Alfalfa Cutting Frequency and Fall Harvest Management

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Harvest timing most powerful tool under the grower’s control to determine both yield and quality
YIELD-QUALITY TRADEOFF
(Yolo County, all harvests, 1999-2000)

The graph illustrates the relationship between yield (T/A) and quality (ADF %) over different days of growth. Two lines are shown:

1. For early harvests:
   - Quality: $y = 0.3417x + 27.893$
   - $R^2 = 0.6066$

2. For mid-harvests:
   - Quality: $y = 0.0393x + 1.2327$
   - $R^2 = 0.6565$

The graph also shows the distribution of data points for yield and quality across different growth stages (V. Early, Early, Mid, Late, V. Late).
Butte Valley Grower Cooperator
Daily Change in Forage Yield

[Bar chart showing the daily change in forage yield for Yolo Cut 1, Fresno Cut 1, Siskiyou Cut 1, Yolo Cut 2, Fresno Cut 2, Siskiyou Cut 2, Yolo Cut 4, and Fresno Cut 4 across Early Spring, Late Spring, and Summer.]
Shasta Valley: Elevation 2,539
3 Cuts (rarely 4 one 5 last year)

Ft. Jones: Elevation 2,762
3 Cuts (some 4 but less common)

Butte Valley: Elevation 4,252
3 cuts (blue moon 4 cuts)

Tulelake: Elevation 4,066
4 Cuts (some 3 depending on year and grower)
The Effect of Cutting Schedule on Yield and Quality

Tulelake, CA

![Bar Chart]

- **3-Cut**
  - Yield (tons/A): 70.0%
  - Good 29-32 ADF: 30.0%
  - Premium 27-29 ADF: 70.0%
  - Supreme <27 ADF: 0%

- **3-Cut (delayed 2nd)**
  - Yield (tons/A): 38.8%
  - Good 29-32 ADF: 37.2%
  - Premium 27-29 ADF: 23.9%
  - Supreme <27 ADF: 100.0%

- **4-Cut**
  - Yield (tons/A): 100.0%
  - Good 29-32 ADF: 100.0%
  - Premium 27-29 ADF: 100.0%
  - Supreme <27 ADF: 100.0%
The Effect of Cutting Schedule on Yield and Quality

Macdoel, CA

<table>
<thead>
<tr>
<th>Cutting Schedule</th>
<th>Yield (tons/A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-Cut</td>
<td>65.5%</td>
</tr>
<tr>
<td>3-Cut (delayed 2nd)</td>
<td>34.5%</td>
</tr>
<tr>
<td>4-Cut</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Legend:
- Good 29-32 ADF
- Premium 27-29 ADF
- Supreme <27 ADF
The Effect of Cutting Schedule on Gross Returns
Tulelake, CA

![Graph showing the effect of cutting schedules on gross returns. The graph compares 3-cut, 3-cut (delayed 2nd), and 4-cut schedules over the years 2001 to 2010.]
Difference in gross returns for a 3-cut schedule (delayed 2\textsuperscript{nd}) and a 4-cut schedule compared with a standard 3-cut schedule. Tulelake, CA
• Over 70% of the alfalfa hay used by dairies

• Average 2013 dairy cow produces >70% more milk than a cow in 1970, and dairies have demanded high quality forage
Traditional harvest time period:
First week of June through early September
Typically takes 3 weeks to harvest entire farm
Primary Concern Winter Survival

- Alfalfa must be cut early enough in the fall to regrow and replenish carbohydrate root reserves and protein
- Or, cut late enough so that alfalfa does not draw on root carbohydrate reserves
- Harvest window to avoid 200 – 500 GDD, base of 41°F prior to hard frost of 25°F
Long-Term Average Max and Min Temperatures
Tulelake, CA (41.9542° N) and Madison Wisconsin (43.0667° N)
Long-Term Average Max and Min Temperatures
Tulelake, CA (41.9542° N) and Madison Wisconsin (43.0667° N)
OBJECTIVES

• Compare yield under 3- and 4-cut harvest schedules
• Compare different last final cutting dates for a 4-cut schedule
• Evaluate the effect of cutting frequency and final harvest date of 4-cut schedule on subsequent alfalfa yield
• Determining whether alternating the number of cuttings from one year to the next can help overcome any negative effects from improper fall management
Materials and Methods

- Established trials initiated in 2009, 2010 and 2011 (each one lasted 3 years)

  - **1st year**
    - 3-cut schedule
    - three 4-cut schedules (last cut mid Sept., end of Sept., after hard killing frost mid Oct.)

  - **2nd year** – Each treatment cut 3 or 4 times
    - (4 cut schedule was with mid Sept. 4th cut)

  - **3rd year** – uniform single cutting
## Typical Harvest Dates

<table>
<thead>
<tr>
<th>Treatment</th>
<th>1st cutting</th>
<th>2nd cutting</th>
<th>3rd cutting</th>
<th>4th cutting</th>
<th>2010 Harvest Schedule</th>
</tr>
</thead>
</table>
Effect of 3 vs 4 cuts and Timing of 4th Cutting

Field A Year 1

Yield (tons/A)

Cutting Schedule

3-cut
4-cut (9/16 4th)
4-cut (9/30 4th)
4-cut (10/16 4th)
**Effect of 3 vs 4 cuts and Timing of 4\(^{th}\) Cutting**

*Field B Year 1*

<table>
<thead>
<tr>
<th>Cutting Schedule</th>
<th>3-cut</th>
<th>4-cut (9/16 4th)</th>
<th>4-cut (9/30 4th)</th>
<th>4-cut (10/15 4th)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield (tons/A)</td>
<td>3.25</td>
<td>1.96</td>
<td>2.01</td>
<td>1.98</td>
</tr>
<tr>
<td></td>
<td>2.26</td>
<td>1.51</td>
<td>1.50</td>
<td>1.51</td>
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<td></td>
<td>1.85</td>
<td>1.26</td>
<td>1.18</td>
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<tr>
<td></td>
<td>1.51</td>
<td>1.00</td>
<td>0.00</td>
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<tr>
<td></td>
<td>1.00</td>
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Effect of 3 vs 4 cuts and Timing of 4\textsuperscript{th} Cutting

Field C Year 1

<table>
<thead>
<tr>
<th>Cutting Schedule</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>4th</th>
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</thead>
<tbody>
<tr>
<td>3-cut</td>
<td>3.30</td>
<td>2.41</td>
<td>0.00</td>
<td>2.00</td>
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<tr>
<td>4-cut (9/16 4th)</td>
<td>2.33</td>
<td>1.53</td>
<td>1.12</td>
<td>1.12</td>
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<tr>
<td>4-cut (9/30 4th)</td>
<td>2.41</td>
<td>1.71</td>
<td>1.07</td>
<td>1.07</td>
</tr>
<tr>
<td>4-cut (10/15 4th)</td>
<td>2.41</td>
<td>1.68</td>
<td>1.24</td>
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</tbody>
</table>
Effect of 3 vs 4 cuts and Timing of 4th Cutting on First-Cut Yield of Alfalfa the Following Year

Filed A Year 2 (2010)

<table>
<thead>
<tr>
<th>Cutting Schedule This Year</th>
<th>Yield (tons/A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-cut</td>
<td>2.00</td>
</tr>
<tr>
<td>4-cut (9/16 4th)</td>
<td>1.90</td>
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<tr>
<td>4-cut (9/30 4th)</td>
<td>1.80</td>
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<tr>
<td>4-cut (10/16 4th)</td>
<td>1.70</td>
</tr>
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Legend:
- 3-cut
- 4-cut (9/16 4th)
- 4-cut (9/30 4th)
- 4-cut (10/16 4th)
Effect of 3 vs 4 cuts and Timing of 4th Cutting on First-Cut Yield of Alfalfa the Following Year

Field B Year 2 (2011)

Cutting Schedule This Year

Yield (tons/A)

- 3-cut
- 4-cut (9/16 4th)
- 4-cut (9/30 4th)
- 4-cut (10/15 4th)
Effect of 3 vs 4 cuts and Timing of 4th Cutting on First-Cut Yield of Alfalfa the Following Year

Field C Year 2 (2012)
Effect of 3 vs 4 cuts and Timing of 4\textsuperscript{th} Cutting on Total Yield of Alfalfa the Following Year

Field A Year 2 (2010)
Effect of 3 vs 4 cuts and Timing of 4th Cutting on Total Yield of Alfalfa the Following Year

Field B Year 2 (2011)
Effect of 3 vs 4 cuts and Timing of 4\textsuperscript{th} Cutting on Total Yield of Alfalfa the Following Year

Field C Year 2 (2012)
Effect of First Year and Second Year Cutting Schedules on First-Cut Yield the Following Year (Uniform Cutting)

Field A Year 3 (2011)
Effect of First Year and Second Year Cutting Schedules on First-Cut Yield the Following Year (Uniform Cutting)

Field B Year 3 (2012)

Cutting Schedule Previous Year

- 3-cut
- 4-cut (9/16 4th)
- 4-cut (9/30 4th)
- 4-cut (10/15 4th)

Yield (tons/A)
Effect of First Year and Second Year Cutting Schedules on First-Cut Yield the Following Year (Uniform Cutting)

Field C Year 3 (2013)
Conclusions

• Weather in California better than Wisconsin

• There are more loggers in Scott Valley than Tulelake

• Whether a 3 cut or 4 cut is a higher yielding strategy depends upon year and timing of 4th cut.

• 3 cut schedule highly unlikely to meet “dairy quality” standards (may not meet future export standards)

• Delaying the timing of 4th cutting did not increase yield appreciably but...
Conclusions

• Fall harvest treatment (timing and number of cuts) had **HUGE** effect on first cutting yield the following year

• To make some dairy quality, best option may be 4-cut schedule with mid-October harvest provided sufficient weather window or silage making opportunity

• Cut fairly early in Sept. or very late after killing frost

• Growers can use this information to lengthen harvest window in fall to minimize risk (avoid inclement weather), enhance root reserves and maximize yield

• Consider alternating strategy from year to year on different fields
Long interval between cuttings results in a higher level of carbohydrate root reserves. Provide energy for survival through winter, growth in spring and after cutting. Plant draws on carbohydrates from roots until new leaves can satisfy needs of growing plant. Occurs when alfalfa attains height of 8-10 inches.