South African Sunflower Crop

Quality Report 2014/2015 Season

Index

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SOUTH AFRICAN
COMMERCIAL SUNFLOWER QUALITY FOR THE 2014/2015 SEASON

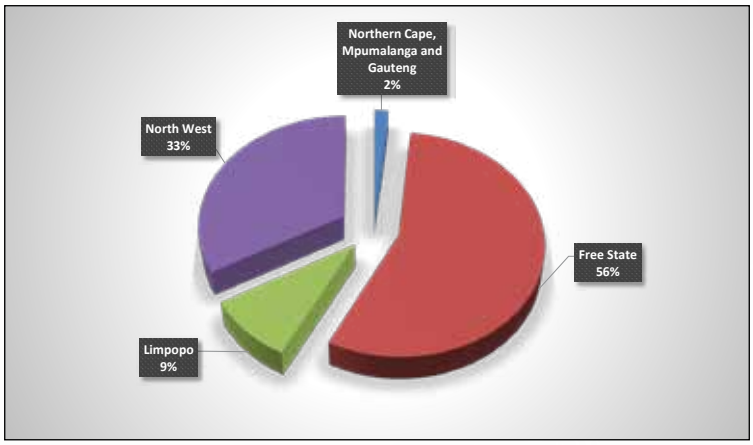
Acknowledgements
With gratitude to:

- ***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.*
- *The Crop Estimates Committee (CEC) of the Department of Agriculture, Forestry and Fisheries for providing production related figures.*
- *South African Grain Information Service (SAGIS) for providing supply and demand figures relating to sunflower.*

Introduction

The final commercial sunflower crop figure of the 2014/2015 season as overseen by the National Crop Estimates Liaison Committee (CELC) is 663 000 tons. The final calculated crop figure was slightly adjusted upward by 2 100 tons (0.32%). The commercial sunflower crop decreased by 20% (169 000 tons) compared to the 2013/2014 season as a result of drought conditions experienced. The major sunflower-producing provinces, namely the Free State and North West, contributed 89% of the total crop.

Graph 1: Contribution of the provinces to the production of the 2014/2015 sunflower crop



Figures 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 24. One hundred and seventy six composite sunflower samples, representing the different production regions, were analysed for quality. The samples were graded, milled and analysed for moisture, crude protein, crude fat, crude fibre and ash content.

This is the third 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 a number of proficiency testing schemes, both nationally and internationally, as part of our ongoing quality assurance procedures to demonstrate technical competency and international comparability.

The goal of this crop quality survey is the compilation of a detailed database, accumulating quality data collected over several seasons on the national commercial sunflower crop, which is essential in assisting with decision making processes. The data reveal general tendencies and highlight quality differences in the commercial sunflower produced in different local production regions.

The results of this survey are available on the SAGL website (www.sagl.co.za). The hard copy reports are distributed 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: 2014/2015 season conducted by the ARC-Grain Crops Institute in collaboration with Agricol, Pannar, Pioneer and Syngenta is also included in this report, as is the national grading regulations as published in the Government Gazette No. 45 of 22 January 2016.

Production

Sunflower seed production is very suitable for South African climatic conditions as sunflower plants are drought tolerant. The deep root system of a sunflower enables the plant to perform better than other crops during dry seasons. Crop rotation management should however be implemented as a result of the moisture being tapped out of the soil by this deep root system. Another advantage of sunflowers is that the plants grow much quicker than for example maize and can be planted later in the season when rainfall occurs late. Sunflower is currently the fourth largest grain crop produced in South Africa after maize, wheat and soybeans.

The area utilized for sunflower production decreased by almost 4% from 598 950 hectares in the previous season to 576 000 hectares this season. The yield decreased from 1.39 t/ha to 1.15 t/ha.

World oilseed production exceeded previous records for the second consecutive season during the 2014/2015 marketing year, mainly due to larger than expected soybean crops in Brazil and Argentina. Please see Table 1 for the world sunflower seed production figures.

Table 1: World Sunflower Seed Production

Season	2010/11	2011/12	2012/13	2013/14	2014/15 (Revised)	2015/16 (Forecast)
Area Harvested (1,000 Ha)	***23,923***	***25,856***	***25,470***	***25,730***	***24,447***	***24,755***
Yield (MT/Ha)	***1.40***	***1.53***	***1.40***	***1.68***	***1.67***	***1.67***
Production (1,000 MT)						
Argentina	3,665	3,775	2,850	2,250	2,800	3,000
European Union	6,975	8,323	7,018	9,105	8,879	7,758
China	1,710	1,700	1,730	2,423	2,380	2,350
Russia	5,820	9,500	8,000	10,200	9,100	9,600
Ukraine	8,000	9,500	8,387	10,941	10,000	11,200
United States	1,241	925	1,264	917	1,005	1,326
India	650	620	615	580	390	360
Turkey	1,020	940	1,100	1,450	1,200	1,150
Other	4,113	4,226	4,783	5,471	4,972	4,708
TOTAL	***33,572***	***39,509***	***35,747***	***43,337***	***40,726***	***41,452***

2015 U.S. Sunflower Crop Quality Report compiled by the National Sunflower Association.

According to *The Bureau for Food and Agricultural Policy (BFAP) Baseline, Agricultural Outlook 2015 – 2024*, sunflower plantings are projected to decline gradually over the next three to four years and then stabilize around 460 000 hectares as the expected growth in sunflower yields will be sufficient to keep the local market in fine balance. The increase in yields expected are due to the adoption of new technology like Clearfield hybrids as well as intensification of production practices. As a result, sunflower production will continue to gradually expand towards 2024.

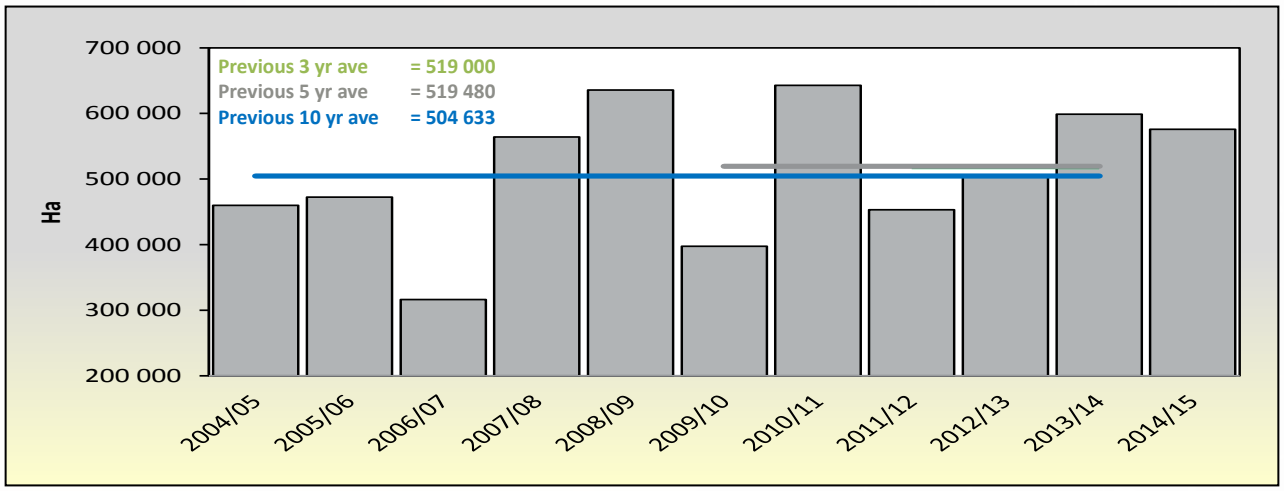
Please see Table 2 for an overview of sunflower production under dry land conditions versus irrigation in the 2014/2015 season, compared to the 2013/2014 season. Graphs 2 to 4 provide national figures with regards to hectares planted, tons produced and yields obtained over the last 11 seasons and Graphs 5 to 10 similar figures for the major sunflower producing provinces, namely the Free State, North West and Limpopo.

Table 2: Sunflower production overview over two seasons

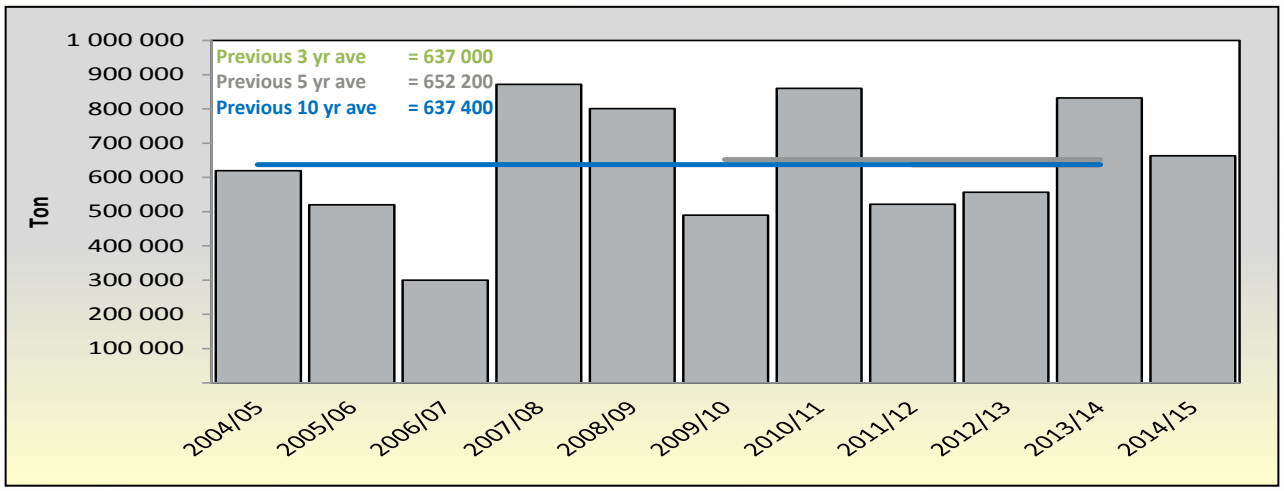
Province	Type of production	2014/2015			2013/2014		
		Hectares planted, ha	Crop, tons	Yield, t/ha	Hectares planted, ha	Crop, tons	Yield, t/ha
Western Cape	Dryland	-	-	-	-	-	-
	Irrigation	-	-	-	-	-	-
	Total	-	-	-	-	-	-
Northern Cape	Dryland	-	-	-	-	-	-
	Irrigation	500	500	1.00	900	450	0.50
	Total	500	500	1.00	900	450	0.50
Free State	Dryland	283 500	367 000	1.29	277 100	443 000	1.60
	Irrigation	1 500	3 500	2.33	2 900	5 000	1.72
	Total	285 000	370 500	1.30	280 000	448 000	1.60
Eastern Cape	Dryland	-	-	-	550	825	1.50
	Irrigation	-	-	-	-	-	-
	Total	-	-	-	550	825	1.50
KwaZulu-Natal	Dryland	-	-	-	-	-	-
	Irrigation	-	-	-	-	-	-
	Total	-	-	-	-	-	-
Mpumalanga	Dryland	2 500	3 300	1.32	3 500	4 550	1.30
	Irrigation	-	-	-	-	-	-
	Total	2 500	3 300	1.32	3 500	4 550	1.30
Limpopo	Dryland	81 300	59 900	0.74	89 100	74 250	0.83
	Irrigation	700	1 600	2.29	900	2 025	2.25
	Total	82 000	61 500	0.75	90 000	76 275	0.85
Gauteng	Dryland	5 500	5 775	1.05	2 550	3 000	1.18
	Irrigation	500	1 425	2.85	450	900	2.00
	Total	6 000	7 200	1.20	3 000	3 900	1.30
North West	Dryland	199 200	218 200	1.10	220 100	296 000	1.34
	Irrigation	800	1 800	2.25	900	2 000	2.22
	Total	200 000	220 000	1.10	221 000	298 000	1.35
RSA	Dryland	572 000	654 175	1.14	592 900	821 625	1.39
	Irrigation	4 000	8 825	2.21	6 050	10 375	1.71
	Total	576 000	663 000	1.15	598 950	832 000	1.39

Figures provided by the CEC.

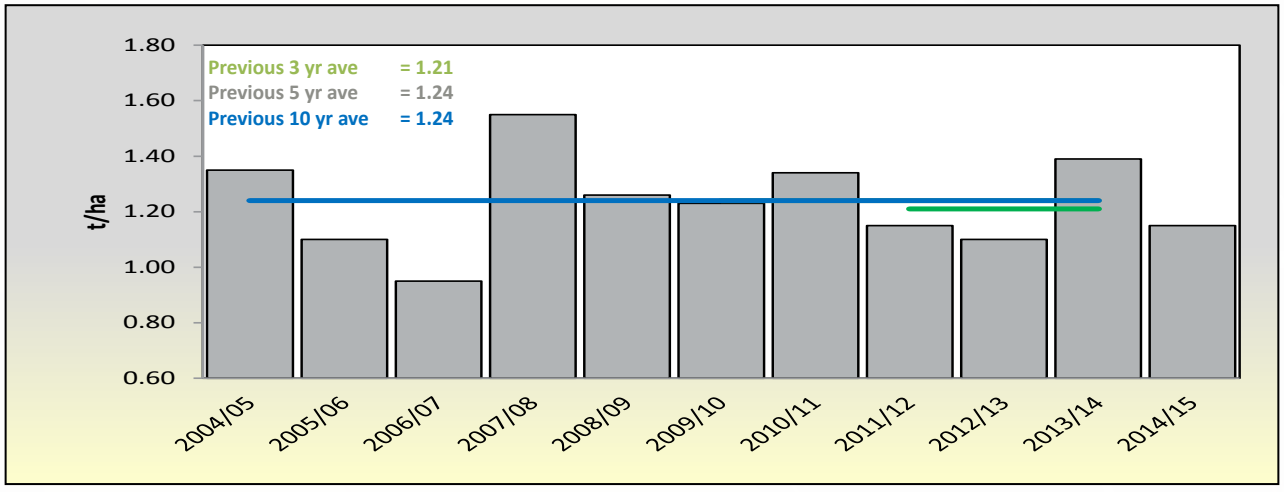
Graph 2: Total RSA area utilized for sunflower production from 2004/05 to 2014/15



Graph 3: Sunflower production in RSA from 2004/05 to 2014/15

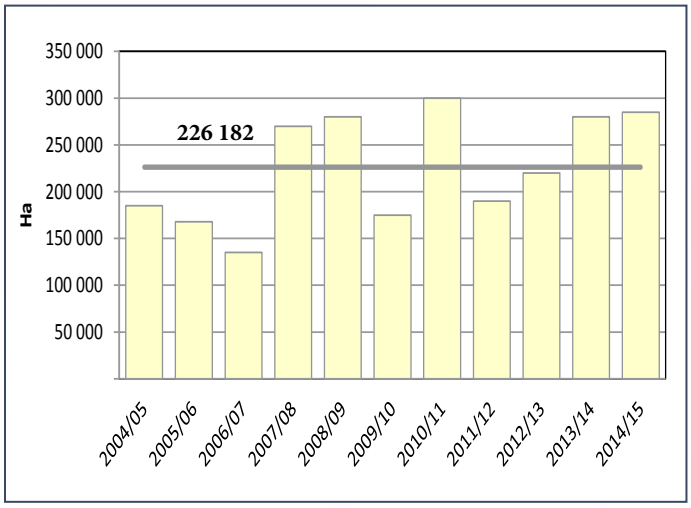


Graph 4: RSA Sunflower yield from 2004/05 to 2014/15

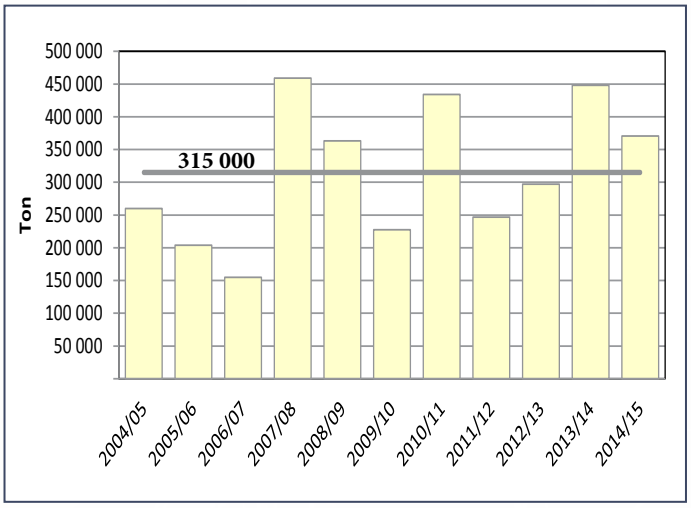


Figures provided by the CEC.

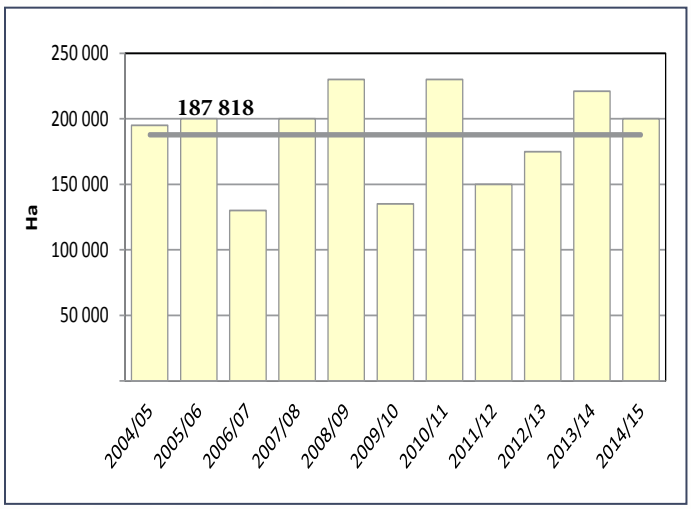
Graph 5: Area utilized for sunflower production in the Free State since 2004/05



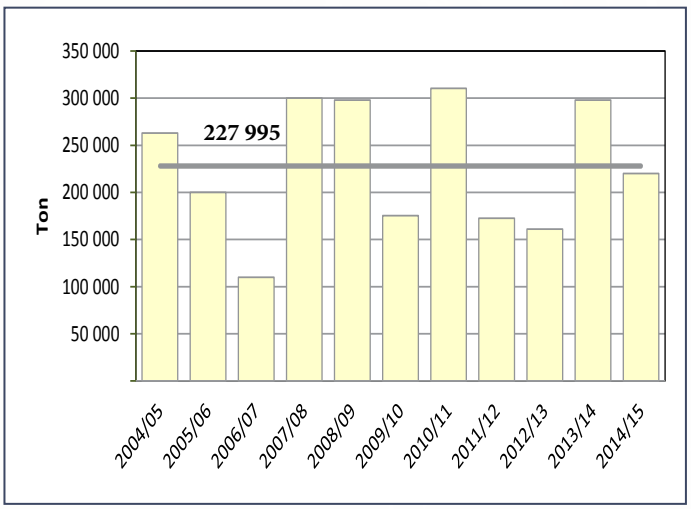
Graph 6: Sunflower production in the Free State since 2004/05



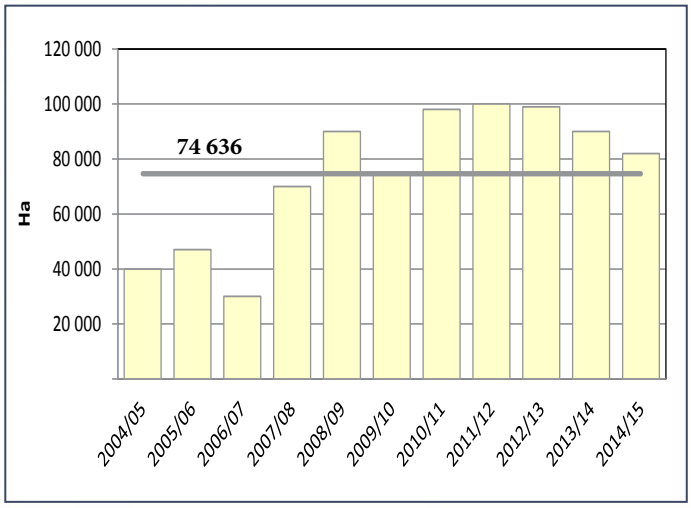
Graph 7: Area utilized for sunflower production in North West since 2004/05



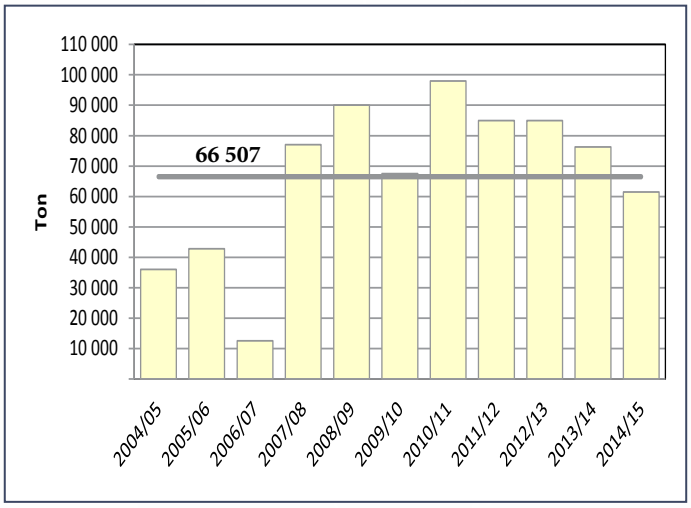
Graph 8: Sunflower production in North West since 2004/05



Graph 9: Area utilized for sunflower production in Limpopo since 2004/05



Graph 10: Sunflower production in Limpopo since 2004/05



Figures provided by the CEC.

Supply and Demand

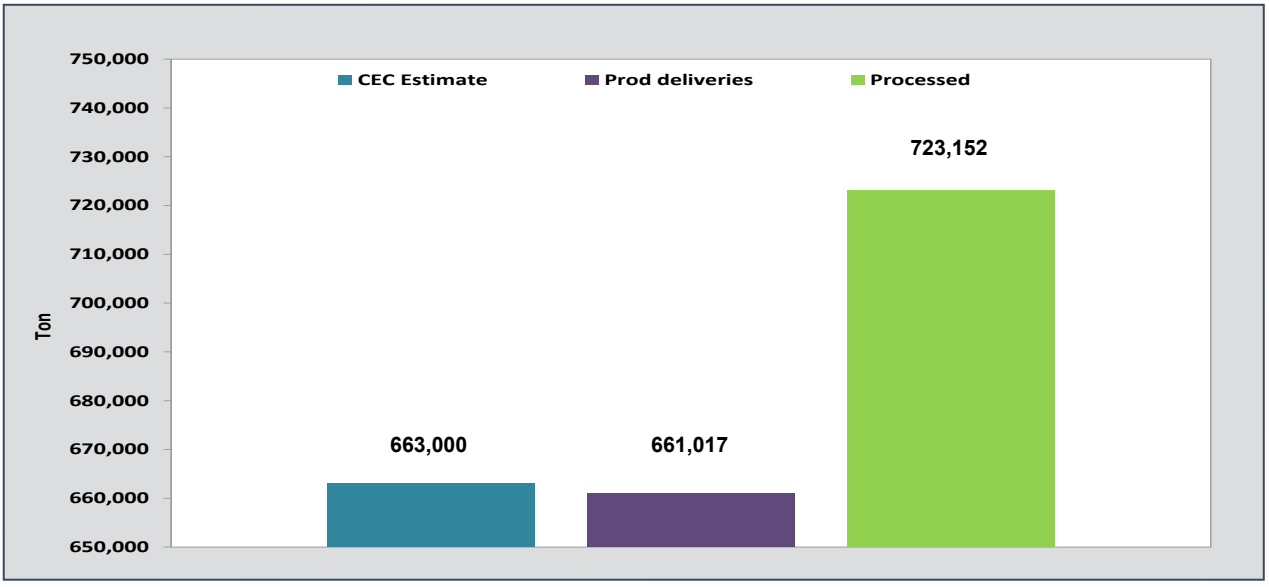
The sunflower seed marketing season dates from March to end of February. According to SAGIS supply and demand figures for the 2015/2016 marketing season to date (March 2015 to January 2016), opening stock almost doubled to 92 927 tons compared to the previous marketing season and is also higher than the ten year average.

To date 35 598 tons of sunflower and sunflower seed products were imported compared to the 63 180 and 94 475 tons of the previous two seasons respectively. South Africa is a net importer of vegetable oils. Sunflower oil currently has the largest share in locally produced vegetable oil. This share is projected to decrease over the next ten years due to the increase in soybean and canola production compared to that of sunflower. Sunflower oil imports are projected to increase from 125 000 tons in 2014 to 182 000 tons by 2024 *(BFAP Baseline, Agricultural Outlook 2015 – 2024)*.

Of the 723 152 tons of sunflower seeds processed so far, only 807 tons were used for human consumption and 8 050 tons for animal feed (mainly pet bird feeds). The vast majority of sunflower seed is crushed to produce oil and oilcake. The 714 295 tons of sunflower seeds crushed to date, are 15.4% less than during the 2014/2015 marketing season (844 322 tons). According to *BFAP*, the domestic consumption of sunflower oilcake is projected to increase from 417 000 tons in 2015 to 433 000 tons by 2024. Most of the increase in consumption will be provided for by imports. Imports are projected to increase to 100 000 tons by the end of the baseline period.

Exports to date amount to 206 tons (48 tons during 2014/2015). Globally, Ukraine and the United States followed by Argentina are the largest exporters of sunflower seeds. Ukraine and Russia are the largest exporters of sunflower oil (combined 70% of total oil exports) *(2015 U.S. Sunflower Crop Quality Report)*.

Graph 11: Sunflower supply and demand overview for the current marketing season (Mar 2015 - Jan 2016)

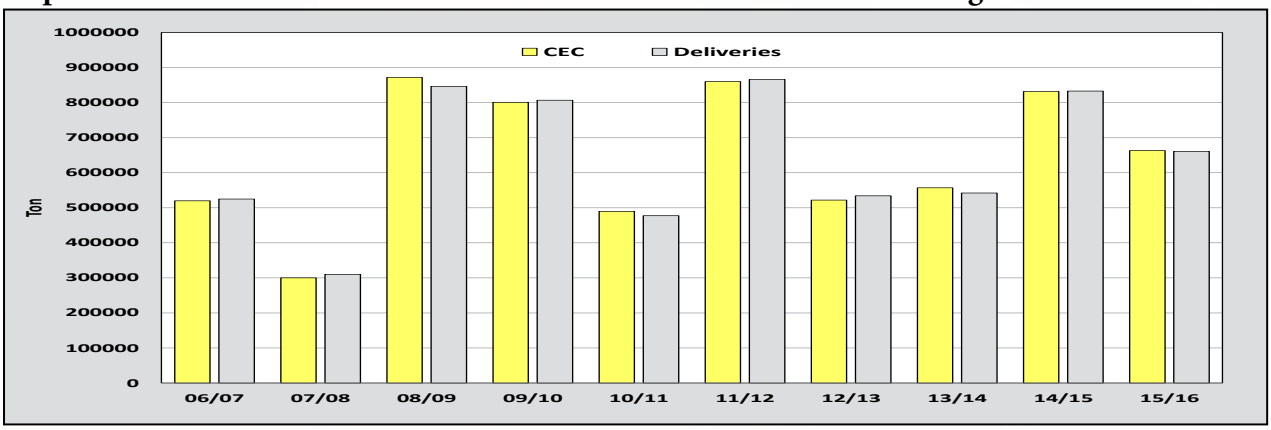


Information provided by SAGIS, includes data up to January 2016

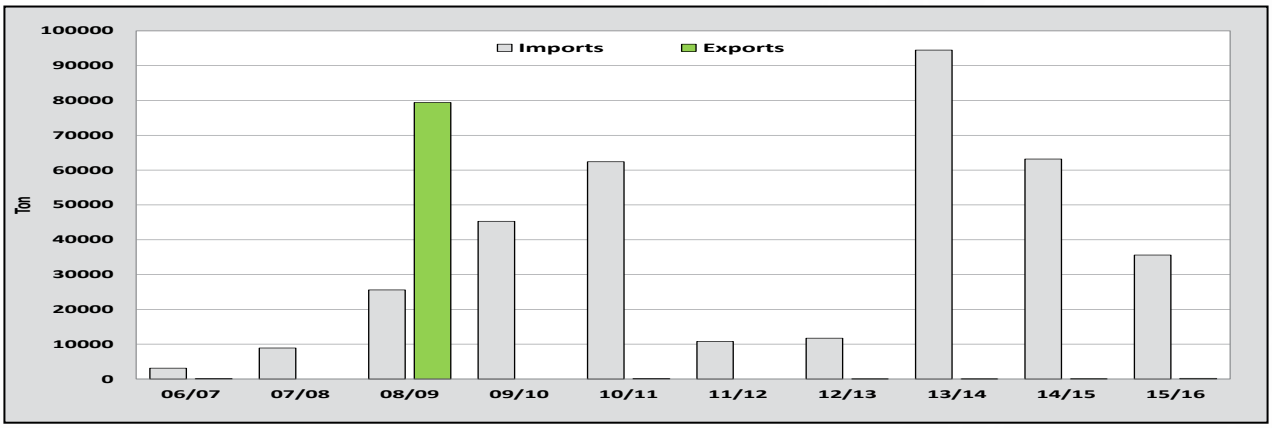
SAGIS South African Grain Information Service
Suid-Afrikaanse Graan Inligtingsdiens

SUNFLOWERSEED: SUPPLY AND DEMAND TABLE BASED ON SAGIS' INFO (TON)											Publication date: 2016-02-24								
	Season (Mar - Feb)																	Current Season Mar-Dec	10 Year average
	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	15/16	2005-2014
																		***	
																		10	
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	663,000	637,400
SUPPLY																			
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	92,927	84,342
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	661,017	635,438
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	35,598	33,139
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	5,948	6,280	3,432
Total Supply	**711,000**	**1,181,100**	**857,100**	**767,500**	**1,012,500**	**825,400**	**694,500**	**692,300**	**571,000**	**410,900**	**941,000**	**1,017,200**	**698,900**	**899,700**	**660,473**	**722,631**	**949,409**	795,822	756,351
DEMAND																			
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	723,152	652,905
-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	807	1,433
-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	2,893	8,050	3,059
-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	714,295	648,413
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	1,148	2,731
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	2,799	2,779	3,348
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	2,809	2,481
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	1,081	2,892	277
Deficit	0	0	4,600	6,900	3,900	9,600	3,100	0	0	0	0	0	0	0	0	0	0	0	0
Exports	0	56,000	300	1,300	45,500	200	200	0	100	0	79,400	0	100	0	27	8	48	206	7,968
Total Demand	**623,000**	**890,300**	**806,800**	**657,900**	**823,100**	**784,100**	**624,600**	**651,600**	**480,600**	**346,200**	**776,700**	**860,000**	**680,100**	**790,700**	**579,205**	**675,515**	**856,482**	732,986	669,710
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**	**92,927**	62,836	86,641
- 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	70,640	65,741	55,319
- 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	0.9	1.6

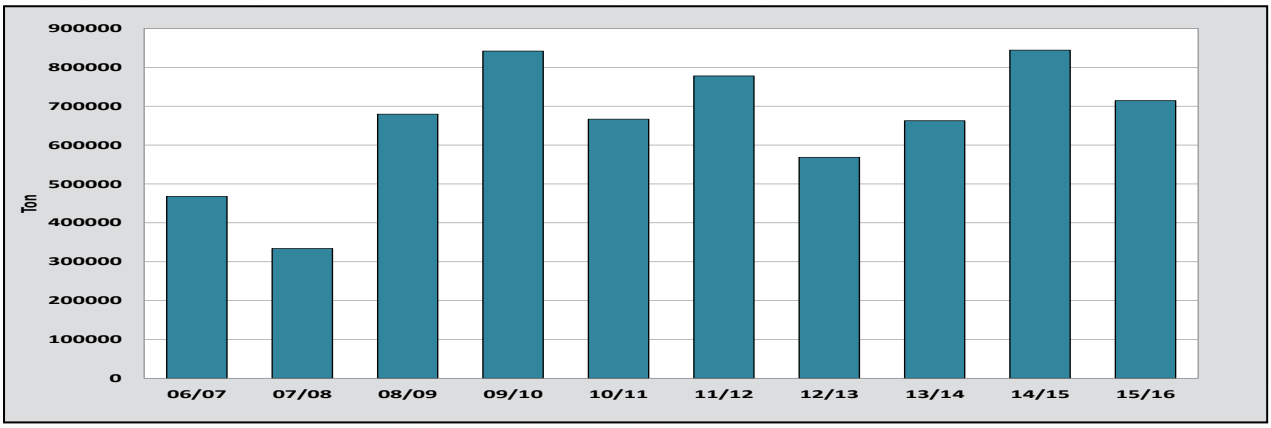
Graph 12: Sunflower: CEC Estimate vs SAGIS deliveries over 10 marketing seasons



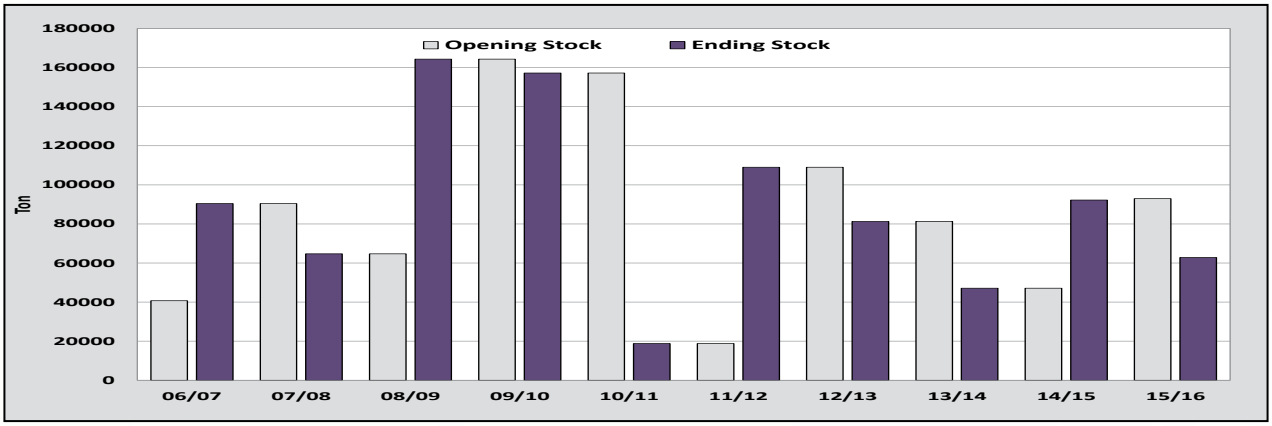
Graph 13: Sunflower: Imports and Exports over 10 marketing seasons



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.

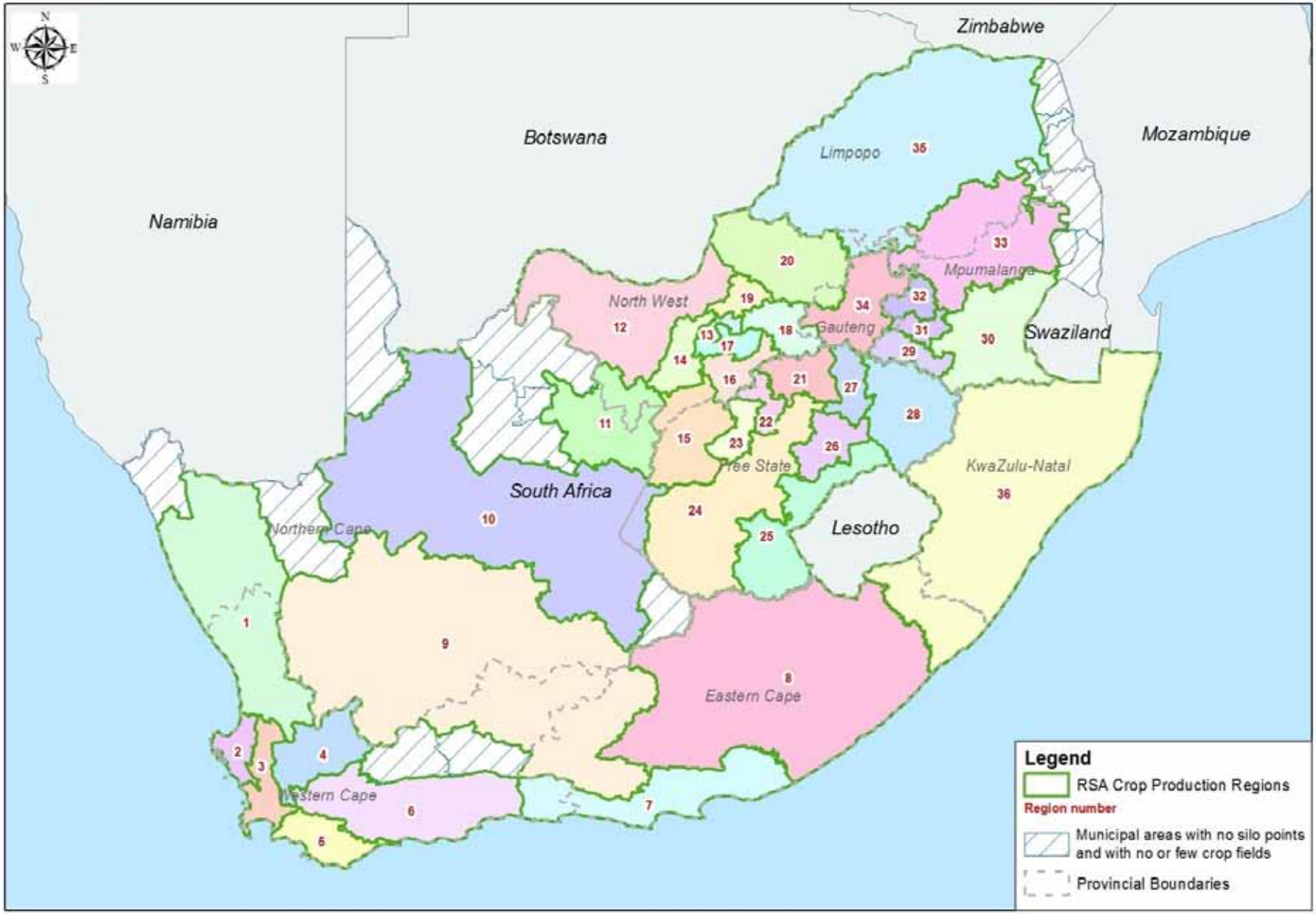
The 9 provinces are divided into 36 grain production regions.

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 2014/2015 production season, are named and described on pages 16 to 23 (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.

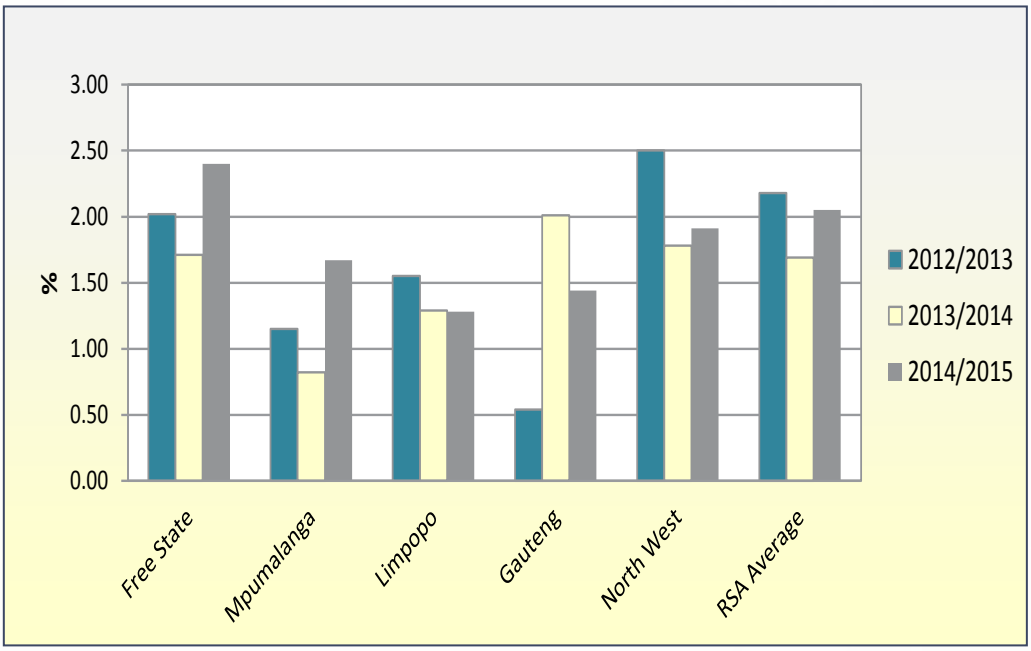
Sunflower Crop Quality 2014/2015 – Summary of results

Eighty six percent (151) of the 176 samples analysed for the purpose of this survey were graded as Grade FH1 and twenty five of the samples were downgraded to COSF (Class Other Sunflower Seed). The percentage of FH1 samples showed an increase compared to the 82% and 80% of the 2013/2014 and 2012/2013 seasons respectively.

- Twenty 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.
- Two of the samples were downgraded as a result of a combination of the foreign matter and collective deviations exceeding the maximum permissible deviations of 4% and 6% respectively.
- Of the remaining three samples, one was downgraded due to the percentage damaged sunflower seeds exceeding the 10% maximum permissible deviation, one as a result of the presence of poisonous seeds *(Datura sp.)* exceeding the maximum permissible number (1 per 1000 g) and the last sample was downgraded as a result of the presence of stones, glass, metal, coal or dung.

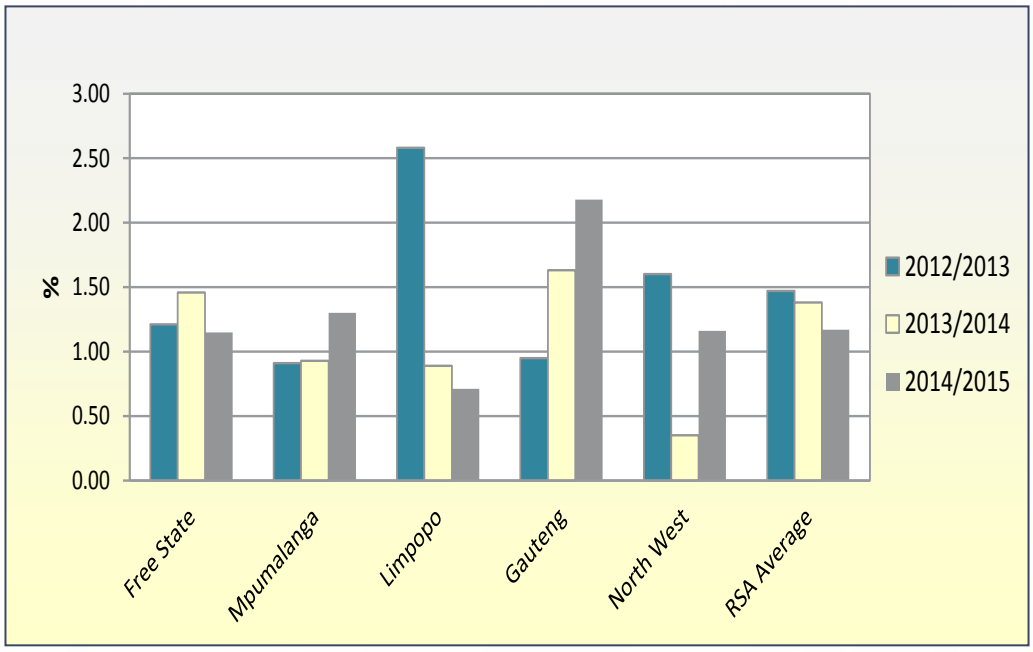
The Free State province (69 samples) reported the highest weighted average percentage screenings namely 2.40%, followed by North West (N = 86) and Mpumalanga (N = 8) provinces with 1.91% and 1.67% respectively. Limpopo (eight samples) reported the lowest average percentage screenings of 1.28%. The weighted national average was 2.05% compared to the 1.69% of the previous season.

Graph 16: Average percentage screenings per province over three seasons



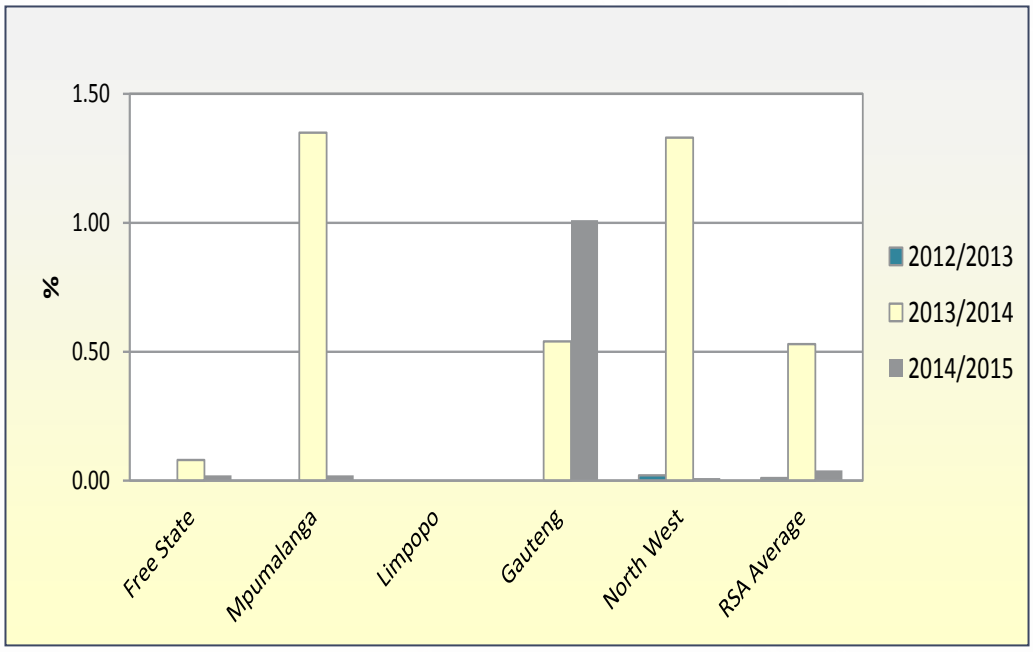
As in the previous season, the highest weighted percentage foreign matter (2.18%) was reported for the samples from Gauteng (N = 5). The Free State and North West provinces averaged 1.15% and 1.16% respectively. The lowest average percentage was found in Limpopo at 0.71%. The RSA average of 1.17% was the lowest of the last three seasons.

Graph 17: Average percentage foreign matter per province over three seasons



Sclerotinia did not pose a problem on any of the samples received for this survey and was observed on only nine of the samples. The highest percentage (3.03%) was present on a sample from Gauteng, this is however still well below the maximum allowable level of 4%. Sclerotinia was not observed on any of the samples from Limpopo. Very low weighted average levels ranged from 0.01% in the North West to 0.02% for both the Free State and Mpumalanga. Gauteng showed the highest weighted average of 1.01%. The national average of 0.04% compared well with the 0.01% of the 2012/2013 season and was lower than the 0.53% of the previous season.

Graph 18: Average percentage Sclerotinia per province over three seasons



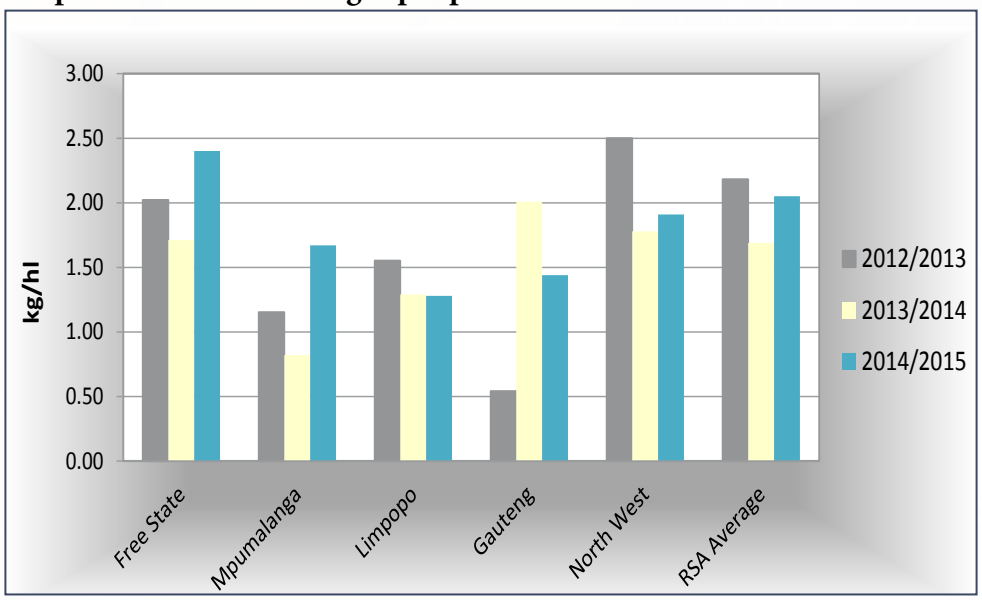
Test weight does not form part of the grading regulations for sunflower seed in South Africa. An approximation of the test weight of South African sunflower seeds is provided in Table 3 for information purposes. The g/1 L filling weight of sunflower seed were determined by means of the Kern 222 apparatus. The test weight 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). Please see also Graph 19 for a comparison of the test weight per province over the last three seasons.

Table 3: Approximation of test weight per province over three seasons

Province	Test weight, kg/hl								
	2014/2015 Season			2013/2014 Season			2012/2013 Season		
	Weighted average	Range	No. of samples	Weighted average	Range	No. of samples	Weighted average	Range	No. of samples
Free State (Regions 21 - 28)	44.1	38.9 - 49.9	69	41.8	36.4 - 48.2	*96	43.8	38.3 - 47.7	58
Mpumalanga (Regions 29 - 33)	41.9	35.0 - 42.2	8	37.6	35.0 - 42.2	5	42.5	38.1 - 45.7	6
Limpopo (Region 35)	43.9	42.2 - 50.5	8	42.4	37.7 - 44.0	11	44.6	42.6 - 47.5	9
Gauteng (Region 34)	44.8	42.2 - 47.6	5	42.8	41.7 - 44.6	4	42.7	42.6 - 42.8	2
North West (Region 12 - 20)	44.5	34.0 - 48.9	86	40.2	31.1 - 46.6	58	43.0	31.5 - 47.3	77
RSA	***44.2***	***34.0 - 50.5***	***176***	***41.3***	***22.6 - 48.2***	***174***	***43.4***	***31.5 - 47.7***	***152***

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

Graph 19: Comparison of the test weight per province over three seasons



The nutritional component analyses, namely crude protein, -fat, -fibre and ash are reported as % (g/100g) on an 'as received' or 'as is' basis. See Table 4 for a summary of the RSA Sunflower Crop Quality averages of the 2014/2015 season compared to those of the 2013/2014 season.

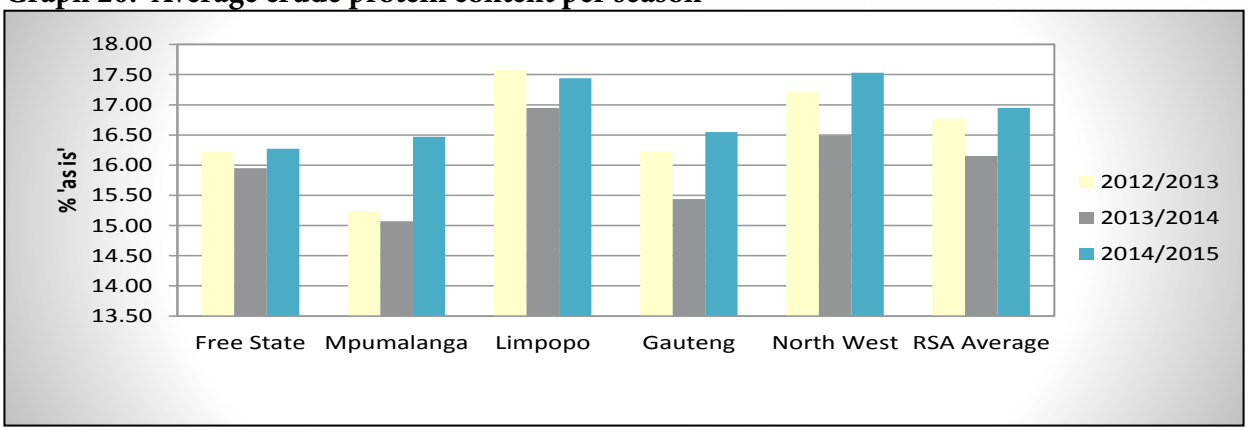
The weighted average crude protein content of the 2014/2015 season was 16.96%, 0.81% higher than the previous season and 0.17% higher than in the 2012/2013 season. North West had the highest weighted average crude protein content of 17.53% and the Free State the lowest with 16.27%. Mpumalanga's crude protein content averaged 16.47%. The weighted average crude fat percentage of 39.7% compared very well with the 39.6% and 39.2% of the two previous seasons. Gauteng had the highest weighted average crude fat content of 41.4%. The lowest average fat content was observed in Limpopo (38.8%). North West and the Free State averaged 39.2% and 40.4% respectively.

The weighted average percentage crude fibre decreased slightly from 20.2% in the previous season to 20.0% this season and equaled the 2012/2013 value. The values varied between 19.1% in Gauteng to 20.7% in Mpumalanga. The weighted average ash content is slightly lower (2.55%) than last season (2.66%) but similar to 2012/2013 (2.54%). The provincial averages ranged from 2.45% in Gauteng and Mpumalanga to 2.58% in the Free State.

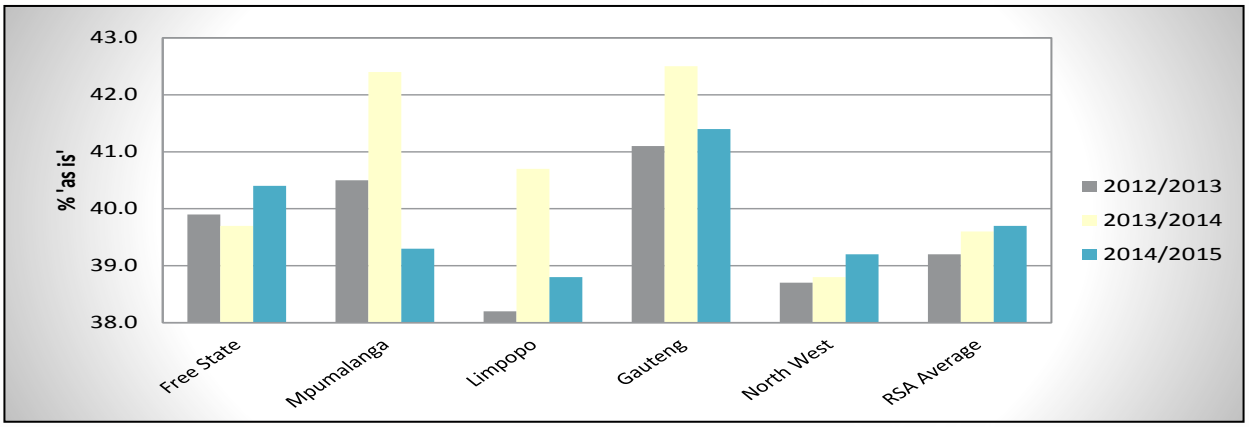
Graphs 20 to 23 on page 14 provide comparisons between provinces for the above mentioned components.

Please also see pages 16 to 23 for the average sunflower quality per region.

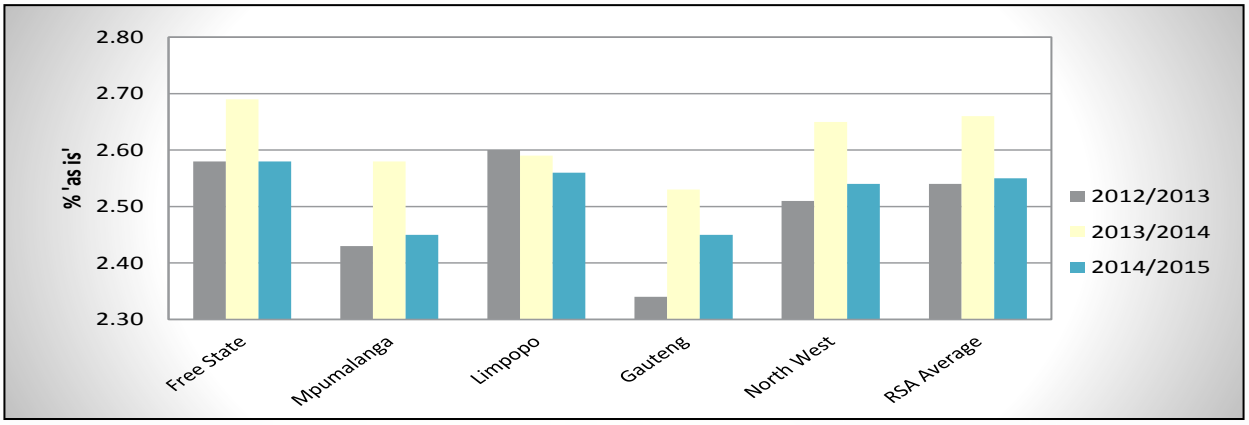
Graph 20: Average crude protein content per season



Graph 21: Average crude fat content per season



Graph 22: Average ash content per season



Graph 23: Average crude fibre content per season

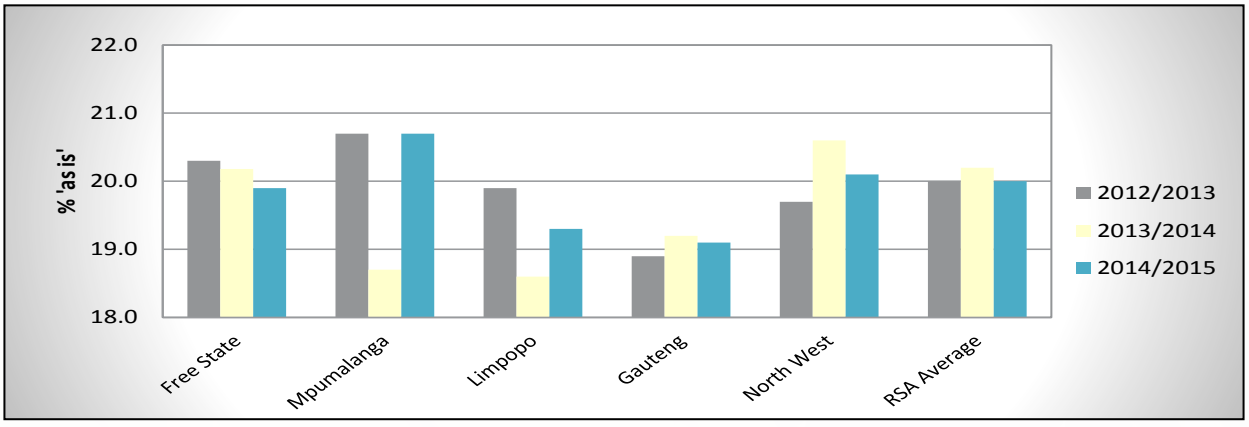


Table 4: South African Sunflower Crop Quality Averages 2014/2015 vs 2013/2014						
Class and Grade Sunflower	**2014/2015**			**2013/2014**		
	FH1	**COSH**	**Average**	**FH1**	**COSF**	**Average**
Grading:						
1. Damaged sunflower seed, %	0.17	0.93	0.27	0.38	4.24	1.06
2. Screenings, %	1.53	5.20	2.05	1.26	3.71	1.69
3. Sclerotinia, %	0.05	0.00	0.04	0.13	2.43	0.53
4. Foreign Matter, %	1.08	1.70	1.17	0.90	3.58	1.38
5. Deviations in 2,3 and 4 collectively. Provided that such diviations are individually within the limits of said items, %	2.66	6.90	3.26	2.29	9.72	3.60
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 *(Crotalaria sp., Datura sp., Ricinis communis)*	0	0	0	0	0	0
Noxious seeds *(Argemone mexicana L., Convolvulus sp., Ipomoea purpurea Roth., Lolium temulentum, Xanthium sp.)*	0	0	0	0	0	0
Number of samples	***151***	***25***	***176***	***145***	***31***	***176***
Chemical analysis:						
Moisture, % (5hr, 105 °C)	4.7	4.5	4.7	2.9	3.2	3.2
Crude Protein, % (as is)	17.06	16.34	16.95	16.19	15.99	16.15
Crude Fat, % (as is)	39.5	41.1	39.7	39.8	38.7	39.6
Ash, % (as is)	2.56	2.52	2.55	2.65	2.70	2.66
Crude Fibre, % (as is)	20.0	19.6	20.0	20.0	20.8	20.2
Number of samples	***151***	***25***	***176***	***145***	***31***	***176***

SOUTH AFRICAN
REGIONAL SUNFLOWER QUALITY

	(12)				(13)				(14)			
PRODUCTION REGION	**North-West Western Region**				**North-West Central Region (Sannieshof)**				**North-West Southern Region**			
Silo/Intake stands (Type of storage)	Blaauwbank (Bins) Buhrmannsdrif (Bins) Kameel (Bins) Mareetsane (Bins) Vryburg (Bins)				Biesiesvlei (Bins) Bossies (Bins) Gerdau (Bins) Oppaslaagte (Bins) Sannieshof (Bins)				Amalia (Bins) Barberspan (Bins) Delareyville (Bins) Excelsior (Bins) Geysdorp (Bins) Hallatshope (Bins) Migdol (Bins) Nooitgedacht (Bins) Taaibospan (Bins) Schweizer-Reneke (Bins)			
Grading:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
1. Damage sunflower seed, %	0.04	0.00	0.14	0.07	0.26	0.00	2.18	0.62	0.04	0.00	1.11	0.22
2. Screenings, %	3.01	0.84	5.61	2.12	1.38	0.24	3.12	1.03	1.75	0.21	5.17	1.20
3. Sclerotinia, %	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4. Foreign Matter, %	1.39	0.68	3.24	1.24	1.14	0.32	2.25	0.54	0.83	0.18	1.76	0.42
5. Deviations in 2,3 and 4 collectively: Provided that such deviations are individually within the limits of said items, %	4.40	1.52	8.85	3.25	2.52	0.67	4.58	1.21	2.58	0.39	5.91	1.44
Noxious seeds *(Crotalaria sp., Datura sp., Ricinis communis)*	1	0	2	1.00	0	0	1	0.29	0	0	1	0.20
Noxious seeds *(Argemone mexicana L., Convolvulus sp., Ipomoea purpurea Roth., Lolium temulentum, Xanthium sp.)*	0	0	0	0	0	0	0	0	0	0	0	0
Number of samples	***4***				***22***				***25***			
Chemical analysis:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
Moisture, % (5 hr, 105 °C)	4.4	3.6	5.4	0.80	5.1	4.4	5.7	0.46	4.9	3.4	6.1	0.69
Crude Protein, % (as is)	17.75	17.29	18.33	0.46	17.98	16.09	18.81	0.74	17.44	15.14	20.40	0.99
Crude Fat, % (as is)	39.1	37.9	39.7	0.82	38.2	35.9	41.0	1.74	39.9	38.3	43.2	1.01
Ash, % (as is)	2.30	2.09	2.44	0.15	2.81	2.12	3.17	0.31	2.43	2.19	2.88	0.13
Crude Fibre, % (as is)	20.1	19.5	20.8	0.70	19.9	16.5	21.6	1.17	20.4	17.3	23.0	1.08
Number of samples	***4***				***22***				***25***			

SOUTH AFRICAN
REGIONAL SUNFLOWER QUALITY

	(15)				(16)				(17)			
PRODUCTION REGION	**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)				Bamboesspruit (Bins) Leeudoringstad (Bins) Makwassie (Bins) Regina (Bins) Strydpoort (Bins) Wolmaransstad (Bins)				Boschpoort (Bags/Bins/Bulk) Hartbeesfontein (Bins) Kleinharts (Bins) Melliodora (Bins) Ottosdal (Bins) Rostrataville (Bins) Vermaas (Bins) Werda (Bins)			
Grading:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
1. Damage sunflower seed, %	0.05	0.00	0.10	0.07	0.00	0.00	0.00	0.00	0.01	0.00	0.08	0.02
2. Screenings, %	1.35	0.84	1.85	0.71	1.21	0.48	1.63	0.63	2.11	1.00	4.00	0.88
3. Sclerotinia, %	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4. Foreign Matter, %	0.84	0.43	1.24	0.57	1.39	0.20	3.14	1.55	1.44	0.38	2.57	0.70
5. Deviations in 2,3 and 4 collectively: Provided that such deviations are individually within the limits of said items, %	2.18	2.08	2.28	0.14	2.60	0.68	4.77	2.06	3.55	1.53	6.57	1.50
Noxious seeds *(Crotalaria sp., Datura sp., Ricinis communis)*	0	0	0	0	0	0	0	0	0	0	1	0.28
Noxious seeds *(Argemone mexicana L., Convolvulus sp., Ipomoea purpurea Roth., Lolium temulentum, Xanthium sp.)*	0	0	0	0	0	0	0	0	0	0	0	0
Number of samples	***2***				***3***				***13***			
Chemical analysis:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
Moisture, % (5 hr, 105 °C)	5.1	4.6	5.6	0.71	4.4	4.2	4.6	0.21	4.8	4.0	5.6	0.49
Crude Protein, % (as is)	18.33	18.08	18.57	0.35	17.29	16.47	17.84	0.72	17.80	16.72	18.94	0.77
Crude Fat, % (as is)	37.4	35.8	39.0	2.26	39.0	38.7	39.2	0.26	39.4	37.1	42.1	1.62
Ash, % (as is)	2.67	2.58	2.75	0.12	2.52	2.26	2.66	0.22	2.51	2.28	2.71	0.11
Crude Fibre, % (as is)	20.4	19.2	21.6	1.70	20.7	20.6	20.8	0.10	19.5	16.4	22.3	1.52
Number of samples	***2***				***3***				***13***			

SOUTH AFRICAN
REGIONAL SUNFLOWER QUALITY

	(18)				(19)				(20)			
PRODUCTION REGION	**North-West Central Region (Ventersdorp)**				**North-West Central Region (Lichtenburg)**				**North-West Eastern Region**			
Silo/Intake stands (Type of storage)	Bodenstein (Bins) Buckingham (Bins) Coligny (Bins) Enselspruit (Bins) Makokskraal (Bins) Potchefstroom (Bins) Ventersdorp (Bins)				Grootpan (Bins) Halfpad (Bins) Hibernia (Bins) Lottie Halte (Bins) Lusthof (Bins) Lichtenburg Silo 3 (Bins) Lichtenburg Silo 5 (Bins) Lichtenburg (Bunkers)				Battery (Bins) Brits (Bins) Boons (Bins) Derby (Bins) Koster (Bins) Swartruggens (Bins) Syferbult (Bins)			
Grading:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
1. Damage sunflower seed, %	0.93	0.00	3.94	1.70	0.02	0.00	0.12	0.04	0.17	0.00	0.69	0.35
2. Screenings, %	1.35	0.49	1.99	0.68	3.46	1.45	7.22	1.91	2.45	0.62	4.31	1.68
3. Sclerotinia, %	0.05	0.00	0.23	0.10	0.00	0.00	0.00	0.00	0.11	0.00	0.44	0.22
4. Foreign Matter, %	1.25	0.49	1.65	0.46	1.73	1.05	3.06	0.67	0.93	0.52	1.52	0.49
5. Deviations in 2,3 and 4 collectively: Provided that such deviations are individually within the limits of said items, %	2.65	1.47	3.40	0.84	5.19	2.50	10.28	2.47	3.49	1.15	5.47	1.85
Noxious seeds *(Crotalaria sp., Datura sp., Ricinis communis)*	0	0	0	0	0	0	0	0	0	0	0	0
Noxious seeds *(Argemone mexicana L., Convolvulus sp., Ipomoea purpurea Roth., Lolium temulentum, Xanthium sp.)*	0	0	0	0	0	0	0	0	0	0	0	0
Number of samples	***5***				***8***				***4***			
Chemical analysis:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
Moisture, % (5 hr, 105 °C)	4.6	4.1	5.2	0.49	4.6	3.7	5.1	0.50	4.5	4.1	4.7	0.26
Crude Protein, % (as is)	16.59	15.83	17.44	0.76	17.26	15.74	18.48	0.89	15.96	15.65	16.61	0.44
Crude Fat, % (as is)	39.3	38.1	41.4	1.45	39.5	34.6	42.5	2.63	40.6	38.9	43.2	1.98
Ash, % (as is)	2.37	2.26	2.49	0.08	2.50	2.33	2.63	0.11	2.27	2.11	2.49	0.18
Crude Fibre, % (as is)	20.6	19.2	21.4	0.88	19.6	16.0	23.2	2.56	20.1	18.0	21.4	1.49
Number of samples	***5***				***8***				***4***			

SOUTH AFRICAN
REGIONAL SUNFLOWER QUALITY

	(21)	(22)	(23)
PRODUCTION REGION	**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) Schuttesdraai (Bins) Misgunst (Bunkers)	Bultfontein (Bins) Losdoorns (Bins) Protespan (Bins) Tierfontein (Bins) Wesselsbron (Bins) Willemsrus (Bins)

Grading:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
1. Damage sunflower seed, %	0.52	0.00	2.47	0.85	0.22	0.00	0.71	0.30	0.42	0.21	0.62	0.21
2. Screenings, %	1.73	0.48	4.42	1.43	1.60	1.17	2.54	0.48	1.93	1.68	2.34	0.36
3. Sclerotinia, %	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4. Foreign Matter, %	1.48	0.39	3.79	1.22	1.04	0.31	2.87	0.92	1.65	0.51	3.70	1.78
5. Deviations in 2,3 and 4 collectively: Provided that such deviations are individually within the limits of said items, %	3.22	1.05	6.69	2.04	2.64	1.70	4.04	0.89	3.58	2.19	6.04	2.14
Noxious seeds *(Crotalaria sp., Datura sp., Ricinis communis)*	0	0	0	0	0	0	0	0	0	0	0	0
Noxious seeds *(Argemone mexicana L., Convolvulus sp., Ipomoea purpurea Roth., Lolium temulentum, Xanthium sp.)*	0	0	0	0	0	0	0	0	0	0	0	0
Number of samples	***9***				***6***				***3***			
Chemical analysis:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
Moisture, % (5 hr, 105 °C)	4.7	4.0	5.2	0.41	4.4	4.1	4.8	0.27	4.4	3.9	4.7	0.46
Crude Protein, % (as is)	17.53	16.54	19.38	0.85	17.49	16.82	18.24	0.56	18.44	17.38	19.98	1.36
Crude Fat, % (as is)	38.7	35.7	42.4	2.03	39.4	38.4	41.4	1.15	38.9	37.2	40.6	1.70
Ash, % (as is)	2.59	2.46	2.74	0.10	2.52	2.32	2.73	0.17	2.63	2.38	2.97	0.30
Crude Fibre, % (as is)	20.4	16.2	24.5	2.43	20.0	18.7	20.9	0.90	19.4	19.0	19.8	0.40
Number of samples	***9***				***6***				***3***			

SOUTH AFRICAN
REGIONAL SUNFLOWER QUALITY

	(24)				(25)				(26)			
PRODUCTION REGION	**Free State Central Region**				**Free State South-Western Region**				**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) Clocolan (Bins) Ficksburg (Bins) Fouriesburg (Bins) Marseilles (Bins) Modderpoort (Bins) Slabberts (Bins) Tweespruit (Bins) Westminster (Bins)				Arlington (Bins) Kaallaagte (Bins) Libertas (Bins) Marquard (Bins) Meets (Bins) Monte Video (Bins) Senekal (Bins) Steynsrus (Bins)			
Grading:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
1. Damage sunflower seed, %	0.24	0.00	0.49	0.25	2.50	0.00	21.88	7.27	0.06	0.00	0.54	0.13
2. Screenings, %	0.95	0.63	1.50	0.48	1.50	0.41	4.04	1.12	3.43	0.31	11.36	3.42
3. Sclerotinia, %	0.00	0.00	0.00	0.00	0.09	0.00	0.77	0.26	0.01	0.00	0.15	0.04
4. Foreign Matter, %	0.94	0.46	1.73	0.69	1.46	0.44	5.63	1.64	0.95	0.27	2.24	0.48
5. Deviations in 2,3 and 4 collectively: Provided that such deviations are individually within the limits of said items, %	1.89	1.09	3.23	1.17	3.04	0.85	6.57	1.72	4.39	1.05	12.04	3.38
Noxious seeds *(Crotalaria sp., Datura sp., Ricinis communis)*	0	0	1	0.58	0	0	0	0	0	0	0	0
Noxious seeds *(Argemone mexicana L., Convolvulus sp., Ipomoea purpurea Roth., Lolium temulentum, Xanthium sp.)*	0	0	0	0	0	0	0	0	0	0	0	0
Number of samples	***3***				***9***				***29***			
Chemical analysis:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
Moisture, % (5 hr, 105 °C)	4.7	4.2	5.0	0.46	4.0	2.6	4.5	0.59	4.7	3.7	6.2	0.73
Crude Protein, % (as is)	17.02	16.73	17.34	0.31	14.66	13.41	16.57	0.89	15.68	14.40	18.60	1.04
Crude Fat, % (as is)	38.6	36.9	41.0	2.14	42.1	40.3	43.3	1.00	41.0	34.0	44.0	2.80
Ash, % (as is)	2.68	2.49	2.80	0.17	2.58	2.44	2.75	0.10	2.57	2.33	3.19	0.20
Crude Fibre, % (as is)	20.2	19.3	20.9	0.82	19.7	17.7	21.7	1.33	20.0	17.1	21.7	1.21
Number of samples	***3***				***9***				***29***			

SOUTH AFRICAN
REGIONAL SUNFLOWER QUALITY

	(27)				(28)				(29)			
PRODUCTION REGION	**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) Petrus Steyn (Bins) Wolwehoek (Bins)				Afrikaskop (Bins/Bunkers) Ascent (Bins) Cornelia (Bins) Daniëlsrus (Bins) Eeram (Bins) Frankfort (Bins) Harrismith (Bins) Jim Fouché (Bins) Kransfontein (Bins/Bunkers) 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)			
Grading:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
1. Damage sunflower seed, %	0.53	0.40	0.74	0.15	0.03	0.00	0.14	0.06	0.00	0.00	0.00	0.00
2. Screenings, %	2.48	0.41	4.10	1.80	1.46	0.08	5.09	1.88	1.39	1.34	1.44	0.07
3. Sclerotinia, %	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4. Foreign Matter, %	1.62	1.00	1.97	0.43	0.85	0.12	1.86	0.58	1.21	0.73	1.68	0.67
5. Deviations in 2,3 and 4 collectively: Provided that such deviations are individually within the limits of said items, %	4.10	2.38	5.72	1.57	2.30	0.44	6.05	2.08	2.60	2.17	3.02	0.60
Noxious seeds *(Crotalaria sp., Datura sp., Ricinis communis)*	0	0	0	0	0	0	0	0	0	0	0	0
Noxious seeds *(Argemone mexicana L., Convolvulus sp., Ipomoea purpurea Roth., Lolium temulentum, Xanthium sp.)*	0	0	0	0	0	0	0	0	0	0	0	0
Number of samples	***4***				***6***				***2***			
Chemical analysis:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
Moisture, % (5 hr, 105 °C)	4.4	4.0	5.0	0.42	4.2	3.5	4.9	0.53	4.7	4.3	5.0	0.49
Crude Protein, % (as is)	16.18	15.22	16.90	0.78	17.04	16.22	17.98	0.76	16.86	16.13	17.59	1.03
Crude Fat, % (as is)	40.5	39.0	42.4	1.44	39.8	34.1	42.0	2.93	39.9	38.2	41.6	2.40
Ash, % (as is)	2.54	2.37	2.67	0.14	2.67	2.42	2.79	0.13	2.31	2.07	2.55	0.34
Crude Fibre, % (as is)	19.7	18.8	21.0	1.05	19.4	17.1	20.7	1.28	20.1	19.6	20.5	0.64
Number of samples	***4***				***6***				***2***			

SOUTH AFRICAN
REGIONAL SUNFLOWER QUALITY

	(31)				(32)				(33)			
PRODUCTION REGION	**Mpumalanga Central Region**				**Mpumalanga Western Region**				**Mpumalanga Northern Region**			
Silo/Intake stands (Type of storage)	Bakenlaagte (Bunkers) Brakfontein (Bunkers) Bethal (Bins) Devon (Bins) Kinross (Bins/Bunkers) Klipfontein (Bunkers) Leslie (Bins) Palmietfontein (Bunkers) Trichardt (Bins) Vaalkrantz (Bunkers)				Argent (Bins/Bunkers) Dryden (Bins) Endicott (Bins) Eloff (Bins) Hawerklip (Bins) Kendal (Bins) Ogies (Bins)				Arnot (Bins) Driefontein (Bins) Lydenburg (Bins) Marble Hall (Bins) Middelburg (Bins) Pan (Bins) Stoffberg (Bins) Wonderfontein (Bins)			
Grading:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
1. Damage sunflower seed, %	0.34	-	-	-	0.20	0.00	0.59	0.34	0.00	0.00	0.00	0.00
2. Screenings, %	1.83	-	-	-	2.84	2.45	3.58	0.64	0.12	0.11	0.13	0.01
3. Sclerotinia, %	0.00	-	-	-	0.05	0.00	0.16	0.09	0.00	0.00	0.00	0.00
4. Foreign Matter, %	0.45	-	-	-	1.24	1.13	1.45	0.18	1.91	0.97	2.84	1.32
5. Deviations in 2,3 and 4 collectively: Provided that such deviations are individually within the limits of said items, %	2.28	-	-	-	4.14	3.76	4.71	0.50	2.03	1.08	2.97	1.34
Noxious seeds *(Crotalaria sp., Datura sp., Ricinis communis)*	1	-	-	-	0	0	0	0	0	0	0	0
Noxious seeds *(Argemone mexicana L., Convolvulus sp., Ipomoea purpurea Roth., Lolium temulentum, Xanthium sp.)*	0	-	-	-	0	0	0	0	0	0	0	0
Number of samples	***1***				***3***				***2***			
Chemical analysis:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
Moisture, % (5 hr, 105 °C)	5.2	-	-	-	4.4	4.0	4.9	0.46	5.1	4.7	5.4	0.49
Crude Protein, % (as is)	17.37	-	-	-	17.65	16.81	18.61	0.91	13.85	13.35	14.35	0.71
Crude Fat, % (as is)	40.6	-	-	-	38.1	37.0	39.8	1.51	39.8	39.3	40.2	0.64
Ash, % (as is)	2.41	-	-	-	2.60	2.50	2.69	0.10	2.37	2.22	2.52	0.21
Crude Fibre, % (as is)	19.1	-	-	-	20.6	20.1	21.5	0.76	22.2	21.9	22.5	0.42
Number of samples	***1***				***3***				***2***			

SOUTH AFRICAN
REGIONAL SUNFLOWER QUALITY

	(34)	(35)
PRODUCTION REGION	**Gauteng**	**Limpopo**
Silo/Intake stands (Type of storage)	Bloekomspruit (Bins) Bronkhorstspruit (Bins) Glenroy (Bins) Goeie Hoek (Bins) Kaalfontein (Bins) Kliprivier (Bunkers) Meyerton (Bunkers) Middelvlei (Bins) Nigel (Bins) Oberholzer (Bins) Pretoria Wes (Bins) Raathsvlei (Bins) Vogelvallei (Bunkers)	Alma (Bins) Lehau (Bins) Naboomspruit (Mookgophong) (Bins) Northam (Bins) Nutfield (Bins) Nylstroom (Modimolle) (Bins) Potgietersrus (Mokopane) (Bins) Roedtan (Bins) Settlers (Bins) Warmbad (Bela-Bela) (Bins)

Grading:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
1. Damage sunflower seed, %	0.01	0.00	0.04	0.02	0.06	0.00	0.30	0.11
2. Screenings, %	1.44	0.37	2.91	0.92	1.28	0.40	2.46	0.78
3. Sclerotinia, %	1.01	0.00	3.03	1.43	0.00	0.00	0.00	0.00
4. Foreign Matter, %	2.18	0.49	4.52	1.71	0.71	0.36	1.16	0.28
5. Deviations in 2,3 and 4 collectively: Provided that such deviations are individually within the limits of said items, %	4.64	1.61	7.43	2.18	1.99	0.88	3.10	0.81
Noxious seeds *(Crotalaria sp., Datura sp., Ricinis communis)*	0	0	0	0	0	0	1	0.35
Noxious seeds *(Argemone mexicana L., Convolvulus sp., Ipomoea purpurea Roth., Lolium temulentum, Xanthium sp.)*	0	0	0	0	0	0	0	0
Number of samples	***5***				***8***			

Chemical analysis:	***ave***	***min***	***max***	***stdev***	***ave***	***min***	***max***	***stdev***
Moisture, % (5 hr, 105 °C)	4.6	4.2	5.4	0.47	4.8	4.1	5.8	0.57
Crude Protein, % (as is)	16.55	14.84	17.92	1.13	17.44	16.42	18.84	1.07
Crude Fat, % (as is)	41.4	40.1	42.1	0.85	38.8	35.8	40.5	1.53
Ash, % (as is)	2.45	2.35	2.60	0.11	2.56	2.40	2.95	0.20
Crude Fibre, % (as is)	19.1	18.6	19.7	0.49	19.3	17.6	20.9	1.02
Number of samples	***5***				***8***			

METHODS

SAMPLING PROCEDURE:

A working group determined the procedure to be followed to ensure that the crop quality samples sent to the SAGL by the various grain silo owners, were representative of the total crop.

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

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

After 80% of the expected harvest had been received, the content of each container was divided with a multi slot divider in order to obtain a 3 kg sample. (This was done for each class and grade separately).

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

The samples were marked clearly with the name of the depot, the bin/bag/bunker number(s) represented by each individual sample as well as the class and grade and were 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. 45 of 22 January 2016).

See pages 63 to 70 of this report.

TEST WEIGHT:

Test weight provides a measure of the bulk density of grain and oilseeds.

Test weight does not form part of the grading regulations for sunflower in South Africa. An approximation of the test weight of South African sunflower is provided in this report for information purposes. The g/1 L filling weight of the sunflower samples were determined by means of the Kern 222 apparatus. The standard working procedure were followed. The test weight 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).

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 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 crude 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. The samples were incinerated at 600 ± 15 °C in a muffle furnace for 2 hours.

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% Sulphuric acid (H_2SO_4) and 1.25% Sodium hydroxide (NaOH) solutions under specific conditions.

sanas
South African National Accreditation System

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: T0116

Permanent Address of Laboratory: Southern African Grain Laboratory (NPC) Grain Building 477 Witherite Road The Willows 0040	**Technical Signatories:**	Ms J Nortjé (All) Ms M Fourie (In-house method 012) Ms M Hammes (Chemical) Ms A de Jager (Nutrients & Contaminants) Ms W Louw (In-House Methods 001, 002, 003, 010, and 026) Ms D Moleke (Rheological) Ms I Terblanche (Rheological) Ms H Meyer (Chemical, Nutrients, Contaminants & Grading) Ms J Kruger (Chemical, excluding In-house method 012) Mr L Badenhorst (Grading) Ms P Modiba (Chemical) Ms M Motlanthe (In-house method 001, 003)
Postal Address: Postnet Suite # 391 Private Bag X 1 The Willows 0041	**Nominated Representative:** **Management Representative:**	Ms S du Preez Ms W Louw
Tel: (012) 807-4019 Fax: (086) 216-7672 E-mail: info@sagl.co.za	Issue No.: Date of Issue: Expiry Date:	24 04 March 2015 31 October 2019

Materials / Products Tested	Type of Tests / Properties Measured, Range of Measurement	Standard Specifications, Equipment / Technique Used
CHEMICAL		
Ground Barley	Moisture (Oven Method)	Analytical EBC Method 3.2, Latest Edition (2hour; 130˚C)
Cereal and cereal products specifically- wheat, rice, (hulled paddy), barley, millet, rye and oats as grains, semolina and flour	Moisture (Oven Method)	ICC Std No.110/1, Latest Edition (90 min; 130˚C) (2 hour, 130°C)
Flour, semolina, bread, all kind of grains and cereal products, and food products (except those that are sugar coated)	Moisture (Oven method)	AACCI 44-15.02, Latest Edition (1hour; 130˚C) (72 hour, 103°C)

Original Date of Accreditation: 01 November 1999 Page 1 of 3

Field Manager

ANNEXURE A

Facility No.: T0116
Date of Issue: 04 March 2015
Expiry Date: 31 October 2019

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 46-30.01, Latest Edition
Food stuff	Dietary fibre (total)	In-house method 012
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 011
Wheat kernels	Moisture (Oven method)	Government Gazette Wheat Grading Regulation, Latest Edition (72 hour, 103ºC)
Flours of grains, e.g. barley, oats, triticale, maize, rye, sorghum and wheat; oilseeds like soybeans and sunflower, feeds and mixed feeds and foodstuffs	Crude Fat (Ether extraction by Soxhlet)	In-house method 024
Meal and flour of wheat, rye, barley, other grains, starch containing and malted products	Falling number	ICC No 107/1, Latest Edition
NUTRIENTS & CONTAMINANTS		
Vitamin fortified food and feed products and fortification mixes grain based	Vitamin A as all trans Retinol (Saponification) (HPLC)	In-house method 001
Vitamin fortified food and feed products and fortification mixes grain based	Thiamine Mononitrate (HPLC) Riboflavin (HPLC) Nicotinamide (HPLC) Pyridoxine Hydrochloride (HPLC)	In-house method 002
Vitamin fortified food and feed products and fortification mixes grain based	Folic Acid (HPLC)	In-house method 003

Original Date of Accreditation: 01 November 1999

Field Manager

ANNEXURE A

Facility No.: T0116
Date of Issue: 04 March 2015
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 010
Food and feed	Multi-Mycotoxin: - Aflatoxin G_1, B_1, G_2, B_2 and total - Deoxynivalenol (DON), 15-ADON - Fumonisin B_1, B_2, B_3 - Ochratoxin A - T2, HT-2 - Zearalenone	In-house method 026
GRADING		
Maize	Defective kernels (white maize/yellow maize)	Government Gazette Maize Regulation, Latest Edition
Cereal as grains (wheat, barley, rye and oats)	Hectolitre mass (Kern222)	ISO 7971-3, Latest Edition
Wheat	Screenings	Government Gazette Wheat Grading Regulation, Latest Edition
RHEOLOGICAL		
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 020 (based on AACCI 54-40.02, Latest Edition Mixograph Method)

Original Date of Accreditation: 01 November 1999 Page 3 of 3

ISSUED BY THE SOUTH AFRICAN NATIONAL ACCREDITATION SYSTEM

Field Manager

AACC INTERNATIONAL

RECOGNITION OF ANALYTICAL PERFORMANCE

Analysis of Feed

Southern African Grain Laboratory
Pretoria SOUTH AFRICA

Achieved Outstanding Accuracy and Precision for the year 2014
in check samples including the following analyses:

Moisture, Protein, Ash, Crude Fiber, Crude Fat EE

Executive Vice President

President

CERTIFICATE
SERTIFIKAAT

IT IS HEREBY CERTIFIED THAT
HIERMEE WORD GESERTIFISEER DAT

Southern African Grain Laboratory

Die Wilgers, Pretoria

Feeds / Voere

FOR THE PERIOD OF / VIR DIE TYDPERK 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 <=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 <=2 VOLDOEN:

Ash	***Crude Fibre***	***Fat***
Moisture	***Nx6.25-Protein***	***Starch***

FOR AGRILASA

AGRILASA
AGRI LABORATORY ASSOCIATION OF SOUTHERN AFRICA
AGRI LABORATORIUM ASSOSIASIE VAN SUIDELIKE AFRIKA

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

Report

Evaluation of sunflower cultivars: 2014/2015 season

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

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INTRODUCTION

Optimisation of processes in any industry is key to it's success. 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 initiative in South Africa that evaluates all the important cultivars in the main production areas. 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 2014/2015 season with the voluntary collaboration of Agricol, Pannar, Pioneer and Syngenta. Seed companies entered 21 cultivars for evaluation (Table 1) and supplied seed to the ARC-GCI, which planned the field trials with randomised complete-block design layouts with three replicates. Germination tests, according to ISTA rules, were done on the supplied seed by a service provider. Seed germination from all cultivars exceeded the 80% requirement (Table 1). Seed from cultivars were packed according to trial plans and send to co-operators before the onset of the growing season.

Six of the 21 cultivars were Clearfield types on which the use of the post emergence broad leaf weed controlling herbicide, imazamox, is possible. These cultivars were treated in the same way as the regular cultivars and received no imazamox herbicide.

Each collaborating seed company undertook to conduct at least one trial for each cultivar entry. Four trials were done by the ARC-GCI, eight by Agricol, seven by Pannar, none by Pioneer and eight by Syngenta. Trial sites were selected by collaborators and the co-workers 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 by collaborators to ARC-GCI for analyses. Seed

from nine trials was analysed by SAGL for oil and protein content. Yield data from all field trials were subjected to analyses of variance and the regression line technique, as described by Loubser and Grimbeek (1984). From this analysis yield probabilities were calculated for cultivars at different yield potentials. Two of the 27 trials were not harvested due to damage by rodents and a thunder storm respectively. Results from a further four trials were rejected due to coefficients of variation exceeding the 20% limit. This report contains results of the 21 successful trials.

RESULTS

Days from planting to flowering

The mean number of days from planting to 50% flowering of cultivars at the various localities (Table 4) ranged from 56 (NK Tutti at Potchefstroom) to 73 days (PHB 65A25 at Marquart and Potchefstroom, and SY 3970 at Marquart). Calculated across cultivars and localities, this period was 65 days. Among cultivars, NK Tutti had the shortest period 62 days and PHB65A25 the longest period from planting to flowering at 68 days.

Oil and protein concentration

The moisture free oil and protein concentrations of seed from eight trial localities, as analysed by the Southern African Grain Laboratory NPC, 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 52% with an overall mean of 43%. 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 1st November 2014) with 45%. The locality with the lowest mean oil content of 37% was Marquart. The highest oil concentration among cultivars and calculated across localities, was SY 3979 CL at 47%.

The protein content varied from 13 to 24% among cultivars at the different localities. Among localities, Marquart had the highest and Bainsvlei the lowest protein content of 21 and 16% respectively. Calculated across localities, NK Adagio CL had the highest protein content (21%) and PAN 7057 the lowest (18%).

Seed yield

The mean seed yield of cultivars at the respective localities is presented in Table 7. The highest locality mean yield of 3.69 t ha^{-1} was obtained at Boskop planted on 30th October 2014 and the lowest of 0.70 t ha^{-1}, at Settlers.

The six best performing cultivars, in terms of average yield calculated over localities, were PAN 7098, PAN 7080, PAN 7102 CLP, PHB 65A70, PAN 7049, and PAN 7095 CL. The overall mean yield for 2014/2015 was 2.19 t ha^{-1}, 9% lower than that of the 2013/2014 season.

Only one high oleic cultivar, namely NK TUTTI, was entered for evaluation in 2014/15. Six Clearfield cultivars, NK ADAGIO CL, PAN 7031 CL, PAN 7095 CL, PAN 7102 CLP, PAN 7117 CL and SY 3970 CL were entered. Of these cultivars, PAN 7095 CL and PAN 7102 CLP had yields higher 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 important to farmers who are compensated for seed oil concentration.

The oil yield for cultivars at the eight localities varied from 0.4 to 1.8 t ha^{-1} with an overall mean of 1.1 t ha^{-1}. The locality with the highest mean oil yield was Boskop at 1.6 t ha^{-1}. Among cultivars, PAN 7117 CL, PHB 65A70 and SY 4045 had equally high values of 1.2 t ha^{-1}.

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 consideration, but not the yield stability. These values are

therefore not reliable for cultivar selection. Individual regression lines for 2014/15 are shown in Figure 1 and for cultivars evaluated in 2013/14 and 2014/15 in Figure 2.

The yield stability of cultivars varied nearly nine fold among cultivars. Cultivars which had exceptionally high stabilities (D-parameter ≤ 0.03) were, AGSUN 5264, PAN 7049, PAN 7057, PAN 7102 CLP, PHB 65A25 AND SY 4065.

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 21 cultivars for 2014/15 are shown in Table 11. It takes into consideration both the cultivar X environment interaction and the yield stability and is therefore a reliable measure for cultivar choice. Yield probabilities higher than 60% 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 13 cultivars evaluated in 40 trials in 2013/14 and 2014/15, are shown in Table 12. Tables 11 and 12 should be used jointly for cultivar selection.

Acknowledgements

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References

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Table 1 Cultivars evaluated, seed germination rate and supplier company 2014/2015

Cultivar	Germinated (%)*			Company
	Normal	Abnormal	Dormant/dead	
AGSUN 5264	91	4	5	Agricol ♠
AGSUN 5271	91	2	7	
AGSUN 5272	99	1	0	
AGSUN 5278	99	1	0	
AGSUN 5279	98	2	0	
AGSUN 8251	96	2	2	
PAN 7031 CL	98	1	1	Pannar ●
PAN 7049	90	5	5	
PAN 7057	98	1	1	
PAN 7080	94	4	2	
PAN 7095 CL	97	2	1	
PAN 7098	98	1	1	
PAN 7102 CLP	97	3	0	
PAN 7117 CL	89	7	4	
PHB 65A25	97	2	1	Pioneer ø
PHB 65A70	95	4	1	
NK ADAGIO CL	94	4	2	Syngenta ◘
NK TUTTI	89	5	6	
SY 3970 CL	96	2	2	
SY 4045	98	2	0	
SY 4065	96	2	2	

* According to ISTA rules

Table 2 Collaborating company, trial localities and responsible co-workers 2014/2015

Company	Localities	Planting dates	Co-workers	Address of co-workers
Agricol ♠	Boskop x 2	30/10/2014 & 19/12/2014	J Swanepoel	PO Box 6645, Baillie Park, 2526
	Lichtenburg	26/11/2014		
	Ottosdal x 2	15/12/2014 & 02/01/2015		
	Viljoenskroon	17/11/2014		
ARC-GCI ▲	Potchefstroom	14/11/2014	W Deale & J Erasmus	P/Bag X1251, Potchefstroom, 2520
		01/12/2014		
		18/12/2014		
		14/01/2015		
PANNAR ●	Bainsvlei	18/11/2014	L Schoonraad & TC Lochner	PO Box 439, Delmas, 2210
	Bothaville	19/12/2014		
	Delmas	28/10/2014		
	Kroonstad	10/12/2014		
	Senekal	18/12/2014		
	Settlers x 2	16/01/2015		
Syngenta ◘	Bainsvlei	06/01/2015	F van Deventer J Viljoen	Private Bag X60, Halfway House, 1685
	Bothaville	26/11/2014		
	Kroonstad	30/12/2014		
	Marquart	05/01/2015		
	Ottosdal	18/12/2014		
	Roedtan	16/01/2015		
	Settlers	12/01/2015		
	Viljoenskroon	18/12/2014		

♠ Agricol; ▲ ARC-GCI; ● Pannar; ◘ Syngenta

Table 3 Trial site information 2014/2015

Locality*	Planting date	Plant population	Soil classi-fication	Top soil analysis (mg kg^{-1})					Fertiliser applied (Kg ha^{-1})	Row width (cm)	Weed contol and insecticides	Nett plot size (m^2)
				pH (KCl)	P	K	Ca	Mg				
Bainsvlei ●	18/11/14	-	-	-	-	-	-	-	-	-	-	17.29
Bainsvlei ◘	06/01/15	43 000	Bainsvlei	-	-	-	-	-		93	None	13.02
Boskop ♠	30/10/14	40 000	-	-	-	-	-	-	N 89, P 20.24, K 6.12	91	Mechanical	6.37
Boskop ♠	19/12/14	40 000	-	-	-	-	-	-	N 89, P 20.24, K 6.12	91	Mechanical	6.37
Bothaville ◘	26/11/14	43 333	Avalon	-	-	-	-	-	-	93	None	13.02
Bothaville ●	19/12/14	-	-	-	-	-	-	-	-	-	-	17.29
Delmas ●	28/10/14	-	-	-	-	-	-	-	-	-	-	13.65
Kroonstad ◘	30/12/14	-	Westleigh	-	-	-	-	-		93	None	13.02
Kroonstad ●	10/12/14	-	-	-	-	-	-	-	-	-	-	13.65
Lichtenburg ♠	26/11/14	40 000	-	-	-	-	-	-		91	Mechanical	5.92
Lichtenburg ●	13/01/15								6:2:1 (31) + Zn			
Marquart ◘	05/01/15	43 000	Clovelly	-	-	-	-	-		93	None	13.02
Ottosdal ♠	15/12/14	40 000	-	-	-	-	-	-		91	Mechanical	5.92
Ottosdal ♠	01/02/15	40 000	-	-	-	-	-	-		91	Mechanical	5.92
Ottosdal ◘	18/12/14	43 000	Clovelly	-	-	-	-	-		93	None	13.02
Potchefstroom ▲	14/11/14	28 000	Westleigh	6.03	41	183	873	405	N 50; P 8; K 4	90	Alanex 480 CS + Racer	14.40
Potchefstroom ▲	01/12/14	28 000	Westleigh	5.89	37	203	893	420	N 50; P 8; K 4	90	Alanex 480 CS + Racer	14.40
Potchefstroom ▲	18/12/14	28 000	Westleigh	5.89	37	203	893	420	N 50; P 8; K 4	90	Alanex 480 CS + Racer	14.40
Potchefstroom ▲	14/01/15	28 000	Westleigh	5.89	37	203	893	420	N 50; P 8; K 4	90	Alanex 480 CS + Racer	14.40
Roedtan ◘	16/01/15	43 000	Arcadia	-	-	-	-	-	-	93	None	13.02
Senekal ●	18/12/14	-	-	-	-	-	-	-	-	-	-	17.29
Settlers ●	16/01/15	-	-	-	-	-	-	-	-	-	-	13.65
Settlers ◘	12/01/15	43 000	Arcadia	-	-	-	-	-	-	93	None	13.02
Viljoenskroon ♠	17/11/14	40 000	-	-	-	-	-	-	-	91	Mechanical	15.92
Viljoenskroon ◘	04/12/14	43 000	Avalon	-	-	-	-	-	-	93	None	13.02

♠ Agricol; ▲ ARC-GCI; ● Pannar; ◘ Syngenta

Table 4 Number of days from planting to 50 percent flowering of cultivars at selected localities and planting dates 2014/2015

Cultivar	Locality and planting date*																
	Boskop 30/10/2014 ♠	Boskop 19/12/2014 ♠	Bothaville 26/11/2014 ◘	NKP Lichtenburg 15/12/2014	Marquard 05/01/2015 ◘	Ottosdal 5/12/2014 ♠	Ottosdal 18/12/2014 ◘	Ottosdal 01/02/2015 ♠	Potchefstroom 14/11/14 ▲	Potchefstroom 1/12/2014 ▲	Potchefstroom 18/12/2014 ▲	Potchefstroom 14/01/2015 ▲	Roedtan 16/01/2015 ◘	Settlers 01/12/2014 ◘	Viljoenskroon 17/11/2014 ♠	Viljoenskroon 04/12/2014 ◘	Mean
AGSUN 5264	67	64	64	65	66	67	63	64	67	64	59	59	63	67	65	61	64
AGSUN 5271	68	66	66	67	64	67	61	66	67	65	60	60	64	66	66	63	64
AGSUN 5272	69	69	68	68	70	69	65	66	72	66	65	65	65	64	68	67	67
AGSUN 5278	69	67	67	66	72	67	63	65	71	67	64	64	66	67	66	65	66
AGSUN 5279	67	65	65	65	72	67	63	64	67	63	58	58	63	63	65	63	64
AGSUN 8251	68	67	67	66	68	68	63	65	71	67	65	65	67	68	66	64	66
NK ADAGIO CL	67	64	64	65	65	66	61	64	69	63	62	62	66	67	65	63	64
NK TUTTI	64	61	59	63	61	64	61	62	64	63	56	56	64	67	63	61	62
PAN 7031 CL	68	64	64	66	68	65	61	63	67	63	61	61	66	67	66	64	64
PAN 7049	68	66	66	67	64	66	64	65	68	64	59	59	66	66	66	65	65
PAN 7057	68	66	65	65	68	67	64	65	67	63	60	60	66	66	65	62	64
PAN 7080	69	67	68	67	72	68	65	66	69	65	64	64	66	68	67	66	67
PAN 7095 CL	69	67	66	66	70	67	64	66	69	65	63	63	63	67	66	66	66
PAN 7098	69	64	66	67	66	67	62	65	69	63	62	62	65	65	66	65	65
PAN 7102 CLP	65	63	66	65	64	66	61	65	66	63	57	57	64	66	65	62	63
PAN 7117 CL	65	66	67	65	68	66	64	66	71	65	66	66	66	63	65	65	66
PHB 65A25	71	69	67	68	73	68	63	67	73	69	67	67	68	68	68	67	68
PHB 65A70	67	65	64	66	63	66	62	65	67	63	59	59	65	68	66	63	64
SY 3970 CL	69	67	68	66	73	66	64	66	71	67	63	63	67	66	66	66	67
SY 4045	65	63	62	64	64	65	60	63	67	62	57	57	66	67	65	61	63
SY 4065	70	67	68	67	72	68	64	66	72	67	63	63	67	67	67	64	67
Mean	68	66	66	66	68	67	63	65	69	65	61	61	65	66	66	64	

♠ Agricol; ▲ ARC-GCI; ● Pannar; ◘ Syngenta

Table 5 The moisture free seed oil concentration (%) of cultivars at selected localities 2014/2015

Cultivar	Locality and planting date								Mean
	Bainsvlei 06/01/2015 ◘	Boskop 19/12/2014 ♠	Delmas 28/10/2014 ●	Marquart 05/01/2015 ◘	Ottosdal 15/12/2014 ♠	Potchefstroom 1/12/2014 ▲	Settlers 12/01/2015 ◘	Viljoenskroon 04/12/2014 ◘	
AGSUN 5264	45.7	46.8	47.6	38.5	44.2	47.5	43.2	43.2	44.6
AGSUN 5271	40.6	39.7	43.2	37.2	41.1	44.3	44.5	42.2	41.6
AGSUN 5272	39.4	41.0	43.2	34.8	39.6	41.6	46.5	38.6	40.6
AGSUN 5278	41.1	38.8	42.4	42.2	39.5	39.8	42.1	37.5	40.4
AGSUN 5279	41.8	40.3	44.8	34.8	40.8	43.8	40.8	39.5	40.8
AGSUN 8251	42.2	40.1	42.0	34.7	40.7	38.9	44.9	36.6	40.0
NK ADAGIO CL	43.1	40.8	42.6	35.9	40.6	44.1	42.2	39.8	41.1
NK TUTTI	44.4	45.5	47.9	37.8	43.9	43.4	41.4	38.0	42.8
PAN 7031 CL	40.4	44.3	40.9	35.2	43.1	46.6	41.5	43.6	42.0
PAN 7049	40.1	41.6	36.3	33.4	40.5	43.1	47.2	42.3	40.6
PAN 7057	43.4	42.6	46.0	35.8	42.3	43.7	41.8	41.1	42.1
PAN 7080	40.1	40.6	43.9	33.2	41.7	44.5	45.6	43.7	41.7
PAN 7095 CL	41.7	41.7	42.6	33.1	40.0	43.7	41.6	43.1	40.9
PAN 7098	41.0	39.2	41.8	34.0	39.6	42.9	50.6	39.8	41.1
PAN 7102 CLP	40.9	41.6	42.5	31.1	39.9	44.0	40.0	37.6	39.7
PAN 7117 CL	46.1	47.1	47.6	41.2	47.0	50.7	41.2	48.0	46.1
PHB 65A25	45.0	45.2	48.4	40.9	46.6	47.7	48.8	44.9	45.9
PHB 65A70	40.8	42.6	45.5	36.3	42.8	44.9	49.6	41.7	43.0
SY 3970 CL	40.4	50.0	50.7	43.2	48.6	52.2	42.9	50.2	47.3
SY 4045	43.5	42.9	43.7	34.3	40.8	42.3	46.9	43.5	42.2
SY 4065	38.2	50.6	51.9	42.9	48.1	51.0	41.0	51.6	46.9
Mean	41.9	43.0	44.5	36.7	42.4	44.8	44.0	42.2	

♠ Agricol; ▲ ARC-GCI; ● Pannar; ◘ Syngenta

Table 6 The moisture free seed protein concentration (%) of cultivars at selected localities 2014/2015

Cultivar	Bainsvlei	Boskop	Delmas	Marquart	Ottosdal	Potchefstroom	Settlers	Viljoenskroon	Mean
	06/01/2015 ◘	19/12/2014 ♠	28/10/2014 ●	05/01/2015 ◘	15/12/2014 ♠	1/12/2014 ▲	12/01/2015 ◘	04/12/2014 ◘	
AGSUN 5264	16.2	20.8	16.4	21.3	21.6	20.3	16.6	22.8	19.5
AGSUN 5271	19.2	20.2	15.6	20.0	21.1	17.9	16.2	21.9	19.0
AGSUN 5272	17.6	21.5	16.2	21.0	20.5	18.6	18.1	21.5	19.4
AGSUN 5278	15.4	20.8	16.1	18.3	20.8	19.7	17.9	21.2	18.8
AGSUN 5279	15.8	21.5	15.8	22.9	21.3	20.2	16.9	22.7	19.6
AGSUN 8251	12.6	20.2	16.6	20.3	19.8	20.6	17.9	21.8	18.7
NK ADAGIO CL	17.7	23.6	19.3	23.2	22.7	21.5	17.4	21.9	20.9
NK TUTTI	13.5	18.6	15.8	21.2	18.8	19.4	17.7	21.1	18.3
PAN 7031 CL	16.9	19.3	15.9	21.3	19.8	20.3	15.7	22.8	19.0
PAN 7049	16.0	19.6	16.1	19.5	19.3	19.2	18.8	17.8	18.3
PAN 7057	13.3	18.7	15.6	19.5	19.0	19.3	17.4	18.7	17.7
PAN 7080	15.8	20.1	14.8	20.8	18.5	18.3	17.2	18.4	18.0
PAN 7095 CL	14.2	19.3	16.9	21.9	19.3	19.4	18.0	19.0	18.5
PAN 7098	15.0	20.6	15.2	19.6	19.1	17.2	17.7	19.8	18.0
PAN 7102 CLP	14.7	21.2	15.4	19.1	20.3	18.1	19.2	20.3	18.5
PAN 7117 CL	14.5	21.3	17.9	21.7	21.2	17.6	18.0	20.7	19.1
PHB 65A25	16.8	20.6	16.7	22.7	19.8	20.4	17.6	22.3	19.6
PHB 65A70	15.2	20.5	14.3	20.3	19.0	19.0	19.6	18.8	18.4
SY 3970 CL	18.2	19.1	16.0	22.0	19.8	19.3	17.2	19.3	18.9
SY 4045	13.6	20.0	18.0	21.1	20.7	21.7	19.9	15.6	18.8
SY 4065	19.2	18.9	14.9	21.4	18.8	18.4	17.8	15.9	18.2
Mean	15.8	20.3	16.2	20.9	20.1	19.3	17.7	20.2	

♠ Agricol; ▲ ARC-GCI; ● Pannar; ◘ Syngenta

Table 7 Mean seed yield (t ha^{-1}) of cultivars at each locality 2014/2015

Cultivar	Bainsvlei 18/11/2014 ●	Bainsvlei 06/01/2015 ◘	Boskop 30/10/2014 ♠	Boskop 19/12/2014 ♠	Bothaville 26/11/2014 ◘	Bothaville 19/12/2014 ●	Delmas 28/10/2014 ●	Kroonstad 10/12/2014 ●	Marquart 05/01/2015 ◘	Ottosdal 15/12/2014 ♠	Ottosdal 01/02/2015 ♠	Mean of all cultivars
AGSUN 5264	1.51	2.39	3.33	3.48	2.41	2.77	1.77	1.62	3.42	2.27	1.99	2.12
AGSUN 5271	1.54	2.75	3.38	4.02	2.69	2.65	1.66	1.80	2.88	2.30	2.20	2.19
AGSUN 5272	1.68	2.52	3.78	3.88	2.65	2.57	1.09	2.00	3.11	2.46	2.42	2.20
AGSUN 5278	1.70	2.84	3.98	3.93	2.22	2.75	1.46	1.67	3.60	2.76	2.39	2.23
AGSUN 5279	1.94	2.48	3.46	3.79	2.84	3.00	1.51	1.95	3.53	2.74	2.19	2.27
AGSUN 8251	1.64	2.76	3.89	3.81	3.00	2.90	1.47	1.82	3.52	2.74	2.30	2.22
NK ADAGIO CL	1.50	2.21	3.22	3.25	1.77	2.33	1.80	1.45	2.87	2.25	1.86	1.94
NK TUTTI	1.69	2.57	3.52	3.06	2.25	2.10	1.55	1.54	3.44	1.99	1.95	2.06
PAN 7031 CL	1.53	2.13	4.21	3.84	1.89	2.77	1.26	1.67	3.04	2.16	2.28	2.06
PAN 7049	1.69	2.58	4.00	3.81	2.65	2.82	1.66	1.89	3.48	2.88	2.38	2.33
PAN 7057	1.81	2.25	3.99	3.65	2.29	2.91	1.64	1.93	3.12	2.36	2.39	2.24
PAN 7080	1.93	2.61	3.84	4.04	3.29	2.93	1.78	2.11	3.18	2.70	2.70	2.37
PAN 7095 CL	1.98	2.43	3.76	3.55	2.60	3.35	2.35	1.80	2.92	2.68	2.22	2.32
PAN 7098	1.70	2.89	3.64	3.86	3.24	2.95	2.02	1.96	3.62	2.84	2.41	2.47
PAN 7102 CLP	1.61	3.00	3.81	3.79	2.49	2.82	1.81	2.03	3.58	2.51	2.39	2.34
PAN 7117 CL	1.52	2.29	3.75	3.57	2.51	2.34	1.86	1.37	2.91	2.97	2.00	2.11
PHB 65A25	1.73	2.54	3.77	3.72	2.17	2.41	1.69	1.62	3.49	2.42	2.32	2.13
PHB 65A70	1.94	2.14	3.99	3.66	2.18	2.87	2.18	1.86	3.60	2.42	2.38	2.33
SY 3970 CL	1.37	2.30	3.50	3.26	2.20	2.69	2.26	1.43	2.94	2.63	2.00	2.05
SY 4045	1.42	2.48	3.43	3.41	1.85	0.87	2.16	1.73	3.33	2.14	2.01	1.99
SY 4065	1.44	2.52	3.33	3.56	2.30	2.50	1.83	1.48	3.05	2.62	2.14	2.10
Mean	1.66	2.51	3.69	3.67	2.45	2.63	1.75	1.75	3.27	2.52	2.24	
CV%	8	13	9	8	16	11	15	10	9	17	13	

♠ Agricol; ▲ ARC-GCI; ● Pannar; ◘ Syngenta

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Table 7 Continue

Cultivar	Potchefstroom 14/11/14 ▲	Potchefstroom 1/12/2014 ▲	Potchefstroom 18/12/14 ▲	Potchefstroom 14/01/2015 ▲	Roedtan 16/01/2015 ◘	Senekal 18/12/2014 ●	Settlers 12/01/2015 ◘	Settlers 16/01/2015 ●	Viljoenskroon 17/11/2014 ♠	Viljoenskroon 04/12/2014 ◘	Mean of all cultivars
AGSUN 5264	1.60	1.65	2.18	1.94	2.41	1.16	1.25	0.70	1.52	3.12	2.12
AGSUN 5271	1.93	1.97	2.16	2.02	2.20	1.36	1.32	0.73	1.35	3.04	2.19
AGSUN 5272	1.72	1.93	2.05	2.01	2.19	1.40	1.43	0.84	1.50	2.96	2.20
AGSUN 5278	1.75	1.63	2.18	1.91	2.31	1.04	1.11	0.81	1.48	3.21	2.23
AGSUN 5279	1.76	1.85	2.06	2.06	2.41	1.48	1.41	0.42	1.33	3.54	2.27
AGSUN 8251	1.55	1.68	1.98	1.92	2.01	1.02	1.15	0.89	1.57	3.06	2.22
NK ADAGIO CL	1.83	1.70	2.00	1.68	1.44	1.15	1.22	0.60	1.57	3.08	1.94
NK TUTTI	1.98	2.11	2.13	1.75	2.34	1.00	1.27	0.43	1.11	3.51	2.06
PAN 7031 CL	1.97	1.82	1.98	1.97	1.94	1.10	1.35	0.17	1.10	3.16	2.06
PAN 7049	2.05	1.90	2.25	2.01	2.44	1.44	1.32	0.77	1.33	3.58	2.33
PAN 7057	2.01	1.91	2.20	2.05	2.28	1.54	1.25	0.76	1.28	3.52	2.24
PAN 7080	1.82	1.78	2.34	2.01	2.06	1.59	1.21	0.97	1.24	3.72	2.37
PAN 7095 CL	1.90	1.99	2.36	1.74	2.25	1.65	1.25	0.86	1.41	3.57	2.32
PAN 7098	1.96	2.73	2.21	2.09	2.65	1.67	1.37	0.76	1.73	3.54	2.47
PAN 7102 CLP	2.07	2.03	2.58	2.14	2.35	1.38	1.10	0.93	1.22	3.51	2.34
PAN 7117 CL	1.57	1.90	2.12	1.81	1.91	1.36	1.25	0.61	1.65	3.04	2.11
PHB 65A25	1.75	1.89	1.81	1.71	1.87	1.37	1.16	0.62	1.22	3.54	2.13
PHB 65A70	2.06	2.05	2.36	1.99	2.69	1.39	1.22	0.72	1.29	3.84	2.33
SY 3970 CL	1.71	1.65	1.94	1.63	2.09	1.23	1.22	0.62	1.13	3.35	2.05
SY 4045	2.01	1.77	2.12	1.93	2.03	0.79	1.25	0.63	1.40	2.97	1.99
SY 4065	2.01	1.71	2.11	1.98	1.69	1.26	1.13	0.77	1.52	3.15	2.10
Mean	1.86	1.89	2.15	1.92	2.17	1.30	1.25	0.70	1.38	3.33	
CV%	10	13	11	8	14	8	11	18	19	10	

♠ Agricol; ▲ ARC-GCI; ● Pannar; ◘ Syngenta

Table 8 Oil yield (t ha^{-1}) of cultivars at selected localities 2014/2015

Cultivar	Bainsvlei	Boskop	Delmas	Marquart	Ottosdal	Potchefstroom	Settlers	Viljoenskroon	Mean
	06/01/2015 ◘	19/12/2014 ♠	28/10/2014 ●	05/01/2015 ◘	15/12/2014 ♠	1/12/2014 ▲	12/01/2015 ◘	04/12/2014 ◘	
AGSUN 5264	1.1	1.6	0.8	1.3	1.0	0.8	0.5	1.3	1.1
AGSUN 5271	1.1	1.6	0.7	1.1	0.9	0.9	0.6	1.3	1.0
AGSUN 5272	1.0	1.6	0.5	1.1	1.0	0.8	0.7	1.1	1.0
AGSUN 5278	1.2	1.5	0.6	1.5	1.1	0.6	0.5	1.2	1.0
AGSUN 5279	1.0	1.5	0.7	1.2	1.1	0.8	0.6	1.4	1.0
AGSUN 8251	1.2	1.5	0.6	1.2	1.1	0.7	0.5	1.1	1.0
CAP2000	1.0	1.3	0.8	1.0	0.9	0.7	0.5	1.2	0.9
NK ADAGIO CL	1.1	1.4	0.7	1.3	0.9	0.9	0.5	1.3	1.0
NK TUTTI	0.9	1.7	0.5	1.1	0.9	0.8	0.6	1.4	1.0
PAN 7031 CL	1.0	1.6	0.6	1.2	1.2	0.8	0.6	1.5	1.1
PAN 7049	1.0	1.6	0.8	1.1	1.0	0.8	0.5	1.4	1.0
PAN 7057	1.0	1.6	0.8	1.1	1.1	0.8	0.6	1.6	1.1
PAN 7080	1.0	1.5	1.0	1.0	1.1	0.9	0.5	1.5	1.1
PAN 7095 CL	1.2	1.5	0.8	1.2	1.1	1.2	0.7	1.4	1.1
PAN 7098	1.2	1.6	0.8	1.1	1.0	0.9	0.4	1.3	1.0
PAN 7102 CLP	1.1	1.7	0.9	1.2	1.4	1.0	0.5	1.5	1.1
PAN 7117 CL	1.1	1.7	0.8	1.4	1.1	0.9	0.6	1.6	1.2
PHB 65A25	0.9	1.6	1.0	1.3	1.0	0.9	0.6	1.6	1.1
PHB 65A70	0.9	1.6	1.1	1.3	1.3	0.9	0.5	1.7	1.2
SY 3970 CL	1.1	1.5	0.9	1.1	0.9	0.7	0.6	1.3	1.0
SY 4045	1.0	1.8	0.9	1.3	1.3	0.9	0.5	1.6	1.2
SY 4065	1.1	1.6	0.8	1.2	1.1	0.8	0.5	1.4	1.1
Mean	1.1	1.6	0.8	1.2	1.1	0.8	0.6	1.4	

♠ Agricol; ▲ ARC-GCI; ● Pannar; ◘ Syngenta

Table 9 Parameters calculated from the analysis of variance for yield data at each locality 2014/2015

Locality	Mean (t ha^{-1})	SE (t ha^{-1})	CV (%)	GCV	t	SE(t)	tn
Bainsvlei 18/11/2014 ●	1.66	0.08	8.1	9.9	0.60	0.114	0.82
Bainsvlei 06/01/2015 ◘	2.51	0.19	13.3	5.9	0.16	0.143	0.36
Boskop 30/10/2014 ♠	3.69	0.18	8.5	5.5	0.30	0.145	0.56
Boskop 19/12/2014 ♠	3.67	0.16	7.7	5.6	0.35	0.143	0.62
Bothaville 26/11/2014 ◘	2.45	0.22	15.8	14.3	0.45	0.135	0.71
Bothaville 19/12/2014 ●	2.63	0.16	10.6	17.6	0.73	0.086	0.89
Delmas 28/10/2014 ●	1.75	0.15	15.3	16.0	0.52	0.126	0.76
Kroonstad 10/12/2014 ●	1.75	0.10	9.6	11.0	0.57	0.119	0.80
Marquart 05/01/2015 ◘	3.27	0.17	9.2	6.7	0.35	0.143	0.62
Ottosdal 15/12/2014 ♠	2.52	0.25	17.2	4.1	0.05	0.135	0.14
Ottosdal 01/02/2015 ♠	2.24	0.17	13.4	5.0	0.12	0.141	0.29
Potchefstroom 14/11/14 ▲	1.86	0.11	9.9	6.9	0.32	0.144	0.59
Potchefstroom 1/12/2014 ▲	1.89	0.14	12.6	10.4	0.40	0.139	0.67
Potchefstroom 18/12/14 ▲	2.15	0.13	10.5	5.2	0.19	0.144	0.41
Potchefstroom 14/01/2015 ▲	1.92	0.09	8.4	5.8	0.32	0.144	0.59
Roedtan 16/01/2015 ◘	2.17	0.17	13.5	11.6	0.42	0.138	0.68
Senekal 18/12/2014 ●	1.30	0.06	8.4	17.1	0.81	0.064	0.93
Settlers 12/01/2015 ◘	1.25	0.08	11.3	3.6	0.09	0.139	0.23
Settlers 16/01/2015_1 ●	0.70	0.07	17.6	25.2	0.67	0.100	0.86
Viljoenskroon 17/11/2014 ♠	1.38	0.15	19.1	6.9	0.12	0.141	0.29
Viljoenskroon 04/12/2014 ◘	3.33	0.19	10.0	5.7	0.24	0.145	0.49

♠ Agricol; ▲ ARC-GCI; ● Pannar; ◘ Syngenta

Table 10 Regression line coordinates at different yield potentials 2014/2015

Cultivar	Yield potential (t ha^{-1})						Mean (t ha^{-1})	Intercept	Slope	D-parameter
	1	1.5	2	2.5	3	3.5				
AGSUN 5264	0.99	1.47	1.94	2.42	2.89	3.37	2.12	0.04	0.95	0.026
AGSUN 5271	1.07	1.54	2.01	2.48	2.95	3.42	2.19	0.13	0.94	0.034
AGSUN 5272	1.05	1.53	2.01	2.49	2.97	3.45	2.20	0.09	0.96	0.047
AGSUN 5278	0.88	1.44	2.00	2.56	3.12	3.68	2.23	-0.24	1.12	0.033
AGSUN 5279	1.01	1.54	2.06	2.59	3.11	3.64	2.27	-0.04	1.05	0.040
AGSUN 8251	0.93	1.47	2.01	2.55	3.09	3.63	2.22	-0.15	1.08	0.054
NK ADAGIO CL	0.93	1.35	1.77	2.19	2.61	3.03	1.94	0.09	0.84	0.034
NK TUTTI	0.89	1.38	1.87	2.36	2.85	3.34	2.06	-0.09	0.98	0.064
PAN 7031 CL	0.71	1.28	1.84	2.41	2.97	3.54	2.06	-0.42	1.13	0.062
PAN 7049	1.04	1.58	2.12	2.66	3.20	3.74	2.33	-0.04	1.08	0.009
PAN 7057	1.05	1.55	2.05	2.55	3.05	3.55	2.24	0.05	1.00	0.026
PAN 7080	1.11	1.64	2.17	2.70	3.23	3.76	2.37	0.05	1.06	0.058
PAN 7095 CL	1.20	1.67	2.14	2.61	3.08	3.55	2.32	0.26	0.94	0.058
PAN 7098	1.28	1.78	2.28	2.78	3.28	3.78	2.47	0.28	1.00	0.053
PAN 7102 CLP	1.08	1.61	2.13	2.66	3.18	3.71	2.34	0.03	1.05	0.026
PAN 7117 CL	0.97	1.45	1.92	2.40	2.87	3.35	2.11	0.02	0.95	0.046
PHB 65A25	0.85	1.39	1.92	2.46	2.99	3.53	2.13	-0.22	1.07	0.023
PHB 65A70	1.07	1.60	2.13	2.66	3.19	3.72	2.33	0.01	1.06	0.054
SY 3970 CL	0.91	1.39	1.86	2.34	2.81	3.29	2.05	-0.04	0.95	0.041
SY 4045	0.95	1.39	1.82	2.26	2.69	3.13	1.99	0.08	0.87	0.177
SY 4065	1.01	1.47	1.93	2.39	2.85	3.31	2.10	0.09	0.92	0.025

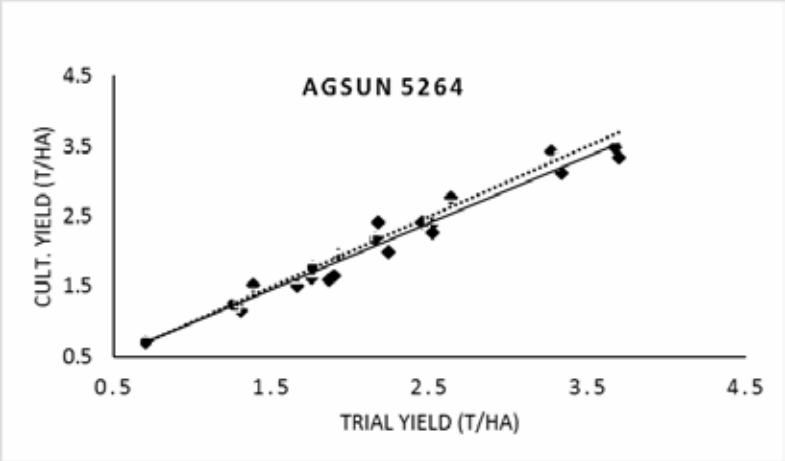
Table 11 Yield probability (%) of cultivars 2014/15 at different yield potentials

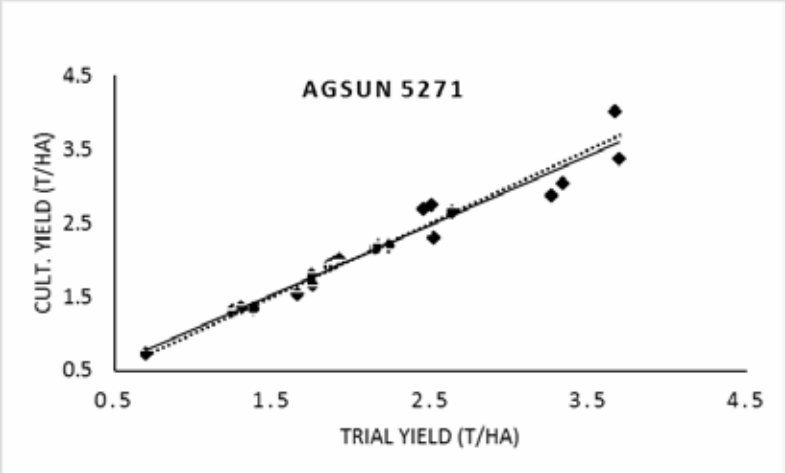
Cultivar	Yield potential (t ha^{-1})					
	1	1.5	2	2.5	3	3.5
AGSUN 5264	48	43	36	31	26	23
AGSUN 5271	**64**	58	52	46	40	34
AGSUN 5272	59	55	52	48	45	42
AGSUN 5278	27	38	50	**63**	**74**	**82**
AGSUN 5279	52	58	**62**	**67**	**70**	**74**
AGSUN 8251	39	45	52	58	**64**	**70**
NK ADAGIO CL	36	22	11	5	2	1
NK TUTTI	34	32	31	30	29	28
PAN 7031 CL	14	20	27	36	45	56
PAN 7049	**65**	**79**	**89**	**95**	**98**	**99**
PAN 7057	**61**	**62**	**62**	**62**	**62**	**61**
PAN 7080	**66**	**71**	**75**	**79**	**82**	**84**
PAN 7095 CL	**78**	**75**	**71**	**67**	**62**	58
PAN 7098	**87**	**88**	**88**	**88**	**88**	**87**
PAN 7102 CLP	**68**	**74**	**78**	**83**	**86**	**88**
PAN 7117 CL	45	41	36	32	28	26
PHB 65A25	18	24	30	40	47	57
PHB 65A70	**61**	**66**	**71**	**75**	**78**	**81**
SY 3970 CL	34	30	25	22	19	17
SY 4045	46	40	34	29	24	21
SY 4065	52	43	33	25	18	13

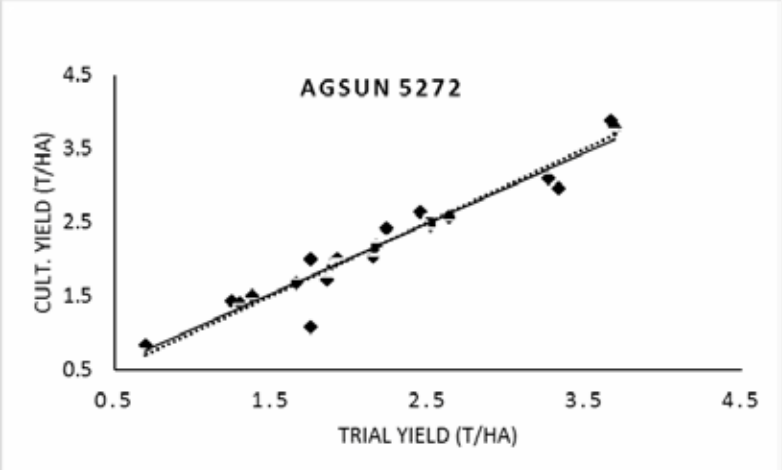
Table 12 Yield probability (%) of cultivars 2013/14 and 2014/15 at different yield potentials

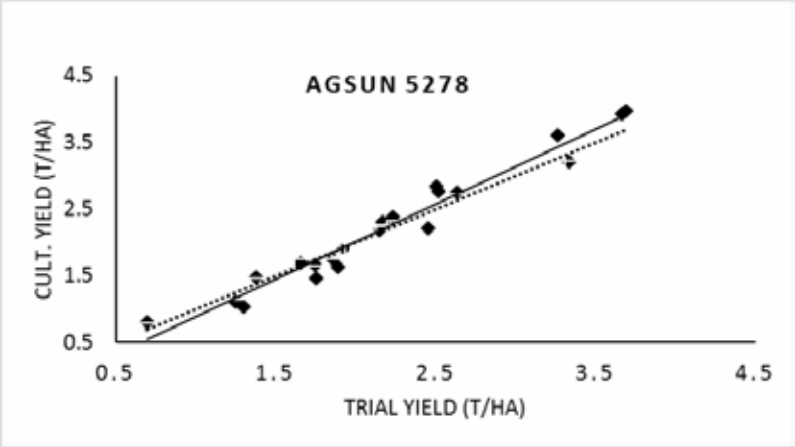
Cultivar	Yield potential (t ha^{-1})					
	1	1.5	2	2.5	3	3.5
Agsun 5264	34	31	27	24	22	20
Agsun 5271	38	41	43	47	48	52
Agsun 5278	27	35	42	52	**60**	**68**
Agsun 5279	47	50	54	57	**61**	**64**
Agsun 8251	29	38	48	58	**68**	**76**
PAN 7049	**67**	**71**	**74**	**78**	**79**	**82**
PAN 7057	53	52	50	48	46	45
PAN 7080	**62**	**69**	**73**	**78**	**81**	**85**
PAN 7098	**69**	**72**	**75**	**78**	**80**	**81**
PAN 7095 CL	**64**	**63**	**60**	59	56	54
PAN 7102 CLP	59	57	52	50	46	43
PHB 65A25	30	29	29	29	29	30
PHB 65A70	58	57	54	52	48	47
SY 4045	55	44	32	23	15	10

Figure 1 Regression lines for cultivars 2014/2015. Regression and mean shown as solid and dotted lines respectively








AGSUN 5278
CULT. YIELD (T/HA)
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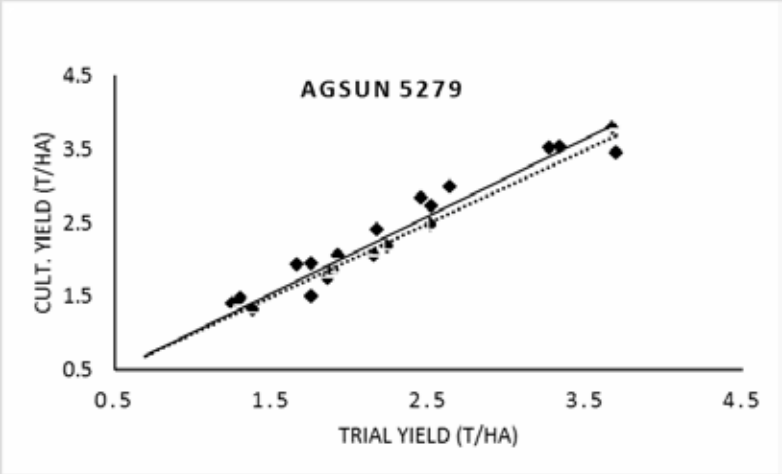
3.5
2.5
1.5
0.5
0.5
1.5
2.5
3.5
4.5
TRIAL YIELD (T/HA)


AGSUN 5279
CULT. YIELD (T/HA)
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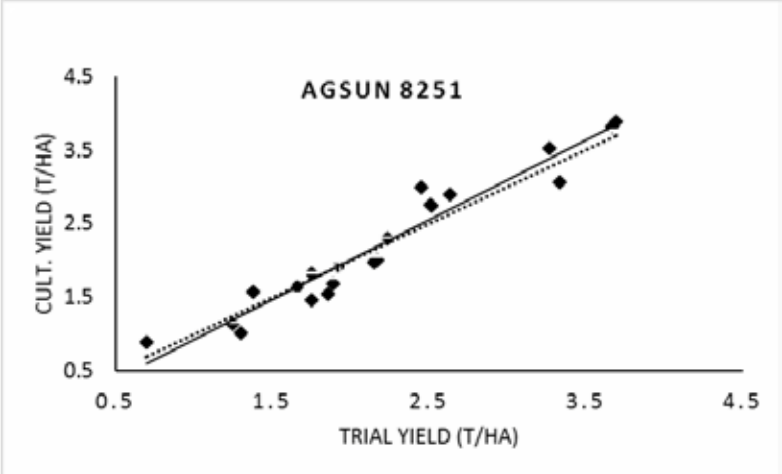
1.5
0.5
0.5
1.5
2.5
3.5
4.5
TRIAL YIELD (T/HA)


AGSUN 8251
CULT. YIELD (T/HA)
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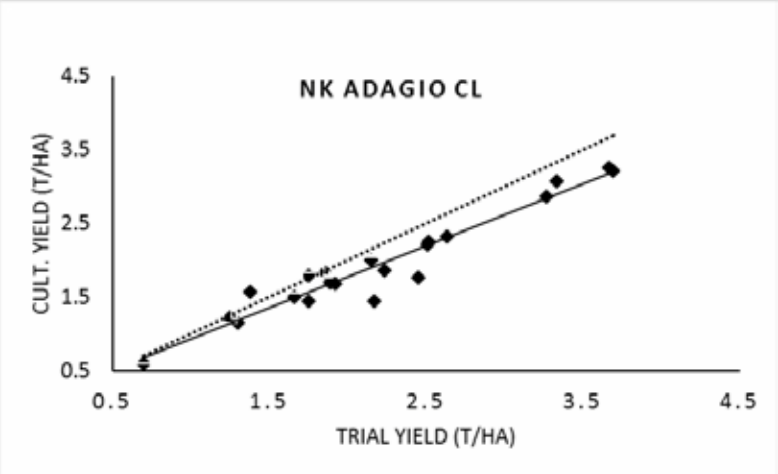
2.5
1.5
0.5
0.5
1.5
2.5
3.5
4.5
TRIAL YIELD (T/HA)


NK ADAGIO CL
CULT. YIELD (T/HA)
TRIAL YIELD (T/HA)
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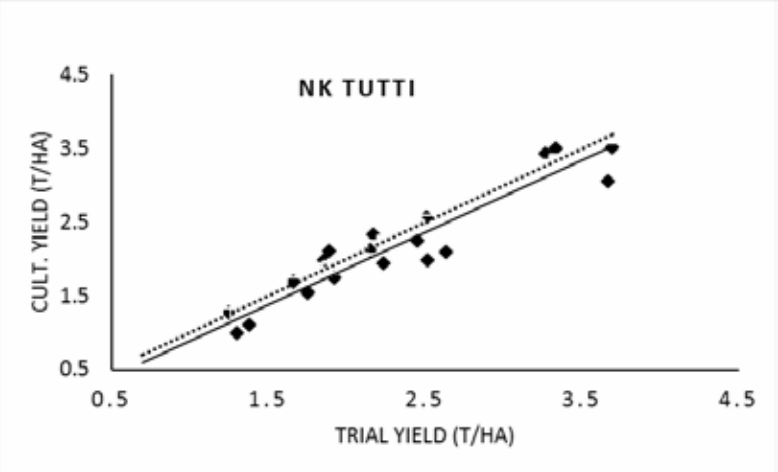
3.5
2.5
1.5
0.5
0.5
1.5
2.5
3.5
4.5


NK TUTTI
CULT. YIELD (T/HA)
TRIAL YIELD (T/HA)
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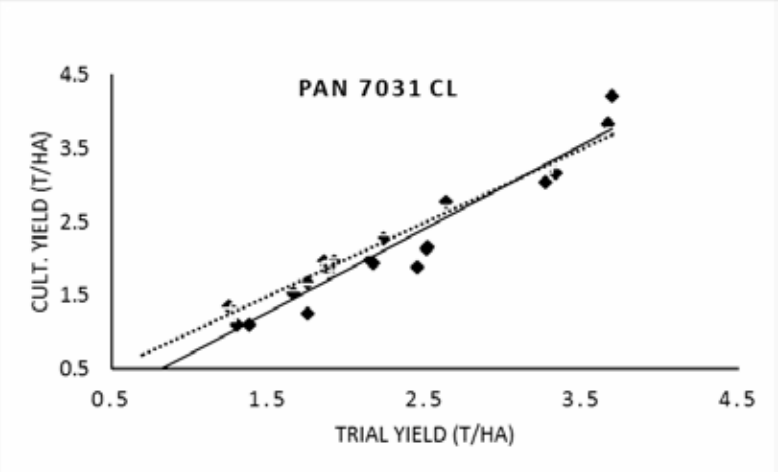
2.5
1.5
0.5
0.5
1.5
2.5
3.5
4.5


PAN 7031 CL
CULT. YIELD (T/HA)
TRIAL YIELD (T/HA)
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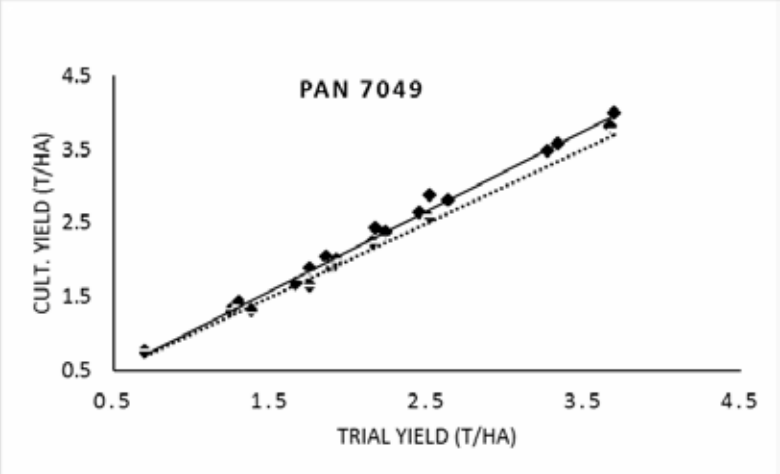
3.5
2.5
1.5
0.5
0.5
1.5
2.5
3.5
4.5


PAN 7049
CULT. YIELD (T/HA)
TRIAL YIELD (T/HA)
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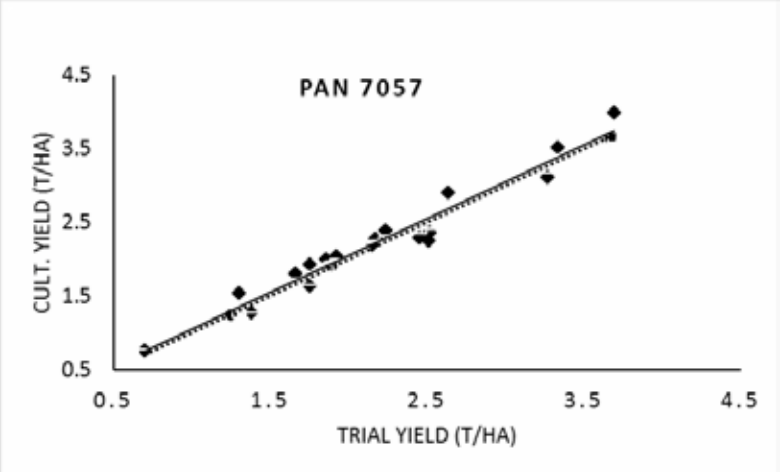
1.5
0.5
0.5
1.5
2.5
3.5
4.5


PAN 7057
CULT. YIELD (T/HA)
TRIAL YIELD (T/HA)
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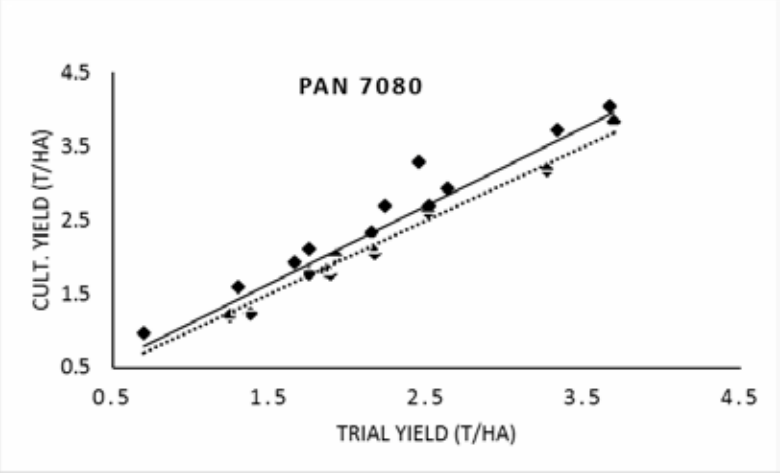
0.5
1.5
2.5
3.5
4.5


PAN 7080
CULT. YIELD (T/HA)
TRIAL YIELD (T/HA)
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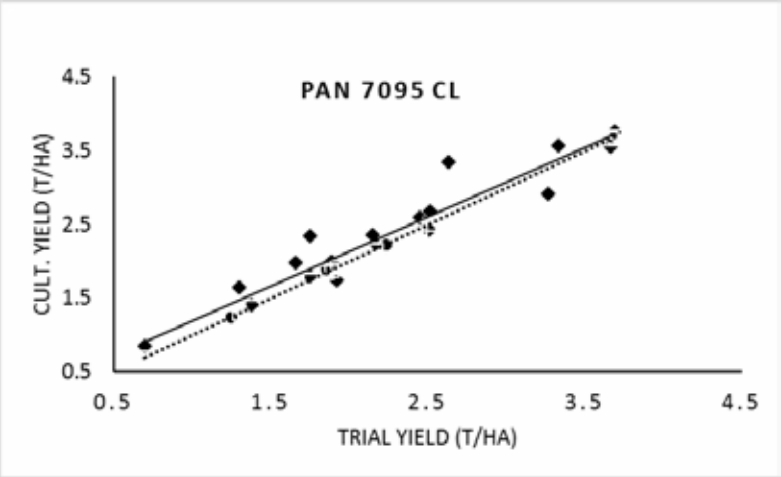
1.5
0.5
0.5
1.5
2.5
3.5
4.5


PAN 7095 CL
CULT. YIELD (T/HA)
TRIAL YIELD (T/HA)
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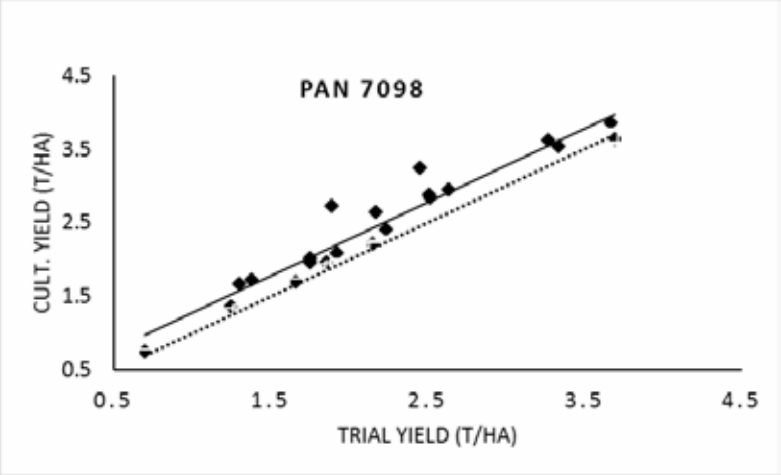
1.5
0.5
0.5
1.5
2.5
3.5
4.5


PAN 7098
CULT. YIELD (T/HA)
TRIAL YIELD (T/HA)
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3.5
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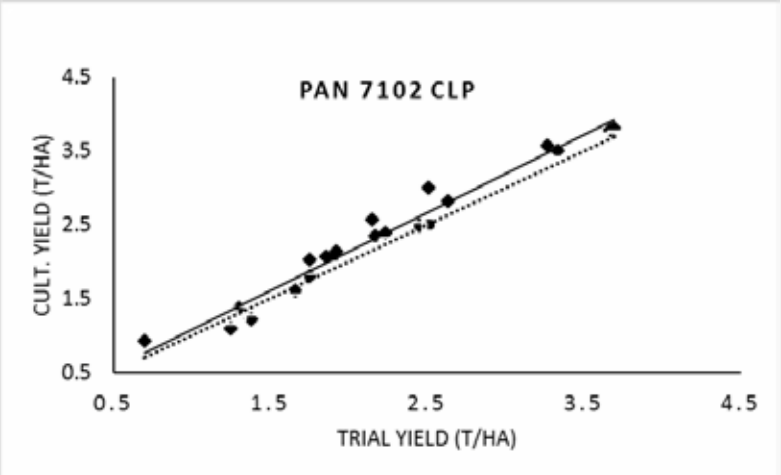
0.5
1.5
2.5
3.5
4.5


PAN 7102 CLP
CULT. YIELD (T/HA)
TRIAL YIELD (T/HA)
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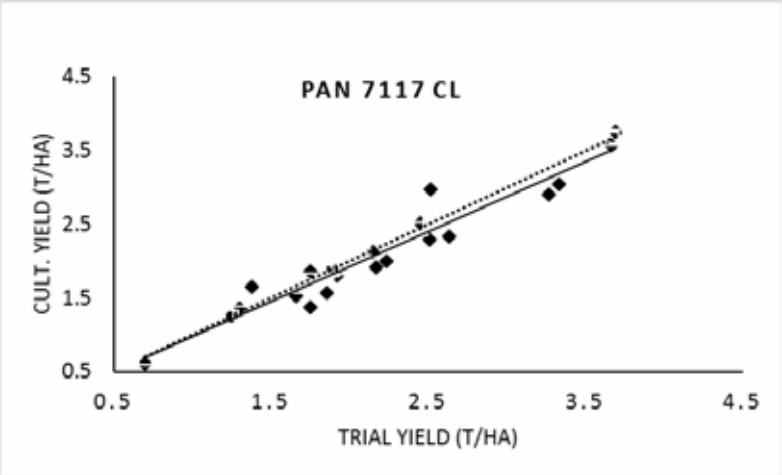
0.5
1.5
2.5
3.5
4.5


PAN 7117 CL
CULT. YIELD (T/HA)
TRIAL YIELD (T/HA)
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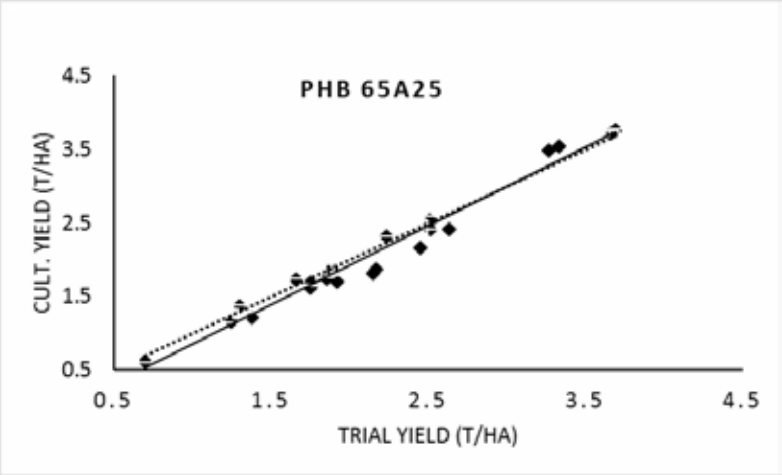
2.5
3.5
4.5


PHB 65A25
CULT. YIELD (T/HA)
TRIAL YIELD (T/HA)
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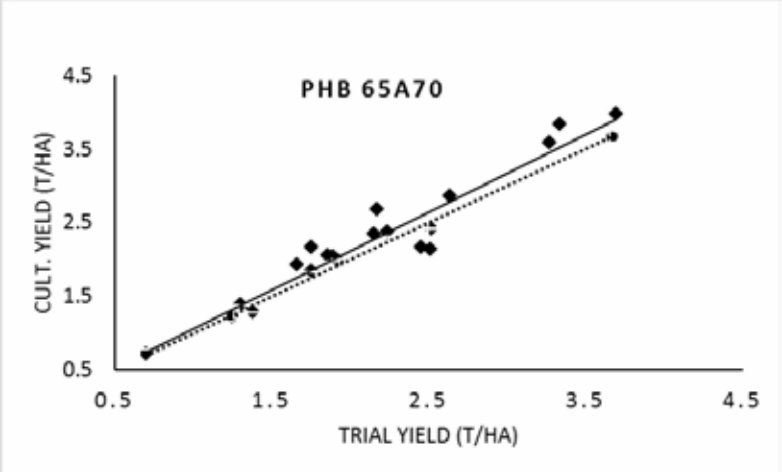
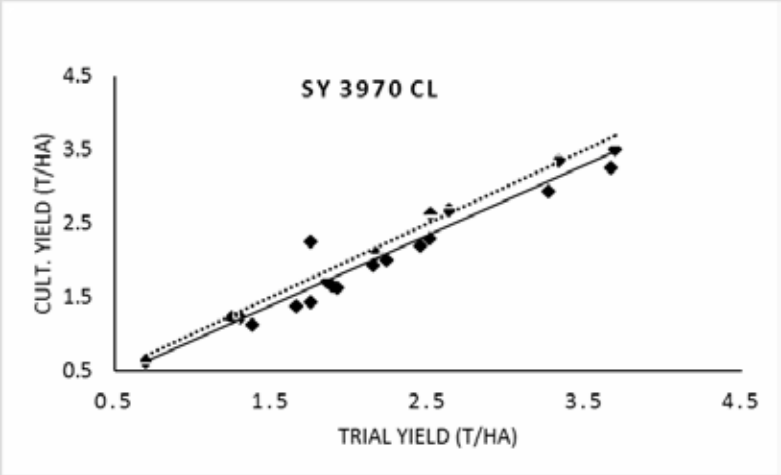
1.5
2.5
3.5
4.5


PHB 65A70
CULT. YIELD (T/HA)
TRIAL YIELD (T/HA)
0.5
1.5
2.5
3.5
4.5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TRIAL YIELD (T/HA)
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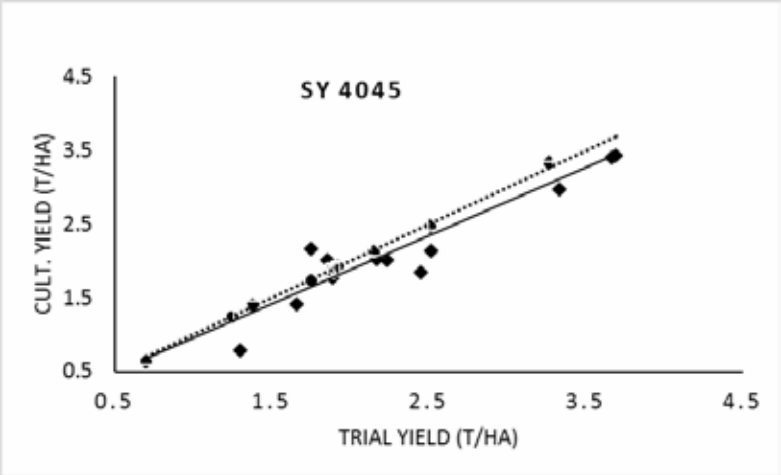
3.5
2.5
1.5
0.5
0.5
1.5
2.5
3.5
4.5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CULT. YIELD (T/HA)
TRIAL YIELD (T/HA)
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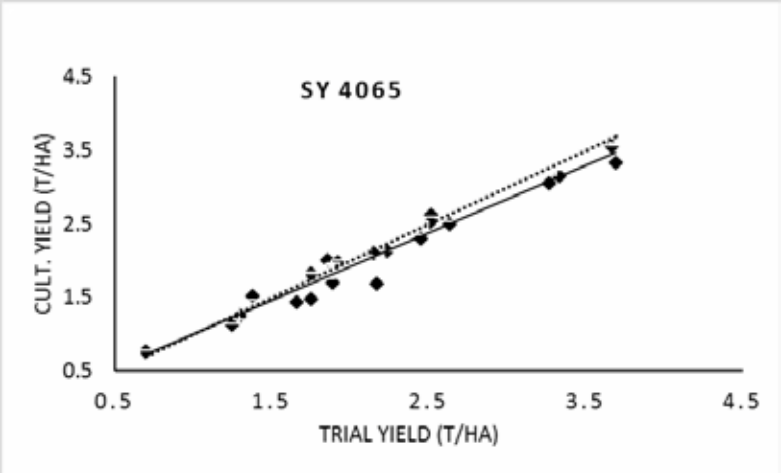
3.5
2.5
1.5
0.5
0.5
1.5
2.5
3.5
4.5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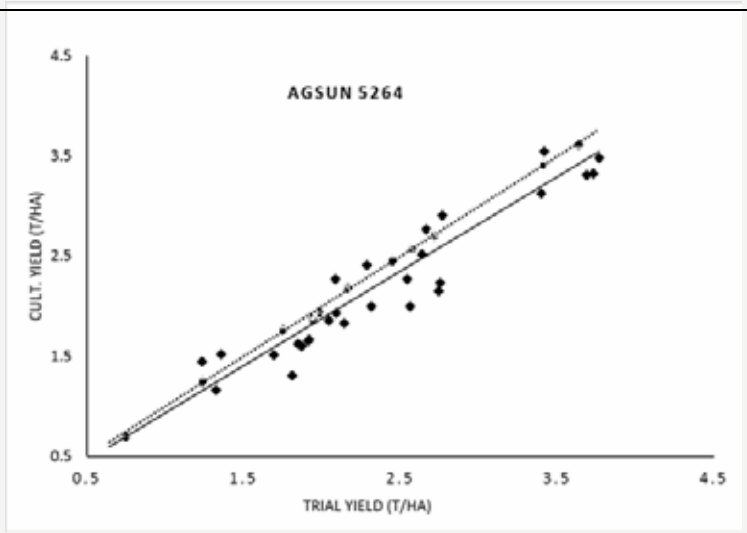
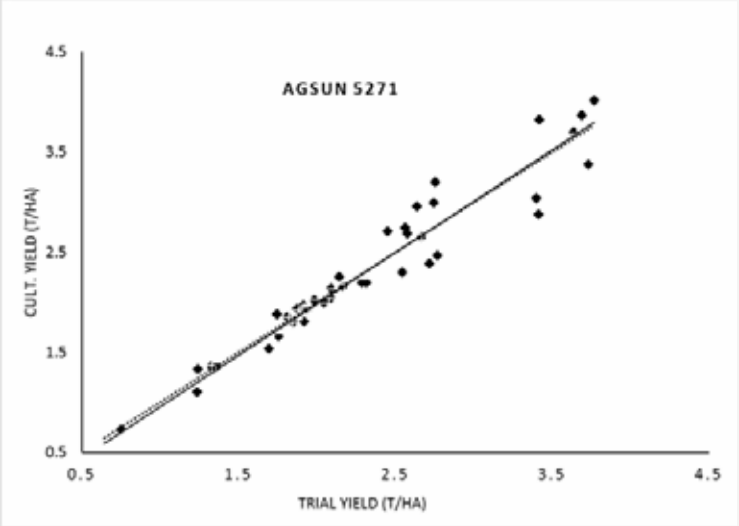
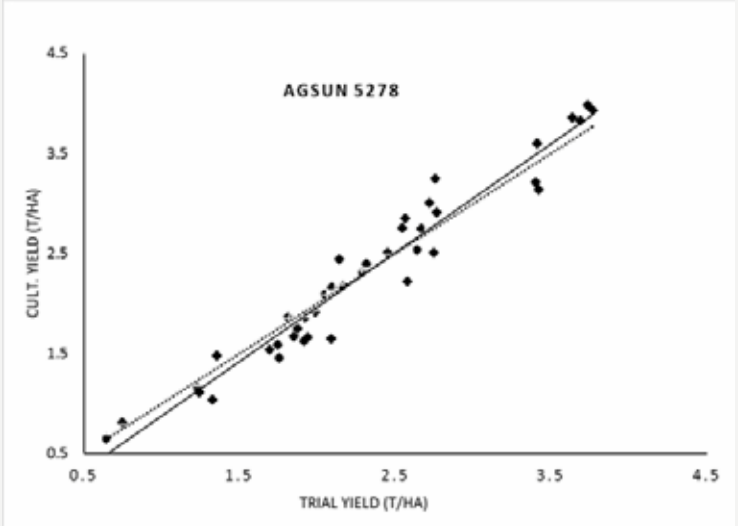
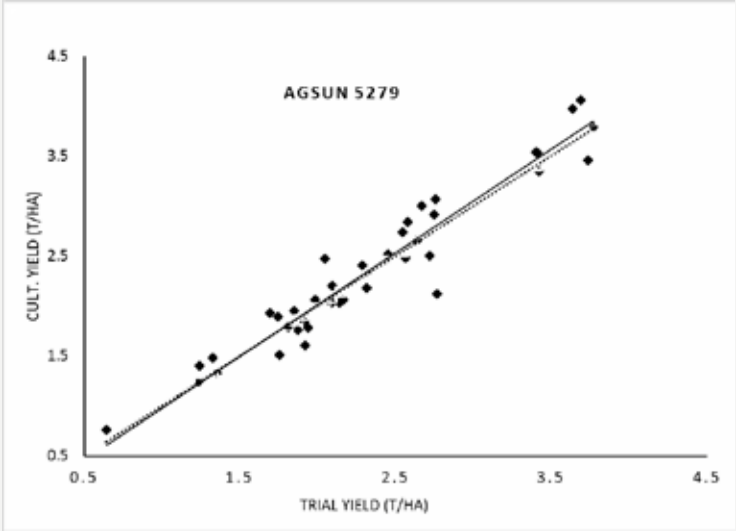
CULT. YIELD (T/HA)
TRIAL YIELD (T/HA)
4.5
3.5
2.5
1.5
0.5
0.5
1.5
2.5
3.5
4.5

Figure 2 Regression lines for cultivars 2013/2014 and 2014/2015. Regression and mean shown as solid and dotted lines respectively








AGSUN 5279
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TRIAL YIELD (T/HA)
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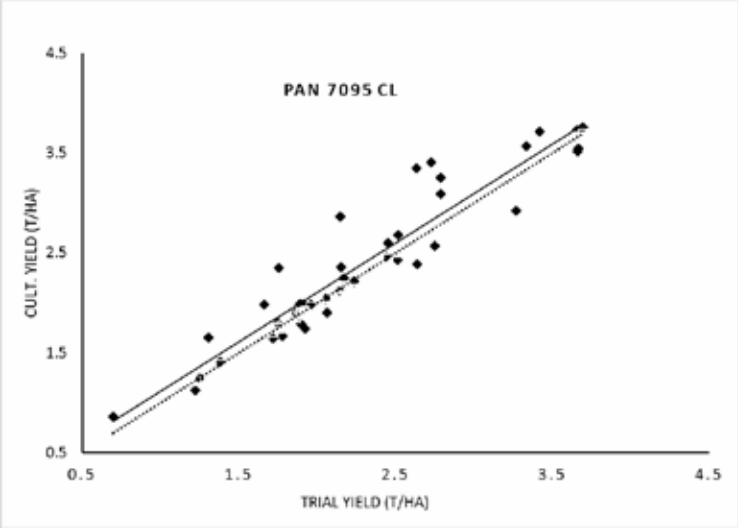
1.5
2.5
3.5
4.5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TRIAL YIELD (T/HA)
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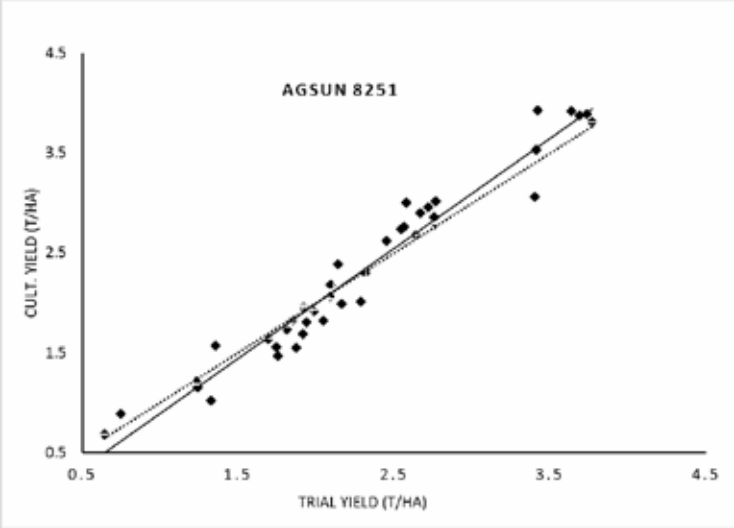
1.5
2.5
3.5
4.5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TRIAL YIELD (T/HA)
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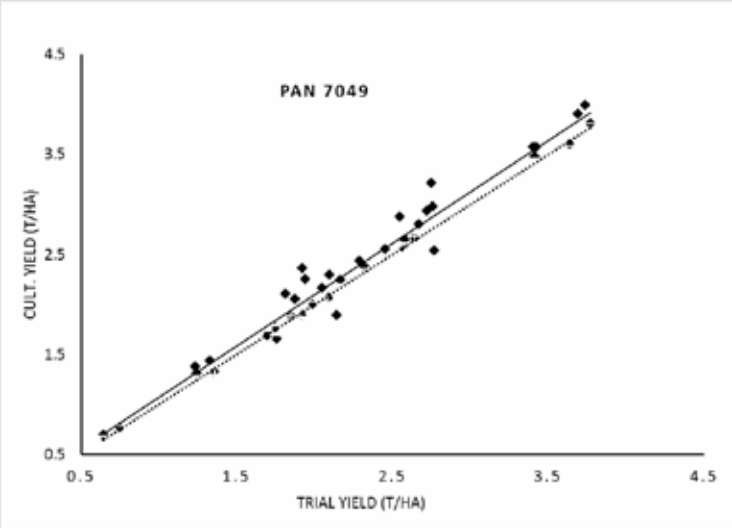
1.5
2.5
3.5
4.5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TRIAL YIELD (T/HA)
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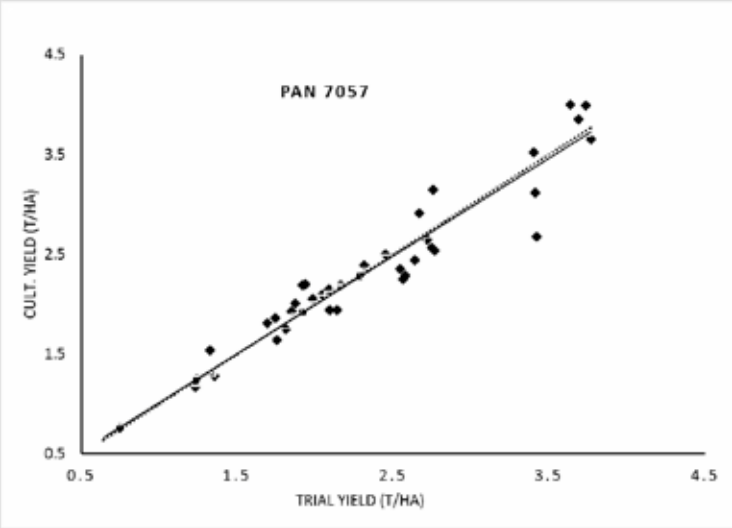
1.5
2.5
3.5
4.5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TRIAL YIELD (T/HA)
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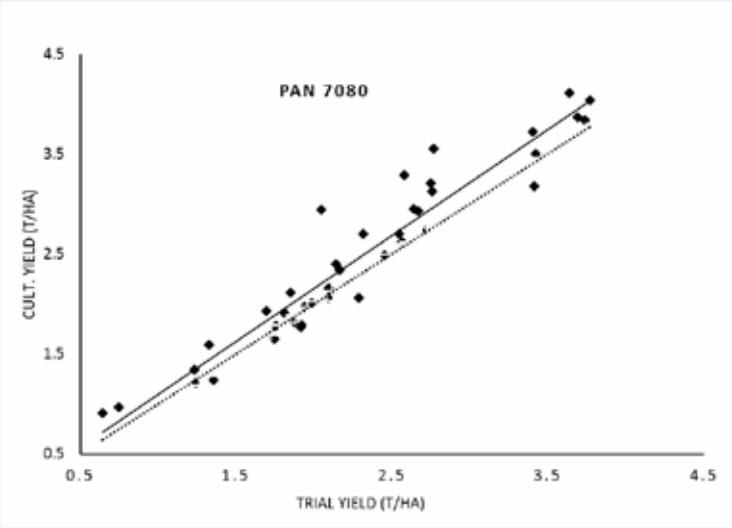
2.5
3.5
4.5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TRIAL YIELD (T/HA)
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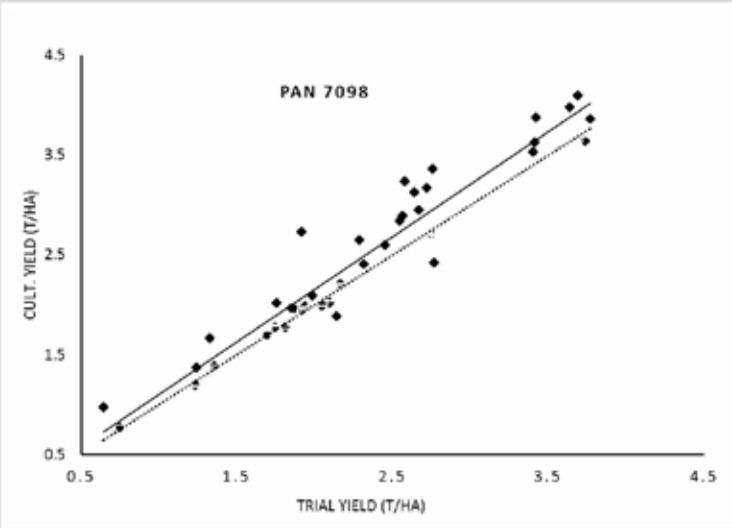
1.5
2.5
3.5
4.5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TRIAL YIELD (T/HA)
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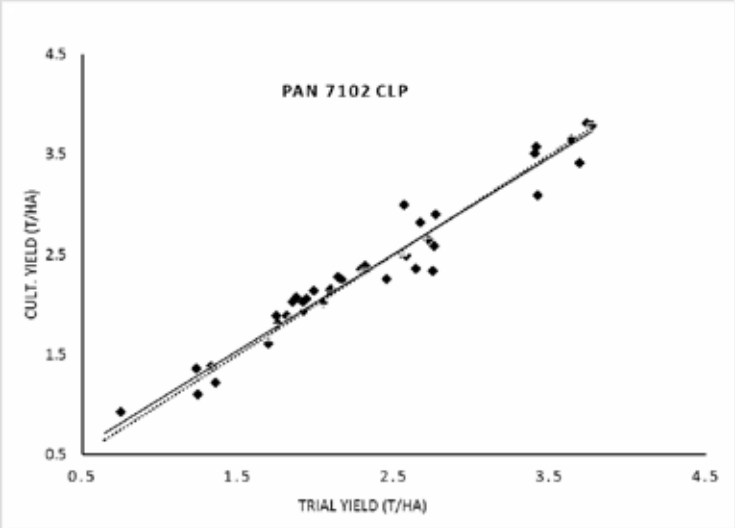
2.5
3.5
4.5


PAN 7102 CLP
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TRIAL YIELD (T/HA)
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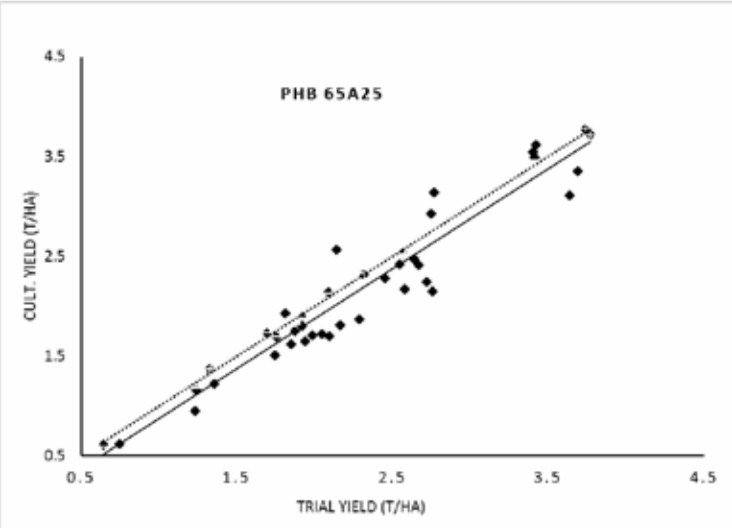
1.5
2.5
3.5
4.5


PHB 65A25
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TRIAL YIELD (T/HA)
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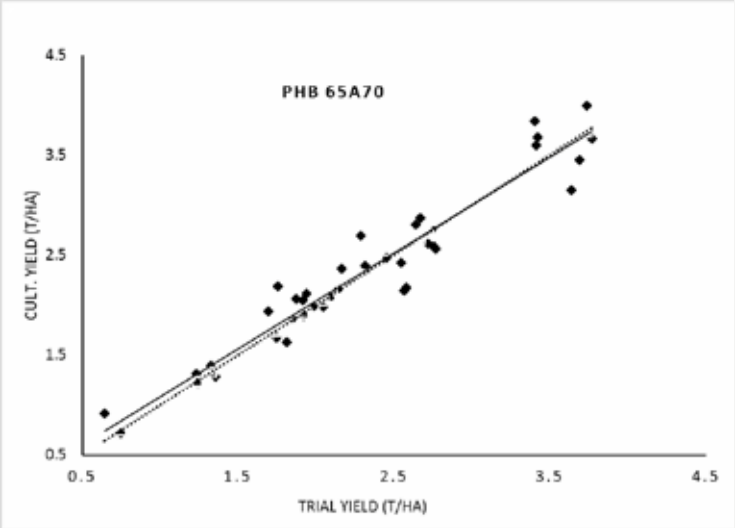
2.5
3.5
4.5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TRIAL YIELD (T/HA)
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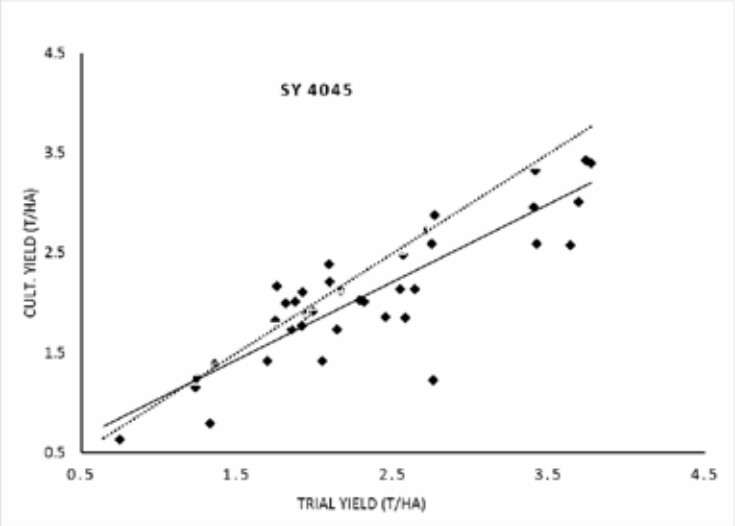
1.5
2.5
3.5
4.5


SY 4045
CULT. YIELD (T/HA)
TRIAL YIELD (T/HA)
0.5
1.5
2.5
3.5
4.5

DEPARTMENT OF AGRICULTURE, FORESTRY AND FISHERIES

NO. 45 **22 JANUARY 2016**

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, Forestry and Fisheries under section 15 of the Agricultural Product Standards Act 119 of 1990, has

(a) made the regulations in the Schedule;

(b) determined that the said regulations shall come into operation on the date of publication thereof; and

(c) read together with section 3(1) of the said Act, repealed the Regulations published by Government Notice No. R 477 of 20 June 2014.

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--

"animal filth" means dead rodents, dead birds and dung;

"bag" means a bag manufactured from--

(a) jute or phormium or a mixture of jute and phormium; or

(b) polypropylene that compiles with SANS specification CKS632 1246: 2012;

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

"consignment" means--

(a) a quantity of sunflower seed of the same class, which belongs to the same owner, delivered at any one time under the same consignment note, delivery note or receipt note, or delivered by the same vehicle or bulk container, or loaded from the same bulk storage structure 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 quality of such grade.

"container" means a bag or a bulk container;

"damaged sunflower seed" means sunflower seed or portion thereof which 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; and

(b) all matter other than sunflower seed and the achene of sunflower seed above the standard sieve. Coal, dung, glass and metal shall not be present in the consignment at all.

"insect" means any live grain insect that is injurious to stored sunflower seed as well as other grain, irrespective of the stage of development of that insect;

"poisonous seeds" mean seeds or part of seeds of plant species that in terms of the Foodstuffs Cosmetics and Disinfectants Act 64 of 1972, may 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;*

"sclerotia" means hard masses of fungal tissue produced by fungus *Sclerotinia sclerotiorum*. The sclerotia vary in size and form and consist of a dark black exterior, a white interior and a rough surface texture;

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

"standard sieve" means 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 (±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; and

(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 seed of the plant species of *Helianthus annuus (L); and*

"the Act" means the Agricultural Product Standards Act 119 of 1990.

Restrictions on sale of sunflower seed

2. (1) No person shall sell sunflower seed in the Republic of South Africa--

(a) unless the sunflower seed are 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 are 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 substance 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) not contain more poisonous seeds than permitted in terms of the Foodstuffs, Cosmetics and Disinfectants Act 54 of 1972;

(d) shall be free from stones, glass, metal, coal or dung;

(e) with the exception of Class Other Sunflower seed, be free from insects;

(f) with the exception of Class Other Sunflower seed, have a moisture content of not more than 10 percent; and

(g) be free from animal filth.

(2) A consignment of sunflower seed shall be classified as --

(a) Class FH if it--

(i) consist of at least 80 percent (m/m) sunflower seed of a cultivar with a high oil content; and

(ii) complies with the standard for Grade 1 set out in regulation 6.

(b) Class FS if it--

(i) consist of at least 80 percent (m/m) sunflower seed of a cultivar with a low oil content; 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 Seed, 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 Grade 1 if the nature of 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 percent 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 the sample referred to in sub regulation (1)(a) is not representative of that consignment, an additional five percent 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 sub regulation(1)(b).

(4) If it is suspected that the sample referred to in sub-regulation (1) (b) is not representative of that consignment, an additional representative sample shall be obtained by using an alternative sampling pattern, apparatus or method.

(5) 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 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 latest revision of the ICC (International Association for Science and Technology) 101/1 method.

PART IV

INSPECTION METHODS

Determination of undesired odour, harmful substances, poisonous seeds, stones, glass, metal, coal, dung, insect and animal filth

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

(a) has a musty, sour, khaki bush or other undesired odour;

(b) contains a substance that renders it unsuitable for human or animal consumption or processing into or utilization thereof as food or feed;

(c) contains poisonous seeds;

(d) contains stones, glass, metal, coal or dung;

(e) contains any insects; and

(f) contains animal filth.

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 result of the 3 hour, 103°C oven dried method [the latest revision of the AACCI ("American Association of Cereal Chemists International") Method 44-15].

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 50g from a representative sample of the consignment.

(b) Place the sample on a standard sieve; 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 that as a 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 of sunflower seed shall be determined as follows:

(a) Obtain a working sample of at least 20g 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 sclerotia

16. The percentage sclerotia in a consignment of sunflower seed is determined as follows:

(a) Remove all sclerotia 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 regulation 15(a) obtained.

(c) Such a percentage represents the percentage sclerotia in the consignment.

Determination of percentage sunflower seed of another class

17. The percentage sunflower seed of another class in a consignment of sunflower seed shall be determined as follows:

(a) Obtain a working sample of at least 20g from a screened sample free of foreign matter and sclerotia.

(b) Remove all sunflower seeds of another class from the working sample by hand and determine the mass thereof.

(c) Express the mass thus determined as a percentage of the working sample.

(d) Such a percentage represents the percentage sunflower seed of another class in the consignment.

Determination of the percentage damaged sunflower seed

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

(a) Obtain a working sample of at least 20 g from a screened sample free of foreign matter and sclerotia.

(b) Shell the seed in the working sample by hand or with a machine so that nucleus portions thereof are retained.

(c) Remove all damaged sunflower seed from the quantity thus shelled and determine the mass thereof.

(d) Express the mass thus determined as a percentage of the working sample.

(e) Such a percentage represents the percentage damaged sunflower seed in the consignment.

PART V

MASS DETERMINATION

19. The mass of sunflower seed shall be determined by deducting the actual percentage sclerotia, screenings and foreign matter found during the inspection process from the total mass of the consignment: Provided that the weighing instruments used for the determination of mass shall comply with the requirements of SANS 1649:2001 published in terms of the Trade Metrology Act 77 of 1973 for the specific class of instrument.

PART VI

OFFENCE AND PENALTIES

20. 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

TABLE 1

STANDARDS FOR GRADES OF SUNFLOWER SEED

DEVIATIONS		**Maximum permissible deviations**	
		Class FH	**Class FS**
		Grade1	
1.	Damaged sunflower seed	10%	
2.	Screenings	4%	
3.	Sclerotia	4%	
4.	Foreign Matter	4%	
5.	Deviation in 2,3 and 4 collectively: Provided that such deviations are individually within the limits of said items.	6%