



# **SOUTH AFRICAN BARLEY BREEDING INSTITUTE**

**REPORT  
to  
BARLEY  
TECHNICAL  
COMMITTEE**

**July 2011**

## OPSOMMING

**TITEL: DIE ONTWIKKELING VAN MOUTGARSKULTIVARS VIR DIE DROëLAND GARSPRODUSERENDE GEBIEDE VAN DIE SUIDKAAP EN DIE BESPROEIINGSGBIEDE VAN DIE NOORDKAAP**

Doelstellings en doelwitte vir die moutgarsprogram:

Die ontwikkeling van nuwe moutgarskultivars wat superieur is oor die huidige dominante kultivars ten opsigte van agronomiese, mout en brou-eienskappe en vir siekteweerstand.

Doelwit	Status	Verwysing in verslag
Om opbrengsvlakke betekenisvol te verhoog - bokant die van bestaande kultivars	Bereik	Tabelle 5,6,7,12,13,14,15
Verbeterde vetkorrelpersentasies onder optimale toestande	Bereik	Tabelle 5,6,7,12,13,14,15
Ontwikkeling van kultivars met verbeterde mouteienskappe	Bereik	Tabelle 8,16
Waardetoevoeging tot die saad deur verbeterde siekteweerstand	In proses	

***Bykomend tot bovermelde, is hulpbronne ook aangewend ten opsigte van:***

- Verkryging van toegang tot nuwe tegnologie en kiemlasma wat benodig word om internasionaal steeds kompetender te bly.
- Doeltreffende monsterring van die produksie omgewing, deur van geskikte lokaliteite gebruik te maak vir die aanplanting van teelmateriaal en buite lokaliteite vir opbrengsproewe.
- Daarstelling van fasiliteite vir die bewaring van ouermateriaal en om generasietyd te verkort

## Suidkaap

### Nuwe eksperimentele kultivars

Geen nuwe kultivars is vanjaar eksperimenteel vir hierdie gebied vrygestel nie

### Prestasie in Proewe

Ontleding van agronomiese eienskappe van eksperimentele en nuwe potensiële lyne in die LE proef in die Suidkaap

	<b>OPBRENGS</b>	<b>VETKORREL</b>	<b>STIKSTOF</b>
<b>Proefgemiddeld</b>	2641	90.6	1.95
<b>Kontrole (SSG 564)</b>	2693	83.5	1.94
<b>Ander Kultivars (2)</b>	2969	90.6	1.92
<b>Eksperimentele Kultivars (4)</b>	2589	90.2	1.93
<b>Nuwe lyne (18)</b>	2613	91.1	1.96
<b>Lyne geselekteer vir 2011 proef (8)</b>	2844	91.1	1.95
<b>Vordering: kultivars/kontr (%)</b>	<b>10.3</b>	<b>8.5</b>	<b>-1.1</b>
<b>Vordering: eksperimenteel/kontr (%)</b>	<b>-3.8</b>	<b>8.1</b>	<b>-0.5</b>
<b>Vordering: nuwe lyne/kontrole ( %)</b>	<b>-3.0</b>	<b>9.0</b>	<b>0.8</b>
<b>Vordering: gesel lyne/kontrole ( %)</b>	<b>5.6</b>	<b>9.1</b>	<b>0.4</b>

### Vordering ten opsigte van Siekteweerstand

Lyne met redelike goeie weerstand teen netvlek en blaarvlek is geïdentifiseer en in die teelouergroep ingesluit en heelwat kruisings met die oog op weerstand teen veral netvlek is gemaak. 'n Paar lyne met redelike algemene weerstand is ook in al die filiale generasies geselekteer.

### Besproeiingsgebied

Daar is besluit om SSG 585 uit te fassier, terwyl die hektare van Cocktail toeneem hoofsaaklik ook as gevolg van 'n groter aanvraag deur SAB. Marthe word op die oomblik as eksperimentele kultivar ge-evalueer, en aanvanklike brouproewe lyk baie belowend.

Ontleding van agronomiese eienskappe van eksperimentele en nuwe potensiële lyne in die  
LE proef onder besproeiing

	<b>OPBRENGS</b>	<b>VETKORREL</b>	<b>STIKSTOF</b>
<b>Proefgemiddeld</b>	7050	91.4	1.84
<b>Kontrole (Puma)</b>	6519	90.2	1.95
<b>Ander Kultivars (2)</b>	7123	88.9	1.84
<b>Eksperimentele Kultivar (2)</b>	6796	92.2	1.84
<b>Nuwe lyne/introduksies (18)</b>	7173	91.4	1.83
<b>Lyne geselekteer vir 2011 proef (10)</b>	7246	91.9	1.83
<b><i>Vordering: kultivars/kontr (%)</i></b>	<b>9.3</b>	<b>-1.4</b>	<b>-5.2</b>
<b><i>Vordering: eksperimenteel/kontr (%)</i></b>	<b>4.3</b>	<b>2.2</b>	<b>-5.7</b>
<b><i>Vordering: nuwe lyne/kontrole ( %)</i></b>	<b>10.0</b>	<b>1.3</b>	<b>-6.1</b>
<b><i>Vordering: gesel lyne/kontrole ( %)</i></b>	<b>11.2</b>	<b>1.8</b>	<b>-6.0</b>

## **SABBI BARLEY REPORT 2010**

*A short report on the SOUTH AFRICAN BARLEY BREEDING INSTITUTE (Sabbi) Research and Development program for barley for the year 2010.*

The overall goal of the program is to develop new malting barley varieties which are superior to the dominant varieties according to agronomic characteristics, malting and brewing quality and disease resistance.

To evaluate performance and progress we should look at the following:

- exploitation of germ plasm,
- genetic improvement in early generations,
- performance of lines during evaluation, and
- performance of new varieties in commercial testing phase.

### **1. HISTORY AND SUCCESSES**

This program started in 1978 when Sensako began evaluating the available local commercial varieties in the Southern Cape. During 1979 the evaluation was extended to include the comparison of two Australian varieties with local varieties. The goal of the program was to evaluate as many varieties as possible from abroad in order to find a variety or varieties, which could be successfully cultivated in South Africa. At that time Clipper, an Australian variety, was the dominant variety in the Southern Cape.

Results of the introduction program indicated that the majority of varieties from abroad are not suitable to the growing conditions of the Southern Cape. The Australian varieties are better adapted to these conditions and two of them have been released as a result of the trials. The two varieties are Stirling (released in 1987) and Schooner (released in a restricted production area in 1989). Both of them have already been withdrawn from commercial production.

Because of the lack of success with the introduction program, a breeding program was started on a limited scale in 1983 and the program gradually developed to its present format. Introductions are still being tested, and a total number of 626 varieties and advanced lines from all the major production countries have been evaluated in this program. Introductions

with the best quality, disease and agronomic characteristics are selected to be used as germ plasm donors in crosses with local improved genotypes to generate recombinations with superior genetic ability.

During 2000 the program became part of an international enterprise when Sensako was taken over by Monsanto. Unfortunately they terminated all their barley activities at the end of 2001 and the program was taken over by SAB. At the moment the program is continued under the name of the South African Barley Breeding Institute (Sabbi), an article 21 company.

When the program started Clipper was the only variety cultivated, and cultivated very successfully, in the Southern Cape. Eight varieties have since been released from our breeding program – S5 being the latest at the beginning of 2010 (see **Table 1**). Four varieties, SSG 525 (2003), SSG 532 (2004), SSG 506 (2008) and S02-11 (2009), has already been phased out for various reasons. Four varieties of SABBI will be cultivated commercially during 2011 - SSG 564, SabbiErica, SabbiNemesia and S5. Two experimental varieties (S6 and S9) will be evaluated this year.

Last year SSG 564 was still the dominant variety with 60,8% of the acreage with SabbiErica 18,1%, SabbiNemesia 17,7%, S5 1,8% and the experimental variety S6 1,6% of the total acreage.

All our varieties are currently classified as Standard Lager Malt (SLM) varieties, although SSG 564 showed fermentability comparable to that of the High Fermentable Malt (HFM) varieties. S5 will this year again be evaluated as a HFM in a commercial blend before final classification is decided on. S6 is this year in its fourth year and S9 in its first year of evaluation.

A second production area was developed in the irrigation areas of the Northern Cape after intensive evaluation on variety adaptability and production practices by SABM. Production started on a small scale in 1994 when Blenheim, a variety from the United Kingdom, was introduced.

Varieties from, especially, Europe are fairly well adapted to this environment and our involvement in this area originally focused on the evaluation of introductions. In 2003 we started making crosses specifically for this area and since then the program expanded gradually to a total program although not yet on the same scale as the one for the Southern Cape.

**Table 1:** List of varieties released from SABBI's program in the Southern Cape and their history.

Variety	Year of exp release	Year of final release	History (as in 2010)
SSG 522	1992	-	Withdrawn before final release
SSG 525	1992	1996	Phased out in 2003
SSG 532	1993	1998	Phased out in 2004
SSG 564	1996	2005	In production (60,8%)
SSG 575	1997	-	Withdrawn before final release
SSG 585	1998	-	Withdrawn before final release
SSG 506	2000	2006	Phased out in 2008
S02-11	2002	2006	Phased out in 2009
S03-09	2003	-	Withdrawn before final release
SabbiErica (S04-11)	2004	2009	In production (18,1%)
SabbiNemesia (S04-16)	2004	2009	In production (17,7%)
S5	2005	2010	In production (1,8%)
S6	2006		Experimental Year 3
S7	2007	-	Withdrawn before final release
S9	2009		Experimental Year 1

The first variety from our program accepted for the irrigation area was SSG 585 in 2006. Evaluation of varieties from Europe is still an integral part of the program in this area and Cocktail, an introduction from the United Kingdom, has been approved for commercial production. In 2010 Cocktail had 31,7% and SSG 585 17,6% of the acreage under irrigation. SSG 585 will be phased out in 2011. Marthe was in its second year of experimental evaluation in 2010, and a new introduction, Cristalia, has been approved as an experimental variety at the beginning of 2011.

**Table 2:** Varieties released under irrigation in the Northern Cape

Variety	Year experimental release	Year of final release	History (as in 2010)
Blenheim		1997	Phased out in 1999
Chariot	1997	2001	Phased out in 2004
Puma	2000	2003	In production (50,4%)
SSG 585	2002	2006	In production (17,6%)
Cocktail	2007	2009	In production (31,7%)
Marthe	2009		Experimental Year 2

## 2. RECOMBINATION PHASE

Each year a thorough evaluation of the material in the program is done and the shortcomings identified. Parental material to be used in the recombination program is then identified with these shortcomings and the demand from the industry in mind. New combinations for 2010 were planned with the following as our major priorities:

### **Agricultural:**

**Southern Cape:** yield and wide adaptability is always important. High plumpness was again an important characteristic and we are also starting to look at drought resistance.

**Irrigation:** Yield and resistance to lodging are the most important characteristics for this area.

### **Disease resistance:**

**Southern Cape:** net and spot form of net blotch remains the big problem and the main focus was again on this disease. A new focus are on scald resistance after the re-appearance of this disease in the Southern Cape.

### **Quality:**

For both areas we are concentrating at the moment on developing a variety with the so-called HFM quality, eg. high AAL, FAN and DP values and low viscosity. Most of our quality crosses were focused in this direction, although crosses with SLM parents were also made.

Total **crosses made** in 2010 were:

**Southern Cape:** 69 new combinations. Of these were

- 30 Adapted x HFM varieties
- 2 Adapted x SLM varieties
- 37 Adapted x disease resistance varieties



**Irrigation:** 53 new combinations. Of these were

- 27 Adapted x HFM varieties
- 26 Adapted x SLM varieties

### 3. SOUTHERN CAPE DRYLAND

#### 3.1 SELECTION PHASE

The symmetry of the lines under selection describes the progressing of recombinants advancing through the filial generations to homozygosity. This information is given in **Table 3**.

**TABLE 3:** Symmetry of lines progressing through the filial (F) generations to near homozygosity in the F5 generation

GENERATION	FAMILIES	LINES
F1	122	
F2	88	
F3	70	3840
F4	80	4260
F5	70	4148
Introductions		40
<b>TOTAL</b>	<b>430</b>	<b>12288</b>

Each family represents a different combination crossed earlier in the program, while a line is a six meter row within each family, the progeny of a single plant selected in the previous year in an earlier generation.

From the F2 generation 4145, the F3 generation 3364 and the F4 generation 3729 individual plants were selected for further evaluation in 2011. In the F5 block 906 lines were selected to be promoted to the Elite 1 trial of 2011. Material was evaluated according to the goal for each specific cross.

#### 3.2 EVALUATION PHASE

Trials were run at different sites in the barley producing area of the Southern Cape, the majority being planted at the research farm on Dunghye Park near Caledon and at Napier. The number of lines that were tested at the different localities are summarised in **Table 4**.

**TABLE 4:** Symmetry of lines in the Evaluation Phase in the Southern Cape

PHASE	NR OF LINES	LOCALITIES
Elite 1	1030	1
Elite 1 Introductions	106	1
Elite 2	161	2
Elite 3	46	2
LE Year 1	12	12
LE Year 2	4	12
LE Year 3	1	12
LE Year 4	1	12
Introduction	23	1
Feed barley	23	1
Experimental 4	S5	
Experimental 3	S6	

Lines in the Elite 1 trials were evaluated on maturity, resistance to lodging, yield potential, plumpness and overall disease resistance. One hundred and sixty-one (161) lines from these trials were selected to be advanced to the Elite 2 phase where more localities in the production area will be sampled. A limited micro malting evaluation, where we look at only a few selected characteristics, will be done on these selected lines.

Performance of the lines in the Elite 2 trials is summarised in **Table 5**

**TABLE 5:** Summary of the Performance of Elite 2 Lines

CULTIVAR	YIELD	PLUMPNESS (>2,5mm)	TN	GE (4ml72h)	GE (8ml72h)
SSG564 (Control)	4383	93.0	1.60	90	41
Nemesia (Control)	4893	94.7	1.66	90	56
All lines (161)	4664	93.6	1.65	85	46
Selected lines (47)	4970	93.7	1.64	86	43

(GE = Germination energy)

Lines selected from the Elite 2 proceeds to the Elite 3 trials (numbers and localities in **Table 4**). Selection was done based on the agronomic performance of lines in 2010 and quality results from 2009.

The Elite 3 trials are the final stage before lines are promoted to the LE phase. Eleven lines were selected to be promoted to the LE trial of 2011. Selection was done on agronomic performance over three years and quality

performance over two years of evaluation. Performances of these lines are summarised in **Table 6**.

**TABLE 6:** Summary of Performance of Elite 3 Lines

LINES	YIELD	PLUMP >2,5mm	TN	MALT EXTR	FAN	DP	AAL	VISCO SITY
SSG 564 (Contr)	4097	94.2	1.58	80.1	219	381	81.2	1.48
Nemesia (Contr)	4668	95.1	1.65					
All lines(46)	4551	93.2	1.64	81.0	224	280	81.5	1.48
Selected lines(11)	4824	95.5	1.63	81.6	222	304	86.8	1.47
Progress with selection	17.7%	1.4%	3.2%	1.9%	1.4%	-20.3%	6.9%	-0.7%

The Introduction Trial, planted at Caledon, was made up of 23 lines from Australia, plus two standard varieties. One of these lines was promoted to the LE Trial.

Lines from our program, the ARC's program and commercial varieties were compared in the LE trial.

The LE trial of 2010 comprised of 25 entries, with SSG 564 as standard, three other varieties and 21 lines (including the experimental varieties). All of them were from our program: three experimental varieties, one fourth year entry, one third year entry, four second year lines and twelve first year lines.

Performances of the standard variety and the selected entries from the 2010 trial are given in **Table 7**.

**TABLE 7:** Performance comparison of lines from SABBI and Commercial varieties in the LE Trial in the Southern Cape in 2010

CULTIVAR	YIELD	PLUMPNESS	KERNEL TN
SSG 564 (std)	2693	83.5	1.94
SabbiErica	3143	89.8	1.91
SabbiNemesia	2796	91.3	1.93
S5	2443	95.1	1.95
S6	2333	88.7	1.88
S9	2990	92.4	1.98
Line 16	2870	94.9	1.94
Line 17	2874	94.2	1.97
Line 18	2729	88.9	1.90
Line 19	3080	92.9	1.93
Line 20	2976	91.0	1.96
Line 21	2929	92.5	1.99
Line 22	2705	91.7	2.06

The long-term quality performance of these lines is given in **Table 8**.

**TABLE 8:** Long term quality performance of lines from SABBI as percentage deviation from SSG 564 (SSG 564=100)

CULTIVAR	EXTRACT	KI	DP	FAN	Viscosity	AAL	BETA GLUCAN
SabbiErica	101.6	102.4	86.7	103.2	100.1	99.6	89.7
SabbiNemesia	100.8	102.2	99.6	108.3	100.3	101.4	88.5
S5	101.1	105.2	95.2	109.9	99.1	102.1	66.8
S6	100.6	88.1	94.2	72.8	101.9	98.9	100.2
S9	102.3	101.6	107.3	103.1	98.5	99.7	64.0
Line 16	101.0	109.0	97.8	115.0	96.6	103.0	92.8
Line 17	102.1	106.7	105.6	119.0	97.4	104.2	31.6
Line 18	103.0	108.3	124.0	126.2	99.3	102.8	
Line 19	106.2	118.9	104.7	112.4	98.7	104.6	
Line 20	107.0	127.8	77.7	106.3	98.7	103.7	
Line 21	106.8	123.3	72.0	100.4	96.7	104.8	
Line 22	108.0	115.6	155.3	127.8	96.1	104.7	

- for characteristics like extract and AAL we are looking for values higher than SSG 564,
- DP and FAN can be similar or slightly better than SSG 564,

- for characteristics like KI, viscosity and beta glucan we are looking for values lower than SSG 564.

### 3.3. DOUBLED HAPLOID PROGRAM

The doubled haploid program is gaining momentum, and an increase of 41% occurred with the production of green plants (F11:656 vs. F12:1113). The majority of the pedigrees (70%) were selected for disease resistance and agronomic adaptability. The remaining pedigrees were selected for specific HFM QTL's to utilize in the MAS program. The focus for F12 will be to increase the efficiency of the program. The ratio of calli plated out vs. green plants produced, varied from 0-34.2% depending on pedigree. The use of colchicine will be investigated during F12 and hopefully lead to more consistent results.

The numbers will gradually increase, and the goal is to produce at least 2000 doubled haploids per year of which most will go through the marker assisted selection program.

The number of doubled haploid lines included in the evaluation phase of the barley program in 2010 is given in **Table 9**.

**TABLE 9:** Status of Doubled Haploid lines in the Trials

PHASE	NR OF COMBINATIONS	NR OF LINES
Elite 2	6	15
Elite 3	3	4
LE Southern Cape	2	3
LE Irrigation	0	0

With the use of the doubled haploid technique it is possible to shorten the selection phase with four to five years. The cumulative effect of this in the release of varieties can be enormous over a long period of time. The latest doubled haploid line in the LE trial, for example, are from a cross made in 2004 and it is already in its second year. Therefore, within six years we managed to get new genotypes into the final evaluation phase. With the traditional methods it normally will take 10 years to get to this stage.

The cumulative effect of this over years can be enormous. Of the last seven experimental varieties that has been released, five were doubled haploids. Varieties like Erica, Nemesia and S5 are all doubled haploids. They were experimentally released 9, 8 and 7 years respectively after the crosses were made. This means a gain of 3, 4 and 5 years respectively over the traditional program.

Not only are they already making a big impact in local industry, they also entered the recombination program much earlier and doubled haploids were already produced from their offspring. Some of these are already in the Elite 1 phase of evaluation. These doubled haploids are from crosses between the varieties and lines with good quality and disease resistance. The cumulative progress in a breeding program over a 20 year period can, indeed, be invaluable.

### **3.4. COMMERCIAL EVALUATION AND PHASING IN OF VARIETIES**

Three experimental varieties were in commercial evaluation in 2010.

Hectares planted in 2010 were as follow:

S5	Overberg Agri	<b>1291 ha;</b>
S6	Overberg Agri	<b>1175 ha;</b>

Seed production of S9 was done at Dunghye Park last season.

## **4. NORTHERN CAPE IRRIGATION**

### **4.1 SELECTION PHASE**

Lines from the F3, F4 and F5 generation were planted at Hartswater last year. Information on these lines is given in **Table 10**.

**TABLE 10:** Symmetry of lines in the Selection phase under irrigation

<b>GENERATION</b>	<b>FAMILIES</b>	<b>LINES</b>
F2	49	336
F3	9	450
F4	10	741
F5	20	672
<b>TOTAL</b>	<b>88</b>	<b>2199</b>

Much emphasis was put on identifying good resistance to lodging with high yielding potential in the filial generations.

#### **4.2 EVALUATION PHASE**

The Northern Cape program is steadily changing into a local program with more of our own developed lines being tested, and less introductions. Last year we had an Elite 1, Elite 2 and Elite 3 trial with locally developed lines. The best entries from the Elite 3 trial have been promoted to the LE trial at six localities in the Northern Cape.

The trials were run at different localities in the barley producing area of the Northern Cape. The number of lines that were tested at the different localities are summarised in **Table 11**.

**TABLE 11:** Symmetry of the Irrigation Evaluation Phase

<b>PHASE</b>	<b>NR OF LINES</b>	<b>LOCALITIES</b>
Elite 1	164	1
Elite 2	35	2
Elite 3	14	2
Introduction	13	2
LE Year 1	8	6
LE Year 2	8	6
LE Year 3	3	6
LE Year 4	1	6
LE Year 5	1	6
Experimental Year 2	Marthe	

Lines in the Elite 1 trial were evaluated on maturity, resistance to lodging, yield potential and plumpness. Thirty-four lines from this trial were selected to be advanced to the Elite 2 phase where more localities in the production area will be sampled. A limited micro malting evaluation, where we look at only a few selected characteristics, will be done on these selected lines.

Performance of the lines in the Elite 2 trials is summarised in **Table 12**.

**TABLE 12:** Summary of the performance of Elite 2 lines under irrigation

CULTIVAR	YIELD	PLUMP (>2,5mm)	TN	GE (4ml72h)	GE (8ml72h)
Puma (Control)	7414	95.9	1.84	96	85
All lines (35)	7731	95.7	1.89	95	67
Selected lines (15)	8094	95.4	1.84	95	69

Lines selected from the Elite 2 proceeded to the Elite 3 trials of 2011. Selection was done based on the agronomic performance of lines in 2010.

Performance of the lines in the Elite 3 trials is summarised in **Table 13**.

**TABLE 13:** Summary of the performance of Elite 3 lines under irrigation

CULTIVAR	YIELD	PLUMP (>2,5mm)	TN	GE (4ml72h)	GE (8ml72h)
Puma (Control)	8263	96.4	1.80	98	84
Cocktail	8684	93.6	1.73	96	83
All lines (14)	8078	95.3	1.79	97	73
Selected lines (8)	8228	94.8	1.77	97	79

Eight of our lines and two introductions were selected from the Elite 3 and Introduction trials to proceed to the LE trial of 2011. Selection was done based on the agronomic performance of lines in 2010 and malting quality results.

SSG 585, Cocktail, Marthe, ten introductions and nine lines from our program were included in the LE trial of 2010. Six introductions and five local lines will be evaluated again in this year's trial. The LE trial was planted at six localities and the results are as follows:



**TABLE 14:** Performance comparison of SSG 585 and selected lines with Puma in the LE Irrigation Trial of 2010

CULTIVAR	YIELD	PLUMPNESS	KERNEL TN	GE (4ml72h)	GE (8ml72h)
Puma (std)	6519	90.2	1.95	98	82
SSG 585	6639	93.9	1.91	94	59
Cocktail	7607	83.8	1.78	99	81
Marthe	6608	92.9	1.88	98	72
Cristalia	6984	91.5	1.79	98	77
Line 10	7355	90.2	1.76	97	75
Line 12	7727	89.1	1.79	96	74
Line 15	6825	93.2	1.92	99	80
Line 16	6882	91.5	1.87	96	74
Line 20	7107	93.2	1.79	98	82
Line 21	7480	91.2	1.87	98	78
Line 22	7649	94.2	1.81	96	80
Line 23	7045	93.6	1.90	93	59
Line 24	6682	93.4	1.81	98	75
Line 25	7712	89.0	1.77	96	76
Trial Mean	7050	91.4	1.84	97	76
CV	8.2	3.7	3.8	5.0	6.4

Marthe was in its second year of experimental evaluation for the irrigation area.

**TABLE 15:** Long term quality performance of the varieties and fourth, third and second year lines as percentage deviation from Puma (Puma=100)

CULTIVAR	EXTRACT	KI	DP	FAN	VISCOSITY	AAL	BETA GLUCAN
SSG 585	99.6	100.8	83.4	102.7	100.6	99.2	84.4
Cocktail	100.2	95.2	91.2	90.2	99.6	100.7	86.5
Marthe	100.5	98.3	111.9	96.7	100.4	102.6	97.0
Cristalia	99.9	95.1	111.3	88.0	99.2	102.2	84.6
Line 10	100.7	95.9	98.9	92.0	99.0	102.8	86.3
Line 12	100.9	100.4	91.0	95.3	99.8	102.8	93.7
Line 15	100.9	105.7	97.1	115.7	99.0	99.6	89.9
Line 16	99.8	105.4	92.1	100.0	100.5	100.4	88.0

## 5. INTRODUCTIONS

We are constantly trying to introduce new varieties and lines (introductions) for evaluation and use in the breeding program. Contact was made with quite a few barley programs over the last few years and agreements have been made on the exchange of germ plasm. The following new introductions were evaluated in the program last year:

**Introductions under Irrigation:** eleven lines from the United Kingdom and two from Europe were evaluated in the Introduction 3 Trial. Two of these introductions were promoted to the LE trial of 2011.

**Introductions Southern Cape:** 23 lines from Australia were evaluated in an Introduction Trial and another 100 in the Elite 1 phase, with 24 from CIMMYT. All these material were thoroughly evaluated for agronomic and disease resistance characteristics and some of them promoted to this year's trials.

## 6. MARKER ASSISTED SELECTION

The MAS program is focusing exclusively on identifying lines with specific quality alleles originating from varieties like Harrington and Alexis. These alleles have been identified to be associated with malt extract, diastatic power,  $\alpha$ -amylase, free  $\alpha$ -amino nitrogen and  $\beta$ -glucan (Alexis) and with  $\beta$ -amylase thermo stability,  $\alpha$ -amylase and superior malt quality (Harrington).

325 of SABBI's lines and 65 HFM introductions were finger printed during F11. Small scale micro malting trials will commence in F12 to validate the markers. Due to the limited amount of seed available composites of lines with the HFM QTLS will be compared to composites of sister lines without the HFM QTLS. Lines with desirable HFM genotypes were selected for back crosses and gene stacking for F12.

The decision was made to start with a S5/SSG 506 DH mapping population for Leaf blotch resistance. If funds are obtained from the WCT, SABBI in

collaboration with CENGEN will develop new unique markers to identify leaf blotch resistance in our environment.

## 7. FOCUS AREAS IN PROGRAM

Our focus in the program over the next few years will mainly be on three important aspects.

### 7.1 HIGH FERMENTABLE VARIETY FOR IRRIGATION

Due to the limited amount of varieties available under irrigation, the expansions of the breeding program under irrigation will continue. Yield, quality and resistance to lodging will be the main selection criteria. The introductions from Europe will continue to play a significant part in our program. Our end goal will be a locally developed HFM variety. During F11 our first HFM (Local variety/Harrington) Doubled haploids for the Irrigation area will be evaluated. The table below indicates the increase in scale of our Irrigation program over years.

	2011	2010	2009	2008	2007	2006	2005
F2	426	336	0	0	0	0	0
F3	1855	516	850	553	0	595	0
F4	589	741	550	0	500	375	550
F5	1382	672	485	817	626	425	495
Elite 1	238	164	249	175	56	118	0
ELite2	36	36	36	25	36	0	0
Elite 3	16	16	16	16	0	0	0
Intro	16	16	0	25	16	16	16
LE	25	25	25	16	16	16	16
# Lines	4583	2522	2211	1627	1250	1545	1077

### 7.2 DISEASE RESISTANCE IN THE SOUTHERN CAPE

Barley diseases under dry land conditions pose a major risk for producers, and disease resistance remains a priority. To identify new sources of resistance in our local environment, 450 lines will be evaluated during 2011. The majority of our resistant material originates from Australia. A new collaborative project with other pathologists in Australia, Canada and the USA will commence in 2011 to identify Net blotch resistance genes. Novel leaf blotch genes will be mapped in another collaborative project with

CENGEN depending on funding from the WCT. During F11 our first Erica and Nemesia with disease resistance doubled haploids will be evaluated. Depending on the quality of the lines, it will progress to the Elite phase or Back Cross program. As part of an integrated control plan, our Fungicide X Variety interactions trials has increased and our research partners now includes both Syngenta and BASF.

### **7.3 DROUGHT RESISTANT VARIETIES**

Climate change is being addressed in a similar way as the risk associated with barley diseases. Introductions from global sources are screened and the superior lines combined with our locally adapted material. The drier parts of the region, i.e. Heidelberg vlakte indicates that the new varieties are more water efficient than SSG 564.