

DELTA STATE GOVERNMENT
OFFICE OF THE CHIEF JOB CREATION OFFICER,
GOVERNOR'S OFFICE.

YOUTH AGRICULTURAL ENTREPRENEURS

PROGRAMME

(YAGEP)

TRAINING MANUAL

ON

**GROWING MAIZE FOR ECONOMIC
EMPOWERMENT**

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INTRODUCTION

1.0 Preamble

The present world population is 6.0 billion and it is estimated to reach 9.6 billion in 2050. A total of 795 million people are estimated not to have enough food to lead a healthy life. Sub-Saharan Africa has the highest prevalence of hunger where one person in four is undernourished. What will be your contribution towards reducing hunger in the world and most importantly in sub-Saharan Africa? You must consider yourself an important factor in reducing world hunger and therefore a contributor towards world food security.

1.1 Relevance of maize in the world food chain

Maize (*Zea mays* L.) otherwise known as corn is the third most important food crop in the world. It occupies a third position next to rice and wheat. The total land area under maize production is 160 million hectares. The total area planted to maize is the highest when compared to wheat and rice.

1.2 Origin and distribution

Maize is a large grain plant first domesticated by indigenous peoples of Mexico about 10,000 years ago.

The story of maize began in 1492 when Christopher Columbus' men discovered this new grain in Cuba. Historians reported that maize went to Spain along with Columbus while others reported that it went to Spain during the second expedition of Columbus to America.

At first, corn was planted in the gardens in Europe and it became a curiosity crop but gradually began to be recognized as a valuable food crop.

Within a few years it spread like wild fire throughout France, Italy and all Southeast Europe and Northern Africa. In 1575 it has spread into Western China, Philippines and East Indies. Maize has become highly adapted in tropical and sub-tropical environments.

Maize came into Nigeria through two routes:

- Through the West African Coast by slave dealers.
- Through North Africa by Arab traders.

1.3 Environmental factors that influence grain yield

- ❖ Rainfall during growth period
- ❖ Degree of cloud cover
- ❖ Temperature
- ❖ Solar radiation
- ❖ Pests and Diseases
- ❖ Human activities
- ❖ Soil characteristics

1.4 Botany

- ❖ Maize is a monocot and belongs to the grain family Poacea
- ❖ It is an annual plant and grows to a height of 200 – 350 feet
- ❖ It is monoecious with the male and female flowers at different positions on the plant
- ❖ Flowering takes place between 45 to 75 days depending on variety and climate
- ❖ Male inflorescence appears first before the female
- ❖ It is cross pollinated with wind as agent

1.5 Types of maize

- ❖ Dent**
- ❖ Flint**
- ❖ Floury**
- ❖ Popcorn**
- ❖ Sweet corn**

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CULTIVATION

2.0 Land preparation

- ❖ Depends on the degree of vegetation existing on the land and the facilities available
- ❖ Where the vegetation or fallow is up to three years or more, land clearing must be carried out either manually or mechanically.
- ❖ The debris is burnt and packed where manual clearing is adopted.
- ❖ For mechanical land clearing efforts should be made to ensure that the top soil is not scrapped off.
- ❖ Where trees are big they should be knocked down using a bull-dozer with minimal disturbance to the top soil.

2.1 Ploughing and harrowing

- Ploughing should be carried out using a tractor mounted plough
- The depth of ploughing should be maintained at 6 inches (15cm) plough depth
- Ploughing should be done when the rains are fully established or after two or three rains.
- Harrowing should be done immediately after ploughing
- When a field is under one or two years fallow, ploughing and harrowing could be done without land clearing
- Where necessary the vegetation may be removed by spraying with post emergence herbicides like glyphosate, paraquat, etc



Plate 1: A ploughed and harrowed field

2.2 Planting

a. Planting Material

Maize is cultivated using seeds of improved materials. The materials may be:

- (i) Open pollinated seed.
 - (ii) Hybrid Seeds
 - (iii) Inbred lines
- (i) Open pollinated varieties are genetically stable varieties that can be recycled for several planting seasons or years. Maturity differences may be observed among the plants.
 - (ii) Hybrid varieties are genetically similar individuals with similar identity. They are usually produced by crossing two genetically unrelated inbred lines. Seeds from hybrid varieties cannot be recycled after cultivation hence the farmer must continuously replace his planting material every planting season. Plants mature uniformly.
 - (iii) Inbred lines are used by breeders and seed producers for the production of hybrids. Individuals within a line are genetically uniform.

2.3 Sources of planting material

- Improved Seeds should be purchased from recognized agro-dealers.
- Saved seeds from previous planting from open pollinated varieties

2.4 Germination Test

Test your seed for percent germination before planting. This will enable you to determine the number of seeds to plant per hole

Procedure

- Place about 30 seeds inside a wet cloth or tissue paper.

- Keep it moist for 4 days.
- On the 6th day count the number of seeds that germinated.
- This will enable you to decide how many seeds to plant per hole.

2.5 Seed treatment

Before planting, the seeds must be treated with a fungicide to prevent soil pest damage. Apron plus is a common chemical used for seed dressing. However, most of the seeds are treated prior to sales.

2.6 Sowing

Planting can be done either manually or by the use of mechanical planters

- ❖ Manual planting: Use a hoe, cutlass or dibble stick to open a hole in the ground and drop one or more seeds at a time.
- ❖ Mechanical planting: A planter is usually used for planting
 - Seed planter usually has 4 hoppers for 4-furrow planting
 - Seeds are loaded into the hoppers and coupled to a tractor
- ❖ Use of cultivators: where continuous cultivation is adopted under very fragile sandy soils use of ploughs and harrows should be minimized. Cultivators mounted on tractors should be used to open the planting furrows

2.7 Spacing

Recommended Spacing:

- 75 cm x 50 cm (two seedlings/stand)
- 75 cm x 25 cm (One seedling/stand)
- 100 cm x 100 cm when intercropped with cassava

2.8 Time of planting

Maize is very sensitive to environmental changes. Optimum grain yield is obtained when maize is exposed to maximum sunlight and moderate rainfall. Maize grown in the first cropping season (March – June) in southern Nigeria usually yields higher than maize grown in the second season (August – November). Maize should be planted after 2-4 rainfall after the dry season. Those living in the wetland areas should start planting once the soil starts to get dry.

Staggering date of planting may be adopted if a farmer is growing maize for green maize production in order to take advantage of variation in market prices. If cultivation is for dry grains planting should be done early in the growing season to ensure that the ears dry sufficiently in the field before the heavy rains.

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PEST MANAGEMENT

3.0 Weed

There are two stages in weed management

- (a) **Pre-emergence:** This takes place at the time of planting. Application of 4-5 l/ha of Primextra or 4-5 l/ha Atrazine is made at planting or 1-3 days after planting. Pre-emergence refers to application of herbicide before weed emergence
- (b) **Post-emergence:** Between 4-6 weeks after planting manual weeding should be carried out using hoes/cutlasses or the use of a cultivator mounted on a tractor. Post-emergence refers to the control of weeds after the weeds have emerged

3.1 Insect control

Maize is commonly infested by two major insect pests:

- Stem borer (*Buseola fusca*) and
- Armyworm (*Spodoptera exempta*) which is the most destructive.

Control should commence when infestation reaches a threshold level

- Apply chemically/organically recommended insecticides. A minimum of two applications and a maximum of three should be made
- Avoid chemical controls close to time of green maize harvest



Plate 2: Larva of armyworm



Plate 3. Maize plants severely infested with armyworm

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MANURING

Chemical or organic manures are required for good growth, development and yield of maize.

4.1 Recommendation for chemical fertilizer:

- Two weeks after planting apply 60kg/ha of N, K₂O and P₂O₅ respectively. This is equivalent to 400 kg of 15:15:15 NPK compound fertilizer (8 bags).
- Four weeks after the first application apply 60kg/ha of N₂ which is equivalent to 150kg of urea (3 bags).
- Where organic fertilizers are used manufacturers' specifications should be adopted.
- Where poultry/cow manures are available about 4-6 t/ha should be applied during ploughing and harrowing.

4.2 Mode of Application

Fertilizers should be applied on wet soil.

- Surface band application at 15 cm away from the plant is recommended.
- Furrows could be made and fertilizer granules placed inside the furrows. The furrows should be covered with light soil.
- Fertilizers could be applied using fertilizer spreaders mounted on tractors.
- Organic fertilizers should be applied according to the manufacturers' specifications.



Plate 4. Healthy looking young maize plants (5 weeks old).



Plate 5. Maize plants nearing tasseling



Plate 6: Maize at reproductive stage

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HARVESTING

5.1 Time to harvest

Harvesting of maize depends on whether the maize is for:

- Green maize consumption
- Dry Grains

5.2 Green Maize

Farmers in the southern rainforest region of Nigeria usually harvest their maize at the green stage when the grains are soft and still at the milk stage. Fresh ears with their green husk are harvested for the local market. They are sold within 0-3 days after harvest.

The economic returns depend on the demand and supply condition of the market. The market is volatile and not very predictable. However good size ears attract good prices compared to small size ears.



Plate 6: A woman selling fresh corn (maize).



Plate 7: A woman roasting corn

5.3 Dry grains

In large scale farms, harvesting is done when the ear husks are completely brown and the grains are dry with about 20-25% moisture content. Harvesting is done by hand when mechanical harvester is not available. The dry leaf sheaths are dehusked on the field and the ears removed, collected and transported to the store.

The ears are kept inside dryers, sheds or cribs to reduce the grain moisture to 12-15%. Where harvesters are used the grains are collected directly from the field and emptied into dryers. Drying temperature should be maintained at 60⁰c

5.4 Shelling, Cleaning and Packaging

- In the case of hand harvested ears, when the grains attain 12-15% moisture content (MC) the grains are shelled.
- Cleaned
- Bagged in sacs
- Stored in warehouses
- Warehouses must be cleaned and disinfested before use to eliminated insect infestation.

5.5 Grain yield

In southern rainforest belt of Nigeria, grain yield is estimated between 2.0 and 3.5 t/ha depending on level of management and variety. In northerner savannah, grain yield is between 4.0 and 7.5 t/ha

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USES

6.1 What we do with maize

Dry maize has over 500 uses:-

- Domestic
- Livestock
- Industrial

6.2 Domestic

- Akamu ‘Ogi’
- Agidi
- Corn flour as a replacement of wheat and it is used to make corn bread. It can be mashed in hot water to form a paste and eaten with nice delicious soup.

Preparation of maize starch (Ogi)

- Soak clean maize grains in water inside a bowl.
- Leave for 3-4 days
- Decant the water
- Wash the maize several times, possibly, with running water
- Grind with a motorized hammer mill
- Sieve the mass of ground maize with a white clean cloth.
- Collect the sieved starch and place in a clean white bag.
- Press all the water out and the starch forms into a semi dry solid state.
- In this form it is sold as ‘Akamu or “Ogi’.

- The fairly dried state can be further dried at 50-60°C to reduce the moisture content to 10-12%.
- The dried 'Ogi' is pulverized into flour and packaged.
- This can be sold as dried Ogi.
- Vitamins like A, D, E and C can be added to enrich it further

Preparation of maize flour

- Fill a bowl with clean dry maize
- Wet the maize lightly with clean water
- Grind with motorized hammer mill
- Sieve the flour to remove large particles
- Bag the flour

6.3 Livestock feed

Maize is a very important ingredient in the manufacture of livestock feeds. About 50% of total ingredients in poultry feed is made up of maize grain. Maize grain supplies 3,520 Kcal/kg energy. It supplies also about 9.5% crude protein. In addition, maize serves also as feeds when used as fodder or silage though with lower energy supply.

6.4 Industrial

Several hundreds of industrial products are made from maize. Some of the products are presented hereunder:

- High fructose corn syrup
- Ethanol
- Packing and insulating materials
- Adhesives

- Filler for plastics
- Insulating materials
- Chemicals and pharmaceuticals
- Paints, pastes, dyes, etc

THANK YOU FOR JOINING US IN THE MAIZE (*Zea mays* L) FAMILY

