

**Annex II**  
**Agricultural Training Topics**

**NGGL AHAFO SOUTH PROJECT  
AGRICULTURAL IMPROVEMENT AND LAND ACCESS PROGRAM**

**FOOD CROP EXTENSION SERVICES**

**MAIZE**

**CASSAVA**

**PLANTAIN**

# PLANTAIN

## PRODUCTION

### GUIDE

PREPARED BY:  
AILAP TEAM

FOR FURTHER INFORMATION  
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#### ENVIRONMENTAL REQUIREMENTS

##### SOIL TYPE

- Soils with good drainage
- Soils with high organic matter content and also that can hold water.
- Loamy or silty-clay loamy soils are recommended.

##### RAINFALL REQUIREMENT

Annual rainfall of not below 1300mm well distributed throughout the year is good for plantain cultivation. Thus the crop does well in hot, humid forest areas

##### AREAS OF PRODUCTION IN GHANA

Forest areas of Central, Volta and Western regions, Brong Ahafo, Ashanti and Eastern regions.

##### COMMON VARIETIES

- False Horne Plantain (Apentu); 2.5-5m high, 5-8 hands per bunch, 18-40 fingers
- French Plantain (Apem); 3-3.5m, 10 hands per bunch, 60 fingers.

Above are recommended for planting.

#### LAND PREPARATION

Land preparation should start from the month of February. The land is cleared, packed and practice control burning. Zero tillage could also be practiced.

#### PLANTING

- Plant on the onset of the rains from April.
- Shallow planting should be avoided as it leads to wind damage.
- Lining is important to ensure that the crops are established in rows for good aeration and other activities on the farm.

#### PLANTING MATERIAL

The suckers should be cleaned by removing red, brown or black discolorations (paring). They should be selected from good and healthy plant. The roots must also be treated with insecticides by dipping into nematicides e.g. Furadan for about 5 minutes before planting. Treatment of suckers can also be done with ash.

Recommended spacing is 3m by 3m or 10ft by 10ft

## **MANURE AND FERTILIZER REQUIREMENT**

Thick mulching is important to retain moisture for leaf production. Hanging leaves and old stems may be cut down to serve as mulch.

- Inorganic fertilizer may not be necessary for properly mulched plantain farm.
- The recommended fertilizer is NPKmg. It may be applied in a ratio of 2:1:3:1.
- Fertilizers should be applied in small (split) doses of 1 month, 3 months and 6-8 months after planting. It should be applied in drill round the plant.

## **MAINTENANCE**

Dead stands should be replanted two months after planting. Adequate support is needed to prevent wind damage.

## **DESUCKERING**

- During shooting only one or two suckers should be allowed.
- Extra suckers should be removed, leaving the healthy ones.

## **TRASHING**

- Remove old, dead leaves which hang around the plant. That can serve as mulch on the farm.

- Regular weeding is important especially at the flower
- initiation and bulking period to avoid competition and to promote yield.

## **HARVESTING**

- Plantain matures between 12-18 months depending on the variety. Sharp edges show immaturity. The fingers are harvested when full.

## **PESTS**

### **Nematodes**

They feed on the plant especially on the rooting system and suckers causing considerable damage and yield reduction.

Control Nematodes as follows:

- Dip plants (suckers) into nematicides e.g Furan for 5 minutes before planting.
- Practice crop rotation.

## **DISEASES**

The common diseases of plantain are Sigatoka or Leaf Spot and Panama disease.

### **Sigatoka**

This is a fungal disease caused by *cercospora musae*

Signs include the following:

- Yellow or brown spots appear on the leaves.
- The leaf tissue dies and decays.
- Prevalent in areas of frequent rainfall and high humidity.

Control Sigatoka as follows:

- Plant clean materials.
- Grow resistant cultivars

# CASSAVA

# PRODUCTION

# GUIDE

**PREPARED BY:**  
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## **CASSAVA PRODUCTION INTRODUCTION**

Cassava production in most African countries has been on the increase because the crop is drought resistant and adapts well to relatively poor soils where other crops do not do well. Moreover, in most parts of Northern Ghana, more and more households are now incorporating cassava into their main diets. The demand for cassava and cassava products is on the increase not only at domestic, but also at industrial levels.

The introduction of new cassava varieties which are not only high yielding but also disease and pest resistant therefore is meant to further increase the availability of cassava for consumption and processing into various forms to raise income levels of farm households.

The new varieties include:

- Abasafita
- Gblemoduade
- Tech Banche
- Afisiafi
- Nyamebikyere
- Agric

## **USES OF CASSAVA**

Cassava has a variety of uses. They include:

- Gari
- Kokonte
- Industrial starch
- Livestock feed
- The leaves are eaten as pot herbs

## **CLIMATIC AND SOIL REQUIREMENT**

Cassava is suitable for well-drained soils and soils rich in nutrients (loam soil). So poor soils, clayey soils, stony soils should be avoided. However, cassava can tolerate marginal soils.

## **LAND PREPARATION**

Land preparation can be done manually and mechanically using cutlasses, hoes and ploughs respectively.

## **SELECTION OF PLANTING MATERIALS**

In selecting the planting materials, the following should be considered:

1. Pest and disease free materials
2. Stems free from mechanical damage
3. Stems with good carbohydrates reserve
4. Robust stems

### **CUTTING QUALITY**

- Cutting should be obtained during the active growth phase.
- Cuttings from young and epical stem portion should be avoided because they are vulnerable to pathogens and lack nutrients reserves.
- Old highly lignified (hardened) stems are low in nutrients and sprout poorly.
- Semi-lignified stem portions are the best.

### **STORAGE OF CASSAVA STEMS**

Cassava sticks can be stored up to eight weeks (two months). There are two ways of storage:

- Tie into bundles and store upright under a tree shade
- Put stems on a horizontal support under a shade.

### **PLANTING AND SPACING**

- Cassava is planted by using stem cuttings.
- Normally, twenty bundles at a length of 1.5 meters are required for an acre.
- The range of spacing is on average: 1m x 1m.
- Cassava can be planted all year round provided there is moisture in

the soil. Ideally, it should be planted between March and October.

### **METHOD OF PLANTING**

Cassava can be planted in three (3) orientations.

1. Slanting
2. Upright or vertical position
3. Horizontal

### **WEED CONTROL**

- Good land preparation helps in weed control. Early weeding prevents weeds from competing with the crop for nutrients, water, light and space. Consequently, it helps in early canopy and tuber formation.
- At least two (2) precisely timed weeding are needed to obtain optimal yields in cassava. Chemicals can also be used to control weeds.
- Chemicals can be applied pre-planting, pre-emergence and post planting. For example Glyphosate (Round-up), Atrazin and Gramoxone.

### **DISEASE AND PEST CONTROL**

Some common pests are:

- Cassava Meallybug

- Cassava Green Mite
- Variegated Grasshopper
- White Flies
- Grass cutter

Cassava pest infestation is very high in the dry season and can cause damage to the leaves and also transmit viral diseases like Cassava Mosaic.

### **CONTROL MEASURES**

- Select suitable site for growing cassava
- Grow cassava varieties that are tolerant to pests.
- Select and plant healthy cassava stem cuttings.

### **DISEASES**

Some common cassava diseases are:

- Cassava Mosaic
- Cassava Bacteria Blight
- Cassava Anthracnose
- Cassava Roots Pot

### **CONTROL**

- Grow varieties that are tolerant to the common diseases.
- Select and plant good quality materials free from diseases.
- Harvesting should be done on time to prevent root rot.

- Too early and late planting should be avoided.

#### ***HARVESTING***

Cassava is ready for harvesting between nine (9) – eighteen (18) months depending on the variety, climate and soil factor.

Eight (8) – ten (10) tons can be harvested from an acre when very good cultural practices are observed.

#### ***STORAGE***

Most of the time, cassava is stored in processed forms. These forms include; meal, flour, chips, and starch.

However, cassava could also be stored in boxes containing moist saw dust for about eight (8) weeks. It could also be stored in refrigerators.

# MAIZE

# PRODUCTION

# GUIDE

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## INTRODUCTION

The introduction of new maize varieties, which are not only high yielding but also disease and pest resistant therefore is meant to further increase the availability of maize consumption.

The new varieties include the following, *Dadaba, Obaatanpa, Abelehi.*

Maize can be eaten after boiling or roasting. And the fresh grains may be prepared into corn pudding. It can also be made into starch.

## SOIL TYPE

- Maize grows well on a wide range of soils
- But the preferred types are deep, easily wet, fertile and well drained loams.
- Shallow sandy or clayey soils should be avoided.
- A soil ph of 4.5 – 6.8 is preferred.

## LAND PREPARATION

- This may be done manually or mechanically.
- Clearing of land is mostly done in the month of March in the case of the major season and August in the case of the minor season.

## PLANTING AND SPACING

- Two to three seeds per hole are planted at a depth of 2cm – 4cm.
- A planting distance of 90cm X 60cm is recommended for manual clearing. And 75cm X25cm for mechanized farming.

## SELECTION OF SEEDS

- Seeds can be purchased from certified agro-chemical and seeds sellers' outlets.
- Seed maize can also be selected from farmers own farms.

## FERTILIZER APPLICATION

Different soils require varying amounts of fertilizer. Optimal fertilizer requirement for maize depends on the productive potential of the cultivars, the previous cropping history and the general fertility of the field used.

In general, the fertilizer requirements for maize in tropical conditions are about 100 – 120kg nitrogen, 40kg phosphorous and 50kg potassium per hectre.

Fertilizer can be applied ten (10) days after planting (NPK) and six (6) weeks later after planting (urea).



For manual weeding, side application of fertilizer is recommended.

### **WEEDING**

- Manual weed control can be done by 3 – 4 weeks after planting and repeated when weeds appear until harvesting.
- Chemicals such as *Chemosate*, *Round-up*, *Kalach* and *Atrazin* can be applied as pre-emergence usually 2 – 3 days after planting.

### **PESTS AND DISEASES**

- Major pests of maize include, Stem Borers, Weevils, and Larger Grain Borers.
- Major diseases of maize include, Smuts, Rust, Bacteria Blight and Maize Streak.

### **CONTROL**

- Crop Rotation
- Early Planting
- Plant Resistant Varieties
- Burning of stalk after harvesting
- Use of chemicals such as *Actellic*, *Malathion* and *Disolphide*.

### **HARVESTING**

- In general, maize requires 120 days (12 weeks) to reach maturity. However, early maturing varieties take 75 – 80 days.
- Maize should be harvested as soon as the grain is dry (15% - 20% moisture content) as delayed harvesting leads to damage by birds, storage pests and diseases.

### **STORAGE**

- Maize cobs are usually stored in cribs while the grains are stored in silos. The free moisture content should not be more than 12%.
- Improved maize cribs are recommended at the village level for effective maize storage whiles the silos is used as storage for large-scale production.

*The 12 Steps to*

# A GOOD MAIZE HARVEST

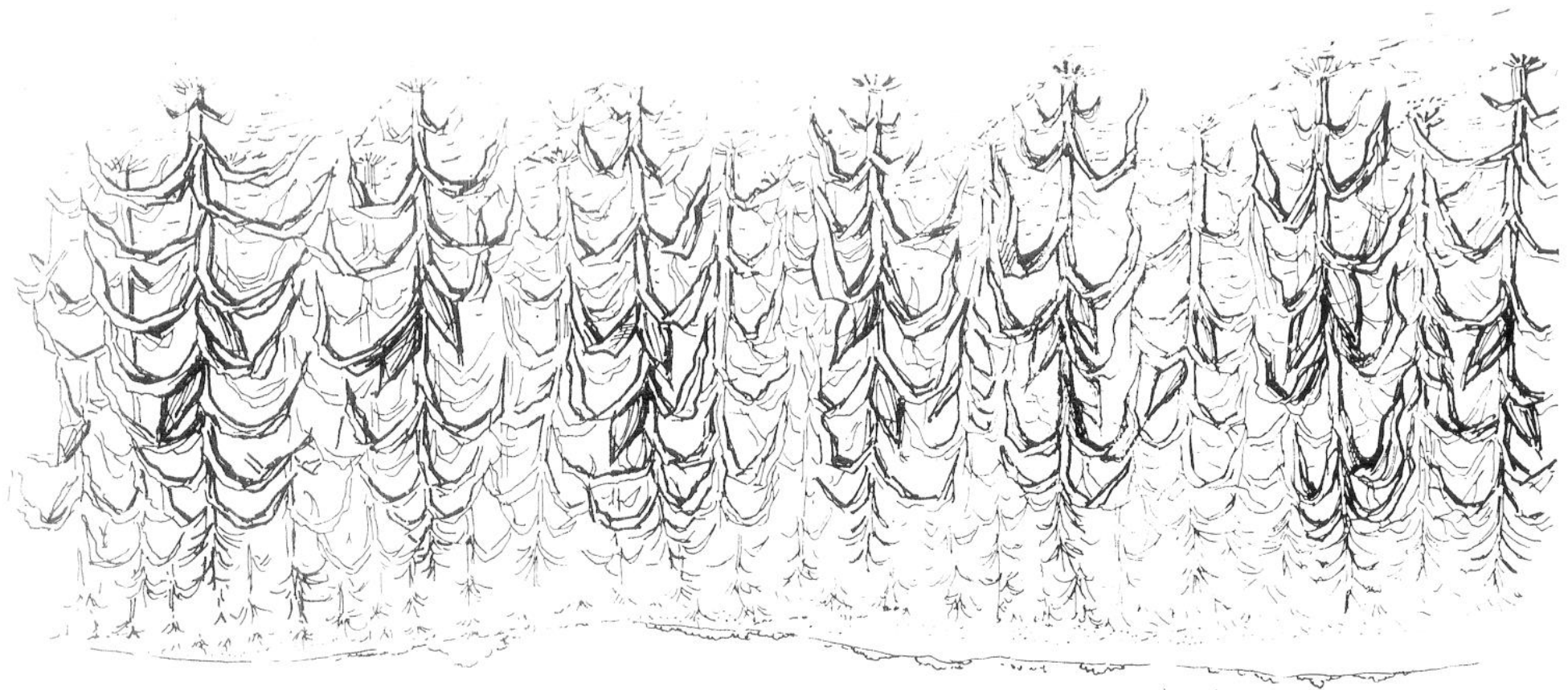
*Ghanaian Farmers :*

Follow these 12 steps and  
increase your maize harvest



GGDP





# Let us learn why Kofi has a good harvest

## Before . . . .

Kofi planted traditional maize and he harvested 2 bags per acre.

He barely had enough food for his family.



## Then . . . .

The extension officer taught Kofi the 12 steps to a good harvest .  
The agent helped Kofi put the steps into practice.



## Now . . . .



Kofi harvests at least 15 bags per acre.  
His family is well fed and healthy.

# Step 1 Prepare the land

Proper clearing helps good stand establishment and reduces weed problems

Do not stir the soil to avoid soil erosion

## Fallowed land

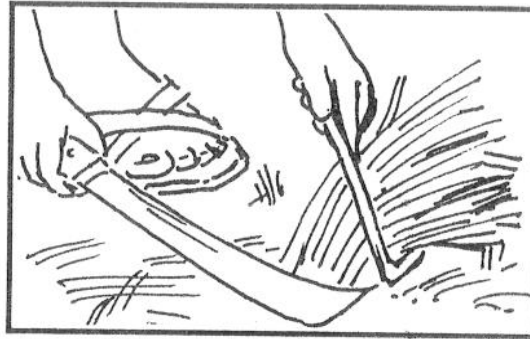
Clear land the traditional way.

Newly cleared land produces more maize.



Choose deep, well drained loamy soil rather than sandy or shallow soil.

## Land cropped last year



A Slash with cutlass.

Do not burn slashings



C

B Plant directly into the cut vegetation.



If grassy weeds are in the field, remove stumps with hoe after brushing with cutlass.

## Step 2 Plant improved varieties

Planting improved varieties  
assures high yields

### SEED STORE



*These varieties are improved*

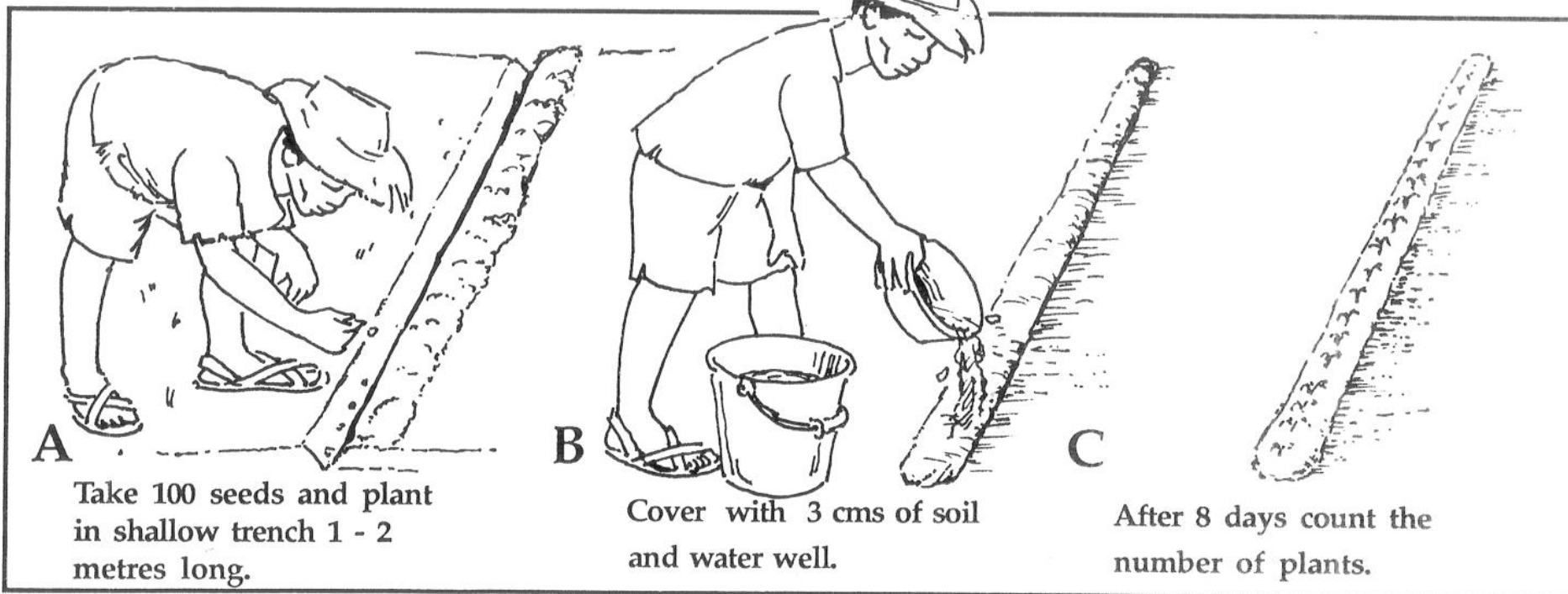
GRAIN COLOR	VARIETY	DAYS TO HARVEST
White	Dobidi	120
	Okomasa	120
	Obatanpa	110
	Aburotia	110
	Abeleehi	110
	SAFITA 2	95
	Dorke SR	95
Yellow	Golden Crystal	110
	Kawanzie	95

For good germination purchase seed from:

- Registered seed growers
- Ministry of Agriculture

# Conduct germination test for all seeds

A germination test before planting will help you prevent poor stands



**A**

Take 100 seeds and plant in shallow trench 1 - 2 metres long.

**B**

Cover with 3 cms of soil and water well.

**C**

After 8 days count the number of plants.

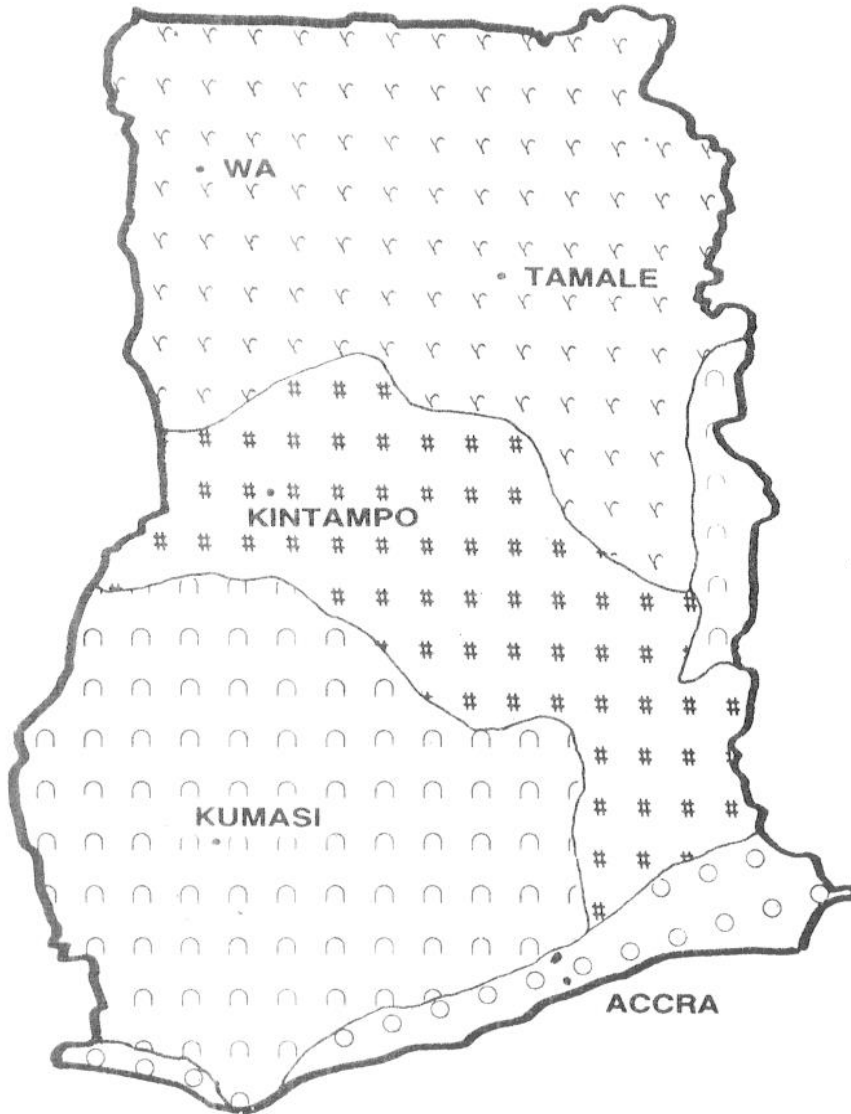
## PLANTING GUIDE

If you have this number of plants ...	Then put this number of seeds in each hole.
85 or more	2 seeds per hole
70-84 plants	3 seeds per hole

If you have this number of plants ...	Then put this number of seeds in each hole.
50 - 70 plants	Get better seeds or 4 per hole
Less than 50 plants	Do not waste your time sowing the seeds

# Step 3 Plant early

Plant early after the rains come to stay



## Major season

	Where	Which Month	What variety to plant	
	Guinea Savannah	End May - End June	Dobidi Okomasa Obatanpa Aburotia	Kawanzie Abeleehi SAFITA 2 Dorke SR
	Transition	Mid March - End April	Dobidi Obatanpa	Okomasa
	Forest	Early March - End of April	Dobidi Obatanpa	Okomasa
	Coastal Savannah	End of March - End of April	Dobidi Okomasa Obatanpa	Abeleehi SAFITA 2 Dorke SR

## Minor season

	Transition	Mid July - Early Sept.	Dobidi Okomasa	Abeleehi Obatanpa
	Forest	Mid July - Early Sept.	Dobidi Okomasa	Abeleehi Obatanpa
	Coastal Savannah	Planting Not Recommended		

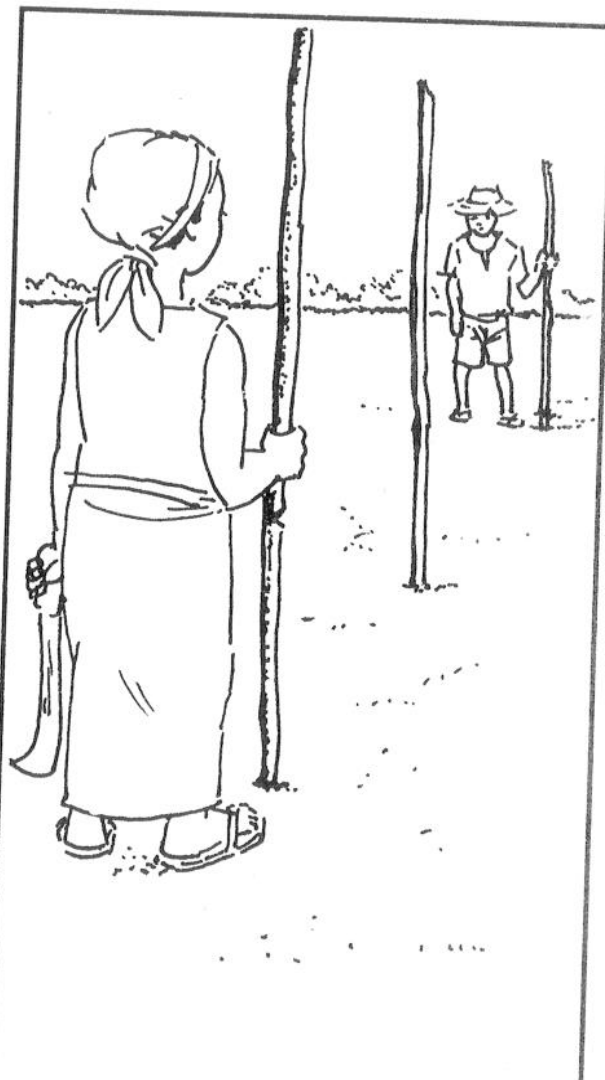


# Step 4 Plant in rows

Planting in rows makes weeding, fertilizing and harvesting easier



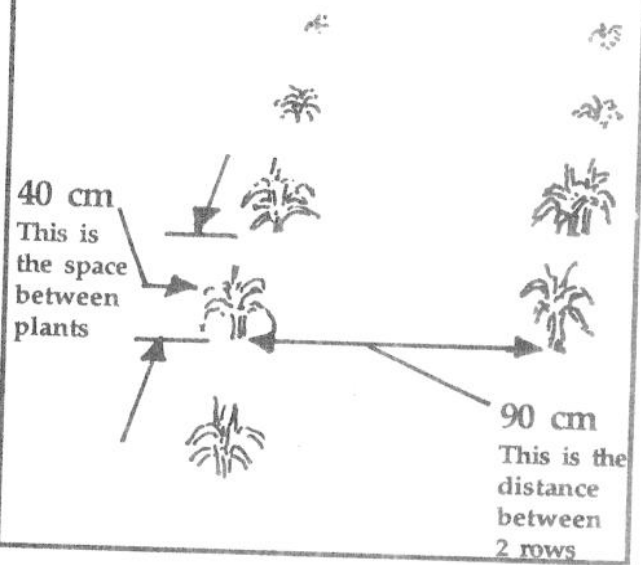
Ask an extension officer to teach you how to plant in rows.



Lining up 3 poles insures that the rows will be straight.



Ama has just planted a row of maize. She is using the sighting pole to measure the distance between rows.

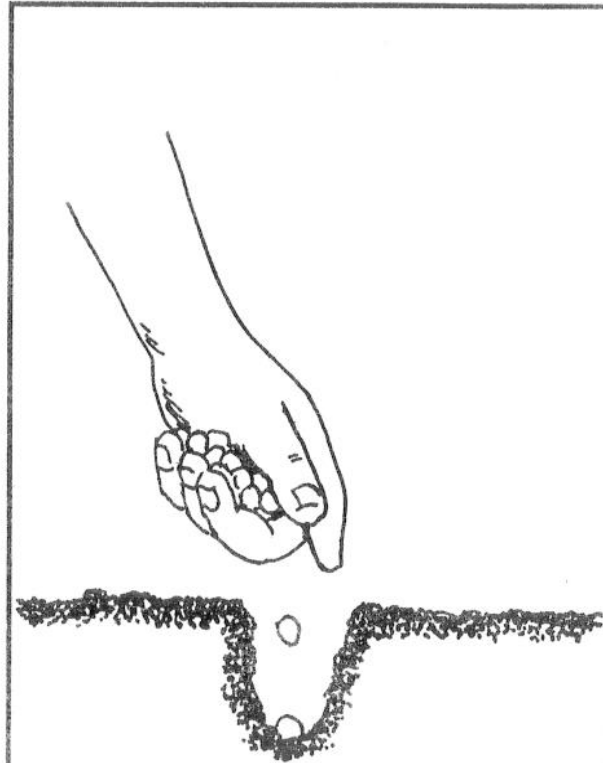


# Step 5 Plant seeds deep

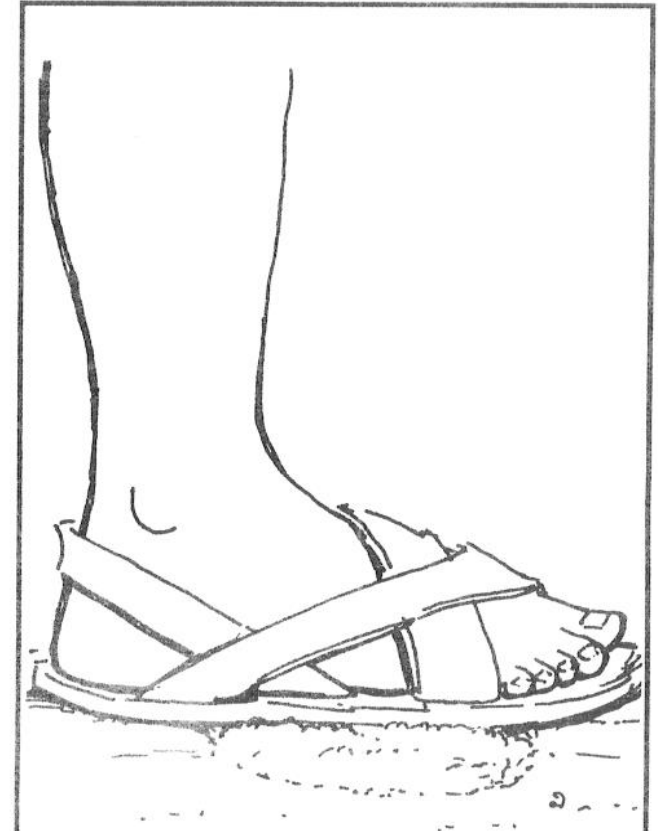
Deep planting and firming the soil protect the seeds from birds and rodents



Use your cutlass to make holes 5 - 7 cm deep.



Plant 2 - 3 seeds per hole depending on the results of the germination test.

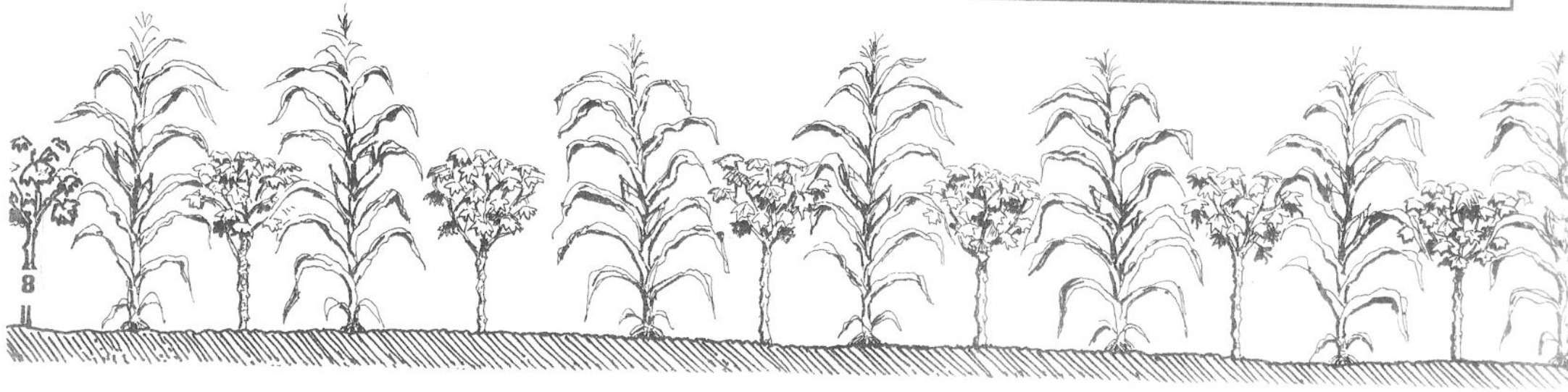
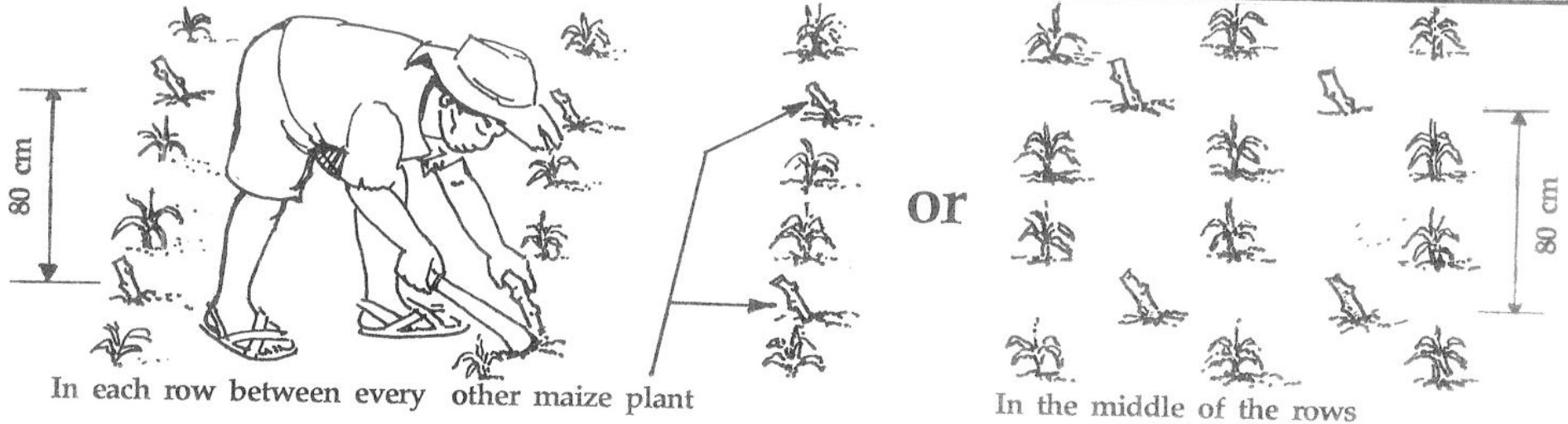


Cover the hole and step on the soil with your full weight.

# Step 6 Intercrop cassava in rows

Intercropping reduces risk of crop loss and increases income

*Plant cassava cuttings 2 weeks after you have sown the maize seed*




# Step 7 Use fertilizer

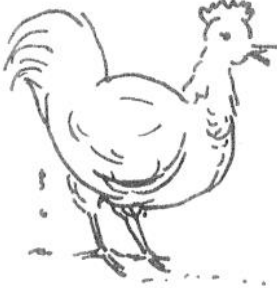
Feed your maize with fertilizer for higher yields

## Fertilizer types

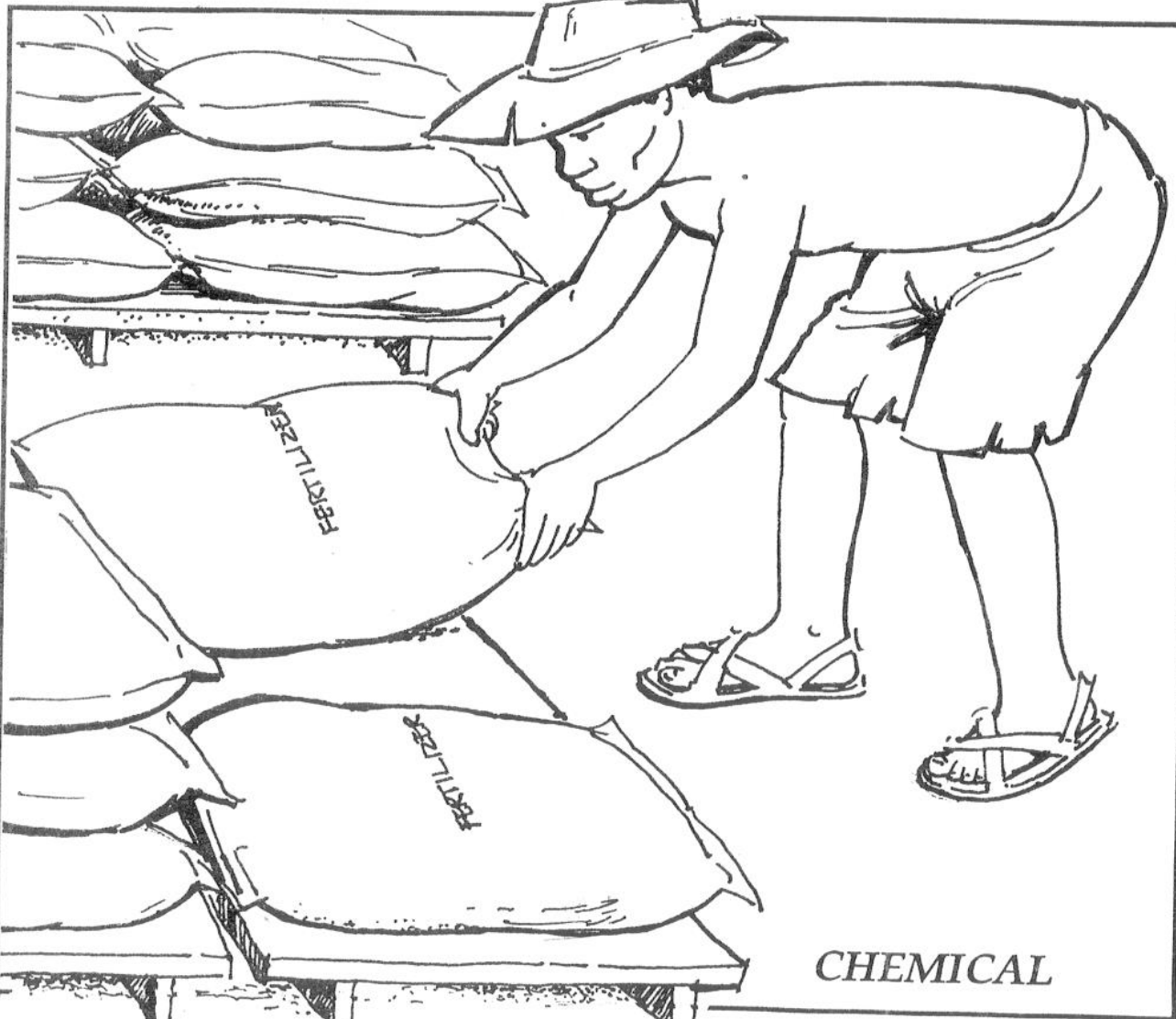

**COW DUNG**  
8 tons/ ha



**CHICKEN MANURE**  
4 tons/ ha



**COMPOST**  
5 tons/ ha



**CHEMICAL**

# How much chemical fertilizer should you use ?

Your extension officer has more detailed information about the type of fertilizer to use in your area

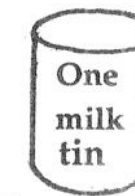
WHEN WAS YOUR LAND LAST CROPPED	WHERE IS YOUR FARM	AMOUNT OF FERTILIZER PER ACRE	WHEN AFTER PLANTING
My land is fallowed for 5 or more years	Forest	No Fertilizer	—
	Transition		
	Savannah	1 bag 20 : 20 : 0 1/ 2 bag UREA	1 Week 6 Weeks (Knee high)
I cropped my land last year	Forest	1 bag 20 : 20 : 0 1/ 2 bag UREA	1 week
	Transition		6 Weeks (Knee high )
	Savannah		
I have cropped my land continuously for many years	Transition	1 bag 20 : 20 : 0	1 week
	Savannah	1 bag UREA	6 Weeks (Knee high)

1 bag / acre



EQUALS For 60 plants

2 bags / acre



EQUALS For 30 plants

1 bag

UREA

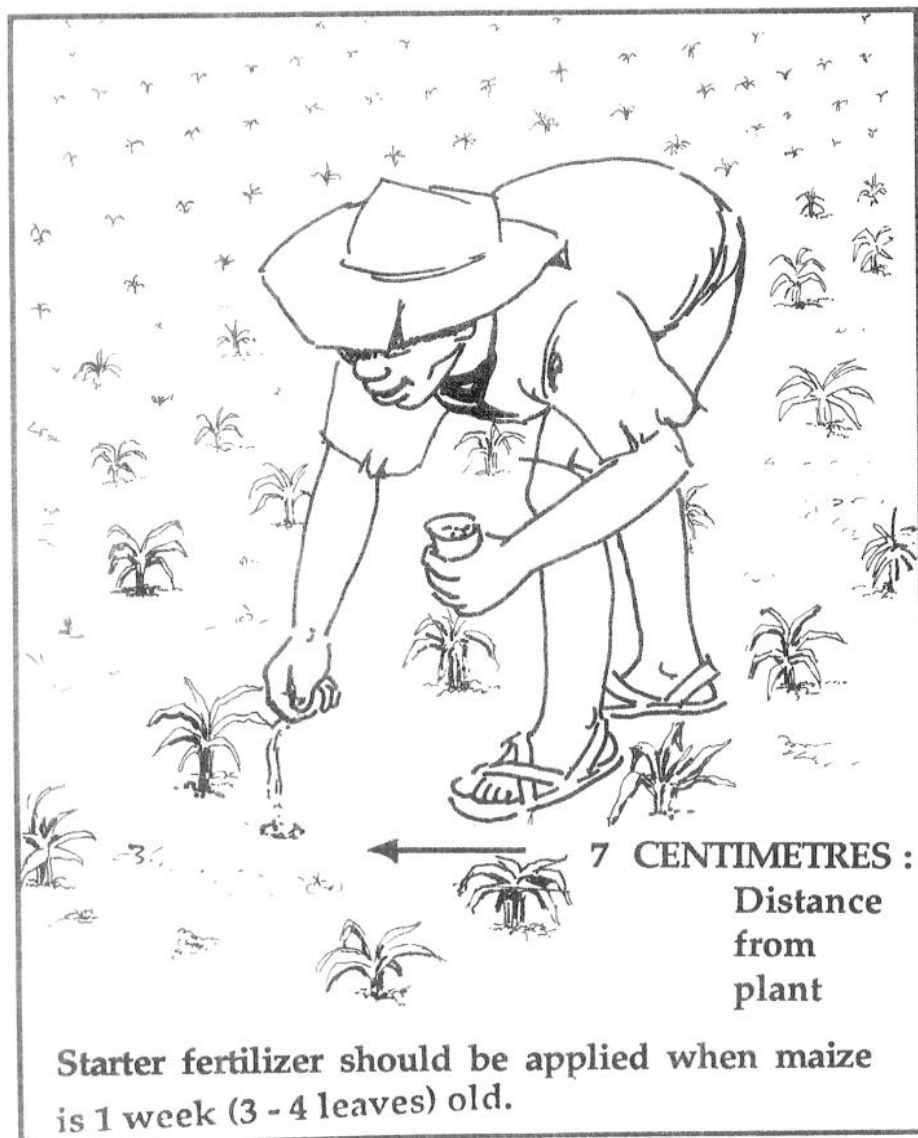
2 bags

EQUALS

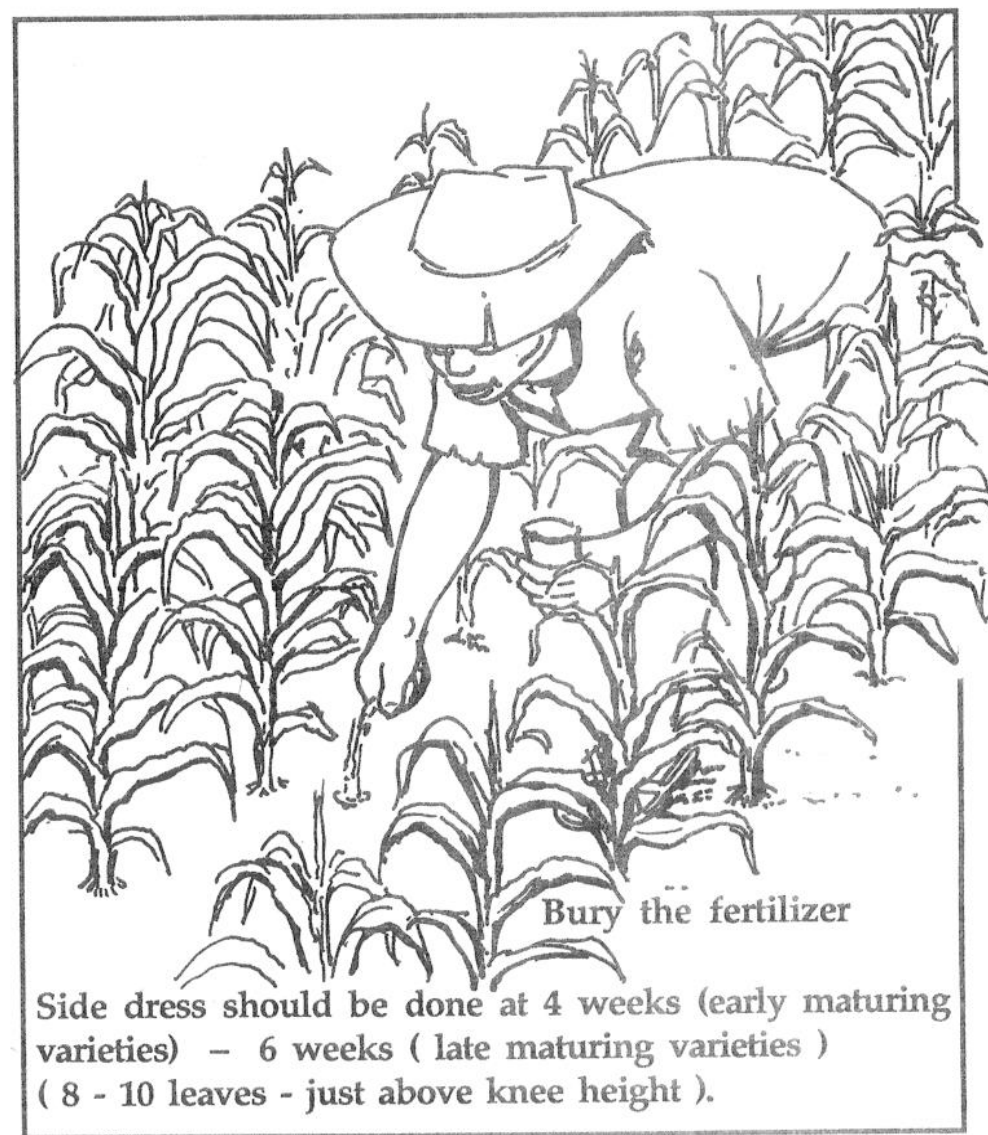
Sulphate of Ammonia

Sulphate of Ammonia

## FIRST APPLICATION



## SECOND APPLICATION





# Step 8 Control Weeds Early

Control weeds on time. Weeds "thief" food and water from your maize

## Hand weeding

As a general rule maintain your field free of weeds during the first 30 days after planting

## Chemical hoe

- Use Gramaxone at 1.0 litre per hectare at low pressure in the knapsack sprayer
- Use only clean water to mix chemical.
- Spray on green weeds between rows during the 4 - 6 weeks after planting

DID YOU CROP THE LAND LAST YEAR	WHERE IS YOUR FARM	WHEN TO WEED
NO, I didn't ( land was fallow or virgin )	Forest Transition Coastal Savannah	1 weeding during the first 4 weeks (6 - 8 leaves )
	Guinea Savannah	1 weeding during the first 3 weeks 1 weeding at 6 weeks
Yes I did	Forest Transition Coastal Savannah Guinea Savannah	1 weeding during the first 3 weeks  1 weeding at 6 weeks



- Do not spray on maize leaves
- Use spray shield to keep chemical of maize plants.

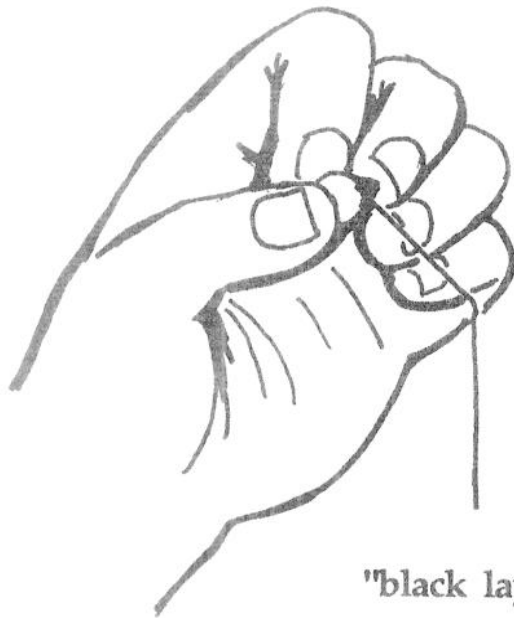
### Attention !

Gramaxone is one of the most poisonous herbicides in Ghana  
**USE WITH CARE**

# Step 9 Harvest early

Early harvest means less storage insects

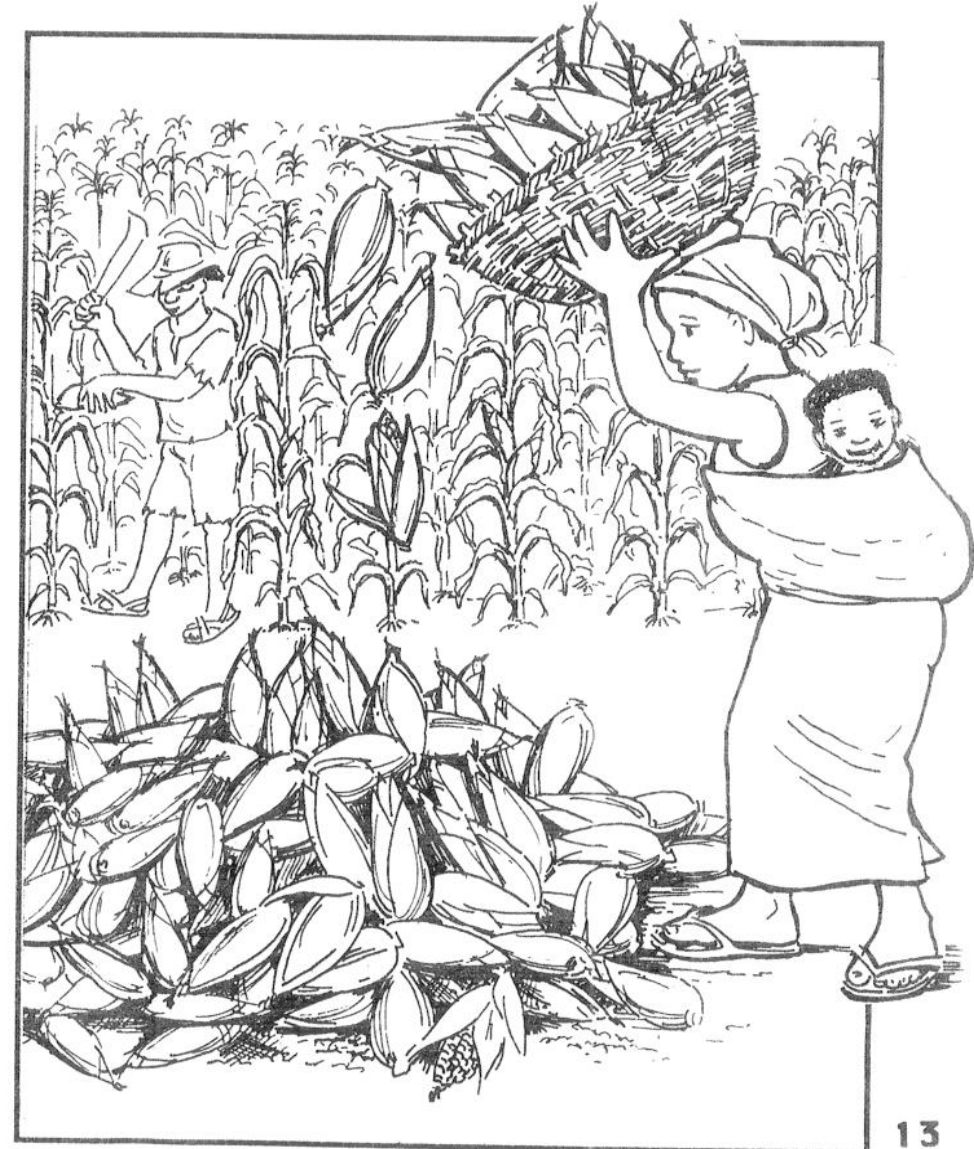
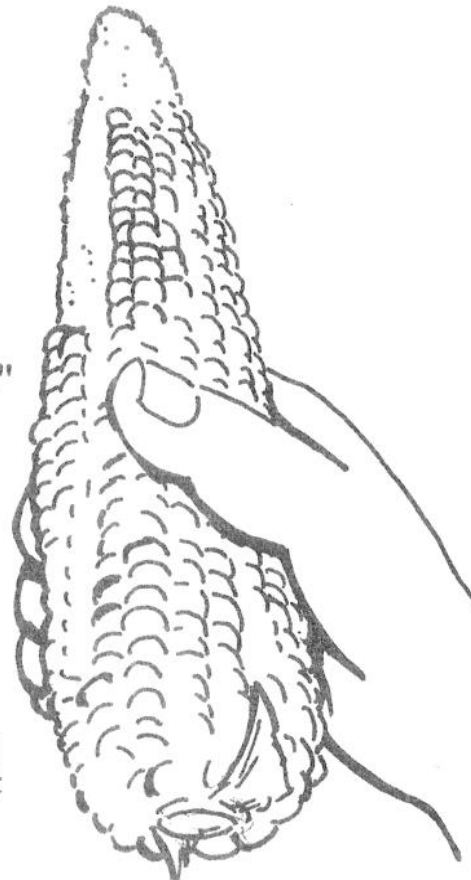
Harvest early as soon as the maize is matured. That is, when the "black layer" develops at the kernel tip.



"black layer"

Maturity is the stage where a "black layer" develops at the point of attachment between the grain and the cob.

It can be easily seen by removing a kernel and breaking the tip of it with your thumb nail.





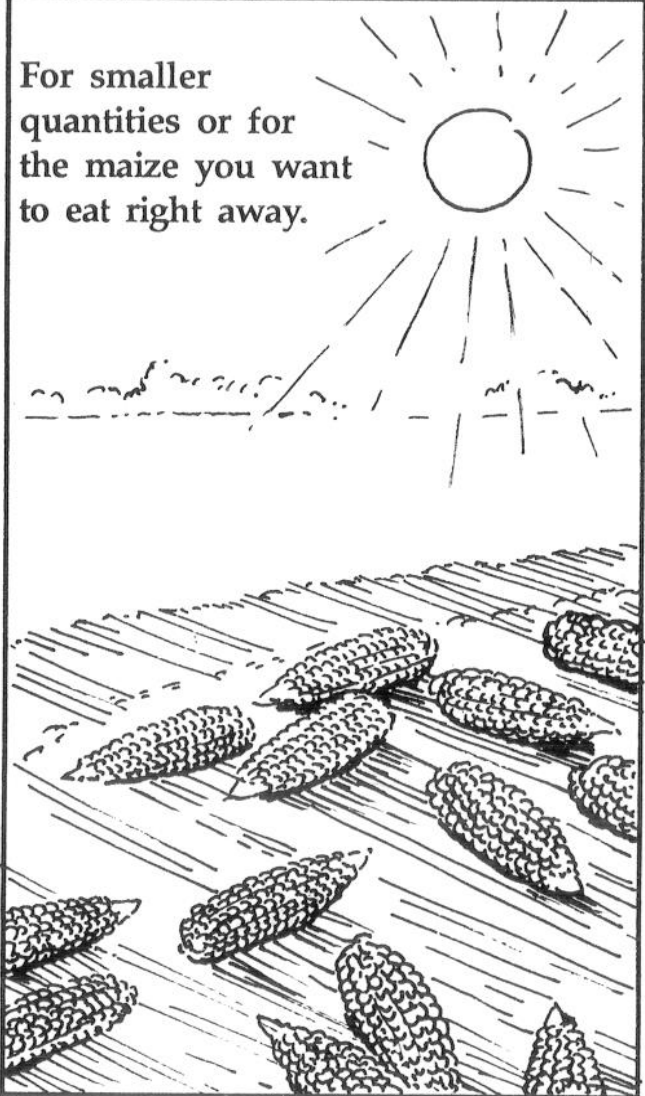
# Step 10

# Dry before storing

A well dried grain will not rot

*In the sun ...*

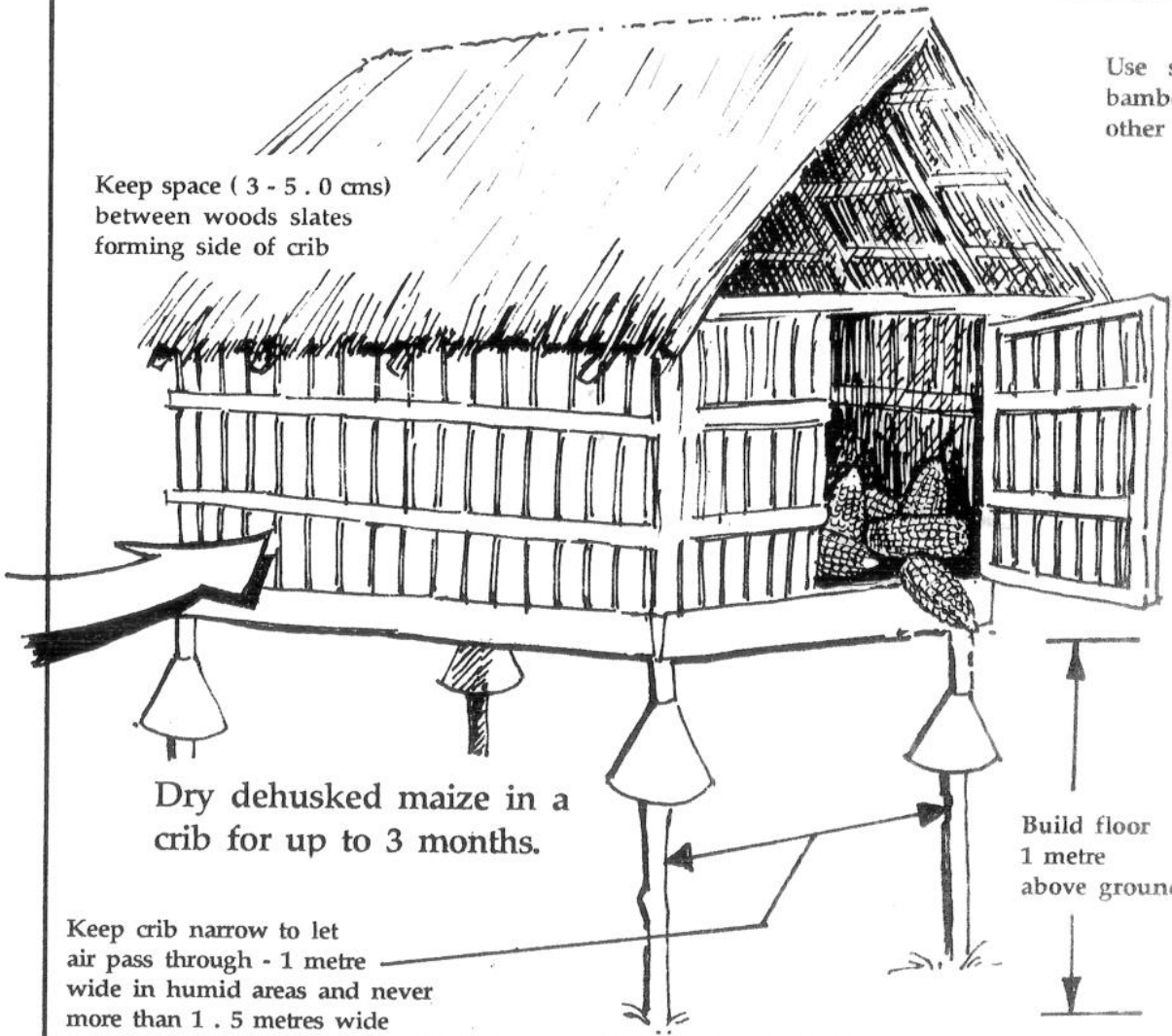
For smaller quantities or for the maize you want to eat right away.



*or in a crib ...*

Keep space (3 - 5.0 cms) between woods slates forming side of crib

Use split bamboo or other wood



Dry dehusked maize in a crib for up to 3 months.

Keep crib narrow to let air pass through - 1 metre wide in humid areas and never more than 1.5 metres wide

Build floor 1 metre above ground

# Step 11 Store properly

Protect your grain against storage insects  
Insects can destroy up to half of your harvest

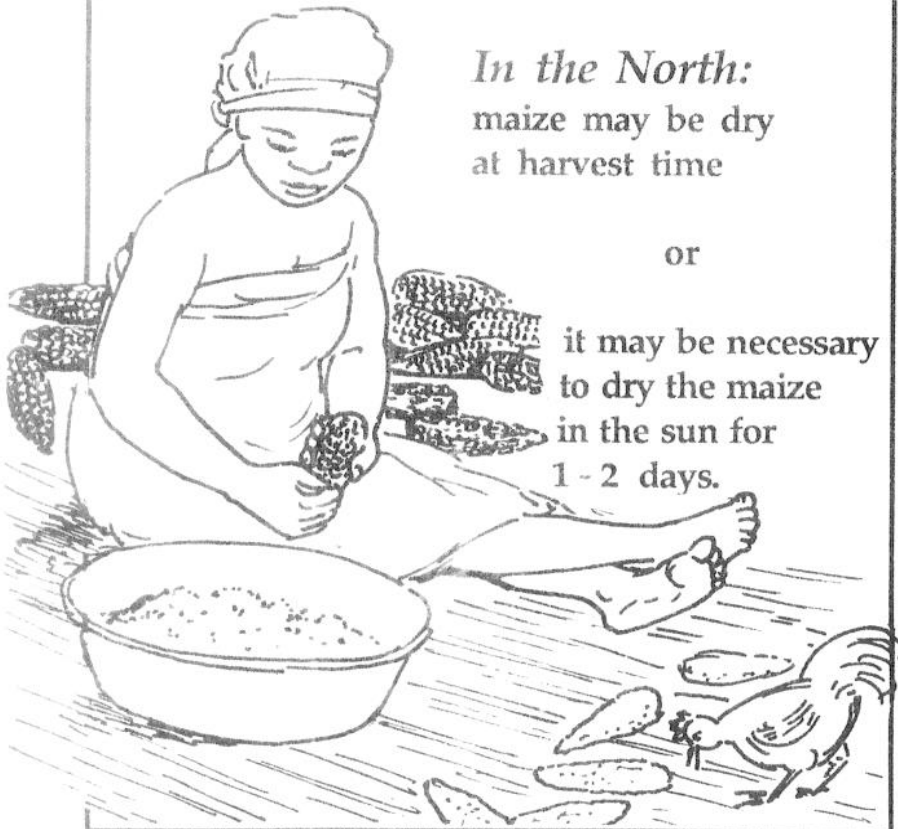
**A** Shell maize as soon as it is dry.

*In the south:*  
drying usually takes  
2 - 3 months in a crib

*In the North:*  
maize may be dry  
at harvest time

or

it may be necessary  
to dry the maize  
in the sun for  
1 - 2 days.



**B** Protect maize against insects with:

ACTELLIC 2 % DUST



5 bottle tops

ACTELLIC 25 EC



Mix one half of the metal cap  
from the ACTELLIC can with  
one IDEAL Milk tin of water  
and spray

100 kg

Maize

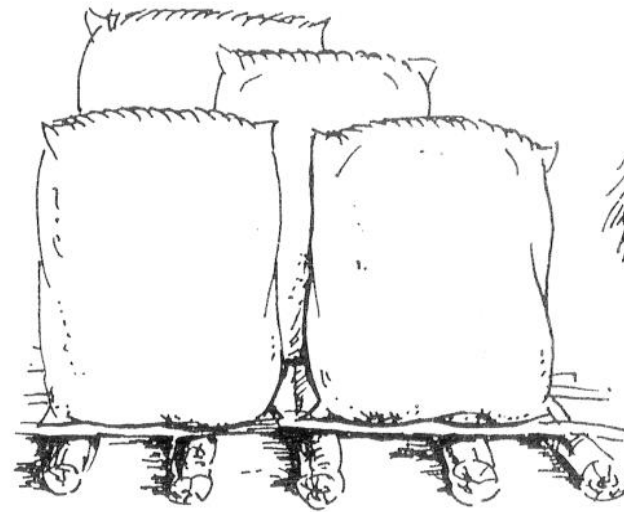
Sprinkle or spray  
ACTELLIC and mix  
the maize



**CAUTION !**  
DO NOT USE  
ELOCRON  
UNDEN, ROXION,  
DDT OR  
GRAMMALIN 20

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**C** *Store in bags or bins*

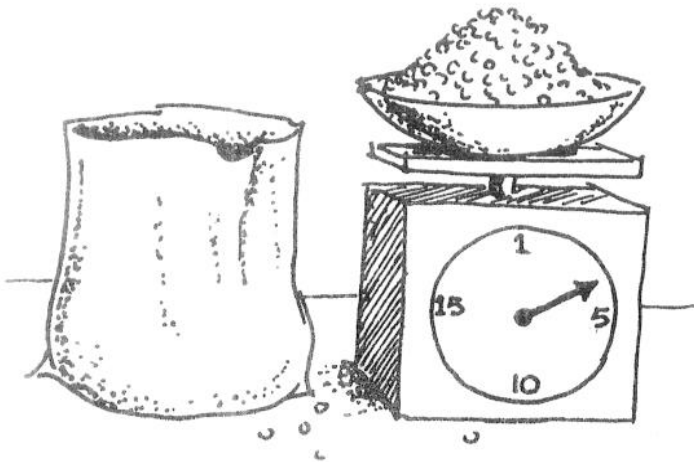


If stored in bags use pallets to keep the bags off the ground.



# Step 12 Select good seed

Good seed is the best way to ensure next year's crop

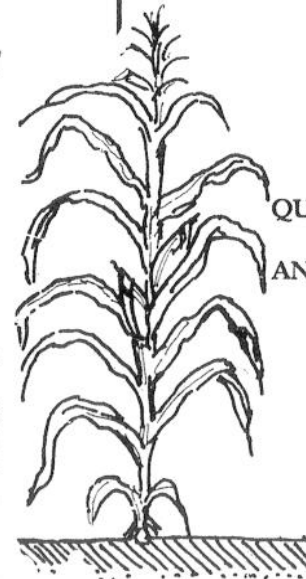
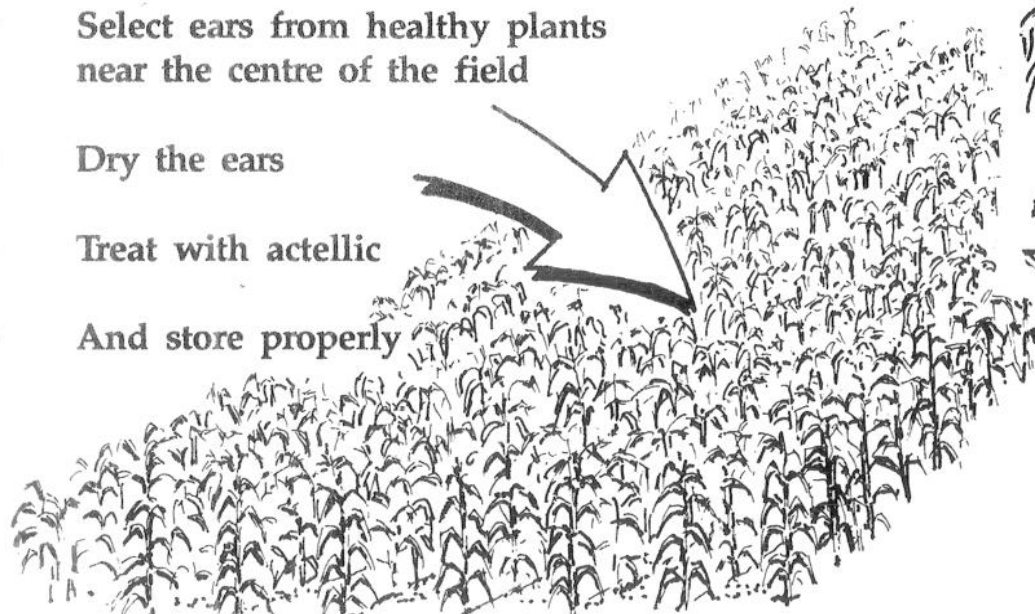


*Purchase new seed :*

- **Idealy every year**

**In case you use your own seeds :**

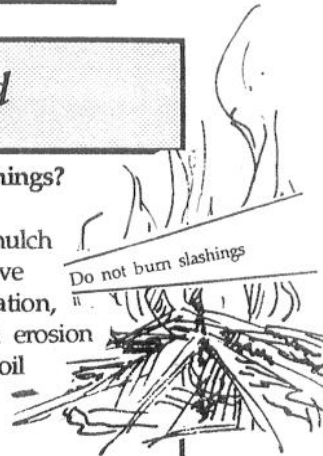
- **Select ears from healthy plants near the centre of the field**
- **Dry the ears**
- **Treat with actellic**
- **And store properly**



## Questions often asked

**QUESTION 1 :** Why shouldn't I burn the slashings?

**ANSWER 1 :** Slashings serve as mulch, the mulch will keep the soil cooler, conserve moisture, increase water infiltration, check weed growth, reduce soil erosion and add organic matter to the soil

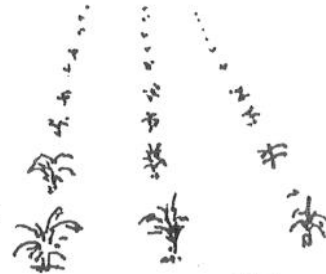


**QUESTION 2 :** What is the best time to select seed?

**ANSWER 2 :** Seed selection should be done before harvesting. Seed should be selected from healthy, true-to-type plants and from the centre of the farm.

**QUESTION 3 :** Why do I have to plant in rows?

**ANSWER 3 :** By planting in rows , you achieve optimum plant population. Also, it makes management easier (weed, fertilizer application and harvesting).



## Questions often asked

QUESTION 4 :

In the absence of improved maize seed, can I plant the local variety in rows?

ANSWER 4 :

Yes ! You can plant local maize varieties in rows. All things being equal, local maize variety planted in rows will yield more than local maize planted at random.

QUESTION 5 :

Do I have to thin four healthy maize plants per hill planted at the recommended spacing?

ANSWER 5 :

Yes ! You should thin to 2 or 3 plants per hill. This should be done between 12 and 15 days after planting.

QUESTION 6 :

Should I fill vacancies in my maize field?

ANSWER 6 :

Follow these guide lines:

- i) If more than 60% of the crop is established , fill vacancies within 10 days.
- ii) If less than 60% of the crop is established, replant the whole field.

QUESTION 7 :

What is wrong with applying fertilizer close to the plant?

ANSWER 7 :

The fertilizer is not placed next to the stem because it may scorch the plant and because the feeder roots are located approximately 7 . 5 cms away from the stem



QUESTION 8 :

Is it advisable to apply Sulphate of Ammonia after maize plant has tasseled?

ANSWER 8 :

No ! Late application of Sulphate of Ammonia will change the colour of the leaves but will not increase yield.

QUESTION 9 :

Can I apply UREA instead of Sulphate of Ammonia?

ANSWER 9 :

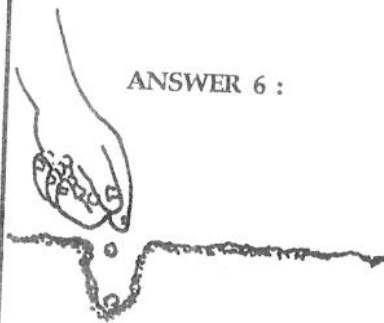
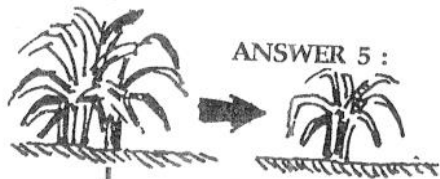
Yes! You must note that UREA must be buried and it contains twice as much nitrogen as Sulphate of Ammonia.

QUESTION 10 :

Why do we see streak on " Okomassa " even though it is supposed to be resistant to streak.

ANSWER 10 :

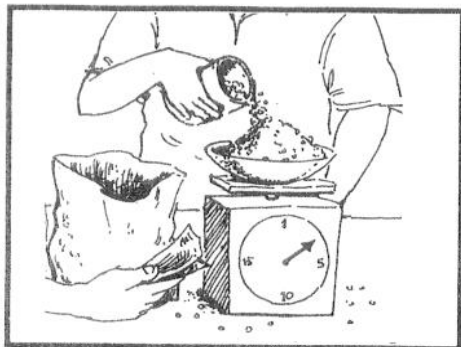
"Okomasa" is not completely resistant to streak, but tolerant to the streak virus.



# Can you remember the 12 steps to a good maize harvest ?



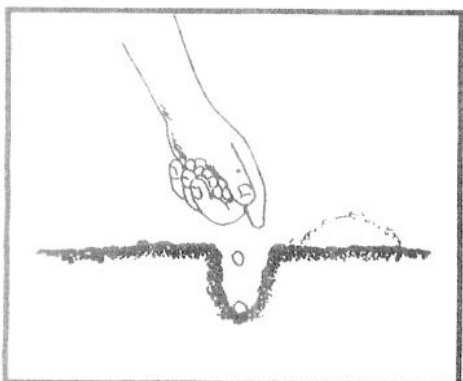
1 Prepare the land



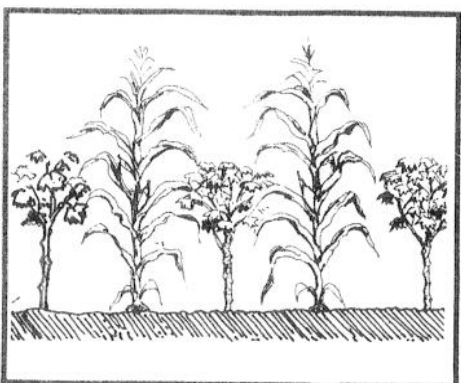
2 Plant improved varieties 3 Plant early



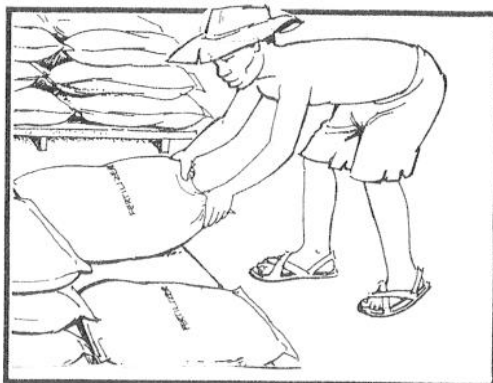
4 Plant in rows



5 Plant seeds deep



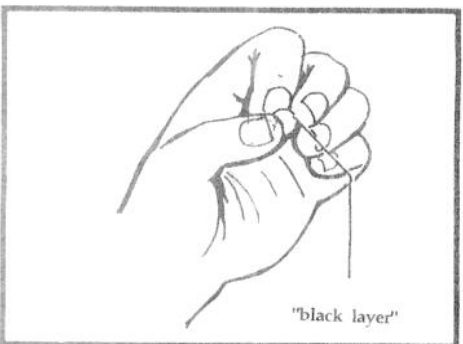
6 Intercrop in rows



7 Use fertilizer



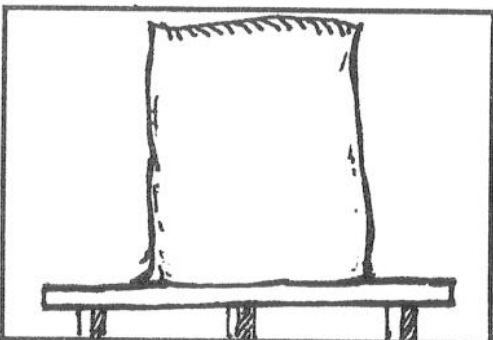
8 Control weeds early



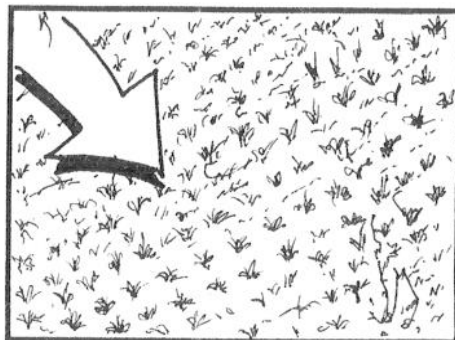
9 Harvest early



10 Dry before storing

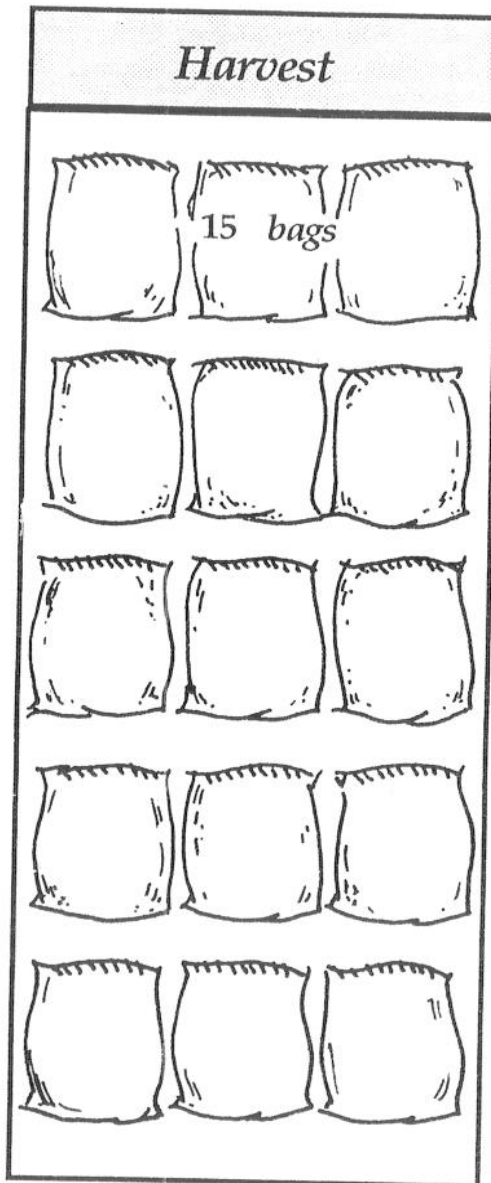


11 Store properly

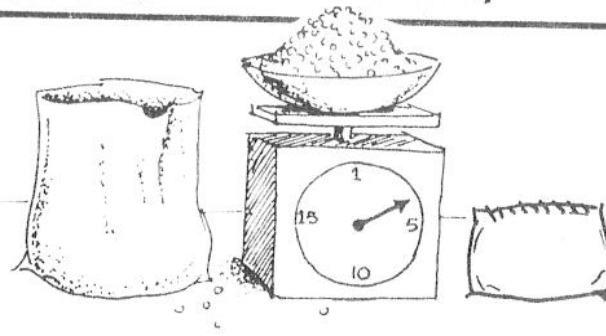


12 Select good seed

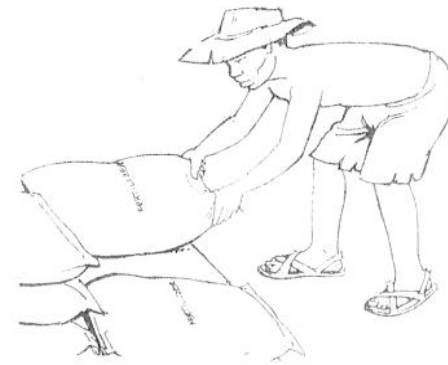
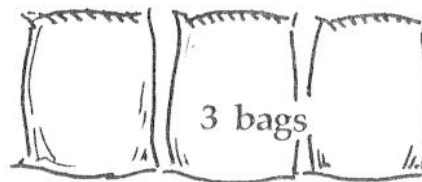
# Let us look at what Kofi spends to have a good harvest



**Expenses**



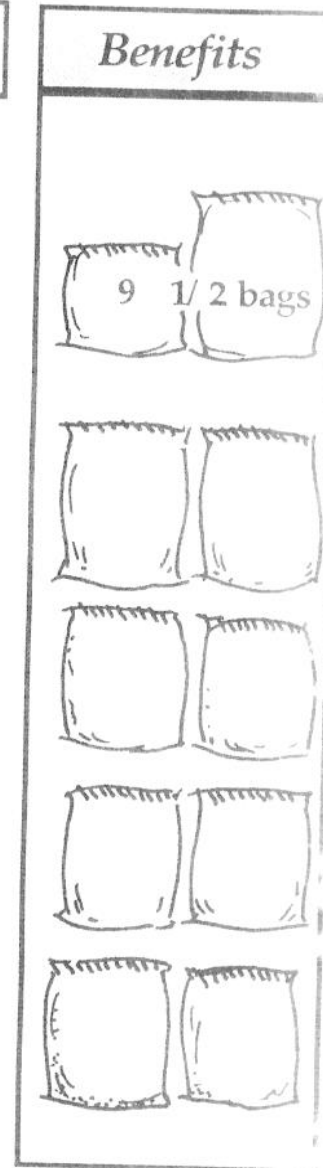
**FERTILIZER**

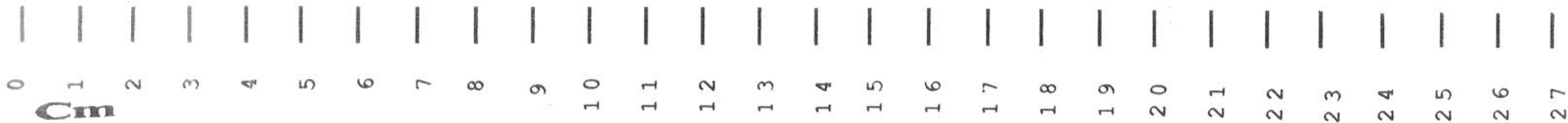


**WEEDING**



Total 5 1/2 bags





## MEASUREMENTS, CONVERSION FACTORS AND COMMON EQUIVALENTS

### Measurements

1 metre (m)	=	3.28 feet (ft)
1 foot	=	0.305 metre
1 centimetre (cm)	=	0.394 inches (in)
1 inch	=	2.54 centimetres
1 hectare (ha)	=	10,000 square metres (m <sup>2</sup> )
1 hectare	=	2.47 acres (ac)
1 acre	=	0.405 hectare
1 kilometre (km)	=	0.621 mile (mi)
1 mile	=	1.61 kilometres
1 kilogram (kg)	=	2.20 pounds (lb)
1 pound	=	0.454 kilograms
1 kg/ha	=	0.89 lb/ac
1 lb/ac	=	1.12 kg/ac

### Conversion Factors

1 t/ha grain	=	approx. 4 maxi bags/acre
1 bag 20:20:0 fertilizer (50 kg)	=	10 kg Nitrogen + 10 kg P <sub>2</sub> O <sub>5</sub>
1 bag 20:20:0 fertilizer (50 kg)	=	25 kg/ha N + 25 kg/ha P <sub>2</sub> O <sub>5</sub>
1 bag ammonium sulphate (50 kg)	=	10.5 kg N
1 bag/acre ammonium sulphate	=	26 kg/ha N

### COMMON EQUIVALENTS

1 full "Ideal" milk tin	=	180 ml
1 beer bottle	=	600 ml
1 mineral bottle	=	300 ml
1 bottle top	=	5 ml
1 cap from Actellic 25 EC can	=	10 ml





This publication is based on the  
**MAIZE AND COWPEA PRODUCTION  
GUIDE FOR GHANA**

published by:

**GHANA GRAINS DEVELOPMENT PROJECT  
CROPS RESEARCH INSTITUTE,  
P.O. Box 3785 Kumasi**

Grains and Legume Development Board,  
P. O. Box 4000 Kumasi

**MINISTRY OF AGRICULTURE,  
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