

## Alfalfa - Getting 10 Ton Yield February 2007

Craig Saxe  
Juneau County UW-Extension

## Special Thanks to:

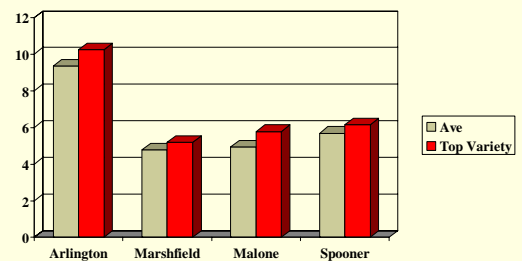
Dr. Dan Undersander  
University of Wisconsin  
For providing many of these slides

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## Alfalfa - Getting 10 Ton Yield

"The good is the enemy of the best"  
"Attention to detail makes the difference"

## 2006 Experimental Variety Trial Results (Sown April 2005)



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## 1. Maintain Proper Soil pH and Fertility

- Proper fertilization:
  - Allows for good stand establishment
  - Promotes growth
  - Increases yield and quality
  - Improves winter hardiness and stand persistence
  - Improves alfalfa's ability to compete with weeds
  - Strengthens disease and insect resistance

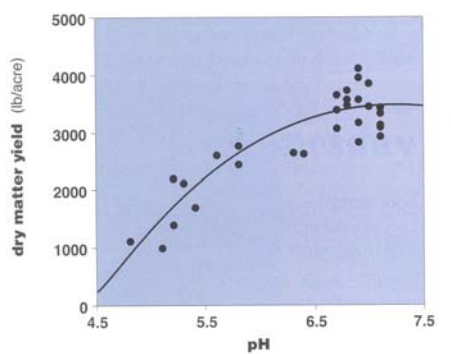
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## Soil pH and Fertility

- Have soils tested
- Lime fields to at least pH 6.7-6.9
- Apply lime at least 12 months before seeding
  - Best timing is as field is coming out of alfalfa

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### First-cutting alfalfa yield relative to soil pH



### Pounds of nutrients removed per ton of alfalfa produced

Nutrient	Dry Matter Removed (lbs/ton)
Phosphate ( $P_2O_5$ )	14
Potash ( $K_2O$ )	58
Calcium (Ca)	30
Magnesium (Mg)	6
Sulfur (S)	6
Boron (B)	0.08

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## 2. Select the Best Alfalfa Varieties

- Cheap seed will not pay off in the long run
- Look over University Trials
- Compare new varieties with ones you've grown
- Select high-yielding varieties with adequate winter survival and disease resistance.

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## Select Varieties with Increased Winterhardiness

- Less winterkill
- Less winter injury – more yield



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## Winterhardiness Test of Alfalfa

### Procedure

- Space plant alfalfa (1 ft apart) in rows 1 ft apart
- Clip frequently during seeding year
- Cut on Sept 20 in seeding year
- Rate individual plants in spring for injury and kill
- Report results relative to check varieties

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## Recommendations

- Very Winterhardy, Winterhardy, Moderately Winterhardy alfalfa varieties recommended for Wisconsin
- Plant more winterhardy type if:
  - Uneven greenup in spring frequently occurs
  - Cutting schedule always less than 35 days
  - Harvest late fall cutting

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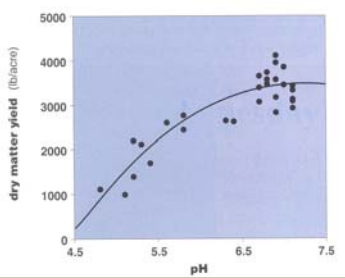
## 3. Proper Seed Bed Preparation and Planting



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## Causes of Seeding Failure: Low Soil pH

First-cutting alfalfa yield relative to soil pH



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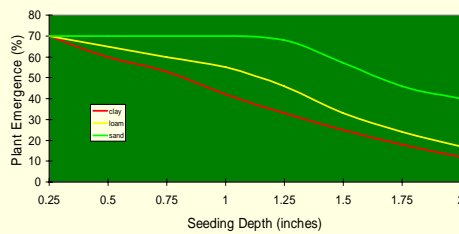
## Causes of Seeding Failure: Loose Soil



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## Causes of Seeding Failure: Seeding Depth

Effect of Seeding Depth on Alfalfa Emergence



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## Choose Best Establishment Method

- Direct Seeding
- Oats with Poast Plus or Roundup
- With Companion crop
  - Oats
  - Ryegrass

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#### 4. Importance of Seeding Year

- Too much competition to the young alfalfa seedlings can stunt their growth and or kill them.
- Alfalfa stressed in the seeding year will never yield as well in future years
- Higher than necessary plant populations of the cover crop add to establishment cost without producing additional return.

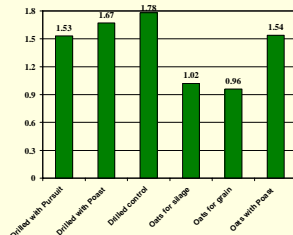
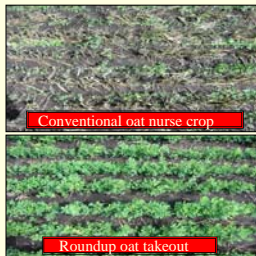
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#### Harvest First Cutting of New Seeding Early

- Take first cutting at 60 days after planting
  - More additional cuttings – higher tonnage
  - Less weed problems

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#### Effect of Cover Crop Competition on Alfalfa Yield



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#### Alfalfa Seeding Trial - Forage Yields

Treatment	Arlington, WI		
	2003	2004	2005
(1) Alfalfa seeded direct	2.8	2.4	2.3
(2) Oats sprayed at 6 inches	3.0	2.3	1.7
(3) Alfalfa + Oat haylage	2.7	4.1	3.1
Oat	2.0	2.3	2.0
Alfalfa	0.7	1.8	1.1

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#### 5. Scout Fields and Spray as Needed

##### Two Major Pests

##### 1. Potato Leafhopper



##### 2. Alfalfa Weevil

#### Potato Leafhoppers

- Adults
  - 1/8 inch long
  - wedge shape
  - florescent green
- Nymphs
  - much smaller
  - yellowish green to florescent green
  - no wings



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## Damage

- Symptoms
  - Hopper burn
  - Distinct V-shape discoloration
- Caused by
  - Sucking plant sap and injecting toxin which inhibits water and nutrient transport



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## Alfalfa Weevil

- Larva
  - Slate-colored when small
  - Bright green when full grown (3/8")
  - White stripe down the back, black head
- Adult
  - Dark gray to brown snout beetle (3/16")
  - Distinct dark shield-like mark on the back



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## Damage

- Larva chew and skeletonize leaves
- Severe damage gives the field a grayish cast
- Most damage occurs on spring growth
- Feeding can continue on second crop new growth
- Some fields may not green up

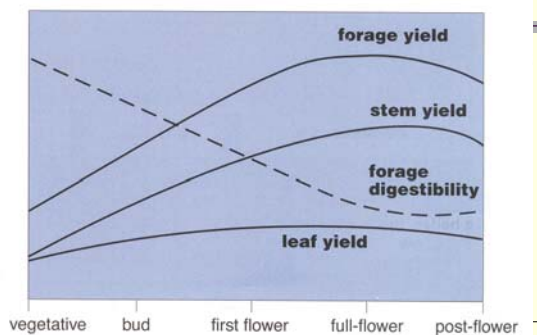


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## 6. Harvest Management



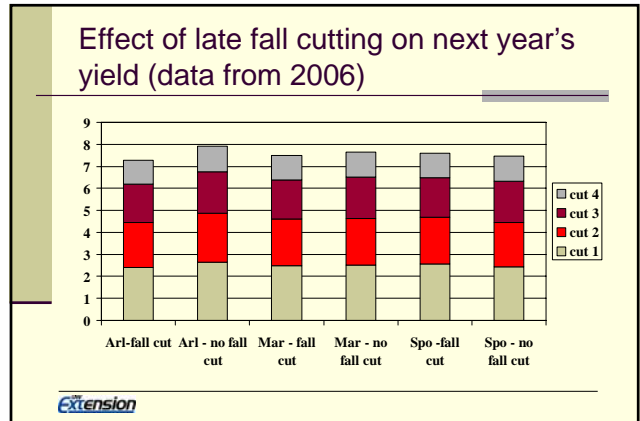
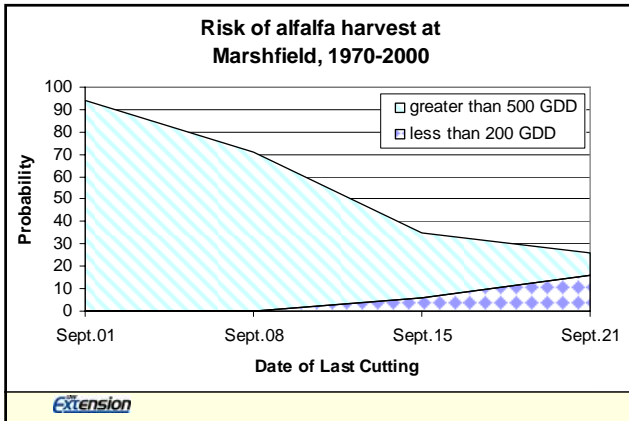
## Forage Yield Relative to Quality



## Cutting Schedules for Different Management Goals



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<b>1. What is your stand age?</b>	
> 3 years	4
2 to 3 years	2
≤ 1 year	1
<b>0</b>	
<b>2. Describe your alfalfa variety:</b>	
<b>A. What is the winterhardiness?</b>	
Moderately winterhardy (ws score 4)	3
Winterhardy (ws score 3)	2
Very Winterhardy (ws score 2)	1
<b>0</b>	
<b>B. What is the disease resistance?</b>	
Moderate resistance to only bacterial wilt	4
Moderate resistance to Bacterial wilt plus either Anthracnose, Fusarium wilt, phytophthora root rot, or Verticillium wilt	3
Moderate resistance to all above mentioned diseases	1
<b>0</b>	
<i>Alfalfa variety total score (multiply two)</i>	
	<b>0</b>

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Moderate resistance to all above mentioned diseases	1
<b>0</b>	
<i>Alfalfa variety total score (multiply two)</i>	
	<b>0</b>

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<b>3. What is your soil pH?</b>	
≤ 6.0	4
6.1 TO 6.5	2
≥ 6.6	0
<b>0</b>	

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**4. What is your soil exchangeable K Level?**

Low ( $\leq 80$ ppm)	4	
Medium (80 to 120 ppm)	3	
Optimum (120 to 160 ppm)	1	
High ( $\geq 161$ ppm)	0	0

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**5. What is your soil drainage?**

Poor (somewhat poorly drained)	3	
Medium (well to moderately drained)	2	
Excellent (sandy soils)	1	0

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**6. What is your soil moisture during fall/winter?**

Wet	5	
Medium to dry	0	0

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**7. Describe your harvest frequency:**

Cut interval	Last Harvest	
< 30 days	Sept. 1 to Oct. 15	5
	After Oct. 15	4
30 to 35 days	Before Sept. 1	3
	Sept. 1 to Oct. 15	4
	After Oct. 15	2
> 30 days	Before Sept. 1	0
	Sept. 1 to Oct. 15	2
	After Oct. 15	0
	Before Sept. 1	0

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**8. For a mid to late October cut, do you leave more than 6 inches of stubble?**

Yes	1	
No	0	0

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<b>1. What is your stubble age?</b>		
< 3 years	4	
3 to 6 years	2	
> 6 years	1	
<b>2. Describe your alfalfa variety:</b>		
<b>a. What is the seedheadiness?</b>		
Higher than recommended for region	3	
Recommended for region	2	
Lower than recommended for region	1	
<b>b. What is the disease resistance?</b>		<b>A. Total</b>
Medium resistance to only bacterial wilt	4	
Medium or higher resistance to bacterial wilt plus	3	
Fusarium wilt, Phytophthora root rot, or Sclerotinia wilt	2	
Medium or higher resistance to all above-mentioned diseases	1	
<b>3. What is your soil pH?</b>		<b>B. Total</b>
< 5.0	4	
5.1-6.0	3	
6.1-7.0	2	
> 7.0	1	
<b>4. What is your soil exchangeable K level?</b>		
Low ( $\leq 80$ ppm)	4	
Medium (80-120 ppm)	3	
Optimum (120-160 ppm)	2	
High ( $\geq 161$ ppm)	1	
<b>5. What is your soil drainage?</b>		
From somewhat poorly drained	3	
Medium (well to moderately well drained)	2	
Excellent (sandy soils)	1	
<b>6. What is your soil moisture during fall/winter?</b>		
Medium to dry	5	
Wet	4	
<b>7. Describe your harvest frequency:</b>		
<b>Cut interval</b>		<b>Last cutting</b>
< 30 days	Sept. 1-Oct. 15	4
	After Oct. 15	4
30-35 days	Before Sept. 1	3
	Sept. 1-Oct. 15	4
	After Oct. 15	2
> 30 days	Before Sept. 1	0
	Sept. 1-Oct. 15	2
	After Oct. 15	0
<b>8. For a mid-September or late-October cut, do you leave more than 6 inches of stubble?</b>		
Yes		1
No		0
<b>9. Determine your total score</b>		<b>Total</b>
Sum of points from questions 1-8		100

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## 7. Maintain Short Rotations



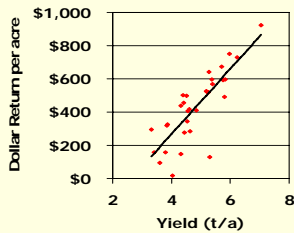
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## Yield is the most important component of profitability

- Fixed costs same regardless of yield
  - e.g. taxes, land costs, machinery depreciation
- Production costs similar
- Harvesting costs similar
  - Slightly higher for extra fuel and labor to harvest higher yield and haul to barn

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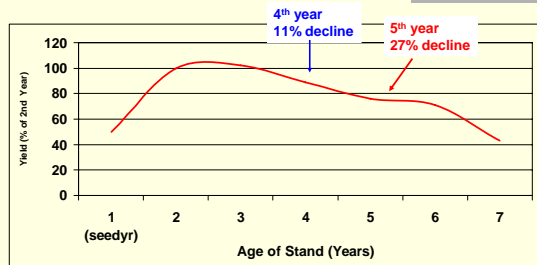
## Alfalfa Yield and Dollar Return from Wisconsin Green-Gold Program



Profitability increases with yield because fixed inputs remain constant and variable inputs increase only slightly as yield increases.

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## Yield of alfalfa as Stand Ages (% of 2<sup>nd</sup> year)



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## Benefits of Shorter Rotations:

- Increased alfalfa yield from younger stands
- Increased corn silage yield following alfalfa
- 10 to 15% higher corn yields following alfalfa
- More legume credits
- Less rootworm insecticide needed following alfalfa

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## Alfalfa Legume Credits

Med, Fine Soils                      Sandy Soils  
-----Regrowth after last cutting-----

	>8 inches	<8 inches	>8 inches	<8 inches
Stand Density	-----lb nitrogen/acre-----			
Good, > 4 pl/ft <sup>2</sup>	190	150	140	100
Fair, 1.5 to 4 pl/ft <sup>2</sup>	160	120	110	70
Poor, < 1.5 pl/ft <sup>2</sup>	130	90	80	40

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## 8. Minimize Wheel Traffic Damage

No traffic



Traffic

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## Minimize Wheel Traffic Damage



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## Effect of Wheel Traffic

- Soil compaction
  - Surface: related to contact weight
  - Subsoil: related to axle weight
- Physical damage to plant
  - Crown Damage
  - Broken Stems

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## Reducing Wheel Traffic Damage

- Minimize driving on field
  - Use smallest tractor when possible
  - Merge windrows where possible
  - Go to larger equipment
  - Take most direct route to edge of field
  - Make road to drive on

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## Reducing Wheel Traffic Damage

- Do driving on field soon after harvest
  - Manage to dry forage quickly
  - Harvest for haylage or baleage
  - Use preservative and harvest wet hay
- Use of duals not recommended
- Apply manure quickly after cutting

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## 9. Avoid Autotoxicity

- Alfalfa plants produce toxins that can reduce germination and growth of new alfalfa seedlings
- Toxins influence increases with age and density of stand
- Water soluble compounds impair seedling tap root development by causing root tips to swell and reduce root hair numbers

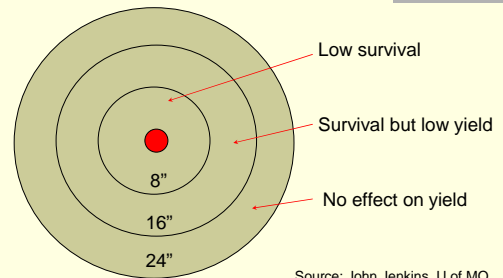
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## Autotoxicity

- Reduces germination if severe
- Reduces yield for life of stand
- Effect most severe on light soils
- Effect most prolonged on heavy soils
- Area of influence around living plant is 16" radius
- Irrigation/rains can wash autotoxic factor from soil

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## Alfalfa Zone of Influence - distance from old plant



Source: John Jenkins, U of MO

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## Autotoxicity Recommendations

- Wait at least one year before reseeding alfalfa if stand in for two or more years
- Can reseed new seeding failures anytime

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## Recommendations for Emergencies

- Accept some yield loss
- Remove topgrowth before plowing to reduce effect
- Tillage can reduce effect
- Irrigation/rains can wash toxic factor from soil
- Select fields with lightest soils

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A Partnership with the University of Wisconsin - Extension and Member Counties: Adams, Green Lake, Juneau, Marquette, Portage, Waushara, and Wood

February 24, 2004

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