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## SADC MAIZE NEWSLETTER

"This is the first issue of the SADC Maize Newsletter and I would like to encourage you to take a look at the topics we have covered in this issue and send us your suggestions and comments. Should you want more information on any particular topic, please do not hesitate to get in touch with me or the cited contact scientists. I wish to encourage you to send submissions on issues relating to maize research in your program which might include research annual report summaries, research highlights or abstracts, trip reports, research ideas or queries, etc. "

--Batson T. Zambezi, MWIRNET

### COLLABORATIVE RESEARCH PROJECTS UNDERTAKEN BETWEEN REGIONAL MAIZE SCIENTISTS AND THE NETWORK

Research proposals, submitted under the Network Regional Collaborative Research Granting Program and considered for approval by the Network Steering Committee, are presented below. Regional relevance, in terms of research topic, was a primary factor in the selection of the proposals. Teams of researchers were identified based on similarity of research topic submitted (e.g., germplasm development, legume-based rotations, nitrogen use efficiency, stalk borer epidemiology and resistance). Selection was also prefaced by target priorities determined by a group of SADC maize scientists: Drought, Earliness, Nitrogen-use Efficiency, Soil Fertility, and Pests and Diseases.

#### Collaborative Maize Research Projects initiated in the 1995/96 Season:

"Selection of a More Uniform Variety from Catete" - Fernando Sito, Angola

"White Maize Genotype performance Study" - Licketso Moremoholo, Lesotho

"Developing Early Maturing Varieties" - Calisto Bias, Mozambique

"Evaluation of Acid Soil Infertility Constraints to Maize Production in the Mahlangatja Rural Development Area of Swaziland" - John Pali-Shikhulu, M. Mkhabela, E. Nxumalo, G. Shongwe and T. Edge, Swaziland

"Evaluation of Maize Streak Converted Germplasm" - Zubeda Mduruma, H.B. Akonaay, N.G. Lyimo, P.M.S. Ngowi, and J.D.S.M. Kaswende, Tanzania

"Breeding for Earliness in Maize" - Catherine Mungoma, Zambia

"Nitrogen Use Efficiency of some Zimbabwean dwarf and Zambian maize Varieties by use of the 15N Methodology" - M. Mwale, N. Manyowa, M. Damaseke, L. Phiri, Zambia

"Response of maize planted on Kalahari Sands to Inorganic and organic Fertilizers in Gokwe South District" - Cornelius Chiduzza, Zimbabwe

"The Use of Protogynous Maize Genotypes to Breed for Tolerance to Moisture Stress at Flowering" - Lewis Machida, Zimbabwe

### PROGRESS REPORTS OF SELECT COLLABORATIVE PROJECTS

#### ZAMBIA

##### Breeding for Earliness in Maize

Dr. Catherine Mungoma, Golden Valley  
Agricultural Research Trust, Private Bag RW  
50834, Lusaka, Zambia. (Tel: 260-1-611150, Fax:  
260-1-290111/250442)

Objective: To develop heterotic populations for use in breeding early maturing maize varieties.

**Activities:** Thirty-two early maturing populations, obtained from CIMMYT-Zimbabwe, were this season, test-crossed to two early inbred lines (MML232 and MML334), of opposite heterotic patterns from the Zambian National Maize Program. Ten rows of each population were planted on 25 November, 1995, as female rows in blocks and these were hand-crossed to MML232, also planted in blocks as male. The crosses with MML334 were planted an isolation plot on 4 December, 1995, using the populations as female.

The season at Golden Valley was generally good, with adequate rainfall. The populations were, however, much earlier than the inbred lines and this may result in poor seed set. The MML334 isolation plot had very poor plant establishment due, mainly to bird and rodent damage at seedling stage. This isolation may be repeated during winter 1996 if inadequate seed is obtained.

#### TANZANIA

##### **On Station Evaluation of Maize Streak Converted Materials**

Dr. Zubeda O. Mduruma, ARTI - Ilonga, P.O. Ilonga, Kilosa, Morogoro, Tanzania.

**Objectives:** (1) To evaluate MSV converted material in hot spot areas of Tanzania. (2) To determine the performance in yield and adaptability of streak converted material.

**Activities:** Two sets of PT Kilima-ST-96 (196 FS Families), received from CIMMYT-Zimbabwe. Kilima is an OPV from the Tanzanian maize program. This variety, which is susceptible to MSV, was sent to the CIMMYT-Zimbabwe Maize Research Station, Harare for conversion to streak resistance. The conversions are now under evaluation at locations in Tanzania, Seliani Agricultural Research Institute and Ukiriguru (1500 masl), in North and West of Tanzania, respectively, in "hot spots" under natural infection. The Ukiriguru trial was planted in February, whereas, the Seliani trial was planted in March, 1996.

At Ukiriguru, the rainfall has so far been reported good and the trial is performing well. There is no recent information on MSV pressure because the scientist has not been able to visit the site yet. At

Seliani the February rains were quite scanty and the trial was planted in March, after a dry spell. Not much information is available so far on disease pressure at both locations.

Progress reports of the other collaborative projects will be featured in the next issue of the Newsletter.

#### **RESEARCH BRIEFS FROM NATIONAL MAIZE RESEARCH PROGRAMS IN THE SADC REGION**

##### **MALAWI**

Contact Scientist: Willie G. Nhlane, Chitedze Agricultural Research Station, P.O. Box 158, Lilongwe, Malawi. (Tel: 265-767222/225)

Malawi has three maize breeding sub-programs focusing on three different agro-ecological zones of the country. The Mid-Altitude Hybrid Sub-program caters for the mid-altitude ecology (60% of the maize area); the Low-altitude Hybrid Sub-program caters for the lowland ecology (40% of the maize area); whereas the Population Improvement Program caters for both mid- and low-altitude ecologies. Each of these component programs has its own objectives. However, the general objectives of the maize program are: To breed maize varieties/hybrids that are high yielding and stable; varieties/hybrids that are resistant to diseases and pests, including storage pests; and to breed maize varieties that keep and process well under traditional way of grain processing; and finally to breed maize varieties/hybrids that respond well to good management practices, e.g. fertilizers and other inputs.

At the 1995 annual maize planning meeting, which was held in Mzuzu last August, a number of maize varieties/hybrids were earmarked for release, by the Malawi Maize Program, at the next sitting of the Malawi Variety Release Committee. Varieties are normally evaluated for 2-3 seasons before the outstanding ones are recommended for release. After release breeder seed is supplied to seed companies for seed production.

It was observed that even though the 1994/95 season experienced unprecedented drought, some encouraging results were achieved in the population improvement program. After testing different populations in major ecological zones of

the country, some superior materials were identified. These were: Population 92, AR804, and AR809, which performed better at mid-altitude, whereas, AR 805 and AR 808, white Pool and AR793, proved superior in the lowland ecology of Malawi. These outstanding populations will be proposed for release to the farming community this year (1995).

## TANZANIA

Contact Scientist: Zubeda O. Mduruma, ARTI - Ilonga, P.O. Ilonga, Kilosa, Morogoro, Tanzania.

The Tanzanian annual maize planning meetings for 1993/94 and 1994/95 were held at Kibaha near Dar-es-Salaam. At these meetings research highlights for the maize research in the country were presented.

The objectives of the National Maize Research Program are:

- To develop high yielding stable hybrids and varieties suitable for the high, intermediate and low altitude maize producing areas.
- To develop improved management practices for the major maize growing areas.
- To evaluate varieties, hybrids and management practices in research stations and farmers' fields.
- To maintain maize germplasm and produce breeder seed.

The presentation included maize production figures for the 1992/93 Season:

Average total maize production in Tanzania during the last 5 years (1988/89-1992/93) was 2484 million mt. In the 1992/93 season the estimate was for 2408 million mt. The largest quantity of maize was produced in the southern highlands, 44.8%. The Lake Zone area produced 22.7%, whereas the Northern and Eastern Zone areas produced 9.9 and 8.9%, respectively.

Main research thrusts for 1993/94 season were:

- Tanzania Maize Variety Trial-94 IS 10 sites
- Preliminary Hybrid Evaluation Trial 3 sites
- Preliminary Trial 11-94 3 sites
- Preliminary Trial 12-94 3 sites
- Primextra Evaluation Trial 1 site
- Hybrid Observation Plots 1 site
- Inbred Line Evaluation 2 sites

The main Maize Breeding Stations are: Ilonga (503 masl), in Morogoro Region; Uyole (1850 masl), Mbeya, Southern Highlands; Ukiriguru (1198 masl), Mwanza, Western Tanzania; and Chollima (360 masl), Morogoro Region. Each station breeds germplasm that is suitable to the agro-ecological zone in which it is situated. Main research thrusts for 1994/95 season were similar to those of the previous season with most activities continuing. One notable aspect of the Tanzanian maize program is collaborative trials with private organizations such as seed companies, chemical companies and international research centers. There is need to expand such collaboration with other National Maize Programs in the region through the Network.

## Research Highlights

- In the Tanzania Maize Variety Trial-IS, conducted in the mid-altitude zone, the highest yielding entries across 6 locations were CARGILL Hybrids, CX5051, CX4006; and CX3010; a CIMMYT-Zimbabwe Population ZM607 and a PANNAR Hybrid PAN 695.
- ZM607 and LAT-A (CIMMYT-Zimbabwe) continued to perform well. These would be used as male parents in a top-cross program for mid-altitude.
- In a hybrid trial from CIMMYT-Mexico conducted at Seliani Research center, two hybrids CMS935001 and CMM935059 were the top yielders.
- Promising hybrids from CIMMYT-Mexico hybrid trial evaluated at Katrin and Ilonga were CMY933153 and CMS93305.

## ZAMBIA

Contact Scientist: Dr. Catherine Mungoma, Golden Valley Agricultural Research Trust, Private Bag RW 50834, Lusaka, Zambia. (Tel: 260-1-611150, Fax: 260-1-290111/250442).

The Zambian Maize Research Program has the following objectives (1993/94 Annual Report):

- "To develop different types of varieties for different categories of farmers, i.e. single crosses, three-way, double crosses, top-crosses, synthetics and open pollinated varieties (OPVs); of different maturity groups. Other important characteristics include high yield potential, insect and disease resistance,

soil acidity and drought tolerance, and desirable plant and grain type.

- To develop production technology that is relevant to farmers' farming systems given their resources and constraints to exploit the production potential of available genotypes in a sustainable manner.
- To increase and stabilize food production through the introduction to farmers of effective pest management methods for control of major pests and vectors of crops.

#### Summary of main research areas - 1993/94

**Population Improvement.** Recombination of selected progenies was done in 12 populations. This was done in order to complete the first cycle of selection in these populations. The following varieties were planted for improvement using S1 selection method: ZUCA, PR7832, Pop 25, A7844 and DTP. There five introductions from CIMMYT: Pop 101, Pool 16 Sequia, La Posta Sequia, ZM 601 and TS6.

**Inbred Line Development and Improvement.** Over 7000 inbred lines and sub-lines were advanced to the next generation of selfing. One hundred and two were introduced from CIMMYT.

#### REGIONAL AND INTERNATIONAL MAIZE CONFERENCES

##### South African Plant Breeding Symposium (March 19-21, 1996)

The South African plant breeding symposium, was held at Elgro Hotel, Potchefstroom, South Africa, from March 19 to 21. Among the scientists from the southern African region, Batson Zambezi presented a paper entitled "Comparison of top-cross, three-way and single-cross maize hybrids at three levels of nitrogen in Malawi". Lewis Machida presented a paper entitled "Patterns of seasonal mean rainfall over Zimbabwe and maize yield levels from 1901/02-1994/95: Necessity to breed drought tolerant maize varieties". A paper presented by Kevin Pixley was entitled "Combining ability for yield and seed traits among ten southern African, temperate, and CIMMYT maize populations". It was a very good symposium, with papers covering various aspects of crop production, and a variety of crops such as

cereals vegetables, fruits and many more. Most of the more than 100 participants were from the host country. However, some came from neighboring countries such as Malawi, Mozambique, and Zimbabwe.

##### Symposium on Developing Drought and Low-Nitrogen Tolerant Maize (March 24-29, 1996)

This symposium was organized by the Maize Physiology Unit at CIMMYT, Mexico. Because of the recent experience this region and some parts of the world had on drought, the symposium attracted a wide audience from all parts of the globe. More than 90 papers and posters were presented, dwelling on the state of the art in breeding for drought and low-nitrogen tolerance in maize.

The Southern African Region was represented by:

Catherine Mungoma and Charles Mwambula (Zambia), who presented a poster on "Drought and low N in Zambia: The problems, and a breeding strategy".

Lewis Machida (Zimbabwe), presented a poster on "Estimates of yield losses in maize production due to drought, and current research efforts to breed for drought tolerance".

Cosmos Magorokosho and Kevin Pixley (CIMMYT-Zimbabwe) presented a poster on "Drought tolerance at flowering and cross-over interactions for yield of three maize populations grown in two agro-ecological zones of Zimbabwe".

Zubeda Mduruma and P. Ngowi (Tanzania) presented a poster on "The need for genetic and management solutions to limitations imposed by drought and low-N on maize production in Tanzania".

Steve Waddington (CIMMYT-Zimbabwe) and Paul Heisey (CIMMYT-Mexico) presented a paper on "Meeting the nitrogen requirements of maize grown by resource-poor farmers in southern Africa by integrating varieties, fertilizer use, crop management and policies".

Calisto Bias and S. Henderson (Mozambique) presented a poster on "Variation in grain yield among early flowering varieties in Mozambique".

Elizabeth Sibale (Malawi) presented a paper on "Relationship between Secondary Traits and Grain Yield of Maize Grown in Low Nitrogen Soils of Malawi".

Batson Zambenzi (CIMMYT-Zimbabwe) and Charles Mwambula (Zambia) presented a paper on "The Impact of Drought and Low soil nitrogen on maize production in the SADC region".

**The Fifth Regional Maize Conference for Eastern, and Southern Africa (June 3-7, 1996)**

Preparations are underway for the fifth regional maize conference for Eastern, and Southern Africa, which will be held at the Novotel Hotel, Arusha, Tanzania, from June 3 to 7, 1996. The theme of this year's conference is "Productivity

gains through maize research and technology dissemination". The conference, which is biennial, is organized by CIMMYT and venues are rotated within countries of Eastern and Southern Africa. The last conference was held in 1994 and was hosted by Zimbabwe. Proceedings of the last conference are now out. Details of the Arusha Conference will be presented in the next issue of the Newsletter. Participants, from southern Africa, who have submitted abstracts to the conference represent Botswana, Malawi, Mozambique and Zimbabwe. Those from East Africa represent Ethiopia, Kenya, Tanzania and Uganda.

#### NETWORK STEERING COMMITTEE MEMBER CONTRACT ADDRESSES...

Angola: Dr. Fernando Sito, Head, Maize Program, Ministerio da Agricultura (IIA), C.Postal 2104, Luanda.  
Tel: 244-2-360733 Fax 244-2-321943.

Botswana: Mr. Peter Setimela, Plant Breeder, Department of Agricultural Research, Private Bag 0033, Gaborone. Tel: 267-328780 Fax: 267-328806/328847.

Lesotho: Mr. Martin Ranthamane, Agricultural Research Division, P.O. Box 829, Maseru. Tel: 266-326042 Fax: 266-310362.

Malawi: Dr. John D.T. Kumwenda, Senior Maize Agronomist, Chitedze Agricultural Research Station, P.O. Box 158, Lilongwe. Tel: 265-767222/225 Fax: 265-784184.

Mozambique: Mr. Calisto A.L.F. Bias, National Institute of Agronomy (INIA), C. Postal 3658, Mavalane, Maputo. Tel: 258-1-460097/460100 Fax: 258-1-460074.

Namibia: Ms. Bianca Rusch, Agricultural Research Namibia, P.O. Box 272, Tsumeb.  
Tel: 264-671-20263/21176 Fax: 264-671-20323.

Swaziland: Mr. John Pali-Shikhulu, Agricultural Research station, P.O. Box 4, Malkerns.  
Tel: 268-83017/83220 Fax: 268-83155/83495/83360.

South Africa: Dr. Hugo van Niekerk, Small Grains Institute, P. Bag X29, Bethlehem 9700.  
Tel: 27-58-303-5686 Fax: 27-58-303-3952. Email: <hvn@kgs1.agric.za>

Tanzania: Dr. Mary Mgonja, Senior Agricultural Research Officer, Selian Agricultural Research Institute, P.O. Box 6024, Arusha. Tel: 255-57-3883 Fax: 255-57-8242. Email: c/o <ciat-tanzania@cgnet.com>

Zambia: Dr. Catherine Mungoma, Golden Valley Agricultural Research Trust, Private Bag RW 50834, Lusaka. Tel: 260-1-611150 Fax: 260-1-290111.

Zimbabwe: Dr. Anthony N. Mashiringwani, Department of Research and Specialist Services, P.O. Box CY 550, Causeway, Harare. Tel: 263-4-704531 Fax: 263-4-728317.

SACCAR (Southern African Center for Cooperation in Agricultural and Natural Resources Research and Training), Mr. Chris Nkwanyana, Private Bag 00108, Gaborone, Botswana. Tel: 267-328847 Fax: 267-328806. Email: <100075.2511@compuserve.com>

European Union, Delegation of the European Commission in Zimbabwe, Mr. Artur Runge-Metzger, P. O. Box 4252, Harare, Zimbabwe. Tel: 263-4-722137 Fax: 263-4-725360  
Email: <eucomzim@harare.iafrica.com>

CIMMYT (International Maize and Wheat Improvement Center), Dr. Thomas S. Payne, P.O. Box MP 163, Harare, Zimbabwe. Tel: 263-4-301945 Fax: 263-4-301327 Email: <cimmyt-mwirnet@cgnet.com>

## SADC MAIZE NEWSLETTER

September 1996, No. 2

This is the second issue of the Newsletter and I would like to encourage our readers to take a look at the topics we have covered in this issue and send us their suggestions and comments. Should you want more information on any particular topic, please do not hesitate to get in touch with the cited contact scientists or myself. I wish to encourage you to send submissions on issues relating to maize research. These could take the form of research summaries, research highlights, proposals, etc.

*Batson T. Zambezi*

### REGIONAL MAIZE CONFERENCE

#### FIFTH CIMMYT REGIONAL MAIZE CONFERENCE FOR EASTERN AND SOUTHERN AFRICA, ARUSHA, TANZANIA - JUNE 3-7, 1996.

The Fifth CIMMYT Regional Maize Conference for Eastern and Southern Africa was held in Arusha, Tanzania, from June 3-7, 1996. The conference whose theme was "Productivity Gains Through Maize Research and Technology Dissemination" drew more than 90 participants from many countries in Africa and Overseas. Abstracts of papers presented by maize scientists from the SADC Region are presented below.

#### Evolution of Hybrid Maize Breeding in Zimbabwe: Ingredient for the Revolution in Maize Yield

Lewis Machida

Department of Agricultural Research and Specialist Services, P.O. Box C.Y. 550, Causeway, Harare, Zimbabwe

The development and release of varietal products from the government maize breeding program of Zimbabwe evolved through stages when emphasis was on open-pollinated varieties (from 1904 to before 1932), double-cross hybrids (from 1932 to 1975), single-cross hybrids (from 1960 to the present), three-way hybrids (from 1969 to the present) and modified single-cross hybrids (from 1977 to the present). From the period under study (1913/14 to 1994/95) the graph of annual average yield levels of maize in the commercial farming sector, against year, rose from just below one ton per hectare during the open-pollinated varieties era to above five tons per hectare during the hybrid varieties era. This occurred simultaneously with the increase in hybrid adoption percentage. When the graph of hybrid adoption percentage against year was about to attain 100 percent, no further increases or rises in yield were observed. This remained so even after hybrid adoption percentage was 100 percent.

Two distinct contributions from the maize breeding program were influential to the rise in annual average maize yield levels in the commercial farming sector. These are: i) the development and release of double-cross hybrids; and ii) the development and release of the single-cross hybrid SR52. All the hybrids released after SR52 consolidated the yield gains from hybrid SR52. They fitted in 'niches' which could not be served by SR52. In the smallholder farming (communal) sector, the results are not as striking as in the commercial farming sector. However, smallholder farmers benefited from hybrid maize technology, especially after 1980, and later on. Communal farming sector yield levels were around 0.7 t/ha, before 1981. Until now, annual average yield levels have averaged at least one ton per hectare, even in seasons of good rainfall. The increase in yield from 0.7 t/ha to 1t/ha, occurred simultaneously with the increase in the graph of deliveries of hybrid maize seed to the communal farming sector. Contributions towards yield improvement from other disciplines like agronomy, soil productivity, extension, seed industry, biometrics and plant protection are acknowledged, since those from breeding are difficult to separate from the rest.

#### **Transferring Viable Soil fertility Management Technologies to the Poorest Farmers**

S. Minae<sup>1</sup>, T. Benson<sup>1</sup>, S. Snapp<sup>1</sup> and G. Kanyama-Phiri<sup>2</sup>

<sup>1</sup>Rockefeller Foundation, P.O. Box 30721, Lilongwe 3, Malawi;

<sup>2</sup>Bunda College of Agriculture, P.O. Box 219, Lilongwe, Malawi

Resource poor farmers in Malawi, are unable to adopt soil fertility technologies which agricultural research has to offer. Limited cash makes inorganic fertilizers too expensive for many of these farmers. These farmers often have limited land and/or labor required by agroforestry and other leguminous species used in soil fertility strategies. There is often limited technical information on soil fertility management and practices. Means to promote and transfer appropriate technologies to farmers is lacking. Traditional soil enhancing practices are no longer possible. Cropping has been pushed to marginal areas as a result of land pressure emanating from the ever increasing population growth. Mechanisms to incorporate farmer input on soil fertility technologies appropriate to their needs have been lacking. As a result, national food production has declined as soil resources are depleted through continual cropping. As implied farmer participation in the development of technologies and mechanisms for promoting soil fertility enhancing technologies is a prerequisite.

There are efforts to reverse this trend by employing strategies to provide information and means to employ viable soil fertility management techniques to these resource constrained farmers. These range from national-wide demonstration run by extension field officers at the lowest development unit represented by Extension Planning Area (EPA), conducting farmer-participatory research at micro watershed/landscape-based on-farm trials, establishment of savings cooperatives to enable farmers mobilize their saving to acquire inorganic fertilizer and hybrid maize seed. This multi-pronged approach to provide farmers with appropriate technologies

reflects the heterogeneity of resource endowments among small holder farmers, and desire to provide a cross-section of practicable technologies to enable farmers to maintain and enhance the quality of the soils upon which they and the nation depends. The multi-pronged mechanism therefore ensures that there is a wide range of technological options to meet different farmer needs hence ensuring high adoption. The extension methods also discussed in this paper ensure that large numbers of different farmer categories are reached thus increasing the potential impact of soil fertility technologies.

#### **The Integration of Research and Development for Improved Technology Transfer to Resource-poor Farmers**

R.B. Jones, I.C. Mughogho and M.Y. Jeremiah-Phiri  
VEZA International, c/o P O Box 30721,  
Lilongwe 3, Malawi

The uptake of improved maize varieties and fertilizer in Malawi has been limited. For farmers that can afford fertilizer, there is an urgent need to increase the profitability of this input by better targeted recommendations that are appropriate for smallholders. For the increasing majority of households, the cash requirement needed to buy inorganic fertilizer far exceeds their total cash income. Credit is often proposed as a solution but is only of value to individuals who are periodically short of cash to purchase inputs. In Malawi, the NGO VEZA International has used a combination of start up grants and savings mobilization to give access to improved maize seed and fertilizer. Project staff work in close collaboration with research staff to ensure that the

technologies being recommended to farmers are profitable. This has resulted in new fertilizer recommendations, that are significantly cheaper, improved fertilizer application methods and new fertilizer formulations procured through commercial channels that represent the best value on the market today. The close supervision between participating farmers, NGO Staff and Researchers has resulted in a rapid transfer of technology that can be taken up by farmers that were previously considered too poor. The menu of options available to these farmers is being widened to allow for crop diversification into high value cash crops. This transition will be relatively easy once household food security has been established through the adoption of improved maize technologies.

#### **Progress Towards Hybrid Maize Development in the Southern Highlands of Tanzania**

N.G. Lyimo  
Marti-Uyole, P O Box 400, Mbeya,  
Tanzania

The Southern Highlands of Tanzania (SH) constitute an important maize growing zone, accounting for almost 50% of total maize production in the country. Hybrid maize varieties are widely accepted in this zone, however, farmers have relied on old relatively low yielding, non-uniform varieties for a long time. In order to address this problem, population improvement, followed by inbred line development work, was initiated in the late 1970's and early 1980's respectively, in order to generate new hybrid varieties for the high and intermediate elevation maize growing areas of the country. Inbred lines developed from high and intermediate altitude maize germplasm

have shown promising results in top cross evaluation trials across locations in the SH. Top crosses involving high altitude inbred lines showed a high grain yield potential, as several entries exceeded the commercial hybrids H6302 and H614 by over 20%. A similar performance was also obtained when inbred lines derived from intermediate elevation germplasm were evaluated using two different top cross parents. These results indicate the possibility of generating a set of high yielding top-cross hybrids for the two agro-ecological zones, as a first step towards improving maize productivity in the SH, to be followed by further work towards formation of three-way and single cross hybrids.

#### **Evaluation of Maize Hybrids for Yield and Stability in Botswana**

P.S. Setimela

Department of Agricultural Research, P. Bag 0033, Gaborone, Botswana

Fifteen maize (*Zea mays*) hybrids and one open pollinated variety Kgalagadi Early Pearl (KEP) were evaluated for two seasons at three locations in the 1993/94 and 1994/95 seasons. The study was undertaken to provide information on yield stability and performance of hybrids in the Botswana environment. Some hybrids were found to be more responsive towards environmental and seasonal variation. Stability parameters were estimated by linear regression coefficient (b) and the following hybrids were found to be more stable across environments PHEB7, PHTJ-6, KEP, and PHB 3253. Genotypes and environments and their interaction were analyzed with additive main effects and multiplicative interaction (AMMI) model and were

significant ( $=0.01$ ) for days to 50% silking, days to 50% anthesis, anthesis silking interval (ASI), plant height and not significant for grain yield. The significance of G x E shows how genotypes are influenced by the environment. Hybrids A298W, PNR 473, PHB 3253, PHTJ-6, KEP and R 201 were found to interact less with seasonal and environmental variation. Days to silking ( $r=0.785$ ) and days to anthesis ( $-0.0776$ ) were negatively correlated with grain yield but plant height was positively correlated (0.780) with grain yield. Some of the hybrids with shortened ASI seemed to perform better compared to those with longer ASI. Based on the AMMI model stability analysis some hybrids could be recommended for particular environments.

#### **Dryland Maize Response to Different Combinations of Tillage and Weeding Methods**

L. Muza<sup>1</sup>, H.D. Dhliwayo<sup>1</sup> and S.J. Twomlow<sup>2</sup>

<sup>1</sup>Department of Research and Specialist Services, Box CY550, Causeway, Harare, Zimbabwe.

<sup>2</sup>Overseas Division, Silsoe Research Institute, Wrest Park, Bedford MK45 4HS, U.K.

Effects of different tillage and weeding methods on maize performance under dryland production were studied over three seasons at Makoholi Experiment Station in the semi-arid region of Zimbabwe. The objective was to identify combinations of tillage and weeding methods which conserve moisture and labor, and can easily be adopted by small scale farmers in semi-arid regions. Tillage systems involved hand planting, opening planting furrows only with an

ox-drawn plow (open plow furrow plant, ripping plant line to a depth of 0.2m, 0.3m, 0.5m, 0.5m deep), whilst weeding methods were hand hoeing, ox-cultivating between maize rows and hoeing in rows, ox-plowing combined with tie-ridging at two and six weeks after crop emergence. Results showed that optimum depth of ripping was approximately 0.3m deep. Open plow furrow plant and ripping to 0.3m deep produced similar maize grain yields. The yields were significantly ( $p < 0.001$ ) higher than either hand planting or ripping to 0.2m deep. Weed control methods had no significant effect on maize grain yield. However plots which were hand planted or ripped to 0.2m deep had heavier weed infestation compared to other weeding methods. Hand weeded plots had significantly ( $p < 0.01$ ) more weeds than either ox-cultivated or ox plowed plots.

The return to labor (kg of maize grain/ha) was similar for open plow furrow plant and ripping to 0.3m deep. This was significantly more ( $p < 0.01$ ) than either hand planting or ripping to 0.2m deep. Labor requirements for ripping to 0.3m deep was significantly ( $p < 0.05$ ) greater than hand planting, open plow furrow plant and ripping to 0.2m deep. The variation in volumetric water content indicated that ripped plots were significantly ( $p < 0.05$ ) wetter than hand planted plots with more water stored below 0.25m.

#### **Varieties of Maize Suitable for Maize and Pigeon Pea Intercropping for Arumeru Districts, Northern Zone of Tanzania**

M.L. Mugendi, H.A. Akonaay, C.S. Lyamchai and W.L Mariki

Selian Agricultural Research Institute,  
P.O. Box 6024, Arusha, Tanzania

Intercropping of maize with pigeon pea is a widely documented and acceptable cropping system in Tanzania. Suitable maize varieties and optimum maize plant population for the system for the Northern Zone of Tanzania have not been determined. A field experiment was conducted at Selian ( $3^{\circ} 20'S 36^{\circ} 25' E$ , 1390m above sea level) in a split plot, where 3 maize varieties were compared at 2 N levels and 2 maize plant populations. Maize grain yield was significantly increased by higher maize plant population and N application. Increased plant population of maize significantly reduced the grain yield of pigeon peas from 0.8 to 0.5 T/ha. TMV 1 and Kito had a significantly lower incidence of maize streak and cob diseases than CG4141 in the intercropping system. Economically, intercropping TMV 1 with N application pays more than the other 2 varieties. Also growing maize at 44444 plants/ha is more profitable than at 22222 plants/ha. In conclusion, it appears that the open pollinated maize varieties TMV 1 and Kito are more profitable for maize/pigeon pea intercropping than the hybrid tested. However, further research work is required to substantiate these findings.

### **Maize Yield Response to Plant Density and Nitrogen Fertilization in Low- and Mid-Altitude Environments of Tanzania**

J.S. Kaswende and V.C. Akulumuka  
ARTI Ilonga, P O Ilonga, Kilosa, Tanzania

Yield responses of a newly released maize variety to plant density and nitrogen fertilizer application were evaluated in a field experiment conducted in 1988, 1989 and 1990 at various locations in the low- and mid-altitude environments of Tanzania. Across location and season analysis showed non-significant effect of plant density on yield. The current recommendation of 44,444 plants per hectare was recommended for the new variety. Yield responses to applied nitrogen was significant in all sites, 40 and 80 kg of Nitrogen per hectare were found to give optimum yield for most locations. Economic analysis showed that 40 kg of Nitrogen per hectare was optimum for Ilonga.

### **Identifying the Most Limiting Factor(s) in Maize Production at Kisongo, Northern Tanzania**

C.J. Lyamchai, L.M. Mugendi, and M.Z. Owenya.  
Selian Agricultural Research Institute,  
P.O. Box 6024, Arusha, Tanzania

A 2-factorial experiment was conducted to determine the most limiting factor(s) in maize production at Kisongo. The experiment was done at both Selian Agricultural Research Institute (SARI) (3° 22 Latitude 36° 38 Longitude, 1400m above sea level) and Kisongo, 12 km away from SARI, during 1995 growing season (first year of a four-year project). Fertilizer, seed rate, variety, and weeding

were factors considered. Fertility x variety and fertility x spacing were factors that showed significance. Grain yield from CG4141 and Katumani at 60 kg N/ha, and from CG4141 without fertilizer were similar but significantly different from Katumani without fertilizer. CG4141 did not respond to fertilizer probably because the amount of fertilizer applied may not have been sufficient for CG4141 but may have been enough for Katumani. The grain yield at recommended population of 44,000 plants/ha with 60 kg N/ha was significantly higher than grain yield from 44,000 plants/ha without fertilizer and 34,000 plants/ha with and without fertilizer. Also, there was no statistically significant difference in grain yield between the two populations without fertilizer. Further studies to confirm these findings are recommended.

### **Productivity of Maize and Cowpea in Monocropping and Intercropping Systems on Black Vertisols of the South-East Low Veld of Zimbabwe**

E.Z. Nyakatawa<sup>1</sup> and E. Kamba<sup>2</sup>  
<sup>1</sup>Chiredzi Research Station, P O Box 97,  
Chiredzi, Zimbabwe  
<sup>2</sup>Chisumbanje Experiment Station, P. Bag  
7006, Chiredzi, Zimbabwe

A study to assess the productivity of maize (*Zea mays* L) and cowpea (*Vigna unguiculata* L) in monocropping and intercropping systems on the black vertisols of the south-east Low Veld of Zimbabwe was done under irrigation in the summer of 1994/95 at Chisumbanje Experiment Station. Cowpea at four plant populations of 105 000, 90 000, 75 000 and 60 000 plants/ha was intercropped with maize at a standard plant population of 44 000 plants/ha.

The control treatments were monocropping maize at 44 000 plants/ha and monocropping cowpea at 105 000 plants/ha. Grain yield of maize in monocropping was 46% greater than that from intercropping treatments. Grain yield of cowpea in monocropping was 135% greater than that from intercropping. Total land equivalent ratios of the intercropping treatments were significantly greater than one. Total cash returns from intercropping treatments were 81% greater than that from monocropping maize but were equal to that from monocropping cowpea. The data of grain yields, total land equivalent ratios and total cash returns from this experiment suggest that intercropping maize and cowpea at the standard maize plant population of 44 000 plant/ha and cowpea plant populations of 90 000 to 105 000 plants/ha gives higher productivity per unit of land on the black basalts of the south-east Low Veld of Zimbabwe.

#### **Response of Local and Hybrid maize to Lower Rates of Phosphorus in Malawi**

Vernon H. Kabambe, John D.T. Kumwenda, Webster D. Sakala and Rosan P. Ganunga,  
Chitedze Agricultural Research Station, P O Box 158, Lilongwe, Malawi

In Malawi, production of maize, the staple cereal, is constrained by poor soil fertility, among other factors. Fertilizer use to enhance production is expensive since all fertilizers are imported. There is a blanket recommendation of 19 kg phosphorus (P) and 92 kg nitrogen (N) ha<sup>-1</sup>, but the current maize grain/fertilizer price ratios indicate that this may be rather high. Hence, two trials were conducted between 1987 and 1990 to

determine maize yield response to P<sub>2</sub>O<sub>5</sub> increments (0.15, 30, 45 and 60 kg ha<sup>-1</sup> for hybrids and 0,15, 30 and 45 kg for farmers' local, unimproved maize) at two rates of N (50 and 100 kg ha<sup>-1</sup> for hybrids and 40 and 80 kg N for local maize). In both trials there was an external fertilizer treatment. In the hybrid trial, out of 31 sites significant responses to P were observed at 7 sites. Response to the first 15 kg P<sub>2</sub>O<sub>5</sub> was observed at 4 sites, to 15 and 30 kg P<sub>2</sub>O<sub>5</sub> at 2 sites and to 45 kg P<sub>2</sub>O<sub>5</sub> at 1 site. For the local maize trial, significant responses were obtained at 2 out of 28 sites. Response to the first 15 kg P<sub>2</sub>O<sub>5</sub> was obtained at one site and to 30 kg P<sub>2</sub>O<sub>5</sub> at the other. The combined yield effect of N and P was much better than N only, which was slightly better than unfertilized plots. This means that some P is needed for best response to N and it is therefore concluded that at least 15 kg P<sub>2</sub>O<sub>5</sub> be applied to sustain the current yield levels.

#### **Factors Influencing Maize Seed Recycling and their Implications on Hybrids**

Vincent Akulumuka<sup>1</sup>, Zubeda Mduruma<sup>1</sup>, Joseph Kaswende<sup>1</sup> and Ephraem Nkonya<sup>2</sup>  
<sup>1</sup>Agricultural Research and Training Institute, Ilonga, P O Ilonga, Kilosa, Tanzania  
<sup>2</sup>Selian Agricultural Research Institute, P O Box 6024, Arusha, Tanzania

In the past, Tanzania put more emphasis on breeding open pollinated varieties and than hybrids for low- and mid-altitude dry areas. Consequently, open pollinated varieties occupied more land than hybrids. Presently, the number of hybrids developed and released for this zone is increasing. Surveys conducted in eastern and northern Tanzania revealed

that farmers are recycling open pollinated varieties for over four years and hybrids for three years contrary to recommendations. Farmers gave high cost of hybrid seed as a factor leading to that practice. The authors also associate the practice of hybrid recycling to farmer's habit of recycling open pollinated varieties, thus, having a carry over effect on hybrids. Other factors include farmers' seed management, and farmers' failure to recognize the significant yield reduction realized when recycling hybrids. Farmers have to sell three bags (300 kg) of grain maize to buy ten kilograms of hybrid seed. This paper recommends that: 1) the price of hybrid seed should be in line with that of maize of maize grain; 2) farmers should be made aware of the deterioration in performance of recycled hybrid maize; (3) farmers need to improve their seed management techniques. Short of that, the future of hybrid maize in low and mid-altitude dry areas and probably other zones is questionable.

#### **Evaluation of Recycled Maize Hybrids at Three Levels of Nitrogen in Malawi**

B.T. Zambezi<sup>1</sup>, F.K. Nyondo<sup>2</sup>, G. Nkhono<sup>2</sup>, G.F. Mbingwani<sup>2</sup> and T.F. Chakhuta<sup>2</sup>  
<sup>1</sup>CIMMYT, P O Box MP 163, Mount Pleasant, Harare, Zimbabwe  
<sup>2</sup>Chitedze Agricultural Research Station, P O Box 158, Lilongwe, Malawi

First, second and third generation maize hybrids (F1, F2 and F3) were evaluated against local farmers' maize (LFM) and Chitedze Composite C (CCC), an improved open pollinated variety (OPV), at 3 levels of nitrogen, 0, 40 and 80 kg ha<sup>-1</sup> for two seasons, 1992/93 and 1993/94 in on-farm trials at 5 sites across Malawi. The hybrids were two single crosses

(MH12 and MH16); two top-crosses (MH17 and MH18); and one three-way cross (NSCM41). The objectives of the study were: 1) To assess the degree of yield decline of the different types of hybrids due to inbreeding depression; and 2) To compare the performance of recycled hybrids with LFM and CCC. The first season results showed that for 0N applied, inbreeding depression was remarkably high for all types of hybrids. At high N, however, top-crosses showed smaller inbreeding depression, 15-20% compared to 30-40%, for single crosses. Recycled top-cross hybrids performed much better than LFM. What was even more interesting was that at low N, recycled top-cross hybrids yielded much more than LFM. MH17F2 yielded 2.3t ha<sup>-1</sup> compared to 1.8t ha<sup>-1</sup> for LFM. In the second season, recycled top-cross hybrids consistently did better than CCC, and LFM, even without fertilizer. This study indicates that these top-crosses tend to tolerate recycling better than the single crosses. Inbreeding depression was more critical at low N than at high N. If farmers have to recycle maize hybrids, some fertilizer needs to be applied in order to get reasonable yield.

#### **Feeding the Plant not the Soil : Performance Criteria for Organic Matter Technologies in Malawi**

S. Snapp<sup>1</sup>, Y. Ntupanyama<sup>2</sup> and S. Minae<sup>2</sup>  
<sup>1</sup>Rockefeller Foundation, P.O. Box 30721, Lilongwe 3, Malawi  
<sup>2</sup>Chitedze Agricultural Research station, P.O. Box 158, Lilongwe, Malawi

Organic matter practices can be divided into those that "feed the soil" and those that "feed the plant". We suggest that building soil organic matter is a problematic enterprise in Malawi maize-

based cropping systems. Instead, a focus on organic matter technologies that feed the plant is a productive strategy for N-limited, sub-humid agro-ecozones of Malawi. Our data and a comprehensive literature review showed that nutrient supply to plants from high quality residues and/or inorganic fertilizers can determine yield to a much greater extent than soil organic matter. Soils from agroforestry system trials were monitored and soil organic matter fractionation conducted. Labile organic carbon and soil nitrogen availability measurements were evaluated for ability to predict yields. Summarizing soil and yield data from several trials suggests that maximizing production of biomass to build up soil organic matter is not an appropriate performance criteria. Rather, organic matter technologies should be evaluated on their ability to produce high quality biomass that enhances soil nutrient availability and crop yields.

#### **The Effect of Maize Crop Residue (Stover) on Yield, Soil Structure and Soil fertility**

W.L. Mariki, H.B. Akonaay and L.M. Mugendi  
Selian Agricultural Research Institute,  
P.O. Box 6024, Arusha, Tanzania

A study on the effect of maize crop residue (stover) on yield, soil structure and soil fertility was initiated at Selian in 1993. Different levels of stover ranging from 0.0t/ha to 9.34t/ha were applied in a randomized complete block design experiment. Application of 8.6t/ha stover, increased maize yield by 0,74t/ha over a control treatment, where no stover was incorporated. Cumulative stover applications for the 1993 and 1994 seasons also contributed to 1995 yield

increase of 0.73t/ha over the control treatment, Soil N% level was also increased by 0.034% in the 8.6t/ha stover treatment over the 1994 and 1995 seasons. Very little or no improvement in soil organic carbon level was realized after two seasons of stover applications. Crop residue that is left in the field after harvesting maize, if properly managed can replenish some of the soil nutrients such as nitrogen and maintain soil organic matter levels and can lead to maize yield increase.

#### **Towards Improved Management of Organic and Inorganic Fertilizer in Dryland Maize Production in Chinyika Resettlement Area, Zimbabwe**

M. Jonga, I.K. Mariga, O.A. Chivinge, M.W. Munguri and E. Rupende  
Department of Crop Science, University of Zimbabwe, P O Box MP 167, Mount Pleasant, Harare, Zimbabwe.

Manure and inorganic fertilizer are used to alleviate the low soil fertility problem in the smallholder sector (SH). However, manure quantities are limited and few SH farmers can afford expensive inorganic fertilizer. Cattle manure increases weed pressure and spectrum. On-farm trials to investigate the effect of manure and basal fertilizer quantity and application method on maize yield were conducted during the 1993/94 and 1994/95 seasons. A glass-house experiment on effect of heaping manure on weed seed survival and nutrient release was also undertaken. Method of manure application significantly increased grain yield during the 1993/94 season. Dolloping achieved the highest yield and was superior to broadcasting but achieved similar yield to dribbling in the planting furrow.

Basal inorganic fertilizer application method caused significant yield differences during the 1994/95 season. Dolloping at planting and 2 weeks after crop emergence (wace) achieved higher yields than dribbling in the planting furrow at sites where moisture was not limiting. Where moisture was limiting at planting, dribbling was better than both

dolloping at planting or at 2wace. There was a significant decrease in weed density and spectrum in manure heaped for 1 to 5 months. Total N availability and K<sub>2</sub> levels increased in heaped compared to unheaped manure.

#### NETWORK STEERING COMMITTEE MEMBER CONTRACT ADDRESSES

- Angola: Dr. Fernando Sito, Head, Maize Program, Ministerio da Agricultura (IIA), C.Postal 2104, Luanda.  
Tel: 244-2-360733 Fax 244-2-321943. email: c/o <claudio\_nankam@wvi.org>
- Botswana: Mrs. N. Molefe, Department of Agricultural Research, Private Bag 0033, Gaborone.  
Tel: 267-328780 Fax: 267-328806/328847. email: <100075.251@compuserve.com>
- Lesotho: Mr. Martin Ranthamane, Agricultural Research Division, P.O. Box 829, Maseru. Tel: 266-326042  
Fax: 266-310362.
- Malawi: Dr. John D.T. Kumwenda, Senior Maize Agronomist, Chitedze Agricultural Research Station,  
P.O. Box 158, Lilongwe. Tel: 265-767222/225 Fax: 265-784184.
- Mozambique: Mr. David Mariote, Maize Breeder, National Institute of Agronomy (INIA), C. Postal 3658,  
Mavalane, Maputo. Tel: 258-1-460097/460100 Fax: 258-1-460074.
- Namibia: Ms. Bianca Rusch, Agricultural Research Namibia, P.O. Box 272, Tsumeb.  
Tel: 264-671-20263/21176 Fax: 264-671-20323.
- Swaziland: Mr. John Pali-Shikhulu, Senior Agronomist, Agricultural Research Station, P.O. Box 4, Malkerns.  
Tel: 268-83017/83220 Fax: 268-83155/83495/83360. email: <MalkernsResearch@iafrica.com>
- South Africa: Dr. Hugo van Niekerk, Wheat Breeder, Small Grains Institute, P. Bag X29, Bethlehem 9700.  
Tel: 27-58-303-5686 Fax: 27-58-303-3952. Email: <hvn@kgs1.agric.za>
- Tanzania: Dr. Mary Mgonja, Senior Agricultural Research Officer, Selian Agricultural Research Institute,  
P.O. Box 6024, Arusha. Tel: 255-57-3883 Fax: 255-57-8242. Email: c/o <sari@marie.sas.unon.org>
- Zambia: Dr. Catherine Mungoma, Maize Breeder, Golden Valley Agricultural Research Trust, Private Bag  
RW 50834, Lusaka. Tel: 260-1-611150 Fax: 260-1-290111. email: <maize@zamnet.zm>
- Zimbabwe: Dr. Anthony N. Mashiringwani, Wheat Breeder, Department of Research and Specialist Services,  
P.O. Box CY 550, Causeway, Harare. Tel: 263-4-704531 Fax: 263-4-728317.
- SACCAR** (Southern African Center for Cooperation in Agricultural and Natural Resources Research and Training), Mr. Chris Nkwanyana, Private Bag 00108, Gaborone, Botswana. Tel: 267-328847  
Fax: 267-328806. Email: <100075.2511@compuserve.com>
- European Union**, Delegation of the European Commission in Zimbabwe, Mr. Artur Runge-Metzger,  
P. O. Box 4252, Harare, Zimbabwe. Tel: 263-4-722137 Fax: 263-4-725360  
Email: <eucomzim@harare.iafrica.com>
- CIMMYT** (International Maize and Wheat Improvement Center), Dr. Thomas S. Payne, P.O. Box MP 163,  
Harare, Zimbabwe. Tel: 263-4-301945 Fax: 263-4-301327 Email: <cimmyt-mwimnet@cgnet.com>

**SADC MAIZE NEWSLETTER**

December 1996, No. 3

This is the third issue of the Newsletter and I would like to encourage readers to take a look at the topics we have covered in this issue and send me their suggestions and comments. Should you want more information on any particular topic, please do not hesitate to get in touch with the cited contact scientists or myself. You are encouraged to send submissions on issues relating to maize research. These could take the form of research summaries, research highlights, proposals, etc.

*Batson T. Zambezi*

**PROGRESS REPORTS OF  
COLLABORATIVE PROJECTS**

In the last issue (May 1996) we covered progress of Collaborative Research Projects of Zambian and Tanzanian Maize Programs. In this issue we will give progress reports of two maize programs, Angola and Mozambique.

**ANGOLA****Selection of a More Uniform Variety  
from Catete Maize Population**

Project Scientist: Dr. Fernando Paulo Sito

Contact Address: Ministerio da  
Agricultura, Instituto de Investigacao

Agronomica (I.I.A.), C.P. 2104, Luanda.  
Tel: 244-2-360733 Fax 244-2-321943.

Background: Catete maize population is a local open pollinated variety (OPV) with white and yellow flint kernel type. It is well adapted to the coastal low altitude areas of Angola, where small-scale farmers have been growing it since time immemorial.

Because of poor maintenance, Catete is no longer a pure variety, as evidenced by the white/yellow kernel color and existence of both flint and dent kernel type. Farmers prefer flint kernel type. The grain admixture, coupled with poor performance has necessitated the collaborative project with the SADC Maize and Wheat Improvement Network to clean it up, with technical assistance from CIMMYT-Zimbabwe Maize Breeders.

**Activities:** The project is being implemented at Mazozo Agricultural Research Station (60 km outside Luanda) since 1994.

1994/95 Summer Season: Catete seed bought from the local market was planted out. Various parameters were recorded: pests and disease incidence, days to 50% silking, days to 50% pollen shed, anthesis and silking interval (ASI), plant height, ear height and grain

weight. This resulted in selection of 120 full-sib (FS) families. Dr. David Jewell, CIMMYT-Zimbabwe, assisted with the selection. Some of the selected FS families were lost due to weevilling. This left 68 FS families for further work.

The 68 FS families were categorized into three groups on the basis of Maturity, ear size and grain type.

1. 21 FS families, white, flint grain type, cobs more than 20 cm long, and 70 days to maturity.

2: 21 FS families, white, flint grain type; ear length between 15 and 19 cm; 75 days to maturity.

3: 26 FS families, white, flint grain type; ear length less than 15 cm; 80 days to maturity.

Yellow and dent versions were discarded because farmers prefer white flint grain type.

1995/96 Summer Season: Only 1 and 2 groups were planted due to shortage of labor. However, group 2 was later discarded, leaving only group 1.

Observations: No serious diseases were observed in the half-sib crossing block. However, rust and ear rots were observed in the field trial of the HS families. Termites were a problem.

The projects is progressing well, except for thieves who are stealing ears in the trials. This will affect the outcome of the trials. Security measures are being enforced to save the trials. This will, however raise the cost of the trial. Transport is also a major constraint that

has affected the supervision of the trial. Mazozo is 60 km outside Luanda, where Fernando Sito is based. The institute of Agronomy (IIA) has a shortage of vehicles. This was exacerbated by the late arrival of funds for the project. Fernando Sito has an urgent need for a PC Computer to facilitate data handling. He appeals for funds for acquiring the computer as soon as possible.

## MOZAMBIQUE

### Developing Early Maturing Varieties of Maize

Project Scientist: Mr. Calisto A.L.F. Bias

Contact Address: Instituto Nacional de Investigacao Agronomica (I.N.I.A.), C. Postal 3658, Mavalane, Maputo.

Tel: 258-1-460097/460100

Fax: 258-1-460074.

Background: The project started in the winter (off-season) of 1995. Twenty early maize populations, obtained from CIMMYT-Zimbabwe Maize Program and 16 varieties from the Mozambique Maize Program were test-crossed to Matuba. Matuba is a local short season open pollinated maize variety, resistant to downy mildew (DM). This variety is commonly grown in the coastal areas of the country where DM causes significant losses to maize production. Further more, early maturing genotypes are desirable because of the erratic nature of the rainfall in these coastal areas, causing persistent droughts.

**Objectives:** To develop short season, DM resistant maize varieties for the coastal areas of Mozambique so that farmers can have a wider choice of varieties to grow.

**Activities:** 1995 Winter: The 36 entries were planted in plots 3 rows wide and 10 metres long, with a total of 105 plants per plot. However, ears of some entries were stolen, while other entries, particularly from the national program showed poor emergence due to old seed. The seed was obtained from the cold store and it had lost viability over the years. The planting pattern was 1 row of Matuba (pollen parent) to 3 female rows. There were three plantings, staggered at one week intervals. The top-crossing block was planted in isolation and detasselling was carried out promptly in the female rows.

1995/96 Summer: Seed from the test-cross block was used setting up yield trials. The 36 entries (test-crosses and checks) were organized in a 6x6 simple lattice design, planted at 6 sites across the country: Umbeluzi, Chokwe, Sussundenga, Nampula, Namialo and Lichinga research stations.

Presently (May), trials at Umbeluzi, Chokwe and Sussundenga have been harvested. The remaining trials will be harvested later.

The trials looked good during the vegetative growth at most of the sites, keeping in mind that no fertilizer was applied. However, at Sussundenga, yields are likely to be low due in part to soil acidity and severe termite damage. At the other sites there was no evidence of pest or disease problems.

1996 Winter: The test-crosses will be repeated in order to increase the quantity of seed per each female entry by planting 10 female rows, 10m long, instead of the 1m row that was done in the previous nursery. This modification will enable

better sampling of each population used as female. The modification came out of discussions that Calisto Bias had with Drs. Kevin Pixley and Marienne Banziger of CIMMYT-Zimbabwe and CIMMYT-Mexico, respectively.

#### **EXCHANGE VISITS BETWEEN MAIZE SCIENTISTS IN THE SADC REGION**

**Trip report to Zambia National Maize Program and CIMMYT-Zimbabwe Maize Program: February 26 - March 8, 1996**

**Fernando P. Sito (Maize Breeder, Angola)**

**Calisto A.L.F. Bias (Maize Breeder, Mozambique)**

One of the objectives of the SADC Maize and Wheat Improvement Research Network is to foster collaboration between maize scientists of different national programs in the region. To this effect, the Network organized a field trip for two maize breeders, Fernando Sito and Calisto Bias from Angola and Mozambique, respectively. The two scientists visited the Zambian National Maize Program at Golden Valley, Lusaka (February 26 - March 1); and the CIMMYT Mid-altitude Maize Research Station, Harare, Zimbabwe (March 4 - 8).

A joint report was compiled and submitted to the SADC Network Office in Harare:

**Golden Valley Agricultural Research Station, Lusaka, Zambia**

The trip started on February 26, 1996, with Golden Valley Agricultural Research Trust (GART), where we were

met by Dr. Catherine Mungoma, Maize Breeder and Team Leader of the Zambian National Maize Program.

The objectives of the visit were:

- To familiarize ourselves with research methods being used in the Zambian Maize Program;
- Share professional skills on maize breeding issues;
- See the main research activities carried out at GART.

During our stay in Zambia we had meetings not only with Dr. Catherine Mungoma, but we also met and had discussions with the director of GART, Dr. S. Muliokela and other staff members.

In the field at Golden Valley, we viewed:

- Combining ability trials
- Population Improvement
  - Progeny evaluations
  - Progeny generations
- Cooperative Trials and Nurseries
- Test-crossing Nurseries

**Observations:** In general the visit was very helpful for us and our maize programs in the sense that we had an excellent opportunity to familiarize ourselves more deeply with many aspects of maize breeding, such as pollination techniques, selfing, heterotic patterns, testers and making of reciprocal crosses. Some of these issues are lacking in our programs. We would have liked to participate more in maize pollinations. Unfortunately at the time of our visit, pollination work had almost been

completed. We would like to suggest that future visits should be organized so as to coincide with pollinations. We would also have appreciated a visit to farmers' fields and seed companies. We recommend that visits of this nature should be encouraged in future.

### **CIMMYT Mid-altitude Maize Station, Harare, Zimbabwe**

The visit to CIMMYT-Zimbabwe was also very interesting and exciting, even though it was organized late in the season. We had the opportunity of seeing how Catete, an Angolan open pollinated maize variety (OPV), was performing at mid-altitude. In Angola it is grown on the coast, almost at sea-level. We were shown different CIMMYT activities, too many to put in this report, at various sites around Harare with Dr. Kevin Pixley, Maize Breeder. We selected some populations that looked very interesting to us and we hope that Dr. Pixley will send us some seed when we send him our formal requests.

Our main interest was short season maize populations, with resistance to rust and turicum leaf blight, as well as maize streak virus. A list has already been prepared and it will be sent to Dr. Pixley soon.

### **Concluding Remarks**

The visits were a great success and we wish to thank Dr. Catherine Mungoma for taking care of our visit in Zambia and Dr. Kevin Pixley for taking us in his fields. Lastly we also are thankful to Drs. David Jewell, Thomas Payne and Batson Zambezi and all those who helped in one way or another to make our visits a great

success. This is one way of strengthening national maize programs.

## **REGIONAL MAIZE CONFERENCE**

### **FIFTH CIMMYT REGIONAL MAIZE CONFERENCE FOR EASTERN AND SOUTHERN AFRICA, ARUSHA, TANZANIA - JUNE 3-7, 1996.**

The Fifth CIMMYT Regional Maize Conference for Eastern and Southern Africa was held in Arusha, Tanzania, from June 3-7, 1996. The conference whose theme was "Productivity Gains Through Maize Research and Technology Dissemination" drew more than 90 participants from many countries in Africa and Overseas. The batch of abstracts of papers presented by maize scientists from the SADC Region are presented below. Abstracts of participants from Botswana, Malawi, Tanzania, Zambia and Zimbabwe were highlighted in the September issue of this newsletter.

#### **On-farm Multi-location Testing of Improved Maize Varieties Across Northern and Central Mozambique**

C. Bias<sup>1</sup>, S.A. Henderson<sup>2</sup>, J. White<sup>2</sup> and L. Sitch<sup>2</sup>

<sup>1</sup>INIA, C.P. 3658, Maputo, Mozambique

<sup>2</sup>World Vision International, Maputo, Mozambique

A major limitation to maize productivity in Mozambique is the acute shortage of seed of improved high yielding varieties. World Vision has implemented a program in collaboration with the National Research Institute in Mozambique to identify and disseminate

material of many crops which is both high yielding and acceptable to farmers. In this paper results from the second phase of the maize testing program are reported. In this phase higher yielding varieties, identified from fully-replicated trials in the first phase, are tested in two replicate on-farm trials across many locations in Northern and Central Mozambique. These trials are of two types. The first type was designed to compare the yield of the improved varieties of maize with that of region varieties under farmers conditions and gauge farmers acceptance of the variety. The second type are designed to demonstrate and test the effect of management techniques that may overcome other limitations to yield such as weeding frequency, fertilizer application, method of seeding and methods of controlling stem borer.

#### **Simultaneous Selection for Earliness and resistance to Downy Mildew and Streak Resistance in Maize**

M. Denic, SEMOC, Maputo

Due to the agroecological conditions and socio-economic situation in Mozambique breeding for earliness (E) and resistance to downy mildew (DMR) and streak virus (SR) in maize is of special importance for lowland areas. In a DM nursery five groups of populations and lines were evaluated for E, DMR and SR. It was found that 63 populations and 675 progenies/lines were very early to medium early, 22 populations and 240 progenies/lines were intermediate and 25 populations and 208 progenies/lines were medium-late to late.

Using late and continuous planting combined with techniques of "sick" field and spreader rows of DM it was found that 5 populations and 89 progenies/lines exhibited strong DMR (0.0-20% of plants with DM symptoms - %DMP), 20 populations and 193 progenies/lines exhibited good resistance (20-40% DMP), 29 populations and 240 progenies/lines showed 40-60% DMP, and 56 populations

and 632 progenies/lines were susceptible to highly susceptible (60-100% DMP). In the case of SR, 61 populations and 510 progenies/lines exhibited strong resistance (1.0 index of SR-ISR) 38 populations and 348 progenies/lines showed 1-5-2.0 ISR, and only 8 populations and 146 progenies/lines exhibited 2.5-5.0 ISR

#### NETWORK STEERING COMMITTEE MEMBER CONTRACT ADDRESSES

- Angola: Dr. Fernando Sito, Head, Maize Program, Ministerio da Agricultura (IIA), C.Postal 2104, Luanda.  
Tel: 244-2-360733 Fax 244-2-321943. email: c/o <claude\_nankam@wvi.org>
- Botswana: Mrs. N. Molefe, Department of Agricultural Research, Private Bag 0033, Gaborone.  
Tel: 267-328780 Fax: 267-328806/328847. email: <100075.251@compuserve.com>
- Lesotho: Mr. Martin Ranthamane, Agricultural Research Division, P.O. Box 829, Maseru. Tel: 266-326042  
Fax: 266-310362.
- Malawi: Dr. John D.T. Kumwenda, Senior Maize Agronomist, Chitedze Agricultural Research Station,  
P.O. Box 158, Lilongwe. Tel: 265-767222/225 Fax: 265-784184.
- Mozambique: Mr. David Mariote, Maize Breeder, National Institute of Agronomy (INIA), C. Postal 3658,  
Mavalane, Maputo. Tel: 258-1-460097/460100 Fax: 258-1-460074.
- Namibia: Ms. Bianca Rusch, Agricultural Research Namibia, P.O. Box 272, Tsumeb.  
Tel: 264-671-20263/21176 Fax: 264-671-20323.
- Swaziland: Mr. John Pali-Shikhulu, Senior Agronomist, Agricultural Research Station, P.O. Box 4, Malkerns.  
Tel: 268-83017/83220 Fax: 268-83155/83495/83360. email: <MalkernsResearch@iafrica.com>
- South Africa: Dr. Hugo van Niekerk, Wheat Breeder, Small Grains Institute, P. Bag X29, Bethlehem 9700.  
Tel: 27-58-303-5686 Fax: 27-58-303-3952. Email: <hvn@kgs1.agric.za>
- Tanzania: Dr. Mary Mgonja, Senior Agricultural Research Officer, Selian Agricultural Research Institute,  
P.O. Box 6024, Arusha. Tel: 255-57-3883 Fax: 255-57-8242. Email: <sari@marie.sasa.unon.org>
- Zambia: Dr. Catherine Mungoma, Maize Breeder, Golden Valley Agricultural Research Trust, Private Bag  
RW 50834, Lusaka. Tel: 260-1-611150 Fax: 260-1-290111. Email: <maize@zamnet.zm>
- Zimbabwe: Dr. Anthony N. Mashiringwani, Wheat Breeder, Department of Research and Specialist Services,  
P.O. Box CY 550, Causeway, Harare. Tel: 263-4-704531 Fax: 263-4-728317.
- SACCAR (Southern African Center for Cooperation in Agricultural and Natural Resources Research and  
Training), Mr. Chris Nkwanyana, Private Bag 00108, Gaborone, Botswana. Tel: 267-328847  
Fax: 267-328806. Email: <100075.2511@compuserve.com>
- European Union, Delegation of the European Commission in Zimbabwe, Mr. Artur Runge-Metzger,  
P. O. Box 4252, Harare, Zimbabwe. Tel: 263-4-722137 Fax: 263-4-725360  
Email: <eucomzim@harare.iafrica.com>
- CIMMYT (International Maize and Wheat Improvement Center), Dr. Thomas S. Payne, P.O. Box MP 163,  
Harare, Zimbabwe. Tel: 263-4-301945 Fax: 263-4-301327 Email: <cimmyt-mwirnet@cgnet.com>