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MAIZE NETWORK FOR WEST AND CENTRAL AFRICA

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Maize Technologies In The Pipe Line At
The End Of SAFGRAD-II

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MAIZE TECHNOLOGIES IN THE PIPE LINE
AT THE END OF SAFGRAD-II

Introduction

The collaborative research and regional trials coordinated by the Maize Network have allowed national programs to identify promising varieties and technologies. After further testing of the selected technologies at several locations in individual countries, new technologies have been released and adopted by farmers.

The improved technologies made available to farmers have helped in extending maize hectareage in all the 17 Network-member countries. The savanna belt of West and Central Africa has witnessed large increases in maize production. The early and extra-early varieties promoted by the Network have made significant contribution to the increase in maize production through the movement of maize into new frontiers, as they escape drought and help to bridge the hunger period in July since they mature when other crops are not ready.

Despite the success that has been achieved by the maize network in stimulating the initiative and capacity of national scientists to identify and solve production constraints, there are still a number of technologies in the pipe line. These would need continued attention after SAFGRAD-II if the goal of self-sufficiency is to be attained. The technologies ~~in the pipe line~~ include:

- 1) *Striga* tolerant varieties
- 2) Early, drought tolerant varieties
- 3) Some new varieties and management practices ^{developed} by the maize network during SAFGRAD Phase-II.

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It may be noted that apart from the two constraints mentioned above, there are other equally important research areas such as breeding for nitrogen use efficiency, breeding for stem borer resistance and the control of the larger grain borer which

would need priority research attention in order to ensure increased maize production and productivity in the sub-region.

However, this paper would concentrate on only the technologies in the pipe line which justify continued funding for SAFGRAD Phase-III.

1. Breeding for *Striga* tolerant Varieties

One of the major biotic constraints to increased maize production in the semi-arid zone of West and Central Africa is the parasitic weed, *Striga hermonthica*. Even though the parasite has always been a serious pest on sorghum, pearl millet, groundnuts and cowpeas, maize is probably more seriously affected than other cereals largely because the crop is relatively new to the region and has not co-evolved with the parasite. *Striga* causes not only high yield losses, ranging up to total crop loss, but also it can compel farmers to abandon maize cultivation in their farms. The parasite is therefore a big threat to the rapid spread of maize into the semi-arid zone.

IITA has identified sources of moderate resistance to *Striga hermonthica* and developed effective resistance screening method. Striga sick plots have been established in Ghana, Cameroon and Benin for screening for *Striga* resistance with the technical assistance of IITA. A number of promising *Striga* tolerant materials have been identified and are being used in the breeding programmes. Also, evaluation of cultural practices for control of the incidence of *Striga* are in progress in Ghana and Cameroon, while Burkina Faso is working on biological control of *Striga*. A *Striga* working group comprised of Ghana, Benin and Cameroon has been formed by the maize Network and these countries have been assigned *Striga* research responsibilities. Striga would deserve priority attention during the next phase of the Network and it is expected that the Lead Centers for *Striga* would be supported to incorporate *Striga* resistance genes into available varieties and breeding materials as well as to continue research into the cultural methods of *Striga* control.

2. Breeding for early, drought tolerant varieties

Rainfall in the semi-arid zone of West and Central Africa are unreliable, unpredictable and vary from year to year. For instance, the Sahelian countries of West and Central Africa were severely affected by exceptional drought that occurred in the late 1960's and early 1970's which resulted in the fall of cereal production by about 600,000 tons, a little less than 15% of the annual harvest in a normal year (Sasson, 1990). In the 1980's most of the countries of sub-Saharan Africa were once again hit by a severe drought which resulted in food shortages in 22 countries, affecting about 250 million people (Farmer and Wigley, 1985). The Sahelian drought has been a persistent feature of the region for more than a decade and largely accounts for the annual fluctuations of maize production in the semi-arid zones (SAS). Tolerance to soil moisture stress is therefore an important trait for increased production and productivity in the semi-arid zones.

Breeding for varieties that combine early maturing (90-95 days) with drought tolerance and reasonable good yield became a major breeding goal of the IITA/SAFGRAD project in 1984. At present, a number of early maturity varieties with moderate level of tolerance to drought have been developed and made available to several national programs. The varieties include Across 86 Pool 16 DT, Across 87 Pool 16 DT, Across 88 Pool 16 DT, Farako-Bâ 86 Pool 16 DT and Farako-Bâ 88 Pool 16 DT. There is however, a need for enhancement of drought tolerance and adaptation to drought stress in the released varieties so as to make them more attractive to farmers. A programme has therefore been initiated towards this goal. There is also the need to incorporate drought tolerance into other drought susceptible varieties already in production in several Network member countries. Furthermore, a program has been initiated to develop an early maturing drought tolerant population from landraces that evolved in some West African countries and some improved varieties that have shown good performance under drought stress. The drought tolerant population would be improved through recurrent selection to serve as the source for future drought tolerant varieties.

There is therefore a need to sustain the research effort in order to make available varieties with good levels of drought tolerance for Network member countries.

3. Promotion of the adoption of technologies made available by the Maize Network

An important area in which remarkable progress has been made by the SAFGRAD IITA Project is the development of maize varieties with good adaptation to the bio-climatic conditions of the semi-arid ecologies and resistance/tolerance to major diseases. In Table 1 is presented a list of promising varieties developed by SAFGRAD which are in the pipe line, while Table 2 shows promising varieties in the pipe line for release in member countries of West and Central Africa. Results of the SAFGRAD Regional Uniform Variety trials have revealed that the streak resistant extra-early varieties, TZEE-W SR, TZEE-Y SR, Maka SR, BDP SR and CSP SR are significantly higher yielding than their non-resistant counterparts. Furthermore, the SR versions are vigorous and more tolerant to other foliar diseases (such as rust, blight and *Curvularia* leaf spot) than their streak susceptible counterparts. Also, results from the RUVT-early over the past 4 years showed that there were Pool 16 DT SR varieties which significantly out yielded the streak susceptible variety SAFITA-2, which has already been released in several member countries. It has therefore been recommended that all countries that have released SAFITA-2 should consider replacing it with Kamboinse 88 Pool 16 DT SR or Farako-Bâ 88 Pool 16 DR SR (HD) in order to ensure yield stability.

Promotion of the new SAFGRAD early and extra-early streak resistant varieties as well as the varieties in the pipe line and released varieties of member countries of the network would be vigorously undertaken by the Network in order to ensure adoption of these improved varieties and the achievement of the goal for food self sufficiency for the countries in the semi-arid zones.

Towards this end, the following activities/measures are

Table 1. Promising SAFGRAD technologies in the pipé line.

1. Extra-early varieties

Name of Variety

(Across 8131 x JFS) x
 Local Raytiri
 CSP
 CSP-SR
 CSP x Local Raytiri
 Pool 27 x Gua 314
 Pool 28 x Gua 314
 Pool 30 x Gua 314
 TZEE-W1
 TZEE-W2
 TZEE-Y
 TZEE-Yellow Pool
 TZEE-YSR
 TZEEF-Y
 TZEESR-W x Gua 314

2. Early Varieties

Across 90 Pool 16 DT.
 Farako-Bâ 90 Pool 16 DT
 Ina 90 Pool 16 DT
 Kamboinse 90 Pool 16 DT
 Maroua 90 Pool 16 DT
 Nyankpala 90 Pool 16 DT
 Maka SR

3. Improved agronomic practices

1. Tied ridges for soil moisture conservation in Sudan savanna.
2. Better seed treatment chemicals for improved plant establishment and grain yield.
3. Increased plant population for higher grain yield of early and extra-early varieties.
4. Earlier date of fertilizer application (top dressing) for increased yield of early and extra-early varieties.

Table 2. Promising maize varieties in the pipeline for release in West and Central Africa countries.

| Country/Name of variety | Origin | Adaptation Area |
|---------------------------|--------------------|-----------------|
| <u>BENIN</u> | | |
| DMR-ESRW | IITA | North |
| Pool 16 DR | SAFGRAD | North |
| EV 8328-SR | CIMMYT-IITA | North |
| <u>BURKINA FASO</u> | | |
| FBC 6 | INERA (Burkina) | |
| KPB | | |
| KPJ | | |
| KEB | | |
| KEJ | | |
| Pool 16 DR | | |
| <u>CAPE VERDE</u> | | |
| Maka | Mauritania/SAFGRAD | |
| <u>CENT.AFR. REPUBLIC</u> | | |
| CMS 8501 | Cameroon | |
| CMS 8710 | Cameroon | |
| <u>CHAD</u> | | |
| Pool 16 DR | SAFGRAD | Soudan Savanna |
| CMS 8602 | Cameroon | Sudan Savanna |
| CSP X L. Raytiri F3 | SAFGRAD | Sahel |
| <u>COTE D'IVOIRE</u> | | |
| Maka | Mauritania/SAFGRAD | Center |
| Pool 16 DR | SAFGRAD | Center |
| TZEF-Y | SAFGRAD | Center |
| Ferke 8336 | CIMMYT | North |
| <u>GHANA</u> | | |
| Dorke SR (Pool 16-SR) | CIMMYT-IITA | Country-wide |
| GH 8363-SR (QPM) | CIMMYT-IITA | Country-wide |
| <u>GUINEA</u> | | |
| Ikenne 83 TZSR-Y-1 | IITA | |
| EV 8428-SR | CIMMYT-IITA | |
| IRAT 200 | IRAT/CI | |
| IRAT 292 | IRAT/CI | |
| Poza Rica 8526 | CIMMYT | |
| <u>MALI</u> | | |
| DMR-ESRY | IITA/SAFGRAD | |
| TZEF-Y | SAFGRAD | |
| Los Banos 8531 | CIMMYT | |
| Across 8464 | CIMMYT | |

Table 2. (Cont'd)

| Country/Name of variety | Origin | Adaptation Area |
|----------------------------|----------------|------------------|
| <u>MAURITANIA</u> | | |
| Gwebi 8422 | CIMMYT | |
| Pool 16 DR | SAFGRAD | |
| CSP Early | CIMMYT/SAFGRAD | |
| <u>NIGER</u> | | |
| Composite Kollo 1 | Niger | South (Rain-fed) |
| <u>NIGERIA</u> | | |
| White Composite | IAR & T | |
| <u>SENEGAL</u> | | |
| Sids 8445 | CIMMYT | |
| Ikenne(1) 8149-SR | CIMMYT-IITA | |
| <u>TOGO</u> | | |
| AB 11 | Togo | |
| AB 12 | Togo | |
| AB 13 | Togo | |

proposed to be carried out by the maize Network in the next phase.

(a) Research for improved cultural practices for early and extra-early varieties

For a sustainable increased level of maize production, the early and extra-early varieties made available to member countries must be managed with all the proven yield-augmenting practices such as pre-planting tillage, tied ridging, the use of crop residues as mulch, fertilizer, the use of optimum population density and seed treatment. As a result of agronomic research carried out by the IITA/SAFGRAD resident research and the national programmes of Burkina Faso, Cameroon and Nigeria on the early and extra-early varieties grower recommendations are now available for these varieties. Efforts would be made to refine the management practices and develop new agronomic practices. Proven agronomic recommendations would be made available and promoted within Network member countries for adoption to ensure a quantum jump in production and productivity. A major effort of the Network during the next phase would be to promote the adoption of the improved early and extra-early varieties and the accompanying agronomic practices in member countries.

(b) Influence of Agricultural Policy

Among the socio-economic constraints to the adoption of improved varieties and other technologies by farmers in Network member countries may be mentioned: unavailable and expensive inputs, low and unstable prices of maize, inadequate or poor seed production and distribution, weak research-extension-farmer linkage, lack of well organized and effective extension services and lack of or inappropriate on-farm testing. Since past experience has revealed that the improved varieties and agronomic practices promoted by the Network member countries are economically feasible and farmers are willing to adopt them when the agricultural policies of the governments are right, the

linkage, lack of well organized and effective extension services and lack of or inappropriate on-farm testing. Since past experience has revealed that the improved varieties and agronomic practices promoted by the Network member countries are economically feasible and farmers are willing to adopt them when the agricultural policies of the governments are right, the Network would explore the possibilities of influencing agricultural policies of member countries in order to remove the socio-economic constraints.

To this end, the Network would encourage members to organize activities, such as:

- (i) Annual maize workshops: These would involve researchers, extensionists, policy makers and farmers. The objective would be to review research findings, grower recommendations and agricultural policies.
- (ii) Annual research planning: This will involve researchers, extensionists and farmers. The objective would be to establish research-extension-farmer linkages to ensure feedback from farmers and extensionists so that the two bodies can influence the research agenda of the Network member countries.

4. Returns from the adoption of maize technologies in the pipe line

With the promotion and adoption of the early and extra-early varieties with good levels of resistance/tolerance to *Striga*, drought and streak, an increase of the maize area under production in most of West and Central Africa will occur. It is expected that maize area in most countries would increase by 50%. If the total package of improved early maturing streak resistant varieties and recommended management practices are adopted, it should be possible to achieve an increase of 0.5 t/ha over the present national average yield. The result will be an increase in total maize production ranging from 50 to over 100% in the various countries. If the right agricultural policies are

implemented

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