# Fodder Conservation Methods

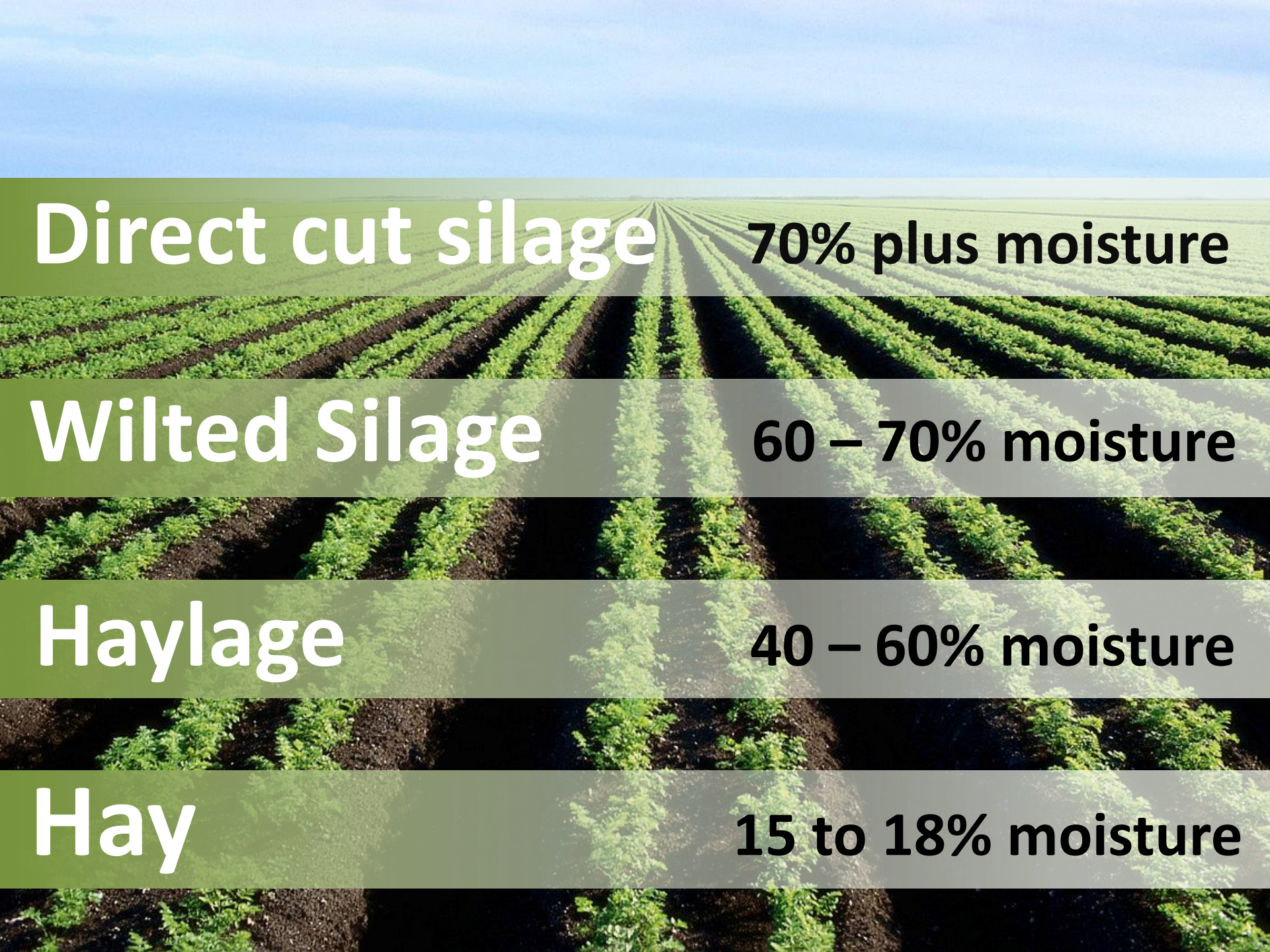
# Introduction

**Dairy industry in India is undergoing a phase of metamorphosis.**

- ***Back yard farming is rapidly vanishing and commercial dairies are replacing them***
- ***Nutrition based farming replacing medicine centric management***
- ***Labour shortage & cost is giving ways to farm mechanization.***
- ***Cost optimization is thought out at every stage of dairy farming***

# Why conserve?

- Natural feed for ruminants
- Essential for rumen function
- Cheap sources of nutrients
- Lowers production cost
- New technologies
- Empower farmers to provide quality roughage throughout the year


Direct cut silage
70% plus moisture
Wilted Silage
60 – 70% moisture
Haylage
40 – 60% moisture
Hay
15 to 18% moisture

# Silage

# Silage

- In the dry tropics having longer dry season, feed shortage in dry season is quite serious, & becomes a major & common constraint in cattle production.
- Hay making is not always a good solution; and Silage is a feasible alternative

# Silage

- Silage-making is practiced to store & preserve green fodder, when it is available in excess, for later use during scarcity period.
- Less dependent on specific weather conditions and can be extended to a great variety of forage.

# Silage - *Principle*

- **After forage crop is cut, loss of nutritional substance starts due to activities of enzymes.**
- **Main objective is to stop enzymatic reactions & minimize loss of energy, protein and other nutrients.**

**Anaerobic condition is foremost requirement**

# Silage - *Principle*

- **Allows lactic acid bacteria to grow, which converts sugars into lactic acid, a strong organic acid.**
- **As pH declines, the enzymatic action is slowed.**
- **At pH 3-4, most degrading enzymes are inhibited and the growth of lactic acid bacteria is also inhibited.**

# Silage – *Crop selection*

- **Chemical composition of a forage crop or agro-industrial by-product is important.**
- **Select crops with,**
  - ***High fermentable sugar;***
  - ***Low level of protein;***
  - ***Low buffering capacity***

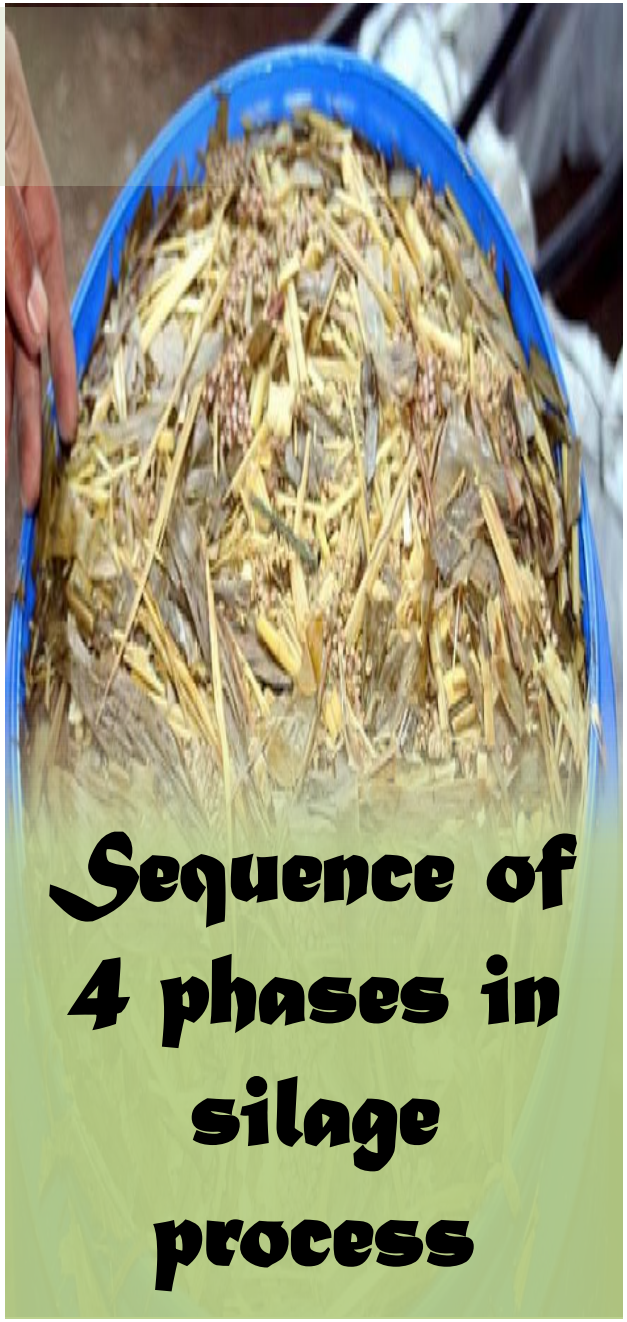
# Silage – *4 phases*

**Phase 1: Respiration**

*Degrades plant nutrients in presence of oxygen (1 to 2 days);*

**Phase 2: Early fermentation**

*Acetic, formic & other organic acids produced due to growth of facultative aerobic bacteria in the presence or absence of oxygen (1 to 2 days);*



Sequence of 4 phases in silage process

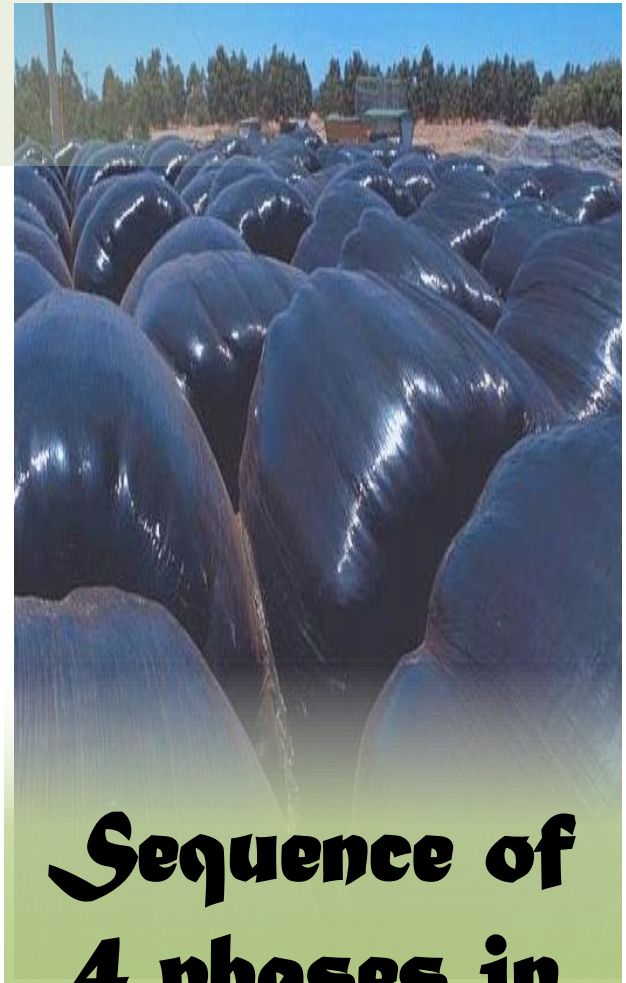
# Silage – *4 phases*

**Phase 3: Lactic acid fermentation**

*Bacteria that are strictly anaerobic, multiply rapidly in the absence of oxygen (14 days).*

**Phase 4: Stabilization phase**

*Further degradation is inhibited, as bacterial and fungal growths are checked.*



Sequence of 4 phases in silage process

# Silage – *Process*

1. Harvesting of fodder.
2. Moisture Testing- 65-70 % moisture level is ideal.
3. Chop forage (1-3 cm)
4. Spread chopped fodder to make a bed of 2 feet height in Silo-Pit
5. Compact forage as tightly as possible with tractor or hand roller or any heavy object

Sequence of 4 phases in silage process

# Silage – *Process*

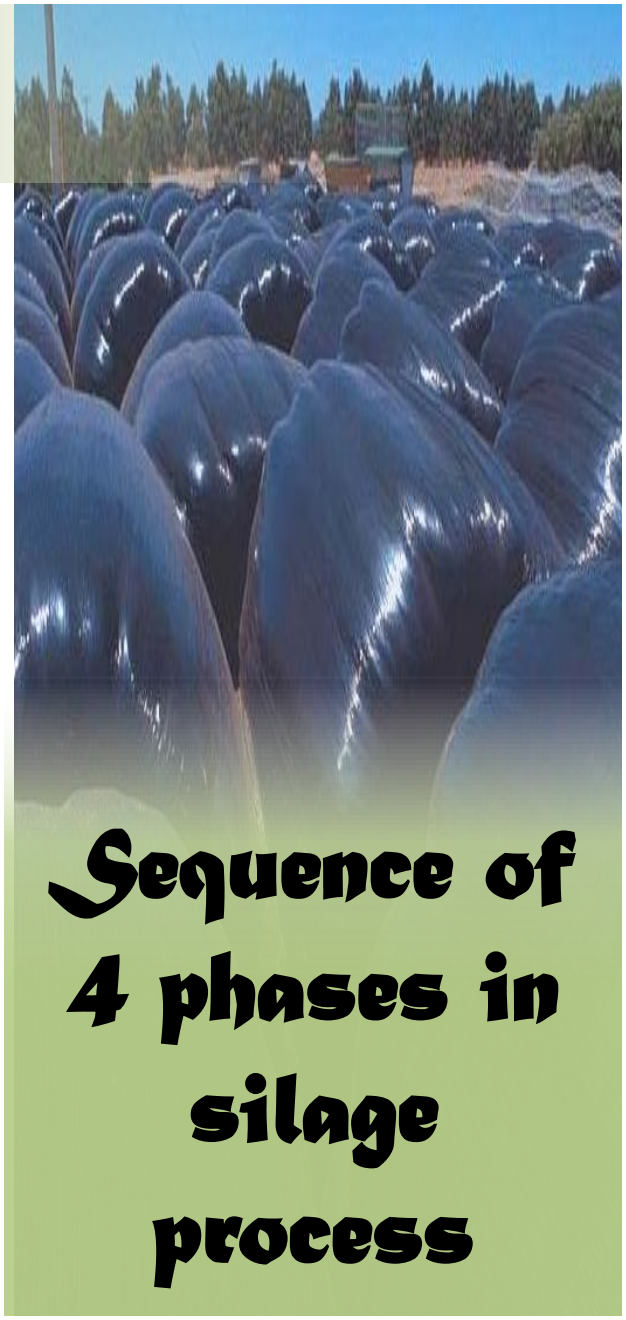
6. Sprinkle Molasses over it.
7. Repeat till the Silo-Pit is completely filled up.
8. Seal the pit airtight & press with heavy objects like bricks or tire.
9. Maintain sealing for 45 days
10. Once silo-pit is open, should be finished within 45-60 days

Sequence of 4 phases in silage process

# Silage – *Judging quality*

**Quality of silage is judged by,**

- ***Colour (pale yellow)***
- ***Smell (sweet & sour flavour)***
- ***Taste (sour)***
- ***Touch (When squeezed in hand & released breaks into two)***



Sequence of 4 phases in silage process

| Category | Grade | Colour | Smell | On touching with hands | Flieg Score | pH | Feeding |
|---|---|---|---|---|---|---|---|
| Safe | A | Pale yellow, olive | Pleasant light sweet odour | Washing hands is not needed | 80 or higher | 3.6 to 3.8 | Can be fed in large quantities |
| | B | Brownish yellow | Sweet & sour smell | Wash hands with cold water | 60 or higher | 3.9 to 4.2 | Careful when feeding cows in milk |
| Danger | C | Dark Brown | Strong pungent smell | Wash hands with hot water | 40 or higher | 4.3 to 4.5 | Feed only to heifers |
| | D | Dark Brown & green | Ammonia & putrid smell | Wash hands with hot water & soap | 39 or below | 4.6 or more | Feed Heifers with caution |

# Types of silo

1. Silo pit
2. Silo tower
3. Silo trench
4. Bunker silo
5. Silage bag

# Silage - *Chaffing*

# Silage – *In discarded plastic bins*

# Silage – *In poly bags*

# Silage – *In poly bags*

# Silage – *Important points*

Pressure

Proper moisture content

High sugar content

Proper Sealing

Chaffing

# Hay

# Hay

- **Hay - primary method of forage preservation.**
- **Hay making combines science and art.**
- **The goal of haymaking is to capture the nutrients in grass in a storable form to make them available as a forage feed later.**

# Hay - *Timing*

- **Time haymaking to coincide with the right stage of plant growth and weather conditions.**
- **Nutrient value is high early in the season, when plants put most of their energy into vegetative growth & has high concentrations of starches, proteins & minerals.**
- **As plant matures lignin content is high and nutrients are trapped in indigestible cell walls.**

# Hay - *Mowing*

# Hay - *Mowing*

- First step in haymaking is mowing the hay.
- Maturity of the grass is the determining factor & grass should be in the early vegetative stage.
- Time your mowing around the most reliable weather forecast you can find.
- It basically takes about three days of good weather to cure hay.

# Hay - *Tedding*

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- **As hay starts drying it needs to be cured.**
- **Tedding, the next step, fluffs up the cut hay and allows the air and sun to contact the under-surfaces to promote drying.**
- **Hay mowed in the morning can be tedded in the noon.**
- **Too much tedding damages leaves.**

*Moving in the evening enhances energy levels*

# Hay - *Raking*

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- **Once dry, hay is ready to rake.**
- **Raking turns the hay one more time to dry the bottom and forms it into a windrow ready to be baled.**
- **As a rule of thumb, wait to rake hay until after the dew has dried and the sun nears its peak, or around 11:00 am**

*Moving in the evening enhances energy levels*

# Hay - *Baling*

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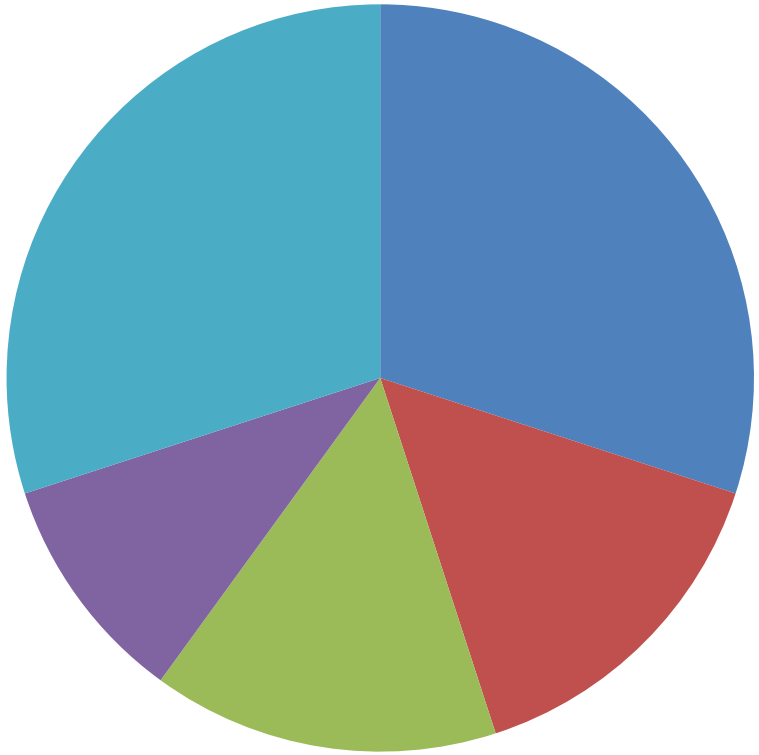
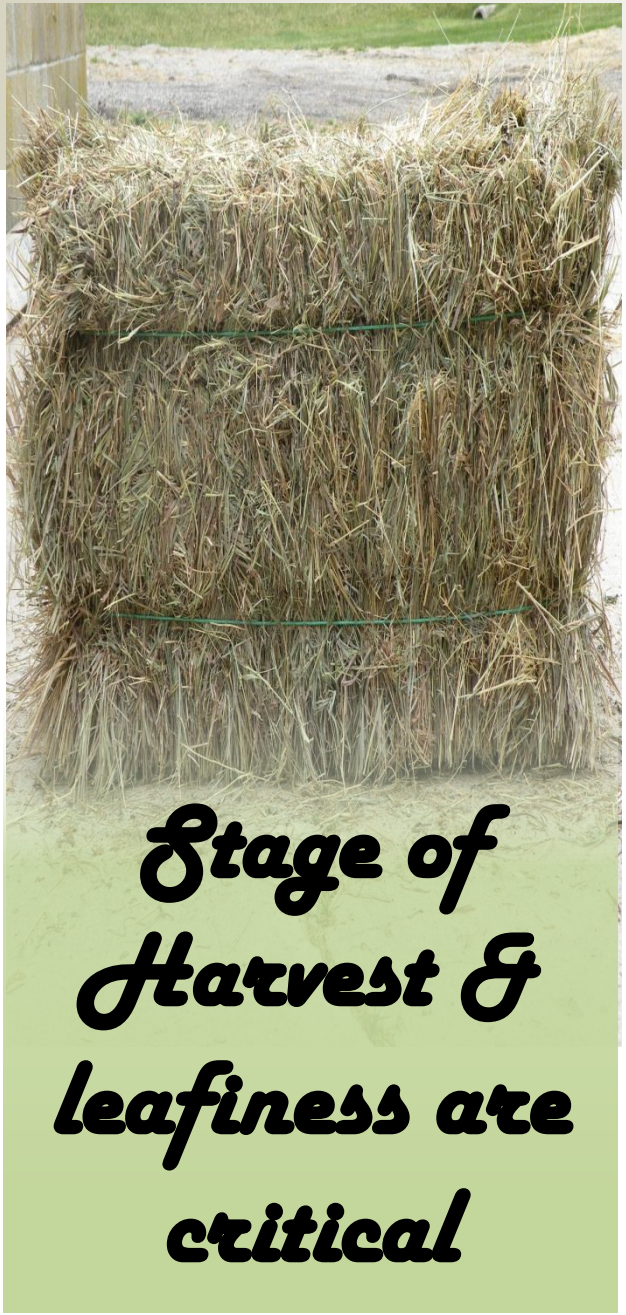
- **Baling hay too early will trap moisture in the bale and result in spoilage.**
- **Baling too dry will cause leaves to shatter and break, lowering hay quality.**
- **Improperly cured hay (hay above 22 percent moisture) can also heat in the barn and cause a fire by spontaneous combustion.**

***Science and art converge while baling hay***

# Hay – *Quality*


Leafiness
Color
Odor
Softness
Harvest Stage


Stage of Harvest & leafiness are critical

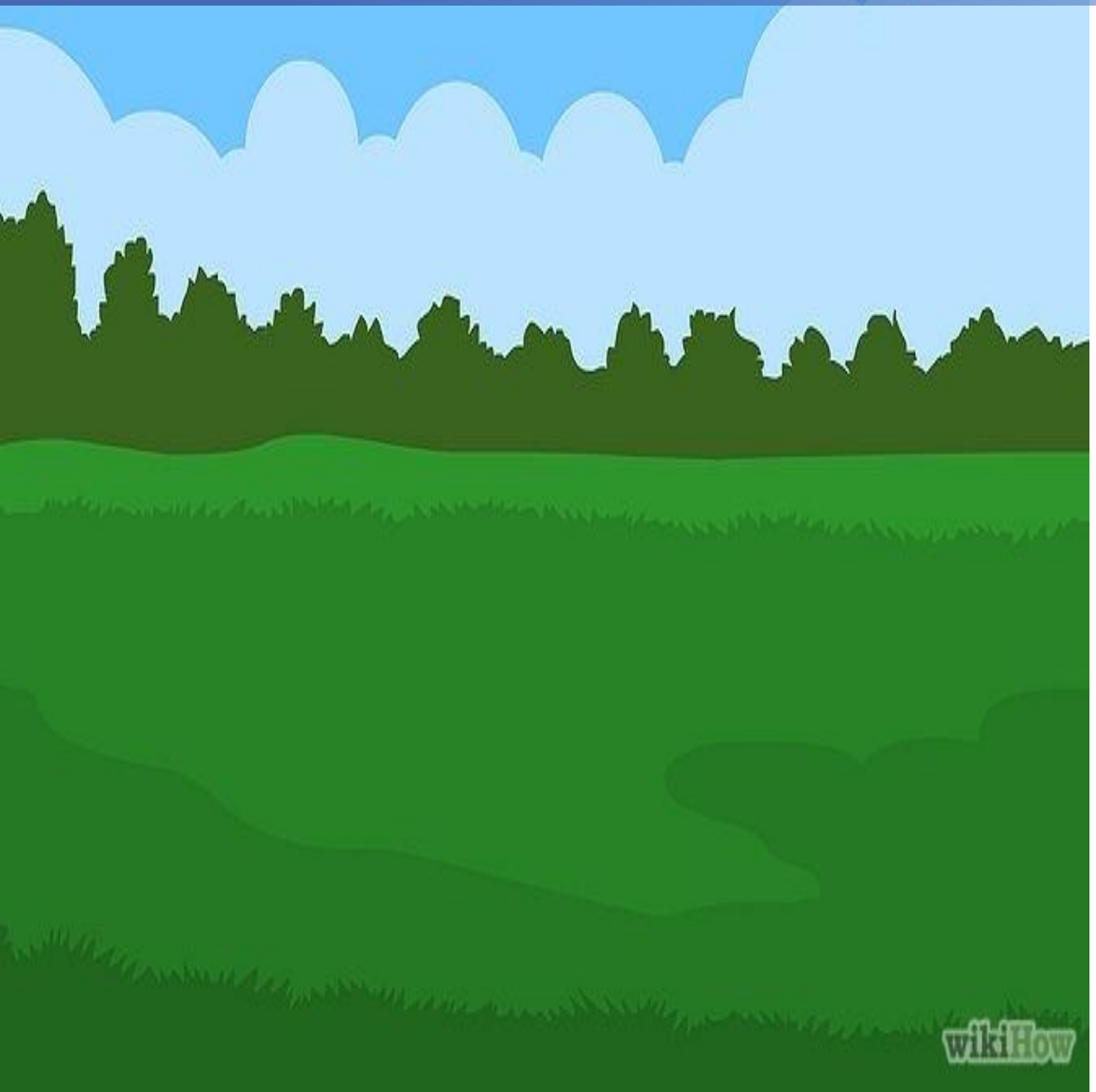
# Haylage

# Haylage

- Haylage is a grass crop, cut, harvested, and stored for feeding farm animals.
- Made from the same crops as hay, but with a higher moisture content.
- With the proper equipment and storage techniques, this method significantly increases the food value and decreases losses for the crop.

*Science and art converge while baling hay*

# Haylage – *Step I*




**Cultivate crops suitable for Haylage. Common crops are alfalfa, clover, and Bermuda grasses, but other grasses and legumes are suitable for this storage technique.**

# Haylage – *Step 2*

**Use a hay mower, sickle-bar mower, or rotary cutter to cut the crop. It is done just as the crop begins to bloom out or flower for the maximum food value and yield.**

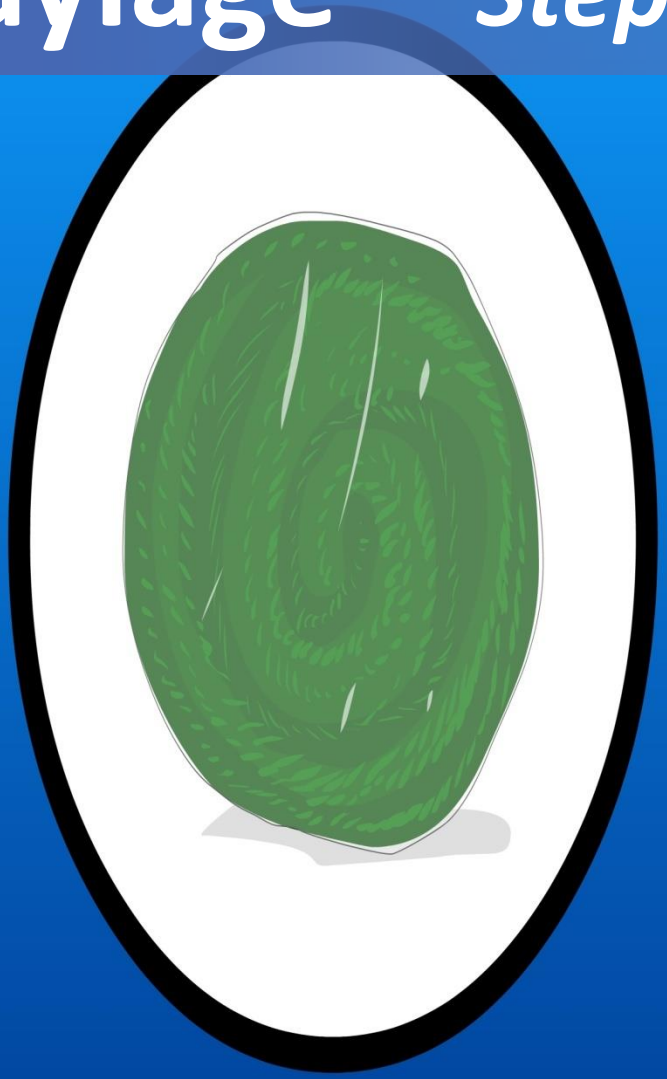
# Haylage – *Step 3*

**Allow the crop to lay until it has dried to about 30 to 50% moisture. The drying time will vary on the climate, the type of forage, and the depth when it is laid down, or cut.**

# Haylage – *Step 4*

**Bale and tie off when it has reached uniform size, and wrap with plastic shrink wrap.**

# Haylage – *Step 5*

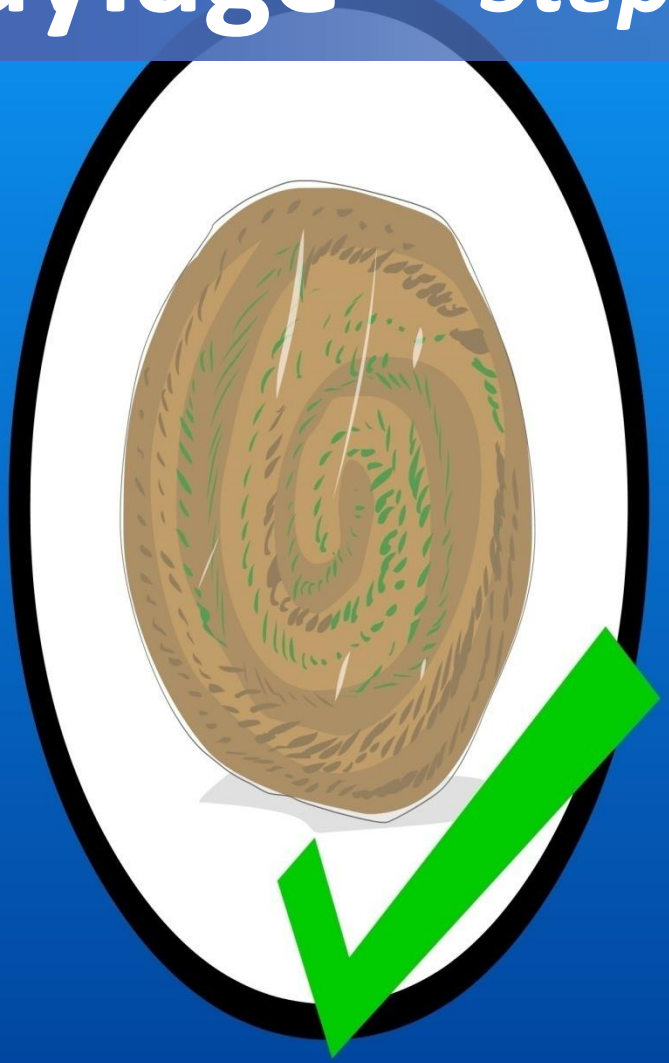


**Wrap your bale with commercial shrink wrap until at least 3 or 4 tight wraps encircle it. Wrap end to end the same number of wraps, so completely seal the bale.**

# Haylage – *Step 6*

**Store the bale in such a way the wrapper will not be punctured. Holes in the wrapper will allow additional air into the bale, causing it to mold or rot.**

# Haylage – *Step 7*

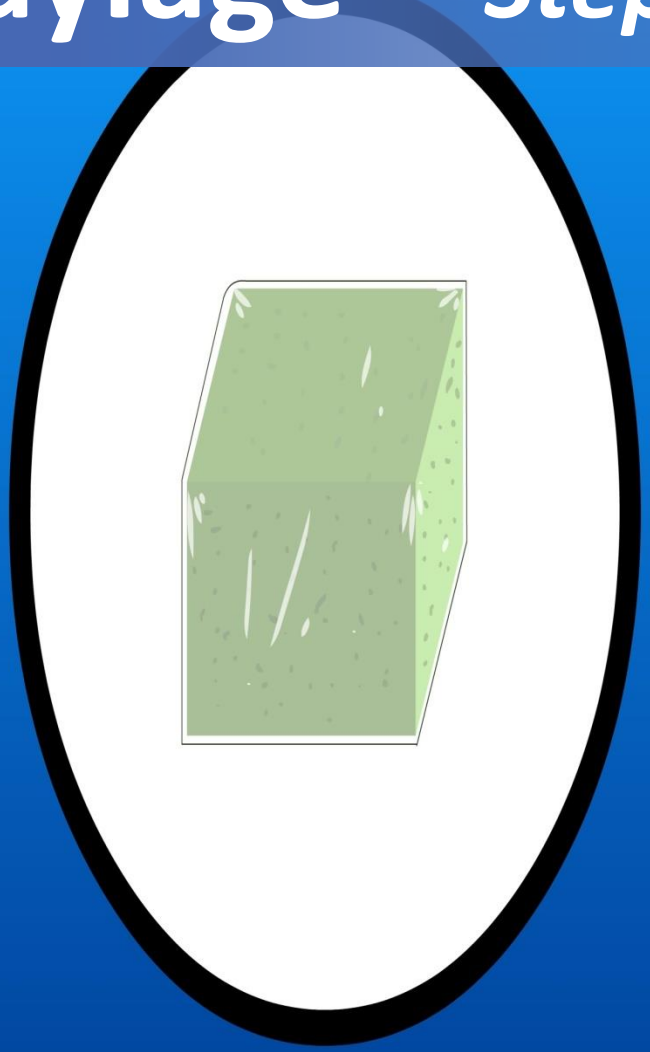


**A sour, fermented odour is expected, but brown discoloration, obvious mold, or other signs of decay will mean the Haylage may no longer be suitable.**

# Haylage – *Step 8*


**Bale your Haylage into square or round bales. Bales weigh as much as 1500 pounds, hydraulic lifts are needed to move them, and do not puncture the bales.**

# Haylage – *Step 9*



**Handle bales carefully as the moisture content is higher than typical hay bales, they will be much heavier. These can be wrapped in heavy duty airtight plastic bags.**

# Haylage - *benefits*

- **Decreased curing time makes weather less of a factor**
- **Potential for more timely harvest of large quantities of forage**
- **Reduces the loss of leaves.**
- **Potential for higher feed quality bale through leaf preservation and possible nitrate reduction.**

***Science and art converge while baling hay***

# Haylage

# Thank you