### Mowing & Drying

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#### Topics to be covered

- Mower setting effect on forage species mix
- Importance of rapid drying for first 15% water loss
- Conditioner settings
- Value of wide swath on drying

### Mowing



#### No difference in stand life due to mower type

Effect of mower type on alfalfa stand and yield						
	Sickle bar	Disc mower				
Yield, t/a last cut	1.47	1.49				
Stand, plt/ft <sup>2</sup>	6.2	6.2				

#### Cutting height 3" for alfalfa and 3.5 to 4" for grass

### Cutting height effect on stand



### Cutting height effect on stand



Timothy stores energy for regrowth in corms at base of stem



Alfalfa regrowth begins to occur at early flowering

### **Operation of Disc Mowers**

- Improved cut in low-yielding forage by lowering RPM at same ground speed
- Replacing conventional knives with 'high lift' knives helped cut low-yield fields

### **Disadvantages of Disc Mowers**

- Cost 25 to 50% more than sickle bar mower
- Require almost twice the power per unit of cutting width
- Makes a poor rock crusher
- May get more dirt and foreign material in hay, e.g., with gopher mounds

### Conditioner types

#### Flail/impellers



#### **Intermeshing Rolls**



### **Operation of Disc Mowers**

- Lower repair costs
  - \$250 for disc mower vs \$800 for sickle mower
- Repairs quicker less down time
- Operators could cut almost twice as fast
- Could cut at least two hours earlier when dew
- Could cut grass and sudangrass better than sickle mower

#### **Disc Mower Summary**

- No effect of mower type on alfalfa yield or stand
- Lower repair costs for disc mower
- Wider range of operating conditions
- Greater cost

# Monitor and adjust conditioner roller spacing



### Factors Reducing Forage Quality

#### Ash content



- Ash provides minerals to the diet, but no calories (i.e. energy).
- Takes the place of nutrients on almost a 1:1 basis.
- Ash content above that contained in plant is dirt contamination

TDN= tdNFC + tdCrude Protein + tdFA\*2.25 + tdNDF - 7NFC = 0.98 \* (100 - [(NDF-NDICP) + CP + EE + Ash])

### Ash Content of Forage Samples

- Average internal ash content of alfalfa is 6 to 8%
- Average internal ash content of grass is 5 to 6%
- Remainder of ash is dirt!

Ash Content of Forage Samples, UW Marshfield Lab				
Туре	Statistic	% Ash		
Haylage	Avg	12.3		
	Max	18.0		
	Min	5.7		
Нау	Average	10.3		
	Max	17.6		
	Min	8.8		

#### Factors Reducing Forage Quality

#### Ash content



### Possible Causes of Higher Levels of Ash in Forages



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#### Possible Causes of Higher Levels of Ash in Forages



Mower knife type Those knives that "pick up hay" better, also pick up more ash

#### Possible Causes of Higher Levels of Ash in Forages

- Disc mower knives angled
- Forage cut too close to ground
- Windrow lays on ground
- Raking to scrape ground
- Merging swaths/windrows will minimize ash content while improving harvest efficiency

### Factors Affecting Drying Rates

#### Environment

- Weather
  - Temperature
  - Relative humidity
  - Solar radiation
  - Wind speed
  - Rain
- Soil moisture content

### Factors affecting forage drying

Environmental or crop variable	Units	Range		Maximum field curing hours difference between
		Min	Max	min and max value)
Solar Radiation	MJ/m²/hr	0.36	3.43	48
Vapor pressure deficit	kPa	0.00	4.48	3.9
Air Temperature	°C	10.00	38.00	3.2
Swath Density	kg DM/m <sup>3</sup>	2.35	23.50	7.8
Soil Moisture Content	% dry basis	10.00	25.00	3.2
First day of curing				2.3

### Solar insolation (Radiation)

- Solar insolation is solar energy received on a surface in a given time.
- Some solar radiation will be absorbed, the remainder will be reflected.
- > Absorbed solar radiation is converted to increased temperature.
- > Amount of solar energy received is controlled by
  - > the angle of the sun,
  - > the state of the atmosphere,
  - Altitude,
  - geographic location.



### Factors Affecting Drying Rates

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#### Management & Equipment

- > Use of weather forecast
- > Time of mowing
- Width of swath
- Raking
- > windrow structure
- > Windrow inversion

#### Wide swath benefits

## Faster dryingHigher forage quality



Respiration continues after cutting until plants dries below 60% water

#### **Breakdown of starch and sugars**



#### 2-8% of Dry Matter loss

#### Boundary Layer effect



#### Need Vapor Pressure Deficit and/or Wind to reduce

#### Relative humidity inside windrow



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### Leaf Structure

Legumes have 10 times more stomata than grasses





#### Wide swath benefits

Faster dryingHigher forage quality



Narrow windrow

### Need to dry off first 15% moisture as quickly as possible



Wide Swath

Mowing without conditioning for Haylage

- Less expensive
- Less energy to operate
- Faster mowing

#### RESULTS

- Alfalfa hay moisture was unaffected by conditioner type in first cutting.
- The "super conditioner" reduced hay moisture significantly over the standard conditioner in third cutting.
- The 60-in wide swath allowed hay to dry faster than the 48-in wide swath during first cutting.
  - Yield = 4 tons/acre
- But swath width was not significant in third

cutting.

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#### Wide Swath

![](_page_30_Picture_1.jpeg)

![](_page_30_Picture_2.jpeg)

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### Summary

#### Lose first 15% water as quickly as possible

- Begin with wide swath (>70% of cut area).
- Conditioning necessary for hay not haylage.
- Condition alfalfa & alfalfa/grass mixtures with roller conditioner.
- Rake/merge with minimal ground contact to reduce dirt in forage.
- Additional tedding often necessary for grasses

### Mowing/conditioning summary

#### Lose first 15% water as quickly as possible

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- Condition alfalfa & alfalfa/grass mixtures with roller conditioner.

![](_page_32_Picture_5.jpeg)

![](_page_32_Picture_6.jpeg)

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