage legumes

- Enzyme activity
- Carbohydrate production and transport
- Stomatal activity
- Links to increased resistance to disease and lodging
- **Balances anionic charges**

Objectives

- The primary objective is to examine the interactive effects of soil pH and topdressed K_2O rate on alfalfa forage mineral balance, yield and quality.

Plot Locations

- Marshfield – seeded 1997
  - 3 cuts 1998*, 1999 & 2000
- Spooner – seeded 1998
  - 2 cuts 1998*, 3 cuts 1999, 2000 & 2001
- Hancock – seeded 1998
  - 2 cuts 1998*, 3 cuts 1999, 2000 & 2001

*1st cut discarded due to high weed content

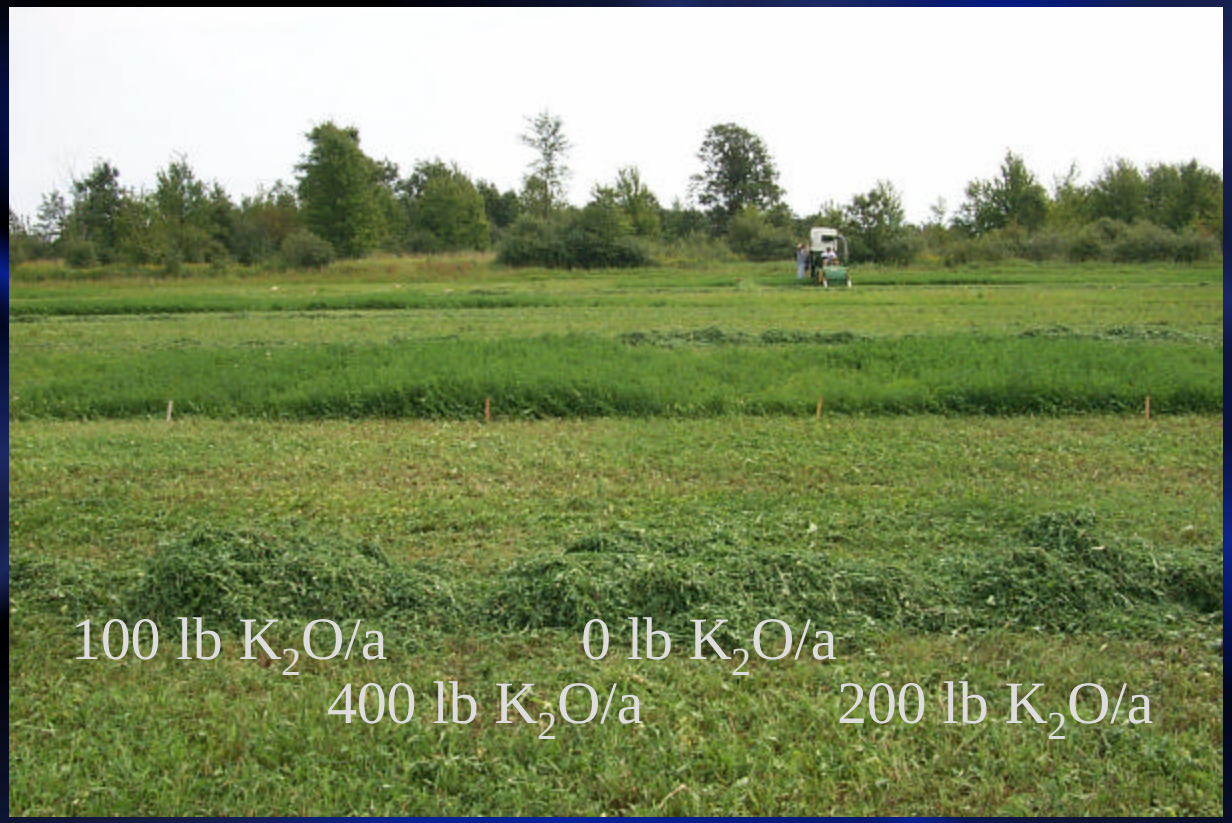
Treatments

- Four K_2O levels – 1, 100, 200, 400 lbs K_2O/a/year*

  *Applied after first cutting

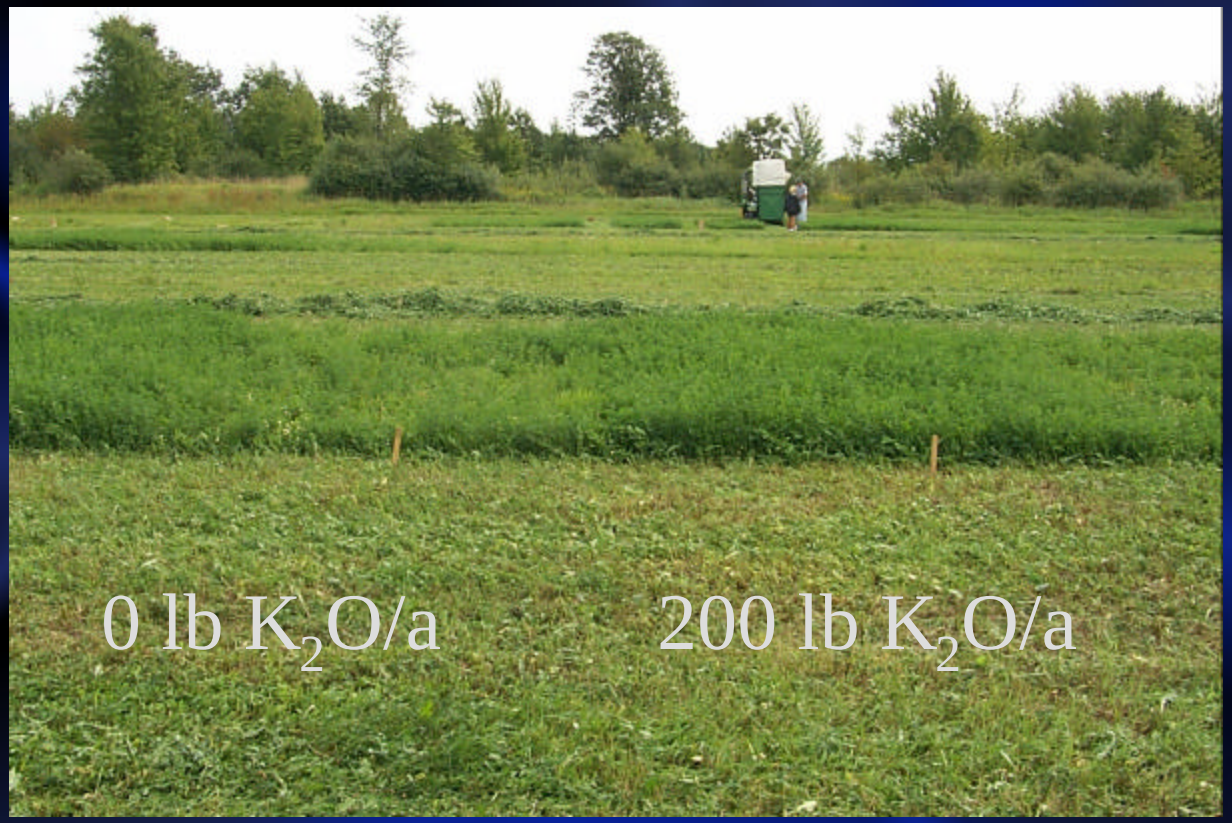
- Target pH levels
  - Marshfield: six levels – 4.8 - 7.3
  - Spooner: five levels – 4.7 - 6.7
  - Hancock: six levels – 4.5 - 7.0

Alfalfa response to annual K applications at pH 7.0



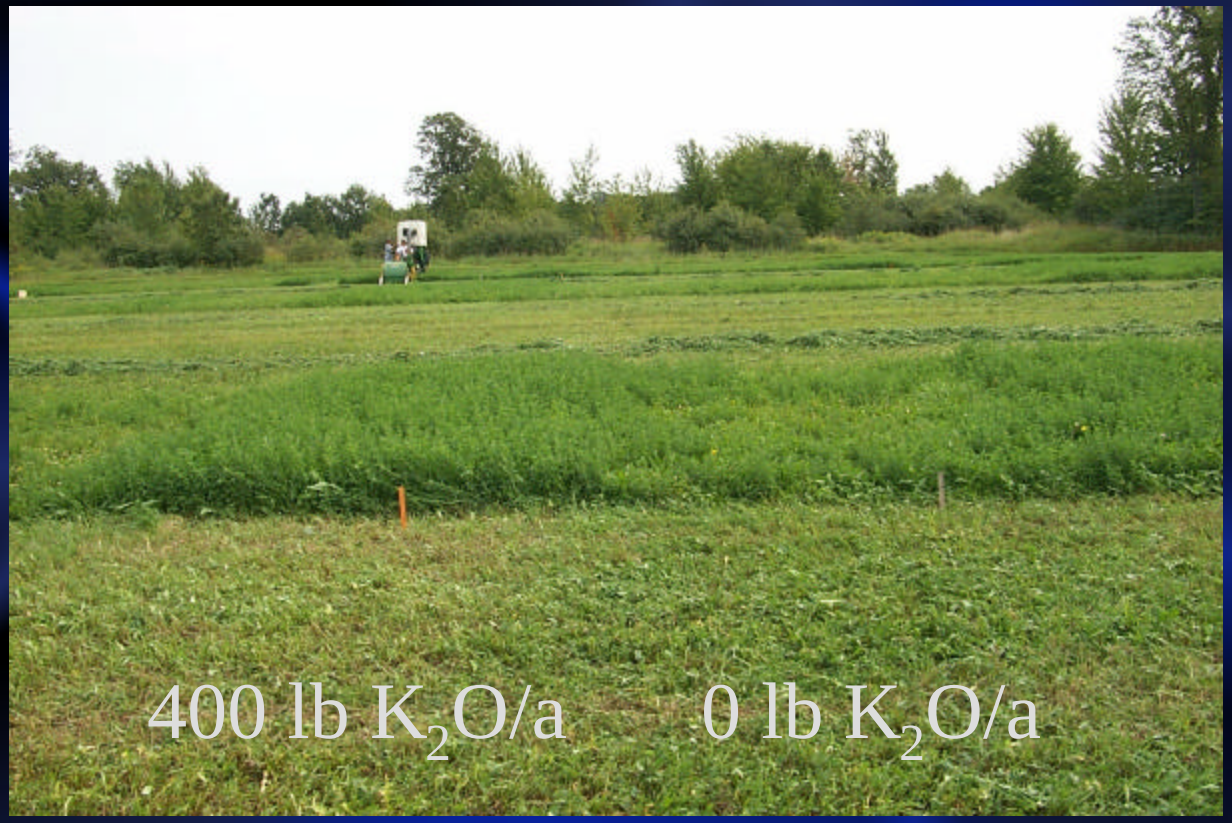
3rd cut Marshfield, 2000

Alfalfa response to annual K applications at pH 7.0



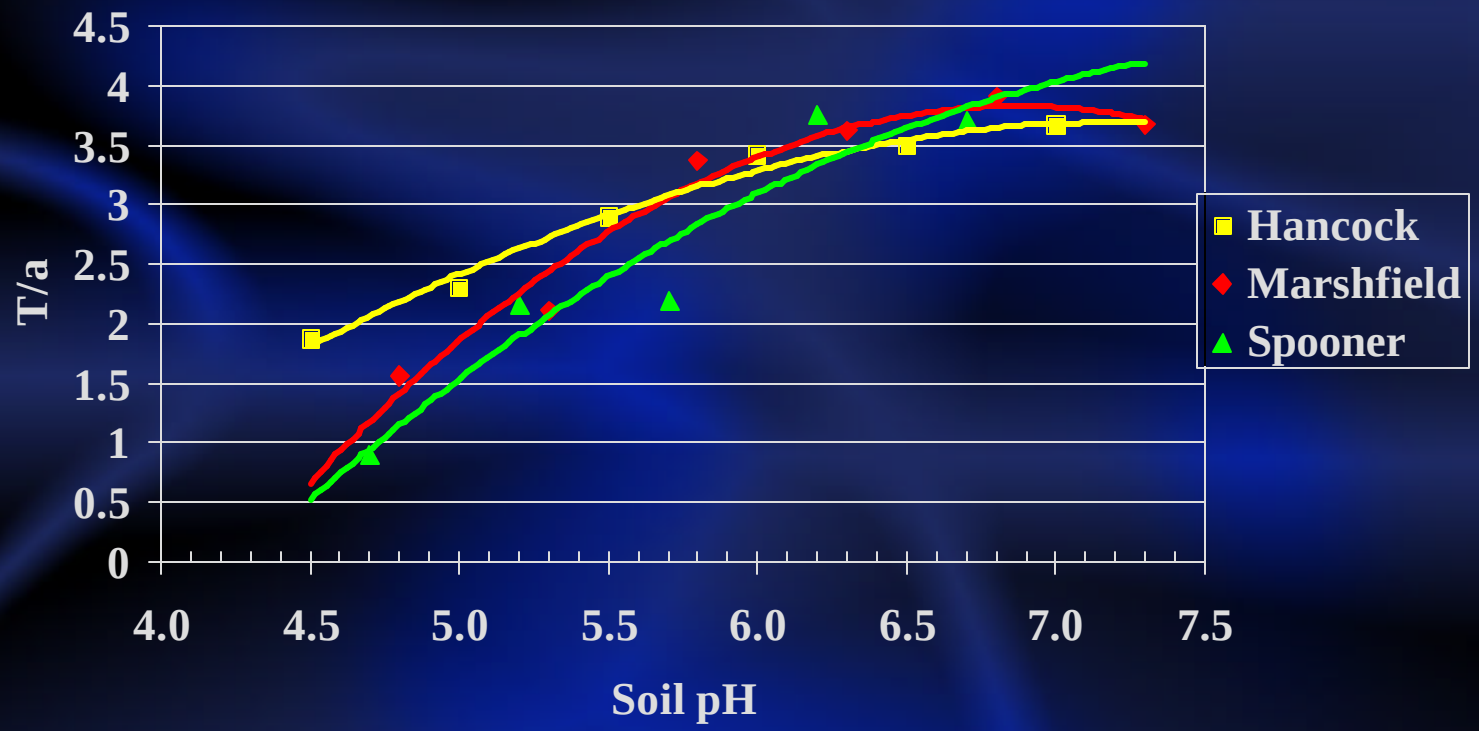
3rd cut Marshfield, 2000

Alfalfa response to annual K applications at pH 6.4

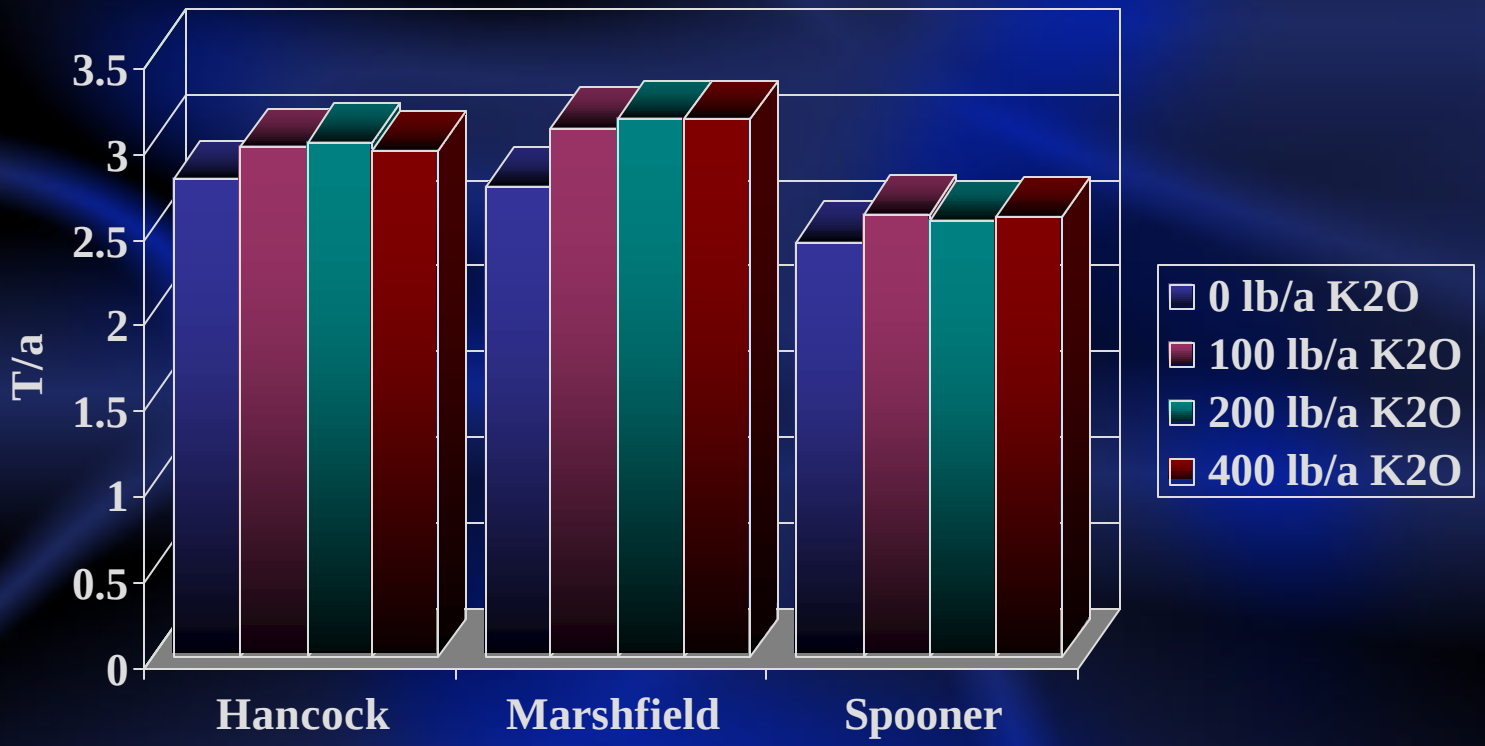


3rd cut Marshfield, 2000

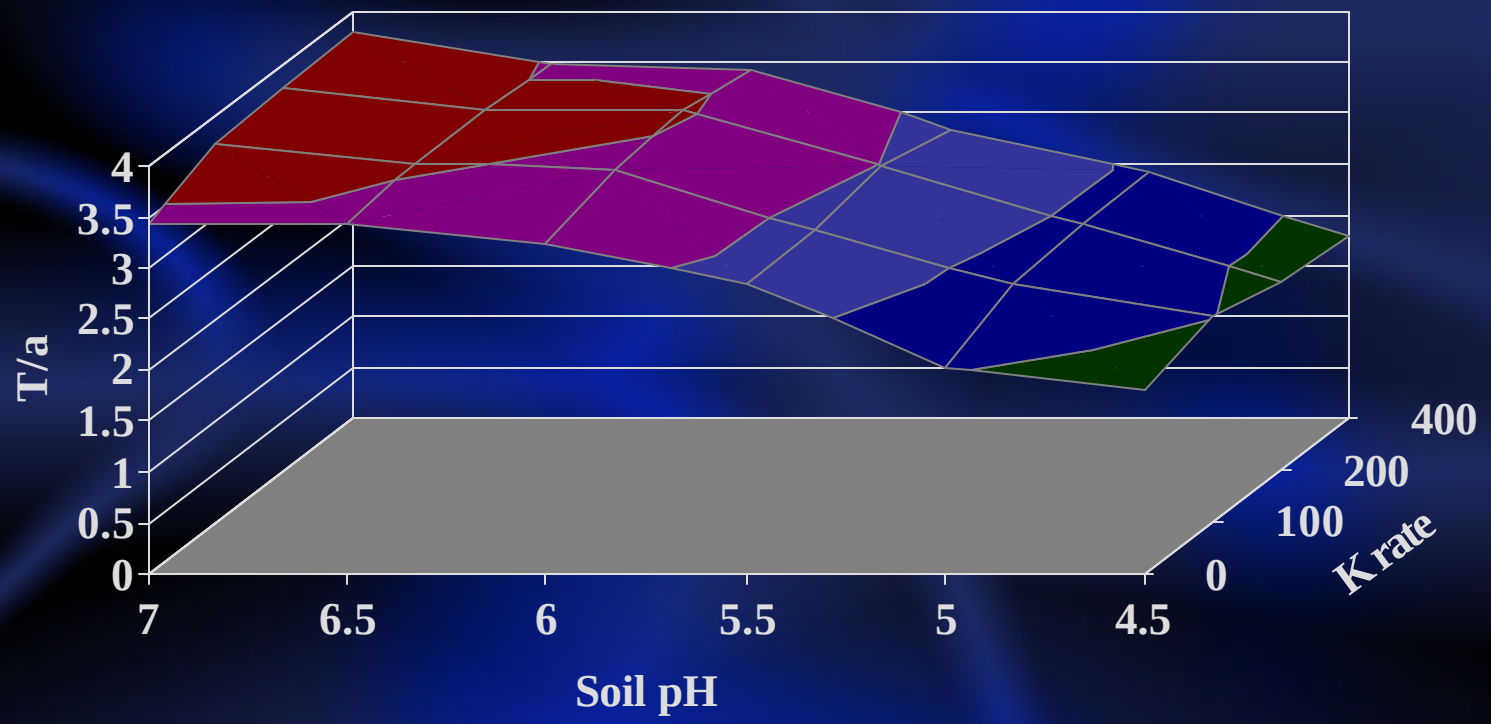
Average annual alfalfa dry matter yield by soil pH (1998-2001)



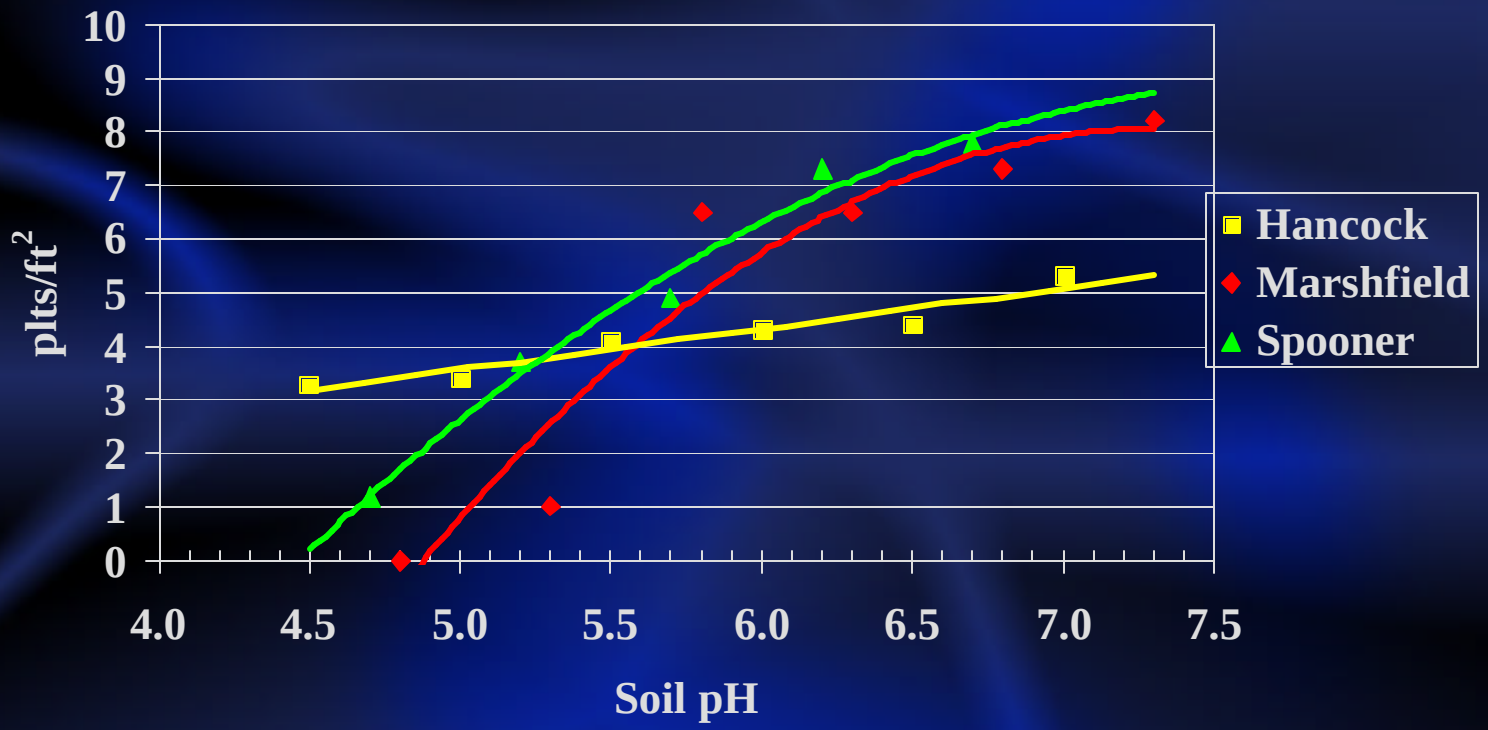
Annual alfalfa yield by K_2O rate (1998-2001)



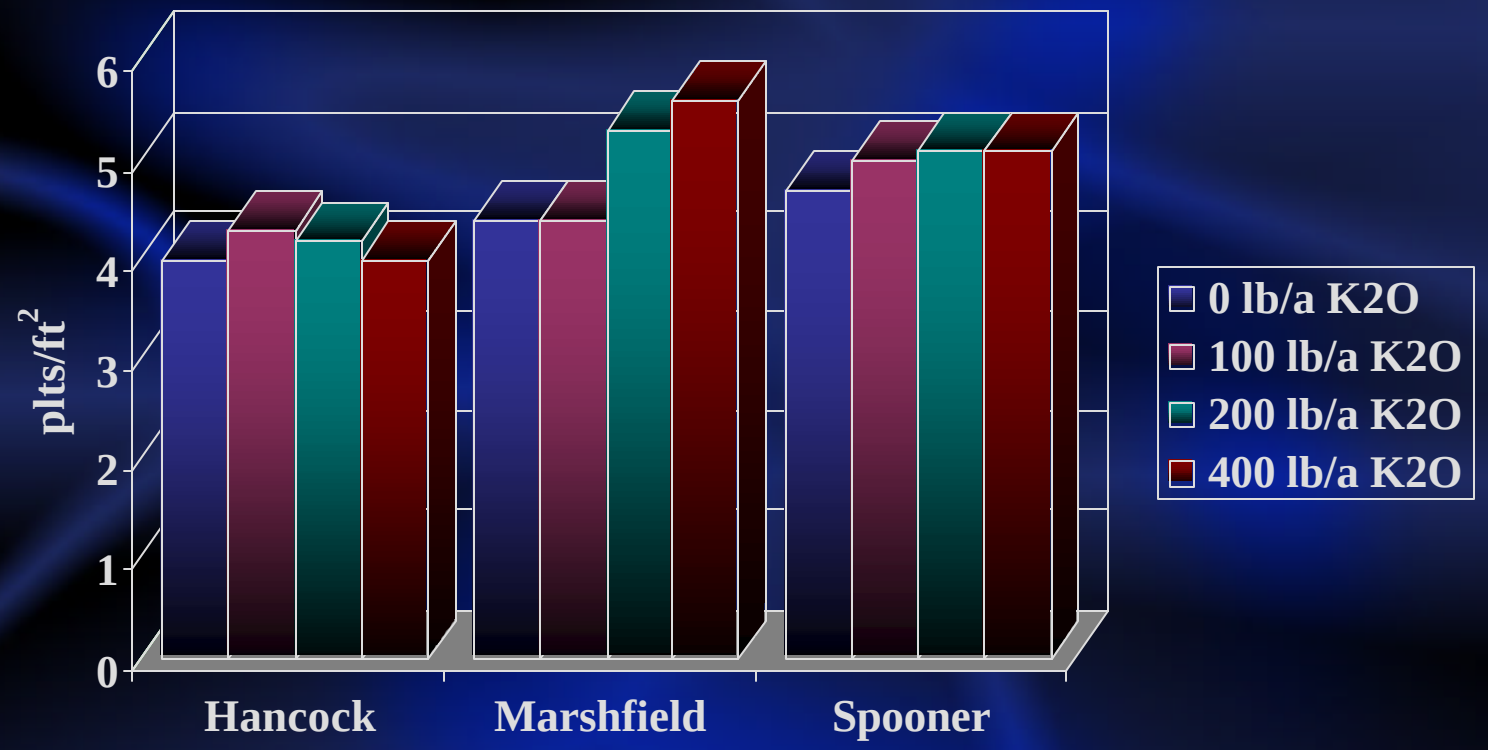
Effects of pH and K on alfalfa dry matter yield (Hancock, 1998-2001)



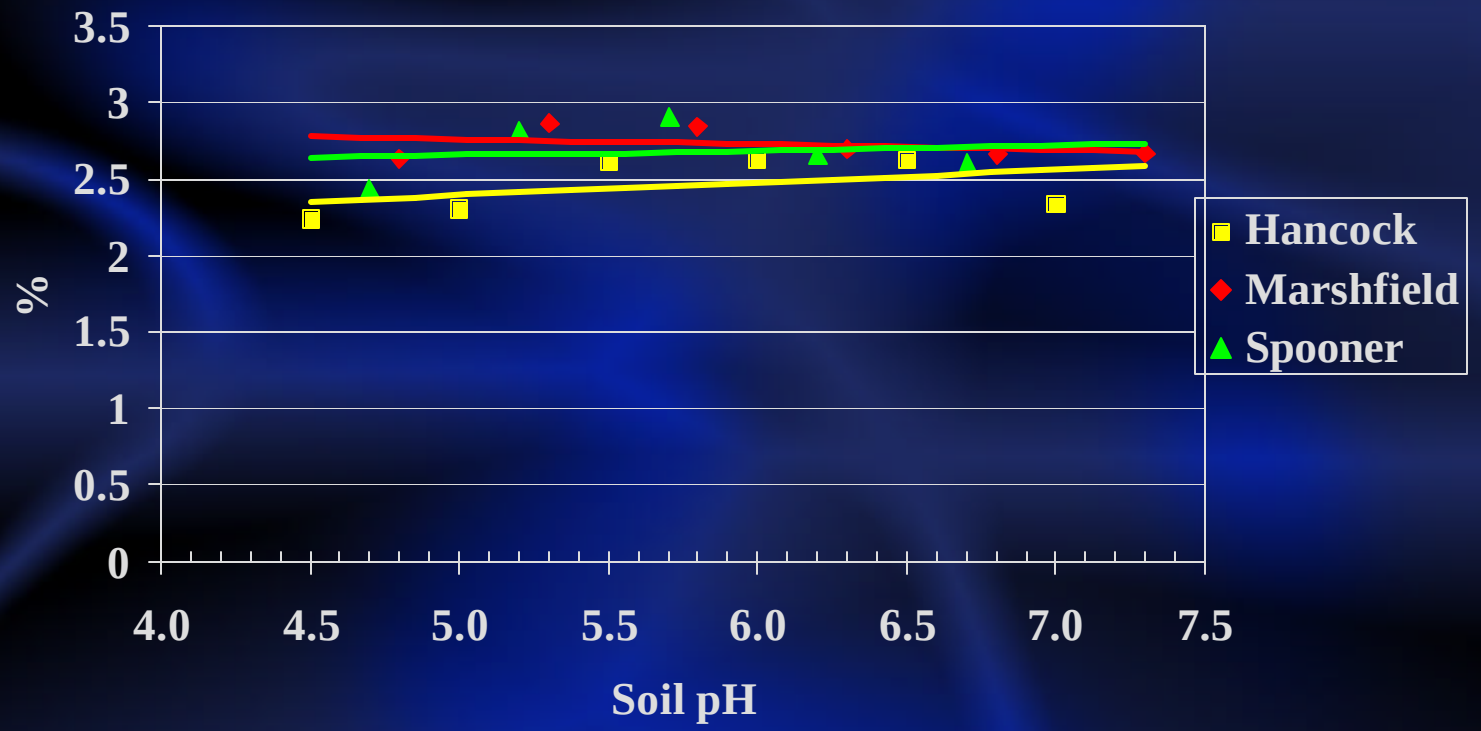
Final stand quality by soil pH (1998-2001)



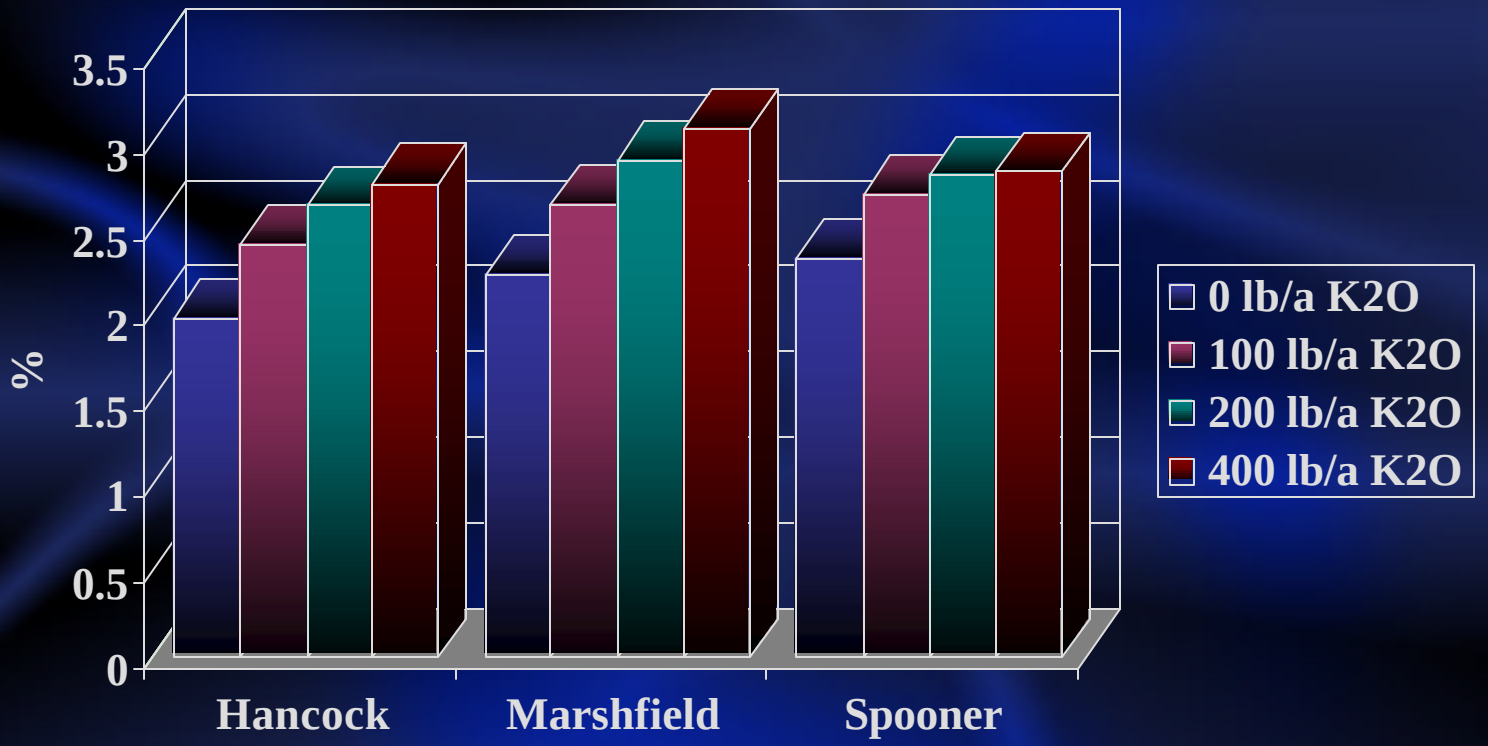
Final stand quality by K_2O rate (1998-2001)



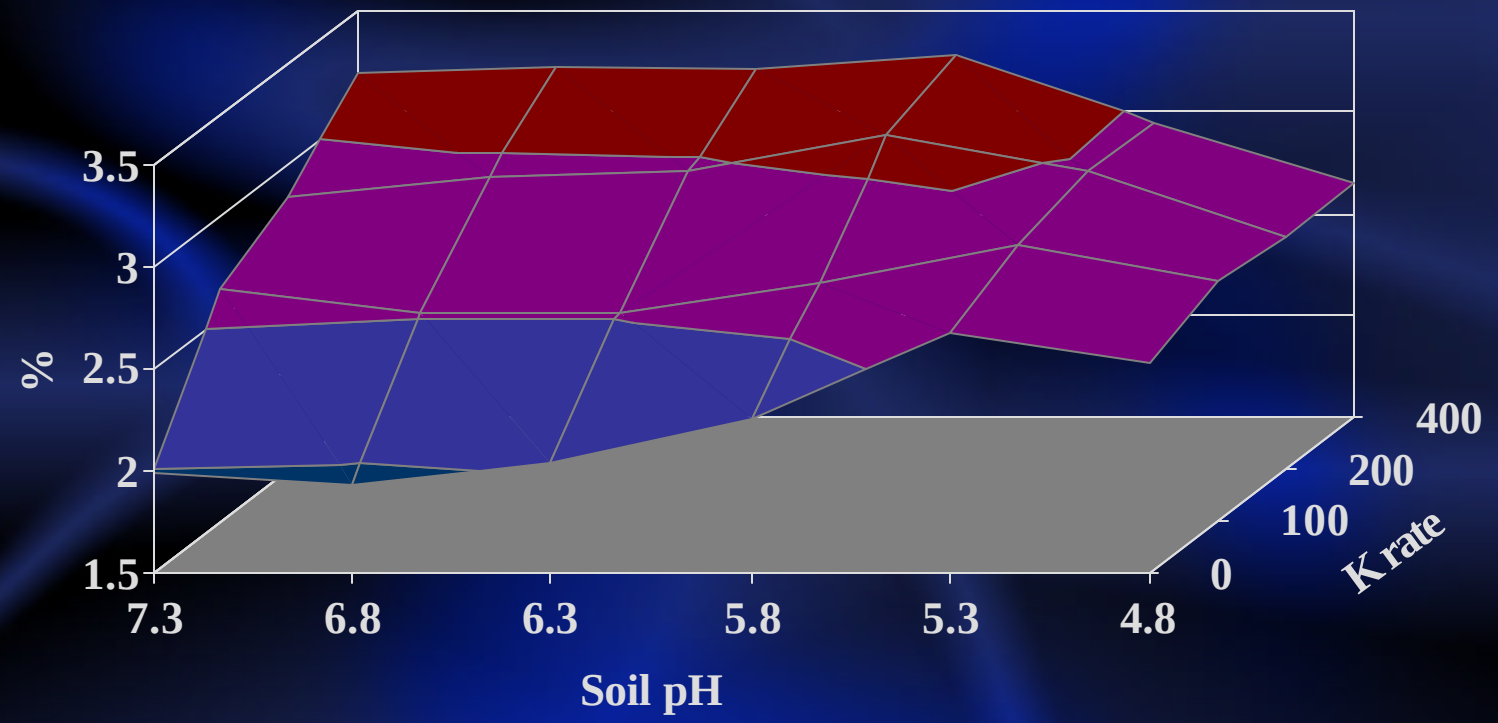
Alfalfa K level by soil pH (1998-2001)



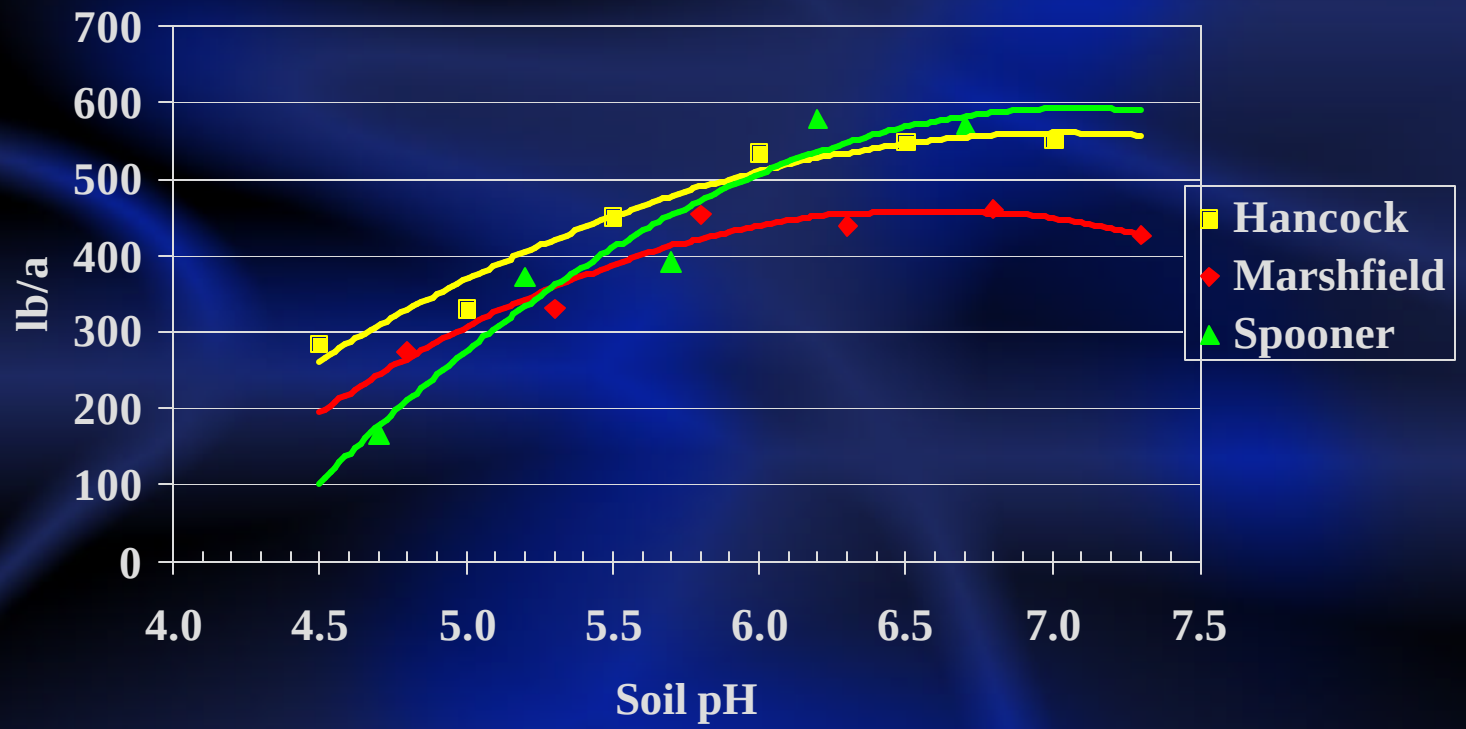
Alfalfa tissue K by K_2O rate (1998-2001)



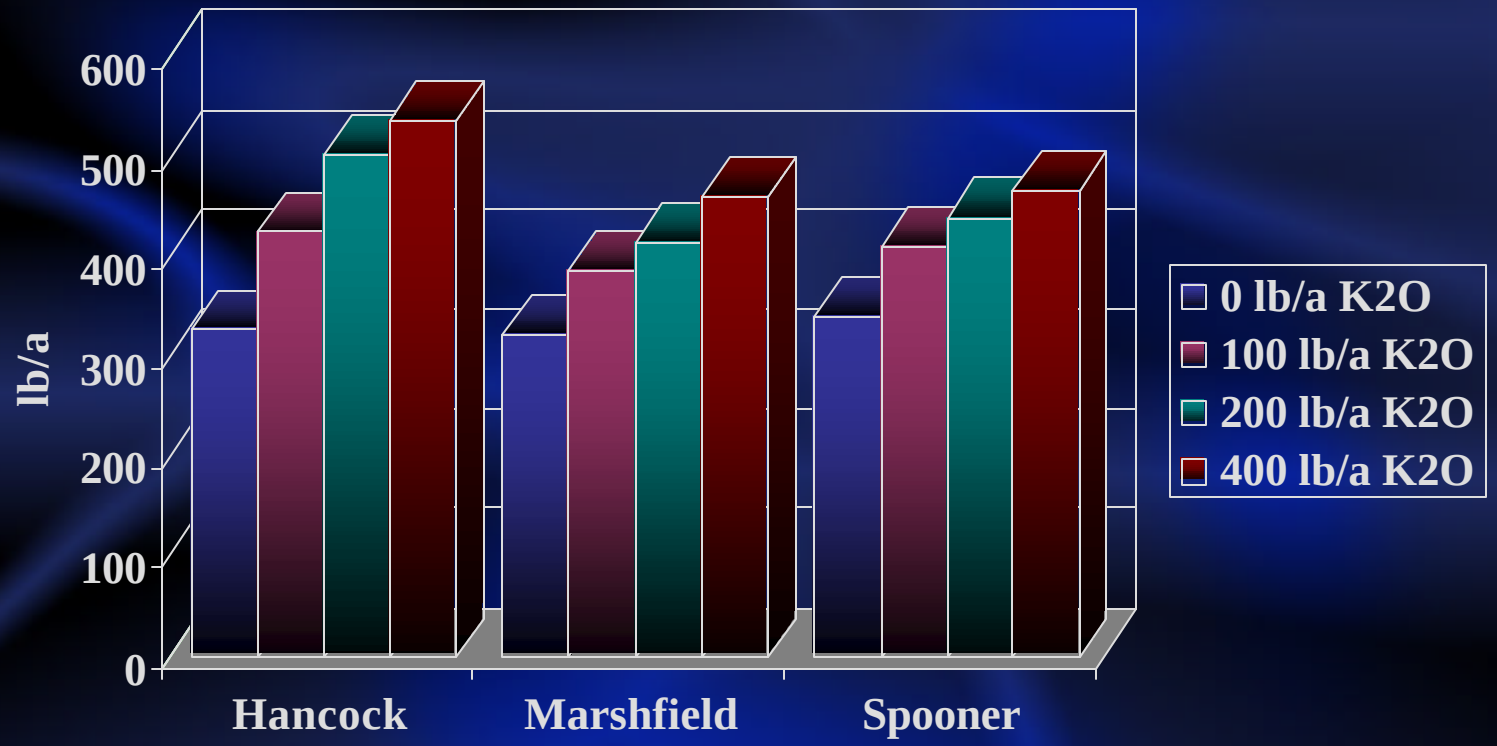
Effects of pH and K on alfalfa tissue K levels (Marshfield, 1998-2000)



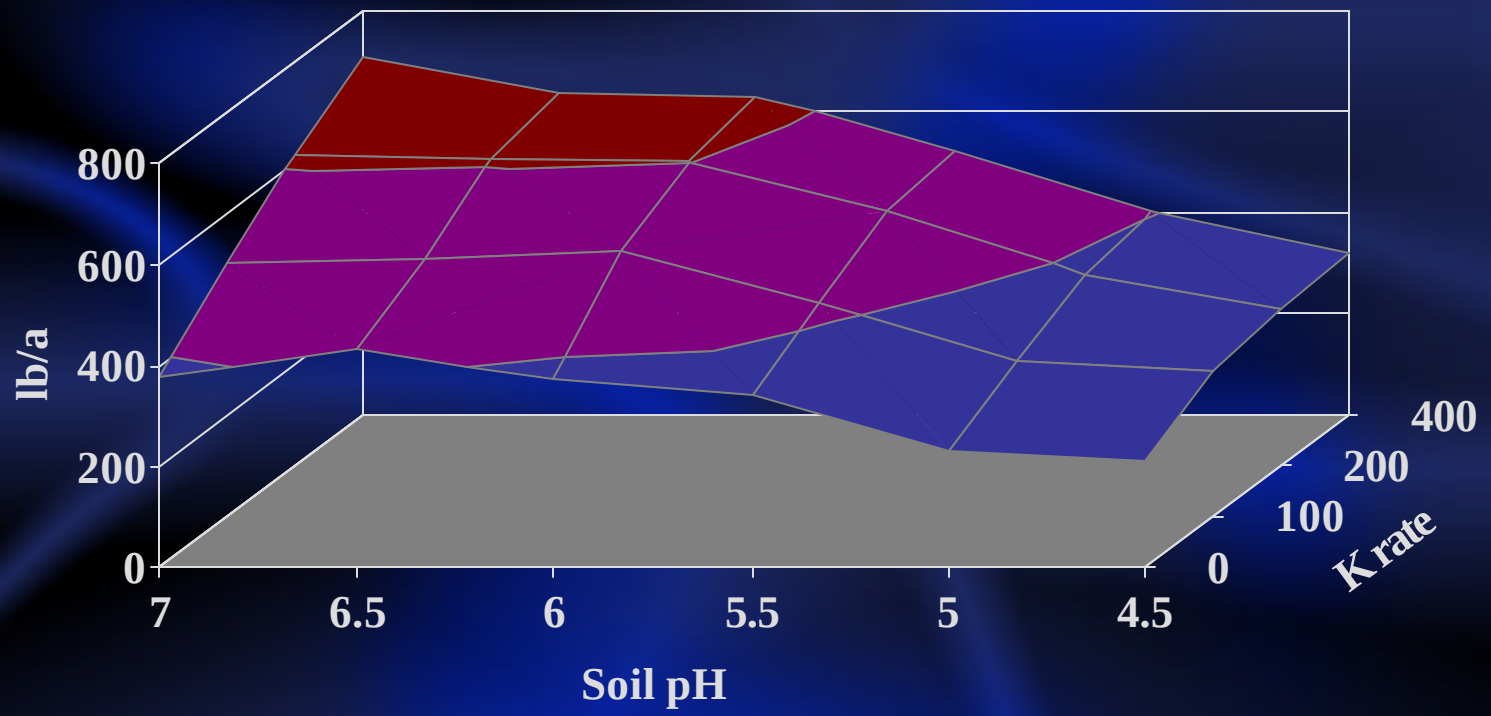
Total K removed in alfalfa tissue (1998-2001)



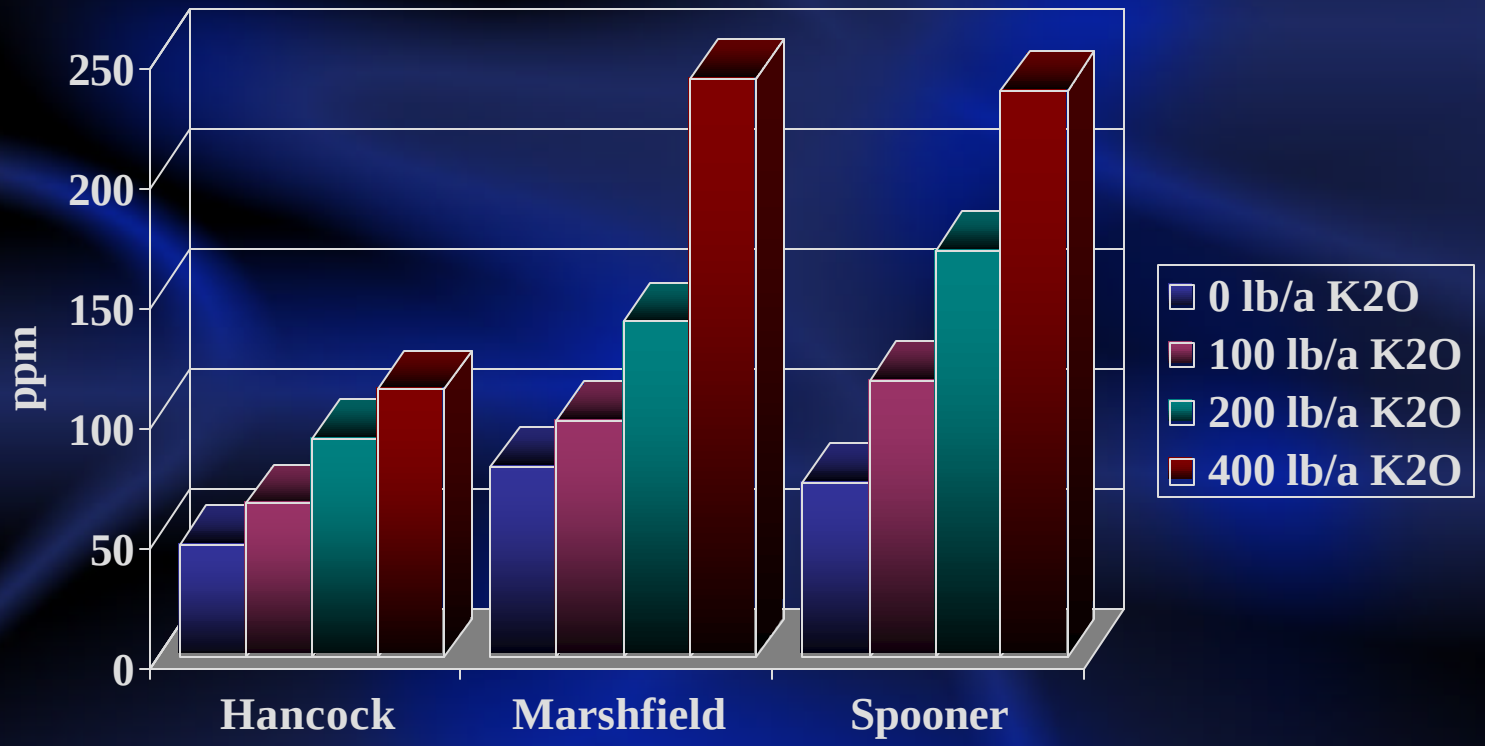
Total K removed in alfalfa tissue (1998-2001)



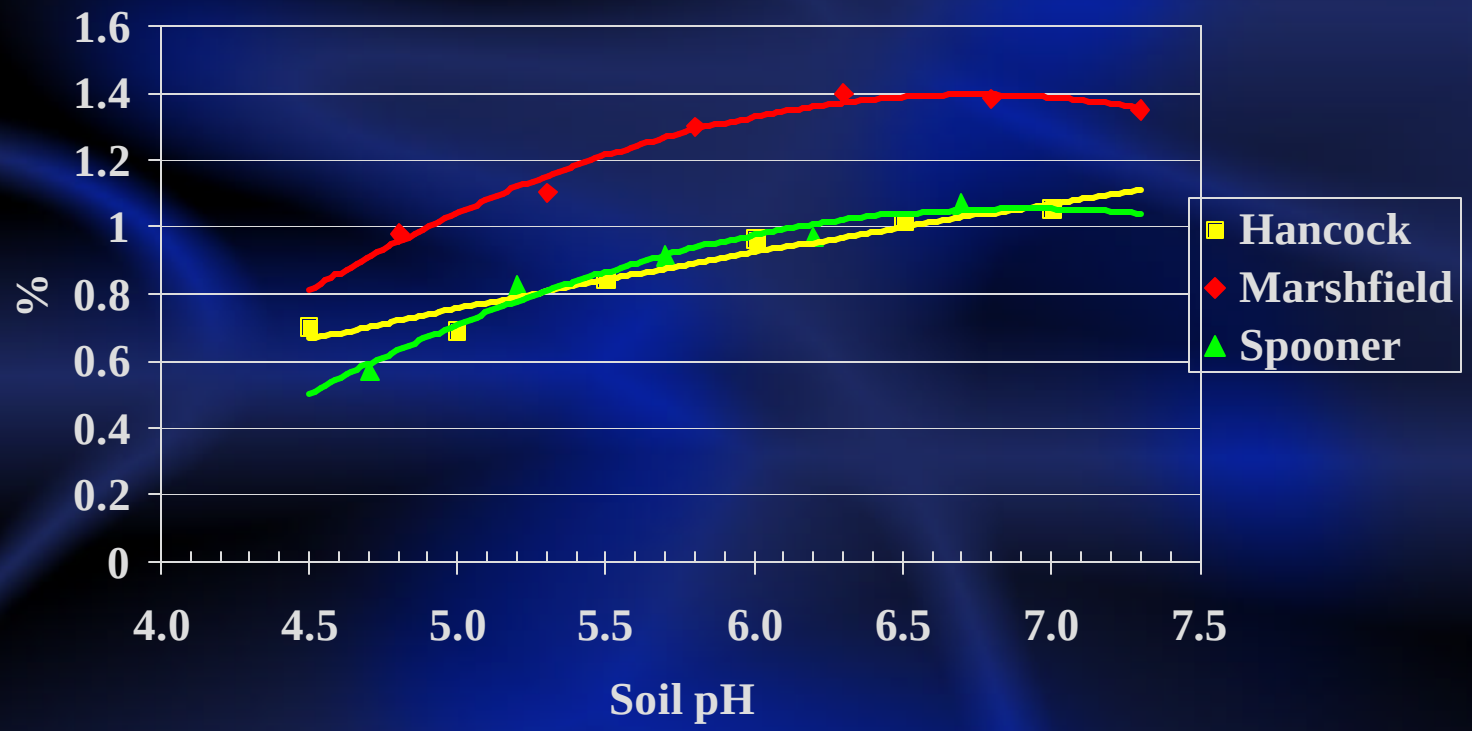
Effects of pH and K on total K in tissue (Hancock 1998-2001)



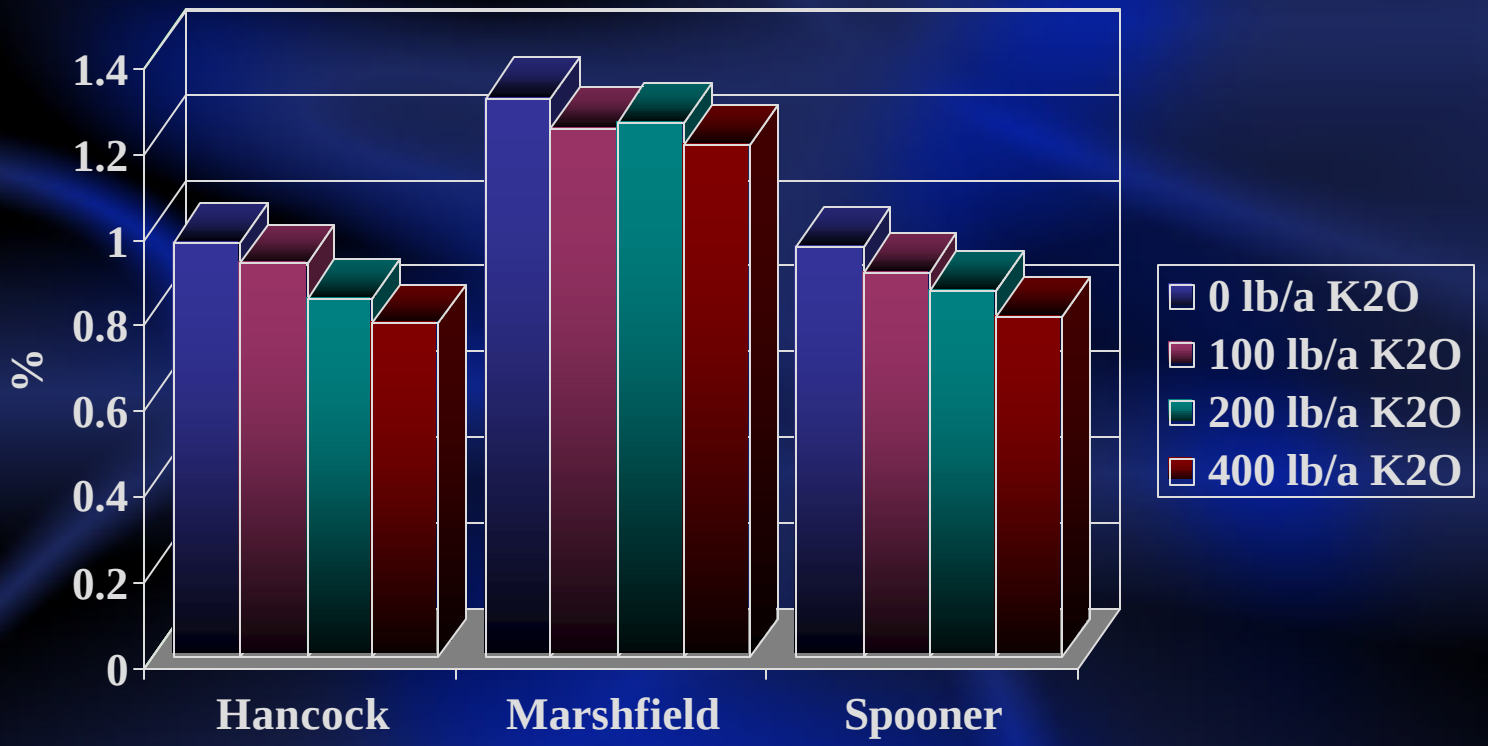
Final soil test K (1998-2001)



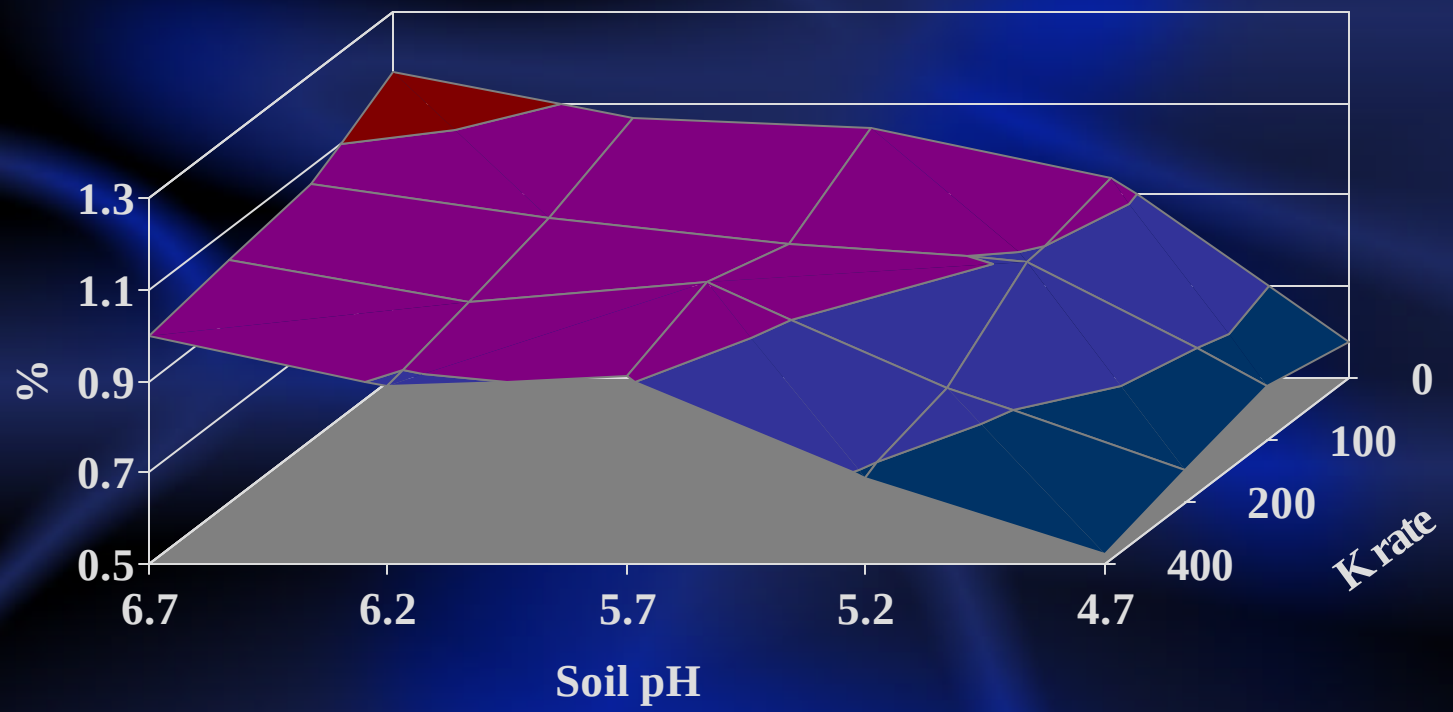
Alfalfa Ca level by soil pH (1998-2001)



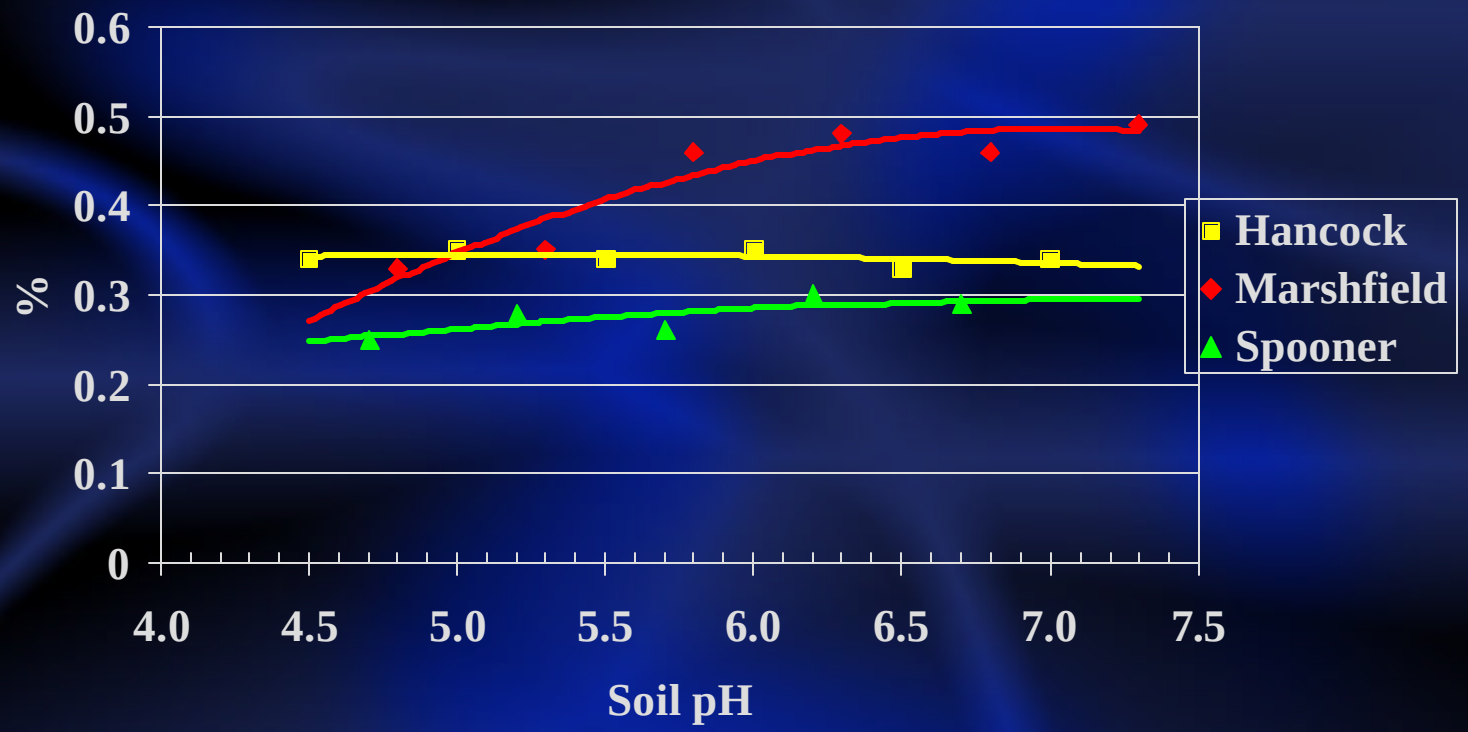
Alfalfa tissue Ca by K_2O rate (1998-2001)



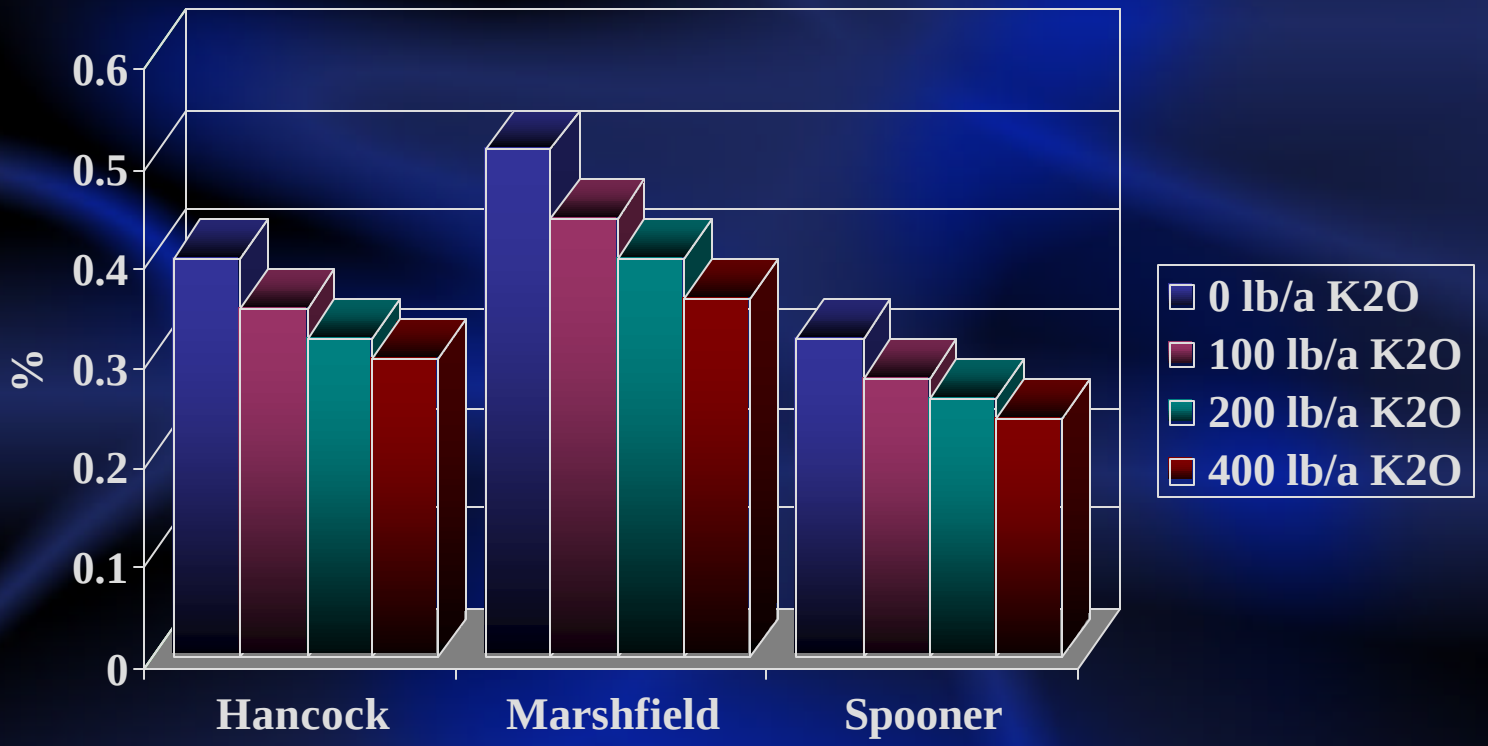
Effects of pH and K on alfalfa tissue Ca levels (Spooner, 1998-2001)



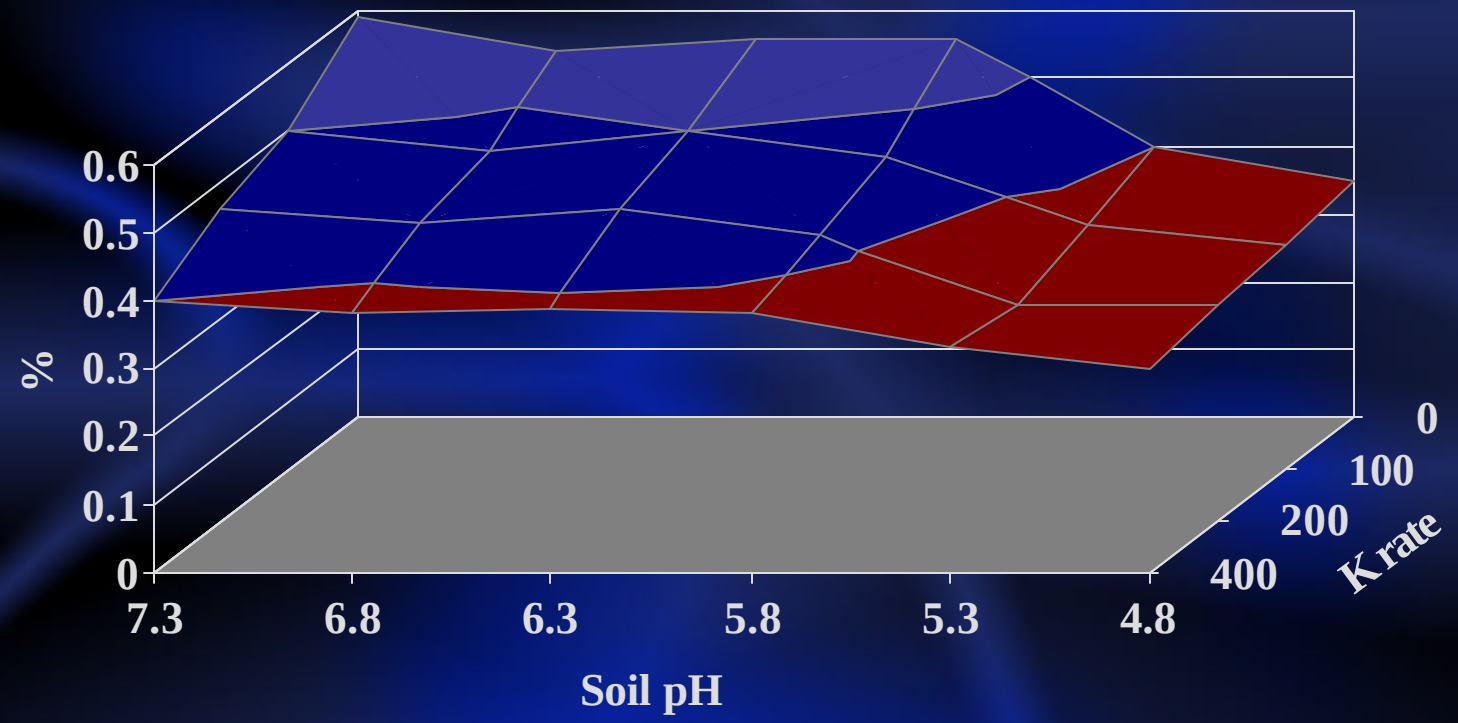
Alfalfa Mg level by soil pH



Alfalfa tissue Mg by K_2O rate (1998-2001)



Effects of pH and K on alfalfa tissue Mg levels (Marshfield, 1998-2000)



Summary

- Soil pH and annual K rate had a significant interactive effect on alfalfa yield
  - Major responses to K when pH >6.5
- Soil pH had a significant influence on final plant stand
  - But K rate was only important at Marshfield when pH was adequate

Summary

- Annual K rate had a significant influence on all tissue cation levels
- In most cases, soil pH also had a significant effect on cation levels in tissue

Summary

- A soil pH of 6.5-7.0 was necessary to optimize alfalfa yields
- At soil pH levels nearly optimum for alfalfa production, about 200 lbs K2O/a is required for optimum yield, stand quality and maintaining soil test levels