



For Professional Dairy Farmers

Module 9

GROWING AND HARVESTING OF FODDER MAIZE



Module maize 1: Growing maize for fodder

Module maize 1 & 2: Growing, harvesting and ensiling fodder maize

Module 1 Growing forage maize

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These modules have been developed through a collaboration between

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Program

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Module maize 1: Growing maize for fodder

CHAPTER 1. Prepare the land for planting

What to do?

Land is free from weeds and stones.

Crop residues are mixed with the soil and land is levelled.

Manure is spread out before planting

What do you need?

- **Jembe**
- **Knowledge of certified maize seeds**
- **Fork jembe**

Maintaining and improving fertility of your land

A good and fertile seedbed can be obtained by correct tillage

- Mixing crop residues with soil to avoid moulds
- Minimum tillage prevents compaction of the soil which gives less soil erosion
- **Reduces cost of production**
- Minimum tillage keeps moisture in the soil and allows moisture to trickle down in the subsoil
- Weeds have to be removed before flowering, this prevents the weeds from spreading new seeds on the shamba
- When using farm machinery: disturb the soil as little as possible
- Creates a suitable pH for growing maize/other crops (target pH of 6-7)
- If necessary, pH can be increased using lime
- The seedbed should be no deeper than the planting depth (2-4cm)
- Finish the seedbed in time before the rainy season starts
- Plant the maize in moist soil once the rains have started
- All the above actions increase fertility of your land
- It is the best start for successful forage maize production

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A. Preparing the shamba

- Remove stones, tree stumps and other obstacles from the shamba
- Make the shamba free from weeds
- Turn the soil over with a jembe
- When digging manually a depth of 10-15 cm is enough
- Mix crop and plant residues and manure/comp with the soil
- Cultivate and level with a fork hoe
- Seed germination and maize growth is stimulated with good land preparation



B. Seed selection

- Buy a good hybrid maize variety with forage potential: low fibre, high in starch
- Select a variety with a good cob/stem ratio
- Stem is high in fibre, should not be too long and too thick
- At least 2 cobs in dough ripe stage
- Certified hybrid maize seeds are treated against diseases, have good germination and are high yielding
- Farm retained seeds: more sensitive to diseases and pests and low yield/acre



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CHAPTER 2. PLANTING

What to do?

On a well prepared shamba plant the desired number of maize seeds (e.g. 1 acre per cow)

What do you need?

- Jembe
- Hybrid maize seeds
- Fork hoe
- Fertilizer DAP or NPK 23:23
- Planting rope
- Measuring tape
- Bucket for carrying manure

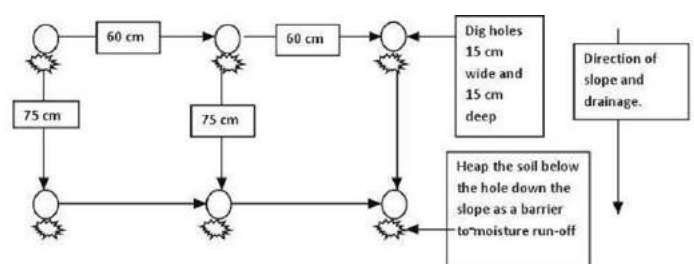
A. Preparation

- Make furrows or holes of 2 – 4cm deep
- Space between the rows 75cm
- Distance in the row 18 – 20cm
- To stimulate uniform growth



B. Planting maize

- Recommendations are meant for fodder maize
- Planting depth is 4-6cm. Normally 4 cm.
- If the soil is still dry, also called *dry planting*, up to 6 cm deep
- In rows: 18 – 20cm in the row
- This is the same as 30.000 – 26.000 seeds per acre
- Planting in holes: measure 60cm between the holes
- Planting in rows: measure 75cm between the rows
- Planting on hills: 1-2 seeds per hill
- Apply DAP fertilizer at 1.5 bag/acre.
- If other fertilizers (SSP, NPK) are used at



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planting, different rates apply

- To ensure maximum yield per acre

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Chapter 3. Fertilization

What to do?

Apply organic and inorganic fertilizer to ensure enough nutrients for fast and healthy growth of the maize crop

What do you need?

- Lime if necessary
- Farmyard manure
- DAP/NPK
- CAN/UREA

A. Mix farm yard manure with the soil

- Farm yard manure is organic fertilizer from farm animals
- Cow manure contains 4%N, 1.5%P and 5.8%K in the dry matter
- N(nitrogen) & P(phosphor) are essential for germinating maize plants
- Fresh cow manure is 91.5% water (8.5% dry matter)
- Apply directly before or after planting the maize
- Make furrows no deeper than 10cm next to the row of maize seeds
- Pour manure with a bucket in the furrows
- Cover with soil directly to avoid Nitrogen losses through the air

B. Apply fertilizer

- Inorganic fertilizer bought from shops (agro-vets)
 - DAP/NPK at planting
 - CAN 26% / UREA 46% top dressing
- At 50kg-75kg /acre



C. Total fertilizer

- N, P and K comes from manure and fertilizer
- Use fertilizer to ensure there are enough nutrients available in the soil before and after harvesting
- Use fertilizer to ensure the soil has always enough nutrients and stays healthy

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D. Soil improvements

- Lime to increase pH in acidic soils
- Use Limestone or calcium carbonate
- 2 kinds of limestone:
 - Dolomitic: Contains both magnesium and calcium
 - Calcitic: Contains only calcium
- Better plant growth

Amounts needed can be known after soil testing

E. Soil testing

- This can be done additionally
- Added costs but soil testing has the potential to increase yield / ha
- Gives specific fertilizer recommendation for every shamba

Field: Field A		Top 50		Fertilizer Recommendation	
Element	Unit	Result	Quick Test	Field Edge	Unit
pH (0-10)		4.48	5.08	5.80	
NO ₃ -N	kg/ha	44.4		4.80	
Phosphorus	ppm	4.96	40.8	18.0	
Potassium	ppm	8.27	120		
Calcium	ppm	10.9	17.50	37.40	
Magnesium	ppm	27.1	18.8	27.0	
Sulfur	ppm	24.7	30.8	18.0	
Silicon	ppm	13.1		<147	
Iron	ppm	75.4	20.8	18.0	
Zinc	ppm	92.8	20.8	28.0	
Boron	ppm	16.0	0.8	2.80	
Copper	ppm	1.85	0.50	30.0	
Zinc	ppm	2.81	1.00	20.0	
C:N Ratio	(range 18-30)	14.0	15.0	30.0	
Total Nitrogen	%	0.38	0.20	0.20	
Organic Matter	%	4.96	0.18	4.80	
N:O ₃ -N		88.8	38.8	25.0	

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CHAPTER 4. CROP MANAGEMENT

What to do?

- Regularly inspect for diseases and insect pests
- Regular weeding
- Topdressing

What do you need?

- Jembe
- Fork hoe
- Good observation skills



Why? It is important for a healthy crop and quality maize silage

A. Pest control

- Always use certified seeds
- Check every week for damage or insects
- Prevent pests and diseases by crop rotation
- Prevention by no crop residues left on the field (good tillage)





B. Weed control

- Inter-row hoeing and herbicides are the mainly used for weed control
- Weed with a hoe once the maize has emerged
- First weeding within 25-30 days after planting
- Second weeding when 3-4 leaves appear of the maize (height 12,5 – 15 cm)
- Last weeding when the maize plants reach a height of 50-75 cm
- Herbicides can be used instead of weeding before the maize germinates (pre-emergence)
- To avoid weeds competing with maize for nutrients
- To optimize growth in early stages







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C. Harmful insects and pests


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

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D. Diseases

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

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<p>Maize streak virus</p> 	<p>Virus</p>	<ul style="list-style-type: none"> • White stripes on leaves • 30-50 days after emergence 	<ul style="list-style-type: none"> • Tear up infected plants before flowering • Use tolerant varieties 	<ul style="list-style-type: none"> • 63 days after emergence
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<p>Others pests and diseases</p>	<ul style="list-style-type: none"> • Leaf blight • Damage to leaves • Wilting 	<ul style="list-style-type: none"> • Chemical fungicides • Insecticides 	<ul style="list-style-type: none"> • After emergence • Kneeheight
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E. Topdressing

- Maize is at knee height 45-60cm
- Use CAN (26% or 27%) / UREA 46% or NPK 21:21
- Apply small amounts around each plant and cover with soil
- When the soil is moist
- Apply 1 bag of fertilizer per acre
- Apply 32kg of UREA per acre and cover with a little bit of soil
- Topdressing will stimulate tasseling of maize and formation of cob



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ANNEX

GROWING MAIZE FOR FODDER WORKSHEET

Purpose of the worksheet: a) Look; see, hear, feel and smell everything. b) Think; what are the causes. c) Act; what is good what has to be improved and what should done.

Examples

- a) How much maize silage do you need for your cows
- b) Calculate the costs of production of maize silage
- c) Make a planning for growing fodder maize

1. Your herd

- a) Number of animals
- b) Lactating cows
- c) Heifers
- d) Dry cows

2. Feeding

- a) No. of days per year that you feed maize silage (kg/week)
- b) Kg maize per animal per day
- c) How much fodder maize in tonnes do you need to produce?
- d) Digestibility of the maize kernels (check in dung for kernels)
- e) Milk production when feeding maize silage

3. Land

- a) Acres of land for fodder production
- b) How much land do you have available for growing fodder maize?
- c) How fertile is your land?
- d) If you lease land: what is the price you pay per acre?
- e) If you can rent out land: what is the price you get per acre?

4. Production

- a) Estimated production in kg per acre (YOUR GOAL):
- b) Is there enough water during growing period for the maize crop?
- c) What do you do when there is too little rain?
- d) What do you do when there is too much rain?
- e) Stage at harvesting

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5. Costs

- a) Costs of making silage
- b) Land lease/acre
- c) Manure and fertilizer
- d) Pesticides and insecticides
- e) Seeds
- f) Labour
- g) Plastic for silage
- h) Hiring machines (chopper, harvester, truck/lorry) or contractor
- i) Transport
- j) What is the milk income per month
- k) Calculate the feeding cost of maize silage
- l) Subtract the costs from your milk income

6. Planning

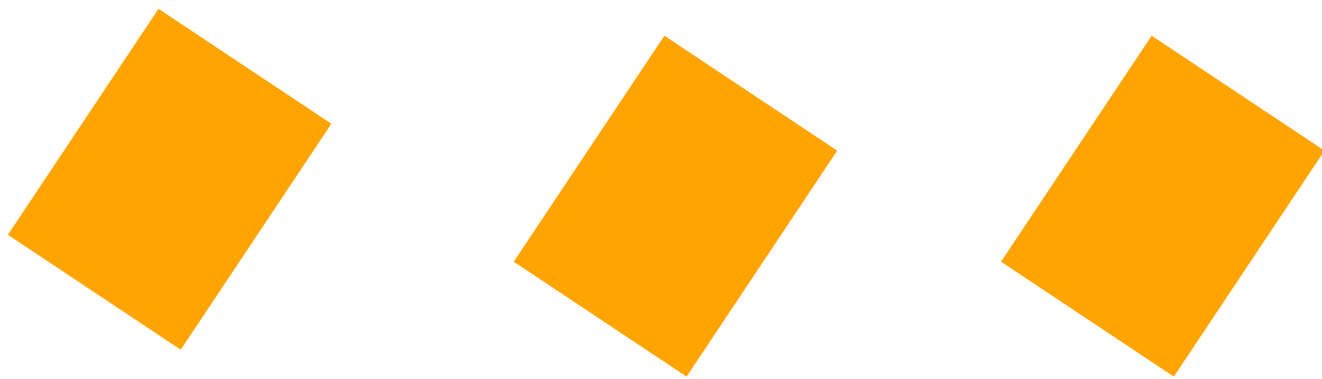
- a) What do you need: Jembe, Fork hoe, seeds, fertilizer
- b) Make a lists of tasks, from beginning until harvesting, including evaluation at 8 weeks after harvesting

7. Maize silage

- a) Height, width and depth of maize pit
- b) Polythene plastic sheet needed: [thickness in mm)
- c) Size of plastic sheet needed (dimensions)
- d) How long can this silage be fed (months)

8. Improvements

- a) What can be done differently next time?
- b) What was difficult?
- c) What was easy?



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