

*Theme 1: Forage production and pasture management*

# GROWING MAIZE FOR FODDER

## 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 pasture management (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



# Growing Maize for Fodder (Level 3)

## Learning Activities - You will learn about:

- ❑ How to grow maize as fodder - for making Silage
  - Land preparation for growing maize for fodder
  - Seedbed and Seed selection
  - Planting
  - Fertilizer application (Farm Yard manure & Inorganic fertilizers)
  - Soil Improvements
  - Weeding (Manual & Chemical)
  - Top dressing
  - Pests and Diseases in a maize field
  - Harvesting

# Growing Maize for Fodder (Level 3)

## Background

- The use of forage maize for animal feeding is becoming very popular in dairy farms in Uganda
- It is therefore important to know the key guidelines to growing maize for fodder (and for making silage).



# Growing Maize for Fodder (Level 3)

## Land Preparation

- Good land preparation increases the yield and reduces cost of production of maize for fodder
- Good land preparation helps retain moisture in the soil. Moisture needs to trickle down to the subsoil slowly



# Growing Maize for Fodder (Level 3)

- Mechanical land preparation is a fast, effective and efficient method but care has to be taken not to damage the soil structure or negatively influence soil fertility



# Growing Maize for Fodder (Level 3)

## Land/Soil tillage

- Prepare the land well using machinery or by hand
- Mix crop residues with soil to avoid fungal infections
- If available, mix manure/compost with the soil
- Remove weeds before they flower to prevent them (weeds) from spreading new seeds
- Practice minimum tillage;
  - Minimum tillage prevents compaction of the soil
  - It also reduces soil erosion and cost of production
  - Minimum tillage helps maintain moisture in the soil, which then trickles down to the sub-soil
- Keep the seedbed not deeper than the planting depth of maize (2-4 cm)



*Tip: 2.5kgs – Good and fertile seedbed can be obtained by correct tillage*

# Growing Maize for Fodder (Level 3)

## Seed Selection

- To maximize yields, use certified hybrid seeds from a reliable and verified seed company
- Certified hybrid seeds are treated against diseases, have good germination rates and are high yielding. Seeds reused/farm retained maize seeds are more sensitive to diseases and pests and have a low yield per acre



# Growing Maize for Fodder (Level 3)



- Buy a good hybrid variety with good forage potential, low fibre content and high in starch
- Select a variety with good cob to stem ratio
- Stem should be low in fibre, should not be too long or too thick.





# Growing Maize for Fodder (Level 3)

## Planting

- Maize seeds should be planted on or just before the onset of long rains
- Distance in the row 18-20 cm. Then make furrows or holes in rows, 75 cm apart. Target target is to have 70,000 plants per ha (equals 7 plants per square meter)
- Planting depth should be is between 2-4 cm deep. For dry planting (when the soil is dry) the depth is 6cm
- Apply phosphatic fertilizer such as DAP or SSP or NPK during planting to stimulate uniform germination and growth in the early stage



Maize seed

Distance in the row  
(between seeds)

Maize seed

# Growing Maize for Fodder (Level 3)



## Mechanized planting

- If using a Planter, check the settings:
  - Fertilizer placement should be 5cm beside and below the seed
  - There should also be no blockage to prevent scorching of the seeds, ensure seeds are able to drop through the perforated plate and to ensure the correct seed rate is obtained.
  - Correct seed rate is critical to get the desired plant population, to avoid competition of plants for nutrients and ensure maximum yield per acre/hectare.

*Tip: Carry out Soil analysis. This helps you supplement the required amounts of nutrients at planting and top dressing as per the soil analysis results. It ensures that the amount of fertilizer supplied meets the deficit to avoid wastage of fertilizer and money in case of oversupply*

# Growing Maize for Fodder (Level 3)

## Fertilizer/Manure Application

### Total amount of fertilizer to apply

- Nitrogen (N), Phosphorus (P) and Potassium (K) are contained in manure, compost and/or inorganic fertilizers
- Use fertilizers/manures to ensure there are enough nutrients available in the soil to grow a healthy crop
- Fertilize the soil before planting and after harvesting.



# Growing Maize for Fodder (Level 3)

## i. Farmyard Manure (FYM)

- Farmyard manure is fertilizer from farm animals
- Cow manure contains 4% N, 0.7-1.5% P and 2.6-5.8% K in dry matter. N and P are essential for good germination of the maize plant
- Apply decomposed FYM directly before or after planting maize (into furrows)



# Growing Maize for Fodder (Level 3)



*Furrow for FYM*

- Make furrows no deeper than 10 cm next to the row of maize seeds.
- Pour farmyard manure in the furrows
- Cover the furrows with soil immediately to avoid Nitrogen losses through the air

# Growing Maize for Fodder (Level 3)

## ii. Inorganic fertilizer

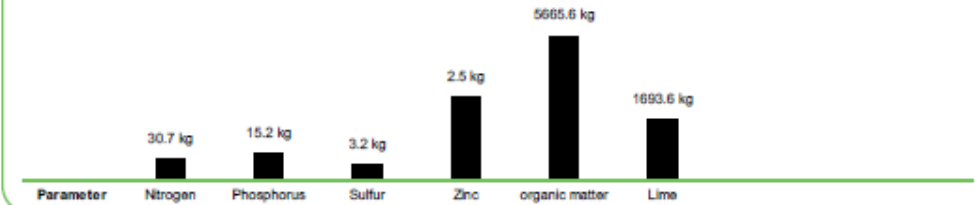
- Its advisable have soil analyzed first to make the right choice of fertilizer
- Soil sampling and testing helps assess soil fertility and know the specific inadequate nutrients
- Sample soil from your seedbed, send the collected sample for analyses and wait for results
- Follow the recommendations in the results to correct those nutrients with status low (deficient).



### General Information

Sample Number : AAASAD0002A18      Date : 2018-02-20      Field Name : FIT      Field Size : 5 acre      Soil Texture : Clay loam  
 Crop Name : maize      Target Yield : 3000 kg

### Actual Nutrient Need(in kg)



### Fertilizer Recommendations

	Activities	Instructions	Best Option	First Alternative	Second Alternative
1	Before Planting	If Available	1700 kg Agricultural Lime		
2	Before Planting	If Available	5666 kg Compost or Animal Manure		
3	At Planting	Place the fertilizer at the bottom of the planting holes, put 10 cm of soil on top, add the seed and cover the seed with soil.	112 kg Miv30:5:5 & 5M	51 kg Miv 12:34:10 & 5M and 61 kg urea	51 kg Miv 12:34:10 & 5M and 102 kg CAN

### Suitable Crop Types

Potatoes	Beans	Grains	Vegetables

Growing potatoes, grains, vegetables and beans on your soil is difficult. Improving your soil acidity should have your priority.

# Growing Maize for Fodder (Level 3)

- During planting, use DAP or NPK (23:23:0)
- Do not apply fertilizer directly on the maize seed as this will damage the maize seed. Make a separate furrow
- During top-dressing Use CAN (26:0:0) or Urea (46:0:0)
- Rate of application 50-75 kg per acre.



# Growing Maize for Fodder (Level 3)

## Soil improvement – from Soil analysis

- Depending on the soil analysis report the pH (acidity) of the soil may need to be corrected. This can be done through liming which increases the pH of the soil
- This makes soil more fertile and plants will be able to grow more vigorously and healthier
- Liming increases nutrient availability for optimum plant growth.





# Growing Maize for Fodder (Level 3)

## Weeding

- Weeding is important to control and avoid weeds competing with maize plants for nutrients. This allows the plants to optimize growth in early stages
- Inter-row hoeing (manual) and herbicides are mainly used for weed control

### i. Manual weeding

- Manual weeding can be done when maize is 5cm high
- First weeding is done between 20-30 days after planting
- Second weeding is done when the fourth leaf appears and/or the plant height is 12.5-15 cm
- Last weeding is done when the maize plants reach a height of 50-75 cm.



# Growing Maize for Fodder (Level 3)



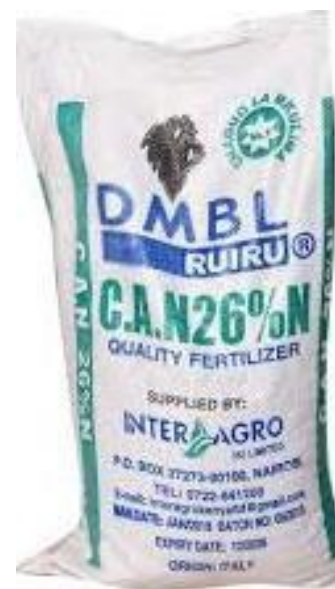
## ii. Chemical weeding – use of herbicides

- Herbicides can be used pre /before the maize germinates (we call this pre-emergence) instead of manual weeding
- Herbicides used post /after the maize has germinated are referred to as suitable to use for post emergence application

# Growing Maize for Fodder (Level 3)

## Fertilizer: Top Dressing (after weeding)

- Top dress using CAN (calcium ammonium nitrate) or Urea
- Apply small amounts close to each plant. Rate of application is 50 kg/acre (equals to  $50 * 27\% = 13.5$  kg pure N)
- Application should be done when maize plants are at knee height (45-60cm) and soil is moist enough to dissolve the fertilizer - preferably after some rain
- Top dressing stimulates tussling of maize plants and formation of cobs.



# Growing Maize for Fodder (Level 3)

## Crop protection in maize field

- Crop protection is done to:
  - maximise yields/production per acre
  - avoid contamination of silage by weeds
  - and to make harvesting of the crop by machines easier
  - Avoid losses through pest and disease attacks
- Use appropriate herbicides or pesticides in recommended concentrations. Apply correctly and under the right conditions



# Growing Maize for Fodder (Level 3)

## Pests in maize field

- Common pests in a maize field include:



Cut worm



Stem and stalk borer







Fall Army Worm

Control: Always monitor your field and apply pesticides



Pests in maize field Continued...

Insect or pest	Symptoms	Control methods	Stage
<p><b>Stem or leaf borer</b></p> 	<ul style="list-style-type: none"> <li>• Damage to leaf and stem</li> <li>• Tunnel in stem</li> </ul>	<ul style="list-style-type: none"> <li>• Use resistant varieties of maize</li> <li>• Plant desmodium in between</li> </ul>	<ul style="list-style-type: none"> <li>• Kneeheight</li> </ul>
<p><b>Fall army worm/earworm</b></p> 	<ul style="list-style-type: none"> <li>• Damage to tip of the cob</li> </ul>	<ul style="list-style-type: none"> <li>• Spray in the evening</li> <li>• Most active</li> </ul>	<ul style="list-style-type: none"> <li>• Two weeks after emergence</li> </ul>
<p><b>Rootworm beetle larvae</b></p> 	<ul style="list-style-type: none"> <li>• Damage to the roots</li> <li>• Wilting</li> </ul>	<ul style="list-style-type: none"> <li>• Insecticide</li> <li>• Crop rotation</li> </ul>	<ul style="list-style-type: none"> <li>• Directly after emergence</li> </ul>
<p><b>Larvae of maizehopper</b></p> 	<ul style="list-style-type: none"> <li>• White points</li> <li>• Wilting</li> </ul>	<ul style="list-style-type: none"> <li>• Chemical control</li> <li>• Detection of white spots on leaves</li> </ul>	<ul style="list-style-type: none"> <li>• Kneeheight</li> </ul>

# Growing Maize for Fodder (Level 3)

## Diseases in a maize field



### Maize Lethal Necrosis

Seed-borne

Yellowing/dying of leaves



### Head Smut

Soil borne






Penetrates seedlings and grows inside with no visible symptoms until tasseling



### Ear Rot

Ears appear chaffy with a white, cottony growth between the kernels

## Diseases in maize field Continued...

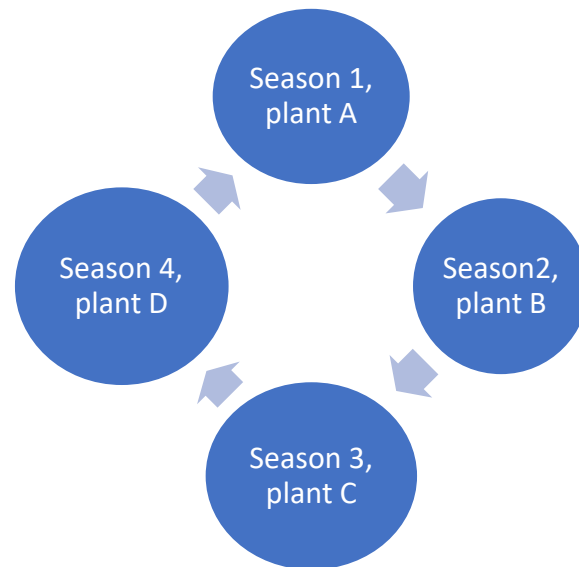
Disease	Caused by	Symptoms	Control methods	Stage
<b>Head smut disease</b> 	Fungus	<ul style="list-style-type: none"> <li>• Large, distorted tumors</li> <li>• Scorched appearance</li> </ul>	<ul style="list-style-type: none"> <li>• Deep tillage</li> <li>• Balanced fertilization</li> <li>• Avoid damage to the plant</li> <li>• Use certified seeds</li> <li>• Burn infected plants</li> </ul>	<ul style="list-style-type: none"> <li>• When tassels and cobs appear</li> </ul>
<b>Maize Rust</b> 	Fungus	<ul style="list-style-type: none"> <li>• Rusty pustules on leaves and upper parts</li> </ul>	<ul style="list-style-type: none"> <li>• Use disease – tolerant varieties</li> <li>• Remove and burn sick plants</li> <li>• Repeat every 10 days till flowering</li> </ul>	<ul style="list-style-type: none"> <li>• When pustules appear</li> </ul>
<b>Leaf blight &amp; stalk rot</b> 	Fungus	<ul style="list-style-type: none"> <li>• Poor kernel growth</li> <li>• Weakened stalk</li> <li>• Black pustules</li> </ul>	<ul style="list-style-type: none"> <li>• Use resistant varieties</li> <li>• Rotate crops</li> <li>• Control of insect and weeds</li> <li>• Sufficient N&amp;P dosage</li> </ul>	<ul style="list-style-type: none"> <li>• When tasseling</li> <li>• 70 days after emergence</li> </ul>
<b>Fusarium stalk rot</b> 	Fungus	<ul style="list-style-type: none"> <li>• Lesions</li> <li>• Dark patches</li> <li>• Inside of stem starts rotting (pink color)</li> </ul>	<ul style="list-style-type: none"> <li>• Use tolerant varieties</li> <li>• Used treated seed</li> <li>• Plough the land, no plant rests and maize stems</li> <li>• Crop rotation</li> <li>• Less irrigation during flowering</li> </ul>	<ul style="list-style-type: none"> <li>• 63-70 days after emergence</li> </ul>
<b>Maize streak virus</b> 	Virus	<ul style="list-style-type: none"> <li>• White stripes on leaves</li> <li>• 30-50 days after emergence</li> </ul>	<ul style="list-style-type: none"> <li>• Tear up infected plants before flowering</li> <li>• Use tolerant varieties</li> </ul>	<ul style="list-style-type: none"> <li>• 63 days after emergence</li> </ul>



# Growing Maize for Fodder (Level 3)

## Pest and disease control

- To prevent or control pests and diseases in a maize field:
  - Always use certified seeds
  - Check frequently (every week) for damage or insects
  - Practice crop rotation
  - Mix crop residues with soil to encourage decomposition

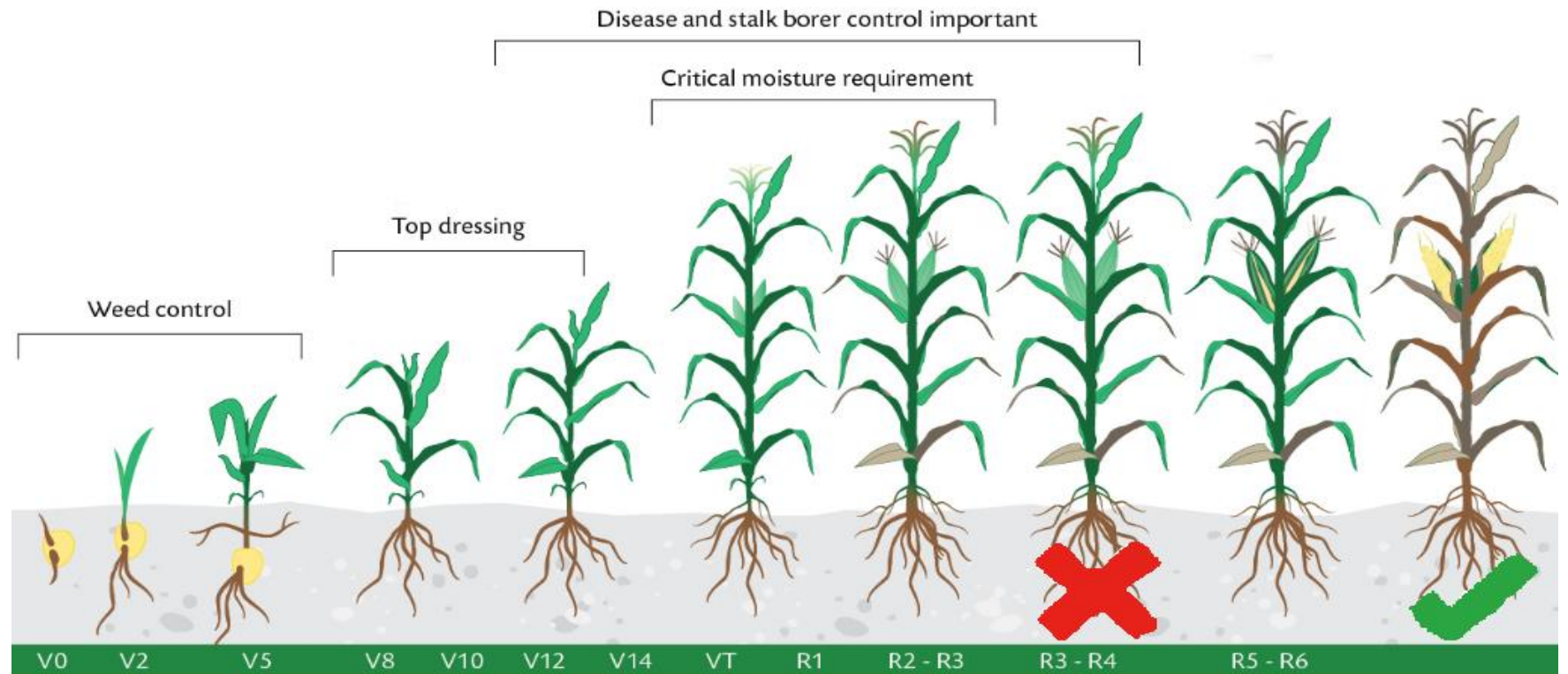


# Growing Maize for Fodder (Level 3)

## Harvesting

- Maize is ready for harvesting for ensiling (silage making) at dough ripe stage
- Stage R3-R4 is milk stage - not for harvesting since the kernel is not hard enough

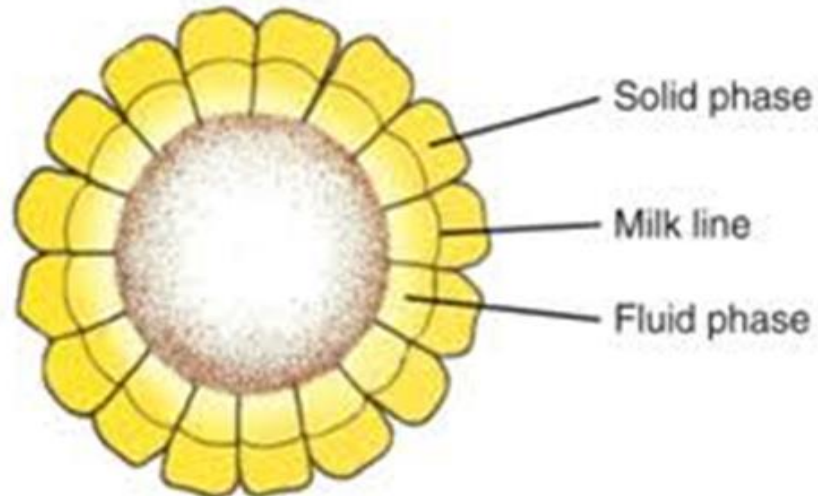
- Harvesting is done using a harvester



# Growing Maize for Fodder (Level 3)

Factors to consider before harvesting:

- The most accurate method of deciding when to harvest is by determining dry matter (DM) content of samples of the whole maize plant. Aim at 30-35% dry matter (DM) level of the whole crop to maximize starch and Metabolizable Energy (ME) levels



# Growing Maize for Fodder (Level 3)

- Kernel should be at dough ripe stage i.e. 160 days (long season maize variety). If using machines, ensure it has a well-functioning kernel crusher to crash the kernels properly
- Aim at high starch content (at least 30%) or at higher/longer stubble length of 30-40 cm improves digestibility and energy content hence better quality silage



*Maize stubble*

*Corn kernels*



# Growing Maize for Fodder (Level 3)

**Do it Yourself:** One can do a simple test to see if starch is present in the chopped material and if kernel is properly processed

- Take a basin filled with water and fill a separate jar (1 litre) with the chopped material. Pour the chopped material into the basin with water. You will notice the starch in the material sink to the bottom while the chopped material (leaves and stem) remain float. This will give an impression if the crop was harvested at a stage where starch is present and if the kernel was processed sufficiently (kernels or its parts if not crushed, would sink to the bottom)



# Growing Maize for Fodder (Level 3)

## Take Home Messages



1. Prepare well the land for growing maize for fodder and use certified seeds when planting
2. It is advisable have soil analyzed first to make the right choice of fertilizer
3. Always monitor your field for any pests or disease attacks
4. Maize is ready for harvesting for ensiling (silage making) at dough ripe stage