Farmers Guide To Hybrid Maize

by
S.K. Kim, Y. Efron, F. Khadr, J. Fajemisin

International Institute of Tropical Agriculture
National Cereals Research Institute,
National Accelerated Food Production Program,
Institute of Agricultural Research, Ahmadu Bello University,
Institute of Agricultural Research and Training,
and University of Ife.

CONTENT

INTRODUCTION

Hybrid maize can greatly increase maize production and farmer income in Nigeria. In 1983, IITA scientists, in collaboration with Nigeria - national programs such as National Cereals Research Institute, National Seed Service, Institute of Agricultural Research, Ahamadu Bello University, University of Ife, succeeded in developing and testing the first generation of single cross maize hybrid varieties for Nigeria. The Project was financially supported by the Federal Ministry of Education, Science and Technology. Yield trials conducted on Research Stations throughout Nigeria showed that hybrid maize varieties performed substantially better than the best available, normal (open-pollinated) maize varieties. In 1984, the primary task is to convincingly demonstrate to farmers and administrators the yield superiority of maize hybrids on farmers fields. The Federal Ministry of Agriculture, through the National Accelerated Food Production Program, will be deeply involved in these nation-wide On-farm demonstration trials.

Hybrid maize seed is neither cheap nor

readily available. It must be produced in a very special way using certain selected inbred parents. The seed produced by a farmer who grows hybrid maize is not hybrid maize seed any longer. Thus each farmer must purchase new hybrid seed every year. If a farmer grows his hybrid maize as carefully and skillfully as possible, this yearly seed purchase expense will be more than adequately repaid through high maize yield. Hybrid maize seed plus good crop management can give high yields and large profits!

The purpose of this manual is to instruct farmers on the best available methods for growing hybrid maize. This is the first edition of the Farmers Guide to Hybrid Maize. It will be updated and improved as farmers and scientists gain further knowledge and experience with hybrid maize. Together we can work to increase our knowledge of maize production for the benefit of all.

E.H. Hartmans
Director-General
IITA.

O.E. Iyamabo
Director,
Agricultural Science
Federal Ministry of
Education, Science and
Technology, Lagos.

Land Preparation

1. When: After the first good rain (>20mm)

2. Ways: Conventional tillage or Strip (minimum) tillage.
   - Tractor : one plow and one disk in case of conventional tillage
   - Ridges or flat

3. Fertilization: BASAL APPLICATION
   400 kg 15-15-15 before planting (8 bags)
   - Suitable soil pH : 5.0 - 8.0
   - If soil pH below 5.0, apply lime or dolomite at the rate of 1.0 ton/ha (broadcast) before disking
   - $MgSO_4$ = 30-50 kg/ha and $ZnSO_4$ = 5 kg are recommended at Ilorin and Gusau area, where S, Mg, and Zn are deficient. Both $MgSO_4$ and $ZnSO_4$ can be mixed with the compound fertilizer.

Planting

1. When: After two good rains (>50mm)
   Forest area : late March - early April
   Guinea savanna area : Mid-late May
   Sudan savanna area : Early-Mid June.

2. Ways: Machine Planting on flat
   - Row spacing : 75cm
   - Hill spacing : 23-25cm

Ridges must be straightened

- Hand planting on ridge
  Row spacing : 85-90cm
  Hill spacing : 18-20cm
  (Final stand : 50-55,000 plants/ha)

3. Seed sowing (65,000 seeds/ha)
   - Only one seed/hill

4. Depth of Seed : 3-5cm
   - Need to press well after planting in case of hand planting
   - Dry area : maize seed can be sown on flat or at side of ridge.
   - Wet, waterlogged area : sow seed on top of ridge.

5. Early planting is important to avoid excess water and overcast, at early maize growing stage and ensure lots of water around flowering time.

Weed Control

Good weed control is essential for good maize yield.

By herbicide:

1. When: Within 2 days after planting
   (Pre-emergence)

2. Name and amount:

Conventional tillage:

- Primextra : 5 lit./ha

Strip tillage:

- Primextra : (5 lit.) plus
  Gramaxone (4 lit./ha)

- Gramaxone (Paraquat) - 4 lit./ha can be sprayed with knap-sack sprayer about 2-weeks before flowering time.

- Guard shield should be used on sprayer to avoid herbicide spalashing on maize plants.

*Herbicide should be sprayed when soil moisture is adequate.

Hand Weeding

- At least two weedings may be necessary

Side Dressing

1. When: 4 weeks after planting (Knee height stage: 6 - 7 leaves)

2. Amount: 250 kg of CAN (5 bags) or 150 kg of urea (3 bags) per hectare

- Aparoximately one tea spoon of CAN/per plant.

3. Ways: band application in dry soil 10cm away from the plants. Fertilizers must be place into soil

4. One additional N can be applied one week before flowering, if there is still N deficiency (100 kg CAN/ha).

Nutrient Deficiency Symptoms

- Nitrogen(N) : Yellowish along mid leaf and tip.
- Phosphorus(P_2O_5) : Purplish along the edge of leaf
- Potash(K_2O) : Yellowish along the edge of leaf
- Sulfur (S) : Pale buds and yellowish top leaves.
- Magnesium(Mg) : White-yellowish stripes between the veins
- Zinc(Zn) : White-yellow stripes and pale buds usually combined with Mg deficiency.

Leaf color of health plants must be dark green until flowering.

*N deficiency at flowering can reduce maize yield drastically.

" and K uptake by maize occurs at early growing state only.

Disease and Pest Control

NB: Most economic way of disease and insect control is to use a resistant hybrid or variety. Maize seeds should be dressed with a systemic chemical such as Furadan (seed treatment).

Disease/Insect	Symptoms	Remarks
◦ Maize Streak Virus	: Whitish streak	Most hybrids are resistant, Furadan may prevent streak virus infection at early stage.
◦ Rust-Polysora (lowland)	: Brownish scattered pustules on leaf surface.	Most hybrids are resistant
Sorghi (highland)	Golden brownish purple on both leaf surface	Most lowland hybrids are susceptible to highland sorghi.
◦ Blight-maydis (lowland)	Reddish-brown, small egg shaped blight.	Most hybrids are resistant
Turcicum (highland)	Long, elliptical grayish-green or tan lesion.	Most lowland hybrids susceptible to highland turcicum.
◦ Stalk/ear rot		Low K and too high N application may cause more rot diseases.

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Disease/Insect	Symptoms	Remarks /2
◦ Stem borers		
Sesamia	Damages young maize causing "dead heart"; Pink worm (Eastern/ Southern Nigeria)	Most hybrids are somewhat tolerant. In heavy stem borer areas, furadan (5 kg/ha) may be applied in soils at planting time.
Eldana	Damages adult plant by making tunnel on stalk/ears; Blackish worm (Western part of Nigeria)	
Busseola	Damages young/adult plants also causing "dead heart"; Creamy-White worm (Northern Savanna and Plateau Nigeria)	

Flowering Time

◦ Maize needs a lot of water for one week around flowering. In case of a dry spell, supplementary irrigation will certainly increase maize yield.

◦ Too many weeds among plants reduces grain yield.

◦ Delaying planting until early July in savanna areas causes poor seed set of maize ears due to dry and hot weather at flowering time.

Post-flowering cautions

1. Adequate soil moisture should be maintained in 30-35 days after flowering
2. Termite: in the dry areas, termite might cause maize roots and stalk to break; May spray chemicals.
3. Bird damage: Birds often cause a great yield loss by attacking ear tips, especially maize ears with open tips.

Maturity/Harvest

1. Time of harvest:

   Maize ears can be harvested at 25 days after flowering for eating green or at 45 to 60 days for grain production.

   - Green ears: 25-30 days after flowering (early dough or sweet corn stage)
   - Grain: Early maturity : 45 - 50 days
     Late Maturity : 55 - 60 days

   *Grain moisture at harvest is usually 20-30%.

2. Physiological maturity:

- Symptom: black layer at the tip of kernels when removed from cob. Grain moisture at this stage : about 20%
- All kernels must be fully dented, with no sign of milk
- Too much delay of harvest may cause ears to fall down which makes machine harvest difficult and also fallen ears might become rotten.

3. Ways of harvest :

Hand or combined by machine.

Ear symptoms of fertilizer deficiency:

- Nitrogen : small ears, unfilled kernels on tip.
- Phosporus : twisted and poorly developed ears
- Potash : loose kernel rows and open unfilled tip.

NB: Maize stalk and leaves must be left in field for soil improvement (manure).

Drying/Shelling/Storage

Maize should be properly dried before shelling

1. Forest area : Maize crib is recommended for natural drying and storage
2. Savanna area : Maize can be left to dry well in the field due to rain ceasing around harvesting time.
3. Maize ears should have moisture around 20% for machine shelling. Otherwise, kernels may be broken.

Ways of drying

1. Crib, 2) Electric dryer, 3) natural drying in the field
2. Hanging on wood or metal standing frames.

IMPORTANT POINTS

- High yielding hybrids can produce good yield only with good field management conditions.
- Adequate levels of fertilizer (N : 120 kg, P_2O_5, 60 kg, and K_2O, 60 kg/ha) and good weed control are needed.

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- Sulfur, Mg and Zn deficiency, and acid soil conditions may result in low yield.
- Good seed bed preparation and optimum plant stand (50,000 - 55,000 plants/ha) account for about 30% of crop success.
- Strip or minimum tillage is recommended with good weed control using herbicides.
- Seeds produced from hybrids cannot be used as seed for the following season : yield will decline by 30 - 50%.
- Good maintenance of soil fertility is essential for continuous production of good maize crop.
- Rotation with a legume crop such as soybean or cowpea must be followed after 2-3 crops of maize. Legume cover crop such as Mucuna (like kudzu) is highly recommended.
- For small farmer's in the forest area, alley cropping with legume tree such as Leuceana etc. is highly recommended.

Edited by: Drs. S.K. Kim, Maize Breeder, IITA

" Y. Efron, Director, Cereals Program, IITA

" F. Khaeri, Maize Breeder/ Agronomist, IITA

" J. Marech, Maize Breeder, IITA

" J. Fajemisin, Maize Pathologist/ Breeder IITA

" B.T. Kang, Soil Scientist, IITA

" C.C. Ago. Leader, Maize Program, NCRI

" G.E.C. Chiaeri, Coordinator, NAFPP

" C.O. Alofe, Agronomist, Univ. of Ife/IITA

" O.O. Olagunde, Agronomist, IAR-ABU.

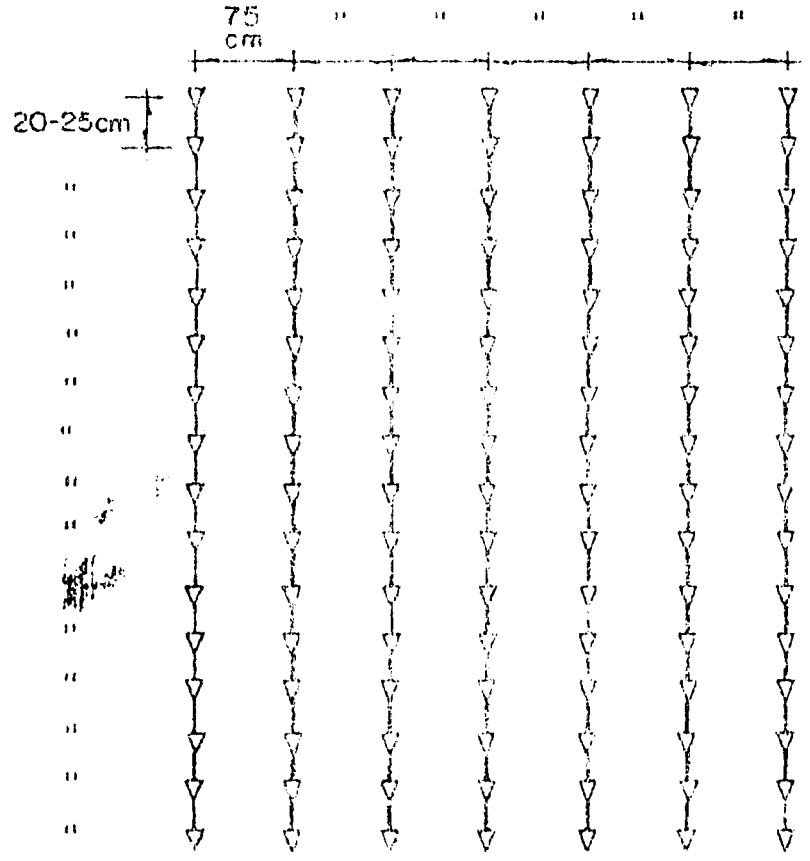

Fig. I. A standard diagram of hybrid maize planting space: One seed can be dropped into 3-5 cm deep in each hill, and covered well with soil, and pressed

- Machine planting by tractor - Planter plate distance should be as 20cm spacing
- Plant spacing can be adjusted based on land preparation and planting equipments, spacing: 75 cm x 25 cm or 85-90 cm x 18-20 cm.

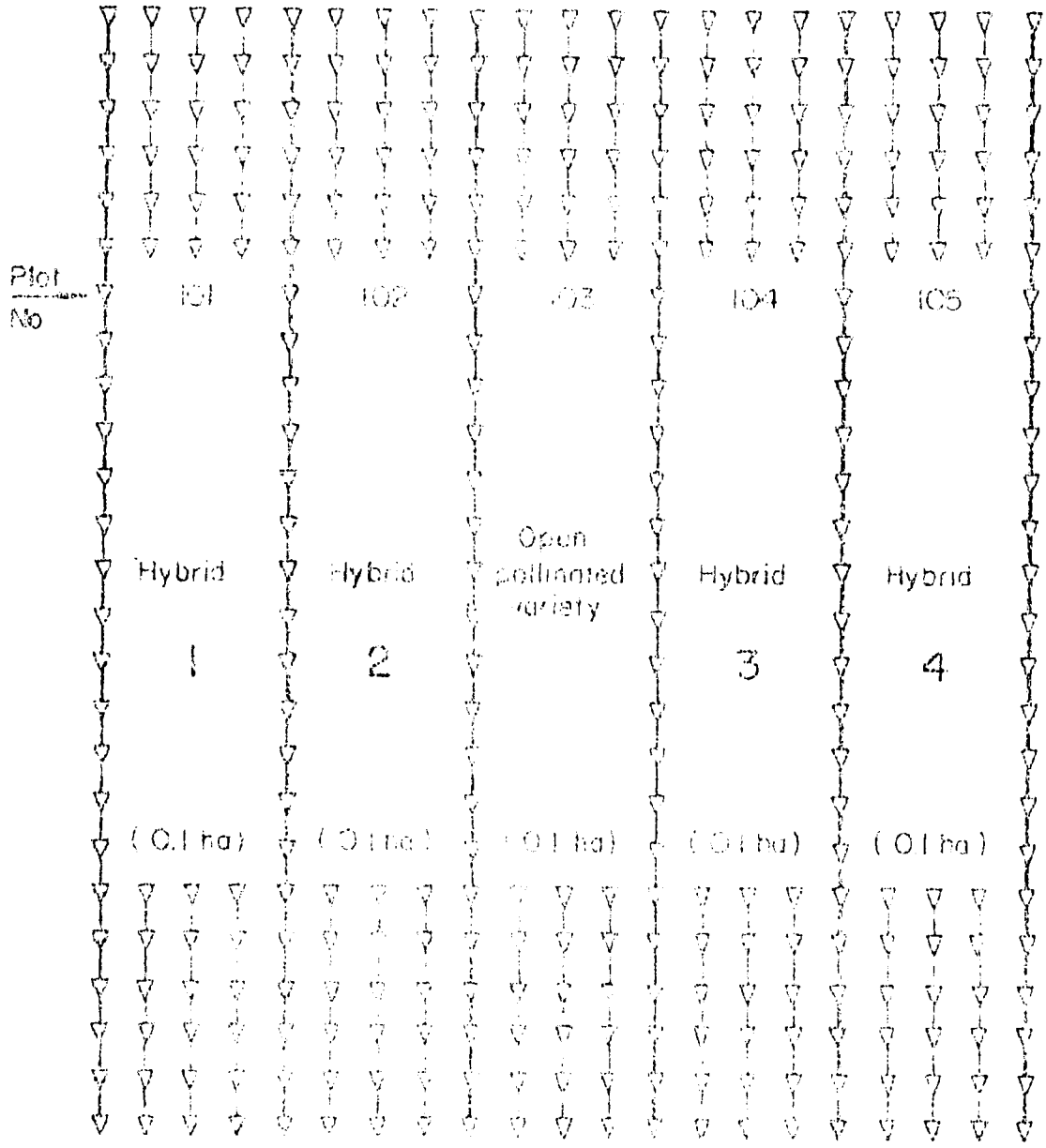

Fig. 2. A diagram for hybrid maize On-farm demonstration

- Each farmer should plant hybrids according to plot no., sequence order : 101, 102, 103, 104 ... etc
- Number of rows can be adjustable based on the shape of field. Assume 75cm row spacing ; (e.g. 13 rows x 100m, 26 rows x 50 m, or 39 rows x 33 m, 66 rows x 20m etc)