Preservation of Green fodder

INTRODUCTION:

Fodder:-

Fodder is the coarse feeds , cut and feed to the animals.

CONTINUE.....

HAY:- Moisture (10-15%)

Dry matter(70-80%)

SILAGE:- Moisture (60-65%)

Dry matter (30-35%)

* Steps of formation of HAY and SILAGE.
*Types of HAY and SILAGE.
*Storage of HAY and SILAGE.
*Losses during HAY and SILAGE making.
*Advantage of HAY and SILAGE.
*Disadvantages of HAY and SILAGE.

What is Conservation of fodder

- Conservation of fodder means preservation and careful maintenance of certain quantities fodder unchanged during chemical reactions or physical transformations of fodder when it is excessively available for future needs.

WHY WE CONSERVE FODDER

- To preserve feed when it is available in excess.
- To maintain optimum nutritional value of fodder.
- To shift available feed from the present to the future.
- To move feed from one location to another location.
- To assist pasture management.

Methods of Conservation

- Hay and silage are the main methods of conserving forage
- Hay is preserved by **drying** and will generally keep while it is kept dry.
- Silage involves **natural fermentation**, which produces lactic and other acids, which 'pickle' or preserve the forage.

HAY

- The forages like grasses and legumes that have been cut ,and then dried under sunlight.
- It is used when there is shortage of forages.
- Hay making is preferred mode of conserving the food of all green forages.

TYPES OF HAY:-

(1) Legume Hay:-

*Cowpea

* Gwar

*Berseem

*Leucern

(2) Non-legume Hay:-

*Jwar

*Bajara

*Maize

* Oat

CONTINUE.....

(3) Mixed Hay:-

*Oat+Legume

* Legume species is more preffered as compare to non legume species and mixed type

PRINCIPLE OF HAY MAKING

- Fast drying maximizes green color and palatability.
- The rapid drying is more suitable for hay making as it minimize the microbial growth.
- The basic principle is to reduce moisture content in order to inhibit the action of microbial enzymes.
- In order to store green crops in a stack the moisture content should be reduced to 15-20%.

SUITABLE CROPS FOR HAY MAKING

- In case of leguminous fodder
  lucerne and **berseem**

- In case of grasses
  like sudan grasses and sadabahar.

METHODS OF HAY MAKING

There are two methods of hay making.

- Traditional method
- New mechanised technique
- It consist of following steps
- Mowing
- Tedding
- Raking
- Baling

MOWING OF HAY

TEDDING OF HAY

HAY BALE

DRYING :-

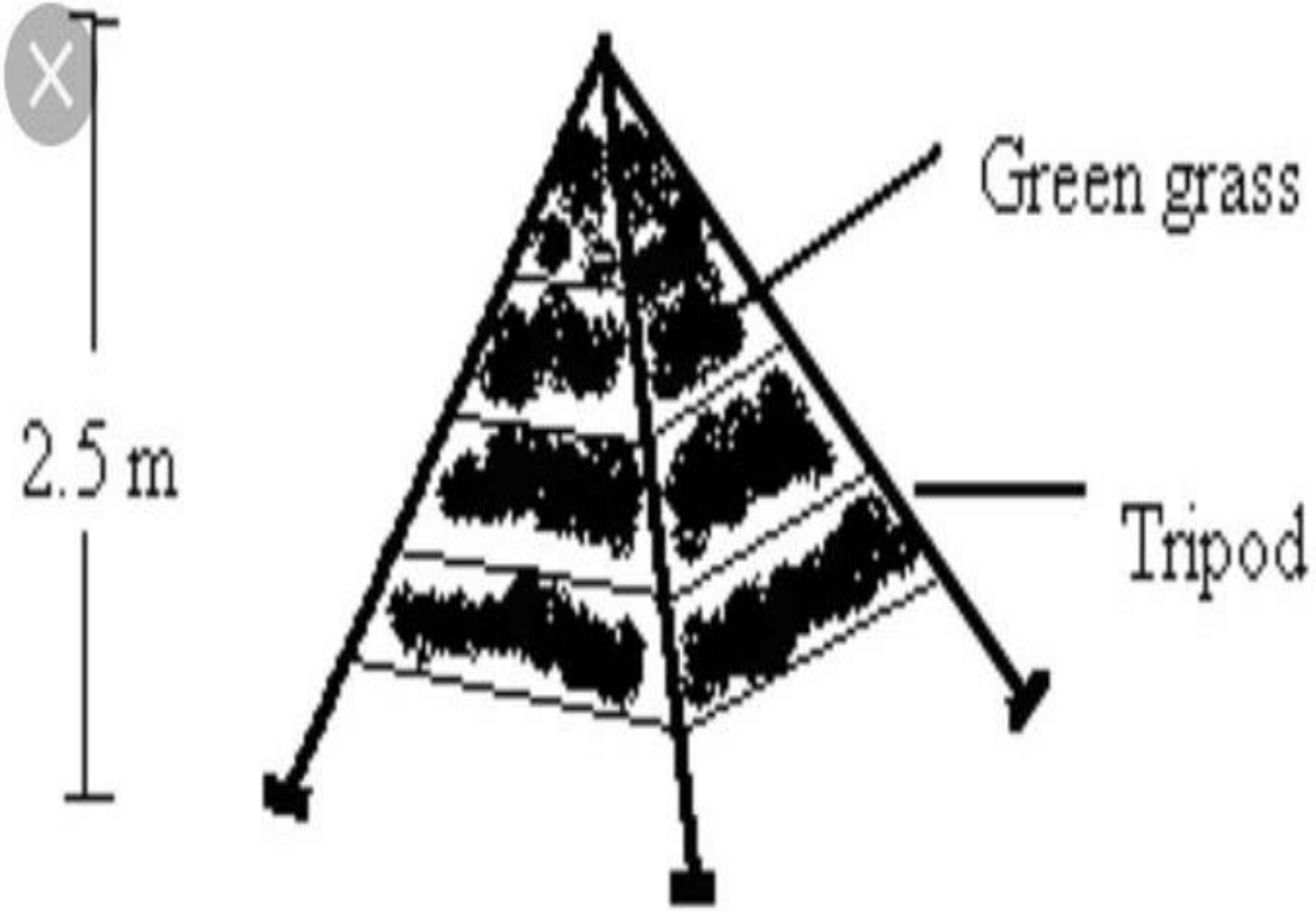
(1) Field drying/Swath curing

(2) Racking

(3) Tripod/ Tetrapod

(4)Stacking

(5) Farm drying


X
2.5 m
Green grass
Tripod

CHARACTERISTICS OF GOOD HAY

- Moisture contents should be less than 15%.
- More leafy and green.
- It should be free from dust and mold.
- It should be easily palatable.
- It should be less expensive.

Good quality hay

Poor quality hay

LOSSES DURING HAY MAKING

(1) Shattering of leaves

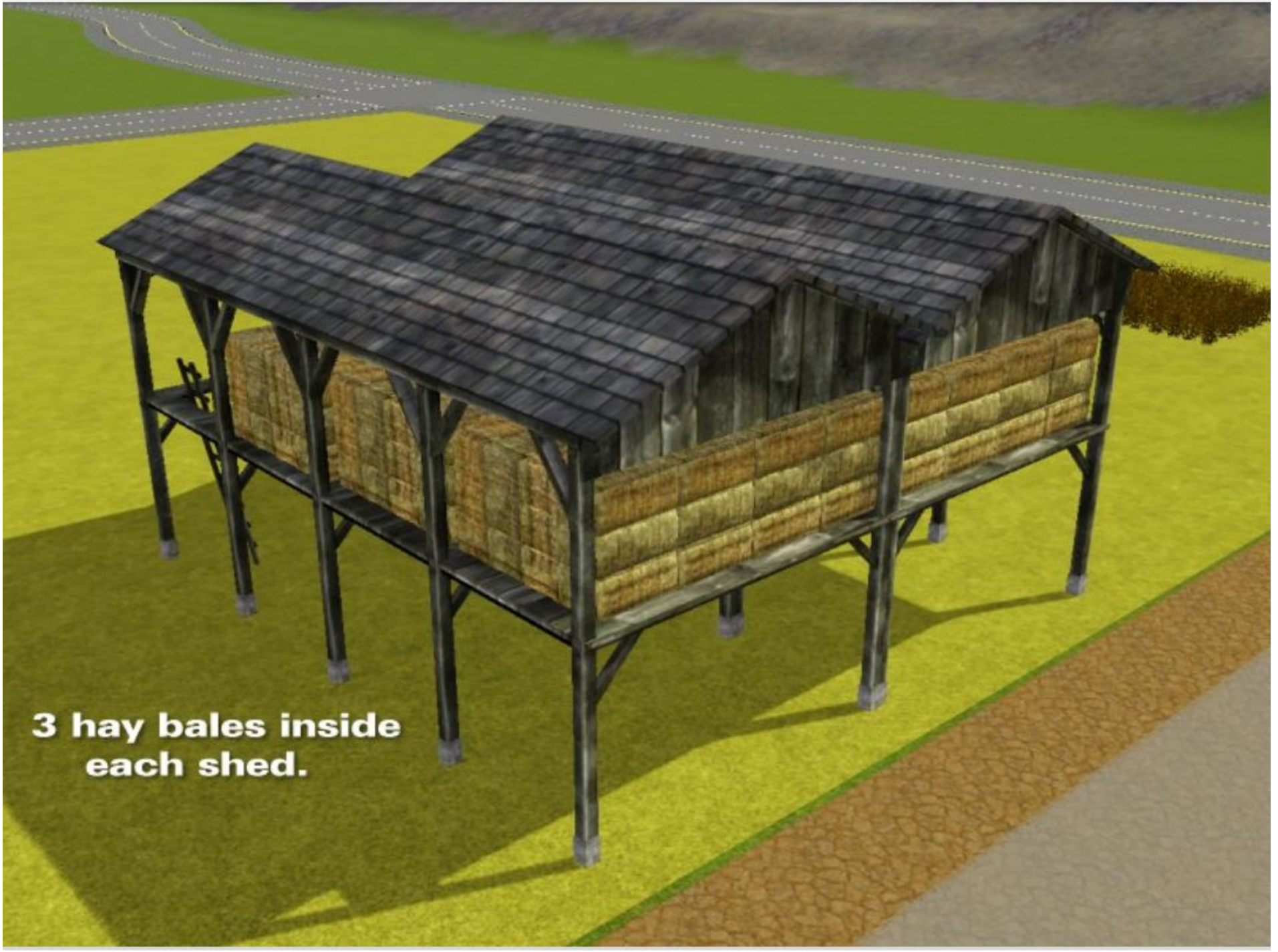
(2) Leaching

(3) The losses in nutrition value in hay making are due to late cutting.

(4) Due to fermentation.

STORAGE OF HAY

- Hay can be stored under a roof when resources permit.
- It is frequently kept inside sheds and may be stacked inside a bale
- Hay never exposed to any possible source of heat.
- Because dry hay and the dust it produces are highly flammable.


3 hay bales inside
each shed.

ADVANTAGES

- It is used when there is less availability of fodder.
- The chances of spoilage will be less than the silage.

DISADVANTAGES

- It also require a lot of time and extra labour.
- During hay making process 10-15% loss of nutrient occur.
- Hay making is done in presence of sun light.
- If sun light not available it difficult the hay making process.

SILAGE

- Silage is the green material produced by **controlled fermentation** of the green fodder crop retaining the high moisture content.

TYPES OF SILAGE:-

(1) Very good silage:-

* Smell-good
* PH-3.8to 4.2
* Ammonical nitrogen less than10%
* Butyric acid nill.

(2)Good silage:-

*Smell- satisfactory
*PH - 4.2 to 4.5
* Ammonical nitrogen - 10-15%
*Butyric acid least amount.

CONTINUE.....

(3) Fair silage:-

*Smell-bad odour

* PH -4.5 to 4.8

* Ammonical nitrogen - 15 to 20 %

(4) Bad silage:-

* Smell - very bad smell

PH - greater than 4.8

*Ammonical nitrogen - more than fair silage

IMPORTANT POINTS ABOUT SILAGE:-

*Optimum PH of good silage is 3.8-4.2

*Lactic acid content of good silage is 8-12% of total dry matter

*Acetic acid content of good silage is 4-7%

*They contain bacterias other than lactobacilli like clostridium species.

*Clostridium can utilize sugar and lactic acid and produce butyric acid.

*Butyric acid not produce in good silage.

CONTINUE.....

*It is predominant acid in silage with PH -5 or

Above 5. Because PH of silage increase with increase in amount of butyric acid.

*If rain water is allow to enter or if moisture content of fodder is very high then lactic acid fermentation will be slow.

* Secondary clostridium fermentation occurs

Attacking amino acid producing ammonia, organic acid ,amide and produce bad smell and less

Palatable silage

CONTINUE.....

*60% of protein will be converted to amino acid in a well preserved silage.

*But in badly preserved silage further breakdown of amino acid into tryptamine,phenyethylamine.

These are toxic to animals if absorbed in blood.

* Brown colour of silage is due to a pigment

Phycophytin ,which is a magnesium free derivative of chlorophyll.

* The process of silage is take around 40-45 days to complete.

Selection of crops for silage making

It is easier to ensile forages that have:

- High level of fermentable sugar.
- Low level of protein.
- Low buffering capacity.
- Should have about 35 per cent dry matter at the time of ensiling.

Making of Silage

- ✓ Harvesting of fodder.
- Pasture grasses: From early heading to heading stage.
- Pasture legumes: From budding to early flowering stage.
- Corn: Yellow ripening stage.
- Sorghum: Dough stage.

Making of Silage cont....

- ✓ Moisture Testing **60-65%** moisture level in green fodder is ideal for silage making (if moisture level is high **Wilting** is required).

  High moisture content leads to **poor fermentation**.

- ✓ Chopping of forage to short length **(1-3 cm).**

  so that the packing density is kept higher, lactic acid fermentation takes place in good condition.

Making of Silage cont....

- ✓ Seal the pit airtight with plastic cover.
- ✓ Plastic covers should be pressed with heavy objects like bricks or tire.
- ✓ Maintain sealing for **45 days.**
- ✓ Once silo-pit will be open, it should be finished within **45-60 days** to avoid fungal contamination.


JCB

Fermentation of Silage

Types of fermentation in Silage formation

Homolactic fermentation (homofermentative pathway)

- Very desirable, common in high sugar grasses,
- sugars fermented to lactic acid, low pH nutrient loss
- mediated by *Lactobacillus plantarum, L acidilacti etc.*

Heterolactic fermentations (heterofermentative pathway)

- Less desirable, occurs when limited sugars are available,
- Mediated by *Lactobacillus brevis, L. buchneri.*
- Sugars mainly fermented to acetic acid, & alcohols.
- Less efficient than Homolactic fermentation.

Fermentation process of silage

➢ **The first stage (Respiratory stage)**

- The packed raw materials are still respiring immediately after chopped and consumes oxygen.
- The temperature will rise to about 32ºC around 4 days after packing.

➢ **The second stage (Early fermentation)**

- Production of acetic acid, formic acid and other organic acids as a result of the growth of **facultative aerobic** bacteria such as *Enterobacteria*.
- The silage pH slowly changes from about 6.0 to 4.0

➢ **The third stage (Lactic acid fermentation)**

- Lactic acid fermentation begins by lactic acid bacteria witch are **strictly anaerobic** about 3 days after packing chopped materials. and acetic acid production declines.

➢ The fourth stage (Cont.... of Lactic acid fermentation)

- Lactic acid production continues for about 2 weeks.
- The temperature goes down slowly to about the normal atmospheric temperature. and pH is maintained at 4.0

➢ The fifth stage (Stabilization phase)

- Due to the presence of lactic acid, further degradation is inhibited, as bacterial and fungal growths are checked.
- The lactic acid fermentation completes in about 20 days, and the silage product is finished.

Inhibition of bacteria and mold growth:

- Generally formic and propionic acids are commonly used as preservative to prevent bacterial and mold growth.
- The major benefit of adding these acids to silage is reduce the spoilage in open storage structures.
- Formic acid is added to crop silages 0.45% of the wet weight or 2.25% of the DM weight.
- Propionic acid is added 0.5 to 1.0% of the wet forage weight.

Factors enhance the nutrient quality of silage

Add dry matter to reduce moisture content:

To reduce seepage losses and

To provide a more suitable medium for the fermentation process.

- Generally, grasses and legumes are wilted or dried to an average of about 65% moisture or less depending on the type of storage used.

Kinds of silos

1) Stack silo

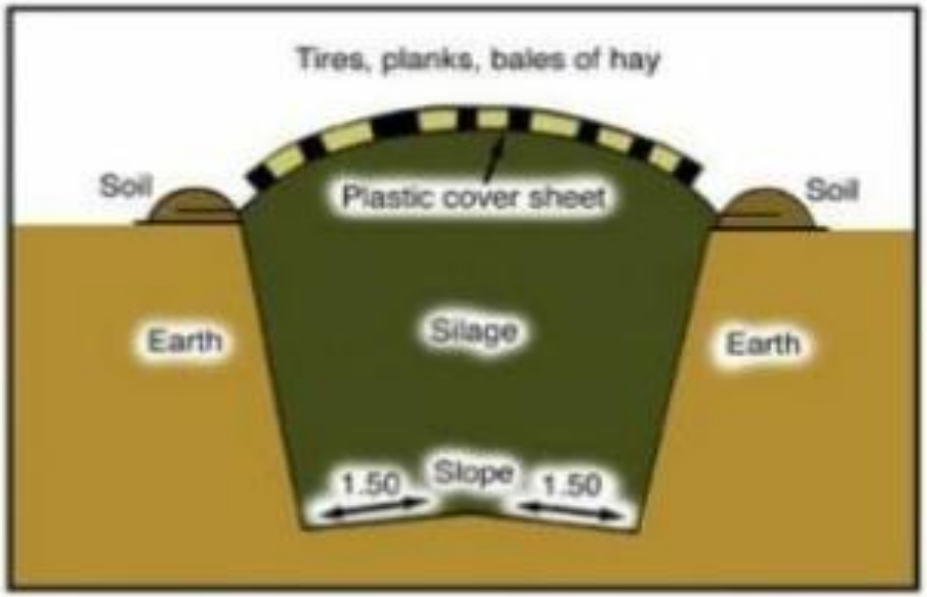
- Simplest type of silo.
- A plastic sheet of 0.1 mm thickness is spread over the ground, and similarly chopped silage materials on the sheet are entirely covered with a plastic sheet. Proper tread pressure and complete sealing are required.

2) Bunker silo

- A bunker silo is generally built on the ground but there are other building methods to build a silo using the configuration of the ground (slope 3-5%) or a semi underground type, which is half below from the ground level.

3) Pit/Trench silo

- A trench silo can be built by simply digging the ground, but it is better to place plastic sheets inside to prevent loss.
- A trench silo whose interior is coated with concrete can be used for a long time

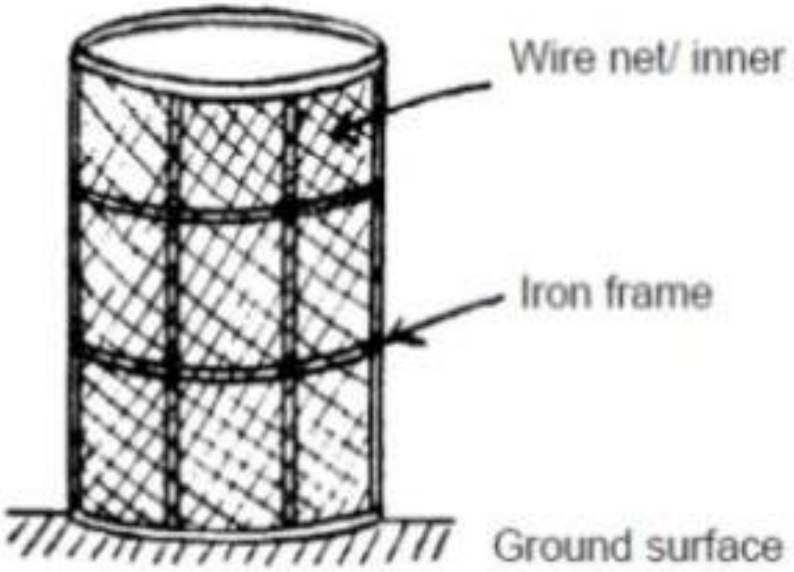


4) Plastic bag silo

- In this type plastic bags with thickness of 0.1 mm are taken and fill bags with chopped raw materials, compressed as much as possible to remove the internal air and then sealed completely.

5) Fenced silo (framed silo)

- The frame is made of bamboo, wooden, iron materials, etc., the shape of cross section may be circular or rectangular. and inside is sealed with plastic sheets.



Fenced silo

Judging the quality of silage

The quality of silage can be judged by its color, smell, taste and touch.

- Color: In general, pale yellow indicates good quality. If the color is from dark brown to dark green, the silage underwent bad fermentation and is of bad quality.

- Smell: Acidic or a sweet-sour pleasant smell indicates good quality. On the other hand, if there is a manure smell or putrid smell and it is so repugnant that one cannot put the silage near one's nose, the quality is poor.
- Taste: If the silage tastes sour and there is no problem in putting it in one's mouth, the quality is good. On the other hand, if the silage tastes bitter and one cannot put it in one's mouth, the quality is poor.

- Touch: When squeezing the silage tightly in a hand and then opening the hand, if the silage breaks slowly into two, that silage is of good quality. If the silage breaks into small pieces separately, the silage is deficient in moisture content. If water is dripping, the moisture content of the silage is too high.

ADVANTAGE OF SILAGE:-

(1) It is less at risk from the weather than Hay making.

(2)Silage required less storage place compare to Hay.

(3)Weedy crops and crops with thick stem can be Ensiling.

(4)Silage is a better source of protein and certain.

CONTINUE.....

(7)Silage is more palatable as compare to Hay.

(8) losses during Silage making is less as compare to Hay making.

(9) Converting crops into Silage clear the land earlier as compare to Hay.

(10) Silage retain higher proportion of nutrition than Hay because losses due to scattering and bleaching are minimised.

Feeding of silage

2 - 3 year old cattle	11-13 kg
3 - 8 year old cattle	13-22 kg
sheep	1-1.5 kg per 45 kg. live wt.
goats	1-1.5 kg per 45 kg. live wt.

SCARCITY FODEER:-

(1) Tree leaves-

Bamboo leaves(Dendra calamus)

Seesem leaves(Delbergia sisso)

Peepal leaves(Ficus glomarata)

Mulberry leaves(Morus indica)

(2) Unconventional roughage resources-

Jute(Corchorus olitorius)

Sunhemp(Croioloria nunca)

Water Hyacinth(Eichhornia crassipes)

CONTINUE.....

(3) Industrial biproducts-

Sugarcane biproduct

(4) Unconventional feed as concentrates-

Mango seed kernel(Mangifera indica)

Babool pods(Acasia arabia)

Sea weeds

Mahua cake(Brassicas latifolia)

Vegetable and fruit processing waste

(5)Other unconventional feed resources

Azolla

CONCLUSION-

*Maize is a popular crop for silage making because it give high yield at the stage of cutting

as it contain required dry matter % and

available sugars.Thus normal fermentation is ensured without addition of any preservative.

*Grasses and legume can be used but they require special methods like lowering the moisture content by wilting,adding radially fermentable carbohydrates,making mixed silage

Etc.because they may not contain sufficient sugar

CONTINUE.....

to produce enough acidity to stop further bacterial degradation ,legume crop contain more

Protein and when acted by bacteria produce ammonia which interested neutralise some acidity thereby allowing the growth of decomposing bacterias.

* Legume crop contain high moisture content.

* Berseem crop have hollow stem,so removing

Of air is very difficult.

CONTINUE.....

*Harvesting of crop should be done at pre-flowering stage when fodder contains maximum amount of nutritions.

* Hay contain maximum amount of dry matter and silage contain maximum amount moisture.

*PH above 5 indicate presence of clostridium bacteria in silage which make bad silage.

THANK YOU