



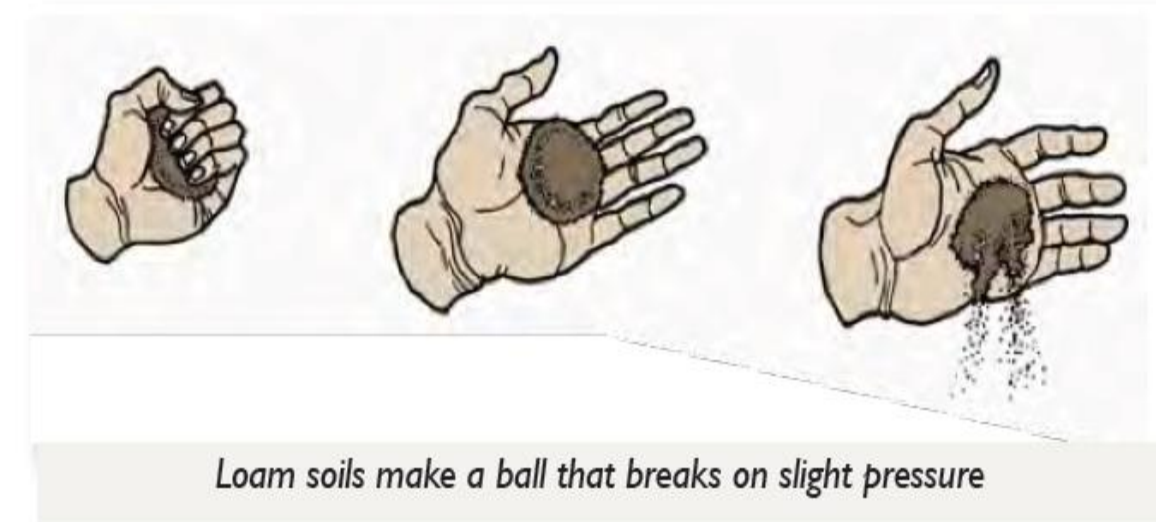
M & A's GREENERY LTD

# A GUIDE TO MAIZE PRODUCTION



# SELECTION OF SITE FOR MAIZE PRODUCTION

- With proper soil management, maize can be grown on a wide range of soils of different texture (from sandy to clay) and color ( grey, brown, red and black)
- But the most preferable soil type is deep, loamy, well drained fertile soil





# CHOICE OF SUITABLE MAIZE VARIETY

- There are 3 categories of maize varieties in Nigeria: Traditional Open Pollinated Varieties - OPVs, Improved OPVs and Hybrids
- Improved OPVs are higher yielding than traditional varieties; farmers are advised to get improved seed from reputable seed companies
- ***Hybrid varieties under good management yield more than OPVs; however, hybrid seed has to be bought every season***
- ***Recycling hybrid seed reduces yield potential***



Most of the Improved seeds are resistant to most pests and diseases with uniform growth

# CRITERIA FOR VARIETY SELECTION

- a) **Adaptability and yield potential:** A farmer should select a variety that is adaptable to the prevailing production conditions but at the same time gives yield that measures up to the potential of the variety
- b) **Resistance to Pests and Diseases:** A wide range of pests and diseases will attack the maize at the different stages of its growth cycle; a farmer therefore, should select a variety that can tolerate both pests and diseases attack
- c) **Length of Growing Season:** The length of the growing season of varieties plays an important role, especially when there is unpredictable variation in the amount and distribution of rainfall; hence farmers should use varieties that have early maturity period and drought tolerant



*Farmer buying improved seed from a certified stockist*

## COMMONLY AVAILABLE OPEN POLLINATED AND HYBRID MAIZE VARIETIES

SN	VARIETY	LINES	DAYS TO MATURITY	STRESS TOLERANCE	POTENTIAL YIELD
1	Sammaz 14 (QPM)	OPV	106 - 110	-	6 tons/ha
2	Sammaz 15	OPV	110 - 120	Striga (NGS)	7 tons/ha
3	MM1155	OPV	110	Striga (NGS)	6.9 tons/ha
4	MM1395	OPV	100	Drought	6.5 tons/ha
5	Sammaz 34	OPV	80	Drought	4 tons/ha
6	Sammaz 27	OPV	90	Drought and Striga (SS)	5.5 tons/ha
7	Oba Supa 1	HYBRID	90 - 110	Striga and MSV	4 -6 tons/ha
8	Sammaz 50	HYBRID	90 - 110	Striga and Drought (NGS)	9.3 tons/ha
9	VSL 2065	HYBRID	80-85	Drought (SS)	6 tons/ha
10	Oba Supa 6 (Pro Vitamin A)	HYBRID	100 - 105	Major Pests and disease	6 – 8 tons/ha

# FEATURES OF A QUALITY MAIZE SEED

- Uniformity
- High germination rate > 85%
- Well dried to 13% moisture content
- Purity 98%: Ensure all seeds are of the same variety
- Clean: not mixed with foreign matter like stones or dirt, or other seeds
- Not damaged, broken, shrivelled, mouldy, or insect damaged
- Not rotten or discoloured





# LAND PREPARATION

- Land preparation involves bush clearing, removal of tree stumps, termite mounds, and ploughing
- Maize requires warm and moist soil, well supplied with air, fine enough to allow rapid germination of the seeds and proper growth of roots to absorb the available soil nutrients
- Land preparation should begin at least three weeks (21 days) before planting to allow breakdown of organic matter



*Bush Slashing*



- a) The **hand hoe** is the most commonly used equipment by small holder farmers though it is slow and labor intensive
- b) **Animal traction:** This involves the use oxen to plough land, although it is not suitable under heavy soils and steep terrain

This method is the most appropriate, affordable, reliable and proven technology for small and medium scale farmers



*Animal traction*



c) Conventional **tractors** open extensive land for commercial farming

d) **Walking tractors** (power tillers) can be used by small and medium scale farmers

e) To control early season weeds spray non-selective herbicide; Glyphosate @ 2 – 4 l/ha 2 weeks before sowing



Tractor ploughing



# ORGANIC MANURE OR COMPOST APPLICATION

- Maize is a heavy feeder for plant nutrients, therefore, there is the need for addition of organic manure during land preparation
- It is best to apply the manure just before land preparation for ease of mixing and incorporation into the soil
- Cured manures like compost may be applied at planting due to high amount of available plant nutrient





# SOWING OF MAIZE

- Sowing should be done on the onset of rains
- Farmers should avoid late planting since it leads to increased incidences of pest and disease attacks hence reduced yields

**Maize should be sown as soon as rains are established**

- **The seed rate** is 17 –20kg/ha (one seed per hole)
- **Spacing** is 25cm between stands
- Thin to 1 plant per stand at 2 WAS where you observe more than one plant
- **Gap filling** at 2 WAS
- Apply **a pre-emergence herbicide** immediately after sowing, not later than 2 days after sowing. **Attrazine** based herbicide is recommended at 3 – 4L per ha.





# FERTILIZER APPLICATION

- Blanket recommendation of **120:60:60** (120kg N, 60kg P<sub>2</sub>O<sub>5</sub>, 60kg K<sub>2</sub>O)
  - ✓ 1<sup>st</sup> application of N with P and K using NPK **applied at sowing**
  - ✓ 2<sup>nd</sup> application of N using Urea **applied at Knee high** or 4- 5 WAS and earthen up.

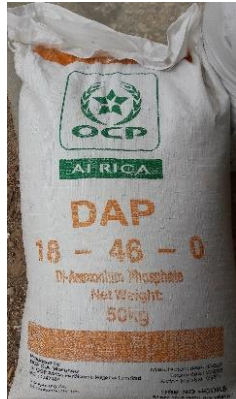
# USING NPK, DAP AND UREA. (1<sup>st</sup> application and 2nd application)



8 BAGS



2 BAGS



3 BAGS DAP



4 BAGS  
UREA

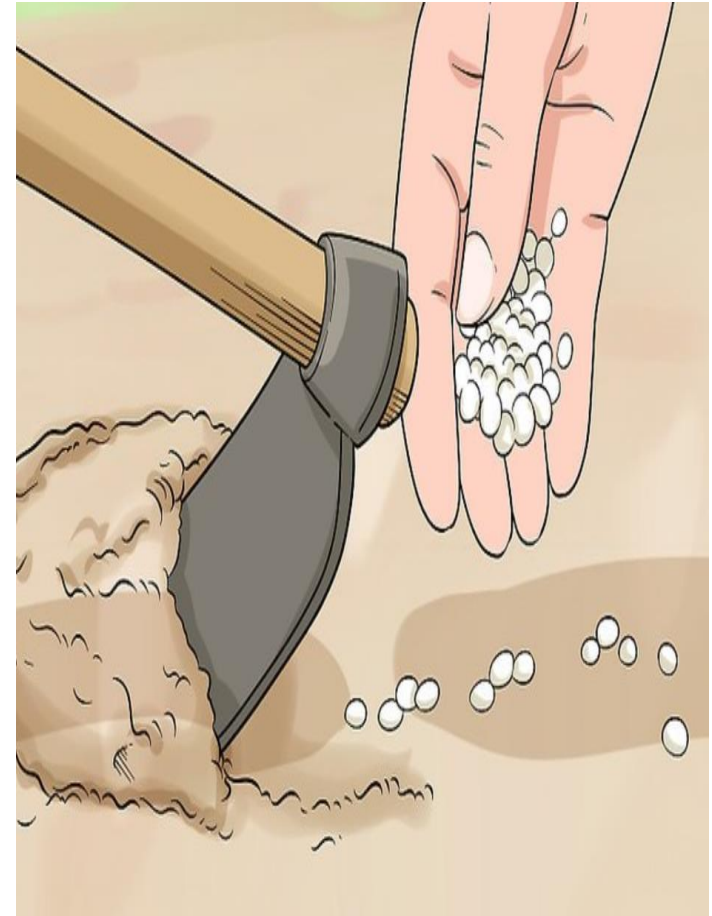


8 BAGS NPK  
15:15:15



3 BAGS  
UREA

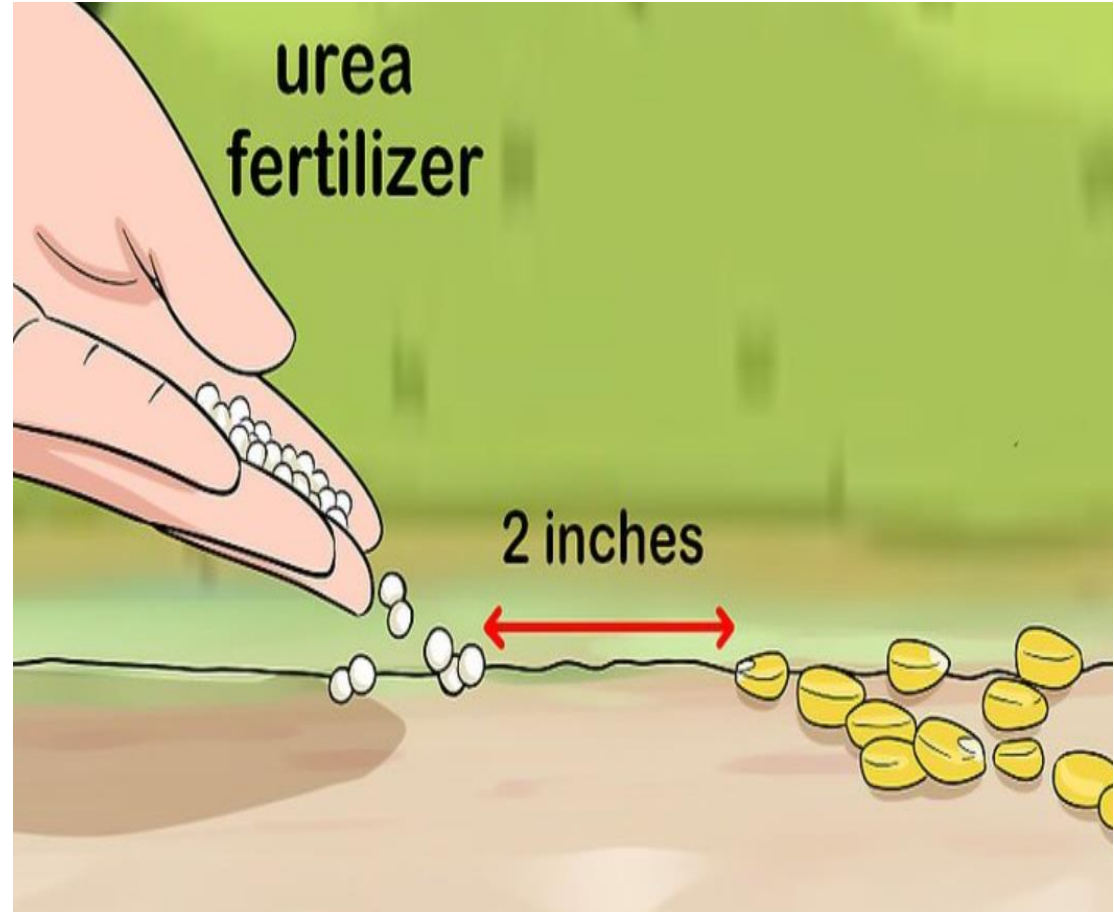
# FERTILIZER APPLICATION METHODS



CORRECT



- ***Always bury fertilizer at some distance from the seed, under high temperature fertilizers will affect germination of the seed***



# WEED MANAGEMENT

- Weeds reduce yield by competing with the maize crop for minerals, light and moisture especially during the early stages of crop growth
- Some weeds are alternative hosts of pests and diseases
- Some weeds are parasitic and poisonous to maize e.g. *Striga* weeds
- A thick growth of weeds in maize makes harvesting difficult



Maize suffocated by weeds



maize well weeded





- The period between emergence and tasseling (6 – 8 WAS) is the most critical period for weed competition in maize
  - **Keep maize farm free of weeds at this period**
- **Earthen up at knee high** after top dressing with urea. It is another form of weed management.





# *Striga* Control

- Control of *Striga* infestations is difficult because so much of the plant's life cycle is underground
- Also the long dormancy period of seeds makes total eradication very difficult
- Commonly used methods include:
  - ✓ Hand weeding and roguing
  - ✓ Seed cleaning
  - ✓ Chemical control
  - ✓ Intercropping with “trap” crops (plants that trigger *Striga* germination but *Striga* can't infect them, so the seedlings die e.g. Soybean
  - ✓ **Suicidal germination** - where ethylene is pumped into the soil before crop sowing to induce the germination of the *Striga* seeds in the absence of the host
  - ✓ Use of resistant crop varieties



# INSECT PESTS MANAGEMENT

- Insecticides can be applied to the crop at early larval stages if infestation levels are high especially for fall army worm
- However, application of insecticides is ineffective once larvae are mature as most crop damage has been completed
- Insecticide application is most effective in the early evening or under overcast conditions when larvae are feeding and therefore exposed
- Insecticides can be selectively applied to field margins to create a barrier to migrating larvae



# Physical Control of Army worm

- Inspect the field frequently for presence of eggs, and young larvae
- Remove all crop residues right after harvesting
- Timely sowing
- Deep plough the soils to bury the larvae and pupae
- At larval stage, inspections should include the soil around plants and under crop debris where larvae hide during the day
- High bird presence in the field may reflect heavy armyworm infestation
- Monitoring is particularly important following herbicide application as larvae are then forced to infest maize plants
- Field edges should be monitored for migrating masses of larvae
- Control should commence when most of the plants have one larva or 25 to 30% of the plants have two or more larvae
- Plough a deep ditch with steep edges or filled with water or insecticide can form a physical barrier to migrating larvae





# Chemical Control of Army Worm

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# Maize Grain Weevil

- Infest stored grain or maize ears before harvest
- The larvae develop into pupae inside the kernel
- **Signs**
  - ✓ Removal of husks in the field will reveal weevils and the irregular punctures they make in kernels during feeding or egg laying
  - ✓ In kernels dislodged from the cob, one can readily observe thread-like galleries made by the legless, stout, whitish grubs as they feed inside the kernels

## Control

- Farm sanitation
- Insecticide / storage fumigants
- Good storage



# DISEASE MANAGEMENT



Maize Rust:

Practice crop rotation

Spray with copper-based fungicides



Ear Rot:

Reduce the infestation of stem borers and the fall army worm



Maize Smut:

Uproot and burn infected crops

Plant resistant varieties



Maize Streak Virus:

Uproot and destroy infected plants

Use resistant varieties



# Aflatoxin

- Aflatoxin contamination of maize grain have two major effects
  - Firstly, eating contaminated food has several harmful health effects and
  - Secondly, aflatoxin contamination affects the quality of the grain which leads to reduced markets for contaminated grains
- Pre-harvest contamination in maize mostly occurs when there is a damage due to pest attack
- Attack also occur during harvest mostly because of drying cobs on bare ground, allowing easy pick up of the fungus from the soil to storage facilities
- Storage of poorly dried cobs exposes them to excessive moisture and humidity and these are preconditions that support fungal infection



# Control of Aflatoxin Contamination

- Using appropriate insect management techniques will reduce formation of holes and damage to the cobs which, in turn, will reduce the entry points for the fungus
- A single application of Aflasafe two to three weeks before maize flowering (30 DAS) can prevent aflatoxin contamination throughout, even when grains are stored
- After harvesting, cobs should not be left to dry in the field on bare soil, where they can easily pick up soil-borne fungus
- It is advised that cobs should be dried on polyethylene sheets laid on the ground
- Damaged cobs should not be mixed with healthy ones to reduce spread of spores and subsequent infection
- Maize cobs should not be heaped in stores but rather packed in a clean, sealed container to avoid exposure to excessive moisture and humidity.

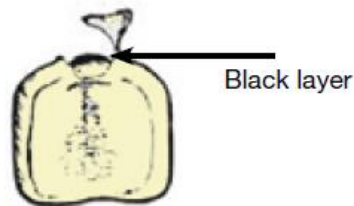


# HARVESTING

- Maize is harvested at different physiological stages depending on the intended use
- When it is for fresh eating, it is harvested when the cob is green and the grains are beginning to harden
- When it is meant for grain, it is harvested when it has dried and achieved full physiological maturity



*Mature maize crop with some drooping cobs*



*Mature maize grain showing black layer beneath the tip (that has been removed)*





# QUALITY CONTROL MEASURES DURING HARVESTING

- Harvest grains when they are physiologically matured
- Harvest on time
- Use clean containers/bags to collect the cobs during harvesting
- Collect the cobs in the farm on a tarpaulin or mat



*Machines harvesting of maize*



Harvest on time, when the crop is mature - some cobs start to droop; bean pods turn yellow.



Harvest mature cereals or beans on a sunny day and place on a mat, tarpaulin or in sacks.



If rain delays the maize harvest, then prevent water from entering the cobs by turning the cobs down.



As soon as possible transport crops from field to the homestead for further drying.



# DRYING OF MAIZE



*Poor drying practice*



*Drying maize by hanging*



*Drying maize on tarpulin (a tick)*



*Drying maize using collapsible driers*



*Drying of maize in a crib*



*Turning maize for uniform drying*



# METHODS OF SHELLING

- **Manual Sheller:** It is carried out using hand and peddle operated sheller
- For the machine to perform optimally, the maize should be dry (13-14% MC)
- It is a low capacity tool used by the farmers that have very low volumes
- **Motorized Maize Shellers:** They are powered by electrical mortars
- They are stationed or mobile, imported or fabricated within the country
- They can shell between 800kg – 3000kg per hour
- The mobile maize shellers have been designed to ease issues of accessibility



*Manual shellers*



*Locally fabricated Non mobile motorised  
maize sheller*



*Mobile motorised maize sheller*

# METHODS OF CHECKING MOISTURE CONTENT FOR PROPER STORAGE



*Biting the grain with teeth*



*Deeping the hand into the grain*



- Pushing the hand into grain bulk: wet grain offers more resistance to penetration than dry grain
- In addition, grain with high moisture content has high temperatures in the middle due to high metabolic rate while grain with optimum moisture content is cold in the middle
- Biting with teeth: dry maize grain is hard and cracks when you bite with teeth, while grain with high moisture content is soft, the teeth penetrates when you try to bite

## Salt method:

- Take a small sample of the maize grain mixed with dry salt, put it a clean dry jar, shake it vigorously for several minutes and allow it to settle
- If salt becomes wet and sticks on the wall of the jar, then the grain has high moisture content above 15% and therefore it needs to be dried further

# STORAGE

- Various storage technologies (traditional and modern) can be used by smallholder farmers to store maize grain and these include; mud house, jute bags, warehouse, etc
- Traditional technologies cannot keep grain over a long period of time
- The type of storage facility will depend on construction materials available in the locality, the expertise in construction, available financial resources, the quantity of maize to be stored, the desired storage period and general weather conditions
- Where big volumes of produce are required to be stored, a grain store/bulking centre/warehouse is used, and good storage management practices are required to ensure grain quality



# STORAGE



*Traditional (granaries) storage facilities*



*Warehouse and silos for storage of big volumes*

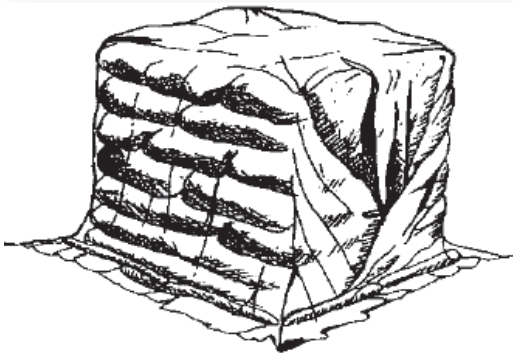


*Stacking of produce on pallets*

# GOOD STORAGE PRACTICES

It is important to inspect the internal and external areas of the store:

- Regularly check the store for signs of water leakage, the floor for cracks and crevices, for signs of damage on bags (rodent or insect) spillage of grain on the floor, presence of live insects and signs of contamination
- Always inspect the surrounding environment to ensure hygiene
- Carry out quality control checks on a regular schedule
- Fumigate to control infestation of storage insects
- Use a licensed professional fumigator
- Ensure FIFO (first in first out) rule when handling stock in storage



*Covered produce*



*Repairing the storage facility*

