Theme 1: Forage production and pasture management

SCALED MECHANISATION OF FORAGE PRODUCTION AND HARVESTING

Level 3

Topic	Training & information Content
1.1	Planning of fodder/feed requirements for the dry season
1.2.1	Integrated soil fertility management I
1.2.2	Integrated soil fertility management II
1.3	Use of natural resources, compost making, farmyard manure, manure storage and use
1.4	Growing maize and sorghum for fodder and estimating time of harvest and yield
1.5	Brachiaria, Panicum, & Napier (cut and carry) grass management
1.6	Growing fodder trees and use of feed
1.7	Estimating of dry matter content, feeding value and yield of various fodder crops
1.8	Guidelines for Tropical pasture management and grazing management
1.9	Scaled mechanization of forage production and harvesting (harvesting practices)
1.10	Operating farm equipment and self-propelled tractors
1.11	Mechanization of feeding management
1.12	Economics of forage and pasture production

1. You will learn about (learning objectives):

- ❑ How to harvest different forage crops based on forage species, grazing and mechanization
- ❑ Mechanically harvesting of grass and forage crops for hay and silage
- ❑ Forage quality
- ❑ Tools for cutting, mowing, raking and turning grass – manual and mechanical
- ❑ Silage and hay making

2. Grazing

- Grazing is the most common practice in South Western Ugandan farms
- It is a cheap way to feed cows. Pasture must be well managed; also ensure regular bush clearing
- Mixed grass legume pastures are more productive and nutritious
- Rotational grazing with paddocked (fenced) pastures is the most recommended

2.2 Why Grazing?

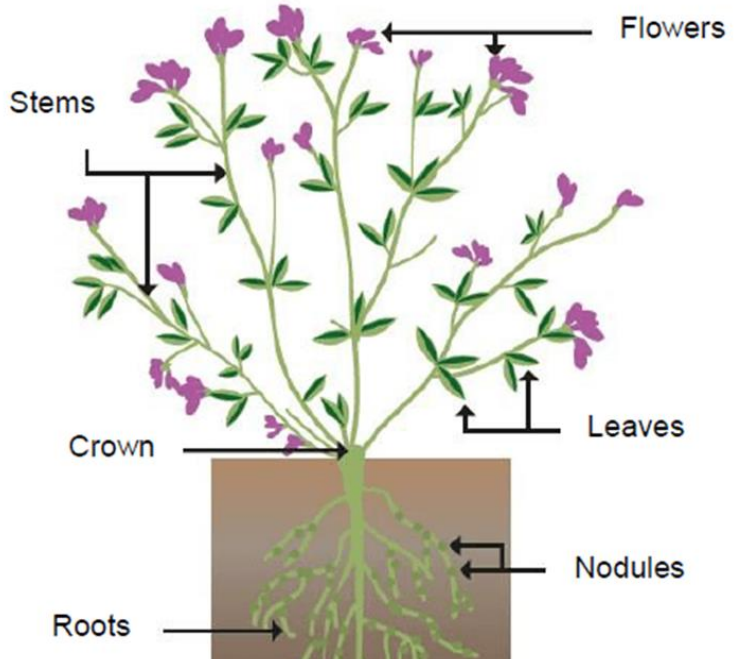
- Naturally grown feed for ruminants
- Grass as a roughage is essential for good rumen function
- Cheap source of nutrients
- Keeps production (milk/meat) cost low

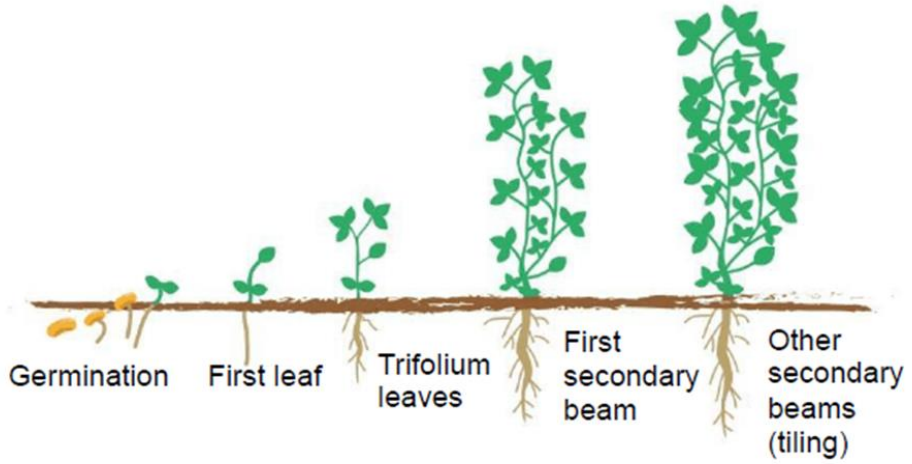
3. Mechanical harvesting of Grass and Forage crops for silage

- Maize/oats/sorghum are best harvested at dough ripe stage
- Napier grass is best harvested at 60-90 cm (knee high)
- Pasture grass at 17-30 cm
  - harvest 2-3 inches/5cm above the ground for fast regrowth
  - pre-dry the grass (wilt) for up to 10-30 hours depending on day's temperature, wind & sunshine

4. Mechanical harvesting of Alfalfa (Lucerne)

- Harvest Lucerne when 10% of the crop has flowered
- Harvest 2-3 inches/5cm above the ground for fast regrowth
- Wilt between 6-8 hours depending on temperatures, wind & sunshine
- Carry the wilted alfalfa to the cows





4.1 Mechanical harvesting of Alfalfa (Lucerne) Cont'd…

- Chop up to 3cm particle length for high intake and less waste (losses)
- If making alfalfa hay, dry in the field for 4-6 days depending on temperature, wind and sunshine
- Dry it well so that when you squeeze, the forage is moisture free (80-85% Dry Matter)
- Bale it and store in a dry place

5. Cut and carry Grasses

- When cut and carry grasses such as Napier, Brachiaria and Panicum grasses are harvested at the right stage, cows get the most nutrients out of the forage

5.1 Cut and carry Grasses: Napier grass

- Harvest the grass when it is 60cm high but not higher than 90 cm
- During the growing season, harvest at intervals of 6-8 weeks
- Harvest the grass following a pattern;
  - Day 1: begin at one end of the row and cut enough grass to feed your cows for 1 day
  - Day 2: the next day, cut the next grass within one row
  - Day 3: carry on until you reach the end of the row
- This way, you will always be able to cut fodder for your livestock well enough, if you planted enough acreage

5.1.1 Cut and carry Grasses: Napier grass Cont'd…

- Well-managed grazed pasture is the cheapest feeds available on-farm
- Maximizing home-grown quality forage can reduce the cost of production
- Better use of home-grown quality forage drives profitability

5.2 Cut and carry Grasses: Alfalfa

- Leguminous forage such as alfalfa are best wilted before given to cows in large volumes

5.3 Cut and carry Grasses: Desmodium

- Like Alfalfa, leguminous forage such as desmodium are best wilted before given to cows in large volumes

6. Conserved feed – best additives?

- Good and cheap additives
  - **Time:** to allow wilting (drying)
  - **Wind (speed):** allows to dry faster
  - **Sun:** more sun helps to dry faster

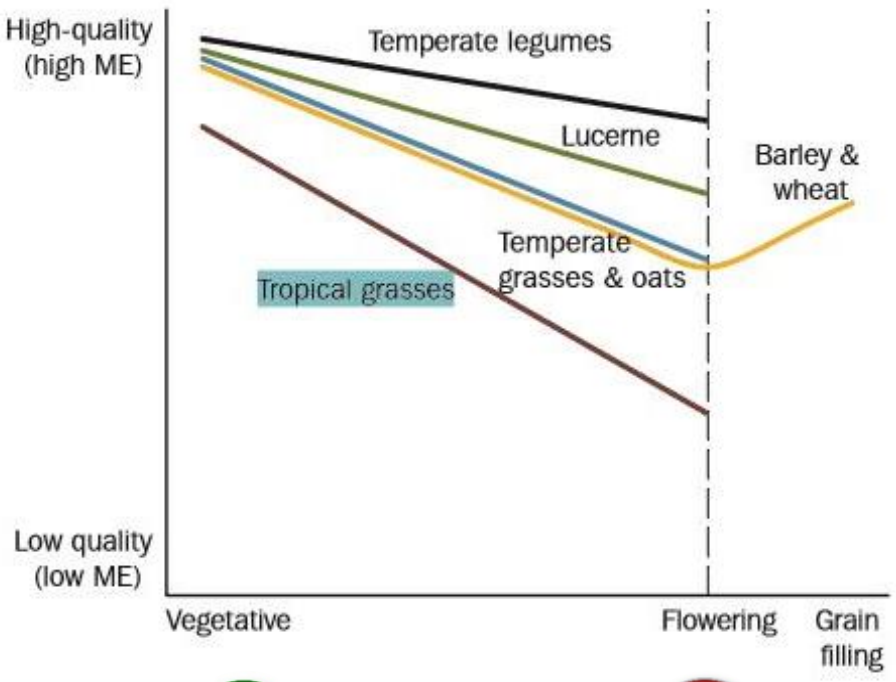
- Bad and costly additive
  - **Rain:** will make valuable nutrients leach from the grass

7. Forage quality

Forage quality lowers when plants mature

- Forage quality (energy) of forage plants decreases as the plants mature
- When whole plant silage is harvested after grain filling, the forage quality increases due to the higher energy content in the grain

Forage quality (ME content) of the parent forage decreases as the plants mature.



7.1 Factors affecting forage quality

- Differences between species
  - grasses vs legumes
  - temperate (cool season, C3) vs tropical (warm season, C4) grasses
- Temperature
- Maturity stage
- Leaf-to-stem ratio
- Grass-legume mixtures
- Fertilization
- Daily fluctuation in forage quality
- Variety effects
- Harvesting and storage

8. Tools for cutting grass

- Manual tools

Slasher

Scythe

Sickle

Panga

8.1 Tools for cutting grass Cont'd…

- Mechanical tools

Lawn mower

1 and 2 drum Mower

Grass brush cutter

Tractor (mounted) mower

9. Principles of cutting grass

- Tractor (mounted) mower has four (4) main principles

    1. Drum mowers
    2. Disc mowers
    3. Finger bar mowers
    4. Flail chopper mowers

Drum mowers

Disc mowers

Finger bar mowers

Flail chopper mowers

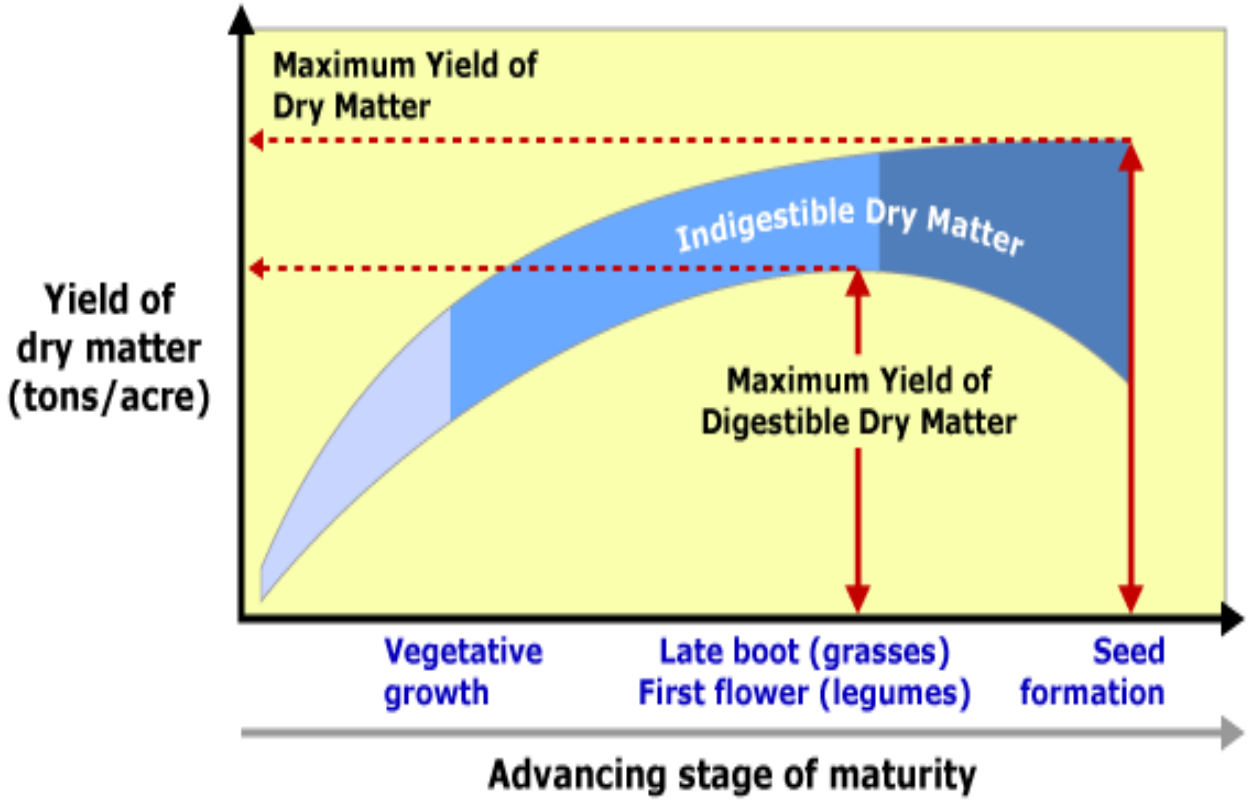
10. Hay making

- The objective of mechanizing is to produce stable animal feed of good nutritive value with minimum loss of dry matter and expenditure

- The goal of haymaking is to produce a stable, high-quality animal feed with minimum expenditure

10.1 Hay making: Ideal stage for cutting

- The ideal stage of cutting grasses and legumes is achieved when we can harvest at the maximum yield of dry matter
- Waiting longer will result in higher dry matter yield and the hay will be indigestible (during and after seed formation)
- The ideal yield/quality (nutritive value) will be achieved when cutting the grass at late bloom stage



10.2 Hay making: High yield (many bales) does not equal good quality

- Hay is not as nutritious as fresh forage grazed by animals. In addition, hay is harvested and stored which requires manual labour and machinery

- But utilizing the surplus forage pastures during peak growing times for use as feed during the dry season is wise if the forage is harvested wisely and stored properly

10.3 Hay making: Mowing the grass

- Mow during dry weather conditions to allow the grass wilt. This can be done using a sickle, scythe or tractor driven (2 drum) mower. A stubble height of 5 cm should be maintained to facilitate faster regrowth

10.4 Hay making: Turning/tedding

- This allows air and sun in contact with the lower surfaces to allow drying
- For smaller plots the grass can be turned manually with a hay fork
- Tractor mounted tedders use the principle of rotation. In the pictures alongside the tractors are mounted with drum tedder and a rotary tedder

10.5 Hay making: Tools for turning hay

- Hay fork(s) can be used to turn grass/hay manually while and mechanical rake(s) can be mounted behind a tractor

Hay tedders

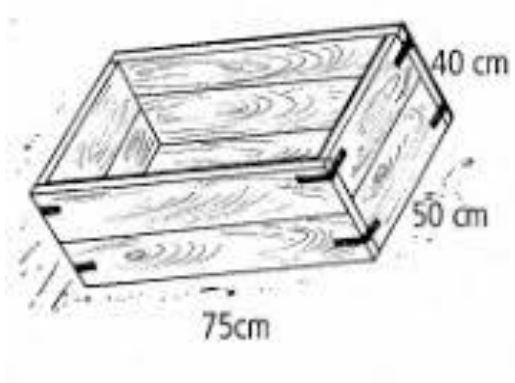
10.6 Hay making: Raking the grass

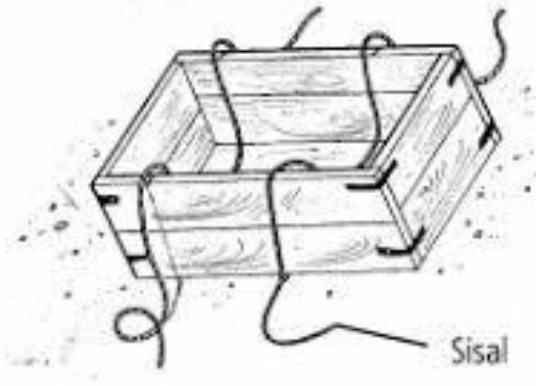
- Bringing the grass together in a row for easy baling. This ensures that most of the cut grass is baled
- Grass which is spread out would make the baler less efficient and the grass when spread remains closer to the ground and is difficult to lift by the pick up of the baler
- The pictures show a manual rake, a tractor pulled rotary rake and a wheel rake

10.7 Hay making: Baling

- The grass is then picked up, compressed and formed into rectangular or cylindrical bales and bound together by a string

- Small holdings can use a wooden frame (75 cm x 50 cm x 40 cm), put 2 strings (as shown in the picture) and compact manually

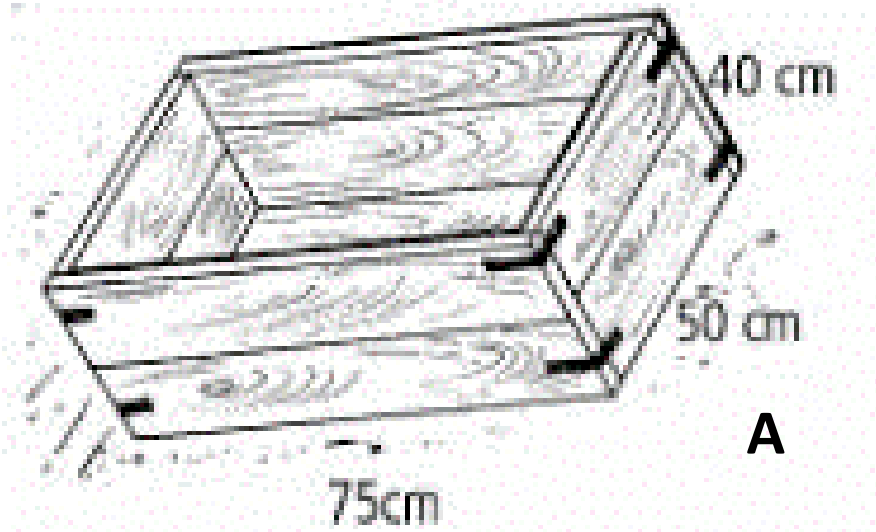




10.8 Hay making: Making a baling box

- What you need;
  - Wood
  - Nails
  - Plane
  - Hammer
  - Strings

- Procedure;
  1. Plane the wood
  2. Assemble the wood with nails as shown in **figure A**
  3. Leave the upper part open
  4. Put the strings as shown in **figure B** and allow them to hang outside
  5. Put the grass into the box and compact
  6. Keep piling the grass while compacting by feet
  7. Fasten the strings
  8. Lift the baler



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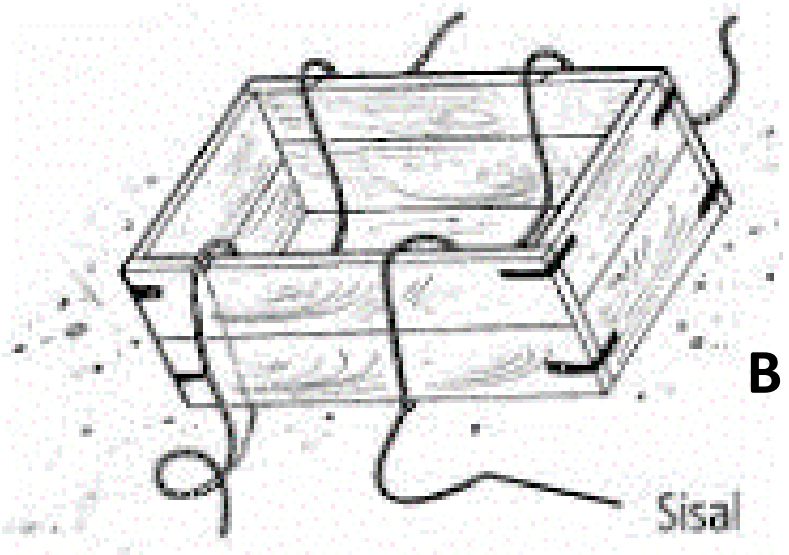

B

10.9 Hay making: Transporting

- It is important to have the hay bales transported and stored in a place devoid of moisture

10.9.1 Hay making: Yields

- There is a significant difference between expected and realized/actual yields

- According to literature by ILRI: 8tonnes DM/ha/year
  - that is, 650 bales/acre/per harvest (2 harvests/year, 15-kg bale)

- Average from respondents: 150 – 250 bales/acre/per harvest (=<2 tonnes/ha/year)

11. Silage: Grass silage

- Collecting grass for making grass silage has four (4) main principles

1. Pick-up loader wagon:
    - Relatively cheap piece if farm machine
    - Needs ability to cut grass in smaller sizes on pickup / preferably possibility to dose additives while dumping.
2. Round/Big baler:
    - Most suitable for dryer haylage
    - Needs ability to cut grass in smaller sizes on pickup
3. Forage harvester:
    - Best for applying additives
    - Most expensive
    - Best result especially when forage material is wet

11.1 Silage: Maize Silage – Stage of harvesting

- Aim at a DM level of the whole crop of 30-35% and a starch level of at least 30%
- The most accurate method of deciding when to harvest is to determine the dry matter on samples of the whole maize plant
- When all the leaves below the cob are drying off, that is optimum stage to harvest
- The kernel should be at dough ripe stage

11.2 Maize Silage – Mechanization

- The machine should have preferably a kernel crusher. This will allow to cut the forage maize crops at dough ripe or ripe stage

- The machine needs proper preventive maintenance and daily service during harvesting (e.g., calibration and sharpening of knives)

11.3 Maize Silage – Pit location

- Determine how far the clamp/pit is from the barn, how well-drained the location is, how safe it is from any traffic and from birds, rodents and wild animals

- Ensure that the pit is close to the animals to ease the feed out

11.4 Maize Silage – Check the weather before harvesting

- Check the weather if appropriate for machines to enter the field and right for harvesting

- Install weather forecast application on a smart phone as this can give an indication of how the weather for one week is

- END -