



# South African Sunflower Crop

*Quality Report*  
*2013/2014 Season*



# *Index*



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# SOUTH AFRICAN COMMERCIAL SUNFLOWER QUALITY FOR THE 2013/2014 SEASON



## Acknowledgements

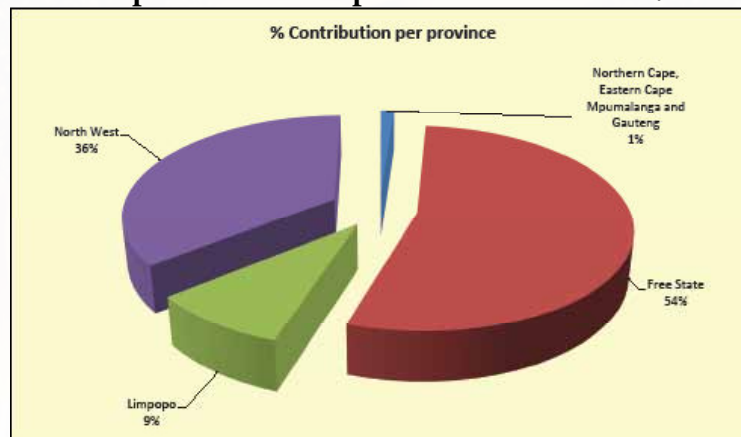
*With gratitude to:*

- *The Oil & Protein Seed Development Trust for its financial support in conducting this survey.*
- *Agbiz Grain and its members for their cooperation in providing the samples to make this survey possible.*

## Introduction

The final commercial sunflower crop figure of the 2013/2014 season as overseen by the National Crop Estimates Liaison Committee (CELC) is 832 000 tons. The final calculated crop figure was adjusted downward by 21 325 tons (2.50%). The commercial sunflower crop increased by 49.37% (275 000 tons) from the 2012/2013 season. The major sunflower-producing provinces, namely the Free State and North West, contributed almost 90% of the total crop.

**Graph 1: Contribution of the provinces to the production of the 2013/2014 sunflower crop**



*Information provided by the CEC.*

During the harvesting season, a representative sample of each delivery of sunflower at the various silos was taken according to the prescribed grading regulations. The sampling procedure for the samples used in this survey is described on page 22. One hundred and seventy six composite sunflower samples, proportionally representing the different production regions, were analysed for quality. The samples were graded, milled and chemically analysed for moisture, crude protein, crude fat, crude fibre as well as ash content.

This is the second annual sunflower crop quality survey performed by The Southern African Grain Laboratory NPC (SAGL). SAGL was established in 1997 on request of the Grain Industry. SAGL is an ISO 17025 accredited testing laboratory and participates in one national and sixteen international proficiency testing schemes as part of our ongoing quality assurance procedures to demonstrate technical competency and international comparability.

The goal of this crop quality survey is to accumulate quality data on the commercial sunflower crop on a national level. This valuable data reveal general tendencies, highlight quality differences in the commercial sunflowers produced in different local production regions and provide important information on the quality of commercial sunflowers intended for export (if any). A detailed database containing information collected over several seasons is essential and will assist with decision making processes.

The results are available on the SAGL website ([www.sagl.co.za](http://www.sagl.co.za)). The hard copy reports are posted to all the Directly Affected Groups and interested parties. The report is also available for download in a PDF format from the website.

In addition to the quality information, production figures (obtained from the Crop Estimates Committee (CEC)) relating to hectares planted, tons produced and yields obtained on a national as well as provincial basis, over an eleven season period, are provided in this report. SAGIS (South African Grain Information Service) supply and demand information over several years is provided in table and graph format.

The report of the Evaluation of sunflower cultivars: 2013/2014 season conducted by the ARC-Grain Crops Institute in collaboration with Agricol, Capstone, Pannar, Pioneer and Syngenta is also included in this report, as is the national grading regulations as published in the Government Gazette of 8 May 2009.

## Production

Sunflower seed production is very suitable for South African climatic conditions. Sunflower is the fourth largest grain crop produced in South Africa after maize, wheat and soybeans.

The area utilized for sunflower production increased by almost 19% from 504 700 hectares in the previous season to 598 950 hectares this season. The yield increased from 1.10 t/ha to 1.39 t/ha.

The world oilseed production increased significantly during 2013/2014. Soya bean production played the largest role in this increase, but sunflower and canola crops were also noticeably bigger. The increased oilseed production can be attributed to an increase in area utilized for oilseed production but also to good yields obtained.

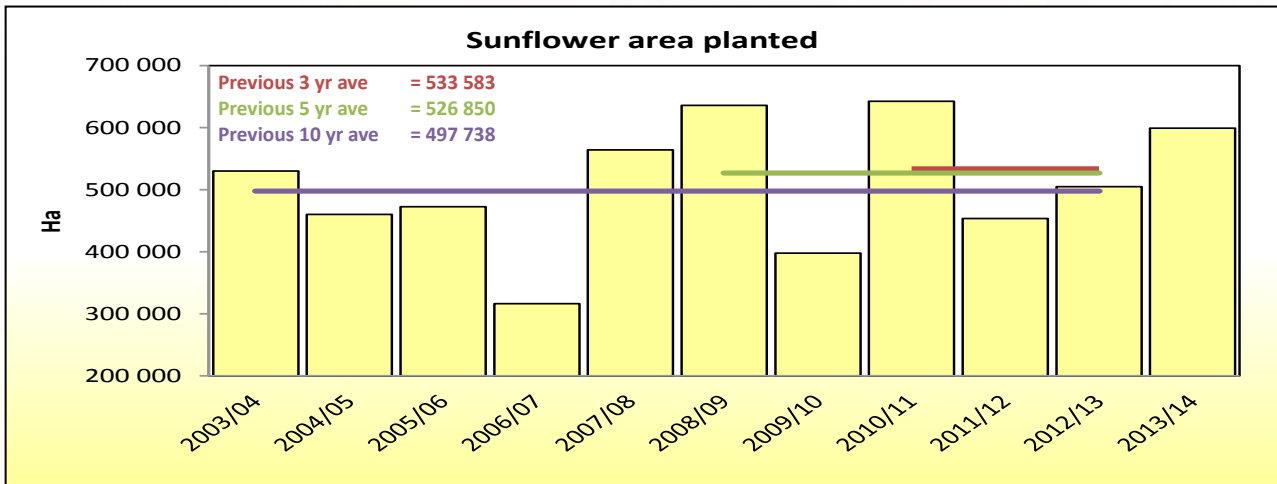
According to The Bureau for Food and Agricultural Policy (BFAP) Baseline, Agricultural Outlook 2014 – 2023, sunflower yields are expected to increase gradually over time to reach a national average of almost 1.6 tons per hectare over the next ten years. Production should remain constant due to this increase in yield even though the total area under production is expected to decrease to below 500 000 hectares.

**Table 1: World Sunflower Seed Production**

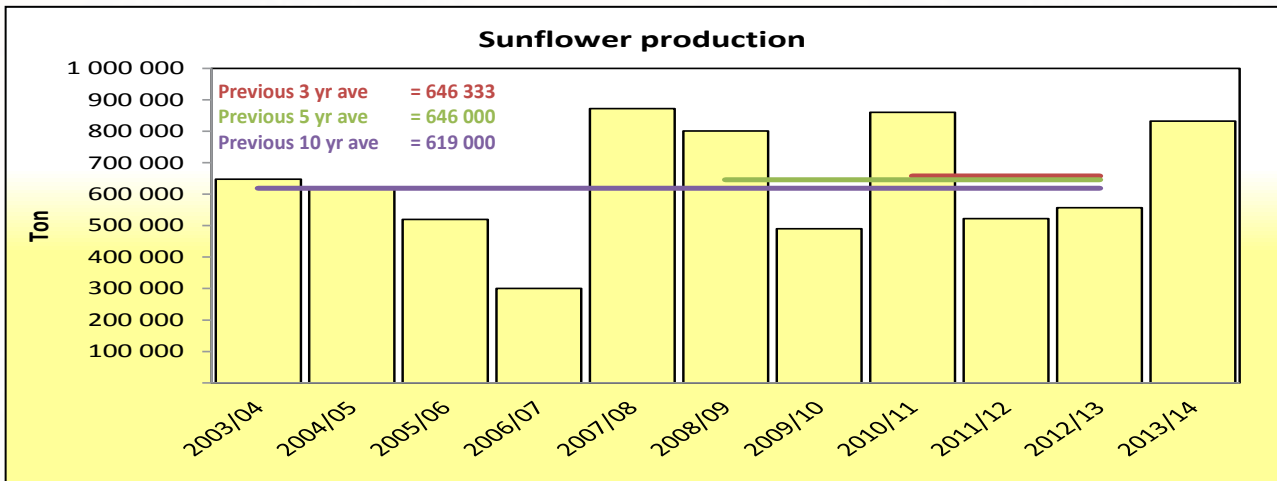
Season	2009/10	2010/11	2011/12	2012/13	2013/14 (Revised)	2014/15 (Forecast)
<i>Area Harvested (1,000 Ha)</i>	24,250	23,923	25,856	25,470	26,235	25,495
<i>Yield (MT/Ha)</i>	1.36	1.40	1.53	1.40	1.63	1.56
<i>Production (1,000 MT)</i>						
Argentina	2,650	3,665	3,775	2,850	2,250	2,650
European Union	7,001	6,975	8,323	7,018	9,029	8,907
China	1,650	1,710	1,700	1,730	1,750	1,750
Russia	6,600	5,820	9,500	8,000	10,000	9,000
Ukraine	7,300	8,000	9,500	8,387	11,051	10,000
United States	1,377	1,241	925	1,264	922	1,005
India	1,000	650	620	615	580	530
Turkey	790	1,020	940	1,100	1,450	1,200
Other	3,425	4,113	4,226	4,783	5,655	5,393
<b>TOTAL</b>	<b>32,171</b>	<b>33,572</b>	<b>39,509</b>	<b>35,747</b>	<b>42,687</b>	<b>40,435</b>

2014 U.S. Sunflower Crop Quality Report compiled by the National Sunflower Association.

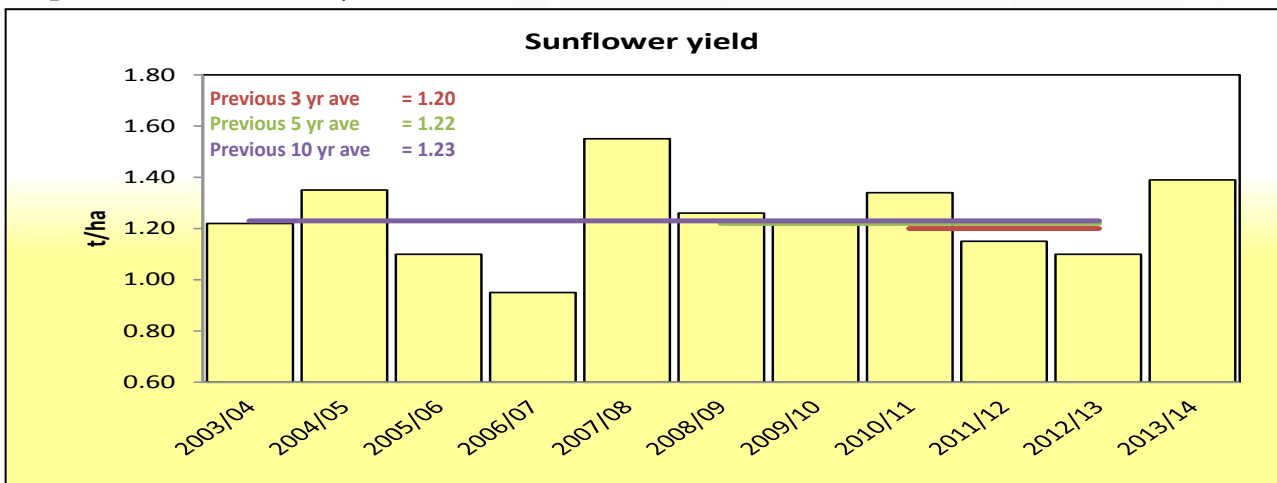
**Graph 2: Total RSA area utilized for sunflower production from 2003/04 to 2013/14**



**Graph 3: Sunflower production in RSA from 2003/04 to 2013/2014**

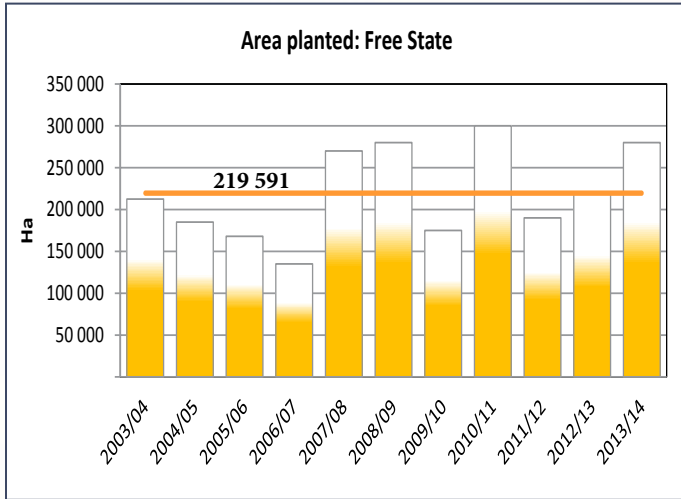


**Graph 4: RSA Sunflower yield from 2003/04 to 2013/14**

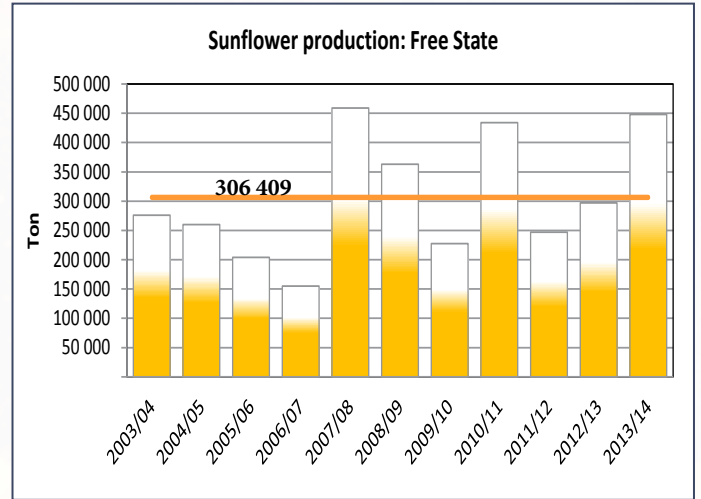


Information provided by the CEC.

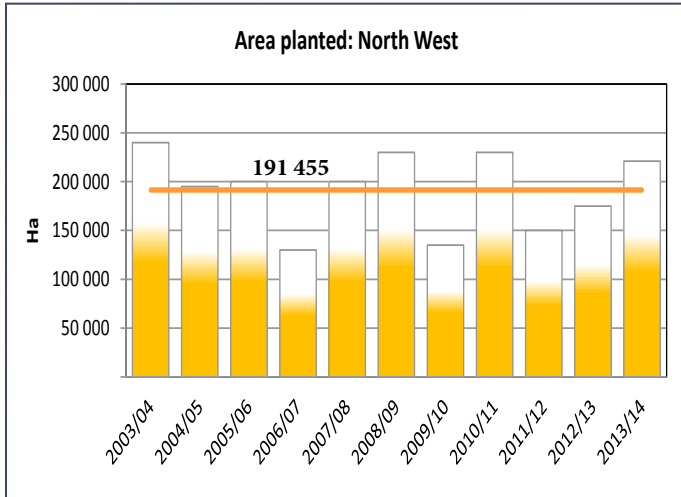
**Graph 5: Area utilized for sunflower production in the Free State since 2003/04**



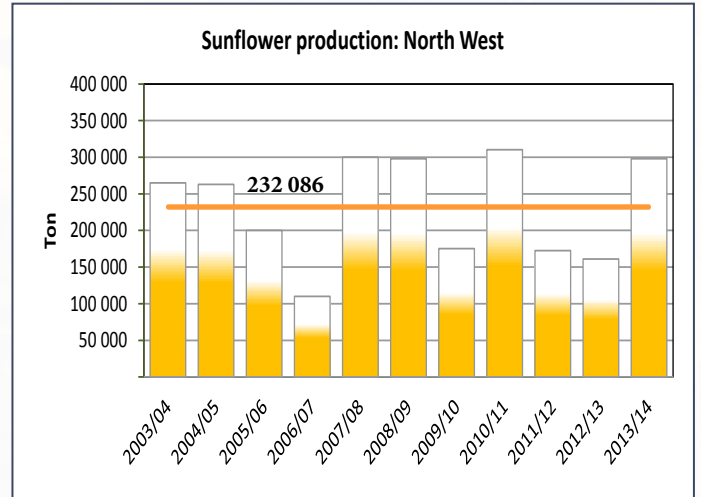
**Graph 6: Sunflower production in the Free State since 2003/04**



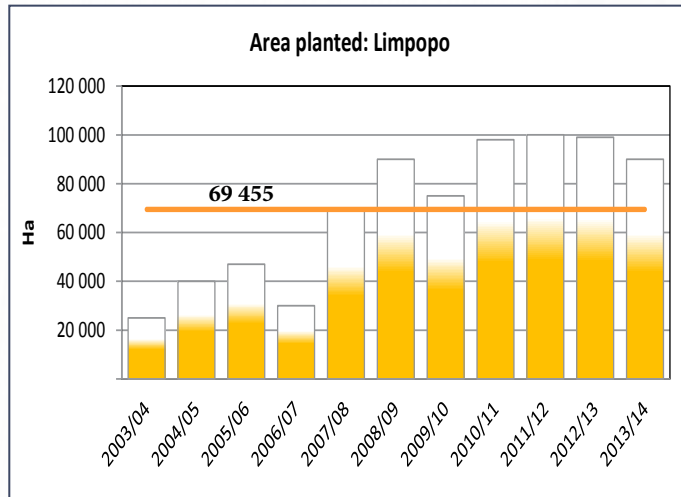
**Graph 7: Area utilized for sunflower production in North West since 2003/04**



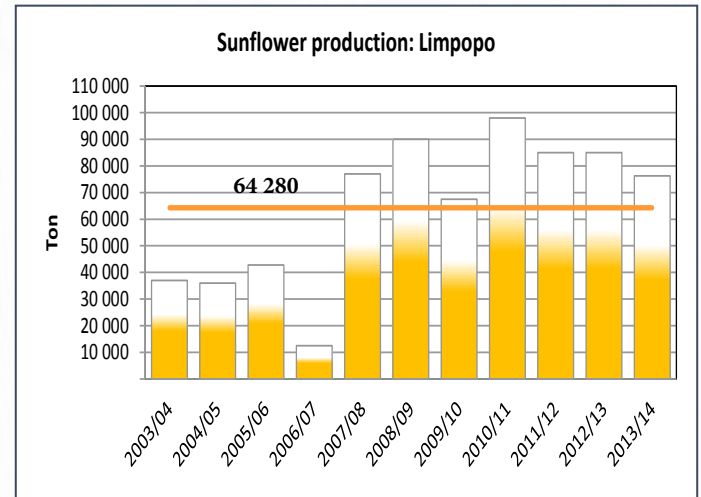
**Graph 8: Sunflower production in North West since 2003/04**



**Graph 9: Area utilized for sunflower production in Limpopo since 2003/04**



**Graph 10: Sunflower production in Limpopo since 2003/04**



Information provided by the CEC.

— Eleven year average



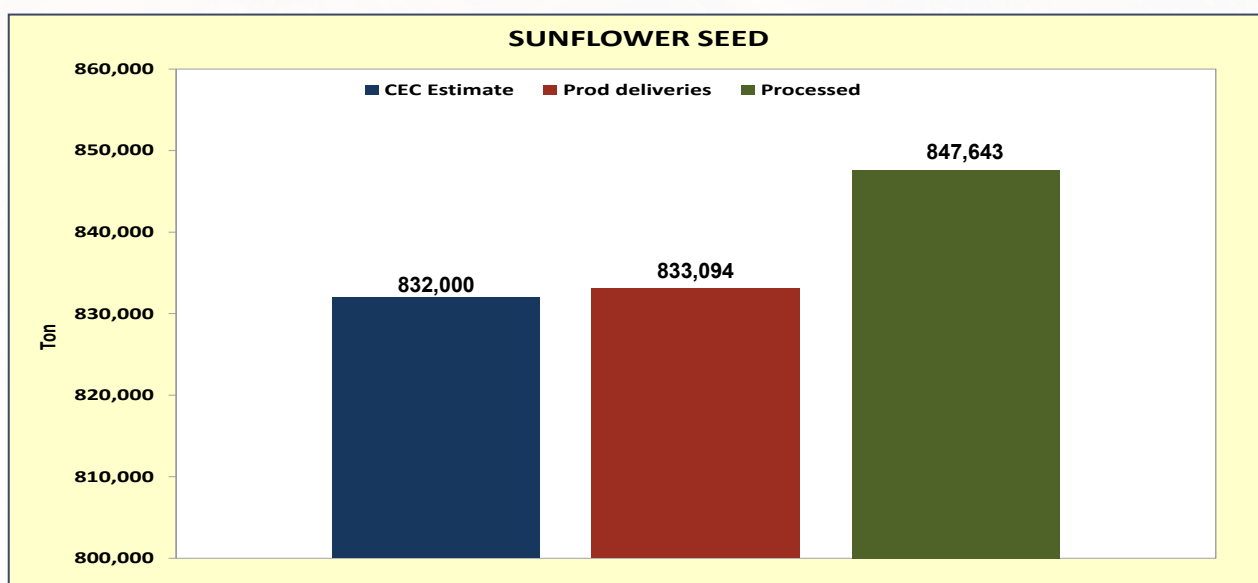
## Supply and Demand

Opening stock decreased by almost 35 000 tons compared to the previous marketing year and was lower than the ten year average. During the 2014/2015 marketing season 63 180 tons of sunflower and sunflower seed products were imported compared to the 94 475 tons of the previous year. South Africa is a net importer of vegetable oils. Domestic consumption of sunflower oil is projected to increase by less than 2% per year over the baseline period. Local sunflower oil production is expected to remain relatively constant at  $\pm$  300 000 tons (BFAP Baseline, Agricultural Outlook 2014 – 2023).

Of the 847 643 tons of sunflower seeds processed during this season, only 467 tons was used for human consumption and 2 854 tons for animal feed (mainly pet bird feeds). The vast majority of sunflower seed is crushed to produce oil and oilcake. The amount of sunflower seeds crushed this year increased by 27.4% (181 710 tons) compared to the previous season. According to BFAP, the domestic consumption of sunflower oilcake is projected to increase from  $\pm$  400 000 tons in 2014 to 550 000 tons by 2023. Most of the increase in consumption will have to be provided by imports, since the local production is expected to remain relatively constant over the baseline period.

No significant exports occurred (48 tons). Globally, the USA and Russia are the largest exporters of sunflower seeds and the Ukraine and Russia the largest exporters of sunflower oil (combined 73% of total oil exports).

**Graph 11: Sunflower supply and demand overview for the current marketing season (Mar 2014 - Feb 2015)**

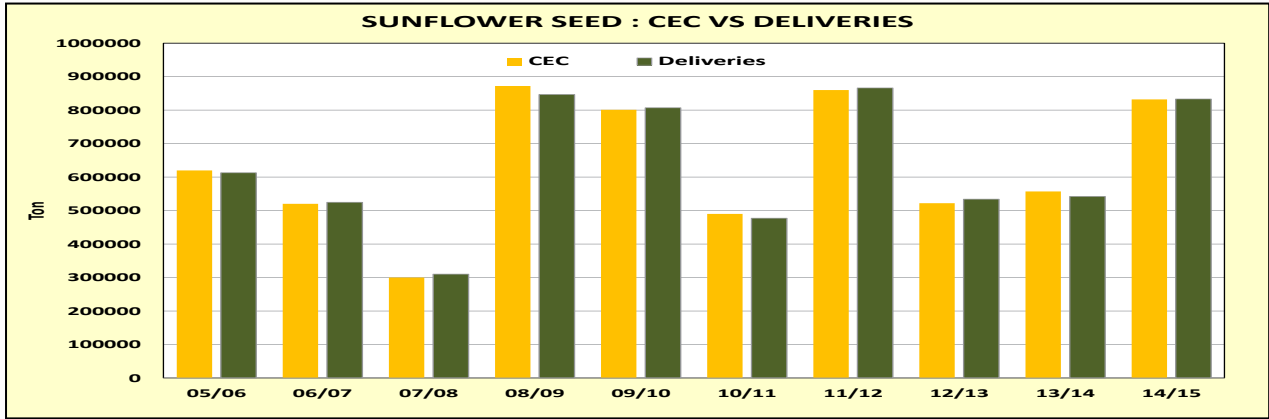


Information provided by SAGIS.

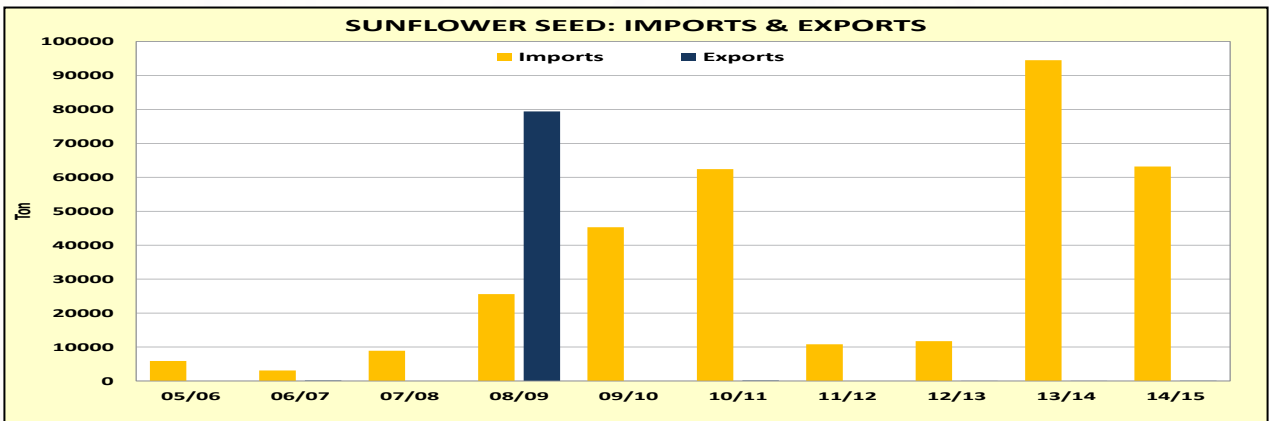
SUNFLOWERSEED: SUPPLY AND DEMAND TABLE BASED ON SAGIS' INFO (TON)

	Publication date: 2015-03-24																	10 Year average 2004-2013
	Season (Mar - Feb)																	
	98/99	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	
CEC (Crop Estimate)	562,100	1,109,000	530,600	638,300	928,800	642,600	648,000	620,000	520,000	300,000	872,000	801,000	490,000	860,000	522,000	557,000	832,000	619,000
<b>SUPPLY</b>																		
Opening stock (1 Mar)	111,000	88,000	303,300	50,300	109,600	189,400	41,300	69,900	40,700	90,400	64,700	164,300	157,200	18,800	109,000	81,302	47,116	83,760
Prod deliveries	587,000	1,087,000	553,400	709,600	901,200	617,200	652,900	612,700	524,900	310,100	846,600	806,900	477,300	866,300	534,251	542,165	833,094	617,412
Imports	3,000	0	400	7,600	1,700	18,800	300	5,900	3,100	8,900	25,600	45,300	62,400	10,800	11,737	94,475	63,180	26,851
Surplus	10,000	6,100	0	0	0	0	0	3,800	2,300	1,500	4,100	700	2,000	3,800	5,485	4,689	8,051	2,837
<b>Total Supply</b>	<b>711,000</b>	<b>1,181,100</b>	<b>857,100</b>	<b>767,500</b>	<b>1,012,500</b>	<b>825,400</b>	<b>694,500</b>	<b>692,300</b>	<b>571,000</b>	<b>410,900</b>	<b>941,000</b>	<b>1,017,200</b>	<b>698,900</b>	<b>899,700</b>	<b>660,473</b>	<b>722,631</b>	<b>951,441</b>	<b>730,860</b>
<b>DEMAND</b>																		
Processed	600,000	837,800	776,500	622,000	748,900	762,300	616,900	644,300	472,300	339,500	685,300	847,200	671,500	782,200	572,519	666,551	847,643	629,827
-human	0	0	0	800	100	1,300	700	1,300	1,200	2,100	2,400	1,900	1,600	1,300	904	1,162	467	1,457
-animal feed	0	100	2,100	2,200	2,100	1,800	3,200	2,600	3,100	3,500	3,400	3,300	3,100	2,900	3,022	2,777	2,854	3,090
-crush (oil and oilcake)	600,000	837,700	774,400	619,000	746,700	759,200	613,000	640,400	468,000	333,900	679,500	842,000	666,800	778,000	568,593	662,612	844,322	625,281
Withdrawn by producers	0	900	14,800	19,600	16,000	8,000	2,700	1,500	2,000	1,900	4,900	5,700	1,700	3,500	2,521	2,524	1,068	2,895
Released to end-consumers	0	500	2,100	2,900	2,900	1,900	2,400	2,700	3,500	3,000	2,800	4,800	4,100	3,700	3,154	2,923	2,739	3,308
Seed for planting purposes	3,000	4,200	1,700	2,000	3,000	1,600	1,300	2,200	1,200	1,800	3,300	2,700	1,700	2,500	2,700	2,903	3,804	2,230
Net receipts(-)/disp(+)	20,000	-9,100	6,800	3,200	2,900	500	-2,000	900	1,500	0	1,000	-400	1,000	-1,200	-1,716	606	3,905	-31
Deficit	0	0	4,600	6,900	3,900	9,600	3,100	0	0	0	0	0	0	0	0	0	0	310
Exports	0	56,000	300	1,300	45,500	200	200	0	100	0	79,400	0	100	0	27	8	48	7,984
<b>Total Demand</b>	<b>623,000</b>	<b>890,300</b>	<b>806,800</b>	<b>657,900</b>	<b>823,100</b>	<b>784,100</b>	<b>624,600</b>	<b>651,600</b>	<b>480,600</b>	<b>346,200</b>	<b>776,700</b>	<b>860,000</b>	<b>680,100</b>	<b>790,700</b>	<b>579,205</b>	<b>675,515</b>	<b>859,207</b>	<b>646,522</b>
Ending Stock (28 Feb)	88,000	290,800	50,300	109,600	189,400	41,300	69,900	40,700	90,400	64,700	164,300	157,200	18,800	109,000	81,268	47,116	92,234	84,338
- processed p/month	50,000	69,800	64,700	51,800	62,400	63,500	51,400	53,700	39,400	28,300	57,100	70,600	65,000	65,200	47,700	55,546	70,637	53,395
- months' stock	1.8	4.2	0.8	2.1	3.0	0.7	1.4	0.8	2.3	2.3	2.9	2.2	0.3	1.7	1.7	0.8	1.3	1.6

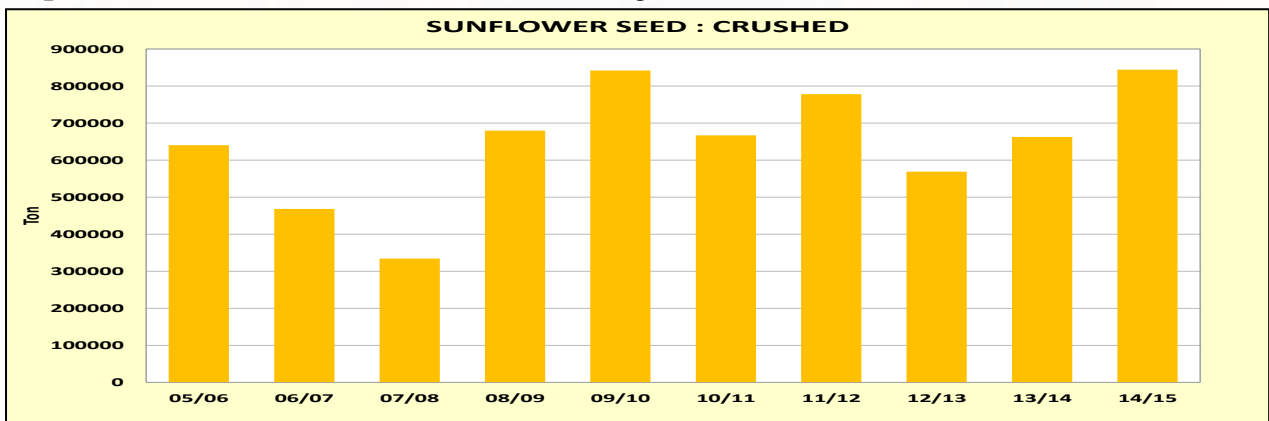
**Graph 12: Sunflower: CEC Estimate vs SAGIS deliveries over 10 marketing seasons**



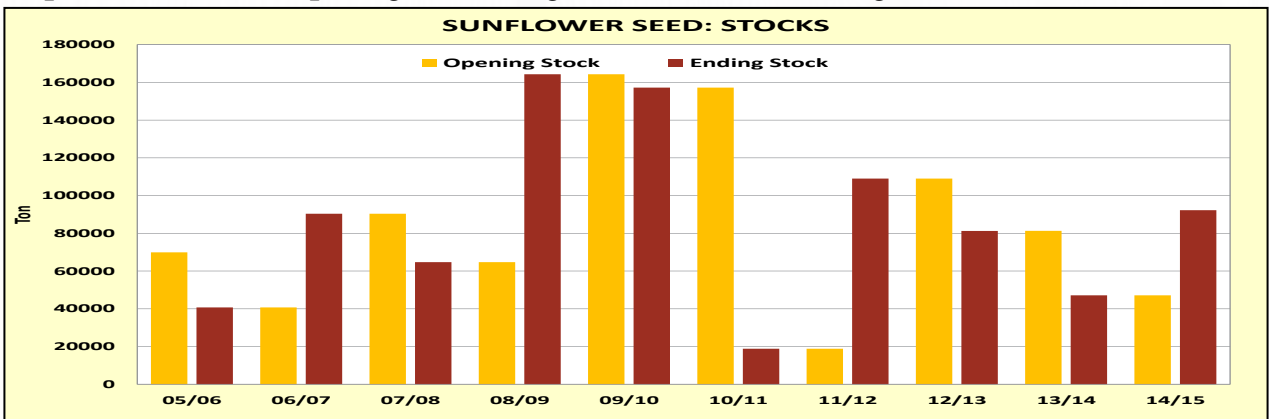
**Graph 13: Sunflower: Imports and Exports over 10 marketing seasons**



**Graph 14: Sunflower: Crushed over 10 marketing seasons**



**Graph 15: Sunflower: Opening and closing stock over 10 marketing seasons**



Information provided by SAGIS.

## RSA Production Regions

The RSA is divided into 9 provinces as illustrated in Figure 1.

**Figure 1: RSA Provinces**



Regional map with gratitude to SIQ.

The 9 provinces are divided into 36 grain production regions.

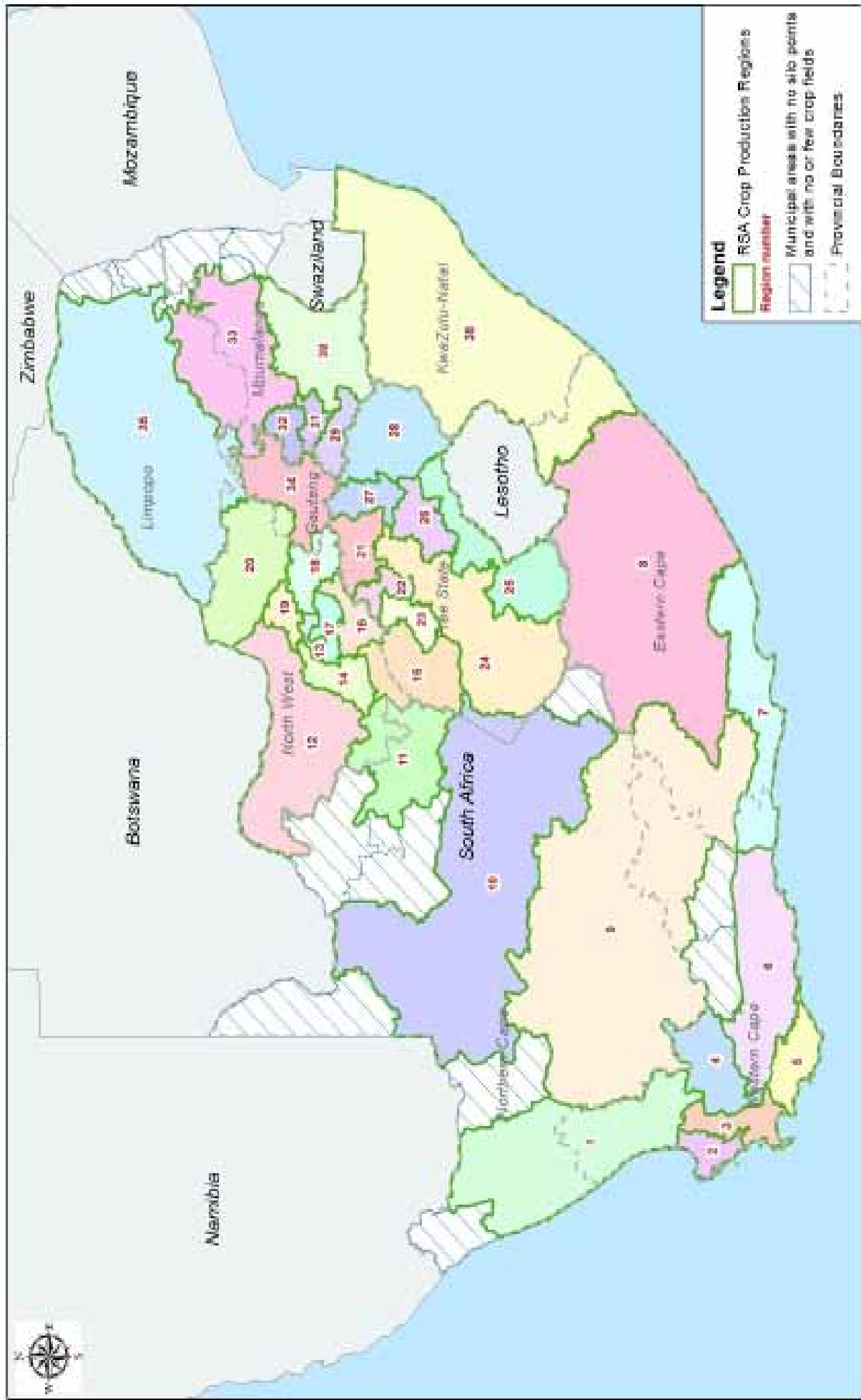
The regions are distributed as follows:

- Region 1: Namakwaland
- Regions 2 and 3: Swartland
- Regions 4 to 6: Rûens
- Regions 7 and 8: Eastern Cape
- Region 9: Karoo
- Region 10: Griqualand West
- Region 11: Vaalharts
- Regions 12 to 20: North West
- Regions 21 to 28: Free State
- Regions 29 to 33: Mpumalanga
- Region 34: Gauteng
- Region 35: Limpopo
- Region 36: KwaZulu-Natal

Please see the Crop Production Regions map on the next page.

The production regions from which sunflower samples have been received for the crop quality survey of the 2013/2014 production season, are named and described on pages 15 to 21 (in the header of the quality data per region tables.) The silo/intake stands as well as the type of storage structure are provided.

Figure 2: RSA Crop Production Regions



Regional map with gratitude to Agbiz Grain and SIQ.

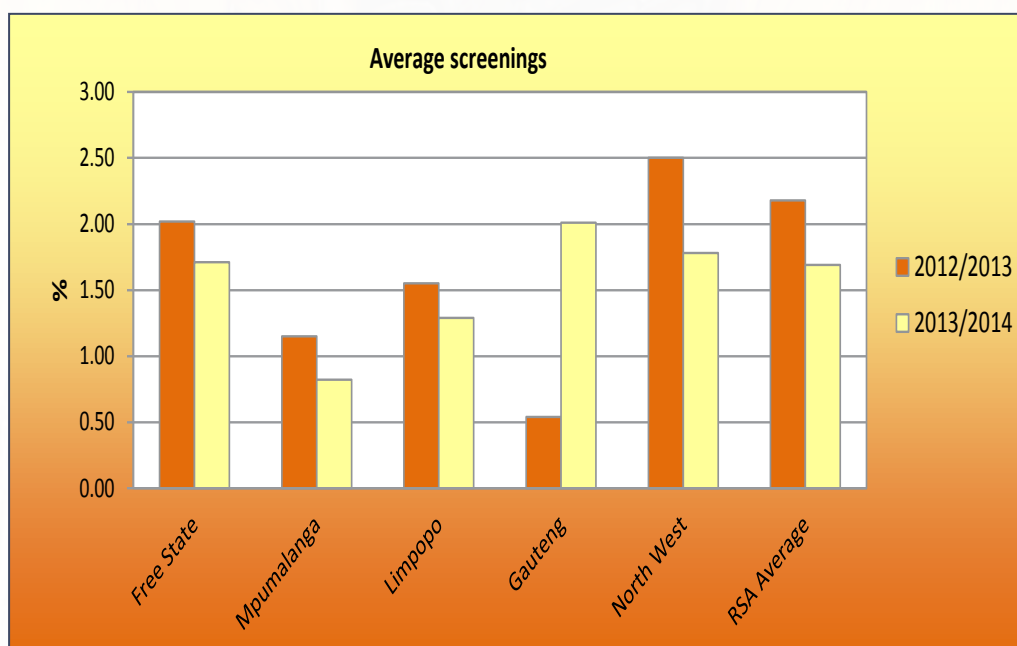
## Sunflower Crop Quality 2013/2014 – Summary of results

Eighty two percent (145) of the 176 samples analysed for the purpose of this survey were graded as Grade FH1 and thirty one of the samples were downgraded to COSF (Class Other Sunflower Seed). The percentage of FH1 samples compares well with the 80% of the 2012/2013 season.

- Sixteen of the samples were downgraded as a result of the percentage of either the screenings or the collective deviations or a combination of both exceeding the maximum permissible deviations of 4% and 6% respectively.
- Five of the samples were downgraded as a result of the percentage of either the foreign matter or a combination of the foreign matter and collective deviations exceeding the maximum permissible deviations of 4% and 6% respectively.
- Eight of the samples were downgraded as a result of the percentage of either the percentage Sclerotinia or a combination of Sclerotinia and collective deviations exceeding the maximum permissible deviations of 4% and 6% respectively. Seven of these sample originated from the regions in the North West province and one from a region in Mpumalanga.
- Of the remaining two samples, one was downgraded due to the percentage screenings, foreign matter and collective deviations exceeding the maximum permissible deviations and the other as a result of the percentage damaged sunflower seeds, Sclerotinia and collective deviations exceeding the maximum permissible deviations. Both these samples originated from the North West province.

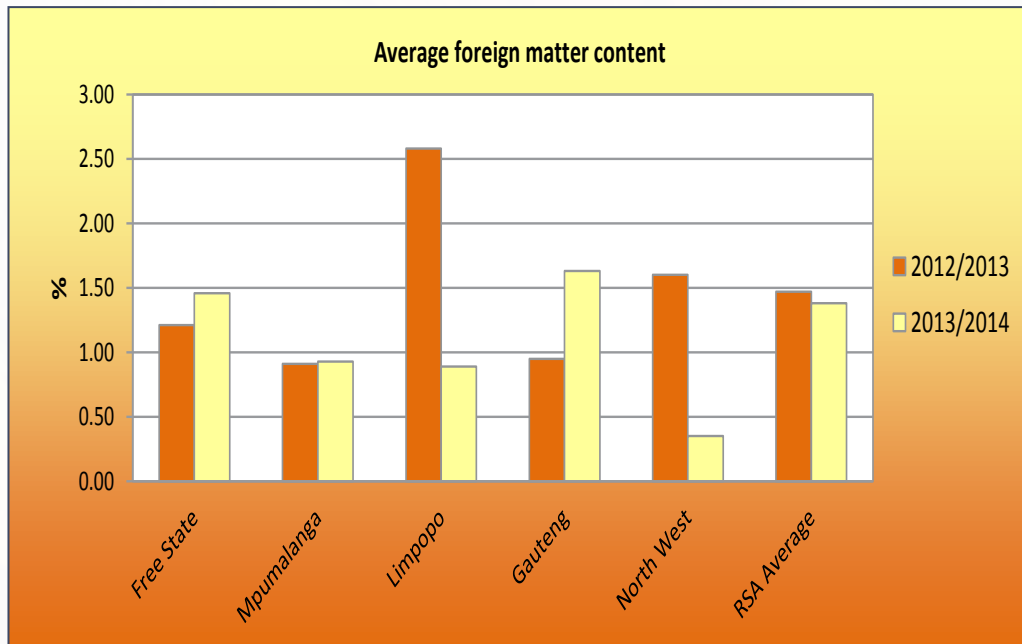
Gauteng province (four samples) reported the highest weighted average percentage screenings namely 2.01%, followed by the North West (N=58) and Free State (N=98) provinces with 1.78% and 1.71% respectively. Mpumalanga (five samples) reported the lowest average percentage screenings of 0.82%.

**Graph 16: Average percentage screenings per province over two seasons**



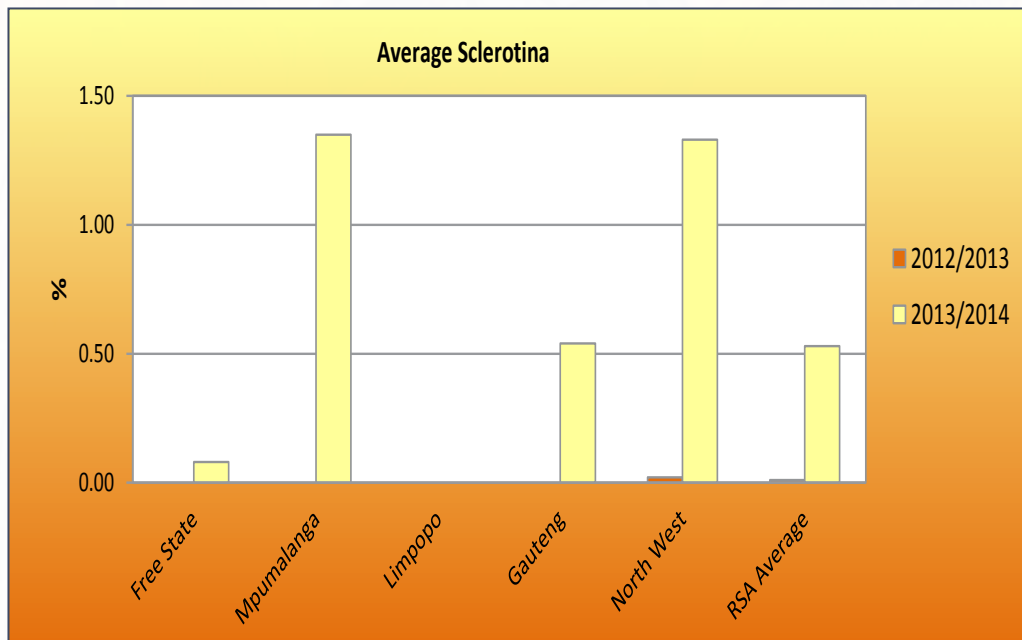
The highest weighted percentage foreign matter (1.63%) was reported for the four Gauteng samples. The Free State and North West provinces averaged 1.46% and 1.35% respectively. The lowest average percentage was found in Limpopo at 0.89%.

**Graph 17: Average percentage foreign matter per province over two seasons**



Sclerotinia was not observed on any of the 11 samples from Limpopo. The samples from the Free State had the lowest weighted average percentage Sclerotinia, namely 0.08%. Mpumalanga had the highest percentage of 1.35%, closely followed by North West province with 1.33%. During the 2012/2013 season, Sclerotinia was observed in the North West province (weighed average of 0.02%) and one region in the Free State (average 0.01%).

**Graph 18: Average percentage Sclerotinia per province over two seasons**



Hectolitre mass does not form part of the grading regulations for sunflower seed in South Africa. An approximation of the hectolitre mass of South African sunflower seeds is provided in Table 2 for information purposes. The g/1 L filling weight of sunflower seed were determined by means of the Kern 222 apparatus. The hectolitre mass was extrapolated by means of the following formulas obtained from the Test Weight Conversion Chart for Sunflower Seed, Oil of the Canadian Grain Commission:  $y = 0.1936x + 2.2775$  (138 to 182 g/0.5 L) and  $y = 0.1943x + 2.1665$  (183 to 227 g/0.5 L).

**Table 2: Approximation of Hectolitre mass per province for the 2013/2014 and 2012/2013 seasons**

Province	Hectolitre mass, kg/hl					
	2013/2014 Season			2012/2013 Season		
	Weighted average	Range	No. of samples	Weighted average	Range	No. of samples
*Free State (Regions 21 - 28)	41.8	36.4 - 48.2	96	43.8	38.3 - 47.7	58
Mpumalanga (Regions 29 - 33)	37.6	35.0 - 42.2	5	42.5	38.1 - 45.7	6
Limpopo (Region 35)	42.4	37.7 - 44.0	11	44.6	42.6 - 47.5	9
Gauteng (Region 34)	42.8	41.7 - 44.6	4	42.7	42.6 - 42.8	2
North West (Region 12 - 20)	40.2	31.1 - 46.6	58	43.0	31.5 - 47.3	77
<b>RSA Average</b>	<b>41.3</b>	<b>31.1 - 48.2</b>	<b>174</b>	<b>43.4</b>	<b>31.5 - 47.7</b>	<b>152</b>

\* Two samples with outlier values as a result of Deviations (Screenings + Sclerotinia + Foreign matter) exceeding 18%, was not taken into account for calculation purposes.

After consultation with industry, it was decided to report the crude protein, -fat, -fibre and ash components as % (g/100g) on an “as received” or “as is” basis. The results of the 2012/2013 crop quality have also been converted to an “as is” basis for comparison purposes. See Table 3 for a summary of the RSA Sunflower Crop Quality averages of the 2013/2014 season compared to those of the 2012/2013 season.

The average crude protein content of the 2013/2014 season was 16.15%, 0.62% lower than the 16.77% of the previous season. Limpopo showed the highest weighted average crude protein content of 16.95% and Mpumalanga the lowest with 15.07%. North West and the Free State had protein contents of 16.49% and 15.95% respectively. The average crude fat percentage increased from 39.2% in 2012/2013, to 39.6% this season. Gauteng had the highest weighted average crude fat content of 42.5%. The lowest average fat contents were observed in North West (38.8%) and the Free State (39.7%).

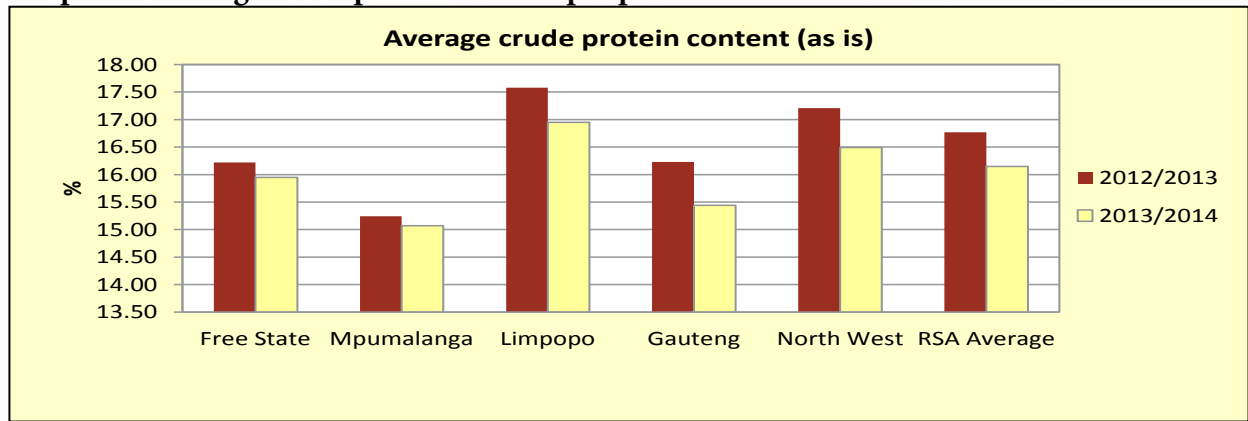
The weighted average percentage crude fibre increased slightly from 20.0% to 20.2% and varied between 18.6% in Limpopo and 20.6% in North West. The weighted average ash content is comparable, 2.66 % this season and 2.54% last season, varying 0.16% on average between provinces (Gauteng the lowest and the Free State the highest).

Graphs 19 to 22 on page 13 provide comparisons between provinces for the above mentioned components.

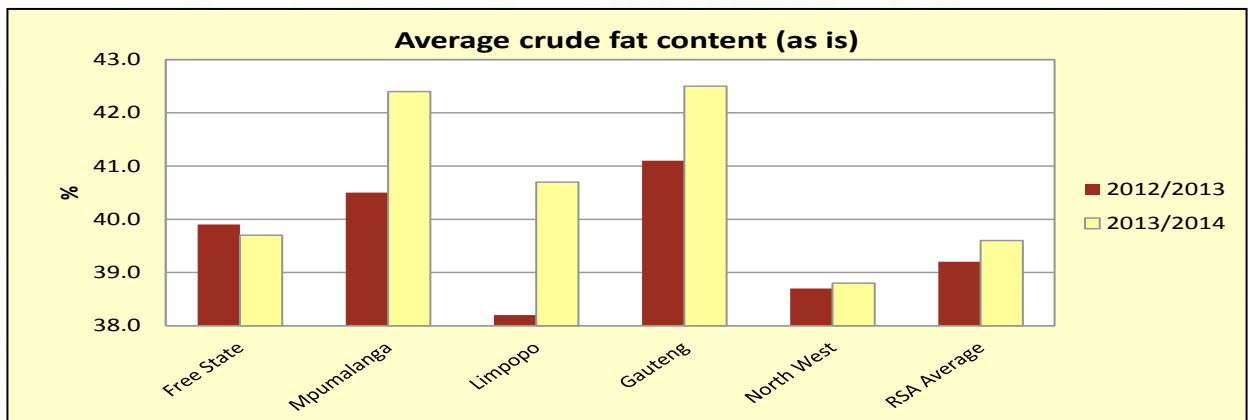
Please also see pages 15 to 21 for the average sunflower quality per region.



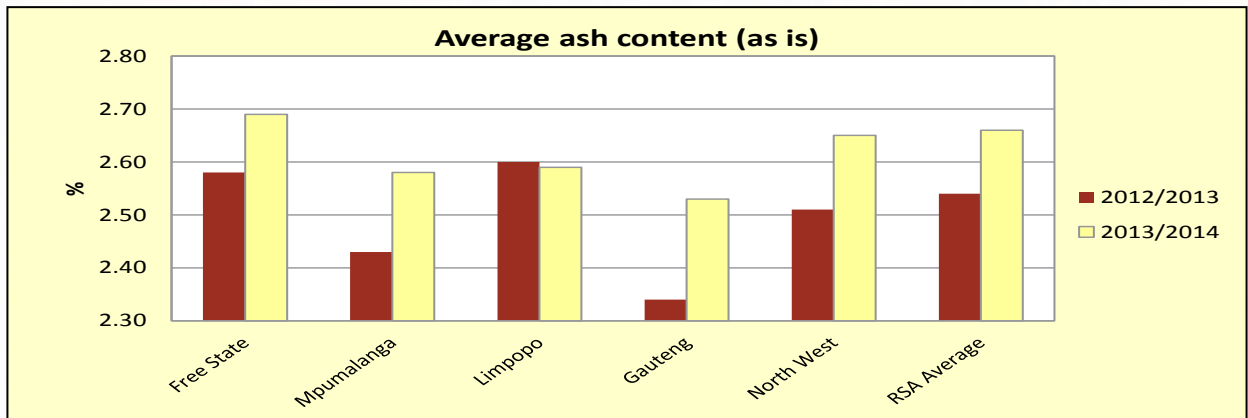
**Graph 19: Average crude protein content per province over two seasons**



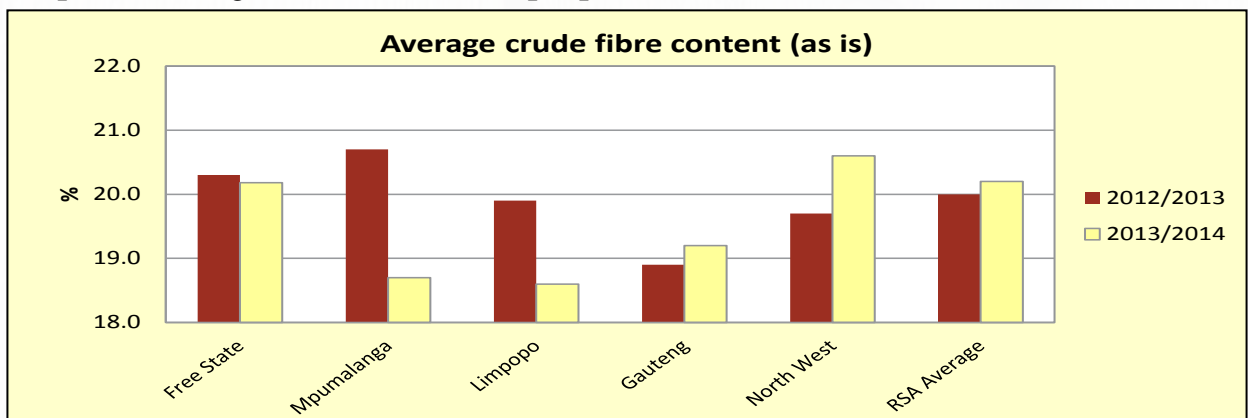
**Graph 20: Average crude fat content per province over two seasons**



**Graph 21: Average ash content per province over two seasons**



**Graph 22: Average crude fibre content per province over two seasons**



**Table 3: South African Sunflower Crop Quality Averages 2013/2014 vs 2012/2013**

Class and Grade Sunflower	2013/2014			2012/2013		
	FH1	COSF	Average	FH1	COSF	Average
<b><i>Grading:</i></b>						
1. Damaged sunflower seed, %	0.38	4.24	1.06	0.07	2.75	0.61
2. Screenings, %	1.26	3.71	1.69	1.73	3.95	2.18
3. Sclerotinia, %	0.13	2.43	0.53	0.00	0.04	0.01
4. Foreign Matter, %	0.90	3.58	1.38	1.17	2.64	1.47
5. Deviations in 2,3 and 4 collectively. Provided that such deviations are individually within the limits of said items, %	2.29	9.72	3.60	2.90	6.63	3.66
Musty, sour, khaki bush or other undesired smell	No	No	No	No	No	No
Substance present that renders the seed unsuitable for human or animal consumption or for processing into or utilization thereof as food or feed	No	No	No	No	No	No
Noxious seeds ( <i>Crotalaria sp.</i> , <i>Datura sp.</i> , <i>Ricinis communis</i> )	0	0	0	0	0	0
Noxious seeds ( <i>Argemone mexicana L.</i> , <i>Convolvulus sp.</i> , <i>Ipomoea purpurea Roth.</i> , <i>Lolium temulentum</i> , <i>Xanthium sp.</i> )	0	0	0	0	0	0
<b><i>Number of samples</i></b>	<b>145</b>	<b>31</b>	<b>176</b>	<b>121</b>	<b>31</b>	<b>152</b>
<b><i>Chemical analysis:</i></b>						
Crude Protein, % (as is)	16.19	15.99	16.15	16.67	17.13	16.77
Crude Fat, % (as is)	39.8	38.7	39.6	39.3	38.8	39.2
Ash, % (as is)	2.65	2.70	2.66	2.51	2.65	2.54
Crude Fibre, % (as is)	20.0	20.8	20.2	19.9	20.1	20.0
<b><i>Number of samples</i></b>	<b>145</b>	<b>31</b>	<b>176</b>	<b>121</b>	<b>31</b>	<b>152</b>

# SOUTH AFRICAN REGIONAL SUNFLOWER QUALITY

PRODUCTION REGION	(12)				(13)				(14)			
	North-Western Region				North-West Central Region (Sannieshof)				North-West Southern Region			
Silo/Intake stands (Type of storage)	Blaauwbank (Bins) Buhmannsdrif (Bins) Kameel (Bins) Mareetsane (Bins) Vryburg (Bins)				Biesiesvlei (Bins) Bossies (Bins) Gerdau (Bins) Oppaslaagte (Bins) Sannieshof (Bins)				Baberspan (Bins) Delareyville (Bins) Excelsior (Bins) Geysdorp (Bins) Migdol (Bins) Nooitgedacht (Bins) Taaibos (Bins) Amalia (Bins) Hallatshope (Bins) Schweizer-Reneke (Bins)			
<b><u>Grading:</u></b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>
1. Damage sunflower seed, %	0.25	0.00	0.62	0.33	1.73	0.00	4.76	2.02	0.25	0.00	1.03	0.38
2. Screenings, %	1.81	0.89	2.30	0.79	1.90	0.78	3.59	1.12	0.79	0.17	2.22	0.63
3. Sclerotinia, %	0.00	0.00	0.00	0.00	0.60	0.00	2.07	0.92	0.14	0.00	0.69	0.27
4. Foreign Matter, %	0.51	0.38	0.74	0.20	1.74	1.26	2.31	0.40	0.90	0.09	4.66	1.24
5. Deviations in 2,3 and 4 collectively: Provided that such deviations are individually within the limits of said items, %	2.32	1.31	3.04	0.90	4.24	2.71	6.17	1.62	1.83	0.33	6.72	1.68
Noxious seeds ( <i>Crotalaria sp.</i> , <i>Datura sp.</i> , <i>Ricinis communis</i> )	0	0	0	0	0	0	0	0	0	0	0	0
Noxious seeds ( <i>Argemone mexicana L.</i> , <i>Convolvulus sp.</i> , <i>Ipomoea purpurea Roth.</i> , <i>Lolium temulentum</i> , <i>Xanthium sp.</i> )	0	0	0	0	0	0	0	0	0	0	0	0
<b>Number of samples</b>	<b>3</b>				<b>5</b>				<b>13</b>			
<b><u>Chemical analysis:</u></b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>
Moisture, % (5hr, 105 °C)	3.2	2.6	3.8	0.60	3.2	1.9	4.3	0.91	3.2	2.1	4.4	0.67
Crude Protein, % (as is)	16.26	15.37	16.94	0.80	16.88	15.87	17.64	0.79	16.57	14.01	17.80	0.88
Crude Fat, % (as is)	39.8	38.4	42.4	2.25	38.9	35.9	41.9	2.40	38.4	32.5	40.3	2.10
Ash, % (as is)	2.47	2.42	2.52	0.05	2.69	2.54	2.81	0.12	2.67	2.55	2.78	0.08
Crude Fibre, % (as is)	19.9	19.1	20.7	0.80	20.2	18.8	21.9	1.53	20.6	18.7	26.2	1.87
<b>Number of samples</b>	<b>3</b>				<b>5</b>				<b>13</b>			

# SOUTH AFRICAN REGIONAL SUNFLOWER QUALITY

PRODUCTION REGION	(15)				(16)				(17)			
	North-West		South-Eastern Region		North-West		Central Eastern Region		North-West		Central Northern Region (Ottosdal)	
Silo/Intake stands (Type of storage)	Bloemhof (Bins) Christiana (Bins) Hertzogville (Bins) Hoopstad (Bins) Kingswood (Bins) Kruising (Bunkers) Poppieland (Bunkers)				Regina (Bins) Bamboesspruit (Bins) Leeudoringstad (Bins) Makwassie (Bins) Strydpoort (Bins) Wolmaranstad (Bins)				Boschpoort (Bags/Bins/Bulk) Kleinharts (Bins) Ottosdal (Bins) Rostrataville (Bins) Vermaas (Bins) Hartbeesfontein (Bins) Melliodora (Bins) Werda (Bins)			
<b><u>Grading:</u></b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>
1. Damage sunflower seed, %	0.28	0.00	0.54	0.27	0.44	0.00	1.39	0.66	1.34	0.00	5.13	1.83
2. Screenings, %	1.43	1.39	1.47	0.04	1.03	0.12	2.39	1.07	1.54	0.34	4.53	1.26
3. Sclerotinia, %	0.00	0.00	0.00	0.00	0.08	0.00	0.31	0.16	0.46	0.00	1.34	0.40
4. Foreign Matter, %	1.40	0.87	1.79	0.47	1.79	0.16	3.58	1.52	1.73	0.42	11.25	3.17
5. Deviations in 2,3 and 4 collectively: Provided that such deviations are individually within the limits of said items, %	2.83	2.34	3.18	0.44	2.90	0.28	6.28	2.71	3.73	0.96	17.12	4.57
Noxious seeds ( <i>Crotalaria sp.</i> , <i>Datura sp.</i> , <i>Ricinis communis</i> )	0	0	0	0	0	0	0	0	0	0	0	0
Noxious seeds ( <i>Argemone mexicana L.</i> , <i>Convolvulus sp.</i> , <i>Ipomoea purpurea Roth.</i> , <i>Lolium temulentum</i> , <i>Xanthium sp.</i> )	0	0	0	0	0	0	0	0	0	0	0	0
<b>Number of samples</b>	<b>3</b>				<b>4</b>				<b>11</b>			
<b><u>Chemical analysis:</u></b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>
Moisture, % (5hr, 105 °C)	3.9	2.7	5.2	1.26	3.4	1.6	4.7	1.46	3.1	2.2	4.2	0.50
Crude Protein, % (as is)	17.96	17.73	18.32	0.32	18.05	16.80	20.55	1.70	16.33	15.42	17.25	0.56
Crude Fat, % (as is)	36.8	32.6	39.7	3.74	38.2	36.2	39.7	1.52	39.2	33.9	41.6	2.07
Ash, % (as is)	2.72	2.68	2.81	0.08	2.69	2.46	3.07	0.26	2.60	2.35	2.82	0.13
Crude Fibre, % (as is)	20.8	19.9	22.4	1.33	20.7	20.0	21.7	0.76	20.7	18.3	24.3	1.65
<b>Number of samples</b>	<b>3</b>				<b>4</b>				<b>11</b>			

# SOUTH AFRICAN REGIONAL SUNFLOWER QUALITY

PRODUCTION REGION	(18)				(19)				(20)			
	North-West Central Region (Ventersdorp)				North-West Central Region (Lichtenburg)				North-West Eastern Region			
Silo/Intake stands (Type of storage)	Bodenstein (Bins) Coligny (Bins) Buckingham (Bins) Enselspruit (Bins) Makokskraal (Bins) Potchefstroom (Bins) Ventersdorp (Bins)				Lichtenburg (Bunkers) Grootpan (Bins) Halfpad (Bins) Hibernia (Bins) Lottie Halte (Bins) Lusthof (Bins) Lichtenburg Silo 3 (Bins) Lichtenburg Silo 5 (Bins)				Battery (Bins) Brits (Bins) Boons (Bins) Derby (Bins) Koster (Bins) Swartruggens (Bins) Syferbult (Bins)			
<b><u>Grading:</u></b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>
1. Damage sunflower seed, %	14.13	1.16	64.80	24.98	2.46	0.51	6.14	2.29	2.04	0.00	4.15	1.84
2. Screenings, %	2.15	0.26	3.84	1.47	3.85	2.28	6.50	1.86	2.57	0.17	5.85	2.17
3. Sclerotinia, %	4.61	0.80	8.07	3.15	2.82	0.00	6.64	2.92	3.14	0.00	11.84	4.23
4. Foreign Matter, %	1.51	0.82	2.25	0.50	2.13	1.32	2.96	0.63	0.75	0.12	1.56	0.59
5. Deviations in 2,3 and 4 collectively: Provided that such deviations are individually within the limits of said items, %	8.27	4.07	12.83	3.55	8.80	4.84	14.67	3.65	6.47	0.31	17.01	6.31
Noxious seeds ( <i>Crotalaria sp.</i> , <i>Datura sp.</i> , <i>Ricinis communis</i> )	0	0	0	0	0	0	0	0	0	0	0	0
Noxious seeds ( <i>Argemone mexicana L.</i> , <i>Convolvulus sp.</i> , <i>Ipomoea purpurea Roth.</i> , <i>Lolium temulentum</i> , <i>Xanthium sp.</i> )	0	0	0	0	0	0	0	0	0	0	0	0
<b>Number of samples</b>	<b>6</b>				<b>5</b>				<b>8</b>			
<b><u>Chemical analysis:</u></b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>
Moisture, % (5hr, 105 °C)	2.5	1.3	3.2	0.71	3.1	2.3	3.7	0.50	3.0	1.9	4.2	0.91
Crude Protein, % (as is)	15.42	14.08	17.48	1.25	16.02	13.53	17.44	1.47	16.16	14.12	18.08	1.56
Crude Fat, % (as is)	40.3	36.5	43.8	2.41	37.7	35.7	39.1	1.52	38.8	36.4	42.0	1.82
Ash, % (as is)	2.74	2.61	2.82	0.08	2.60	2.38	2.75	0.15	2.64	2.51	2.78	0.09
Crude Fibre, % (as is)	20.6	18.7	22.4	1.47	21.9	21.0	23.3	0.91	20.1	18.5	21.2	0.82
<b>Number of samples</b>	<b>6</b>				<b>5</b>				<b>8</b>			

# SOUTH AFRICAN REGIONAL SUNFLOWER QUALITY

PRODUCTION REGION	(21)				(22)				(23)			
	Free State North-Western Region (Viljoenskroon)				Free State North-Western Region (Bothaville)				Free State North-Western Region (Bultfontein)			
Silo/Intake stands (Type of storage)	Attie (Bins) Groenebloem (Bins) Heuningspruit (Bins) Koppies (Bins) Rooiwal (Bins) Vierfontein (Bins) Viljoenskroon (Bins) Vredefort (Bins) Weiveld (Bins)				Allanridge (Bins) Bothaville (Bins) Mirage (Bins) Odendaalsrus (Bins) Schoonspruit (Bins) Schuttendraai (Bins) Misgunst (Bunkers)				Bultfontein (Bins) Losdoorns (Bins) Protespan (Bins) Tierfontein (Bins) Wesselsbron (Bins) Willemsrus (Bins)			
<b><u>Grading:</u></b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>
1. Damage sunflower seed, %	0.28	0.00	1.05	0.33	0.19	0.00	0.53	0.26	0.04	0.00	0.19	0.07
2. Screenings, %	2.50	0.89	4.79	1.13	0.66	0.09	1.50	0.63	1.30	0.25	2.00	0.64
3. Sclerotinia, %	0.09	0.00	1.04	0.25	0.20	0.00	0.98	0.44	0.00	0.00	0.00	0.00
4. Foreign Matter, %	2.04	0.51	5.92	1.50	0.48	0.11	1.75	0.71	0.61	0.00	1.12	0.39
5. Deviations in 2,3 and 4 collectively: Provided that such deviations are individually within the limits of said items, %	4.63	1.92	9.40	2.34	1.34	0.20	2.90	1.35	1.91	0.49	2.66	0.85
Noxious seeds ( <i>Crotalaria sp.</i> , <i>Datura sp.</i> , <i>Ricinis communis</i> )	0	0	0	0	0	0	0	0	0	0	0	0
Noxious seeds ( <i>Argemone mexicana L.</i> , <i>Convolvulus sp.</i> , <i>Ipomoea purpurea Roth.</i> , <i>Lolium temulentum</i> , <i>Xanthium sp.</i> )	0	0	0	0	0	0	0	0	0	0	0	0
<b>Number of samples</b>	<b>21</b>				<b>5</b>				<b>8</b>			
<b><u>Chemical analysis:</u></b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>
Moisture, % (5hr, 105 °C)	3.5	1.8	4.9	0.92	2.3	1.5	3.1	0.69	3.5	1.5	4.8	1.13
Crude Protein, % (as is)	16.68	15.33	18.42	0.80	17.47	16.24	18.04	0.70	17.93	16.72	18.84	0.85
Crude Fat, % (as is)	38.1	26.0	41.0	3.29	40.6	39.1	42.4	1.21	38.1	33.3	41.2	2.56
Ash, % (as is)	2.67	2.29	2.97	0.16	2.67	2.49	2.74	0.10	2.73	2.64	2.89	0.08
Crude Fibre, % (as is)	20.7	18.3	23.3	1.47	19.2	17.5	20.1	1.08	20.6	19.3	22.7	1.31
<b>Number of samples</b>	<b>21</b>				<b>5</b>				<b>8</b>			

# SOUTH AFRICAN REGIONAL SUNFLOWER QUALITY

PRODUCTION REGION	(24) Free State Central Region				(25) Free State South-Western Region				(26) Free State South-Eastern Region						
	Silo/Intake stands (Type of storage)				Bloemfontein (Bins) Brandfort (Bins) De Brug (Bins) Geneva (Bins) Hennenman (Bins) Kroonstad (Bins) Petrusburg (Bins) Theunissen (Bins) Van Tonder (Bins) Welgeleë (Bins) Winburg (Bins)				Bethlehem (Bins) Slabberts (Bins) Clocolan (Bins) Ficksburg (Bins) Fouriesburg (Bins) Marseilles (Bins) Modderpoort (Bins) Tweespruit (Bins) Westminster (Bins)				Kaallaagte (Bins) Libertas (Bins) Marquard (Bins) Meets (Bins) Monte Video (Bins) Senekal (Bins) Arlington (Bins) Steynsrus (Bins)		
<b><u>Grading:</u></b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>			
1. Damage sunflower seed, %	0.13	0.00	0.55	0.17	0.17	0.00	0.75	0.22	0.62	0.00	8.61	2.14			
2. Screenings, %	2.60	0.25	9.22	2.12	1.28	0.16	1.78	0.50	1.19	0.12	2.79	0.92			
3. Sclerotinia, %	0.01	0.00	0.13	0.04	0.11	0.00	0.62	0.20	0.05	0.00	0.44	0.15			
4. Foreign Matter, %	3.12	0.11	16.39	4.94	0.88	0.17	1.72	0.47	0.50	0.09	1.47	0.38			
5. Deviations in 2,3 and 4 collectively: Provided that such deviations are individually within the limits of said items, %	5.73	0.39	18.56	5.47	2.27	1.00	3.36	0.77	1.74	0.23	4.22	1.21			
Noxious seeds ( <i>Crotalaria sp.</i> , <i>Datura sp.</i> , <i>Ricinis communis</i> )	0	0	2	0.49	0	0	0	0	0	0	0	0			
Noxious seeds ( <i>Argemone mexicana L.</i> , <i>Convolvulus sp.</i> , <i>Ipomoea purpurea Roth.</i> , <i>Lolium temulentum</i> , <i>Xanthium sp.</i> )	0	0	0	0	0	0	0	0	0	0	0	0			
<b>Number of samples</b>	<b>17</b>				<b>13</b>				<b>16</b>						
<b><u>Chemical analysis:</u></b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>			
Moisture, % (5hr, 105 °C)	3.4	2.0	6.3	1.13	2.9	1.4	4.5	0.89	4.0	1.4	4.7	0.95			
Crude Protein, % (as is)	16.87	12.58	19.27	1.47	13.84	11.56	16.00	1.64	14.85	13.08	16.40	0.72			
Crude Fat, % (as is)	37.5	26.2	42.8	4.87	42.7	40.1	46.3	1.73	40.4	39.5	41.9	0.68			
Ash, % (as is)	2.79	2.57	2.94	0.11	2.68	2.52	2.87	0.11	2.54	2.08	2.90	0.30			
Crude Fibre, % (as is)	20.7	17.5	26.8	2.49	18.9	15.7	20.3	1.37	20.9	19.2	22.5	1.06			
<b>Number of samples</b>	<b>17</b>				<b>13</b>				<b>16</b>						

# SOUTH AFRICAN REGIONAL SUNFLOWER QUALITY

PRODUCTION REGION	(27)				(28)				(29)			
	Free State Northern Region				Free State Eastern Region				Mpumalanga Southern Region			
Silo/Intake stands (Type of storage)	Gottenburg (Bins) Heilbron (Bins) Hoogte (Bins) Mooigeleë (Bins) Wolwehoek (Bins) Petrus Steyn (Bins)				Afrikaskop (Bins/Bunkers) Eeram (Bins) Harrismith (Bins) Kransfontein (Bins/Bunkers) Ascent (Bins) Cornelia (Bins) Daniëlsrus (Bins) Frankfort (Bins) Jim Fouché (Bins) Memel (Bins) Reitz (Bins) Tweeling (Bins) Villiers (Bins/Bulk) Vrede (Bins) Warden (Bins) Windfield (Bins)				Balfour (Bins) Greylingstad (Bins) Grootvlei (Bins) Harvard (Bins) Holmdene (Bins) Leeuspruit (Bins) Platrand (Bins) Standerton (Bins) Val (Bins)			
<b><u>Grading:</u></b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>
1. Damage sunflower seed, %	0.13	0.00	0.45	0.18	0.03	0.00	0.18	0.07	3.04	1.59	5.30	1.80
2. Screenings, %	2.01	0.38	5.94	1.61	0.42	0.14	1.07	0.33	0.74	0.33	1.15	0.36
3. Sclerotinia, %	0.10	0.00	0.62	0.20	0.16	0.00	1.41	0.47	1.42	0.00	4.51	2.08
4. Foreign Matter, %	1.60	0.14	3.33	1.17	0.69	0.00	1.57	0.58	0.72	0.30	1.14	0.39
5. Deviations in 2,3 and 4 collectively: Provided that such deviations are individually within the limits of said items, %	3.71	0.87	8.43	2.31	1.27	0.14	2.80	0.93	2.88	1.47	6.16	2.21
Noxious seeds ( <i>Crotalaria sp.</i> , <i>Datura sp.</i> , <i>Ricinis communis</i> )	0	0	0	0	0	0	0	0	0	0	0	0
Noxious seeds ( <i>Argemone mexicana L.</i> , <i>Convolvulus sp.</i> , <i>Ipomoea purpurea Roth.</i> , <i>Lolium temulentum</i> , <i>Xanthium sp.</i> )	0	0	0	0	0	0	0	0	0	0	0	0
<b>Number of samples</b>	<b>9</b>				<b>9</b>				<b>4</b>			
<b><u>Chemical analysis:</u></b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>
Moisture, % (5hr, 105 °C)	3.1	2.1	3.8	0.55	2.5	1.8	3.8	0.68	1.6	1.1	2.2	0.50
Crude Protein, % (as is)	15.79	14.05	17.62	1.05	15.05	12.22	17.64	1.65	15.49	15.27	15.67	0.19
Crude Fat, % (as is)	39.5	38.1	43.1	1.51	42.7	35.4	49.1	4.25	42.9	42.4	43.6	0.52
Ash, % (as is)	2.67	2.44	2.87	0.14	2.81	2.44	3.47	0.27	2.53	2.46	2.59	0.06
Crude Fibre, % (as is)	20.2	17.8	21.5	1.12	18.7	14.7	21.7	1.94	18.2	17.2	19.2	0.81
<b>Number of samples</b>	<b>9</b>				<b>9</b>				<b>4</b>			



# SOUTH AFRICAN REGIONAL SUNFLOWER QUALITY

PRODUCTION REGION	(33)				(34)				(35)			
	Mpumalanga Northern Region				Gauteng				Limpopo			
Silo/Intake stands (Type of storage)	Arnot (Bins) Driefontein (Bins) Lydenburg (Bins) Marble Hall (Bins) Middelburg (Bins) Pan (Bins) Stoffberg (Bins) Wonderfontein (Bins)				Bloekomspruit (Bins) Bronkhorstspuit (Bins) Glenroy (Bins) Goeie Hoek (Bins) Kaalfontein (Bins) Kliprivier (Bunkers) Meyerton (Bunkers) Nigel (Bins) Pretoria West (Bins) Vogelvallei (Bunkers) Middelvlei (Bins) Oberholzer (Bins) Raathsvlei (Bins)				Northam (Bins) Alma (Bins) Lehau (Bins) Naboomspruit (Mookgophong) (Bins) Nutfield (Bins) Nylstroom (Modimolle) (Bins) Potgietersrus (Mokopane) (Bins) Roedtan (Bins) Settlers (Bins) Warmbad (Bela-Bela) (Bins)			
<b><u>Grading:</u></b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>
1. Damage sunflower seed, %	1.88	-	-	-	1.05	0.00	1.74	0.76	0.17	0.00	1.00	0.37
2. Screenings, %	1.15	-	-	-	2.01	0.74	4.20	1.53	1.29	0.37	3.44	0.90
3. Sclerotinia, %	1.05	-	-	-	0.54	0.00	1.64	0.77	0.00	0.00	0.00	0.00
4. Foreign Matter, %	1.79	-	-	-	1.63	0.24	4.48	1.94	0.89	0.59	1.25	0.26
5. Deviations in 2,3 and 4 collectively: Provided that such deviations are individually within the limits of said items, %	3.99	-	-	-	4.17	0.98	7.34	2.93	2.18	1.24	4.37	0.88
Noxious seeds ( <i>Crotalaria sp.</i> , <i>Datura sp.</i> , <i>Ricinis communis</i> )	0	-	-	-	0	0	0	0	0	0	0	0
Noxious seeds ( <i>Argemone mexicana L.</i> , <i>Convolvulus sp.</i> , <i>Ipomoea purpurea Roth.</i> , <i>Lolium temulentum</i> , <i>Xanthium sp.</i> )	0	-	-	-	0	0	0	0	0	0	0	0
<b>Number of samples</b>	<b>1</b>				<b>4</b>				<b>11</b>			
<b><u>Chemical analysis:</u></b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>	<b>ave</b>	<b>min</b>	<b>max</b>	<b>stdev</b>
Moisture, % (5hr, 105 °C)	1.6	-	-	-	2.3	1.0	3.8	1.23	3.3	1.2	5.0	1.28
Crude Protein, % (as is)	13.39	-	-	-	15.44	13.25	17.55	1.97	16.95	14.26	19.32	1.64
Crude Fat, % (as is)	40.4	-	-	-	42.5	39.4	46.1	3.14	40.7	34.1	44.3	3.02
Ash, % (as is)	2.78	-	-	-	2.53	2.18	2.80	0.26	2.59	2.09	2.90	0.26
Crude Fibre, % (as is)	20.8	-	-	-	19.2	17.6	20.1	1.10	18.6	14.4	22.2	2.47
<b>Number of samples</b>	<b>1</b>				<b>4</b>				<b>11</b>			

# METHODS

## SAMPLING PROCEDURE:

A working group determined the process to be followed to ensure that the crop quality samples which are sent to the SAGL by the various grain silo owners/agricultural businesses, are representative of the total crop.

Each delivery is sampled as per the grading regulations for grading purposes.

After grading, the grading samples are placed in separate containers according to class and grade.

After 80% of the expected harvest has been received, the silo divides the content of each container with a multi slot divider in order to obtain a 3 kg sample (this should be done for each class and grade separately).

If there is more than one container per class and grade, the combined contents of the containers is mixed thoroughly before dividing it with a multi slot divider to obtain the required 3 kg sample.

The samples are marked clearly with the name of the depot, the bin/bag/bunker/dam number(s) represented by each individual sample as well as the class and grade and are then forwarded to the SAGL.

## GRADING:

Full grading was done in accordance with the Regulations relating to the Grading, Packing and Marking of Sunflower Seed intended for sale in the Republic of South Africa (No. R. 493 of 8 May 2009).

See pages 54 to 62 of this report.

## CHEMICAL ANALYSIS:

### Milling

Prior to the chemical analyses, the Sunflower samples were milled on a Retch ZM 200 mill fitted with a 1.0 mm screen.

### Moisture

The moisture content of the milled samples was determined as a loss in weight when dried in an oven at 105 °C for 5 hours according to AgriLASA method 2.1, latest edition.

### Crude Protein

The Dumas combustion analysis technique was used to determine the crude protein content, according to AACCI method 46-30.01, latest edition.

This method prescribes a generic combustion method for the determination of crude protein. Combustion at high temperature in pure oxygen sets nitrogen free, which is measured by thermal conductivity detection. The total nitrogen content of the sample is determined and converted to equivalent protein by multiplication with a factor of 6.25 to obtain the protein content.

### Crude Fat

In-House method 024 was used for the determination of the crude fat in the samples. After sample preparation the fat is extracted by petroleum ether with the aid of the Soxhlet extraction apparatus, followed by the removal of the solvent by evaporation and weighing the dried residue thus obtained. The residue is expressed as % crude fat.

### Ash

Ash is defined as the quantity of mineral matter which remains as incombustible residue of the tested substance, after application of the described working method. In-house method No. 011, based on AACCI method 08-03.01, was used for the determination.

### Crude Fibre

In-House method 020 was used for the determination of the crude fibre in the samples. Crude fibre is the loss on ignition of the dried residue remaining after digestion of the sample with 1.25% H<sub>2</sub>SO<sub>4</sub> (Sulphuric acid) and 1.25% NaOH (Sodium hydroxide) solutions under specific conditions.

This method is based on AACCI method 32-10.01, latest edition and the method described in the Government Gazette No. R. 31 of 25 January 2008.



## CERTIFICATE OF ACCREDITATION

*In terms of section 22(2) (b) of the Accreditation for Conformity Assessment, Calibration and Good Laboratory Practice Act, 2006 (Act 19 of 2006), read with sections 23(1), (2) and (3) of the said Act, I hereby certify that:-*

### **SOUTHERN AFRICAN GRAIN LABORATORY NPC**

**Co. Reg. No.: 1997/018518/08**

**Facility Accreditation Number: T0116**

is a South African National Accreditation System accredited Testing laboratory provided that all SANAS conditions and requirements are complied with

This certificate is valid as per the scope as stated in the accompanying schedule of accreditation Annexure "A", bearing the above accreditation number for

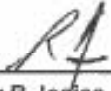
### **CHEMICAL AND PHYSICAL ANALYSIS**

The facility is accredited in accordance with the recognised International Standard

**ISO/IEC 17025:2005**

The accreditation demonstrates technical competency for a defined scope and the operation of a laboratory quality management system

While this certificate remains valid, the Accredited Facility named above is authorised to use the relevant SANAS accreditation symbol to issue facility reports and/or certificates

  
\_\_\_\_\_  
Mr R Josias  
Chief Executive Officer

Effective Date: 01 November 2014  
Certificate Expires: 31 October 2019

**ANNEXURE A**

**SCHEDULE OF ACCREDITATION**

**Facility Number: TD118**

<p><b>Permanent Address of Laboratory:</b>                  Southern African Grain Laboratory (NPC)                  Grain Building                  477 Witherika Road                  The Willows                  0040</p> <p><b>Postal Address:</b>                  Postnet Suite # 391                  Private Bag X 1                  The Willows                  0041</p> <p>Tel: (012) 867-4018                  Fax: (086) 218-7872                  E-mail: <a href="mailto:info@sagj.co.za">info@sagj.co.za</a></p>	<p><b>Technical Signatories:</b></p> <p>Ms J Nortjé (All)                  Ms M Fourie (In-house method 012)                  Ms M Hanman (Chemical)                  Ms A de Jager (Nutrients &amp; Contaminants)                  Ms W Louw (In-house Methods 001, 002, 003, 010, and 020)                  Ms D Moloka (Physiological)                  Ms I Terblanche (Physiological)                  Ms H Meyer (Chemical, Nutrients, Contaminants &amp; Grading)                  Ms J Kruger (Chemical, including in-house method 012)                  Mr L Badenhorst (Grading)                  Ms P Moxibe (Chemical)                  Ms M Molanthe (In-house method 001, 003)</p> <p><b>Nominal Representative:</b> Ms S du Preez</p> <p><b>Management Representative:</b> Ms W Louw</p> <p>Issue No.: 24                  Date of Issue: 04 March 2015                  Expiry Date: 31 October 2018</p>	
<p align="center"><b>Materials / Products Tested</b></p> <p><b>CHEMICAL</b></p> <p>Ground Barley</p> <p>Cereal and cereal products specifically- wheat, rice, (hulled paddy), barley, millet, rye and oats as grains, semolina and flour</p> <p>Flour, semolina, bread, all kind of grains and cereal products, and food products (except those that are sugar coated)</p>	<p align="center"><b>Type of Tests / Properties Measured, Range of Measurement</b></p> <p>Moisture (Oven Method)</p> <p>Moisture (Oven Method)</p> <p>Moisture (Oven method)</p>	<p align="center"><b>Standard Specifications, Equipment / Technique Used</b></p> <p>Analytical EBC Method 3.2, Latest Edition (2hour; 130°C)</p> <p>ICC Std No.116/1, Latest Edition (90 min; 130°C) (2 hour; 130°C)</p> <p>AACCI 44-16.02, Latest Edition (1 hour; 130°C) (72 hour; 105°C)</p>

Original Date of Accreditation: 01 November 1999

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**Field Manager**

## ANNEXURE A

Facility No.: TQ118  
Date of Issue: 04 March 2016  
Expiry Date: 31 October 2018

Materials / Products Tested	Type of Tests / Properties Measured, Range of Measurement	Standard Specifications, Equipment/ Technique Used
All flours, cereal grains, oilseeds and animal feeds	Nitrogen and protein (Combustion method - Dumas)	AACCI 48-30.01, Latest Edition
Food stuff	Dietary fibre (total)	In-house method D12
Food stuff and feeds	Carbohydrates (by difference) (calculation) Energy value (calculation) Total digestible nutrition value (calculation)	SOP MC 23
Food stuff and feeds	Determination of ash	In-house method D11
Wheat kernels	Moisture (Oven method)	Government Gazette Wheat Grading Regulation, Latest Edition (72 hour, 103°C)
Flours of grains, e.g. barley, oats, triticale, maize, rye, sorghum and wheat; oilseeds like soyabean and sunflower, feeds and mixed feeds and foodstuffs	Crude Fat (Ether extraction by Soxhlet)	In-house method D24
Meal and flour of wheat, rye, barley, other grains, starch containing and milled products	Falling number	ICC No 107/1, Latest Edition
<b><u>NUTRIENTS &amp; CONTAMINANTS</u></b>		
Vitamin fortified food and feed products and fortification mixes grain based	Vitamin A as all trans Retinol (Saponification) (HPLC)	In-house method D01
Vitamin fortified food and feed products and fortification mixes grain based	Thiamine Mononitrate (HPLC) Riboflavin (HPLC) Nicotinamide (HPLC) Pyridoxine Hydrochloride (HPLC)	In-house method D02
Vitamin fortified food and feed products and fortification mixes grain based	Folic Acid (HPLC)	In-house method D03

Original Date of Accreditation: 01 November 1998

Page 2 of 3

Field Manager

## ANNEXURE A

Facility No.: TM118  
Date of Issue: 04 March 2016  
Expiry Date: 31 October 2019

Materials / Products Tested	Type of Tests / Properties Measured / Range of Measurement	Standard Specifications, Equipment / Technique Used
Grain based food and feed products (fortified and unfortified) and fortification mixes	Total sodium (Na) Total Iron (Fe) Total zinc (Zn)	In-house method B19
Food and feed	Multi-Mycotoxin: - Aflatoxin G <sub>1</sub> , B <sub>1</sub> , G <sub>2</sub> , B <sub>2</sub> and total - Deoxynivalenol (DON), 15-ADON - Furocoulin B <sub>1</sub> , B <sub>2</sub> , B <sub>3</sub> - Ochratoxin A - T2, HT-2 - Zearalenone	In-house method B25
<b><u>GRADING</u></b>		
Maize	Defective kernels (white maize/yellow maize)	Government Gazette Maize Regulation, Latest Edition
Cereal as grains (wheat, barley, rye and oats)	Hectolitre mass (KernZG)	ISO 7971-3, Latest Edition
Wheat	Screenings	Government Gazette Wheat Grading Regulation, Latest Edition
<b><u>RHEOLOGICAL</u></b>		
Wheat flour	Alveograph (Rheological properties)	ICC No 121, Latest Edition
Flours	Farinograph (Rheological properties)	AACCI 54.02, Latest Edition (Rheological behaviour of Flour Farinograph: Constant Flour Weight procedure)
Hard, soft and durum wheat, (flour and whole wheat flour)	Mixograph (Rheological properties)	Industry Accepted Method B29 (based on AACCI 54-40.02, Latest Edition Mixograph Method)

Original Date of Accreditation: 01 November 1998

Page 3 of 3

ISSUED BY THE SOUTH AFRICAN NATIONAL ACCREDITATION SYSTEM

Field Manager



**CERTIFICATE  
SERTIFIKAAT**

IT IS HEREBY CERTIFIED THAT  
HERMEE WORD GESERTIFISEER DAT

**Southern African Grain Laboratory  
Die Wilgers, Pretoria**

**Feeds / Voere**

FOR THE PERIOD OF  
VIR DIETYDPERK VAN **9 June 2014** TO  
TOT **9 February 2015**

PARTICIPATED IN THE PROFICIENCY TEST SCHEME AND THE FOLLOWING ANALYTES HAVE CONFORMED TO 83%  
PARTICIPATION WITH A Z VALUE  $\leq -2$ , AS SET BY AgrILASA:

DEELGENEEM HET AAN DIE INTERLAB-KONTROLESKEMA EN DIE VOLGENDE ONTLEDINGS HET AAN DIE AgrILASA  
VOORGESKREWE 83% DEELNAME MET N Z WAARDE VAN  $\leq -2$  VOLDOEN:

<b>Ash</b>	<b>Crude Fibre</b>	<b>Fat</b>
<b>Moisture</b>	<b>Nx6.25-Protein</b>	<b>Starch</b>

  
 FOR AGRILASA



Prepared and published by Thistle QA on behalf of, and under direction of, AGRILASA Printed: 06/03/2015

**Evaluation of sunflower cultivars:  
2013/2014 season**

**ARC–Grain Crops Institute in collaboration with the following seed companies:  
Agricol, Capstone, Pannar, Pioneer and Syngenta**



## **INTRODUCTION**

Optimisation of processes in any industry is key to their successes. Sunflower cultivar trials, which are done since the early nineteen seventies in South Africa, have the aim to enable farmers to optimise sunflower production through sound cultivar selection.

In this project, commercially available cultivars are evaluated in order to predict their future yield performances and to assess their seed composition. This project is the only unbiased effort in South Africa that strives to evaluate all the important cultivars in the main areas of production. The information generated in field trials on grain yield and seed quality is not only available to farmers but to all interested parties.

## **MATERIALS AND METHODS**

This project was conducted during the 2013/2014 season with the voluntary collaboration of Agricol, Capstone, Pannar, Pioneer and Syngenta. Seed companies entered 20 cultivars for evaluation (Table 1) and supplied seed to the ARC-GCI which planned field trials with randomised complete-block design layouts with three replicates. Germination tests, according to ISTA rules, were done on the supplied seed. Seed germination from all cultivars exceeded the 80% requirement (Table 1). Seed from cultivars were packed according to trial plans and sent to co-operators before the onset of the growing season.

Six of the 20 cultivars were Clearfield types on which use of the post emergence broad leaf weed controlling herbicide imazamox herbicide, is possible. These cultivars was treated in the same way as the regular cultivars and received no imazamox herbicide.

Each collaborating seed company had to conduct at least one trial for each cultivar entry. Four trials were done by the ARC-GCI, six by Agricol, one by Capstone, ten by Pannar, two by Pioneer and two by Syngenta. Trial sites were selected by collaborators and the people involved are listed in Table 2. Planting dates, amount of fertiliser applied, soil analyses and other agronomic details from some field trials are reported in Table 3. Grain yields were recorded on all trials while the period from planting to 50% flowering was recorded on selected trials only.

Yield data and seed samples were sent to ARC-GCI for analyses. The seed were analysed by a service provider using the Near Infrared Spectroscopy method. Yield data from all field trials were subjected to analyses of variance and the regression line technique as described by Loubser and Grimbeek (1984) was used to calculate yield probabilities for cultivars at different yield potentials. Six of the 25 trials failed due poor crop establishment or, were rejected due to coefficients of variation exceeding 20%. This report contains results of successful trials only.

## **RESULTS**

### **Days from planting to flowering**

The mean number of days from planting to 50% flowering of cultivars ranged from 58 to 75 days (Table 4). Calculated across cultivars and localities, this period was 67 days. Among cultivars, SY 4045 had the shortest period 62 days and CAP 4000 the longest period from planting to flowering at 69 days.

### **Oil and protein concentration**

The moisture free oil and protein concentrations of the seed are shown in Tables 5 and 6, respectively. The oil analyses were done with a Soxhlet apparatus while the protein analyses were done according to the Dumas method.

The oil content for cultivars at the various localities varied from 31 to 53% with an overall mean of 42%. Adjusted for a moisture content of 9% at which sunflower grain is traded, the overall mean would be about 39%.

The highest mean oil concentration among localities was at Potchefstroom (planting date 3<sup>rd</sup> November 2013) with 48%. The locality with the lowest mean oil content of 39% was again Potchefstroom at the relative late planting date of 20 January 2014. The highest oil concentration among cultivars and calculated across localities, was found to be Agsun 5264 at 47%.

The protein content varied from 10 to 22% among cultivars at the different localities. Among localities, Potchefstroom had both the mean highest and lowest protein contents of 20 and 11 % for 3 November 2013 and 20 January 2014, respectively. Calculated across localities, Agsun 5264 had the highest protein content (18%) and PAN 7049 the lowest (16%).

### **Seed yield**

The mean seed yield of cultivars at the respective localities is presented in Table 7. The highest trial mean yield of 3.66 t ha<sup>-1</sup> was obtained at Boskop planted on 4<sup>th</sup> January 2014 and the lowest of 1.20 t ha<sup>-1</sup>, at Settlers.

The six best performing cultivars, in terms of average yield calculated over localities, were PAN 7080, PAN 7049, PAN 7098, PAN 7100, AGSUN 5270, and AGSUN 8251. The overall mean yield for 2013/2014 was 2.41 t ha<sup>-1</sup>, about 14% higher than that of the 2012/2013 season.

No high oleic cultivar was entered for evaluation in 2013/14. Three Clearfield cultivars, PAN 7095CL, PAN 7101CL and PAN 7102CLP were entered. The mean yield of PAN 7095CL was 3% higher and the mean yield of PAN 7101CL and PAN 7102CLP about 4% lower, than the overall mean yield.

### **Oil yield**

Oil yield per unit area is the product of grain yield and seed oil content and it is presented in Table 8. The performance of cultivars regarding oil yield is of importance to farmers who are compensated for seed oil concentration.

The oil yield for cultivars at the various localities varied from 0.47 to 1.90 t ha<sup>-1</sup> with an overall mean of 1.11 t ha<sup>-1</sup>. The locality with the highest mean oil yield was Boskop at 1.58 t ha<sup>-1</sup>. The cultivar with the highest mean oil yield was AGSUN 5270 with 1.21 t ha<sup>-1</sup>.

### **Parameters calculated from the analysis of variance**

The trial mean yield, standard error of the trial mean and other parameters, calculated for each locality, are shown in Table 9. These parameters are presented for evaluation of individual trials.

### **Regression line coordinates at different yield targets**

Regression line coordinates at different yield targets, the overall mean yield, the intercept and slope from the regression line and yield stability (D-parameter) are shown in Table 10. The coordinate values of a particular cultivar are estimates of the mean expected yield at corresponding yield potentials. These values take the cultivar X environment interaction into account but not the yield stability. These values are accordingly not reliable for cultivar selection. Individual regression lines for 2014/14 are shown in Figure 1 and for cultivars evaluated in 2012/13 and 2013/14 in Figure 2.

The yield stability of cultivars varied nearly nine fold among cultivars. Cultivars which had exceptionally high stabilities (D-parameter  $\leq 0.03$ ) were, AGSUN 8251, PAN 7033, PAN 7100, PAN 7102CLP AND SY 4200.

### **Yield probability**

The yield probability of a cultivar, is the probability of exceeding the mean yield of all cultivars at a particular yield potential. The yield probabilities of all 20 cultivars for 2013/14 are shown in Table 11. It takes account of both the the cultivar X environment interaction and the yield stability and is therefore a reliable measure for cultivar choice. Yield probabilities higher than 50% are shown in bold print in Table 11 and indicates which cultivars would be a sensible choice at the various yield potentials.

The yield probabilities of 14 cultivars evaluated in 34 trials in 2012/13 and 2013/14, are shown in Table 12. Tables 11 and 12 should be used jointly for cultivar selection.

### **Acknowledgements**

Funding from the Oil and Protein Seed Development Trust is acknowledged.

### **References**

LOUBSER, H.L. & GRIMBEEK, C.L., 1984. Cultivarevaluasie: 'n vergelyking tussen verskillende legnieke. In: Notule van vergadering gehou deur die ondersoekkomitee na cultivarprogramme by die NIGG te Potchefstroom.

**Table 1 Cultivars evaluated, seed germination rate and supplier company 2013/2014**

Cultivar	Germinated (%)*			Company
	Normal	Abnormal	Dormant/dead	
<b>Agsun 5264</b>	<b>91</b>	<b>7</b>	<b>2</b>	<b>Agricol ♦</b>
<b>Agsun 5270</b>	<b>97</b>	<b>3</b>	<b>0</b>	
<b>Agsun 5271</b>	<b>87</b>	<b>11</b>	<b>2</b>	
<b>Agsun 5278</b>	<b>96</b>	<b>4</b>	<b>0</b>	
<b>Agsun 5279</b>	<b>93</b>	<b>6</b>	<b>1</b>	
<b>Agsun 8251</b>	<b>97</b>	<b>2</b>	<b>1</b>	
<b>CAP 4000</b>	<b>93</b>	<b>5</b>	<b>2</b>	<b>Capstone ♦</b>
<b>PAN 7033</b>	<b>96</b>	<b>3</b>	<b>1</b>	<b>Pannar •</b>
<b>PAN 7049</b>	<b>95</b>	<b>4</b>	<b>1</b>	
<b>PAN 7057</b>	<b>95</b>	<b>4</b>	<b>1</b>	
<b>PAN 7080</b>	<b>98</b>	<b>2</b>	<b>0</b>	
<b>PAN 7098</b>	<b>99</b>	<b>1</b>	<b>0</b>	
<b>PAN 7100</b>	<b>96</b>	<b>3</b>	<b>1</b>	
<b>PAN 7095CL</b>	<b>97</b>	<b>1</b>	<b>2</b>	
<b>PAN 7101CL</b>	<b>89</b>	<b>4</b>	<b>7</b>	
<b>PAN 7102CLP</b>	<b>97</b>	<b>2</b>	<b>1</b>	
<b>PHB 65A25</b>	<b>94</b>	<b>3</b>	<b>3</b>	
<b>PHB 65A70</b>	<b>94</b>	<b>5</b>	<b>1</b>	
<b>SY4200</b>	<b>98</b>	<b>1</b>	<b>1</b>	<b>Syngenta ■</b>
<b>SY4045</b>	<b>89</b>	<b>7</b>	<b>4</b>	

\* According to ISTA rules

**Table 2 Collaborating company, trial localities and responsible co-workers 2013/2014**

Company	Localities	Planting dates	Co-workers	Address of co-workers
Agricol •	Boskop	04/01/2014		
	Kroonstad	14/12/2013		
	Ottobsdal	13/12/2013	J Swanepoel	PO Box 6645, Baillie Park, 2526
	Wesseksbron	27/11/2013		
	Vijjoenskroon	20/12/2013		
ARC-GCI ▲		03/11/2013		
	Polchefstroom	06/12/2013	W Deale	P/Bag X1251, Polchefstroom, 2520
		09/01/2014		
		20/01/2014		
Capstone ♦	Bethlehem	31/12/2013	G Willemse	P O Box 302, Howick, 3290.
	Bainsvlei	20/11/2013		
PANINAR •	Delmas	06/11/2013		
	Lichtenburg	09/01/2014	L Schoonraad/ R Lochner	PO Box 439, Delmas, 2210
	Senekal	20/12/2013		
	Settlers X 2	16/01/2014		
	Wesseksbron	11/12/2013		
Pioneer ♦	Gerdaau	13/12/2013	P Fourie	Ouispan House, OR Tambo 64, Polchefstroom, 2531
Syngenta ■	Settlers	09/01/2014	F van Deventer	Private Bag X60, Halfway House, 1685

**Table 3 Trial site information 2013/2014**

Locality	Planting date	Plant population	Soil classification	Top soil analysis (mg kg <sup>-1</sup> )				Fertiliser applied (kg ha <sup>-1</sup> )	Row width (cm)	Weed- and insecticides	Net p to t size (µm)	
				pH (KCl)	P	K	Ca					Mg
Rainfed ●	06/11/13	40,000	Rainfed	4.3	12.6	166.3	343	131	91	N 4, P 2, K 1	Mechanical	16.36
Bichilem †	31/12/13	42,000	-	-	-	-	-	-	91	-	-	12.74
Bostup †	04/01/14	-	-	-	-	-	-	-	-	-	-	-
Delmas ●	06/11/13	-	-	-	-	-	-	-	-	-	-	-
Gezrau †	13/12/13	-	-	-	-	-	-	-	-	-	-	-
Kronstad †	14/12/13	40,000	Acacia	5	20	120	300	15	91	21 organic lime	Absorb, Razer, Gallant, Alliance	13.65
Lichtenburg †	14/12/13	36,000	-	5	15	-	-	-	91	N 45, P 10, K 0	S-Metolator, mechanical	9.1
Clifford †	-	-	-	-	-	-	-	-	-	-	-	-
Polchelskum †	13/11/13	35,000	Washed	6.06	31	233	655	345	90	N 44, P 6, K 4	Amax 480 CS	14.4
Polchelskum †	6/12/13	35,000	Washed	6.38	25	126	1050	463	90	N 44, P 6, K 4	Amax 480 CS	14.4
Polchelskum †	09/01/14	35,000	Acacia	5.98	33	125	693	375	90	N 44, P 6, K 4	Amax 480 CS	14.4
Polchelskum †	20/11/14	35,000	Acacia	6.17	37	275	1006	413	90	N 44, P 6, K 4	Amax 480 CS	14.4
Skatal ●	-	-	-	-	-	-	-	-	-	-	-	-
Seffers ●	09/01/14	26,500	Acacia	5.1	1.21	200.9	2513	503.2	100	-	-	14
Seffers ●	16/01/14	40,000	Acacia	5.9	3	300	6010	1760	91	70 kg MAP	Metolator	13.65
Seffers ●	16/01/14	40,000	Acacia	5.9	3	300	6010	1760	91	70 kg MAP	Metolator	13.65
Wasselara ●	27/11/13	-	-	-	-	-	-	-	-	-	-	-
Wasselara ●	11/12/13	40,000	-	-	-	-	-	-	91	N 62, P 13, K 0 + 1.51 organic lime	Effland Metagon, Karale	16.03
Vijayakum †	20/12/13	-	-	-	-	-	-	-	-	-	-	-

† ● Agricut, ▲ ARC-GCI, † Capstone, ● Pammar, † Pioneer, † Syngenta

**Table 4 Number of days from planting to 50 percent flowering of cultivars at selected localities and planting dates 2013/2014**

Cultivar	Locality and planting date											Mean
	Boskop 16/12/2013 <sup>‡</sup>	Boskop 04/01/2014 <sup>‡</sup>	Gedau 13/12/2013 <sup>®</sup>	Kroonstad 14/12/2013 <sup>‡</sup>	Lichtenburg 14/12/2013 <sup>®</sup>	Ottosdal 13/12/2013 <sup>‡</sup>	Potchefstroom 13-11-2013 <sup>‡</sup>	Potchefstroom 06/12/13 <sup>‡</sup>	Potchefstroom 09/01/2014 <sup>‡</sup>	Potchefstroom 20/01/2014 <sup>‡</sup>	Wijenskrone 20/12/2013 <sup>‡</sup>	
AGSUN 5284	65	64	68	64	66	66	68	67	68	70	68	68
AGSUN 5270	68	62	73	67	70	67	68	68	67	69	63	67
AGSUN 5271	68	63	74	67	70	68	68	70	67	70	64	68
AGSUN 5278	68	65	68	64	67	68	68	67	74	74	64	67
AGSUN 5279	65	62	74	68	71	67	68	68	67	69	64	67
AGSUN 8251	68	64	68	64	66	67	67	73	73	73	64	67
CAP 4000	68	64	75	68	71	68	68	71	72	74	64	69
PAN 7033	65	64	73	68	69	68	68	67	73	74	65	68
PAN 7049	68	64	71	67	69	67	68	68	71	72	64	67
PAN 7057	68	63	72	67	70	67	68	67	72	72	64	68
PAN 7080	68	64	72	67	70	67	68	70	72	74	68	68
PAN 7088	65	64	73	68	70	68	68	71	74	71	65	68
PAN 7100	65	63	70	67	69	67	68	68	71	72	63	67
PAN 7085CL	68	62	73	64	69	67	68	70	71	71	68	67
PAN 7101CL	68	64	75	68	71	68	68	72	72	69	68	68
PAN 7102CLP	64	62	67	68	67	68	68	64	67	71	63	65
PHB 85A25	68	65	73	64	69	67	68	71	75	71	65	68
PHB 85A70	64	61	68	65	67	65	68	67	68	71	63	68
SY 4200	65	62	74	68	70	67	68	68	75	75	65	68
SY 4045	63	60	63	62	63	61	62	64	64	64	63	62
Mean	68	63	71	66	69	67	68	68	71	71	62	64

<sup>‡</sup> Agricut ▲ ARC-GCI; <sup>®</sup> Capstone; <sup>®</sup> Pannar; <sup>®</sup> Pioneer; <sup>■</sup> Syngenta.



**Table 5 The moisture free seed oil concentration (%) of cultivars at selected localities 2013/2014**

Cultivar	Locality												Mean
	Bainsvel 20/11/2013	Booskop 04/01/2014	Delmas 06/11/2013	Kroonstad 14/12/2013	Lichtenburg 09/01/2014	Ottedal 13/12/2013	Potchefstroom 3/11/2013	Potchefstroom 20/1/2014	Senekal 20/12/2013	Setlers 16/01/2014	Wesselsbron 11/12/2013	Viljoenskroon 20/12/2013	
Agusan 5284	48.1	47.3	45.7	48.0	41.3	47.3	48.8	45.0	48.3	43.3	48.4	48.8	46.5
Agusan 5270	38.5	44.8	44.0	45.7	42.5	42.8	44.7	40.3	48.4	40.7	44.2	44.5	43.4
Agusan 5271	45.0	43.8	42.7	41.0	40.4	38.0	48.5	36.1		38.8	41.5	43.4	41.8
Agusan 5278	42.5	40.4	40.8	42.3	38.0	40.8	48.6	40.7	43.5	38.8	38.4	41.3	41.3
Agusan 5278	45.8	44.0	42.1	41.0	41.3	41.4	43.1	38.7	44.4	42.8	38.2	41.4	42.1
Agusan 5251	51.1	41.0	42.7	43.4	38.7	36.8	48.1	30.8	44.6	38.8	40.3	42.0	41.8
CAP 4000	42.5	41.3	42.1	38.5	38.7	40.5	48.0	43.1	43.5	40.0	37.3	40.0	41.4
PAN 7083	45.0	42.8	42.3	40.0	38.6	38.8	48.5	36.8	40.8	36.7	37.4	41.8	40.7
PAN 7049	44.4	42.8	42.8	40.2	38.8	41.2	52.8	40.2	43.3	40.8	40.6	41.8	42.5
PAN 7057	34.7	43.8	43.4	41.0	40.2	41.7	50.4	37.7	45.4	38.8	40.4	42.3	41.7
PAN 7080	48.1	42.2	42.1	41.8	38.2	41.8	51.6	38.1	41.7	38.5	40.8	41.8	42.2
PAN 7088	43.7	46.4	42.3	38.7	38.0	41.2	48.6	37.5	41.6	38.5	38.8	39.5	41.8
PAN 7100	48.6	40.3	44.6	43.0	41.7	44.3	47.3	38.3	47.6	41.8	38.4	44.1	43.3
PAN 7085CL	44.1	43.4	42.1	38.8	38.3	41.0	45.3	37.8	43.8	38.5	38.8	42.8	41.5
PAN 7101CL	41.8	42.0	40.8	38.7	37.1	38.7	40.6	37.7	41.6	33.8	38.8	42.2	38.7
PAN 7102CLP	44.8	36.5	43.2	44.1	38.3	42.8	44.8	38.1	45.8	38.7	42.0	43.8	42.0
PHB 85A25	43.2	48.4	44.0	44.0	42.5	48.3	48.5	41.8	48.4	45.1	48.7	48.4	45.4
PHB 85A70	43.7	41.4	43.5	43.5	40.0	40.3	48.2	40.8	43.8	41.4	43.8	41.8	42.5
SY4200	51.4	50.1	43.5	43.5	41.3	43.1	52.8	38.3		44.8	43.8	44.8	45.2
SY40M5	47.1	41.2	43.5	43.5	40.0	41.2	47.2	38.2	45.5	41.4	43.8	41.2	42.5
Mean	44.72	43.08	42.82	42.24	38.8	41.84	47.83	38.85	45.5	40.21	40.87	42.71	42.4

\* a, Agrest; Δ ABC-GCI; † Dapdang; e Panmar; ‡ Phases; § Syngenta.

**Table 6 The moisture free seed protein concentration (%) of cultivars at selected localities 2013/2014**

Cultivar	Locality												Mean
	Bellevue 20/11/2013	Boekop 04/01/2014	Delmas 06/11/2013	Kroonstad 14/12/2013	Lichtenburg 09/01/2014	Oteodal 13/12/2013	Potchefstroom 3/11/2013	Potchefstroom 20/1/2014	Senekal 20/12/2013	Setters 16/01/2014	Wesselsbron 11/12/2013	Viljoenskroon 20/12/2013	
Agsun 5264	18.8	19.3	18.8	16.9	18.6	18.9	10.4	21.9	16.1	17.6	19.9	17.8	17.8
Agsun 5270	17.1	17.8	17.8	13.9	18.2	18.6	10.7	20.2	14.4	17.0	16.7	18.9	18.4
Agsun 5271	18.1	17.5	17.2	17.3	20.0	18.5	10.4	21.0		17.8	16.8	16.8	17.2
Agsun 5276	17.4	18.4	17.5	18.9	20.1	18.0	10.8	21.0	14.8	18.2	18.8	17.6	17.1
Agsun 5279	19.2	17.7	17.8	17.7	18.4	15.0	10.9	18.9	15.1	17.8	18.7	17.2	17.0
Agsun 8251	17.2	17.6	18.0	13.9	18.4	18.1	10.0	22.3	14.1	18.3	18.5	17.2	18.9
CAP 4000	19.8	18.7	17.4	16.9	20.2	15.7	10.1	20.8	15.9	17.0	20.3	17.8	17.5
PAN 7033	17.4	17.3	17.5	18.3	20.0	14.8	10.8	21.0	14.0	18.8	18.8	17.4	18.8
PAN 7049	16.8	16.9	17.0	14.3	18.8	14.5	12.2	20.1	12.8	17.3	16.8	16.2	16.2
PAN 7057	17.7	18.6	17.3	16.5	18.9	15.1	11.5	20.1	13.4	18.7	17.2	18.5	18.5
PAN 7080	17.1	18.8	17.8	14.6	20.8	15.4	11.0	19.9	14.8	17.5	16.7	18.3	16.7
PAN 7088	17.5	18.0	16.9	15.7	18.5	14.6	11.8	20.2	13.5	18.9	16.8	17.2	18.3
PAN 7100	17.9	17.3	17.5	15.2	20.4	15.1	11.0	19.8	13.5	17.6	18.7	18.9	16.7
PAN 7085CL	18.9	19.0	17.0	17.3	20.3	18.0	11.3	19.5	14.4	18.2	17.3	17.4	17.1
PAN 7101CL	17.8	17.7	17.5	15.3	20.8	15.2	10.9	20.7	15.7	18.5	17.4	16.4	16.8
PAN 7102CLP	18.0	18.9	17.9	14.0	18.0	18.7	11.3	19.6	13.8	18.5	17.4	18.3	18.5
PHB 65A25	19.3	17.0	18.0	15.4	21.0	18.6	11.2	19.2	14.1	18.6	18.3	18.1	17.1
PHB 65A70	17.2	18.1	17.7	18.2	18.2	17.3	10.5	18.4	14.9	18.1	16.7	18.9	18.7
SY4200	18.0	18.3	18.8	17.0	22.3	15.8	11.3	19.9		18.4	18.8	17.4	17.6
SY4045	16.9	21.1	18.9	14.8	21.4	15.7	12.7	18.7	14.7	18.3	20.3	18.2	17.3
Mean	17.9	17.9	17.8	15.8	18.8	16.0	11.0	20.2	14.4	18.8	18.1	17.0	17.0

\* = Agrico, & ARC-GCT, † Capetown, ‡ Pannar, § Pannar, ¶ Syngenta

**Table 7 Mean seed yield (t ha<sup>-1</sup>) of cultivars at each locality 2013/2014**

Cultivar	Locality														Mean					
	Bainsvlei 20/11/2013	Bethlehem 3/11/2013	Boskop 04/01/2014	Delmas 06/11/2013	Gerdau 13/12/2013	Kroonstad 14/12/2013	Lechtenburg 09/01/2014	Ottosdal 13/12/2013	Potchefstroom 3/11/2013	Potchefstroom 06/12/2013	Potchefstroom 09/01/2014	Potchefstroom 20/1/2014	Senekal 20/12/2013	Setters 09/01/2014		Setters 16/01/2014	Setters 16/01/2014	Wesselsbron 27/11/2013	Wesselsbron 11/12/2013	Villieuskroon 20/12/2013
Agriant 52014	2.15	1.45	3.31	2.71	2.81	2.45	1.83	2.23	1.87	2.27	1.93	1.78	1.86	1.88	1.45	1.67	2.52	3.55	3.81	2.27
Agriant 5270	3.02	1.07	3.98	2.47	2.42	2.48	2.40	3.47	2.28	1.77	2.12	1.75	2.09	1.78	2.05	1.87	2.84	3.65	4.08	2.51
Agriant 5271	3.00	1.10	3.87	2.38	2.47	2.71	2.26	3.20	1.93	2.04	2.14	1.88	2.00	1.85	1.57	1.81	2.88	3.83	3.70	2.46
Agriant 5278	2.50	1.16	3.83	3.01	2.81	2.51	2.44	3.25	1.88	1.65	2.16	1.58	2.09	1.88	1.85	1.85	2.54	3.14	3.88	2.42
Agriant 5279	2.81	1.24	4.08	2.50	2.12	2.52	2.03	3.07	1.78	2.03	2.20	1.88	2.47	1.78	2.01	1.81	2.88	3.34	3.87	2.43
Agriant 8251	2.77	1.21	3.88	2.87	3.02	2.82	2.38	2.88	1.81	2.06	2.18	1.58	1.82	1.73	2.03	1.85	2.88	3.83	3.82	2.50
CAP 4000	2.88	1.18	3.17	2.57	2.88	2.15	2.05	2.52	1.88	2.04	1.88	1.71	2.42	1.71	1.86	1.88	2.43	3.78	3.73	2.35
PAN 7033	2.88	1.37	3.72	2.28	2.88	2.87	2.08	2.88	2.85	1.82	2.18	1.45	2.81	1.82	1.80	2.00	2.88	3.32	3.83	2.38
PAN 7048	3.23	1.38	3.81	2.85	2.54	2.58	1.88	2.88	2.25	2.07	2.30	1.78	2.17	2.11	2.23	2.37	2.87	3.55	3.81	2.58
PAN 7057	2.57	1.17	3.85	2.85	2.53	2.50	1.94	3.15	2.21	2.15	1.84	1.88	2.10	1.75	2.21	2.18	2.44	2.88	4.00	2.42
PAN 7080	3.21	1.34	3.87	2.74	3.55	2.48	2.40	3.13	1.87	2.06	2.18	1.85	2.84	1.81	1.87	1.88	2.85	3.50	4.11	2.81
PAN 7085	2.70	1.20	4.10	3.17	2.42	2.80	1.88	3.38	1.88	2.03	2.01	1.78	1.88	1.78	2.31	1.85	3.13	3.85	3.88	2.54
PAN 7100	2.58	1.42	3.80	2.83	2.70	2.51	2.37	3.21	2.11	2.08	2.27	1.91	2.58	1.80	2.03	2.08	2.82	3.16	3.58	2.53
PAN 7085CL	3.25	1.13	3.52	3.41	3.88	2.47	2.12	2.57	1.88	2.04	1.88	1.85	2.87	1.87	1.78	1.88	2.38	3.72	3.73	2.48
PAN 7101CL	3.38	1.13	3.58	2.73	3.85	2.43	1.77	2.38	1.88	1.88	1.77	1.55	2.18	1.38	1.33	1.88	2.78	2.84	3.18	2.28
PAN 7102CLP	2.34	1.38	3.42	2.88	2.88	2.28	2.28	2.58	2.88	2.14	2.18	1.88	2.81	1.88	1.88	1.84	2.38	3.08	3.85	2.35
PHB 65425	2.83	0.85	3.35	2.24	3.14	2.28	2.58	2.15	1.85	2.15	1.70	1.51	1.73	1.83	1.88	1.88	2.47	3.82	3.11	2.28
PHB 65430	2.77	1.31	3.45	2.81	2.58	2.47	2.17	2.58	2.11	2.08	2.18	1.87	1.88	1.82	1.48	1.88	2.88	3.85	3.15	2.34
SY4200	2.46	1.11	3.38	2.80	2.88	2.30	2.21	2.28	1.82	2.25	1.88	1.83	2.21	1.55	1.84	1.74	2.35	3.31	3.71	2.31
SY4845	2.58	1.15	3.81	2.73	2.88	1.88	1.73	1.23	1.88	2.38	2.20	1.83	1.42	2.88	2.14	2.11	2.14	2.58	2.58	2.13
Mean	2.78	1.22	3.88	2.73	2.78	2.44	2.14	2.75	1.88	2.05	2.18	1.71	2.15	1.78	1.88	1.81	2.84	3.42	3.85	
CV	12	17	8	11	11	10	18	12	11	7	8	8	18	14	18	18	13	14	14	8

. = Agritoot, ▲ ARC-GCT, † Capshane, v Panzer, ‡ Panzer, § Spangela

**Table B Oil yield (t ha<sup>-1</sup>) of cultivars at selected localities 2013/2014**

Cultivar	Locality													Mean
	Bainslei 20/11/2013	Boskop 04/01/2014	Demas 06/11/2013	Kroonstad 14/12/2013	Lichtenburg 09/01/2014	Ottosdal 13/12/2013	Potchefstroom 3/11/2013	Potchefstroom 20/12/2014	Senekal 20/12/2013	Setters 16/01/2014	Weeselsbron 11/12/2013	Viljoenskroon 20/12/2013		
Agsum 5284	1.00	1.57	1.24	1.18	0.76	1.05	0.91	0.79	0.92	0.72	1.05	1.00	1.13	
Agsum 5270	1.19	1.79	1.09	1.13	1.02	1.40	1.02	0.71	0.97	0.72	1.02	1.51	1.21	
Agsum 5271	1.35	1.70	1.02	1.11	0.91	1.25	0.94	0.88	0.90	0.72	1.59	1.01	1.07	
Agsum 5278	1.08	1.55	1.23	1.06	0.93	1.32	0.81	0.65	0.91	0.72	1.21	1.59	1.09	
Agsum 5279	1.33	1.79	1.05	1.03	0.84	1.27	0.77	0.73	1.10	0.76	1.31	1.04	1.14	
Agsum 8251	1.42	1.59	1.27	1.14	0.95	1.06	0.83	0.48	0.81	0.68	1.58	1.05	1.12	
CAP 4000	1.14	1.31	1.08	0.85	0.79	1.02	0.90	0.74	1.05	0.68	1.41	1.49	1.04	
PAN 7033	1.20	1.59	0.87	1.07	0.81	1.06	0.95	0.54	0.82	0.67	1.24	1.00	1.04	
PAN 7048	1.43	1.67	1.27	1.03	0.73	1.23	1.19	0.71	0.94	0.88	1.45	1.51	1.17	
PAN 7057	0.89	1.09	1.15	1.03	0.75	1.31	1.11	0.70	0.95	0.68	1.06	1.09	1.09	
PAN 7080	1.54	1.03	1.15	1.04	0.92	1.31	1.02	0.63	1.23	0.74	1.43	1.72	1.20	
PAN 7088	1.18	1.80	1.34	1.03	0.74	1.35	0.99	0.67	0.83	0.68	1.55	1.57	1.16	
PAN 7100	1.21	1.57	1.31	1.06	0.99	1.42	1.00	0.73	1.22	0.75	1.25	1.58	1.17	
PAN 7085CL	1.43	1.53	1.44	0.98	0.83	1.05	0.90	0.62	1.28	0.68	1.44	1.00	1.15	
PAN 7101CL	1.42	1.50	1.11	0.96	0.66	0.95	0.73	0.58	0.91	0.47	1.14	1.33	0.98	
PAN 7102CLP	1.05	1.25	1.15	1.00	0.90	1.11	0.92	0.72	0.92	0.73	1.30	1.00	1.05	
PT-B 85A25	1.27	1.55	0.99	1.00	1.10	1.00	0.82	0.63	0.85	0.67	1.09	1.44	1.10	
PT-B 85A70	1.21	1.43	1.14	1.07	0.87	1.04	0.97	0.68	0.87	0.67	1.02	1.32	1.07	
SY4200	1.26	1.70	1.22	1.00	0.91	0.96	1.02	0.62	0.90	0.68	1.45	1.00	1.04	
SY4045	1.22	1.24	1.19	0.81	0.69	0.51	0.89	0.72	0.65	0.63	1.02	1.06	0.90	
Mean	1.24	1.58	1.17	1.03	0.86	1.14	0.93	0.67	0.98	0.72	1.40	1.50		

\* = Agilent, ▲ ARC-GCL, ◆ Capstone, ♣ Panvar, # Pioneer, # Syngenta

**Table 9 Parameters calculated from the analysis of variance for yield data at each locality 2013/2014**

Locality	Mean (t/ha)	SE (t/ha)	CV (%)	GCV (%)	t	SE(t)	tn
Bainsvlei 20/11/2013 *	2.79	0.19	12	10	0.39	0.14	0.66
Bethlehem 31/12/2013 †	1.22	0.12	17	5	0.08	0.14	0.20
Boskop 04/01/2014 ‡	3.06	0.19	9	7	0.35	0.15	0.62
Delmas 06/11/2013 •	2.73	0.17	11	8	0.41	0.14	0.67
Gerdau 13/12/2013 ◊	2.79	0.18	11	10	0.45	0.14	0.71
Kroonstad 14/12/2013 †	2.44	0.14	10	8	0.25	0.15	0.50
Lichtenburg 09/01/2014 •	2.14	0.09	18	4	0.08	0.14	0.15
Ottosdal 13/12/2013 †	2.75	0.19	12	18	0.71	0.09	0.88
Potchefstroom 13/11/2013 ▲	1.86	0.12	11	7	0.28	0.15	0.54
Potchefstroom 08/12/2013 ▲	2.05	0.08	7	7	0.52	0.13	0.77
Potchefstroom 09/01/2014 ▲	2.06	0.11	9	8	0.30	0.15	0.57
Potchefstroom 20/01/2014 ▲	1.71	0.08	8	7	0.42	0.14	0.60
Senekal 20/12/2013 •	2.15	0.20	18	14	0.42	0.14	0.60
Settlers 09/01/2014 ◻	1.78	0.14	14	4	0.08	0.14	0.21
Settlers 16/01/2014 •	1.81	0.19	18	<1	<0.01	0.13	<0.01
Settlers 16/01/2014 •	1.89	0.19	18	10	0.25	0.15	0.50
Viljoenskroon 20/12/2013 †	3.05	0.20	9	8	0.49	0.13	0.74
Wesselsbron 11/12/2013 •	3.42	0.28	14	8	0.22	0.15	0.46
Wesselsbron 27/11/2013 †	2.84	0.20	13	8	0.18	0.15	0.37

SE : Standard error of trial mean  
 CV : Error coefficient of variation  
 GCV : Genetic coefficient of variation  
 t : Intra class correlation

SE(t) : Standard error of t  
 tn : Repeatability of cultivar mean  
 r : Not used for calculation of reliability

▲ Agrilaid; ▲ ARC-GCI; † Capstone; ‡ Pannar; ◊ Pioneer; • Syngenta

**Table 10 Regression line coordinates at different yield targets 2013/2014**

Cultivar	Yield potential (t ha <sup>-1</sup> )						Mean (t ha <sup>-1</sup> )	Inter-cept	Slope	D-parameter
	1	1.5	2	2.5	3	3.5				
Agrium 5204	0.95	1.42	1.89	2.36	2.83	3.30	2.27	0.009	0.941	0.06
Agrium 5270	0.87	1.45	2.04	2.62	3.20	3.78	2.51	-0.296	1.166	0.06
Agrium 5271	0.87	1.43	2.00	2.56	3.13	3.69	2.46	-0.259	1.129	0.05
Agrium 5278	0.90	1.44	1.98	2.52	3.06	3.60	2.42	-0.182	1.081	0.05
Agrium 5279	0.92	1.46	1.99	2.53	3.07	3.61	2.43	-0.153	1.074	0.07
Agrium 8251	0.84	1.42	2.01	2.60	3.19	3.78	2.50	-0.345	1.180	0.02
CAP 4000	0.98	1.47	1.96	2.44	2.93	3.42	2.35	0.011	0.973	0.04
PAN 7033	0.98	1.48	1.98	2.47	2.97	3.47	2.38	-0.014	0.995	0.03
PAN 7049	1.21	1.69	2.17	2.65	3.12	3.60	2.56	0.248	0.959	0.04
PAN 7057	1.10	1.57	2.04	2.50	2.97	3.44	2.42	0.168	0.934	0.08
PAN 7080	1.00	1.58	2.15	2.72	3.29	3.86	2.61	-0.139	1.144	0.06
PAN 7088	0.86	1.46	2.06	2.65	3.25	3.85	2.54	-0.337	1.196	0.07
PAN 7100	1.25	1.70	2.16	2.61	3.07	3.52	2.53	0.343	0.908	0.03
PAN 7085GL	0.95	1.50	2.04	2.59	3.13	3.68	2.49	-0.135	1.090	0.08
PAN 7101GL	0.83	1.34	1.85	2.36	2.87	3.38	2.26	-0.196	1.022	0.09
PAN 7102GLP	1.17	1.59	2.01	2.43	2.85	3.27	2.35	0.326	0.842	0.02
PHB 85A25	0.95	1.42	1.89	2.36	2.84	3.31	2.28	0.010	0.942	0.10
PHB 85A70	1.03	1.50	1.96	2.43	2.89	3.36	2.34	0.105	0.929	0.04
SY4200	0.94	1.43	1.91	2.40	2.89	3.38	2.31	-0.034	0.975	0.03
SY4045	1.39	1.66	1.92	2.18	2.44	2.70	2.13	0.872	0.522	0.17

**Table 11 Yield probability (%) of cultivars 2013/14**

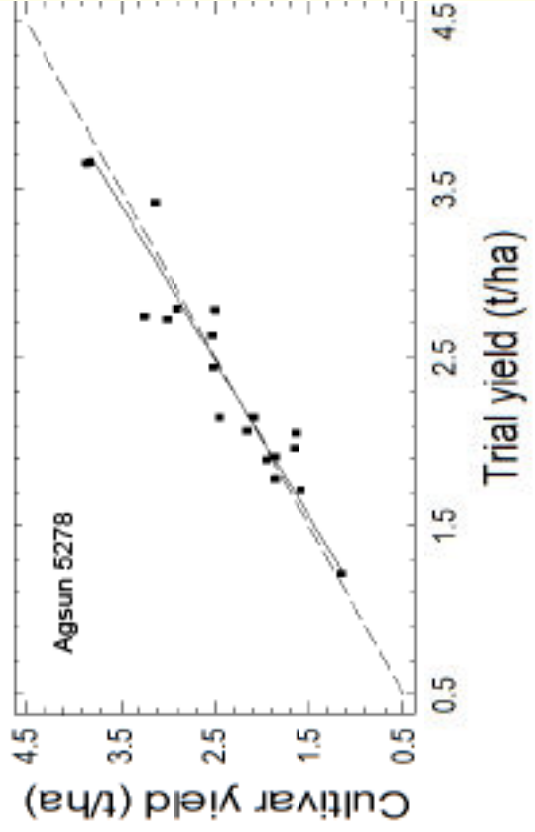
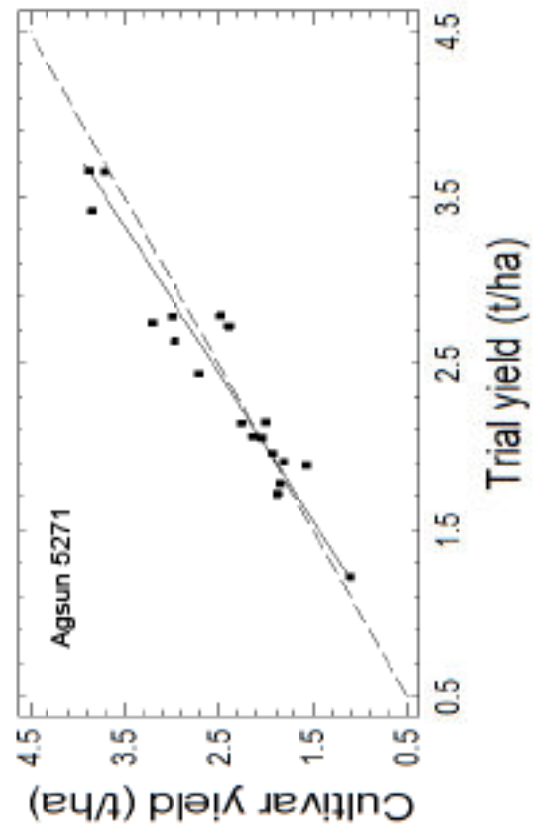
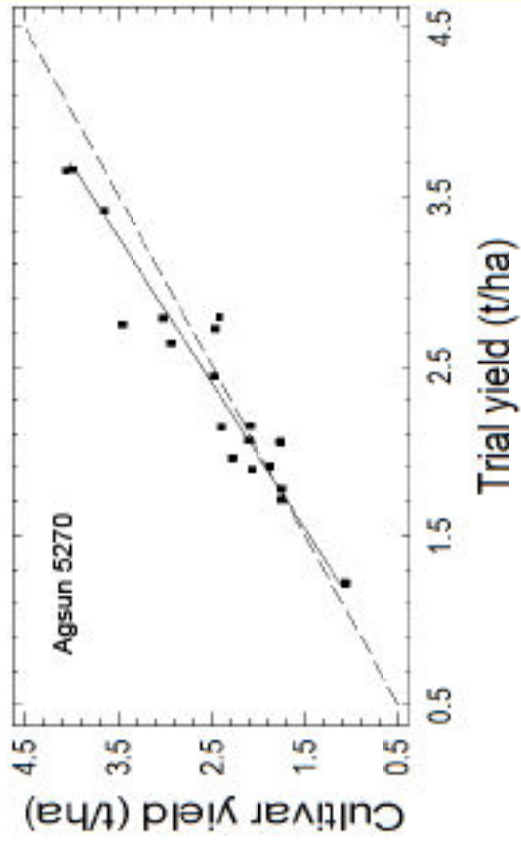
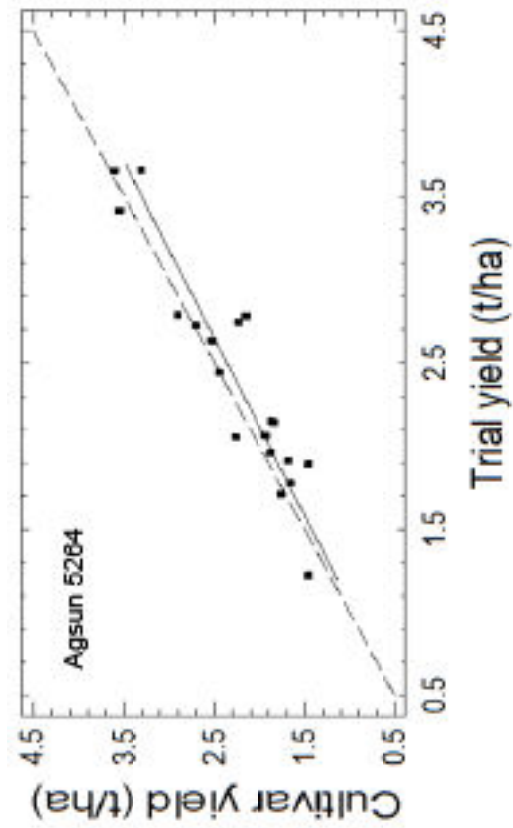
Cultivar	Yield potential (t ha <sup>-1</sup> )					
	1	1.5	2	2.5	3	3.5
Agsun 5284	42	38	33	28	25	22
Agsun 5270	31	43	56	68	79	86
Agsun 5271	30	38	50	68	70	78
Agsun 5278	34	40	47	53	60	66
Agsun 5279	38	43	49	55	61	66
Agsun 8251	21	35	53	71	84	92
CAP 4000	47	45	42	40	37	36
PAN 7033	47	48	48	45	45	44
PAN 7049	81	79	77	74	71	67
PAN 7057	64	60	55	50	45	41
PAN 7080	51	62	73	81	88	92
PAN 7088	30	43	59	73	84	91
PAN 7100	87	83	78	71	62	54
PAN 7085CL	44	50	57	63	69	74
PAN 7101CL	27	28	29	30	32	34
PAN 7102CLP	80	66	52	38	27	18
PHB B5A25	43	40	38	34	31	29
PHB B5A70	56	50	44	39	34	30
SY4200	39	37	36	34	33	32
SY4045	89	68	41	19	8	3

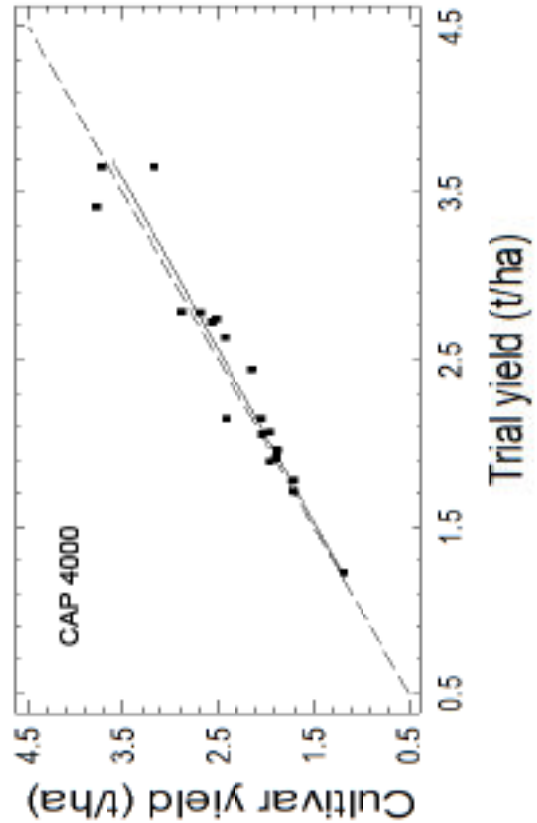
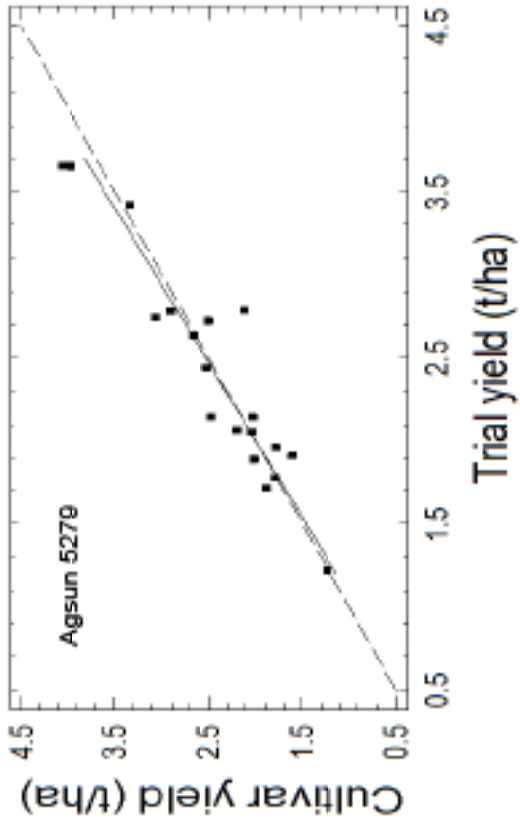
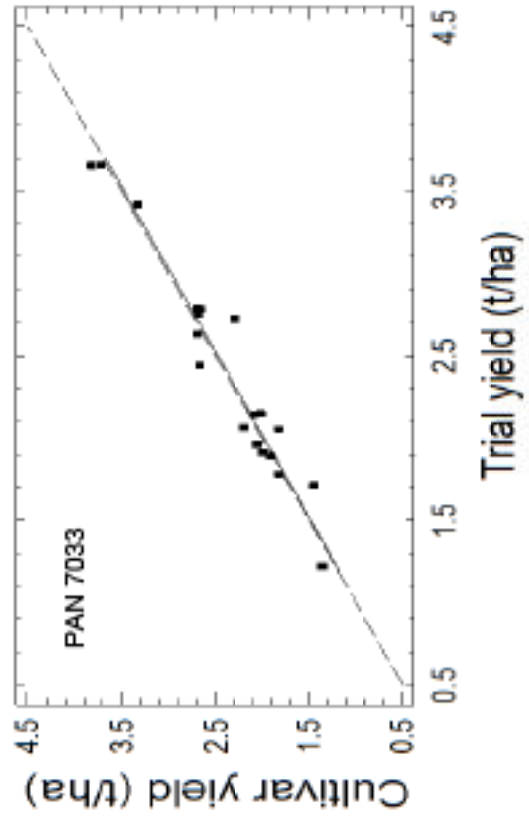
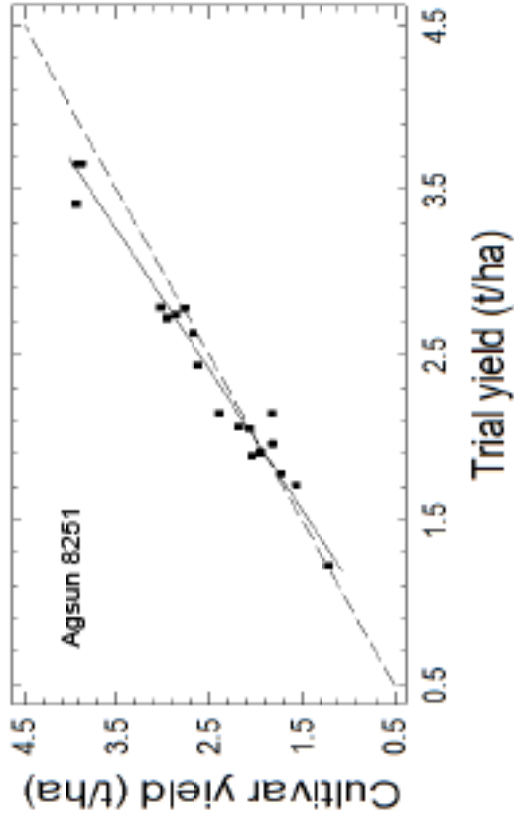
**Table 12 Yield probability (%) of cultivars 2012/13 and 2013/14**

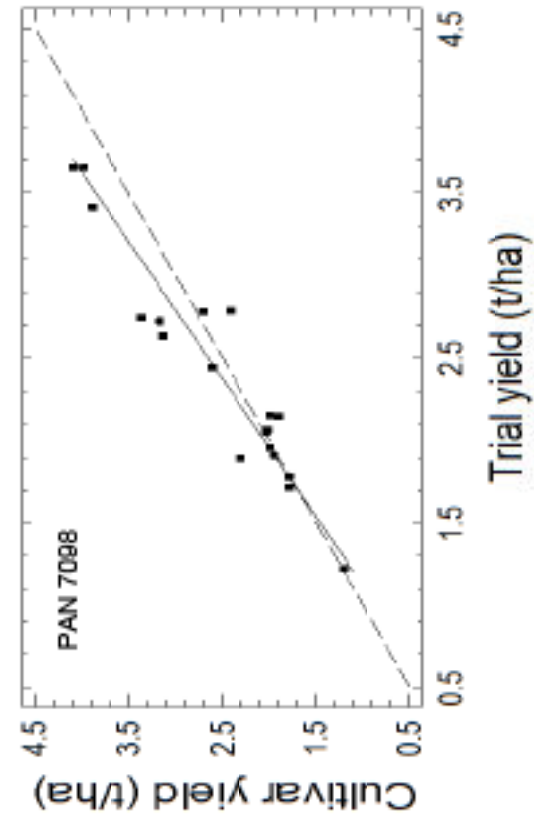
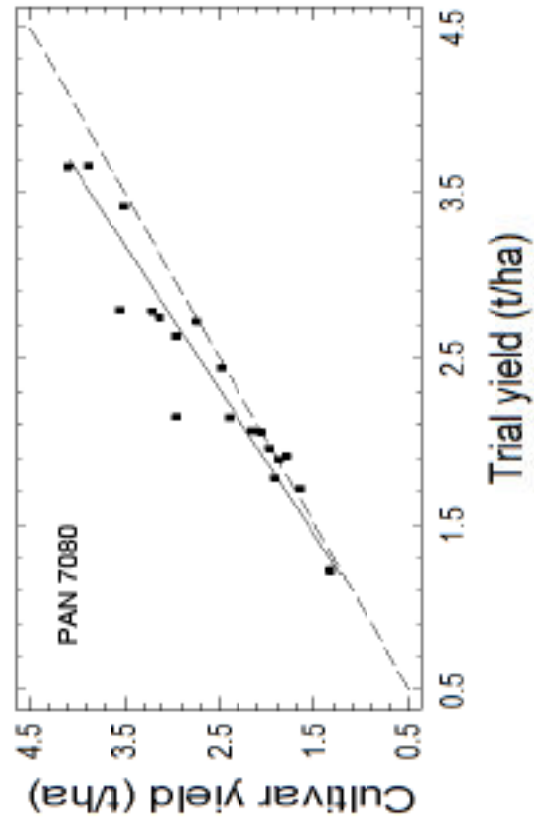
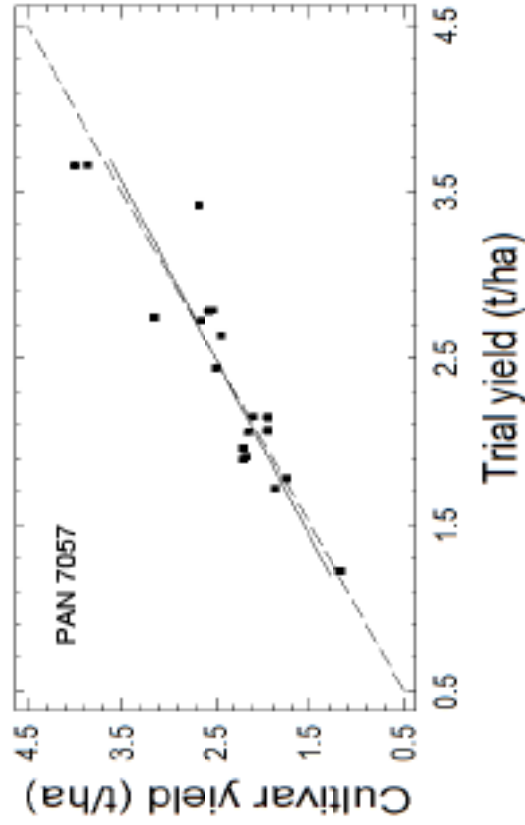
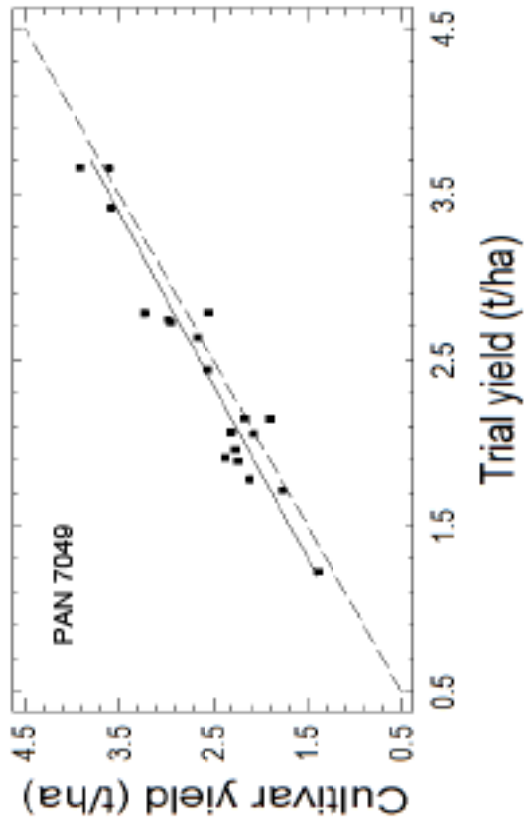
Cultivar	Yield potential (t ha <sup>-1</sup> )						
	1	1.5	2	2.5	3	3.5	
AGSUN 5264	45	40	35	31	27	24	
AGSUN 5270	43	55	67	77	85	90	
AGSUN 5271	30	39	50	62	72	80	
AGSUN 5278	56	57	59	60	61	62	
AGSUN 8251	45	55	66	75	83	88	
CAP4000	28	23	19	18	13	12	
PAN 7033	51	49	47	45	43	42	
PAN 7049	61	66	70	74	78	80	
PAN 7057	54	53	52	51	49	48	
PAN 7080	57	68	78	85	91	94	
PAN 7095CL	72	71	70	69	67	65	
PNR 65A25	48	38	31	25	20	17	
SY 4045	78	60	38	19	8	3	
SY 4200	43	38	30	24	20	17	

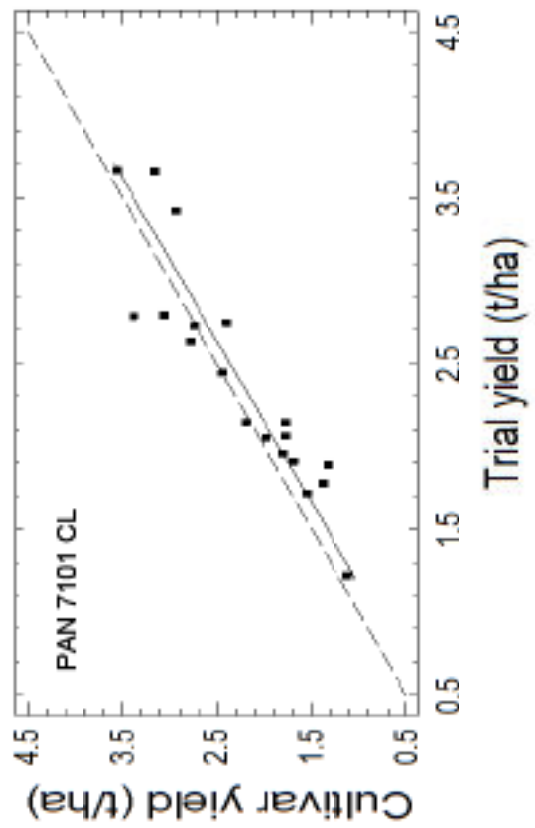
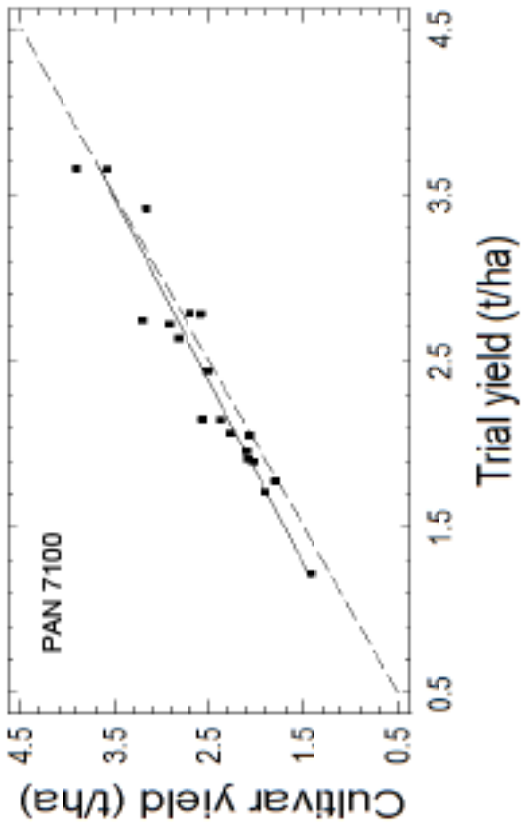
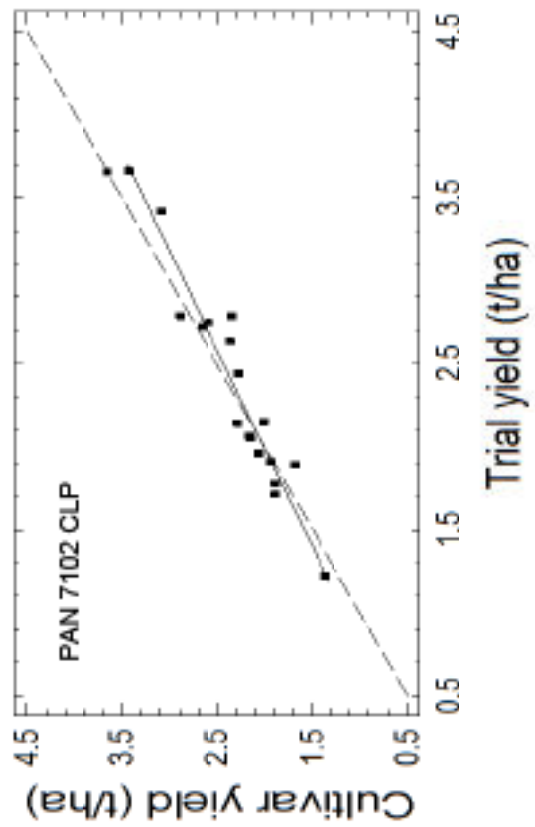
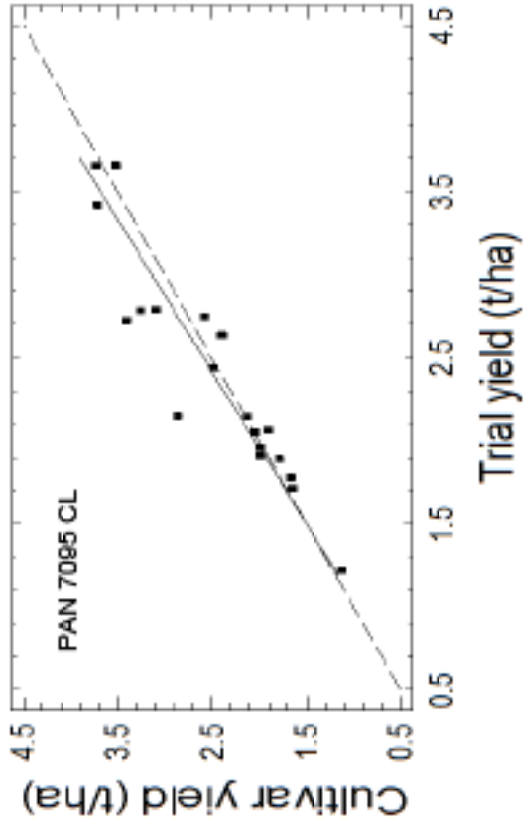


Figure 1: Regression lines for cultivars 2013/2014









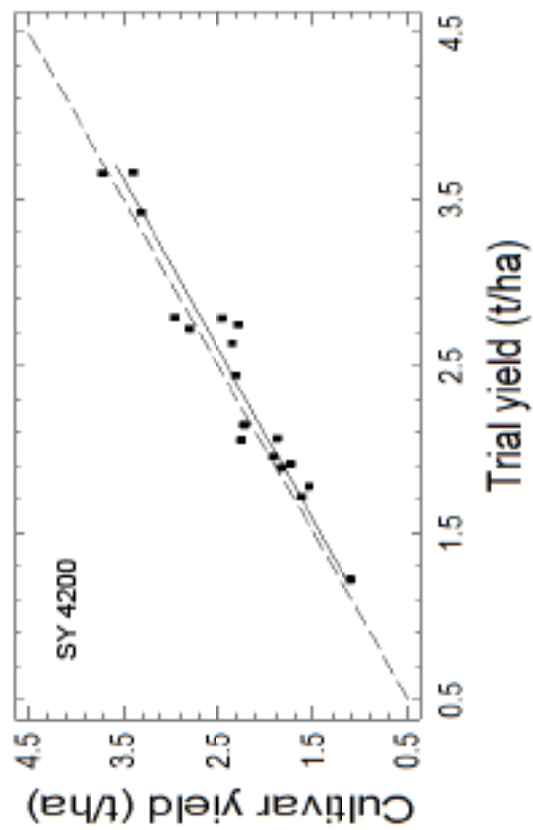
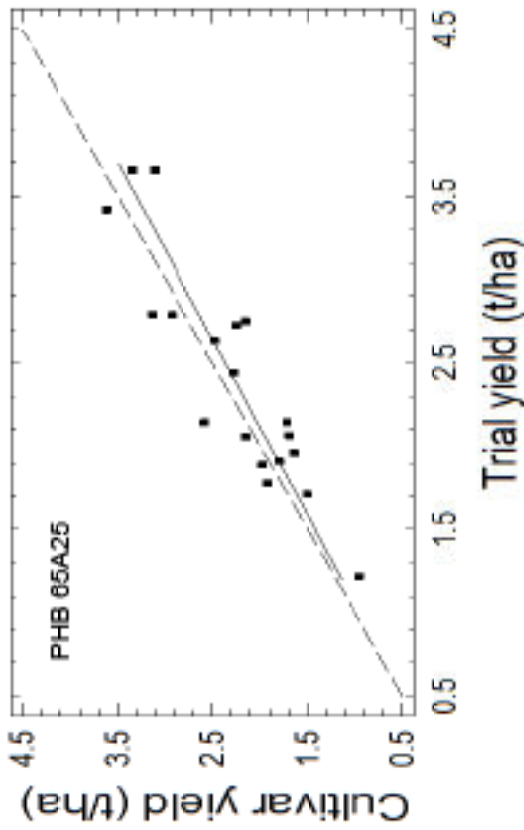
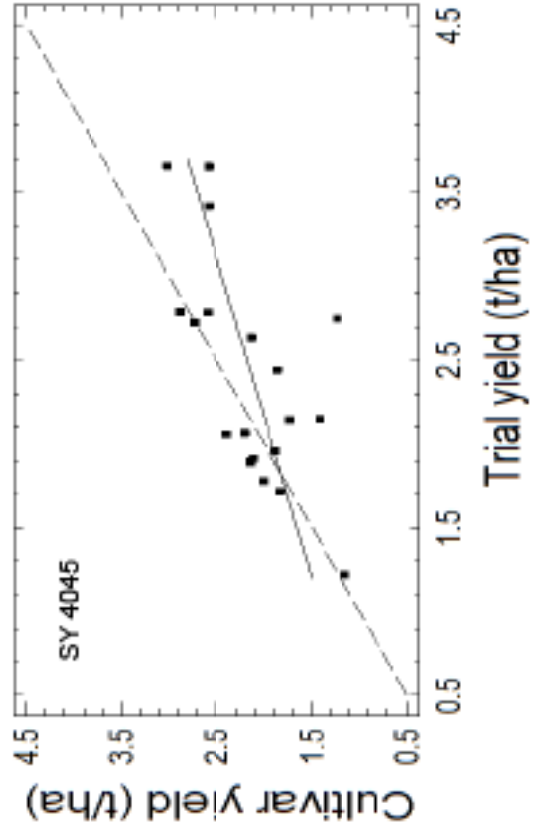
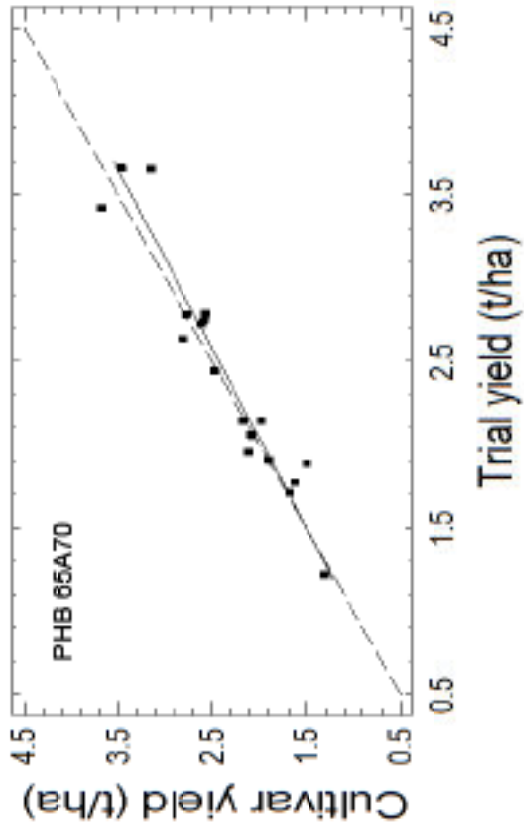
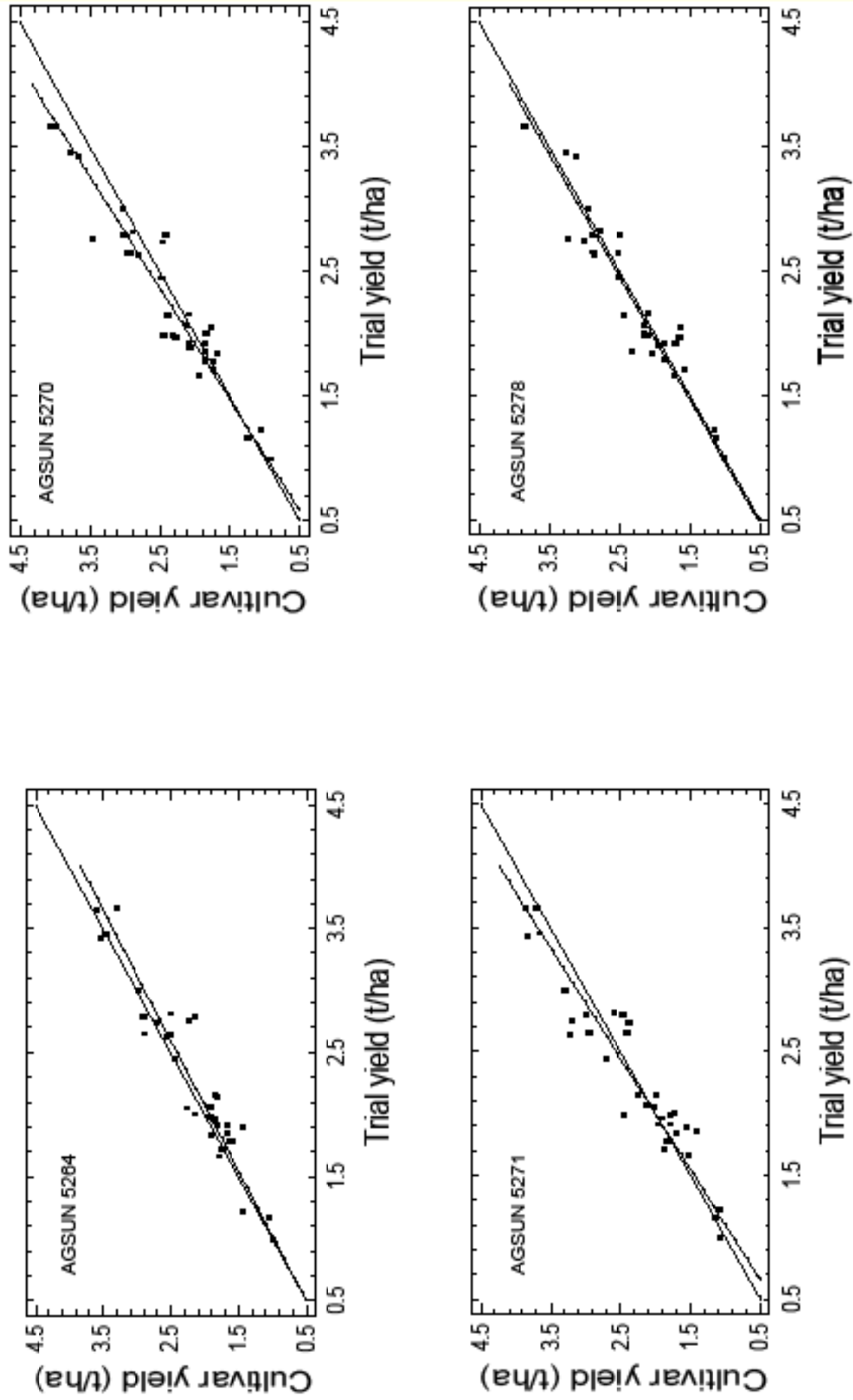
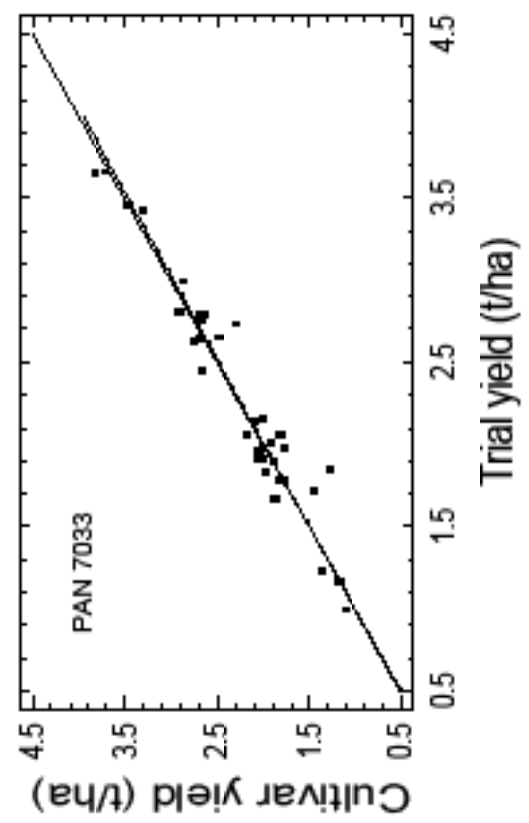
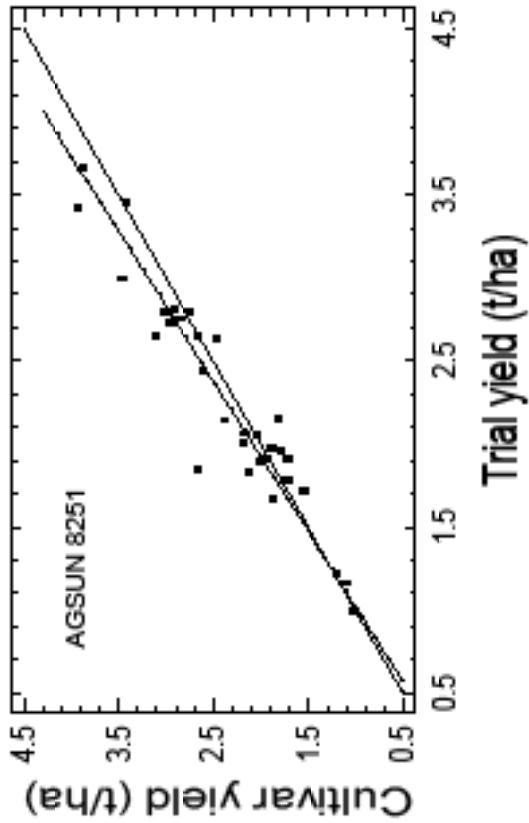
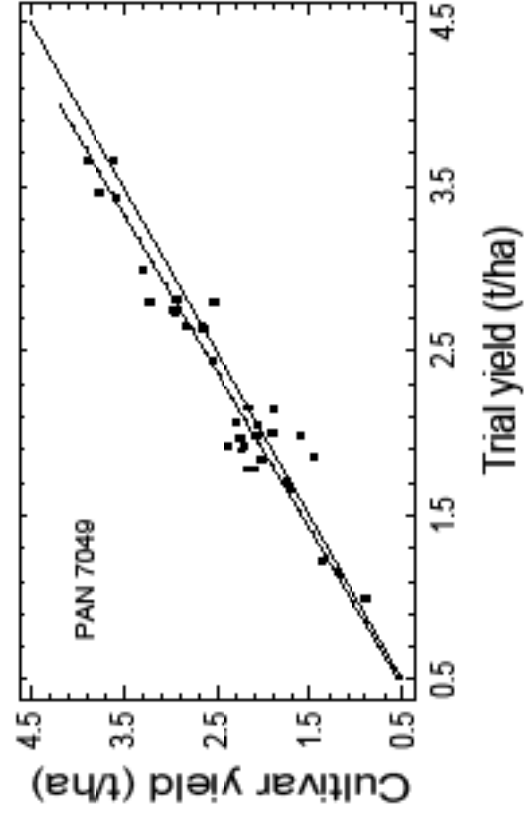
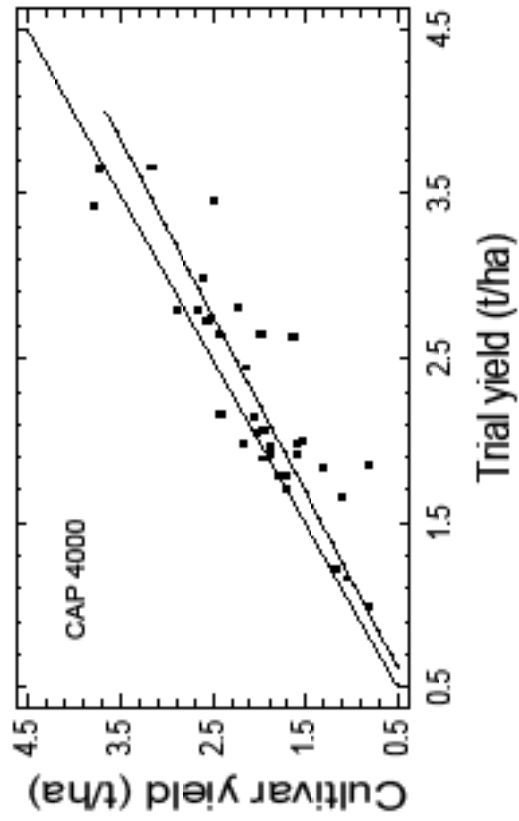
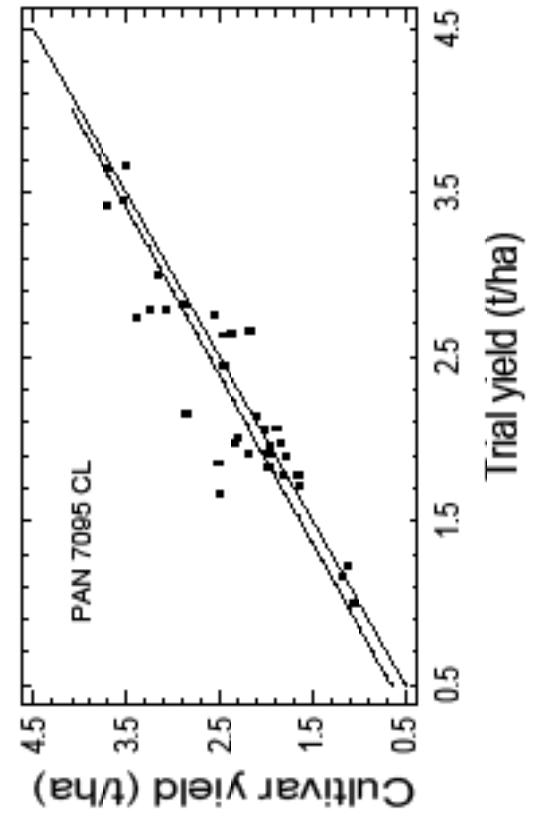
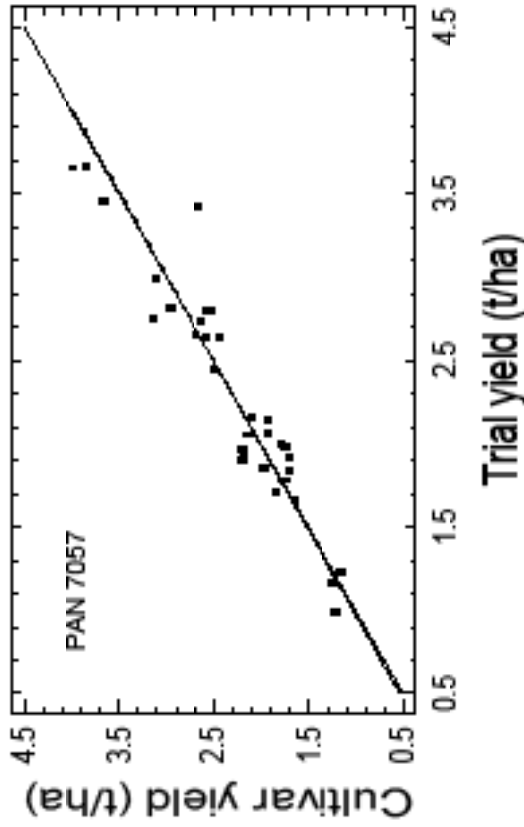
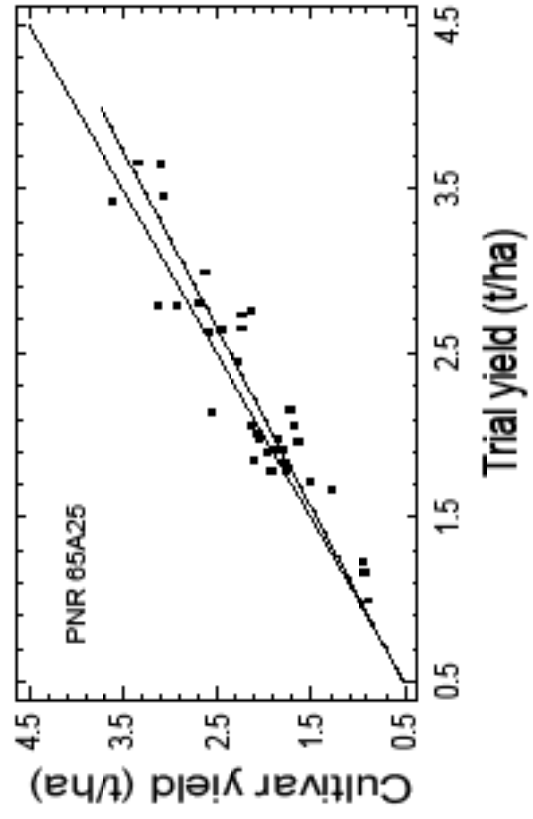
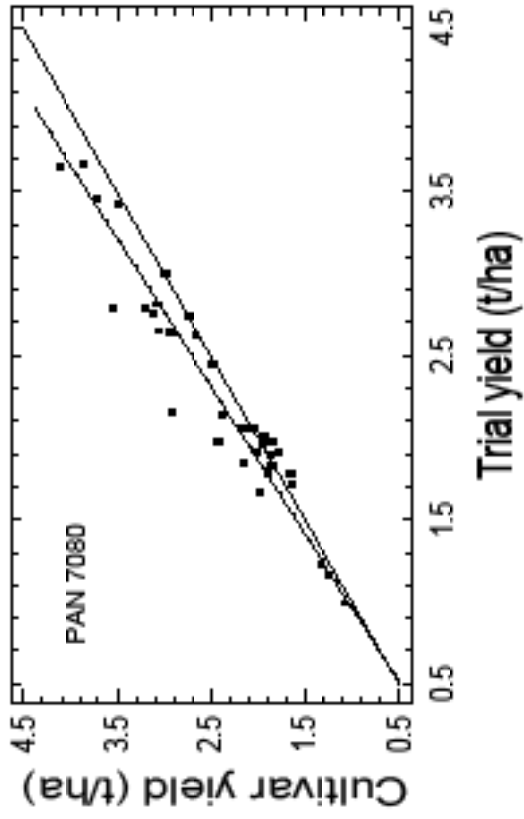


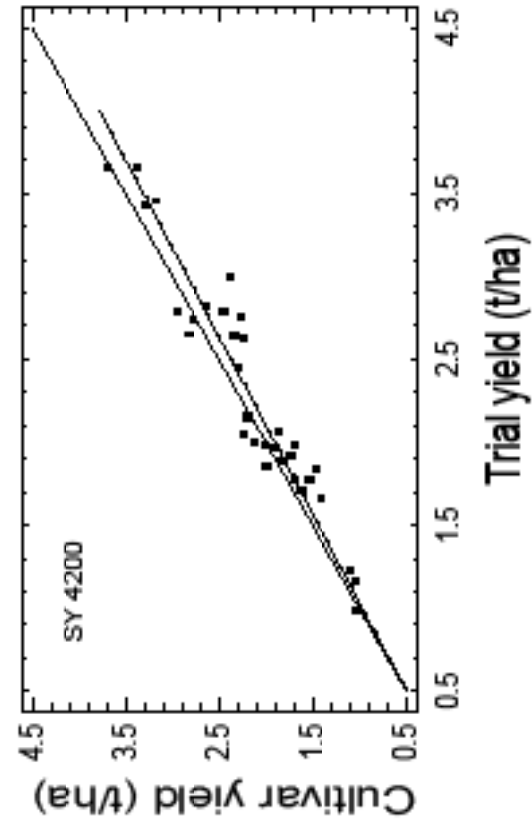
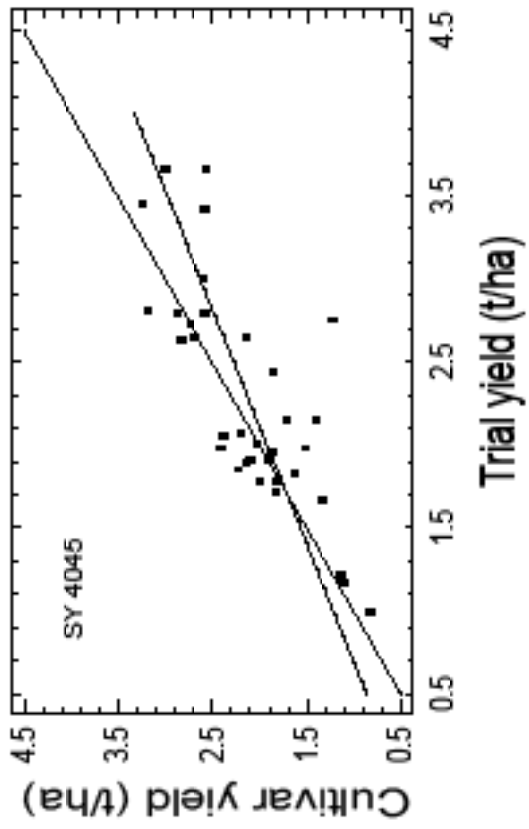
Figure 2: Regression lines for cultivars 2012/2013 and 2013/2014











No. R. 493

8 May 2009

AGRICULTURAL PRODUCT STANDARDS ACT, 1990  
(ACT No. 119 OF 1990)

**REGULATIONS RELATING TO THE GRADING, PACKING AND MARKING OF SUNFLOWER SEED  
INTENDED FOR SALE IN THE REPUBLIC OF SOUTH AFRICA**

The Minister of Agriculture has, under section 15 of the Agricultural Product Standards Act, 1990 (Act No. 119 of 1990) –

- (a) made the regulations in the Schedule; and
- (b) determined that the said regulations shall come into operation on the date of publication thereof.

**SCHEDULE**

**Definitions**

1. In these regulations any word or expression to which a meaning has been assigned in the Act, shall have that meaning and, unless the context otherwise indicates –

"bag" means a bag manufactured from –

- (a) jute or phormium or a mixture of jute and phormium; or
- (b) polypropylene that complies with SABS specification CKS632;

"bulk container" means any vehicle or container in which bulk sunflower seed is transported or stored;

"consignment" means –

- (a) a quantity of sunflower seeds of the same class, which belongs to the same owner, delivered at any one time under cover of the same consignment note, delivery note or receipt note, or delivered by the same vehicle or bulk container, or loaded from the same bin of a grain elevator or from a ship's hold; or
- (b) in the case where a quantity referred to in paragraph (a), is subdivided into a grade, each such quantity of such grade;

"container" means a bag or a bulk container;

"cultivar list" means the list of cultivars determined from time to time by the Executive Officer: Agricultural Product Standards and which is obtainable from the Executive Officer: Agricultural Product Standards, Private Bag X258, Pretoria, 0001;

"damaged sunflower seed" means sunflower seeds or portions thereof of which the nucleus is visibly discoloured as a result of external heat or heating due to internal fermentation;

"foreign matter" means –

- (a) loose and empty shells above the sieve that occur in the consignment concerned;
- (b) all matter other than glass, dung, coal, stones, metal, screenings, sclerotinia, sunflower seed and the nucleus of sunflower seed that occur in the consignment concerned;

"insect" means any live insect that is injurious to stored sunflower seed irrespective of the stage of development of the insect;

"poisonous seeds" means seeds or part of seeds of plant species that may in terms of the Foodstuffs, Cosmetics and Disinfectants Act, 1972 (Act No. 54 of 1972), represent a hazard to human or animal health when consumed, including seeds of *Argemone mexicana* L., *Convolvulus* spp., *Crotalaria* spp., *Datura* spp., *Ipomoea* spp., *Lolium temulentum*, *Ricinus communis* or *Xanthium* spp.;

"sclerotinia" *Sclerotinia sclerotiorum* is a fungus that produces hard masses of fungi tissue and is also known as sclerotinia. The sclerotinia varies in size and form and consists of a dark black exterior, a white interior and a rough surface texture;

"screenings" means all material that passes through the standard sieve;

"standard sieve" is a slotted sieve –

- (a) with a flat bottom of metal sheet of 1,0 mm thickness with apertures 12,7 mm long and 1,8 mm wide with rounded ends ( $\pm 0,03$  mm). The spacing between the slots in the same row must be 2,43 mm wide and the spacing between the rows of slots must be 2,0 mm wide. The slots must be alternately oriented with a slot always opposite the solid inter segment of the next row of slots;
- (b) of which the upper surface of the sieve is smooth;
- (c) with a round frame of suitable material with an inner diameter of at least 300 mm and at least 50 mm high;
- (d) that fits onto a tray with a solid bottom and must be at least 20 mm above bottom of the tray;

"sunflower seed" means the achene of plants of *Helianthus annuus* (L); and

"the Act" means the Agricultural Product Standards Act, 1990 (Act No. 119 of 1990).

**Restriction on sale of sunflower seed**

2. (1) No person shall sell sunflower seed in the Republic of South Africa –
- (a) unless the sunflower seed is sold according to the classes set out in regulation 3
  - (b) unless the sunflower seed comply with the standards for the classes concerned set out in regulation 4;
  - (c) unless the sunflower seed, where applicable, comply with the grades of sunflower seed and the standards for grades set out in regulation 5 and 6 respectively;
  - (d) unless the sunflower seed is packed in accordance with the packing requirements set out in regulation 7;
  - (e) unless the container or sale documents, as the case may be, are marked in accordance with the marking requirements set out in regulation 8; and
  - (f) if such sunflower seed contains a substances that renders it unfit for human or animal consumption or for processing into or utilisation thereof as food or feed.

(2) The Executive Officer may grant written exemption, entirely or partially, to any person on such conditions as he or she may deem necessary, from the provisions of sub regulation (1). Provided that such exemption is done in terms of section 3(1)(c) of the Act.

**PART I  
QUALITY STANDARDS**

***Classes of sunflower seed***

3. Sunflower seed shall be classified as --
- (a) Class FH;
  - (b) Class FS; and
  - (c) Class Other Sunflower Seed.

***Standards for classes of sunflower seed***

4. (1) A consignment of sunflower seed shall --
- (a) be free from a musty, sour, khaki bush or other undesired odour;
  - (b) be free from any substance that renders it unsuitable for human or animal consumption or for processing into or utilisation as food or feed;
  - (c) contain not more poisonous seeds than permitted in terms of the Foodstuffs, Cosmetics and Disinfectants Act, 1972 (Act No. 54 of 1972);
  - (d) shall be free from glass, metal, coal or dung;
  - (e) with the exception of Class Other sunflower seed, be free from insects; and
  - (f) with the exception of Class Other sunflower seed, have a moisture content of not more than 10 per cent.
- (2) A consignment of sunflower seed shall be classified as --
- (a) Class FH if it --
    - (i) consists of at least 80 percent (m/m) sunflower seeds of a cultivar with a high oil content as specified in the cultivar list; and
    - (ii) Complies with the standard for Grade 1 set out in regulation 6.
  - (b) Class FS if it --
    - (i) consists of at least 80 percent (m/m) sunflower seeds of a cultivar with a low oil content as specified in the cultivar list; and
    - (ii) Complies with the standards for Grade 1 set out in regulation 6.
  - (c) Class Other Sunflower Seed if it does not comply with the requirements for Class FH or Class FS.

***Grades for sunflower seed***

5. (1) There is only one grade for the Classes FH and FS Sunflower Seeds, namely Grade 1.
- (2) No grades are determined for Class Other sunflower seed.

**Standards for grades of sunflower seed**

6. A consignment of Grade 1 sunflower seed shall be graded as:
- (a) Grade 1 if the nature of the deviation, specified in column 1 of Table 1 of the Annexure, in that consignment does not exceed the percentage specified in column 2 of the said table opposite the deviation concerned.

**PART II  
PACKING AND MARKING REQUIREMENTS****Packing requirements**

7. Sunflower seed of different classes and grades shall be packed in different containers or stored separately.

**Marking requirements**

8. Every container or the accompanying sale documents of a sunflower seed shall be marked or endorsed with the class and, where applicable, the grade of the sunflower seed.

**PART III  
SAMPLING****Obtaining a sample**

9. (1) A representative sample of a consignment of sunflower seed shall --
- (a) in the case of sunflower seed delivered in bags and subject to regulation 10, be obtained by sampling at least 10 per cent of the bags, chosen from that consignment at random, with a bag probe: Provided that at least 25 bags in a consignment shall be sampled and where a consignment consists of less than 25 bags, all the bags in that consignment shall be sampled; and
- (b) in the case of sunflower seed delivered in bulk and subject to regulation 10, be obtained by sampling that consignment throughout the whole depth of the layer, in at least six different places, chosen at random in that bulk quantity, with a bulk sampling apparatus.
- (2) The collective sample obtained in sub regulation (1)(a) or (b) shall --
- (a) have a total mass of at least 5 kg; and
- (b) be thoroughly mixed by means of dividing before further examination.
- (3) If it is suspected that that sample referred to in subregulation (1)(a) is not representative of that consignment, an additional five per cent of the remaining bags, chosen from that consignment at random, shall be emptied into a suitable bulk container and sampled in the manner contemplated in subregulation (1)(b).
- (4) A sample taken in terms of these regulations shall be deemed to be representative of the consignment from which it was taken.

**Sampling if contents differ**

10. (1) If, after an examination of the sunflower seed taken from different bags in a consignment in terms of regulation 9(1), it appears that the contents of those bags differ substantially --

- (a) the bags concerned shall be separated from each other;
- (b) all the bags in the consignment concerned shall be sampled in order to do such separation; and
- (c) each group of bags with similar contents in that consignment shall for the purpose of these regulations be deemed to be separate consignment.

(2) If, after the discharge of a consignment of sunflower seed in bulk has commenced, it is suspected that the consignment could be of a class or grade other than that determined by means of the initial sampling, the discharge shall immediately be stopped and that part of the consignment remaining in the bulk container, as well as the sunflower seed that is already in the collecting tray, shall be sampled anew with a bulk sampling apparatus or by catching at least 20 samples at regular intervals throughout the whole off loading period with a suitable container from the stream of sunflower seed that is flowing in bulk.

#### *Working sample*

11. (1) A working sample of sunflower seed shall be obtained by dividing the representative sample of the consignment according to the ICC 101/1 method.

### PART IV INSPECTION METHODS

#### *Determination of undesired smell, harmful substances, poisonous seeds, stones, glass, metal, coal, dung, and insect content*

12. A consignment or a sample of a consignment shall be assessed sensorially or chemically analysed in order to determine --

- (a) whether it has a musty, sour, khaki bush or other undesired smell;
- (b) whether it contains sunflower seed in or on which a substance occurs that renders it unsuitable for human or animal consumption or for processing into or utilization thereof as food or feed;
- (c) whether it contains poisonous seeds;
- (d) whether it contains stones, glass, metal, coal or dung; and
- (e) whether it contains any insects.

#### *Determination of moisture content*

13. The moisture content of a consignment of sunflower seed may be determined according to any suitable method: Provided that the result thus obtained is in accordance with the maximum permissible deviation for a class 1 moisture meter as detailed in ISO 7700/2, based upon results of the 72 hour, 103°C oven dried method [AACC Method 44-15A].

#### *Determination of percentage screenings*

14. The percentage screenings in a consignment of sunflower seed is determined as follows:

- (a) Obtain a working sample of at least 50 g from a representative sample of the consignment.

- (b) Place the sample on the standard sieve and screen the sample by moving the sieve 50 strokes to and fro, alternately away from and towards the operator of the sieve, in the same direction as the long axes of the slots of the sieve. Move the sieve, which rests on a table or other suitable smooth surface, 250 mm to 460 mm away from and towards the operator with each stroke. The prescribed 50 strokes must be completed within 50 to 60 seconds: Provided that the screening process may also be performed in some or other container or an automatic sieving apparatus.
- (c) Determine the mass of the material that has passed through the sieve and express it as percentage of the mass of the working sample.
- (d) Such percentage represents the percentage screenings in the consignment.

***Determination of percentage foreign matter***

15. The percentage foreign matter in a consignment sunflower seed shall be determined as follows:
- (a) Obtain a working sample of at least 20 g of a screened sample.
  - (b) Remove all foreign matter by hand and determine the mass thereof.
  - (c) Express the mass thus determined as a percentage of the mass of the working sample.
  - (d) Such a percentage represents the percentage foreign matter in the consignment.

***Determination of percentage sunflower seed of another class***

16. The percentage sunflower seed of another class in a consignment sunflower seed shall be determined as follows:
- (a) Remove all sunflower seeds of another class from the working sample in 15(a) obtained by hand and determine the mass thereof.
  - (b) Express the mass thus determined as a percentage of the working sample in 15(a) obtained.
  - (c) Such percentage represents the percentage sunflower seed of another class in the consignment.

***Determination of the percentage damaged sunflower seed***

17. The percentage damaged sunflower seed in a consignment sunflower seed shall be determined as follows:
- (a) Shell the seeds in the working sample in 15(a) obtained by hand or with a machine so that the nucleus portions thereof are retained.
  - (b) Remove all damaged sunflower seeds from the quantity thus shelled and determine the mass thereof.
  - (c) Express the mass thus determined as a percentage of the working sample in 15(a) obtained.
  - (d) Such a percentage represents the percentage damaged sunflower seed in the consignment.

***Determination of percentage sclerotinia***

18. The percentage sclerotinia in a consignment of sunflower seed shall be determined as follows:

- (a) Remove all sclerotinia in the working sample in 15(a) obtained by hand and determine the mass thereof.
- (b) Express the mass thus determined as a percentage of the working sample in 15(a) obtained.
- (c) Such a percentage represents the percentage sclerotinia in the consignment.

**PART IV  
OFFENCE AND PENALTIES**

19. Any person who contravenes or fails to comply with any provision of these regulations shall be guilty of an offence and upon conviction be liable to a fine or imprisonment in terms of section 11 of the Act.



## ANNEXURE/AANHANGSEL

TABLE1/TABEL1

STANDARDS FOR GRADES OF SUNFLOWER SEED/  
STANDAARDE VIR GRADE VAN SONNEBLOMSAAD

Deviation/Afwyking	Maximum permissible deviation/ Maksimum toelaatbare afwyking	
	Class/Klas FH	Class/Klas FS
	Grade1/Grade1	
1. Damaged sunflower seed/Beskadigde sonneblomsaad	10%	
2. Screenings/Sifsel	4%	
3. Sclerotinia	4%	
4. Foreign Matter/Vreemde voorwerpe	4%	
5. Deviation in 2,3 and 4 collectively: Provided that such deviations are individually within the limits of said items/Afwykinge in 2, 3 en 4 gesamentlik: Met dien verstande dat sodanige afwykinge individueel binne die perke van genoemde items is	6%	



agriculture

Department:  
Agriculture  
REPUBLIC OF SOUTH AFRICA

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SERIAL NO:  
DATE: 03 September 2009

Subject

**INDUSTRY-WIDE DISPENSATION: AMENDMENT OF REGULATIONS RELATING TO THE GRADING, PACKING AND MARKING OF SUNFLOWER INTENDED FOR SALE IN THE REPUBLIC OF SOUTH AFRICA.**

Please refer to your e-mail dated 28<sup>th</sup> August 2009

Permission is hereby granted by the Executive Officer: Agricultural Product Standards in terms of Section (3) of the Agricultural Product Standard Act, 1990 (Act No. 119 of 1990) to all producers, wholesalers, traders, retailers and importers of Sunflower, to sell and import Sunflower whereby regulation 4 (1) (d) is amended and replaced by the following:

"4 (1) (d). shall be free from glass, metal, coal, stones or dung".

This permission is subject to the following conditions:

- (a) All other conditions of the Regulations shall be complied with.
- (b) It may be withdrawn at any time should a valid complaint be received.
- (c) All producers, wholesalers, traders, retailers and importers of Sunflower indemnify this Directorate and the Department of any detrimental effect, financially or otherwise as a result of this permission.
- (d) Termination date: **Until the Regulation is reviewed.**

  
EXECUTIVE OFFICER:  
AGRICULTURAL PRODUCT STANDARDS ACT

Copies: Assistant Director: Quality Auditing North and South



