AGRONOMY RESEARCH

INSTITUTE

ANNUAL TECHNICAL REPORT FOR 2007-08

DEPARTMENT OF AGRICULTURAL RESEARCH AND EXTENSION (AREX)
ZIMBABWE

Agronomy Research Institute,
Department of Agricultural Research and Extension
P.O. Box CY 550
Causeway, Harare, Zimbabwe
Tel: 263 4 704531-9
Fax: 263 4 731133
E-mail: agronomy@mweb.co.zw

Ministry of Lands, Agriculture and Rural Development

Harare

2009

ACKNOWLEDGEMENTS
The Agronomy Research Institute would like to thank the following groups, organisations and individuals who contributed in different ways to come up with the work reported in this document.

- The Government of Zimbabwe and The Ministry of Agriculture for funding.
- Institutes within the Department of Research and Specialist Services, Biometrics Bureau, Crop Breeding Institute, Chemistry and Soils Research Institute, Seed Services, Plant protection Research Institute and the Horticulture Research Centre.
- The stations at which our Crop Production Units are based , Harare Research Station, Henderson Research Station, Cotton Research Institute, Mlezu Agricultural Institute, Makoholi Research Station and Matopos Research Station.
- Agritex, Farmer Organizations, Various Seed Houses, CIMMYT and farmers in carrying out the reported work.
- Field staff who carried out field work
- The administrative staff of the Institute
- Programme Leaders who put up their reports
- Mr J. Hodzi for compiling the report
- Ms B. O. Mavankeni who edited the final report

8

TABLE OF CONTENTS

1 INTRODUCTION

1.1 THE AGRONOMY INSTITUTE

The mandate: Agronomy Institute is one of the Institutes of the Crop Research Division in the Department of Research and Specialist Services. It is responsible for conducting agronomic research on most field crops in the high and mid-altitude areas of Zimbabwe. The crops researched by the Institute include maize, sorghum and millets, rice, wheat and barley, soybean, sunflower, groundnuts, dry bean, Bambara nut, cowpea, pigeon pea, chickpea, sweet potato and cassava, castor and jatropha. The Institute also carries out research in Agroforestry. The Institute also deals with weed ecology and biology and control in field crops excluding tobacco.

Where and how it conducts its research: Agronomy Institute is situated at Harare Research Station, but has six research teams called Crop Productivity Units (CPUs) at Harare research Station, Panmure Experiment Station near Shamva, Cotton Research Institute (Kadoma), Makoholi Experiment Station near Masvingo, Matopos Research Station near Bulawayo and at Mlezu Agricultural College. Each of these units is headed by a Research Technician and supported by Agricultural Assistants and in some more than one Research Technician. The Weed Research Team is located at Henderson Research Station near Mazowe. Among them, these six teams cover nine research-station based experimental sites including Horticultural Research Centre near Marondera, Mlezu Agricultural Institute near Kwe Kwe and Gwebi Variety Testing Centre, northwest of Harare. The Institute also conducts on-farm trials in communal areas.

The organization of the institute's research: The Agronomy Institute has eleven teams responsible for conducting research to solve production related problems and to develop appropriate production technology for different crops. Each of these teams is headed by a Research Officer and supported by technical staff. The teams are:

1. Maize Agronomy Team
2. Sorghum and Millets Agronomy Team
3. Rice Agronomy Team
4. Wheat and Barley Agronomy Team
5. Soyabean and Dry bean Agronomy Team
6. Cowpea, Bambaranut, Pigeonpea and Chickpea Agronomy Team
7. Groundnut Agronomy Team

8 Sweet potato and Cassava Agronomy Team

9 Sunflower, Jatropha and Castor Agronomy Team

10 Agroforestry Team

11 Weed Research Team

Research work conducted by each of these teams during the 2007/8 crop season is presented under different sections in this report.

1.2 SITES AND THE SEASON

TABLE 1 LIST OF AGRONOMY INSTITUTE STATIONS

Station	Area	Altitude	Longitude	Latitude	Natural region
Horticulture Res Stn	Marondera	1628	31°47”E	18°11”S	IIa
Henderson Res Stn	Mazowe	1292	30°38”E	17°35”S	IIb
Cotton Res Ins	Kadoma	1157	29°53”E	18°19”S	IIb
Gwebi VTC	Harare west	1488	30°32”E	17°41”S	IIa
Matopos Res Stn	Matopos	1388	28°28”E	20°24”S	IV
Makoholi Exp Stn	Masvingo	1204	30°47”E	19°50”S	IV
Panmure Exp Stn	Shamva	881	31°47”E	17°16”S	IIb
Mlezu Exp Stn	Kwe Kwe	1200	29°55”E	19°09”S	III

STAFF LIST

B.O. Mavankeni	Acting Head of Institute
Maize Team	
B. Neurashe	Research Officer
L. Pashapa	Research Technician
A .Murape	Agricultural Assistant
Rice Team	
A.E. Muzira	Research Officer
B. Kureva	Research Technician
P. Mpisa	Agricultural Assistant
Soybean and Dry bean Team	
J. Hodzi	Research Officer
A.A. Dube	Research Technician
E.J. Kadaira	Agricultural Assistant
Weed Research Team based at Henderson	
E. Mangosho	Officer In Charge
G. Kanonge	Research Officer
H.A. Mupambwa	Research Officer
N. Mandlazi	Research Technician
G. Mutatavikwa	Research Technician
G. Nhamoinesu	Research Technician
T. Mukarakate	Agricultural Assistant
C. Nyatoro	Agricultural Assistant
O. Chironga	Agricultural Assistant
C. Charakupa	Agricultural Assistant
Crop Production Unit at Harare	
T. Chiwasa	CPU Leader
J. Karambwe	Chief Research Technician
Kadoma Crop Production Unit	
N.Mutasa	CPU Leader
D Dhliwayo	Research Technician
J. Murove	Agricultural Assistant
M. Makamure	Agricultural Assistant
M.Musiniwa	Agricultural Assistant
S. Sibanda	Agricultural Assistant
Makoholi Crop Production Unit	
M. Manyonganise	CPU Leader

T. Marimbe	Research Technician
K. Doba	Agricultural Assistant
D.Dhliwayo	Agricultural Assistant
C. Chekure	Agricultural Assistant
M. Mushiringi	Agricultural Assistant
C. Chougurei	Agricultural Assistant
M. Mbindi	Agricultural Assistant
M. Machavira	Agricultural Assistant
Matopos Crop Production Unit	
M.Dube	CPU leader
A. Magaisa	Research Technician
P. Xaba	Research Technician
Panmure Experiment Station	
E Petro	CPU leader
G. Muchina	Agricultural Assistant
K.Garutsa	Agricultural Assistant
L.Cheza	Agricultural Assistant

Administration

J. Mugomba	Accountant
G.B. Nyadongo	Accounting Assistant

SUMMER CEREALS
MAIZE PROGRAMME

Evaluation of maize varieties in farmers' fields in Zimbabwe using the Mother-Baby Trial scheme

1. Introduction

Maize yields have remained low in the smallholder farming sector of the country, averaging 1 to 1.5 tonnes per hectare. The seed, bred and produced under optimal agronomic conditions as found mainly on research stations and commercial farms, have not met farmers' needs and may be inappropriate to the conditions in the smallholder farmers' fields, where drought and low soil fertility are common. It is thus imperative that cultivars that perform under those challenging conditions be identified. The acceptance of new cultivars by farmers should be systematically sought and considered in breeding programs.

Information flow in the traditional research and extension system in Zimbabwe has largely been unidirectional - from research to extension to farmers. Extension has been an on-looker and only got involved when new varieties has been released, whilst the farmer (especially the small scale farmer) has been left out of the picture completely and only received the new varieties to grow. There has been little interaction between the three institutions, resulting in little understanding of farmers' needs, priorities and conditions.

In 1998, the International Maize and Wheat Improvement Centre (CIMMYT) and Agricultural Research and Extension (AREX), then Department of Research and Specialist Services (DR&SS) and Agricultural and Technical Extension (AGRITEX), initiated the 'Mother and Baby' trials to try and bridge the gap between the high yields of maize obtained by the breeders and commercial farmers and the low yields obtained at smallholder farm level. The trials evaluate the performance and acceptance of new maize varieties (hybrids and open pollinated varieties (OPVs)) under smallholder farmers' conditions. Devised by Sieglinde Snapp, of the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), the 'mother and baby' (MB) trials is a participatory research and extension project where farmers, researchers, extension, seed companies and rural development agents evaluate released and pre-released maize varieties in farmers' fields in different agro-ecological zones. The project consists of multi-site trials that allow farmers and researchers to test performance and acceptability of maize varieties by farmers under two types of experiments: a researcher-managed 'mother trial' and a farmer managed 'baby trial'.

The design facilitates adoption of superior and appropriate maize varieties that raise and stabilize maize yields in the resource-poor farming sectors. The MB project concentrates on maize (*Zea mays*), the preferred staple with per capita consumption in excess of 100 kilograms in several countries in southern Africa (Bänziger 2002).

2. Goal

The Mother/Baby Trial project aims **to facilitate adoption of maize varieties that are adapted to and appropriate to smallholder farmers' fields and ultimately raise and stabilize maize yields in the resource poor farming sector.**

3. Materials and Methodology

Cultivars

Sixteen released commercial and experimental (pre-released) hybrids and open-pollinated maize cultivars were used (See *Table 1*). The varieties include one quality protein maize (QPM) hybrid (VP05181).

Table 1: Varieties used in the 2007/2008 season and their origins.

Cultivars			
Variety	Origin	Maturity	Type
AG101	AGPY	Early	Commercial hybrid
AG103	AGPY	Early	Commercial hybrid
AG107	AGPY	Intermediate	Commercial hybrid
VP05163	CIMMYT	Early	Experimental OPV
VP05181	CIMMYT	Intermediate	Experimental OPV
ZM309	CIMMYT	Early	Commercial OPV
ZM401	CIMMYT	Early	Commercial OPV
ZM627	CIMMYT	Late	Commercial OPV
PAN53	PANNAR	Intermediate	Commercial Hybrid
PAN413	PANNAR	Intermediate	Commercial hybrid
PAN7M-97	PANNAR	Intermediate	Commercial hybrid
SC403	SEED-CO	Early	Commercial hybrid
SC513	SEED-CO	Intermediate	Commercial hybrid
ZMS402	ZAMSEEDS(Zambia)	Early	Commercial hybrid
ZMS528	ZAMSEEDS(Zambia)	Intermediate	Commercial hybrid
ZMS616	ZAMSEEDS(Zambia)	Late	Commercial hybrid

Seed Treatment

The experimental cultivars and the OPVs were treated with a solution of 125 ml *Captan*, 15 g *Sodium Molybdate*, 1.5 ml *Acylic Super* and 5 g *Dye* in 600 ml of water (for 50 kg of seed).

Partnership and sites

The study was conducted in partnership with private seed companies (Table 1), DAR4D, AGRITEX, CIMMYT, Care International, Development Aid From People to People (DAPP), farmers' organizations, schools and smallholder farmers (Table 2).

<u>Table 2:</u> Sites and partner organizations that hosted maize variety trials in the 2007/2008 season

Site	Partner Organization	Natural region
Bikita	CARE	3
Bingaguru	AGRITEX	2B
Buhera	AGRITEX	3
Chimanimani	AGRITEX	1
Chiredzi	AGRITEX	5
Chivi	AGRITEX	4
Chiweshe	AGRITEX	2A
Daitai	AGRITEX	3
Domboshava	AGRITEX	2A
Filabusi	AGRITEX	4
Gokwe	AGRITEX.	3
Guruve	AGRITEX	2A
Gwebi	AGRITEX	2A
Harare	AGRITEX	2A
Jaka	CARE	4
Makoholi	AGRITEX	4
Matopos	AGRITEX	4
Murehwa N.	AGRITEX	2B
Murehwa Z.	AGRITEX	2B
Mutasa	DAPP	2B
Mutoko	AGRITEX	3
Muzarabani	AGRITEX/CIMMYT	4
Nembudziya	AGRITEX	3
Nkayi	AGRITEX	4
Save Valley	AGRITEX	5
Wedza	AGRITEX	2B
Zvimba	AGRITEX	2A
Zvishavane	AGRITEX	4

Trials were grown in all the 4 of the agro-ecological regions (or Natural Regions) of Zimbabwe (Table 2).

Trial Design

The trials were planted using a "Mother-Baby Trial Design" (Snapp, 1999) adapted for cultivar evaluation.

Under this design maize cultivars are tested using two types of trials namely

(i) a **researcher-managed Mother Trial**,

(ii) an exclusively **farmer-managed Baby Trial**.

Mother Trial: A replicated researcher-managed trial and is planted by partners at the center of a farming community.

It has two different levels of fertilizer:

The **“green” experiment** is grown under recommended fertilizer levels.

The **“yellow” experiment** is grown under farmer-representative fertilizer levels. The two experiments of one trial were planted on the same date.

Each experiment has an **alpha (0,1) lattice design** with **three replicates** (Patterson and Williams, 1976).

Each cultivar represented a treatment, thus giving a total of sixteen treatments in each experiment.

Nett plot: two rows 4.8 m long and 0.9m apart = 4.32m^2.

Planting: Intra-row spacing: 0.9m

In-row spacing: 0.30 m. Two seeds per planting station.

Border: -three stations at either end of the experiment;

-two borders rows on either side of the trial, and two

border rows between green and yellow experiments (Fig. 1).

Thinning: thinned to one plant/station at 3-4 weeks after planting.

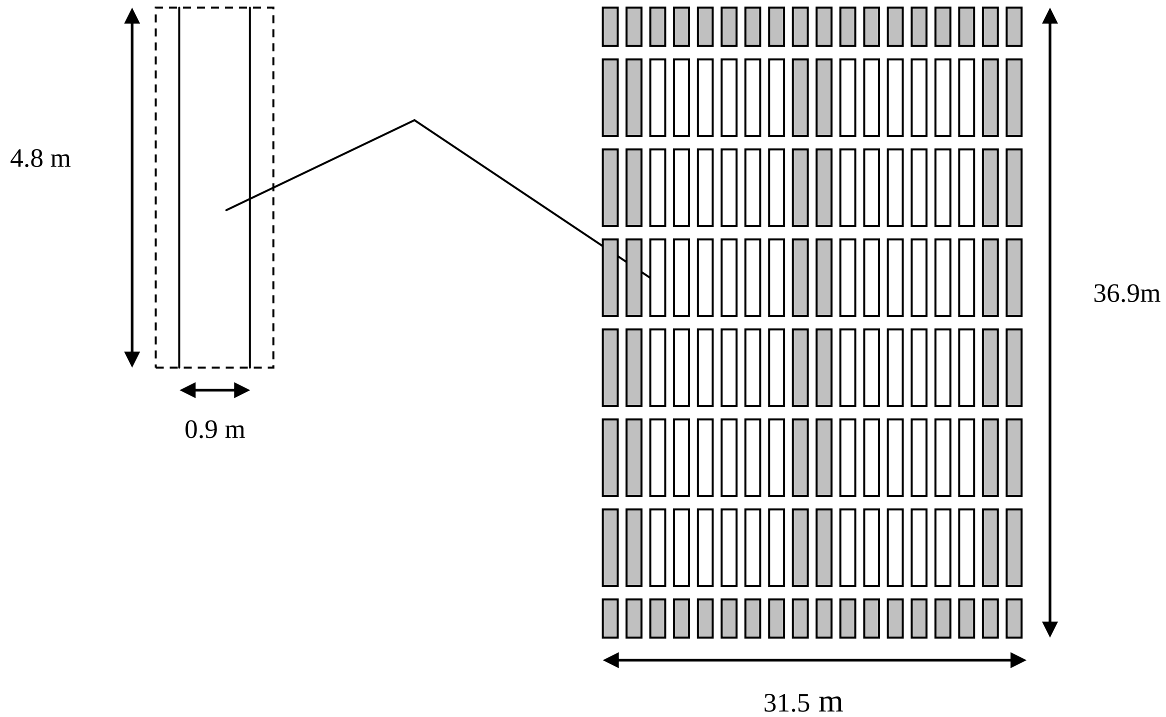

Fig. 1: Generic map of Mother Trials grown on-farm during the 2007/08 cropping season. Border plots are gray, trial plots are transparent.

Agronomic management of the Mother Trial

The two experiments in the mother trial were treated as follows:

- The Green experiment has **optimal fertilization,** as recommended by AGRITEX for the area where the trial is grown. Between 100-250 kg/ha compound fertilizer (Sand Maize Fert, or Compound D –e.g. N-P-K; 7-14-7) and 100-250 kg/ha ammonium nitrate (AN, 34.5% N) were applied, depending on the Natural Region.
- The yellow experiment has **farmer-representative fertilization,** representing average fertilizer application by smallholder farmers in that area. The amount of fertilizer applied is determined through an informal survey conducted by students of partner schools or in discussion with the partner in the area.

For ease of communication with the farmers, the experiment with the recommended amount of fertilizer is named the “green” experiment – *as plants are expected to stay green longer.* The experiment with the farmer-representative, sub-optimal level of fertilizer is named “yellow” experiment - *as plants are expected to show nutrient stress symptoms and turn yellow earlier.* One yellow and one green experiment together constituted one Mother Trial (see *Fig. 1*).

The Baby Trial: Each Baby Trial consisted of four varieties, which were a subset of the varieties in the Mother Trial. The varieties were selected at random from the sixteen available.

Cultivars were allocated to Baby Trials using an alpha (0,1) lattice design (Patterson and Williams, 1976), with each Baby Trial being an incomplete block.

Plot size: Gross plot depended on the farmer's spacing. Each baby farmer is given 650 seeds of each cultivar and asked to maintain a row length of 10m but use his usual spacing for maize.

Nett plot: 7m x 7 m = $49m^2$

The seed is packed in colored plastic bags with the name of the variety on it. Each farmer received four cultivars together forming one Baby Trial. To avoid planting mistakes, cultivars in a Baby Trial were color-coded: blue, red, yellow and green.

A Baby Trial "kit" contained:

- Four packets containing the seeds of the four varieties - the front of the packet showed the name of the variety and the back of the packet is spray-painted with the color identifying the plot (blue, red, yellow, green)
- Four stones painted in blue, red, yellow, and green
- A 15-meter string
- A questionnaire with instructions and an A4 exercise book for farmers' notes and record keeping.
- Four colored harvesting bags

Farmers were asked to apply their usual management practices when managing the Baby Trial. They were requested to **treat the four cultivars uniformly**.

Agronomic management of the Baby Trial
This is determined by the individual farmer and followed his/her usual practices.

4. Measurements

Mother Trial
The following measurements were taken on the Mother Trials:

- Number of plants at harvesting
- Number of ears per harvested plot
- Field weight: The weight of the ears harvested from each plot is measured in the field using a digital hanging scale.
- Shelling percentage and grain weight: Ear and grain weight of 10 representative ears per plot were determined and grain weight per plot is calculated. The cobs were hand-shelled.
- Moisture content: The moisture content of a sample of kernels for each plot is measured with a hand-held moisture meter (Dickey-John Multi-Grain, Mod. 46233-12223A).

Baby Trial
Quantitative and qualitative data were recorded on the Baby Trials:

- **Quantitative data:** A nett plot of 49 m^2 is marked after flowering in each plot of a Baby Trial. The ear weight of this nett plot is measured at harvest using a Chatillon Spring Scale (Model 50). Grain weight is calculated assuming a shelling percentage of 85% and grain moisture of 12.5%.
- **Qualitative data:** Farmers growing a Baby Trial were given a questionnaire asking for:
    1. Socio-economical parameters of the farm
    2. Ranking the importance of 16 criteria when deciding on the relative merit of a maize cultivar. These criteria were defined based on discussions with farmers during the previous year. Options were: ‘very important’, ‘regular’ and ‘not important’.
    3. Information on the management of the Baby Trial
    4. An assessment of the varieties planted in the Baby Trial based on the following criteria:

        I. Husk cover

        II. Ear size

III. Ear aspect
IV. Number of kernel lines
V. Taste after cooking (boiling)
VI. Kernel size
VII. Resistance to weevils
VIII. Time to maturity
IX. Resistance to diseases
X. Kernel color
XI. Resistance to rots
XII. Yield
XIII. Resistance to lodging

5. Information Dissemination

(i) Farmers and partners hosting the trials are encouraged to share information about the mother/baby trials with non-host farmers within and outside their communities at all times.

(ii) Information is also disseminated within the community through field days where farmers, researchers and extension staff access and evaluate all the varieties in the mother trial. Farmers hosting the baby trials, present to the community, their observations and experiences on their four varieties. Members of the Coordinating Unit (CU) take this opportunity to explain issues regarding the mother/baby trials and to answer questions farmers might have about the trials or about farming in general.

This year field days were not held due to the volatile political situation that prevailed in the country.

(iii) The national results are discussed during the annual feed back workshops where representative farmers from all regions; extension staff, seed company representatives and researchers share their experiences and observations. In these workshops, farmers are afforded the chances to interact and access analyzed results on the performance of different varieties under different agro ecological zones.

This year the workshop was not held due to shortage of funds because of inflation.

6. Data analysis

Mother Trials

Results of the Mother Trials were analyzed using ASREML, following a basic spatial model in two dimensions (Gilmour *et al.*, 1997). Adjusted means were calculated for the best statistical model. Least significant differences (LSD) between adjusted means were calculated for pair-wise comparison among entries.

The results of the Mother Trials are presented as follows:

Grain yield of each cultivar, calculated as follows:

$$FW \times \frac{GW_{10ears}}{FW_{10ears}} \times \frac{100[\%] - MOIST[\%]}{87.5[\%]} \times \frac{10000}{0.9[m] \times 2[rows] \times 4.8[m] \times 1000}$$

Calculation of the Grain Weight of the whole plot:

FW multiplied by the shelling percentage

Correction of the Grain Weight to 12.5 % Moisture

Extrapolation of the result for one ha and divided by 1000 to transform the Kg in tons per Hectares
- 0.9 inter row distance
- 4.8 is the length of 1 row

- FW is the field weight of the whole plot
- $GW_{10\ ears}$ is the grain weight of 10 ears after shelling
- $FW_{10\ ears}$ is the weight of 10 cobs before shelling
- MOIST is the Moisture content of the grain at harvesting in %

Remarks: The statistical method used to analyze the results enabled to compensate for some of the effects of field variation. As a consequence, the means presented in the result table are not always the average of the records of the three replicates, but include compensations for field variations.

- Rank of the cultivar in comparison to the other cultivars in the trial
- Mean of the 16 cultivars in the trial
- Minimum (Min) and the maximum (Max) values recorded in the trial
- P (0.05): The probability that the difference among cultivars is statistically significant with an error probability of 10% (+), 5% (*), 1% (**) or less than 0.1% (***). Otherwise differences in the trial are declared as being not significant (ns)
- Least significant difference (LSD): the yield of two cultivars has to be different by at least the value of the LSD to be statistically different. The formula to calculate LSD is:

$$\text{LSD}= t * \sqrt{\frac{2 * s^2}{r}} \qquad \text{(V)}$$

- t is the tabular t-value for degrees of freedom
- s^2 is the mean square for error
- r is the number of replicates (3 in our case)

Baby Trials

Grain yield results of the Baby Trial are presented as follows:

- Relative rank of a cultivar based on its ear weight: *A cultivar is ranked 1 to 4 in each Baby Trial based on its ear weight. These ranks were averaged across the whole country and the relative rank calculated for each cultivar.*
- Subjective rank attributed to each cultivar by the farmer: *Farmers ranked cultivar from 1 to 4 in each Baby Trial. These ranks were averaged across the whole country and the relative rank calculated for each cultivar.*

Farmers' perceptions were analyzed as follows:

- *Criteria Importance (CI)*: Farmers were asked to rank the importance of 16 characteristics when deciding on the relative merit of a maize cultivar. Options were: 'very important', 'regular' or 'not important'. A value of 1 is allocated to 'very important', a value of 0.5 is allocated to 'regular' and a value of -1 is allocated to 'not important'. Criteria importance (CI) is the average score given to a characteristic. A low score indicated that farmers considered the criteria to be important. A high score indicated that farmers considered the criteria to be not important.
- *Specific Farmer Perception of a Cultivar (SFP)*: Farmers were asked to assess the variety planted in their baby plots based on 13 different criteria. Each variety is assessed as being 'good', 'regular' or 'bad' for a certain criteria, scored 1, 2 and 3 respectively. Specific Farmer Perception of a Cultivar (SFP) is the average score given to a cultivar for a certain characteristic. A low score indicated a positive perception by farmers. A high score indicated a negative perception by farmers.
- *General Farmer Perception of a Cultivar (GFP)*: The general perception of a variety by the farmers is achieved by multiplying the criterion importance (CI) with the farmers' perception of a cultivar for that criterion (SFP), and adding these values over the 13 criteria. A low score indicated a positive perception by farmers. A high score indicated a negative perception by farmers.

GFP= $\sum_{13}^{1} CI_n * SFP_n$

Rainfall status in 2007/08 season

The season was generally short and it was characterized by poor rainfall distribution although most sites received above normal rains.

The first effective rains were received during the period 20-30 November 2007 for most sites. Onset rains were near normal at most sites but this was followed by heavy rains in December 2007 and January 2008. Thereafter very little rains were received in February and March, thereby creating drought conditions.

***Table 3:* Rainfall received at some sites during the 2007/2008 season**

Site	Natural Region	Average Rainfall (mm)	Rainfall received (mm)
Bingaguru (Rusape)	2B	700 - 950	960
Chimanimani	1	1 000+	1 300
Daitai	3	650 - 800	1 008
Domboshava	2A	750 – 1 000	1 241
Gokwe	3	650 - 800	743
Guruve	2A	750 – 1 000	691.5
Makoholi	4	450 - 650	888.5
Murehwa Nheweyembwa	2B	700 - 950	1 026.5
Murehwa Zunde	2B	700 - 950	1 026.5
Muzarabani	4	450 - 650	1 098
Nembudziya	3	650 - 800	1 062

7. Results and discussion

Mother trials results and discussion

Results of this season were obtained from 14 sites out of the 26 giving a total of 28 green and yellow experiments. This is about 52% success rate. This low rate is largely attributed to the unusual rainfall pattern during the season. The excessive rains during the early part of the season disrupted land preparation, planting, weeding and fertilizer application in some instances. In addition there was water logging and excessive nutrient leaching especially at sites with sandy to sandy loam soils.

Crop development at some sites was adversely affected by the dry spell experienced during the late part of the season, this resulted in stressed plants, poor pollination, grain formation and filling. Crops at some sites failed to reach physiological maturity.

As a consequence yields were generally low, with the average yield across all 28 experiments at 2.08 t/ha (Table 4). However there was a narrow yield range between the lowest yielding variety and the highest (1.78 and 2.30 t/ha, respectively).

As expected, varieties performed better in the green experiments than in the yellow experiments and hybrids performed better than open pollinated varieties.

Key to colour codes in tables 4, 5 and 6:

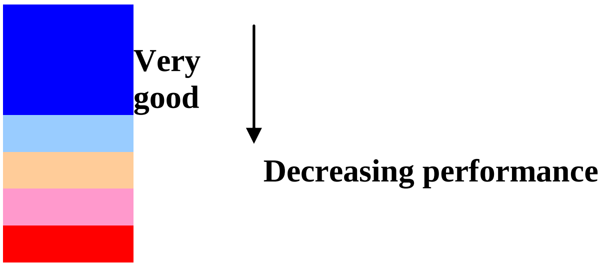

Table 4: Mean Grain yield of 16 maize varieties evaluated in 28 on-farm experiments grown under recommended (green trial) and farmer-representative (yellow trial) fertilizer levels and farmer practice (Babies) in Zimbabwe during the 2007/2008 season.

		All Trials		Green Trial		Yellow trial	
Variety	**Origin**	**t/ha**	**Rank**	**t/ha**	**Rank**	**t/ha**	**Rank**
Early Maturing Hybrids							
AG101	AGPY	2.25	3	2.48	6	2.03	1
AG103	AGPY	2.22	4	2.54	4	1.89	4
PAN413	PANNAR	2.30	1	2.61	2	2.00	2
ZMS402	ZAMSEEDS	2.05	11	2.33	11	1.78	9
SC403	SEED-CO	2.07	10	2.48	7	1.67	12
Intermediate-maturing Hybrids							
AG107	AGPY	2.20	6	2.59	3	1.81	8

PAN 53	PANNAR	2.30	2	2.65	1	1.95	3
PAN 7M-97	PANNAR	2.18	7	2.46	8	1.89	6
SC513	SEED-CO	2.08	8	2.40	9	1.76	10
ZMS528	ZAMSEEDS	2.21	5	2.54	5	1.89	5
Late-maturing Hybrids							
ZMS616	ZAMSEEDS	2.075	9	2.33	10	1.82	7
Early Maturing Open Pollinated Varieties							
VP05163	CIMMYT	1.90	14	2.15	13	1.65	14
VP05181	CIMMYT	1.93	12	2.13	14	1.73	11
ZM309	CIMMYT	1.87	15	2.11	15	1.64	15
ZM401	CIMMYT	1.783	16	2.06	16	1.51	16
Late-maturing Open Pollinated Varieties							
ZM627	CIMMYT	1.92	13	2.17	12	1.66	13
Mean		**2.08**		**2.38**		**1.79**	
Min		**1.78**		**2.06**		**1.51**	
Max		**2.30**		**2.65**		**2.03**	

Individual sites:

Table 5 shows the grain yield at various sites. Sites which produced results were relatively evenly spread among the four natural regions. Generally, sites in natural regions 2 and 3 produced higher yields than those in natural region 4. Muzarabani, though, produced unusually high yields for natural region 4. This was possibly because of the above normal rainfall (Table 3) received. Gwebi (natural region 2A) produced the highest yields in both the green and yellow experiments a reflection of the good soils, good rains and the high level of crop management at the site. Makoholi had very poor yields which produced very high CVs and insignificant differences. Significant differences in grain yield were however recorded at most sites.
As expected green experiments produced higher yields than yellow experiments although at Daitai its was the reverse for some of the varieties.
At most sites early maturing varieties were higher yielding than late varieties suggesting that the intermediate to late maturing varieties did not reach their full potential. As expected at most sites hybrids produced higher yields than open pollinated varieties.

Table 5: Grain yield of cultivars in each Mother experiment in the 2007/2008 season (G = green experiment, Y = Yellow experiment).

Variety	**Origin**	**Rusape (2B)**		**Matopos (4)**		**Guruwe (2A)**		**Zvimba (2A)**		**Mutoko (3)**		**Murehwa N (2B)**		**Makoholi (4)**	
		G	**Y**	**G**	**Y**	**G**	**Y**	**G**	**Y**	**G**	**Y**	**G**	**Y**	**G**	**Y**
Early Maturing Hybrids															
AG101	AGPY	2.03	2.04	1.98	2.87	4.97	5.19	0.63	0.21	2.97	2.30	2.28	1.06	0.63	0.10
AG103	AGPY	1.94	1.10	2.26	2.88	4.58	4.46	0.76	0.41	3.31	1.80	1.11	0.64	0.29	0.10
PAN413	PANNAR	2.96	1.68	2.43	3.15	4.83	4.22	1.30	0.65	2.84	2.04	1.84	1.15	0.11	0.10
ZMS402	ZAMSEEDS	1.76	1.15	2.33	3.12	4.65	4.70	1.29	0.17	3.00	1.69	1.54	0.61	0.18	0.12
SC403	SEED-CO	1.90	1.10	1.92	3.50	4.82	4.13	1.86	0.26	3.58	1.39	1.56	1.09	0.24	0.06
Intermediate-maturing Hybrids															
AG107	AGPY	1.81	1.56	2.04	2.01	4.77	3.79	0.78	0.45	2.64	1.73	1.55	1.00	0.22	0.11
PAN 53	PANNAR	1.72	1.53	1.71	2.61	5.52	4.21	1.04	0.44	2.68	2.32	1.59	0.76	0.12	0.11
PAN 7M-97	PANNAR	2.02	1.71	1.71	2.51	6.10	4.98	0.31	0.10	1.37	2.11	1.25	0.81	0.16	0.06
SC513	SEED-CO	1.55	0.87	1.81	3.34	6.57	4.56	0.94	0.43	2.80	1.32	0.84	1.24	0.09	0.09
ZMS528	ZAMSEEDS	2.68	1.61	1.89	2.43	4.83	3.82	1.28	0.68	2.37	2.15	2.08	1.01	0.02	0.06
Late-maturing Hybrids															
ZMS616	ZAMSEEDS	3.09	1.30	1.87	2.27	5.08	4.64	0.89	0.87	1.86	2.15	1.69	1.07	0.01	0.12
Early Maturing Open Pollinated Varieties															
VP05163	CIMMYT	1.25	0.75	2.07	3.06	5.28	4.00	1.05	0.36	3.30	1.99	1.24	1.48	0.05	0.20
VP05181	CIMMYT	1.91	0.74	2.04	2.64	5.13	4.26	1.26	0.41	3.03	1.94	0.86	0.88	0.03	0.13
ZM309	CIMMYT	2.14	0.64	1.74	3.33	4.88	4.74	1.08	0.34	2.00	1.76	0.98	0.80	0.25	0.17
ZM401	CIMMYT	1.85	0.94	1.80	2.73	5.49	4.42	1.31	0.13	3.17	1.44	1.42	0.77	0.03	0.10
Late-maturing Open Pollinated Varieties															
ZM627	CIMMYT	1.94	1.42	1.56	2.42	4.06	4.94	0.96	0.25	1.89	1.58	0.97	0.86	0.03	0.13
Mean		2.03	1.26	1.95	2.80	5.1	4.4	1.0	0.4	2.7	1.9	1.4	0.9	0.2	0.1
Min		1.25	0.64	1.71	2.01	4.1	3.8	0.3	0.1	1.4	1.3	0.8	0.6	0.0	0.0
Max		3.09	2.04	2.43	3.50	6.6	5.2	1.9	0.9	3.6	2.3	2.3	1.5	0.6	0.2
LSD		0.80	0.64	0.91	1.18	1.4	1.2	0.6	0.3	1.6	1.0	0.7	0.6	0.2	1.6
CV		22.72	29.24	26.78	24.26	15.4	15.7	33.8	50.8	33.5	30.5	29.4	37.8	90.8	882.6
P		***	***	ns	ns	ns	ns	**	**	ns	ns	**	ns	***	ns

Table 5 continued: Grain yield of cultivars in each Mother experiment planted during the 2007/2008 season (G = green experiment, Y = Yellow experiment)

Variety	Origin	Daitai (3)		Muzarabani (4)		Murehwa Z (2B)		Zvishavane (4)		Domboshava (2A)		Gwebi (2A)		Harare (2A)	
		G	Y	G	Y	G	Y	G	Y	G	Y	G	Y	G	Y
Early Maturing Hybrids															
AG101	AGPY	2.04	2.25	4.11	1.37	1.67	0.59	1.24	0.56	1.78	1.73	4.44	5.33	3.94	2.78
AG103	AGPY	2.53	2.96	5.19	0.79	1.47	0.49	0.72	0.35	1.78	1.48	6.72	6.65	2.85	2.40
PAN413	PANNAR	2.23	3.64	5.00	1.89	1.55	0.59	1.83	0.58	1.29	1.84	5.37	4.74	2.95	1.79
ZMS402	ZAMSEEDS	1.47	2.48	3.60	0.98	1.09	0.42	1.62	0.53	1.88	1.79	4.24	5.22	3.91	1.98
SC403	SEED-CO	2.02	2.77	4.58	1.01	1.53	0.68	2.18	0.37	1.46	1.49	4.68	3.56	2.31	1.89
Intermediate-maturing Hybrids															
AG107	AGPY	2.66	3.37	5.69	1.40	1.60	0.20	1.26	0.68	2.08	2.11	6.28	5.07	2.93	1.89
PAN 53	PANNAR	2.39	3.64	4.68	0.77	1.79	0.72	1.32	0.56	1.52	1.26	8.69	5.79	2.28	2.54
PAN 7M-97	PANNAR	3.04	3.02	4.85	1.73	0.80	0.62	1.49	0.67	1.79	1.56	6.98	4.79	2.58	1.79
SC513	SEED-CO	2.56	3.17	4.06	0.94	1.16	0.67	2.17	0.58	1.10	0.91	5.85	4.94	2.15	1.57
ZMS528	ZAMSEEDS	1.90	3.64	5.28	0.61	2.10	0.43	1.68	0.57	1.62	1.58	4.82	5.78	2.96	2.13
Late-maturing Hybrids															
ZMS616	ZAMSEEDS	3.30	2.85	3.02	0.81	1.79	0.58	1.20	0.74	1.54	1.35	5.13	5.10	2.10	1.69
Early Maturing Open Pollinated Varieties															
VP05163	CIMMYT	2.56	2.96	3.37	1.00	1.20	0.41	1.94	0.37	1.57	1.55	3.51	3.23	1.76	1.73
VP05181	CIMMYT	1.78	3.99	3.70	0.59	1.33	0.28	1.74	0.63	1.15	1.76	3.56	4.64	2.34	1.30
ZM309	CIMMYT	1.85	2.65	2.98	0.66	1.26	0.40	1.86	0.83	1.56	1.23	4.49	3.32	2.41	2.16
ZM401	CIMMYT	1.79	1.81	2.67	1.05	1.39	0.75	1.26	0.52	1.36	1.57	2.74	3.88	2.49	1.05
Late-maturing Open Pollinated Varieties															
ZM627	CIMMYT	2.67	2.62	3.43	0.79	1.32	0.23	1.66	0.63	1.78	1.54	5.04	3.86	3.09	1.96
Mean		2.3	3.0	4.1	1.0	1.4	0.5	1.6	0.6	1.6	1.5	5.2	4.7	2.66	1.92
Min		1.5	1.8	2.7	0.6	0.8	0.2	0.7	0.3	1.1	0.9	2.7	3.2	1.76	1.05
Max		3.3	4.0	5.7	1.9	2.1	0.8	2.2	0.8	2.1	2.1	8.7	6.7	3.94	2.78
LSD		1.1	1.0	2.0	0.9	0.6	0.5	0.7	0.3	0.6	0.7	1.6	1.2	0.89	0.82

CV	28.0	18.7	27.5	52.0	25.0	55.6	25.3	28.1	23.4	27.8	17.8	15.0	19.20	24.61
P	+	***	*	+	*	ns	**	*	+	ns	***	***	***	***

Baby Results and discussion

Table 6: Results of the 2007/2008 season Baby Trials. Farmers' assessment scores were 1 = good, 2 = average, 3 = poor.

Variety	**Origin**	**ASREML**		**Arithm. Mean**		**Farmer assessment (1 = good, 2 = average, 3 = bad)**												
		GY t/ha	**Rank**	**GY t/ha**	**Rank**	**Husk**	**E size**	**E asp**	**Line #**	**Taste**	**K Size**	**Weevil**	**Matur**	**Disease**	**Color**	**Rot**	**Yield**	**Lodg**
Early Maturing Hybrids																		
AG101	AGPY	1.92	7	1.86	2.36	**1.27**	**1.53**	**1.47**	**1.13**	**1.27**	**1.33**	**1.13**	**1.27**	**1.13**	**1.13**	**1.07**	**1.40**	**1.33**
AG103	AGPY	1.88	9	1.74	1.67	**1.08**	**1.00**	**1.08**	**1.00**	**1.00**	**1.00**	**1.08**	**1.08**	**1.00**	**1.17**	**1.25**	**1.17**	**1.00**
PAN413	PANNAR	1.81	11	2.28	2.83	**1.09**	**1.45**	**1.18**	**1.18**	**1.18**	**1.36**	**1.45**	**1.27**	**1.27**	**1.09**	**1.64**	**1.27**	**1.27**
ZMS402	ZAMSEEDS (Zambia)	1.69	15	1.82	2.31	**1.08**	**1.33**	**1.33**	**1.25**	**1.17**	**1.33**	**1.25**	**1.17**	**1.33**	**1.08**	**1.17**	**1.33**	**1.17**
SC403	SEEDCO	1.81	12	1.65	2.38	**1.08**	**1.25**	**1.25**	**1.50**	**1.25**	**1.33**	**1.08**	**1.08**	**1.17**	**1.00**	**1.08**	**2.08**	**1.25**
Intermediate-maturing Hybrids																		
AG107	AGPY	2.13	2	2.31	1.92	**1.08**	**1.31**	**1.08**	**1.23**	**1.00**	**1.15**	**1.00**	**1.23**	**1.08**	**1.00**	**1.08**	**1.08**	**1.00**
PAN 53	PANNAR	2.23	1	2.13	1.86	**1.00**	**1.14**	**1.14**	**1.14**	**1.14**	**1.14**	**1.14**	**1.21**	**1.21**	**1.00**	**1.07**	**1.21**	**1.14**
PAN 7M-97	PANNAR	2.03	5	1.85	2.45	**1.00**	**1.42**	**1.42**	**1.25**	**1.33**	**1.42**	**1.25**	**1.33**	**1.25**	**1.08**	**1.25**	**1.33**	**1.42**
SC513	SEEDCO	2.10	4	1.79	2.21	**1.07**	**1.14**	**1.14**	**1.00**	**1.00**	**1.07**	**1.07**	**1.29**	**1.00**	**1.00**	**1.14**	**1.14**	**1.14**
ZMS528	ZAMSEEDS (Zambia)	1.76	13	2.25	2.27	**1.00**	**1.00**	**1.18**	**1.27**	**1.00**	**1.27**	**1.09**	**1.18**	**1.00**	**1.00**	**1.09**	**1.18**	**1.36**
Late-maturing Hybrids																		
ZMS616	ZAMSEEDS (Zambia)	1.83	10	2.12	2.44	**1.00**	**1.13**	**1.33**	**1.20**	**1.13**	**1.07**	**1.13**	**1.07**	**1.00**	**1.00**	**1.00**	**1.27**	**1.20**
Early Maturing Open Pollinated Varieties																		
VP05163	CIMMYT	1.99	6	2.29	2.23	**1.50**	**1.58**	**1.58**	**1.75**	**1.75**	**1.58**	**1.17**	**1.50**	**1.58**	**1.17**	**1.42**	**1.67**	**1.75**
VP05181	CIMMYT	2.11	3	2.25	2.71	**1.33**	**1.42**	**1.33**	**1.50**	**1.08**	**1.33**	**1.17**	**1.17**	**1.33**	**1.08**	**1.42**	**1.50**	**1.25**
ZM309	CIMMYT	1.67	16	2.09	2.46	**1.17**	**1.17**	**1.17**	**1.25**	**1.17**	**1.58**	**1.25**	**1.25**	**1.17**	**1.17**	**1.25**	**1.25**	**1.25**
ZM401	CIMMYT	1.71	14	1.63	2.46	**1.15**	**1.69**	**1.46**	**1.46**	**1.15**	**1.31**	**1.46**	**1.15**	**1.23**	**1.08**	**1.54**	**1.31**	**1.46**
Late-maturing Open Pollinated Varieties																		
ZM627	CIMMYT	1.91	8	2.30	2.50	**1.29**	**1.36**	**1.43**	**1.21**	**1.29**	**1.36**	**1.29**	**1.43**	**1.21**	**1.21**	**1.07**	**1.50**	**1.29**
Mean		1.91	8.50	2.02	2.32	1.14	1.31	1.29	1.27	1.18	1.29	1.19	1.23	1.19	1.08	1.22	1.36	1.27
Min		1.67	1.00	1.63	1.67	1.00	1.00	1.08	1.00	1.00	1.00	1.00	1.07	1.00	1.00	1.00	1.08	1.00
Max		2.23	16.00	2.31	2.83	1.50	1.69	1.58	1.75	1.75	1.58	1.46	1.50	1.58	1.21	1.64	2.08	1.75

A total of 55 baby trials were analyzed out of the expected 176. This translates to about 32% success rate. This very low rate is attributable to the excessive rains experienced throughout the country, which however, ended abruptly creating drought conditions at the end of the season. Most baby farmers did not harvest anything from their plots.
Table 6 shows the yield rankings and the qualitative assessments of the sixteen varieties in the baby trials. The yield range according to ASREML analysis was very narrow (1.67 to 2.23 t/ha). The highest yielding variety in the baby trials was PAN53 at 2.23 t/ha followed by AG107 with a yield level of 2.13 t/ha.

Bibliography.

Bänziger M., and M.E. Cooper, 2001. Breeding for low-input conditions and consequences for participatory plant breeding - examples from tropical maize and wheat. Euphytica 122: 503-519.

Gilmour, A.R., B.R. Cullis, and A.P. Verbyla. 1997. Accounting for natural and extraneous variation in the analysis of field experiments. Journal of Agricultural, Biological, and Environmental Statistics 2(3): 269-293

Patterson, H.D., and E.R. Williams. 1976. A new class of resolvable incomplete block designs. Biometrika 63: 83-89.

Snapp, S. 1999. TARGET, the newsletter of the soil fertility research network for maize-based cropping systems in Malawi and Zimbabwe, Issue 17, pp 8

EFFECT OF INCORPORATING GREEN MANURE LEGUMES ON STRIGA EMERGENCE AND SUBSEQUENT EFFECT ON MAIZE PRODUCTION

Summary

Witch weed (*Striga asiatica* and *S. hermonthica*) are parasitic weeds of mostly cereals including maize is among the several factors that hinder maize production in the smallholder sector in Zimbabwe and the rest of sub-Saharan Africa. Significant gains have been made in maize breeding under the unique abiotic environmental stresses of sub-Saharan Africa, but maize improved for *striga* resistance has lagged behind (Rich, McMillan, de Framond and Ejeta, 2005). Three green manure legumes namely velvet bean (*Mucuna pruriens*), Cowpea (*Vigna unguiculata*) and sunnhemp (*Crotalaria juncea*) were used as mulch and intercrops with maize to determine their suppressive effect on emergence of *Striga asiatica*. The experiment was carried out in pots at Henderson Research Station (30^{o} 58' 17^{o} 35') (Mazowe) for two seasons 2002/03 and 2003/04. Generally *striga* counts were reduced where the green manure legumes were used as mulch compared to where they were used intercrops. At 89 and 105 days after crop emergence green manure mulch significantly reduced *striga* counts ($P<0.001$) (Ndhlela, Bwakaya. Pashapa, unpublished). Since the experiment was only done in pots there is now need to take the work into the field in order to further verify the results and come up with a recommendation that would assist smallholder farmers who have a problem of *striga* in their fields. This study is expected to address two of the limitations of maize production in smallholder (resource poor) farms namely the devastating effects of *striga* and low soil fertility.

Background

Maize grain accounts for about 15-56% of the total daily calories in diets of people in developing countries particularly in Africa. Zimbabwe has maize as its staple food crop.

Witchweed (*striga asiatica*) a parasitic weed of maize is among the several factors that affect maize production in the smallholder sector. According to the Zimbabwe Agronomy Institute Annual Report (1988-89) about 79% of the smallholder farmers interviewed in Zimbabwe's small scale non-commercial sector reported that *striga* was present in their fields and about 8,9% of the farmers had abandoned their *striga*-infested fields. *Striga asiatica* and *S. hermonthica* are root parasites, which seriously constrain cereal production in sub-Saharan Africa. *Striga* spp are estimated to infest 21 million hectares in Africa with a potential to spread to a further 23 million hectares, (Sauerborn, 1991). *Striga* is difficult to control as it causes much of its damage before it emerges from the soil and emerges after most other weeding operations have been completed.

The use of the green manure legumes could be one of the answers on increasing food production through enhancement of soil fertility and eventually suppressing *striga.* Green manures such as velvet beans form a thick canopy during their growth thereby smothering weeds. Green manuring may result in weed suppression and some farmers in the communal areas have even reported that a velvet bean is capable of suppressing *striga*. According to Jasi (2002) not much work has been done in Zimbabwe in terms of evaluating the effects of green manure legumes on *striga asiatica* germination and growth. Nitrogen has been found to reduce *striga* infestation but sources of mineral N are very expensive for smallholder farmers. Green manure legumes such as velvet bean (*Mucuna pruriens*), fish bean (*Tephrosia vogelli*), sunnhemp (*Crotalaria juncea*) and dolichos (*Lablab purpureus*) are an important source of nutrients (particularly biologically fixed N) in Zimbabwe (Chibudu, 1998). For *S. asiatica* control green manure legumes should be established at the same time as maize in a field heavily infested with *S. asiatica*. There was less *striga asiatica* incidence when the green manure legumes namely velvet bean, fish bean, sunnhemp and dolichos were planted at the same time as maize compared to staggering the planting dates (Jasi, Chivinge and Mariga, 2003). Jasi et.al (2003) reported that although not significantly different, legumes planted two weeks after maize allowed slightly higher *striga asiatica* counts of 0.25 compared to 0.06 for simultaneous planting in the field at Mlezu (80 days after planting). Legume intercrops showed that they do not differ in the way they suppress *S. asiatica* emergence, only the time of legume establishment is important. The reasons for reduction of *striga* when maize is intercropped with cowpea include suicidal germination of *striga*; release of nitrogen into the soil and shading which consequently lowers soil temperature (Carsky, Singh and Ndikawa, 1994).

In a study carried out in 2002/03 and 2003/04 seasons at Henderson Research Station in pots generally *striga* counts were reduced where the green manure legumes were used as mulch compared to where they were used as intercrops (Ndhlela et.al 2004 unpublished). At 89 and 105 days after crop emergence green manure mulch significantly reduced *striga* counts ($P<0.001$) (Table 1. and Table.2 respectively). Incorporating green manure legumes significantly ($P<0.001$) increased maize plant height and there was an interaction between the farming system and the legume in which case incorporation of the green manure resulted in an increase in plant height regardless of the type of legume. However, incorporating dolichos beans resulted in a significant increase in plant height. The effect of *striga* on cob dry weight was significant ($P<0.05$) with infested pots having average cob dry weight of 4.52kg and un-infested pots having average cob dry weight of 7.48kg.
The study will then be carried to the smallholder farm this time round to verify the results and to test the practical applicability.
Its objectives are to assess effects of green manure mulch on striga emergence and to develop strategies for rehabilitation of low soil fertility striga infested fields and improve maize productivity.

Materials and Methods

The trial is scheduled to run for three seasons (2005/6-2007/8). The first season (2005/06) will be for the establishment and incorporation of the green manures. The last two seasons (2006/07 and 2007/08) will then be for evaluating the effects of the green manures.
The trial design is a completely randomized block (RCBD) design with four replications.
Treatments are as follows:

1. Maize cowpea intercrop (MCI)
2. Maize velvet bean intercrop (MVI)

3. Maize sunnhemp intercrop (MSI)
4. Maize velvet bean incorporated (MVInc)
5. Maize sunnhemp incorporated (MSInc)
6. Sole maize (SM)
7. Maize cowpea incorporated (MCInc)

Gross plot size will be 6 rows of 6m long and 5.4m wide ($32.4m^2$) and the nett plot size 4 rows and a discard of 0.9m at each end ($5.67m^2$).

The trial was established at two sites, Mlezu Agricultural Research station and Chiota communal area (see table 1 for site description and experimental details) during the first season. Farmer selection for Chiota was done after consultations with the local extension worker on *striga* infestation in the area. The trial at Zimuto communal lands could not be established.

Table 1: *Site details of the trial "Effect of incorporating green manure legumes on striga emergence and subsequent on maize production."*

Site	NR	Soil texture	pH	N after incubation(ppm)	N status	P after incubation(ppm)	Soil P status
Chihota	IIb	mgs	4.4	31	M	8	D
Mlezu	III	mgs	4.5	33	M	11	D

Key: M = Soil nitrogen status medium.
D = Soil P status medium

N.B. pH 4.5 – pH status very strongly acidic.

Maize variety PAN 413 was planted at spacing of 90cm x 30cm and received 300kg/ha of maizefert as basal dressing and 250 kg/ha ammonium nitrate as top dressing. Legumes used in the trial were cowpeas, velvet beans and sunnhemp. Cowpea and velvet bean were planted at 45cm x 15cm. Velvet bean was inoculated with rhizobium to enhance nodulation. Sunnhemp was drilled in rows 45cm apart. Plots with intercrop and sole maize treatments were planted to maize and plots with legume incorporation treatments were planted to the respective legumes.

Maize stalkborer in maize was controlled with thiodin 1% granular. Cowpea was sprayed once against aphids. Weeding was done twice in all plots.

The legumes were incorporated after they had reached over 50 % flowering. After taking biomass estimates and chopping the legumes to facilitate incorporation, incorporation was done using an ox-drawn plough. After harvesting maize stover was removed before ploughing. The soils at Chihota were very acidic and ploughing in the legume and maize plots 600kg lime/ha was applied.

2006/07 season

A maize test crop was grown in all the treatments. It is then when striga counts were taken every fortnight beginning five weeks after maize emergence to determine the effects of the treatments of the first season on *striga* emergence. Maize grain yield improvement was assessed.

Results for 2006/2007

Results and Discussion

The trial could not be continued during the 2007/2008 season because there was no striga at the sites. It was suspended until suitable sites are identified and then it can be continued.

RICE PROGRAMME

A01/B0602/99 THE EFFECT OF SEED RATE ON THE YIELD OF RICE (O*ryza sativa*)

Background and justification

Rice consumption has been on the increase over the years. The government is losing a lot of foreign currency in rice importation. Thus the government saw it necessary to engage in rice production at a larger scale. In this light it was found that one of the limiting factors in production was seed availability. Thus this necessitated that the ideal seed rate be established. The amount of seed used influences the crop establishment and the final yield attained. At the present moment we are not very sure of what seed rate is ideal for rice production. Presently we are using rates adopted from other countries, which may not be ideal for our conditions. Seed rates used in other countries range from as low as 40kg/ha to as high as 250kg/ha. Seed rates vary according to cultural practices and cropping seasons. Thus we found it necessary to investigate the seed rate to use in rice production in Zimbabwe.

Objective

- To establish the ideal seed rate for rice production

Method and Materials

One rice variety, Nerica 3 was planted at Panmure (NRIIa) and Kadoma (NRIII). The rice was planted at five seeding rates, 40, 50, 60, 70, and 80 kg/ha. The rice was drilled in rows 25cm apart. The plot size was 15m^2 (10 rows x 0.25m x 6m). Fertilizer was applied at the rate of 100- 56 - 28 NPK kg/ha. The fertilizer was split applied with 28 – 56 – 28 NPK kg/ha applied at planting, 36kg N/ha at 4weeks after sowing and 36kg N/ha at 6 weeks after sowing. The design was a completely randomized block design replicated 3 times.

Treatments
Seed rate:

R1 = 40kg/ha
R1 = 50kg/ha
R1 = 60kg/ha
R1 = 70kg/ha
R1 = 80kg/ha

Results and discussion

There are no results because the crop wilted due to the occurrence of a dry spell and breakdown in irrigation facilities.

A01/B0601/99 Evaluation of eight rice (O*ryza sativa*) varieties for yield and adaptability in Zimbabwe

Background and justification

Rice consumption has been on the increase over the years due to urbanization. Rice is preferred by most urban population because it is easy to prepare and can be stored for future use. Currently rice consumed in Zimbabwe is almost 95% imported. The rise in demand for foreign currency for other products necessitated the reduction in the amount channeled to rice importations by growing more rice. The main factors that have been hindering rice production are the absence of high yielding varieties and poor agronomic practices. The introduction of Nericas which are better yielding than the traditional varieties might be the answer. On that note we need to establish the Nerica varieties most suited for production in Zimbabwe.

Objective

- To identify the most suitable rice varieties for commercial production in Zimbabwe
- To increase the quantities of seed available for nationwide variety testing and evaluation in the future

Method and Materials

Eight rice varieties, Nerica 1, Nerica 2, Nerica 3, Nerica 4, Nerica 5, Nerica6, Nerica7 and Mhara2 were planted at Panmure (NRIIa).The rice was drilled in rows 25cm apart at the seed rate of 60kg/ha. The plot size was $5m^2$ (10 rows x 0.25m x 2m).Fertilizer was applied at the rate of 300kg/ha (7:14:7) before planting, 150kg/ha AN (34.5%N) at 4 weeks after sowing and 150kg/ha AN (34.5%N) at 6 weeks after sowing. The design was a completely randomized block design replicated 3 times.

Treatments

Rice variety

V1 = Nerica 1
V2 = Nerica 2
V3 = Nerica 3
V4 = Nerica 4
V5 = Nerica 5
V6 = Nerica 6
V7 = Nerica 7
V8 = Mhara 2

Results and discussion

There are no results because the crop wilted due to the occurrence of a dry spell and breakdown in irrigation facilities.

WEEDS RESEARCH TEAM

WINTER CEREALS

A02J/0506/02 EVALUATION OF POST-EMERGENCE HERBICIDES IN WHEAT AT HENDERSON RESEARCH STATION IN THE 2007 WINTER SEASON

OBJECTIVE: To evaluate the efficacy of different post emergence herbicide compounds in wheat with MCPA and Banvel as standards.

MATERIALS AND METHODS

Site location
The experiment was conducted at Henderson Research Station, located in Natural Region 2b, altitude 1292m, longitude 30°38', and latitude 17°35' during the 2007 winter season, on a clay soil.

Trial establishment
Primary land preparation was done using a tractor drawn plough in April 2007, followed by discing to break soil clods. Fertilizer recommendations were done according to soil analysis results. Basal fertilizer was applied before planting at a rate of 400 kg/ ha maize fert (8N, 14 P_2O_5, 7K_2O) and incorporated using hand hoes. Top dressing fertilizer was applied at a rate of 300kg/ ha Urea (46% N) split applied with one half of the recommendation being applied at the same time as the basal fertilizer and the other half at 4 weeks after crop emergence (WACE). Seed was dribbled rate of 120 kg/ha in an interrow spacing of 0,25m.Wheat variety SC Kana, was planted on the 11th of May 2008.A total of 60ml of irrigation were applied just after planting so as to induce uniform emergence of the crop. A medium maturing variety SC Dande was planted around the trial as border rows. Irrigation was done according to the irrigation scheduling and for the crop to reach physiological maturity, a total of 430 mm of water were applied. The amount of water applied was below the recommended 600mm and this was due to persistent power cuts that hampered normal irrigation cycles.

Experimental design
The experimental design used was a randomized complete block design (RCBD) with 8 treatments replicated 3 times. The treatments were as follows:

1. Control (no chemical and no weeding)
2. Banvel (125 ml/ha) + MCPA (3l/ha)
3. Puma super (300ml/ha)
4. Banvel (125 ml/ha) + Peak (15g/ha)

5. U46 Combi fluid (1,5l/ha)
6. Banvel (250 ml/ha)
7. Peak (30g/ha)
8. Buctril (1,7l/ha)

The gross plot size was 4.5m x 2.5m ($11.25m^2$); with 0.5m form each plot border being then discarded at harvest to give a net plot size of 3.5m x 1.5m ($5.25m^2$).

Measurements

Spraying was done at 6 WACE when weed pressure was sufficient enough to warrant herbicide application. A knapsack sprayer calibrated to give an output of 198 l/ha was used to apply the herbicides. After effecting the herbicidal treatments, the following records were done:

- weed counts at 7, 14, and 21 days after spraying , 3 positions in each plot, using 0.3m x 0.3m quadrants.
- the European Weed Research Council (EWRC) scoring method was used to score for herbicide effects on weeds at 7, 14 and 21 days after spraying and the scores are as follows:
  1- Complete kill
  2- Very good
  3- Good
  4- Sufficient in practice
  5- Medium
  6- Fair
  7- Poor
  8- Very poor
  9- No effect
- tiller counts at 7 WACE
- at harvest the following parameters were also measured, i.e
  Average spikelets per ear
  Average grains per ear
  Average grain weight per ear
  100 g dry weight
  Total grain yield per net plot

Analysis of results

Data was subjected to Analysis of variance (ANOVA) using Genstat 5 Release 3.22 statistical package. Treatment means were separated using Fischer's Protected Least Significant Difference (LSD) at $p < 0.05$).

RESULTS AND DISCUSSION

The dominant weeds found at the trial site were *Chenopodium album*, *Galinsoga parviflora*, *Bidens pilosa*, *Oxalis latifolia* and *Nicandra physaloides*. Minor weeds were *Cyperus esculentus*, *Apium leptophyllum*, *Physalis angulata, Sonchus oleracea,* and *Tagetes minuta*. EWRC scores showed that the herbicide treatments and their combinations had good control of weeds (Table 1, 2 and 3). However, *Bidens pilosa* was poorly controlled by all the herbicide treatments.

Herbicide treatment effects on individual weed species at first weed count were highly significant on *Bidens pilosa* (Table 4). Buctril at 1.7 l/ha had the best weed control compared to other herbicide treatments and it was as good as the standard, MCPA (3l /ha and Banvel 125 ml/ha). Peak poorly controlled the weeds and had a higher total weed count /m^2 compared to Buctril at 1.7 l/ha. There was no significant difference between treatment effects on *C. album, C. esculentus* and *G. parviflora*. Treatment effects on second weed counts were only significantly different on *B. pilosa* and *N. physaloides*. There was no significant difference on the total weed counts on all the 7herbicide treatments. All the other treatments except for Buctril at 1.7l/ha had higher weed counts compared to the standard of MCPA and Banvel on the second weed counts (Table 5). Peak at 30 g/ha poorly controlled *B. pilosa* and was similar to the control treatment.

There were significant differences between treatments on *B. pilosa*, *C. album* and total weed count on the third weed count, 21 days after spraying. There were no significant differences between *G. parviflora*, *Apium leptophyllum*, *N. physaloides* and *T. minuta.* (Table 6). Buctril at 1.7 l/ha and the standard (MCPA at 3 l/ha and Banvel at 125 ml/ha) reduced the total weed counts.

The results on yield parameters were not quite representative of the treatments affected as the plots were damaged by quelea birds. There were only significant differences between treatments on average grains per ear and on tillers per plant only(Table 7) .There were no significant differences on yield, plant height, grains per ear and spikelets per ear.

CONCLUSION

The herbicide treatments were effected late due to very low weed pressures in the trial. This could have resulted in those herbicides, which are not systemically translocated giving poor results. However, according to this trial, the standard (Banvel at 125ml/ha and MCPA at 3 l/ha) and Buctril at 1.7l/ha had the best post emergent control of weeds. Peak at 30g/ha did not give good control results. This can be due to the fact that either the herbicide treatments were effected late or because the rate of Peak that was used was slightly low. However, for moderate control, when applied earlier, Peak at 30 g/ha can be used as a post emergent herbicide in wheat, giving moderate weed control results. All the other herbicides treatments i.e. Puma super at 300 ml/ha, U46 Combi fluid at 1.5 l/ha and Buctril at 1.7 l/ha, can be effectively used for post emergent weed control in wheat, giving medium to above medium weed control results.

Table 1: Treatment effects on weeds in wheat 7 days after spraying, using the EWRC scoring system at Henderson Research Station in the 2007 winter season

Treatments	*Amaranthus hybridus*	*Bidens pilosa*	*Chenopodium album*	*Cyperus esculentus*	*Galinsoga parviflora*	*Apium leptophyllum*	*Nicandra physaloides*	*Tagetes minuta*	*Physalis angulata*
Control (no chemical and no weeding)	9	9	9	9	9	9	9	9	9
Banvel (125 ml/ha) + MCPA (3l/ha)	1	5	3	2	4	1	6	2	1
Puma super (300ml/ha)	1	7	4	1	5	3	5	3	1
Banvel (125 ml/ha) + Peak (15g/ha)	2	6	5	2	5	2	4	1	1
U46 Combi fluid (1,5l/ha)	1	4	3	2	3	2	7	2	1
Banvel (250 ml/ha)	1	5	4	1	4	1	4	1	1
Peak (30g/ha)	1	7	8	2	6	3	6	4	2
Buctril (1,7l/ha)	1	2	3	2	2	2	2	1	1

Table 2: Treatment effects on weeds in wheat 14ays after spraying using the EWRC scoring system at Henderson Research Station in the 2007 winter season

Treatments	*Amaranthus hybridus*	*Bidens pilosa*	*Chenopodium album*	*Cyperus esculentus*	*Galinsoga parviflora*	*Apium leptophyllum*	*Nicandra physaloides*	*Oxalis latifolia*	*Physalis angulata*	*Sonchus orelacea*
Control (no chemical and no weeding)	9	9	9	9	9	9	9	9	9	9
Banvel (125 ml/ha) + MCPA (3l/ha)	1	4	3	1	3	1	4	1	2	1
Puma super (300ml/ha)	1	7	5	1	4	3	5	1	1	1
Banvel (125 ml/ha) + Peak (15g/ha)	2	6	4	1	4	1	4	1	1	1
U46 Combi fluid (1,5l/ha)	1	3	4	1	3	1	7	1	1	1
Banvel (250 ml/ha)	1	5	4	1	3	1	3	1	1	1
Peak (30g/ha)	1	7	4	2	2	2	5	1	1	1
Buctril (1,7l/ha)	1	1	1	2	1	2	1	1	1	1

Table 3: Treatment effects on weeds in wheat 21 days after spraying using the EWRC scoring system at Henderson Research Station in the 2007 winter season

Treatments	*Bidens pilosa*	*Chenopodium album*	*Cyperus esculentus*	*Galinsoga parviflora*	Apium *leptophyllum*	*Nicandra physaloides*	*Oxalis latifolia*	*Physalis angulata*	*Tagetes minuta*
Control (no chemical and no weeding)	9	9	9	9	9	9	9	9	9
Banvel (125 ml/ha) + MCPA (3l/ha)	3	1	1	2	1	3	1	1	1
Puma super (300ml/ha)	4	3	1	3	2	4	1	1	3
Banvel (125 ml/ha) + Peak (15g/ha)	4	3	1	2	1	3	1	1	1
U46 Combi fluid (1,5l/ha)	3	2	1	1	1	4	1	1	1
Banvel (250 ml/ha)	3	4	1	2	2	3	2	1	1
Peak (30g/ha)	4	2	2	1	2	4	1	1	2
Buctril (1,7l/ha)	1	1	2	1	3	1	1	1	2

Table 4: Effect of herbicide treatments in wheat on first weed count (7 days after spraying) at Henderson Research Station in the 2007 winter season.

Treatment	*Bidens pilosa*	*Chenopodium album*	*Galinsoga parviflora*	*Nicandra physaloides*	**Total**
Control (no chemical and no weeding)	19.3 (1.11)	1.33 (0.32)	2.7 (0.46)	21.0 (1.12)	46.3
Banvel (125 ml/ha) + MCPA (3l/ha)	6.0 (0.84)	2.33 (0.46)	0 (0.0)	11.0 (1.01)	19.3
Puma super (300ml/ha)	10.0 (1.04)	4.33 (0.66)	5.3 (0.63)	12.7 (0.99)	32.7
Banvel (125 ml/ha) + Peak (15g/ha)	12.3 (1.10)	5.0 (0.62)	21.0 (0.85)	15.3 (1.12)	55.7
U46 Combi fluid (1,5l/ha)	3.7 (0.67)	2.0 (0.40)	2.7 (0.47)	16.3 (1.22)	25.7
Banvel (250 ml/ha)	9.7 (1.01)	3.67 (0.64)	5.3 (0.62)	7.7 (0.94)	26.3
Peak (30g/ha)	16.0 (1.2)	3.33 (0.35)	5.3 (0.62)	13.3 (1.07)	39.7
Buctril (1,7l/ha)	0 (0.0)	0.33 (0.10)	0 (0.0)	0 (0.0)	4.0
s.e.d	0.1683	0.2531	0.3308	0.2791	13.38
LSD ($p<0.05$)	***0.3609	ns	ns	*0.5986	*28.7
c.v %	23.7	69.9	84.8	36.7	52.5

*** = $p<0.001$
*= $p< 0.05$
ns = not significant
Figures in brackets are $\log_{10}$ (weed counts + 1)

Table 5: Effect of herbicide treatments in wheat on second weed count (14 days after spraying) at Henderson Research Station in the 2007 winter season.

Treatment	*Bidens pilosa*	*Chenopodium album*	*Galinsoga parviflora*	*Apium leptophyllum*	*Nicandra physaloides*	*Physalis angulata*	*Tagetes minuta*	Total
Control (no chemical and no weeding)	26.0 (1.33)	4.67 (0.67)	5.0 (0.71)	0.33 (0.10)	26.0 (1.38)	0.67 (0.16)	0.67 (0.2)	63.3
Banvel (125 ml/ha) + MCPA (3l/ha)	5.0 (0.71)	2.33 (0.3)	8.7 (0.66)	0.67 (0.16)	9.3 (0.92)	0.33 (0.1)	0 (0.0)	26.3
Puma super (300ml/ha)	10.0 (1.01)	5.0 (0.59)	8.7 (0.96)	0.67 (0.20)	15.0 (1.09)	2.33 (0.301)	0 (0.0)	4.7
Banvel (125 ml/ha) + Peak (15g/ha)	11.0 (1.05)	4.0 (0.64)	20.0 (0.92)	1.0 (0.26)	10.0 (0.94)	0 (0.0)	0.33 (0.1)	46.3
U46 Combi fluid (1,5l/ha)	4.0 (0.53)	4.67 (0.53)	5.0 (0.57)	0.67 (0.16)	20.0 (1.08)	0 (0.0)	0.33 (0.1)	34.7
Banvel (250 ml/ha)	9.0 (0.86)	5.33 (0.71)	10.7 (1.05)	0.33 (0.10)	27.0 (1.44)	0 (0.0)	0 (0.0)	52.3
Peak (30g/ha)	20.7 (1.16)	1.67 (0.26)	10.3 (1.05)	1.67 (0.33)	15.7 (1.01)	0 (0.0)	0.67 (0.20)	51.0
Buctril (1,7l/ha)	0.3 (0.16)	0 (0.0)	0.3 (0.1)	3.0 (0.54)	0 (0.0)	0 (0.0)	0 (0.0)	6.0
s.e.d	0.273	0.2987	0.403	0.179	0.2893	0.1821	0.1073	16.26
LSD (p<0.05)	*0.587	ns	ns	ns	**0.6205	ns	ns	ns
c.v %	39.4	79.3	66.9	95.1	35.6	318.3	174.6	49.5

** = $p < 0.01$
* = $p < 0.05$
ns = not significant
Figures in brackets are $\log_{10}$ (weed counts + 1)

Table 6: Effect of herbicide treatments in wheat on third weed count (21 days after spraying) at Henderson Research Station in the 2007 winter season.

Treatment	*Bidens pilosa*	*Chenopodium album*	*Galinsoga parviflora*	*Apium leptophyllum*	*Nicandra physaloides*	*Tagetes minuta*	Total
Control (no chemical and no weeding)	18.0 (1.00)	5.67 (0.78)	2.33 (0.43)	2.33 (0.382)	16.7 (1.172)	0.67 (0.159)	46.3
Banvel (125 ml/ha) + MCPA (3l/ha)	1.3 (0.30)	1.33 (0.30)	2.0 (0.36)	0 (0.0)	2.3 (0.30)	0 (0.0)	7.7
Puma super (300ml/ha)	14.3 (1.14)	4.33 (0.68)	3.0 (0.48)	1.67 (0.36)	10.7 (0.91)	0.67 (0.159)	35.3
Banvel (125 ml/ha) + Peak (15g/ha)	8.7 (0.92)	2.0 (0.46)	10.3 (0.87)	0.33 (0.10)	8.0 (0.85)	0.33 (0.10)	30.7
U46 Combi fluid (1,5l/ha)	5.3 (0.79)	4.0 (0.51)	3.67 (0.45)	0.33 (0.10)	15.7 (1.13)	0 (0.0)	29.0
Banvel (250 ml/ha)	9.0 (0.96)	2.0 (0.43)	2.3 (0.43)	1.33 (0.36)	2.3 (0.38)	0 (0.0)	17.7
Peak (30g/ha)	3.3 (0.63)	0 (0.0)	3.3 (0.63)	0.33 (0.10)	11.0 (0.93)	0 (0.0)	18.7
Buctril (1,7l/ha)	0.3 (0.10)	0 (0.0)	0 (0.0)	1.67 (0.36)	1.0 (0.26)	0 (0.0)	3.0
s.e.d	0.25	0.217	0.3306	0.199	0.3524	0.1204	6.55
LSD (p<0.05)	*0.5363	*0.4654	ns	ns	ns	ns	***14.04
c.v %	41.8	67.4	0.709	110.7	58.2	281.9	34.1

*** = p< 0.001
*= p < 0.05
ns = not significant
Figures in brackets are $\log_{10}$ (weed counts + 1)

Table 7: Effect of herbicide treatments in wheat on grains per ear, grain weight, plant height, spikelets per ear, tillers per plant and grain yield at Henderson Research Station in the 2007 winter season.

Treatment	**Average grains per ear**	**Grain weight (g)**	**Plant height (cm)**	**Spikelets per ear**	**Tillers per plant**	**Yield kg/ha**
Control (no chemical and no weeding)	3.47	0.153	65.83	10.87	1.427	6216.6
Banvel (125 ml/ha) + MCPA (3l/ha)	11.7	0.407	62.07	15.37	2.457	6950.0
Puma super (300ml/ha)	7.73	0.407	67.53	12.67	1.553	6916.6
Banvel (125 ml/ha) + Peak (15g/ha)	8.77	0.363	62.50	13.07	1.420	5483.3
U46 Combi fluid (1,5l/ha)	5.77	0.190	65.77	13.77	1.517	3983.3
Banvel (250 ml/ha)	13.87	0.523	60.73	13.20	1.583	8500.0
Peak (30g/ha)	7.23	0.200	64.23	13.83	1.337	3300.0
Buctril (1,7l/ha)	7.10	0.230	62.73	12.77	1.360	3516.6
s.e.d	2.516	0.1397	3.533	1.582	0.3023	3367.95
LSD (P<0.05)	*5.397	ns	ns	ns	*0.6483	73.5
cv %	37.6	55.3	6.8	14.8	23.4	73.5

*= p< 0.05
ns= not significant

SOYA BEAN AND DRY BEAN PROGRAMME

TITLE: EVALUATION OF THE EFFECT OF STRIP ORIENTATION ON THE PRODUCTIVITY OF MAIZE/DRY BEAN INTERCROPS UNDER SMALLHOLDER CONDITIONS.

Background: Many smallholder farmers practice intercropping of maize and dry bean. Farmers lack information on the performance of different maize and dry bean varieties which are used as component crops in intercropping systems and how row orientation may affect the productivity of the intercrops. Strip orientation may affect productivity due to shading effects and also wind break effects.

OBJECTIVES: 1. To evaluate the effect of strip orientation on the productivity of maize dry bean intercrops.
2. To evaluate the effect of maize variety on the productivity of maize dry bean intercrop.
3. To evaluate the effect of dry bean variety on the productivity of maize dry bean intercrop.

LOCATIONS: Gwebi
Panmure
Kadoma
Matopos

TREATMENTS:

Varieties:	Maize	Dry bean
	ZM521	Pan 148
	AC31	CIM9314-17
Strip orientation:	East- West	
	North- South	

DESIGN: Split plot replicated 3 times

Plot Size: Length 3.6m x Width 3.6m = 12.96m^2

Plant Spacing:

	Maize	Dry bean
Row	90cm	45cm
In Row	30cm	7.5cm

FERTILIZER: Basal dressing 200-300kg/ha Compound D
Inoculant

Fertilizer was applied at 300-kg/ha compound D and dry bean inoculant was used on beans.

TREATMENT	Maize	Dry bean	Strip orientation
1	ZM 421	Pan 148	E-W
2	ZM 421	CIM9314-17	E-W
3	AC 31	Pan 148	E-W
4	AC31	CIM 9314-17	E-W
5	ZM 421	Pan 148	N-S
6	ZM 421	CIM9314-17	N-S
7	AC 31	Pan 148	N-S
8	AC31	CIM 9314-17	N-S
9	Sole ZM421		E-W
10	Sole AC31		E-W
11		Sole Pan 148	E-W
12		Sole CIM9314-17	E-W
13	Sole ZM421		N-S
14	Sole AC31		N-S
15		Sole Pan 148	N-S
16		Sole CIM9314-17	N-S

RESULTS AND DISCUSSION

This trial was established at Gwebi Variety Testing Centre only. No results are available as wild animals as well as thieves destroyed the trial. The trial will continue in the 2008 2009 season.

PROJECT CODE: AO1/L0429/99

EVALUATION OF PROMISING DRY BEAN GENOTYPES (*PHASEOLUS VULGARIS* L) FOR YIELD AND OTHER AGRONOMIC TRAITS.

INTRODUCTION

In Zimbabwe, the bulk of dry bean production is from smallholder farmers whose average yields have been as low as 240 kg/ha compared to the commercial farmers whose average yield range from between 1500 kg/ha to 4000 kg/ha. There are several varieties of dry bean, which are commercially available to growers, but most smallholder farmers do not have agronomic data on these varieties. Variety performance, including yield, varies according to location, climatic conditions, environmental adaptability to soils, maturity lodging, pest and disease resistance among others, hence the need to asses the performance on grain yield and other agronomic traits of some of the current varieties and newly released varieties for production suitability in Natural Regions II and III.

MATERIALS AND METHODS

Field experiments were carried out at Gwebi VTC, Panmure, Kadoma and Mlezu. Ten dry bean varieties Pan 148, Iris, Pan 159, Red Canadian Wonder, Bounty, CIM 9314-18, RAB 482, C30P21, Uyole 98 and UBR (92)25 will be evaluated. Four replications of RCBD was used. Individual plots consisted of four rows each 5m long spaced 45cm apart. Seeds were planted 7,5cm apart within each row.
Fertilizer was applied at 300 kg/ha compound D as basal dressing and 100 kg/ha AN as top dressing.

RESULTS

TABLE 1 Grain yield of dry bean varieties in kg/ha 2007 2008

VARIETY	GWEBI	MATOPOS
PAN148	703	1250
IRIS	372	1472
PAN 159	554	1299
RED CANADIAN WONDER	328	1375
BOUNTY	492	1080
CIM9314-18	933	997
RAB 482	324	1316
C30P21	576	1212
UYOLE	390	1044
UBR (92) 25	422	1045
CV%	58,3	30
L.S.D	430,8	528

DISCUSSION

Significant yield differences were noted at both sites CIM9314-18 gave a significantly higher yield at Gwebi. At Matopos highest yield was attained by the variety Iris which had a yield of 1 472kg/ha. Variety RAB 482 had the lowest ($P<0.05$) yield at Matopos site. Generally higher yields of above 1tonne were attained at the Matopos site.

A01/N0430/99: PROJECT TITLE: EVALUATION OF SOYBEAN (*GLYCINE MAX* (L) MERRIL) VARIETIES FOR PRODUCTION SUITABILITY UNDER RAIN FED CONDITIONS IN NATURAL REGIONS II, III AND IV.

JUSTIFICATION

Soybean productivity in the communal sector averaged about 780,6 kg/ha against 2093,2 kg/ha for the years 1997 to 2001. With good agronomic practices smallholder farmers are capable of producing 1500 to 2500 kg/ha. For farmers to be able to produce higher yields, they need to be provided with adapted varieties. Information required by farmers in order to produce more soybeans includes yield, environmental adaptability, maturity, lodging, height, pest and disease resistance, seed size and low fertilizer requiring variety.

Objectives: To screen some of the current commercial soybean varieties and recently released varieties for production suitability in Natural Regions II, III and IV.

LOCATIONS: Gwebi
Panmure
Makoholi Research Station
Mlezu
Kadoma

Duration: Two seasons, 2007/2008, 2008/ 2009

TREATMENTS

Varieties: 1. Pan 891 2. Santa 3. Siesta 4. Solitare 5. Safari
6. Soprano 7. Magoye 8. Mhofu 9. Bimha 10. Nyathi

Design: RCBD, replicated 4 times
Plot size: Gross plot 4 rows, x 0,45m x 5m = 9m2
Nett plot 2 centre rows, x 0,45m x 5m = 3,6m2
Plant Spacing: Inter row 0,45m
In row 0,075m
Fertilizer: 200kg/ha Compound D or L
Lime as per Soil and Chemistry Research Institute recommendation
Rhizobium Inoculant

RESULTS

TABLE 1 Grain yield of various varieties in kg/ha 2007 2008

VARIETY	GWEBI	MATOPOS
PAN891	590	868
SANTA	503	851
SIESTA	1042	1160
SOLITAIRE	729	983
SAFARI	417	976
SOPRANO	1215	1573
MAGOYE	486	1069
MHOFU	417	1243
BIMHA	816	1299
NYATHI	503	889
CV	79.5	25.7
L.S.D	774.9	406.3

DISCUSSION

Generally the yield for all varieties was higher for Matopos than Gwebi this is uncharacteristic due to the fact that Gwebi in Natural Region II whilst Matopos is Region IV and higher yields are therefore expected in Natural region II than IV. The probable reasons for this were that the crop at Gwebi experienced heavy rains in December and January hence weeding was difficult. The crop at Gwebi experienced drought at grain filling stages whereas Matopos received adequate and well distributes rainfall. For Matopos the highest yielding soybean varieties were Soprano, Bimha and Mhofu. At Gwebi, Safari and Mhofu varieties had significantly lower ($P<0.05$) yields. The trial will continue in the next season to verify the results and come up with recommendations to farmers.