Hay making

“Hay -refers to cereals, grasses or legumes that are harvested at appropriate stage, dried and stored”

- High quality hay is light grey color
- Leafy, pliable & free from mustiness
- Easy method of storing seasonal excess
  - Only way for farm by-products
- Principle is to reduce water content
- Legume, non-legume & mixed gay are the major three types

Field method

- In field there are two methods
  - Windrows – occupies 1/3rd land area
  - Swath – Entire field
- Drying in ‘Windrows’ faster than swath
- For this, harvest few hrs after dew drying
- Allowed to cure in the field itself
  - Turned after every 4-5 hrs
  - By the evening moisture reduced (75% to 40%)
  - Next day requires 1 or 2 turnings
  - Moisture content in the 2nd day comes to 25%
  - Now ready for storage as bales or in tripod stand
  - End of curing moisture to be reduced to 20%
  - Normally 70-75 sunshine hrs require
- Not suitable for rainy season

Mechanical method

- Fence method – wire fencing with angle iron posts are used
  - More suitable for berseem, Lucerne, groundnut haulms and legume fodders
Protein loss is minimized (2-3%)
- Forced air batch – developed at IGFRI
  - Capacity 1 t /day
  - Cost Rs.60/t

**Chemical changes in hay making**
- Conversion of soluble sugars to CO2 & H2O
- Loss of digestibility
- Increase in cellulose and lignin content
- Reduce in nutritive and keeping quality

**Loss in fodder value**
- Nutrient loss in late cutting
- Shattering of leaves & finer parts (in legumes)
- Fermentation loss leads to dry mass loss by 6%
- Oxidation by sun bleaching leads to
  - Loss of chlorophyll and carotene
    ◆ Carotene decreases from 150-200 to 5-10ppm
    ◆ Carotene is to give aroma
      - Animals are color blind
  - Leaching leads to loss of
    - Protein, nitrogen free extract (NFE), minerals, and vitamins
    - Consequently crude fibre increases & digestibility decreases
    - In Berseem crude protein loss is from 22% to 16-18%

**Ensilage / Silage making**

‘Silage’ may be defined as the green succulent roughage preserved under controlled anaerobic fermentation in the absence of oxygen by compacting green chops in air and watertight receptacles
- Silage leads to fermentation of water soluble carbohydrates to organic acids which increases acidity of the materials (pH – 4)
- Such anaerobic acid (lactic acid) arrests the
  - growth of bacteria
  - Moulds
  - Inactivates putrefying organisms (act as preservative)
  - Consequently reduces nutrient losses and
- Change in nutritive value
- Best method than hay

**Crops suitable for silage**
- Crops suitable are based
  - Dry matter of 30-45%
  - Soluble sugar 8-10%
  - Ratio between water soluble CHO's and buffer capacity
  - Ratio of sugars to crude protein
    ◆ All these decide production of lactic acid
- Crops suitable for cut at 50% flowering and at milking
  ◆ Crops like sorghum, maize

**Points for consideration while ensiling**
- Dry matter content for the materials should be 30-45%
- More succulent materials may be taken after field drying only
- Polythene layering on all sides improves the quality
- Filling should be done on a clear day as quickly as possible
- Filling should be in layers of 20-30cm at a time and uniformly
- Compaction must be perfect
- Trampling is useful to remove air pockets
- Top must be convex / dome
- Silage pit size
  - 20 x 20 x 20 c. ft for 50-55 t
  - 5 x 5 x 6 c. ft for 22.5 t
  - 10 x 5 x 6 c. ft for 45.0 t

**Characteristics of good silage**
- No mould growth
- Golden / greenish yellow
- Pleasant fruity odour or acceptable aroma
- Free flowering and non-sticky texture
- 3-4% increased palatability
- Increased nutritive value
- pH around 4.0 – 4.5
- Lactic acid proportionally more than other acids
- Decrease in nitrate-N and increase in ammoniacal-N
- Ammoniacal N should not exceed more than 15% of the total N

Haylage
- It is low moisture silage (40-45%)
- Made from grass / legume that is wilted to reduce moisture content
- But for moisture it is almost silage

Fortification of Fodder
- ‘Fortification or enriching is the direct addition of feed supplements to the poor quality roughage to improve its fodder value’
- Mixing green legume with fodder
- Mixing liquid ammonia (2.5 to 3.0%)
- Mixing Urea molasses
  - 2-3% for concentrates
  - 1% of dry matter
- After mixing similar to silage

Fortifying materials and usage
- Molasses for rice, wheat
- Mineral mixture and salt for low grade grass hay
- Urea for sorghum & maize green fodder
- Tapioca powder/ maize powder for leguminous fodder
- Bacteria and / fungi for dried ground nut haulms

Advantages of Fortification
- Improves palatability
- Reduces wastage
- Improves rumen environment
- Increases crude protein
- Cleavage of cell wall for increased digestibility
- Neutralize or reduce the concentration of toxic principles
- Increases digestibility
- Milk protein and fat increase

Multiple choice questions
1. Green succulent roughage preserved under controlled anaerobic fermentation
   a. Forage  b. Hay  c. Silage
2. Cool-season grass is ________
   a. **Rye**   b. Bermuda   c. Corn

3. Warm-season grass is __________
   a. Rye   b. Blue grass   c. **Bermuda**

4. Enriching is the addition of feed supplements to the poor quality roughage _____
   a. Silage   b. Haylage   c. **Fortification**

5. Moisture content in silage is ________
   a. **40-45%**   b. 20 - 25%   c. 25 - 35%