

Theme 3: Fodder management and conservation

ESTIMATING IDEAL TIME OF HARVEST



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You will learn about:

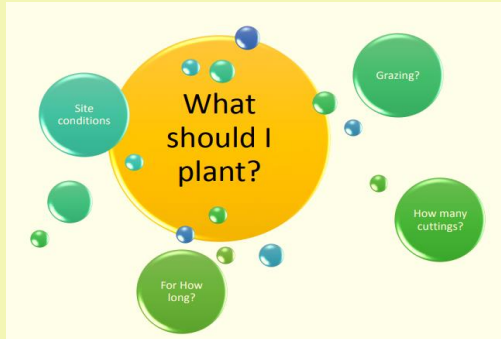
The trainee knows the best stage at which to harvest grasses, maize and legumes used as forage

- Forage quality
- Selection of crops and stage of harvest
- Good vs bad silage
- Hay making
- Machinery for harvesting and chopping maize and kernel crushers

Introduction

Every forage crop has an optimum stage of harvesting - balance between maximum yield and the best quality

The optimum stage depends on how the forage material will be utilized i.e. either fresh feed or conserved feed (hay or silage)



Forage quality: Grasses, Alfalfa and Maize

Forage quality is influenced by the stage of harvesting. The stage/time of harvesting and condition of forage material vary based on:

- maturity
- moisture content
- type of forage crop
- conservation method to be used

In this module we are focusing on three main forages;

1. Grass for silage and hay
2. Alfalfa for hay
3. Maize silage



Grasses: Best stage for harvesting grasses

At the ideal harvesting/cutting stage, the grass should;

- Be highly palatable
- Have high intake
- Highly digestible
- Have high nutrient content
- Have limited anti-quality (nutritional) factors
- Improve animal performance



Selection of crop and stage of harvest

The primary methods of preserving forage crops include silage making and hay making. The crops can also be harvested as green chops or grazed

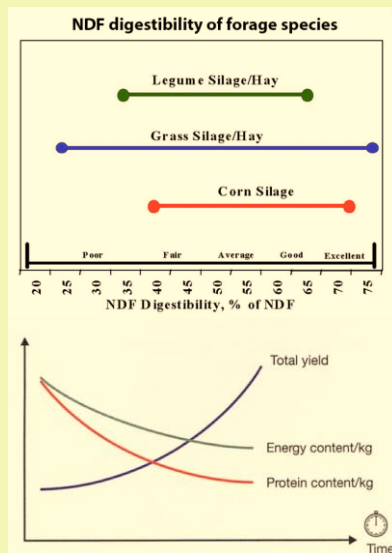
Each of these methods of forage harvest and/or preservation has benefits and limitations

Farmers, based on the scale of their farm and level of intensification, must review each management practice and evaluate their own production situation to determine which method to use to gain maximum economic returns



Factors affecting the choice of harvesting stage

- Grass variety
- Protein content
- Fibre content (NDF)
- Stage of maturity
- Balance between yield and nutritive value



Young grass is a source of nutrients

Grass is a very good source of protein when harvested before flowering

To optimize the nutrients available in the plant, feed the grass when fresh. If there is more than the cows can finish, make silage



Napier grass – stage of harvesting

Cut the grass at the vegetative stage

Napier silage should be made when the grass is between 60-90 cm. Alternative way is to cut the grass every 4-6 weeks



Steps in making grass silage e.g. using Napier grass

1. Harvest grass when there is excess, and quality is high
2. Wilt the grass to approximately 30-35% Dry Matter
3. Ideally chop the forage into pieces of 1-3 cm before ensiling
4. Add fermentable substrate (e.g. molasses) when ensiling
5. Compact the forage tight and repeatedly in layers of 10- 15 cm of forage material
6. Complete the entire pit or clamp within 24 hours
7. Seal the pit immediately after filling
8. Cover the pit / silo with about 10 cm of soil
9. Maintain airtight seal until feeding out
10. Feed out the whole face of the pit to a depth of 15-30 cm very day day



Good vs bad silage

- Good quality silage is light brown and palatable with a sweet smell and can be kept for years under anaerobic conditions
- The forage material is high in carbohydrates with a low moisture content (after wilting)
- There should be a balance between yield and digestibility; higher yielding crops will be more stemmy therefore the digestibility is lower
- The first cut is generally higher in energy, with later cuts being more fibrous
- A mature grass crop will have low sugar content, leading to poor fermentation
- If the crop is mature and too dry, it will be difficult to compact which can lead to spoilage on feed out
- Poorly made silage will result in cows refusing to eat the silage which leaves the farmer with a lot of waste
- Poorly made silage and contaminated with soil can also make cows sick: *Listeria*, botulism and clostridia thrive in the soil and can be picked up when harvesting the grass



Grass silage from star grass



Stage of harvest for hay making

- Hay made when grass is overgrown is of poor quality
- Early flowering stage is a good alternative between the number of hay bales per hectare and nutritive value (quality)



Harvesting stage for maize silage

Factors that affect harvesting stage of maize for silage include:

- Dry matter
- Maize variety (uniform ripening cob/stem)
- Starch content
- Forage choppers used



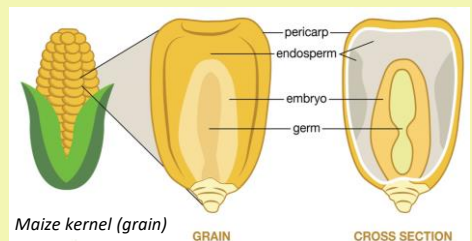
Access the crop on dry matter (DM) yield

Identify the % dry matter; should be between 30-35% DM. The cob and kernel maturity correlate directly to dry matter;

- Firstly, collect at least five representative cobs and pull back the outer leaves
- Secondly, break the cobs in half to examine kernels
- Thirdly collect at least five stalks (stalk/leave maturity), crack and twist
- Fourthly, decide on the intended cutting height



Note: Dry down rate is 0.5-0.75 % per day → higher in hot climate



The maize kernel at 30-35% dry matter

- Milk ripe:
- milk white (or yellow) kernel
 - kernel is filled with milky substance
 - the outer skin (pericarp) is tight

- Soft dough ripe:
- cream white (or darker yellow) kernel
 - kernel is filled with dough like substance
 - some milky substance still comes out of the kernel when is squeezed

- Dough ripe:
- cream white/glazy (or dark yellow)
 - pressing your fingernail into the kernels should result in a soft cheese texture at top of the cob
 - leave no indentation in kernels in the middle and bottom

- Hard dough ripe:
- top kernel is hard
 - difficult to press your fingernail in top of the kernel



Milk line
Wax/Starch
Milk



Always look at the stage of maturity of leaves and the cob

The desired stage of harvesting maize is when the milk line is at $\frac{3}{4}$ of grain. This is when starch content is at optimum

The kernel milk line

- To see the milk line, break a cob, look at the non-embryo side of the kernels. The broken surface of the tip is half of the cob
- Find the line between milky and dry endosperm
- A visual average around the cob is considered kernel milk line
- Half milk line occurs at about 35% dry matter



Determining dry matter in maize crop

When you twist the stem of the maize crop, the number of drops indicate the level of Dry matter

- 4 drops \leq 18 % DM 100 % green
- 3 drops \approx 21 % DM 75 % green
- 2 drops \approx 24 % DM 50 % green
- 1 drop \approx 27 % DM 25 % green
- 0 drops \geq 30 % DM 0 % green



Stubble height

Cut at a higher height (leaving 30 to 40 cm of the stalk)

- lower fibre and lignin
- higher starch (cut at dough ripe stage)
- increased energy content and nutrient digestibility

The stubble height can be a tool to manage

- dry matter content
- harvest timing of maize silage



Note: Leaving more of the stalk in the field with high fibre and lignin content will improve soil conditioning

Machinery used for harvesting maize

- Always make sure the knives are sharpened regularly (4-8 hours) to ensure the correct chopping size (0.8- 1.5 cm)
- If a forage harvester or chopper has no kernel crusher, many grains will pass unbroken (not damaged). These kernels can not be digested in the rumen and can be found in the manure
- The energy in the kernels is lost for the cow
- In this case it is better to harvest the maize earlier at the dough stage



Machinery used for chopping maize

- If a machine has no kernel crusher, many kernels (grains) will pass unbroken, this will force early (sub optimal) harvest i.e. at milky stage



Machinery with kernel crushers

- A machine with kernel crusher will allow maize to be harvested at dough-ripe stage



Legumes

- Legumes are best fed fresh or harvested as hay
- Making silage using legumes is not easy because of the high protein content



Lablab



Sunn hemp (Clotolaria)



Alfalfa (Lucerne)

Making hay from Alfalfa

1. Start with a good, full stand of healthy plants

- Maintain your field well by ensuring proper fertilization and weed control

2. Cut at proper maturity under ideal drying conditions

- If weather permits, the ideal maturity to cut alfalfa is in the bud to 10 % flowering
- This maturity is the perfect blend of yield/ha and high nutritive value
- Alfalfa should be cut in the morning – leaving 1 to 2 inches of stubble, and it should be conditioned when cut to disrupt the waxy cuticle on the stem

3. Drying

- To promote rapid drying, alfalfa should be laid out in wide swaths that are at least 70% or greater the width of the cut row
- Wide swaths increase overall hay quality due to two main factors – the hay dries faster and hay cured in wide swaths has a lower ash content

4. Bale the alfalfa quickly at optimum moisture levels

- Alfalfa is ready for baling only when you twist the forage crop in your hand there is no moisture



Alfalfa hay – the nutrients are in the leaves

- Lucerne should be harvested at 10% flowering
- Care should be taken to ensure that there is minimal leaf loss
- The leaves contain most of the valuable nutrients



- END -





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About the ICSIAPL Project

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