



MIELIEKULTIVARPROEWE

MAIZE CULTIVAR TRIALS

Met OPV's / basters

With OPV's / hybrids

2005/2006

DANKBETUIGING

Die sukses van hierdie navorsingsprojek is toe te skryf aan goeie samewerking en medewerking tussen die private en openbare sektore asook instansies by wie proewe aangeplant is. Hiermee word die grootste waardering uitgespreek vir al die medewerkers wat in Tabel 2 genoem word, asook die saadbedryf vir beskikbaarstelling van saad.

SAADMAATSKAPPY

Agricol Saad (Edms) Bpk

K₂ Agric

Monsanto SA (Edms) Bpk

Pannar Saad (Edms) Bpk

United seed

GCI-Breeding Programme

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SEED COMPANIES

Agricol Seed (Pty) Ltd

K₂ agric

Monsanto SA (Pty) Ltd

Pannar Seed (Pty) Ltd

United seed (Pty) Ltd

GCI-Breeding programme

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INLEIDING

Hierdie stel kultivarproewe is hoofsaaklik saamgestel om in die behoefte van kleiner produsente te voldoen. Die hoofdoel kan in twee kategorië verdeel word. Eerstens om 'n vergelyking te tref tussen nuwer oopbestuifde variëteite (OBV's) en bastermielies. Tweedens kan die proewe demonstratief aangewend word om verskille tussen die twee groepe mielies uit te wys.

Die persepsie bestaan dat kultivars onder sub-optimale produksietoestande en lae insette anders sal reageer as onder kommersiële toestande, en dat die OBV's beter sal doen onder hierdie toestande. Die vergelyking van die twee groepe kultivars kan dus geregverdig word.

NAVORSINGSPROSEDURE

Medewerkers is 'n vrye keuse gelaat om verteenwoordigende lokaliteite te selekteer om die produksiepraktyke van die omgewing te verteenwoordig. 'n Roosterontwerp (3x3) met drie herhalings is gebruik om die 9 Kultivars te akkommodeer. Elke proeflokaliteit het 'n unieke proefontwerp en die kultivars bestaan uit slegs witmielies. Die OBV's wat ingesluit was het bestaan uit SAM1101, SAM1107, SAM1109, ZAMA, Obatampa SR, AFRIC 1 en ZM523.

PERSEELGROOTTE EN SPASIËRING

As standaard word 40 plante per netto perseel voorgeskryf terwyl 'n vrye keuse ten opsigte van rywydtes en spasiëring binne die plantry toegelaat is. 'n Plantestand van 26 plante in elk van vier plantrye per bruto perseel is vir rywydtes minder as 1.5 m en 'n plantestand van 46 plante in 'n enkele plantry per bruto perseel vir rywydtes van 1.5 m en wyer aanbeveel. Geen kantrye is tussen persele benodig nie en slegs kantrye rondom die proef is voorgeskryf. Drie grensplante, op elke punt van elke plantry, moes voor oestyd verwyder word.

GROND EN BEMESTING

Grondsoorte wat algemeen vir mielieproduksie in die betrokke omgewings geskik is, is waar moontlik uitgesoek. Verskille in produksiepotensiaal is ook benut deur spesifieke grondtoestande vir spesifieke proefdoeleindes uit te kies. Bemesting geskied hoofsaaklik volgens grondvrugbaarheid asook die potensiaal vir mielies in die betrokke omgewings en is derhalwe nie voorgeskryf nie.

PLANTTYD

Die aangewese planttyd vir suksesvolle mielieproduksie in die betrokke omgewings is as planttyd aanbeveel.

PLANT- EN OESMETODES

Proewe is meganies of met die hand geplant (twee of meer pitte per plantgat) en uitgedun sodra die saailinge sterk genoeg was. Proewe is met die hand of meganies geoes. Al drie herhalings van die proewe moes deurgaans geoes word. Indien met die hand ge-oes is, moes elke inskrywing van herhaling I se kopmassa en graanmassa bepaal word. Proewe is geoes sodra die graanvogpersentasie 19.0 % of laer was.

PLAAGBEHEER

Doeltreffende plaagbeheer (onkruid en insekte) is noodsaaklik en die gebruik van onkruidodders en insekmiddels is vryelik toegelaat. Die gebruik van grondsistemiese-insekdoders is ook toegelaat. Die gebruik van plaagmiddels moet gerapporteer word.

SIEKTES

Medewerkers word elke jaar versoek om die voorkoms van enige siektes onmiddellik te rapporteer sodat die nodige opvolging en data-insameling kon geskied. Natuurlike besmetting moes egter straf genoeg wees om kultivarreaksie te kon rapporteer. 'n Besmetting van meer as 10% word as riglyn gebruik.

WAARNEMINGS

Die volgende inligting en waarnemings word jaarliks aangevra:

1. Grondvorm-familie skedules, -diepte en -ontleding.
2. Hoeveelheid bemesting, tyd en metode van toediening.

3. Hoeveelheid plaagdoder, tyd en metode van toediening.
4. Plant-, opkoms- en oesdatum.
5. Spasiëring, bruto en netto perseeloppervlaktes.
6. Maandelikse reënval (en besproeiing waar van toepassing).
7. Aantal dae vanaf plantdatum tot 50 % stuifmeelstorting (slegs navorsingstasies en proefplase).
8. Aantal dae vanaf plantdatum tot 50 % baardverskyning (slegs navorsingstasies en proefplase).
9. Aantal plante wat teen oestyd omgeval het (meer as 45 grade omlê).
10. Aantal plante per netto perseel.
11. Aantal spruite per netto perseel.
12. Aantal koppe per netto perseel.
13. Ongedorste kopmassa of graanmassa van alle persele oor al twee herhalings.
14. Gedorste graanmassa van Herhaling □, indien kopmassa bepaal is.
15. Graanvogpersentasie.
16. Addisionele waarnemings oor opmerklike en sinvolle Kultivarverskille waar en wanneer dit voorkom.

STATISTIESE VERWERKING

Graanopbrengs was die enigste parameter wat statisties ontleed is. In die algemeen is 'n AMMI analise gebruik om die aanpasbaarheid en stabiliteit van kultivars aan te dui vir verskillende omgewings. Die gekombineerde variansie-analise volgens die "Additive Mean Effective And Multiplicative Interaction (AMMI)" model is uitgevoer met die GENSTAT program (Tabel 1). AMMI Stabiliteits-Waardes (ASW) is die afstand vanaf nul in 'n tweedimensionele verspreidingsgrafiek van IPCA 1-waardes teenoor IPCA 2-waardes. Soos die ASW-waarde nader kom aan nul kan 'n spesifieke kultivar as meer stabiel geklassifiseer word vir omgewings. Addisionele beskrywings en informasie oor AMMI is beskikbaar in Aanhangsel A.

Statistiese prosedures wat normaalweg gebruik word om uitskieterproewe te

identifiseer, is vir doeleindes van hierdie verslag wel toegepas. Sekere statistiese parameters is egter ook vir diagnostiese doeleindes gebruik aan die hand waarvan besluit is watter proewe liefs weggelaat moes word.

Diagnostiese parameters

- KV- Die Koëffisiënt van Variasie verwys na die fout van enkel persele en gee 'n aanduiding van die grootte van die variasie tussen perseelwaardes wat vanaf verskeie bronne afkomstig is. Die KV gee dus 'n aanduiding van die akkuraatheid van die perseelwaardes (grootte van die waarde). Bronne van variasie is byvoorbeeld grondvariasie (vrugbaarheid, diepte, grondvog, kleipersentasie, ongelykheid, ens) en plantvariasie (bevolkingsgrootte, oneweredige groei ens). Stremmingstoestande (vog, temperatuur, siektes, ens) het so dikwels tot gevolg dat normaalweg aanvaarbare grond- en plantvariasie baie sterker in die proefdata tot uiting kan kom en die KV vergroot. 'n Relatief hoë KV, wat aan hand van bekende bronne van variasie verklaar kan word, kan nie as die enigste parameter gebruik word om onbetroubare proefdata te identifiseer nie.
- GKV- Die Genetiese Koëffisiënt van Variasie verwys na die verskille in genotype-opbrenge. Die GKV is dus 'n aanduiding van die variasiegrootte wat aan verskille in genetiese samestelling tussen genotype-inskrywings toegeskryf kan word. Hoë waardes kan die gevolg wees van siektevatbaarheid, groot verskille in rypwordingstadium, temperatuurgevoeligheid en soortgelyke afwykings. Dit word ook gebruik om uitskieterproewe te identifiseer.
- tn- Genotipeherhaalbaarheid verwys na die herhaalbaarheid van genotypegemiddeldes en kan gedefinieer word as die verwantskap tussen die genotype variansie en die totale variansie. Hierdie parameter is eintlik van waarde vir proewe waarvan die aantal herhalings nie dieselfde is nie.
- t- Die Intraklas Korrelasie verwys na die herhaalbaarheid van perseelwaardes oor herhalings. Hoe groter die ooreenstemming tussen perseelwaardes oor herhalings vir elke genotype-inskrywing is, hoe nader sal "t" na 1.0 neig.

SF(t)- Die Standaard Fout van die Intraklas Korrelasie (t) gee 'n aanduiding van hoe akkuraat die skatting van "t" is.

t/SF(t)- Hierdie verhouding word as 'n belangrike parameter beskou daar die Intraklas Korrelasie (t) moet verkieslik minstens drie keer groter as sy foutterm moet wees. 'n Verhouding van kleiner as 3.0 dui aan dat die betrokke stel proefdata as minder betroubaar beskou kan word.

RESULTATE

Proeflokaliteite

Lokaliteite, proefplasinge en die besonderhede van medewerkers vir die 2005/2006 proefreeks verskyn in Tabel 2.

Lokaliteitsbeskrywing

Die grondbeskrywing met bemesting en ander relevante verbouings-inligting verskyn in Tabel 3, reënval en besproeiing in Tabel 4, asook die chemiese plaagbeheer in Tabel 5.

Groei-toestande

Die 2005/2006 groeiseisoen is gekenmerk deur vroeë droë toestande gevolg deur nat toestande gedurende Februarie en Maart. Die meeste van die proewe is later as die normale plantdatum aangeplant.

Groei-toestande verskil tussen lokaliteite en dit moet in ag geneem word wanneer die genotiperesultate vertolk word.

Standaard van proefuitvoering

Tydens proefbesoeke is vasgestel dat voorskriftelike prosedures oor die algemeen nagekom is en dat proefversorging aan die verwagtings voldoen het. Dataverwerking is vertraag deurdat proefdata in sommige gevalle nie in die aanbevole formaat was nie.

Proefmislukkings

Die proewe by Delmas D, Hoogekraal D, Lichtenburg D, Maphumulo D, Makhatini D, Phiri & Sons D, Verulam D het misluk of is nie aangeplant nie.

Statistiese diagnostiek

Volgens die statistiese parameters in Tabel 6 was die graanopbrengs van die proewe te Cedara (GLS), Cedara D Potchefstroom D nie vir statistiese verwerking en vir verdere opbrengsanalises aanvaarbaar nie.

Omval

Inligting oor omval word in Tabel 7 weergegee.

Spruitvorming

Inligting oor spruitvorming word in Tabel 8 weergegee.

Meerkoppigheid

Inligting oor aantal koppe per plant verskyn in Tabel 9. Nie alle kultivars het 'n geneigdheid tot meerkoppigheid nie.

Graanvog

Inligting oor die vogpersentasie tydens oestyd verskyn in Tabel 10. Die vogpersentasie saam met die groeiseisoenlengte kan 'n aanduiding gee van die afdrogingstempo van die kultivars. Verskille kon waargeneem word.

Dorspersentasie

Inligting oor dorspersentasie verskyn in Tabel 11.

Graanopbrengs

Die opbrengspotensiaal en aanpassingsvermoë van kultivars in spesifieke omgewings bly die belangrikste maatstaf om kultivarprestasie te vergelyk. Omgewingstoestande verskil van jaar tot jaar en afleidings van kultivarprestasie vanaf een jaar se data is nie so betroubaar soos vanaf meerjarige data nie. Die gekombineerde variansie-analise (ANOVA) van die 16 genotipes oor 12 lokaliteite wat ontleed is volgens die AMMI 2 model word weergegee in Tabel 1. Die ANOVA dui op hoogs betekenisvolle verskille vir omgewings, genotipes en belangrik, genotipe x omgewingsinteraksies. Die IPCA 1

en IPCA 2 – waardes was ook hoogs betekenisvol. Tabel 12 toon die gemiddelde graanopbrengs aan van 16 mielie genotipes wat getoets is by 12 omgewings.

Die hoogste gemiddelde opbrengs van 10.53 t ha^{-1} is by Middelburg aangeteken en die laagste by Moalosi (1.51 t ha^{-1}). Waargenome algemene gemiddeld oor lokaliteite was 5.45 t ha^{-1} . Die genotipe DKC78-15B, met 'n opbrengs van 6.38 t ha^{-1} , het die beste presteer, en LS8517 en SAM1107 met 6.20 t ha^{-1} het as die beste baster en oop bestuifde kultivars presteer. Tabel 13 verteenwoordig data van die AMMI analise met die IPCA 1 en IPCA 2 – waardes vir die omgewings. Tabel 14 verteenwoordig die AMMI stabiliteitswaardes vir individuele genotipes. Die mees stabiele omgewing was Nale en die mees onstabiele was Greytown. Die mees stabiele genotipe was SAM1107 gevolg deur Afric 1 en die mees onstabiele genotipe was PAN8M-95 gevolg deur LS8515. Tabel 15 dui die beste AMMI seleksies aan vir kultivars per omgewing.

Gemiddelde waardes van eienskappe

'n Samevatting van die gemiddelde waardes van alle eienskappe vir droëland word in Tabel 16 aangegee.

Vrywaring

Die opsteller van die dokument en enige ander bron/instansie/persoon verantwoordelik vir enige inligting genoem in hierdie dokument is na die beste wete van die opstellers korrek met druktyd. Die inligting is ontwikkel deur wetenskaplike prosesse en word in goeder trou aangebied. Enige persoon/instansie wat hierdie inligting gebruik doen dit op eie risiko en die opstellers of enige ander party sal onder geen omstandighede verantwoordelik gehou kan word vir enige verliese gelei deur enige persoon/instansie wat die inligting in hierdie dokument gebruik nie.

INTRODUCTION

These cultivar trials were mainly conducted to fulfil in the needs of the smaller producer. The aim of the trials can be split into two categories. Firstly, to make a comparison between newer open pollinated varieties (OPV's) and hybrid maize. Secondly these trials can be used for demonstration purposes to illustrate the differences between the two groups of cultivars.

The perception does exist that the hybrids could react differently under lower production conditions with low inputs under commercial conditions, and that OPV's could perform better under these conditions. The comparison of these two groups of cultivars in a set of trials can thus be justified.

RESEARCH PROCEDURES

Co-workers were given a free hand to identify representative localities to represent the production practices of the local area. A Randomized Complete Block Design with three replications was used throughout to accommodate the 16 genotypes. Each trial had its own randomisation, and the entries consisted of only white maize cultivars. The OPV's included in the trials were SAM1101, SAM1107, SAM1109, ZAMA, Obatampa SR, AFRIC 1 and ZM523.

PLOT SIZE AND SPACING

Under normal conditions, a standard of 40 plants per net plot was prescribed throughout whereas the choice of row widths and spacing was left to the co-workers discretion. A number of 26 plants in each of two plant rows per gross plot were recommended for row widths less than 1.5 m, while a number of 46 plants in a single plant row per gross plot was recommended for row widths of 1.5 m and greater. Border rows were only prescribed for the perimeter of the trial and no border rows were required between plots. Three boundary plants should be removed from each end of the plant row at harvest.

SOIL AND FERTILIZATION

Soil types normally used for maize production were used where possible. Choosing specific soil conditions for specific trial purposes also incorporated differences in production potentials. Fertilizer applications were not prescribed but applied according to soil fertility and the maize yield potential of that area.

PLANTING DATE

Accepted planting dates for successful maize production in the area involved were recommended.

PLANTING AND HARVESTING METHODS

Trials were mechanically or manually planted (two or more seeds per hill) and thinned out as soon as the seedlings were strong enough. Trials were mechanically or hand harvested. Yield had to be determined for all replications. When harvesting by hand the cob mass and grain mass had to be determined of each the entries of Replication I. Trials were harvested when the grain moisture was 19.0 % or lower.

PEST CONTROL

The use of suitable herbicides and insecticides were freely allowed as effective pest control, weeds and insect, was required. Use of suitable systemic soil insecticides was also allowed. The use of pesticides was required to be reported.

DISEASE

Co-workers were requested to report the incidence of any diseases immediately to ensure that the necessary follow-up and data collecting could be done. Natural infection of any disease should be severe enough to give cultivar reaction and differences. A disease infestation rate of more than 10 % is used as a guideline.

OBSERVATIONS

The following information and observations are requested each year:

1. Soil form- family schedule, depth and - analysis.
2. Fertilizer quantity, time and method of application.
3. Pesticide quantity, time and method of application.
4. Planting, plant emergence and harvesting dates.

5. Spacing, gross and net plot size.
6. Monthly rainfall (and irrigation where applicable).
7. Number of days from planting date to 50 % pollen shed (where possible).
8. Number of days from planting date to 50 % silking (where possible).
9. Number of plants lodged (leaning more than 45 degrees) at harvest.
10. Number of plants per net plot.
11. Number of tillers per net plot.
12. Number of ears per net plot.
13. Ear mass or grain mass of all plots of all three replications.
14. Grain mass of Replication I, if ear mass was measured.
15. Grain moisture percentage.
16. Additional observations, for example the amount of rotted ears or other noticeable and meaningful cultivar differences.

STATISTICAL ANALYSIS

Grain yield and disease incidence (where applicable) were the only two observations statistically analysed. In general, an AMMI analysis was used to indicate the adaptability and stability of cultivars for different environments. The combined analysis of variance according to the Additive Mean Effects And Multiplicative Interaction (AMMI) model was performed using the GENSTAT Package (Table1). AMMI Stability Value (ASV) is the distance from zero in a two dimensional scatter-gram of IPCA 1 scores against IPCA 2 scores. As the ASV nearing zero the genotype can be considered more stable for the environments. Additional explanations and information about AMMI were available in Appendix A.

Statistical procedures normally used to identify and exclude outlier trials from the AMMI model were used for the purposes of this report. Certain statistical parameters (diagnostic parameters) were also used to help in the selection of trials for presentation.

The diagnostic parameters were as follows:

- CV The coefficient of variation - this parameter relates to the error of a single plot, and as such relates to the variability as induced by soil variation or plant population i.e. the larger the variation the larger the CV. Stress conditions (moisture, temperature, diseases, etc.) result in acceptable soil variation to be

more pronounced in trials and a higher CV is recorded. The CV on its own cannot be used as a parameter to discard trials.

GCV The genetic coefficient of variation - this parameter relates to the yield differential between the highest and lowest entry yield, relative to the trial mean i.e. the greater the difference between the extreme values, the larger the GCV. High values are indicative of disease sensitivity, differences in maturity stage, temperature sensitivity and like problems.

tn Repeatability of genotype mean yield - relates to the repeatability of entry means, and can be defined as the relationship of genetic variance of observed means. In genotype trials this parameter is useful only when the number of replications between trials varies, otherwise the t-value is sufficient.

t The repeatability of plot yield or intra class correlation coefficient - relates to the repeatability of plot means over replications, and is interpreted as is the normal correlation coefficient, i.e. the greater the concurrence of plot values per entry over replications the closer "t" will strive towards unity. The standard error calculated for a particular t-value indicates the accuracy of the estimate of "t"

SE(t) Standard Error of the Intraclass Correlation (t) denotes how accurate the estimation of "t" is.

t/SE(t) This relationship is considered an important parameter as the Inter Class Correlation

(t) Should be at least three times greater than it's error term. A relationship of less than 3.0 denotes low reliability.

RESULTS

Trial localities

The trial localities, trial placement and information about co-workers for the 2005/2006 season appear in Table 2.

Locality description

Soil description, fertiliser and relevant cultivation information are presented in Table 3, rainfall in Table 4 and weed- and pest control in Table 5.

Growing conditions

The 2005/2006 growing season was characterized by an early dry season followed by very wet spells during February and March. Most of the plantings were done later than optimal planting time.

Growing conditions differed between localities and this must be taken into account, when interpreting results.

Standard of trial execution

Visits to trials confirmed that prescribed procedures were followed and that trials were satisfactorily carried out. Data processing was delayed as some of the trial data was not in the prescribed format or incomplete, which made it unacceptable or unreliable.

Trial failures

The trials at Delmas D, Hoogekraal D, Lichtenburg D, Maphumulo D, Makhatini D, Phiri & Sons D and Verulam D were not planted or failed during the season.,

Statistical diagnostics

According to the statistical parameters in Table 6 the grain yield of the trial at Cedara (GLS), Cedara D and Potchefstroom D was unacceptable for statistical and yield analysis.

Stand ability

Stand ability of the cultivars is presented in Table 7.

Tillering

Information on tillering is presented in Table 8.

Prolificacy

Information on the number of ears per plant is given in Table 9. Not all cultivars showed signs of prolificacy.

Grain moisture

Information on grain moisture at harvest is presented in Table 10. The grain moisture together with the length of the growing season can give an indication on the drying rate of the cultivars. Differences were observed.

Threshing percentage

Information on threshing percentage of the cultivars is presented in Table 11.

Grain yield

The yield potential and adaptability of cultivars in specific environments are the most important criteria for measuring cultivar performance. Environmental conditions differ from year to year, thus more reliable conclusions can be drawn from multi-seasonal data than from just one years data. The combined analysis of variance (ANOVA) of the 16 genotypes over 12 environments according to AMMI 2 model are presented in Table 1. The ANOVA indicated highly significant differences for environments, genotypes and importantly genotype X environment interaction. The IPCA 1 and IPCA 2 were also highly significant. Table 12 shows the mean grain yield of 9 maize genotypes tested at 12 environments.

According to the yield data in Table 12 the highest mean yield was observed at Middelburg with 10.53t. ha⁻¹ and Moalosi 1.51 t. ha⁻¹, the lowest. Recorded overall mean, was 5.45 t. ha⁻¹. The DKC78-15B with a yield of 6.38 t. ha⁻¹ produced the highest yield followed by LS8517 and the open pollinated variety SAM1107 with 6.20 t. ha⁻¹. Table 13 presents the AMMI analysis data with the IPCA1 and IPCA2 scores for the environments. Table 14 represents the AMMI stability values for each cultivar. The most stable environment was Nala and the most unstable environment was Greytown .The most stable genotype was SAM1107 followed by Afric 1, and the most unstable genotype was PAN8M-95 followed by LS8515. Table 15 indicates the

best AMMI selections of cultivars per environment.

Mean values for all characteristics.

A summary of the mean values of all characteristics, for the dry land trials, are presented in Table 16.

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TABELLE /TABLES

Tabel 1 ANOVA analise van die mielie genotipe evaluasie proewe met die gebruik van die AMMI 2 model vir kleinboer proewe gedurende die 2005-06 seisoen.

Table 1 ANOVA analysis according to the AMMI 2 model of the maize genotypes evaluation trials in small scale farmer's fields during the 2005-06 season.

Bron					
Source	df	SS	MS	F	F_prob
Totaal/Total	575	4879	8.48	*	*
Behandeling/Treatments	191	4517	23.65	30.57	0
Genotipe/Genotypes	15	139	9.3	12.02	0
Omgewing/Environments	11	4043	367.57	105.37	0
Block	24	84	3.49	4.51	0
Interaksie/Interactions	165	334	2.02	2.62	0
IPCA	25	143	5.72	7.4	0
IPCA	23	80	3.48	4.5	0
Res/Residuals	117	111	0.95	1.22	0.083
Fout/Error	360	278	0.77	*	*

Tabel 2 Proeflokaleiteite en medewerkers 2005/06

Table 2 Trial localities and co-workers 2005/06

LOKALITEIT/ LOCALITY	ADRES /ADDRESS	MEDEWERKER / CO - WORKER
BETHLEHEM C1 D	Bethlehem	KGI, D BRUWER
BETHLEHEM C2 D	Bethlehem	KGI, D BRUWER
CEDARA (SPRAYED)	-	-
CEDARA (UNSPRAYED)	-	-
GREYTOWN	-	PANNAR (PTY) LTD
KOKSTAD	KZN DLO/DAEA	M.P. SIKHAKHANE
MOALOSI D		SENWES
MOTLOUNG D		SENWES
NALA D		SENWES
POTCHEFSTROOM C1		D. MULLER (GCI)
POTCHEFSTROOM C2		D. MULLER (GCI)
POTCHEFSTROOM C3		D. MULLER (GCI)
POTCHEFSTROOM D		D BRUWER (GCI)
VAALHARTS B		LNR-IGG
WARMBAD D	Towoomba	A.C. SONNEKUS

Tabel 3 Grondbeskrywing, bemesting, plantdatum, spasiëring en plantbevolking vir elke proeflokaleiteit.

Table 3 Soil description, fertilization, planting date, row width and plant population for localities.

LOKALITEIT	Grondvorm & serie								Bemesting voor/ met planttyd	Bemesting na planttyd	Plant- datum	Oes- datum	Rywydte	Plantbe- volking
LOCALITY	Soil form & series		pH water	pH KCl	P ppm	K ppm	Ca ppm	Mg ppm	Fertilization before/at planting kg/ha	Fertilization after planting kg/ha	Planting date	Harvest date	Row width cm	Plant population x1000
BETHLEHEM C1 D	-	-	-	-	-	-	-	-	31.3N:20.8P:10.4K	100kg KAN	31/10/05	11/07/06	100.0	30.3
BETHLEHEM C2 D	-	-	-	-	-	-	-	-	Superfosfaat	-	31/10/05	28/06/06	100.0	30.3
CEDARA GLS (SPRAYED)	-	-	-	-	-	-	-	-	N:P:K	-	-	-	-	44.0
CEDARA GLS (UNSPRAYED)	-	-	-	-	-	-	-	-	N:P:K	-	-	-	-	44.0
GREYTOWN	MISPAH	-	4.63	-	-	-	-	-	16.7N:25P:33.3K+Zn Urea 300kg	-	9/11/05	29/05/06	90.0	50.0
KOKSTAD	CLOVELLY	-	4.31	20	216	723	133	-	MAP	-	22/11/05	18/07/06	90.0	42.0
MOALOSI D	-	-	-	-	-	-	-	-	22.5N:15P:7.5K	-	13/01/06	26/07/06	150.0	22.0
MOTLOUNG D	-	-	-	-	-	-	-	-	22.5N:15P:7.5K	KAN	14/12/05	18/07/06	150.0	22.0
NALA	-	-	-	-	-	-	-	-	22.5N:15P:7.5K	KAN	15/12/05	13/07/06	150.0	22.0
POTCHEFSTROOM C1	HUTTON	-	-	-	-	-	-	-	31.3N:20.8P:10.4K	KAN	24/11/05	19/06/06	150.0	19.5
POTCHEFSTROOM C2	HUTTON	-	-	-	-	-	-	-	Superfosfaat	-	24/11/05	19/06/06	150.0	19.5
POTCHEFSTROOM C3	HUTTON	-	-	-	-	-	-	-	N:P:K	-	24/11/04	19/06/06	150.0	18.0
POTCHEFSTROOM D	HUTTON	-	-	-	-	-	-	-	N:P:K	-	15/12/05	30/06/06	150.0	16.5
VAALHARTS B	HUTTON	-	-	-	-	-	-	-	62.5N:41.7P:20.8K	-	2/12/05	30/5/06	150.0	33.0
WARMBAD D	ARCADIA	-	-	-	-	-	-	-	KAN	-	27/12/05	7/07/06	100.0	20.0

Tabel 4 Reënval en besproeiing by proeflokaleite

Table 4 Rainfall and irrigation at trial localities

LOKALITEITE	Reënval	vir	2005				Reënval	vir	2006				Totaal	Besproeiing
LOCALITIES	Rainfall	for	2005	(mm)			Rainfall	for	2006	(mm)			Total	Irrigation
	Jul	Aug	Sept	Okt/Oct	Nov	Des/Dec	Jan	Feb	Mrt	Apr	Mei/May	Jun		
BETHLEHEM C1 D	0	11	7	138.4	142.4	83	252.2	26.3	204.2	51.2	41.7	0	957.4	
BETHLEHEM C2 D	0	11	7	138.4	142.4	83	252.2	26.3	204.2	51.2	41.7	0	957.4	
CEDARA (SPRAYED)	-	-	-	-	-	-	-	-	-	-	-	-	-	
CEDARA (UNSPRAYED)	-	-	-	-	-	-	-	-	-	-	-	-	-	
GREYTOWN	0.5	31.0	42.0	131.3	129.0	60.9	289.0	142.9	87.6	31.2	7.3	2.1	954.8	
KOKSTAD	0.0	28.0	9.0	79.5	145.8	50.0	218.8	244.1	45.1	48.5	31.9	12.0	912.7	
MOALOSI D	-	-	-	-	-	-	-	-	-	-	-	-	-	
MOTLOUNG D	-	-	-	-	-	-	-	-	-	-	-	-	-	
NALA	-	-	-	-	-	-	-	-	-	-	-	-	-	
POTCHEFSTROOM C1	0.0	0.0	0.3	15.3	34.4	64.7	161.6	138.3	161.5	65.9	6.4	0.0	648.4	
POTCHEFSTROOM C2	0.0	0.0	0.3	15.3	34.4	64.7	161.6	138.3	161.5	65.9	6.4	0.0	648.4	
POTCHEFSTROOM C3	0.0	0.0	0.3	15.3	34.4	64.7	161.6	138.3	161.5	65.9	6.4	0.0	648.4	
POTCHEFSTROOM D	0.0	0.0	0.3	15.3	34.4	64.7	161.6	138.3	161.5	65.9	6.4	0.0	648.4	
VAALHARTS B	0.0	0.0	0.3	38.5	92.5	18.9	110.8	206.4	105.1	39.0	5.0	0.0	616.5	100.0
WARMBAD D	0.0	0.0	0.0	0.0	0.0	40.2	215.0	156.0	95.4	0.0	0.0	0.0	506.6	40.0

Tabel 5 Chemiese onkruid - en plaagbeheer by lokaliteite
Table 5 Chemical weed and insecticide control at localities

LOKALITEITE LOCALITIES	ONKRUIDDODERS HERBICIDES	INSEKODODERS INSECTICIDES
BETHLEHEM C1 D	WENNER 700 SC	KOMBAT
BETHLEHEM C2 D	WENNER 700 SC	KOMBAT
CEDARA S (SPRAYED)	-	-
CEDARA (UNSPRAYED)	-	-
GREYTOWN	EPTAM, GUARDIAN, GESAPRIM	CURATERR, DECIS
KOKSTAD	DUAL	GEEN/NIL
MOALOSI D	GEEN/NIL	GEEN/NIL
MOTLOUNG D	LASSO	STALKBORER GRANULES
NALA D	GEEN/NIL	STALKBORER GRANULES
POTCHEFSTROOM C1	ATTRAZINE, WENNER	KOMBAT
POTCHEFSTROOM C2	ATTRAZINE, WENNER	KOMBAT
POTCHEFSTROOM C3	ATTRAZINE, WENNER	KOMBAT
POTCHEFSTROOM D	GEEN/NIL	GEEN/NIL
VAALHARTS B	LASSO	GEEN/NIL
WARMBAD D	GEEN/NIL	DECIS

Tabel 6 Diagnostiese parameters vir die statistiese aanvaarbaarheid van proewe vir betroubare opbrengsanalises

Table 6 Diagnostic parameters for the statistical acceptability of trials for reliable yield analysis

Lokaliteit locality	Proefgemiddeld Trial mean	KV CV %	GKV GCV %	tn %	t	SF(t) SE(t)	t/Sf(t) t/Se(t)
Middelburg	10.53	12.20	7.85	55.61	0.2946	0.1273	2.31
Vaalharts	4.65	20.80	22.78	78.28	0.5457	0.1518	3.59
Nala	4.477	11.8	15.33	83.41	0.6263	0.1433	4.37
Motloung	2.828	24.4	22.33	71.49	0.4553	0.1519	3.00
Moalosi	1.51	25.70	23.22	70.95	0.4488	0.1515	2.96
Greytown	9.74	10.70	16.72	87.94	0.7084	0.1265	5.60
Cedara (GLS)	4.52	17.5	#NUM!	-14.81	-0.0449	0.0288	-1.56
Cedara D	4.01	15.5	3.02	10.23	0.0366	0.0216	1.70
PotchefstroomC3	6.16	11.6	6.78	50.64	0.2548	0.1163	2.19
Warmbad	3.52	25.3	14.46	49.52	0.2464	0.1137	2.17
PotchefstroomC1	6.469	7.9	11.48	86.37	0.6786	0.1336	5.08
Bethlehem C2	6.5	16.9	4.62	18.37	0.0698	0.0397	1.76
PotchefstroomC2	3.74	15.3	15.21	74.81	0.4974	0.1531	3.25
Bethlehem C1	7.79	16.6	8.28	42.62	0.1985	0.0974	2.04
Potchefstroom	4.038	16.3	19.24	80.80	0.5839	0.1488	3.92

Bold=Rejected trials

Tabel 7 Gemiddelde persentasie totale omval 2005_06**Table 7** Mean percentage lodged plants 2005_06

Genotipe Genotypes	Grey- town	Middel- burg	Moalosi	Motlounq	Nala	Potchef- stroom	Potchef- stroomC1	Potchef- stroomC2	Potchef- stroomC3	Warm- bad	Gem Mean
AFG4501	46.03	1.01	0.85	0.83	4.44	0.00	0.00	0.00	2.70	11.43	6.73
Afric1	43.40	5.95	2.69	9.49	7.47	6.03	0.00	0.00	9.62	4.21	8.88
DKC78-15B	77.23	5.38	1.71	13.19	3.25	5.20	0.85	1.52	1.01	2.66	11.20
LS8507	77.20	4.71	7.38	1.89	6.89	1.73	4.34	1.59	0.00	2.52	10.82
LS8515	74.67	2.68	4.68	1.63	6.67	0.88	0.00	1.45	1.85	1.69	9.62
Obatampa SR	79.89	10.15	9.46	7.77	12.08	19.03	1.93	5.26	8.63	10.61	16.48
PAN6549	67.52	3.81	4.15	8.35	4.84	0.00	0.00	0.00	4.78	1.71	9.52
PAN67	65.22	16.61	9.74	14.91	12.56	5.99	5.81	7.94	12.31	12.62	16.37
PAN8M-95	39.60	37.71	16.75	22.10	27.35	5.05	2.13	0.00	1.98	5.04	15.77
QS7711	82.36	8.39	2.27	14.35	4.24	2.78	0.00	7.58	2.37	9.89	13.42
QS7715	68.58	1.15	6.57	4.22	3.66	1.28	1.01	0.00	6.06	5.96	9.85
SAM1101	60.14	3.12	7.15	1.77	8.75	4.25	0.00	5.56	7.78	6.71	10.52
SAM1107	55.83	4.63	2.95	8.70	8.73	3.57	1.88	0.00	4.45	1.76	9.25
SAM1109	65.06	7.97	3.55	6.27	14.25	4.52	2.70	12.05	4.46	6.28	12.71
Zama	60.82	2.78	5.25	1.69	12.42	1.67	0.88	2.22	2.68	3.34	9.37
ZM523	49.79	6.39	5.59	7.50	11.45	14.17	3.10	0.00	7.95	0.81	10.67
Gem/Mean	63.33	7.65	5.67	7.79	9.31	4.76	1.54	2.82	4.91	5.45	11.33

Tabel 8 Gemiddelde persentasie spruitvorming 2005_06**Table 8** Mean percentage tillering 2005_06

Genotipes	Beth-lehem	Vaal-	Warm-	Moalosi	Motloung	Nala	Potchef-	Potchef-	Potchef-	Potchef-	Gem
Genotypes	C1	harts B	bad				stroom	stroomC2	stroomC3	stroomC1	Mean
AFG4501	20.11	0.01	22.86	0.31	0.26	0.16	10.25	55.05	15.73	18.41	14.31
Afric1	24.65	0.08	21.26	0.29	0.22	0.10	11.25	36.83	7.58	7.57	10.98
DKC78-15B	8.69	0.15	14.94	0.32	0.12	0.09	34.64	52.21	23.89	37.46	17.25
LS8507	13.16	0.13	21.85	0.25	0.14	0.07	30.31	51.10	18.85	18.49	15.43
LS8515	16.20	0.10	24.05	0.23	0.16	0.09	23.62	39.90	14.47	17.46	13.63
Obatampa SR	16.90	0.02	9.57	0.21	0.11	0.09	14.16	18.95	5.08	11.61	7.67
PAN6549	20.86	0.10	13.42	0.24	0.16	0.15	22.37	39.91	20.19	24.96	14.24
PAN67	20.15	0.17	6.35	0.21	0.08	0.09	16.18	35.49	12.87	15.76	10.73
PAN8M-95	22.19	0.05	11.86	0.16	0.17	0.08	26.40	34.36	5.82	11.36	11.25
QS7711	29.81	0.17	10.67	0.29	0.15	0.13	14.69	47.14	23.93	17.47	14.44
QS7715	16.44	0.12	7.93	0.26	0.15	0.05	40.78	26.67	11.42	36.71	14.05
SAM1101	18.85	0.07	8.00	0.20	0.10	0.15	15.74	18.77	14.83	16.70	9.34
SAM1107	22.75	0.06	22.03	0.24	0.16	0.11	13.81	31.07	23.16	11.56	12.49
SAM1109	23.04	0.01	13.88	0.22	0.18	0.05	23.87	17.30	5.98	10.20	9.47
Zama	22.49	0.03	16.64	0.22	0.23	0.10	20.00	25.82	16.81	28.82	13.12
ZM523	18.82	0.06	8.34	0.32	0.24	0.09	21.94	35.60	10.61	21.85	11.79
Gem/Mean	19.69	0.08	14.60	0.25	0.16	0.10	21.25	35.39	14.45	19.15	12.51

Tabel 9 Gemiddelde aantal koppe per plant 2005_06

Table 9 Mean number of cobs per plant 2005_06

Genotipes	Beth-	Grey-	Middel-	Vaal-	Warm-	Potchef-	Potchef-	Potchef-	Potchef-	Gem
Genotypes	lehem C1	towm	burg	harts B	bad	stroom	stroomC1	stroomC2	stroomC3	Mean
AFG4501	1.21	1.10	1.31	1.28	1.07	1.47	1.91	2.05	1.92	1.48
Afric1	1.19	0.98	1.00	1.12	1.26	1.25	1.58	2.18	1.80	1.37
DKC78-15B	1.03	1.65	1.47	1.89	1.47	2.12	2.11	1.96	2.02	1.75
LS8507	1.25	1.27	1.31	1.50	1.37	1.74	2.02	1.96	1.98	1.60
LS8515	1.26	1.40	1.18	1.22	1.38	1.57	1.99	2.10	1.89	1.55
Obatampa SR	1.23	1.11	1.06	1.25	1.03	1.35	1.81	2.05	1.74	1.40
PAN6549	1.20	1.50	4.79	1.66	1.06	1.42	1.84	1.99	1.79	1.92
PAN67	1.26	1.23	1.12	1.48	1.05	1.57	1.84	2.01	1.60	1.46
PAN8M-95	1.24	1.06	1.05	1.23	1.11	1.11	1.68	2.05	1.59	1.35
QS7711	1.23	1.30	1.19	1.52	0.93	1.32	1.86	2.23	2.13	1.52
QS7715	1.28	1.23	1.43	1.33	1.24	1.87	1.99	2.04	2.31	1.64
SAM1101	1.27	1.50	1.20	1.16	0.93	1.67	1.99	2.12	1.74	1.51
SAM1107	1.28	1.36	1.27	1.56	1.15	1.75	1.89	2.29	2.13	1.63
SAM1109	1.14	1.21	1.22	1.31	1.05	1.52	1.80	1.73	1.93	1.44
Zama	1.08	1.21	1.27	1.13	1.36	1.52	1.84	2.01	1.80	1.47
ZM523	1.20	1.09	1.13	1.38	1.35	1.42	1.88	1.96	1.81	1.47
Gem/Mean	1.21	1.26	1.44	1.38	1.17	1.54	1.88	2.05	1.89	1.53

Tabel 10 Gemiddelde graanvogpersentasie met oestyd 2005_06**Table 10** Mean percentage grain moisture at harvest 2005_06

Genotipes Genotypes	Beth- lehem C1	Middel- burg	Moalosi	Motloun	Nala	Potchef- stroom	Vaal- harts B
AFG4501	14.55	19.00	14.05	22.94	14.73	23.40	23.40
Afric1	17.24	18.10	16.05	16.73	12.62	17.60	20.90
DKC78-15B	13.63	13.80	12.68	14.53	11.90	22.40	20.50
LS8507	12.06	18.00	13.12	15.53	12.52	17.30	17.70
LS8515	12.50	18.10	14.39	13.04	11.14	21.00	18.50
Obatampa SR	13.54	20.50	11.96	17.39	10.14	19.00	18.50
PAN6549	12.68	18.20	13.37	14.23	11.22	19.60	18.70
PAN67	12.06	15.70	17.01	20.28	14.45	23.30	19.30
PAN8M-95	14.05	21.80	18.79	26.70	17.59	27.20	24.90
QS7711	13.88	16.20	11.77	12.70	12.96	20.50	18.10
QS7715	12.68	18.60	13.88	14.67	10.86	19.70	18.80
SAM1101	12.32	17.40	13.71	13.38	10.30	18.00	18.20
SAM1107	11.30	16.80	13.37	13.72	10.52	18.40	18.20
SAM1109	13.12	15.20	12.68	20.00	13.98	20.70	18.10
Zama	10.46	16.60	10.54	15.05	10.52	17.90	18.30
ZM523	17.55	15.10	15.09	16.09	12.62	18.10	19.10
Gem/Mean	13.35	17.44	13.90	16.69	12.38	20.26	19.45

Tabel 10 Vervolg**Table 10** Continued

Genotipes Genotypes	Potchef- stroomC2	Potchef- stroomC3	Potchef- stroomC1	Warm- bad	Gem Mean
AFG4501	14.73	18.21	17.45	13.80	17.84
Afric1	12.62	16.65	17.69	14.70	16.45
DKC78-15B	11.90	15.14	13.48	12.20	14.74
LS8507	12.52	17.69	16.74	12.80	15.09
LS8515	11.14	14.69	14.57	11.00	14.55
Obatampa SR	10.14	18.48	16.02	12.50	15.29
PAN6549	11.22	16.47	14.50	12.60	14.80
PAN67	14.45	16.59	16.65	14.60	16.76
PAN8M-95	17.59	18.93	18.84	14.60	20.09
QS7711	12.96	21.47	16.86	13.20	15.51
QS7715	10.86	16.14	15.42	12.30	14.90
SAM1101	10.30	16.98	14.67	12.40	14.33
SAM1107	10.52	13.29	15.14	14.70	14.18
SAM1109	13.98	18.48	17.22	13.50	16.09
Zama	10.52	15.87	16.38	14.00	14.19
ZM523	12.62	15.28	14.67	14.00	15.47
Gem/Mean	12.38	16.90	16.02	13.31	15.64

Tabel 11 Gemiddelde dorspersentasie met oestyd 2005_06**Table 11** Mean threshing percentage at harvest 2005_06

Genotipes Genotypes	Grey- town	Middel- burg	Moalosi	Motlounq	Nala	Vaal- harts B	Gem Mean
AFG4501	81.20	94.22	64.06	78.04	81.34	81.39	80.04
Afric1	82.47	97.83	60.00	74.92	78.59	80.22	79.01
DKC78-15B	86.64	57.45	71.03	82.34	84.34	84.91	77.79
LS8507	86.73	84.90	64.00	77.23	84.71	85.97	80.59
LS8515	88.89	79.53	71.72	84.43	85.95	85.45	82.66
Obatampa SR	84.50	87.33	58.82	71.84	78.53	81.13	77.03
PAN6549	86.36	76.61	61.79	78.00	81.90	80.37	77.51
PAN67	86.21	93.15	65.50	80.72	81.85	83.60	81.84
PAN8M-95	80.60	76.40	42.46	68.64	74.01	75.48	69.60
QS7711	82.44	89.46	63.41	81.29	84.09	80.57	80.21
QS7715	82.35	81.50	67.95	78.15	79.87	78.71	78.09
SAM1101	85.14	99.16	60.25	81.25	82.30	83.18	81.88
SAM1107	85.63	93.67	71.09	80.08	83.52	83.20	82.87
SAM1109	82.13	78.74	66.39	75.08	78.07	77.02	76.24
Zama	84.54	81.35	66.40	80.14	84.89	81.95	79.88
ZM523	82.63	102.66	58.79	75.74	78.99	81.79	80.10
Gem/Mean	84.28	85.87	63.35	77.99	81.43	81.56	79.08

Tabel 12 Gemiddelde graanopbrengs (t ha-1) vir mielie genotipes by verskillende kleinboer proewe omgewings gedurende 2005-2006

Table 12 Mean yield (t ha-1) for different maize genotypes under different environments in the small scale region during 2005-06

Omgewing	AFG4501	Afric1	DKC78-15B	LS8509	LS8517	Obatampa SR	PAN6549	PAN67
Environments								
Bethlehem C1	7.31	7.58	6.94	5.16	7.43	7.71	9.26	6.99
Greytown	8.50	9.47	12.05	10.35	13.06	8.10	9.40	10.41
Middelburg	11.85	11.53	9.87	11.35	10.86	9.60	8.82	11.63
Moalosi	1.45	1.27	2.20	1.23	1.82	1.30	1.31	1.66
Motlounge	3.26	2.52	3.96	2.84	2.45	1.91	2.25	2.32
Nala	4.37	3.80	6.36	5.15	4.57	3.36	4.68	4.56
Potchefstroom	4.33	3.80	6.15	4.26	4.24	2.43	4.07	4.07
PotchefstroomC1	6.35	5.92	8.09	7.59	7.78	5.60	7.01	6.28
PotchefstroomC2	4.50	3.88	3.73	3.74	3.48	2.71	3.06	3.79
PotchefstroomC3	5.98	6.13	6.74	5.97	7.38	5.39	6.35	6.24
Vaalharts B	5.68	5.43	5.25	5.57	7.06	2.83	4.82	5.30
Warmbad	2.82	4.01	5.26	4.39	4.26	2.99	3.39	2.79
Gem/Mean	5.53	5.44	6.38	5.63	6.20	4.49	5.37	5.50

Tabel 12 Vervolg

Table 12 Continued

Omgewings	PAN8M-95	QS7712	QS7715	SAM1101	SAM1107	SAM1109	Zama	ZM523
Environments								
Bethlehem C1	8.17	8.55	8.39	8.50	8.87	7.86	7.30	8.70
Greytown	13.09	9.13	8.07	7.97	10.70	7.86	8.75	8.94
Middelburg	8.41	10.48	10.92	10.17	12.22	9.50	9.97	11.23
Moalosi	0.70	1.52	1.60	0.87	1.93	2.21	1.44	1.66
Motlounge	1.36	3.75	3.28	3.40	3.73	2.22	3.48	2.52
Nala	3.37	4.79	4.30	4.18	5.47	4.13	4.49	4.06
Potchefstroom	2.71	3.81	3.49	4.18	5.21	3.85	4.44	3.59
PotchefstroomC1	5.34	5.90	6.32	6.21	6.51	5.91	6.87	5.83
PotchefstroomC2	3.47	4.02	4.02	3.69	4.41	2.38	3.87	3.27
PotchefstroomC3	5.45	5.85	6.08	5.15	6.91	6.18	6.80	6.02
Vaalharts B	3.48	4.38	3.23	2.76	5.13	3.88	5.54	4.04
Warmbad	3.20	3.12	3.39	2.62	3.35	2.93	4.19	3.68
Gem/Mean	4.90	5.44	5.26	4.97	6.20	4.91	5.59	5.29

Tabel 13 Die IPCA 1 en IPCA 2 waardes vir 12 omgewings gesorteer volgens omgewings-gemiddelde opbrengs

Table 13 The IPCA 1 and IPCA2 scores for 12 environments, sorted environmental mean yield

Omgewing Environment	Omg/Env. .No	Gem Mean	IPCA1 Waarde/Score	IPCA2 Waarde/Score
Middelburg	3	10.53	0.648	0.932
Greytown	2	9.74	-2.080	-0.737
Bethlehem C1	1	7.79	0.967	-1.661
PotchefstroomC1	8	6.47	-0.221	0.279
PotchefstroomC3	10	6.16	-0.015	-0.067
Vaalharts B	11	4.65	-0.618	0.866
Nala	6	4.48	0.084	0.141
Potchefstroom	7	4.04	0.108	0.288
PotchefstroomC2	9	3.63	0.361	0.000
Warmbad	12	3.52	-0.258	0.017
Motloun	5	2.83	0.680	0.141
Moalosi	4	1.51	0.344	-0.199

Tabel 14 Gemiddelde opbrengs($t\cdot ha^{-1}$), orde,IPVA1 en IPCA2 waardes en AMMI stabiliteitswaarde (ASW) vir mielie genotipes geanaliseer volgens die AMMI model

oor 12lokaliteite vir die 2005/06 seisoen

Table 14 Mean yield ($t\cdot ha^{-1}$),rank, IPCA1 and IPCA2 scores and AMMI stability value (ASV) of maize genotypes analysed according to the AMMI model over 12 environments during the 2005/06 season

Genotipes Genotypes	Gen.No.	Gem/Mean	Ord Rank	IPCA1 Score	IPCA2 Score	ASW ASV	Ord Rank
SAM1107	13	6.20	2	0.164	-0.003	0.293	1
Afric1	2	5.45	8	0.035	0.361	0.366	2
Zama	15	5.60	5	0.138	0.408	0.476	3
PAN67	8	5.50	7	-0.270	0.442	0.654	4
PAN6549	7	5.37	10	0.026	-0.676	0.677	5
ZM523	16	5.30	11	0.449	-0.234	0.836	6
QS7711	10	5.44	9	0.455	-0.218	0.842	7
Obatampa SR	6	4.49	16	0.421	-0.386	0.845	8
SAM1109	14	4.91	14	0.492	-0.162	0.894	9
AFG4501	1	5.53	6	0.457	0.768	1.121	10
QS7715	11	5.26	12	0.818	-0.153	1.470	11
DKC78-15B	3	6.38	1	-0.842	0.186	1.517	12
SAM1101	12	4.98	13	0.839	-0.316	1.534	13
LS8507	4	5.63	4	-0.622	1.171	1.614	14
LS8515	5	6.20	3	-1.332	0.155	2.386	15
PAN8M-95	9	4.90	15	-1.227	-1.341	2.571	16
Gem/Mean		5.45					
LSD _T (0.05)		1.544					
CV%		17.70					

Table 15 Die AMMI model seleksie vir Vier beste drie genotipes se gemiddelde opbrengste in verhouding tot die omgewings geëvalueer gedurende 2005/06

Table 15 The AMMI model's best four genotype selection for mean yield in relation to the environments evaluated during 2005/06

Omgewings Environment	Gem Mean	IPCA 1 waarde Score	AMMI seleksies/selection			
Bethlehem C1	7.79	0.967	PAN6549	SAM1107	SAM1101	QS7715
Motloung	2.83	0.680	SAM1107	AFG4501	DKC78-15B	QS7715
Middelburg	10.53	0.648	AFG4501	LS8507	SAM1107	Zama
PotchefstroomC2	3.63	0.361	SAM1107	DKC78-15B	LS8515	AFG4501
Moalosi	1.51	0.344	SAM1107	DKC78-15B	LS8515	QS7711
Potchefstroom	4.04	0.108	DKC78-15B	SAM1107	LS8515	LS8507
Nala	4.48	0.084	DKC78-15B	SAM1107	LS8515	LS8507
PotchefstroomC3	6.16	-0.015	DKC78-15B	LS8515	SAM1107	Zama
PotchefstroomC1	6.47	-0.221	DKC78-15B	LS8515	SAM1107	LS8507
Warmbad	3.52	-0.258	DKC78-15B	LS8515	SAM1107	LS8507
Vaalharts B	4.65	-0.618	LS8515	DKC78-15B	LS8507	SAM1107
Greytown	9.74	-2.080	LS8515	PAN8M-95	DKC78-15B	LS8507

Tabel 16 Opsomming van alle eienskappe vir 2005/06

Table 16 Summary of mean values for all characteristics for 2005/06

Genotipes	Omval %	Spruite %	Koppe plant ¹	Graan vog%	Dors %	Graan opbrengs Grain yield (t.ha ⁻¹)
Genotypes	Lodged	Tillering	Ears plant ¹	Grain moist.	Threshing	
AFG4501	6.73	14.31	1.48	17.84	80.04	5.53
Afric1	8.88	10.98	1.37	16.45	79.01	5.45
DKC78-15B	11.20	17.25	1.75	14.74	77.79	6.38
LS8507	10.82	15.43	1.60	15.09	80.59	5.63
LS8515	9.62	13.63	1.55	14.55	82.66	6.20
Obatampa SR	16.48	7.67	1.40	15.29	77.03	4.49
PAN6549	9.52	14.24	1.92	14.80	77.51	5.37
PAN67	16.37	10.73	1.46	16.76	81.84	5.50
PAN8M-95	15.77	11.25	1.35	20.09	69.60	4.90
QS7711	13.42	14.44	1.52	15.51	80.21	5.44
QS7715	9.85	14.05	1.64	14.90	78.09	5.26
SAM1101	10.52	9.34	1.51	14.33	81.88	4.98
SAM1107	9.25	12.49	1.63	14.18	82.87	6.20
SAM1109	12.71	9.47	1.44	16.09	76.24	4.91
Zama	9.37	13.12	1.47	14.19	79.88	5.60
ZM523	10.67	11.79	1.47	15.47	80.10	5.30
Gem/Mean	11.33	12.51	1.53	15.64	79.08	5.45

AANHANGSEL A / APPENDIX A

Die interpretasie van die “ Additive Main Effects and Multiplicative Interactions

(AMMI)” model en opbrengsstabieleit.

Die effek van genotype by omgewing (G x O) interaksies in die interpretasie van resultate van opbrengste is welbekend. ‘n Gekombineerde variansie-analise kan die interaksie kwantifiseer maar beskryf slegs die hoof effekte. Die klassieke ANOVA help nie veel om die interaksies te verstaan of te interpreteer nie. Dit is dan ook die rede hoekom stabiliteits-analises, verskeie vorme van liniêre regressies en afgeleide G x O prosedures tekort skiet in definiëring van hoofeffekte, betekenisvolle interaksies of te min verklaar van interaksievariasies. AMMI bied ‘n baie beter alternatiewe statistiese benadering vir veldproewe waar ‘n G x O interaksie relevant kan wees. Multivariasie-analises het drie hoof doelwitte:

- a) Om die akkuraatheid van analises en datapatrone te verbeter
- b) Om die data op te som.
- c) Om die genotype – omgewingsinteraksie te kwalifiseer.

Met behulp van multivariansie-analise kan genotipes met ooreenstemmende reaksies gekombineer word waardeur analises makliker uitgevoer kan word. Die doel van verskillende multivariansie metodes is om genotipes in te deel in kwalitatiewe homogene en stabiele subgroepe. Binne sulke subgroepe bestaan daar geen betekenisvolle G x O interaksies nie, terwyl daar wel verskille tussen subgroepe bestaan. ‘n XY- grafiek help baie vir modellering of om genotipes, omgewing of die interaksie te verstaan. Die basiese prinsiep van so ‘n AMMI XY – grafiek is dat die punte op die X-as die hoof effekte aandui terwyl die Y-as die interaksie aandui. ‘n Genotipe en omgewingskombinasie met beide negatiewe of positiewe waardes het ‘n positiewe interaksie en andersins ‘n negatiewe interaksie. Genotipes naby die bopunt van ‘n XY – grafiek presteer goed in dienooreenkomstige omgewings en dieselfde geld vir genotipes aan die onderkant. Genotipes of omgewings naby die nul lyn op die Y – as het klein interaksies en is dus relatief stabiel. Genotipes met hoë opbrengspotensiale lê aan die regterkant van so ‘n grafiek.

DEFINISIES

Interaksie Prinsiep Komponent Analise (IPCA)

IPCA van genotipes in die AMMI analise gee 'n aanduiding van die stabiliteit daarvan oor omgewings. Hoe groter die waarde, beide positief en negatief, hoe meer is 'n genotipe aangepas vir 'n spesifieke omgewing. Hoe nader die IPCA-waarde aan nul kom hoe meer stabiel is 'n genotipe oor alle gemete omgewings.

AMMI Stabiliteits Waarde (ASW)

Figuur 3a is 'n voorbeeld van die AMMI model se klassifikasie vir genotipes se aanpasbaarheid en stabiliteitskarakteristieke. Indien die letters A tot E verskillende genotipes verteenwoordig kan die volgende afleidings gemaak word. Genotipe A is baie goed aangepas vir hoë potensiaal toestande, maar is nie baie stabiel nie. Onder swak heersende toestande kan die genotipe swak presteer. Genotipes B en C is stabiel vir die meeste omgewings alhoewel hulle opbrengste laer kan wees as A onder hoë potensiaal kondisies. Genotipe C is meer stabiel as Genotipe B omdat dit nader aan die nul waarde van IPCA lê. Genotipe D word ook as relatief stabiel geklassifiseer, maar slegs vir lae potensiaal omgewings. Genotipe E is onstabiel en slegs aangepas vir lae potensiaal omgewings. In die algemeen word genotipes wat geleë is tussen IPCA-waardes van 1 en -1 gereken as stabiel maar hulle aanpasbaarheids-karakteristieke kan wissel tussen hoë en lae potensiaal omgewings.

The interpretation of the Additive Main Effects And Multiplicative Interactions (AMMI) model and yield stability

The effect of genotype by environment (GxE) interactions in the interpretation of results of yield trials, are well known. A combined analysis of variance can quantify the interactions, but as an additive statistical model describes only the main effects. The classical ANOVA does little to help understand or interpret the interactions.

That is why stability analysis, various forms of joint linear regression, and related GxE statistical procedures can be deficient in defining main effects, incorrectly declaring interactions insignificantly, or explaining too little of the interaction variance. AMMI offers a more appropriate first statistical analysis of yield trials that may have a GxE interaction.

Multivariate analysis has three main purposes:

- a) To increase the accuracy of data pattern and analysis
- b) To summarize the data
- c) To clarify the genotype–environment interactions.

Through multivariate analysis, genotypes with similar responses can be clustered, and the data can be summarized and analysed more easily. The aim of various multivariate classification methods are therefore to allocate genotypes to qualitatively homogeneous stability subsets. Within subsets, no significant GxE interactions occur, while differences among subsets are due to GxE interactions. A bi-plot is helpful for modelling or understanding the genotypes, the environments, and the interaction. The basic interpretive principle for such bi-plots is that bi-plots points displaced along the X-axis differ in main effects, whereas points displaced along the Y-axis differ in interaction. The joint structure of genotype and environment points in a bi-plot show the interaction. A genotype and environment combination with both negative scores or both positive scores, has a positive interaction, and otherwise a negative interaction. Hence genotypes near the top of a bi-plot do especially well in environments near the top, and likewise for the bottom genotypes and environments. Genotypes or environments near zero on the Y-axis have small interactions – they are relatively stable. Genotypes with high yield over the growing region of the trial are located to the right.

DEFINITIONS

Interaction Principle Component Analysis (IPCA)

The Principle Component Interaction Analysis (IPCA) of genotypes in the AMMI analysis is an indication of the stability of a genotype over environments. The greater the IPCA scores, either negative or positive, the more specifically adapted a genotype is to a certain environment.

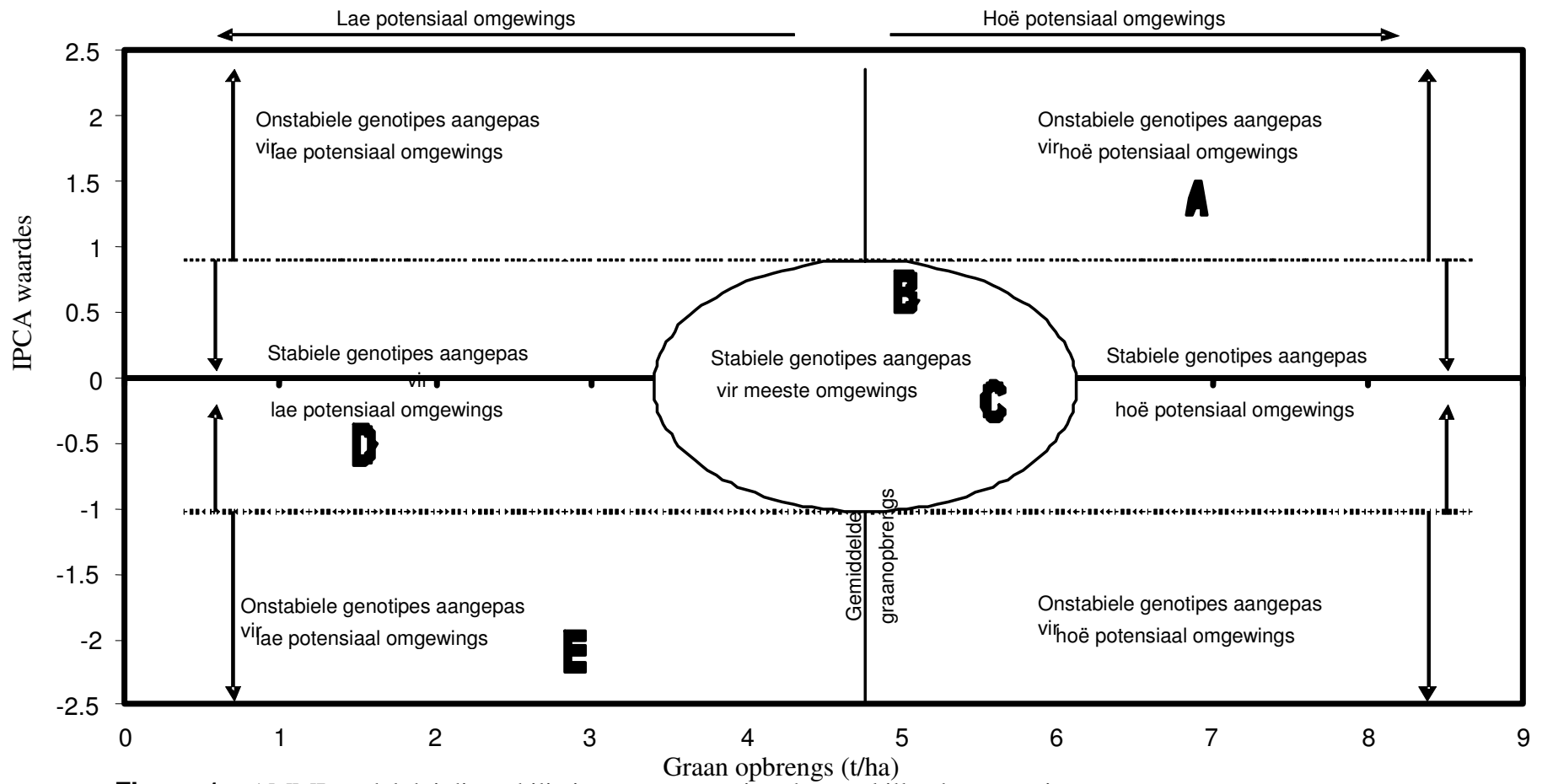
The closer IPCA scores approach zero the more stable the genotype is over all environments sampled.

AMMI Stability Value (ASV)

AMMI Stability Value (ASV) is the distance from zero in a two dimensional scatter gram of IPCA 1 scores against IPCA 2 scores. As the ASV nearing zero the genotype can be

considered more stable for most of the environments.

Figure 3b is an example of the AMMI model's classification of genotypes adaptability and stability characteristics. If the letters A to E represent genotypes the following conclusions could be made. Genotype A is very good adapted towards high potential conditions but is not stable. Therefore, under poor prevailing conditions this genotype may yield poorly. Genotypes B and C are stable for most environmental potential conditions although their yields will be lower compared to genotype A under high potential conditions. Genotype C is more stable than genotype B because it is lying closer to the IPCA value of zero. Genotype D is also considered stable but only for low potential environments. Genotype E is unstable and only adapted to low potential environments. In general, genotypes that are falling between IPCA values of 1 and -1 are considered stable but their adaptabilities can range between low and high potential environments.



Figuur 1a. AMMI model dui die stabiliteit aan van genotipes by verskillende omgewings

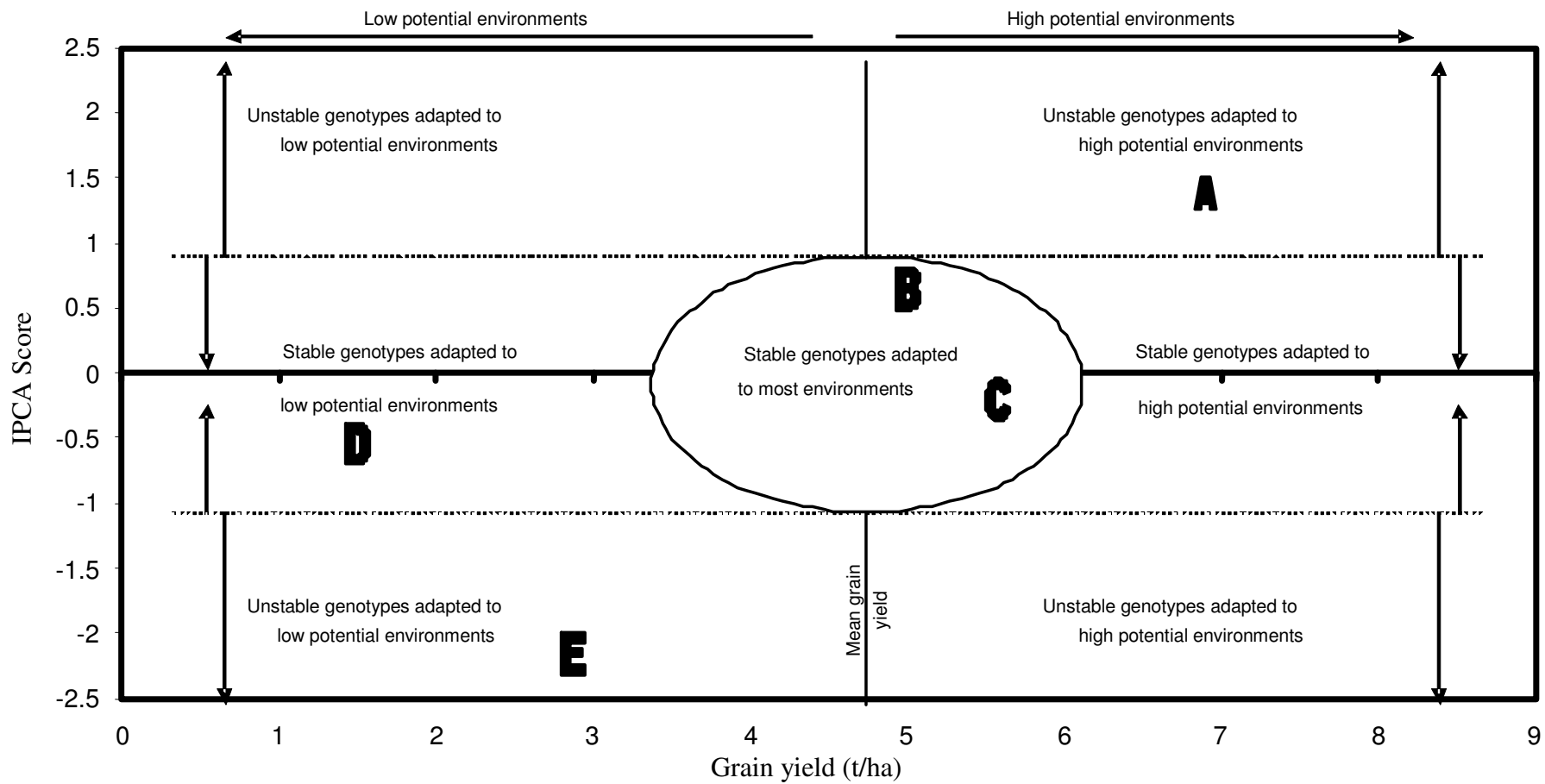


Figure 1b AMMI model indicates the stability of genotypes at different environments