State of the Industry

- 2008 Overview for Seed and Hay
  - Weather challenges
  - Commodity price impact
  - Anticipated supply for 2009
- Future Trends
  - Alfalfa Breeding
  - Biotechnology
  - Seed Treatments
  - Industry Consolidation
2008 Season

Weather

- A late spring and decent fall
- Dry in the West

California fall seeding down 20-30%.
2008 U.S. Crop

- 2008 Seed Crop
  - Dormant
  - Non-dormant
- 2008 Hay Crop
  - Acres harvested
  - Yield/acre
- 2008 Prices
  - Seed
  - Hay
2008 U.S. Crop

- 2008 Seed Crop
  - Dormant (acres down slightly, yield average)
  - Non-dormant (acres and yield up moderately)

- 2008 Hay Crop
  - Acres harvested
  - Yield/acre

- 2008 Prices
  - Seed
  - Hay
Acres Planted/Harvested

Source: NASS (Nov 2008)
Wild Commodity Prices!
Corn futures prices

11/21/2008 C=338^4  O=381^4  H=389^4  L=337^4  Mov Avg 3 lines

RSI 30.19  20.00  80.00
Volume 1064168.00  Open Interest 950912.00

Created with SuperCharts by Omega Financial © 1997
Commodity Prices

Prices relative to 1990-92

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Year</th>
<th>% increase</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>90-92</td>
<td>11/07</td>
</tr>
<tr>
<td>Alfalfa Hay</td>
<td>77.20</td>
<td>136</td>
</tr>
<tr>
<td>Corn grain</td>
<td>2.30</td>
<td>3.44</td>
</tr>
<tr>
<td>Soybeans</td>
<td>5.61</td>
<td>9.42</td>
</tr>
<tr>
<td>Wheat</td>
<td>2.96</td>
<td>7.39</td>
</tr>
</tbody>
</table>

Source: NASS (Nov 2008)

2008 Alfalfa Seed Prices up ~40% over 2007
2007 Input Costs (% 2003)

Source: NASS (Nov 2008)
Import/Export Updates

Seed import
- Canada
- Australia

Seed export
- Mexico
- Argentina
- Middle East

Hay Export
Import/Export Updates

❌ Seed import
- Canada (varies by region, down slightly)
- Australia (down slightly, continued drought)

❌ Seed export
- Mexico
- Argentina
- Middle East

❌ Hay Export
Import/Export Updates

- Seed import
  - Canada
  - Australia

- Seed export
  - Mexico (down slightly – pricing)
  - Argentina (moderately down – pricing)
  - Middle East (down – pricing/govt programs)

- Hay Export
Import/Export Updates

❌ Seed import
- Canada
- Australia

❌ Seed export
- Mexico
- Argentina
- Middle East

❌ Hay Export (down slightly)
State of the Industry

- 2008 Overview for Seed and Hay
  - Weather challenges
  - Commodity price impact
  - Anticipated supply for 2009

- Future Trends
  - Alfalfa Breeding
  - Biotechnology
  - Seed Treatments
  - Industry Consolidation
Marker Assisted Selection

**PHENOTYPE**
- WYSWYG
- Genotype x Environment
- Phenotype expression conditions

**GENOTYPE**

Chromosome 9
- 0: Dotted
- 7: Yellow-green seedlings
- 28: c Kernel color
- 30: Shrunken endosperm
- 31: Bn: Bronze color
- 50: Waxy endosperm
- 80: Centromere
- 64: Male sterility
- 62: Brittle stalk
- 107: White endosperm cap
- 141: Brown midrib

Molecular marker

Forage Genetics International
Marker Assisted Selection

- Molecular markers associated with desirable traits are being used to increase efficiency of breeding programs in corn and soybeans.
- These tools are being developed in alfalfa, and will be applied in the next few years.
  - Sequencing project w/ M. truncatula
  - Marker strategies from soy/corn
Projected Corn Yield

Source: 2008 ASTA/USDA/CSREES Workshop on Doubling Crop Yields
Projected Corn Yield

Double rate of gain w/ MAS

Source: 2008 ASTA/USDA/CSREES Workshop on Doubling Crop Yields
Projected Corn Yield

Source: 2008 ASTA/USDA/CSREES Workshop on Doubling Crop Yields
Biotech Traits

- Genomics-based gene discovery
- Input and Output traits
- Alfalfa will benefit
- Forage only traits (Reduced Lignin)
- Broadly applied input traits (WUE)
- Higher yield, lower inputs, increased $/A

Wide adoption of current traits

>$1B/yr in private/public investment

UCD Alfalfa Workgroup
Figure 1. Acreage Planted to Biotechnology-Derived Crops, 2000 to 2006.

# Herbicide Tolerance Benefits

<table>
<thead>
<tr>
<th>Herbicide Tolerant Crop</th>
<th>Production Costs Decrease</th>
<th>Herbicide Use Decrease</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>per acre</td>
<td>Total</td>
</tr>
<tr>
<td>Corn</td>
<td>7.69</td>
<td>315,535K</td>
</tr>
<tr>
<td>Soy</td>
<td>22.05</td>
<td>1,561,545K</td>
</tr>
<tr>
<td>Cotton</td>
<td>17.44</td>
<td>230,133K</td>
</tr>
</tbody>
</table>

Biotech Traits in Alfalfa

- Roundup Ready
- Reduced Lignin
- Protein Improvement
- Increased Biomass
- Delayed Flowering
- Delayed Senescence
- Alfalfa Weevil Resistance
- Abiotic Stress Tolerance
  - Drought
  - Salt
  - Low pH
DMD (RL as % null)
3\textsuperscript{rd} cut early vs late

>30\% higher digestibility at late harvest

(\text{Getachew, et.al., unpublished})
RL1 Changes in NDFD
First Harvest

Whole Plant Samples

RL = slower decline in quality with late maturity

NDFD = digestibility of the NDF (fiber) fraction
RNAi CCOMT F1 Syn1 (combination of 6 events)
Null F1 Syn1

UCD Alfalfa Workgroup
Seed Treatments

❌ Increased research/testing focus
  ❇️ Micro-nutrients
  ❇️ Growth regulators
  ❇️ Fungicides/insecticides
  ❇️ Seed coatings

❌ 2nd generation products now available
❌ There’s more to come
Consolidation

- Consolidation in all sectors
  - USDA/ARS
  - Universities
  - Private industry

- Impact of Consolidation
  - Realization that we’re all in this together
    - CAI – ARS/Noble Fdn/Industry
    - NAFA RRA Best Practices
  - Clear focus of limited resources
    - Stable ownership = long term committment
Conclusions

- Incredible potential for the crop
  - Higher forage yield
  - Higher value (increased quality)
  - Potential new uses
- Speaking with one voice
  - Importance of NAFA/CAFA
- Alfalfa is the tail, not the dog
  - Commodity/energy prices will impact crop