Alternative Feeds:
A Solution for a
Temporary Crisis or a
Permanent Problem?

Travis Whitney
Associate Professor
Livestock Nutritionist
TX A&M AgriLife Research
San Angelo
325-653-4576
trwhitney@ag.tamu.edu

June 19, 2013
Bozeman, MT

Whit Stewart
Research Associate
Ph.D. Student
TX A&M AgriLife Research
San Angelo
325-653-4576
Whit.Stewart@ag.tamu.edu
TX A&M AgriLife Nutrition Program

GOAL: Reduce production costs and
↑ SUSTAINABILITY

• ↑ the “value” of underutilized feed ingredients
  without negatively affecting growth/health/end products
TX A&M AgriLife Nutrition Program

GOAL: Reduce production costs and ↑ SUSTAINABILITY

• ↑ the “value” of underutilized feed ingredients without negatively affecting growth/health/end products

• Maximize ranch resources & ecosystem health: forages/water
Rising Feed Costs

- Feed costs are unsustainable due to numerous variables:
  - rising fuel/transportation costs
  - federal mandates: feed resources diverted to biofuels
  - inflation
  - drought
- Not profitable to use feed as a **substitute** for growing forages
- You are losing money if purchasing feeder lambs
Rising Feed Costs

We believe that this “temporary” feed crisis has become a permanent problem.
Roughages (100 miles x $3/loaded mile)

Source
CSH: Hansen Mueller Trading
Alfalfa; Coastal Hay: USDA-AMS Amarillo, TX
Concentrates

$/Dry Ton

Source
Feedstuffs,
Ingredient Market

Juniper?
What Do You Do?

1. Minimize predator loss
2. Feed less animals vs. feeding each animal less
3. Precision diet formulation (e.g. TX A&M SRNS)
   - analyze forages/feeds for nutrients
   - minimize cost/lb. nutrient intake
4. Buy on DM basis
5. Stay away from “horse-quality” hay
   *if* not backed up by nutrient analysis
What Do You Do?

7. Mix on site if possible
8. Use “alternative” feeds
   - know the history/research (benefits vs. risks)
   - know total cost: capital investment, transportation, sorting
     - 500 head, supplement 4 months, assume $100/ton savings, 0.75 lbs./day, 40% juniper = $2,250 savings/year
   - try it on a small-scale
Wood for Feed History (brief)

- **1920s**
  - Sawdust (e.g. Douglas fir, white pine) fed to dairy/beef cattle and sheep. Mass. Exp. Station
- **1950s: Mesquite**
  - Marion et al. (1957): steers/cows
Wood for Feed History (brief)

- **1920s**
  - Sawdust (e.g. Douglas fir, white pine) fed to dairy/beef cattle and sheep. Mass. Exp. Station

- **1950s: Mesquite**
  - Marion et al. (1957): steers/cows

- **1965-1990: Aspen, pine, alder**
  - Forest Products Lab, WI (1969 - 1980s)
  - Univ. of MN & MN Agric. Exp. Station (1970 - 1980s)
  - Texas Tech: mesquite (1970 - 1980s)
  - K-State (1970s)
  - Canada (1970s)
  - SD State (1980s)

- **1980s:**
  - Aspen received AAFCO definition; approved to be sold commercially
Wood for Feed History

Current:
- Redberry juniper:
  - lamb growing/finishing diets
  - pregnant ewe supplements
  - reduce internal parasite infection
  - increase bypass protein
  - alter rumen microbial species
  - compared to 3 other juniper spp.

http://microbewiki.kenyon.edu/index.php/Bovine_Rumen
Wood for Feed History

Current:
• Redberry juniper:
  ◆ lamb growing/finishing diets
  ◆ pregnant ewe supplements
  ◆ reduce internal parasite infection
  ◆ increase bypass protein
  ◆ alter rumen microbial species
  ◆ compared to 3 other juniper spp.

On deck:
• Mesquite/cactus/mixed brush
• Pre-treatment (heating, pelleting, ensiling, etc.)
• Maximizing harvest/processing efficiency
• Cattle, goats, & deer
• Cooperatives?
Texas A&M AgriLife Research
Wood to Feed Program:
Goal # 1

Reduce the cost of livestock production while synergistically enhancing natural resources
Can a Wood to Feed Program Work?

Knowledge is built over time, which reduces skepticism

“Such material as this (CSH) belongs with the very lowest grade of coarse fodder, as both composition and experience demonstrate.”

– W. H. Jordan, 1903
The Feeding of Animals

“47 years later, CSH are junk

When properly fed, CSH are generally about equal in values to fair-quality grass hay and are worth more/ton than corn stover, straw, or poor hay. The hulls are well liked by cattle, even when fed as the only roughage”

– F. B. Morrison, 1950
Feeds and Feeding
Can a Wood to Feed Program Work?

AIM HIGH
What's the worst that could happen?
What does process look like?

84 lbs. wet; 46 lbs. dry
Converting Into Feed
Commercial-scale
Some Things We Know

1. Numerous benefits
   - animal
   - rangelands

2. Woody plants are available year-round
Some Things We Know

1. Numerous benefits
   - animal
   - rangelands

2. Woody plants are available year-round

3. TX A&M AgriLife Research has been successfully feeding ground Redberry juniper trees
   - can reduce cost of feed/lb. gain and total feedlot costs
   - can enhance animal growth performance when used with other roughages
   - does not negatively affect fetus or pregnant ewe
   - can reduce internal parasite motility and fecal eggs and potential increase IVM efficacy
   - can increase “healthy” fatty acids in meat

4. More research needed
Nutritional Quality of 4 *Juniperus* Species: Immature and Mature Trees
Nutritional Quality of 4 *Juniperus* Species: Immature and Mature Trees
Nutritional Quality of 4 *Juniperus* Species: Immature and Mature Trees

<table>
<thead>
<tr>
<th></th>
<th>Mature Plant &gt; 10ft</th>
<th>Immature Plant &lt;6ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digest.</td>
<td>29%</td>
<td>32%</td>
</tr>
<tr>
<td>Crude Protein</td>
<td>3.6</td>
<td>3.6</td>
</tr>
<tr>
<td>% NDF</td>
<td>66</td>
<td>64</td>
</tr>
<tr>
<td>% ADF</td>
<td>56</td>
<td>53</td>
</tr>
</tbody>
</table>

Mature Plant > 10ft
- Redberry: Mature
- Blueberry: Mature
- One-seed: Mature
- ERC: Mature

Immature Plant <6ft
- Redberry: Immature
- Blueberry: Immature
- One-seed: Immature
- ERC: Immature

**CSH:** 21% digestibility; 6.6% CP; 80% NDF; 70% ADF (cell/lignin); 40% TDN
## Nutritional Quality of 4 *Juniperus* Species: Immature and Mature Trees

<table>
<thead>
<tr>
<th></th>
<th>Mature Plant &gt; 10ft</th>
<th>Immature Plant &lt;6ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Redberry: Mature</td>
<td>29%</td>
<td>49%</td>
</tr>
<tr>
<td>Blueberry: Mature</td>
<td>29%</td>
<td>44%</td>
</tr>
<tr>
<td>One-seed: Mature</td>
<td>32%</td>
<td>49%</td>
</tr>
<tr>
<td>ERC: Mature</td>
<td>29%</td>
<td>44%</td>
</tr>
<tr>
<td>Digest.</td>
<td>29%</td>
<td>49%</td>
</tr>
<tr>
<td>Crude Protein</td>
<td>3.6</td>
<td>4.7</td>
</tr>
<tr>
<td>% NDF</td>
<td>66</td>
<td>50</td>
</tr>
<tr>
<td>% ADF</td>
<td>56</td>
<td>40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Immature Plant &lt;6ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Redberry: Immature</td>
<td>3.7</td>
</tr>
<tr>
<td>Blueberry: Immature</td>
<td>4.0</td>
</tr>
<tr>
<td>One-seed: Immature</td>
<td>4.0</td>
</tr>
<tr>
<td>ERC: Immature</td>
<td>4.6</td>
</tr>
<tr>
<td>Digest.</td>
<td>33%</td>
</tr>
<tr>
<td>Crude Protein</td>
<td>4.6</td>
</tr>
<tr>
<td>% NDF</td>
<td>62</td>
</tr>
<tr>
<td>% ADF</td>
<td>52</td>
</tr>
</tbody>
</table>

**CSH:** 21% digestibility; 6.6% CP; 80% NDF; 70% ADF (cell/lignin); 40% TDN
Scenario 1

Own sheep and can mix on your property:
* Drive from Bozeman to Big Timber (~70 miles)
Scenario 1

Costs

Round trip: 140 miles
Fuel (10 mpg): 14 gallons x $4.00/gallon = $56
Truck/trailer (round trip: ~$0.15/mile): $25
6 hours of someone’s time ($15/hour): $90
Pounds of feed hauled (DM basis): 7,200 lbs. (3.6 tons)

Dry/Hammermill
labor (4 hours): $60
maint./elect.: $15

TOTAL COST = $246
Scenario 1

Costs
Round trip: 140 miles
Fuel (10 mpg): 14 gallons x $4.00/gallon = $56

Truck/trailer (round trip: ~$0.15/mile): $25
6 hours of someone’s time ($15/hour): $90
Pounds of feed hauled (DM basis): 7,200 lbs. (3.6 tons)

Dry/Hammermill
labor (4 hours): $60
maint./elect.: $15

TOTAL COST = $246
TOTAL COST/dry ton = $68
Scenario 2: don’t dry, closer to ranch, and larger hauling capacity

Costs

Round trip: 80 miles
Fuel (10 mpg): 8 gallons x $4.00/gallon = $32

Truck/trailer: $12
4 hours of someone’s time ($15/hr): $60
Pounds of feed hauled (dm-basis): 16,500 lbs. (8.25 tons)

Hammermill
labor (8 hours): $120
maint./elect.: $25

TOTAL COST = $249
TOTAL COST/dry ton = $30
CONCLUSION

Feed costs & brush control costs will not get any better

You can start feeding ground trees on your own property today

*But*, must have AFFCO (or FDA) approval to be sold commercially

Must secure funding to maximize research efforts

We know:

- Redberry juniper and mesquite can be fed to livestock
- Redberry juniper: greater digestibility, less fiber, and similar CP as compared to CSH
- Reduces *H. contortus* motility/fecal egg shedding

Potential to:

- Change how juniper/mesquite are managed
- Become a commercial feed ingredient
QUESTIONS/COMMENTS

Texas A&M AgriLife Research “Wood to Feed” Program

Vision
A commercialized Wood to Feed industry that delivers quality livestock feed ingredients, while synergistically reducing feed costs and enhancing natural resources.

Mission
Texas A&M AgriLife Research Wood to Feed Program is a multi-disciplined team of scientists, ranchers, landowners, investors, and industry and government representatives, collaborating to enhance the livestock feeding value of woody products and demonstrate the benefits to livestock production and natural resources.