Growing and Feeding Cereal Forages
MT Livestock Forum and Nutrition Conference
13 April 2011, Bozeman

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MSU Extension Service
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Situation April 2011:

- Good cattle prices
- Good grain prices
- Good soil moisture for pastures
- Plenty of “inexpensive” hay

“This might be the year to consider replacing/renovating old alfalfa stands or perennial pastures”
Situation 2011:

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“This might be the year to consider replacing/renovating old alfalfa stands or perennial pastures”
Topics April 2011

Forage Crops 101:

• Alfalfa
• Crop rotation with cereals
• Annual cereal forages
• Advantages and disadvantages of cereal forages
Bass ackward
Winter Rations

Winter wheat hay analysis (2010):
10% CP, 55% TDN
(conservative)
Winter Rations

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- 1200-lb cow NRC daily requirements:
  2.2 lbs CP and 13 lbs TDN

- @ 2% BW = 24 lbs DM (1200 lb x 0.02)
Winter Rations

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- 1200-lb cow NRC daily requirements:
  2.2 lbs CP and 13 lbs TDN

- @ 2% BW = 24 lbs DM \((1200 \text{ lb} \times 0.02)\)
  2.4 lbs CP \((24 \text{ lbs} \times 10\% \text{ CP})\)
Winter Rations

Winter wheat hay analysis (2010):
10% CP, 55% TDN

• 1200-lb cow NRC daily requirements:
  2.2 lbs CP and 13 lbs TDN

• @ 2% BW = 24 lbs DM (1200 lb x 0.02)
  2.4 lbs CP (24 lbs x 10% CP)
  13.2 lbs TDN (24 lbs x 55% TDN)
THE END
ALFALFA:
Highest yield, FQ, adaptation
ALFALFA:
Highest yield, FQ, adaptation,
THE ULTIMATE
CONSERVATION AND
“ORGANIC” CROP – FIXES N₂
What does an old alfalfa stand look like?
Alfalfa Stand Decline

- Old age
- Winterkill
- Weeds?
Alfalfa Stand Decline

- Old age
- Winterkill
- Weeds?
- Diseases
- Rodents
Direct-interseed Alfalfa into Alfalfa?

No
Stand Replacement (Renovation)

- 1st consideration: hay value.
- 2 years (minimum) to “grassy crop” – cereal, corn, etc.
Rotation Crops

- Cool season cereals for grain or forage peas, Brassicas, etc.

- Warm season corn, sudangrass, millet
Cereal forages

Why? 10 million A, adapted, equipment, expertise, diversified operations in MT
Stand Replacement (Renovation)

- 1st consideration: hay value.
- 2 years (minimum) to “grassy crop”
  - cereal, corn, etc.

- Re-establish alfalfa into clean, prepared seedbed or stubble.
Cereal Forages

- **Spring**: Barley, oat, wheat, triticale
- **Winter**: Rye?, beardless wheat, triticale, spelt
Haybet hay barley
Beardless WW, trit, barley
Growing cereals for hay

- Increase seeding rate +50% (dry) to +100% (irr)
- About 25 lb/A available per expected ton/A forage (soil + fertilizer N)
- Seed treatments, herbicides, irrigation
- Cut at proper stage
No-till into stubble
Triticale  FWW  Haybet

May 24
## Forage Yield of FWW vs. Haybet

<table>
<thead>
<tr>
<th>Date</th>
<th>Haybet Plant Height (in.)</th>
<th>FWW Forage (tons DM/A)</th>
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<td>May 24</td>
<td>3</td>
<td>21</td>
<td></td>
<td></td>
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<tr>
<td>June 6</td>
<td>21</td>
<td>29</td>
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<td></td>
</tr>
<tr>
<td>June 20</td>
<td>29</td>
<td>42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>July 5</td>
<td>38</td>
<td>53</td>
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<td></td>
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<tr>
<td>July 19</td>
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<td>-</td>
<td>0.72</td>
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<tr>
<td>June 6</td>
<td>21</td>
<td>29</td>
<td>0.64</td>
<td>1.25</td>
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<tr>
<td>June 20</td>
<td>29</td>
<td>42</td>
<td>1.41</td>
<td>2.95</td>
</tr>
<tr>
<td>July 5</td>
<td>38</td>
<td>53</td>
<td>2.10</td>
<td>HAY 3.45</td>
</tr>
<tr>
<td>July 19</td>
<td>44</td>
<td>54</td>
<td>HAY 3.07</td>
<td>(4.22)</td>
</tr>
</tbody>
</table>
Grazing?
Leaf and Tiller Development

Winter Dormant
tillering begins
one shoot

Stem Elongation
first node of stem visible
second node visible
leaf sheaths strongly erected
leaf sheaths visible
ligule of last leaf just visible
last leaf just visible
in "boot"

Head Emergence and Flowering
flowering [wheat]
Fig. 44. Watery ripe wheat kernel.

Fig. 45. Watery ripe barley kernel.
Fig. 46. Milk stage wheat kernel.

Fig. 47. Milk stage barley kernel.
Backgrounding Trials
Backgrounding Trials
(2000 – 2007)

Forage: ad lib
(20 – 25 lbs)
Grain: 4 – 8 lbs

60-day trials
Initial, 30-d, 60-d
Refusals, intake, ADG
<table>
<thead>
<tr>
<th>Year</th>
<th>ADG (lbs)</th>
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<tbody>
<tr>
<td>2000</td>
<td>2.7 lb/d</td>
</tr>
<tr>
<td>2002</td>
<td>2.9 lb/d</td>
</tr>
<tr>
<td>2003</td>
<td>2.5 lb/d</td>
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### University Backgrounding Trials

#### Winter vs. Spring Cereals

<table>
<thead>
<tr>
<th></th>
<th>‘Robust’ Barley Hay</th>
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<th>‘Loyal’ Oat Hay</th>
<th>‘Willow Creek’ Winter Wheat Hay</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADG (Nov. 2005 – Jan. 2006)</td>
<td>2.78 a</td>
<td>3.21 b</td>
<td>2.63 a</td>
<td>2.50 a</td>
</tr>
</tbody>
</table>

### University Backgrounding Trials

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<tr>
<th></th>
<th>‘Hays’ Barley Hay</th>
<th>Alfalfa/grass 1st-cut Hay</th>
<th>‘Trical 102’ triticale Hay</th>
<th>‘Willow Creek’ Winter Wheat Hay</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSU 60-d ADG (Nov. 2006 – Jan. 2007)</td>
<td>3.34 a</td>
<td>2.80 b</td>
<td>2.75 b</td>
<td>3.22 a</td>
</tr>
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<th>‘Trical 102’ triticale Hay</th>
<th>‘Willow Creek’ Winter Wheat Hay</th>
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<tr>
<td>Yield (ton/A)</td>
<td>3.34 a</td>
<td>2.80 b</td>
<td>2.75 b</td>
<td>3.22 a</td>
</tr>
</tbody>
</table>

| Yield (ton/A)                     | 3.1              | 3.4                       | 4.8                       | 4.4                            |

*(actual 2006 MSU on-farm yields)*
Growth

Maintenance
Cereal Forages

Advantages

• Adapted
• Widely grown, equipment
• High production
• Good quality
• Good herbicides (crop rotation control of weeds prior to alfalfa)
Any downsides to cereal forages?
From Steven Wright:

If everything seems to be going well,..... you have obviously overlooked something.
Cereal Forages

Advantages

• Adapted
• Widely grown
• High production
• Good quality
• Good herbicides (crop rotation control of weeds prior to alfalfa)

Disadvantages

• Annual crop
• Nitrate risk
Nitrate (Nitrite) Toxicity

Abortion, reduced milk production, weight loss, muscle tremors, cyanosis, DEATH.

Normal ruminal digestion (bacteria):

\[ \text{NO}_3 \rightarrow \text{NO}_2 \rightarrow \text{NH}_3 \rightarrow \text{aa} \rightarrow \text{proteins} \]

“too much too fast” forage, water
Nitrate (Nitrite) Toxicity

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Normal plant N absorption:

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“too much too fast” - light, water, T
Nitrate (Nitrite) Toxicity

Normal plant N absorption:

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“too much too fast” - light, water, T

Drought, fertilizer?, plant maturity
Nitrate accumulation by cereals:

Corvallis Cereal Species Nitrate

- Triticale
- Oat
- Barley
- Wheat
- Spelt
- LSD0.05

Nitrate-N (ppm)
Nitrate accumulation by cereals:

Cautionary level
~1100 ppm
## Barley Forage Yield and Quality, 2000 – 2002, Bozeman Irrigated

<table>
<thead>
<tr>
<th>Variety</th>
<th>Tons/A</th>
<th>%CP</th>
<th>%TDN</th>
<th>% NO₃-N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lewis</td>
<td>3.42</td>
<td>11.2</td>
<td>59.3</td>
<td>0.120</td>
</tr>
<tr>
<td>Haybet</td>
<td>3.36</td>
<td>12.0</td>
<td>61.3</td>
<td>0.108</td>
</tr>
<tr>
<td>Hays</td>
<td>3.33</td>
<td>12.6</td>
<td>58.1</td>
<td>0.173</td>
</tr>
<tr>
<td>Valier</td>
<td>3.28</td>
<td>12.5</td>
<td>59.9</td>
<td>0.163</td>
</tr>
<tr>
<td>Bestford</td>
<td>3.27</td>
<td>13.4</td>
<td>57.1</td>
<td>0.281</td>
</tr>
<tr>
<td>Baronesse</td>
<td>3.26</td>
<td>12.0</td>
<td>60.2</td>
<td>0.162</td>
</tr>
<tr>
<td>Westford</td>
<td>3.07</td>
<td>12.9</td>
<td>55.6</td>
<td>0.282</td>
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Nitrate “QuikTest”
Testing for Nitrate:

Nitrate QuikTest:
Qualitative

Laboratory analysis:
Quantitative
Irrigated Haybet barley, Gulf annual ryegrass
## Haybet & annual ryegrass (tons/A)

<table>
<thead>
<tr>
<th></th>
<th>Cut 1 7/22/02</th>
<th>Cut 2 10/7/02</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haybet alone</td>
<td>3.39 a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARG alone</td>
<td>0.74 b</td>
<td></td>
<td></td>
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<tr>
<td>Haybet + ARG</td>
<td>3.40 a</td>
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<td>0.53 c</td>
<td>3.91 b</td>
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<td>0.74 b</td>
<td>2.84 a</td>
<td>3.59 b</td>
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<td>3.40 a</td>
<td>1.90 b</td>
<td>5.30 a</td>
</tr>
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Cereal forages in Montana

- >300,000 acres
  (2000 – 2010)
- Barley, wheat, oat
- Well-balanced roughage

Haybet barley
Annual Forages Ahead of Alfalfa

Dryland (crop-fallow)
# Dryland Forages at CARC
(During drought, 1999-2002):

<table>
<thead>
<tr>
<th></th>
<th>Alfalfa</th>
<th>Grasses</th>
<th>Spring Barley</th>
<th>Winter Grain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tons/A</td>
<td>0.8</td>
<td>0.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(%CP)</td>
<td>(17%)</td>
<td>(6%)</td>
<td></td>
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<tr>
<td>(%TDN)</td>
<td>(58%)</td>
<td>(51%)</td>
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*(During drought, 1999-2002)*:

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**Annual Forages Ahead of Alfalfa**

- **Spring**: (Hay barley, oat, triticale)  
  3-3.6 tons by 7/24

- **Winter**: (wheat, spelt, triticale)  
  3-6 tons by 7/10
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