



What's New in Forage Machinery hay

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Harvesting Forage

- Wide swath
- Conditioning
- Reconditioning
- Tedding, Raking, Merging
- Baling

Wide swath benefits

- Faster drying
- Higher forage quality



Respiration continues after cutting until plants dries below

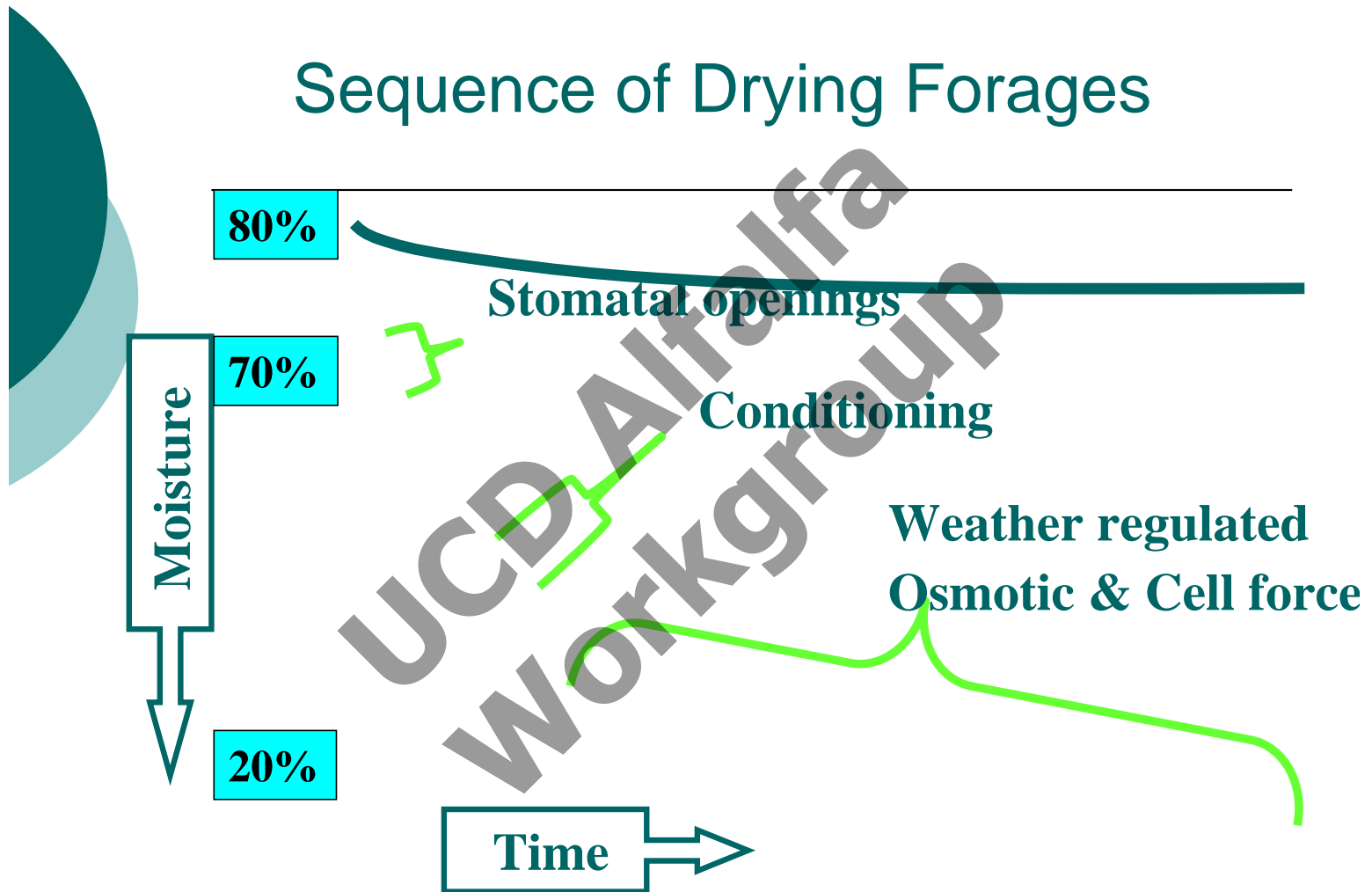
60% water

Breakdown of starch and sugars



2 – 8% of Dry Matter loss

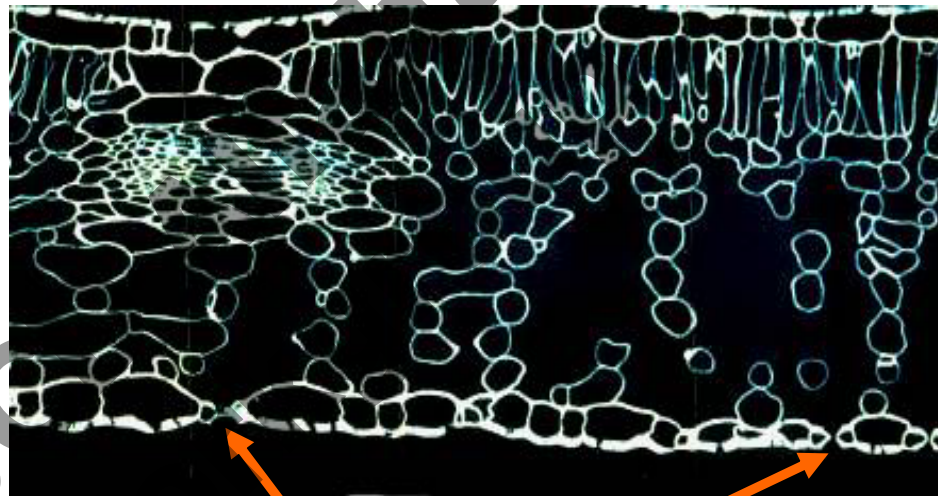
Sequence of Drying Forages



Leaf Structure

Legumes have 10 times more stomata than grasses

Upper and lower **epidermis** is heavily coated with waxy cutin, conserves water and protects



Stomatal openings



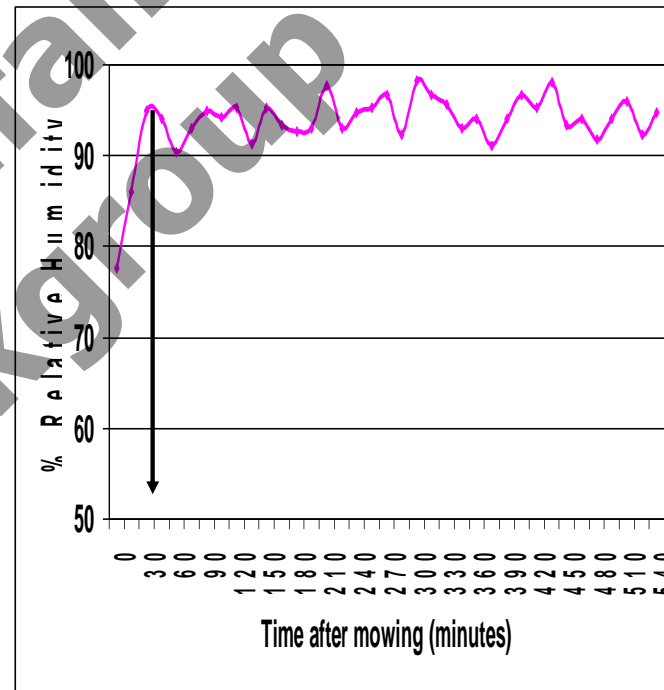
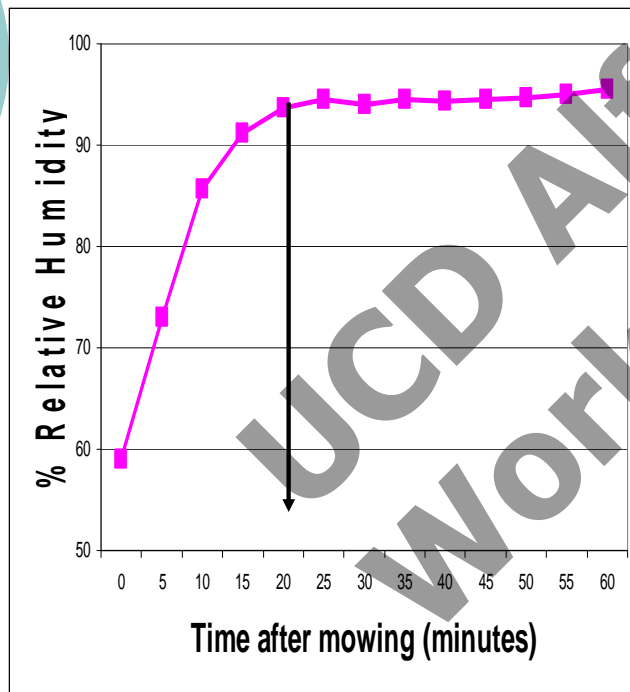
Keeping Stomata Open

- Sunlight – necessary to keep stomata open
- Shading closes Stomata
- 20 – 30% of water removed before stomata close

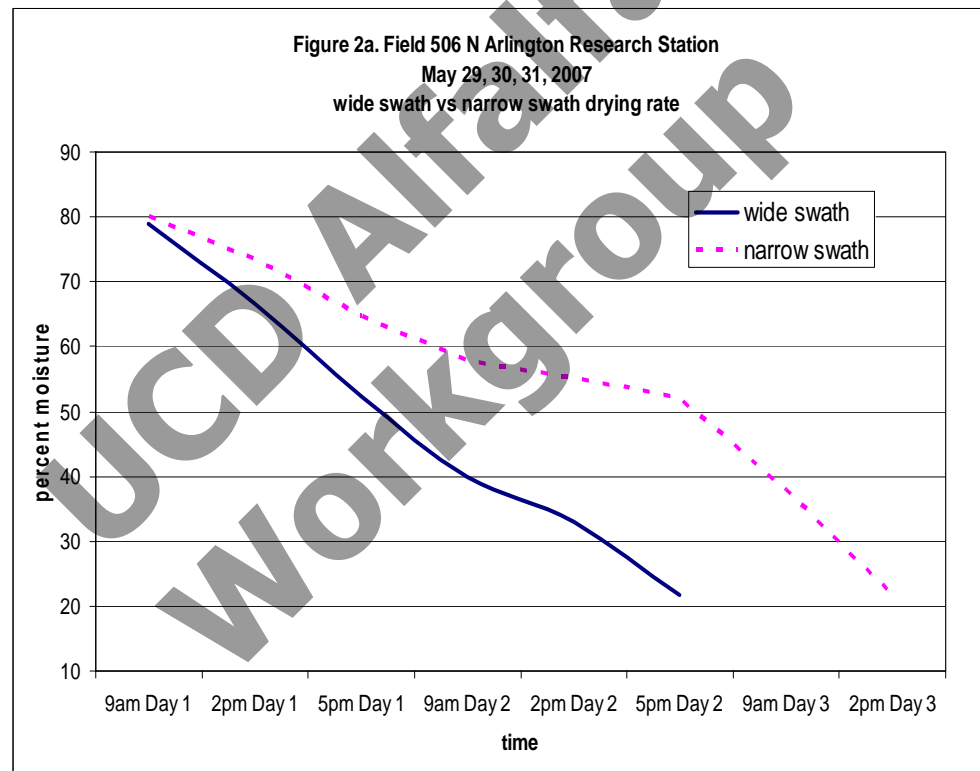
Put hay into wide swath
Keep off of ground



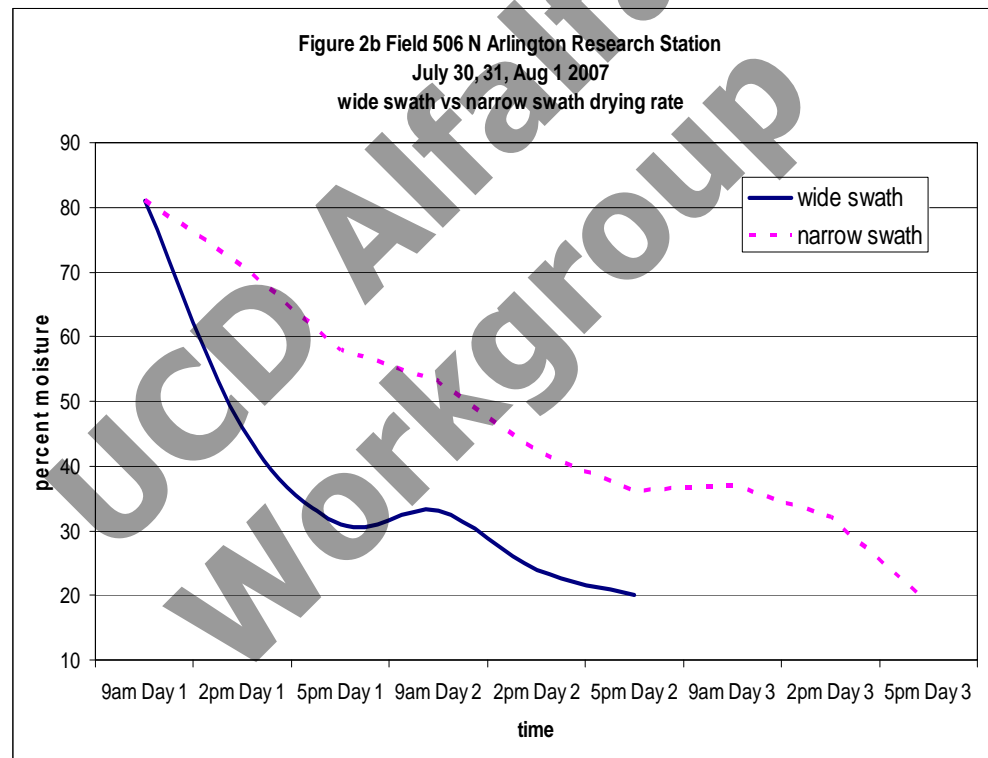
Relative humidity inside windrow



Effect of wide swath on drying rate



Effect of wide swath on drying rate

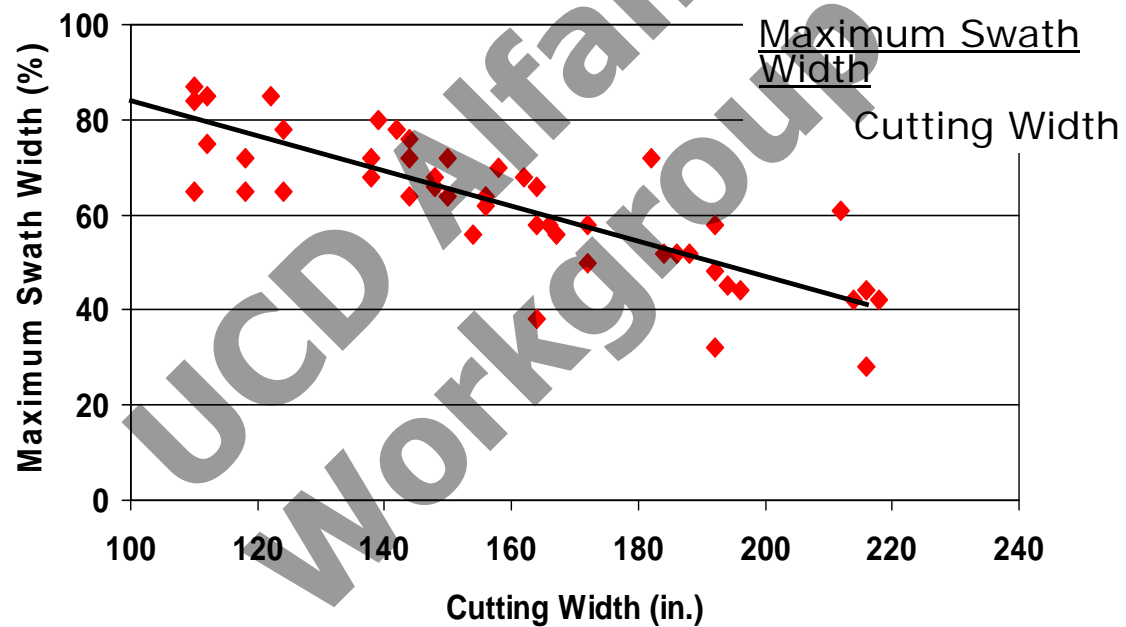


Effect of wide swath on alfalfa composition at harvest

Difference (wide minus narrow) in composition at harvest				
Component	Average Difference	Number of trials	Minimum difference	Maximum difference
CP	0.15	14	-1.16	1.75
NDF	-0.9	14	-4.3	4.0
NFC	0.49	14	-4.03	3.07
Ash	0.47	14	-0.8	3

Note: beneficial differences observed in 10 of 14 trials

Maximum swath width versus cutting width



Mowing without conditioning for Silage


- Less expensive
- Less energy to operate
- Faster mowing



Why should ash content be a concern?



- ❖ 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



What about research looking directly at the effect of % ash in the forage in milk production?

“While there have been few dairy research trials in this area, it is highly likely that cows do not milk well when fed dirt.”

*Pat Hoffman, Dairy Scientist,
Marshfield ARS, 2002*

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



Disk
Cutterbar
Cutting
height



Possible Causes of Higher Levels of Ash in Forages

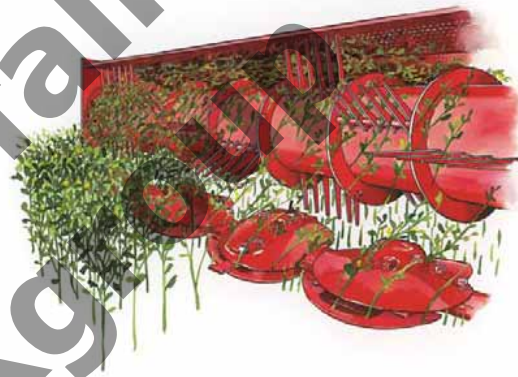
- Disc mower knives angled
- Forage cut too close to ground
- Windrow falls on ground
- Raking

Conditioning to break stems

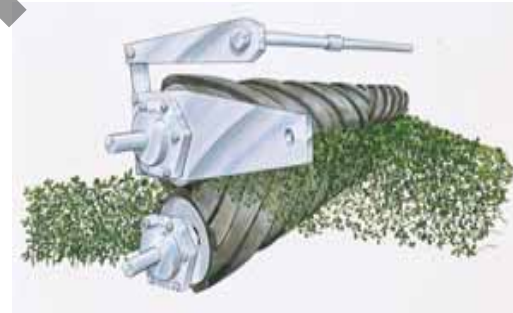


Conditioner types

Flail/impellers



Rubber Rolls



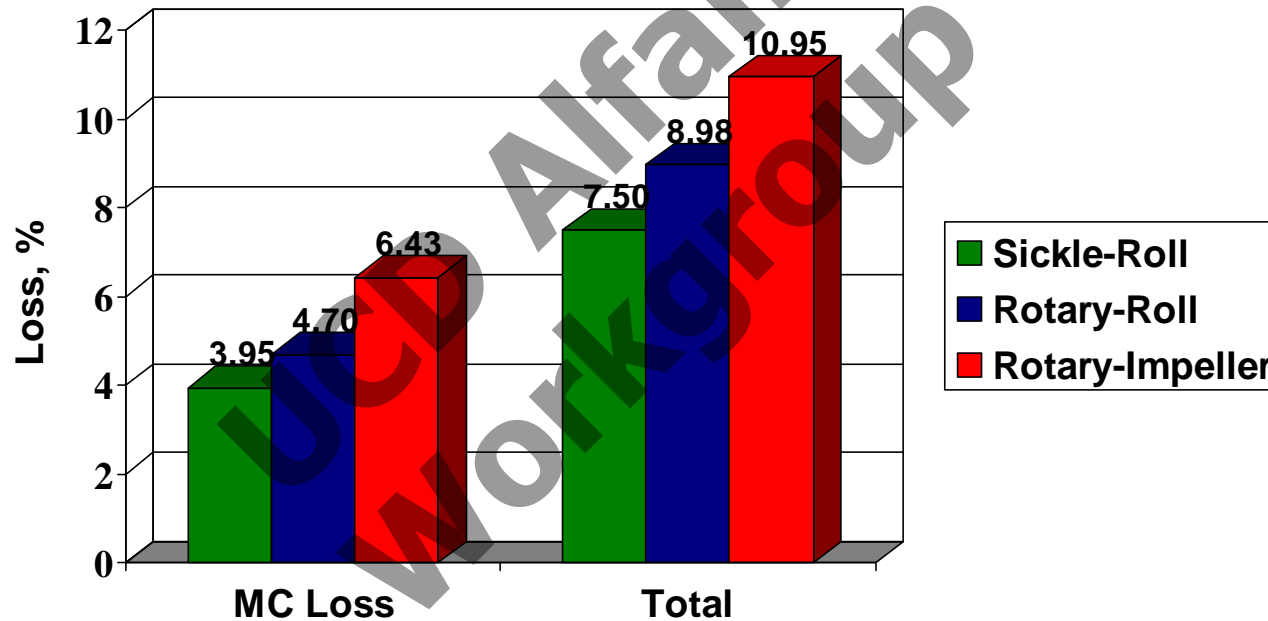


Roll and Impeller Comparison

- Roll creates a crushing action
- Impeller creates a stripping action
- Impeller tends to have higher leaf losses

Comparison of Losses(%)

Wisconsin Study





Mowing and conditioning

- Mow without conditioning for silage with wide swath
- Mow with conditioning for hay or silage in windrow
 - Buy with conditioner to make swath at least 70% of cut area.
 - Use flail conditioner for grasses.
 - Use roller conditioner for alfalfa.

Superconditioner

completely crushes alfalfa stems
without stripping off leaves.



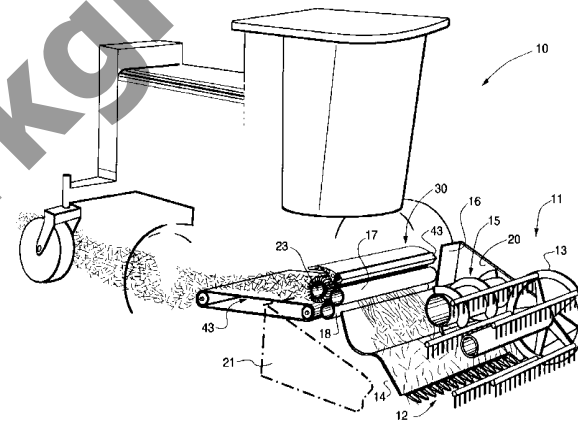
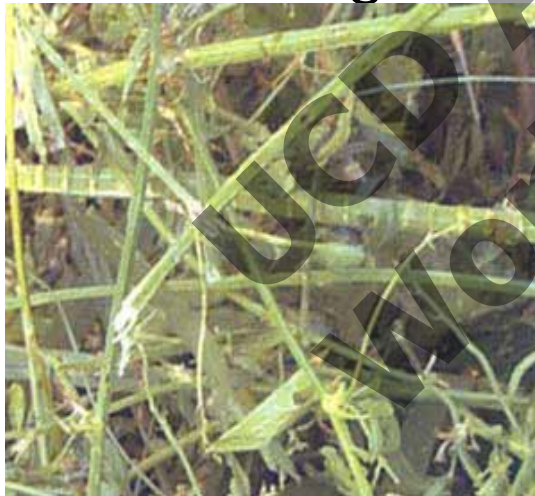
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Macerator

- A first rotating crushing roller coupled with a second rotatable crushing roller

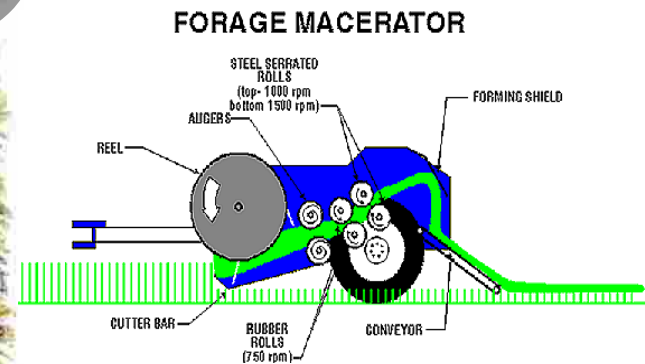


Macerator

1. Feed cut forage into the rubber rolls
2. Then into a set of steel, serrated rolls which macerate.
3. Aggressiveness of the maceration is determined by the air pressure settings on the



Extension
Learning for life



Dan Undersander-Agronomy © 2008



Raking, tedding, merging

UCD Alfalfa
Workgroup

Tedders

- To spread swath or windrow for



Tedder - fluffer



Inverter

- Inverts or turn windrows over



Wheel Rakes



Ash Content of Forage Samples

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



Wheel Rake

- Least Expensive
- High ash potential
 - Adjust wheel float to minimum needed to pick up hay.

Parallel Bar Rake

- Powered
- High maintenance
- Rigid across uneven ground



Rotary Rakes

- Powered
- High maintenance
- Can ted/rake/merge windrows
- Most expensive

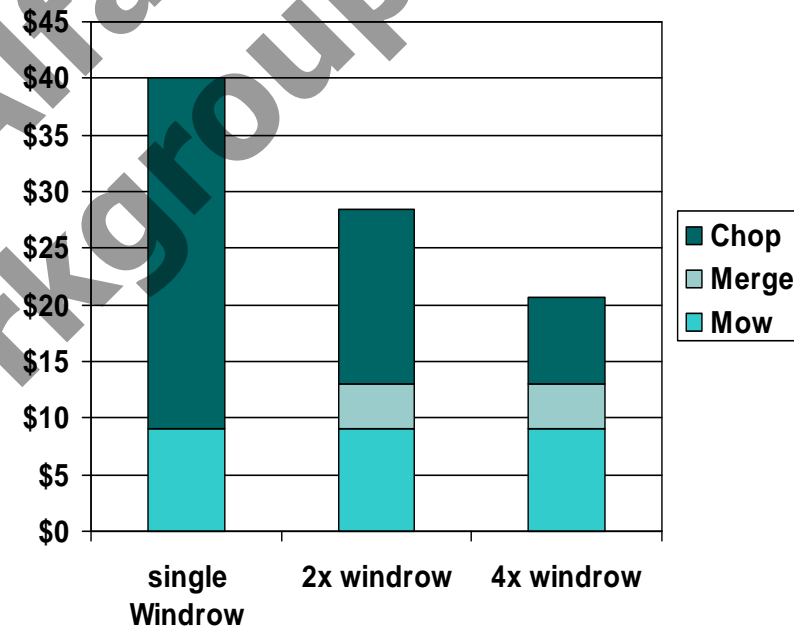


Windrow Merger

- Picks up hay to move across ground
- Expensive



Economics of Merging



Baling

- Cutting forage for hay/haylage - bales that break apart easily for feeding

- Higher initial cost
- Higher energy requirements
- Stones

✓ Better feed intake

✓ Better animal gain

✓ Less feeding loss



Electronic Monitoring Systems

○ The electronic control system

- Automatically maintains bale density by adjusting hydraulic pressure on the top and sides of the bale as crop and moisture conditions change.
- Registers the movement of each individual twine to provide you with earliest possible warning of a mistie.



Hay Preservative Application System

- Senses moisture on-the-go
- Adjusts the application of preservative every three seconds to match the condition of the hay.
- Adjusts for dew and hay drying

Harvest Tec



Hay Preservative Application System



Automatic systems for round balers are equipped with two sensing discs, one mounted on each of the baler's side walls, sensing from side to side.



HayBoss™ systems for large square balers are equipped with star wheel sensors that run through the bale picking up moisture and speed of baling.

Dew Simulator

- Used in arid regions where need softening effect of dew
- Lengthen baling time
- Water delivered by tines on a cam
 - When tine in hay water sprayed at 2500psi



Harvest Tec

Constant bale flake size

- Crop is compressed in a crescent-shaped feeding chamber.
 - When the flake of material reaches the density level that you set, sensor paddles are tripped and the stuffer forks deliver the flake into the bale chamber.
 - Each hay charge is the same size, density and weight, creating uniform bales with an equal mass.

Case IH



Tight round bale centers

- Hay entering the forming chamber from the pickup, immediately formed to a tight, dense core.
- Incoming hay then feeds between the bale and the lower-gate roll and is tightly compressed into smooth, dense layers as it enters the bale.
- Full-size bale in bale chamber. Idler arm rises with bale growth, forcing oil from the hydraulic cylinder through a pressure-relief valve.





Summary

- Begin with wide swath
- Conditioning necessary for hay not haylage
- Reconditioning only for grass
- Tedding for grasses
- Raking, merging for grasses and legume
- New technology improves baling

Bigger Equipment



Up to 31 ft 9.9 in



Up to 30 feet



32 feet



1020 hp max. output